

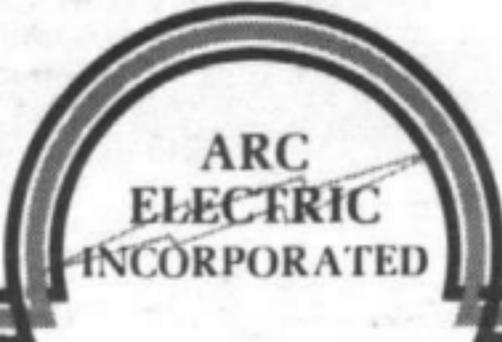
UNIVERSAL CONTROLS

CHESAPEAKE VA

PHONE 420-4672



N62470-85-C-5162



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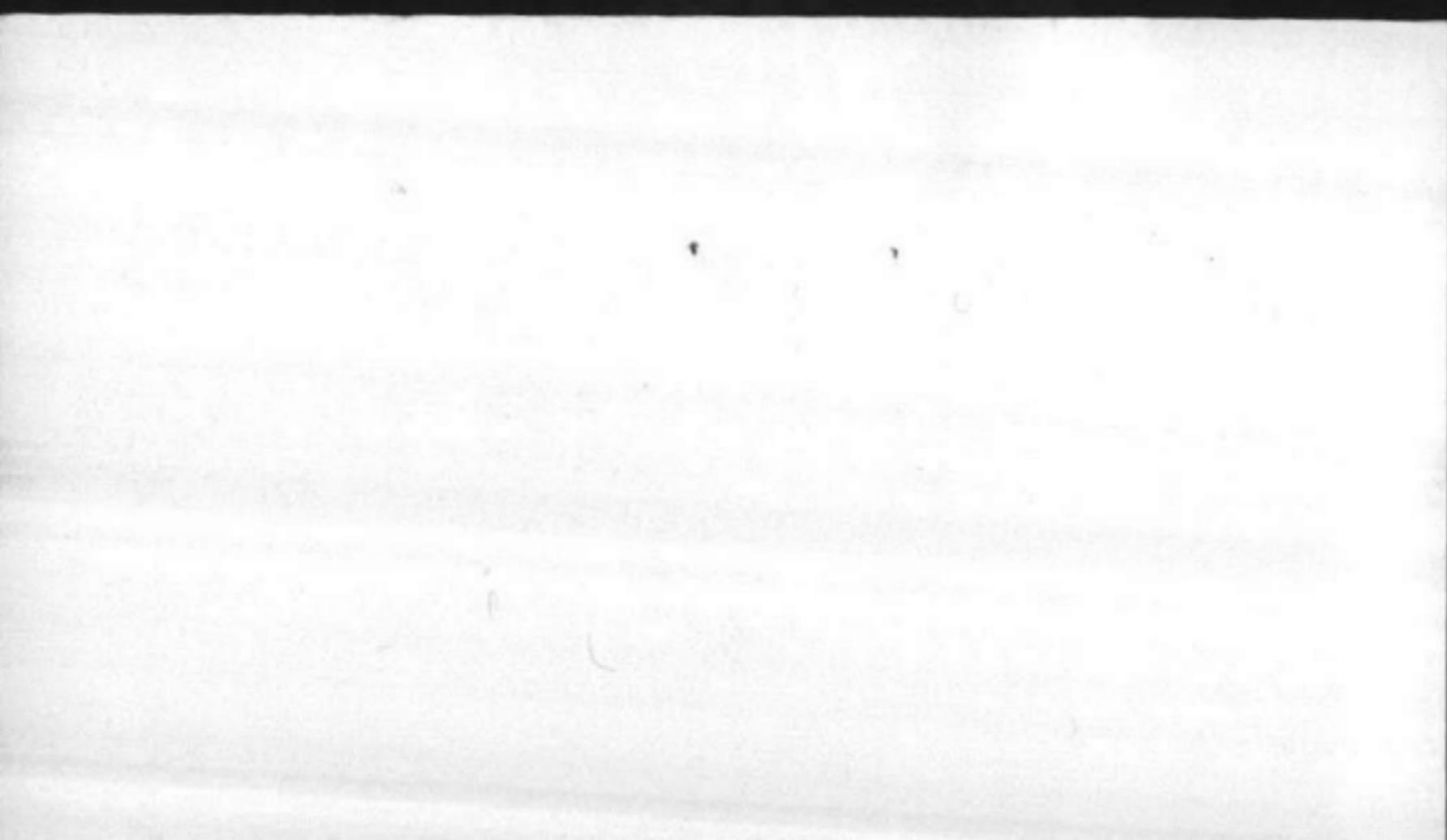
Robertshaw
LICENSEE 

**UNIVERSAL
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Commercial, Industrial Control Systems

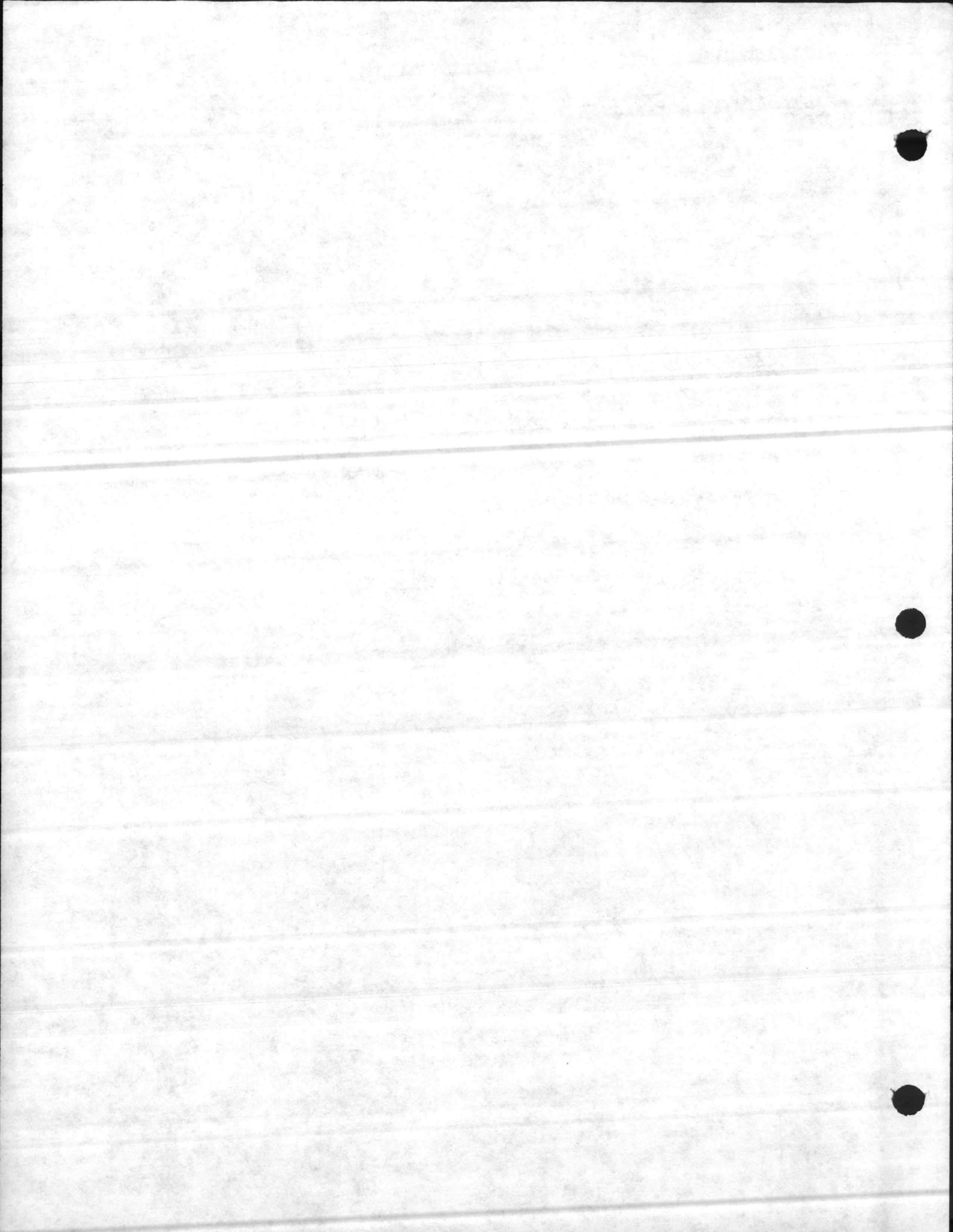
OPERATION AND MAINTENANCE MANUALS

FOR

BACHELOR ENLISTED QUARTERS

MCAS, NEW RIVER, N.C.

N62470-85-C-5162





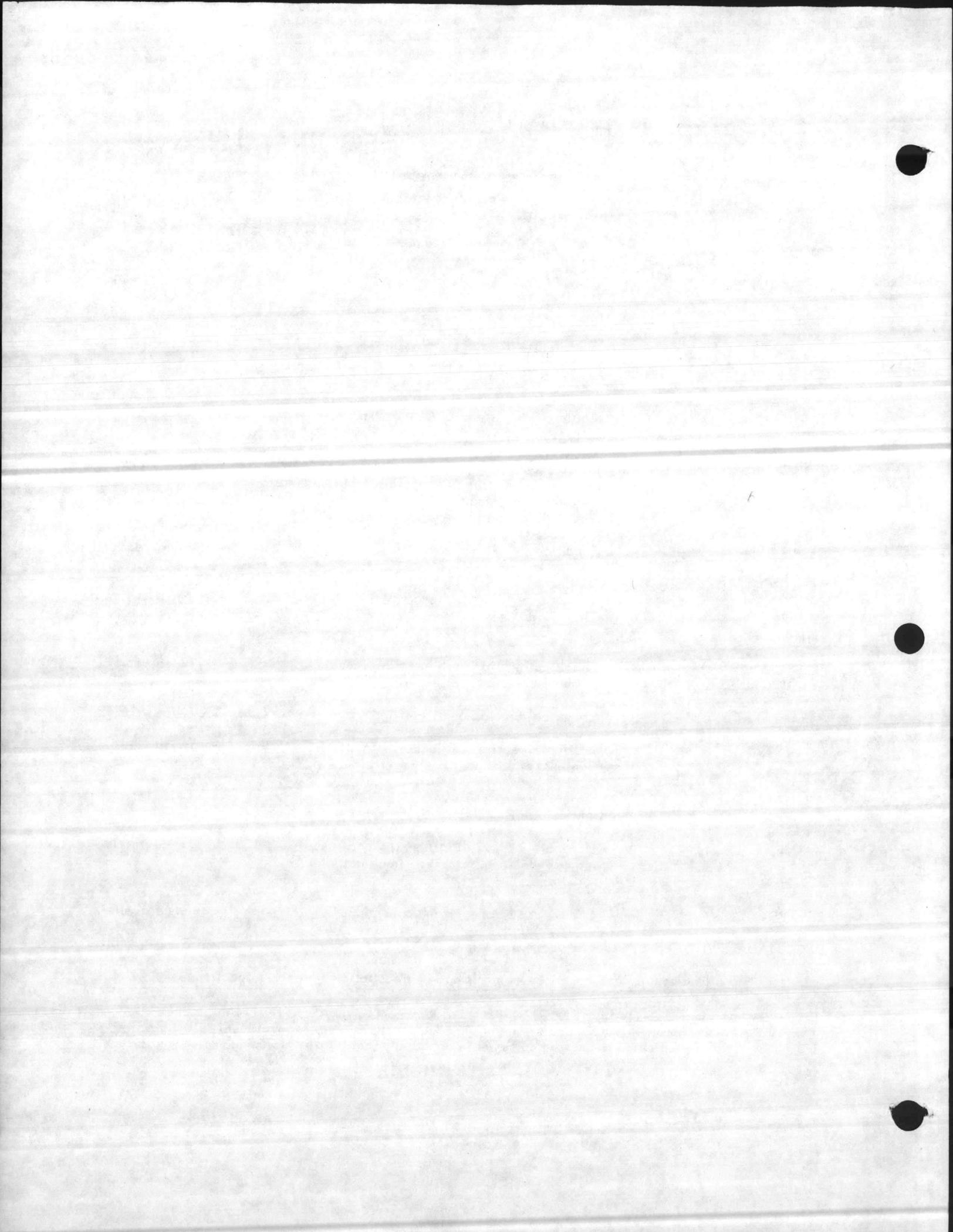
MAINTENANCE REQUIREMENTS

The items listed below are normal recommended maintenance procedures to be performed by the owner's maintenance staff.

<u>EQUIPMENT</u>	<u>TYPICAL SERVICE REQUIRED</u>	<u>FREQUENCY</u>
AIR COMPRESSOR(S)	Drain air volume tank.	Once a week
	Check crankcase oil level.	Twice monthly
	Drain and refill crankcase with recommended oil. Oil motor.	Three months
	Clean supply air intake filter. Check pressure regulator valves and air filter. Manually actuate safety valve.	Three months
CONTROL SYSTEM AIR DRYER (If included in system)	Inspect condenser coil, blow the dust off the coils and fans. Check temperature of condenser air for correct amount of heat transfer. Check automatic condensate trap on dryer.	Three months
THERMOSTAT & TEMPERATURE CONTROLLERS	Check calibration and throttling range.	Twice yearly
EP & PE SWITCHES	Clean and check for proper operation.	Twice yearly
PRESSURE CONTROLLERS	Check calibration and throttling range, examine pressure control piping for leaks.	Twice yearly
HUMIDISTATS	Check calibration and throttling range.	Twice yearly
DAMPERS	Lubricate bearings. Check all linkage for tightness and damper for proper close-off.	Twice yearly
ACTUATORS	Inspect stroke, positive positioner relay and actuator mechanism for accuracy.	Twice yearly
VALVES	Lubricate stem. Adjust packing and replace where necessary. Check actuator for stroke.	Twice yearly
RELAYS	Check for switchover and operation.	Once a year
PNEUMATIC SWITCHES	Check for operation and leakage.	Once a year

In all cases, replace covers on controls and devices following each inspection.

If your control system is covered by a **Robertshaw** PREVENTATIVE or GENERAL MAINTENANCE PROGRAM, many of the above items will automatically be performed under the agreement. Our local Robertshaw Branch Office will be pleased to furnish additional information or design a service program for your system.



UNIVERSAL CONTROLS DIVISION
820 JUNIPER CRESCENT
CHESAPEAKE, VA 23320

BEQ, NEW RIVER

CONTRACT NO. N62470-85-C-5162

SEQUENCE OF OPERATION

CENTRAL SYSTEM CHANGEOVER CONTROL

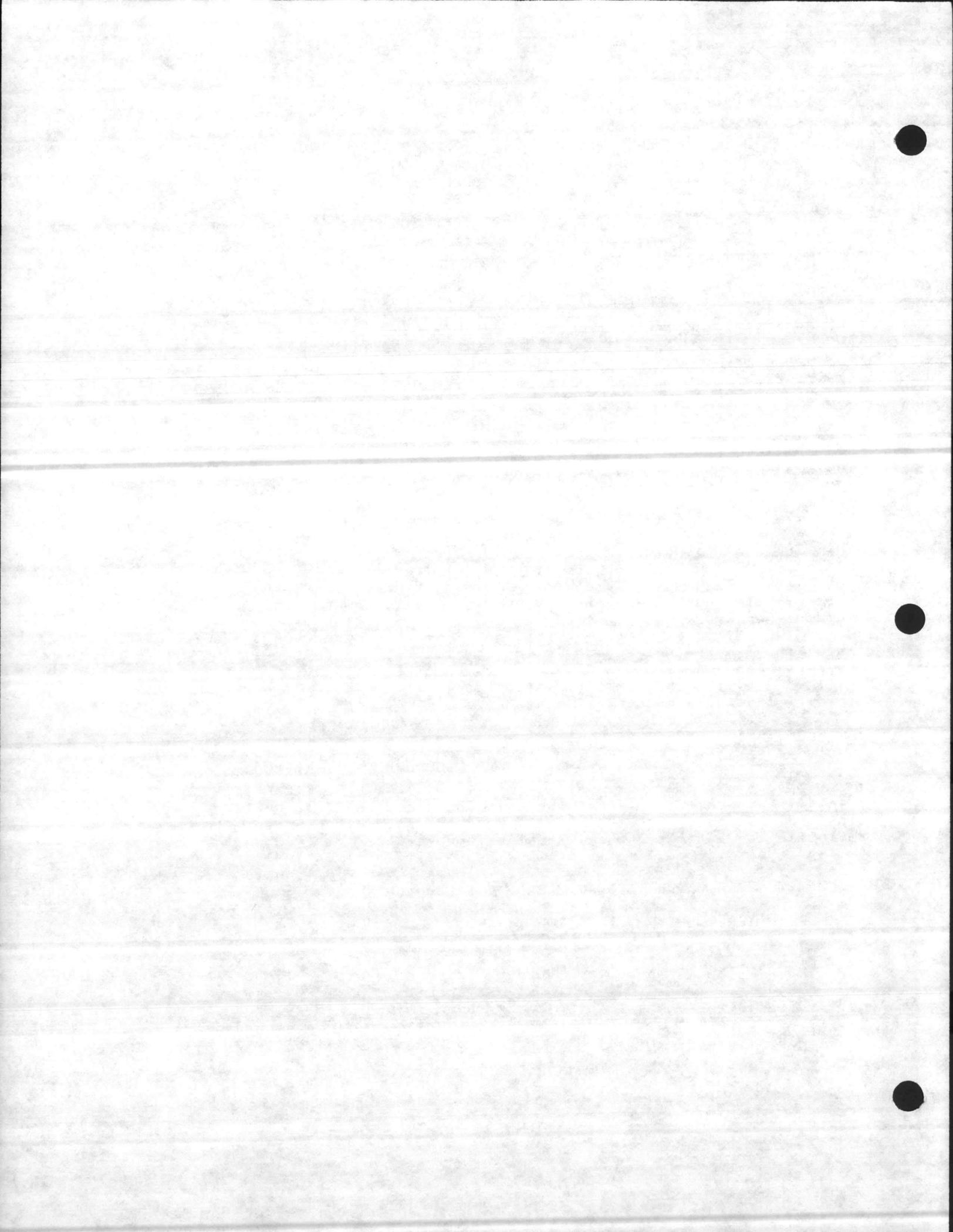
=====
System changeover from heating to cooling (and vice versa) shall be accomplished by a manual "summer/winter" switch mounted in the control panel located in the mechanical building. With the changeover switch in the "winter" position, no control air will be passed to diverting valves V-3 causing flow diversion to hot water converter, SC-1, and bypassing the chiller cross-over bridges. When the changeover switch is in the "summer" position, 20 PSI control air will be supplied to diverting valve V-3 causing flow diversion from SC-1 to the chiller cross-over bridge. The 20 PSI air will be supplied to PE-2 which is wired to the receiver-controller of the chiller protection valve V-4. Valve V-4 will begin to open the port from the cross-over bridge when the temperature sensor in the location indicated senses 80 degrees Fahrenheit water. The port from the cross-over bridge will be fully open when the sensor senses 60 degrees Fahrenheit water. (See chiller control sequence).

CHILLER (C-1) CONTROL

=====
The air-cooled water chiller (C-1) will have self-contained controls which will start the unit on a demand for cooling. Integral capacity controls will operate system unloaders to maintain the indicated chilled water temperature. A flow switch will prevent the chiller from starting unless there is a flow in the chilled water line. For system change-over from "heat" to "cool". See "Central System Change-Over Control".

CHILLER WATER PUMP (P-1) CONTROL

=====
Pump P-1 will be controlled by a "hand-off-auto" switch. In the "auto" position, Pump P-1 will be energized by a P.E. switch activated by the summer/winter change-over switch. In the "hand" position, Pump P-1 will run continuously. Flow will be sensed by a flow switch and verified by a panel mounted pilot light.



HOT WATER PUMP (P-2) CONTROL
=====

Pump P-2 will be controlled by a "hand-off-auto" switch. In the "auto" position, P-2 will be energized through a pneumatic-electric switch activated by the summer/winter change-over switch. In the "hand" position, Pump P-2 will run continuously. Pump energization will be indicated by a panel mounted pilot light.

DOMESTIC HOT WATER RECIRCULATING PUMP (P-4) CONTROL
=====

Pump P-4 will be controlled by a "hand-off-auto" switch. In the "auto" position Pump P-4 will be energized when the recirculated domestic hot water temperature falls below 105 degrees Fahrenheit. When the temperature rises above the setpoint, the reverse will occur. In the "hand" position, Pump P-4 will run continuously. Flow will be verified by a panel mounted pilot light.

CHILLED WATER PUMP P-3 CONTROL
=====

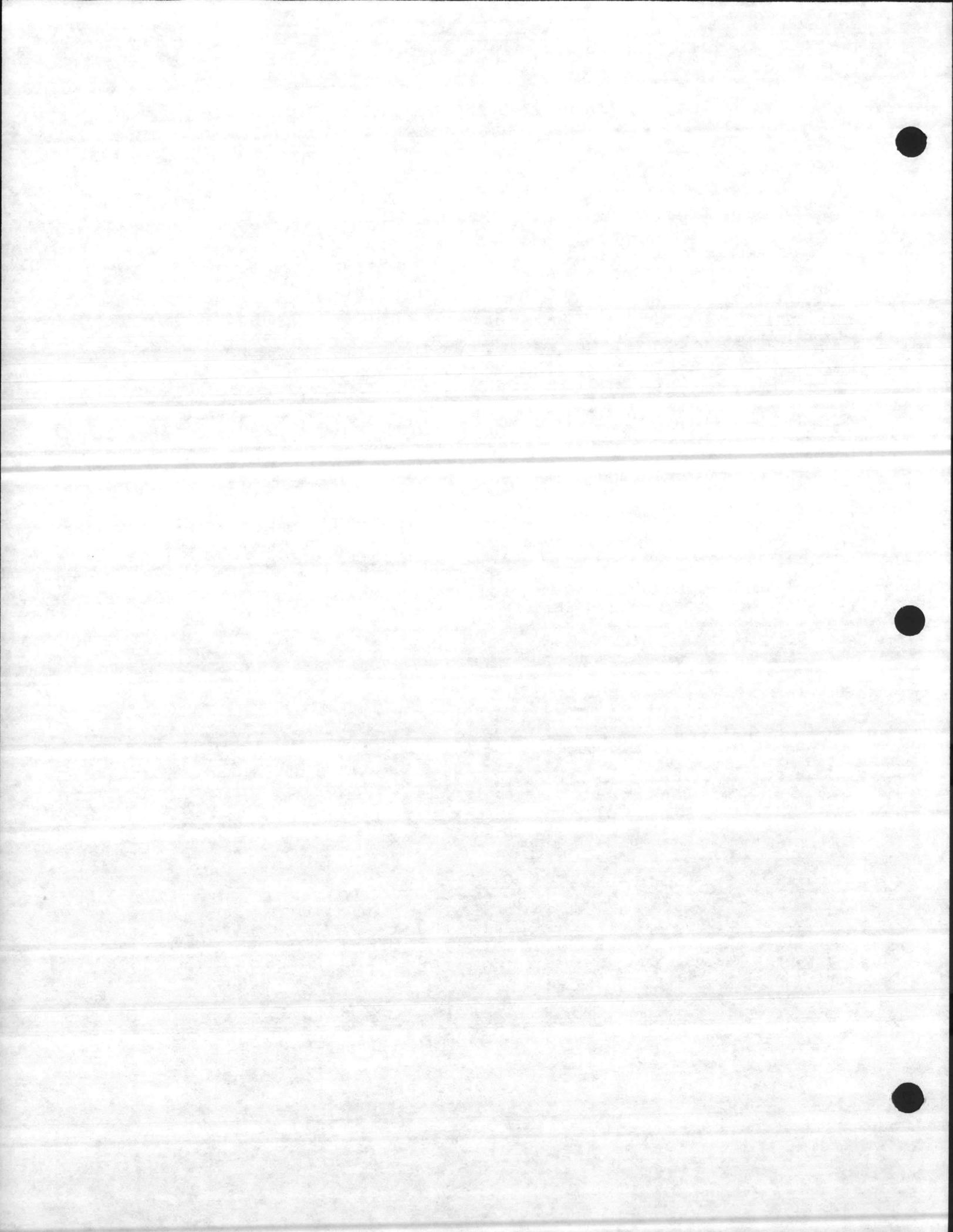
Similar to Pump P-1 control.

SUMP PUMP (P-5 & P-6) CONTROL
=====

Pump P-5 will be controlled by a "hand-off-auto" switch. In the "auto" position, Pump P-5 will be energized by a float switch set to close at a predetermined water level. In the "hand" position, Pump will be started manually. Pump P-6 will have same control sequence.

HOT WATER CONVERTOR (SC-1) CONTROL
=====

When the "summer/winter" change-over switch is in the "winter" position, the hot water supply (HWS) temperature will be maintained by a panel-mounted controller (C-12) which will modulate the convertor control valve (V-1). V-1 will be indexed "closed" whenever the change-over switch is in the "summer" position. When the outside air temperature rises to 65 degrees Fahrenheit and above, V-1 will be fully closed. On a fall in outside air temperature below 65 degrees Fahrenheit, the reverse will occur.



DOMESTIC HOT WATER HEATER (SC-2) CONTROL
=====

The domestic hot water tank temperature will be controlled by a panel-mounted controller (C-6). The water temperature will be sensed by a sensor with its bulb in the hot water tank so that on a drop in tank water temperature below the controller will modulate "open" the steam control valve (V-2). On a rise in water temperature above the setpoint (V-2) will modulate "closed".

EXHAUST FAN (EF) CONTROL
=====

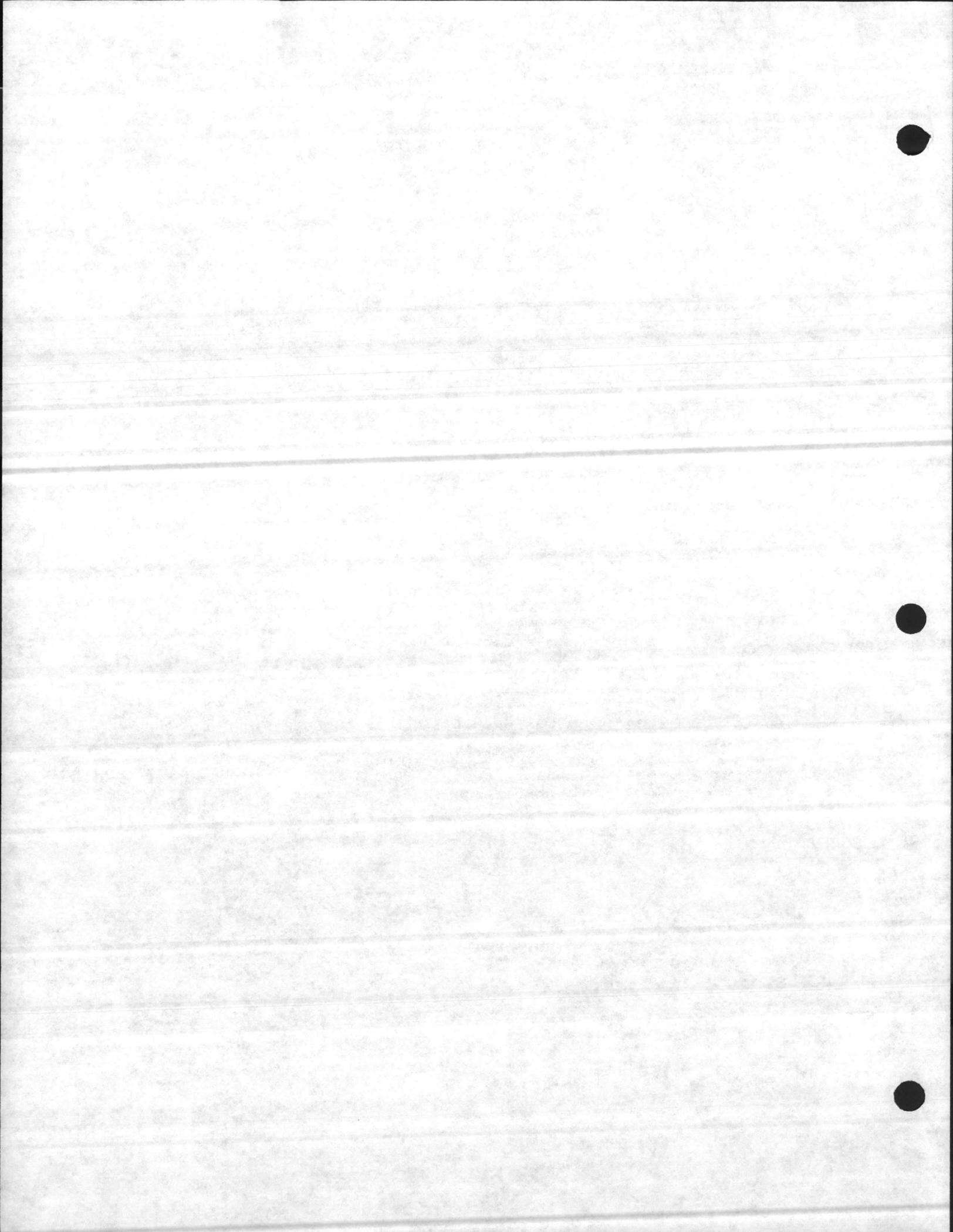
Exhaust fans (EF-1, EF-7 and EF-8 will be energized by the light switches in their respective rooms. Exhaust fans EF-2, EF-3 and EF-4 will be interlocked with fan coil units FCU-1, FCU-3 and FCU-5, respectively. Exhaust fan EF-5 and its motor operated discharge damper will be energized by a wall-mounted thermostat with its setpoint at 85 degrees Fahrenheit. Exhaust fans EF-8 and EF-9 will be energized by wall-mounted thermostats with their setpoints at 80 and 90 degrees Fahrenheit, respectively. Exhaust fans EF-10, EF-11 and EF-12 will be interlocked with fan coil units FCU-2, FCU-4 and FCU-6, respectively.

ENCLOSED STAIRWELL VENTILATION CONTROL
=====

Natural stairwell ventilation will be provided by the opening of O.A. intake louver and relief vent 2-position, motor operated dampers. The aforementioned dampers will energize fully open at 85 degrees Fahrenheit through the action of a wall-mounted thermostat with an 85 degree Fahrenheit setpoint. Below the setpoint temperature, the reverse will occur.

FAN COIL UNITS
=====

A heating cooling pneumatic thermostat at (RT-1) will control the fan coil unit valve (V-11,12,13,14,15 or V16). The changeover will be from the central control aquastat (AQ-2). Fan operation will be controlled by a fan switch. Unit outside air dampers will open whenever unit is running.



LAUNDRY ROOM CONTROL
=====

A two-stage heating/cooling thermostat (RT-2) will energize the exhaust fan anytime space temperature exceeds 83 degrees F. and energize the unit heater fan whenever the space temperature falls below 68 degrees F. When the room temperature falls below 80 degrees F., the exhaust fan will be de-energized. A strap-on aquastat (AQ-3) will prevent the unit heater from operating if the water temperature is below 80 degrees F. and close two-position valve (V-17).

AIR HANDLER UNIT CONTROL (FOR EACH A.H. UNIT)
=====

Units will be started and stopped manually. When energized N.C. O.A. (D-1) will open to its set position.

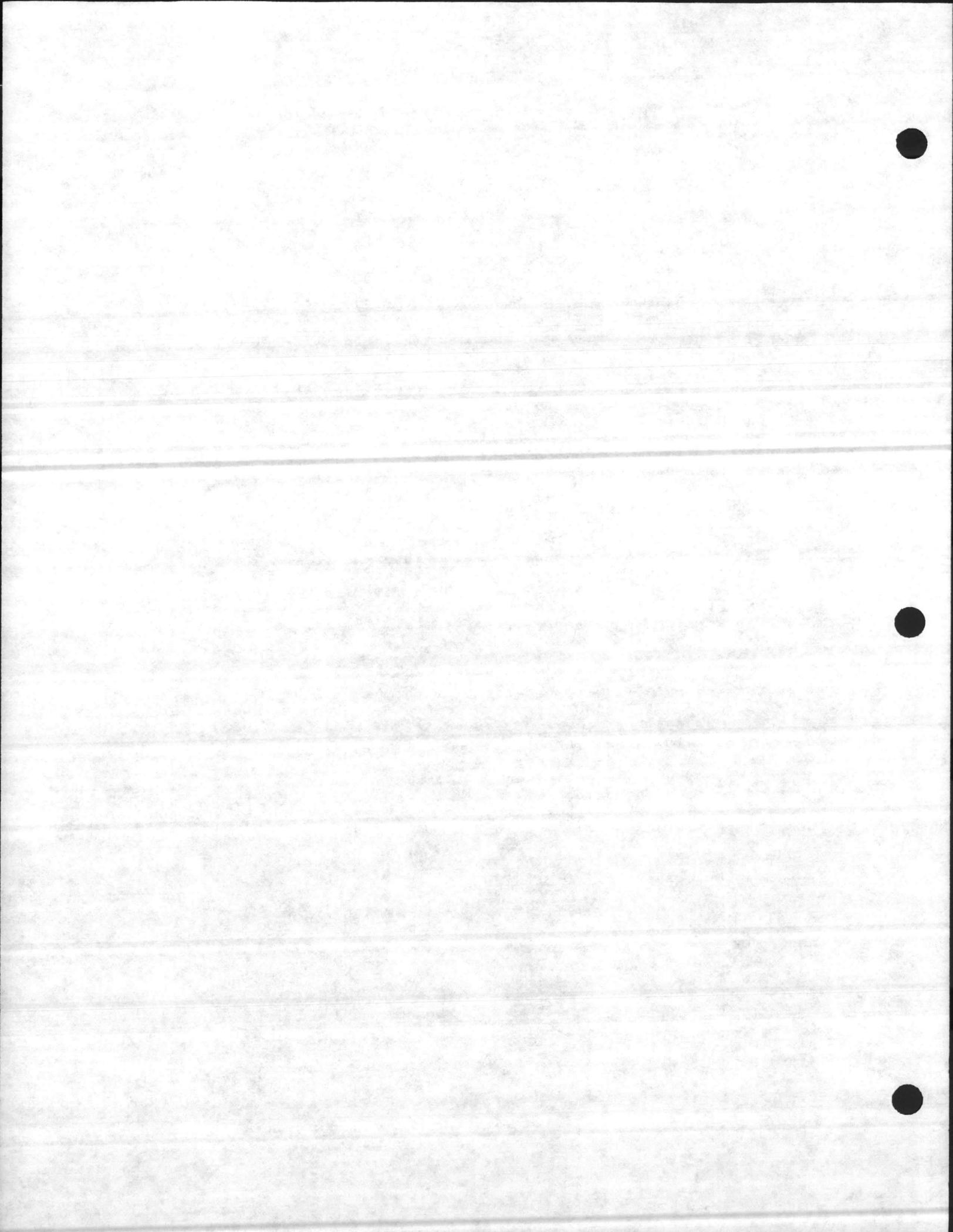
The AH unit and room controls will be indexed for heating or cooling from an aquastat (AQ-2) in the CW/HW supply piping from central system. When 75 degrees F. or above water temperature is sensed, the system will be indexed for heating. When 65 degrees F. or below water is sensed, the system will be indexed for cooling.

With AH units operating and system indexed for heating, the outside air sensor (OAT) will reset the discharge air temperature (SAT) over a predetermined schedule. On a fall in discharge temperature, controller (C-2) will reposition three-way or two-way valve (V5 - V10) supplying hot water to the unit coil.

With the AH unit operating and system indexed for cooling, the discharge air controller (SAT) will be automatically set to maintain 59 degrees F. constant discharge air temperature at C-3) The return air sensor will be locked out along with (C-2).

A temperature low limit thermostat (LL) will shut the AH unit down at 38 degrees F.

A smoke detector (SD) will shut down if smoke is sensed.



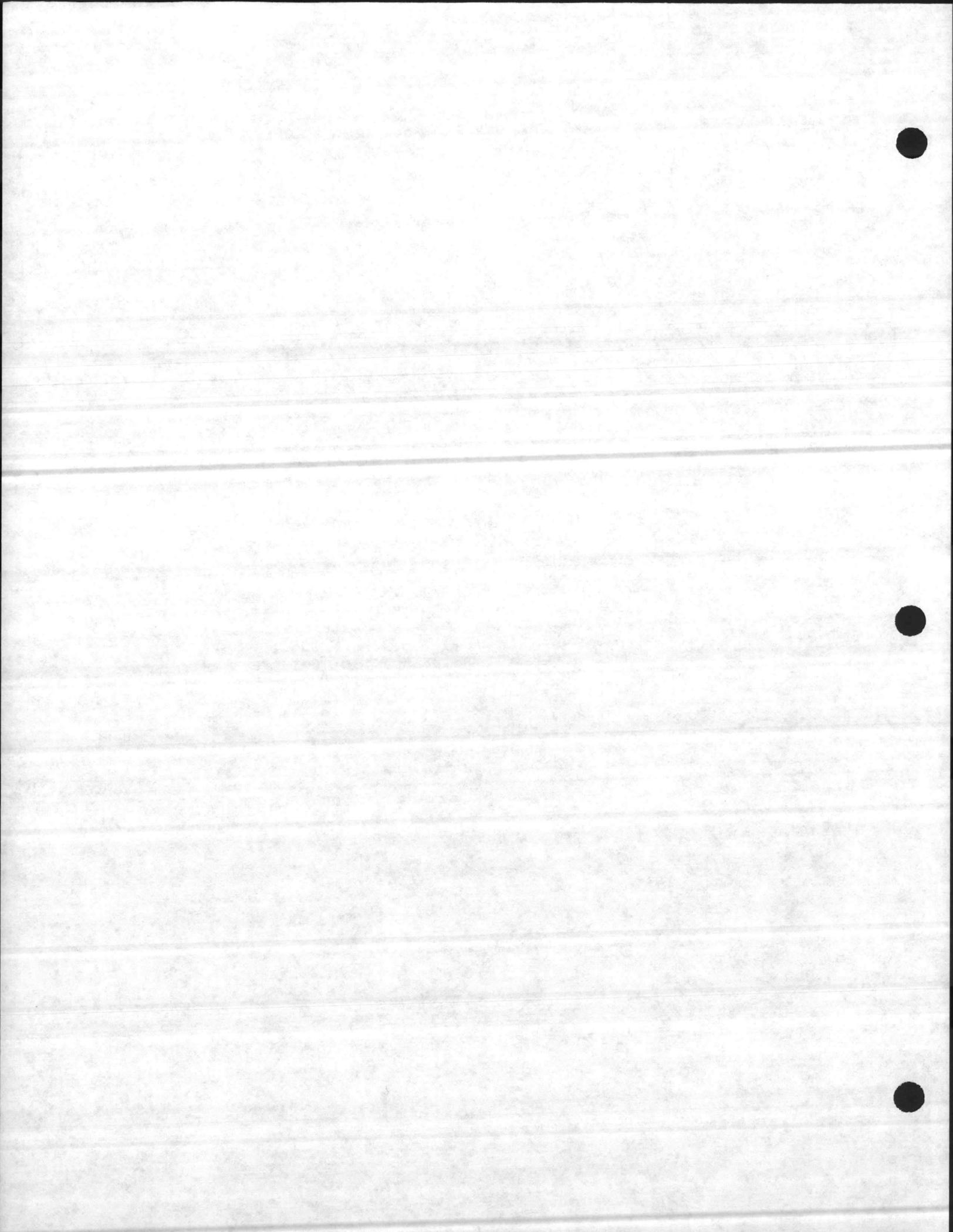
ROOM CONTROL
=====

With the unit thermostat (UT-1) indexed for heating, the unit thermostat will on a fall in temperature modulate the tab supply air damper open simultaneously closing the room return air damper. With the thermostat indexed for cooling the thermostat will on a rise in temperature modulate to open the tab supply air simultaneously closing the room return. Indexing for heating and cooling will be automatic by central source. Unit thermostat will be mounted to sense terminal air blender return air as shown on drawings.

Unit fans will run continuously if the associated air handling unit is running and if the room switch is in the on position. Units can be disabled by either the room switch or by shutting down its respective air handling unit.

AH UNIT STATIC PRESSURE CONTROL
=====

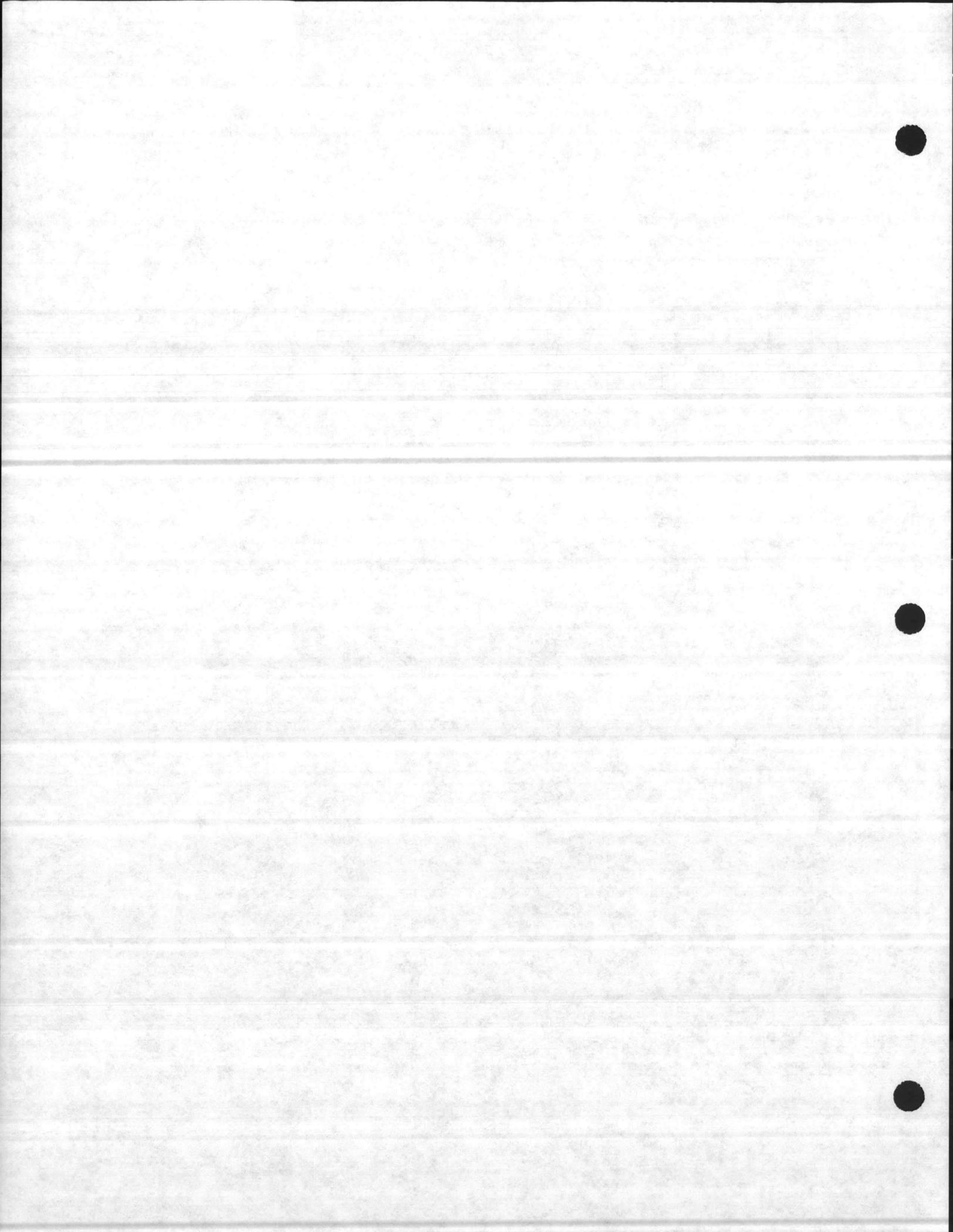
A static pressure control (SP) will be provided for each AH unit. On a rise in static pressure above the controller (C-5) setpoint (1 inch adj.) the controller will modulate (D-2) on the inlet vane on the AHU unit fan. The controller setpoint is adjustable.



FIELD - MATERIAL LIST

QTY	DESCRIPTION	CAT NO	MANUFACTURER	SPEC.#	LEGEND

6	ACTUATORS	M574-1211	ROBERTSHAW	2.1.3.1	D-2
14	ACTUATORS	M572-5311	ROBERTSHAW	2.1.3.1	D-1/3
6	TEMP. TRANS.	T150-1022	ROBERTSHAW	2.1.5	SAT
7	TEMP. TRANS.	T150-1054	ROBERTSHAW	2.1.5	OAT
1	TEMP. TRANS.	T150-1011	ROBERTSHAW	2.1.5	T-1
1	TEMP. TRANS.	T150-1031	ROBERTSHAW	2.1.5	T-3
1	TEMP. TRANS.	T150-1021	ROBERTSHAW	2.1.5	T-2
6	LOW LIMIT	T312-2	ROBERTSHAW	2.1.8.7	LL
1	THERMOSTATS	T675A1540	HONEYWELL	2.1.8.5	T-4
1	THERMOSTATS	T18-301	ROBERTSHAW	2.1.8	RT-1
3	THERMOSTATS	T35-301	ROBERTSHAW	2.1.8	RT-2
*186	THERMOSTATS	T34-3011	ROBERTSHAW	2.1.8	RT-3/UT-1/2
186	DUCT MOUNTING BRACKET	UCDMB1	ROBERTSHAW	2.1.8	UT
1	THERMOSTAT	TC-2974	BARBER COLEMAN	2.1.13	AQ-1
1	THERMOSTAT	T42B1027	HONEYWELL	2.1.13	T-5
6	STATIC PRESS. TRANS.	P323-03	ROBERTSHAW	2.1.6.1	SP
6	DIFF. PRESS. SWITCH	R436	ROBERTSHAW	2.1.10.2	DP
2	VALVE	V6600-35307	ROBERTSHAW	2.1.2	V-7/10
4	VALVE	V6800-15307	ROBERTSHAW	2.1.2	V-12/14/16
2	VALVE	V6800-35307	ROBERTSHAW	2.1.2	V-8/9
2	VALVE	V6800-25307	ROBERTSHAW	2.1.2	V-11/13
2	VALVE	V6800-30307	ROBERTSHAW	2.1.2	V-5/6
1	VALVE	V6600-25307	ROBERTSHAW	2.1.2	V-15
1	VALVE	V6700-40307	ROBERTSHAW	2.1.2	V-1
1	VALVE	V6700-16307	ROBERTSHAW	2.1.2	V-17
1	VALVE	V6700-30307	ROBERTSHAW	2.1.2	V-2
2	BUTTERFLY VALVE	4" 3-WAY	VALVE ASSEMB.	2.1.2	V-3/4
1	FLOW SWITCH	FS4-3	MCDONALD MILL.	2.1.12	FS
***1	STEAM METER	2"	BIF	2.1.15	
6	SMOKE DETECTORS	MS110N	DETROIT CONTR.	2.1.13	SD
6	STATIC PRESS. PROBE	VOLU-PROBE 1	AIR MONITOR	2.1.6.1	
7	P/E	R471-1	ROBERTSHAW	2.1.13	PE
9	E/P	R429-120	ROBERTSHAW	2.1.13	EP
3	E/P	225B-111CA	MAC	2.1.13	EP1
**1	THERMOSTAT	T318	ROBERTSHAW	2.1.8.5	AQ-2
9	PRV	N1-11B	ROBERTSHAW	2.2.1.5	PRV
12	CONTACT	1A656	FURNAS	2.3.2	C
3	DAMPERS PARELL. BLADE	61" X 6" RCD46	RUSKIN	2.1.1	
3	DAMPERS PARELL. BLADE	10" X 6"	RUSKIN	2.1.1	
1	DAMPERS PARELL. BLADE	24" X 24"	RUSKIN	2.1.1	
1	DAMPERS PARELL. BLADE	44" X 24"	RUSKIN	2.1.1	
6	DAMPERS PARELL. BLADE	10" X 10"	RUSKIN	2.1.1	
1	AIR COMPRESSOR	ACP-C6S-520DP	ACP	2.21	
1	AIR DRYER	8010	HANKINSON	2.2.1.3	

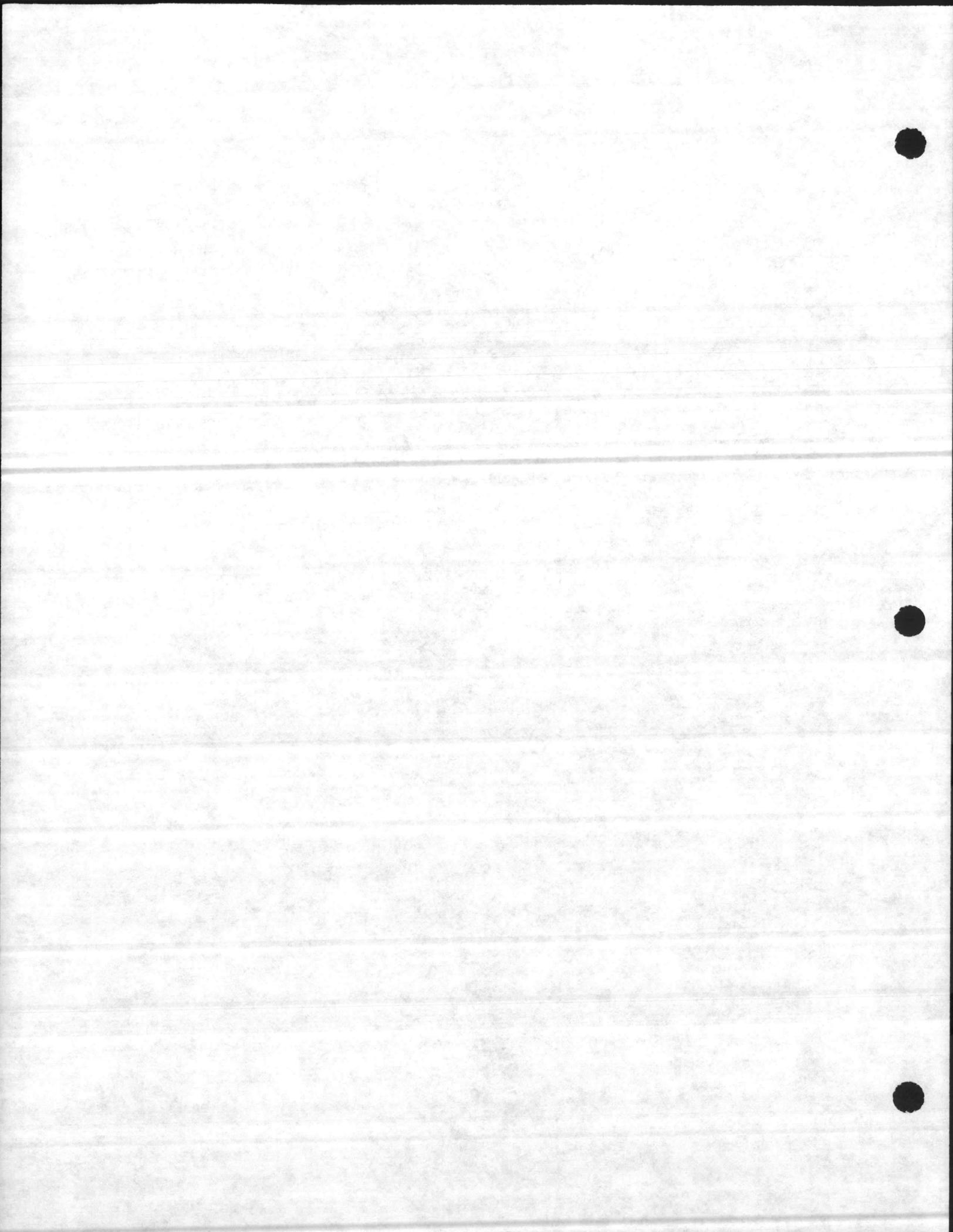


NOTE:

*We propose to use this thermostat with our UCDBM1 duct mounting bracket in place of the remote capillary type shown. We checked with other manufactures such as Honeywell, Johnson and Barber Coleman and could not find anyone with a two setpoint, pressure, direct and reverse acting deadband energy conservation thermostat with a remote capillary. We feel that our thermostat with duct mounting bracket meets the intent of the drawings by sensing the return air.

**We propose to use a aquastat (AQ-2, Page 1 of drawings) to change-over the main building controls from heating to cooling based on the primary chilled/hot water line temperature. This will cause controls to switch over only when the proper water temperature is available. This will prevent an over heating or cooling condition from happening by allowing the proper time to switch over.

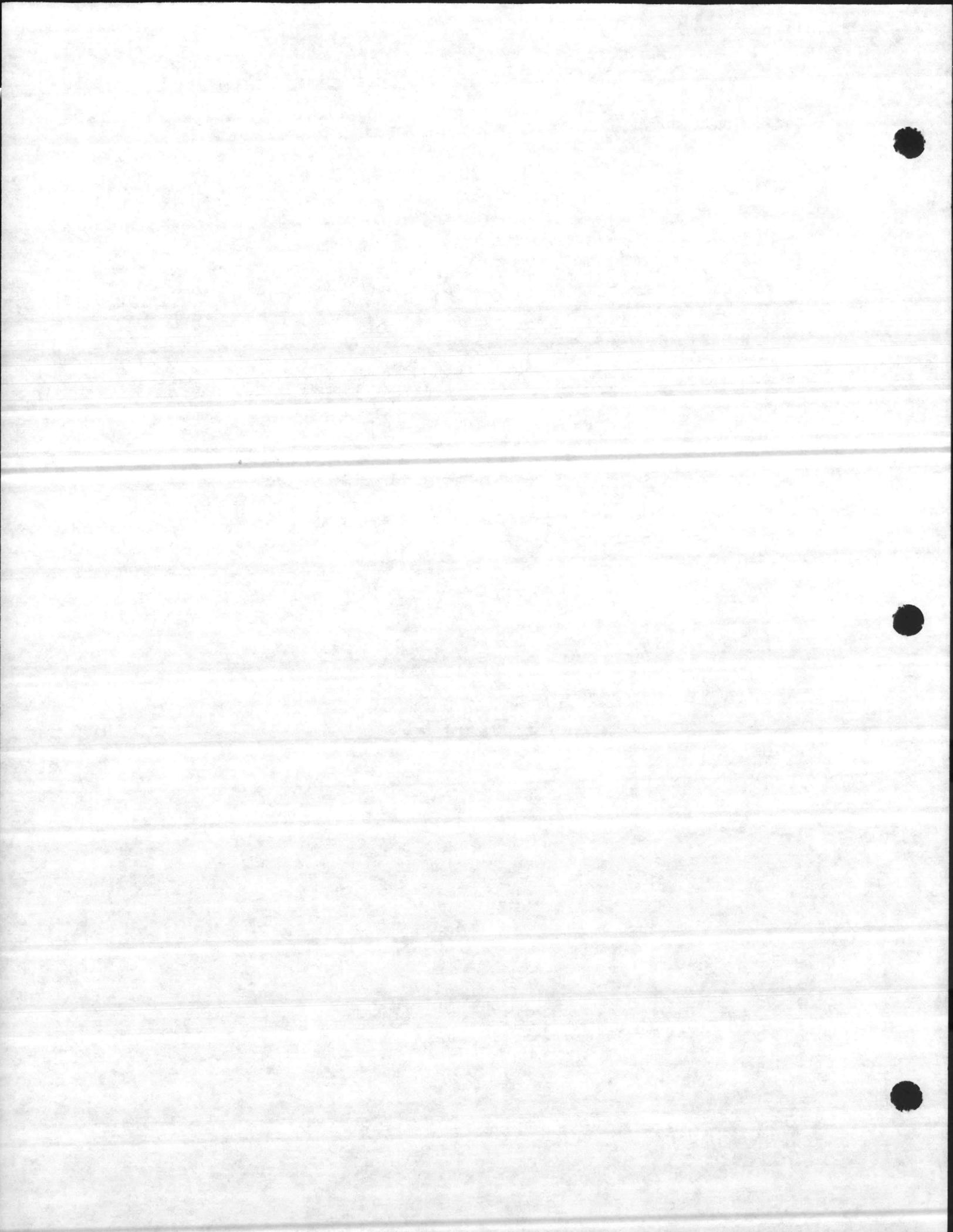
***See attached booklet for steam and water meter cut sheets.



PANEL - MATERIAL LIST

QTY	DESCRIPTION	CAT NO	MANUFACTURER	SPEC. #	LEGEND

1	PANEL ENCLOSURE	AB-18186G5B	AUSTIN	2.1.16.5	DTC
15	RECEIVER CONTROLLER	P541RA	ROBERTSHAW	2.1.4	C3,5,6,12,13
6	RECEIVER CONTROLLER	P541	ROBERTSHAW	2.1.4	C-2
7	E/P RELAY	R527-110	ROBERTSHAW	2.1.13	C-1/10
6	DIVERTING RELAY	R504-2	ROBERTSHAW	2.1.13	C-4
12	GAGE	A252	ROBERTSHAW	2.1.9	G-1/G-2
1	ENCLOSURE	PCP-6	ROBERTSHAW	2.1.14	PCP6
1	SWITCH	S521	ROBERTSHAW	2.1.13	C-7
1	DIVERTING RELAY	R503-1	ROBERTSHAW	2.1.13	C-11
2	P/E RELAY	R571-1	ROBERTSHAW	2.1.13	C-8/9
	LIGHTS	81-1059	DIALIGHT	2.1.15	
	RELAYS	RH	IDEC	2.3.2	PR1,PCR





2, 1, 3, 1

DATA SHEET

PISTON DAMPER ACTUATORS 2-, 3-, AND 4-INCH STROKES

M574- D2
M572- D1, D2, + D3

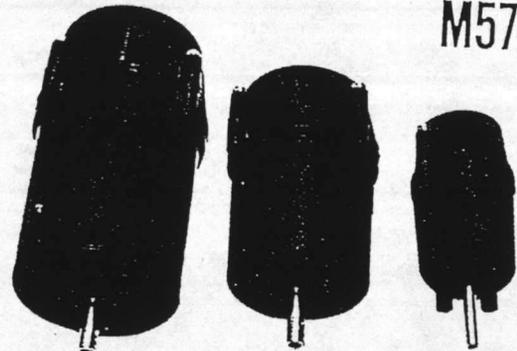
MODEL

M572
M573
M574

GENERAL DESCRIPTION

The M570-series piston damper actuators are used in pneumatic control systems to position automatic air dampers upon receipt of an air pressure signal from a control device. The piston actuator can be used for either gradual action or 2-position action applications.

Standard mounting is with right-angle bracket supplied; special mounting brackets are available for use in unit ventilators, fan coil units, and terminal boxes. The M573 and M574 models are optionally available with post mounting, and are also available with positive positioning relay.



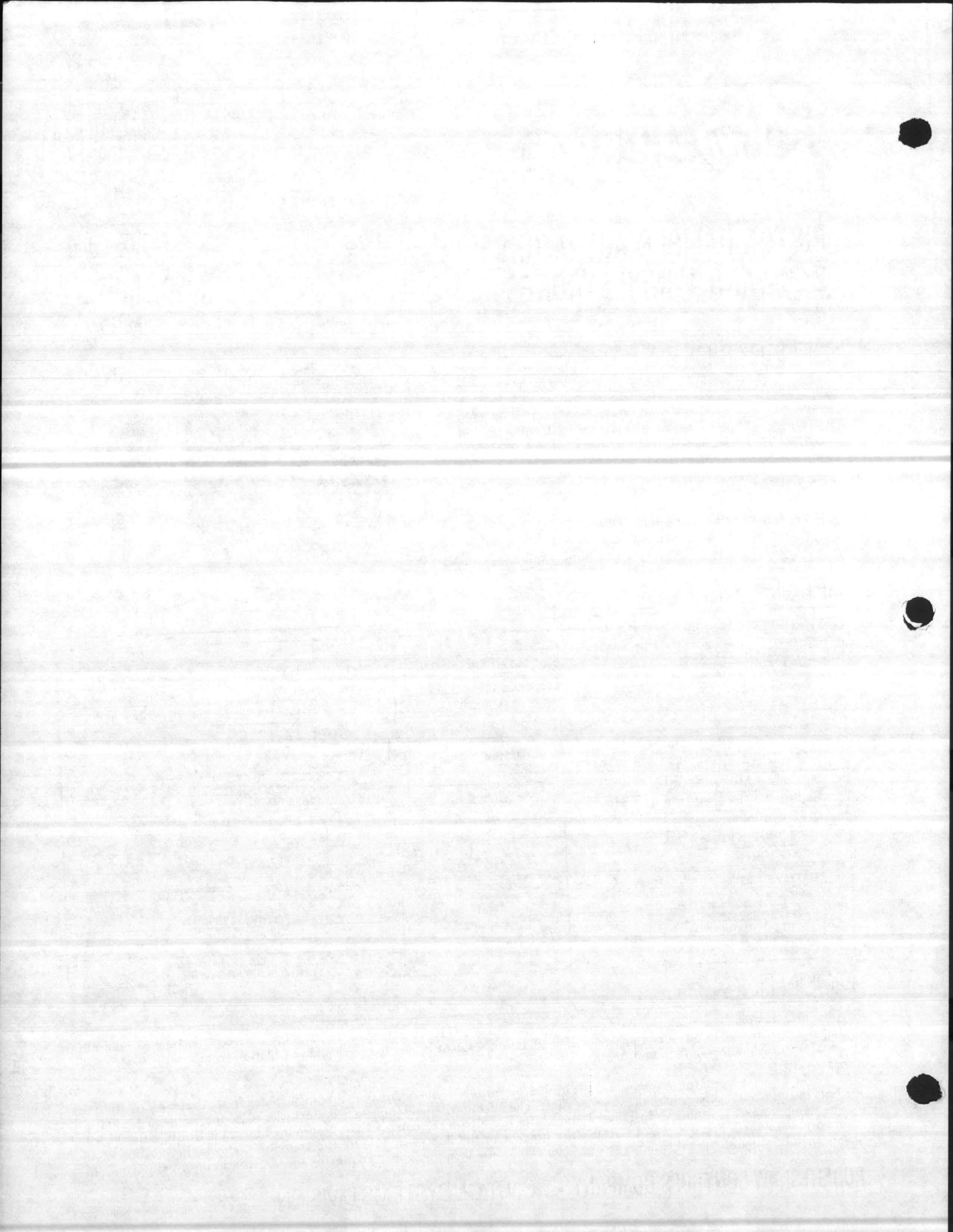
SPECIFICATIONS

MODEL	M572	M573	M574
EFFECTIVE PISTON AREA:	3 in ² (19 cm ²)	7 in ² (45 cm ²)	11 in ² (71 cm ²)
NORMAL STROKE:	2" (51 mm)	3" (76 mm)	4" (102 mm)
MAXIMUM DAMPER AREA (@ 1000 FPM)	Gradual operation:	12 ft ² (1.1 m ²)	25 ft ² (2.3 m ²)
	Two-position:	4.5 ft ² (0.42 m ²)	30 ft ² (2.8 m ²)
AVAILABLE SPRING RANGES:	3-12, 4-8, 5-10, 8-13, 10-15 psig (21-82, 28-55, 35-70, 55-90, 70-105 kPa)		
NORMAL AIR PRESSURE:	0-20 psig (0-138 kPa)		
MAXIMUM AIR PRESSURE:	30 psig (207 kPa)		
AMBIENT TEMPERATURE RATING:	-20°F to 140°F (-29°C to 60°C)		
DIAPHRAGM:	Rolling Type		
AIR CONNECTIONS:	3/16" DIA Nipple for 1/4" (6.35 mm) OD tubing		
DIMENSIONS:	See dimensional drawings on reverse		
POSITIVE POSITIONING RELAY	Not available on M572	20 psig (138 kPa)	
Normal main air pressure:		30 psig (207 kPa)	
Maximum pressure:		3-13 psig (21-90 kPa)	
Start point; adjustable		5 psig (35 kPa) standard 10 psig (69 kPa) optional	
Throttling range; fixed			

MOUNTING

If possible, damper actuators should be mounted on the outside of a duct or air handling unit, as this type of mounting arrangement offers such advantages as ease of installation, ease of access for service, and isolation from internal duct conditions of heating, cooling, and humidification.

The angle bracket actuator requires no additional mounting devices. Position the angle bracket so that one of the two cutouts in the front is adjacent to the damper shaft. The selection depends on whether clockwise or counter-clockwise rotation of the damper shaft is required. Install the crank arm loosely on the damper shaft before the bracket is firmly affixed to the ductwork. Use steel metal screws to attach the bracket to the ductwork, line up the crank arm, check the position of the damper, and tighten the crank arm set screws. The actuator is then positioned to provide the 90° rotation normally required.



INSTALLATION INSTRUCTIONS

PISTON DAMPER ACTUATORS

3- AND 4-INCH STROKES

M573 M574 M594

GENERAL DESCRIPTION

The Models M573, M574 and M594 piston damper actuators are designed for use in pneumatic control systems to position an air control damper in response to a signal from a pneumatic controller. The M573 and M574 housings are glass filled Nylon; the M594 housing is cast zinc.

These actuators have a constant effective piston area to provide linear response to gradual signal changes, al-

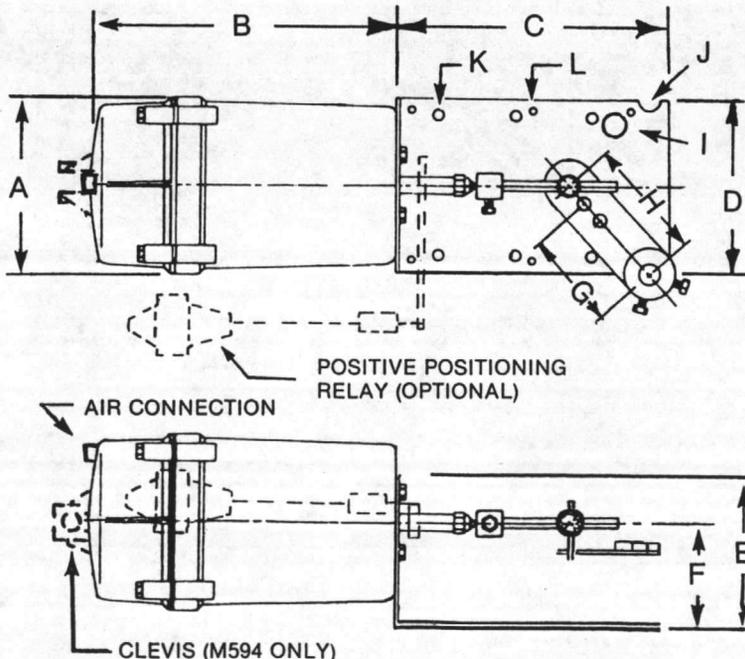
though they are also suitable for two-position operation.

All models are available with a right angle bracket for external mounting on a duct or with a post mounting bracket for internal mounting on a damper frame. They are also available with special hardware for OEM use. Positive positioning relays are optional on all models. See Figures 1 and 2 for actuator details.

MODEL	M573	M574 & M594
PISTON AREA	7 sq. in. (45 cm ²)	11 sq. in. (71 cm ²)
NOMINAL STROKE	3 in. (76mm)	4 in. (102mm)
NOMINAL RATING (1000 FPM, 305 m/min)	Gradual: 12 sq. ft. (1.1 m ²) 2-Position: 15 sq. ft. (1.4 m ²)	Gradual: 25 sq. ft. (2.3 m ²) 2-Position: 30 sq. ft. (2.8 m ²)
AIR CONNECTIONS (INCL. POSITIONER)	3/16" (4.8mm) nipple for 1/4" (6.4mm) O.D. tubing	M574: 3/16" (4.8mm) nipple for 1/4" (6.4mm) O.D. tubing M594: 1/8" FPT

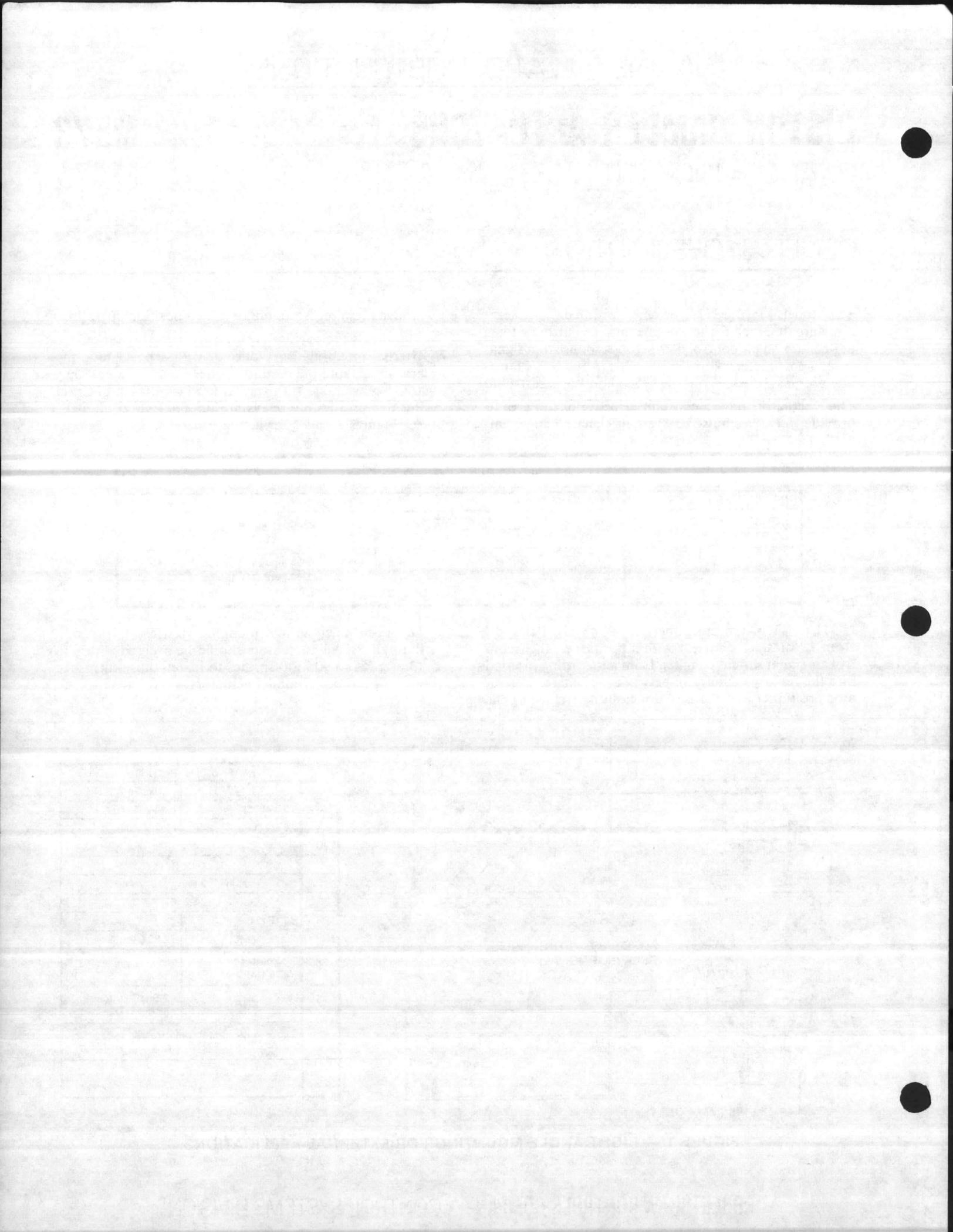
NOTE: When non-positioner actuators are "slaved" from a "master" actuator with a positioner, their control air signal should be taken from a toe fitting inserted into the factory connection between the "master" actuator positioner and the actuator housing (replacing the

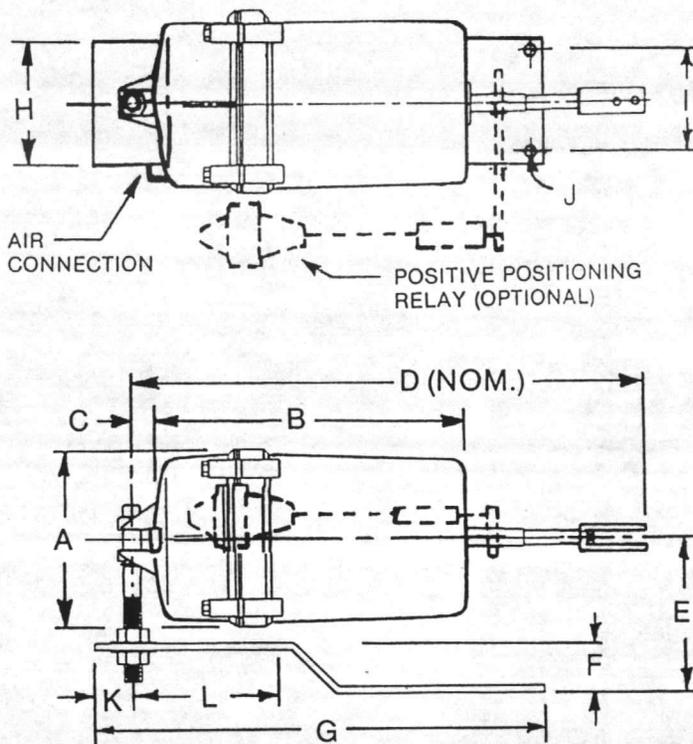
factory-installed in-line damping restrictor). In addition, all "slave" actuators should be ordered with 8 to 13 psig (55 to 90 kPa) springs to match those furnished with all positioner-model actuators.



	DIMENSIONS, INCHES (mm)	
	M573	M574 & M594
A	3-3/4 (95)	4-5/8 (117)
B	6-3/4 (171)	7-7/8 (200)
C	7-1/4 (184)	
D	4-1/2 (114)	
E	3 (76)	
F	2-5/8 (67)	
G	2.12 (54)	NA
H	NA	2.83 (72)
I	2 Shaft Holes 9/16 (14) Dia.	NA
J	NA	2 Shaft Notches 9/16 (14) Dia.
K	6 Mounting Holes 9/32 (7) Dia.	
L	6 Mounting Holes 3/16 (5) Dia.	

FIGURE 1 — RIGHT ANGLE MOUNTING FOR EXTERNAL APPLICATIONS.





	DIMENSIONS, INCHES (mm)	
	M573	M574 & M594
A	3-3/4 (95)	4-5/8 (117)
B	5-5/8 (143)	7-3/4 (197)
C	9/16 (14)	9/16 (14)
D	10-1/2 (267)	12-1/2 (318)
E	3-1/4 to 4-1/8 (83 to 105)	3-3/8 to 4-1/8 (86 to 105)
F	7/8 (22)	
G	11-5/8 (295)	
H	3 (76)	
I	2-1/2 (64)	
J	8 Mounting Holes 9/32 (7) Dia.	
K	1 (25)	
L	Post Adjustment Slot 3-5/8 (92) Travel	

FIGURE 2 — POST MOUNTING FOR INTERNAL APPLICATIONS.

INSTALLATION

EXTERNAL MOUNTING: Whenever feasible, piston actuators operating air control dampers should be mounted on the external surface of ducts by means of right angle brackets (see Figure 3). By selection of the proper model number and suffix (see Model Number

Book), actuators of the proper size (effective area and stroke), spring range and positioner option can be obtained complete with the right angle bracket and the necessary linkage components for driving dampers with 1/2" (13mm) or 3/8" (10mm) shafts.

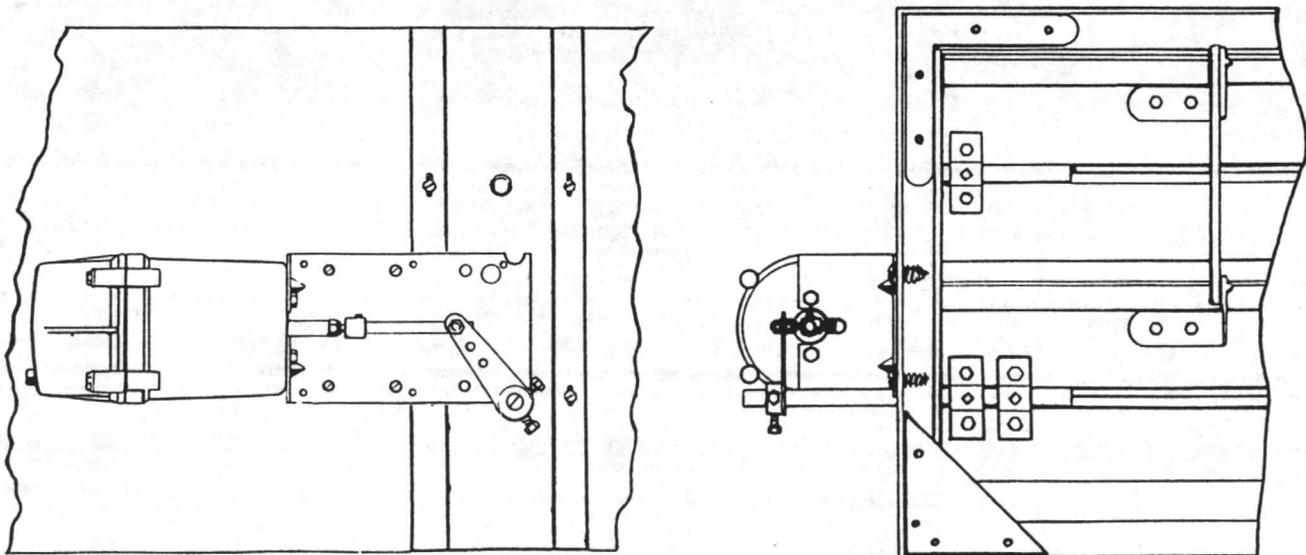
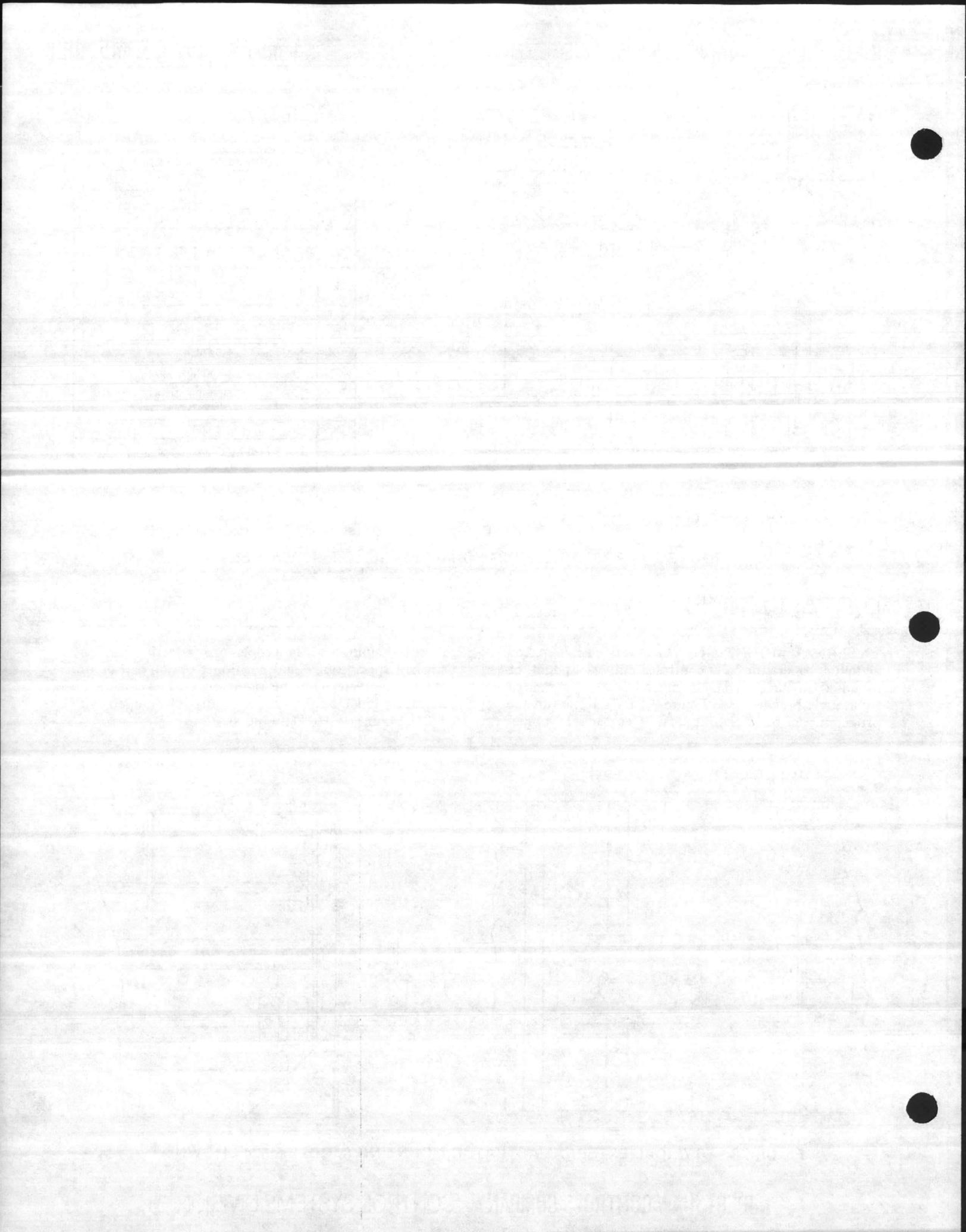


FIGURE 3 — TYPICAL EXTERNAL ACTUATOR MOUNTING (MODEL M574 SHOWN).



When ordered properly, the control damper will have one or more shaft extensions for the required number of actuators. These extensions will be in their retracted or "stored" positions when shipped and must be extended and locked in position with their set screws or through bolts.

Next, the "normal" position of the damper blades (open or closed when signal air is removed and the actuator piston retracts) and direction of shaft rotation as the piston is extended must be determined to establish the mounting position of the actuator bracket. The standard right angle bracket has two locator holes ("dimension I" in Figure 1) for 3 inch (76mm) stroke actuators and two locator notches ("dimension J" in Figure 1) for 4 inch (102mm) stroke actuators; the choice of a locator being based on whether clockwise or counterclockwise rotation is required as the piston shaft is extended by increasing signal pressure.

The pre-assembled crank arm is then slipped over the damper shaft extension and, when properly positioned, the bracket is secured to the duct surface by driving sheet metal screws through its mounting holes, using care not to obstruct movement of the damper blades. If the duct is to be insulated, suitable standoff posts and bolts should be substituted for the sheet metal screws. (NOTE: 3 inch stroke actuators use the middle pivot hole of the crank arm; 4 inch stroke actuators use the outermost pivot hole.)

The final installation step of locking the crank arm to

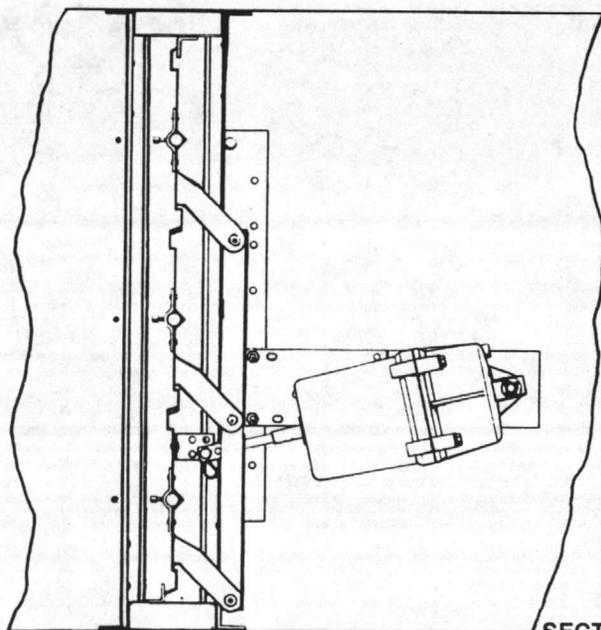
the damper shaft extension should be done when control air is available or by means of a squeeze bulb:

- a. For a normally closed damper, apply air pressure to the actuator equal to the *low* end of its spring range, e.g.: 4 psig (28 kPa) for a 4 to 8 psig (28 to 55 kPa) spring, then close the damper blades against their stops; a slot in the end of the extension shaft indicates blade position. After assuring that it is parallel to the duct surface, secure the crank arm to the extension shaft by tightening the two hex head screws. When air pressure is removed from the actuator, its residual low end spring force will provide additional damper closeoff pressure.
- b. For a normally open damper, apply air pressure to the actuator equal to the *high* end of its spring range, e.g.: 8 psig (55 kPa) for a 4 to 8 psig (28 to 55 kPa) spring, then close the damper blades against their stops. Secure the crank arm to the drive shaft as described above. Signal pressure above the spring range will then provide additional closeoff force.

NOTE: The standard actuator hardware will rotate a damper 90° for full actuator stroke. If less rotation is desired (for either external or internal mounting applications), a stop collar (Model N800-1153) may be applied to the actuator shaft to limit its return stroke. Stroke stop screws (Model N800-188x series) are also available to limit actuator shaft extension.

INTERNAL MOUNTING: When necessary, piston actuators may be internally mounted on damper frames (see Figure 4). For these applications, the dampers must be fabricated with mounting brackets affixed to their frames and clevis lugs affixed to their blades (see

Figures 5 and 6). The number and location of these items must be specified in advance to meet the actuator application requirements (size, quantity and normal damper position).



SECTIONAL VIEW

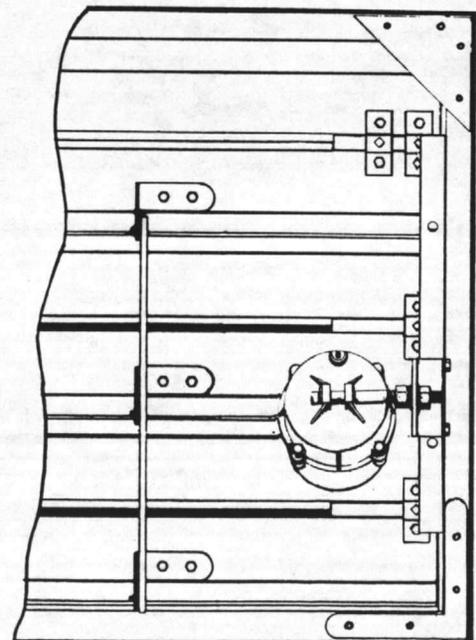
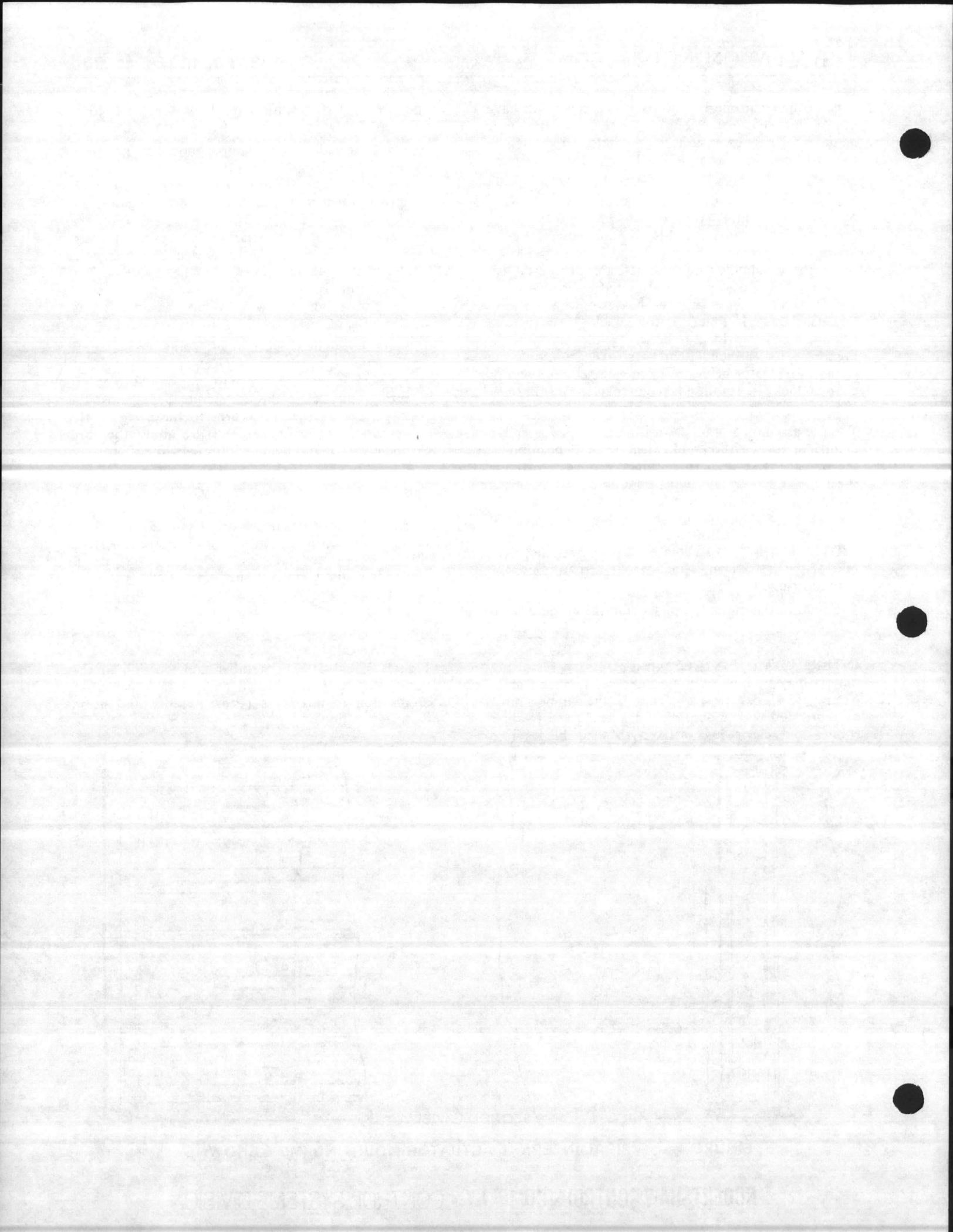


FIGURE 4 — TYPICAL INTERNAL ACTUATOR MOUNTING (M574 SHOWN).



An actuator is field mounted by screwing its offset mounting plate to the proper holes in the mounting bracket and pinning its clevis to the clevis lug.

The actuator post should be loosely connected through the adjustment slot in the mounting plate so that the actuator shaft is in line with the clevis lug.

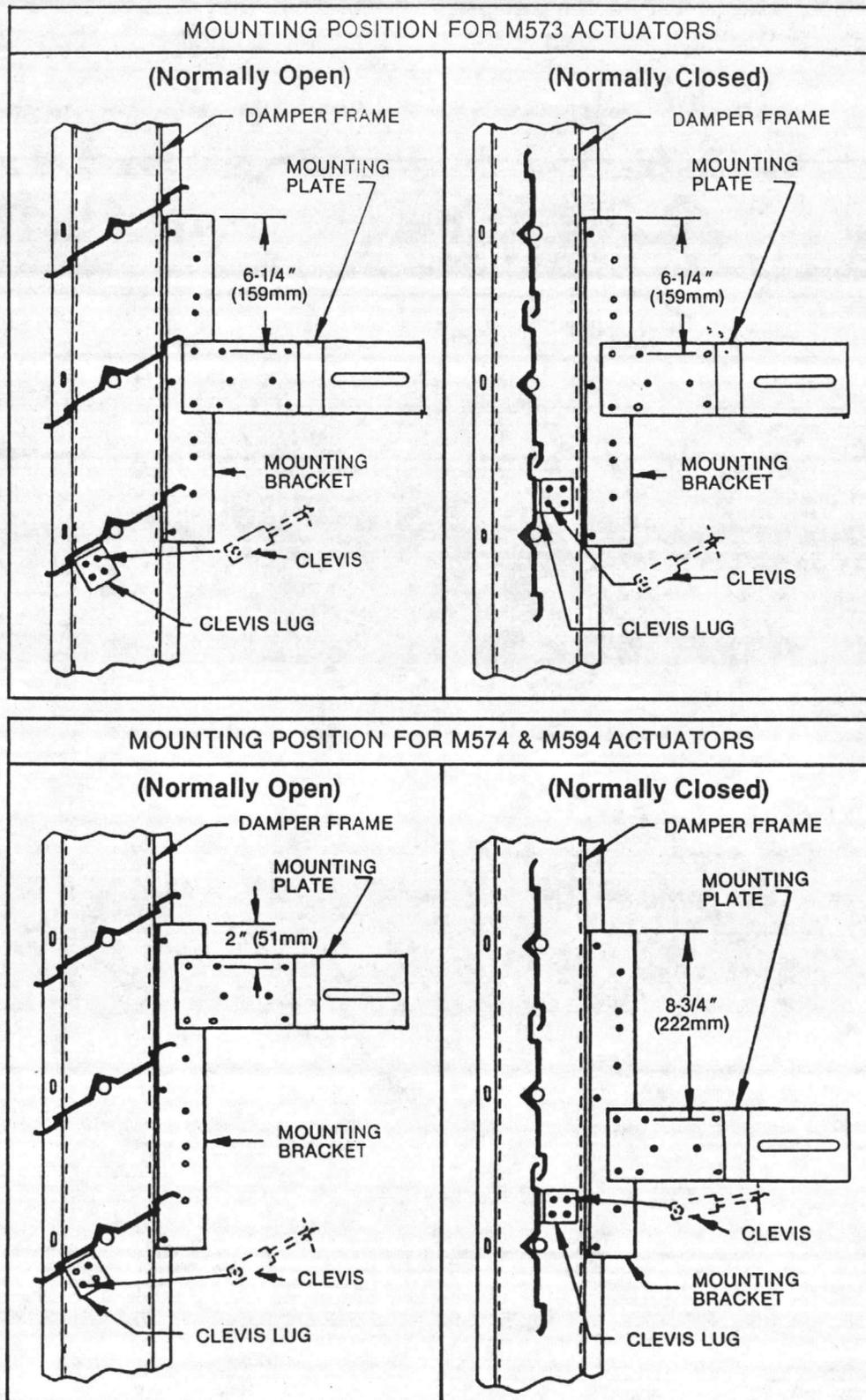
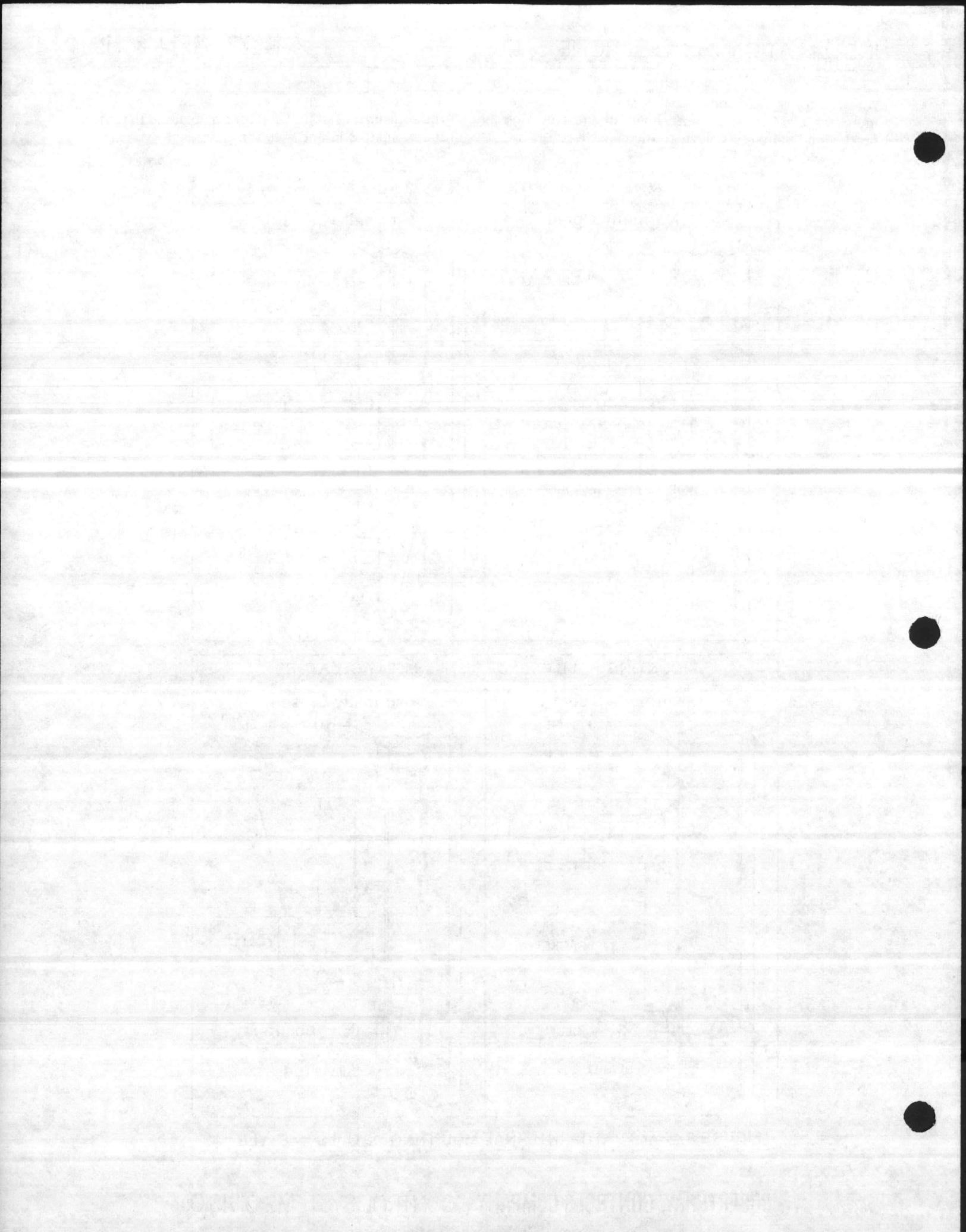


FIGURE 5 — ACTUATOR INTERNAL MOUNTING DETAILS — STYLE "A."



Using control air or a squeeze bulb, complete the final installation step (similar to externally mounted actuators described above) as follows:

- a. For a normally closed damper, apply air pressure to the actuator equal to the *low* end of its spring range, close the damper blades against their stops and then tighten the post mounting nuts to lock the actuator to its mounting plate.
- b. For a normally open damper, apply air pressure to

the actuator equal to the *high* end of its spring range, close the damper blades against their stops and then tighten the post mounting nuts to lock the actuator to its mounting plate.

NOTE: If an actuator is furnished with a positive positioning relay, the final installation steps described above should be done with the positioner's output line disconnected and signal air applied directly to the actuator housing. (Positioner adjustment is described elsewhere.)

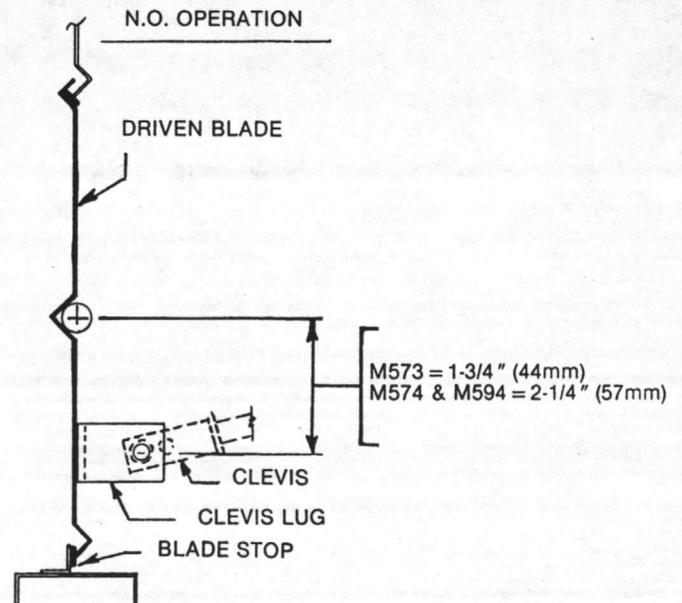
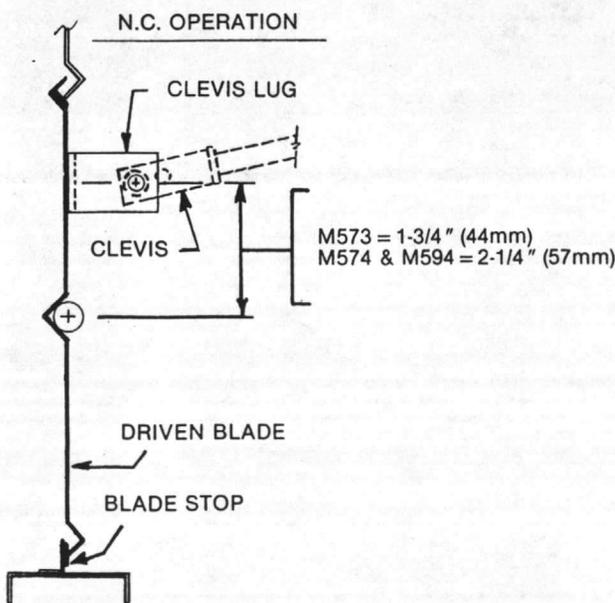
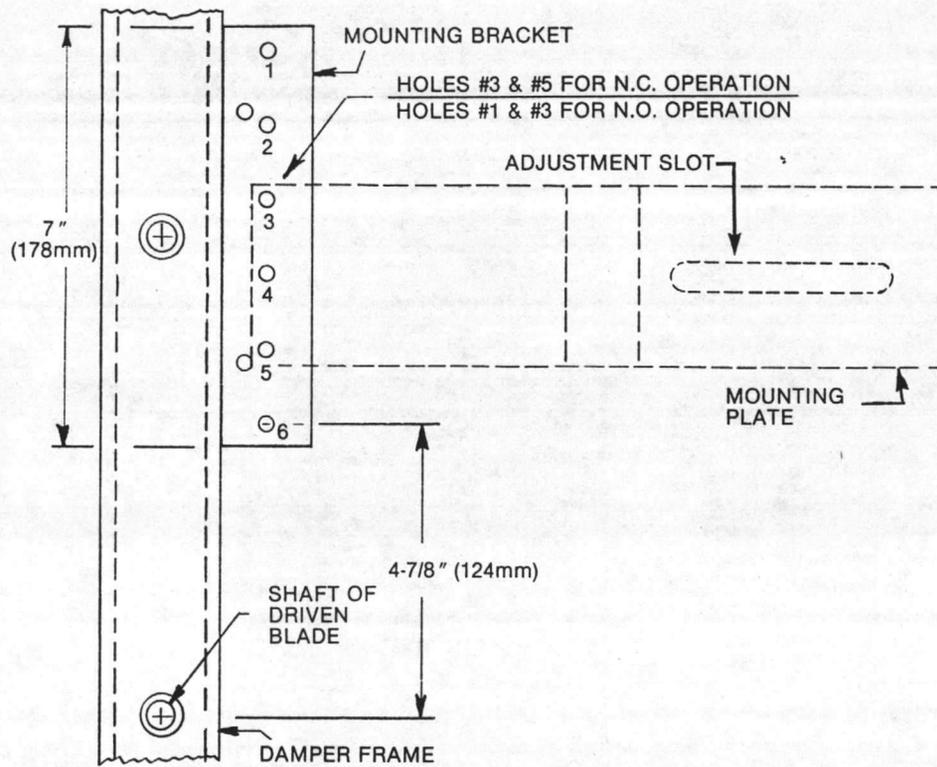
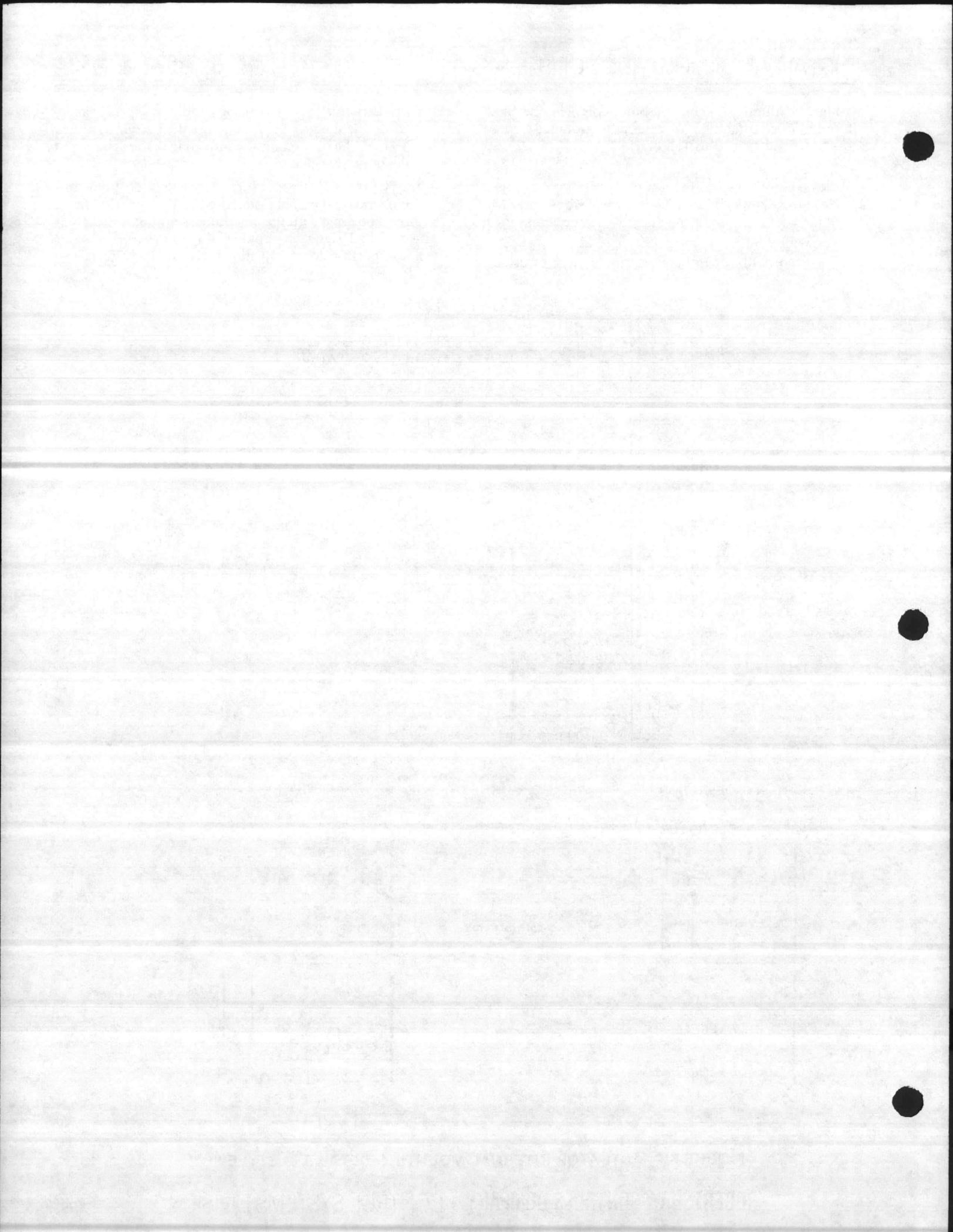


FIGURE 6 — ACTUATOR INTERNAL MOUNTING DETAILS — STYLE "B."



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PISTON DAMPER ACTUATORS

3-, 4- AND 6-INCH STROKES

M556
M573
M574
M594

CALIBRATION

These piston damper actuator models are available in a variety of sizes (strokes and effective areas), mounting hardware and spring ranges. All models (see Table I) are available with optional positive positioning relays fabricated of ABS plastic or cast zinc. Preferably, positioners should be ordered as factory installed by select-

ing the proper model number, but they may be field installed by separately ordering the desired positioner model, feedback arm and feedback spring. Positioners on actuators are furnished with 5 psi (34 kPa) span feedback springs installed and are calibrated for 8 to 13 psig (55 to 90 kPa) operation.

TABLE I

ACTUATOR MODEL		M556	M573	M574	M594
ACTUATOR MATERIAL		Glass Filled Nylon			Cast Zinc
STROKE, INCHES (mm)		6 (152)	3 (76)	4 (102)	
EFFECTIVE AREA, SQ. IN. (cm ²)		24.8 (160)	7 (45)	11 (71)	
N800-0551 POSITIONER, ABS PLASTIC	ACTUATOR MODEL SUFFIX	-1x	-1xxx	-1xxx	NA
	3 PSI (21 kPa) SPRING	N800-2272	N800-2270	N800-2271	
	5 PSI (34 kPa) SPRING	N800-2252*	N800-2250*	N800-2251*	
	10 PSI (69 kPa) SPRING	N800-2262*	N800-2260	N800-2261	
N800-0552 POSITIONER, CAST ZINC	ACTUATOR MODEL SUFFIX	-9x	-9xxx	-9xxx	-1xxx
	5 PSI (34 kPa) SPRING	N800-2256*	N800-2254*	N800-2253*	
	10 PSI (69 kPa) SPRING	N80-2266	N800-2264	N800-2263	
FEEDBACK ARM		N800-1500*			

* Furnished with positioner-model actuator; other springs must be ordered separately.

ADJUSTMENT

Spring Range: The range of the factory installed piston actuator spring is not adjustable.

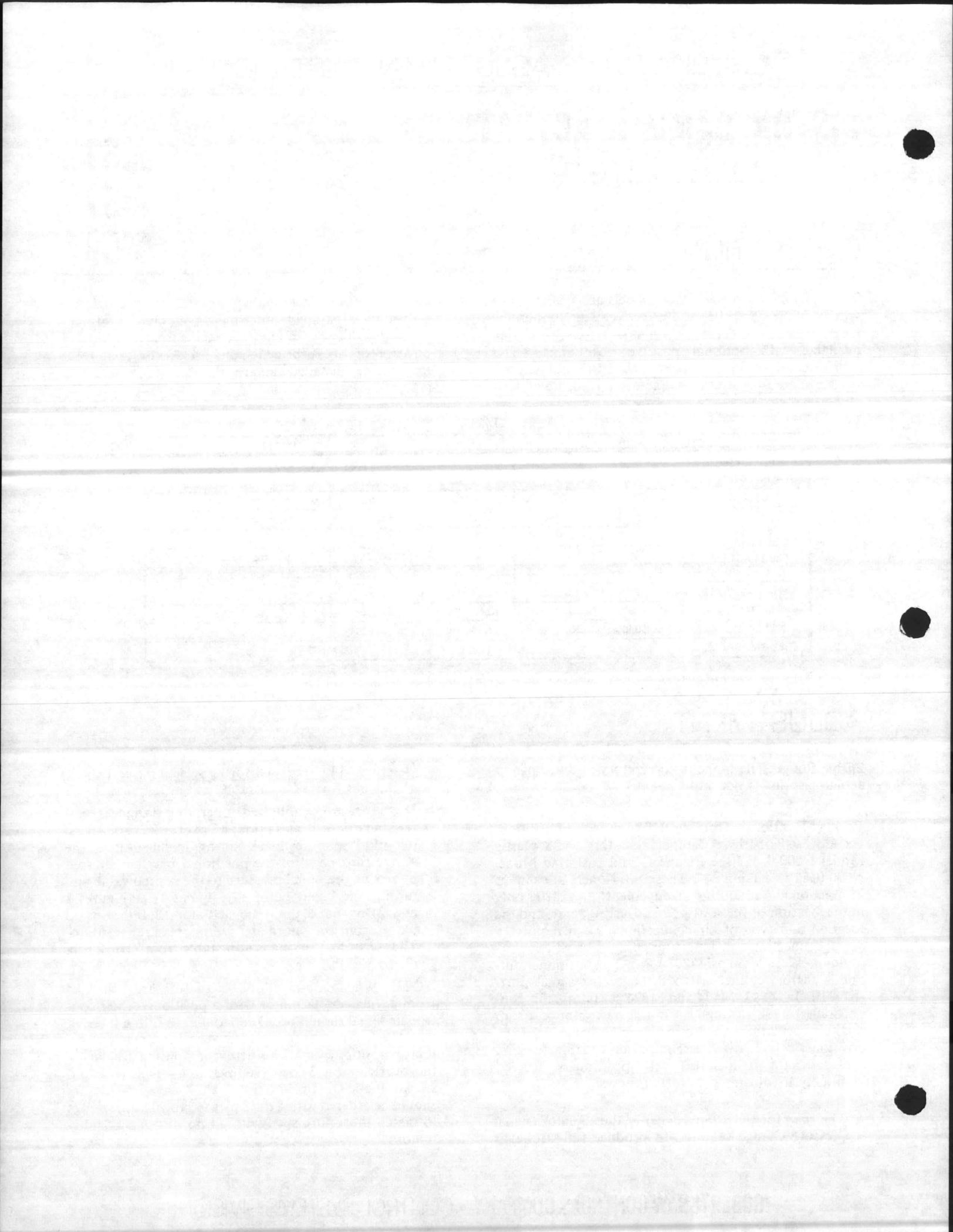
Positive Positioner (Optional): Two models of positioners are used on these damper actuators, ABS plastic Model N800-0551 (see Figure 1) and cast zinc Model N800-0552 (see Figure 2). These positioners are similar in function and mounting arrangement; they differ only in the location of the start point adjusting screw and the location and type of air connections. Each requires a signal connection and a main air connection with a maximum pressure of 30 psig (207 kPa). The positioner output is factory-connected to the actuator signal port. (NOTE: On M573, M574 and M594 actuators, this connection is made through an in-line restrictor to damp possible oscillations due to the large air capacity of the positioner relay. It is not required on M556 actuators. The restrictor is included with positioners ordered separately.) Adjustments are as follows:

a. The *span* (or *throttling range*) of the actuator (signal pressure change required to produce full stroke) is

determined by feedback spring selection (see Table I) and is not further adjustable.

b. If the factory-calibrated operating range is not satisfactory or if an optional 3 psi (21 kPa) or 10 psi (69 kPa) span feedback spring is substituted, the stroke *start point* of the positioner may be adjusted by setting the signal pressure to the desired value and turning the "start point adjustment" (see Figures 1 and 2) by hand until the actuator shaft begins to move from its "normal" (zero pressure) position. The start point setting is adjustable from 3 to 12 psig (21 to 83 kPa).

NOTE: When non-positioner actuators are "slaved" from a "master" actuator with a positioner, their control air signal should be taken from a tee fitting inserted into the factory connection between the "master" actuator positioner and the actuator housing (replacing the restrictor on 3 inch (76mm) and 4 inch (102mm) stroke models). In addition, all "slave" actuators should be ordered with 8 to 13 psig (55 to 90 kPa) springs to match those furnished with all positioner-model actuators.



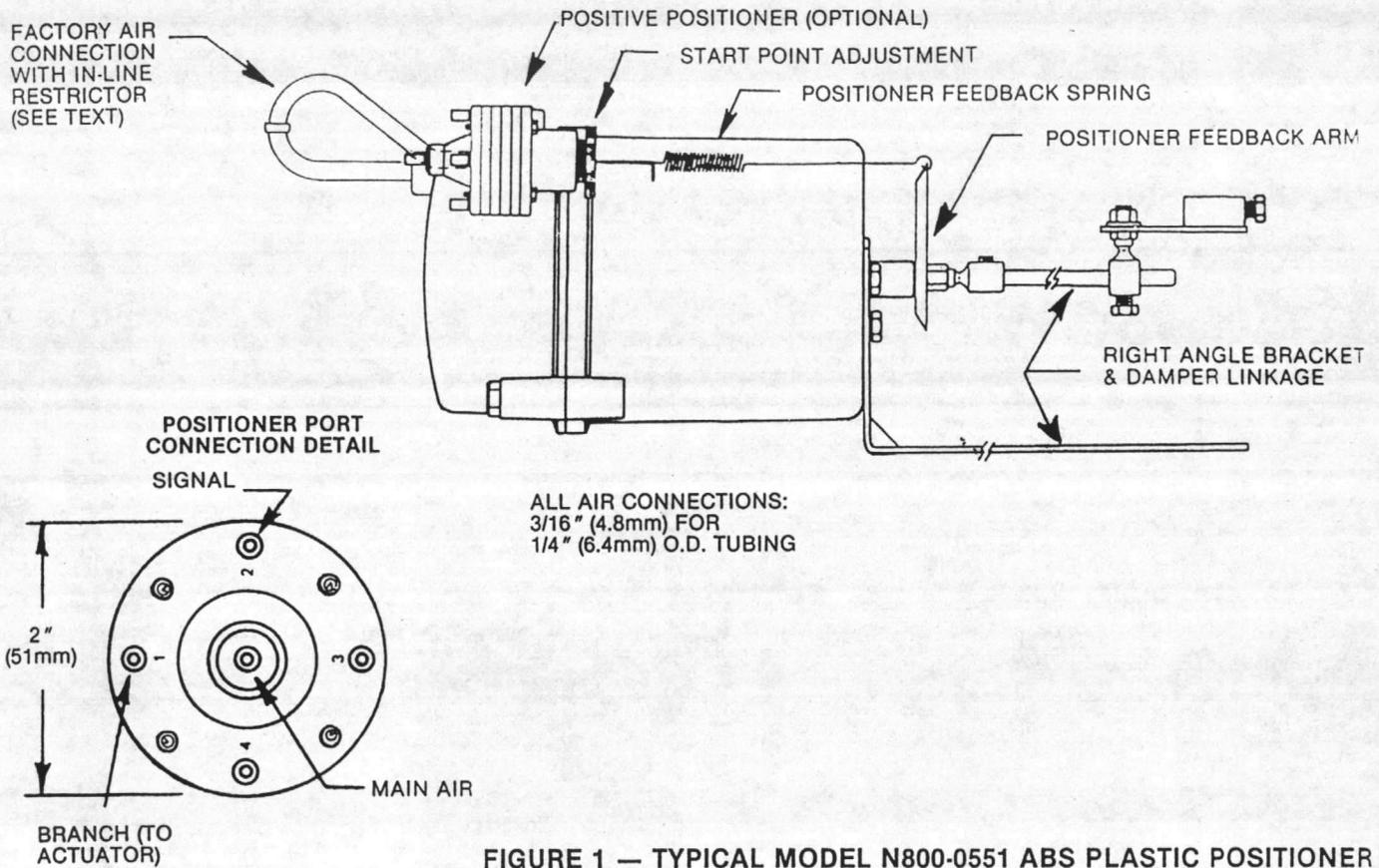


FIGURE 1 — TYPICAL MODEL N800-0551 ABS PLASTIC POSITIONER INSTALLATION (SHOWN ON M574 ACTUATOR).

AIR CONNECTIONS:
 ACTUATOR: 3/16" (4.8mm) NIPPLE FOR 1/4" (6.4mm) O.D. TUBING
 POSITIONER: 1/8" FPT

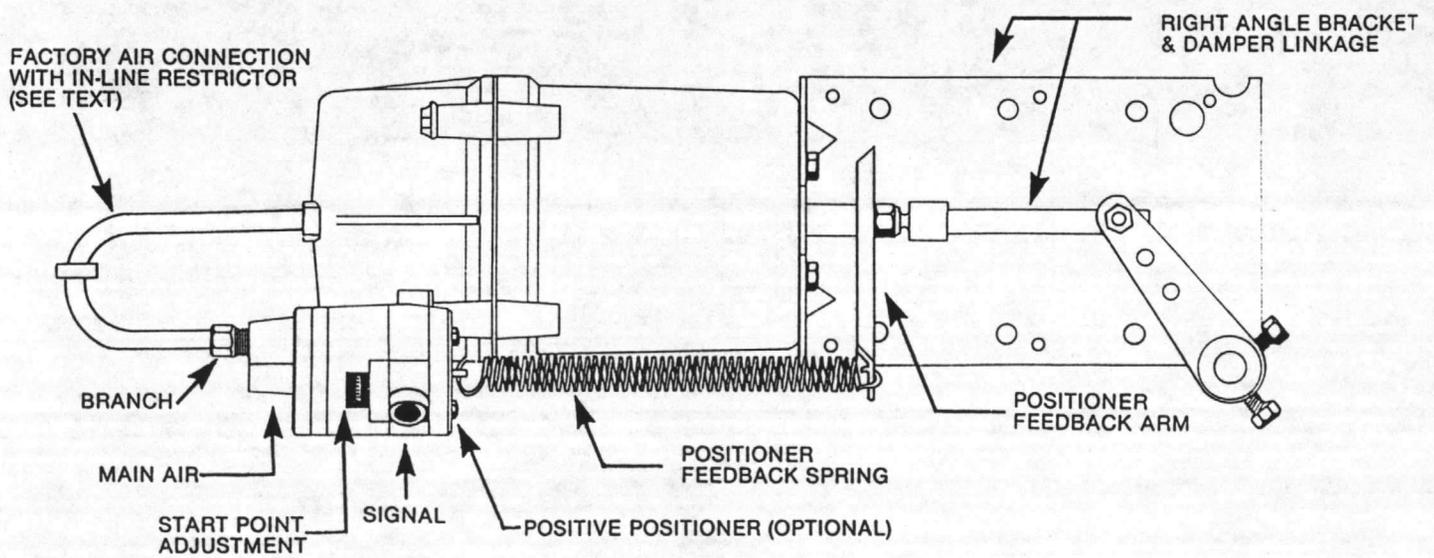
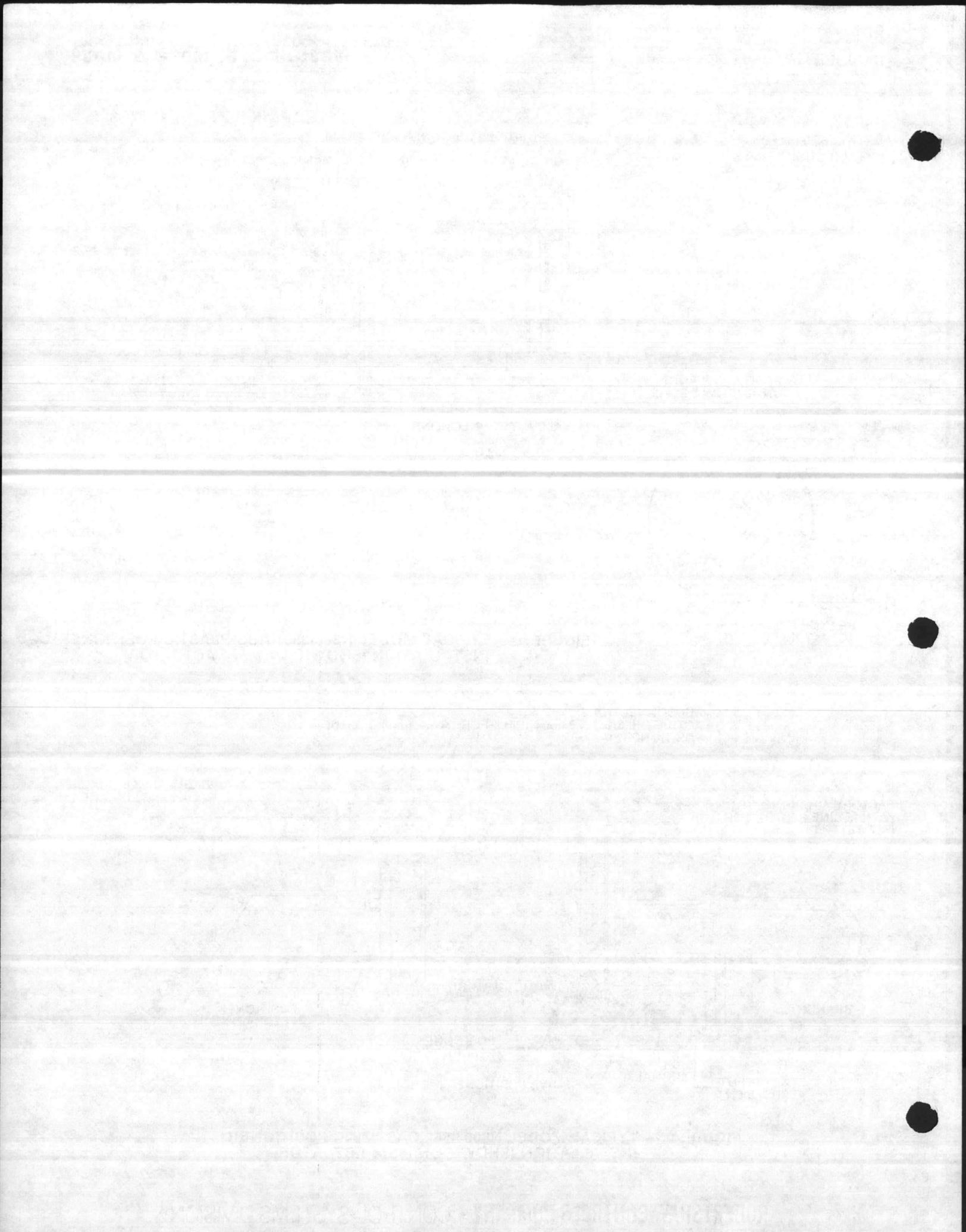


FIGURE 2 — TYPICAL MODEL N800-0552 CAST ZINC POSITIONER INSTALLATION (SHOWN ON M574 ACTUATOR).



INSTALLATION INSTRUCTIONS

PISTON DAMPER ACTUATOR 2 INCH STROKE

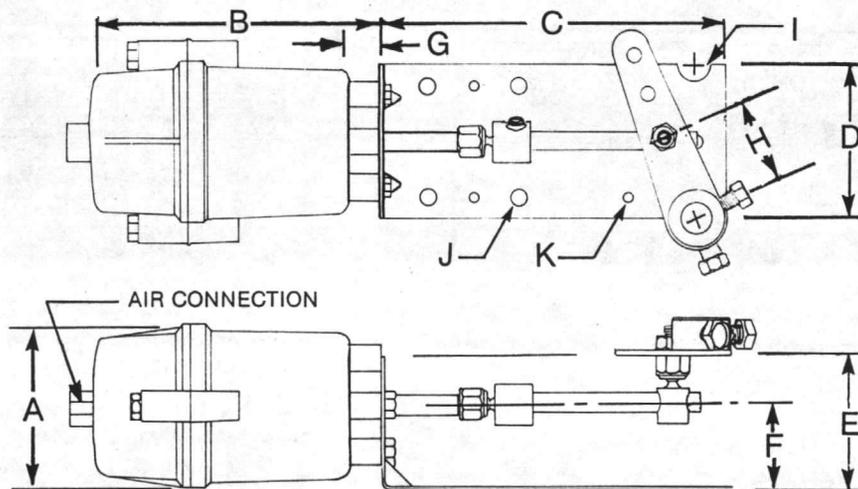
M572

GENERAL DESCRIPTION

The Model M572 piston damper actuator is designed for use in a pneumatic control system to position an air control damper in response to a signal from a pneumatic controller. It has a constant effective piston area to provide linear response to gradual signal changes, although it is also suitable for two-position operation.

The standard M572 is furnished with a right angle mounting bracket for external use on ducts. It is also available with special hardware and a clevis-type end cap for OEM applications. Positive positioning relays are not available for the M572. See Figure 1 for actuator details.

PISTON AREA	3 sq. in. (19cm ²)
NOMINAL STROKE	2 in. (51mm)
NOMINAL RATING (1000 FPM, 305 m/min)	Gradual: 3 sq. ft. (0.3m ²) 2-Position: 4.5 sq. ft. (0.4m ²)
AIR CONNECTION	3/16" (4.8mm) nipple for 1/4" (6.4mm) O.D. tubing



DIMENSIONS, INCHES (mm)	
A	2-5/8 (67)
B	4-3/4 (121)
C	5-9/16 (141)
D	2-7/16 (62)
E	2-1/8 (54)
F	1-3/8 (35)
G	1/2 (13)
H	1.41 (36)
I	2 Shaft Notches 1/2 (13) Dia.
J	5 Mounting Holes 9/32 (7) Dia.
K	4 Mounting Holes 3/16 (5) Dia.

FIGURE 1 — M572 ACTUATOR APPEARANCE AND DIMENSIONS.

INSTALLATION

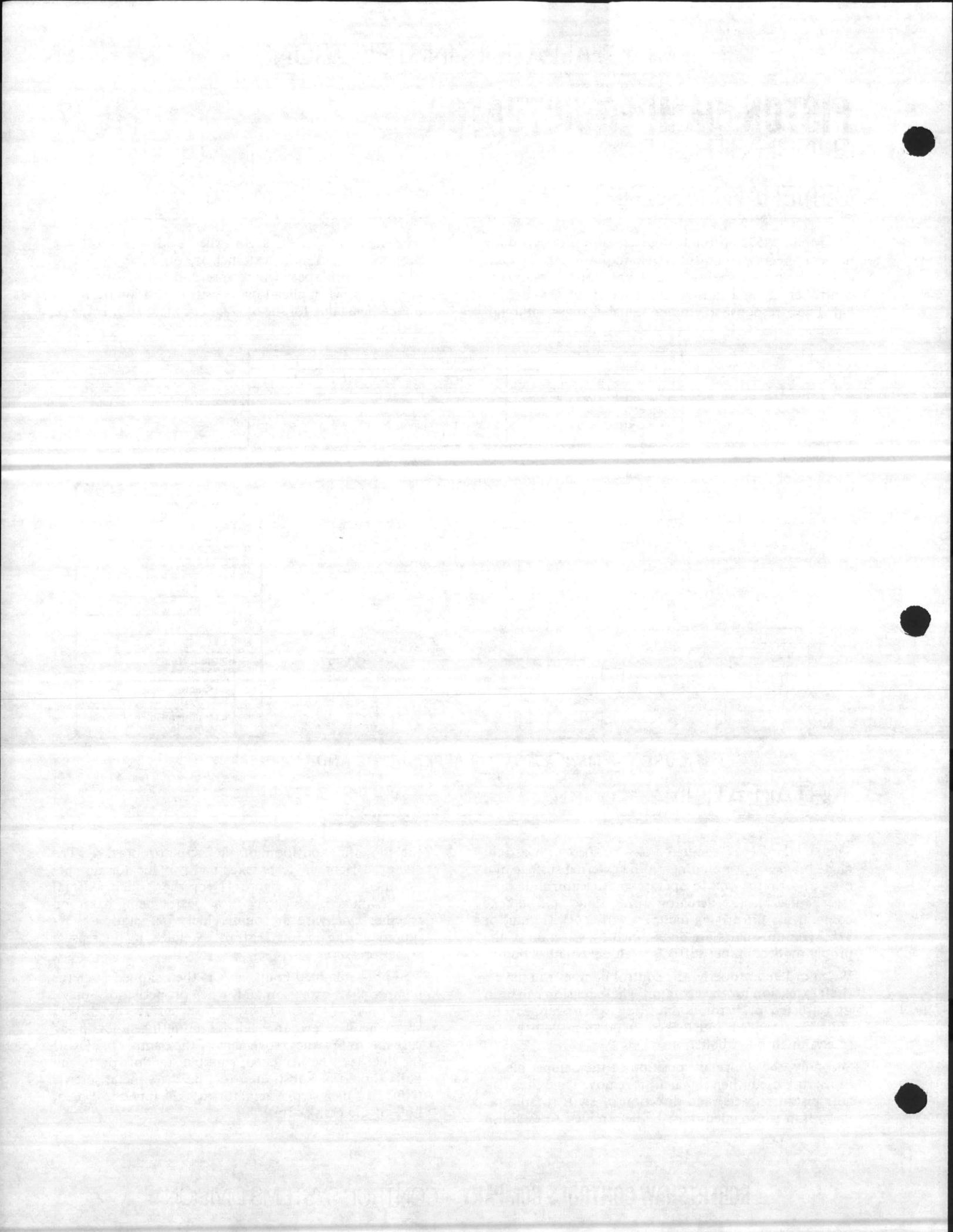
The standard M572 actuator is furnished with a right angle bracket for mounting on the external surface of a duct or terminal box to operate an air control damper (see Figure 2). The actuator spring range and linkage components for driving dampers with 1/2" (13mm) or 3/8" (10mm) shafts are determined by selection of the proper model number suffix (see Model Number Book).

When ordered properly, the control damper will have a shaft extension for the actuator. The extension will be in its retracted or "stored" position when shipped and must be extended and locked in position with its set screws or through bolts.

Secondly, the "normal" position of the damper blades (open or closed when signal air is removed and the actuator piston retracts) and direction of shaft rotation as the piston is extended must be determined to establish

the mounting position of the actuator bracket. The standard right angle bracket has two locator notches ("dimension I" in Figure 1) for the 2 inch (51mm) stroke linkage, the choice of a locator being based on whether clockwise or counterclockwise rotation is required as the piston shaft is extended by increasing signal pressure.

The pre-assembled crank arm is then slipped over the damper shaft extension and, when properly positioned, the bracket is secured to the duct surface by driving sheet metal screws through its mounting holes, using care not to obstruct movement of the damper blades. If the duct is to be insulated, suitable standoff posts and bolts should be substituted for the sheet metal screws. (NOTE: 2 inch stroke actuators use the innermost pivot hole of the crank arm.)



The final installation step of locking the crank arm to the damper shaft extension should be done when control air is available or by means of a squeeze bulb:

a. For a normally closed damper, apply air pressure to the actuator equal to the **low** end of its spring range, e.g.: 4 psig (28 kPa) for a 4 to 8 psig (28 to 55 kPa) spring, then close the damper blades against their stops; a slot in the end of the extension shaft indicates blade position. After assuring that it is parallel to the duct surface, secure the crank arm to the extension shaft by tightening the two box head screws. When air pressure is removed from the actuator, its residual low end spring force will provide additional damper closeoff pressure.

b. For a normally open damper, apply air pressure to the actuator equal to the **high** end of its spring range, e.g.: 8 psig (55 kPa) for a 4 to 8 psig (28 to 55 kPa) spring, then close the damper blades against their stops. Secure the crank arm to the drive shaft as described above. Signal pressure above the spring range will then provide additional closeoff force.

NOTE: The standard actuator hardware will rotate a damper 90° for the full actuator stroke. If less rotation is desired, a stop collar (Model N800-1151) may be applied to the actuator shaft to limit its return stroke.

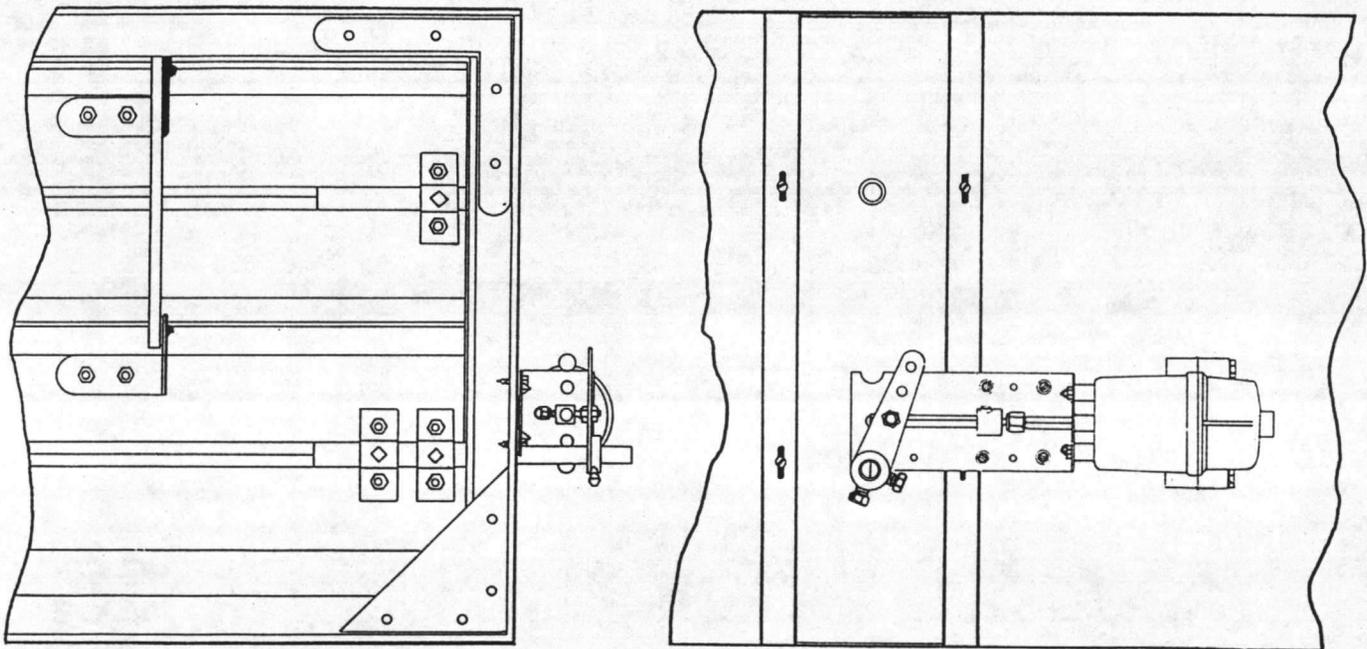
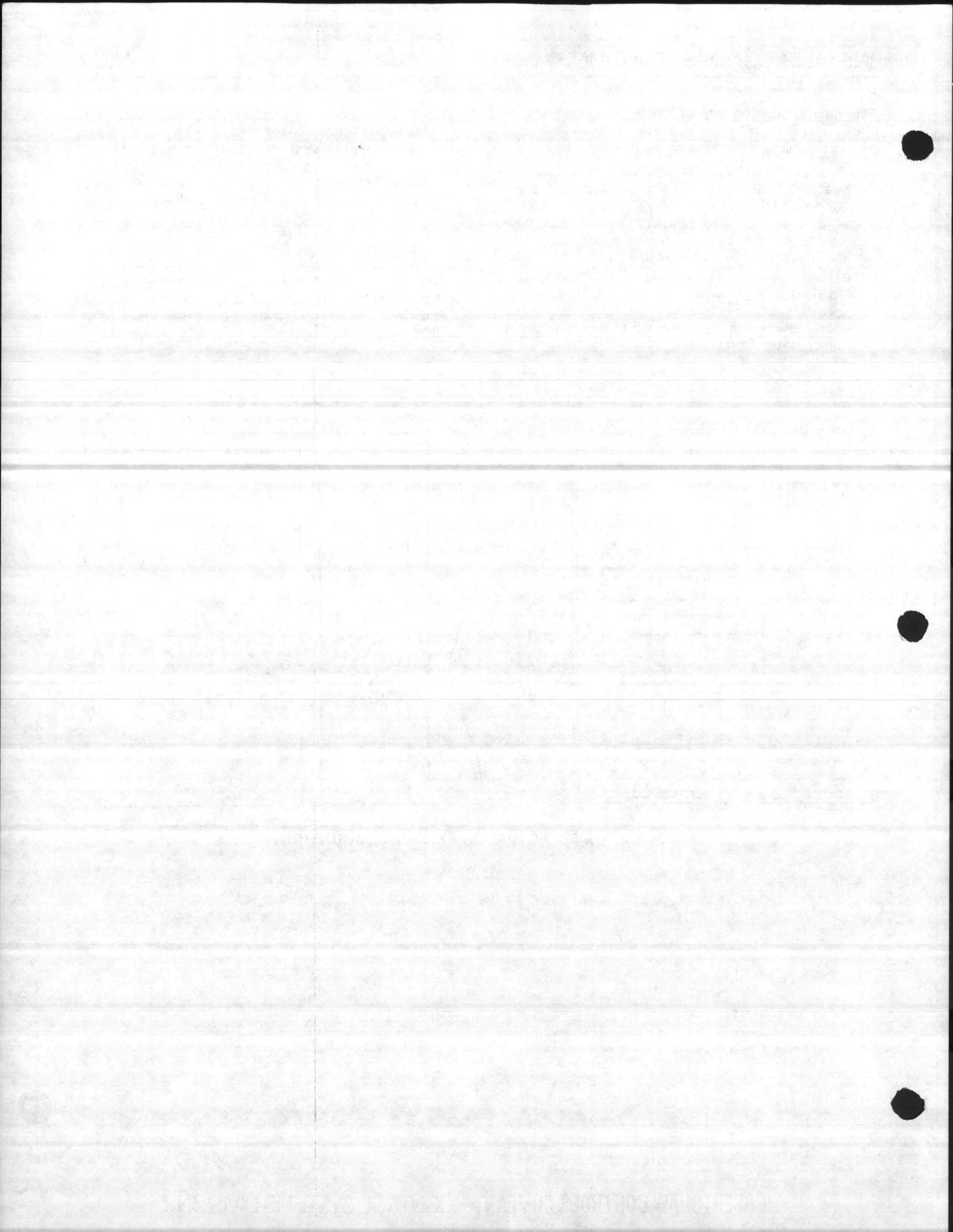


FIGURE 2 — M572 ACTUATOR EXTERNAL MOUNTING.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PISTON DAMPER ACTUATOR 2 INCH STROKE

M572

CALIBRATION

The Model M572 piston damper actuator is available only with a right angle mounting bracket, but with a selection of fixed spring ranges and linkage hardware. It is

not available with a positive positioning relay and requires no factory calibration. See Figure 1 for actuator appearance and linkage details.

PISTON AREA	3 sq. in. (19cm ²)
NOMINAL STROKE	2 in. (51mm)
AIR CONNECTION	3/16" (4.8mm) nipple for 1/4" (6.4mm) O.D. tubing

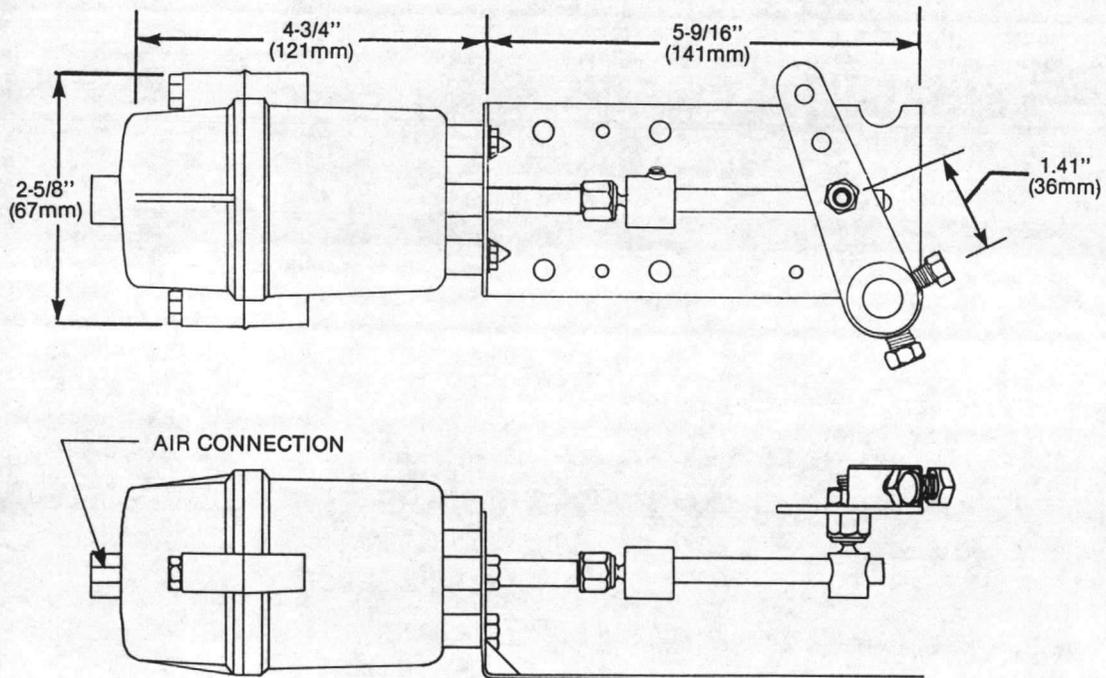


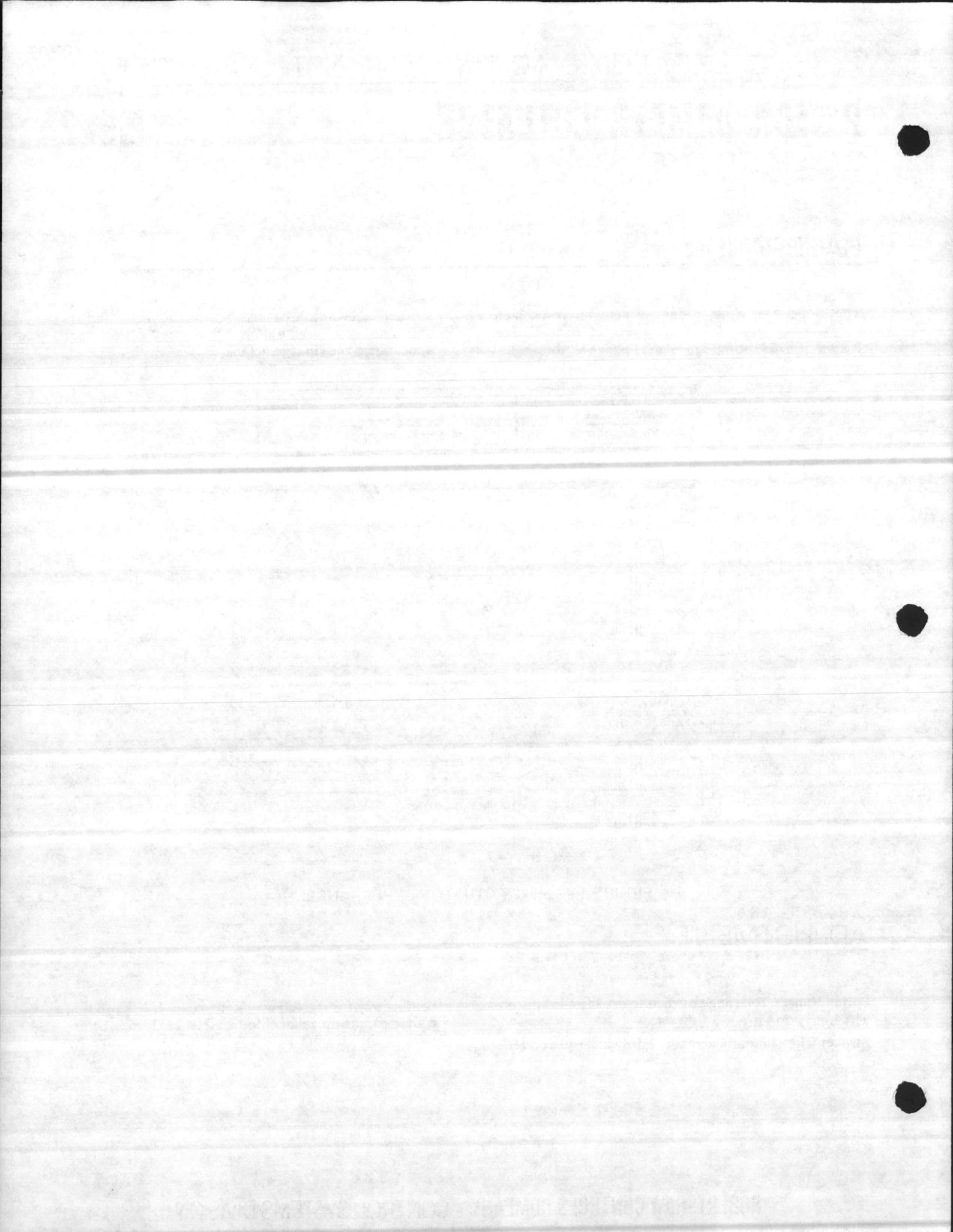
FIGURE 1 — M572 ACTUATOR APPEARANCE.

ADJUSTMENT

Spring Range: The range of the factory installed piston actuator spring is not adjustable.

Stroke: The standard actuator hardware will rotate a

damper 90° for the full actuator stroke. If less rotation is desired, a stop collar (Model N800-1151) may be applied to the actuator shaft to limit its return stroke.





PNEUMATIC TEMPERATURE TRANSMITTERS

2.1.5

SAT & OAT

T1, T-2,
T3

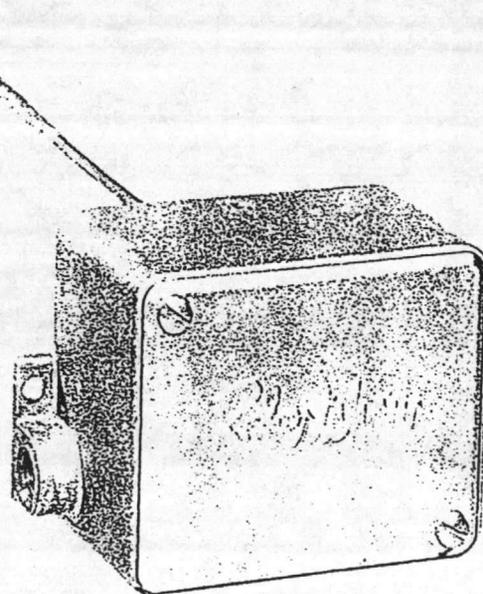
DATA SHEET
MODEL T150

GENERAL DESCRIPTION

T150 pneumatic temperature transmitters are designed to measure air or fluid temperatures in pneumatic control systems and transmit a fixed-span, 3 to 15 psig signal to controlling and indicating devices, such as receiver controllers, receiver gauges and sensitive pressure switches. These transmitters are available with several types of sensing elements (rigid stem, averaging, remote bulb or a rigid coil for fast response) and various temperature ranges to meet most control system application requirements.

T150 transmitters are "one-pipe" devices requiring an externally restricted source of constant pressure control air. Their design features pneumatic feedback to assure accuracy and stability over a wide temperature span.

External mounting ears are provided for strain-free mounting on ducts or other flat surfaces. Separable wells are available for rigid stem elements for immersion sensing in fluid systems.



SPECIFICATION

Model Number: T150
Temperature Ranges, °F:

Rigid Stem	Rigid Coiled	20-Foot Averaging	Remote-Bulb 3' Capillary	Remote-Bulb 9' Capillary
0 to 100 40 to 140 40 to 240 -40 to 160	0 to 100 40 to 140	0 to 100 30 to 80 40 to 140	-25 to 125	-25 to 125 40 to 240

Action: Direct acting, proportional
 Adjustments: None. Factory calibrated.
 Supply Pressure: 20 psig ±0.5 psi.
 Output Pressure: 3 to 15 psig
 Maximum Air Pressure: 30 psig
 Air Connection: 1/8"-27 female NPT
 Maximum Ambient Temperature: 140°F
 Dimensions: See Figure 1.
 Weight: 15 oz. nominal
 Construction: Copper element, cast aluminum base, cadmium plated steel cover.

ACCESSORIES:

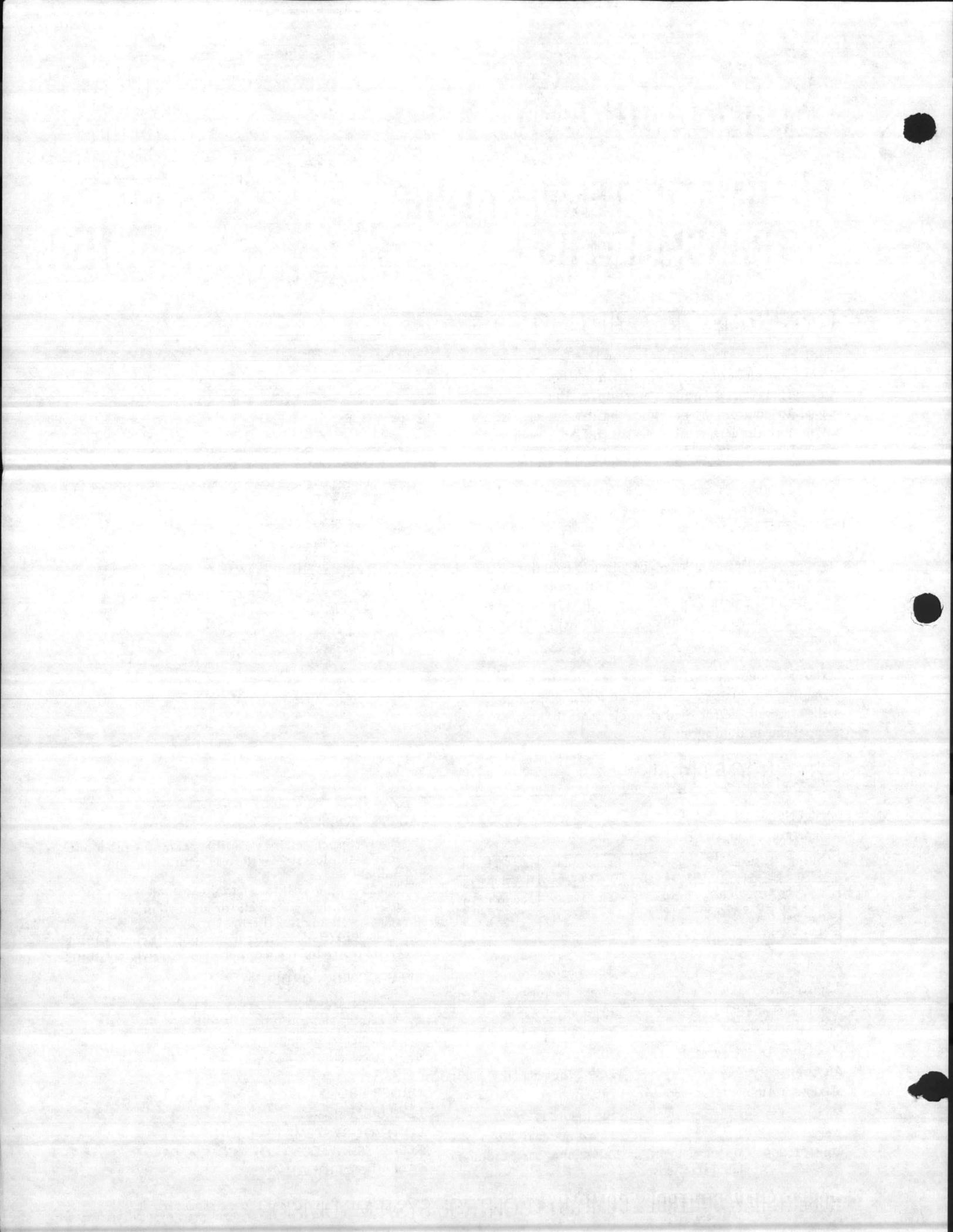
- 100-17 copper well for 9' capillary remote bulb model.
- 100-18 stainless steel well for 9' capillary remote bulb model.
- 100-25 copper well for rigid stem models
- 100-49 stainless steel well for rigid stem models
- 100-47 well adapter (Figure 3)
- N100-0010 (Red) restrictor tee (polyethylene tubing)
- N4-32 restrictor tee (copper or polyethylene tubing)

SPECIFY WHEN ORDERING:

- Model Number.
- Sensing element type.
- Temperature range.
- Accessories.

ORDER FROM:

Local office of:
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
 or office noted below.



INSTALLATION INSTRUCTIONS

PNEUMATIC TEMPERATURE TRANSMITTER

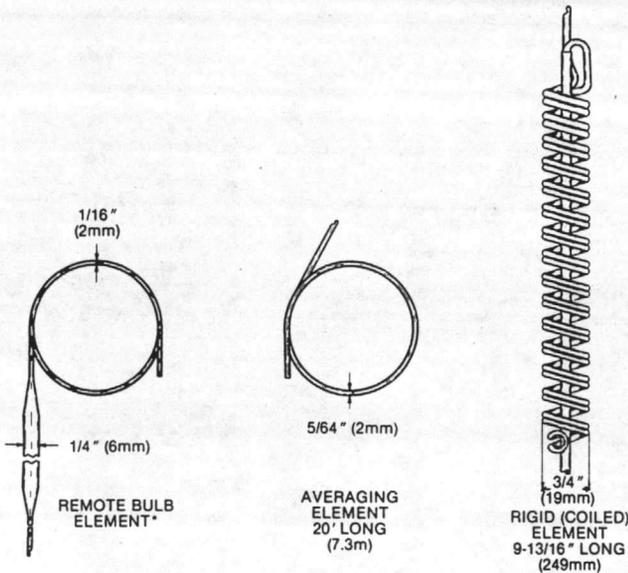
T150

GENERAL DESCRIPTION & DIMENSIONS

T150 transmitters are "one-pipe" devices requiring an externally restricted source of constant pressure control air. These transmitters are available with several types of sensing elements (rigid stem, averaging, remote bulb or a rigid coil for fast response).

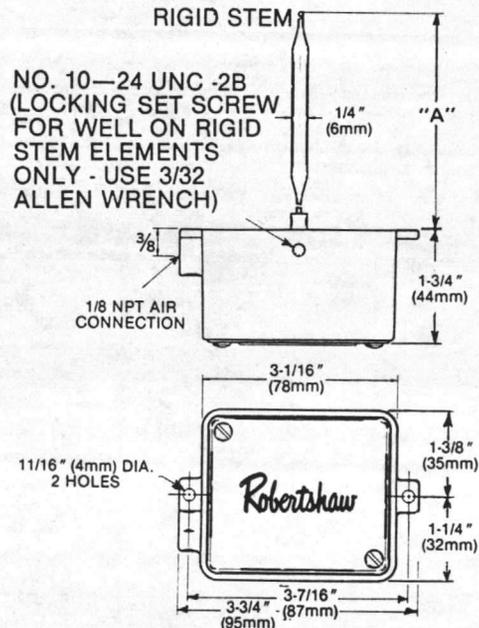
RIGID STEM LENGTHS

TEMPERATURE RANGE	DIM. "A"
0 to 100 (-18° to 38°C), 40 to 140°F (4° to 60°C)	9-3/8" (238mm)
-40 to 160 (-40° to 71°C), 40 to 240°F (4° to 116°C)	7-1/16" (179mm)



* NOTE: 9' CAPILLARY MODEL HAS 1/4" OD COPPER SLEEVE SILVER-SOLDERED TO BULB FOR USE WITH IMMERSION WELLS.

FIGURE 1 — T150 DIMENSIONS



No. 8 SHEET METAL SCREW (TYPICAL)

DUCT INSTALLATION

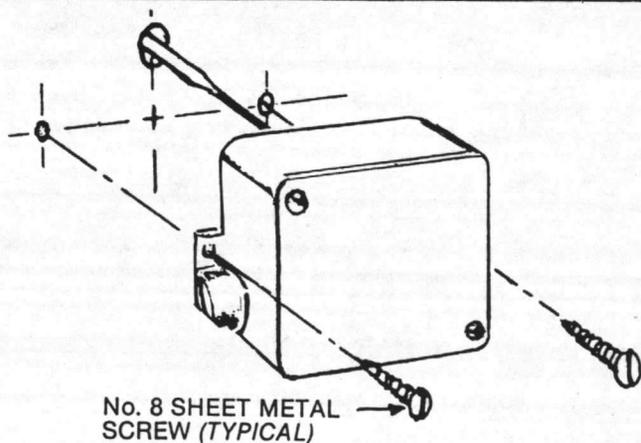
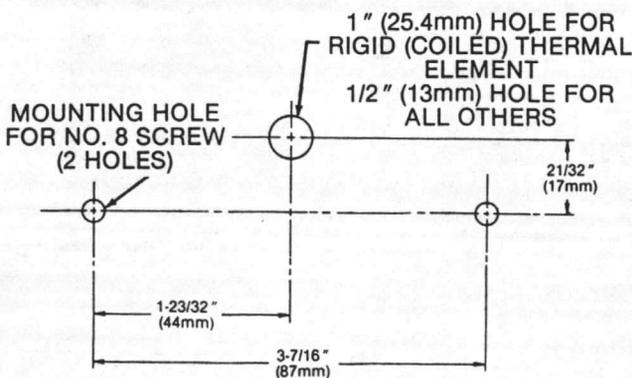
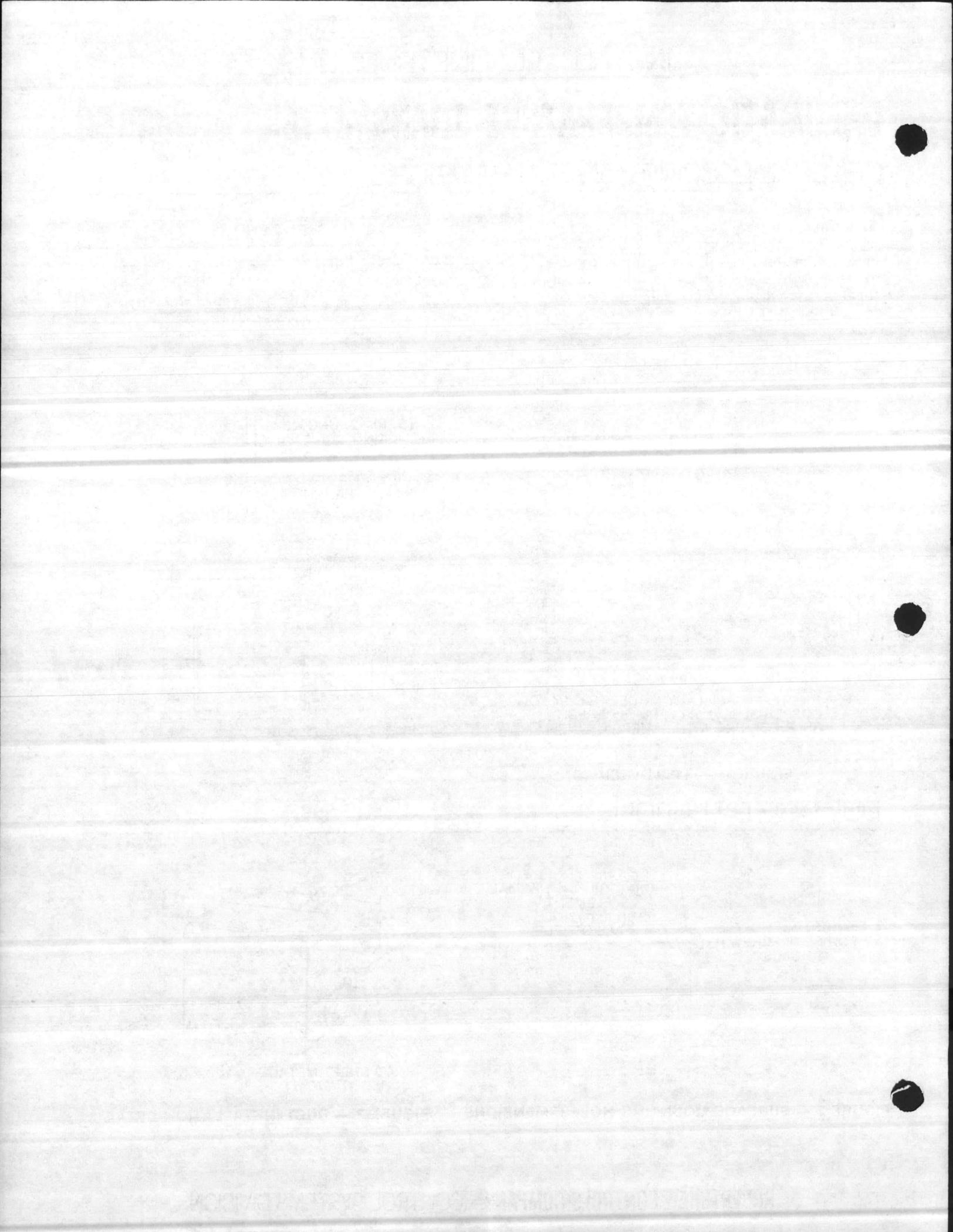


FIGURE 2 — SURFACE MOUNTING HOLE DIMENSIONS

FIGURE 3 — DUCT INSTALLATION DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMATIC TEMPERATURE TRANSMITTER

T150

CALIBRATION

The Model T150 Temperature Transmitter measures a system temperature and transmits a proportional pneumatic signal to a calibrated receiver gauge and/or receiver controller. (See table I for complete model number descriptions.) It is a "one-pipe," force-balance transmitter which utilizes an external restrictor in its supply line. It is not intended to be field calibrated. If the output pressure does not correspond to Table II, check the following:

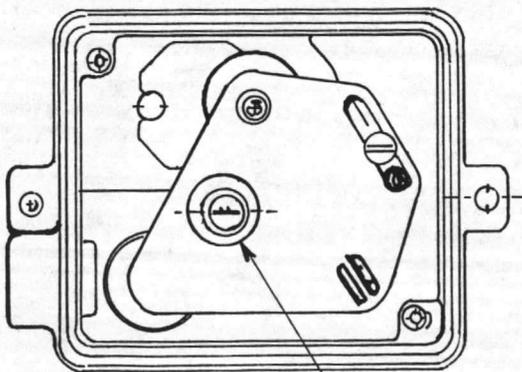
1. The air supply to the restrictor must be 20 psig \pm 0.5 psi (138 kPa \pm 3.4 kPa) and must be clean, dry and oil-free.
2. The restrictor and the device filter must be free of obstructions.

If, after completing the above checks, the transmitter output varies from Table II, see "Adjustments."

T150 MODEL NUMBERS						
TEMPERATURE RANGE	ELEMENT					
	RIGID 1/4" x 9-3/8"	RIGID 1/4" x 7-1/16"	AVERAGING 20 FT.	COILED 10"	1/4" x 10-1/2" 9 FT. CAPILLARY	1/4" x 4" 3 FT. CAPILLARY
-40°/160°	—	T150-1041	—	—	—	—
-25°/125°	—	—	—	—	T150-1055	T150-1054
0°/100°	T150-1021	—	T150-1022	T150-1023	—	—
30°/80°	—	—	T150-1062	—	—	—
40°/140°	T150-1011	—	T150-1012	T150-1013	—	—
40°/240°	—	T150-1031	—	—	T150-1035	—

TABLE I — T150 MODEL NUMBERS

ADJUSTMENT

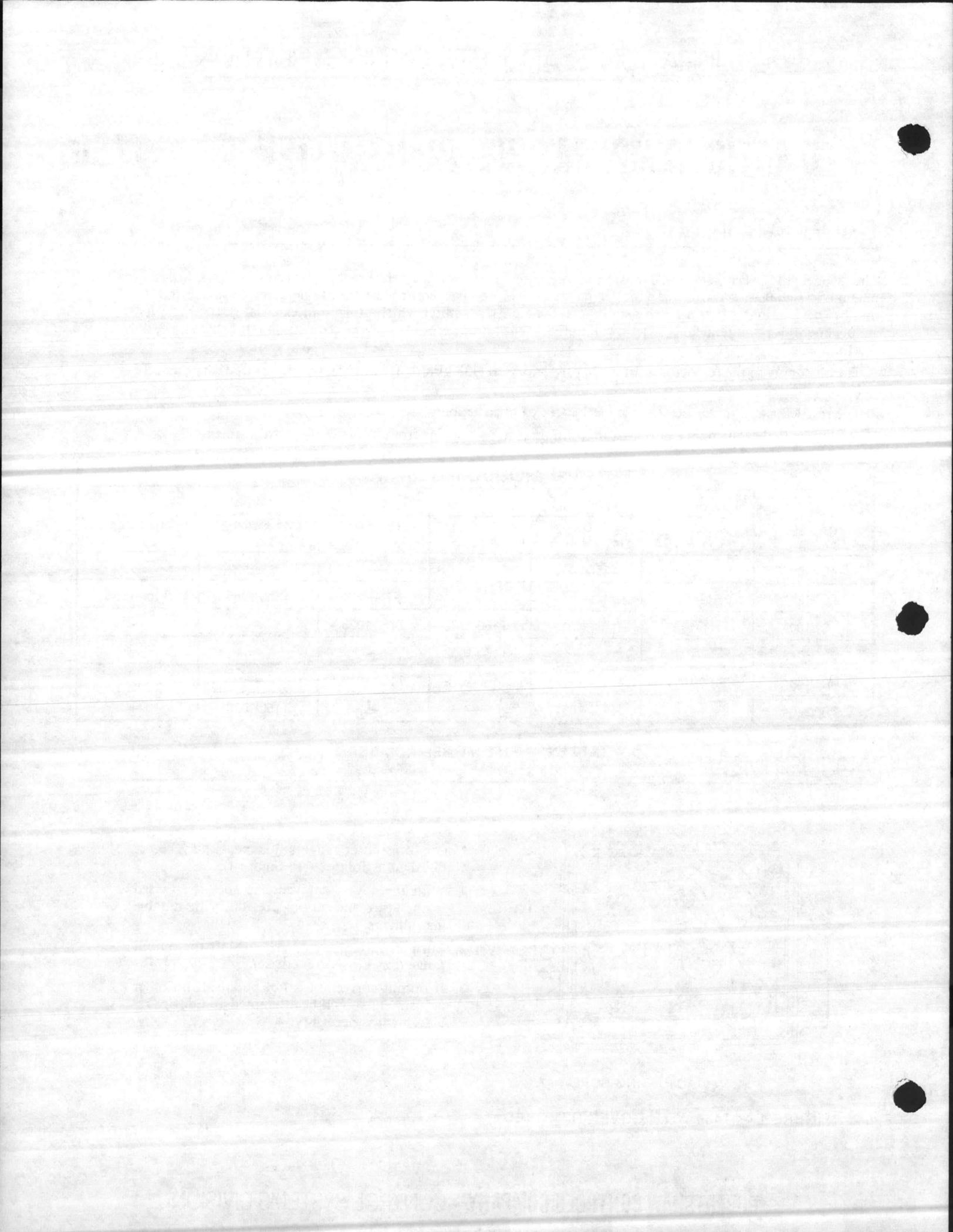


ADJUSTING SCREW "A"

FIGURE 1 — T150 WITH COVER REMOVED

Minor transmitter range adjustments may be accomplished as follows (see Figure 1):

1. With the cover removed, measure the sensed temperature and output pressure with suitable instruments.
2. Turn adjusting screw "A" to shift the output range (clockwise to increase).
3. If output correction is not obtained, no other adjustment should be attempted and device replacement is necessary.



Robertshaw



2,1,8,7

DATA
SHEET
MODEL
T312

LL

LOW LIMIT CONTROL ELECTRIC

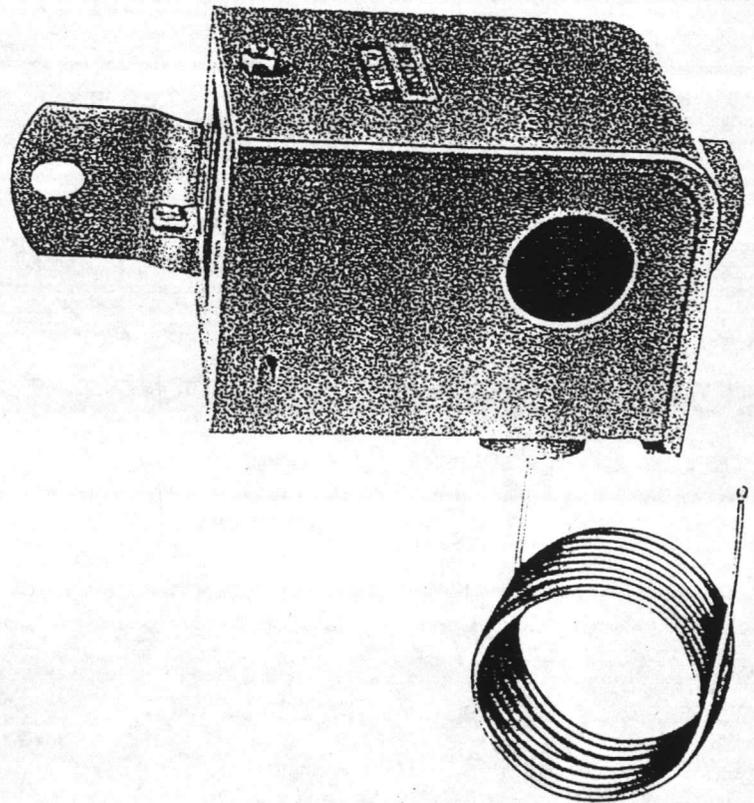
GENERAL DESCRIPTION

The Model T312 Low Limit Controller is a two-wire, line-voltage control used for low-temperature-limit applications on heating coils, cooling coils, etc.

The control is responsive only to the lowest temperature along the 20-foot sensing element. The single-pole, single-throw contact block is used to open the circuit on a temperature drop. Controls are supplied with manual reset; however, automatic recycling can be provided if so specified.

A single scale on the side of the unit shows the "cut-off" setting. Adjustments can be made from the bottom of the case without removal of the cover, or from the top when the cover is removed.

After opening when the temperature drops to the low limit set point, the T312-1 will automatically re-close upon a subsequent temperature rise of 12°F. The T312-2 locks out upon opening at the set point and requires a subsequent temperature rise of at least 12°F before it can be manually reset.



SPECIFICATIONS

MODEL NUMBER:

T312-1 (less manual reset—opens low)

T312-2 (with manual reset—opens low)

CONTROL ACTION: Single-pole, single throw; circuit opens on temperature drop.

ELEMENT: 1/8" x 20' (3.2 mm x 6.1 m)

RANGE: 35 to 45°F (1.67 to 7.22°C) (cutout). Maximum temperature at bulb 250°F (121°C).

MOUNTING BRACKETS: Supplied as standard.

DIFFERENTIAL: 12°F (6.7°C).

ELECTRICAL RATINGS: See Table 1.

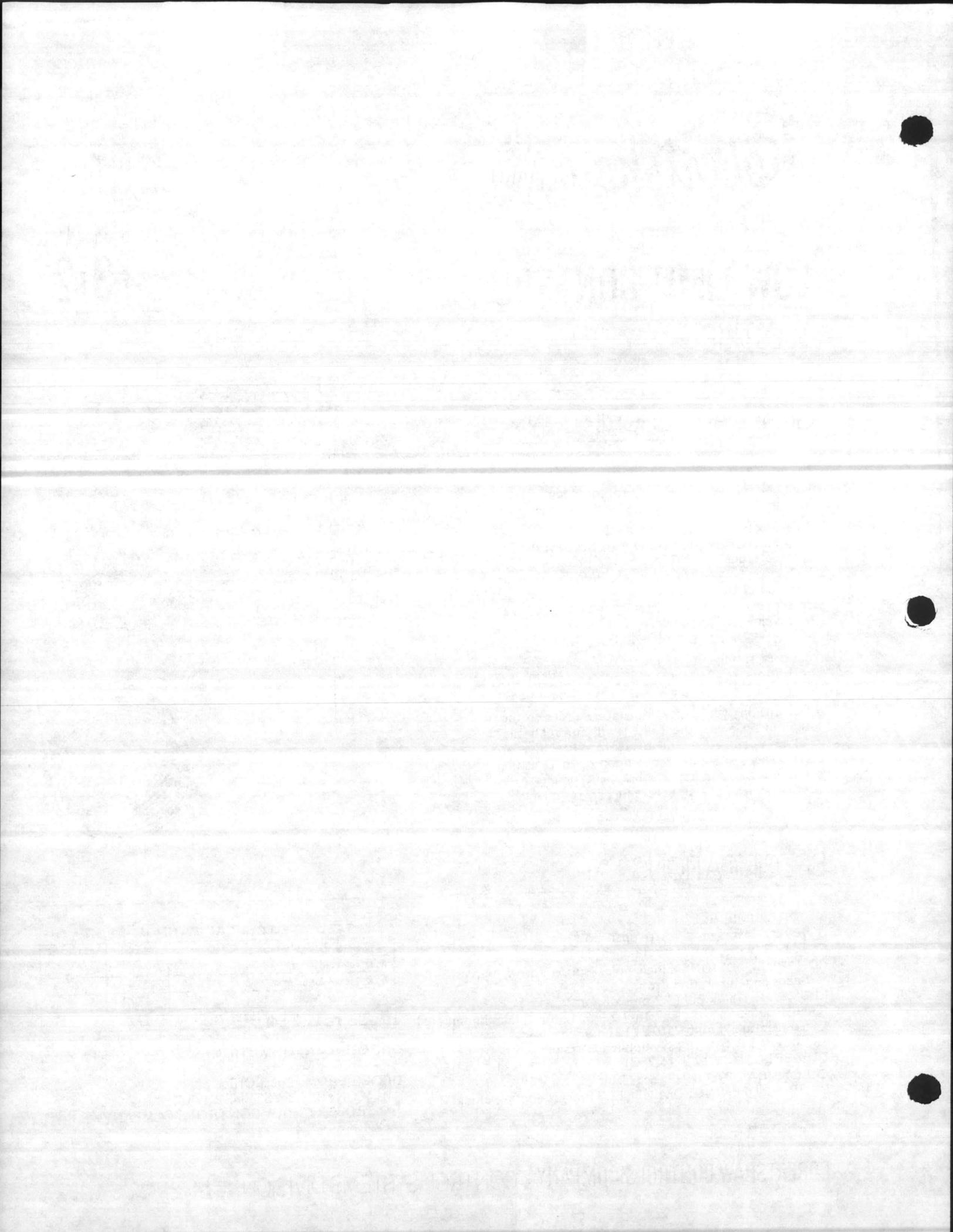
CONDUIT OPENING: One 1/2" (12.7 mm) conduit opening.

TABLE 1 ELECTRICAL RATINGS, S.P.S.T.

Motor Ratings	120 - Volts	208 - Volts	240 - Volts
A. C. Full-Load Amps	16	9.2	8
A. C. Locked Rotor Amps	96	55.2	48
Non-inductive Amps	16	9.2	8
Pilot Duty — 125 VA. 24 to 27 V.A.C.			

ORDERING INFORMATION: SPECIFY: Model Number.

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY



INSTALLATION INSTRUCTIONS

LOW TEMPERATURE LIMIT CONTROLLER

T312

ELECTRIC

GENERAL DESCRIPTION

The model T312 electric low temperature limit controller is a line voltage device for limit applications on heating and cooling coils. It is responsive only to the lowest temperature along the 20-foot (6.1 meter) sensing element. The single-pole, single-throw contact is used to open an electrical circuit on a temperature drop. Two versions of this controller are available:

T312-1: Contact opens if the sensed temperature drops to the setpoint. Contact recloses on a subsequent temperature rise to 12°F above the setpoint ("automatic reset").

T312-2: Contact opens and locks out if the sensed temperature drops to the setpoint. Contact can be reclosed manually ("manual reset") only after a subsequent temperature rise of 12°F above setpoint.

See Table I for electrical ratings.

TABLE 1 — ELECTRICAL RATINGS

Motor Ratings	120 - Volts	208 - Volts	240 - Volts
A. C. Full-Load Amps	16	9.2	8
A. C. Locked Rotor Amps	96	55.2	48
Non-inductive Amps	16	9.2	8
Pilot Duty — 125 VA. 24 to 277 V.A.C.			

INSTALLATION

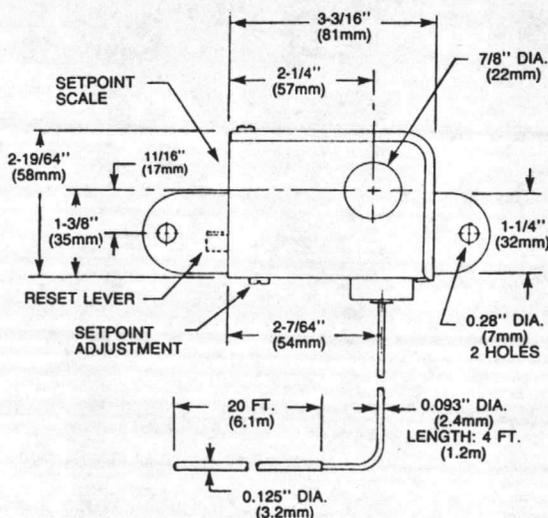
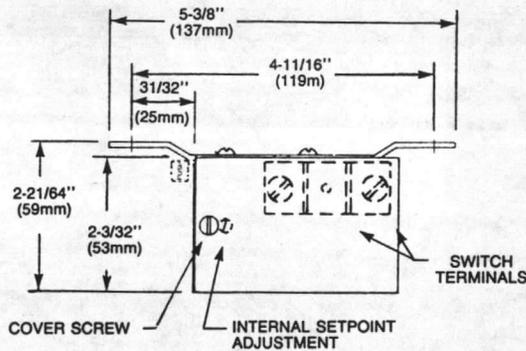


FIGURE 1 — MODEL T312 DETAILS.

See Figure 1 for device details.

Sensing Element: The sensing element of a T312 low limit usually is horizontally serpentine across a duct on the downstream side of a coil (see Figure 2) so that it is exposed to all areas where low temperatures are likely to be encountered; it should be fastened at sufficient points to prevent element damage due to air movement or mechanical vibration. (Note that the 4-foot [1.2 meter] capillary extension is not significantly affected by ambient temperatures and should not be relied upon for low limit action.) It is recommended that extended vertical routing of the sensing element be avoided to prevent reevaporation of the element "fill" under certain conditions.

Case: The T312 may be secured to a duct or other surface by means of two mounting holes in its integral bracket. The location of a "manual reset" device should permit convenient access to its reset lever.

Electrical: The electrical compartment is accessed by loosening a slotted, captive cover screw and swinging the cover from the case. Screw terminals with cup washers are provided for wire connections and a hole is provided in the front of the case for a conduit connection.

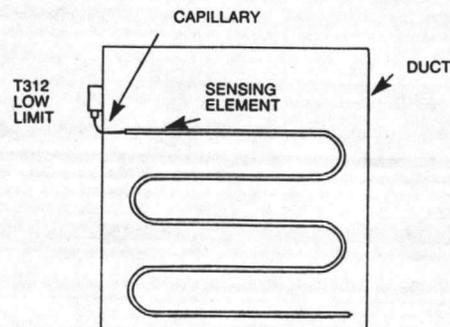
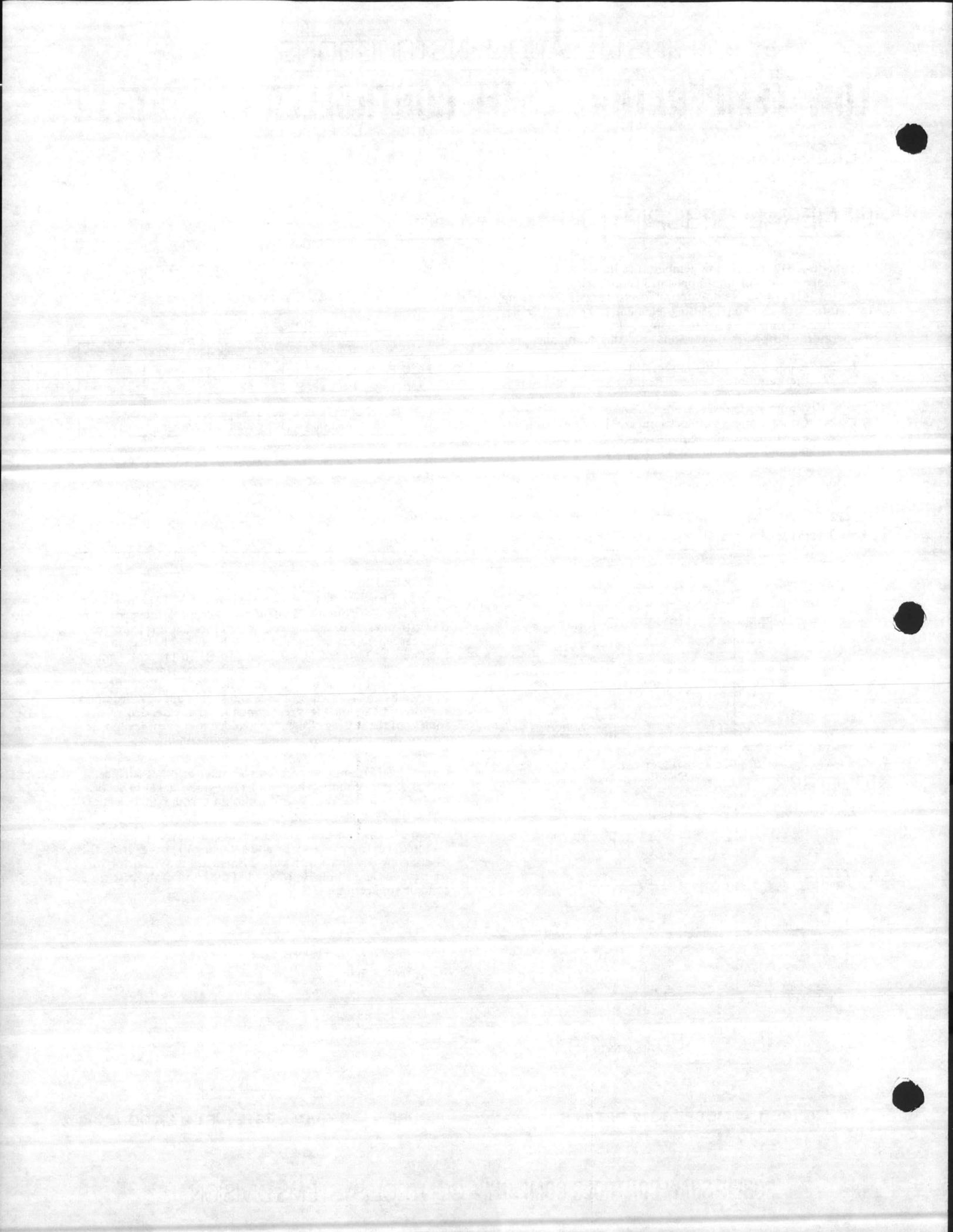


FIGURE 2 — TYPICAL T312 INSTALLATION.



CALIBRATION & ADJUSTMENT INSTRUCTION

LOW TEMPERATURE LIMIT CONTROLLER

T312

ELECTRIC

CALIBRATION

The model T312 electric low temperature limit controller is a line voltage device for limit applications on heating and cooling coils. It is responsive only to the lowest temperature along the 20-foot (6.1 meter) sensing element. The single-pole, single-throw contact is used to open an electrical circuit on a temperature drop. Two versions of this controller are available:

T312-1: Contact opens if the sensed temperature drops to the setpoint. Contact recloses on a subsequent temperature rise to 12°F above the setpoint ("automatic reset").

T312-2: Contact opens and locks out if the sensed temperature drops to the setpoint. Contact can be reclosed manually ("manual reset")

only after a subsequent temperature rise of 12°F above setpoint.

See Table 1 for electrical ratings.

The T312 setpoint is factory calibrated at 35°F.

TABLE 1 — ELECTRICAL RATINGS

Motor Ratings	120 - Volts	208 - Volts	240 - Volts
A. C. Full-Load Amps	16	9.2	8
A. C. Locked Rotor Amps	96	55.2	48
Non-inductive Amps	16	9.2	8
Pilot Duty — 125 VA. 24 to 277 V.A.C.			

ADJUSTMENT

See Figure 1 for device appearance.

The switching **differential** of the T312 is fixed at 12°F above the setpoint (not field adjustable).

If the factory calibration is not suitable, the **setpoint** of the T312 may be field adjusted from 35 to 45°F by turn-

ing a double-ended, slotted adjustment screw that is accessible from the bottom of the case with the cover in place or from the top of the device with the cover removed (one slotted, captive screw). The setpoint scale is visible from outside the left end of the case.

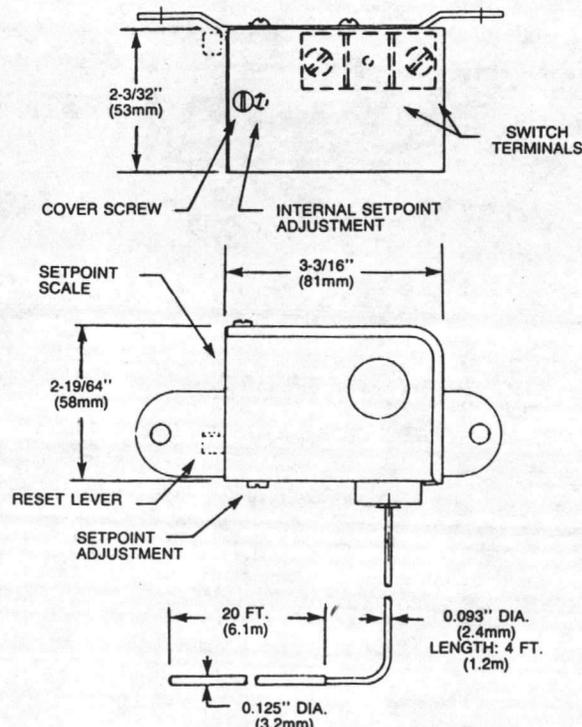
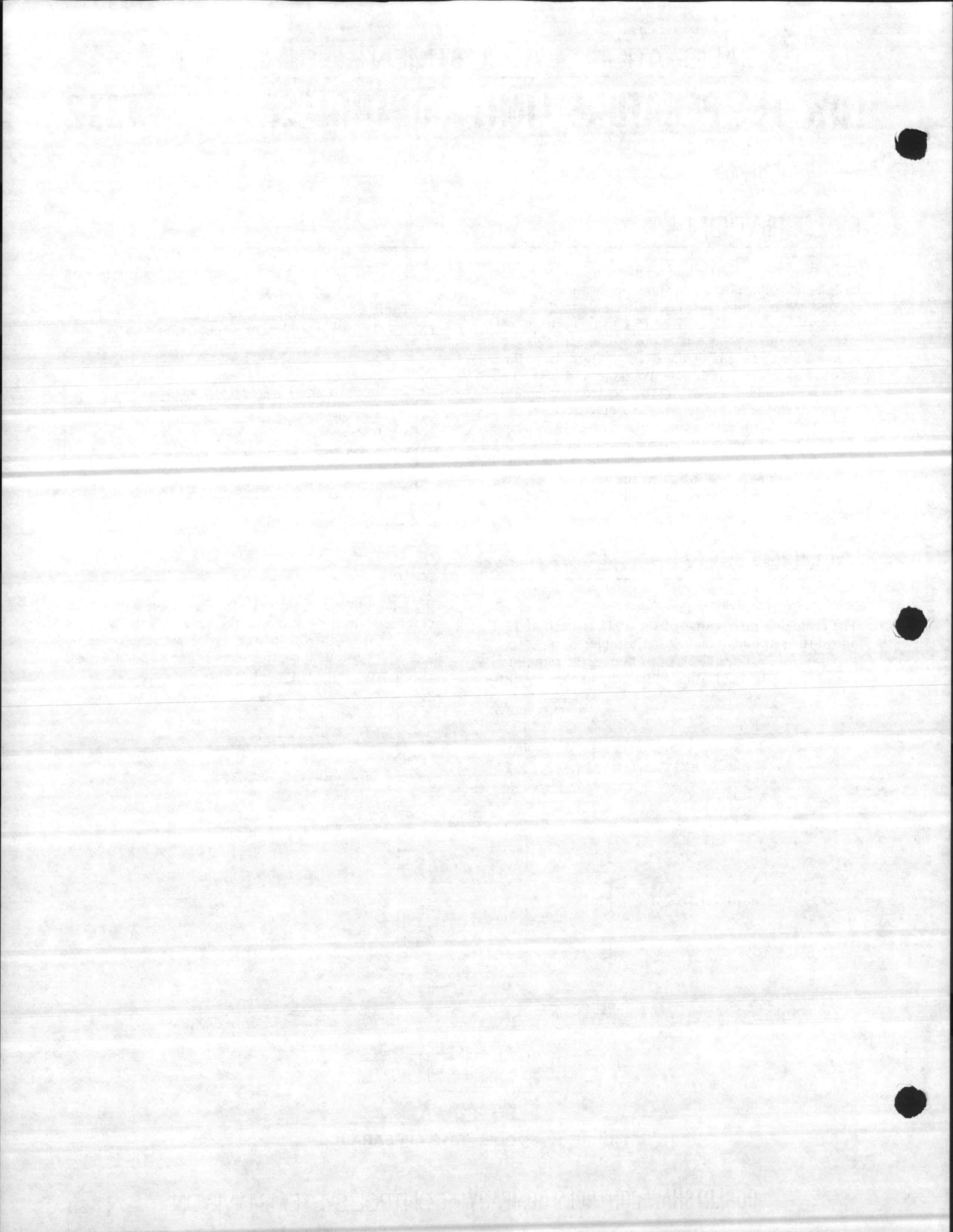


FIGURE 1 — MODEL T312 APPEARANCE.



Remote Bulb Temperature Controls

2.1.8.5 T4

54B; T6064A,B continued

Order Number	Switching ^a	Control Temp. Range		Differential		Application
		F	C	F	C	
T6054B1003	1-spdt	60 to 80	16 to 27	0.8	0.4	Heating/cooling
T6064A1003	2-spdt	60 to 80	16 to 27	0.8	0.4	Heating/cooling
T6064A1011	2-spdt	60 to 80	16 to 27	0.8	0.4	Heating/cooling
T6064B1001	2-spdt	55 to 85	13 to 29	3.0	1.7	Heating/cooling

^aSwitches make R-W on temperature rise; make R-B on temperature fall.

T675A,B; T678A Controllers

Remote bulb thermostats regulate temperature of air or liquids in ducts, pipes, tanks, and boilers.

For applications requiring accurate temperature control of air or liquids where controller must be placed outside the sensing area. Typical uses include control of dampers and valves in heating, cooling, and heating-cooling systems. Fast response models available for use in return air duct operate approximately 4 times faster than standard models. Bulb Size: 1/2 x 4-3/16 in. [13 x 106 mm] for standard models, 1/2 x 3-9/16 in. [13 x 90 mm] available for 55 F to 175 F [13 C to 79 C] models. Approximate Dimensions: 5-5/8 in. [143 mm] high, 2 in. [51 mm] wide, 2-5/8 in. [67 mm] deep. Listed by Underwriters Laboratories Inc.; Canadian Standards Association certified—T675A, T678A.

ELECTRICAL RATINGS (A):

T675A adjustable differential models and T678A—

	120 Vac	240 Vac
Full Load	8.0	5.1
Locked Rotor	48.0	30.6

T675A nonadjustable differential models—125 VA at 120/208/240 Vac.

T675B—125 VA at 240 Vac pilot duty.

T678A—Maximum connected load: 2000 VA.

REPLACEMENT PART:

131524A Capillary Holder for mounting a fast-response sensing element in an air duct.

ACCESSORIES:

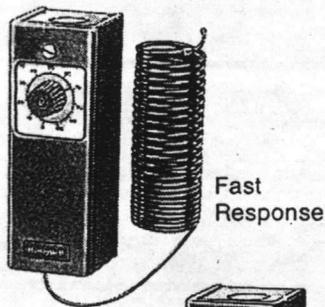
107324A Capillary Holder for mounting a sensing bulb in an air duct; 8-3/8 in. [213 mm] long.

311266D Duct Bulb Holder.

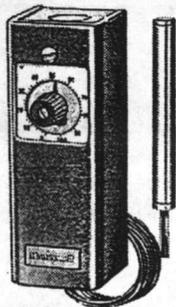
Immersion Well Assembly. To protect sensing bulb from mechanical or chemical damage when mounting in a boiler or storage tank; copper; 4-3/4 in. [121 mm] insertion length; includes tube clip for clamping capillary tube to immersion well.

112622AA, 1/2-14 NPT external threads on spud, includes 112721 clip.

112630AA, 3/4-14 NPT external threads on spud, includes 112720 clip.

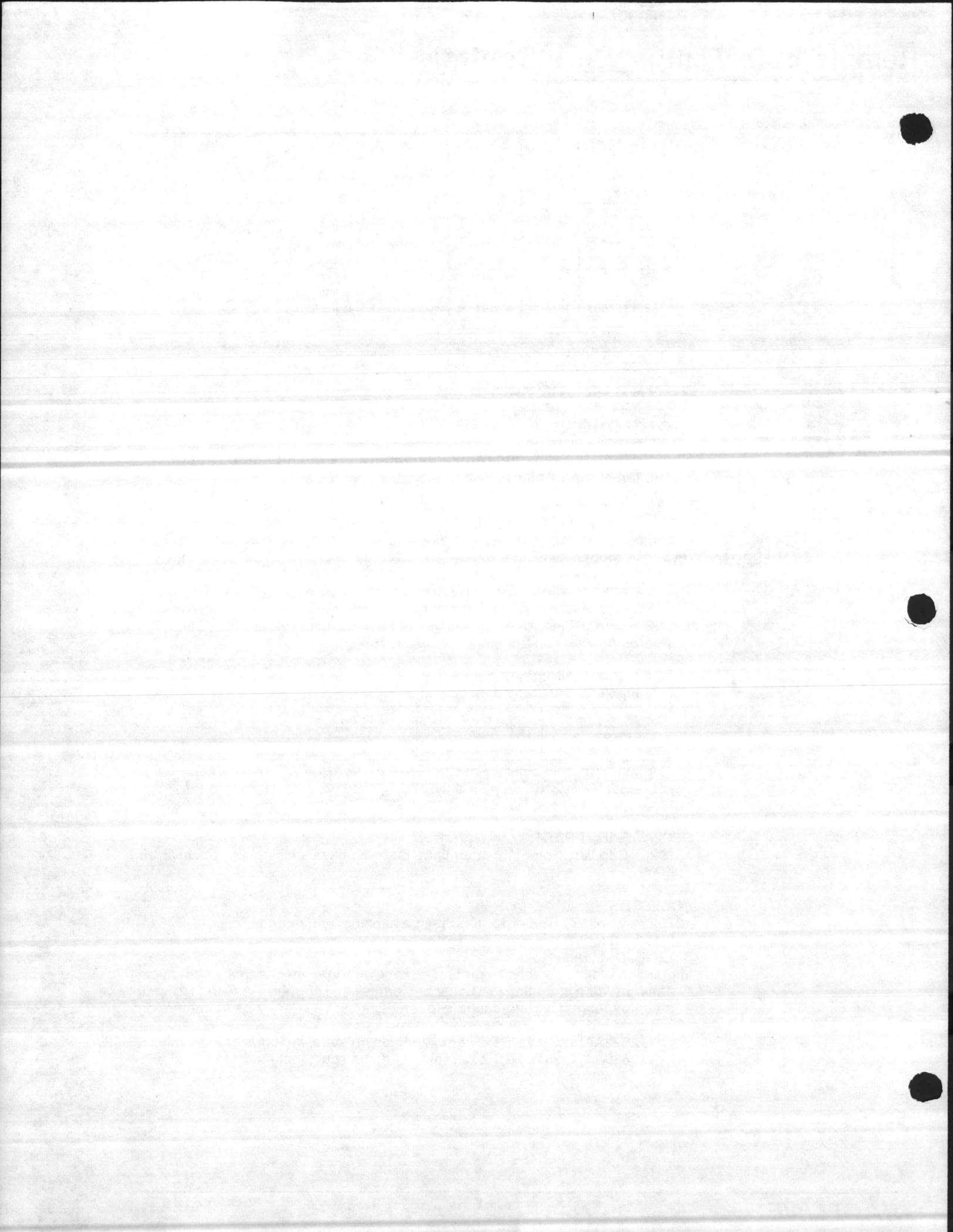


Fast Response



Standard

continued next page





2.1.8
RT-1

DATA
SHEET

MODEL
T 18 & T 19

PNEUMATIC ROOM THERMOSTATS

DIRECT AND REVERSE ACTING

GENERAL DESCRIPTION

The Model T18 and T19 Pneumatic Room Thermostats are designed for proportional control of pneumatic valves and damper actuators in environmental control systems. Their design incorporates a highly sensitive bimetal thermostatic element and a pilot-bleed relay with pneumatic feedback for accuracy and stability over the entire operating range.

Thermostat covers are available with thermometer and set point scale, thermometer only, set point scale only, or blank; with any cover, the external set point adjustment may be concealed with a clip-in plastic barrier.

The component parts are die cast aluminum, stainless steel and glass-filled Nylon. Diaphragms are fabric-reinforced Neoprene. Air lines are connected to the thermostat nipples with spring-reinforced plastic tubes and both main and branch connections are provided with internal filters.

GENERAL INSTRUCTIONS

1. A thermostat should be mounted where it will be affected only by the average room temperature. Free circulation of air must exist at the selected location. Avoid locations that are affected by drafts or by radiant heat from the sun, water pipes, air ducts, etc.
2. Installation on outside walls should be avoided. If such a location is necessary, the thermostat should be mounted on an insulated backplate (accessory item).
3. Thermostats should be mounted AFTER WALL SURFACES HAVE BEEN FINISHED.



SPECIFICATIONS

MODEL NUMBERS: Direct-acting, proportional T18-301 (55° - 85° F); T18-305 (35° - 65° F); T18-306 (75° - 105° F). Reverse-acting, proportional T19-301 (55° - 85° F); T19-305 (35° - 65° F); T19-306 (75° - 105° F).

SET POINT: adjustable by means of serrated thumbwheel.

THROTTLING RANGE: Adjustable from approximately 2° - 12°F by T.R. Slide.

SUPPLY AIR PRESSURE: 20 psig (1.38 bar) operating, 30 psig (2.06 bar) maximum.

MAIN AIR CONSUMPTION: 15 SCFM (0.0117 m³/hr)

CALIBRATION POINT: 9 psig (0.62 bar) branch pressure

THERMOMETER: Bimetal spiral with separate scale.

COVER TYPES: See table on rear of sheet.

STANDARD FINISH: Satin chrome painted aluminum cover.

DIMENSIONS: See Figure 1.

WEIGHT: 2.7 ounces (76 g).

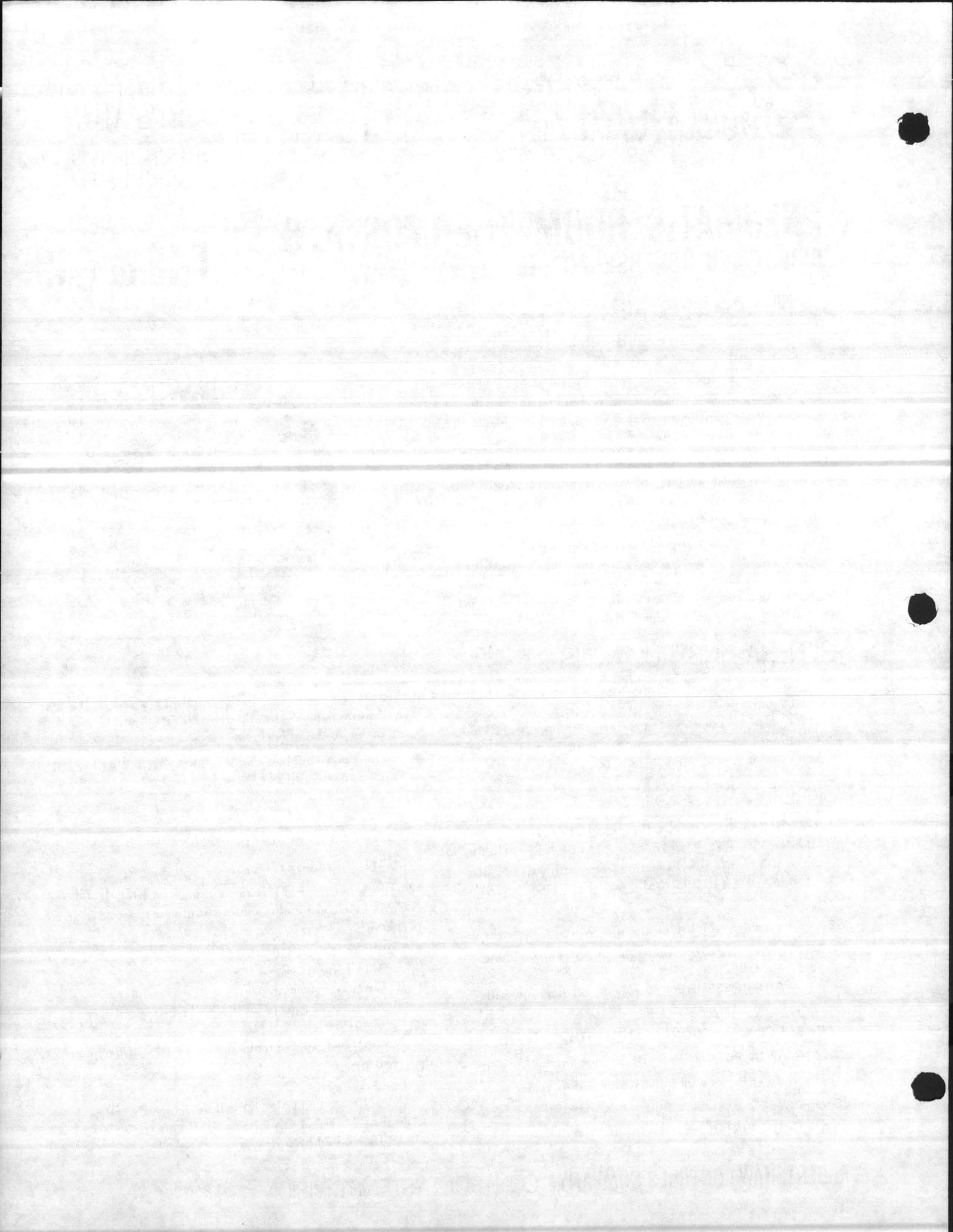
INSTALLATION FITTINGS: Tubing assembly 10-64 and selected rough-in and mounting hardware must be ordered separately.

SPECIFY WHEN ORDERING:

1. Model Number
2. Cover type (see reverse).
3. Limit Stops (pair) Model 10-59 (if required - see Figure 3).
4. Concealed Adjustment Clip Model 10-72 (if required).

ORDER FROM:

Local office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.



INSTALLATION INSTRUCTIONS

PNEUMATIC ROOM HUMIDISTAT & THERMOSTATS

TWO-PIPE

**H18
T18 & T19
T23 & T24
T32 & T33
T34
T35 & T36**

GENERAL INSTRUCTIONS

1. A thermostat should be mounted where it will be affected only by the average room temperature. Free circulation of air must exist at the selected location. Avoid locations that are affected by drafts or by radiant heat from the sun, water pipes, air ducts, etc.
2. Thermostat installation on outside walls should be avoided. If such a location is necessary, the thermostat should be mounted on an insulated backplate (accessory item).
3. Humidistat should be located to sense average room humidity.
4. Thermostats and humidistats should be mounted **AFTER WALL SURFACES HAVE BEEN FINISHED.**

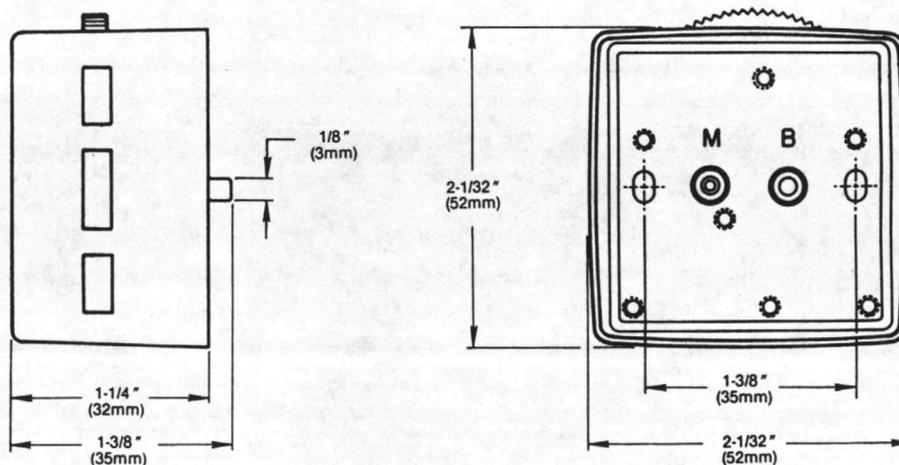
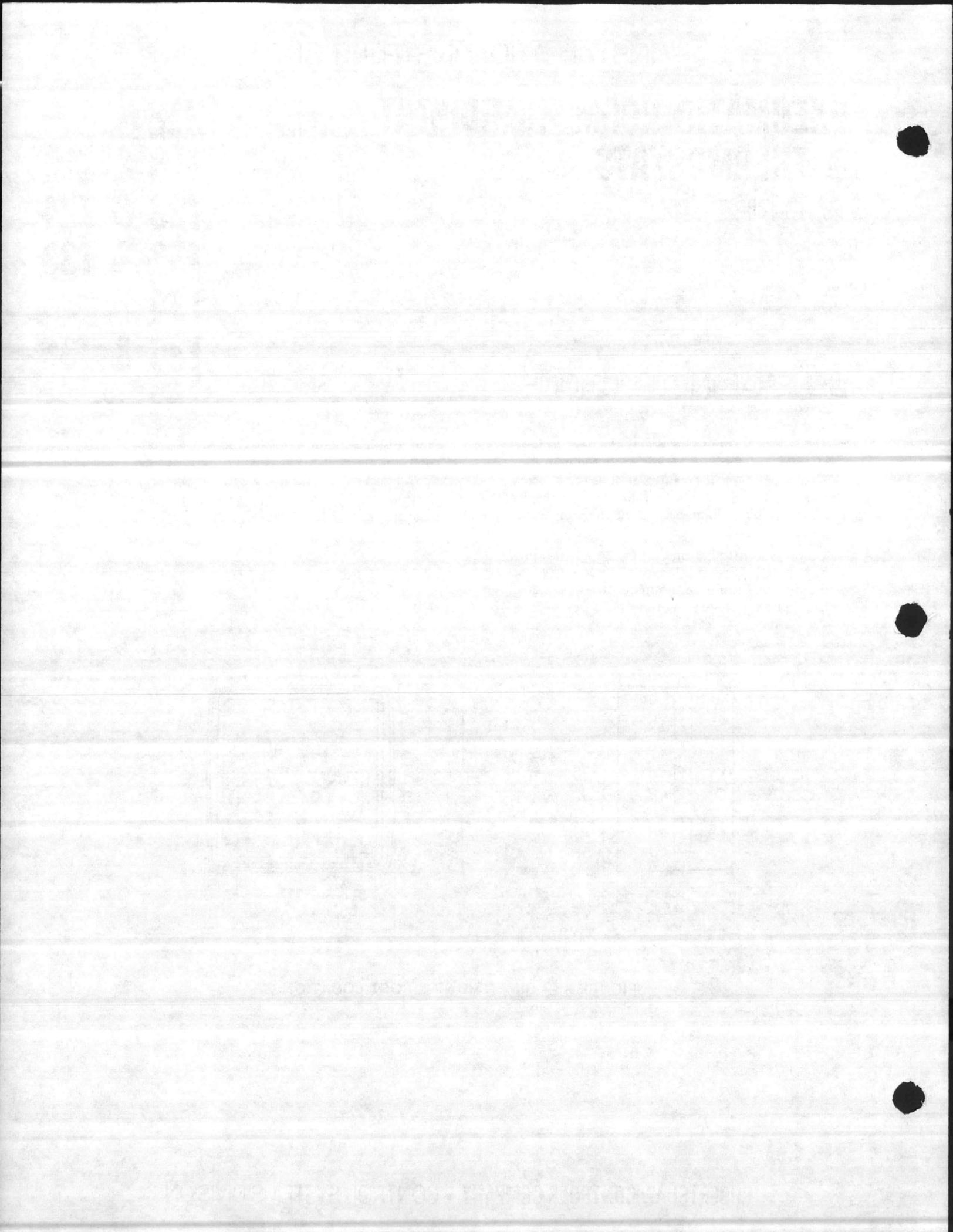


FIGURE 1 — DIMENSIONS & PORT LOCATIONS



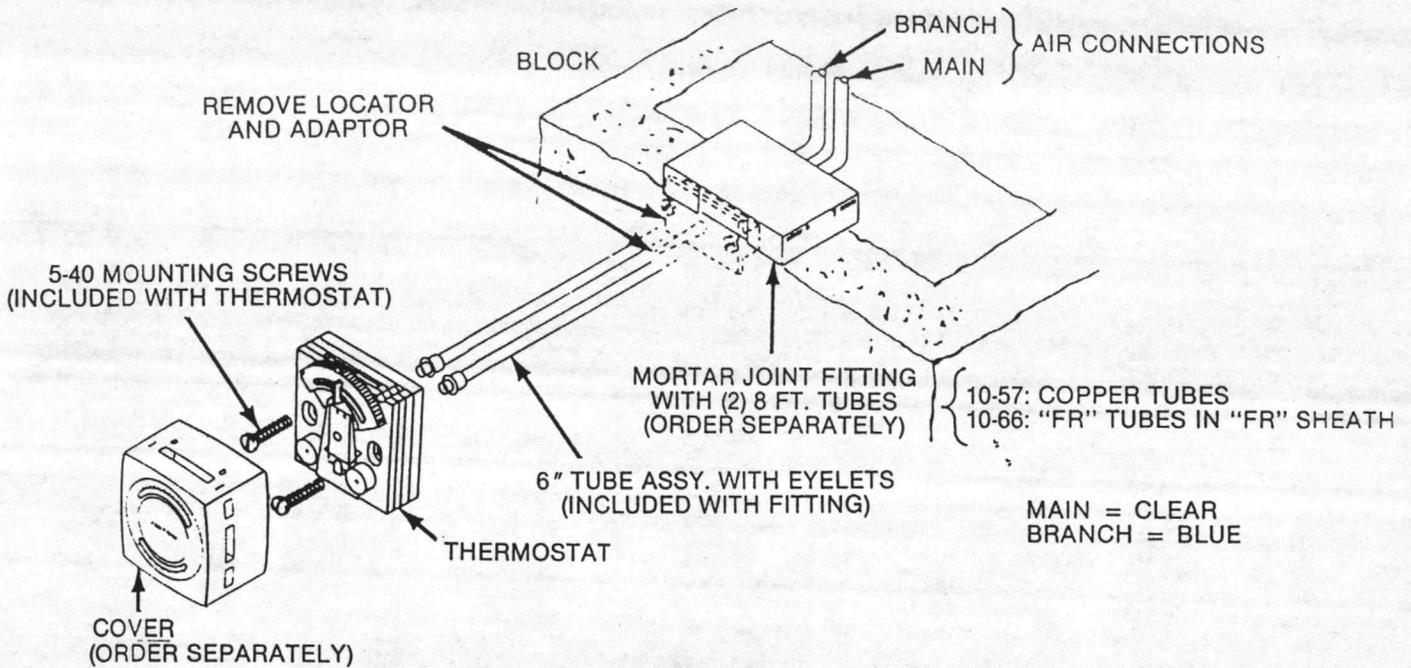


FIGURE 2 — MORTAR JOINT FITTING IN MASONRY WALL (TYPICAL)

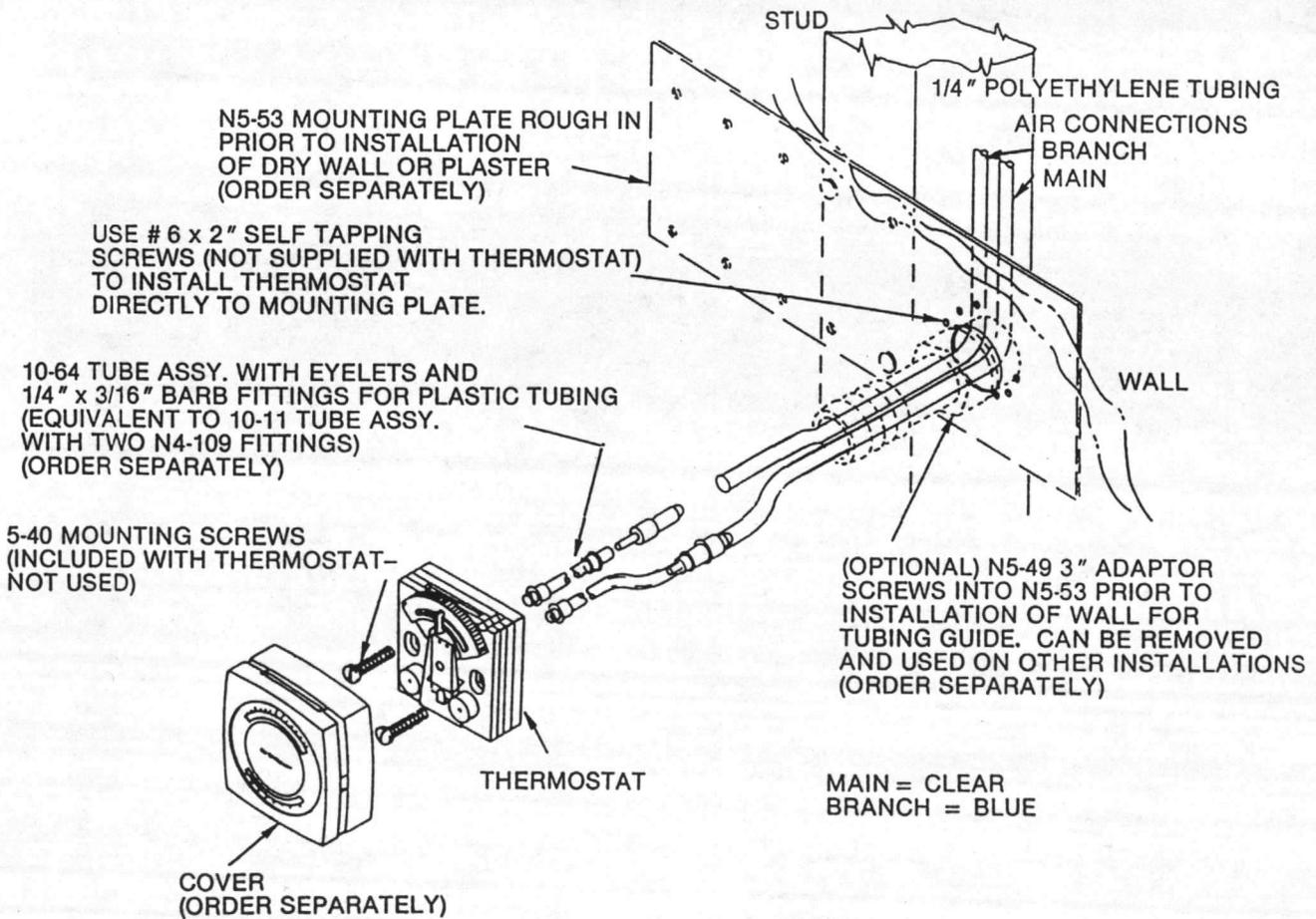
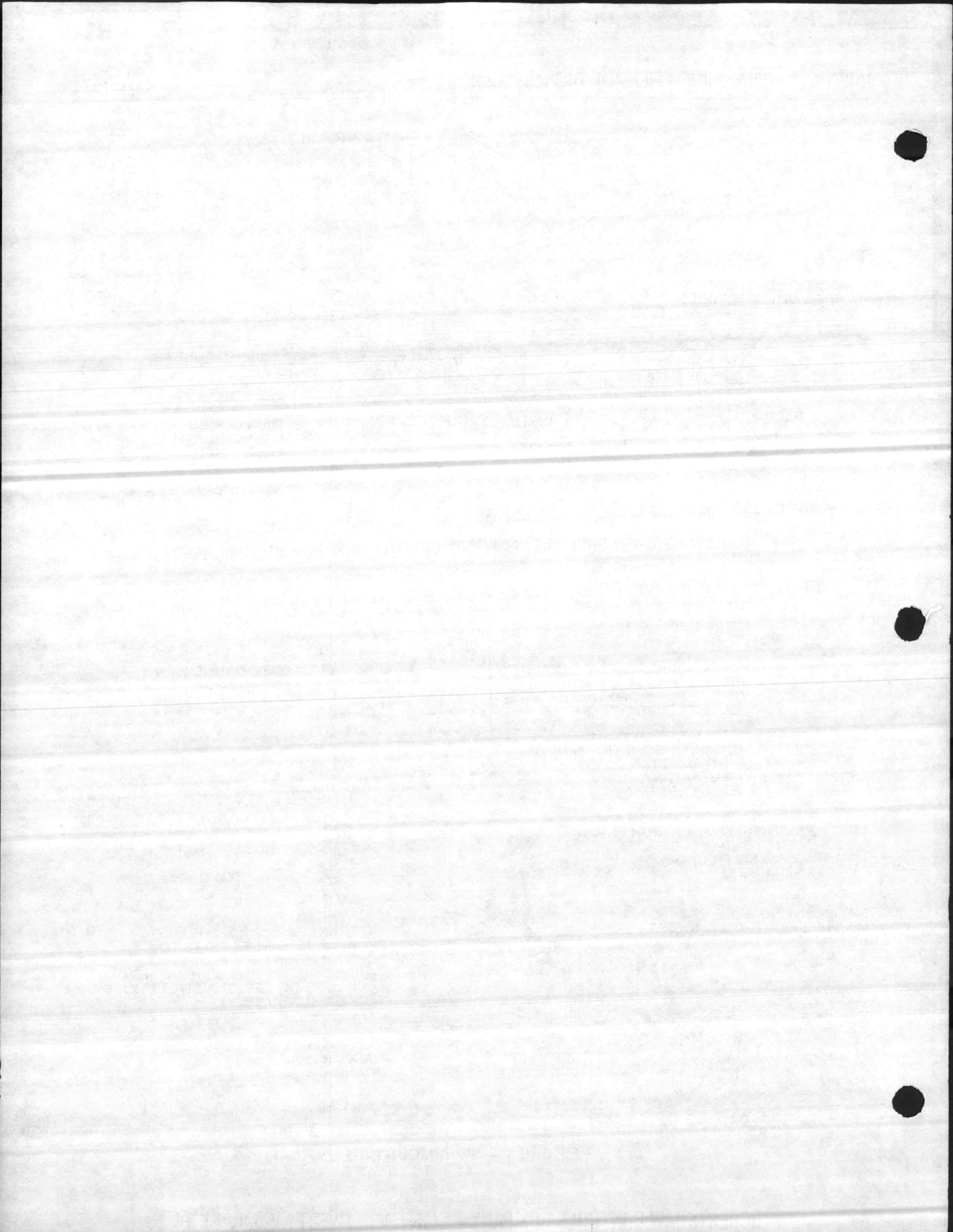


FIGURE 3 — STUD MOUNTING (TYPICAL)



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMATIC ROOM THERMOSTATS

DIRECT AND REVERSE ACTING

T18 (D.A.)

T19 (R.A.)

CALIBRATION

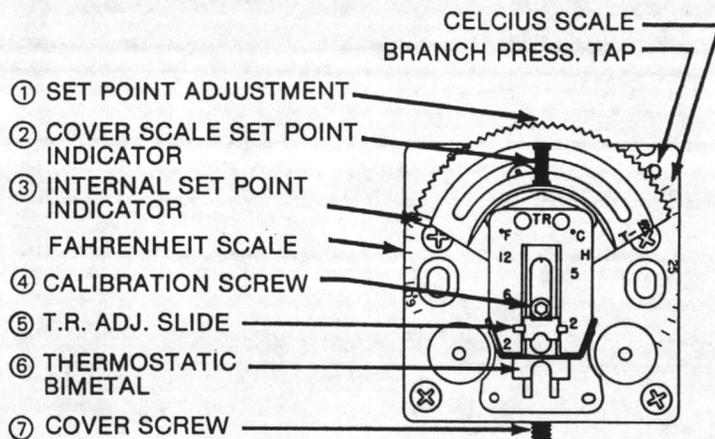


FIGURE 1 — T18 WITH COVER REMOVED

The T18 and T19 thermostats are factory calibrated with the throttling range set at 3°F. and should not require calibration upon installation.

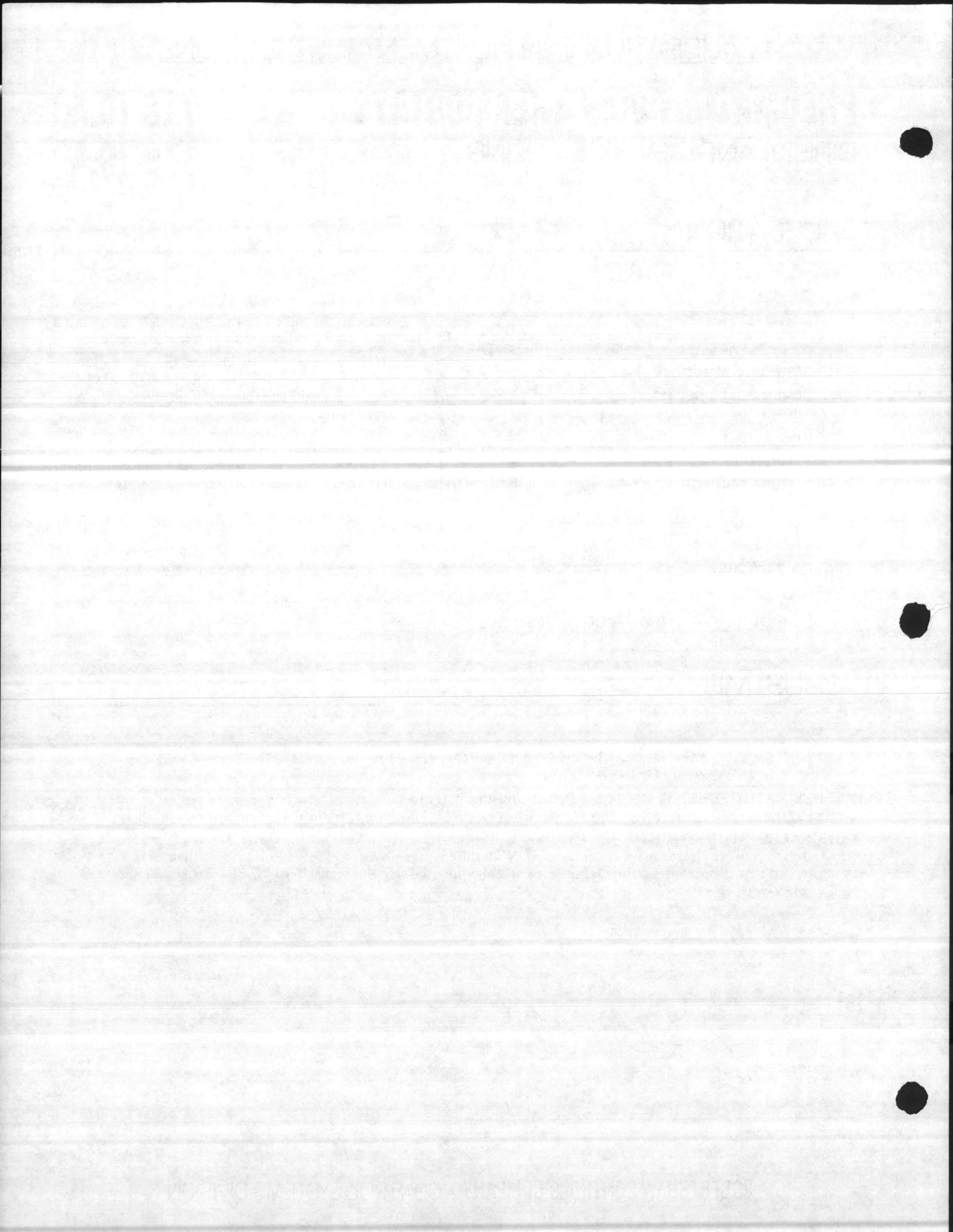
If it is necessary to change the calibration or change throttling range setting, install an adapter MCS-GA and suitable gauge in the branch pressure tap hole and measure the ambient temperature with an accurate thermometer. The temperature **MUST BE WITHIN THE RANGE OF THE THERMOSTAT**. Move the Set Point Adjustment (1) to the measured ambient temperature, using Internal Set Point Indicator (3). Taking care not to breathe on or hold hand near bimetal (6), use a 1/16" hex wrench (N2-4 Thermostat Wrench) to turn Calibration Screw (4) until the test gauge indicates 9 psig. Clockwise rotation increases the pressure. Move the Set Point Adjustment (1) to the desired temperature. The cover may now be installed using Cover Screw (7).

ADJUSTMENT

CAUTION: Set Point adjustment will be restricted if Limit Stops have been installed. **DO NOT APPLY EXCESSIVE FORCE AGAINST STOPS.**

EXPOSED ADJUSTMENT. Rotate Set Point Adjustment (1) to the desired new temperature setting as indicated by the cover set point scale or to a "warmer" or "cooler" position as indicated by the cover scale labels.

CONCEALED ADJUSTMENT: Using Thermostat Wrench N2-4 (1/16" hex), turn Cover Screw (7) inward (clockwise) to provide clearance for cover removal. With the cover removed, rotate Set Point Adjustment (1) until the desired new temperature setting is indicated on either internal setpoint scale (°F or °C). Replace cover and lock in place with cover screw.





2.1.8

RT-2

**DATA
SHEET**
**MODEL
T35 & T36**

DEADBAND ROOM THERMOSTATS DIRECT AND REVERSE ACTING

GENERAL DESCRIPTION

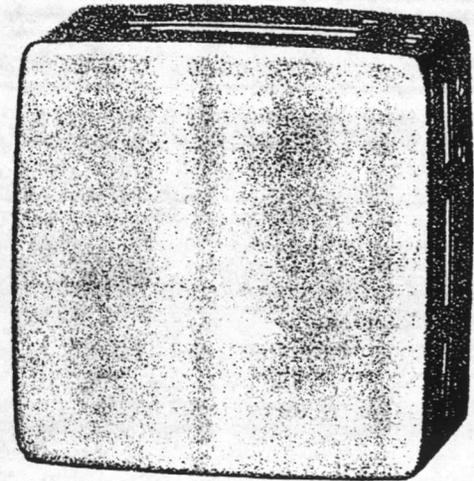
The Model T35 and T36 pneumatic Deadband Room Thermostats are dual set point, direct and reverse-acting energy conservation thermostats designed for proportional control of pneumatic valves, damper actuators or other final control devices in environmental control systems where it is desirable to set up a temperature span within which the HVAC system USES NO ENERGY FOR EITHER HEATING OR COOLING BETWEEN SELECTED HEATING AND COOLING SET POINTS.

The high-capacity, two-pipe (main and branch), pilot-operated, relay-type design incorporates two highly sensitive bimetal thermostatic elements to produce the desired branch output changes at each end of the selected deadband. A phosphor bronze leaf spring is utilized to stabilize the desired (adjustable) deadband output pressure. Pneumatic feedback assures stability throughout the operating range.

Two separate and concealed set point dials are used to set the individual heating and cooling set points, thereby creating the desired "deadband" which will occur between the two selected set points.

When the thermostat's cover is removed, all calibrations and settings are accessible on the thermostat face, without removing the device from the surface on which it is mounted.

The component parts are die-cast aluminum, stainless steel, phosphor bronze and glass-filled nylon. Diaphragms are fabric-reinforced neoprene. Air lines are connected to the thermostat nipples with flexible plastic tubes. Both main and branch connections are provided with internal filters.



SPECIFICATIONS

MODELS: T35-301; Proportional, Direct Acting
T36-301; Proportional, Reverse Acting

RANGE: 57° to 75°F (14-24°C) Heating
65° to 83°F (18-28°C) Cooling

Each set point and deadband pressure individually adjustable using 1/16" (1.6 mm) Allen wrench.

THROTTLING RANGE: Approx. 1.5°F (.83°C) per set point when used with actuators having 5 psig (.35 bar) spring range, non-adjustable.

SUPPLY AIR PRESSURE: 20 psig (1.4 bar) operating
30 psig (2.1 bar) maximum

CALIBRATION POINTS: Heating: Output pressure equal to mid-range of heating actuator @ desired heating set point. (Factory calibrated at 4 psig on T35, 10.5 psig on T36.)

Cooling: Output pressure equal to mid-range of cooling actuator @ desired cooling set point. (Factory calibrated at 10.5 psig on T35, 4 psig on T36.)

Deadband pressure: Midway between "closed" pressure of heating actuator and "start-to-open" pressure of cooling actuator. (Factory set at 7 psig.)

DIMENSIONS: See reverse side.

WEIGHT: 2.6 ounces (75 g)

INSTALLATION FITTINGS: If needed, tubing assembly 10-64 and selected rough-in and mounting hardware must be ordered separately.

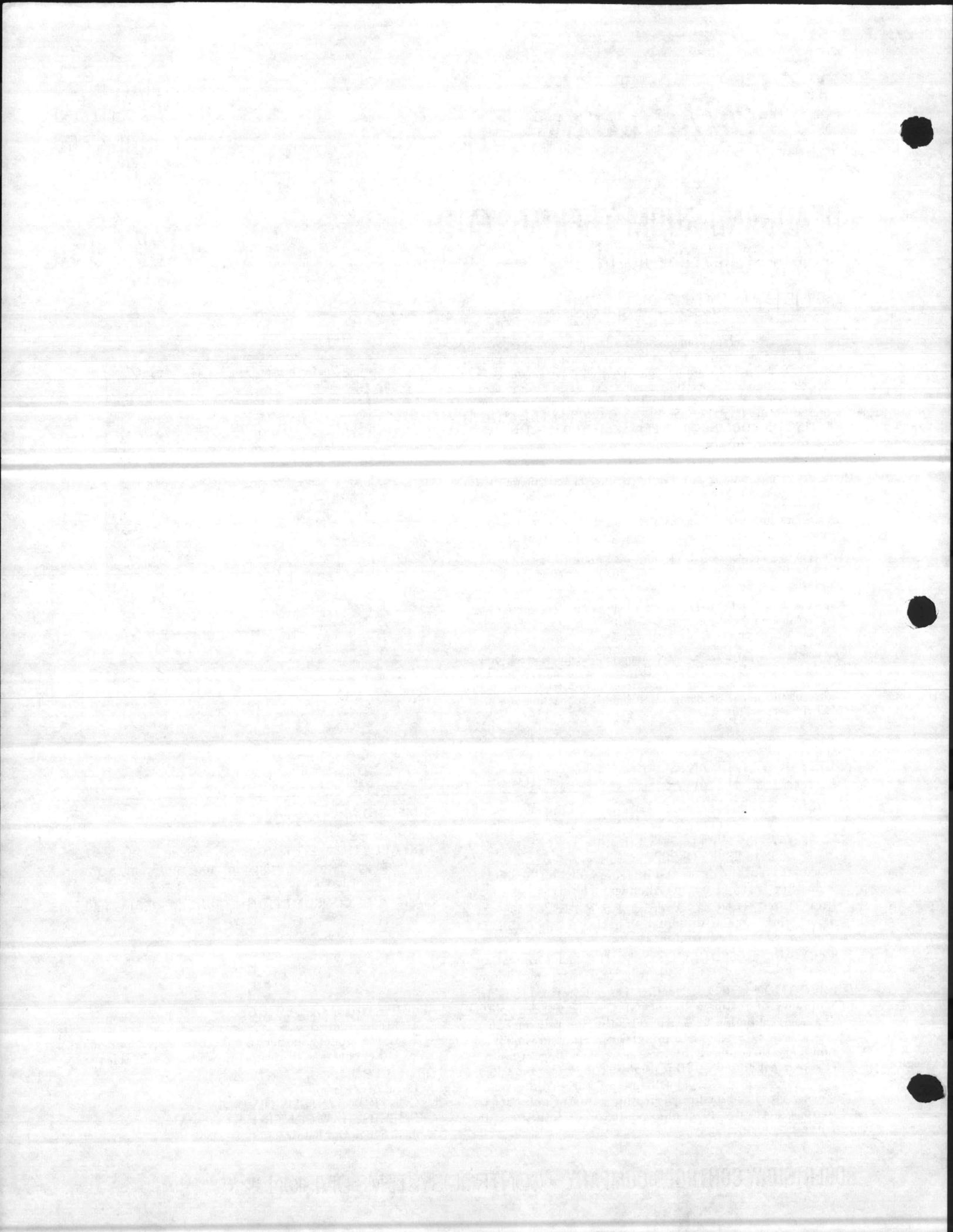
MAIN AIR CONSUMPTION: 15 SCIM (0.0147 m³/hr)

SPECIFY WHEN ORDERING:

1. Model number.
2. Cover model number (blank cover is recommended.)
Other covers with various finishes are available.

ORDER FROM:

Local office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.





RT-3, UT-1+2

2, 1, 8

DATA
SHEET
MODEL
T34

PNEUMATIC ROOM THERMOSTATS SUMMER-WINTER ENERGY CONSERVATION

GENERAL DESCRIPTION

The model T34 Pneumatic Room Thermostat is designed for proportional control of pneumatic valves and damper actuators in environmental control systems where a two-pressure air main is utilized for seasonal changeover of heating and cooling functions. Its design incorporates two highly sensitive bimetal thermostatic elements and a pilot-bleed relay with pneumatic feed-back for accuracy and stability over the entire operating range.

The Model T34 provides winter control (direct action) at 25 psig main air pressure and summer control (reverse action) at 16 psig. Direct and reverse action set points are factory calibrated at different temperatures: higher for summer operation, lower for winter operation, to conserve energy. Blank cover with 10-72 clip-in plastic barrier is recommended to prevent set point changes by unauthorized personnel.

The component parts are die-cast aluminum, stainless steel and glass-filled Nylon. Diaphragms are fabric-reinforced Neoprene®. Air lines are connected to the thermostat nipples with spring-reinforced plastic tubes and both main and branch connections are provided with internal filters.

GENERAL INSTRUCTIONS

1. A thermostat should be mounted where it will be affected only by the average room temperature. Free circulation of air must exist at the selected location. Avoid locations that are affected by drafts or by radiant heat from the sun, water pipes, air ducts, etc.
2. Installation on outside walls should be avoided. If such a location is necessary, the thermostat should be mounted on an insulated backplate (accessory item).
3. Thermostats should be mounted AFTER WALL SURFACES HAVE BEEN FINISHED.

SPECIFICATIONS

MODEL NUMBER: T34-3011 (with factory-installed 10-59 limit stops).
ACTION: Direct (winter) and reverse (summer), proportional.
SET POINT RANGE: 76 to 85°F summer; 44 to 74°F winter.
THROTTLING RANGE: Approximately 2°F when used with actuator having 5 psi spring range.
SUPPLY AIR PRESSURE: 25 psig (1.7 bar) for winter operation. 16 psig (1.1 bar) for summer operation. 30 psig (2.1 bar) maximum.
AIR CONSUMPTION: 30 SCIM.
CALIBRATION POINT: 9 psig (0.62 bar) branch pressure.

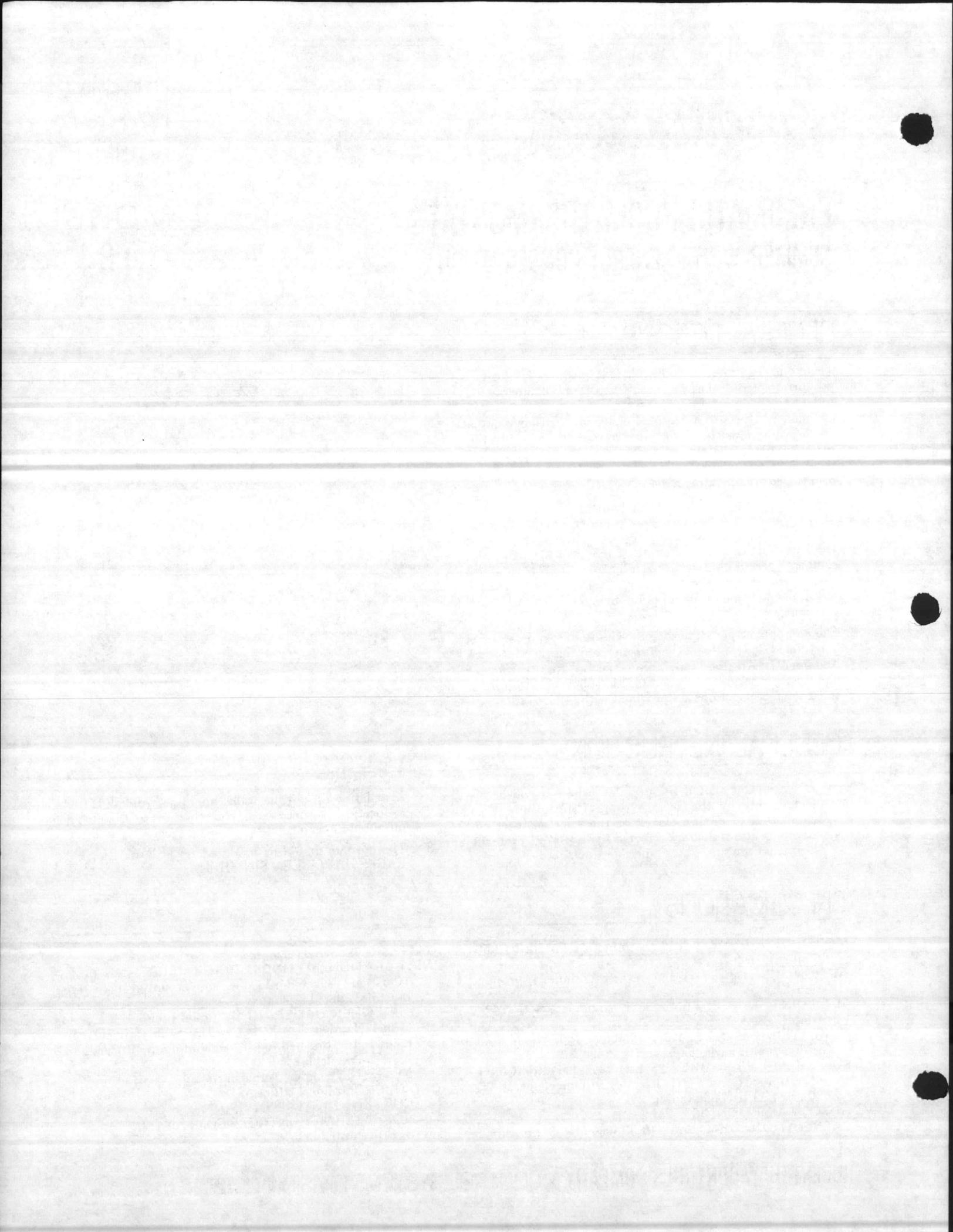
DIMENSIONS: See reverse side.

INSTALLATION FITTINGS: If needed, tubing assembly 10-64 and selected rough-in and mounting hardware must be ordered separately.

SPECIFY WHEN ORDERING: 1. Model number. 2. Cover Model Number (C2-42 is standard with satin-chrome paint finish. Brushed finishes in aluminum, bronze, and brass are available).

NOTE: 10-72 clip is factory-installed.

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.





USED W/T34
ON (UT) UNIT
THERMOSTATS

211B

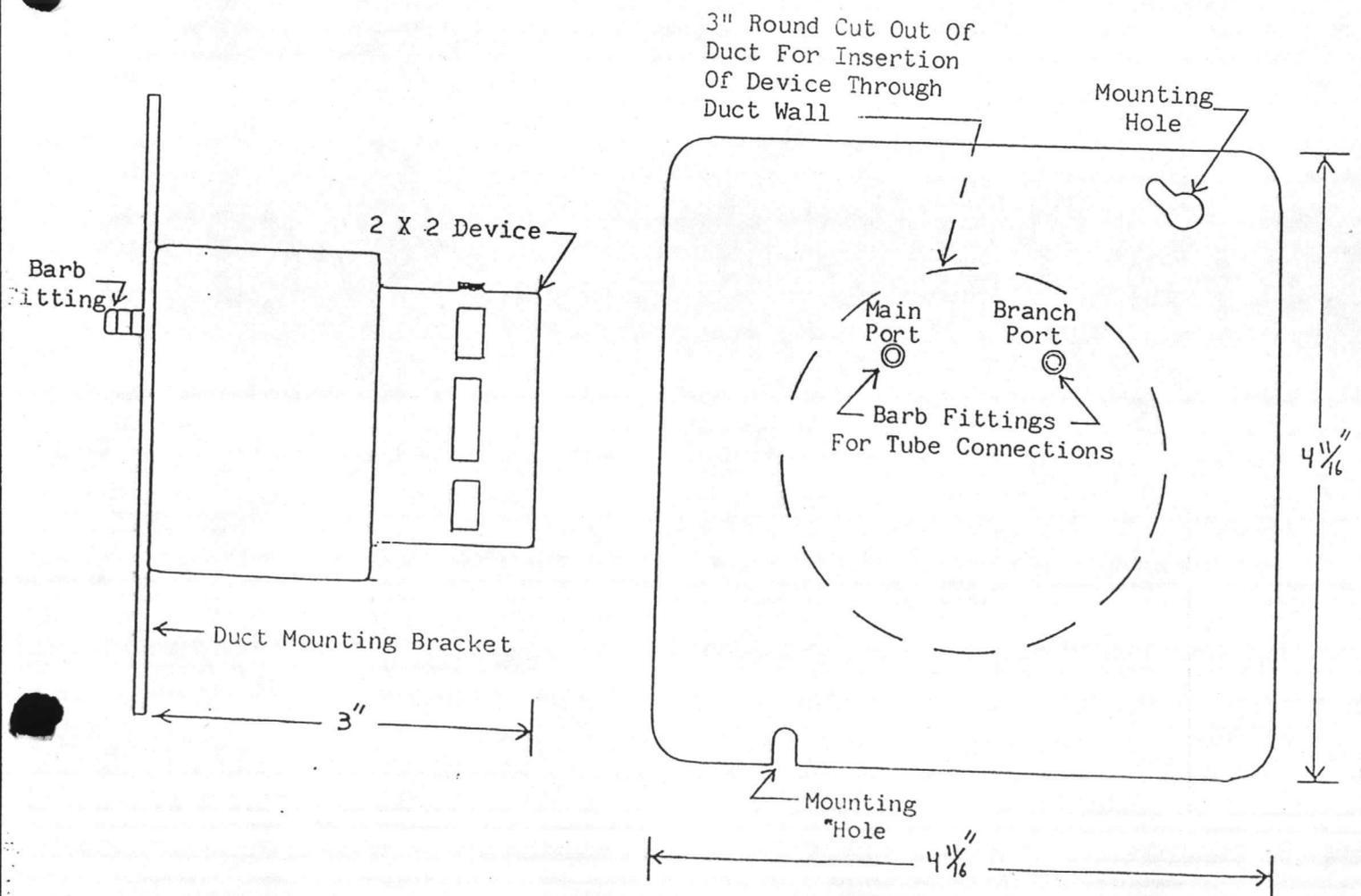
MOUNTING KITS

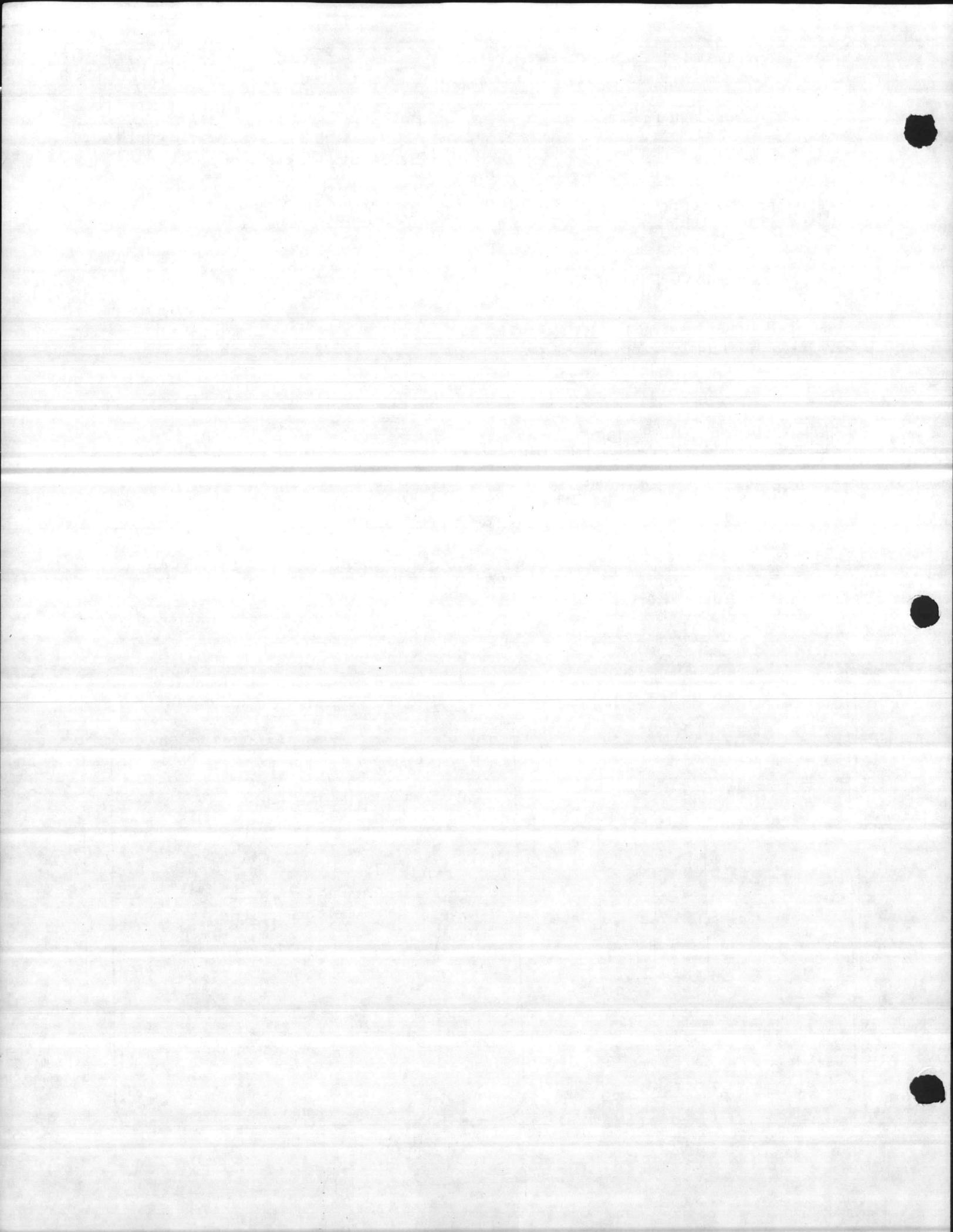
GENERAL DESCRIPTION

This duct mounting bracket is designed for use with 2 X 2 devices where duct mounting is required for the devices listed below.

DIMENSIONS AND APPEARANCE

This Model UCDBM1 kit is designed for use with the following devices: T12, T13, T18, T19, T23, T24, T32, T33, T34, T35, T53 and H18, H53.





INSTALLATION INSTRUCTIONS

PNEUMATIC ROOM HUMIDISTAT & THERMOSTATS

TWO-PIPE

H18
T18 & T19
T23 & T24
T32 & T33
T34
T35 & T36

GENERAL INSTRUCTIONS

1. A thermostat should be mounted where it will be affected only by the average room temperature. Free circulation of air must exist at the selected location. Avoid locations that are affected by drafts or by radiant heat from the sun, water pipes, air ducts, etc.
2. Thermostat installation on outside walls should be avoided. If such a location is necessary, the thermostat should be mounted on an insulated backplate (accessory item).
3. Humidistat should be located to sense average room humidity.
4. Thermostats and humidistats should be mounted AFTER WALL SURFACES HAVE BEEN FINISHED.

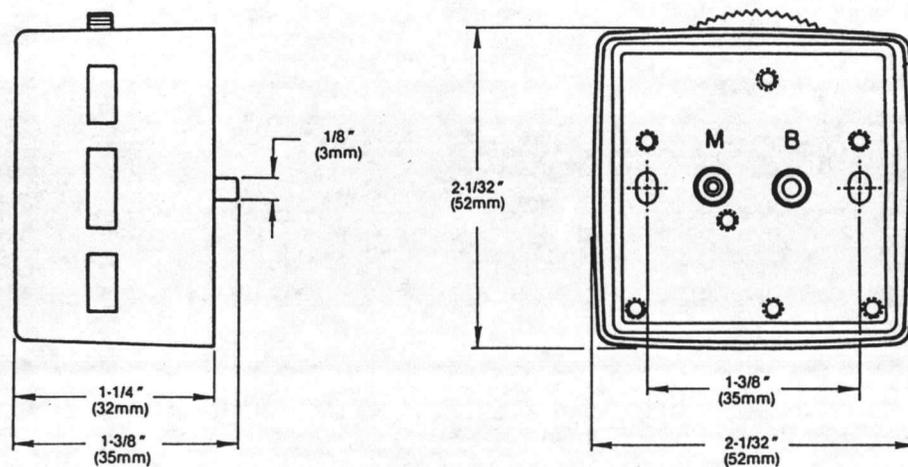
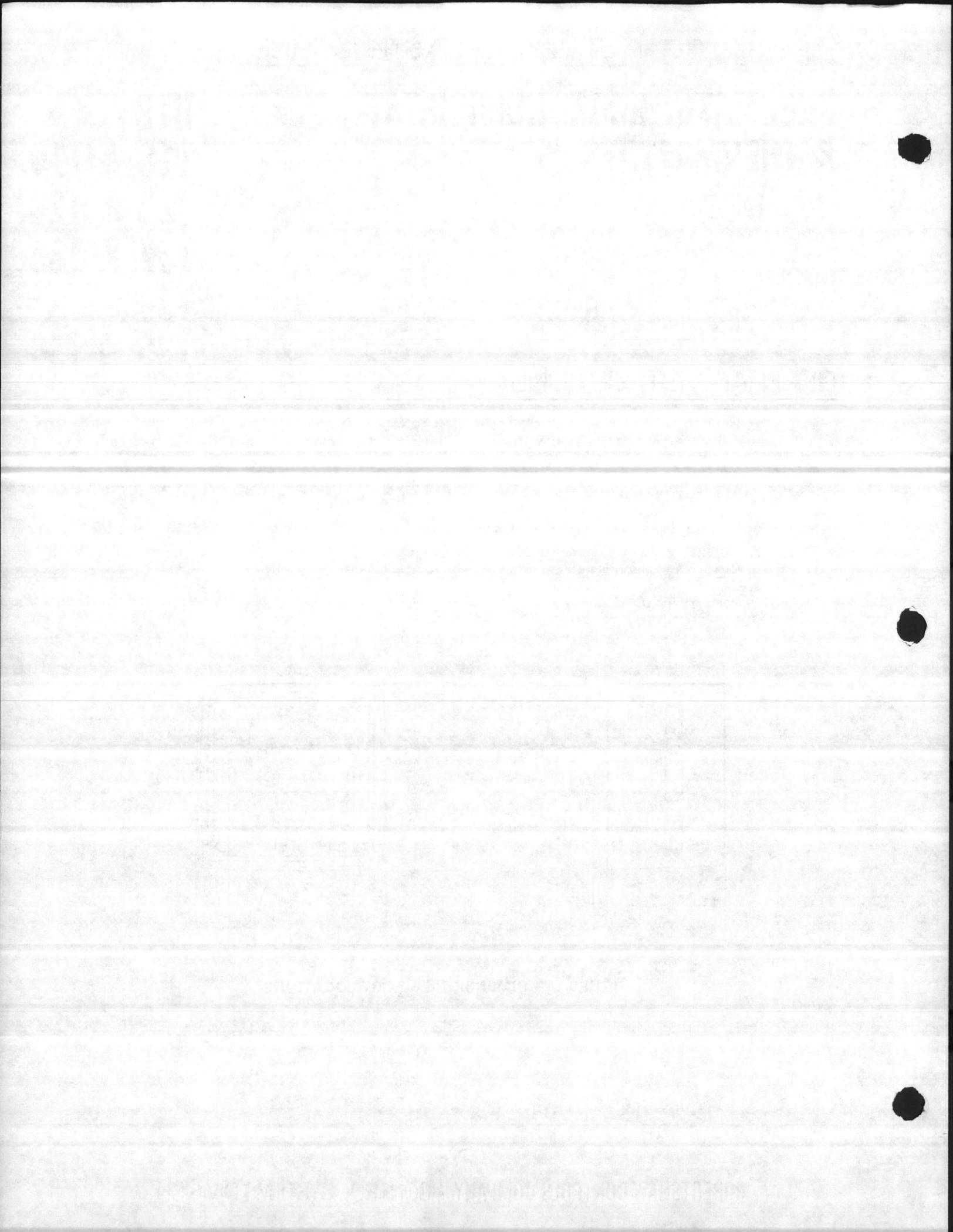


FIGURE 1 — DIMENSIONS & PORT LOCATIONS



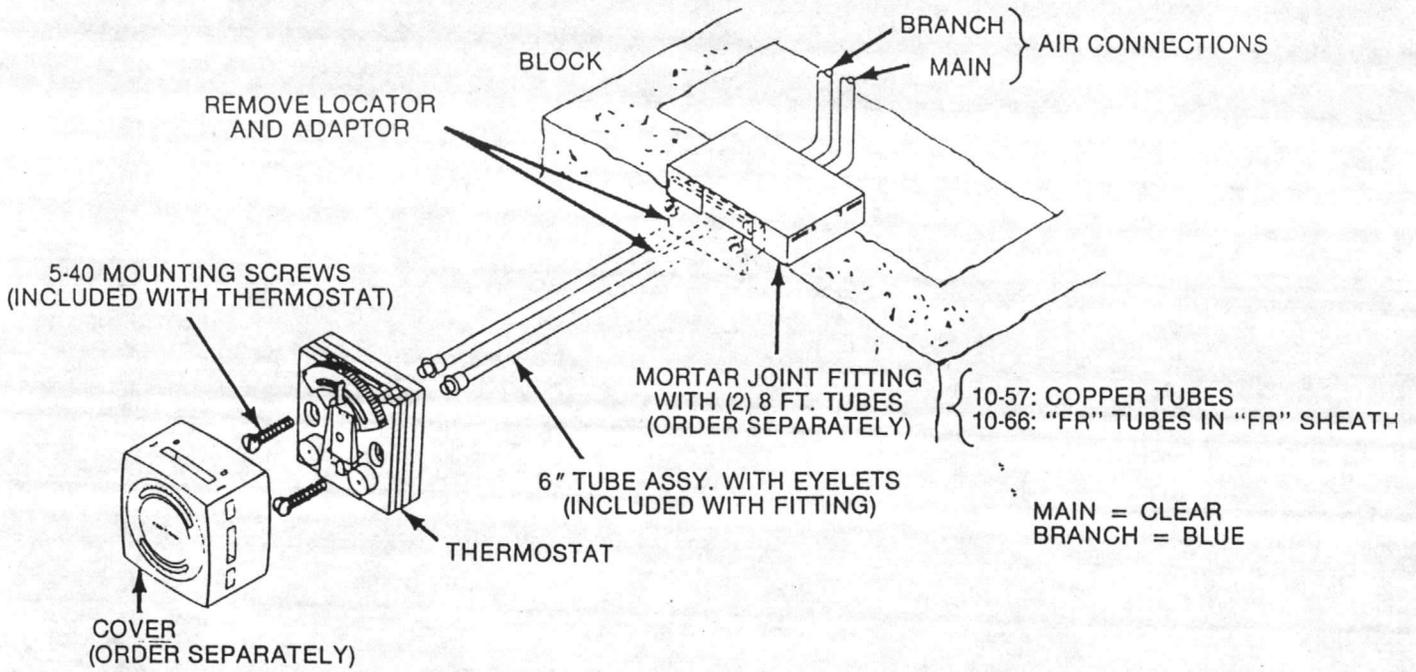


FIGURE 2 — MORTAR JOINT FITTING IN MASONRY WALL (TYPICAL)

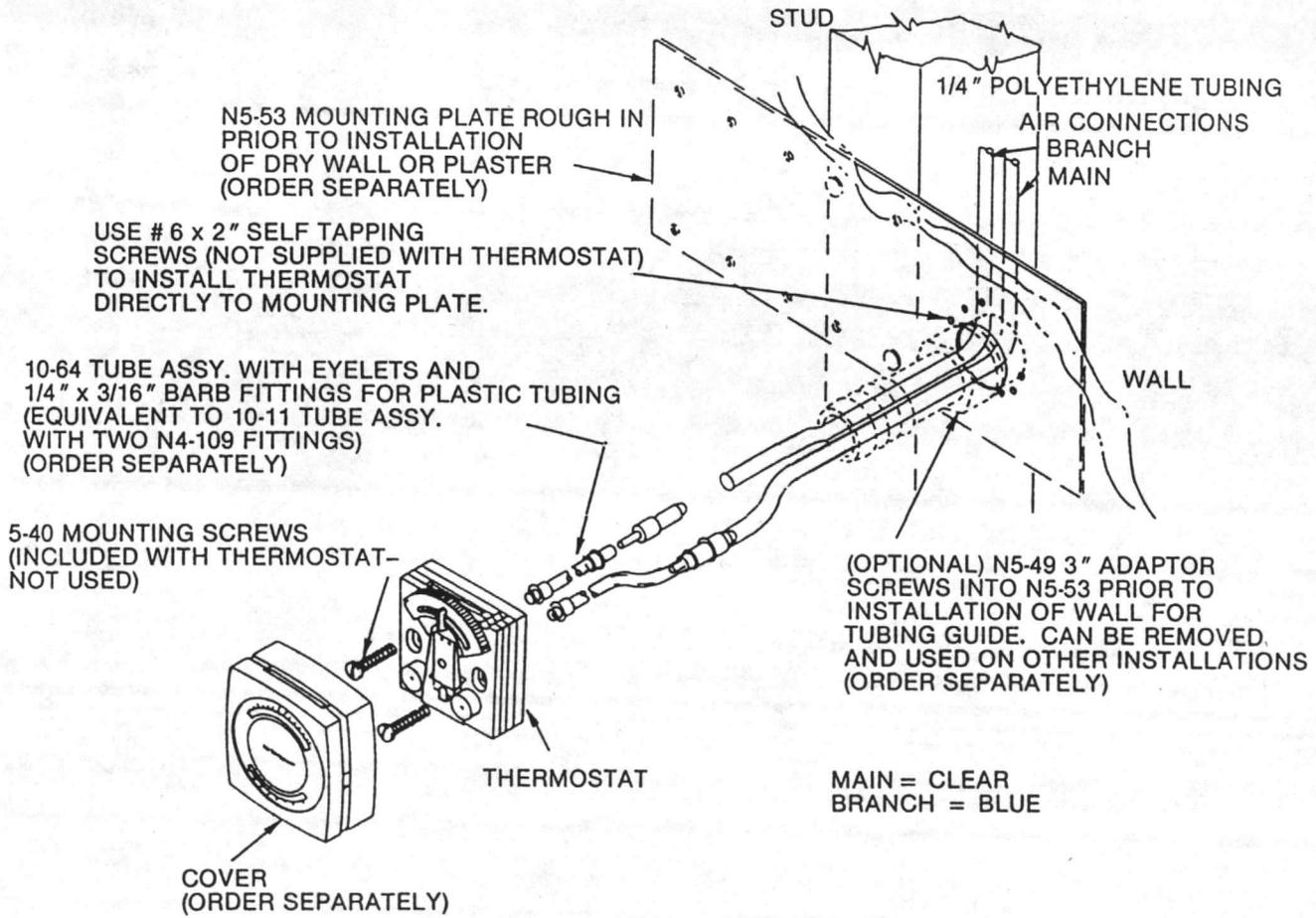
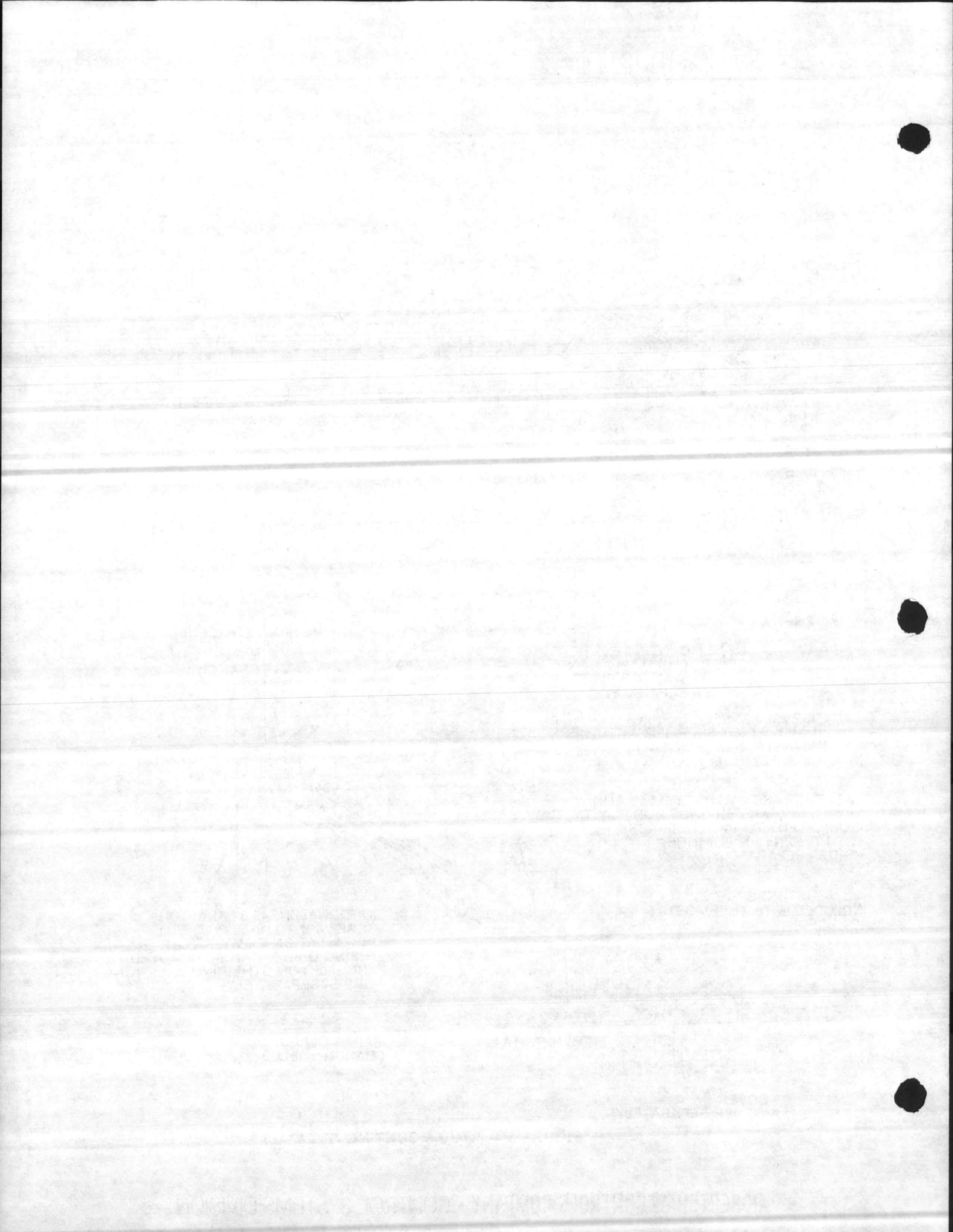


FIGURE 3 — STUD MOUNTING (TYPICAL)



CALIBRATION & ADJUSTMENT INSTRUCTIONS

DEADBAND ROOM THERMOSTATS

DIRECT AND REVERSE ACTING

T35 (D.A.)
T36 (R.A.)

CALIBRATION

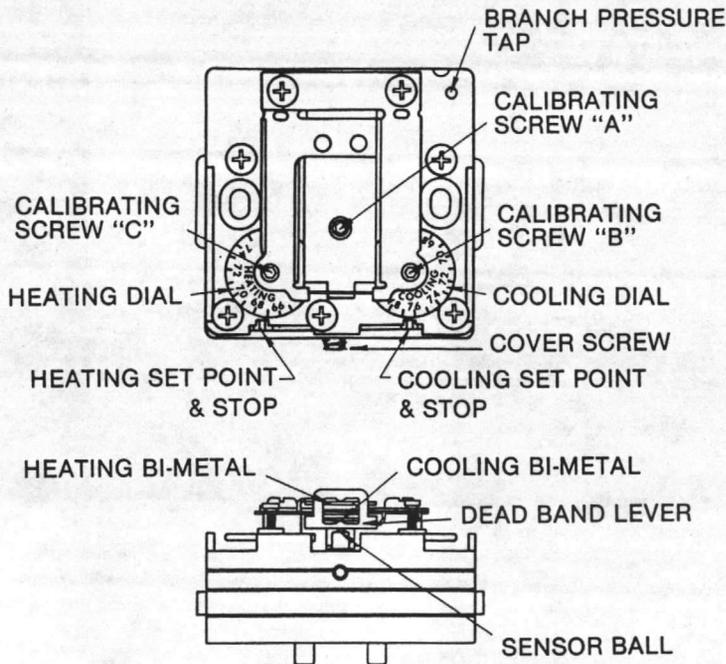


FIGURE 1 — T35 WITH COVER REMOVED

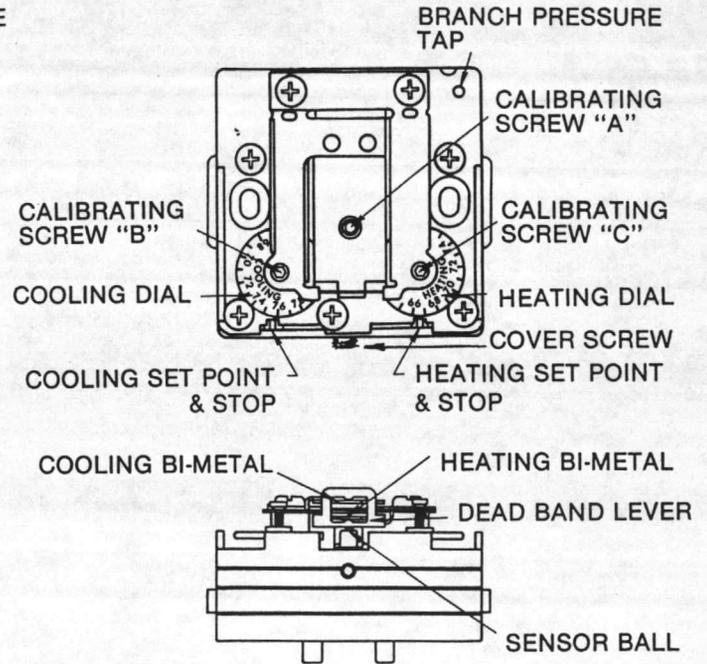
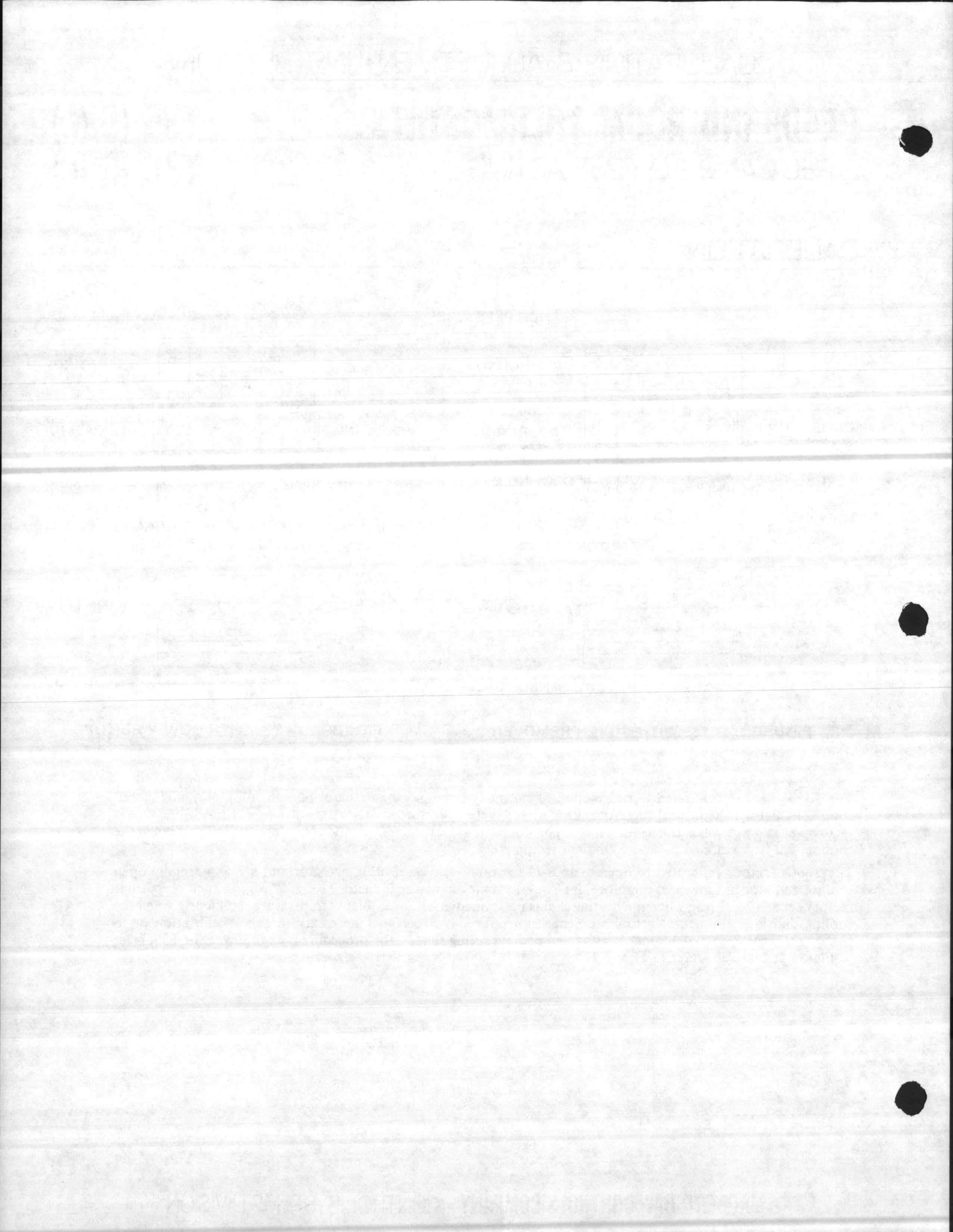


FIGURE 2 — T36 WITH COVER REMOVED

The T35 is factory calibrated to operate a 2-6# normally open heating actuator and an 8-13# normally closed cooling actuator in sequence; therefore, its "intermediate" pressure is factory set at 7 psig. Branch pressure is factory set at 4 psig when the heating dial is positioned at actual ambient temperature, and 10 1/2 psig when the cooling dial is positioned at actual ambient temperature.

The T36 is factory calibrated to operate an 8-13# normally-closed heating actuator and a 2-6# normally open cooling actuator in sequence; therefore, its "intermediate" pressure is factory set at 7 psig. Branch pressure is factory set at 10 1/2 psig when the heating dial is positioned at actual ambient temperature, and 4 psig when the cooling dial is positioned at actual ambient temperature. If it becomes necessary to check calibration or to change calibration to match other heating and cooling spring ranges, the procedure is as follows: For T35, refer to Figure 1; For T36, refer to Figure 2.



Insert a branch tap adapter MCS-GA and pressure gauge into the thermostat branch tap hole. Measure the ambient temperature, which **must be between 65° and 75°F**. Using the thermostat wrench (N2-4) turn the heating dial hex screw "C" to set the heating dial at 57°F. Then turn the cooling dial to the 83° setting. This moves both bimetals away from the deadband lever which controls the intermediate or deadband pressure. Turn the deadband pressure adjustment screw "A" so the branch pressure equals the midpoint between the high end of the heating actuator and the low end of the cooling actuator, i.e., with a 2-6# heating actuator and an 8-13# cooling actuator, the pressure should be 7 psig. Next, position the heating dial so that the Branch output pressure equals the mid-range of the heating actuator at the ambient temperature read on the thermometer. If there is a difference between the temperature set point on the heating dial and actual ambient temperature, rotate the heating dial in the appropriate direction to the end stop. Then, "slipping" the screw inside the dial, continue rotating the screw the amount of difference previously observed between the ambient temperature and set point. Then, return the dial so that the desired branch output pressure is observed at ambient.

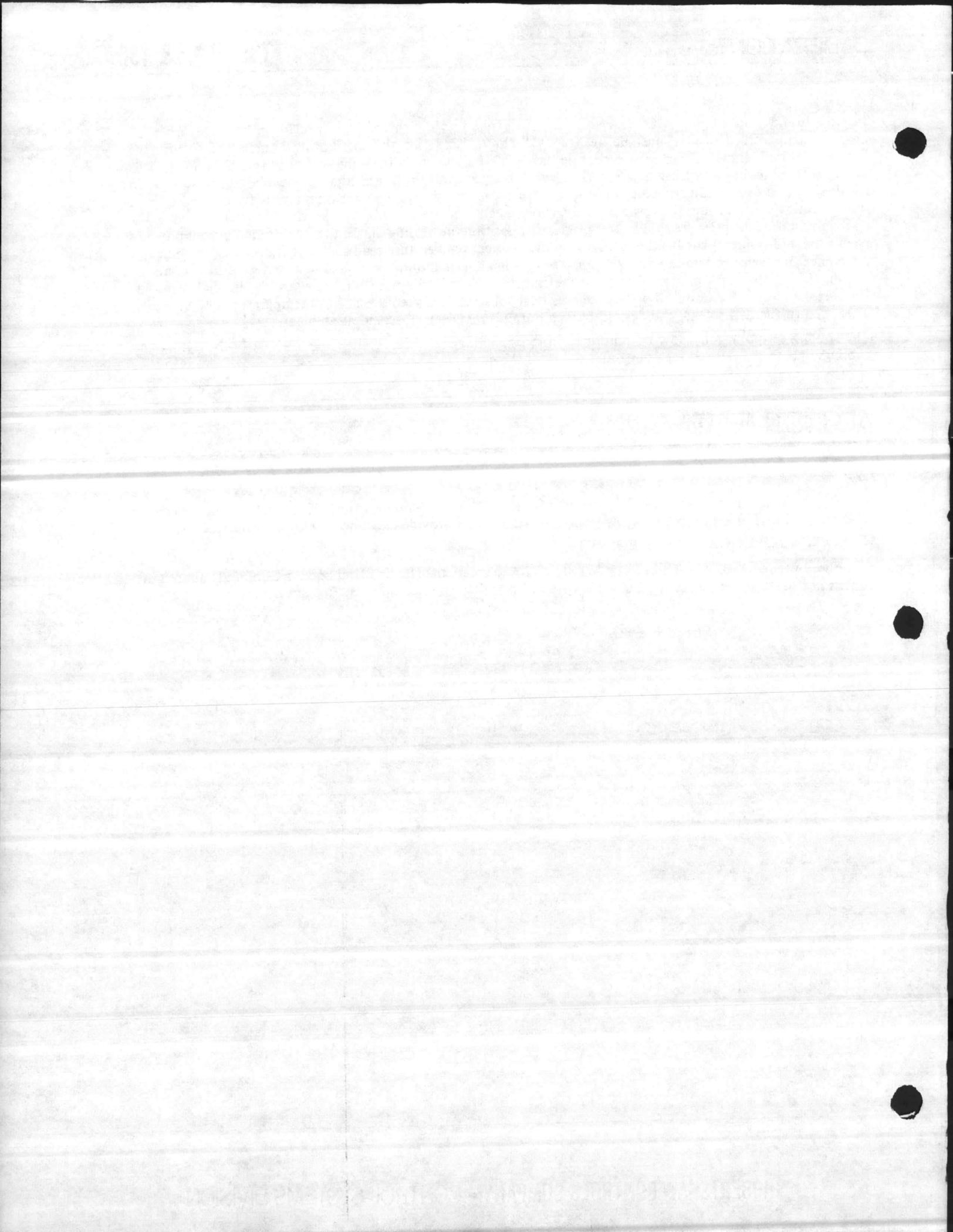
The cooling set point may now be calibrated in the same manner (Screw "B"). Finally, set both heating and cooling dials to the desired set points and re-install the cover.

ADJUSTMENT

NOTE: Concealed adjustment covers are used with the T35 and T36 thermostats. Using Thermostat Wrench N2-4 (1/16" hex), turn the Cover Screw inward (clockwise) to provide clearance for cover removal.

HEATING AND COOLING SET POINTS

With the cover removed, use Thermostat Wrench N2-4 to rotate the Heating Dial and/or Cooling Dial until the desired heating and cooling set points are aligned with their respective indexes. Replace cover.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMATIC ROOM THERMOSTATS SUMMER-WINTER ENERGY CONSERVATION

T34

CALIBRATION

16 PSIG (110 kPa) MAIN	R.A. (SUMMER)
25 PSIG (172 kPa) MAIN	D.A. (WINTER)

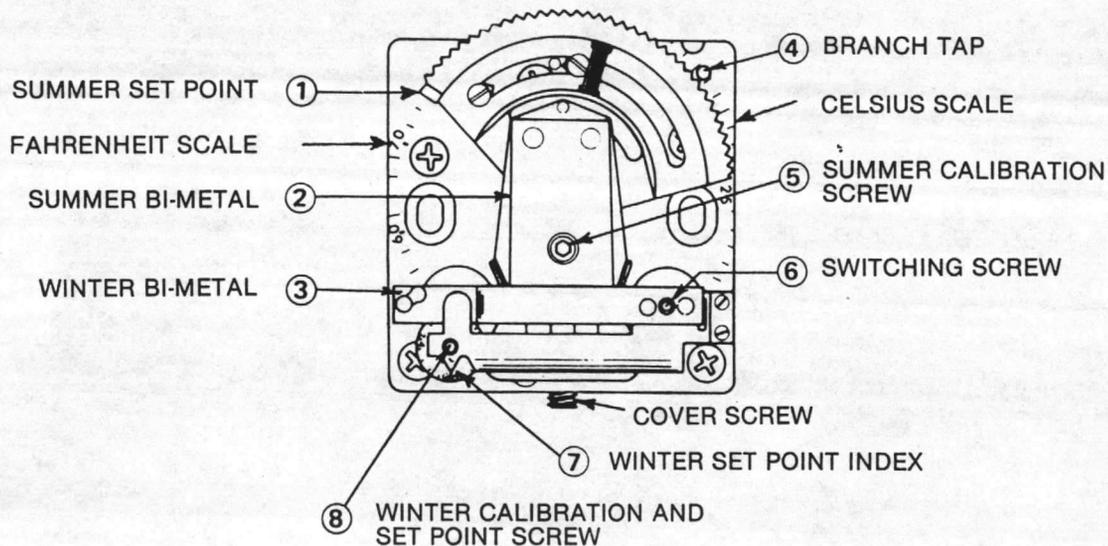


FIGURE 1 — T34 WITH COVER REMOVED

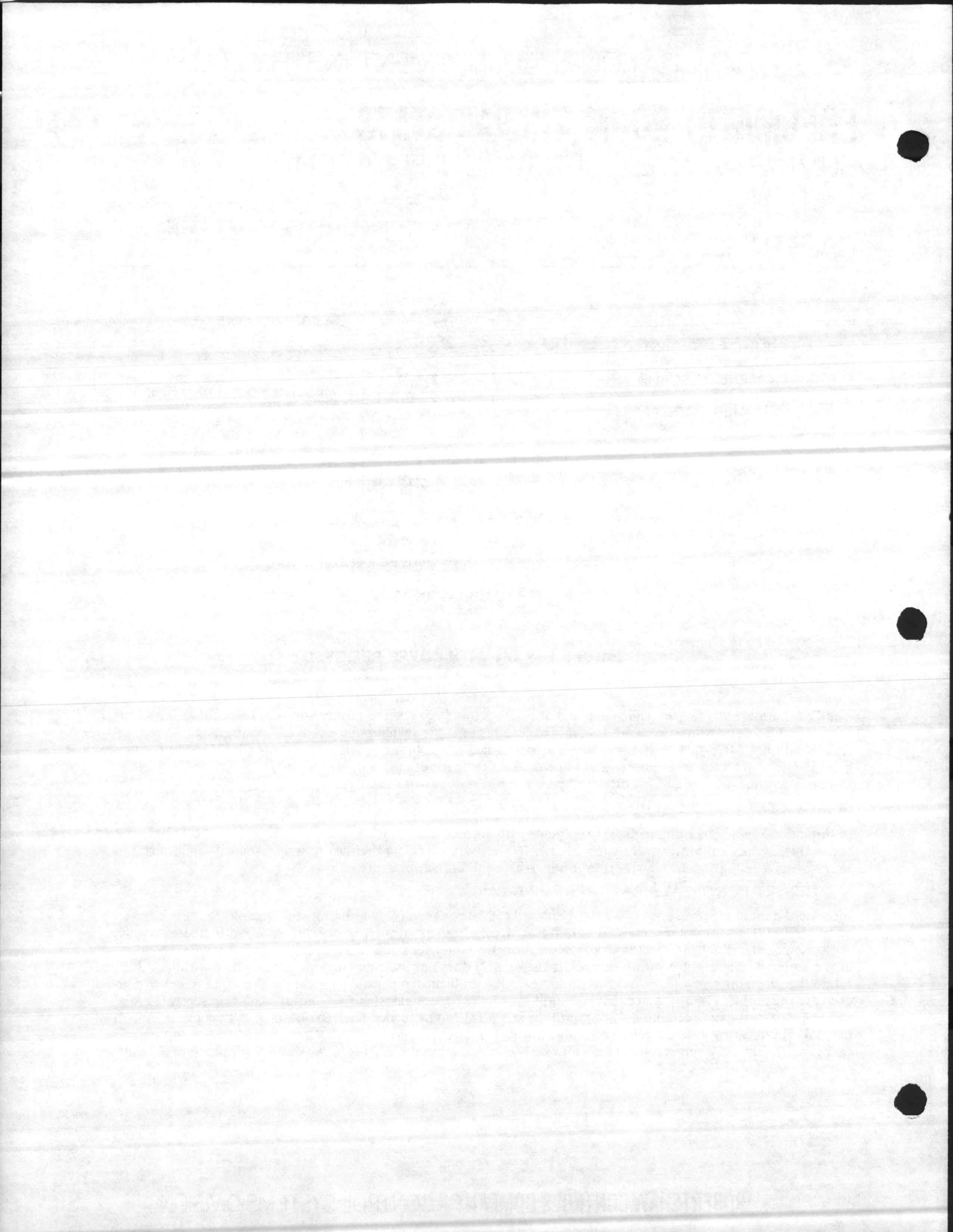
The T34 thermostat is factory calibrated and normally should not need to be recalibrated. If recalibration of the summer set point or winter set point becomes necessary, or if the switch point needs to be raised or lowered, install an adaptor MCS-GA, with a suitable 0-30 psi gauge, in the branch pressure tap hole (4). Measure the ambient temperature with an accurate thermometer. This temperature must be within the range of the thermostat. Caution: Do not breathe on or hold hand near the bimetals (2) and (3).

SUMMER SET POINT CALIBRATION (Reverse Action).

Position the summer set point cam (1) to coincide with ambient temperature. Set main air pressure to 16 psig and adjust the summer calibrating screw (5) using 1/16" hex wrench (N2-4 thermostat wrench) until the branch tap gauge reads 9 ± 1 psig. Clockwise rotation increases the branch pressure.

WINTER SET POINT CALIBRATION (Direct Action).

Increase the main air pressure to 25 psig. Using a 1/16" hex wrench (N2-4 thermostat wrench) in the winter set point screw (8), position this screw to obtain 9 ± 1 psig branch pressure (clockwise rotation increases branch pressure, counter-clockwise decreases pressure). For the winter set point to be in calibration, dial (7) should indicate ambient temperature within $\pm 1^\circ\text{F}$. If the dial (7) does not indicate ambient temperature within $\pm 1^\circ\text{F}$, rotate the set point screw (8) (clockwise to increase the ambient temperature reading and counter-clockwise to decrease the ambient temperature reading) until the dial (7) goes against stop. Continue rotating screw (8) (dial will be restrained from rotating by stop) until the screw (8) can be turned back to obtain 9 ± 1 psig branch with the dial (7) indicating ambient temperature within $\pm 1^\circ\text{F}$ (more than one try may be required to accomplish this calibration). The set point screw (8) may now be used to position the dial (7) to the desired winter control point.



SWITCHING CALIBRATION.

Set the main pressure to 15 psig. Position the summer set point (1) to 85 °F setting and the winter set point dial (7) to 44 °F setting. The branch pressure tap gauge should be reading approximately 15 psig. If not, recheck the summer set point calibration. Slowly increase the main pressure until the branch pressure drops to 0 psig. This is the main pressure at which the thermostat switches from summer control to winter control. If the main pressure at switching point is less than 17 psig or more than 21 psig, adjust the switching screw (6) counter-clockwise to raise switching point or clockwise to lower switching point 1/8 turn at a time and raise and lower the main pressure until the desired switching pressure is obtained (use the rise and fall of the branch pressure as an indication of switching). Caution: Do not force the calibration screws. If action is not obtained when screws are rotated, check for proper direction of rotation. The bimetals (2) and (3) may be raised and lowered, using the end of the calibrating wrench, to test action.

NOTE: ambient temperature must be between 65 and 75 °F when making this calibration.

ADJUSTMENT

NOTE: Concealed adjustment cover is used with the T34 thermostat. Using Thermostat Wrench N2-4 (1/16" hex), turn the Cover Screw inward (clockwise) to provide clearance for cover removal.

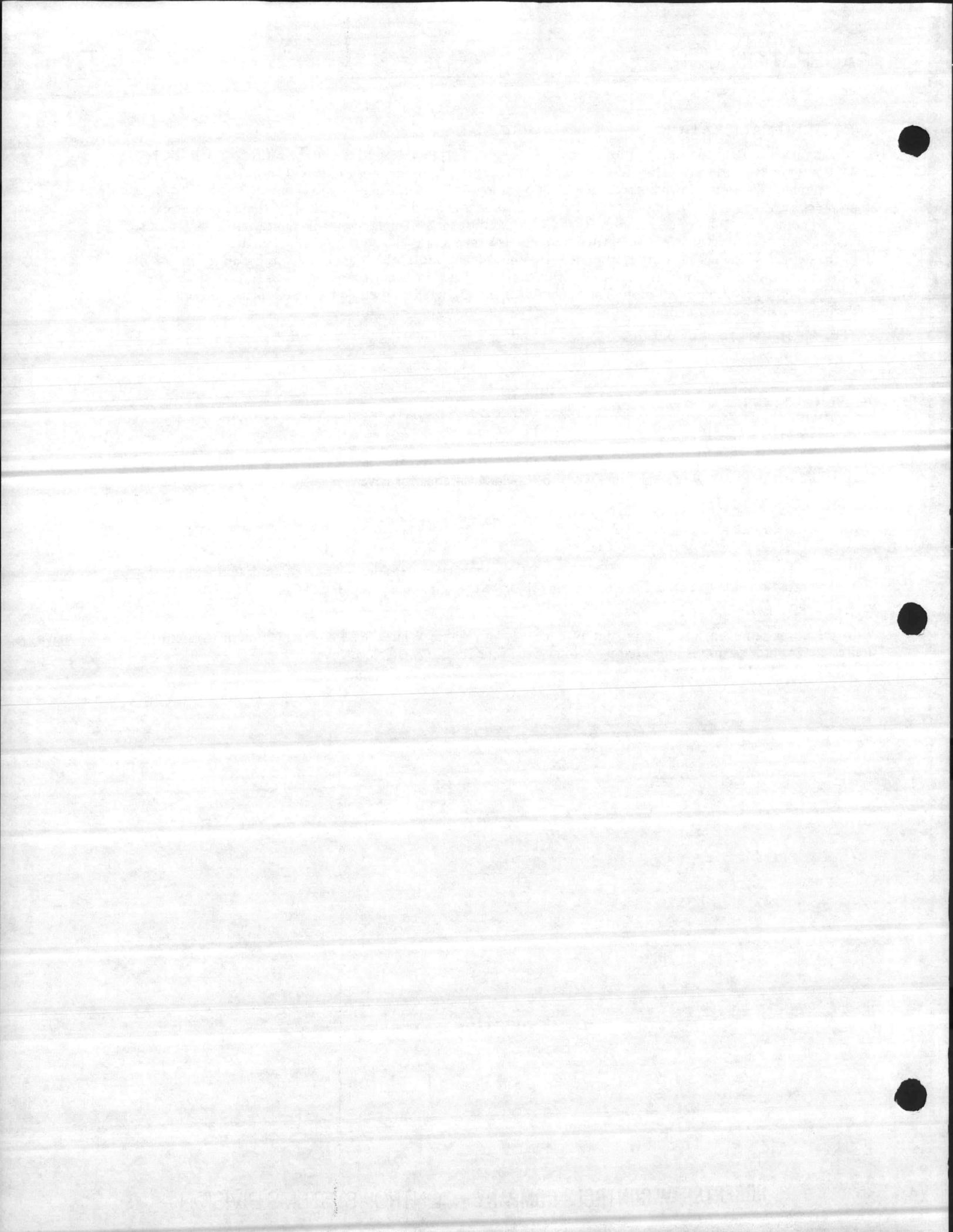
SUMMER SET POINT:

CAUTION: Set Point adjustment will be restricted if Limit Stops have been installed. DO NOT APPLY EXCESSIVE FORCE AGAINST STOPS.

With the cover removed, rotate Summer Set Point Adjustment (1) until the desired new summer temperature setting is indicated on either internal Set Point scale (°F or °C). Replace cover and lock in place with cover screw.

WINTER SET POINT:

With the cover removed, use Thermostat Wrench N2-4 to rotate Winter Set Point Adjustment (8) until the desired new winter setting is indicated by Winter Set Point Index (7). Replace cover.





2,1,9

2,1,3

DATA SHEET

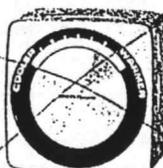
GENERAL # 7

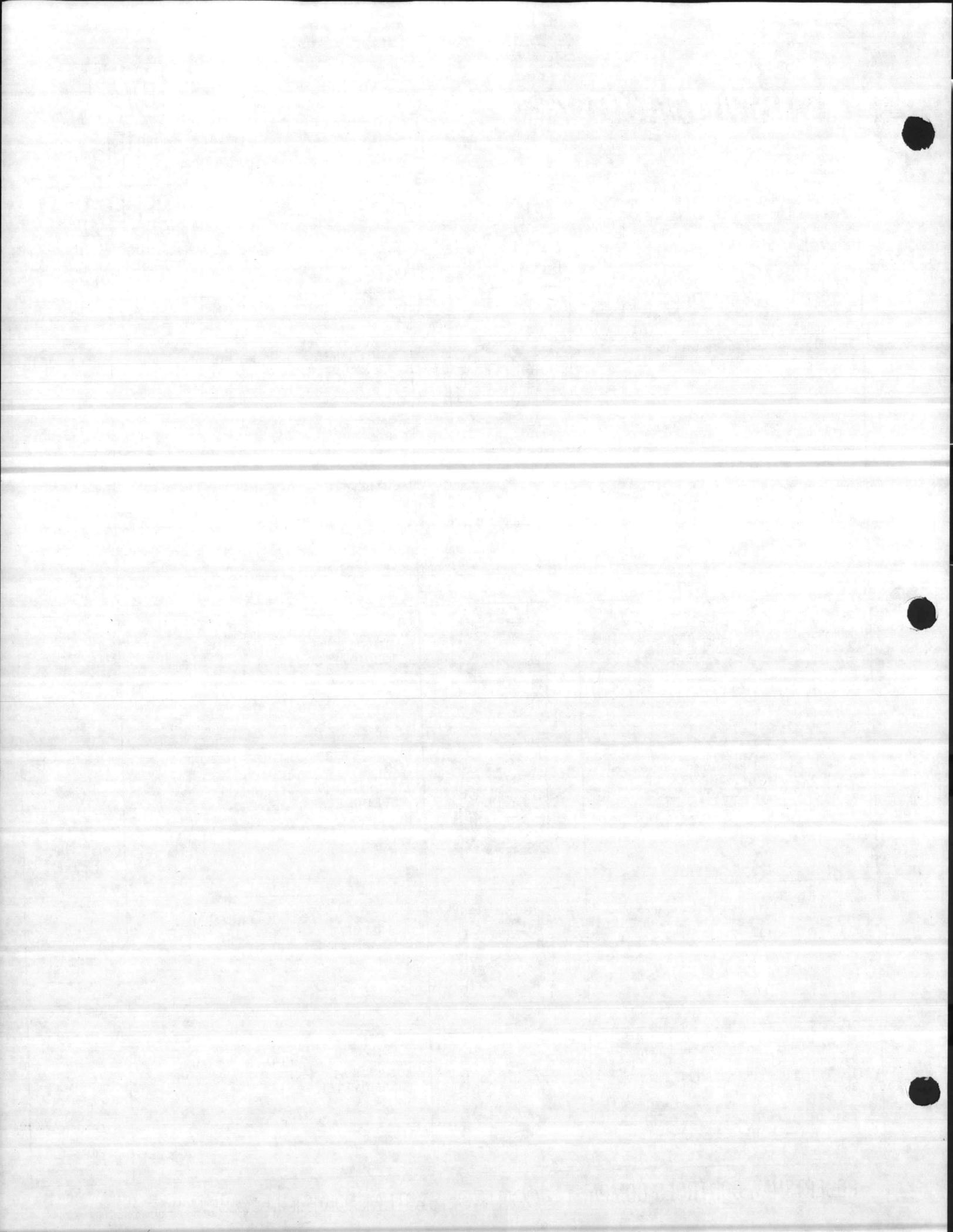
Drawn aluminum covers fit Robertshaw thermostats, humidistats, and transmitters. Concealed adjustment models include a factory-installed 10-72 adjustment cover clip; the 10-72 is available separately and may be added to any model not so equipped.

Standard finish is satin-chrome enamel; brushed aluminum, brushed bronze, or brushed brass finishes are available for most models at extra cost. Select finish by appropriate suffix from table at right.

SUFFIX	FINISH
-42	Satin-chrome enamel
-43	Brushed aluminum
-44	Brushed bronze
-45	Brushed brass

COVERS FOR ROOM THERMOSTATS, HUMIDISTATS, AND TRANSMITTERS

DESCRIPTION	ITEM	SPECIFICATIONS	CHECK
55-85°F set point scale; no thermometer; exposed adjustment. For use with the following: T12, T13, T18, T19, T23, T24, T27, T32, T33.	 C1-42	SCALE ADJUSTMENT THERMOMETER 55-85°F EXPOSED NO	C1-42 <input type="checkbox"/> C1-43 <input type="checkbox"/> C1-44 <input type="checkbox"/> C1-45 <input type="checkbox"/>
Blank cover with concealed adjustment. For use with: T12, T13, T18, T19, T23, T24, T27, T32, T33, T34, T35, T36, T53.	 C2-42	SCALE ADJUSTMENT THERMOMETER NONE CONCEALED NO	C2-42 <input type="checkbox"/> C2-43 <input type="checkbox"/> C2-44 <input type="checkbox"/> C2-45 <input type="checkbox"/>
55-85°F set point scale; thermometer; exposed adjustment. For use with: T12, T13, T18, T19, T23, T24, T27, T32, T33.	 C3-42	SCALE ADJUSTMENT THERMOMETER 55-85°F EXPOSED YES	C3-42 <input type="checkbox"/> C3-43 <input type="checkbox"/> C3-44 <input type="checkbox"/> C3-45 <input type="checkbox"/>
55-85°F set point scale; thermometer; concealed adjustment. For use with: T12, T13, T18, T19, T23, T24, T27, T32, T33.	 C4-42	SCALE ADJUSTMENT THERMOMETER 55-85°F CONCEALED YES	C4-42 <input type="checkbox"/> C4-43 <input type="checkbox"/> C4-44 <input type="checkbox"/> C4-45 <input type="checkbox"/>
"Cooler-Warmer" set point scale; no thermometer; exposed adjustment. For use with: T12, T13, T18, T19, T23, T24, T27, T32, T33.	 C5-42	SCALE ADJUSTMENT THERMOMETER COOLER-WARMER EXPOSED NO	C5-42 <input type="checkbox"/> C5-43 <input type="checkbox"/> C5-44 <input type="checkbox"/> C5-45 <input type="checkbox"/>
"Cooler-Warmer" set point scale; thermometer; exposed adjustment. For use with: T12, T13, T17, T18, T19, T23, T24, T27, T32, T33.	 C6-42	SCALE ADJUSTMENT THERMOMETER COOLER-WARMER EXPOSED YES	C6-42 <input type="checkbox"/> C6-43 <input type="checkbox"/> C6-44 <input type="checkbox"/> C6-45 <input type="checkbox"/>



ELECTRIC CONTROLLER

CHANGEOVER THERMOSTATS, STRAP-ON

ELECTRICAL

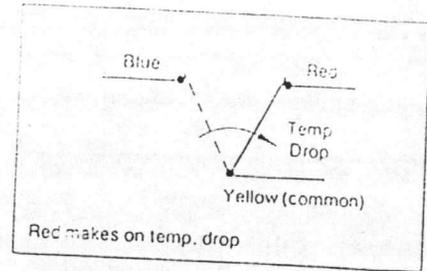
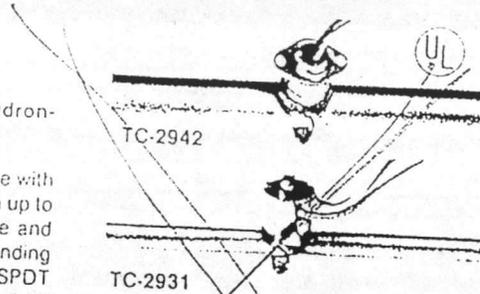
TC-2931
TC-2942

For summer-winter changeover in hydronic heating-cooling system.

Units are hermetically sealed and come with mounting springs for easy mounting on up to 1-1/2" pipe. TC-2942 is enclosed type and has 1/2" conduit adaptor. Fast responding bimetal metal actuates snap-acting SPDT with silver contacts. Three color coded 16 gauge leads 3' long. Dimensions: 2" diameter x 1-1/2" high.

OPTIONS: TC-2931-205† with 3' cable for CP-5341

ACCESSORIES: None



Part Number	Type	Setpoint	Differential	Switch Ratings (AC Only)			
				Voltage (Vac)	FLA (Amps)	LRA (Amps)	Pilot Duty (VA)
TC-2931	Strap on	Setpoint fixed at 70°F approx.	Fixed 15°F approx.	120	5.8	34.8	125
TC-2942	Strap on enclosed			240	2.9	17.4	

TC-2974

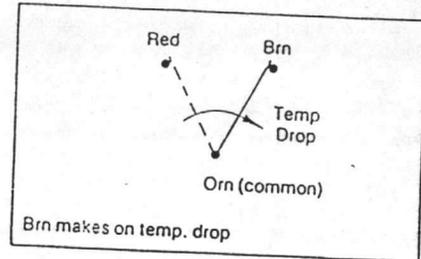
2.1.13 AQ1

For hot water unit heater control and summer/winter changeover. May be used as either an open high control or as open low control.

Device is enclosed in steel case with 1/2" to 3/4" conduit opening on bottom. Liquid filled thermal element actuates heavy-duty SPDT switch with coded screw terminals. Graduated external setpoint adjustment marked in °F on one side and °C on the other. Shipped with metal strap and spring which will fit supply lines up to 4" O.D. Ambient Limits: -40 to 140°F for case, 260°F maximum bulb temperature. Dimensions: 4-5/8" high x 2-1/4" wide x 2-5/8" deep.

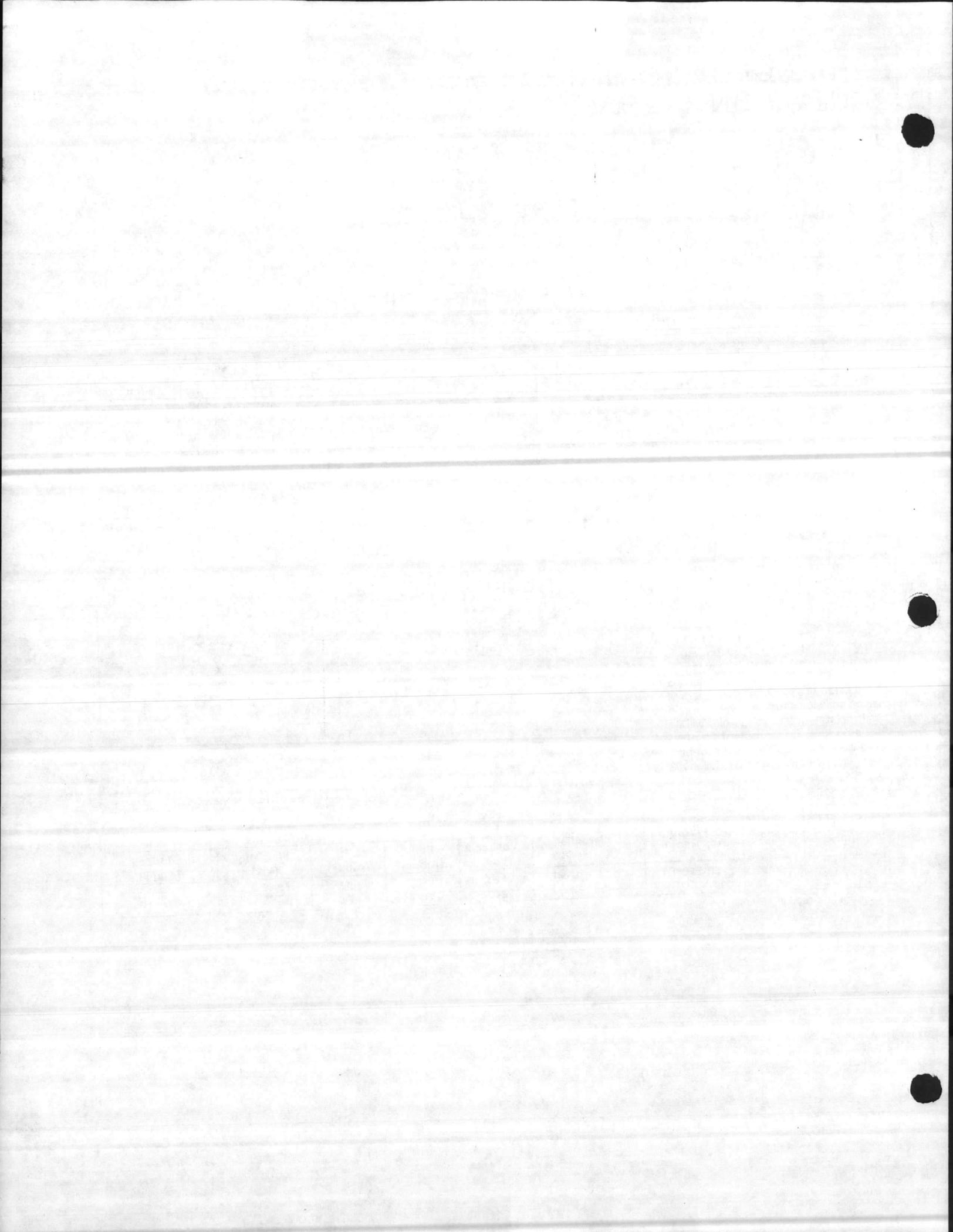
OPTIONS: None

ACCESSORIES: None

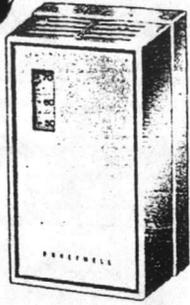


Part Number	Type	Set Point Adj. Range	Differential	Switch Ratings (AC Only)				
				Voltage (Vac)	FLA (Amps)	LRS (Amps)	Pilot Duty (VA)	Non-Inductive (Amps)
TC-2974	Strap on	50-210°F (10-99°C)	Fixed at 10°F (5.5°C)	120	9.8	58.8	360	22
				240	8	48.0		

*Unit dual marked in °F and °C.



Line Voltage and Proportional Thermostats



T92 Proportional Thermostat

Low voltage, 3-wire proportional controller for valve motors, damper motors, and balancing relays used in heating or cooling applications.

Bellows element adjusts 2 potentiometers in proportion to temperature changes to regulate motor operation. Removable setting knob prevents unauthorized tampering with set point. Electrical Rating: 24 V to 30 V. Potentiometer Resistance: 135 ohms. Mounting: Furnished screws fasten through three mounting holes to wall, or to adapter plate for outlet box mounting. Calibration Point: 3 F [1.7 C] below set point to offset internal heat from operation. Approximate Dimensions: 5-11/16 in. [144 mm] high, 3-3/8 in. [86 mm] wide, 2-5/8 in. [67 mm] deep.

REPLACEMENT PART:
130224 Set Point Knob.

ACCESSORIES:
23394B Guard, metal, locking.
138541A Mounting Plate—23394B to outlet box.
See Thermostat Guards in RESIDENTIAL CONTROLS section, pages 373-374.

Order Number	Scale Range		Throttling Range						Potentiometers
			Low		Med		High		
			F	C	F	C	F	C	
T92E1029	63 to 87	17 to 31	1.5 to 6.5	0.8 to 3.6	—	—	—	—	2 (for unison or sequence control)



T42A,B Single Stage, T42G-P Multistage Thermostats

2.1.13
T5

For line voltage or low voltage temperature control of heating or cooling equipment.

Multistage models control 2 or 3 circuits in sequence. Setting knob is removable to lock setting at desired temperature. Mercury switches are actuated by vapor-filled bellows element. Die-cast metal cover. Approximate Dimensions: 5-11/16 in. [144 mm] high, 3-3/8 in. [86 mm] wide, 2-1/8 in. [54 mm] deep. Listed by Underwriters Laboratories Inc. (except T42B).

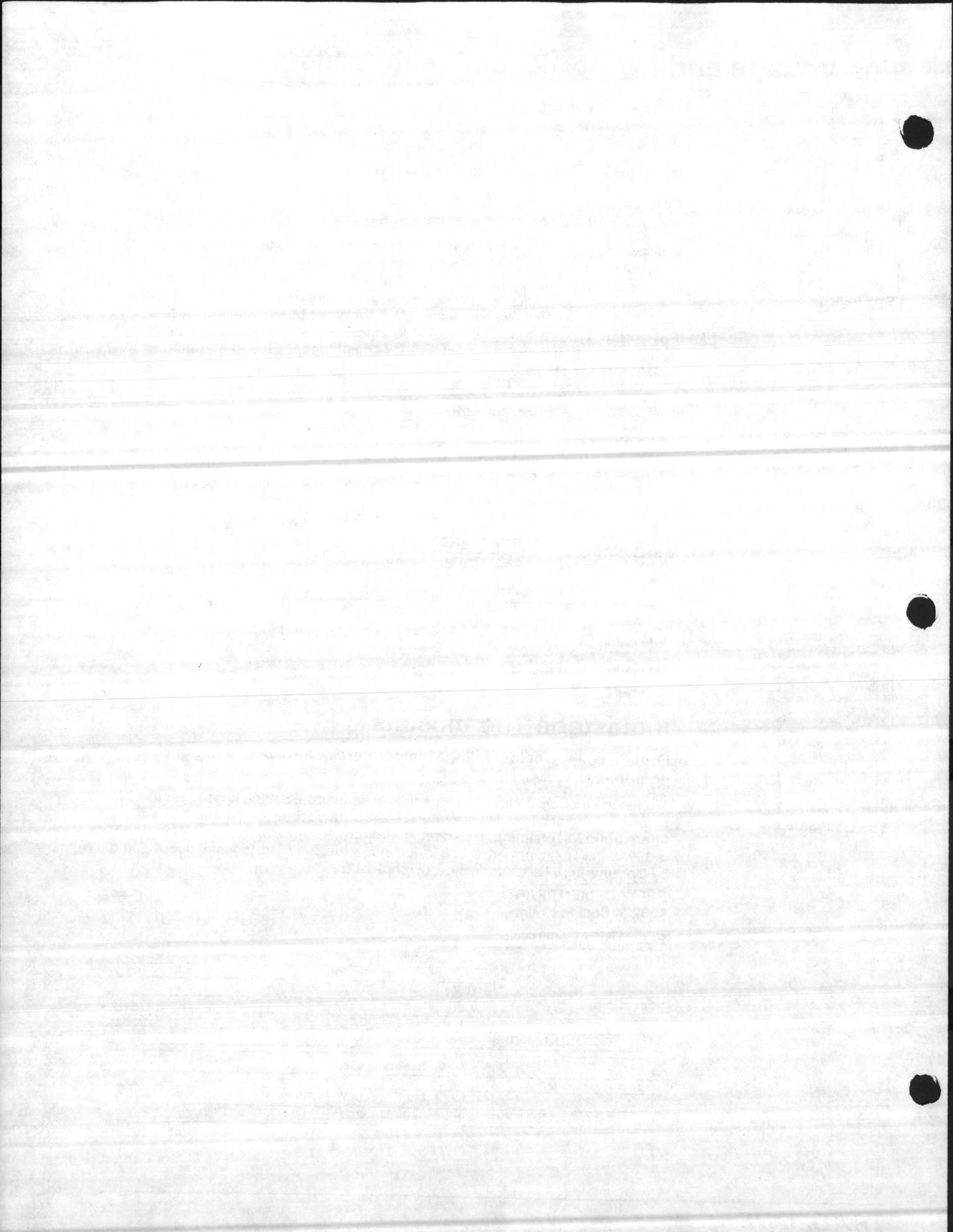
REPLACEMENT PART:
130224 Setting Knob.

ELECTRICAL RATINGS:

Model Number	Inductive Load			
	ac		dc	
	120 V	240 V	115 V	230 V
T42A	7.4	3.7	2.4	1.2
T42B	2.0	1.0	2.0	1.0
T42G,H,J,K,L,M,N,P	1.0	0.5	1.0	0.5

Model Number	Resistive Load			
	ac		dc	
	120 V	240 V	115 V	230 V
T42G,H,J,K,L,M,N,P	2.0	1.0	2.0	1.0

continued next page



Line Voltage and Proportional Thermostats

T42A,B T42G-P continued

ACCESSORIES:

23394B Guard, metal, locking.

138541A Mounting Plate—23394B to outlet box.

See Thermostat Guards in RESIDENTIAL CONTROLS section, pages 373-374.

Order Number	Control	Range		Differential			
				Per Stage		Interstage	
		F	C	F	C	F	C
T42A1052	1-stage heat	40- 80	4-27	2.0-3.0, fixed	1.1-1.7, fixed	—	—
T42B1027	1-stage cool	60-100	16-38	2.0-3.0, fixed	1.1-1.7, fixed	—	—
T42B1035	1-stage cool	40- 80	4-27	2-5, fixed	1.1-2.5, fixed	—	—
T42G1026	3-stage cool	60-100	16-38	3.0	1.7	—	—
T42H1073	2-stage heat	60-100	16-38	1.0 ^a	0.5	2.0 ^a	1.1 ^a
T42H1081	2-stage heat	40- 80	4-27	1.0 ^a	0.6	1.0-5.0	0.6-2.8
T42H1099	2-stage heat	60-100	16-38	1.0 ^a	0.6 ^a	1.0-5.0	0.6-2.8
T42J1078	2-stage cool	60-100	16-38	3.0	1.7	1.0-5.0	0.6-2.8
T42J1094 ^c	2-stage cool	59- 95	15-35	3.0	1.7	1.0-5.0	0.6-2.8
T42K1084	1-stage heat	60-100	16-38	1.0	0.6	1.0-5.0	0.6-2.8
	1-stage cool			3.0	1.7		
T42K1092	1-stage heat	40- 80	4-27	1.0	0.6	1.0-5.0	0.6-2.8
	1-stage cool			3.0	1.7		
T42M1023	3-stage heat	60-100	16-38	2.0	1.1	2.0 ^a	1.1 ^a
T42M1031	3-stage heat	40- 80	4-27	2.0	1.1	2.0 ^a	1.1 ^a
T42N1020 ^c	2-stage heat	59- 95	15-35	2.0	1.1	2.0 ^a	1.1 ^a
	1-stage cool						
T42N1038	2-stage heat	60-100	16-38	2.0	1.1	2.0 ^a	1.1 ^a
	1-stage cool						
T42P1018	1-stage heat	60-100	16-38	2.0	1.1	b	b
	2-stage cool						

^aNonadjustable.

^b2 F [1.1 C] between cool stages; 5.5 F [3.1 C] between cool stage 1 and heat stage.

^cCelsius model.



T921A-E Proportioning Thermostats

Low voltage, 3-wire controllers for valve motors, damper motors, and balancing relays in heating or cooling system applications.

Bellows element adjusts the potentiometer slider to regulate motor operation. Removable setting knob prevents unauthorized tampering with set point. Refer to the ordering table below for application of models. Approximate Dimensions: 5-11/16 in. [144 mm] high, 3-3/8 in. [86 mm] wide, 2-1/4 in. [57 mm] deep (2-11/16 in. [68 mm] deep on T921C,D models).

AUXILIARY SWITCH DIFFERENTIAL:

T921C—2 F [1.1 C].

T921D—1 F [0.6 C].

REPLACEMENT PARTS:

130224 Setting Knob.

100655A-01370 Cover.

ELECTRICAL RATINGS:

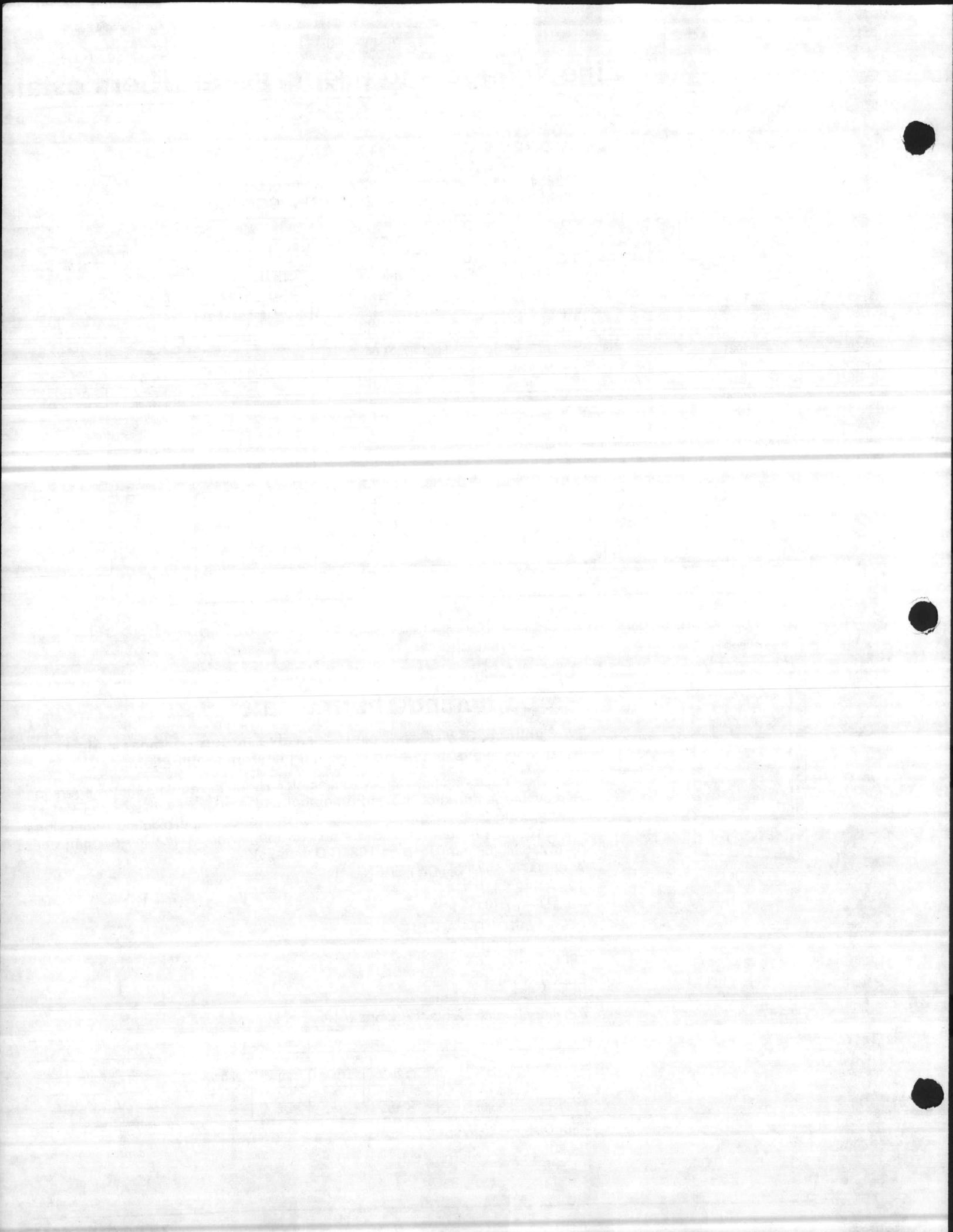
Voltage—24 to 30 Vac.

Auxiliary Switch Contact Ratings (A)—

	R-W		R-B	
	120 V	240 V	120 V	240 V
Full Load	8	4	4	2
Locked Rotor	48	24	24	12

Pilot Duty—125 VA.

continued next page





DIFFERENTIAL PRESSURE TRANSMITTER

2,1,6.1

SP

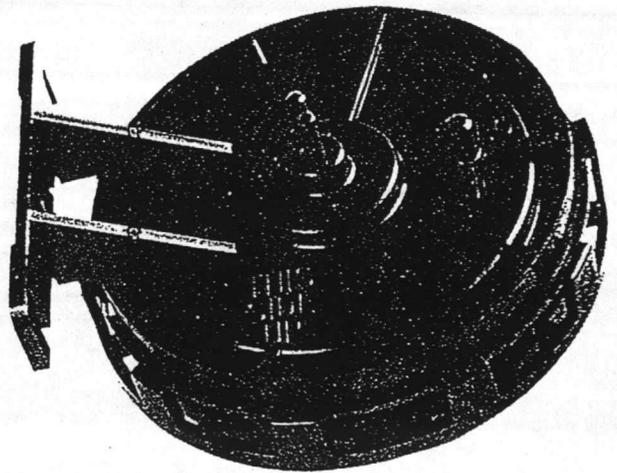
DATA
SHEET
MODEL
P323

GENERAL DESCRIPTION

These transmitters are used to sense and transmit differential pressure across fans, coils, filters, or between two reference points, to a remote location and can be used to sense either static or velocity pressure differentials. They may be used with receiver-controllers, receiver gauges, and/or sensitive switching pneumatic relays and pressure switches.

These devices are one-pipe force-balance transmitters with pneumatic feedback and require an external restrictor in the supply line.

The P323 differential pressure transmitter is made in several ranges, as noted below. The transmitter must be ordered in the range to fit the desired application, since there is no range adjustment supplied.



SPECIFICATIONS

MODEL	DIFFERENTIAL PRESSURE RANGE (static or velocity)
P323-0025	-0.05" to +0.20" H ₂ O (0.13 to +0.51 cm H ₂ O)
P323-01	-0.5" to +0.5" H ₂ O (-1.27 to +1.27 cm H ₂ O)
P323-03	0" to 3" H ₂ O (0 to 14.22 cm H ₂ O)
P323-10	0" to 10" H ₂ O (0 to 25.4 cm H ₂ O)

AIR PRESSURE: 20 psig (138 kPa) operating
30 psig (207 kPa) maximum

OUTPUT: 3-15 psig (20.7-103.5 kPa) for stated span.

DIMENSIONS: See Figure 1.

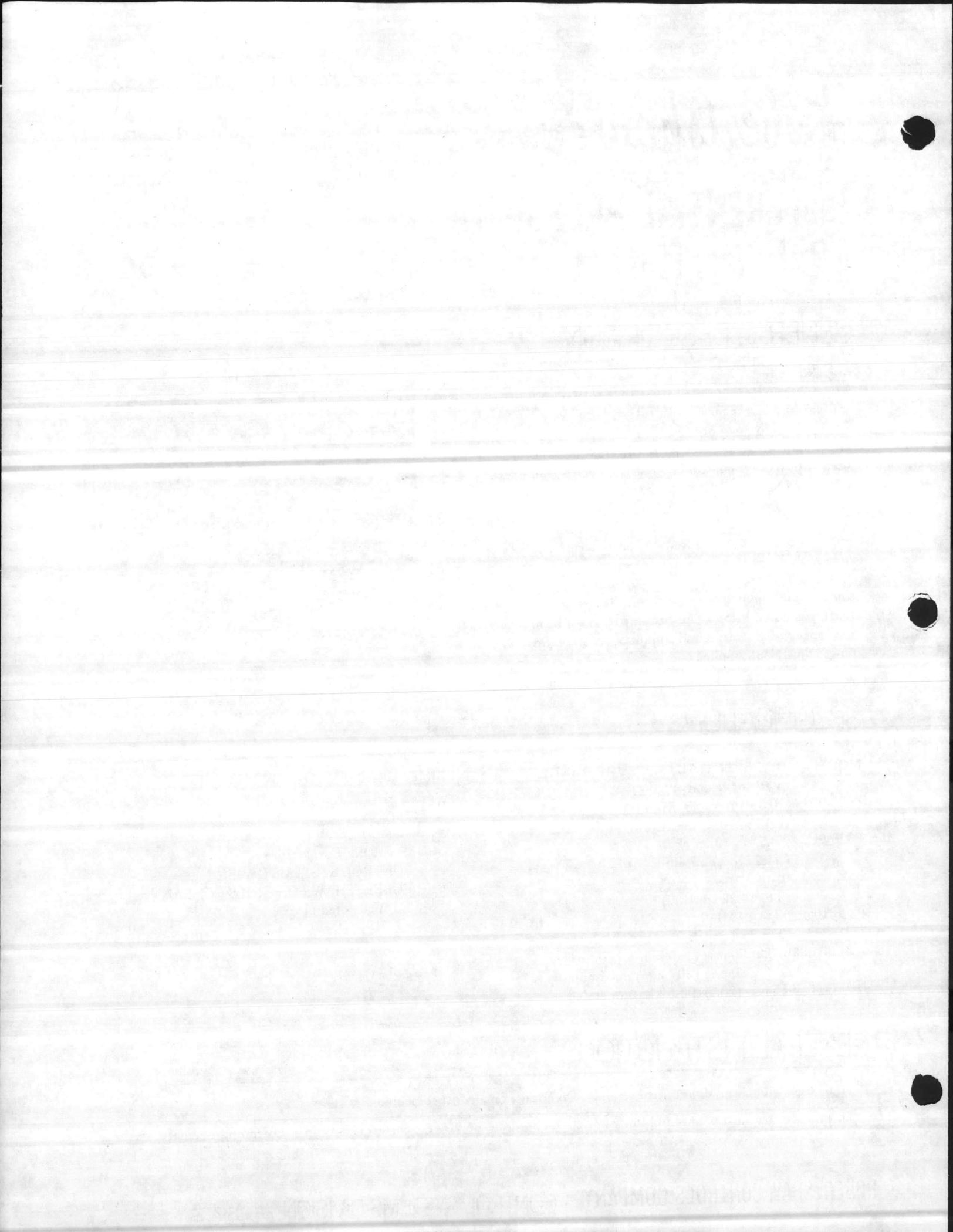
WEIGHT: 8 ounces (227 g).

ORDERING INFORMATION: Specify: Model Number

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.

GENERAL INSTRUCTIONS

1. To be used with clean, dry control air only. Do not use on any other medium.
2. This transmitter must be mounted in a horizontal position. Be sure the correct side is up as noted on the device.



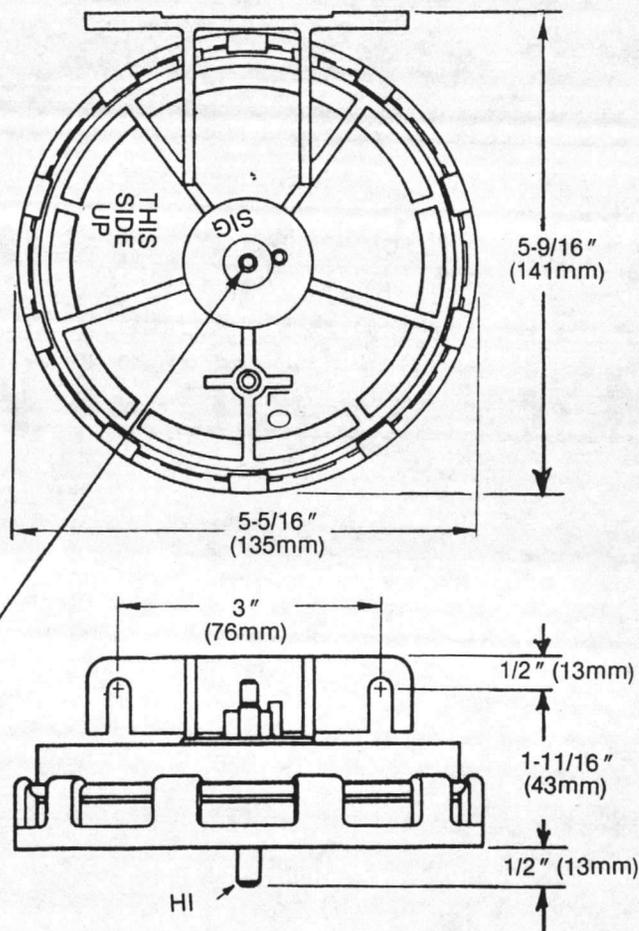
INSTALLATION INSTRUCTIONS

DIFFERENTIAL PRESSURE TRANSMITTER AIR SENSING

P323

GENERAL DESCRIPTION & DIMENSIONS

P323 transmitters are "one-pipe" devices requiring an externally restricted source of constant pressure control air.



NOTE:

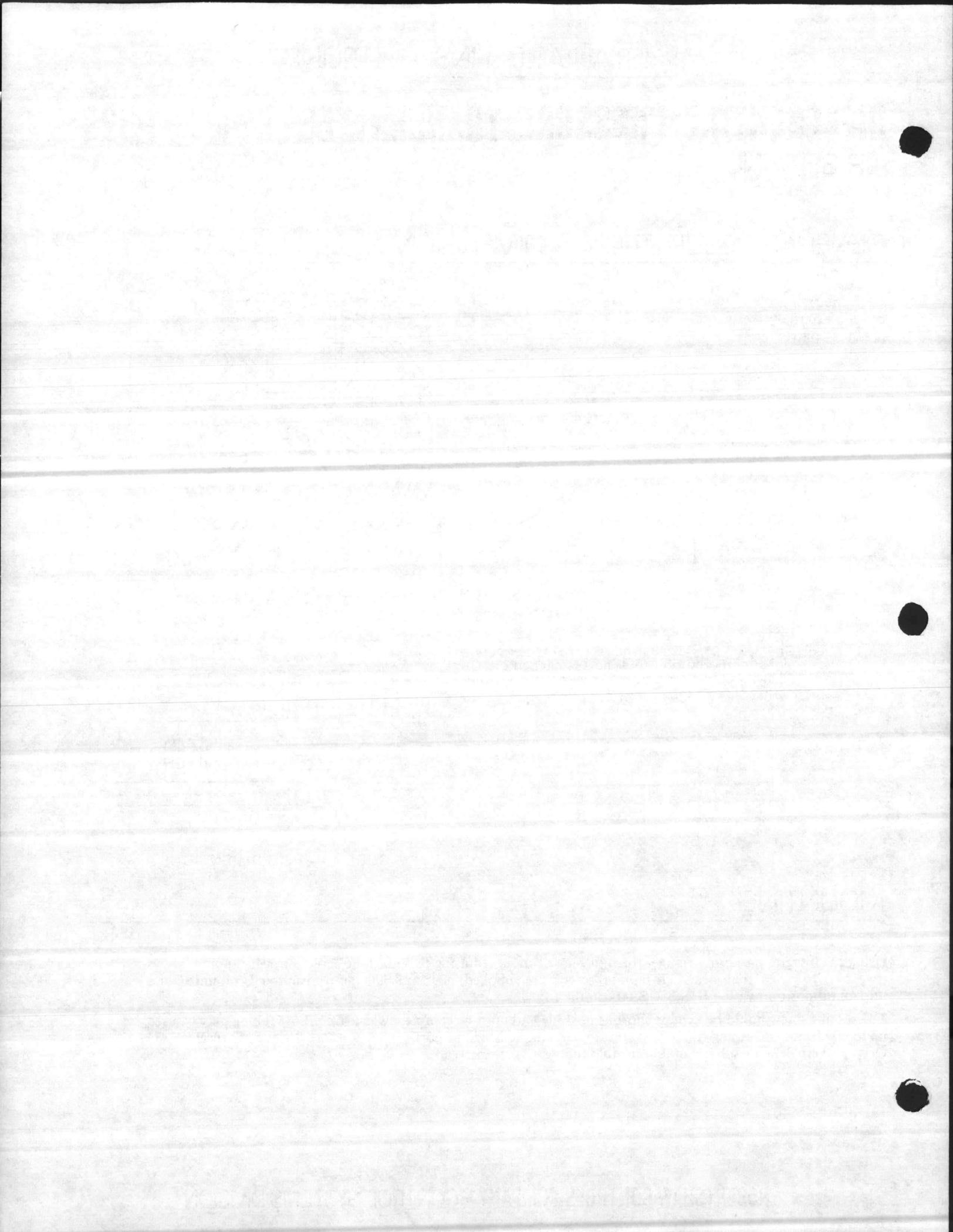
On P323-0025, P323-01 and P323-03, center port is signal port, and off-center port is clipped off. On P323-10, off-center port is signal port and center port is clipped off.

FIGURE 1 — P323 DIMENSIONS

MOUNTING

Using the integral mounting flange, the unit may be mounted using two machine screws or self-tapping screws (two No. 10 x 5/8" pan-head self-tapping screws are supplied). Be sure that the transmitter is mounted in a horizontal position with THIS SIDE UP on the top.

The sensing lines should be kept as short as possible and must be completely leak-free. 1/4" tubing may be used up to 200 feet; 3/8" tubing for 200-500 feet maximum. Sensing line port connections are designed to receive 3/8" O.D. polyethylene or other suitable flexible tubing.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

DIFFERENTIAL PRESSURE TRANSMITTER

P323

AIR SENSING

CALIBRATION

The Model P323 Temperature Transmitter measures either static or velocity pressure differentials and transmits a proportional pneumatic signal to a calibrated receiver gauge and/or receiver controller. (See Table I for complete model number descriptions.) It is a "one-pipe," force-balance transmitter which utilizes an external restrictor in its supply line. It is not intended to be field calibrated. If the output pressure does not correspond to Table II, check the following:

1. The air supply to the restrictor must be 20 psig \pm 0.5 psi (138 kPa \pm 3.4 kPa) and must be clean, dry and oil-free.
2. The restrictor and the device filter must be free of obstructions.

If, after completing the above checks, the transmitter output varies from Table II, see "Adjustments."

Number	Input Pressure Range
P323-0025	-0.05" to 0.20" wg
P323-01	-0.5" to +0.5" wg
P323-03	0" to 3" wg
P323-10	0" to 10" wg

TABLE I — P323 MODEL NUMBERS

ADJUSTMENT

The P323 set points may be adjusted slightly as outlined below:

For adjustment of "zero": Remove the high pressure input line and insert a 3/32" hex wrench into the high pressure input port. Turn the adjusting screw clockwise to increase output, counterclockwise to decrease output. High input is the center hole on the side marked "THIS SIDE DOWN."

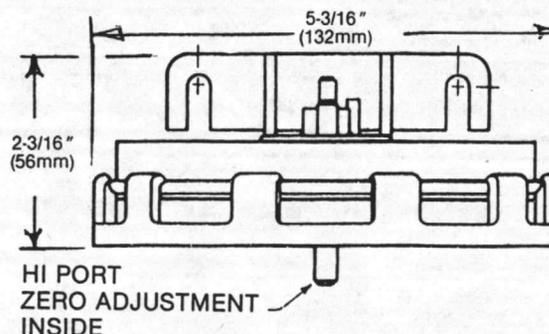
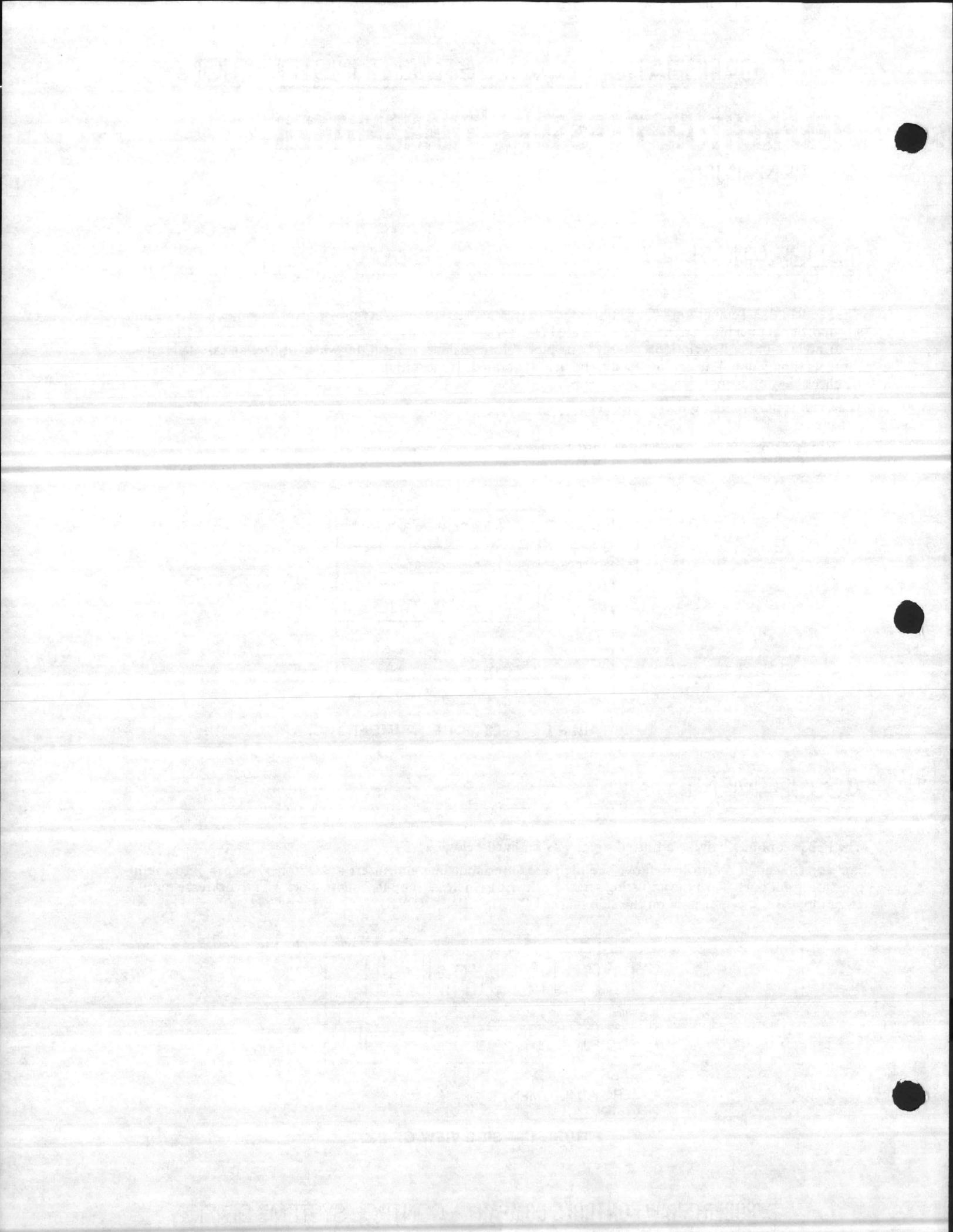
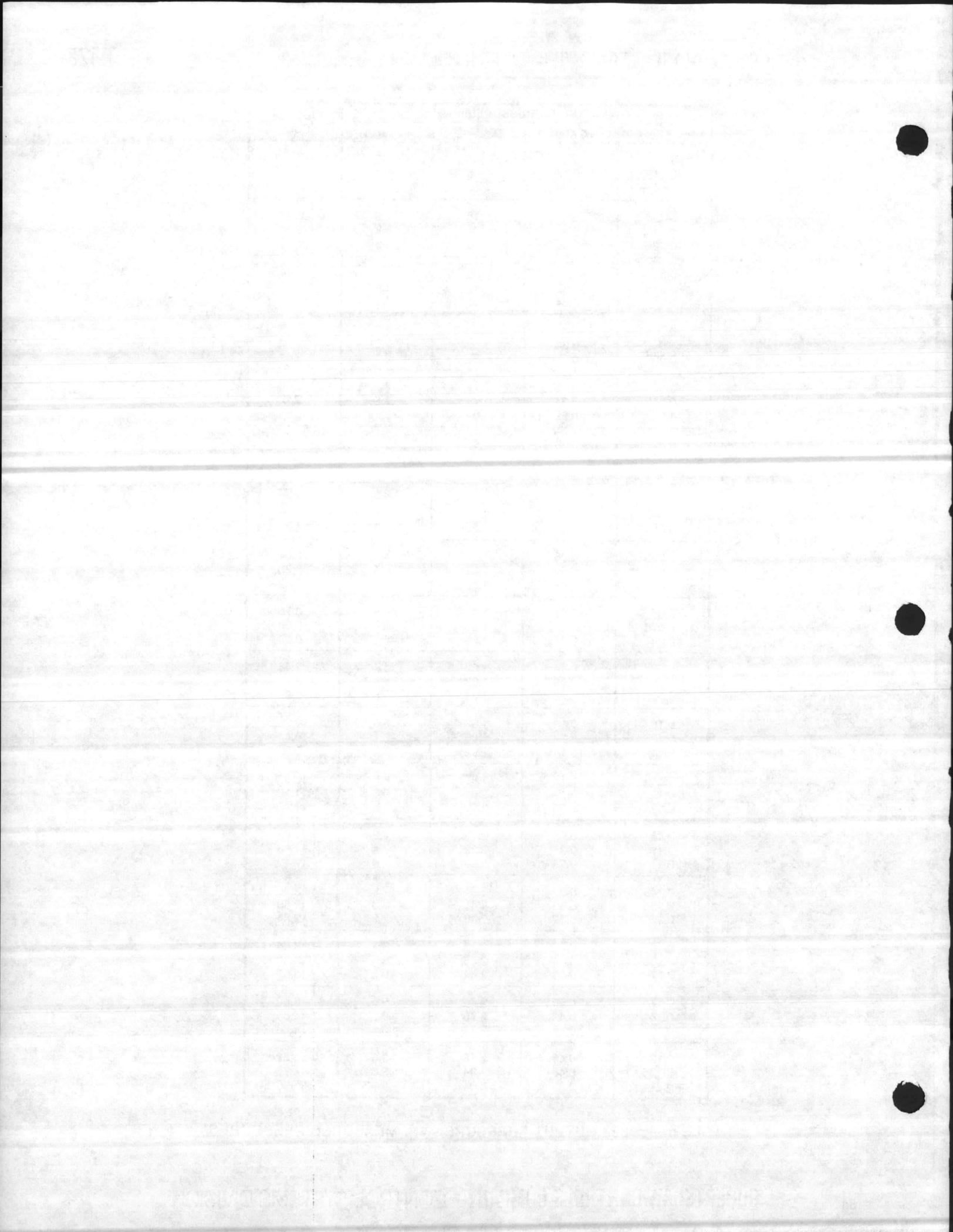


FIGURE 1 — SIDE VIEW OF P323



MEASURED PRESSURE (in wg)				OUTPUT (PSIG)
P323-0025	P323-01	P323-03	P323-10	
-0.05	-0.5	0	0	3.00
-0.045	-0.48	.06	.2	3.24
-0.04	-0.46	.12	.4	3.48
-0.035	-0.44	.18	.6	3.72
-0.03	-0.42	.24	.8	3.96
-0.025	-0.40	.30	1.0	4.20
-0.02	-0.38	.36	1.2	4.44
-0.015	-0.36	.42	1.4	4.68
-0.01	-0.34	.48	1.6	4.92
-0.005	-0.32	.54	1.8	5.16
0	-0.30	.60	2.0	5.40
0.005	-0.28	.66	2.2	5.64
0.01	-0.26	.72	2.4	5.88
0.015	-0.24	.78	2.6	6.12
0.02	-0.22	.84	2.8	6.36
0.025	-0.20	.90	3.0	6.60
0.03	-0.18	.96	3.2	6.84
0.035	-0.16	1.02	3.4	7.08
0.04	-0.14	1.08	3.6	7.32
0.045	-0.12	1.14	3.8	7.56
0.05	-0.10	1.20	4.0	7.80
0.055	-0.08	1.26	4.2	8.04
0.06	-0.06	1.32	4.4	8.28
0.065	-0.04	1.38	4.6	8.52
0.07	-0.02	1.44	4.8	8.76
0.075	0	1.5	5.0	9.00
0.08	0.02	1.56	5.2	9.24
0.085	0.04	1.62	5.4	9.48
0.09	0.06	1.68	5.6	9.72
0.095	0.08	1.74	5.8	9.96
0.10	0.1	1.80	6.0	10.20
0.105	0.12	1.86	6.2	10.44
0.11	0.14	1.92	6.4	10.68
0.115	0.16	1.98	6.6	10.92
0.12	0.18	2.04	6.8	11.16
0.125	0.2	2.1	7.0	11.40
0.13	0.22	2.16	7.2	11.64
0.135	0.24	2.22	7.4	11.88
0.14	0.26	2.28	7.6	12.12
0.145	0.28	2.34	7.8	12.36
0.15	0.30	2.4	8.0	12.60
0.155	0.32	2.46	8.2	12.84
0.16	0.34	2.52	8.4	13.08
0.165	0.36	2.58	8.6	13.32
0.17	0.38	2.64	8.8	13.56
0.175	0.40	2.7	9.0	13.80
0.18	0.42	2.76	9.2	14.04
0.185	0.44	2.82	9.4	14.28
0.19	0.46	2.88	9.6	14.52
0.195	0.48	2.94	9.8	14.76
+0.2	+0.5	3.0	10	15.00

TABLE II — P323 OUTPUT PRESSURES VS. MEASURED PRESSURES





21,1012
DT

DATA SHEET

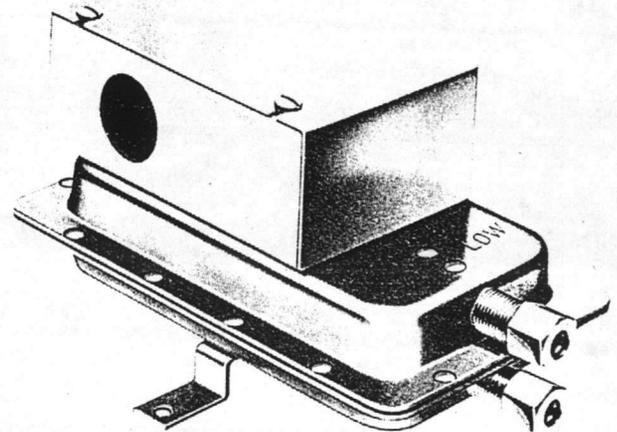
MODEL R436

DIFFERENTIAL PRESSURE SWITCH

GENERAL DESCRIPTION

The R436 Differential Pressure Switch is a sensitive and reliable device for remotely sensing the operation of fans or blowers associated with ducted ventilating systems, and for sensing static pressure drop across filters. Pressure differentials as small as 0.05" WC are sufficient to actuate the SPDT contacts, which in turn operate remote status indicators, alarms, or control circuits of other devices.

The R436 is field-adjustable over a wide range of pressures, and is relatively insensitive to temperature extremes. It is recommended for any differential pressure application within its operating range.



SPECIFICATIONS

MODEL NO.: R436

CONTROL SET POINT: Field adjustable.

SET POINT RANGE: 0.05" \pm 0.02" to 12" WC (0.13 mbar \pm 0.05 mbar to 29.9 mbar)

DIFFERENTIAL: 0.02" WC (0.05 mbar), with slight increase at higher operating pressures.

MAXIMUM PRESSURE: 0.5 psig (34.5 mbar)

ELECTRICAL SWITCH: SPDT, 300 VA pilot duty at 115 to 277 V ac; 10 A non-inductive to 277 V ac.

ELECTRICAL CONNECTIONS: screw terminals with cup washers.

SAMPLING LINE CONNECTIONS: connectors supplied accept 1/4" (.635 cm) OD rigid or semi-rigid tubing; slip-on tubing adapters available.

OPERATING POSITION: diaphragm vertical.

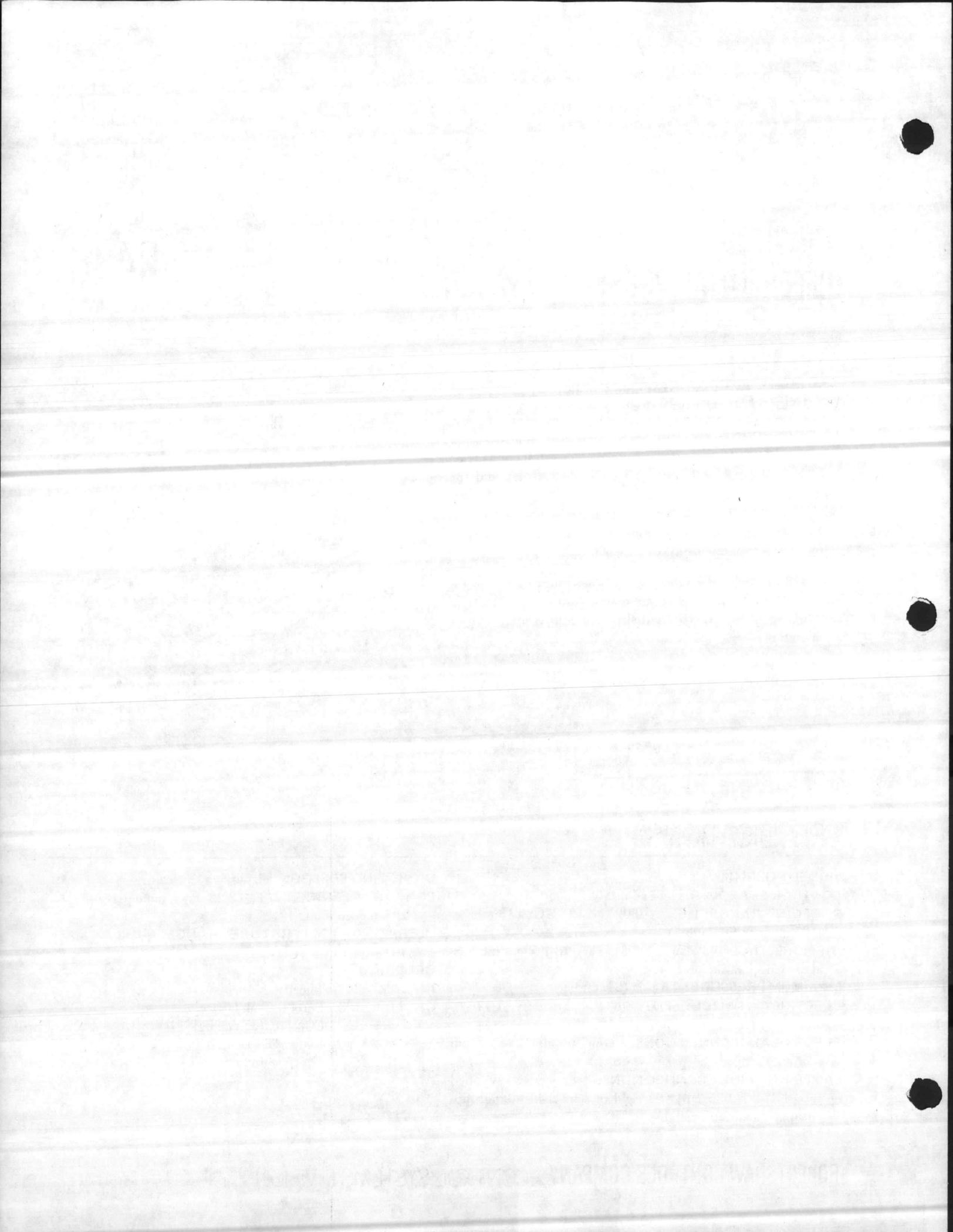
CONDUIT OPENING: 7/8" (2.22 cm) diameter for 1/2" (1.27 cm) conduit.

OPERATING TEMPERATURE RANGE: -40°F to 180°F (-40°C to 82°C).

ORDERING

INFORMATION: Specify: Model Number

ORDER FROM: Local Branch Office of CONTROL SYSTEMS DIVISION ROBERTSHAW CONTROLS COMPANY or office noted below.



INSTALLATION INSTRUCTIONS

DIFFERENTIAL PRESSURE SWITCH

R436

GENERAL DESCRIPTION

The Model R436 differential pressure switch is designed to sense the difference between two air pressures within its range and transfer the contacts of a single-pole, double-pole electrical switch at its setpoint (adjustable). The switch contacts will make common (C) to normally closed (NC) when the sensed pressure difference is less than the setpoint and make common to normally open (NO) when the difference is greater than the setpoint plus a fixed differential.

The R436 is commonly used from remote monitoring of the status of fans and filters in air handling systems. The sensed pressures should not exceed 0.5 psig (27" or 686mm wg). See Table I for electrical switch ratings.

TABLE I

R436 ELECTRICAL SWITCH RATINGS	
Non-Inductive	10 amp to 277 VAC
Pilot Duty	300 VA, 115 to 277 VAC

INSTALLATION

See Figure 1 for device details.

Mounting: The R436 has an integral bracket with two mounting holes. It should be mounted with the diaphragm in a vertical plane, but the case may be rotated to any convenient position.

Sensing Tubes: The R436 is furnished with compression fittings for 1/4" (6.4mm) O.D. rigid or semi-rigid tubing and the fittings can be adapted to accept flexible

tubing. The "HIGH" port should be connected to the most positive or the least negative of the two pressures being sensed.

Electrical: The electrical switch of the R436 has screw terminals with cup washers. It is accessed by loosening two slotted screws and sliding the cover from the electrical enclosure, which has an opening for a conduit connection.

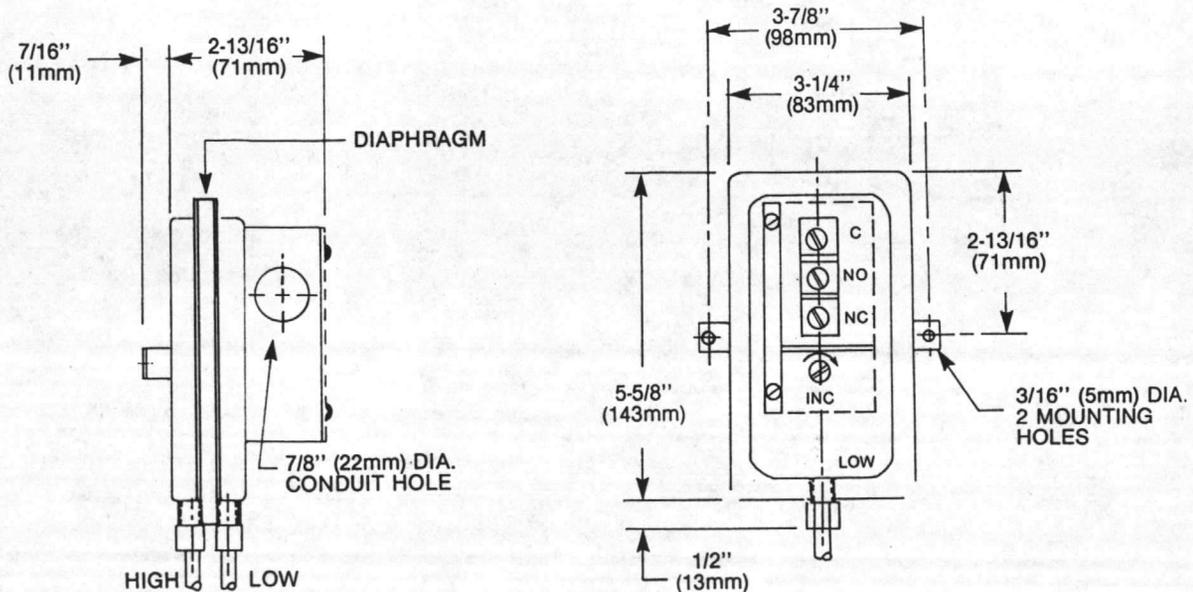
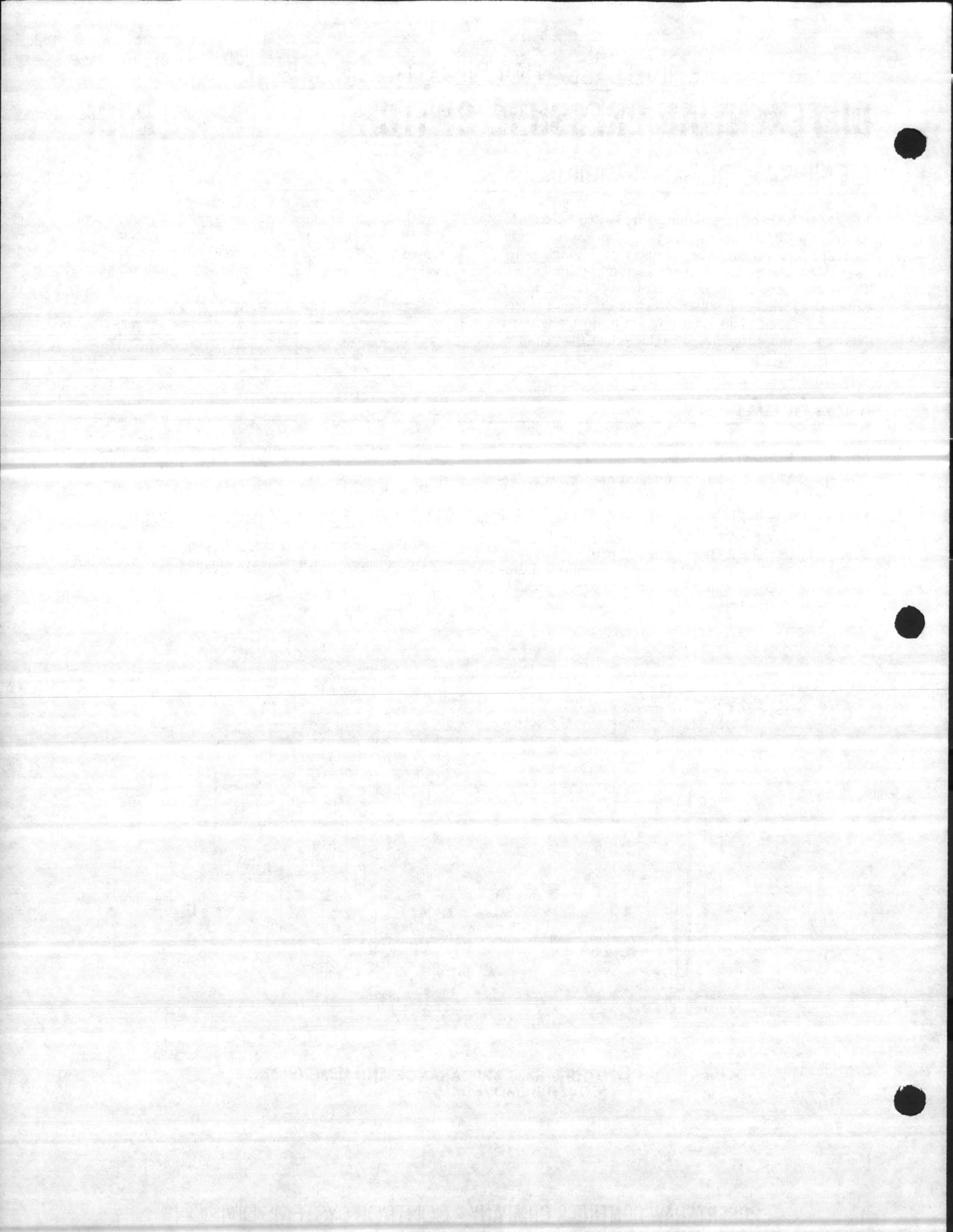


FIGURE 1 — MODEL R436 APPEARANCE AND DIMENSIONS (COVER REMOVED).



CALIBRATION & ADJUSTMENT INSTRUCTIONS

DIFFERENTIAL PRESSURE SWITCH

R436

CALIBRATION

The Model R436 differential pressure switch is designed to sense the difference between two air pressures within its range and transfer the contacts of a single-pole, double-pole electrical switch at its setpoint (adjustable). The switch contacts will make common (C) to normally closed (NC) when the sensed pressure difference is less than the setpoint and make common to normally open (NO) when the difference is greater than the setpoint plus a fixed differential.

The R436 is commonly used for remote monitoring of

the status of fans and filters in air handling systems. The sensed pressures should not exceed 0.5 psig (27" or 686mm wg). See Table I for electrical switch ratings. The R436 is not factory calibrated.

TABLE I

R436 ELECTRICAL SWITCH RATINGS	
Non-Inductive	10 amp to 277 VAC
Pilot Duty	300 VA, 115 to 277 VAC

ADJUSTMENT

The switching **differential** of the R436 is not field adjustable. It increases with increasing setpoint, from 0.02" (0.5mm) wg at the minimum setting to approximately 0.8" (20mm) wg at the maximum setting.

The **setpoint** of the R436 may be adjusted from 0.05" (1.3mm) wg to 12" (305mm) wg by means of a knurled

and slotted knob located under the enclosure cover (clockwise increases setpoint, see Figure 1). The knob is not scaled; the setpoint value must be determined by separate measurement of the pressure difference between the two sensing ports.

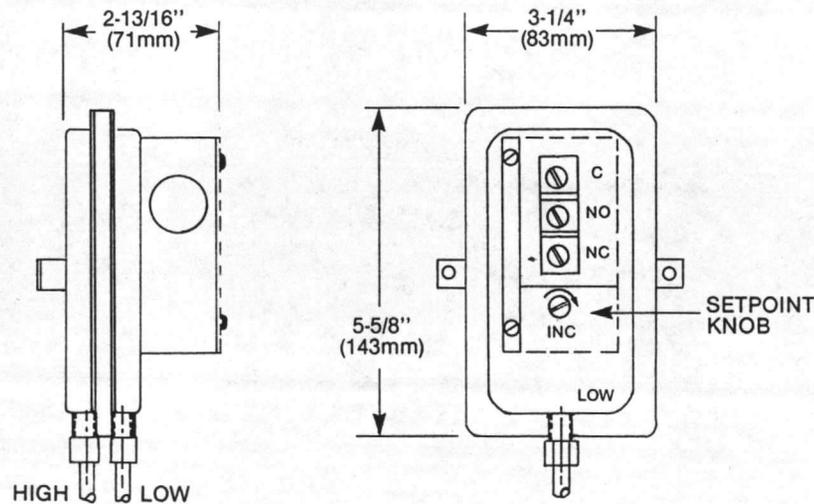
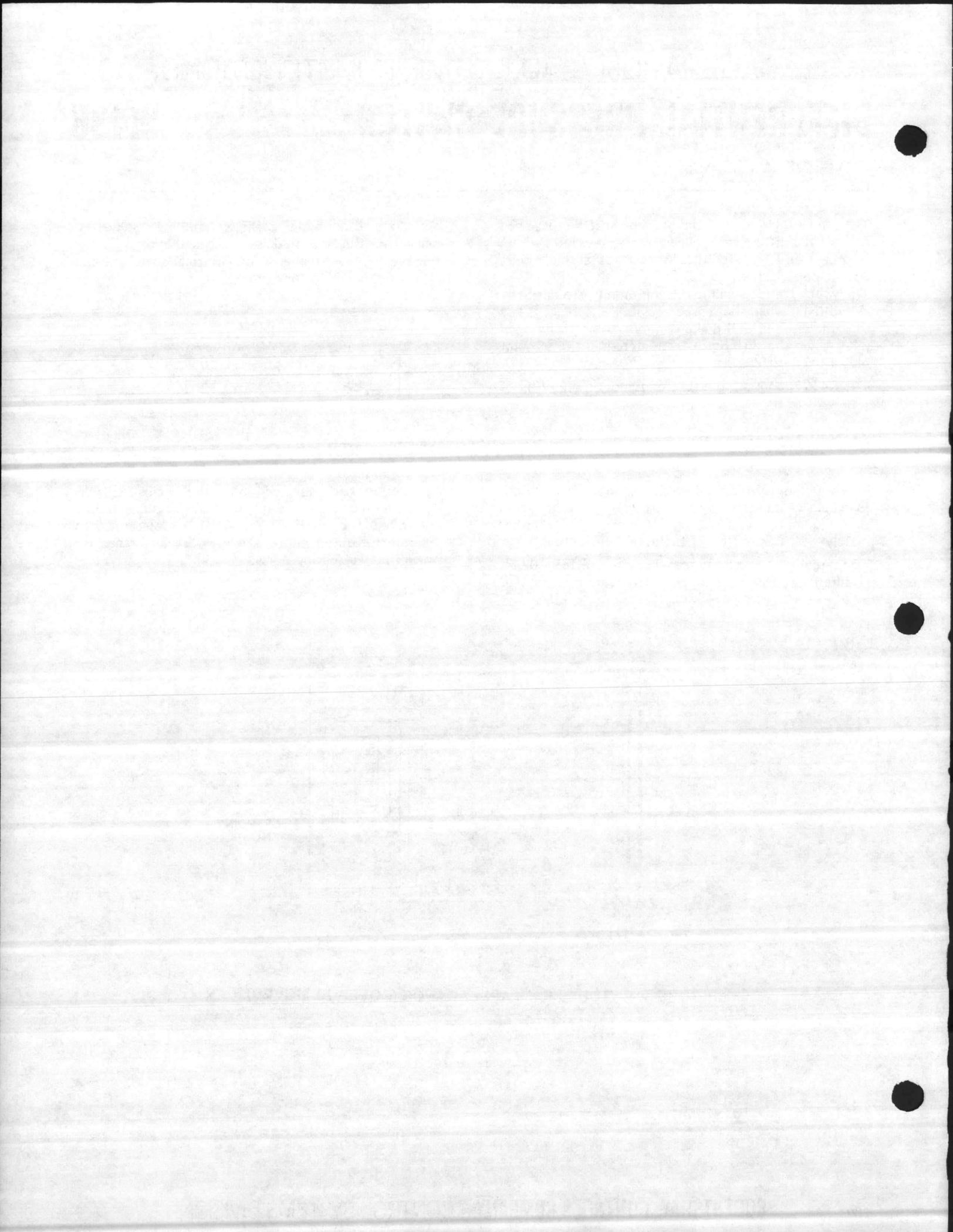


FIGURE 1 — MODEL R436 APPEARANCE (COVER REMOVED).





2,1,13
AV

DATA
SHEET
MODEL
V60

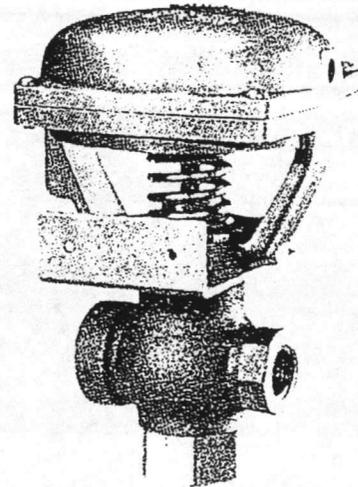
AIR SWITCHING VALVE 3-WAY

GENERAL DESCRIPTION

This valve is especially designed to alternately switch either of two different air pressures to a common main and is available in 1/2" and 3/4" sizes having a quick-opening flow characteristic.

Spring-loaded packing with two U-Cups and two expanders provides a positive self-adjusting seal around the stainless steel stem.

The valve is operated by a pneumatic actuator, which includes a die-cast aluminum yoke and case and a molded rubber diaphragm.



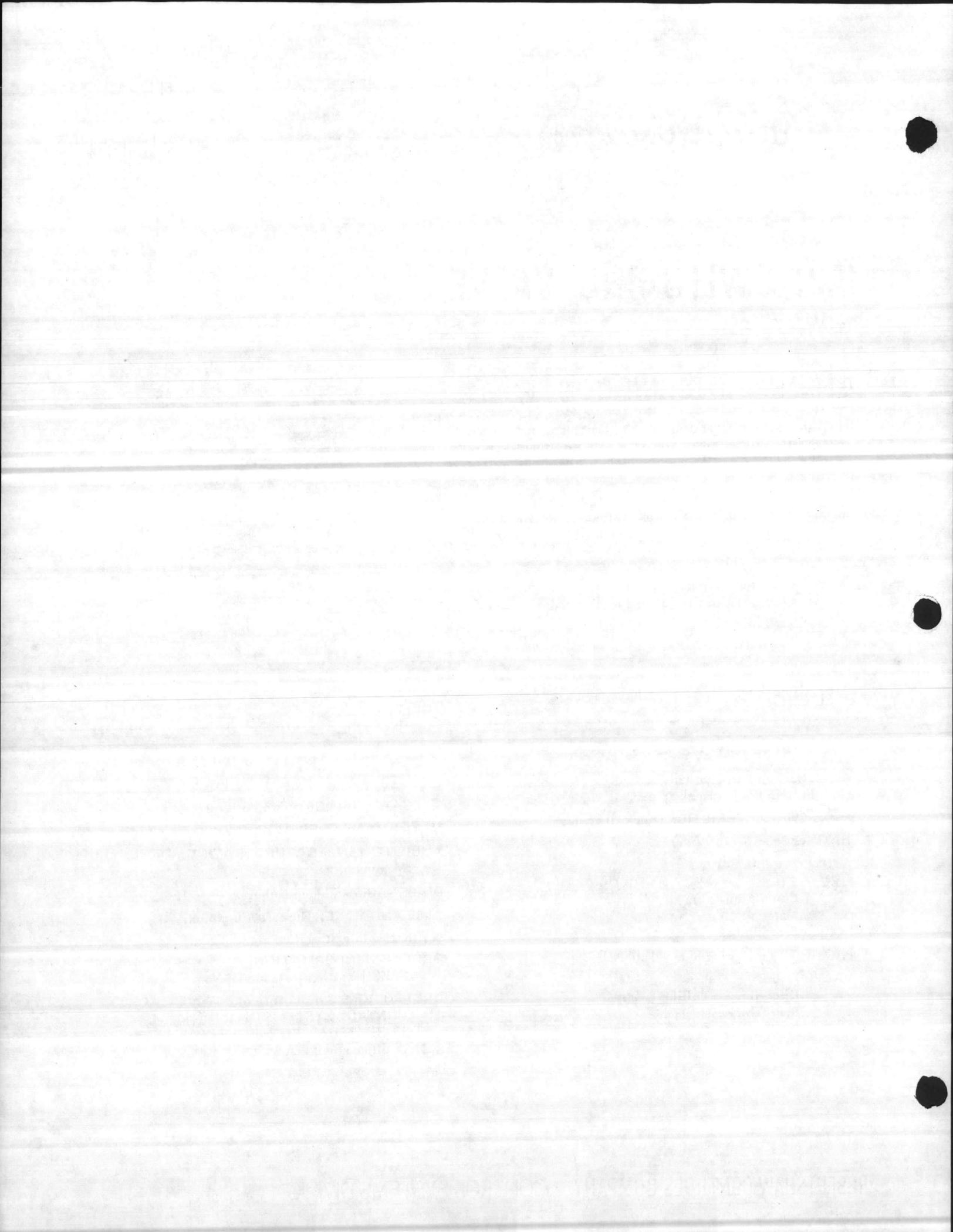
SPECIFICATIONS

VALVE ASSEMBLY

- ACTION:** Top Port Normally Closed.
Bottom Port Normally Open.
- FLOW CHARACTERISTIC:** Quick Opening.
- RATING:** 300 psi. (20.7 bar)
- BODY:** Pattern: 3-Way.
Sizes: 1/2" and 3/4" NPT (12.7 and 19 mm).
Connections: Female NPT.
Material: Brass.
Seat: Brass.
- PACKING:** Two spring-loaded rubber U-Cups.
- VALVE TRIM:**
Disc: Buna-N O-Ring.
Stem: Stainless Steel.

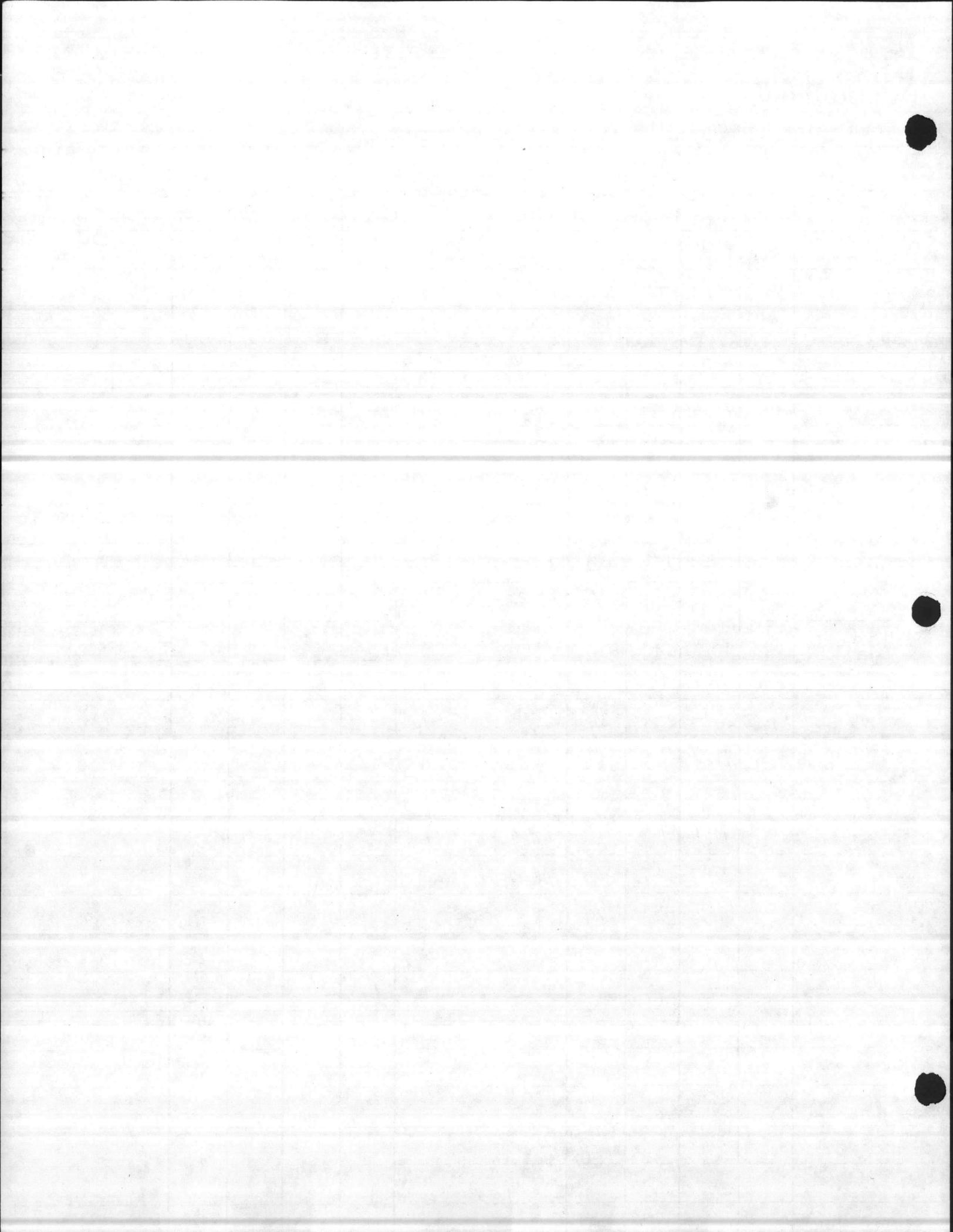
ACTUATOR ASSEMBLY

- SIZE:** 10 sq. in. (64.5 cm²) effective area.
- ACTUATOR RANGE:** Two-Position.
- MAXIMUM AIR PRESSURE:** 30 psi. (2.1 bar)
- AMBIENT TEMPERATURE RATING:** 250°F. (121°C)
Maximum.
- DIAPHRAGM:** Molded Rubber.
- CASE AND YOKE:** Die-cast Aluminum.
- SPRING:** Alloy Steel, Cadmium plated.
- ORDERING INFORMATION:**
SPECIFY: Complete Model No.
- ORDER FROM:** Local office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.



VALVE SCHEDULE

UNIT #	HEATING VALVE					COOLING VALVE			
	GPM	#/HR	CV	SIZE	VALVE NO.	GPM	CV	SIZE	VALVE NO.
STEAM CONVER. SC-1		1490	40	2"	V6700-40307 (V-1)				
STEAM CONVER. SC-2		540	17	1 1/4"	V6700-30307 (V-2)				
CHANGEOVER		244.5	280	4"	3WAY BUTTERFLY (V-3)				
CHANGEOVER C1		233.7	280	4"	3WAY BUTTERFLY (V-4)				
AHU-1		29.5	17	1 1/4"	V6800-30307 (V-5)				
2		29.5	17	1 1/4"	V6800-30307 (V-6)				
3		31.5	25	1 1/2"	V6600-35307 (V-7)				
4		33.9	25	1 1/2"	V6600-35307 (V-8)				
5		33.9	25	1 1/2"	V6600-35307 (V-9)				
6		36.5	25	1 1/2"	V6600-35307 (V-10)				
FCU-1		11.4	9.3	1"	V6800-25307 (V-11)				
2		5.3	4.6	3/4"	V6800-15307 (V-12)				
3		11.4	9.3	1"	V6800-25307 (V-13)				
4		5.3	4.6	3/4"	V6800-15307 (V-14)				
5		11.1	9.3	1"	V6800-25307 (V-15)				
6		5.2	4.6	3/4"	V6800-15307 (V-16)				
HEATING SYSTEM VALVE		5.2	5.7	3/4"	V6700-16307 (V-17)				





2, 1, 2

DIAPHRAGM CONTROL VALVE

3-WAY MIXING

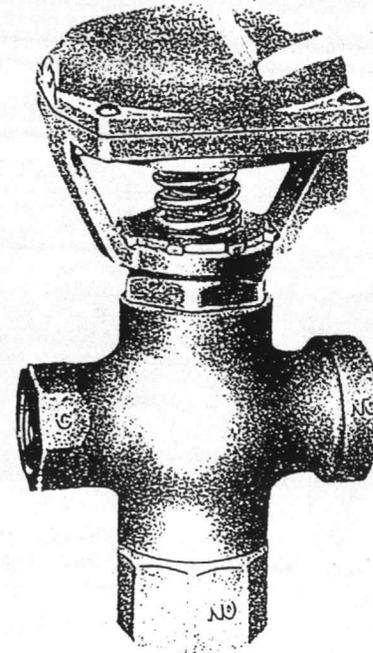
V7, V10, ~~V11, V12, V13, V14, V16~~
V15

GENERAL DESCRIPTION

This valve is especially designed for the control of either hot water or chilled water, and is available in sizes 1/2" through 2" with linear flow characteristics.

Two spring-loaded U-cups and two expanders provide a positive self-adjusting seal around the valve stem. Service life of the seal is greatly extended by the use of a stainless steel stem.

The valve is operated by a pneumatic actuator, which includes a die-cast aluminum yoke and case and a molded rubber diaphragm.



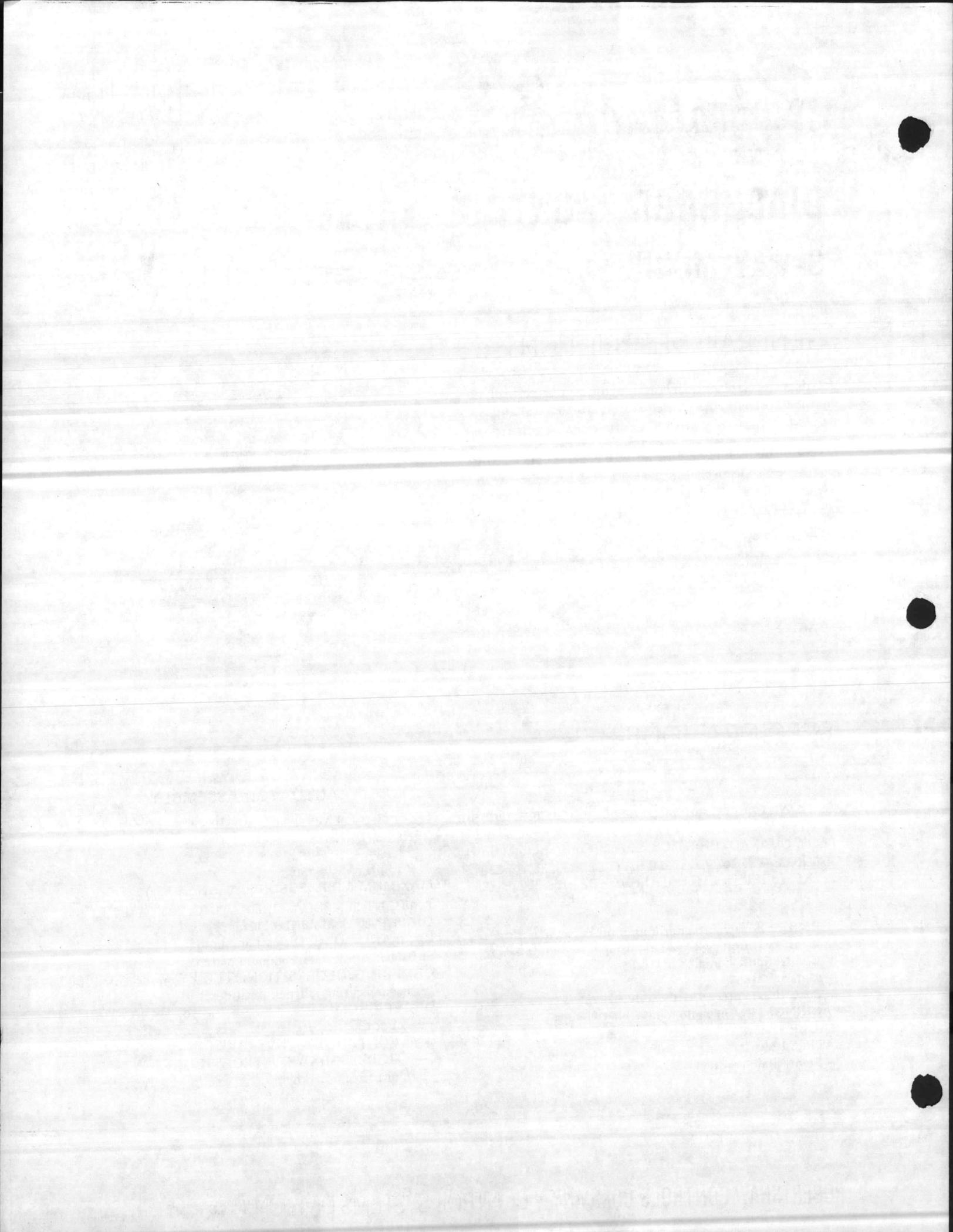
SPECIFICATIONS

VALVE ASSEMBLY

- ACTION:** Top port normally closed. Bottom port normally open.
- FLOW CHARACTERISTICS:** Linear (Constant total flow).
- RATING:** 1/2" & 3/4" sizes, 250 psi (17.2 bar), 35° to 250° F (1.6° to 121° C) water. 1" through 2" sizes, 300 psi (20.7 bar), 35° to 250° F (1.6° to 121° C) water.
- BODY:**
 - Pattern: 3-Way (integral bonnet on 1/2" and 3/4" sizes).
 - Sizes: 1/2" through 2" (23.7 through 50.8 mm) NPT.
 - Connections: Female NPT.
 - Material: Brass.
 - Seat: Brass, integral with body.
- PACKING:** Two spring-loaded rubber U-cups.
- VALVE TRIM:**
 - Plug: Brass.
 - Stem: Stainless steel.

ACTUATOR ASSEMBLY

- SIZE:** 10 sq. in. (64.5 cm²) effective area.
- SPRING RANGES:**
 - 4-8 psi (.28-.55 bar)
 - 8-13 psi (.55-.90 bar)
- MAXIMUM AIR PRESSURE:** 30 psi (2.1 bar)
- AMBIENT TEMPERATURE RATING:** 225° F (107° C) max.
- DIAPHRAGM:** Molded rubber.
- CASE AND YOKE:** Die-cast aluminum.
- SPRING:** Alloy steel, cadmium plated.
- ORDERING INFORMATION:** SPECIFY: Model No. V6600.
size and spring range or positioner.
- ORDER FROM:**
 - Local Office of
 - CONTROL SYSTEMS DIVISION
 - ROBERTSHAW CONTROLS COMPANY
 - or office noted below.



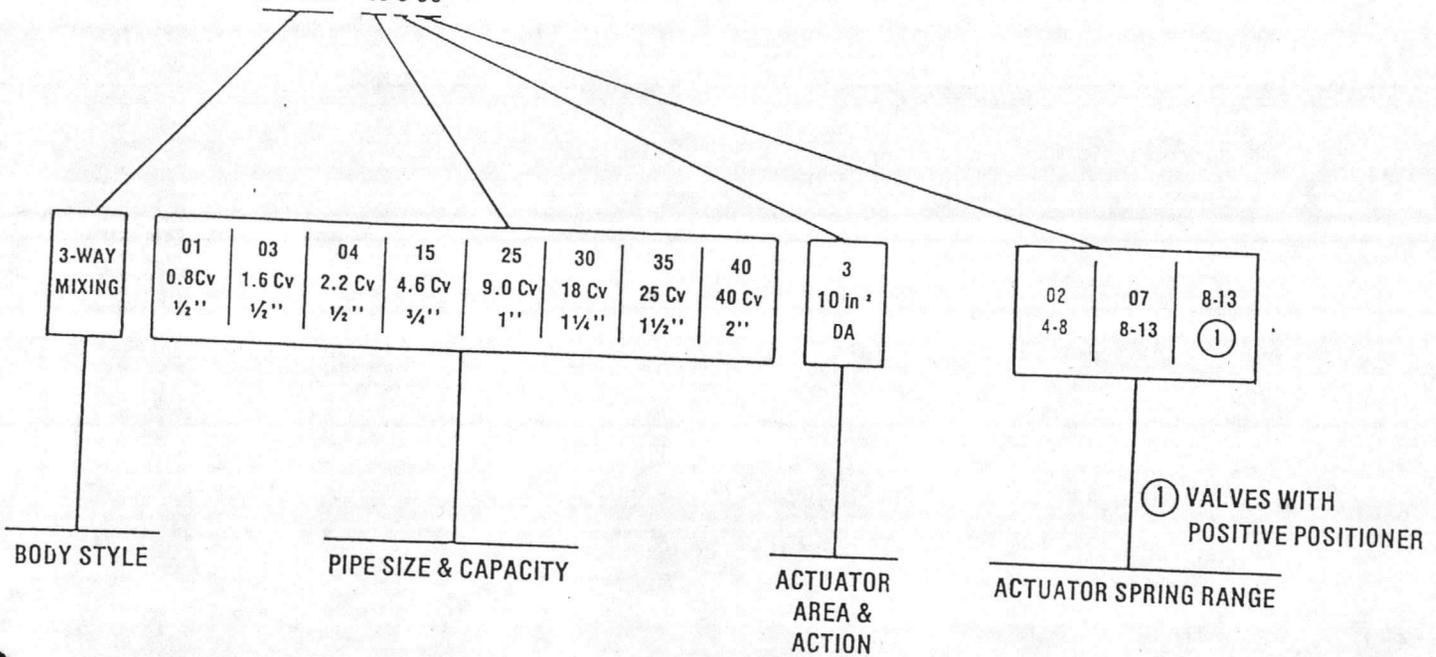
SPECIFICATIONS (Continued)

2.1.2

MODEL NO. CODES

EXAMPLE:

V6600-25 3 06



CLOSE OFF RATINGS

Pressure drop acting against the unbalanced area of the valve produces a thrust. When the pressure in the normally-open port is greater than the pressure in the normally-closed port, the additional thrust must be compensated for by additional signal pressure applied at the top limit of the actuator range.

Conversely, when the pressure in the normally-closed port is greater than the pressure in the normally-open port, the additional thrust must be compensated for by a decrease in signal pressure at the low limit of the actuator range. (See Fig. 1)

For tight close off the valve must not be operated at pressure drops greater than those designated by the intersections of the valve size curves with the appropriate line selected from Table III (See Fig. 1). Maximum allowable pressure drop for any valve (including other actuator ranges) is 40 psi.

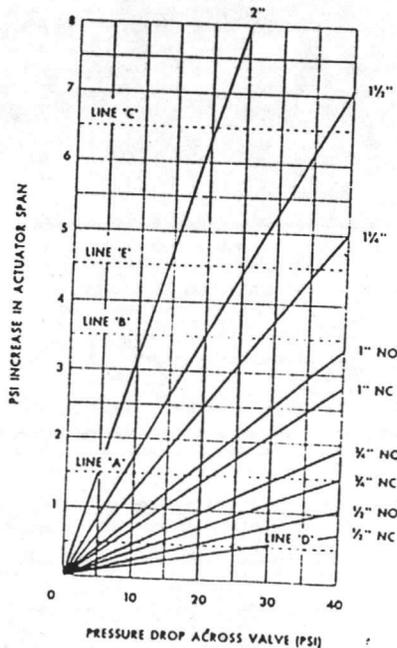
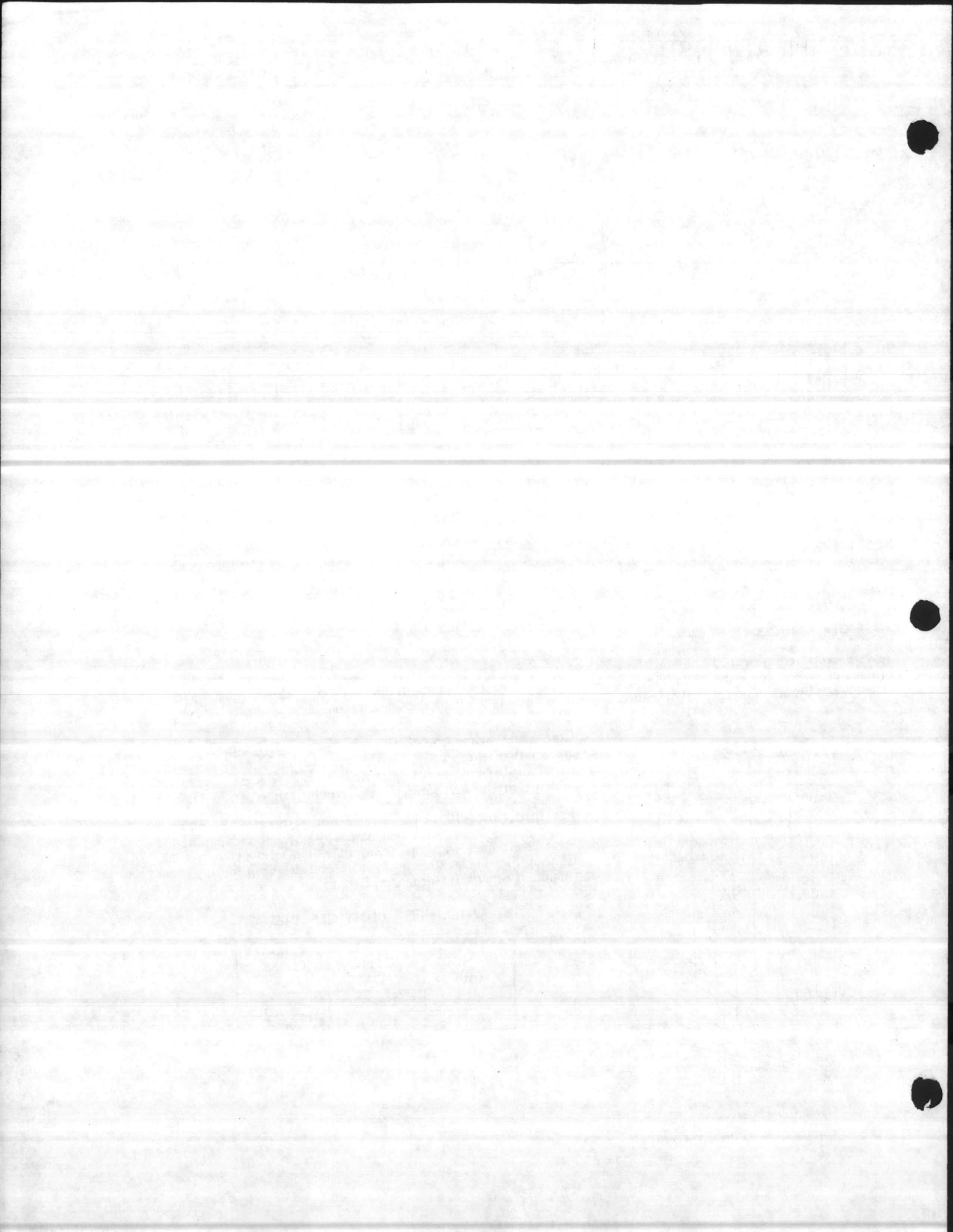


Figure 1—CLOSE OFF RATING, V66 VALVE

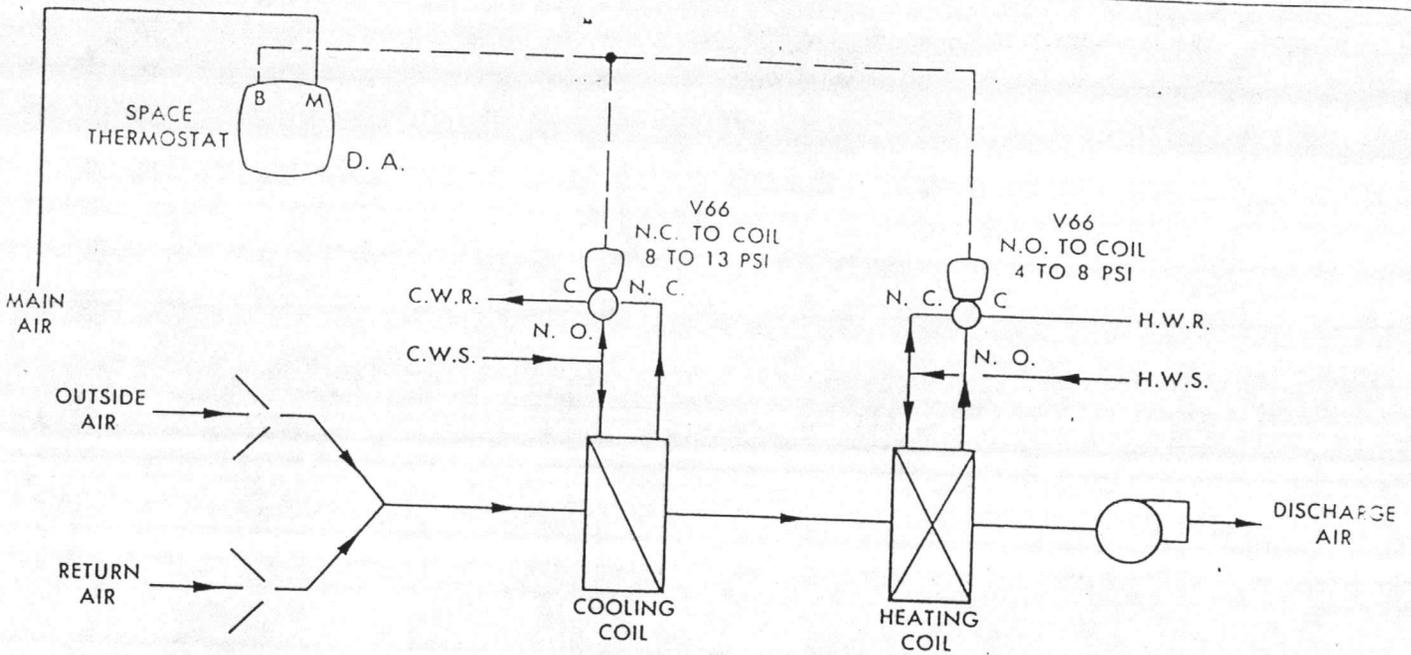
Table III—CLOSE OFF LINES

ACTUATOR RANGE (psi)	NORMALLY-OPEN PORT	NORMALLY-CLOSED PORT
4 - 8	Line C	Line B
8 - 13	Line A	Line C



TYPICAL APPLICATION

2, 1, 2



A. H. UNIT HEATING AND COOLING COIL CONTROL

INSTALLATION

Control valves are sized to the demand of the system to be controlled and are frequently smaller than supply lines. They should be installed as close as possible to the coil being controlled. Preferably, a control valve should be installed in the vertical position so the actuator will be over the valve, but can be installed in any position if necessary.

When installing a valve, these simple precautions should be taken:

1. Install a pipeline strainer just ahead of the valve.
2. Allow sufficient clearance that the valve may be easily serviced if necessary.
3. A minimum clearance of 3½" must be allowed between the extreme top of the actuator and the nearest obstruction. This permits removal of actuator yoke and parts required to replace packing.

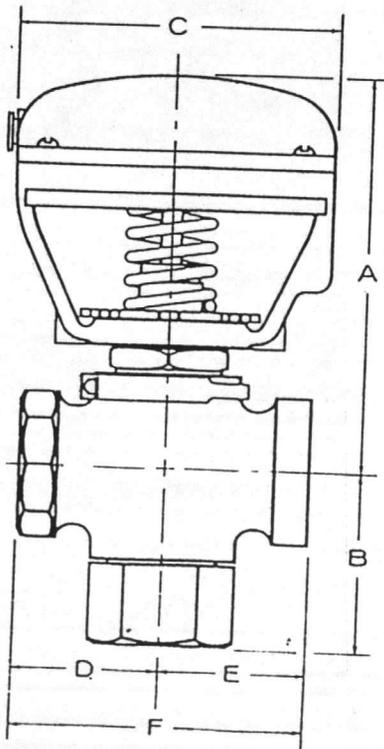
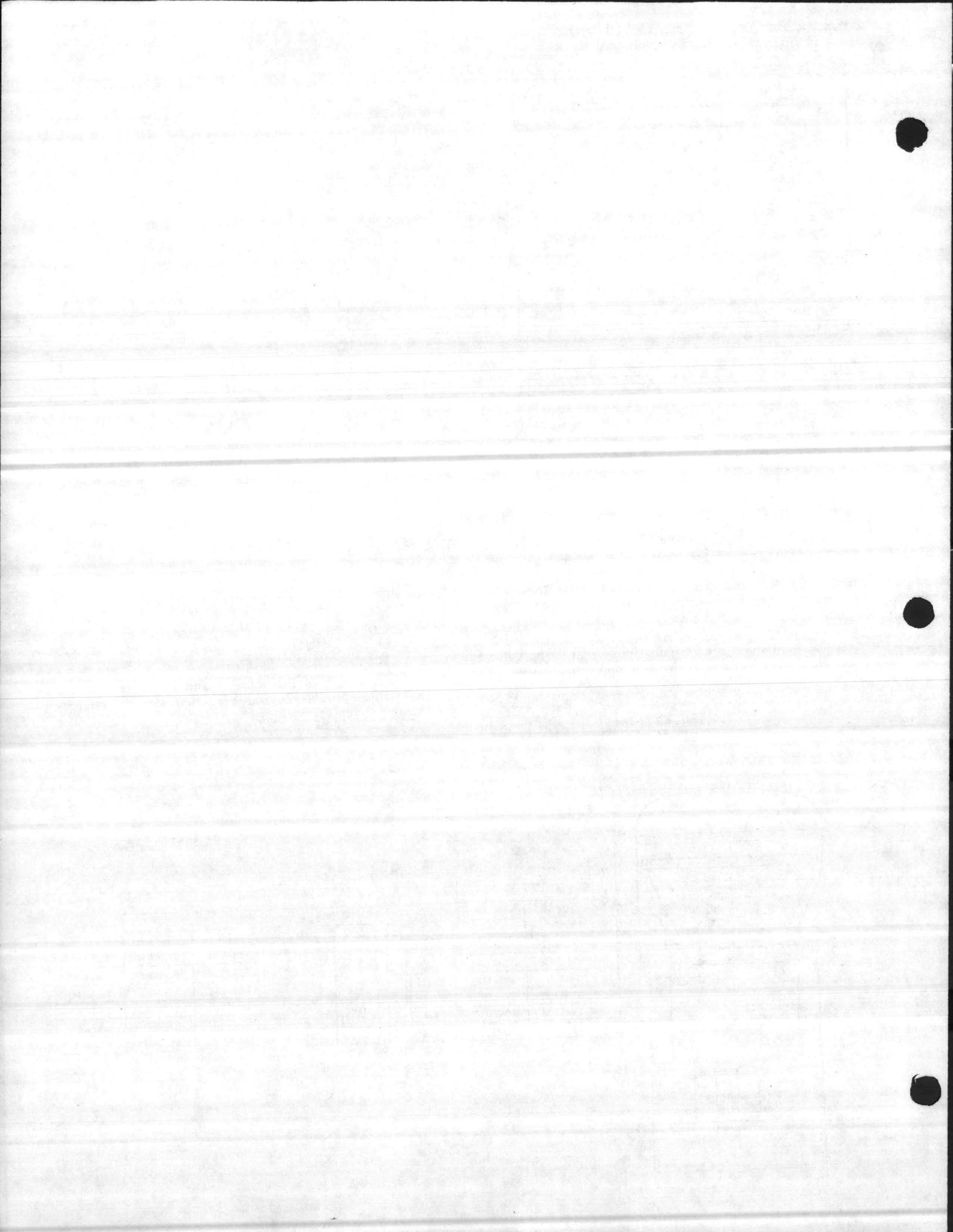


TABLE IV

SIZE. in. (mm)	DIMENSIONS — in. (mm)						WEIGHT LBS. (KG)
	A	B	C	D	E	F	
½ (12.7)	4 7/16 (116)	1 1/8 (49.2)	4 7/16 (110)	1 3/4 (34.9)	1 3/4 (34.9)	2 1/2 (69.9)	3.1 (1.41)
¾ (19.05)	4 7/8 (120)	2 1/2 (56.3)	4 7/16 (110)	1 7/8 (40.5)	1 7/8 (40.5)	3 1/4 (55.6)	3.4 (1.55)
1 (25.4)	5 1/2 (150)	3 1/2 (85.7)	4 7/16 (110)	2 1/2 (63.5)	2 1/2 (63.5)	5 (127)	6.9 (3.14)
1 1/4 (31.8)	5 7/8 (150)	3 7/8 (85.7)	4 7/16 (110)	2 7/8 (65.1)	2 7/8 (65.1)	5 1/2 (130)	8.0 (3.64)
1 1/2 (38.1)	5 7/8 (150)	3 7/8 (85.7)	4 7/16 (110)	2 7/8 (65.1)	2 7/8 (65.1)	5 1/2 (130)	8.0 (3.64)
2 (50.8)	6 7/8 (160)	3 7/8 (96.1)	4 7/16 (110)	3 1/2 (85.7)	3 1/2 (85.7)	6 1/2 (171)	16.3 (7.41)



MAINTENANCE AND REPAIR

2.1, 2

The V66 requires very little maintenance after proper installation. It is recommended that field repairs be limited to the following (No Special Tools Required)

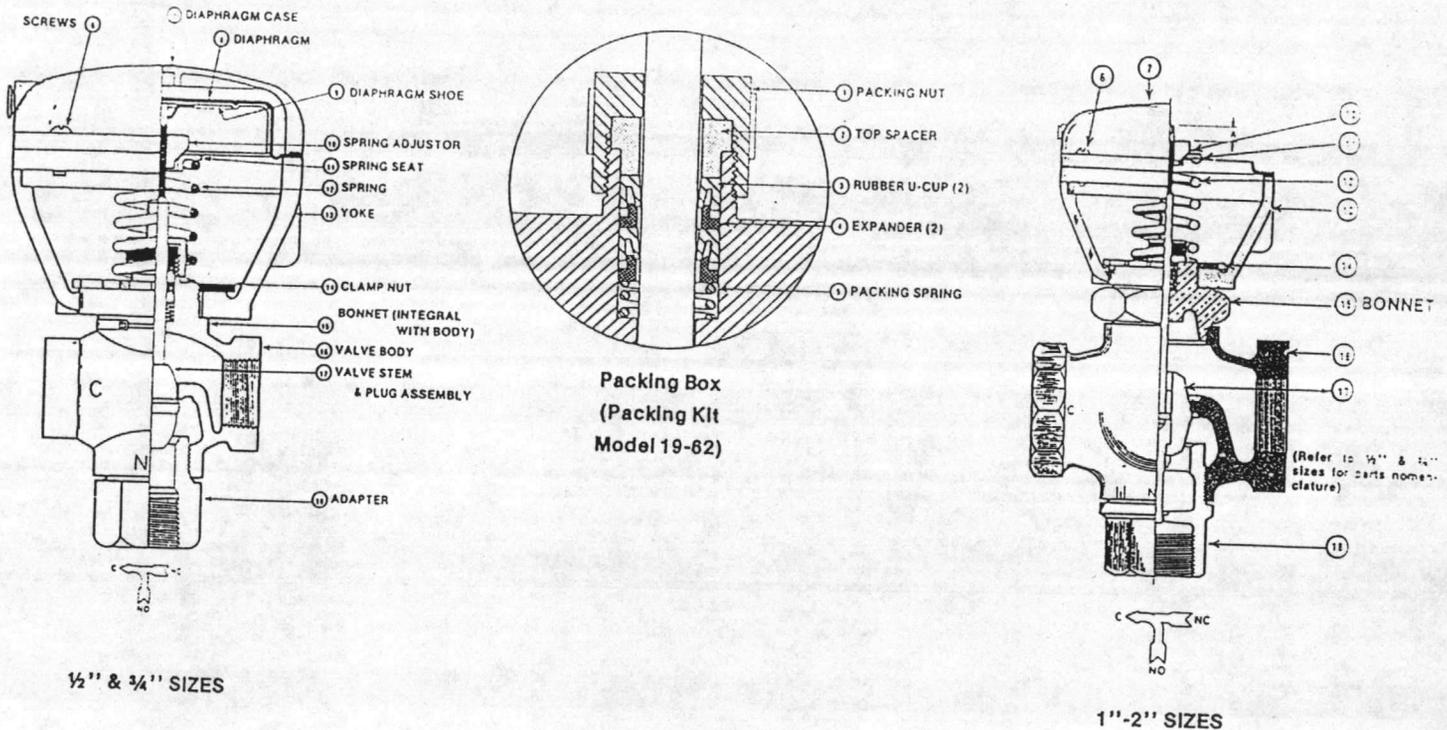


FIGURE 2-V66 VALVE ASSEMBLY

PACKING REPLACEMENT

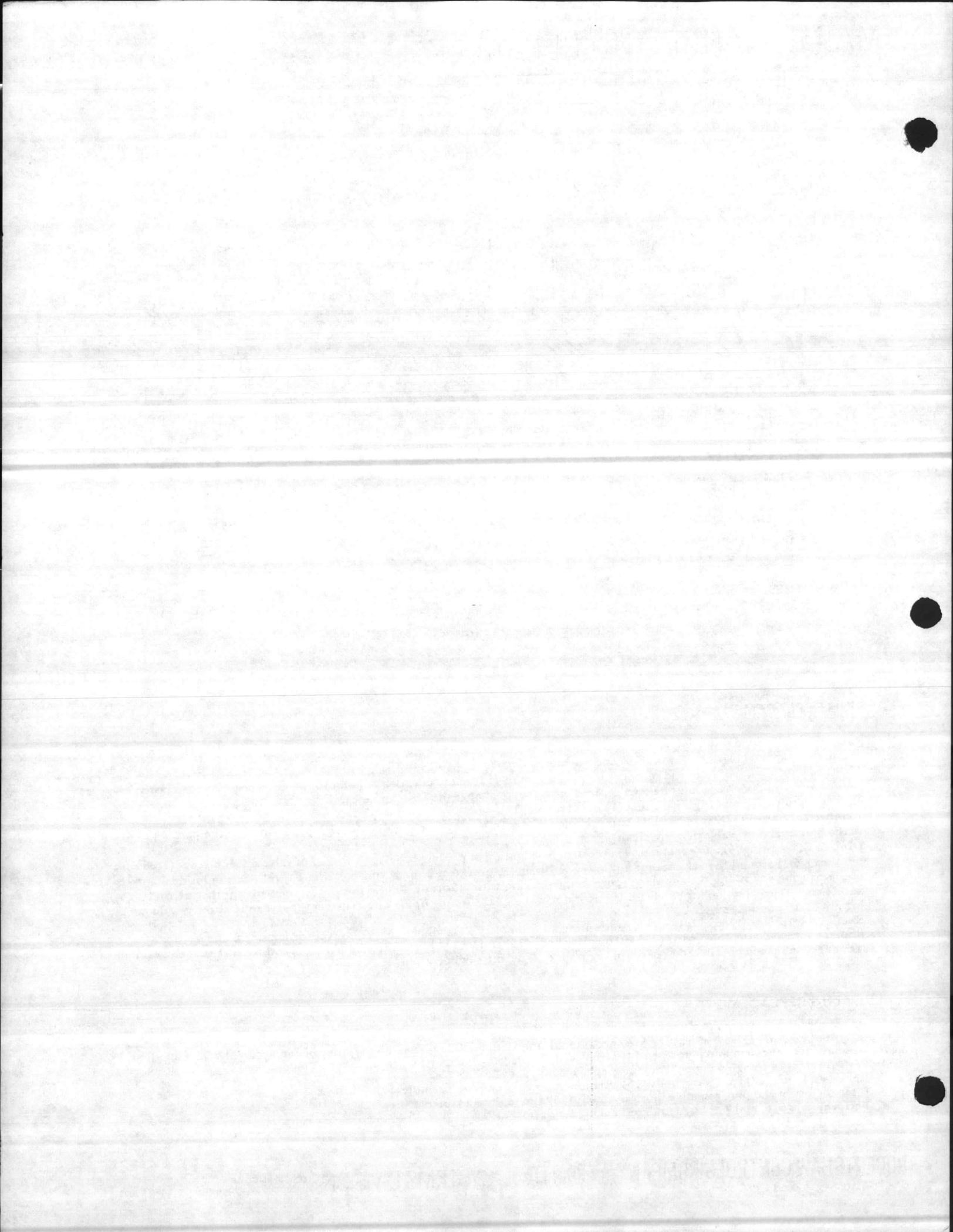
If valve stem leakage is encountered, replace the U-cup packing as follows:

1. Remove clamp nut (14) and lift yoke (13) and assembled parts (7, 8, 9) off valve.
2. Measure dimension "A" from end of stem and plug assembly (17) to top of spring adjustor (10) and record. During reassembly of the valve, this dimension must be reset $\pm 1/64$ " so as not to change the actuator range.
3. Remove spring adjustor (10), spring seat (11), and spring (12).
4. Remove packing nut (1), spacer (2), U-cup packing (3), expanders (4), and packing spring (5). Be sure that the packing cavity in the bonnet and the valve stem are clean.
5. Drop packing spring (5) and expander (4) over stem into bottom of packing box. Apply a bead of valve seal lubricant (accessory number N6-3) around the valve stem and push one U-cup (3) over stem into packing box, thereby lubricating inside diameter of the packing and filling the annular groove in the packing with lubricant. Repeat this procedure with another expander (4) and U-cup (3) packing, taking care with U-cup *not to damage the sealing lip*. Drop top spacer (2) over stem and screw on packing nut (1) to a positive stop.
6. Reassemble spring (12), spring seat (11), and spring adjustor (10). Reset dimension "A" as recorded in step 2 above.
7. Replace yoke and assembled parts (7, 8, 9) on valve body (16) and lock in place with clamp nut (14). Make sure that end of stem is engaged in shaped hole in center of diaphragm shoe (9) during this operation.

VALVE PLUG REPLACEMENT

If indications of excessive valve seat leakage are encountered, the Stem and Plug Assembly (17) may be replaced. The packing should be replaced any time the stem and plug assembly is replaced. Replacement of parts is accomplished as follows:

1. Perform steps 1 through 4 under "Packing Replacement" above.
2. Remove adapter (18) from valve body (16). Remove old stem and plug assembly (17).
3. Insert new stem and plug assembly into valve body (16) and replace adapter (18).
4. Perform steps 5, 6, and 7 as listed under "Packing Replacement."



INSTALLATION INSTRUCTIONS

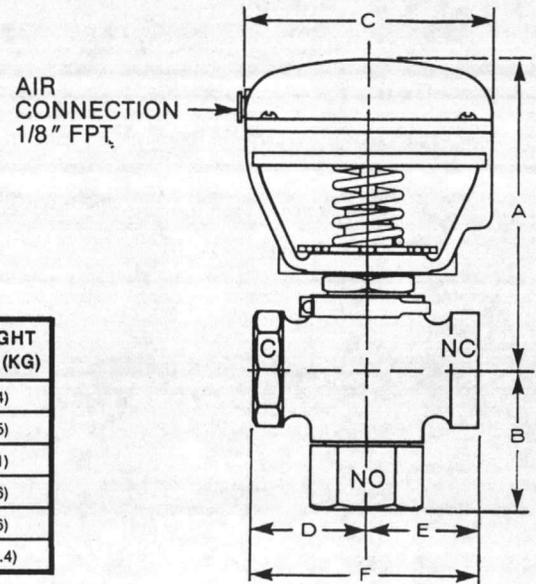
DIAPHRAGM CONTROL VALVE 3-WAY MIXING

V66

GENERAL DESCRIPTION

Model V6600 3-way pneumatic valves are designed for mixing control of hot or chilled water and have linear flow characteristics for constant total flow. Port connections are threaded (FPT).

Actuators are 10 sq. in. (64.5 cm²). Position indicators and positive positioners are optional.



V66 DIMENSIONS AND WEIGHTS

SIZE in. (mm)	DIMENSIONS — in. (mm)						WEIGHT LBS. (KG)
	A	B	C	D	E	F	
1/2 (13)	4-9/16 (116)	1-15/16 (49)	4-5/16 (110)	1-3/8 (35)	1-3/8 (35)	2-3/4 (70)	3.1 (1.4)
3/4 (19)	4-23/32 (120)	2-7/32 (56)	4-5/16 (110)	1-19/32 (40)	1-19/32 (40)	3-3/16 (81)	3.4 (1.5)
1 (25)	5-29/32 (150)	3-3/8 (86)	4-5/16 (110)	2-1/2 (64)	2-1/2 (64)	5 (127)	6.9 (3.1)
1-1/4 (32)	5-29/32 (150)	3-3/8 (86)	4-5/16 (110)	2-9/16 (65)	2-9/16 (65)	5-1/8 (130)	8.0 (3.6)
1-1/2 (38)	5-29/32 (150)	3-3/8 (86)	4-5/16 (110)	2-9/16 (65)	2-9/16 (65)	5-1/8 (130)	8.0 (3.6)
2 (51)	6-5/16 (160)	3-25/32 (96)	4-5/16 (110)	3-3/8 (86)	3-3/8 (86)	6-3/4 (171)	16.3 (7.4)

INSTALLATION

Control valves are sized to the demand of the system being controlled and frequently are smaller than supply line sizes, thus requiring pipe reducers/increasers to be provided by the installer. Preferably, a control valve should be installed in the vertical position with the actuator above the valve, but it can be installed in any position if necessary.

When installing a valve, these precautions should be taken:

1. Verify that flow through the valve will be in the correct direction as indicated by installation drawings and the valve flow arrows and/or port identification.
2. Install a pipeline strainer just ahead of the valve.
3. Allow sufficient clearance to service the valve (3-1/2" [89mm] minimum above the top of the actuator).

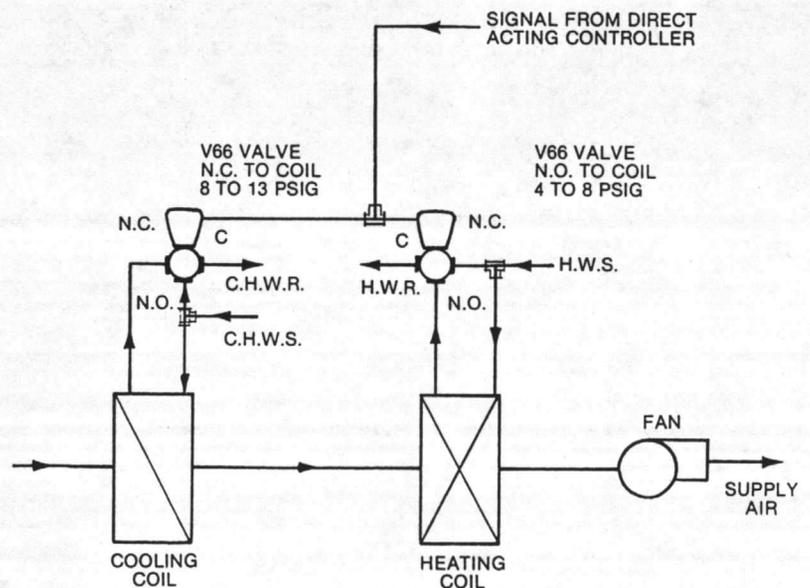
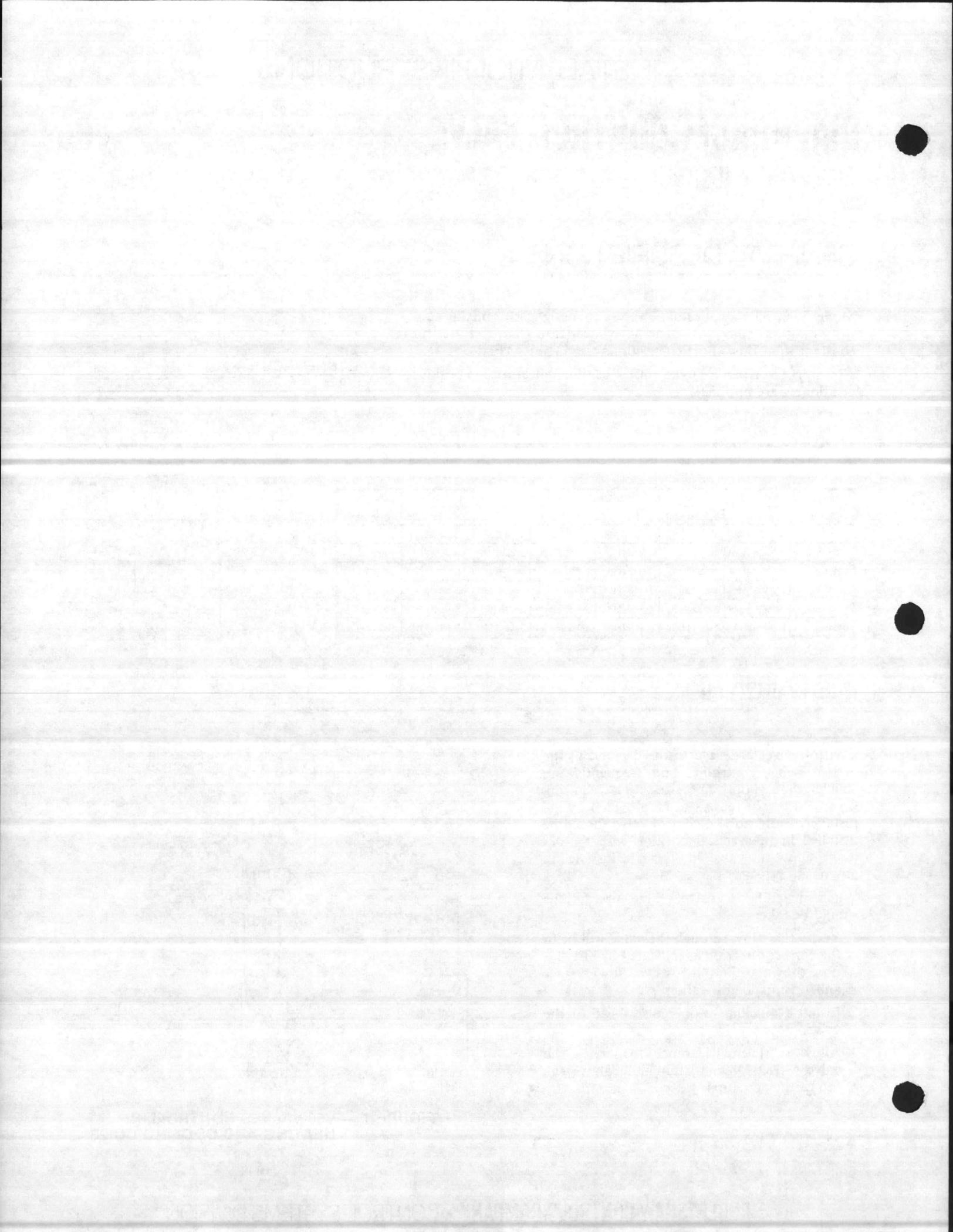


FIGURE 1 — V66 VALVES CONTROLLING HEATING AND COOLING COILS.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

DIAPHRAGM CONTROL VALVES 10 SQUARE INCH ACTUATOR

V66
V67
V68

CALIBRATION

This information applies to the diaphragm actuators used with the Model V6600, V6700 and V6800 pneumatic control valves scheduled in Table I. All listed valves are furnished with a direct acting actuator of 10 sq. in. (65cm²) effective diaphragm area and are available with an optional positive positioning relay (model number suffix -xxx19) and/or an optional position indicator (model number suffix -xxxxx2).

Table I lists the available actuator fixed spring ranges and the spring ranges used when the positioner option is selected. The fixed ranges are designated by model number suffix (see Data Sheets) and should be noted on installation drawings. Port connections for all models are female NPT.

TABLE I — ACTUATOR AVAILABILITY

SPRING RANGE, PSIG (kPa)	MODEL NUMBER & DESCRIPTION		
	V6600	V6700	V6800
1-5 (7-34)	X		
2-6 (14-41)			X(P)
2-13 (14-90)	X	X	X
4-8 (28-55)	X	X	X
5-9 (34-62)	X ^a		
7-11 (48-76)	-(P)		
8-13 (55-90)	X	X(P)	X
9-14 (62-97)		X ^a	

a — Not available for all sizes (see Model No. Book).
(P) Used with positioner option.

ADJUSTMENT

Spring Range: Model V6600, V6700 and V6800 actuator spring ranges are not field adjustable.

Positive Positioner (Optional): A common model of positioner is used on all listed valves (see Figures 1 and 2); however, each assembly has custom hardware described by a kit number. The positioner requires a signal connection to the "Instrument" port and a main air connection to the "Supply" port with a maximum pressure of 30 psig (207 kPa). The branch pressure from the positioner "Output" port is factory-connected to the actuator signal port. Two field adjustments are provided:

- The **span** (or **throttling range**) of the positioner (signal pressure change required to produce full stroke) may be adjusted by inserting a small screwdriver through an opening in the positioner cover (see Figure 2) and turning the slotted "span adjusting screw" until full stroke is obtained for the desired units of pressure change.
- The stroke **start point** of the positioner is adjusted by setting the signal pressure to the desired value and turning the "start point adjusting nut" (see Figure 2) with an open end wrench until the valve stem begins to move from its "normal" (zero pressure) position.

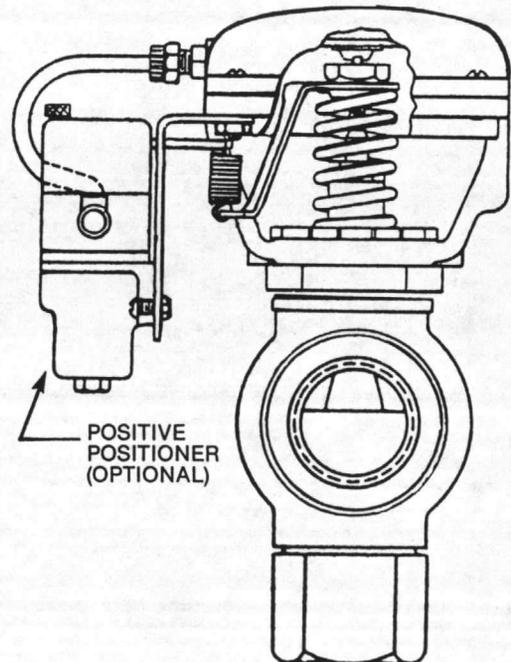
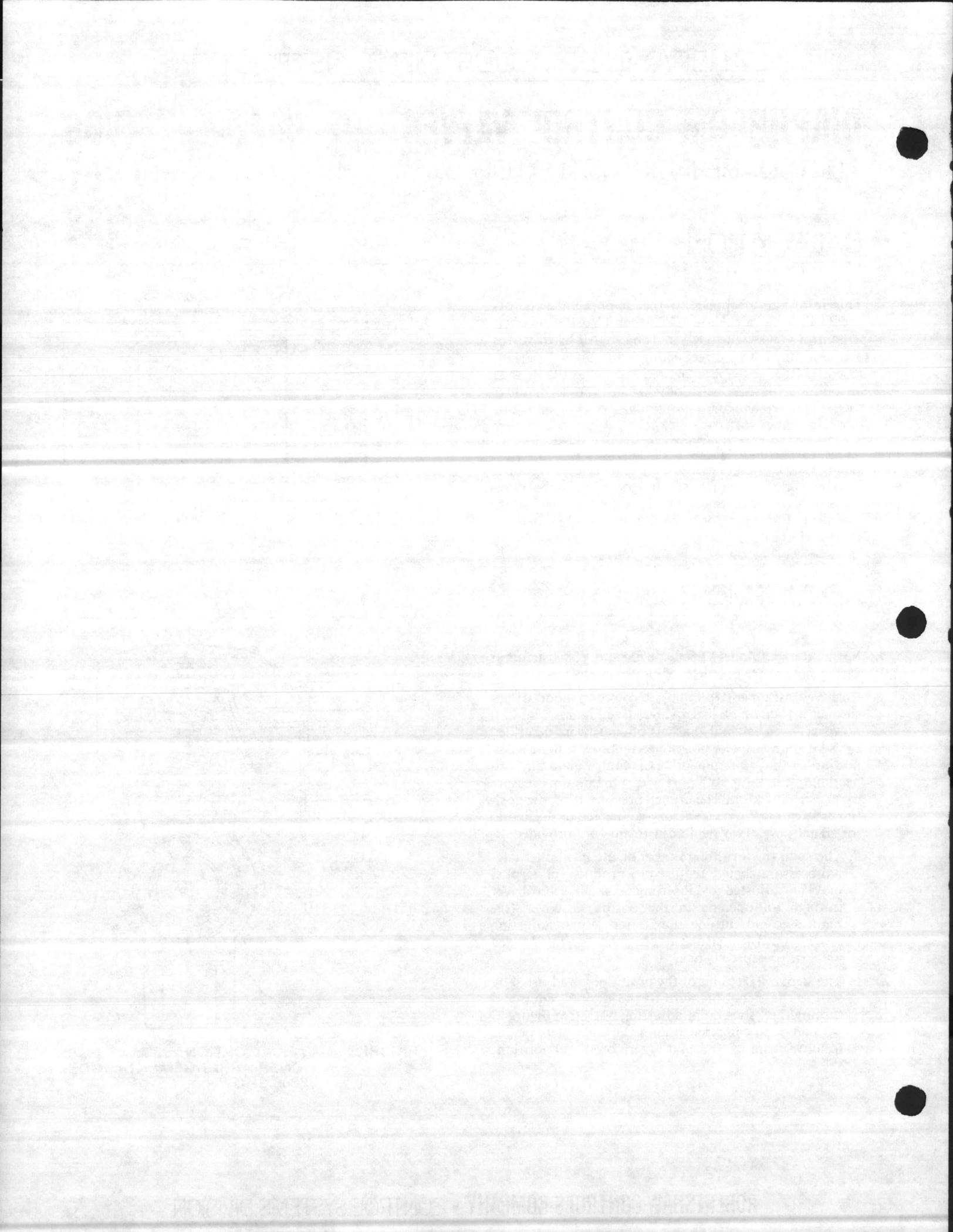


FIGURE 1 — TYPICAL OPTIONAL VALVE POSITIONER ARRANGEMENT (MODEL V6600 SHOWN).



DIAPHRAGM CONTROL VALVE

V66

3-WAY MIXING

GENERAL INSTRUCTIONS

The V66 requires very little maintenance after proper installation. It is recommended that field repairs be limited to the following: (No Special Tools Required)

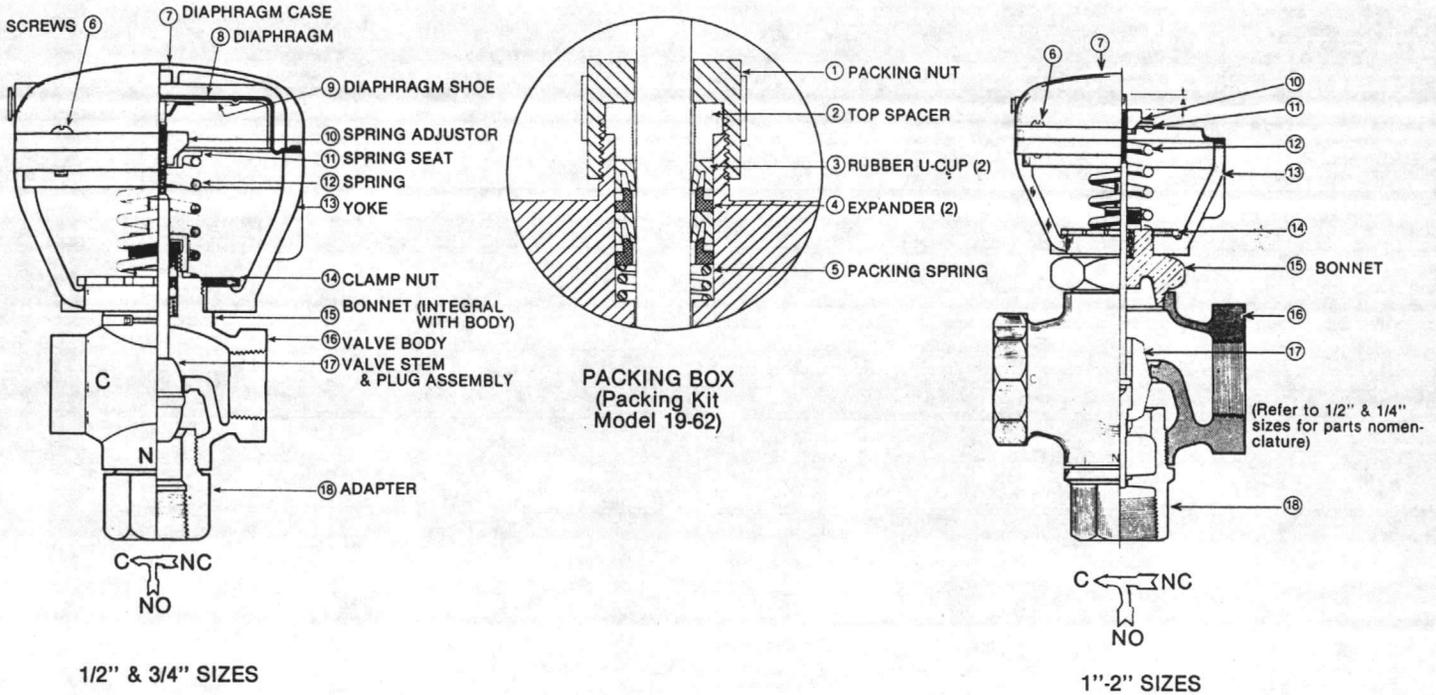


FIGURE 1 — V66 VALVE ASSEMBLY

Packing Replacement

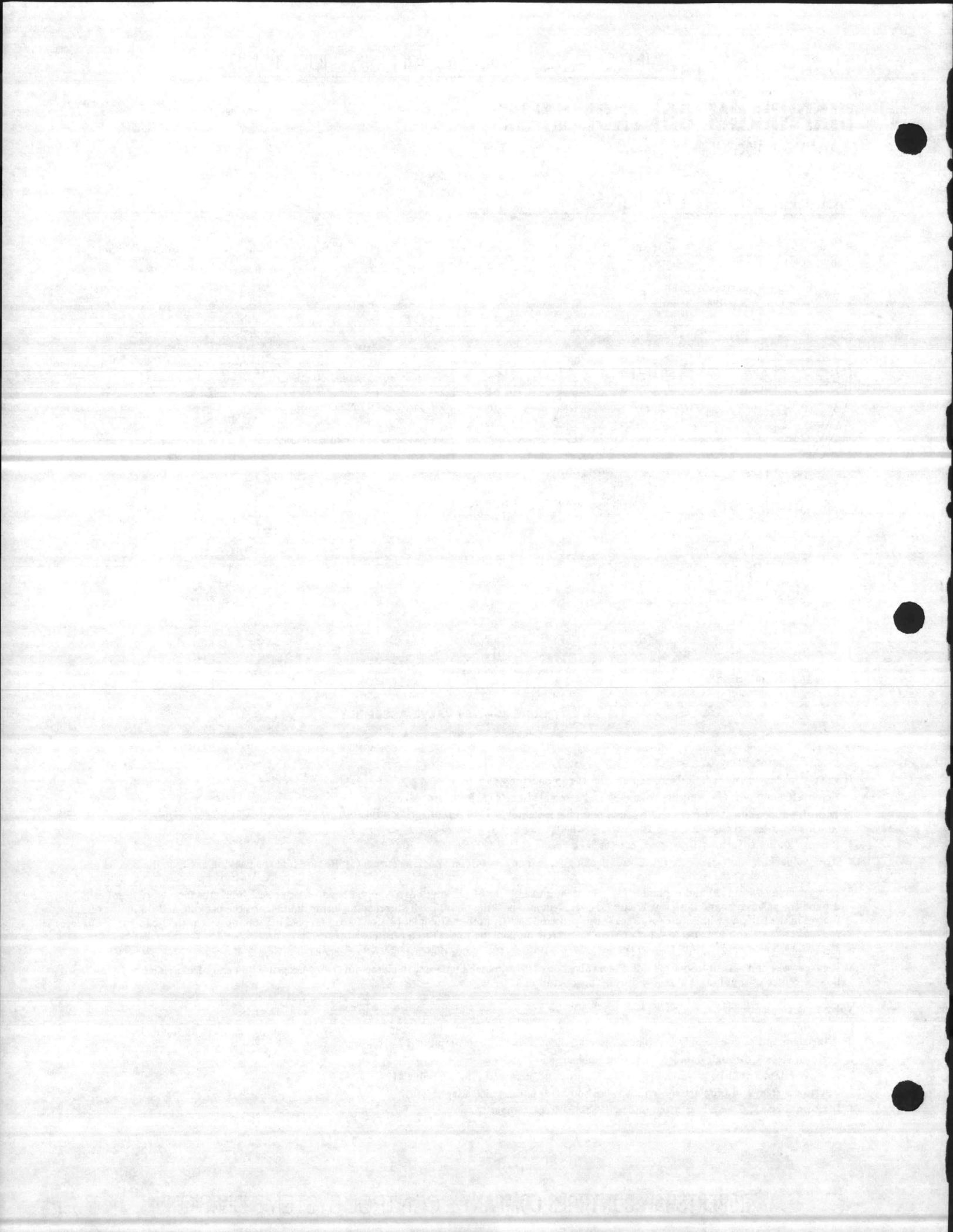
If valve stem leakage is encountered, replace the U-cup packing as follows:

1. Remove Clamp Nut (14) and lift yoke (13) and assembled parts (7, 8, 9) off valve.
2. Measure dimension "A" from end of stem and plug assembly (17) to top of spring adjustor (10) and record. During reassembly of the valve, this dimension must be reset $\pm 1/64$ " so as not to change the actuator range.
3. Remove spring adjustor (10), spring seat (11) and spring (12).
4. Remove packing nut (1), spacer (2), U-cup packing (3), expanders (4), and packing spring (5). Be sure that the packing cavity in the bonnet and the valve stem are clean.
5. Drop packing spring (5) and expander (4) over stem into bottom of packing box. Apply a bead of valve seal lubricant (accessory number N6-3) around the valve stem and push one U-cup (3) over stem into packing box, thereby lubricating inside diameter of the packing and filling the annular groove in the packing with lubricant. Repeat this procedure with another expander (4) and U-cup (3) packing, taking care with U-cup *not to damage the sealing lip*. Drop top spacer (2) over stem and screw on packing nut (1) to a positive stop.
6. Reassemble spring (12), spring seat (11), and spring adjustor (10). Reset dimension "A" as recorded in step 2 above.
7. Replace yoke and assembled parts (7, 8, 9) on valve body (16) and lock in place with clamp nut (14). Make sure that end of stem is engaged in shaped hole in center of diaphragm shoe (9) during this operation.

Valve Plug Replacement

If indications of excessive valve seat leakage are encountered, the Stem and Plug Assembly (17) may be replaced. The packing should be replaced any time the stem and plug assembly is replaced. Replacement of parts is accomplished as follows:

1. Perform steps 1 through 4 under "Packing Replacement" above.
2. Remove adapter (18) from valve body (16). Remove old stem and plug assembly (17).
3. Insert new stem and plug assembly into valve body (16) and replace adapter (18).
4. Perform Steps 5, 6, and 7 as listed under "Packing Replacement".





DATA SHEET

MODEL V67 & V68

DIAPHRAGM CONTROL VALVES

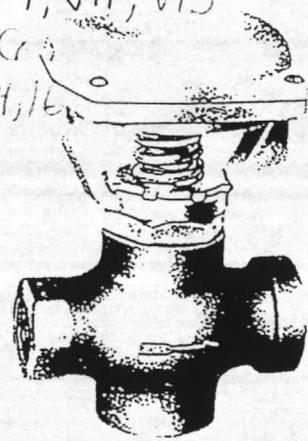
GENERAL DESCRIPTION

These valves are especially designed for the control of hot water, low pressure steam, or chilled water. The V67 series is a normally closed control valve and the V68 series is a normally open control valve. Sizes from 1/2" to 2" are available with characterized plugs. Top and bottom guiding is provided in the 1" thru 2" sizes for stable operation.

Spring loaded packing with 2 U-cups and 2 expanders provides a positive self-adjusting seal around the valve stem.

These valves are operated by pneumatic actuators, which include a die-cast aluminum yoke and case and a molded rubber diaphragm.

V67- V16, V2, V-17
 V68- V8, V9, VII, V13
 V5 + V6
 V12, 14, 16



SPECIFICATIONS

VALVE ASSEMBLY

ACTION: V67 Normally Closed
 V68 Normally Open

FLOW CHARACTERISTICS: Modified equal percentage.

RATINGS: 1" through 2" sizes
 water, 300 psi (20.7 bar)
 35 to 250°F (1.67 to 121°C);
 steam, 25 psi (1.7 bar)
 1/2" and 3/4" sizes
 water, 250 psi (17.2 bar)
 35 to 250°F (1.67 to 121°C);
 steam, 25 psi (1.7 bar)

BODY:

Pattern: Straight Through
Sizes: 1/2" through 2" NPT
 (1.27 through 5.08 cm)
Connections: Female NPT inlet and outlet
Material: Brass; 300 psi body rating
Seat: Brass, integral with body
Packing: Spring-loaded rubber U-cups.

VALVE TRIM:

Plug: Brass
Disc: Renewable EP rubber
Stem: Stainless steel
Back Seat: V68 only, rubber O-ring.

ACTUATOR ASSEMBLY

ACTION: Direct Acting

SIZE: 10 sq. in. (64.5 cm²) effective area

ACTUATOR RANGES:

4-8 psig (.28-.55 bar), V67 only
 8-13 psig (.55-.90 bar), V67 and V68
 2-6 psig (.14-.41 bar), V68 only

MAXIMUM AIR PRESSURE: 30 psig (2.1 bar)

AMBIENT TEMPERATURE RATING: 250°F (121°C) max.

DIAPHRAGM: Molded Rubber

CASE & YOKE: Die-cast aluminum

SPRING: Alloy steel, cadmium plated

ORDERING INFORMATION:

Specify Complete Model No.:

V6800 - 023192

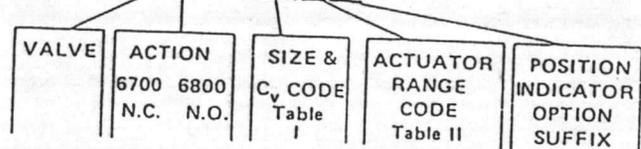


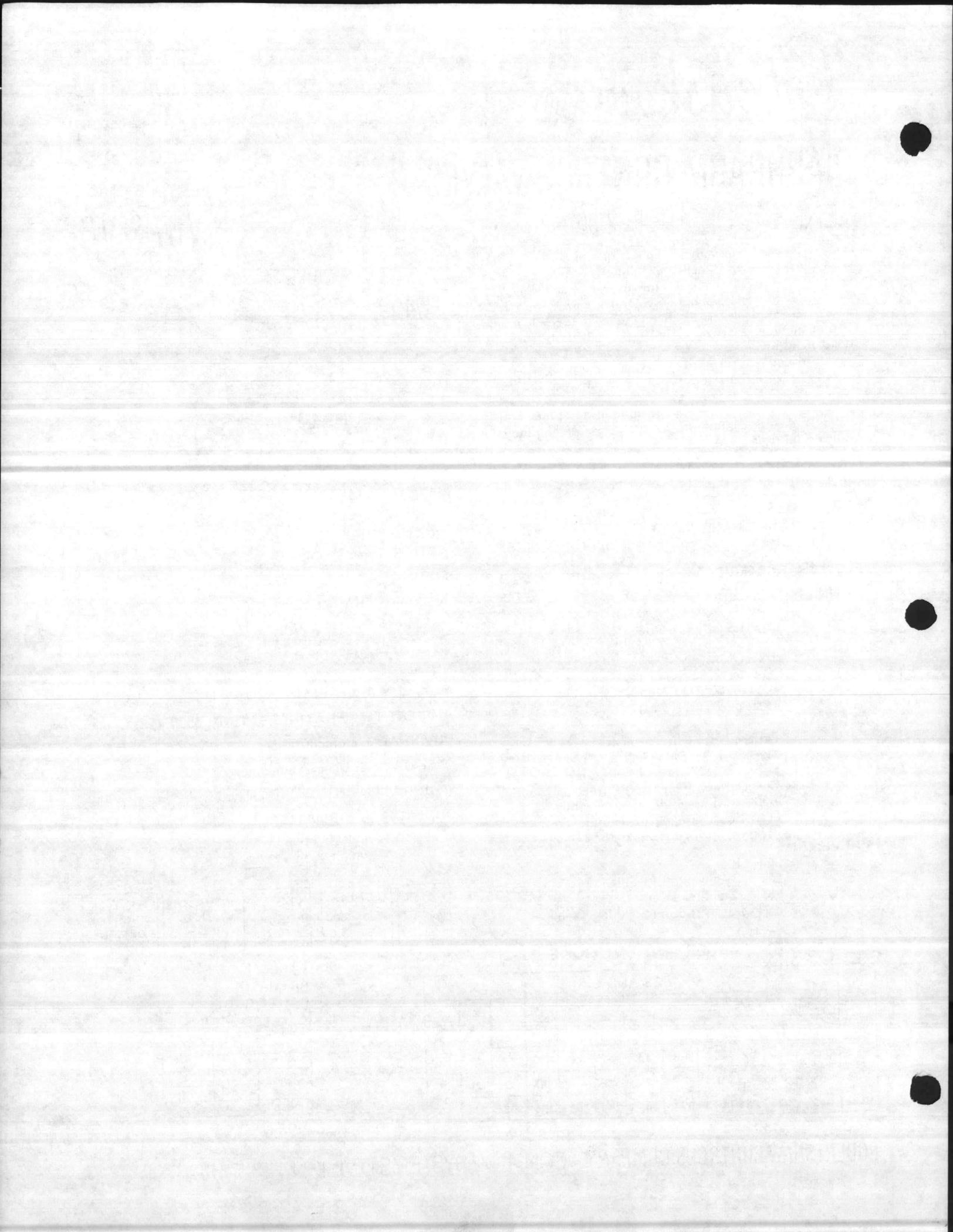
TABLE I - VALVE CODE

Model	SIZE AND Cv											
	1/2"						3/4"	1"	1 1/4"	1 1/2"	2"	
	Cv						Cv	Cv	Cv	Cv	Cv	Cv
V67	0.6		1.2		1.8	2.2	5.7	9.3	17	25	40	
V68		0.9		1.6		2.2	4.6	9.3	17	25	40	
Code	013	023	033	043	053	063	153	163	253	303	353	403

TABLE II
 ACTUATOR RANGE CODE

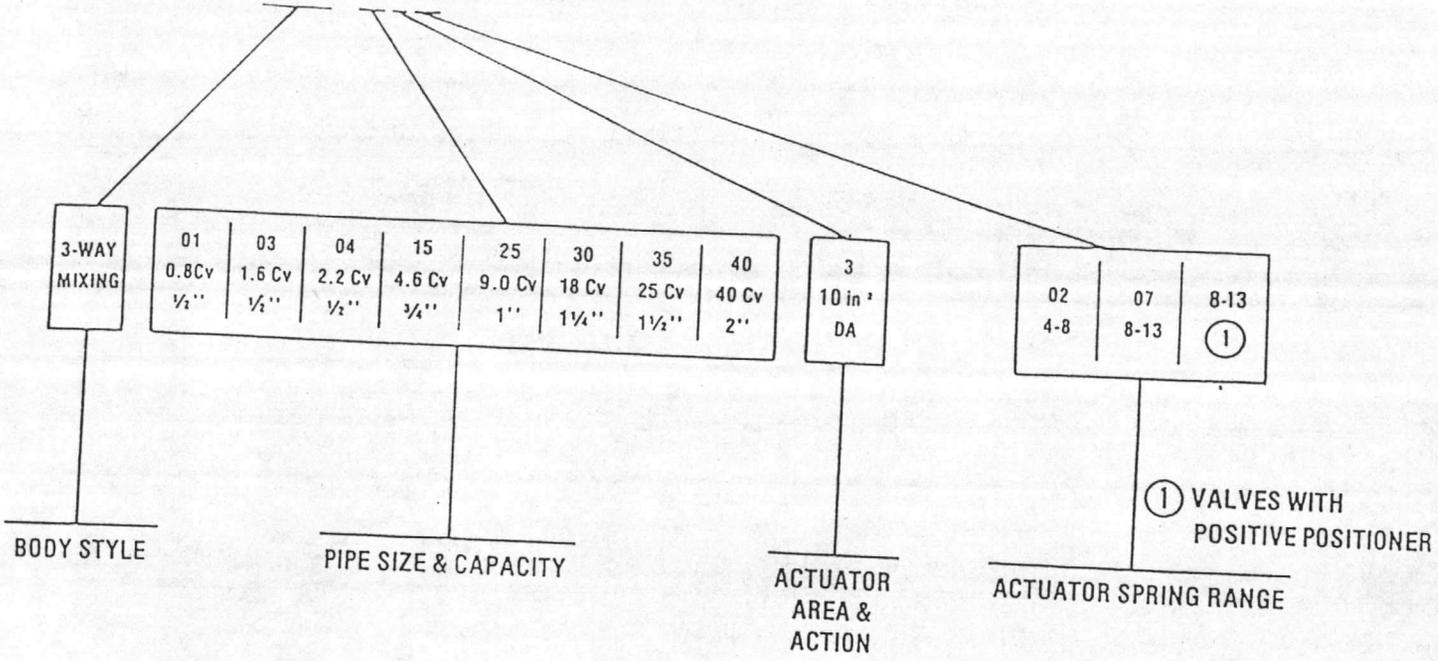
ACTUATOR		
RANGE (psi)	SPAN (psi)	CODE
4 - 8	4	02
8 - 13	5	07
2 - 6	4	08*
POSITIONER		19

*NOTE: V68 only



MODEL NO. CODES

EXAMPLE: V6600-25 3 06



CLOSE OFF RATINGS

Pressure drop acting against the unbalanced area of the valve produces a thrust. When the pressure in the normally-open port is greater than the pressure in the normally-closed port, the additional thrust must be compensated for by additional signal pressure applied at the top limit of the actuator range.

Conversely, when the pressure in the normally-closed port is greater than the pressure in the normally-open port, the additional thrust must be compensated for by a decrease in signal pressure at the low limit of the actuator range. (See Fig. 1)

For tight close off the valve must not be operated at pressure drops greater than those designated by the intersections of the valve size curves with the appropriate line selected from Table III (See Fig. 1). Maximum allowable pressure drop for any valve (including other actuator ranges) is 40 psi.

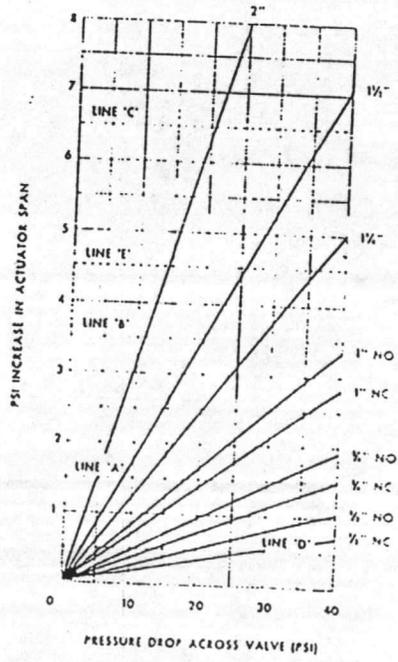
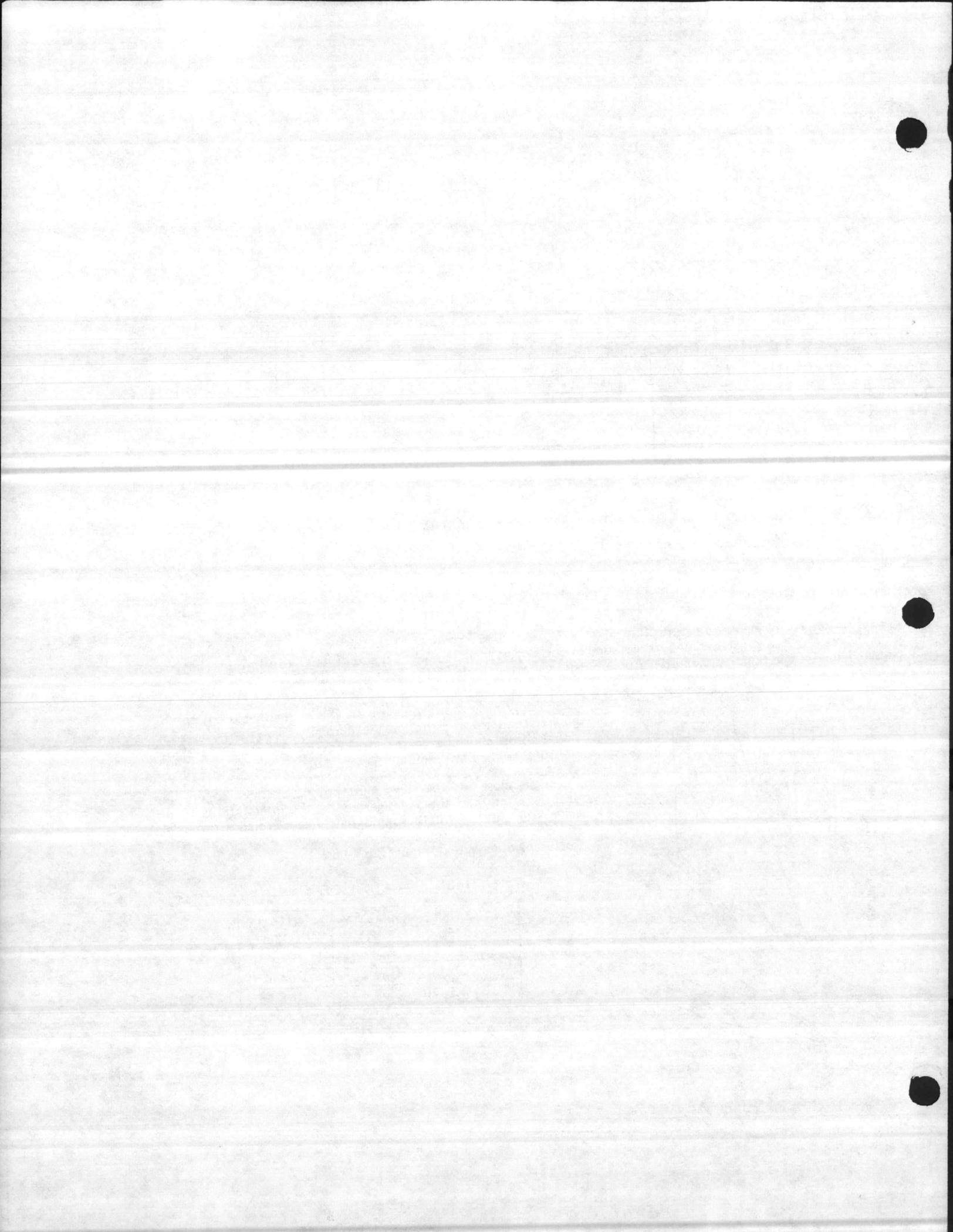


Figure 1—CLOSE OFF RATING, V66 VALVE

Table III—CLOSE OFF LINES

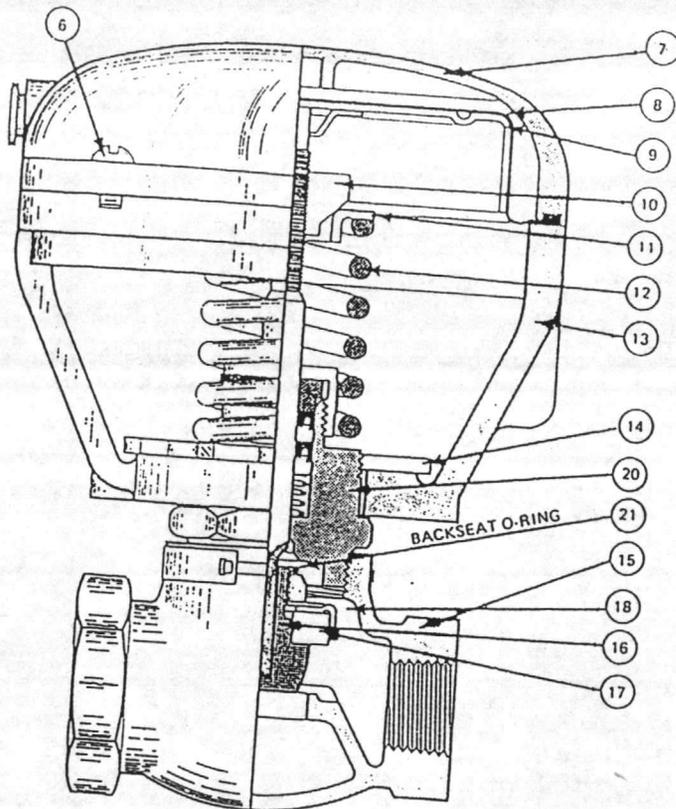
ACTUATOR RANGE (psi)	NORMALLY-OPEN PORT	NORMALLY-CLOSED PORT
4 - 8	Line C	Line B
8 - 13	Line A	Line C



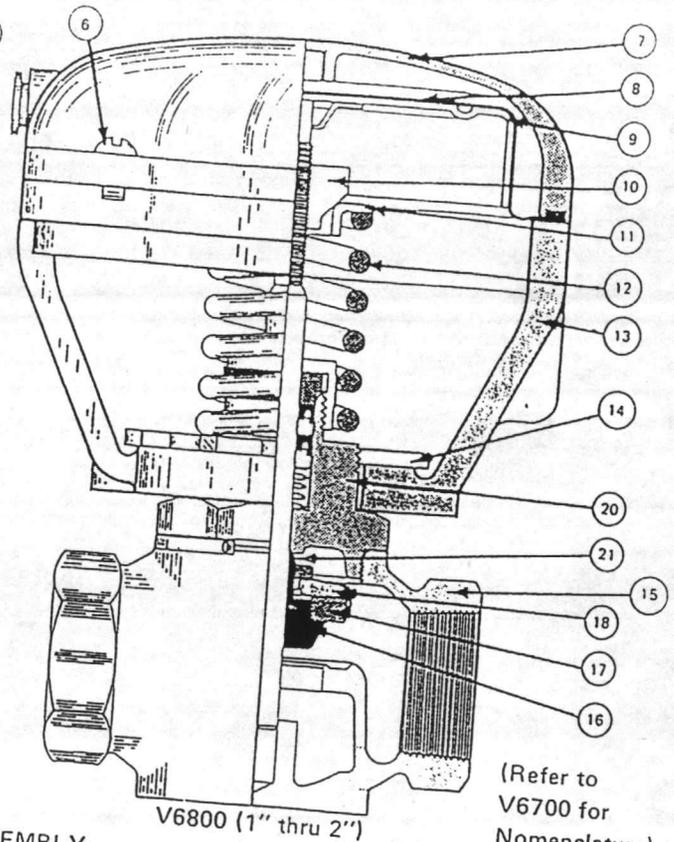
MAINTENANCE AND REPAIR

2, 1, 2

The V67 and V68 require little maintenance after proper installation. It is recommended that field repairs be limited to the following: (No Special Tools Required)



V6800 1/2 thru 3/4" Shown



V6800 VALVE ASSEMBLY

V6800 (1" thru 2")

(Refer to V6700 for Nomenclature)

PACKING REPLACEMENT

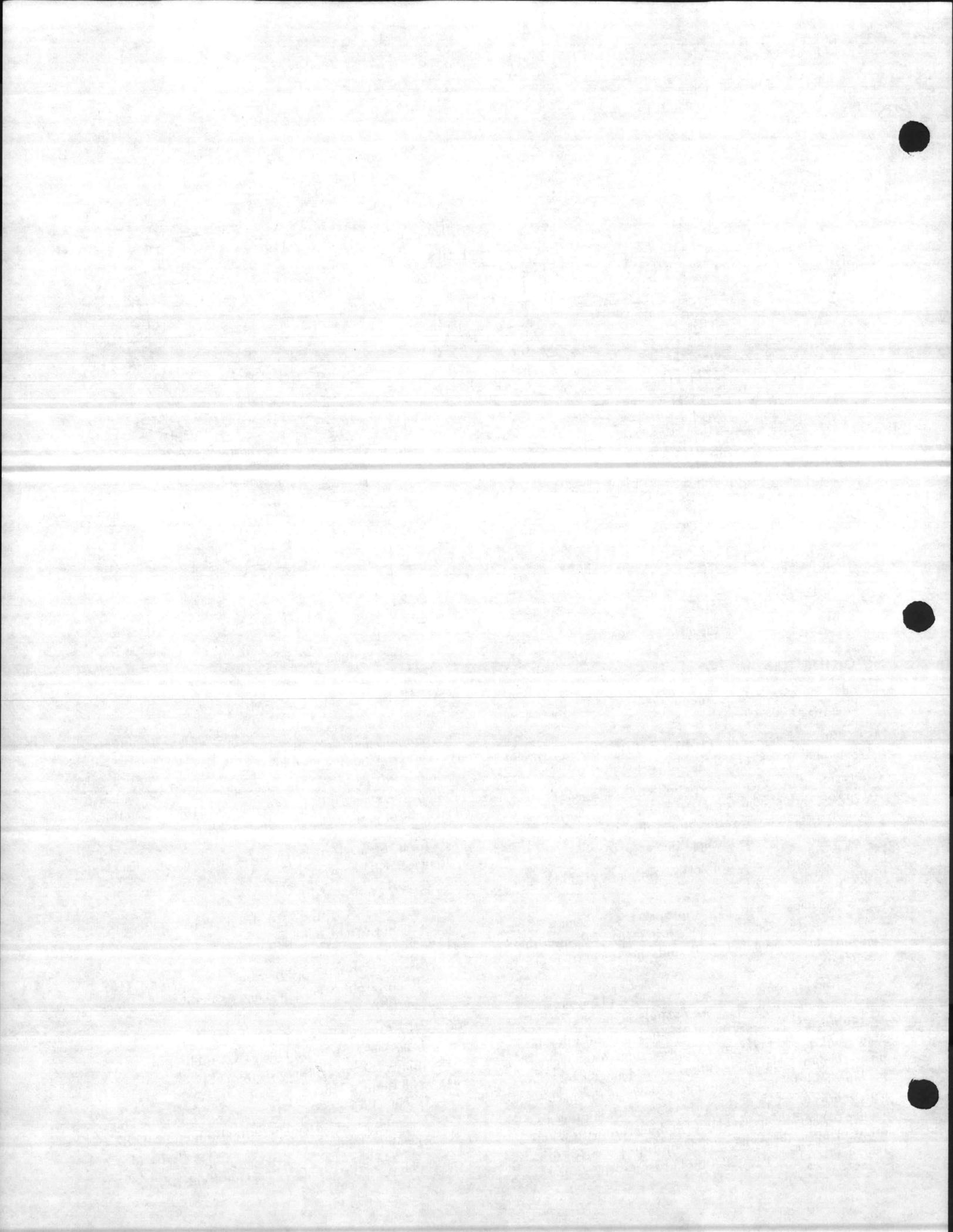
If valve stem leakage is encountered, replace the U-cup packing (3) as follows:

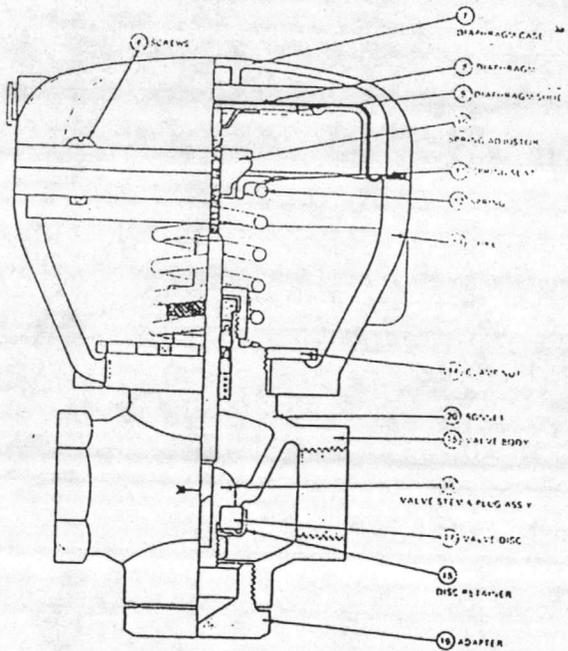
1. Remove Clamp Nut (14) and lift Yoke (13) and assembled parts (7, 8 & 9) off valve.
2. Measure dimension "A" from end of stem (16) to top of spring adjuster (10) and record. During reassembly of the valve this dimension must be reset $\pm 1/16$ " so as not to change the actuator range.
3. Remove spring adjuster (10), spring seat (11) and spring (12).
4. Remove packing nut (1), top spacer (2), U-cups (3), expanders (4), and packing spring (5). Be sure the packing box in bonnet (20) and the valve stem (16) are clean.
5. Drop packing spring (5) and expander (4) over stem into bottom of packing box. Apply a bead of valve seal lubricant, accessory number N6-3, around the valve stem and push 1 U-cup (3) over stem into packing box, thereby lubricating the inside diameter of the packing and filling the annular groove in the packing with lubricant. Repeat this procedure with another expander (4) and U-cup packing (3) taking care with U-cup not to damage the sealing lip. Drop top spacer (2) over stem, and screw on packing nut (1) to a positive stop.

VALVE PLUG REPLACEMENT

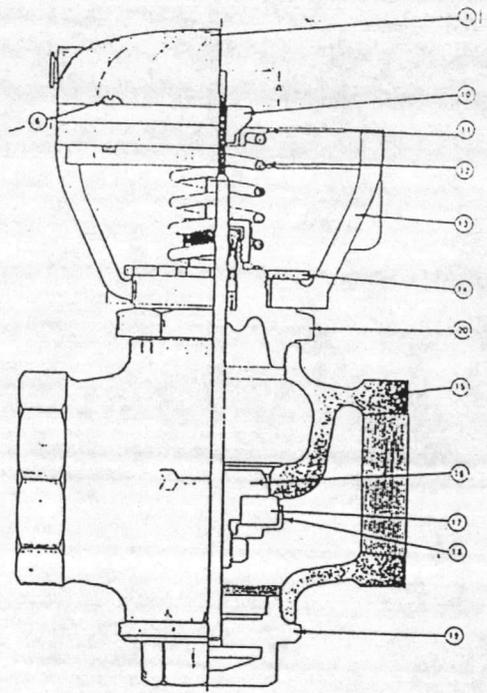
If indications of excessive valve seat leakage are encountered, the stem and plug assembly (16) may be replaced. (Details 18 (Disc Retainer) and (17) Valve Disc may be ordered separately if desired). The packing should be replaced anytime the stem and plug assembly (16) is replaced. Replacement of parts is accomplished as follows:

1. Perform Steps 1 through 4 as shown in "Packing Replacement" above.
2. (a) V67 Control Valves:
Remove Adapter (19) from Valve Body (15).
Remove Stem and Plug Assembly.
(b) V68 Control Valves:
Remove Bonnet (20) from Valve Body (15).
Remove old Stem and Plug Assembly from Bonnet (20).
3. (a) V67 Control Valves.
Insert new Stem and Plug Assembly into Valve Body (15) and replace Adapter (19)
(b) V68 Control Valves.
Install O-Ring Seat (21) on new Stem and Plug Assembly and assemble into Bonnet (20). Reassemble Bonnet (20) into Valve Body (15).
4. Perform Step 5 as listed under "Packing Replacement".





V 6700 1/2 and 3/4" Shown



V 6700 1 thru 2" Shown

Control valves are sized to the demand of the system to be controlled and are frequently smaller than supply lines. They should be installed as close as possible to the coil being controlled. Preferably, a control valve should be installed in the vertical position so the actuator will be over the valve, but can be installed in any position if necessary. When installing a valve, these simple precautions should be taken:

1. Install a pipeline strainer just ahead of the valve.
2. Install the valve so it closes against the flow.
3. Allow sufficient clearance that the valve may be easily serviced if necessary.
4. A minimum clearance of 3 1/2" must be allowed between the extreme top of the actuator and the nearest obstruction. This permits removal of actuator yoke and parts required to replace packing.

TABLE III V67 DIMENSIONS AND WEIGHTS

in SIZE	cm	in A	cm	in B	cm	in C	cm	in D	cm	in E	cm	in F	cm	lb. WEIGHT	kg.
1/2	(1.27)	4 1/16	(11.59)	1 9/32	(4.05)	4 5/16	(10.95)	1 3/8	(3.49)	1 3/8	(3.49)	2 3/4	(6.99)	3.1	(1.41)
3/4	(1.91)	4 23/32	(11.99)	1 19/32	(4.05)	4 5/16	(10.95)	1 19/32	(4.05)	1 19/32	(4.05)	3 3/16	(8.10)	3.3	(1.50)
1	(2.54)	5 29/32	(15.0)	2 21/32	(6.75)	4 5/16	(10.95)	2 1/2	(6.35)	2 1/2	(6.35)	5	(12.7)	6.4	(2.90)
1 1/4	(3.175)	5 29/32	(15.0)	2 21/32	(6.75)	4 5/16	(10.95)	2 9/16	(6.51)	2 9/16	(6.51)	5 1/8	(13.01)	8.0	(3.63)
1 1/2	(3.81)	5 29/32	(15.0)	2 21/32	(6.75)	4 5/16	(10.95)	2 9/16	(6.51)	2 9/16	(6.51)	5 1/8	(13.01)	8.1	(3.67)
2	(5.08)	6 5/16	(16.03)	2 7/8	(6.45)	4 5/16	(10.95)	3 3/8	(8.57)	3 3/8	(8.57)	6 3/4	(17.15)	15.5	(7.03)

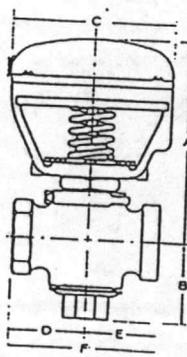
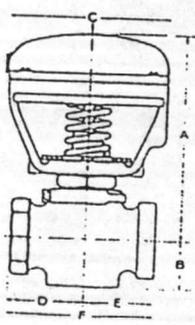
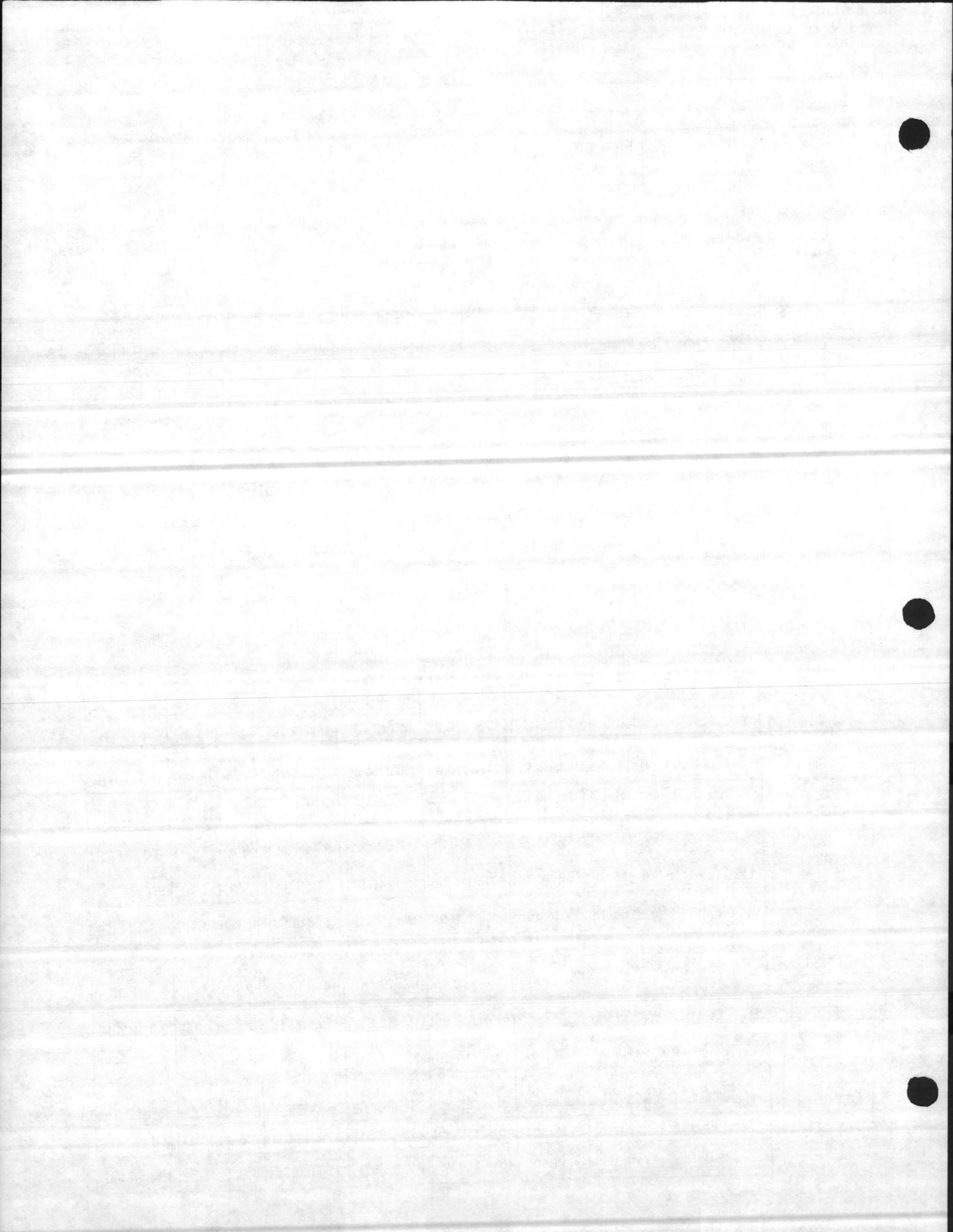


TABLE IV V68 DIMENSIONS AND WEIGHTS

1/2	(1.27)	5 5/16	(13.17)	2 5/32	(1.98)	4 5/16	(10.95)	1 3/8	(3.49)	1 3/8	(3.49)	2 3/4	(6.99)	2.9	(1.32)
3/4	(1.91)	5 1/16	(12.86)	7/8	(2.22)	4 5/16	(10.95)	1 1/2	(3.81)	1 1/2	(3.81)	3	(7.62)	3.0	(1.36)
1	(2.54)	5 29/32	(15.0)	1 7/8	(4.76)	4 5/16	(10.95)	2 1/2	(6.35)	2 1/2	(6.35)	5	(12.7)	6.3	(3.0)
1 1/4	(3.175)	5 29/32	(15.0)	1 7/8	(4.76)	4 5/16	(10.95)	2 9/16	(6.51)	2 9/16	(6.51)	5 1/8	(13.01)	8.2	(3.72)
1 1/2	(3.81)	5 29/32	(15.0)	1 7/8	(4.76)	4 5/16	(10.95)	2 9/16	(6.51)	2 9/16	(6.51)	5 1/8	(13.01)	7.8	(3.54)
2	(5.08)	6 5/32	(15.95)	2 1/8	(5.40)	4 5/16	(10.95)	3 3/8	(8.57)	3 3/8	(8.57)	6 3/4	(17.15)	14.5	(6.58)





RATINGS

2, 1, 2

Pressure drop acting against the unbalanced area of the valve produces a thrust. This thrust must be overcome by the actuator through the application of additional signal pressure above the top end of the signal range for normally open control valves, or by reducing the signal pressure below the bottom end of the range for normally closed control valves. In either case, the actuator span is increased.

For tight close-off, the valve must not be operated at pressure drops greater than those designated by the intersections of the valve size curves with the appropriate line selected from Table V. Maximum allowable pressure drop for any valve (including other actuator ranges) is 40 psi.

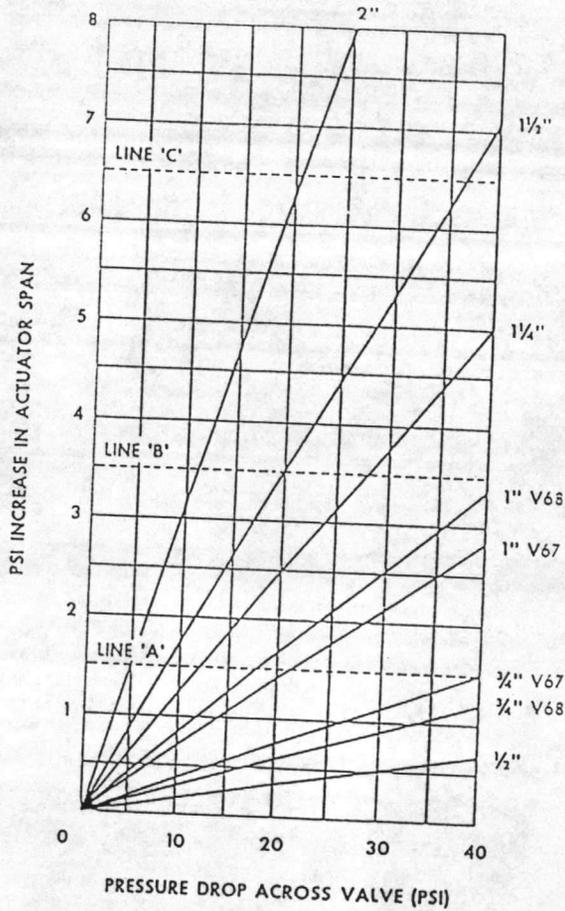
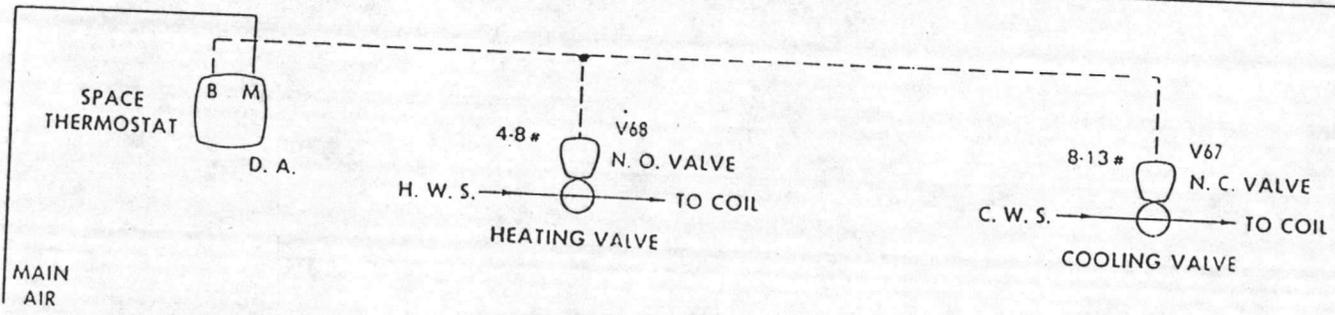


Table V - CLOSE OFF LINES

ACTUATOR RANGE	V67	V68
4 - 8	Line B	—
8 - 13	Line C	Line A
2 - 6	—	Line C

TYPICAL APPLICATION



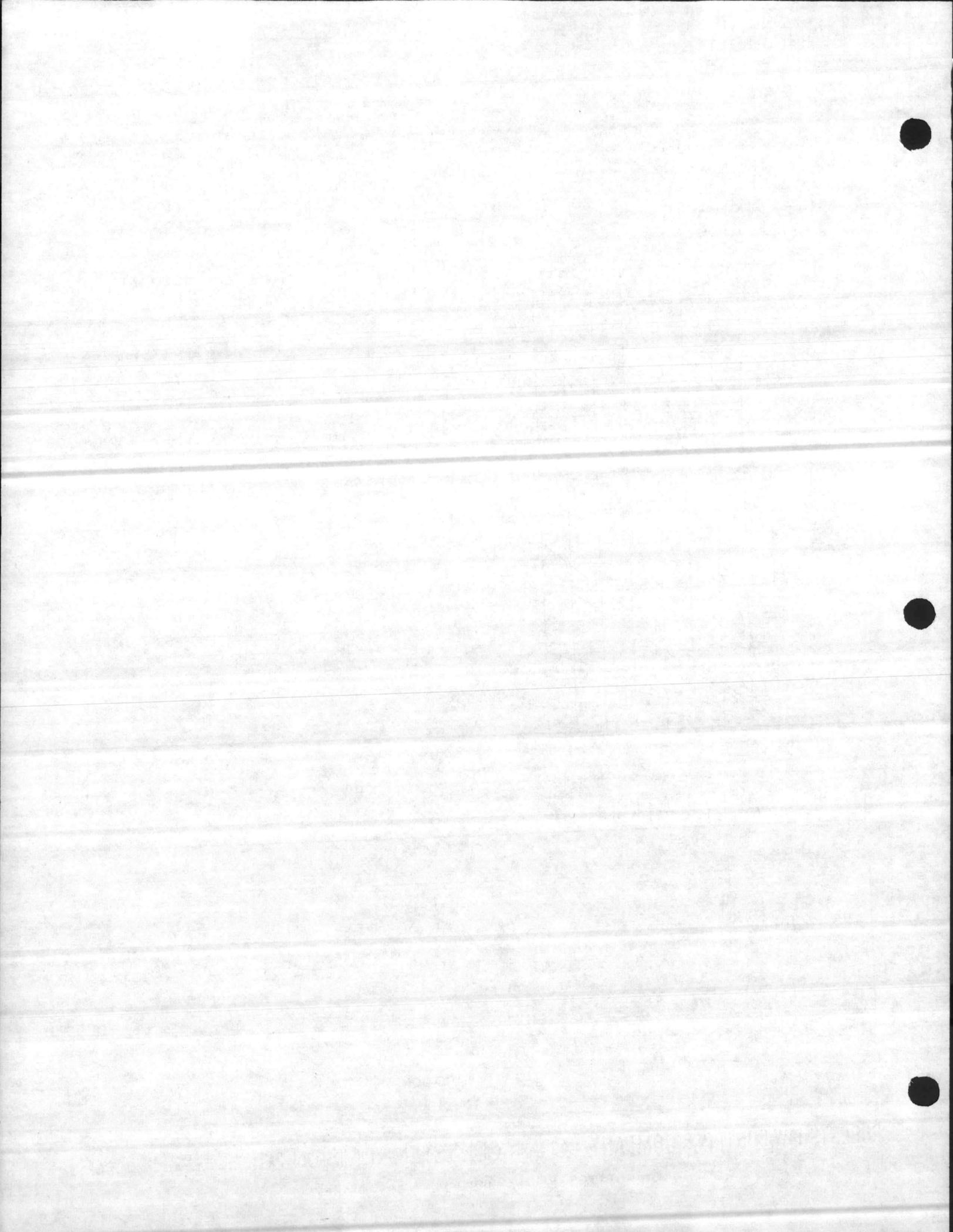
V67 & V68 APPLICATION

ROBERTSHAW CONTROLS COMPANY - CONTROL SYSTEMS DIVISION

CSD FORM 052-DS-V-067/3 (Rev. 8-86)

1800 GLENSIDE DRIVE
P. O. BOX 27606 - RICHMOND, VIRGINIA 23261

ALL RIGHTS TO REVISE DESCRIBED DESIGN ARE RESERVED.



INSTALLATION INSTRUCTIONS

V67 V68

DIAPHRAGM CONTROL VALVES

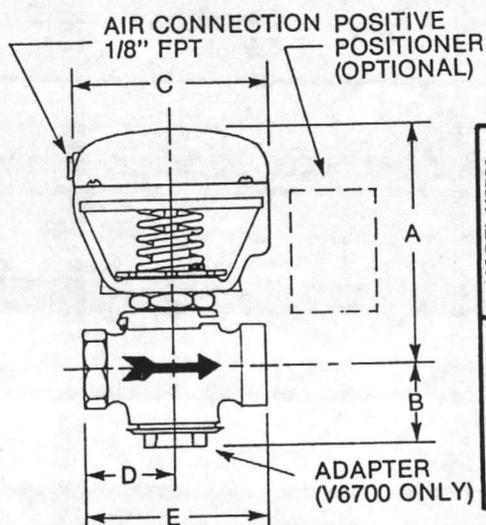
2-WAY

GENERAL DESCRIPTION

These 2-way pneumatic control valves are designed for throttling control of hot or chilled water or low pressure steam and have modified equal percentage characteristics. Model V6700 is a normally closed assembly. Model V6800 is a normally open assembly. Port connections

for both models are female NPT.

Actuators for both models have 10 sq. in. (65cm²) diaphragms. Positive positioners and position indicators are optional for both models.



DIMENSIONS AND WEIGHTS FOR VALVES WITH ACTUATORS

		DIMENSIONS, INCHES (mm)					WEIGHT, LB (kg)
VALVE SIZE		A	B	C	D	E	
MODEL V6700	1/2 (13)	4-9/16 (116)	1-19/32 (40)	4-5/16 (110)	1-3/8 (35)	2-3/4 (70)	3.1 (1.4)
	3/4 (19)	4-23/32 (120)	1-19/32 (40)	4-5/16 (110)	1-19/32 (40)	3-3/16 (81)	3.3 (1.5)
	1 (25)	5-29/32 (150)	2-21/32 (67)	4-5/16 (110)	2-1/2 (64)	5 (127)	6.4 (2.9)
	1-1/4 (32)	5-29/32 (150)	2-21/32 (67)	4-5/16 (110)	2-9/16 (65)	5-1/8 (130)	8.0 (3.6)
	1-1/2 (38)	5-29/32 (150)	2-21/32 (67)	4-5/16 (110)	2-9/16 (65)	5-1/8 (130)	8.1 (3.7)
	2 (51)	6-5/16 (160)	2-7/8 (73)	4-5/16 (110)	3-3/8 (86)	6-3/4 (171)	15.5 (7.0)
MODEL V6800	1/2 (13)	5-3/16 (132)	25/32 (20)	4-5/16 (110)	1-3/8 (35)	2-3/4 (70)	2.9 (1.3)
	3/4 (19)	5-1/16 (129)	7/8 (22)	4-5/16 (110)	1-1/2 (38)	3 (76)	3.0 (1.4)
	1 (25)	5-29/32 (150)	1-7/8 (48)	4-5/16 (110)	2-1/2 (64)	5 (127)	6.3 (2.9)
	1-1/4 (32)	5-29/32 (150)	1-7/8 (48)	4-5/16 (110)	2-9/16 (65)	5-1/8 (130)	8.2 (3.7)
	1-1/2 (38)	5-29/32 (150)	1-7/8 (48)	4-5/16 (110)	2-9/16 (65)	5-1/8 (130)	7.8 (3.5)
	2 (51)	6-9/32 (160)	2-1/8 (54)	4-5/16 (110)	3-3/8 (86)	6-3/4 (171)	14.5 (6.6)

INSTALLATION

Control valves are sized to the demand of the system being controlled and frequently are smaller than supply line sizes, thus requiring pipe reducers/increasers to be provided by the installer. Preferably, a control valve should be installed in the vertical position with the actuator above the valve, but it can be installed in any position if necessary.

When installing a valve, these precautions should be taken:

1. Verify that flow through the valve will be in the correct direction as indicated by installation drawings and the valve flow arrows and/or port identification.
2. Install a pipeline strainer just ahead of the valve.
3. Allow sufficient clearance to service the valve (3-1/2" [89mm] minimum above the top of the actuator).

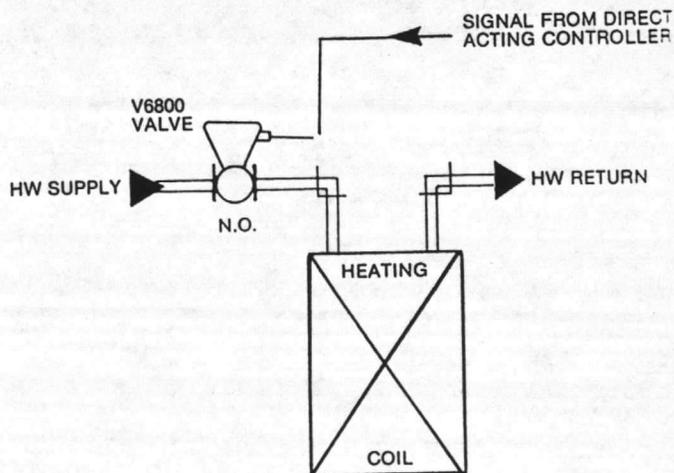
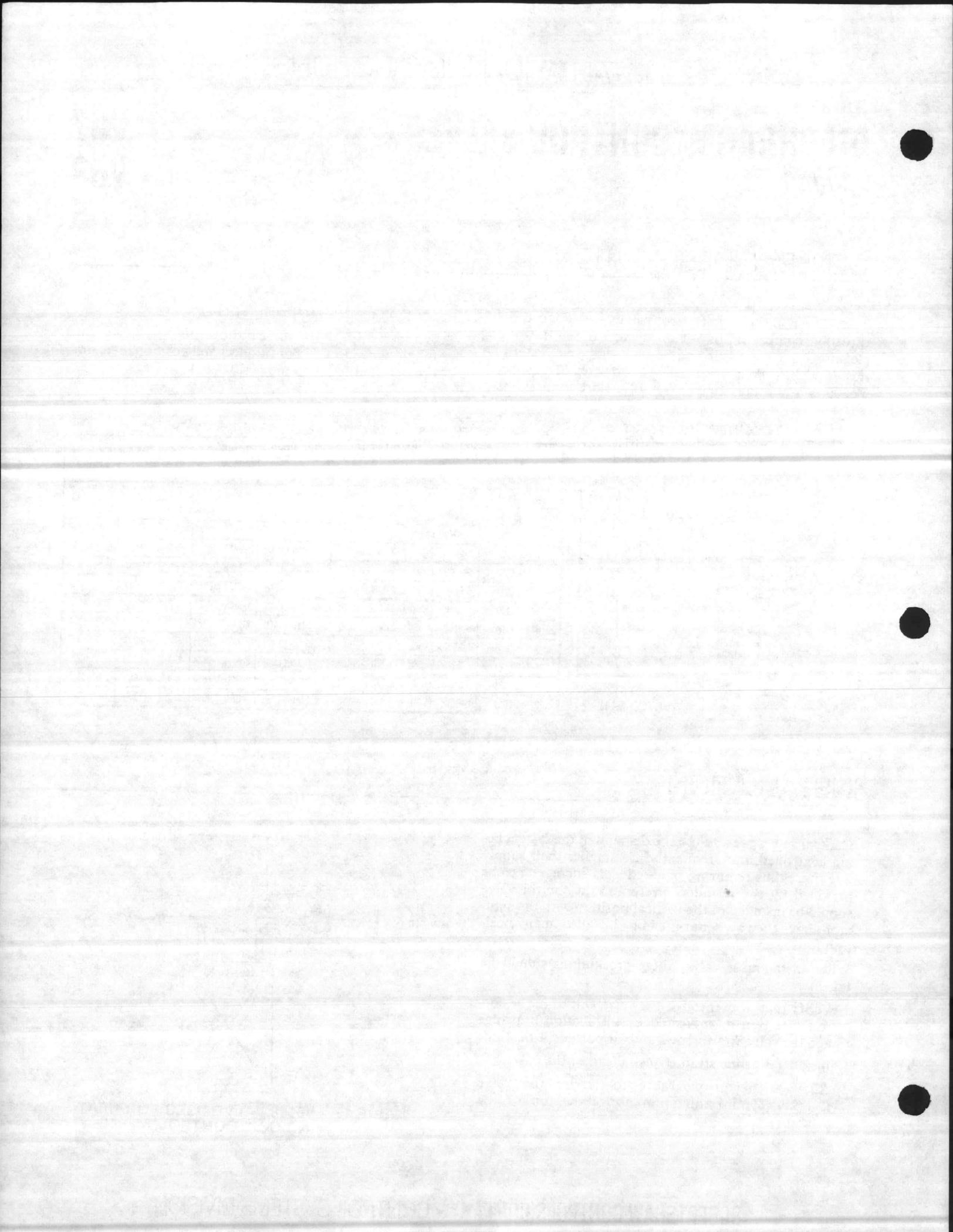


FIGURE 1 — V6800 VALVE USED FOR HEATING COIL CONTROL.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

DIAPHRAGM CONTROL VALVES 10 SQUARE INCH ACTUATOR

V66
V67
V68

CALIBRATION

This information applies to the diaphragm actuators used with the Model V6600, V6700 and V6800 pneumatic control valves scheduled in Table I. All listed valves are furnished with a direct acting actuator of 10 sq. in. (65cm²) effective diaphragm area and are available with an optional positive positioning relay (model number suffix -xxx19) and/or an optional position indicator (model number suffix -xxxx2).

Table I lists the available actuator fixed spring ranges and the spring ranges used when the positioner option is selected. The fixed ranges are designated by model number suffix (see Data Sheets) and should be noted on installation drawings. Port connections for all models are female NPT.

TABLE I — ACTUATOR AVAILABILITY

SPRING RANGE, PSIG (kPa)	MODEL NUMBER & DESCRIPTION		
	V6600	V6700	V6800
1-5 (7-34)	X		
2-6 (14-41)			X(P)
2-13 (14-90)	X	X	X
4-8 (28-55)	X	X	X
5-9 (34-62)	X ^a		
7-11 (48-76)	-(P)		
8-13 (55-90)	X	X(P)	X
9-14 (62-97)		X ^a	

a — Not available for all sizes (see Model No. Book).
(P) Used with positioner option.

ADJUSTMENT

Spring Range: Model V6600, V6700 and V6800 actuator spring ranges are not field adjustable.

Positive Positioner (Optional): A common model of positioner is used on all listed valves (see Figures 1 and 2); however, each assembly has custom hardware described by a kit number. The positioner requires a signal connection to the "Instrument" port and a main air connection to the "Supply" port with a maximum pressure of 30 psig (207 kPa). The branch pressure from the positioner "Output" port is factory-connected to the actuator signal port. Two field adjustments are provided:

- The **span** (or **throttling range**) of the positioner (signal pressure change required to produce full stroke) may be adjusted by inserting a small screwdriver through an opening in the positioner cover (see Figure 2) and turning the slotted "span adjusting screw" until full stroke is obtained for the desired units of pressure change.
- The **stroke start point** of the positioner is adjusted by setting the signal pressure to the desired value and turning the "start point adjusting nut" (see Figure 2) with an open end wrench until the valve stem begins to move from its "normal" (zero pressure) position.

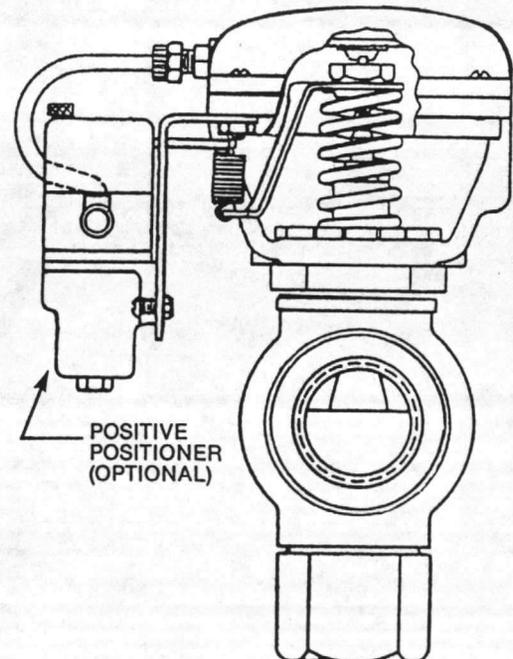
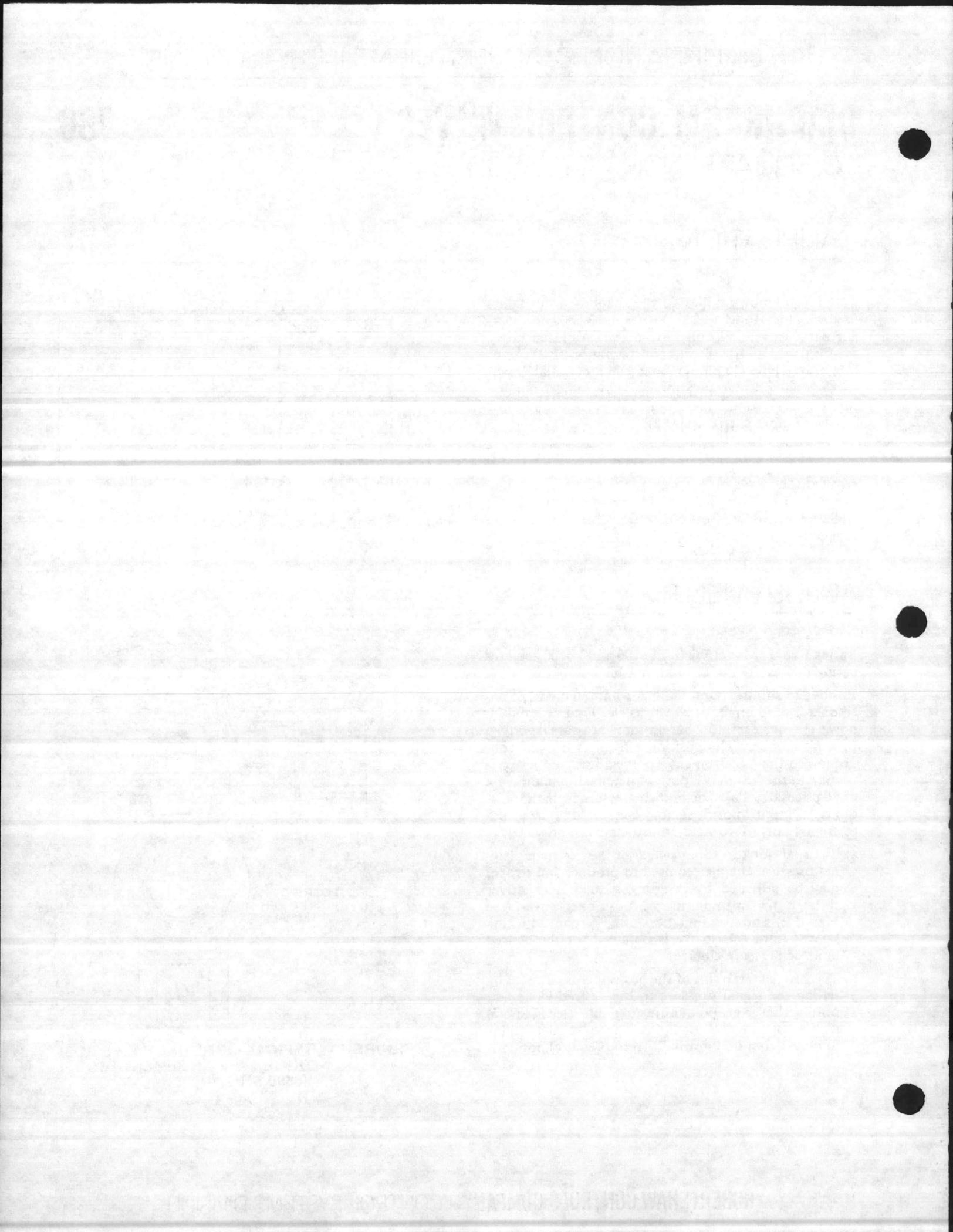


FIGURE 1 — TYPICAL OPTIONAL VALVE POSITIONER ARRANGEMENT (MODEL V6600 SHOWN).



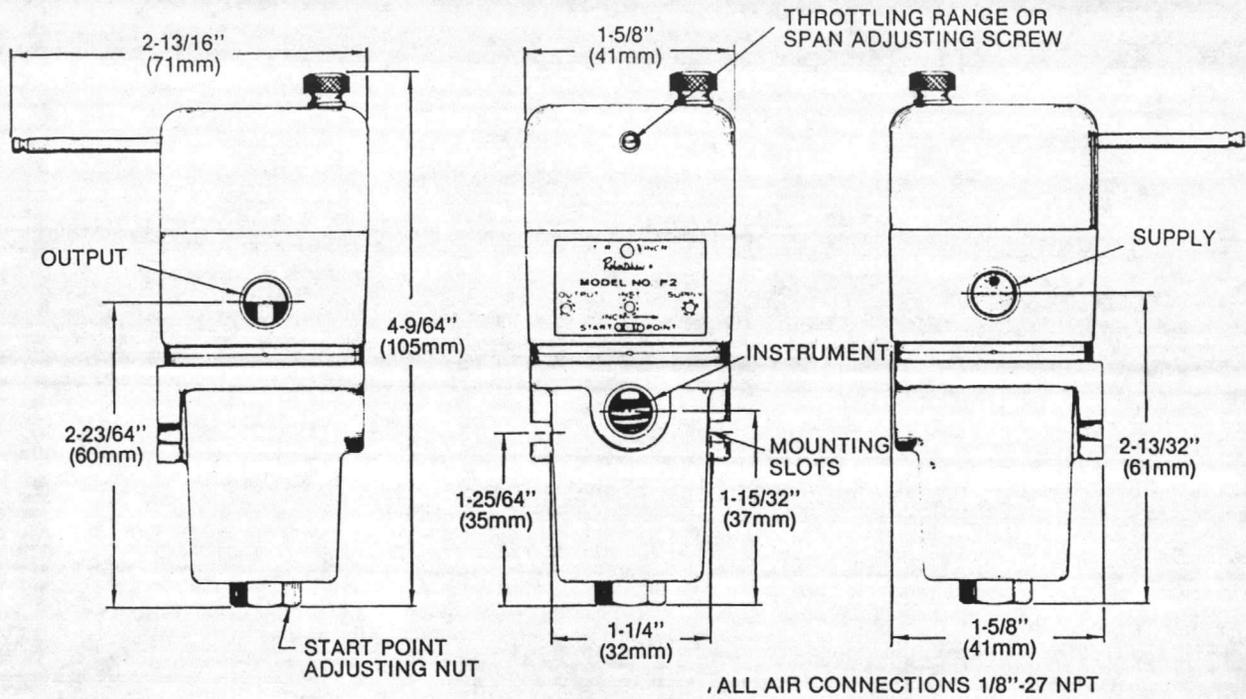
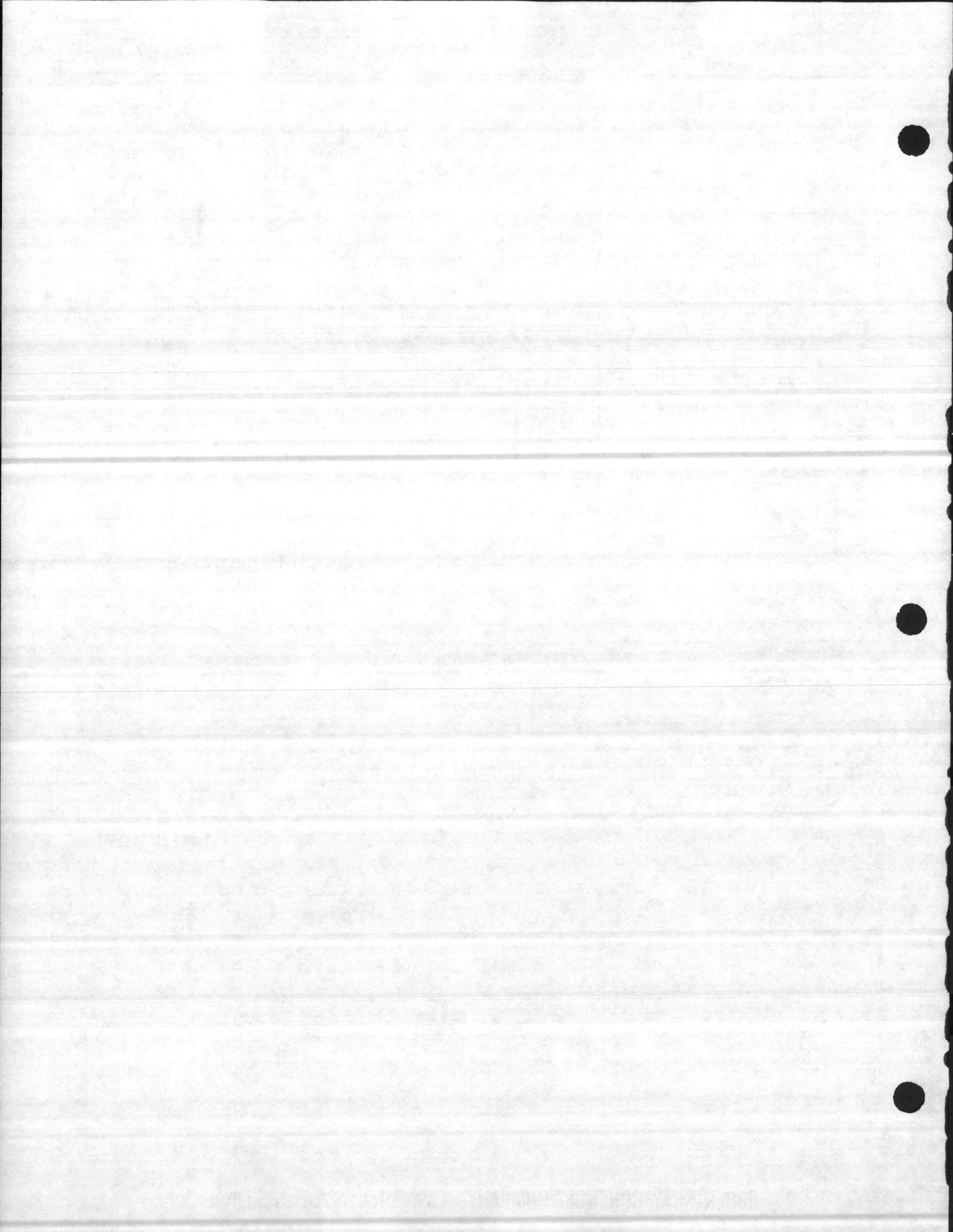


FIGURE 2 — VALVE POSITIVE POSITIONER APPEARANCE (CSD MODEL 5-415).



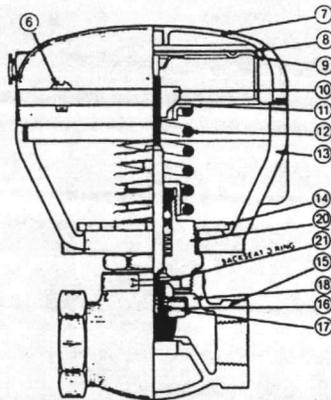
DIAPHRAGM CONTROL VALVE

2-WAY

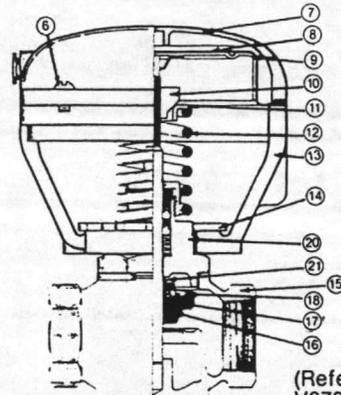
V67
V68

GENERAL INSTRUCTIONS

The V67 and V68 require little maintenance after proper installation. It is recommended that field repairs be limited to the following: (No Special Tools Required)



V6800 1/2 thru 3/4" Shown

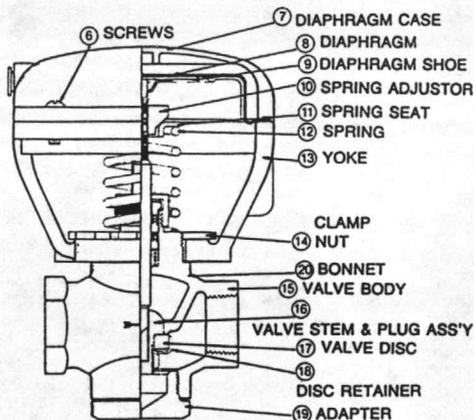


V6800 VALVE ASSEMBLY

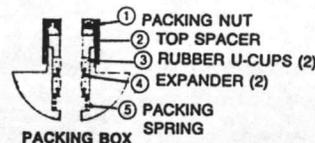
V6800 (1" thru 2")

(Refer to V6700 for Nomenclature)

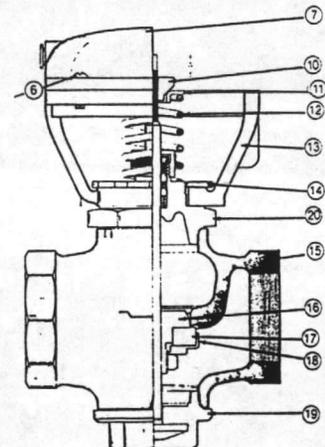
FIGURE 1



V 6700 1/2 and 3/4" Shown



PACKING BOX



V 6700 1 thru 2" Shown

Packing Replacement

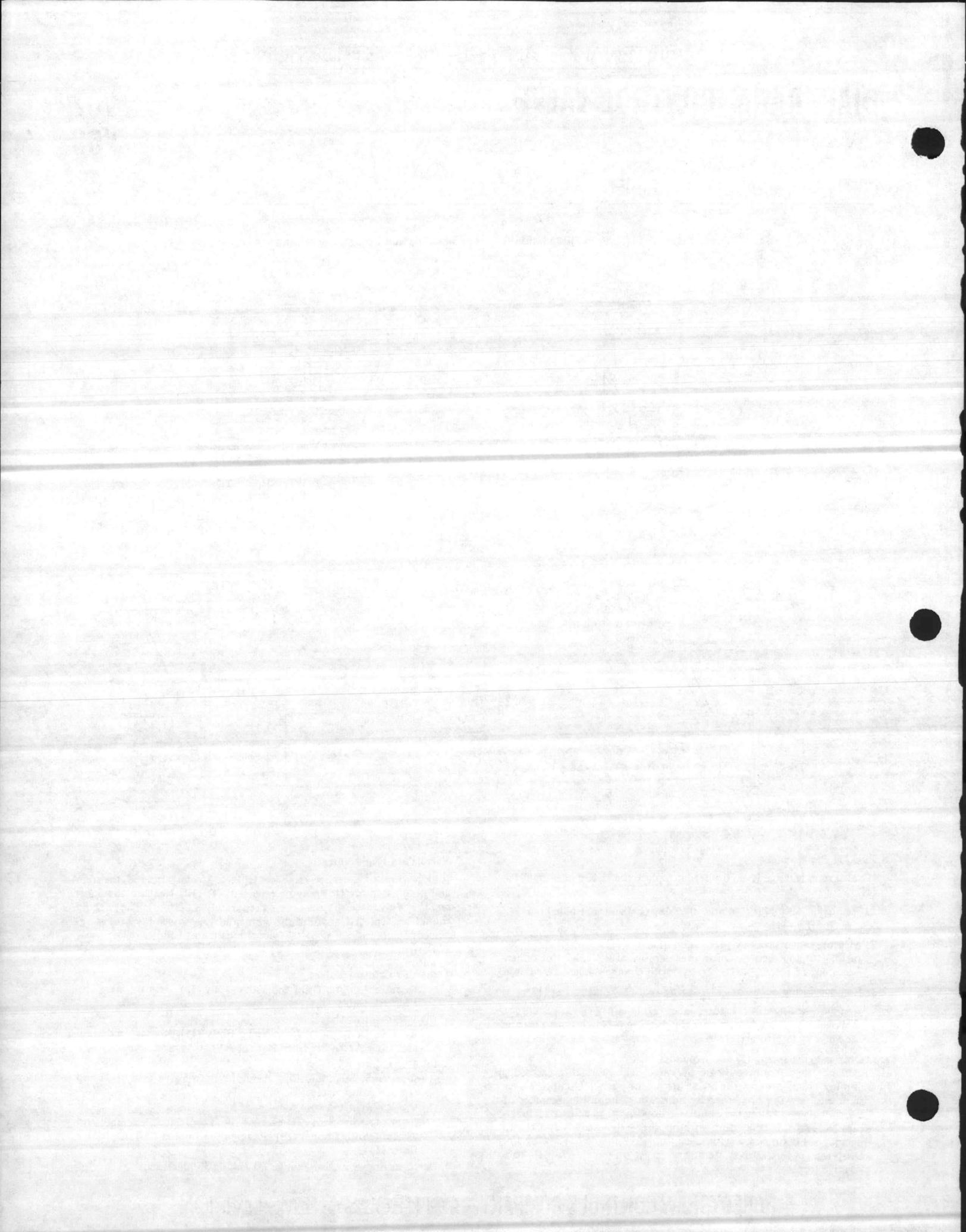
If valve stem leakage is encountered, replace the U-cup packing (3) as follows:

1. Remove Clamp Nut (14) and lift Yoke (13) and assembled parts (7, 8 & 9) off valve.
2. Measure dimension "A" from end of stem (16) to top of spring adjuster (10) and record. During reassembly of the valve this dimension must be reset $\pm 1/16"$ so as not to change the actuator range.
3. Remove spring adjuster (10), spring seat (11) and spring (12).
4. Remove packing nut (1), top spacer (2), U-cups (3), expanders (4), and packing spring (5). Be sure the packing box in bonnet (20) and the valve stem (16) are clean.
5. Drop packing spring (5) and expander (4) over stem into bottom of packing box. Apply a bead of valve seal lubricant, accessory number N6-3, around the valve stem and push 1 U-cup (3) over stem into packing box, thereby lubricating the inside diameter of the packing and filling the annular groove in the packing with lubricant. Repeat this procedure with another expander (4) and U-cup packing (3) taking care with U-cup *not to damage the sealing lip*. Drop top spacer (2) over stem, and screw on packing nut (1) to a positive stop.

Valve Plug Replacement

If indications of excessive valve seat leakage are encountered, the stem and plug assembly (16) may be replaced. (Details 18 [Disc Retainer] and [17] Valve Disc may be ordered separately if desired). The packing should be replaced anytime the stem and plug assembly (16) is replaced. Replacement of parts is accomplished as follows:

1. Perform Steps 1 through 4 as shown in "Packing Replacement" above.
2. (a) V67 Control Valves:
Remove Adapter (19) from Valve Body (15). Remove Stem and Plug Assembly.
- (b) V68 Control Valves:
Remove Bonnet (20) from Valve Body (15). Remove old Stem and Plug Assembly from Bonnet (20).
3. (a) V67 Control Valves.
Insert new Stem and Plug Assembly into Valve Body (15) and replace Adapter (19)
- (b) V68 Control Valves.
Install O-Ring Seat (21) on new Stem and Plug Assembly and assemble into Bonnet (20). Reassemble Bonnet (20) into Valve Body (15).
4. Perform Step 5 as listed under "Packing Replacement".



2.1.2 V3 + V4

ENGINEERING DATA

PLAST-A-VANE[®]

BUTTERFLY VALVES

PRESSURE RATED — 150 PSI — 200°

(Bubble Tested at 150 PSI Before Shipment)

TORQUE-VALUES

MODEL 'B' ELASTOMER LINED

Do not be surprised that the torque values of PLAST-A-VANE valve will be less than it will be on other butterfly valves of this type.

The PLAST-A-VANE glass filled Noryl Disc has an extremely smooth surface on the perimeter — and the selection of the liner material is a special EPT compound.

The liner has a raised rib on the center line of the outside diameter that mates with a groove in the body, for rigidity under pressure.

To further accentuate low torque we are using lubricated bronze bearings protected by "O" ring seals.

MODEL 'A' UNLINED FLIP-THRU

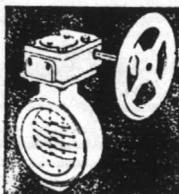
Designed for throttling and balancing of systems — has such low torque that they must be checked on the job with the pressure and material to be considered as the variable factors.

The reason is — no liner friction — plus the "O" ring protected luberized bronze bearing approach for a low torque valve.

TORQUE CHART (IN LBS.)

SIZE	0 PSI	25 PSI	50 PSI	75 PSI	100 PSI	125 PSI	150 PSI
2	36	48	60	72	84	96	108
2½	60	75	100	115	120	125	132
3	108	120	144	156	168	180	192
4	180	240	276	300	360	396	420
5	396	456	540	580	625	700	780
6	420	480	600	720	840	900	1020
8	720	970	1220	1470	1720	1970	2220
10	1200	1836	2040	2640	3000	3360	3840
12	1550	2090	2350	2800	3445	3850	4800
14	2880	3740	4600	5460	6320	7180	8040
16	3360	3900	5000	6420	8040	9900	12240

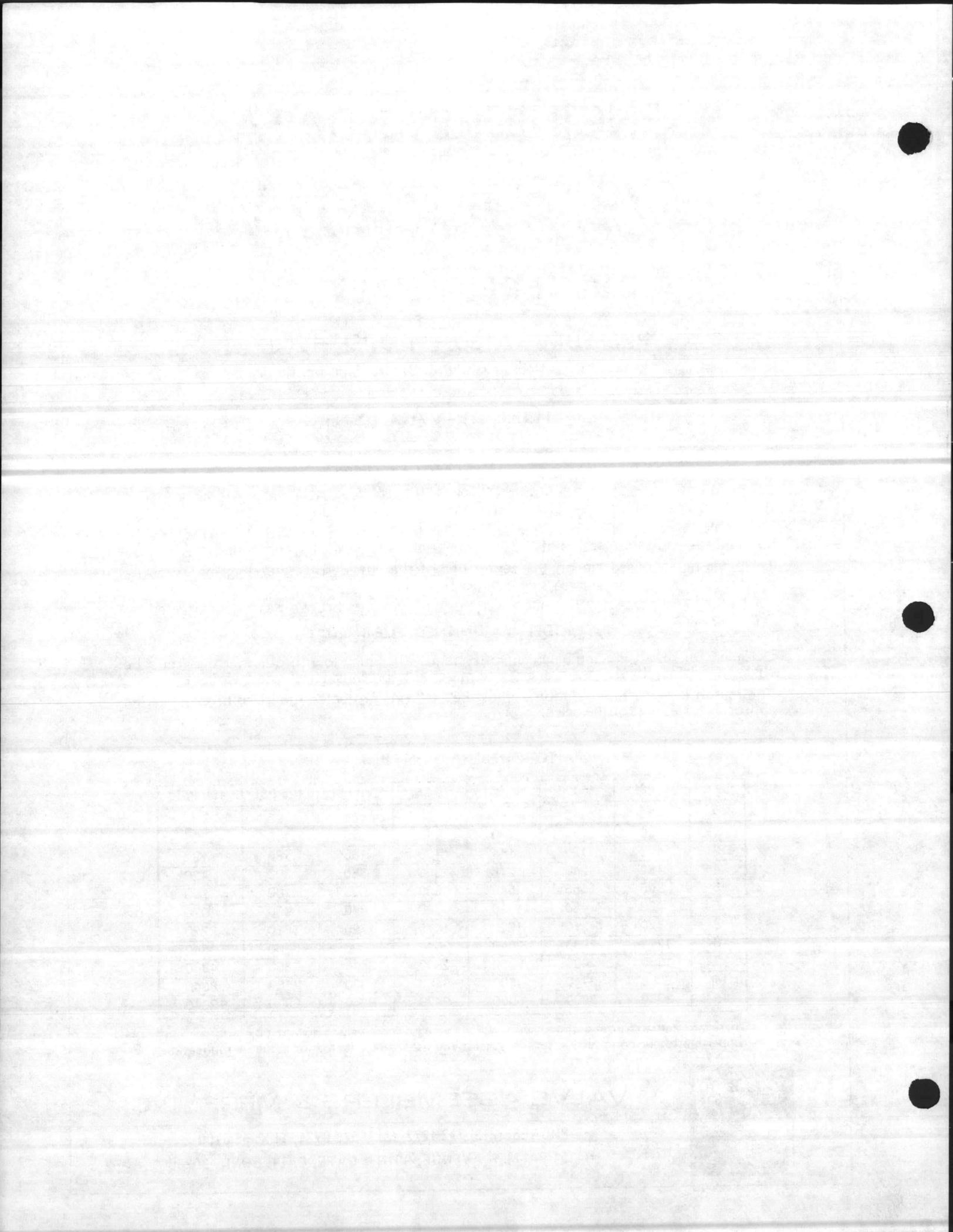
These are actual torques, tested with 70° F. water. These values do not take into account rubber elastomer compression set. We suggest you use a safety factor for actuator application.



VALVE ASSEMBLERS & MFRS., INC.

PHONES: (213) 773-1272, (213) 923-0721, TLX: 68-6400

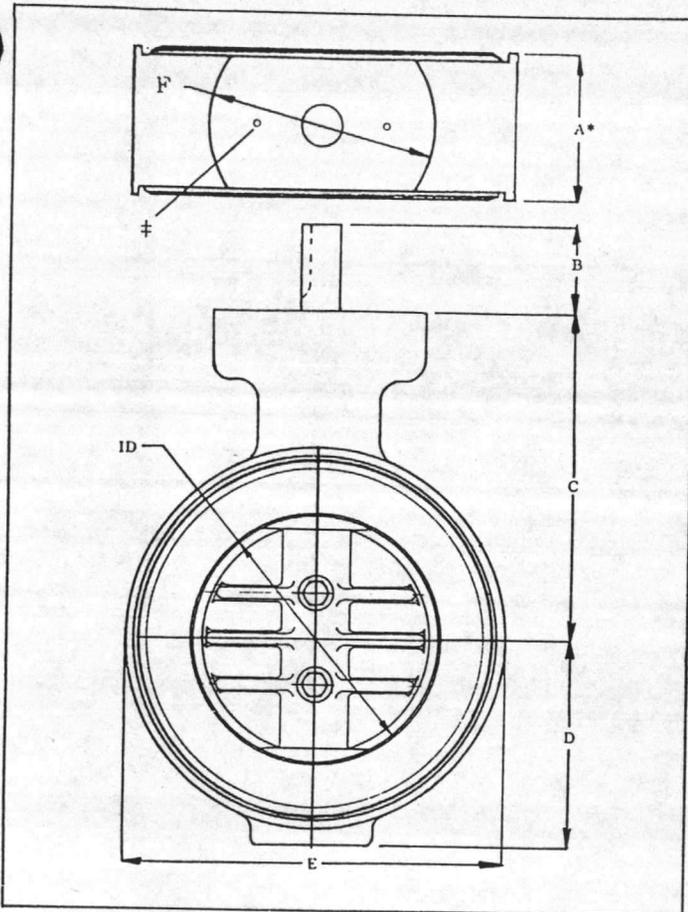
11151 PALMER AVENUE, SOUTH GATE, CALIFORNIA 90280



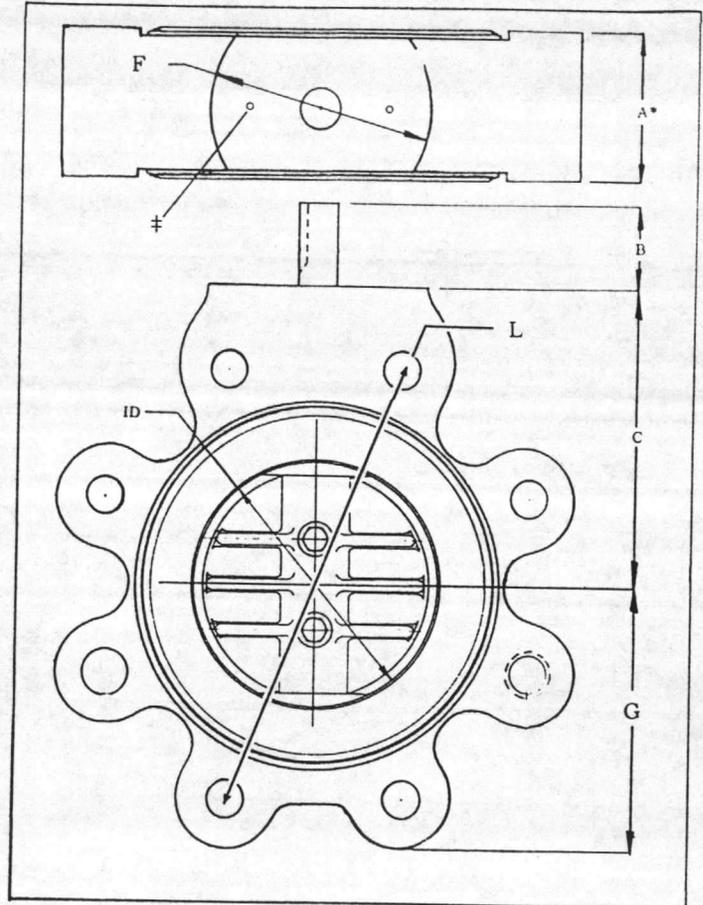
VAMI-BUTTERFLY VALVE DIMENSIONS

2.1.2

SERIES WCB



SERIES LDB & LTB



DIMENSIONS SERIES WCB

SIZE	A*	B	C	D	E	F	ID	SHAFT DIA.	SHAFT KEYWAY	WT.	BOLT UNC	LENGTH BOLT STUD	QTY. BOLTS
2	1.720	1-1/2	3-5/8	2-9/16	3-5/8	3 3/4	2	1/2	1/8x1/16x1	5	5/8-11	4 1/4	4
2 1/2	2.000	1-1/2	3-7/8	2-7/8	4-1/8	3 3/4	2 1/2	1/2	1/8x1/16x1	8	5/8-11	4 1/2	4
3	2.005	1-1/2	4-1/8	3	5	3 3/4	3	1/2	1/8x1/16x1-1/8	10	5/8-11	4 3/4	4
4	2.285	1-7/8	5-1/4	3-1/2	6-3/16	3 3/4	4	5/8	3/16x3/32x1-1/4	12	5/8-11	5	5 1/2
5	2.300	1-7/8	6-1/16	4-1/2	7-3/8	3 3/4	5	3/4	3/16x3/32x1-1/4	15	3/4-10	5 1/2	8
6	2.845	1-7/8	6-1/16	4-3/4	8-1/2	3 3/4	6	3/4	3/16x3/32x1-1/4	22	3/4-10	6	8
8	3.000	2	7-1/2	6-7/8	10-5/8	3 3/4	8	1	1/4x1/8x1-1/4	34	3/4-10	6 1/2	8
10	3.140	2	9-3/8	8	13	4 1/2	10	1-3/8	5/16x5/32x1-1/4	65	7/8-9	6 3/4	12
12	3.390	2-1/2	10-3/8	9-1/8	15-3/4	5	12	1-1/2	3/8x3/16x1-1/4	92	7/8-9	7 1/2	12

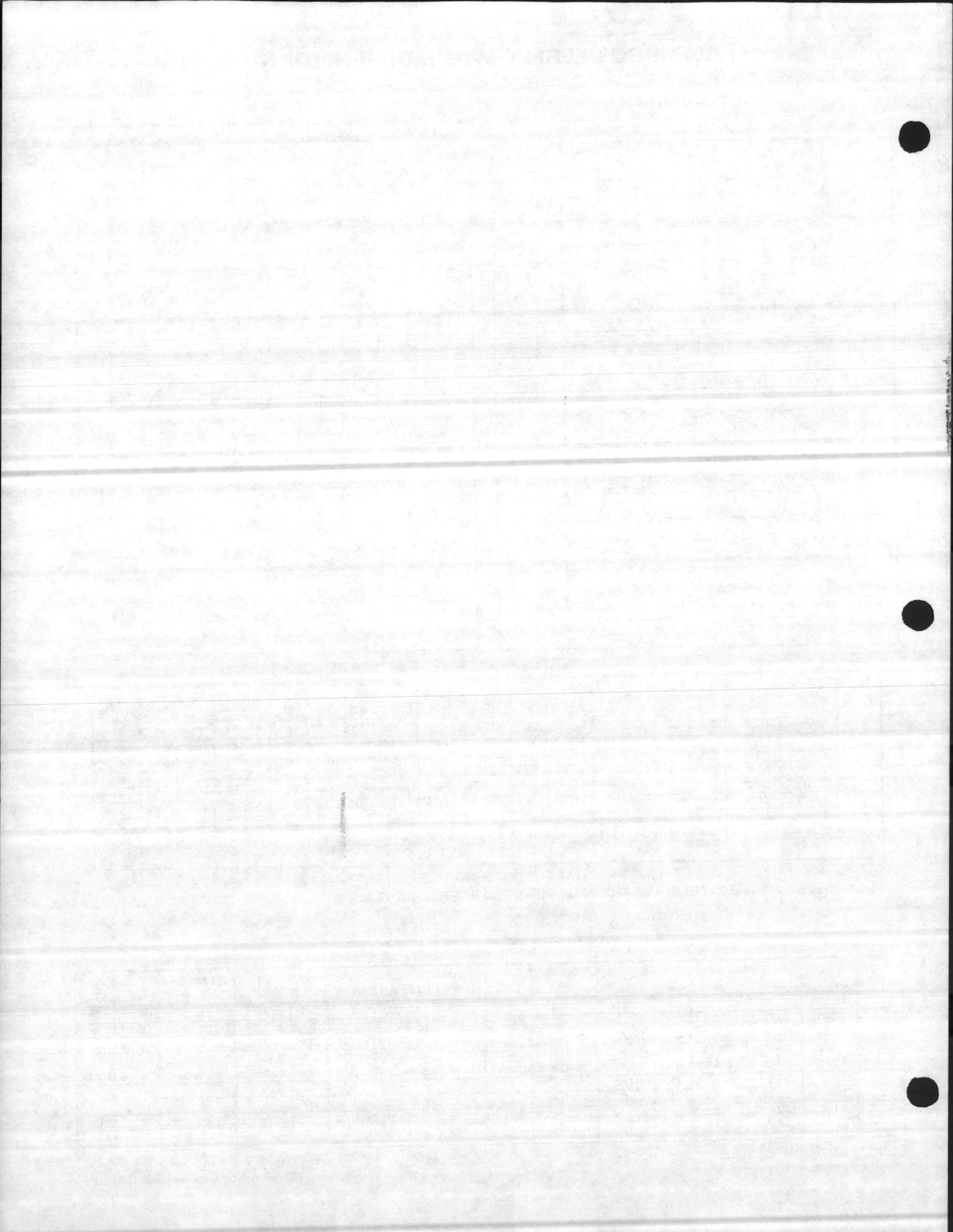
Valves to AWWA Specifications can be supplied. Above Wafer Valves fit inside bolt circle of standard flanges. Lug Type Valves fit bolt circle of standard flanges 150 lb. ANSI - B 16.5 and 125 lb. ANSI - B 16.1.

DIMENSIONS SERIES LDB & LTB

SIZE	A*	B	C	F	G	L	ID	SHAFT DIA.	SHAFT KEYWAY	LD HOLE	LT UNC	LENGTH CAP SCREW	QTY.	WT.
2	1.720	1-1/2	3-5/8	3 3/4	2-9/16	4-3/4	2	1/2	1/8x1/16x1	3/4	5/8-11	1 1/2	8	8
2 1/2	2.000	1-1/2	3-7/8	3 3/4	2-5/8	5-1/2	2 1/2	1/2	1/8x1/16x1	3/4	5/8-11	1 1/2	8	11
3	2.055	1-1/2	4-1/8	3 3/4	3-1/16	6	3	1/2	1/8x1/16x1-1/8	3/4	5/8-11	1 1/2	8	12
4	2.285	1-7/8	5-1/4	3 3/4	4-1/4	7-1/2	4	5/8	3/16x3/32x1-1/4	3/4	5/8-11	1 1/2	16	19
5	2.300	1-7/8	6-1/16	3 3/4	4-5/8	8-1/2	5	3/4	3/16x3/32x1-1/4	1	3/4-10	2	16	23
6	2.845	1-7/8	6-1/16	3 3/4	5-1/2	9-1/12	6	3/4	3/16x3/32x1-1/4	7/8	3/4-10	2	16	29
8	3.000	2	7-1/2	3 3/4	6-1/2	11-3/4	8	1	1/4x1/8x1-1/4	7/8	3/4-10	2 1/2	16	45
10	3.140	2	9-3/8	5	8	14-1/4	10	1-3/8	5/16x5/32x1-1/4	1	7/8-9	2 1/2	24	67
12	3.390	2-1/2	10-3/8	5	9-3/8	17	12	1-1/2	3/8x3/16x1-1/4	1	7/8-9	2 1/2	24	111

* LINER NOT COMPRESSED
(will compress 1/16 per side)

‡ 2" - 6" Valves: 5/16-18 x 3/4 thd. on 2-7/8 B.C.
8" - 12" Valves: 1/2-13 x 1 thd. on 2-7/8 B.C.



2112

ENVIRONMENTAL COMPATIBILITY CHART

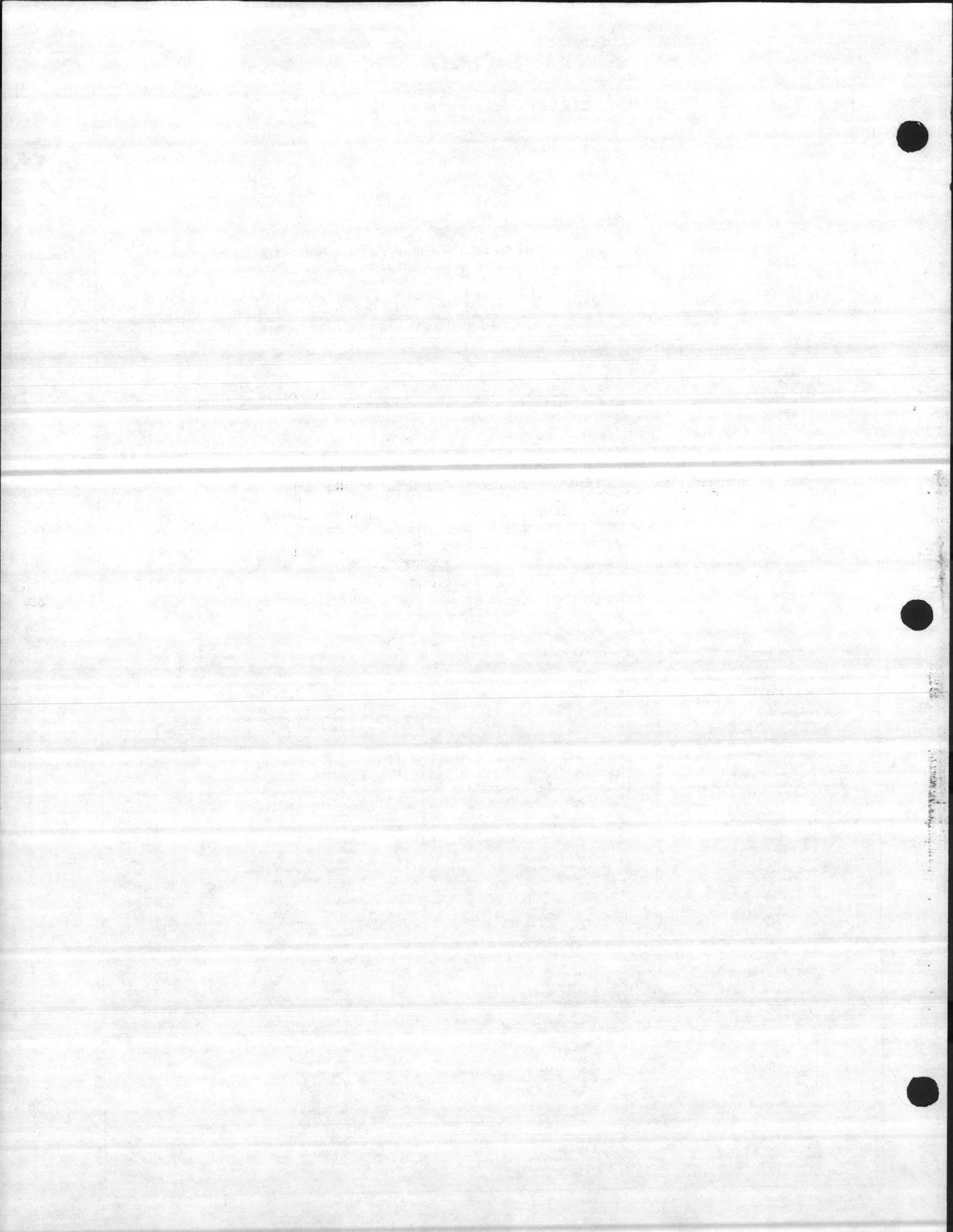
- CAP SCREWS** 316 Stainless Steel
- SHAFT** 17-4-PH Stainless Steel — We have selected this material for our shaft due to its strength and corrosion resistant properties.
- BODY** Cast Iron — Long life — corrosion resistant — generally accepted.
- ON SPECIAL ORDER** { Carbon Steel — Required by refinery and petro-chemical plants as it will not crack or break under strain.
 316 Stainless Steel — Extremely corrosion resistant. May be required by the food and drug industry. Accepted as the material for high temperatures.
- BEARINGS** Luberized Bronze.
- LINER — "O" RINGS** EPT — It is the liner usually accepted by the industry — has a good memory, good environmental properties and long life. Our special compound is also self-lubricating.
- 2" thru 10" DISC** **PLAST-A-VANE®** Glass Filled Noryl — see environmental compatibility chart below.
- 12" thru 16" DISC** Cast Iron — fused epoxy coated if desired.
- Disc — 316 Stainless Steel** — Required for higher temperature and other special applications. See PLAST-A-VANE valve specification sheet.

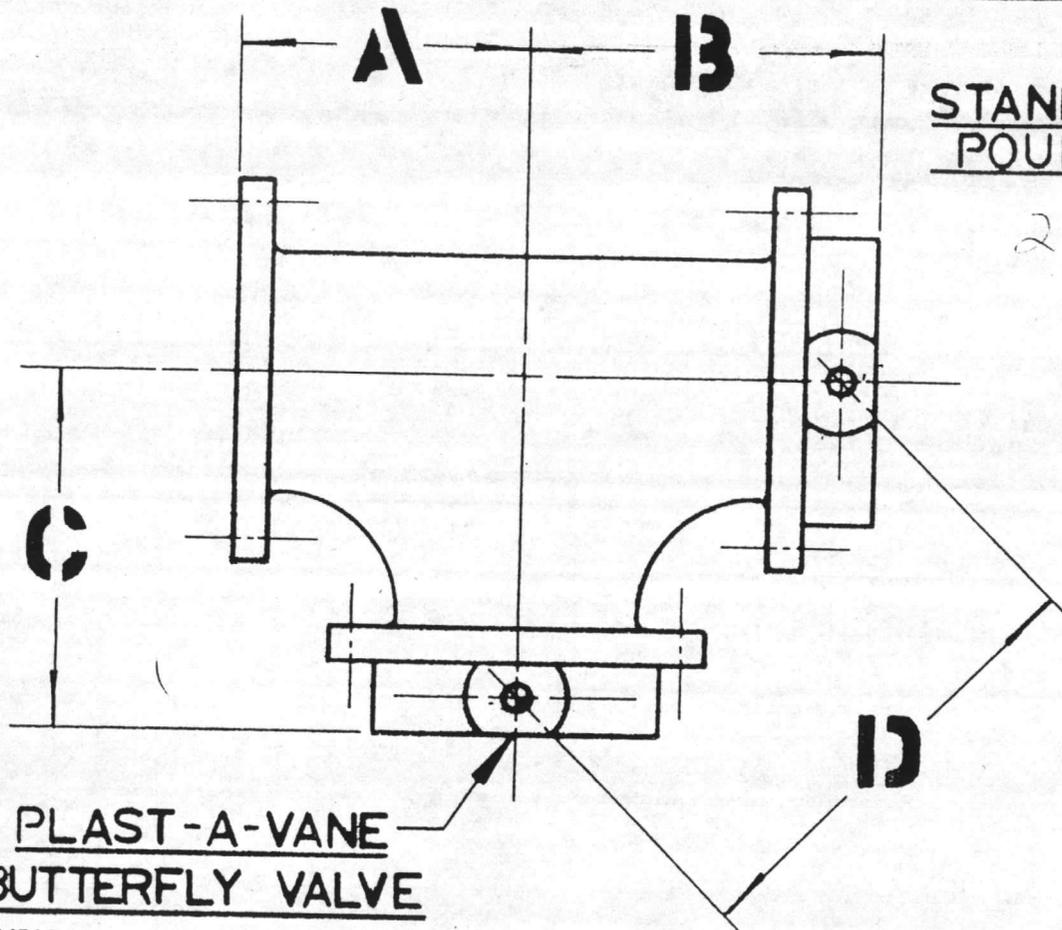
30% GLASS FILLED NORYL®

N - No Effect C - Cracking or Significant Property Decrease

ENVIRONMENT	180° F. 3 Days	75° F. 7 Days	ENVIRONMENT	180° F. 3 Days	75° F. 7 Days	ENVIRONMENT	180° F. 3 Days	75° F. 7 Days
Acetone	-	C	Gulf Oil #49	N	N	Polaroid Film	N	N
Alcojet (3%)	N	N	Gulf security Oil	N	-	Potassium Acetate (40%)	N	N
Alconox (3%)	N	N	Hays-Seal	N	N	Potassium Carbonate (40%)	N	N
Alcotab (3%)	N	N	HCl	N	N	Potassium Hydroxide (30%)	N	N
All Dishwasher (10%)	N	N	Heptane	-	N	Propane	-	N
Ammonia	-	N	Houghton Hi-Temp. Oil	N	N	Rapidshave	N	N
Ammonium Hydroxide (10%)	N	N	H ₂ SO ₄	N	N	Right Guard Deodorant	N	N
Ammonium Nitrate (60%)	-	N	Hydrochloric Acid (10%)	N	N	Rinse Dry	N	N
Anderol (L465)	C	N	Hydraulic Cylinder	-	-	Rise	N	N
API Gravity Oil 42.7	-	N	Oil Standard MS-68	N	-	Rose Chocolate Drink	N	N
Aquarium Cement	N	N	Hydrofluoric Acid (30%)	-	N	Rubber Compound #19,005	N	N
Armstrong C7 Resin	N	N	Industrial Oil #14	N	N	Ryton #2-EP	N	N
Carbon Tetrachloride	C	C	Industrial Oil #15P	N	-	Shell Sol #B	-	N
Cascade (10%)	N	N	Ipana	N	N	Shell Sol #17	-	N
Climax Grease	N	N	Isopar Toner B	N	N	Shell Tolu Sol 5	-	N
Cloroben De (4/1 mix)	N	N	Isopar Toner H	N	N	Silicone Lub. Grease G 300	N	-
Clorox	N	N	Isopropanol	-	N	Sodium Hydroxide Conc.	N	N
Coca Cola Syrup	N	N	Joy Cleaner (2%)	N	N	Stripe	N	N
Colgate	N	N	Kemtex 195 DA	N	-	Sulphur Dioxide	-	N
Crest	N	N	Kester #135	N	-	Sonoco 57-NH Sun Par #110	N	-
Diethylene Glycol	N	N	Kester #1544	N	-	Thermodent	N	N
Drain Demon	N	N	Lustoil	C	N	Tri iso octyl phosphate	N	N
Dynamate (3%)	N	N	Linseed Oil	-	N	Vaseline	N	N
Dyne (2%)	N	N	Liquid Soap	N	N	Zephiran (Conc.)	N	N
Electrosol Finish (10%)	N	N	Lithium Bromide (62%)	N	N			
Ethanol	N	N	Lithium Grease	N	N			
Ethyl Acetate	-	C	Lubriplate	-	N			
Ethylene Glycol	N	N	Mazola Corn Oil	N	N			
Ethylene Oxide	-	N	Methanol	-	N			
FC-78	N	N	Mineral Oil	N	N			
Fogging Oil (Chevron)(A-2)	C	N	Mobil Oil Pyrogard #43	C	-			
Freon Gas #22	-	N	Mold Release Krylon (#1328)	N	N			
Freon 113 (MS-230)	N	-	Onkite	C	N			
Freon TA	-	N	Oleic Acid	N	N			
Freon TC	-	N	Pepsodent	N	N			
Freon TF-30	-	N	Pipeline Powder Plus (3%)	N	N			
Freon TP-30	-	N	Planters Peanut Oil	N	N			
Freon TWD-602	-	N						
Gas Cook Grease	N	N						
Gillette Foamy	N	N						
Gleem	N	N						
Glycol Hydraulic Fluid	N	N						

ENVIRONMENT	75° F. 10 Days	125° F. 10 Days
Acetic (60%)	-	N
Acetic (90%)	N	N
Chromic (3%)	N	N
Chromic (5%)	N	C
Chromic (20%)	N	-
Nitric Acid (20%)	N	N
Nitric Acid (30%)	N	N
Nitric Acid (40%)	N	N
Hydrofluoric (25%)	N	-
Sulphuric Acid (30%)	N	N
Sulphuric Acid (60%)	N	N
Sulphuric Acid (90%)	N	N





STANDARD 125 POUND TEE

2.1.2

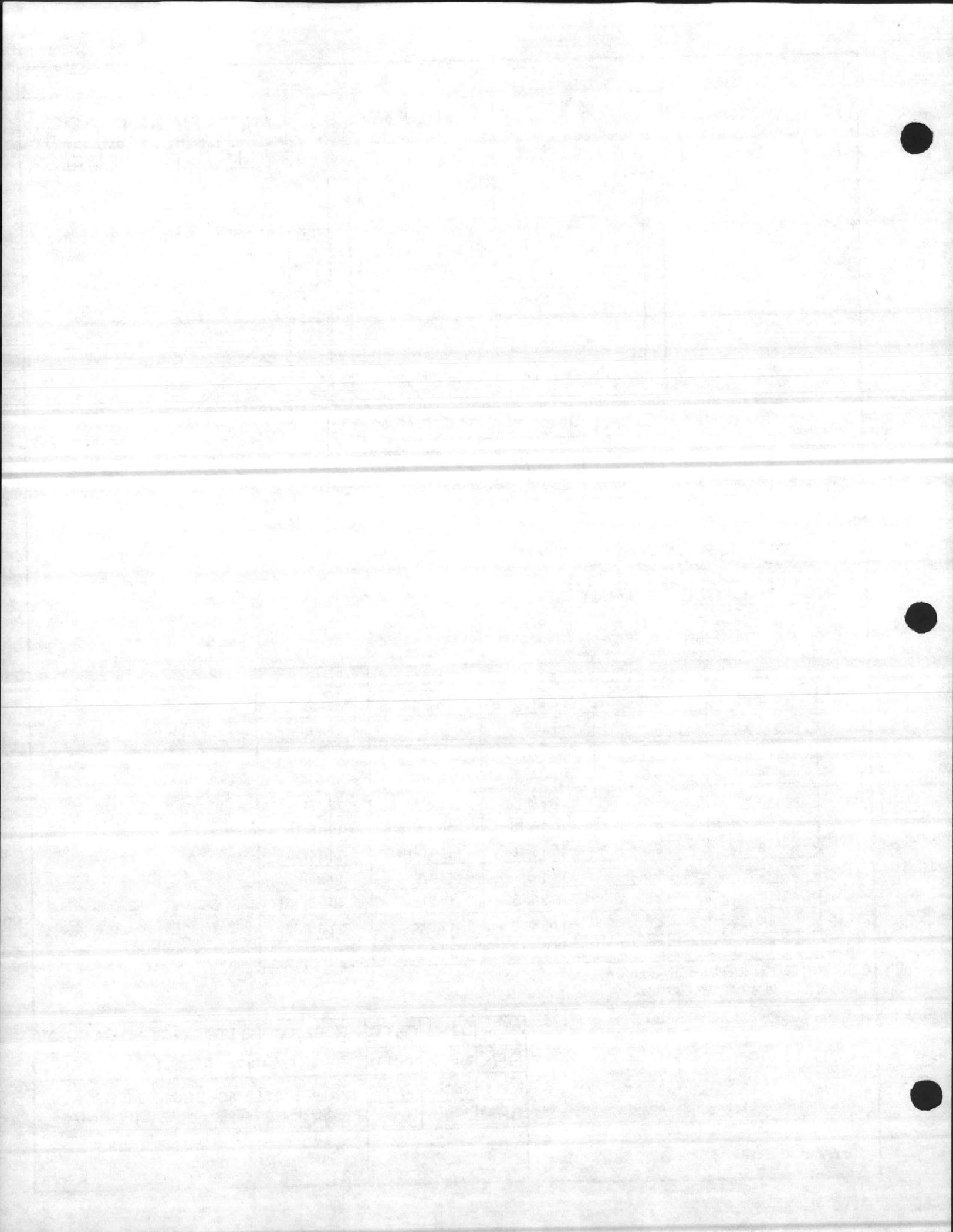
PLAST-A-VANE BUTTERFLY VALVE

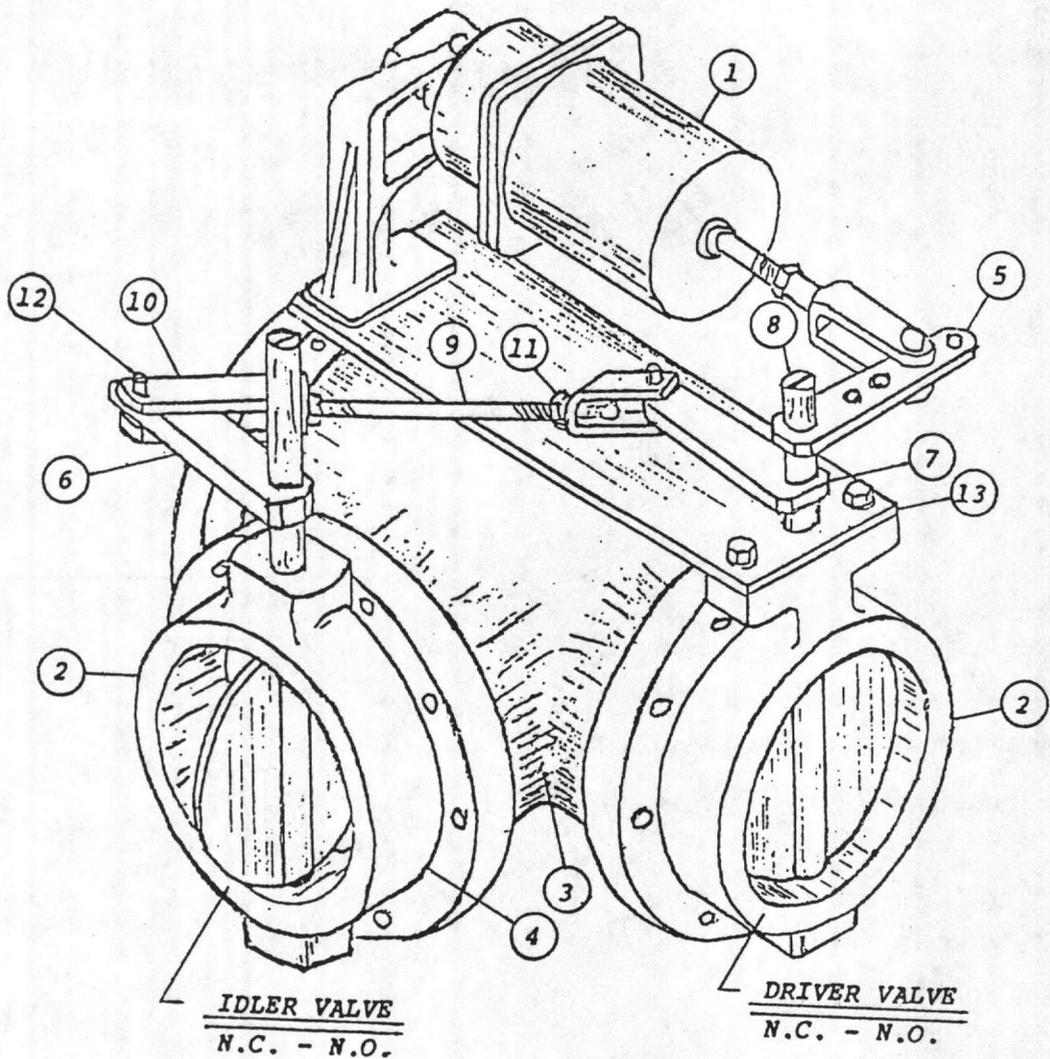
TYPICAL — Advise Valve Mounting Position and Normally Open and Closed Position Each Valve.

SIZE	A DIM	B DIM	C DIM	D DIM
2	4.5	6-3/16	6-3/16	7-1/2
2½	5.0	7.0	7.0	8-3/8
3	5.5	7-1/2	7-1/2	9-3/16
4	6.5	8-3/4	8-3/4	10-3/4
5	7.5	9-3/4	9-3/4	12-1/4
6	8.0	10-13/16	10-13/16	13-15/16
8	9.0	11-15/16	11-15/16	14-14/16
10	11.0	14-1/8	14-1/8	17-3/4
12	12.0	15-3/8	15-3/8	19-3/8
14	14.0	17-5/8	17-5/8	22-3/8
16	15.0	19.0	19.0	24-1/16

NOTE: For sizes larger than shown — please contact factory.

	BY	DATE	3 WAY BUTTERFLY VALVE ASSEMBLY
DR	<i>[Signature]</i>	12-31-71	
CK	<i>[Signature]</i>	12/31/71	
APP			VALVE ASSEMBLERS & MFRS., INC. SOUTH GATE CALIFORNIA





IDLER VALVE
N.C. - N.O.

DRIVER VALVE
N.C. - N.O.

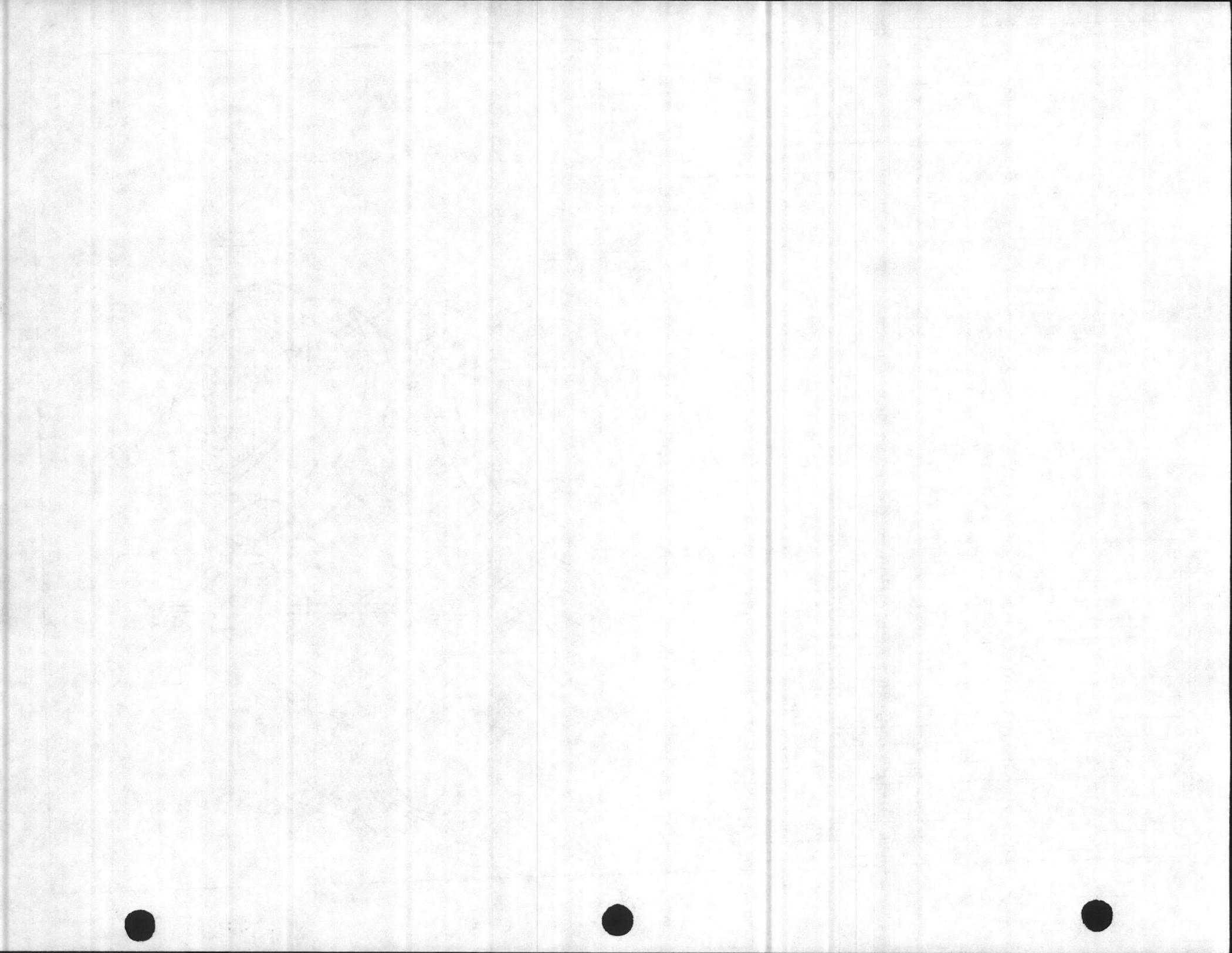
VALVE ROTATION: 60° - 90°

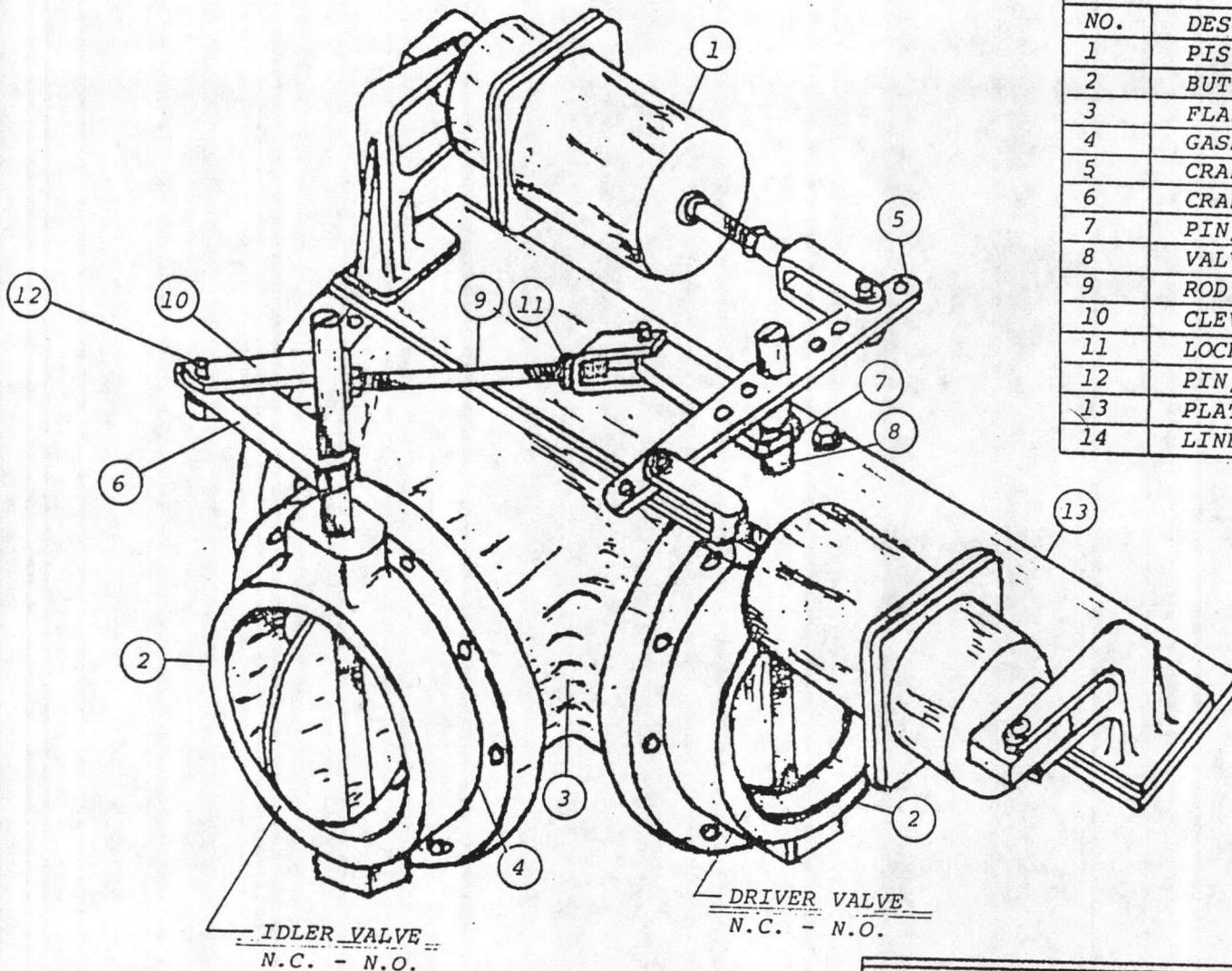
MATERIAL SCHEDULE		
NO.	DESCRIPTION	MATERIAL
1	PISTON ACTUATOR	SEE DATA SHEET
2	BUTTERFLY VALVE	SEE DATA SHEET
3	FLANGED TEE	125 lb. CAST IRON
4	GASKET	MODEL "A" ONLY
5	CRANK ARM	DUCTILE IRON
6	CRANK ARM	DUCTILE IRON
7	PIN, STEM	STEEL
8	VALVE STEM	SEE DATA SHEET
9	ROD CONNECTOR	STEEL
10	CLEVIS	STEEL
11	LOCK NUT, ROD	STEEL
12	PIN, CLEVIS	STEEL
13	PLATE, MOUNTING	STEEL
14	LINER, NOT SHOWN	MODEL "B" ONLY

SERIES - DESCRIPTION

- WCB - Wafer, EPT Lined
- WLA - Wafer, Unlined
- LTB - Lug, Tapped, EPT Lined
- LTA - Lug, Tapped, Unlined
- LDB - Lug, Drilled, EPT Lined
- LDA - Lug, Drilled, Unlined

PROJECT:	VALVE ASSEMBLERS & MFRS., INC.
JOB #	
P.O. #	3-WAY BUTTERFLY VALVE
ACTUATOR:	ASS'Y W/ 1 ACTUATOR
SIZE:	DRAWING
SERIES:	NUMBER:





VALVE ROTATION: 60°- 90°

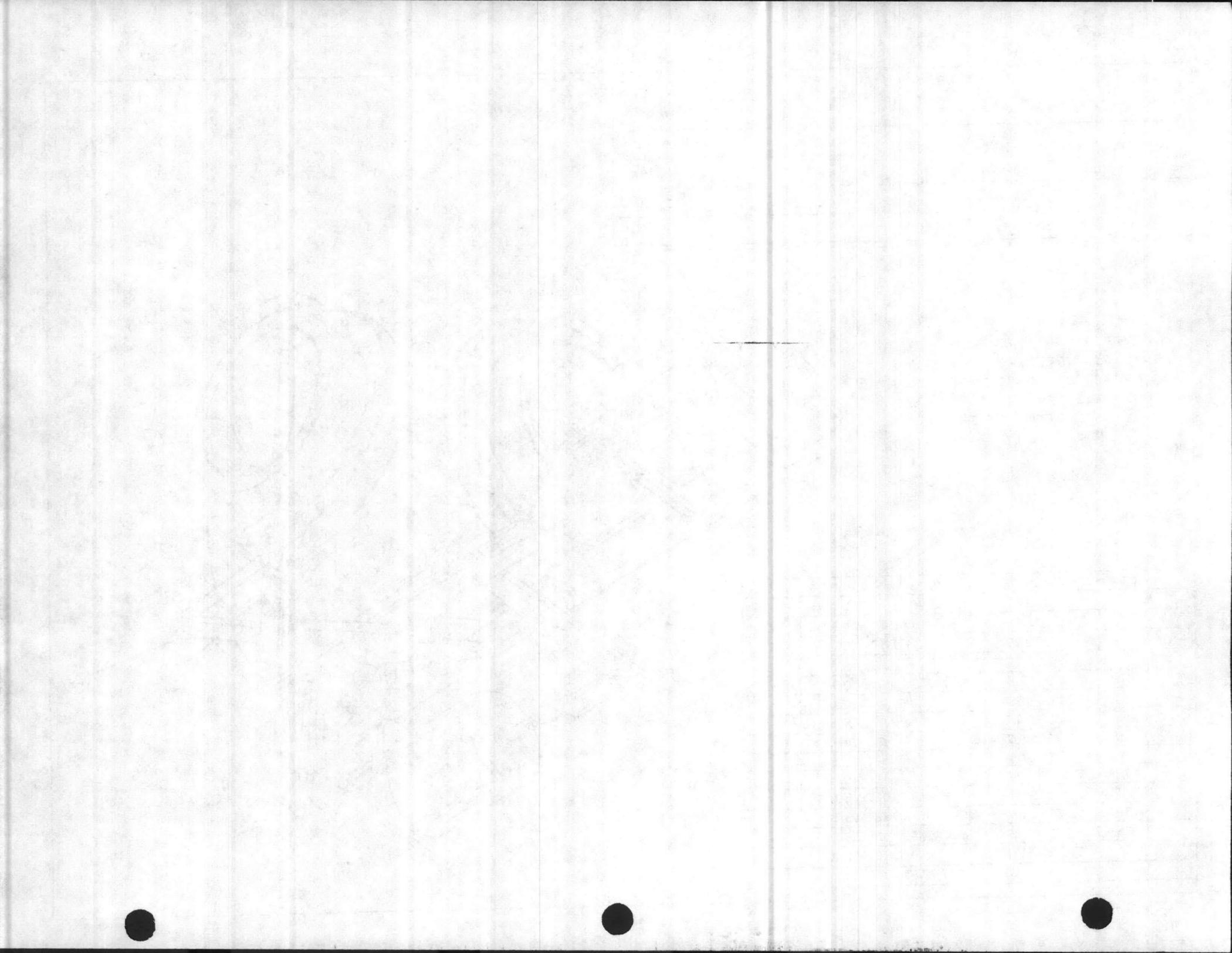
MATERIAL SCHEDULE		
NO.	DESCRIPTION	MATERIAL
1	PISTON ACTUATOR	SEE DATA SHEET
2	BUTTERFLY VALVE	SEE DATA SHEET
3	FLANGED TEE	125 lb. CAST IRON
4	GASKET	MODEL "A" ONLY
5	CRANK ARM	DUCTILE IRON
6	CRANK ARM	DUCTILE IRON
7	PIN, STEM	STEEL
8	VALVE STEM	SEE DATA SHEET
9	ROD CONNECTOR	STEEL
10	CLEVIS	STEEL
11	LOCK NUT, ROD	STEEL
12	PIN, CLEVIS	STEEL
13	PLATE, MOUNTING	STEEL
14	LINER, NOT SHOWN	MODEL "B" ONLY

SERIES - DESCRIPTION

- WCB - Wafer, EPT Lined
- WLA - Wafer, Unlined
- LTB - Lug, Tapped, EPT Lined
- LTA - Lug, Tapped, Unlined
- LDB - Lug, Drilled, EPT Lined
- LDA - Lug, Drilled, Unlined

21/2

Project:	VALVE ASSEMBLERS & MFRS., INC.
Job #	
P.O. #	3-WAY BUTTERFLY VALVE ASS'Y. W/2 ACTUATORS
Actuator:	
Size:	
Series:	DRAWING NUMBER:



2.1.2

RATED FLOW COEFFICIENTS

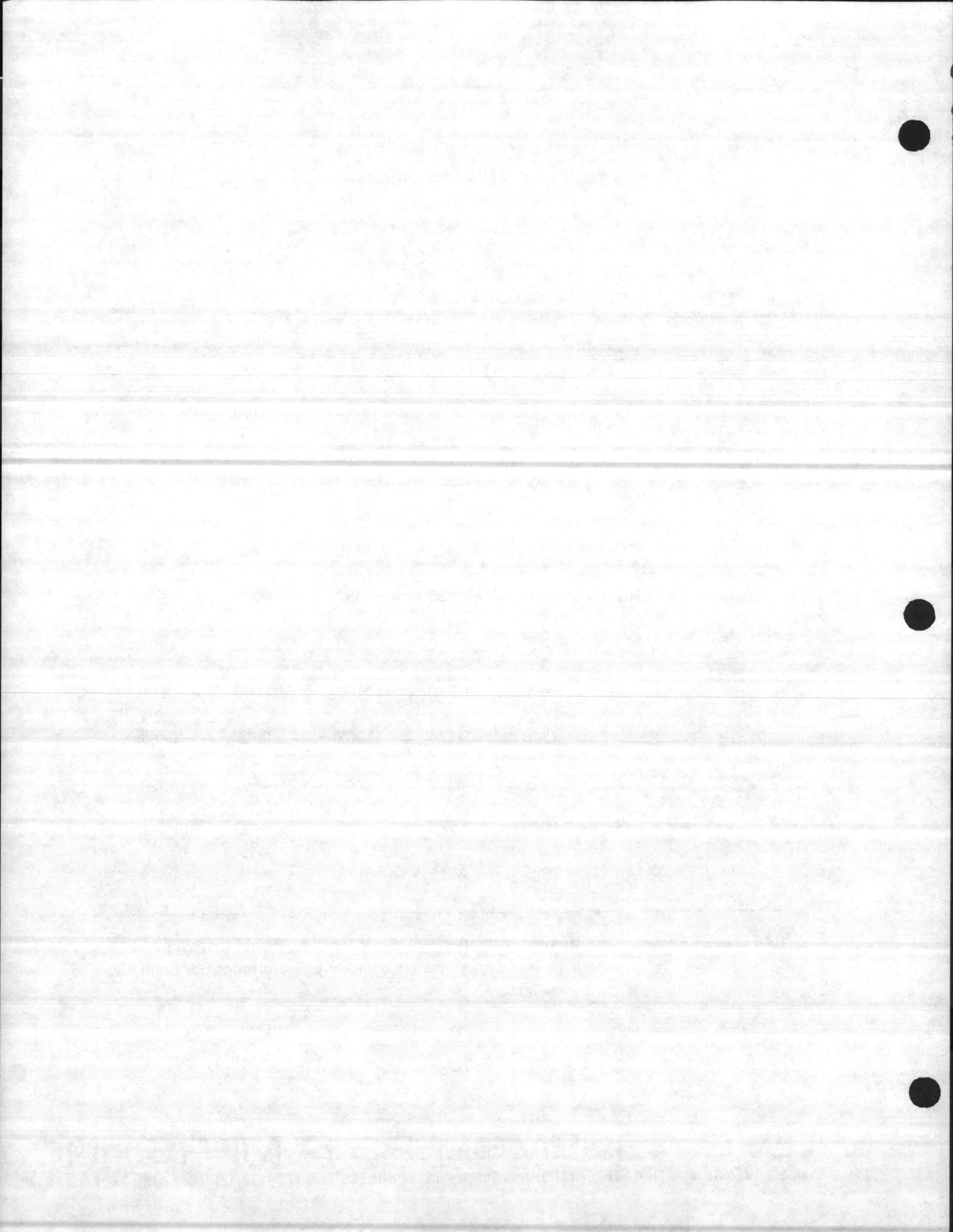
C/V

Valve Size	Full Open					
	30°	40°	50°	60°	70°	90°
2	14	23	36	63	105	130
2½	25	44	70	110	180	320
3	38	66	110	170	280	500
↖ 4	63	110	180	280	460	820
5	100	180	280	450	740	1300
6	140	250	400	640	1100	1900
8	250	440	690	1100	1800	3200
10	420	710	1174	1802	3059	5462
12	641	1082	1790	2748	4663	8326
14	883	1605	2523	3899	6423	11,470
16	1147	2065	3211	5113	9712	14,311

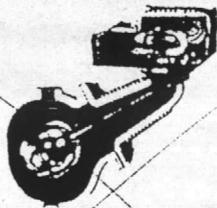
RATED — C/V = The Volume of Water in U. S. Gallons per Minute that will pass through a given valve opening with a pressure drop of one pound per square inch.

VALVE ASSEMBLERS & MFRS., INC.

11151 PALMER AVENUE, SOUTH GATE, CALIFORNIA 90280 — TELEPHONES: (213) 773-1272, (213) 923-0721, TELEX: 68-6400



NO. 150 PUMP CONTROL LOW WATER CUT-OFF AND ALARM SWITCH



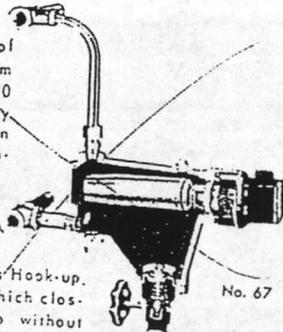
For steam boilers of any size. Maximum steam pressure, 150 lbs. All operating parts are away from heat. No stuffing box to bind or leak. Has two-switch construction. One starts and stops pump as boiler calls for water; second operates on greater drop of water line to stop burner and/or complete alarm circuit. Has 1 inch equalizing tappings. If manual reset cut-off switch as desired, order 150-M.

No. 150

LOW WATER FUEL CUT-OFF

For steam boilers of any size; maximum steam pressure, 20 lbs. Dependably stops burner when water level falls into danger zone.

Has a deep sediment chamber, packless construction, Quick Hook-up, and extra switch which closes on small stop without stopping burner to operate alarm or control No. 101 Electric Water Feeder.



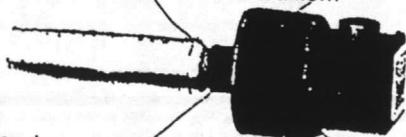
No. 67

NO. 94 PUMP CONTROL LOW WATER CUT-OFF AND ALARM SWITCH



For steam boilers of any size. Maximum boiler pressure, 250 lbs. Utilizes the principle of repulsion magnetic switching. Junction box sealed from float chamber. Installed with 1 1/4 inch equalizing pipes. For electrical connections use wire suitable for at least 75°C. (167°F.).

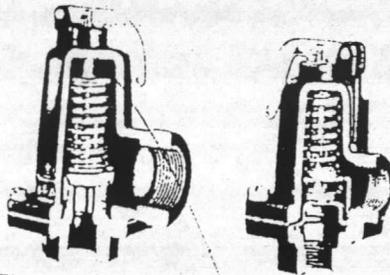
REPLACEMENT HEAD MECHANISM



Complete replacement for 67, 69, and 70. 70 Series, Nos. 467, 767 and older 66. For 115V or 230V circuits.

No. 6667

A.S.M.E. PRESSURE RELIEF VALVES



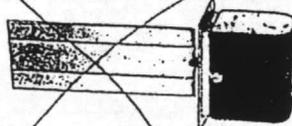
The 230 Series was developed to provide dependable pressure protection for space heating hot water boilers and hot water tanks at a modest price, and economy has been achieved largely through ingenious design.

The 230 Series valves conform to the A.S.M.E. Boiler Code requirements, and have been tested and rated by the National Board of Boiler and Pressure Vessel Inspectors. Interior operating parts are all of non-ferrous materials. Valve seat is of brass, valve disc of Silicone. Testing-lever has independent action and tying it down does not interfere with automatic operation of valve.

No.	BTU/Hr. Cap.	Opening Pressure PSI
FOR HOT WATER TANKS AND HEATERS		
230-3/4 In.-75	502,000	75
230-3/4 In.-100	640,000	100
230-3/4 In.-125	783,000	125
230-3/4 In.-150	925,000	150
240-1 In.-75	1,260,000	75
240-1 In.-100	1,610,000	100
240-1 In.-125	1,960,000	125
240-1 In.-150	2,320,000	150

No.	BTU/Hr. Cap.	Opening Pressure PSI
FOR HOT WATER SPACE HEATING BOILERS		
230-3/4 In.-30	303,000	30
240-3/4 In.-30	513,000	30
230-1 In.-30	743,400	30
240-1 In.-30	910,000	30
230-1 1/2 In.-30	1,025,100	30
240-1 1/2 In.-30	1,560,000	30
240M-3	2,313,000	30
240M-4	2,710,000	30
240-2 In.-30	3,130,000	30
240-2 In.-30	3,550,000	36

NO. AF3 AIR FLOW SWITCH FOR DUCT INSTALLATION

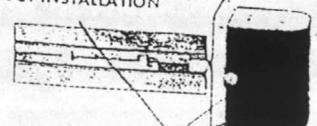


AIR FLOW VELOCITIES IN FPM REQUIRED TO ACTUATE SWITCH
(Based on Standard Air 0.075 Lbs. Per Cu./Ft.)

Installed In	Approx. FPM Vel.
Horizontal Duct	235
Factory Or Min. Adjust.	No Flow FPM 175

No. AF3

NO. AFI AIR FLOW SWITCH FOR DUCT INSTALLATION

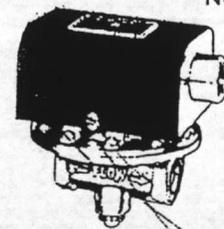


VERTICAL DUCT, UPWARD FLOW (For Downward Flow, write factory)			
INSTALLED IN VERTICAL DUCT WITH UPWARD FLOW OF AIR		Standard Paddle (7 1/2" x 1 1/2")	Paddle Trimmed 2" (5 1/2" x 1 1/2")
Factory Or Minimum Adjustment	Flow FPM	910	1235
	No Flow FPM	785	1050
Maximum Adjustment	Flow FPM	1610	2560
	No Flow FPM	1460	2410

HORIZONTAL DUCT (Preferred Installation)			
INSTALLED IN HORIZONTAL DUCT		Standard Paddle (7 1/2" x 1 1/2")	Paddle Trimmed 2" (5 1/2" x 1 1/2")
Factory Or Minimum Adjustment	Flow FPM	480	700
	No Flow FPM	185	220
Maximum Adjustment	Flow FPM	1385	2730
	No Flow FPM	1160	1820

No. AFI

NO. FS1 FLOW SWITCH



Designed to respond at very low flow rates, yet allow large flow-through capacity. They find particular application in domestic, municipal and industrial water treatment systems; cooling systems for electronic tubes, bearings compressors; booster pumps; jobs requiring instant switch action, etc. Connections are tapped for installation right in the pipe line. U.L. Listed.

No. FS1

FLOW RATES REQUIRED TO ACTUATE NO. FS1 FLOW SWITCH

Minimum Adjustment	Flow	GPM FFS	
		0.41	0.23
Maximum Adjustment	Flow	1.81	1.15
	No Flow	1.28	1.35

Flow rates are averages which may vary ± 10% from tabulated values

FLOW CAPACITY OF NO. FS1 FLOW SWITCH

Differential Pressure	10 psi	20 psi	30 psi	40 psi	50 psi	70 psi	90 psi
GPM Capacity	8.35	11.50	13.60	15.75	17.75	21.25	24.25

Equivalent Velocities in Feet per Second

FFS Velocity	8.82	12.30	14.35	16.62	18.74	22.44	25.61
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NO. FS4-3 FLOW SWITCH

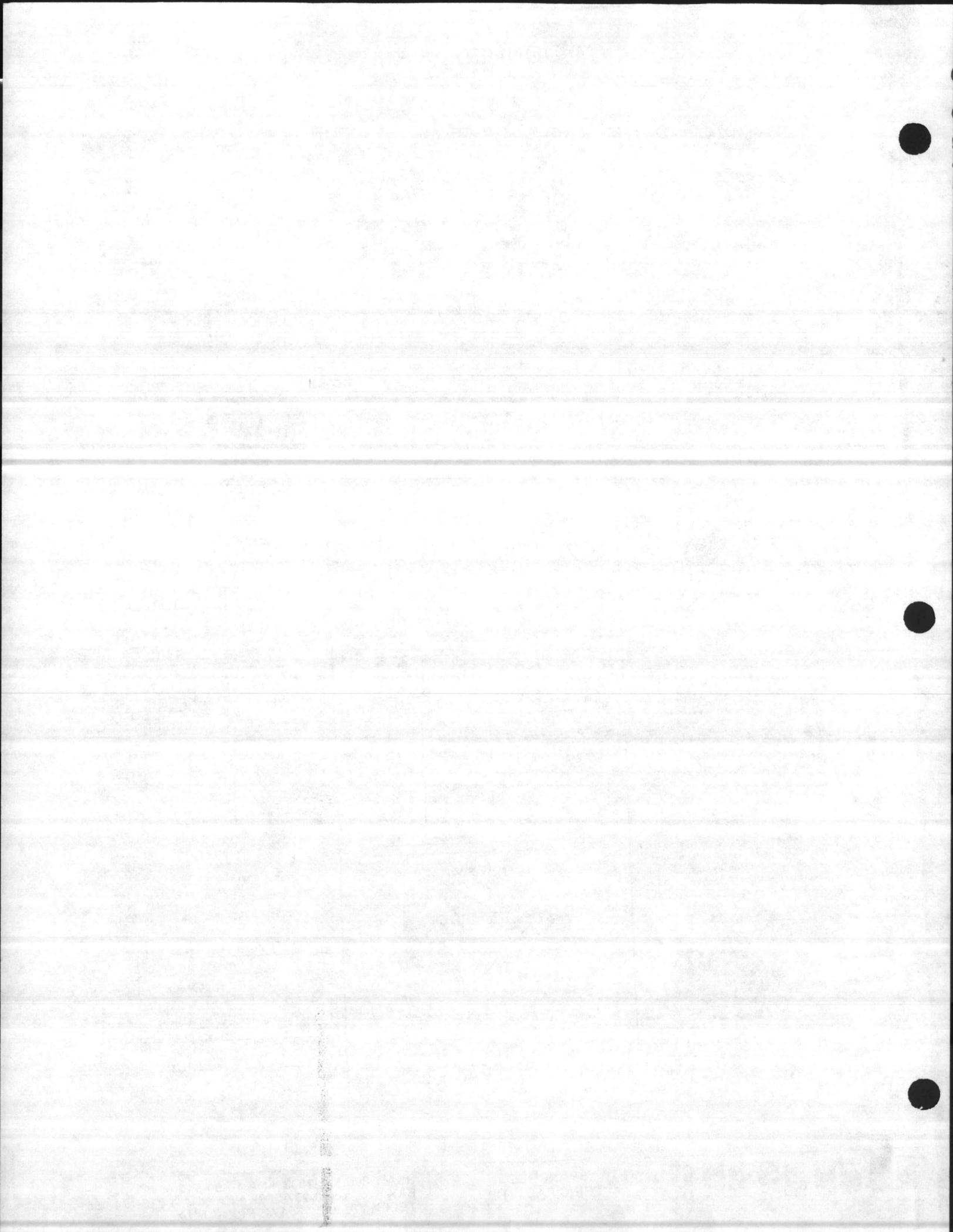


Compact, moderately-priced device that makes or breaks an electrical circuit when flow in pipe starts or stops. Used to activate signal lights, alarms, burners, motors, metering devices, etc. For pressures up to 150 lbs., temperatures to 300° F. SPDT switch action, packless construction, segmented paddle quickly adaptable for pipe 1 inch and larger; easy adjustment of switch activity.

Electrical Ratings (U/L listed)

	MOTOR DUTY	
	120 V.A.C.	240 V.A.C.
Full load	7.4 amps.	3.7 amp.
Locked Rotor	44.4 amps.	22.2 amp.
PILOT DUTY		
AC	125 VA	115-230 V
DC	57 VA	115-230 V

No. FS4-3





AIR PRODUCTS & CONTROLS, LTD.

2.1.13
SD

MS-SERIES DUCT SMOKE DETECTOR PNEUMATIC OUTPUT OPTION

PRODUCT DESCRIPTION

The MS Series Duct Smoke Detectors have the capability of being supplied with an optional pneumatic output. In addition to the two form-C alarm contacts, the three-way valve may be connected directly to pneumatic devices to be controlled in the event of smoke detection such as pneumatic damper actuators. This eliminates using a relay contact output within the smoke detector and installing a remote electro-pneumatic valve (E/P).

The pneumatic output option may be ordered by *ADDING* the suffix *P.O.* to the standard MS Duct Smoke Detector model numbers.

Air Products & Controls, Ltd. - Air Products

PRODUCT SPECIFICATIONS

- MODEL NUMBERS:**
- MS-024N-PO - 24 V.A.C./24 V.D.C. Ionization w/Pneumatic Output
 - MS-024P-PO - 24 V.A.C./24 V.D.C. Photoelectric w/Pneumatic Output
 - MS-110N-PO - 115 V.A.C./24 V.D.C. Ionization w/Pneumatic Output
 - MS-110P-PO - 115 V.A.C./24 V.D.C. Photoelectric w/Pneumatic Output

SMOKE DETECTORS: Air Products & Controls MS Series

ORIFICE SIZE: 0.030"

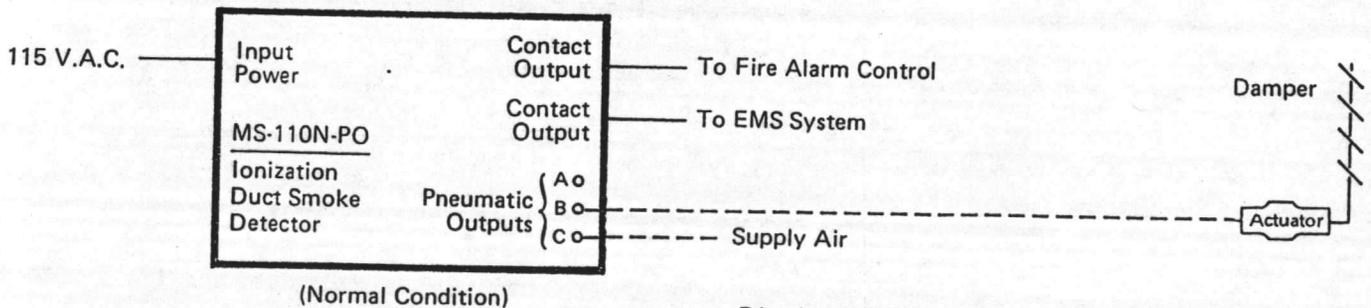
OPERATING PRESSURE: 0 to 50 psig

PORTS: Barbed fittings to accept 1/4" O.D. FR rated poly tubing

OPERATING TEMPERATURE: 0 to 55°C

Air Products & Controls, Ltd. - Air Products & Controls, Ltd.

A TYPICAL APPLICATION



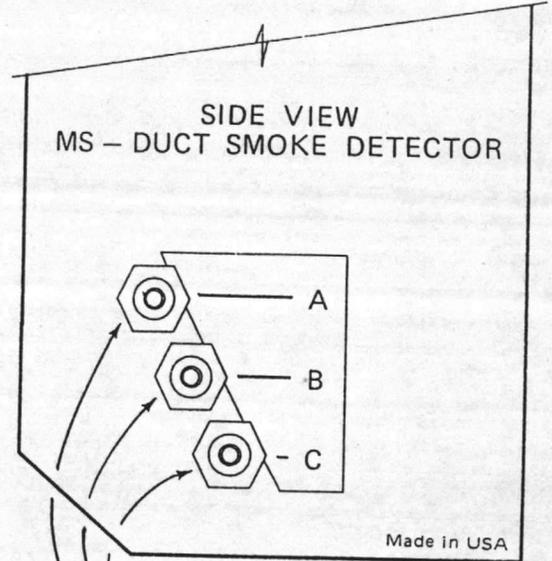
Distributed By:

DETROIT CONTROLS INC.
P.O. BOX 221
SOUTHFIELD, MICHIGAN 48037
(313) 541-2363 - (800) 628-2424
TELECOPIER: (313) 545-1369

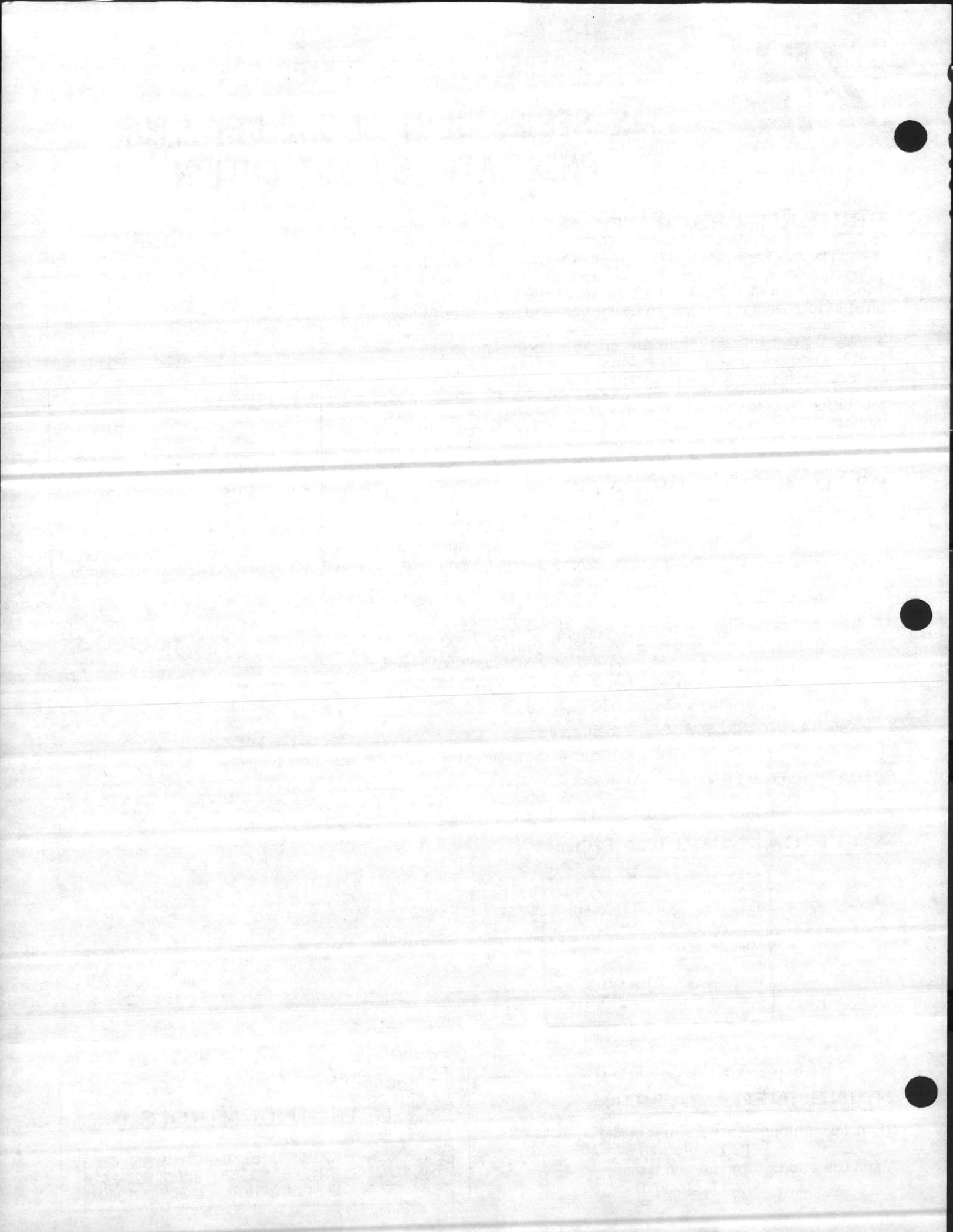
Air Products & Controls, Ltd. - Air Products & Controls, Ltd. - Air Products & Controls, Ltd. - Air Products

PIPING INFORMATION

- Normal condition: Ports B and C made, Port A blocked
- Alarm condition: Ports A and B made, Port C blocked



PORTS: Barbed (Bulkhead) Fittings to Accept 1/4" O.D. FR Rated Poly Tubing



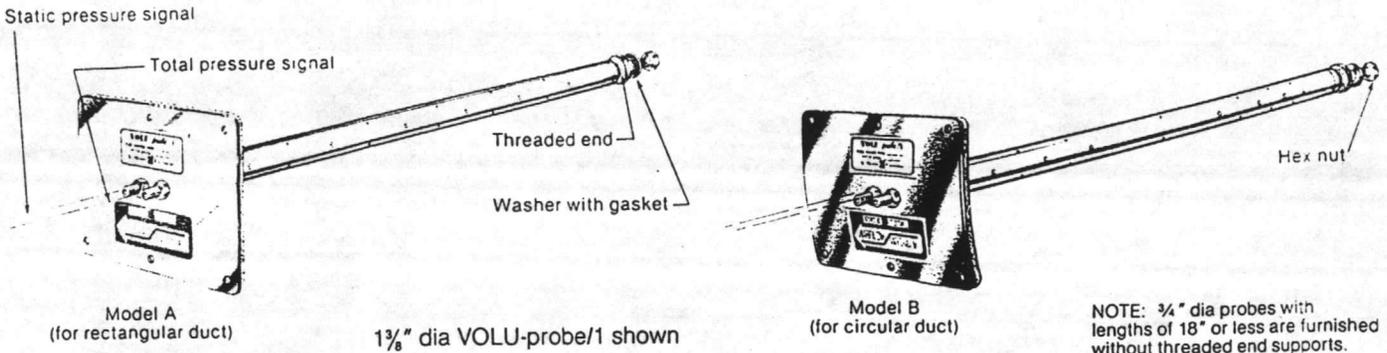
2.1.6.1

VOLU-probe™ / I

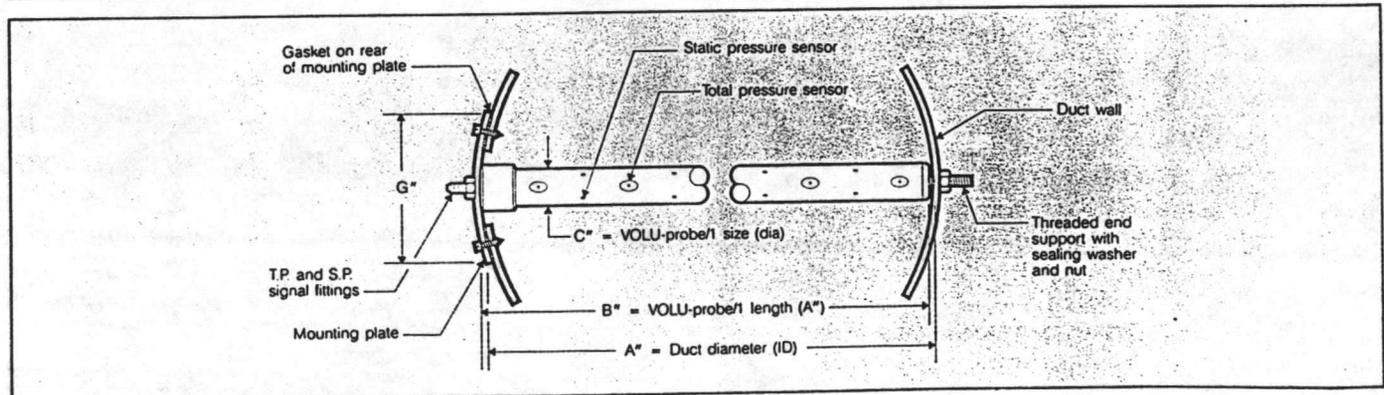
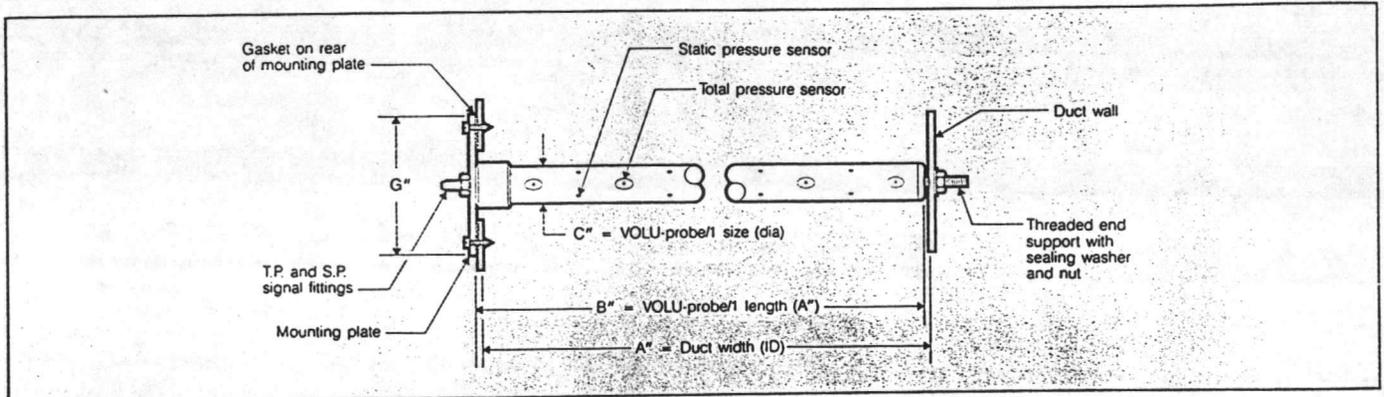
COMMERCIAL HVAC

The VOLU-probe/1 is designed for the lighter duty commercial HVAC applications. The VOLU-probe/1 is furnished with a threaded end support and a mounting plate suitable for

installation in light gauge duct construction. Said installation can be accomplished by cutting or drilling two holes in opposing duct walls, without need to enter the duct.

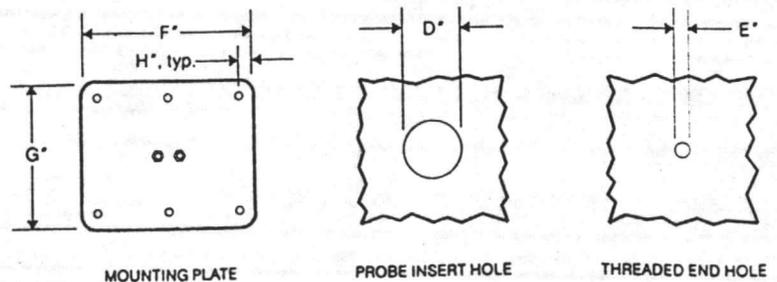


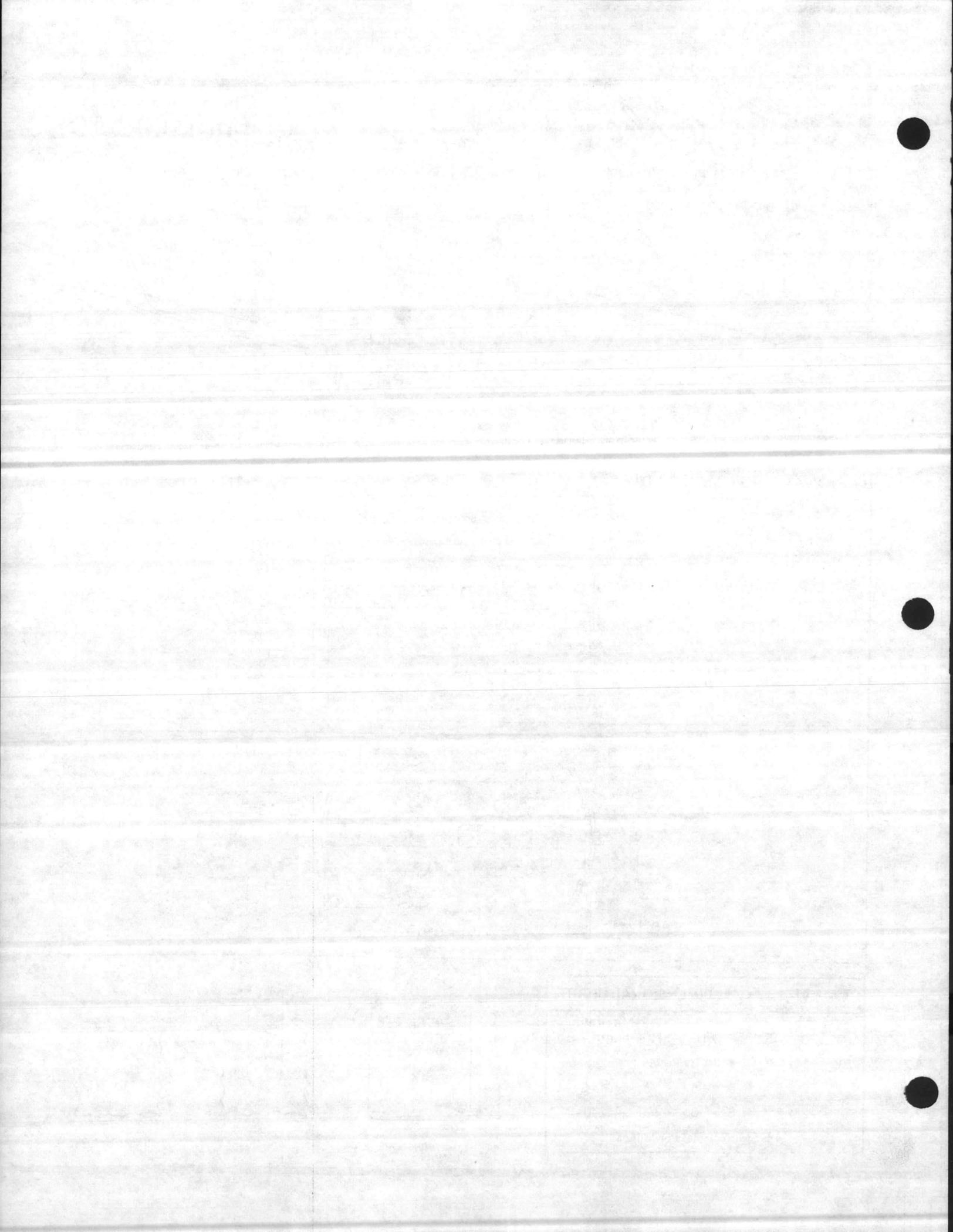
BASIC DIMENSIONAL DATA



VOLU-probe™/I DIMENSIONAL CHART						
C"	D"	E"	F"	G"	H"	Maximum length - B"
3/4	1 1/4	5/16	4	3	1/2	48
1 1/8	2	3/8	6	5	1/2	144
2	2 3/4	3/8	8	8	3/4	240

* 1 3/4" with compression fittings





the Airflow Traverse Probe

In 1970, Air Monitor Corporation developed and introduced the multiple point, self-averaging Pitot tube station with built-in air straightener. Termed an "airflow measuring station", it now represents the standard for measuring airflow in commercial and industrial HVAC applications. There are, however, many existing ducts or stacks where it is not practical or possible to remove a duct section and install an airflow measuring station, or where the presence of particulate contaminants in the air stream makes periodic cleaning of the flow sensing means a requirement. It is in these applications that the task of

accurate air (or gas) flow measurement falls to the multiple point, flow traverse probe, or "airflow traverse probe".

This probe is not to be confused with a single point, flow sensing probe, such as a Pitot tube, Velometer, or thermal (hot) wire, where the flow is sensed at a single location in the air stream. The "airflow traverse probe" senses the airflow at multiple velocity (Pitot) sensing points along the entire length of the probe—traversing the air stream in a single line across the duct or stack—and averages these sensed values (total and static pressure) in separate manifolds.

the Accuracy of the Airflow Traverse Probe

The accuracy of an airflow measuring station, which incorporates an air straightener or equalizer (to eliminate turbulent, rotational flow) and has multiple Pitot tube sensors positioned in a balanced, equal area, array across the entire cross-section of the station area (air stream), is stated as a percentage of ACTUAL (or true) flow. With a rated accuracy of 2%, it means that the airflow measuring station is capable of sensing the rate of the air flowing through the station (and duct) to within 98% of the true (actual) flow rate.

The "airflow traverse probe" does not incorporate an air straightening or equalizing means, and while it has multiple flow sensors, they are positioned on a single line across the air stream. Obviously if only a single probe is installed across a large duct, it will be traversing and sensing the flow rate across only that single line of the air stream in the duct and not the entire cross-section. While the probe may have sensed the flow rate very accurately in that line, the flow rates in the other unsensed portions of the duct cross-section may be at sharp variance. This can result in a highly erroneous measurement or calculation of the duct flow rate.

A simple rule must therefore be applied to the statement of accuracy for airflow traverse probes:

Unless multiple probes are applied across the entire duct cross-section in the quantity and manner as set forth in the ASHRAE Guide on airflow measurement, the accuracy of the airflow traverse probe will be that of an instrument only (as determined when laboratory tested and compared against a known airflow rate directly in front of the probe), and NOT that of the actual or true airflow rate passing through the duct.

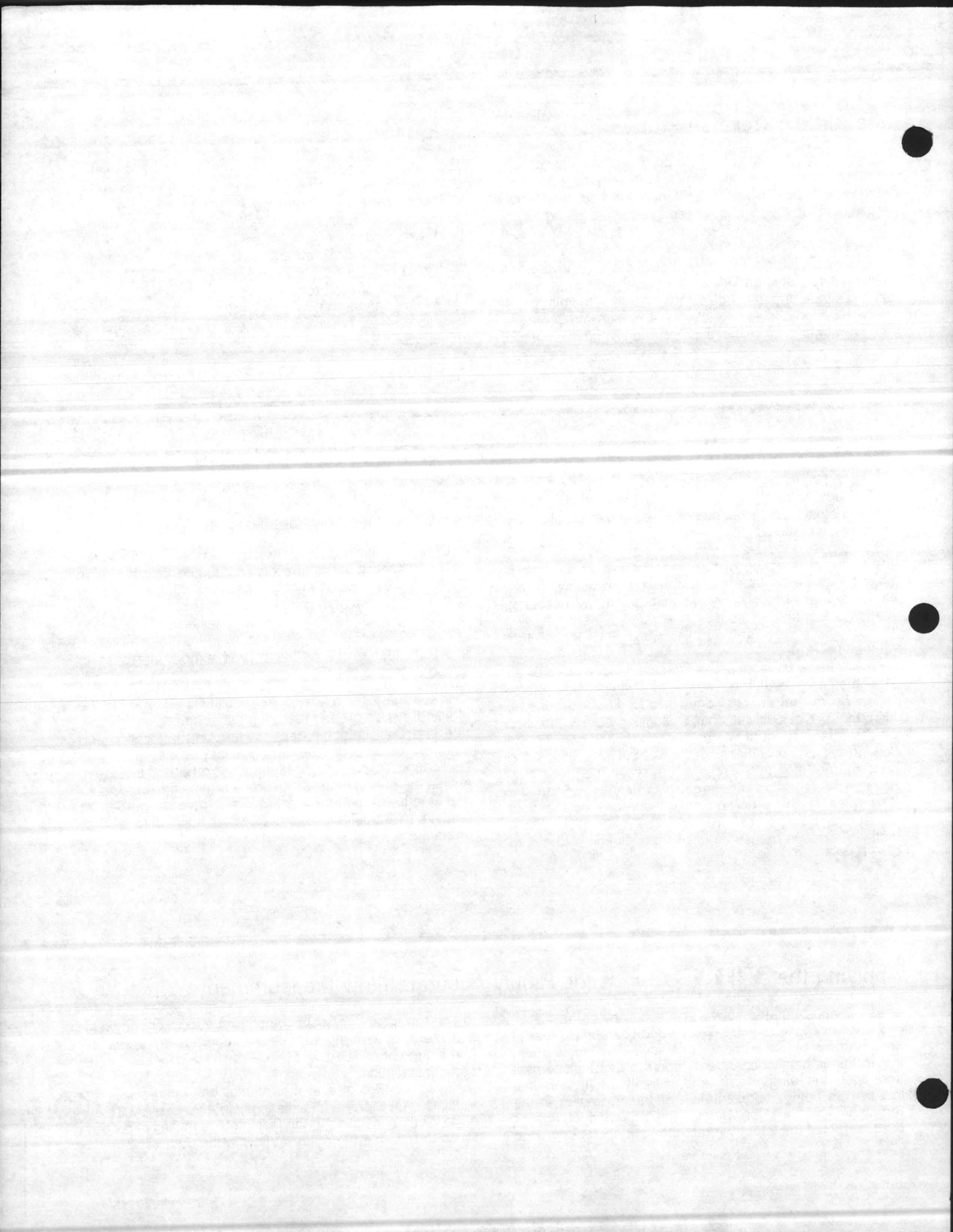
In summary, the measuring capability or accuracy of the airflow traverse probe in sensing the actual or true airflow rate in a duct is highly dependent upon the location and quantity of probes utilized in that installation and application. On page 3, Air Monitor has proposed a guide to enable the design engineer to predetermine the anticipated percentage of accuracy of airflow traverse probes in relation to actual or true flow when applied to a duct or stack.

Applying the VOLU-probe™ for Highly Accurate Flow Measurement

As previously stated above, the accuracy of the VOLU-probe when applied singularly (to a duct) can be expressed only in terms of "instrument accuracy". The single probe installation is highly dependent upon the probe placement and upon the air patterns and velocity profiles in that location as being representative of those present in the remainder of the duct. Unless the actual duct flow is predetermined (by Pitot traverse, etc.) and the duct probed

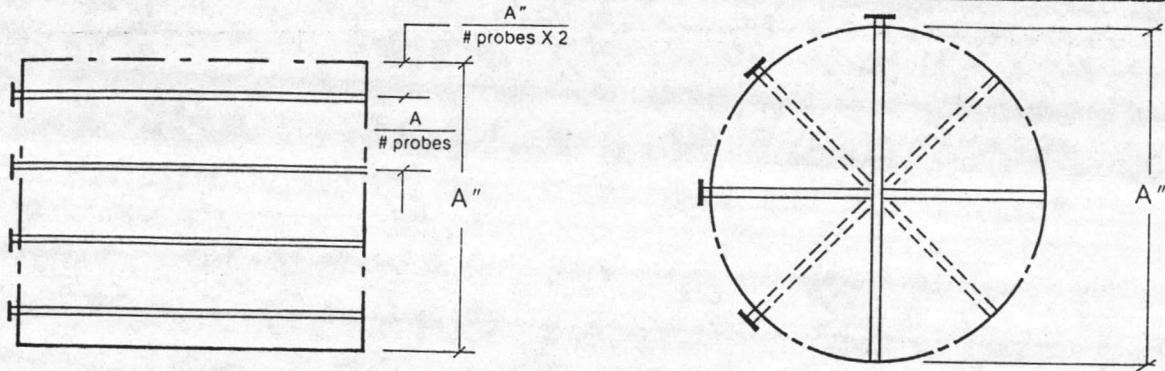
to find the ideal "corresponding" probe location, no valid statement of overall installation accuracy in terms of percentage of ACTUAL airflow can be issued for any single probe installation.

Listed in Fig. 1 are the predictable accuracies for multiple VOLU-probe installations, in terms of ACTUAL airflow, when installed in the indicated quantities of probes so as to traverse the entire airflow in the duct.



2.1.6.1

Fig. 1



FOR RECTANGULAR DUCTS

"A" Dimension — Inches		12	16	20	24	30	36	42	48	60	72	84	96	108	120
No. of VOLU-probes Required	95 + % Accuracy*	1	1	2	2	3	3	3	3	3	4	4	5	6	6
	98 + % Accuracy*	2	2	3	3	4	4	4	4	5	6	7	8	9	10

FOR CIRCULAR DUCTS

"A" Diameter — Inches		6	12	16	20	24	30	36	42	48	60	72	84	96	108	120
No. of VOLU-probes Required	95 + % Accuracy*	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3
	98 + % Accuracy*	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4

Note: Above VOLU-probe installations assume compliance with proper probe orientation and required minimum distances from air turbulence producing sources. (See Page 11).

*Percent of ACTUAL airflow

Fig. 2 Airflow pressure distribution on surface of cylinder inserted across flow

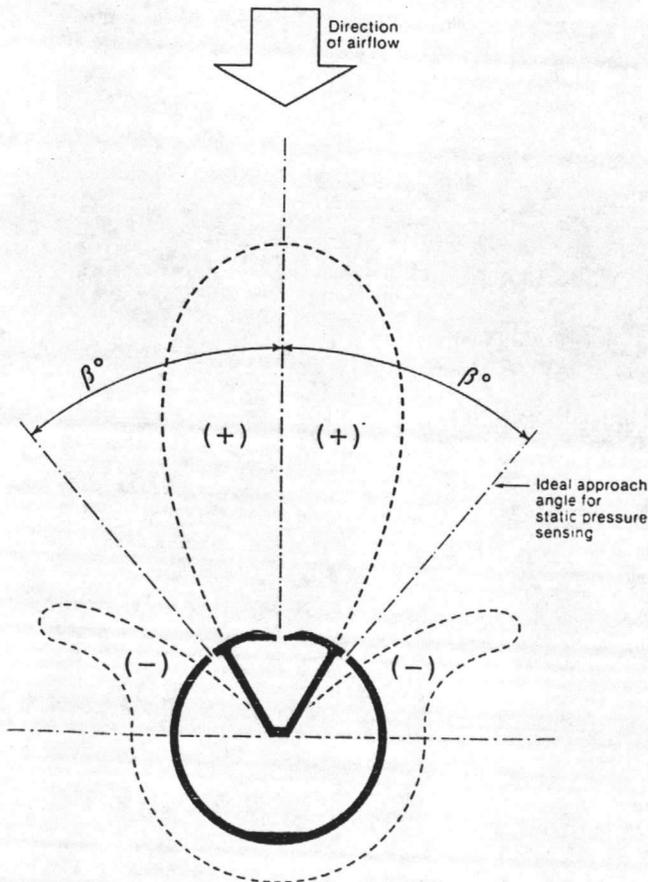
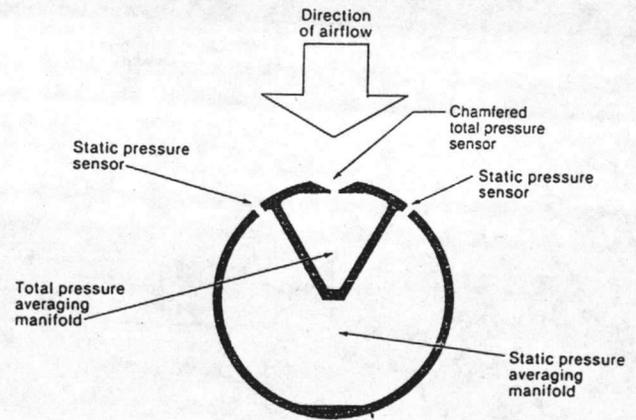


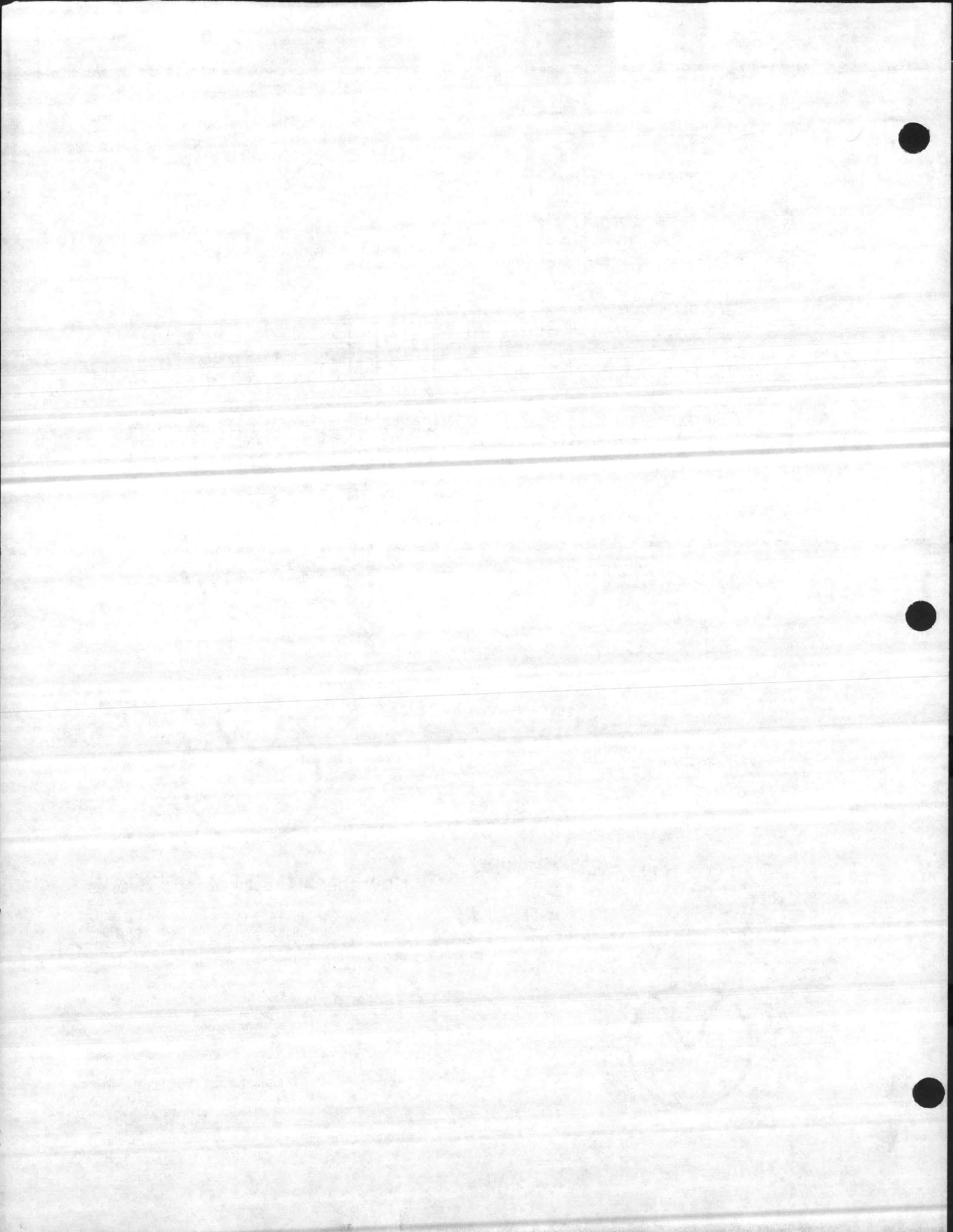
Fig. 3 Cross section of VOLU-probe



How the VOLU-probe™ works

The flow sensors (total and static pressure sensing ports) are located on the surface of the VOLU-probe at the ideal angles for accurate flow sensing (see Fig. 2). In addition the VOLU-probe design utilizes dual static pressure sensors on opposing surfaces of the VOLU-probe to minimize the effect of airflow direction on these probes. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure ($P_s + \text{part of } P_t$), whereas the other static sensor experiences a lower pressure ($P_s - \text{part of } P_t$) of the same magnitude, thereby balancing out the undesired effect of total pressure.

In addition, the total pressure sensing ports are chamfered at angles up to 60°. It is this unique design of offset static pressure and chamfered total pressure sensors (Fig. 1) that makes the VOLU-probe insensitive to approaching multi-directional, rotating airflow with pitch and yaw up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. The unique design of the VOLU-probe is covered by U.S. Patent No. 4,559,835.



the Operating and Installation Features

VOLU-probe™

■ EQUAL AREA TRAVERSE PROBE

Each VOLU-probe contains multiple total and static pressure sensors specifically and precisely located along the length of the probe to provide an equal area traverse of the duct or stack it is mounted into. For rectangular duct configurations, the VOLU-probe has the sensors spaced at equal distances along the probe. For circular duct configurations, the sensors are located at the centers of the equivalent concentric areas along the probe. All sensor locations are in full compliance with the formulation for duct traversing as set forth in *ASHRAE Handbook 1977 Fundamentals Edition*, Chapter 13, page 13.15, Subject: Pitot tubes.

■ HIGHLY ACCURATE FLOW SENSORS

The multiple total pressure sensors are located on the cylindrical VOLU-probe along the stagnation plane of the approaching airflow (see Fig. 2), thereby assuring the accurate sensing of these total pressure values without the need for the physical presence of forward projecting sensors into the air stream, and minimizing the possibility of impingement of airborne contaminants in or over the sensor holes.

The VOLU-probe static pressure sensor design utilizes the principle of dual offset static taps on opposing sides of the averaging manifold. As the airflow direction veers from the normal straight approach, one static tap is exposed to a lower pressure while the other static tap experiences a higher pressure of the same magnitude. This unique design of dual static taps is insensitive to flow-angle variations of as much as $\pm 20^\circ$ in the approaching air stream, thereby minimizing the effect of non-directional, turbulent, rotational airflow upon the sensor, and providing the most accurate method for sensing the static pressure of the air stream (without the benefit of an air straightener).

■ EQUAL WEIGHT AVERAGING MANIFOLDS

The averaging process in the airflow traverse probe is a critical process if accuracy is to be maintained. Unlike single point probes (such as the Pitot tube), where individual velocity pressure readings are recorded and mathematically averaged,

the airflow traverse probe must instantaneously average all the sensed pressures in a manner that gives equal weight to each pressure value and produce a final "averaged" value to be transmitted to the exterior of the probe for signal or control use.

To assure accuracy in the sensed-pressure averaging process, the VOLU-probe traverse probe utilizes the patented averaging process (U.S. Patent 3,685,355) called symmetrical averaging, which requires that all stages in the averaging process occur at a point where there is a balanced array of sensors present, thereby assuring that each sensed pressure is given the same "equal weight" in the averaging process.

■ COMMERCIAL HVAC DESIGN

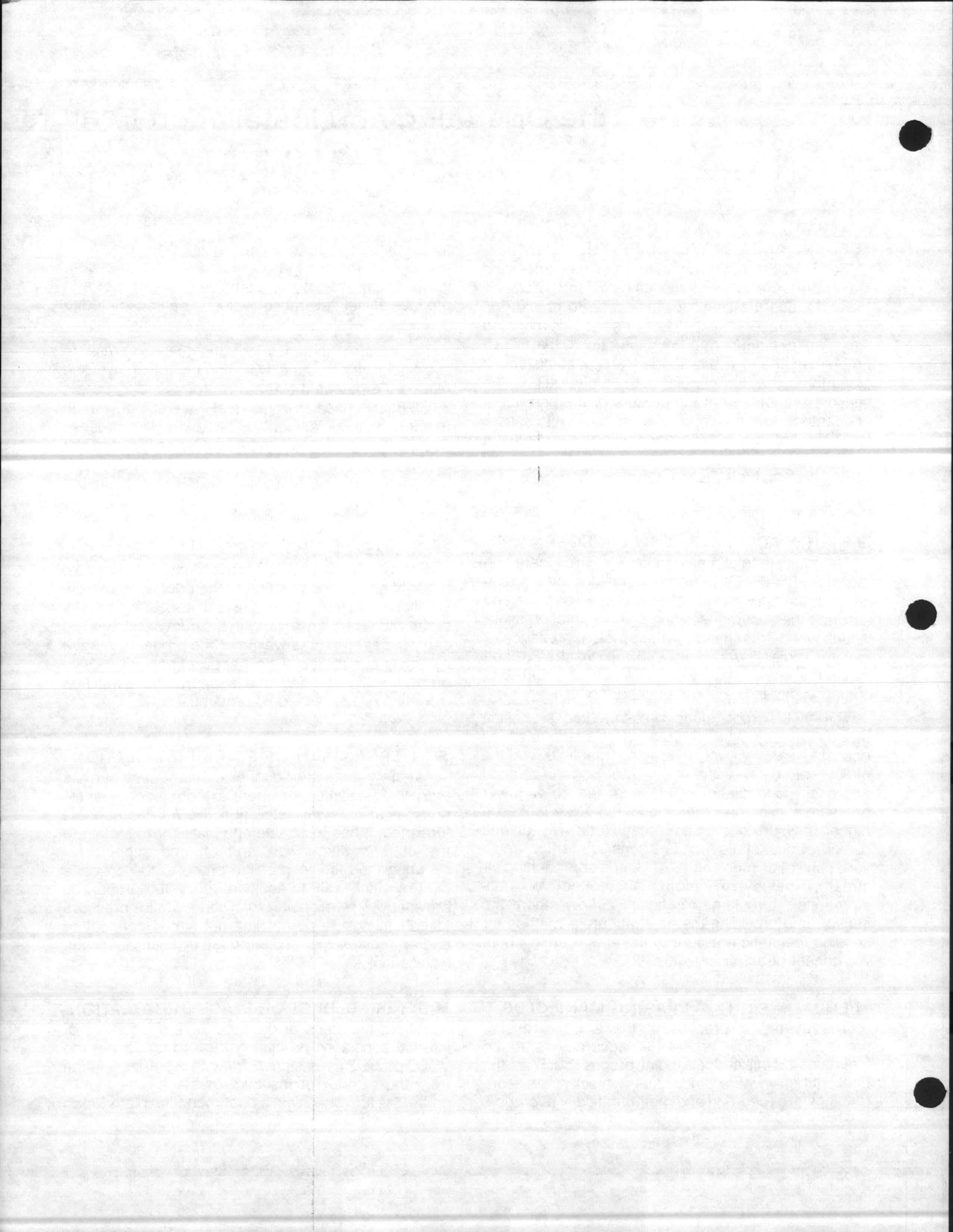
For commercial HVAC and small duct configurations, the light gauge construction of the duct walls usually will not permit the use of a self-supported VOLU-probe which requires rigidity in the duct casing wall to carry the cantilevered weight of the probe. For these light duty commercial HVAC applications, the VOLU-probe/1 with threaded end support and simplified mounting plate is the ideal product.

■ INTERNAL DUCT OR STACK INSTALLATION

Where the stack or duct size and access permits entry for installation, or where exterior inaccessibility prohibits an external installation, the VOLU-probe/2 is furnished. It has a suitable end plate for mounting to the duct or stack wall, and an end support for securing the other end of the probe to the opposite duct or stack wall. In addition, the VOLU-probe/2 is provided with midpoint total and static pressure takeoff fittings to permit internal signal connecting and/or manifolding of individual or multiple probe installations.

■ EXTERNAL DUCT OR STACK INSTALLATION

Where the stack or duct location, orientation, or internal conditions prohibit entry for installation, the VOLU-probe/3 is designed for complete installation from the exterior of the duct or stack. The VOLU-probe/3 is furnished with a duct mounting plate which



of the

AIRFLOW MEASURING TRAVERSE PROBE

serves to secure the mounting end of the probe as well as to seal the stack or duct opening used to insert the probe. In addition, an end support suitable for installation from outside the stack or duct is provided to secure the projected end of the probe. The total and static pressure takeoff fittings are provided on the duct mounting plate to permit external signal connecting and/or manifolding of individual or multiple probe installations.

■ SELF-SUPPORTED PROBE DESIGN

For stack, industrial HVAC, and process air duct applications, where access for mounting the probe may be limited to one location and/or where the heavy gauge or plate construction of the stack or duct casing or wall provide a rigid member, the self-supported VOLU-probe/4 is the ideal product. Where periodic removal of the probe may be required for cleaning, the self-supported VOLU-probe/4 eliminates the task of disengaging and re-engaging the probe at the end support when removing and reinserting the probe.

The VOLU-probe/4 is specially designed so that the self-support means, which rigidly secures the probe to the mounting plate, does not present any obstruction to the air stream or produce turbulence that might adversely affect the flow sensing capabilities of the probe.

■ EXTENDED-ACCESS CHAMBER DESIGN

For high temperature applications where an external covering of insulation material is present over the stack or duct, or where a masonry structure is present, the VOLU-probe is also designed with an extended-access chamber. This permits the probe mounting plate to be located outside the depth of the insulating covering, thereby maintaining full flexibility for the periodic removal of the probe (for cleaning, if required) without need to remove or disturb the insulating material.

The VOLU-probe/4 with extended-access chamber can be furnished in either the self-support or end-support design.

■ SIMPLICITY OF INSTALLATION

The family of VOLU-probe airflow traverse probes have been specifically designed to meet all the varied conditions present with existing stack or duct installations. The VOLU-probe/1 is designed for a simple, rapid installation in HVAC sheet metal ducts, requiring only two small holes (for probe insertion and end support) and several sheet metal screws. The VOLU-probe/2 permits complete installation from inside the stack or duct, while the VOLU-probe/3 and VOLU-probe/4 permit installation entirely from outside the stack or duct. Other than cutting the entry or end support holes (for VOLU-probe/1, 3, and 4), no other sheet metal or casing cutting or patching is required.

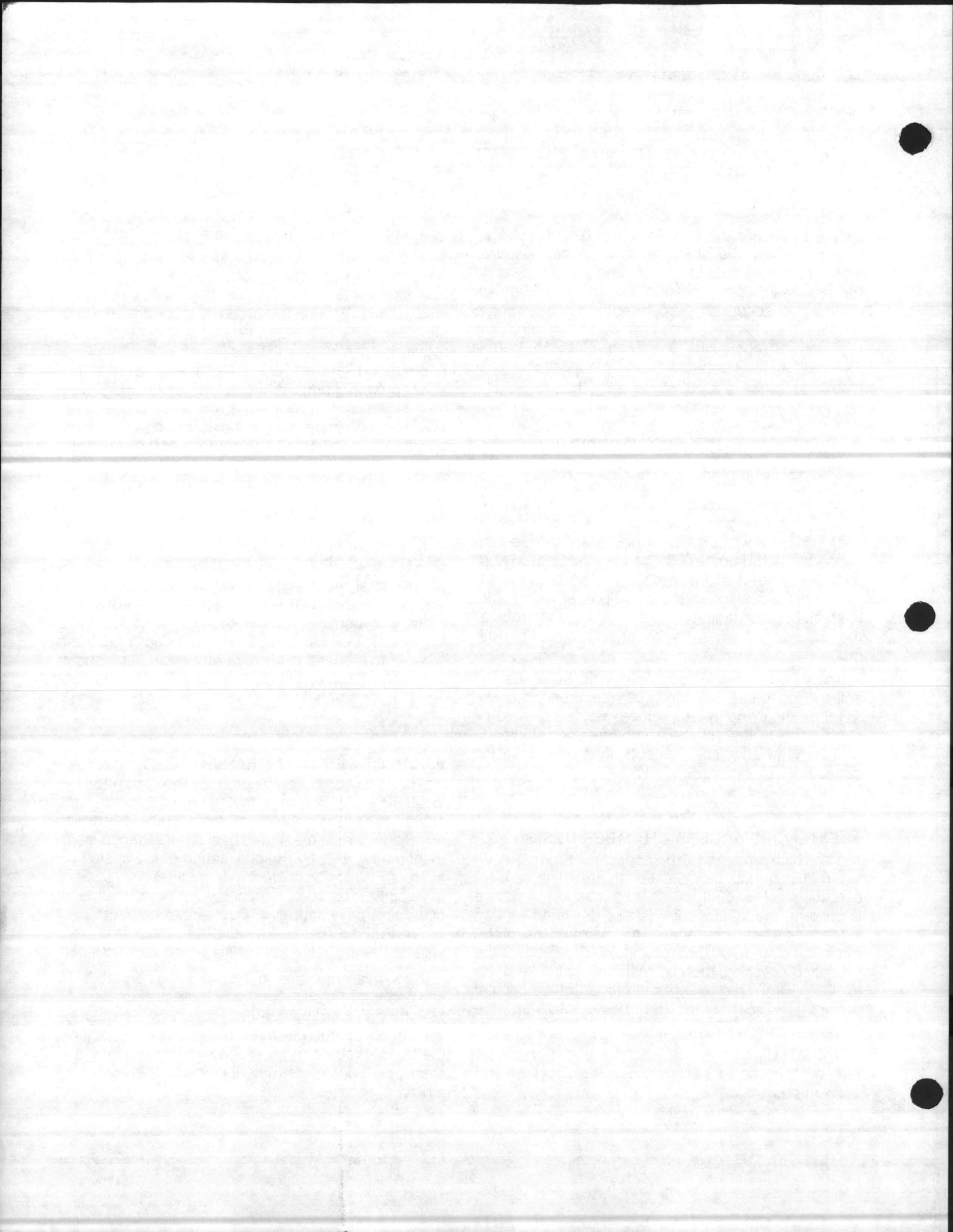
■ NO SENSOR PROTRUSIONS

The total and static pressure sensors of the VOLU-probe airflow traverse probes are all contained within the confines of the exterior surface of the cylindrical VOLU-probe. There are no protruding sensors to be bent, broken, or otherwise damaged in the process of installation or possible subsequent removal for cleaning.

■ DIRECT AIRFLOW MEASUREMENT

The VOLU-probe configuration, sensors, and their locations are designed so that the reading of total and static pressure obtained from the averaging manifolds can be measured by a differential gauge or manometer, and, by the application of the basic flow formulas [Velocity (in feet per minute) = $4005 \times \sqrt{\text{Velocity Pressure (in inches w.c.)}}$, and Volume (in cubic feet per minute) = Duct Area (in square feet) \times Velocity (in feet per minute)] the air velocity and volume flowing in the duct or stack can be calculated.

Also available are direct reading portable or stationary air velocity and/or volume meters (see Air Monitor page Airflow Meter brochure) which can be used in conjunction with the VOLU-probe. In addition, the VOLU-probe can be utilized with pneumatic and electronic control-instrumentation for the control of airflow processes.





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DATA
SHEET

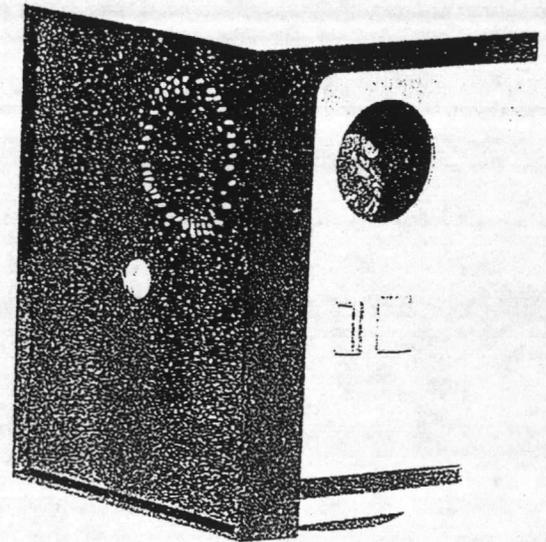
R471

PNEUMATIC ELECTRIC RELAY

GENERAL DESCRIPTION

The R471 Pneumatic-Electric Relays are used in control systems requiring conversion of gradual air pressure changes to positive electrical switching actions. Typical applications are starting/stopping unit ventilator and fan coil motors, unit heaters, and air handling unit fans.

The R471 incorporates a non-metallic diaphragm that is displaced by air pressure changes. The diaphragm in turn actuates a heavy duty electrical contact mechanism.



SPECIFICATIONS

MODEL NUMBER: R471-1

CONTROL SWITCHING ACTION: Three wire, single pole, double throw.

AIR CONNECTION: 3/16" (4.76) Nipple for 1/4" (6.35) Tubing

SET POINT RANGE: 2 to 25 psig (13.79 to 172.4 kPa)

MAXIMUM PRESSURE: 30 psig (206.8 kPa)

DIFFERENTIAL: 2.0 psi Fixed (13.79 kPa)

AMBIENT TEMPERATURE: 32° to 140°F (0° to 60°C)

CONDUIT OPENING: 1/2" Conduit size

ELECTRICAL RATING:

21 Amps non-inductive @ 120-240-480 VAC

1 HP @ 120 VAC

2 HP @ 240 VAC

ORDERING INFORMATION: SPECIFY: Model Number

ORDER FROM:

Local Office of

CONTROL SYSTEMS DIVISION

ROBERTSHAW CONTROLS COMPANY

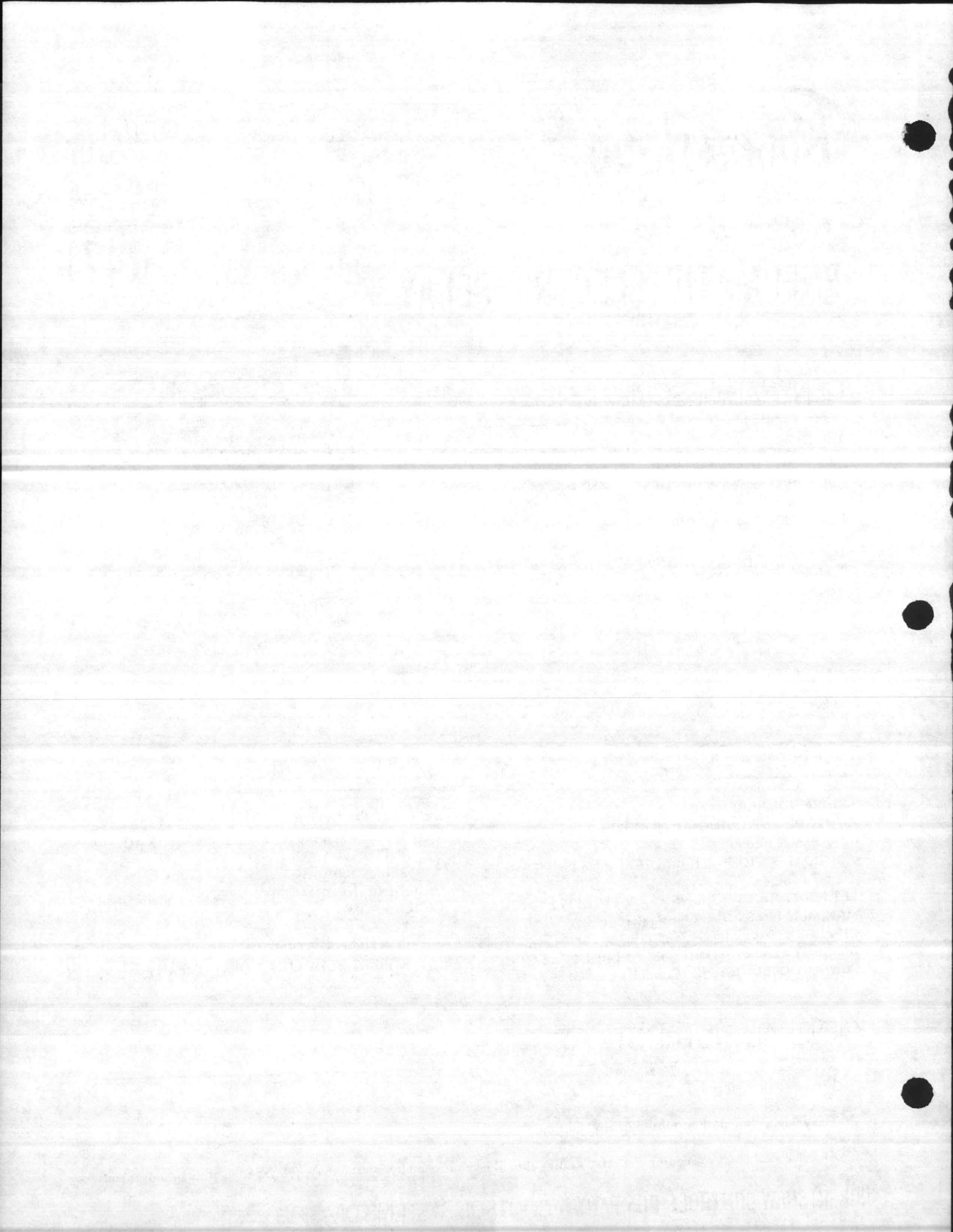
or office noted below.

GENERAL INSTRUCTIONS

1. Use on control air only.
2. This relay will operate mounted in any position.
3. Any electrical loads exceeding the relay's rating should be controlled by intermediate relays, contactors or motor starters.

ROBERTSHAW CONTROLS COMPANY • CONTROL SYSTEMS DIVISION

1800 GLENSIDE DRIVE
P. O. BOX 27606 • RICHMOND, VIRGINIA 23261



INSTALLATION INSTRUCTIONS

PNEUMATIC-ELECTRIC RELAYS

R471 R472

GENERAL DESCRIPTION

Model R471 and R472 pneumatic-electric relays are used in pneumatic control system applications requiring conversion of gradual air pressure changes to positive electrical switching action.

The R471-1 relay has single-pole, double-throw switching action; the R472-1 has double-pole, double-throw action. These relays should be operated by control air only with a maximum pressure of 30 psig (207 kPa). Electrical ratings are listed in Table I.

TABLE I

ELECTRICAL RATING (EACH SWITCH)
21 Amps non-inductive @ 120-240-480 VAC
1 HP @ 120 VAC
2 HP @ 240 VAC

INSTALLATION

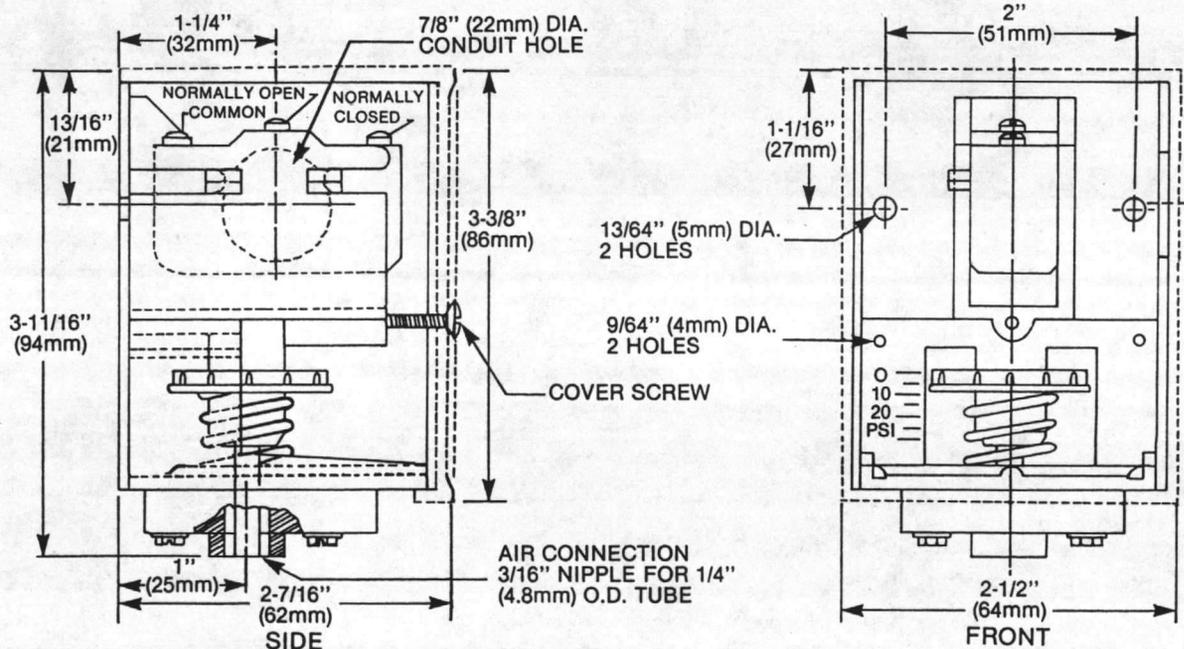


FIGURE 1 — TYPICAL RELAY APPEARANCE AND DIMENSIONS (R471 SHOWN).

Model R471 and R472 relays will operate in any position. See Figures 1 and 2 for relay details.

Field Mounting: Remove the slotted cover screw and the relay cover. Fasten the relay to any surface by means of the two mounting holes in the back of the metal enclosure.

Panel Mounting: Remove the relay cover. Spread the sides of the metal enclosure to release the relay assembly. Discard the enclosure and attach the relay assembly to the panel backplate by means of the two mounting holes in the relay body (suitable for #8 screws).

Wiring: Screw-type terminals are provided for all switch wiring. A conduit hole is provided in the side of the metal relay enclosure (when used).

Air Connection: A sleeved 3/16\"

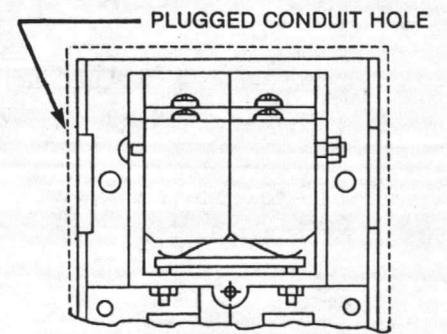
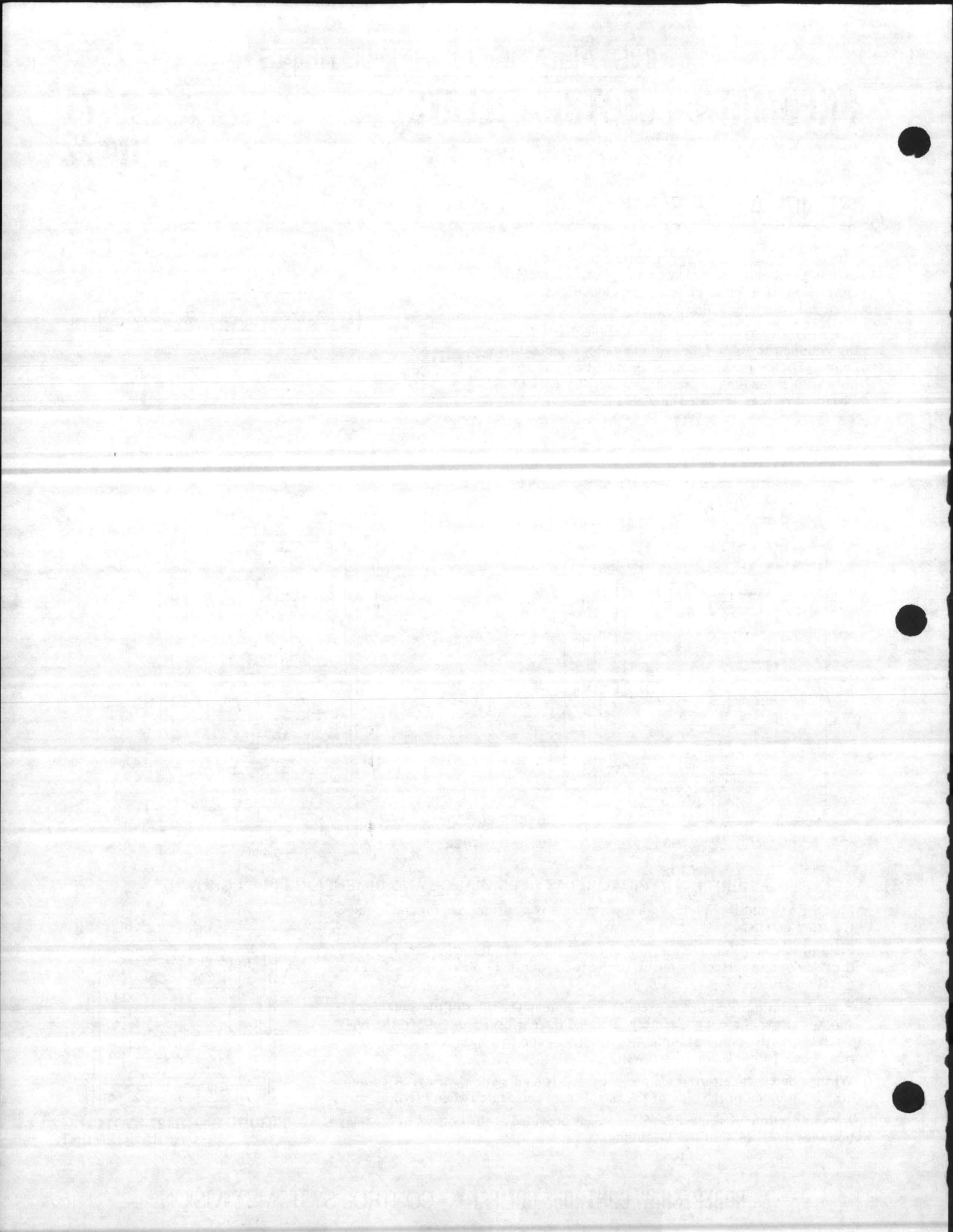


FIGURE 2 — R472 SWITCH ARRANGEMENT.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMATIC-ELECTRIC RELAYS

R471
R472

CALIBRATION

Model R471 and R472 pneumatic-electric relays are used in pneumatic control system applications requiring conversion of gradual air pressure changes to positive electrical switching action.

The R471-1 relay has single-pole, double-throw switching action; the R472-1 has double-pole, double-throw action. These relays should be operated by control air only with a maximum pressure of 30 psig (207 kPa). Electrical ratings are listed in Table I.

These relays are not factory calibrated.

TABLE I

ELECTRICAL RATING (EACH SWITCH)
21 Amps non-inductive @ 120-240-480 VAC
1 HP @ 120 VAC
2 HP @ 240 VAC

ADJUSTMENT

The switching **differential** of these relays is not adjustable. It is fixed at approximately 2 psi (14 kPa) for the R471 and 3 psi (21 kPa) for the R472.

The **setpoint** ranges of these relays are as follows:

- R471-1 (SPDT): 2 to 25 psig (14 to 172 kPa)
- R472-1 (DPDT): 4 to 20 psig (28 to 138 kPa)

The device setpoint may be adjusted by removing the enclosure cover (retained by a slotted screw in the front of the cover) and then rotating the adjustment disc until the bottom surface of the disc is aligned with the desired value on the adjacent pressure scale (see Figure 1). For maximum accuracy, the switch points should be measured with a pressure gauge in the signal line.

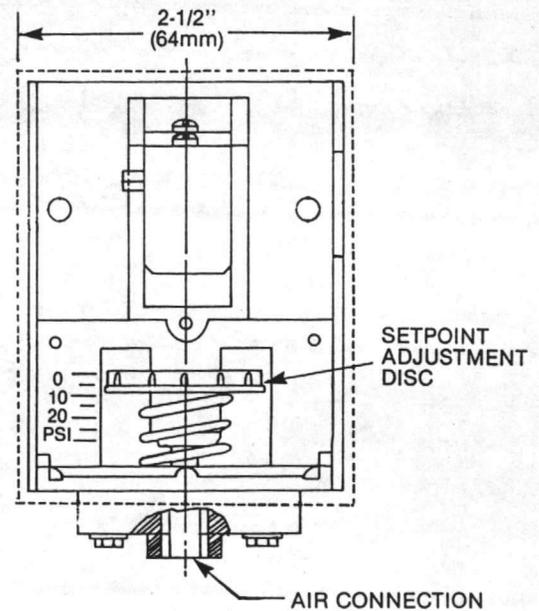
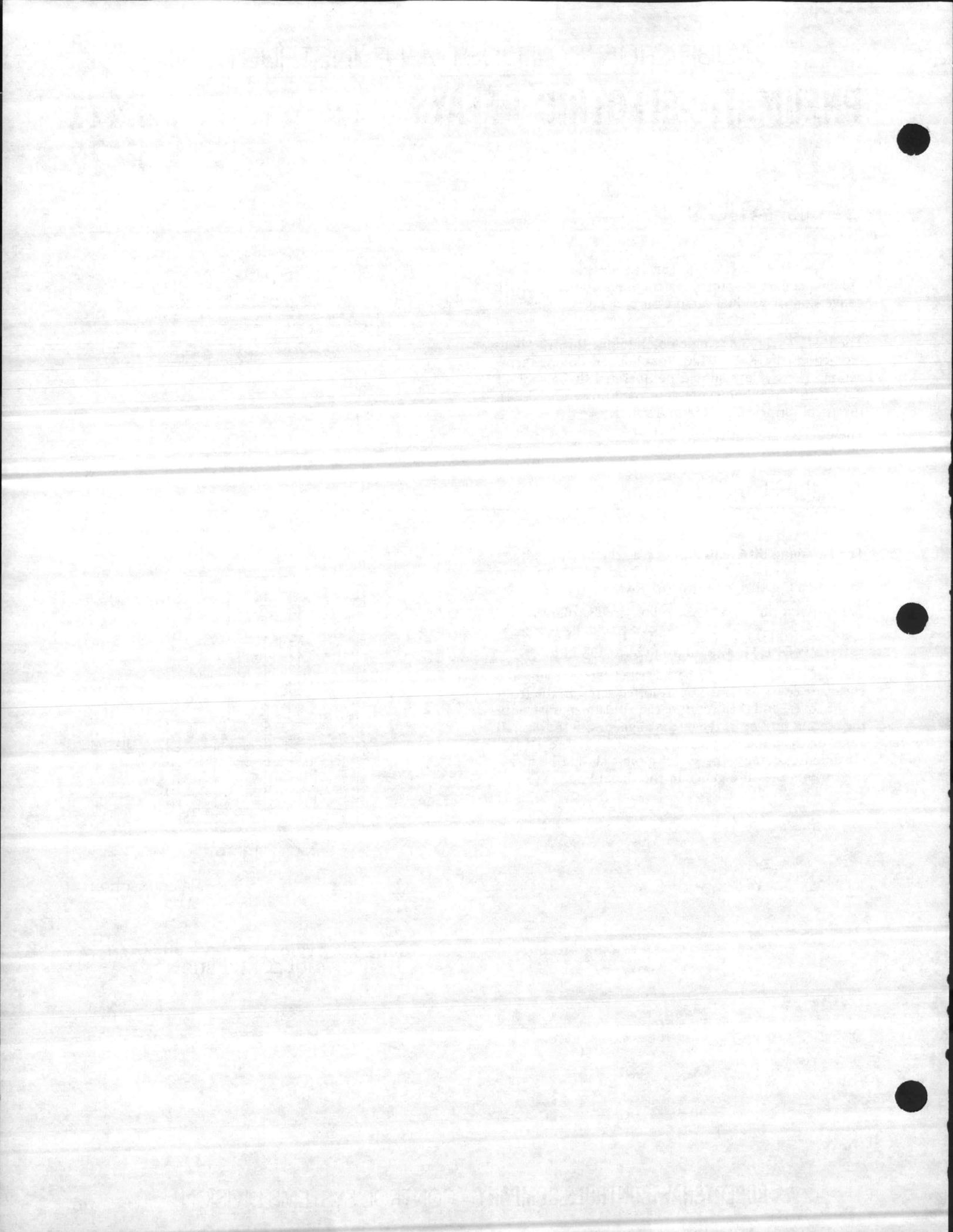


FIGURE 1 — TYPICAL RELAY APPEARANCE (MODEL R471 SHOWN).





DATA SHEET

MODELS

R429

R430

ELECTRIC PNEUMATIC RELAYS

GENERAL DESCRIPTION

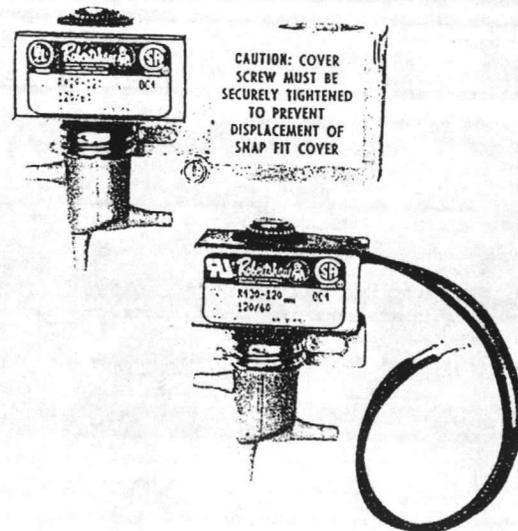
The Model R429 and R430 Electric-Pneumatic Relays are solenoid air valves for two-position action. Their three tubing connections are marked 1 (normally-closed), 2 (normally-open) and 3 (common). These 3-way air valves are designed for applications where control air is to be supplied to or exhausted from a pneumatic device, or where control air is to be diverted from one device to another, in response to an on-off electrical signal. Supply, exhaust and diverting operations depend on tubing connections.

All three tubing connections are of the barbed type, sized for 1/4 inch (6 mm) OD polyethylene tubing, or other suitable tubing.

ACTION: Coil Deenergized: Ports 2 and 3 connected, Port 1 blocked.

Coil Energized: Ports 1 and 3 connected, Port 2 blocked.

These relays may be mounted in any position, and are designed for continuous duty cycle. Valve body may be rotated 360° if necessary.



SPECIFICATIONS

MODEL NO. R429 (Splice Box Model)

MODEL NO. R430 (Open Frame Model)

POWER CONSUMPTION: 4 watts.

HEAT RISE: 120° F. (49° C) Max.

AIR CONNECTIONS: 3/16" O.D. Barbed Fittings, for 1/4" O.D. (6 mm) Polyethylene Tubing, or equivalent.

CONSTRUCTION: Outer Body: Plastic
Internal: Nitrile, Copper, Stainless Steel

NOISE: No Audible Hum or Vibration at 90% Rated Voltage at 3 FT. (.9M).

INTERNAL LEAKAGE: 2.44 in³ (40 cm³) per minute @ 50 psi (345kPa) Δ p.

EXTERNAL LEAKAGE: Bubble Tight

MAXIMUM OPERATING PRESSURE: 30 psig

BURST PRESSURE: 250 psig (1724kPa) minimum

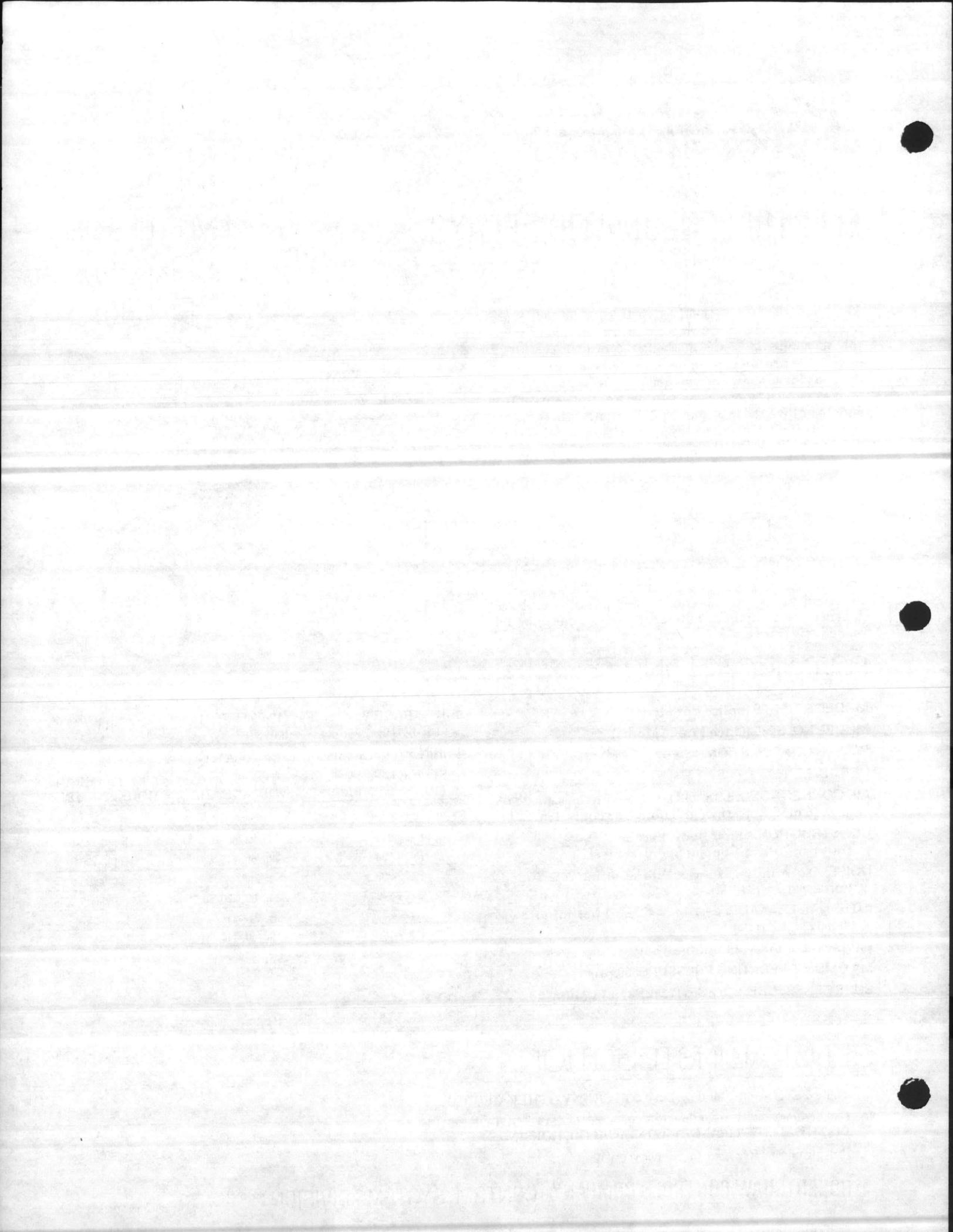
AIR CAPACITY: .42 SCFM (12,000 SCCM) at 20 psig (138kPa) with 1 psi (7kPa) drop. CV = 0.075

WIRING: Thermoplastic leads, #18 AWG

SPLICE BOX TYPE MODEL NUMBERS	VOLTAGE / HZ	OPEN FRAME TYPE MODEL NUMBERS
R429-24	24/60	R430-24
R429-2450	24/50	R430-2450
R429-120	120/60, 110/50	R430-120
R429-208	208/60	R430-208
R429-240	240/60, 220/50	R430-240
R429-277	277/60	R430-277
R429-480	480/60, 440/50	R430-480

GENERAL INSTRUCTIONS

1. To be used on control air only. DO NOT USE ANY OTHER MEDIUM.
2. Coil becomes hot when continuously energized. LOCATE OUT OF REACH. DO NOT ALLOW TUBING TO CONTACT COIL HOUSING.
3. Provide normal free space for proper ventilation.



OPERATING DATA

<p>PRESSURE RANGE: Vacuum to 150 PSIG</p> <p>ORIFICE (ALL PORTS): 0.19" (4.8 mm)</p> <p>FLOW CONSTANT: INLINE $C_v = 0.4 (1/8")$ MANIFOLD $= 0.4 (1/4")$</p> <p>AMBIENT TEMPERATURE RANGE: All valves rated 0°F to 140°F (-18° to 60°C). For UL purposes, maximum is 40°C (104°F). Consult factory outside these ranges.</p>	<p>Pressures shown are minimum and maximum safe working pressures</p> <p>FLUIDS: Air and inert gases</p> <p>LUBRICATION: Not required, but if lubrication is used, a light aniline point oil is recommended.</p> <p>ELECTRICAL: AC 120/60 DC 24 VOLT ABOVE COILS</p> <p>LEADS: General Purpose Class A, cont. duty, encapsulated except 2.5 and 1.0 watts which are varnished #18 AWG x 18" std.</p>
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HOW TO ORDER

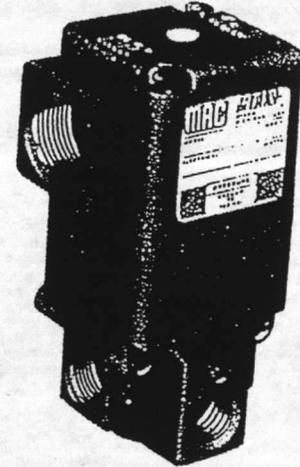
200B SERIES

Select the desired model number from the tables below and add the desired voltage, manual operator and electrical enclosure to obtain complete model number, e.g.: 224B-111B.

2.1.13 EP

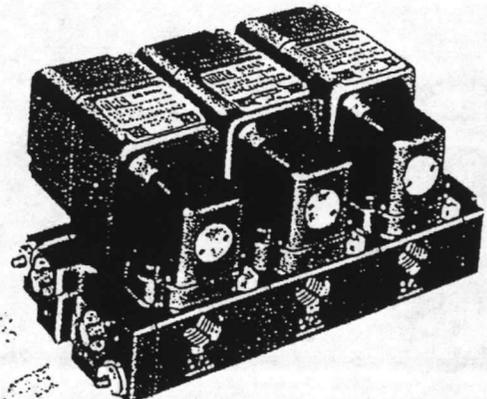
INLINE MODELS

MODEL NO.		DESCRIPTION
PORT SIZE		
1/8"	1/4"	
224B-	225B-	*†Universal 2- or 3-Way (N.C. & N.O.)
274B-	275B-	N.C. Only 3-Way



MANIFOLD MODELS

MODEL NO.		DESCRIPTION	MODEL NO.	
VALVE LESS BASE			VALVE WITH BASE	
			1/8"	1/4"
†250B-	Universal 3-Way (N.C. & N.O.)	Std. Sol.	†256B-	†257B-
		Exp. Proof Solenoid	258B-	259B-
†260B-	Universal 2-Way (N.C. & N.O.)	Std. Sol.	†266B-	†267B-
		Exp. Proof Solenoid	268B-	269B-
280B-	N.C. Only 3-Way	Std. Sol.	286B-	287B-
		Exp. Proof Solenoid	288B-	289B-



SOLENOID OPTIONS:

EXAMPLE: 225B-11 1 B

XX AC Voltage		XX DC Voltage		X Manual Operators		X Enclosure	
11	*†120/60, 110/50 24 VDC (6W)	50	*†24 VDC (6.0W)	0	*†No Operator	A	JIC w/1/2" NPS Conduit
12	*†240/60, 220/50	51	24 VDC (4.5W)	1	*†Non-Locking Recessed (Std.)	B	†Grommet
22	*†24/50-60	52	24 VDC (2.5W)	2	*†Locking Recessed	C	*†Conduit 1/2" NPS
26	*†480/60, 440/50	53	24 VDC (1.0W)	3	*†Non-Locking Extended	E	Explosion Proof ②
		55	12 VDC (6.0W)	4	*†Locking Extended	N	*†Conduit 1/2" NPS w/Grd. Wire
		60	*†12 VDC (8.5W)	5	No Operator with Light ①		
		61	*†24 VDC (8.5W)	6	Non-Locking ① Recessed w/Lgl.		
		68	*†120 VDC	7	Locking ① Recessed w/Lgl.		
		69	250 VDC	8	Non-Locking ① Extended w/Lgl.		
		78	24VDC (24.0W) ③	9	Locking ① Extended w/Lgl.		

For Voltages Not Shown, Consult Factory.

- ① Lights are available for 120/60, 110/50 or 240/60 and 220/50 with JIC enclosure only ("A").
- ② Explosion proof enclosure supplied with No Operator only ("O").
- ③ Not recommended for extended energization periods. Available as Class F only. Specify: MOD CLSF.

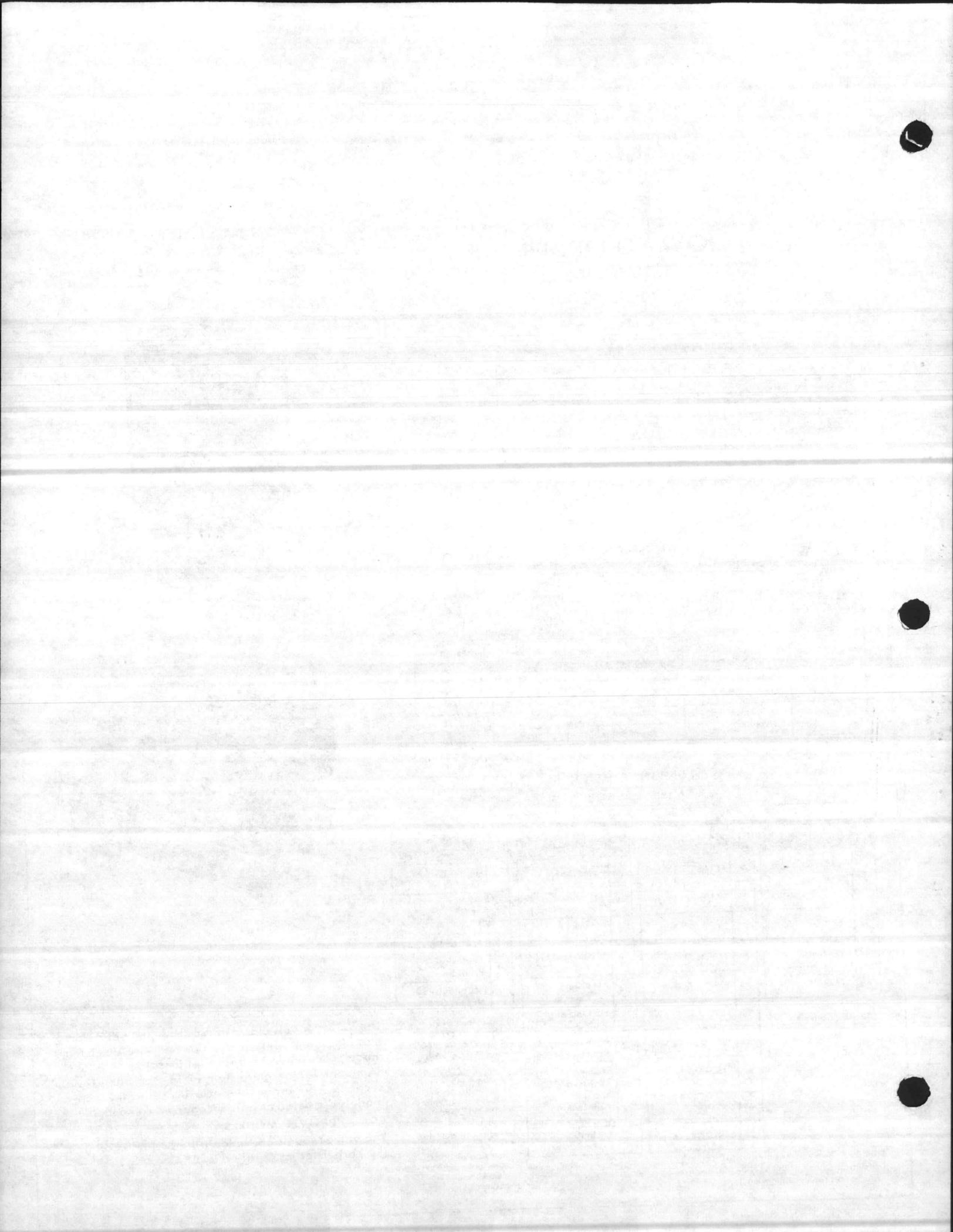
UL APPROVED MODELS

The Valve Models above in the "How to Order" section identified with the symbol ("*") are UL Listed models for General Purpose—Class A service (See "Ambient Temperature Range" in Operating Data section). The grommet enclosures for the same models are listed as a UL recognized component.

CSA APPROVED MODELS

The Valve Models above identified with the symbol ("†") are listed as Certified by CSA.

See "200 Series—Supplemental Technical Data" at the back of this section for modifications, accessories and dimensions.



Robertshaw



T318 - 2.1.8.5
AQ2

DATA SHEET

MODEL

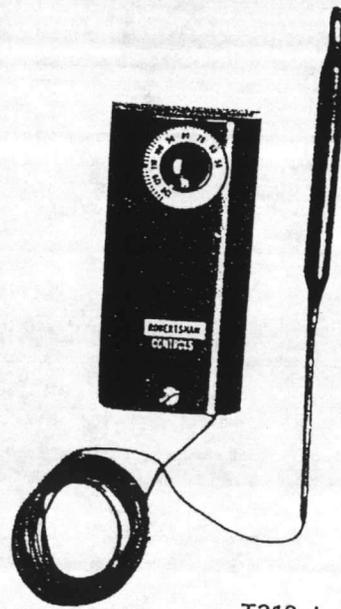
T316 THROUGH T319

REMOTE BULB TEMPERATURE CONTROLLERS ELECTRIC

GENERAL DESCRIPTION

T316 through T319 Remote Bulb Temperature Controls feature rugged switch mechanisms enclosed in dustproof housings, with highly sensitive remote bulbs, and capillary tubes to permit mounting of switches and bulbs in any desired positions. Externally set indicators are calibrated in °F.

These controls are suitable for use in air or with liquids that are non-corrosive to copper, and may be used with accessory wells 100-52, 100-53, and 100-54 as listed below. Applications include high-limit, reverse-action, heating/cooling, and outdoor thermostat functions, depending on model selected.

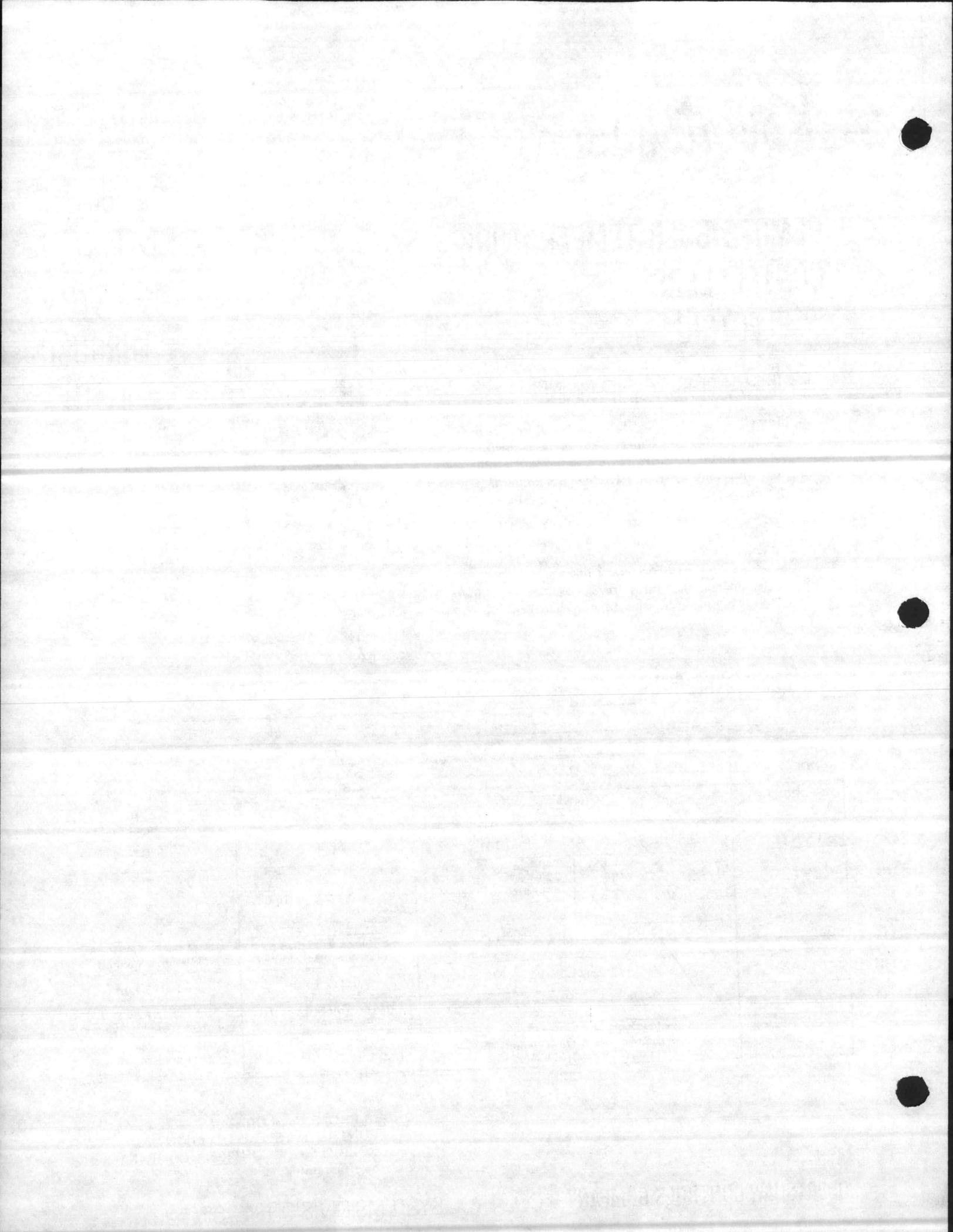


T318 shown

SPECIFICATIONS

MODEL	T316		T317		T318	T319	
RANGE	100° to 240°F (38° to 116°C)		100° to 240°F (38° to 116°C)		50° to 130°F (10° to 54°C)	-30° to 90°F (-18° to 48°C)	
DIFFERENTIAL (Adjustable)	5° to 45°F (2.8° to 25°C)		5° to 45°F (2.8° to 25°C)		3.5° to 14°F (1.9° to 7.8°C)	4.5° to 40°F (2.5° to 22°C)	
SWITCH ACTION	opens on rise (NC)		closes on rise (NO)		SPDT	SPDT	
SWITCH RATING	240 Vac 120 Vac 25 Vac 0.3 - 12 Vdc	6.0 A 10.0 A 6.0 A 1.0 A	240 Vac 120 Vac not suited to lower voltages	7.0 A 14.0 A	240 Vac 208 Vac 120 Vac pilot duty: 24-600 Vac	8.0 A 9.2 A 16.0 A 125 VA	240 Vac 120 Vac 3.7 A 7.4 A
BULB	3-1/2" long x 7/16" diameter (89 mm x 11 mm)		3-1/2" long x 7/16" diameter (89 mm x 11 mm)		5" long x 3/8" diam. (127 mm x 9.5 mm)	5-3/4" long x 3/8" diam. (146 mm x 9.5 mm)	
CAPILLARY	5 feet (1.5 m)		5 feet (1.5 m)		8 feet (2.4 m)	8 feet (2.4 m)	
HOUSING	5-3/8" x 2-5/16" x 2-9/16" (137 mm x 59 mm x 65 mm)		5-3/8" x 2-5/16" x 2-9/16" (137 mm x 59 mm x 65 mm)		4-13/16" x 2-5/32" x 1-3/16" (122 mm x 55 mm x 30 mm)	5-3/8" x 2-5/16" x 2-9/16" (137 mm x 59 mm x 65 mm)	
WELLS	100-52: 1/2" MPT; 4-7/16" (113 mm) overall; insertion approx. 3-1/8" (79 mm). To 100 psig (689 Kpa); 250°F (121°C)		100-53: 1/2" MPT; for T318		100-54: 1/2" MPT; 7-5/8" (194 mm); insertion approx. 6" (152 mm)	100-54: 1/2" MPT; 7-5/8" (194 mm); insertion approx. 6" (152 mm)	

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.



INSTALLATION INSTRUCTIONS

ELECTRIC TEMPERATURE CONTROLLERS

REMOTE BULB

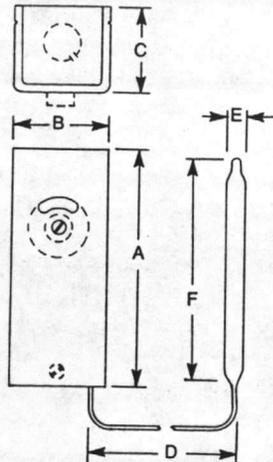
T316
T317
T318
T319

GENERAL DESCRIPTION

Model T316 through T319 electric remote bulb temperature controllers are suitable for use in air or with liquids that are non-corrosive to copper and may be used with the immersion wells listed below (order separately). All models have adjustable differentials and line voltage contact ratings (see Table I).

INSTALLATION

Controllers: These controllers will operate in any position. They can be wall, duct or panel mounted using the four slotted mounting holes in the back of the controller case.



MODEL		T316 & T317	T319	T318
DIMENSIONS	A	5-3/8" (137mm)		4-13/16" (122mm)
	B	2-5/16" (59mm)		2-5/32" (55mm)
	C	2-9/16" (65mm)		1-13/16" (46mm)
	D	5 ft. (1.5m) ^a	8 ft. (2.4m)	8 ft. (2.4m)
	E	7/16" (11mm)	3/8" (10mm)	3/8" (10mm)
	F	3-1/2" (90mm)	5-3/4" (146mm)	5-5/8" (143mm)
SETPOINT DIAL	90° Window		360° Window	
SETPOINT ADJ.	Screwdriver Slot		Knob	
COVER REMOVAL	Detents (Friction)		Slotted Screw	
1/2" CONDUIT ENTRY	Knockouts in Top, Bottom and Back		Hole in Bottom	

a — Armored capillary on T316.

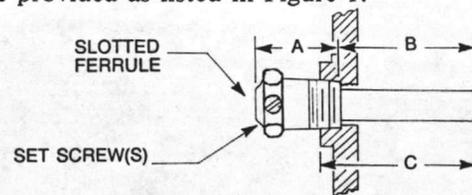
FIGURE 1 — CONTROLLER DIMENSIONS AND DETAILS.

TABLE I

MODEL	SETPOINT RANGE	DIFFERENTIAL (Adjustable)	SWITCH ACTION	MOTOR RATING, AMPS			OTHER RATINGS
				120 VAC	208 VAC	240 VAC	
T316	100° to 240°F (38° to 116°C)	5° to 45°F (2.8° to 25°C)	SPST (NC) Open on Rise	10.0	—	6.0	6A @ 25 VAC 1A @ 0.3 to 12 VDC
T317			SPST (NO) Close on Rise	14.0	—	7.0	—
T318	50° to 130°F (10° to 54°C)	3.5° to 14°F (1.9° to 7.8°C)	SPDT	16.0	9.2	8.0	Pilot Duty: 125 VA @ 24 to 600 VAC
T319	-30° to 90°F (-18° to 48°C)	4.5° to 40°F (2.5° to 22°C)	SPDT	7.4	—	3.7	—

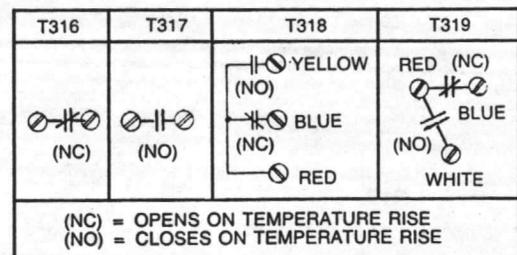
Sensing Bulbs: The remote sensing bulbs can be mounted in any position in an immersion well (see Figure 2), in a duct (bulb holder model 100-02 may be ordered separately) or in the outside air (O.A. shield model 100-13 may be ordered separately).

Electrical: The electrical compartment is exposed by removing the controller cover. Screw terminals are provided for wire connections (see Figure 3) and conduit openings are provided as listed in Figure 1.



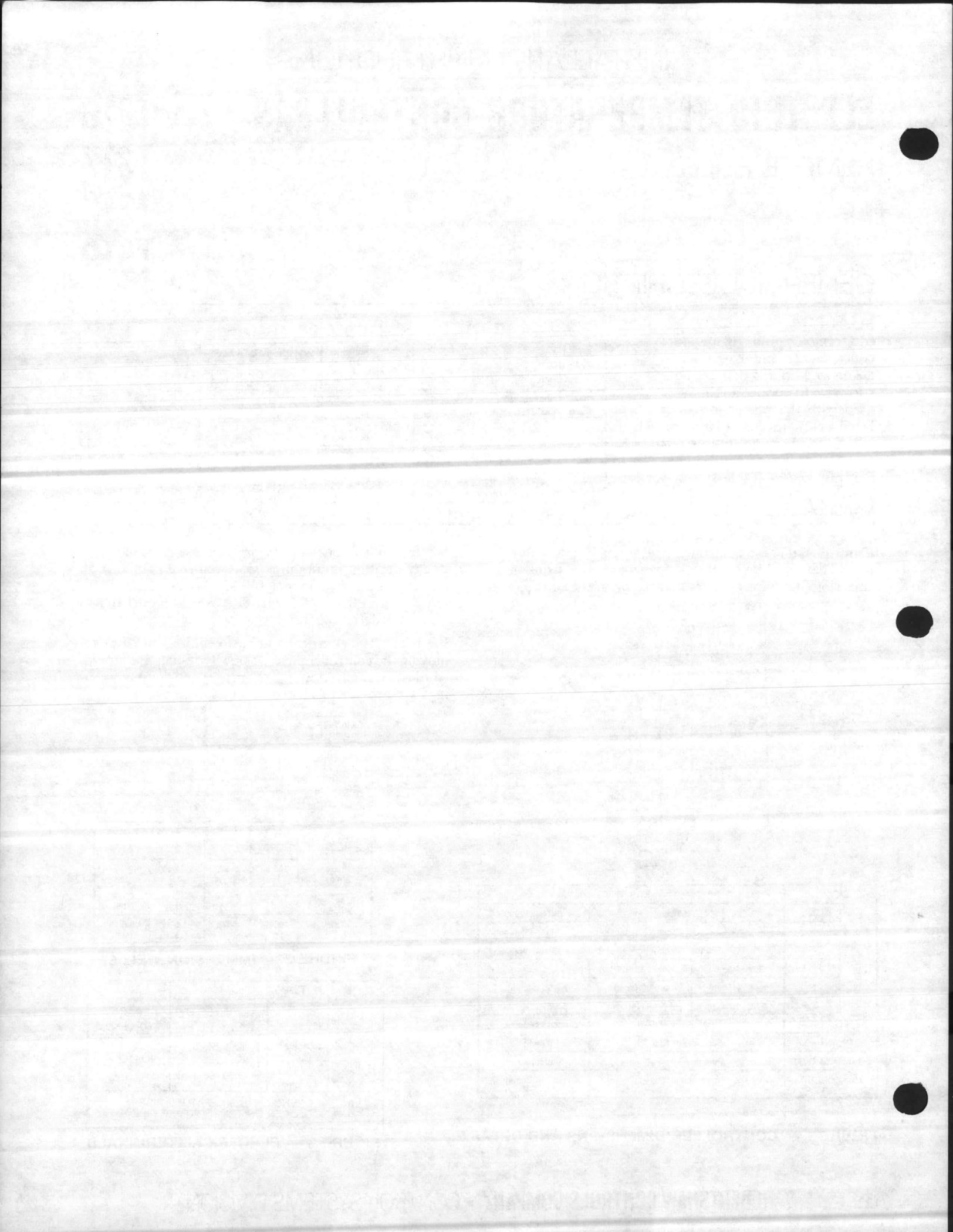
CONTROLLER MODEL	WELL MODEL	DIMENSIONS — INCHES (mm)		
		A	B	C
T316 & T317	100-52	1-5/8 (41)	2-13/16 (71)	3-1/8 (79)
T318	100-53	2-1/16 (52)	5-13/16 (148)	6-1/8 (156)
T319	100-54	1-5/8 (41)	6 (152)	6-5/16 (160)

FIGURE 2 — IMMERSION WELLS.



(NC) = OPENS ON TEMPERATURE RISE
(NO) = CLOSSES ON TEMPERATURE RISE

FIGURE 3 — ELECTRICAL TERMINALS.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

ELECTRIC TEMPERATURE CONTROLLERS

REMOTE BULB

T316
T317
T318
T319

CALIBRATION

Model T316 through T319 electric remote bulb temperature controllers are suitable for use in air or with liquids (non-corrosive to copper) when used with immersion wells. All models have adjustable differentials and line voltage contact ratings (see Table I). Field calibration is not required.

ADJUSTMENT

TABLE I

MODEL	SETPOINT RANGE	DIFFERENTIAL (Adjustable)	SWITCH ACTION	MOTOR RATING, AMPS			OTHER RATINGS
				120 VAC	208 VAC	240 VAC	
T316	100° to 240°F (38° to 116°C)	5° to 45°F (2.8° to 25°C)	SPST (NC) Open on Rise	10.0	—	6.0	6A @ 25 VAC 1A @ 0.3 to 12 VDC
T317			SPST (NO) Close on Rise	14.0	—	7.0	
T318	50° to 130°F (10° to 54°C)	3.5° to 14°F (1.9° to 7.8°C)	SPDT	16.0	9.2	8.0	Pilot Duty: 125 VA @ 24 to 600 VAC
T319	-30° to 90°F (-18° to 48°C)	4.5° to 40°F (2.5° to 22°C)	SPDT	7.4	—	3.7	—

Differential: See Table I for differential adjustment ranges. Adjustments are accessible by removing the controller covers.

A. Models T316, T317 and T319: See Figure 1. First, insert a screwdriver in adjusting slot "A" and turn the setpoint dial until the lower differential temperature is at indicator "B" ("cut-in" for T317, "cut-out" for T319, Red to Blue for T319). Then turn slotted differential screw "C" until movable indicator "D" is at the higher differential temperature ("cut-out" for T317, "cut-in" for T318, Red to White for T319).

B. Model T319: See Figure 2. The T319 is shipped with a minimum differential setting which may be increased by sliding the differential lever (right side of contact block) to the desired value by reference to the scale multipliers of the minimum value (X2, X3 and X4). The contacts make Red to Blue at the setpoint minus the differential.

Setpoint: See Table I for setpoint ranges. Setpoint adjustments are external for all models, screwdriver slot "A" for the T316, T317 and T319, and a knurled knob for the T318.

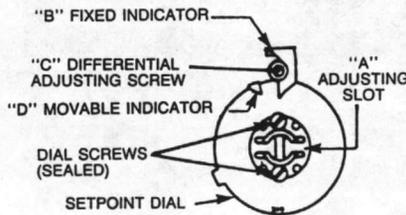


FIGURE 1 — MODELS T316, T317 & T319.

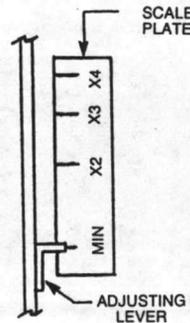
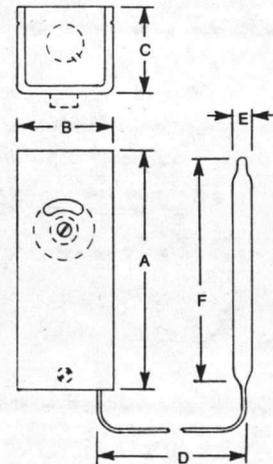


FIGURE 2 — MODEL T318.



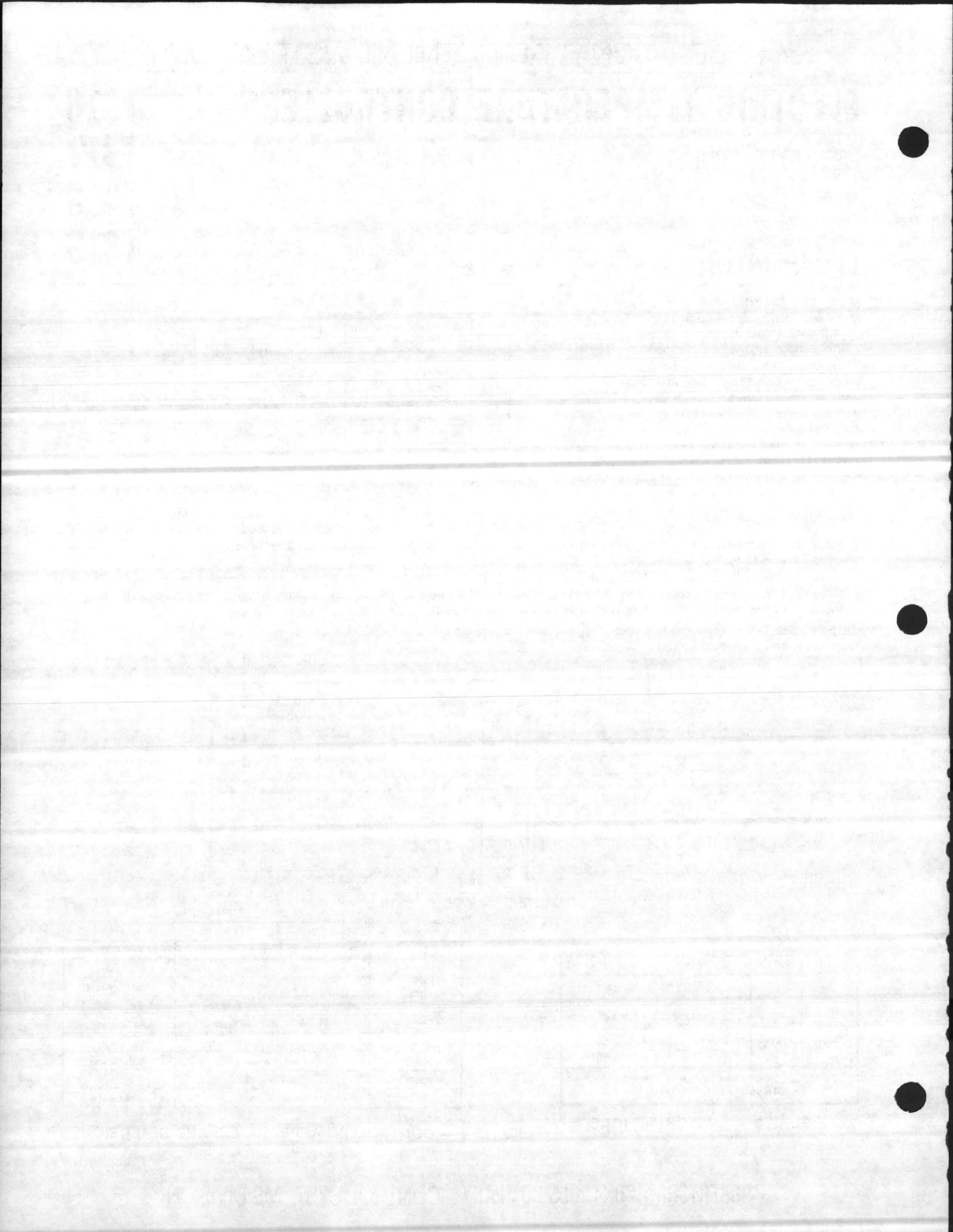
T316	T317	T318	T319
 (NC)	 (NO)	 YELLOW (NO) BLUE (NC) RED	 RED (NC) BLUE (NO) WHITE
(NC) = OPENS ON TEMPERATURE RISE (NO) = CLOSSES ON TEMPERATURE RISE			

FIGURE 3 — SWITCH ACTIONS.

MODEL	T316 & T317	T319	T318	
	DIMENSIONS	A	5-3/8" (137mm)	4-13/16" (122mm)
B		2-5/16" (59mm)	2-5/32" (55mm)	
C		2-9/16" (65mm)	1-13/16" (46mm)	
D		5 ft. (1.5m) ^a	8 ft. (2.4m)	8 ft. (2.4m)
E		7/16" (11mm)	3/8" (10mm)	3/8" (10mm)
F		3-1/2" (90mm)	5-3/4" (146mm)	5-5/8" (143mm)
SETPOINT DIAL	90° Window		360° Window	
SETPOINT ADJ.	Screwdriver Slot		Knob	
COVER REMOVAL	Detents (Friction)		Slotted Screw	

^a — Armored capillary on T316.

FIGURE 4 — CONTROLLER APPEARANCE AND DIMENSIONS.



Robertshaw 

2,2,15

PRV



~~MODEL N1-7A
MINIATURE PRESSURE REGULATOR
PRIMARY PRESSURE: Up to 150 psig (1034 kPa)
OUTPUT PRESSURE: Adjustable 1-10 psig (7-69 kPa)
Relieving type, 1/8" FPT port connections. Unit has knob and locknut. Max. temp. 150°F (66°C).~~



~~MODEL N1-11B
FILTER REGULATOR (5 Micron)
PRIMARY PRESSURE: Up to 150 psig (1034 kPa)
OUTPUT PRESSURE: Adjustable 5-50 psig (34-345 kPa)
Relieving type, 3/8" (10mm) FPT port connections. Unit has a metal bowl guard and mounting bracket included.
Max. Temp. 125°F (52°C).~~

~~SPARE PARTS
N1-12B Replacement Filter Cartridge~~



~~MODEL N1-13
AUTOMATIC TANK DRAIN
150 psig (1034 kPa) at 125°F (52°C).
1/2" FPT connection. Unit has bowl guard.~~



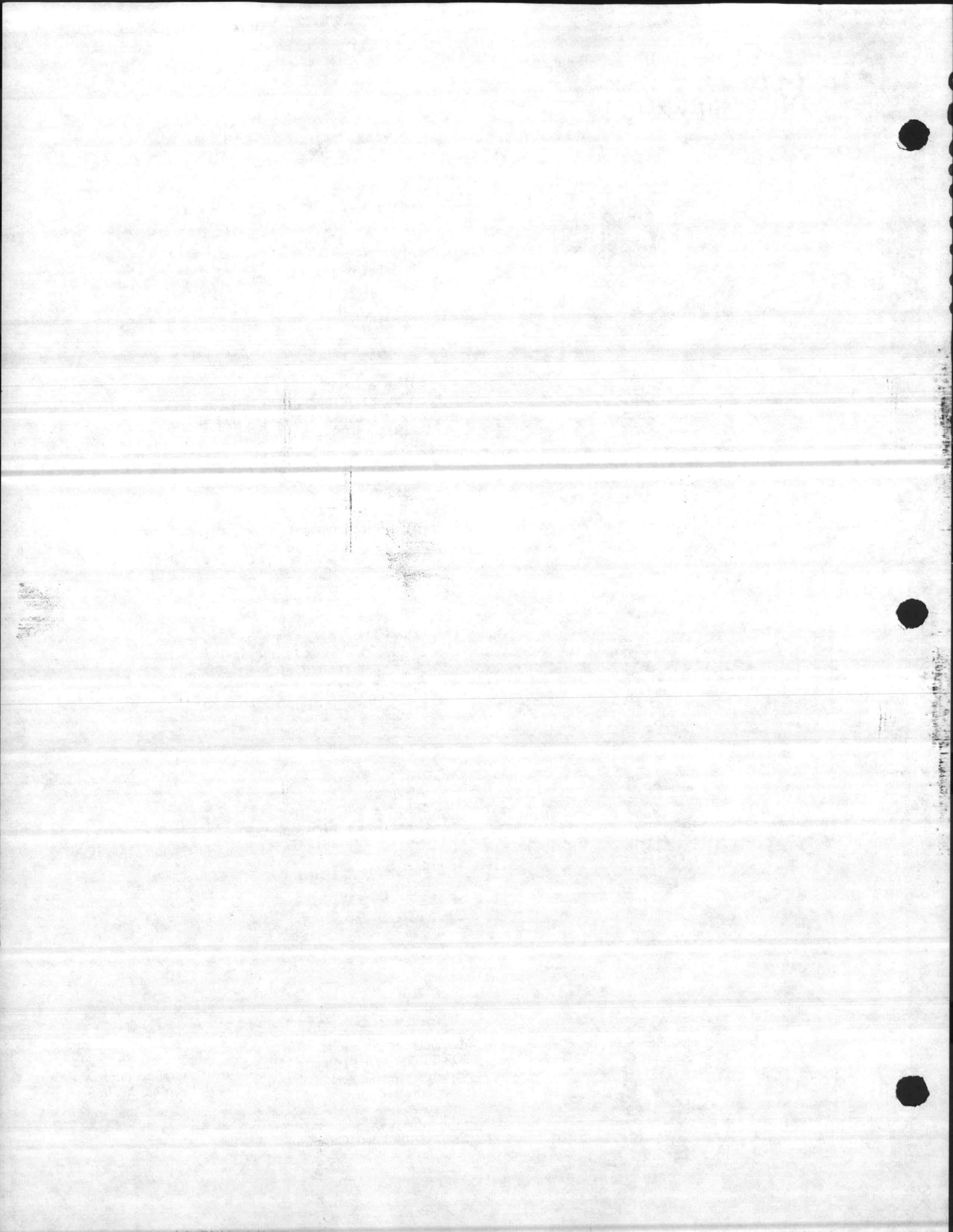
~~MODEL N1-14
OIL FILTER
10 SCFM Capacity @ 100 psig (689 kPa).
3/8" (10mm) FPT Air Connections.
MAXIMUM PRESSURE: 150 psig (1034 kPa) at 125°F (52°C).
Unit includes bowl guard.~~

~~SPARE PARTS
N1-15 Replacement Filter Cartridge~~



~~MODEL N1-20
CONTROL AIR FILTER using toilet tissue roll as filtering element for the removal of oil vapor and sub-micronic dirt from the compressed air.~~

~~SPARE PARTS
Toilet Tissue Filter Cartridge.~~



INSTALLATION INSTRUCTIONS

FILTER REGULATOR

N1-11B

GENERAL DESCRIPTION

This filter/regulator performs two functions in a compressed air system. It removes most solid and liquid particles from the compressed air and it maintains a nearly constant outlet pressure despite changes in the inlet air pressure and changes in downstream flow requirements.

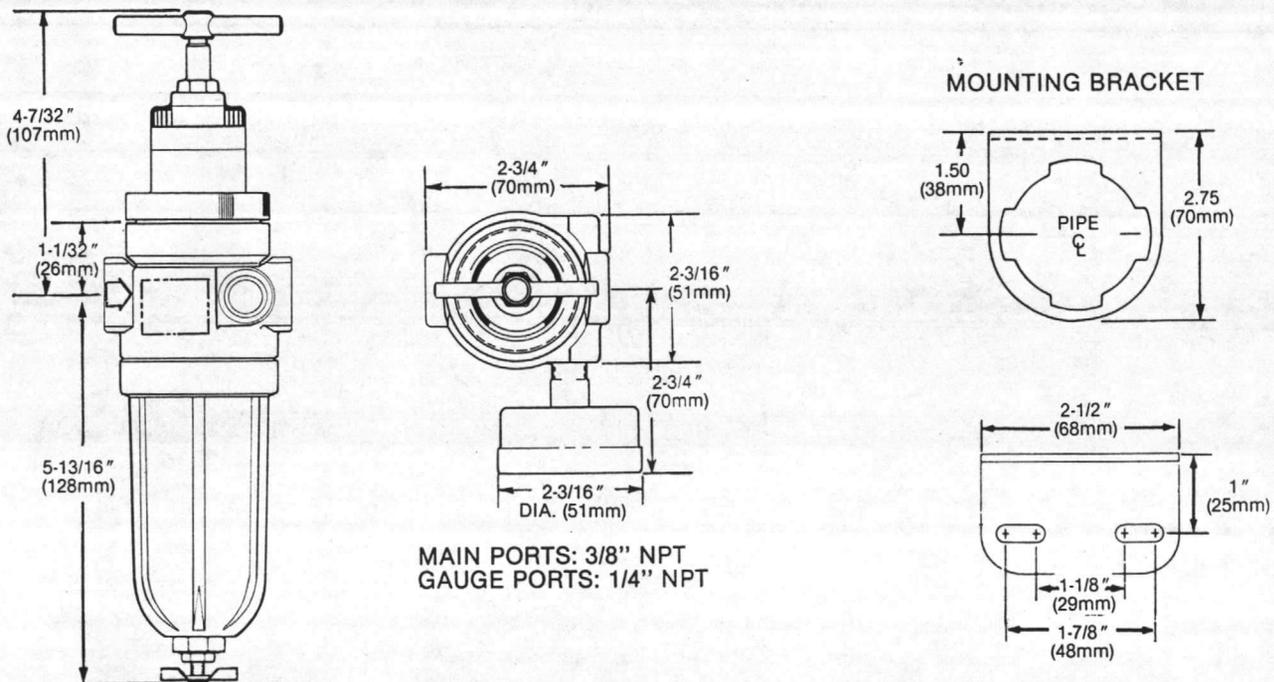
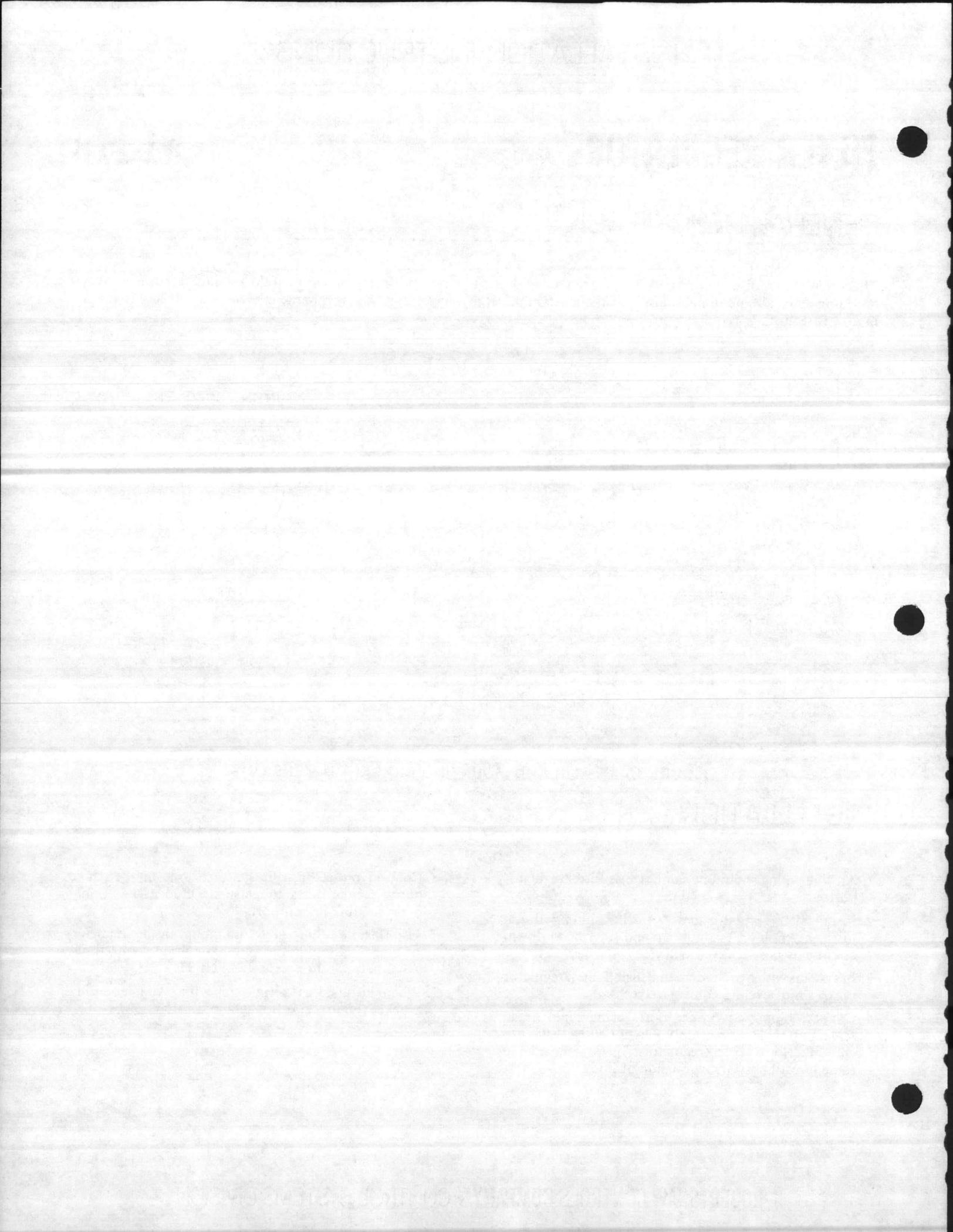


FIGURE 1 — N1-11B AND MOUNTING BRACKET DIMENSIONS.

INSTALLATION

1. Air line piping should be same size as filter/regulator ports.
2. Install filter/regulator in a vertical position with adjustment knob or T-handle up and filter bowl down, as close as possible to the device being serviced.
3. In systems with a cyclic demand, install filter/regulator upstream of cycling control valves.
4. Connect piping to proper ports using pipe thread sealant on male threads only. Do not allow sealant to enter interior of filter/regulator. Air flow must be in same direction as arrow on side of body.
5. Connect outlet pressure gauge to one of the gauge ports. Gauge ports can also be used as additional outlets. Plug unused ports.
6. Use flexible tubing (1/8" minimum inside diameter) or non-rigid piping for automatic drain connections. Automatic drain port is 1/8" NPTF.
7. When installed in a rigid pipe line, the mounting bracket (Figure 1) is not required.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

FILTER REGULATOR

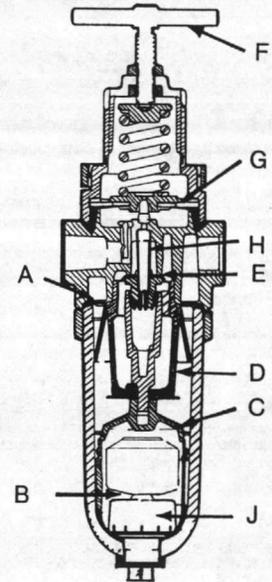
N1-11B

OPERATION

Flow through the directional louvers (A) forces air into a swirling pattern. Liquids and heavy solids in the air stream are directed away from the filter element and held against the inside of the bowl by centrifugal force. They move down the bowl wall into the quiet zone (B) below the baffle. The baffle (C) maintains the quiet zone in the lower part of the bowl to prevent air turbulence from picking up the liquid and returning it to the air stream. Air then flows inward and passes through the filter element (D) which further cleans the air and removes the fine solids.

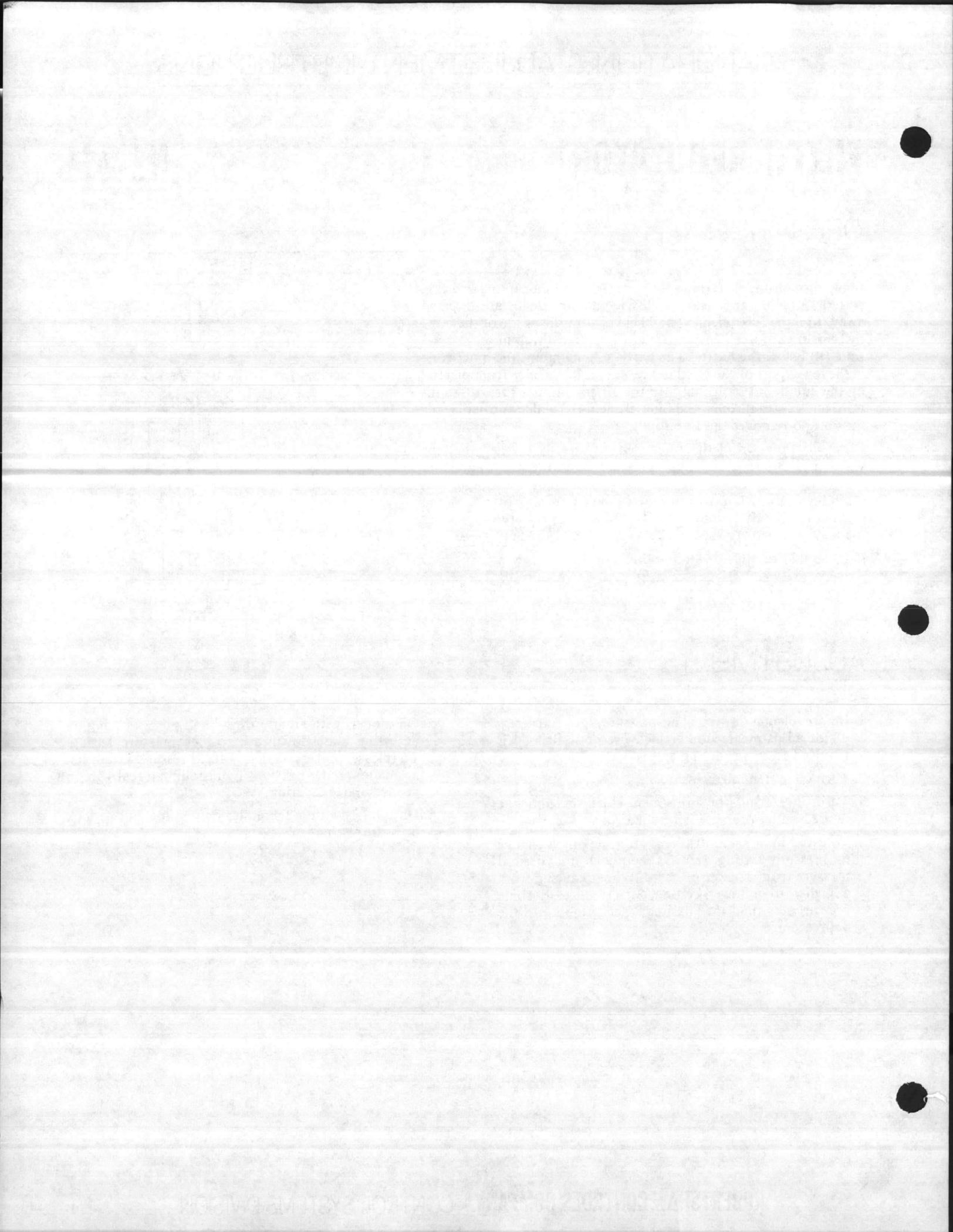
Clean air flows from the filter element directly to the regulator valve (E). Desired secondary pressure is adjusted by adjusting screw (F). The secondary pressure is sensed by the diaphragm assembly (G) which moves the valve pin (H) opening or closing the regulator valve to maintain the desired outlet pressure.

Liquids accumulated in the filter quiet zone are drained off through the manual drain (J) or an automatic drain.



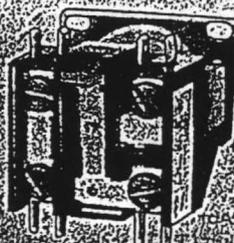
ADJUSTMENTS

1. Before turning on system air pressure, turn filter/regulator adjustment counterclockwise until all load is removed from regulating spring.
2. Turn on system air pressure.
3. Turn filter/regulator adjustment clockwise until the desired outlet pressure is reached.
4. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure from a lower pressure. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired, then bring up to the desired point.
5. On models with an adjusting knob push locking on adjusting knob downward to lock pressure setting. To release, pull locking upward. Pressure setting can be made tamper resistant by installing a seal wire in groove above locking.
6. On models with a T-handle, tighten locknut to lock pressure setting.



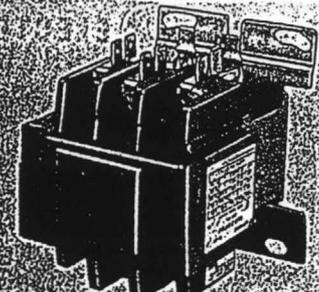
Designed for Switching Electrical Loads Such as Air-conditioning, Refrigeration, Compressors and Resistance Heating Appliances

C

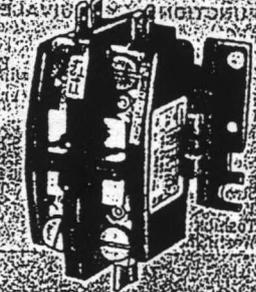


Single Pole
Class 45

NEW ITEM



Three Pole
Class 42



Two Pole
Class 42



Furnas




Accessories Available: See Index

FEATURES

- Auxiliary Contacts Available - See Accessories on Nearby Page
- Pressure/Quick Connect Line and Load Terminals
- Coils Have Pressure/Quick Connect Terminals
- Test Life Operations: 2 Million Mechanical, 0.25 Million Electrical
- Contacts are Not Replaceable
- Replaceable Tape Insulated Coil
- Black Phenolic Housing
- Arc Chambers to Provide Arc Suppression and Phase to Phase Protection
- Contact Covers with 50 FLA and above models

DEFINITE PURPOSE CONTACTOR ELECTRICAL SPECIFICATIONS

Motor Full Load Amps	Coil Data @ 60 Hz					Locked Rotor, Amps			Non-Inductive Amps
	Inrush VA	Sealed VA	Sealed Watts	Operating Time, m sec. Make	Operating Time, m sec. Break	3 Phase 3 Pole Break	1 Phase 2 Pole Break	277V, 480V, 600V	
18	12	7	4.75	13-17	12-15	100	100	100	25
25†	12	7	4.75	13-17	12-15	100	100	100	30
20	37.4	7.7	2.8	13-17	12-15	120	100	80	30
25	35	8	3.5	13-17	12-15	150	125	100	35
30	52	6.2	2.5	13-17	12-15	150	125	100	40
40	52	6.2	2.5	13-17	12-15	240	200	160	50
50	92	10	4	13-17	12-15	300	250	200	63
60	92	10	4	13-17	12-15	360	300	240	75
75	200	31	13.5	13-17	12-15	450	375	300	93
90	200	31	13.5	12-17	12-15	540	450	360	112
120	310	96	14	13-17	12-15	720	600	480	120

(†) 240VAC. (*) BC single pole series.

Normally Open Construction. 50/60 Hz Coils. Mounting Plate Included. Heavy duty magnet ensures sharp pick-up and drop-out; precision ground surface with cushion type armature design for quiet operation. Screw or box lug type connectors on line terminals; push-on or screw type coil connections. Contactors can be mounted in any position and have a mounting plate that permits interchangeability with many competitive models.

246 NET WHOLESALE PRICES—W.W.GRAINGER, INC.

MAGNETIC CONTACTORS

ELEC INI C

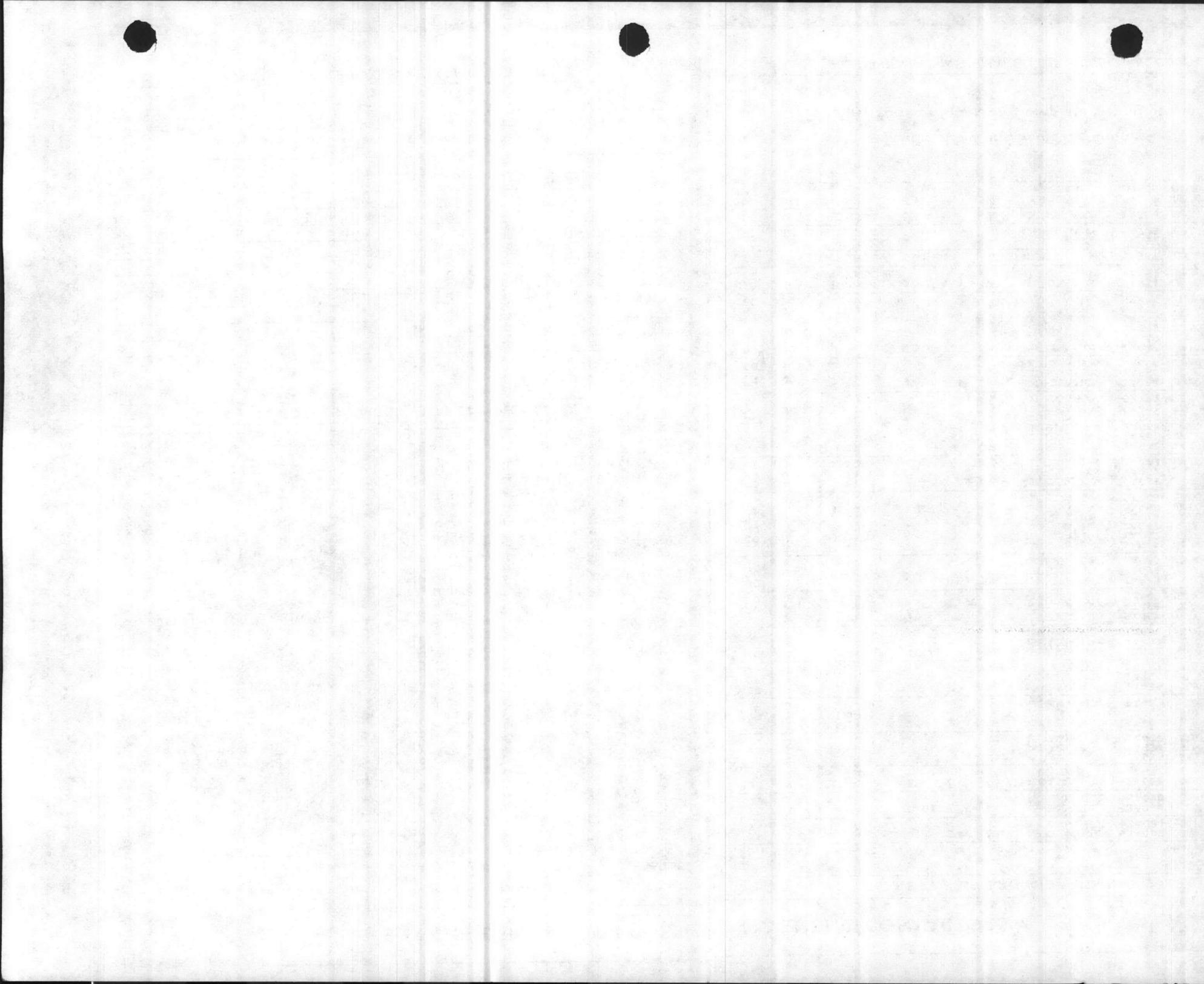
DEFINITE PURPOSE CONTACTOR ORDERING GUIDE

Full Load Amps	Poles	Coil Volts 60 Hz AC	H	W	D	Mfr's Mod.	Stock No.	List Price
18	1	24	2"	2 1/2"	2 1/2"	45BC10AJLL2	3A087	330.00
18	1	120				45BC10AFL2	3A088	30.00
25	1	24	2 1/4"	2	2 1/2"	45DC10AJLL2	3A089	333.00
25	1	120				45DC10AFL2	3A090	33.00
20	2	24	3 1/4"	2	2 1/2"	45CA20AJ	2A651	46.00
20	2	120				45CA20AG	2A652	46.00
25	2	24	2 1/4"	2	2 1/2"	45DA20AJ	1A635	57.00
25	2	110-120				45DA20AF	1A636	57.00
25	2	208-240				45DA20AG	1A637	57.00
25	3	24	3 3/4"	3 1/4"	3 3/4"	42BE35AJ478	5X464	80.00
25	3	110-120				42BE35AF478	5X462	80.00
25	3	208-240				42BE35AG478	5X463	80.00
25	4	24	3 3/4"	3 1/2"	3 1/2"	42BE25AJ478	1A655	97.00
25	4	110-120				42BE25AF478	1A656	97.00
25	4	208-240				42BE25AG478	1A657	97.00
30	2	24	2 1/4"	2	2 1/2"	45EA20AJ	1A638	60.00
30	2	110-120				45EA20AF	1A639	60.00
30	2	208-240				45EA20AG	1A640	60.00
30	3	24	3 3/4"	3 3/4"	3 3/4"	42BE35AJ106	5X467	90.00
30	3	110-240				42BE35AF106	5X465	90.00
30	3	208-240				42BE35AG106	5X466	90.00
30	4	24	3 3/4"	3 1/2"	3 1/2"	42BE25AJ106	1A658	108.00
30	4	110-120				42BE25AF106	1A659	108.00
30	4	208-240				42BE25AG106	1A660	108.00
40	2	24	3 3/4"	3 3/4"	3 3/4"	42CE15AJ106	1A641	95.00
40	2	110-120				42CE15AF106	1A642	95.00
40	2	208-240				42CE15AG106	1A643	95.00
40	3	24				42CE35AJ106	5X470	106.00
40	3	110-120				42CE35AF106	5X468	106.00
40	3	208-240				42CE35AG106	5X469	106.00
40	4	24	3 3/4"	3 1/2"	3 1/2"	42CE25AJ106	1A661	124.00
40	4	110-120				42CE25AF106	1A662	124.00
40	4	208-240				42CE25AG106	1A663	124.00
50	2	24	3 3/4"	3 3/4"	3 3/4"	42DE15AJ106	1A644	197.00
50	2	110-120				42DE15AF106	1A645	197.00
50	2	208-240				42DE15AG106	1A646	197.00
50	3	24				42DE35AJ106	1A653	209.00
50	3	110-120				42DE35AF106	5X471	209.00
50	3	208-240				42DE35AG106	5X472	209.00
50	4	24	3 3/4"	3 1/2"	3 1/2"	42DE25AJ106	1A664	229.00
50	4	110-120				42DE25AF106	1A665	229.00
50	4	220-240				42DE25AG106	1A666	229.00
60	2	24	3 3/4"	3 3/4"	3 3/4"	42EE15AJ106	1A647	223.00
60	2	110-120				42EE15AF106	1A648	223.00
60	2	220-240				42EE15AG106	1A649	223.00
60	3	24				42EE35AJ106	1A654	232.00
60	3	110-120				42EE35AF106	5X473	232.00
60	3	220-240				42EE35AG106	5X474	232.00
75	2	110-120/208-240	5	4	4 1/2"	42FE15AA106	1A651	287.00
75	3	110-120/208-240				42FE35AA106	1A151	285.00
75	4	110-120/220-240	5	4 1/4"	4 1/4"	42CE25AA106	1A667	313.00
90	2	110-120/208-240	5	4	4 1/2"	42GE15AA106	1A652	345.00
90	3	110-120/208-240				42GE35AA106	1A223	373.00
90	4	110-120/220-240	5	4 1/4"	4 1/4"	42CE25AA106	1A668	410.00
120	2	110-120	6 1/4"	5 1/2"	5 1/2"	42HF15AAA	2W747	452.00
120	3	110-120				42HF32AA	2W559	490.00

Terminology and Selection Guides

See First Page of Index for Complete Listing of Guide

SEE WARRANTY INFORMATION ON INSIDE BACK COVER



RUSKIN®

PO BOX 129 Grandview, Mo. 64030

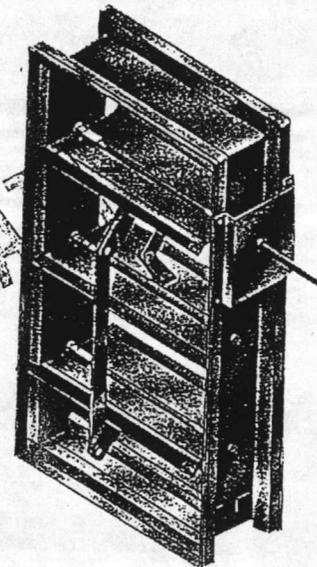
2.1.1

RCD 45 SERIES CONTROL DAMPERS FOR THE TEMPERATURE CONTROL INDUSTRY

RCD45 SERIES FEATURES

- **STRONG FRAME**
Roll formed galvanized steel, double thickness reinforced for structural strength equal to 13 gage channel type frames.
- **RUGGED BLADES**
Triple v-groove, 16 gage galvanized steel. Parallel or opposed action available.
- **LEAKAGE OPTIONS**
 - ½% maximum leakage for Model RCD46, which meets the often specified "less than 10 cfm/ft² leakage at 4" w.g. Δ P".
 - 1% maximum leakage for Model RCD45.
 - 2+ % leakage for Model RCD44.
- **SHAKEPROOF LINKAGE**
Low maintenance face linkage.
- **LONG LIFE AXLES AND BEARINGS**
Hex axles lock firmly with blades.
Noncorrosive bearings operate smoothly.
- **SECURE OPERATING SHAFT**
Low friction outboard ball bearing support eliminates torque loss and operating problems. Factory installed jackshaft provided on multiple sections.

CERTIFIED DAMPER



STANDARD CONSTRUCTION

FRAME

5" x 1" x 16 gage galvanized steel channel with corner braces. Low profile top and bottom 3½" x ¾" x 16 gage galvanized steel channel on units under 14" high. Slightly different frame (see back of page) supplied with dampers made at Ruskin's California plant.

BLADES

Maximum 8" wide, 16 gage galvanized steel on approximately 8" centers.

SEALS

RCD46 — Flexible metal jamb seals and EPDM blade seals.

RCD45 — Flexible metal jamb seals and polyurethane foam blade seals.

RCD44 — No jamb or blade seals.

LINKAGE

Exposed. Concealed in frame on units under 14" high.

AXLES

½" plated steel hex.

BEARINGS

Synthetic.

CONTROL SHAFT

Removable ½" diameter control shaft extends 6" beyond frame. Outboard support bearings supplied with all single section dampers for field mounted motors. Factory installed jackshaft provided on multiple section dampers.

FINISH

Mill.

MINIMUM SIZE (A x B Dimensions)

Single blade, parallel action — 5" w x 5" h.

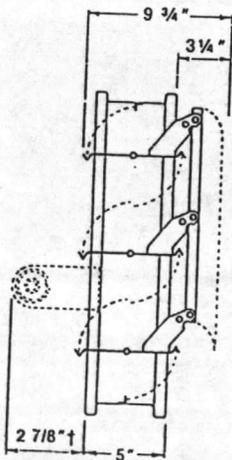
Two blade, parallel or opposed action, concealed linkage — 5" w x 8" h.

Two blade, parallel or opposed action, exposed linkage — 8" w x 14" h.

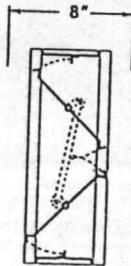
MAXIMUM SIZE (A x B Dimensions)**

Single section — 48" w x 72" h.

Multiple section assembly — Unlimited size.



PARALLEL
BLADE



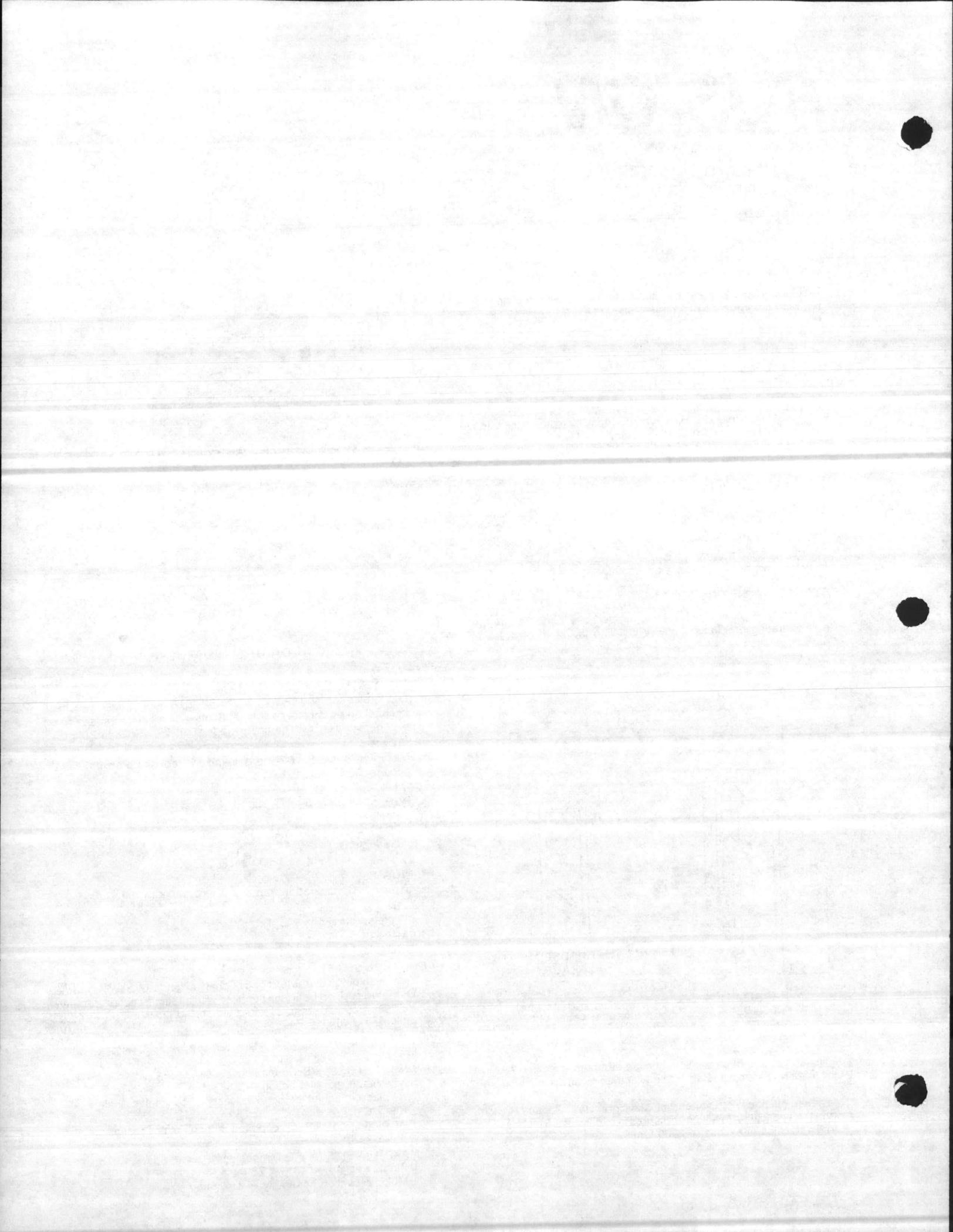
OPPOSED
BLADE

Low profile frame
illustrated is typical
for units under 14" high.

† Jackshaft used only on multiple section dampers.

* Unit furnished approximately ¼" smaller than given opening dimensions.

** Maximum section width varies with static pressure. Consult Ruskin when the application involves pressures in excess of 2.5 inches w.g. or air velocities in excess of 2000 fpm.



DAMPER SIZE INQUIRY FORM

To: R & W

Subject: BEG NEW RIVER

Our Job No.: 2750

Date: _____

Sheet 1 of 1

Attn: _____

By: _____

Please furnish correct duct sizes for automatic dampers for the above job and return one copy to the attention of the writer as soon as possible. Indicate exact duct or opening size. Dampers will be built smaller to allow for clearance. Indicate horizontal or vertical blade mounting for multisection dampers by figure number.

Dampers are built in even 2 in. increments. If a duct has odd dimensions, we will furnish next smaller even size. Filler sections must be field fabricated. When correct duct sizes have been received, we will order the dampers from our factory and will provide you with a damper information form giving the exact sizes of dampers we will supply and an installation planning guide to assist your installer.

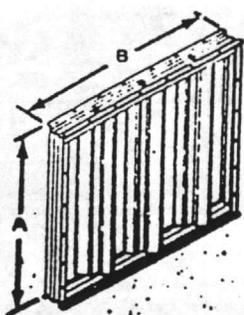


Fig. 1-PARALLEL
Types D640 & D642
(Vertical Blades)

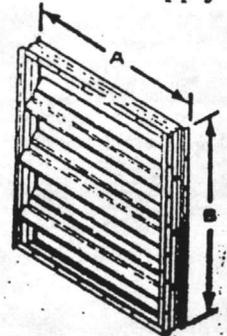


Fig. 2-PARALLEL
Types D640 & D642
(Horizontal Blades)

MINIMUM SIZE EITHER DIMENSION - 8 IN.

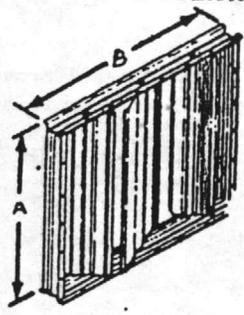


Fig. 3-OPPOSED
Types D641 & D643
(Vertical Blades)

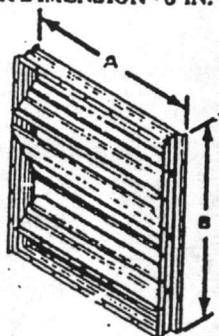


Fig. 4-OPPOSED
Types D641 & D643
(Horizontal Blades)

MINIMUM SIZE EITHER DIMENSION - 14 IN.

NOTE: "A" dimension is always blade length (including frame).

Ref. No.	Damper Location (Dampers you mark with an * will have edging.)	Qty.	Fig. No.	Duct Dimensions	
				A	B
	OUTSIDE AIR AHU-1-6	6	2	10"	10"
	RV-2 STAIRWELL	1	4	24"	24"
	OUTSIDE AIR STAIRWELL	1	4	44"	24"
	OUTSIDE AIR FCU-2, 4 & 6	3	2	6"	6"
	OUTSIDE AIR FCU-1, 3 & 5	3	2	10"	8"

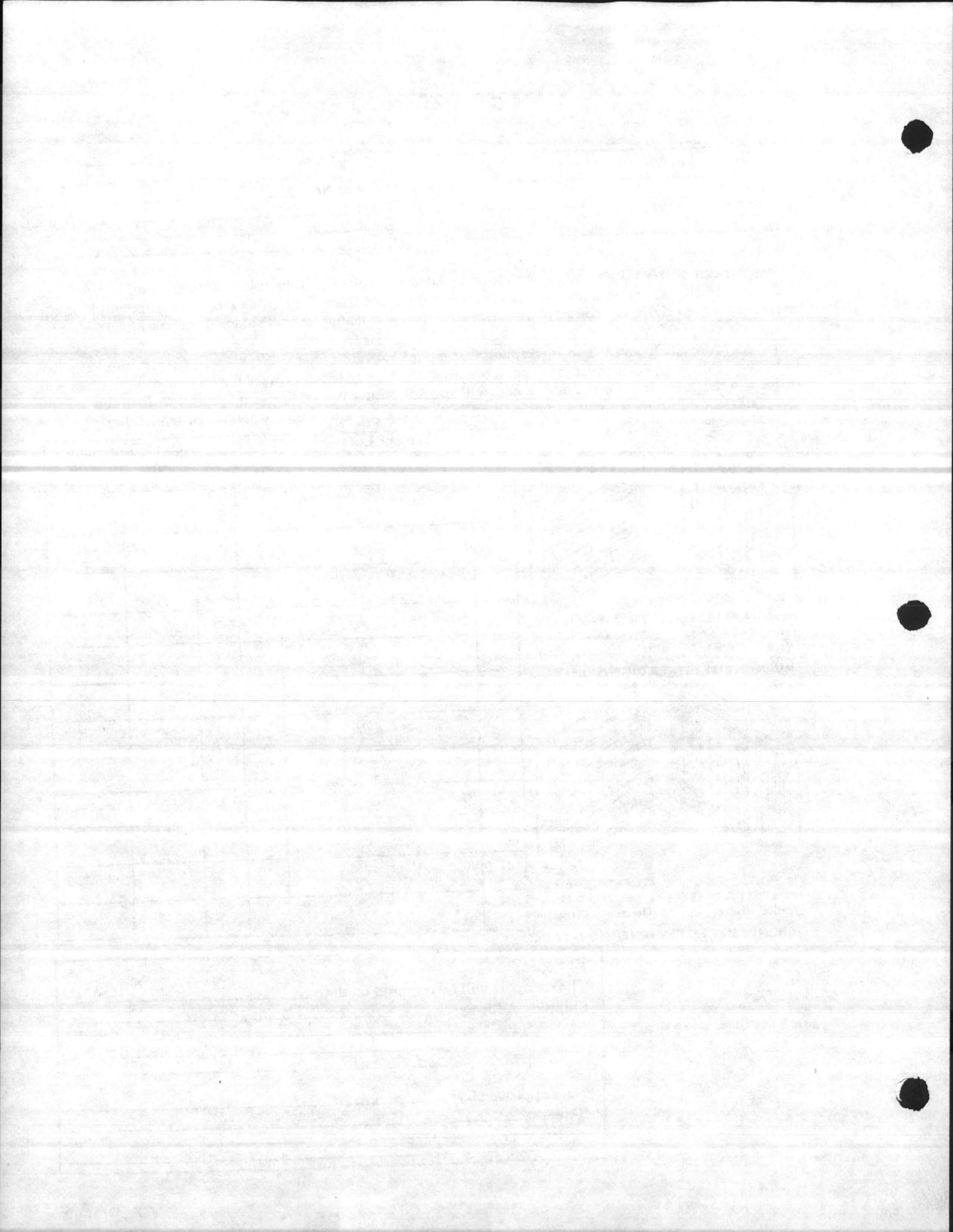
Reply: _____

The dampers will be required on date _____

Shipping Address: _____

Sizes approved by: _____

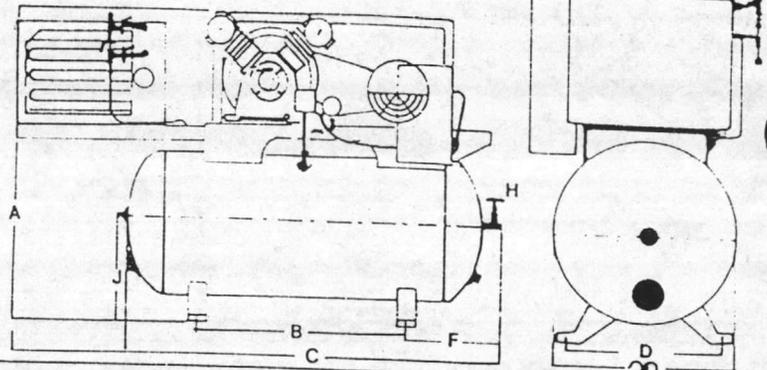
Remarks: _____



SPECIFICATIONS FOR SIMPLEX DRYER MT'D. CLIMATE CONTROL COMPRESSORS

STANDARD EQUIPMENT

- Pressure switch operated automatic start-stop control.
- Combination intake filter silencer
- Pressure gauge
- ASME safety valve
- Tank shut-off valve
- Tank drain valve
- Totally enclosed belt guard
- ASME air receiver
- Hankison Refrigerated Air Dryer 115 Volt 1 Phase 10.0 CFMFA, Two way by pass



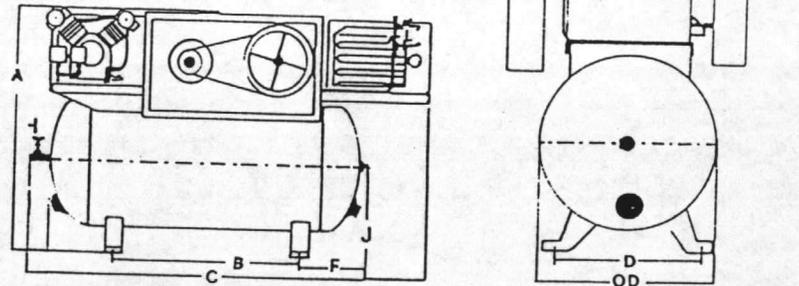
MODEL NO.	HP	RPM	TANK SIZE	CFM@ 90psig	A	B	C	D	OD	F	H	J	K	APPROX. WT.
ACP-C0S-033HP	1/3	446	30	1.7	30	22	55	14	15	11	3/8	11	20	220
ACP-C0S-053HP	1/2	490	30	2.2	30	22	55	14	16	11	3/8	11	20	225
ACP-C1S-0753HP	3/4	460	30	3.0	30	22	55	14	16	11	3/8	11	20	230
ACP-C2T-16HP	1	432	60	4.0	38	28	64	18	20	13	3/8	13	22	360
ACP-C2S-156HP	1 1/2	492	60	6.2	39 1/2	28	64	18	20	13	3/8	13	22	360
ACP-C3S-26HP	2	465	60	8.1	39 1/2	28	64	18	20	13	3/8	13	22	370
ACP-C3S-28HP	2	465	80	8.1	39 1/2	40	78	18	20	15	3/8	13	22	455
ACP-C4T-38HP	3	532	80	10.2	43 1/2	40	78	18	20	15	3/8	13	22	535
ACP-C4T-312HP	3	532	120	10.2	48	40	81	22	24	17	3/8	16	25	720
ACP-C5S-38HP	3	514	80	13.0	43 1/2	40	78	18	20	15	3/8	13	22	535
ACP-C5S-312HP	3	514	120	13.9	55 1/2	40	81	22	24	17	3/8	16	25	720
ACP-C65S-512HP	5	436	120	21.0	55 1/2	40	81	22	24	17	3/8	16	30	840
ACP-C65S-512HP	5	500	120	24.0	55 1/2	40	81	22	24	17	3/8	16	30	840

SPECIFICATIONS FOR DUPLEX DRYER MT'D. CLIMATE CONTROL COMPRESSORS

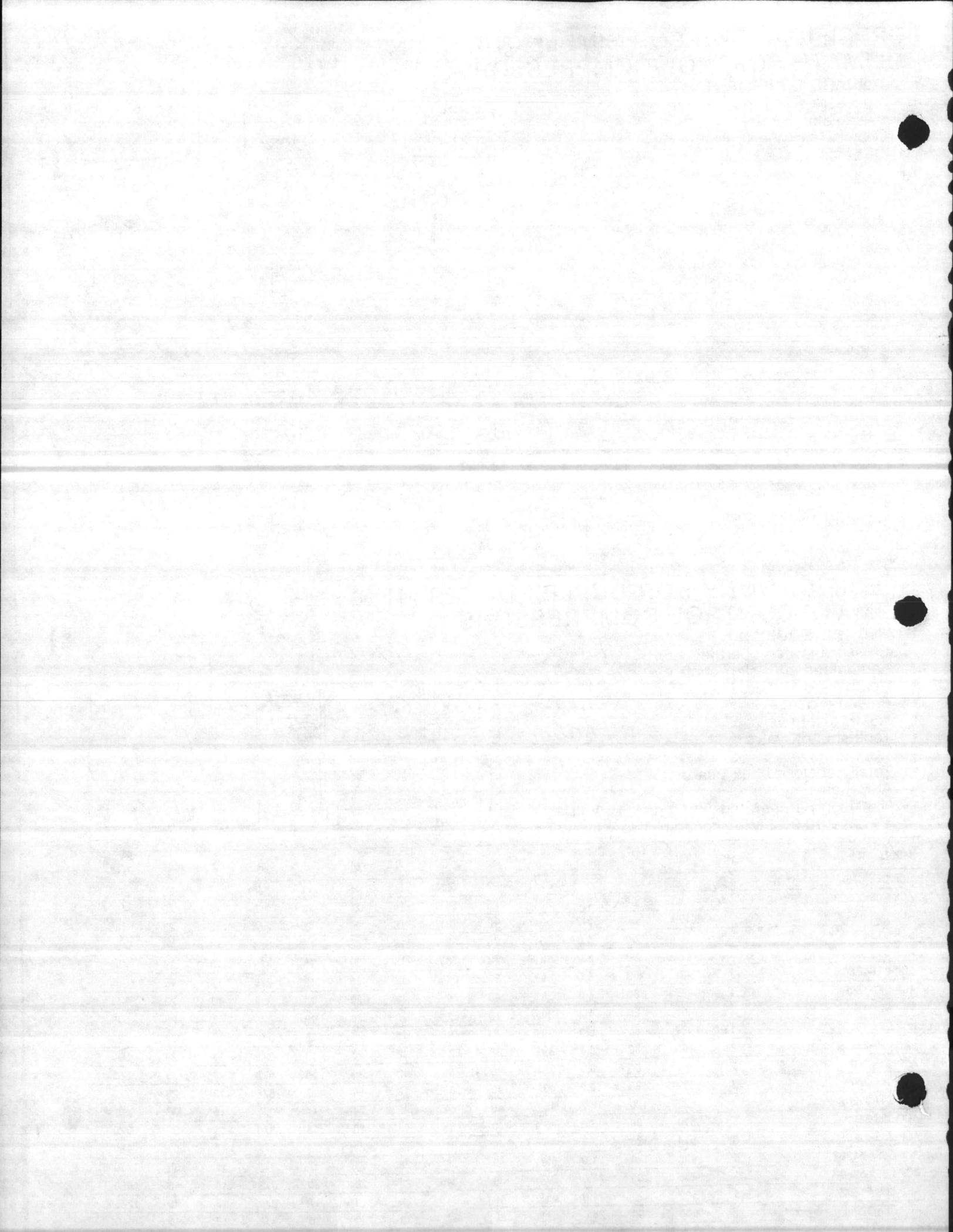
STANDARD EQUIPMENT

- Pressure switch operated automatic start-stop control.
- Combination intake filter silencer
- Pressure gauge
- ASME safety valve
- Tank shut-off valve
- Tank drain valve
- Totally enclosed belt guard
- ASME air receiver
- Hankison Refrigerated Air Dryer 115 Volt 1 Phase 10.0 CFMFA capacity two way by pass

2.2.1 ACP
W/ ALTERNATOR & STARTERS
& AUTO TANK DRAIN



MODEL NO.	HP	RPM	TANK SIZE	CFM@ 90psig	A	B	C	D	OD	F	H	J	K	APPROX. WT#
ACP-C0S-036DP	1/3	446	60	1.7	36 1/2	22	63 1/4	14	16	11	3/8	11	29	400
ACP-C0S-056DP	1/2	490	60	2.2	36 1/2	28	63 1/4	18	20	13	3/8	13	29	405
ACP-C0S-058DP	1/2	490	80	2.2	36 1/2	40	78 1/2	18	20	15	3/8	13	29	465
ACP-C1S-0756DP	3/4	460	60	3.0	36 1/2	28	63 1/4	18	20	13	3/8	13	29	430
ACP-C1S-0758DP	3/4	460	80	3.0	36 1/2	40	78 1/2	18	20	15	3/8	13	29	495
ACP-C2T-16DP	1	432	60	4.0	38	28	63 1/4	18	20	13	3/8	13	29	505
ACP-C2T-18DP	1	432	80	4.0	38	40	78 1/2	18	20	15	3/8	13	29	575
ACP-C2S-156DP	1 1/2	492	60	6.2	39 1/2	28	63 1/4	18	20	13	3/8	13	29	510
ACP-C2S-158F	1 1/2	492	80	6.2	39 1/2	40	78 1/2	18	20	15	3/8	13	29	575
ACP-C3S-26I	2	465	60	8.1	39 1/2	28	63 1/4	18	20	13	3/8	13	29	530
ACP-C3S-28D.	2	465	80	8.1	39 1/2	40	78 1/2	18	20	15	3/8	13	29	585
ACP-C4T-38DP	3	532	80	10.2	43 1/2	40	78 1/2	18	20	15	3/8	13	29	770
ACP-C4T-312DP	3	532	120	10.2	45 1/2	40	84	22	24	17	3/8	16	37	980
ACP-C5S-38DP	3	514	80	13.0	43 1/2	40	78 1/2	18	20	15	3/8	13	37	770
ACP-C5S-312DP	3	514	120	13.9	55 1/2	40	84	22	24	17	3/8	16	37	980
ACP-C6SA-512DP	5	436	120	21.0	55 1/2	40	84	28	24	17	3/8	16	35	1220
ACP-C6SA-520DP	5	436	200	21.0	61 1/2	39	84	28	30	20	3/8	19	46	1450
ACP-C6S-512DP	5	500	120	24.0	55 1/2	40	84	28	24	17	3/8	16	35	1225
ACP-C6S-520DP	5	500	200	24.0	61 1/2	39	84	28	30	20	3/8	19	46	1440



2,2,13

HANKISON® SERIES 80 Compressed Air Dryers

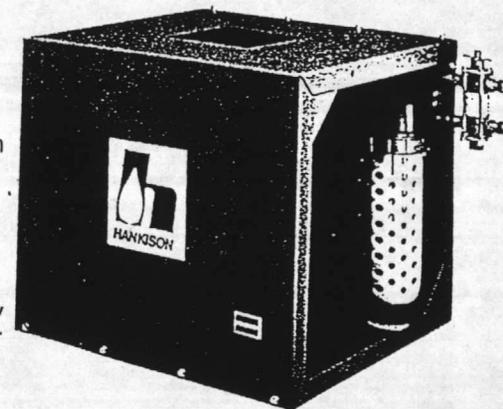
STANDARD FEATURES FOR THESE DRYERS INCLUDE:

- Power On Light (green)—Indicates power to unit
- High Air Temperature Warning Light (red)—Gives indication of refrigeration system malfunction or overloading.
- Hankison Designed & Manufactured Pilot Operated Automatic Condensate Drain Trap
- Facility for Wall Mounting Models 8010 thru 8035—Models 8010 & 8015 feature exclusive "one man" wall mounting bracket assembly
- Integral 3 Micron Particulate Afterfilter—Assures clean air downstream
- Provisions for Connection of Remote Alarm

ENGINEERING AND ORDERING INFORMATION

Hankison Series 80 dryers are complete with: non-fouling, smooth surface, tube-in-tube heat exchanger/chiller; non-cycling, hermetically sealed refrigeration system; self-regulating hot gas by-pass valve to maintain constant dew point from no load to full load; mechanical condensate separator; integral 3 micron in-depth afterfilter; and pilot operated automatic condensate drain trap.

All units can handle additional capacity (scfm) when inlet air pressure is higher than 100 psig, inlet air temperature is lower than 100°F, ambient air or condenser cooling water temperature is lower than 100°F or if elevated dew points (up to 50°F) are suitable for the application.



Typical Series 80 Dryer* (Model 8010 shown with optional air by-pass valve)

*Model 8010 can be purchased as a package complete with Hankison Air By-Pass Valve (model 1701-1), Aerolescer[®] oil removal filter, pressure regulator and pressure gauges, all factory mounted on unit.

MODEL NO.	8010	8015	8025	8035	8045	8055	8070	80100
Flow Capacity (scfm) ¹	10	15	25	35	45	55	70	100
Max. Working Pressure	150 psig (175 psig & 300 psig available)							
Air Line Conn.	In (in) ¾ O.D. tube	¾ O.D. tube	¾ O.D. tube	¾ O.D. tube	1 ¼ O.D. tube	175 psig (300 psig available) 1 ¼ O.D. tube		
Drain Connections (in)	¾ Male NPT	¾ Male NPT	½ Male NPT	¾ O.D. tube	1 Female NPT	1 ¼ O.D. tube	1 Female NPT	1 ¼ O.D. tube
Refrigeration Comp. HP	1/6	1/5	1/3	1/3	1/2	3/8 O.D. Tube Fitting		
Standard Voltages Available ²	115 V, 1 phase, 60 Hz 240/220 V, 1 phase, 50 Hz				1/2	1/2	3/4	3/4
Full Load Amps.	3.4 1.5	4.8 2.2	7.4 3.5	7.4 3.5	115V 230/208V	115V 230/208V	115V 230/208V	115V 230/208V
Locked Rotor Amps.	18.5 9.1	24.5 11.6	35.7 16.4	35.7 16.4	47.9 24.4	47.9 24.4	71 33	71 33
Unit Protection ³	5 2	6 3	10 5	10 5	12 6	12 6	20 10	20 10
Fuse Size (Max.) Amps.	15 15	15 15	15 15	15 15	20 15	20 15	20 15	20 15
Branch Circuit Fuse Size (Max.) Amps.	Thermal & Current (Automatic Reset)							
Overload Protector	14	14	16	16	22 ¼	22 ¼	22 ¼	22 ¼
Height (in)	16 ½	16 ½	22 ½	22 ½	32 ½	32 ½	32 ½	32 ½
Width (in)	15	15	16	16	19 ½	19 ½	19 ½	19 ½
Depth (in)	57	65	97	100	188	206	214	231
Weight (lb)								

¹Rated Dryer Flow Capacity—Conditions for rating dryers are in accordance with Compressed Air and Gas Institute (CAGI) Standard for Rating and Testing Compressed Air Dryers and National Fluid Power Association (NFPA) Recommended Standard NFPA/T3.27.2-1975. Conditions for rating above dryers are: 100 psig (6.9 bar) and 100° F (37.8° C) inlet air, 100° F (37.8° C) ambient air or 85° F (29.4° C) cooling water and a maximum 5 psi (.35 bar) pressure drop. Actual dew point may vary from the stated nominal value depending on site conditions and operating parameters.

²Convert scfm to metric units as follows: 1 scfm = 1.736 m³/h.

³For other power requirements, consult factory.

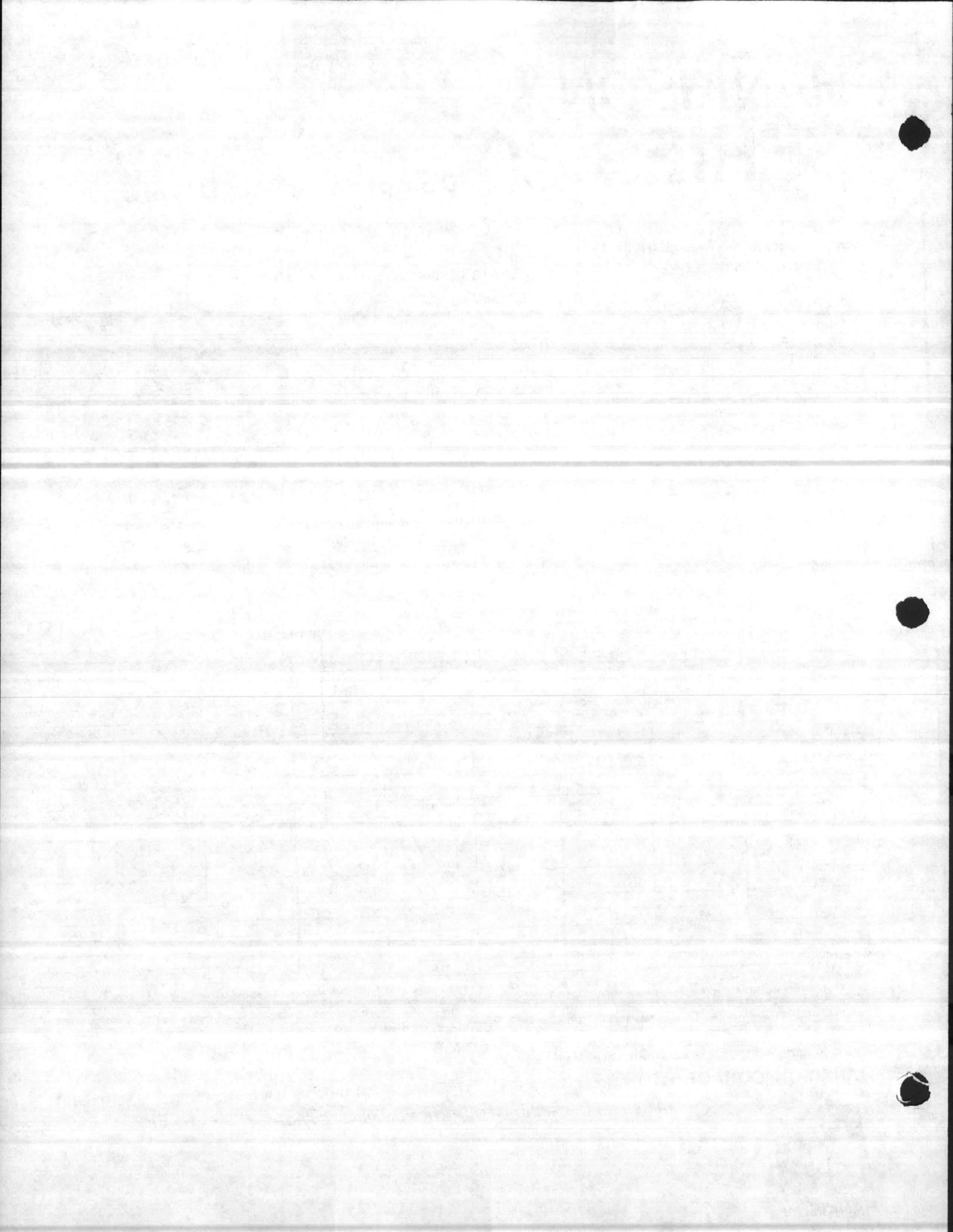
*Ratings are for dual element fuses.

Dryers to handle larger flow capacities are available.

HANKISON CORPORATION, Canonsburg, Pa. 15317, Phone (412) 745-1555, Telex: 81-2452, Cable: HANKORP

PRICE AND ORDERING INFORMATION AVAILABLE FROM:





2.2.1.3

Hankison® Compressed Air Dryers are first for dependability because of the extra performance features built into them.

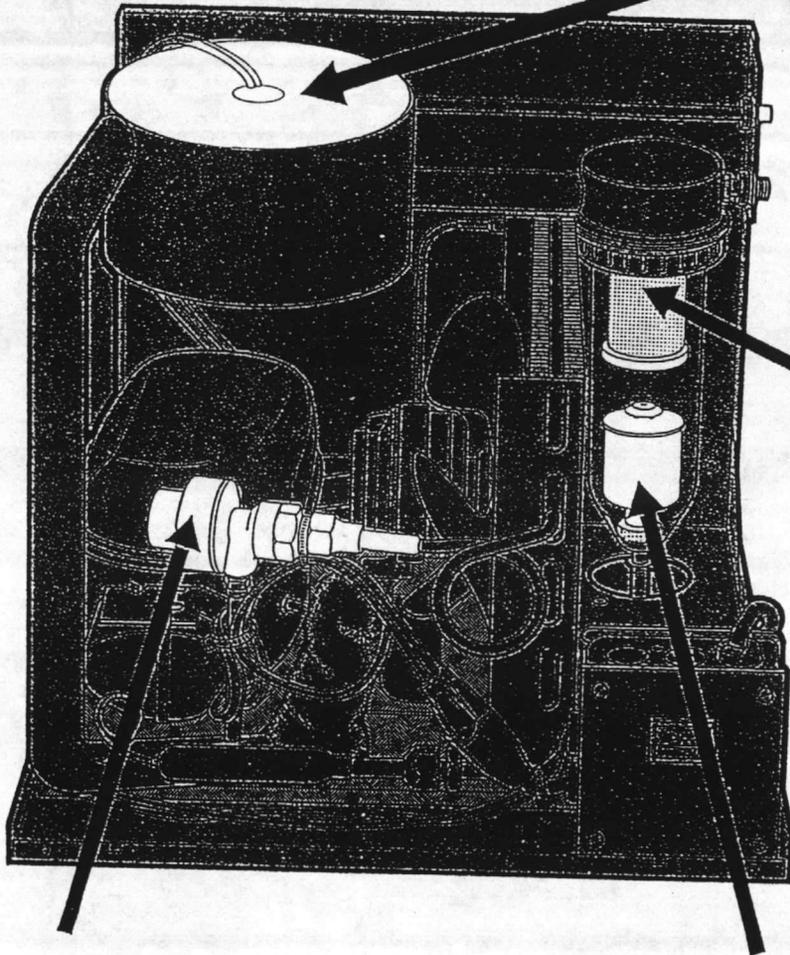
A dependable supply of clean, dry air is necessary to assure trouble-free operation of pneumatic equipment.

Hankison dryers are designed to produce that dependable supply of clean, dry air. Installed on all of your jobs, they reduce maintenance while letting pneumatic components work more efficiently and last longer.



DEPENDABLE — Smooth surface heat exchangers

Hankison heat exchangers are made from non-fouling, self-cleaning, smooth surface copper tubes. This assures that the high heat transfer efficiency and low pressure drop built into your dryer are still there after years of service. And because heat transfer efficiency is maintained, so is your supply of dry air.



DEPENDABLE — Separator/Filter system

Hankison's Centriflex™ separator/filter provides positive protection for your pneumatic system.

In the first of two stages in the Centriflex, a cleanable, stainless steel separator core uses centrifugal force and impaction to remove bulk liquids.

In the second stage, a replaceable, in-depth filter sleeve removes 100% of all solids and liquids 3 microns and larger in size. The filter sleeve is composed of an in-depth medium that resists oil varnish clogging and collects large amounts of solid particles, allowing the sleeve to have a long service life.

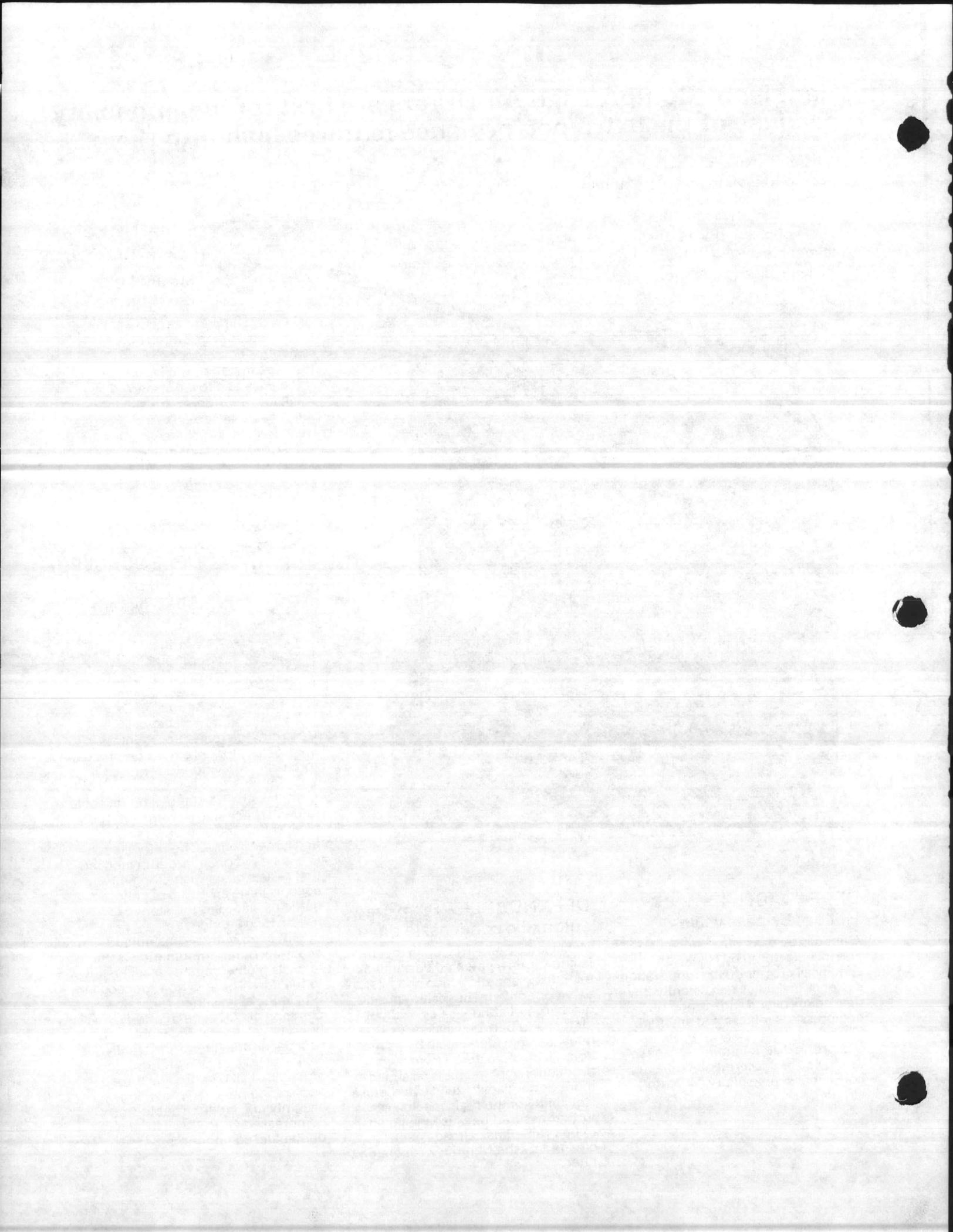
But even better—this unique separator/filter combination maintains its high efficiency from no flow to full flow. There is no reduction in efficiency at less than rated flows, a common occurrence in purely centrifugal separators. Hankison's new separator/filter consistently removes 99% of all water droplets and 40% of all oil aerosols through a full range of flows, providing consistently dry, clean, trouble-free compressed air to downstream pneumatic components.

DEPENDABLE— Hot gas by-pass valve

A hot gas by-pass valve, designed and manufactured by Hankison specifically for air dryer refrigeration systems, maintains consistently low dew points over a wide range of compressed air flows and ambient conditions. By closely controlling compressed air temperatures in the dryer, you are assured of a reliable, consistent supply of dry air downstream.

DEPENDABLE—Snap-Trap® automatic condensate drain

Hankison's Snap-Trap drain mechanism features a patented design that includes magnetic action and pilot valve operation. The result—positive discharge of condensates, without air leakage between cycles. Our latest design, identifiable by its red color, is manufactured from high production molded parts, assuring more dependability than ever before. Reliability of the drain mechanism is further assured because the liquid to be drained has already been cleaned by the Centriflex separator/filter.



HANKISON® AEROLESCER®

2,2,1,3

BULLETIN 1300-19

Coalescing Type Oil Removal Filters

99.999+% efficient in removing oil aerosols from compressed air lines.

Why remove oil?

Compressor oil downstream—it can contaminate the end product, decrease the efficiency of the production process by ruining paint jobs, gumming up air tools, motors, etc., or clog the tiny orifices in instruments or fluid logic components. Oil from a lubricated compressor is subjected to high temperatures during the compression cycle. This alters its characteristics so that it does not adequately lubricate downstream pneumatic components. It's best to take this oil out of the system and add the proper lubricant at the point of use.

Are special filters required to remove oil?

In a typical 90 psig air system 72% by weight of the oil aerosols present are less than 5 microns in size. 50% are below 1 micron in size. Droplets of this size blow right through a mechanical separator. Air line filters (particulate filters e.g. a 5 micron filter) can't trap the bulk of the aerosols either. To adequately remove oil, a special filter is required. The Hankison Aerolescer filter has been designed to remove oil by means of coalescence.

The result—an oil free compressed air system

The Hankison Aerolescer filter, when used within its rated design conditions, will eliminate the oil aerosols contained in a compressed air stream. Exhaustive tests verify a liquid oil removal efficiency of 99.999+%. In most instances, this means that the filtered air will contain less than .1 ppm of oil by weight. It assures virtually oil free air without the expense and maintenance headaches of non-lubricated compressors.

Features:

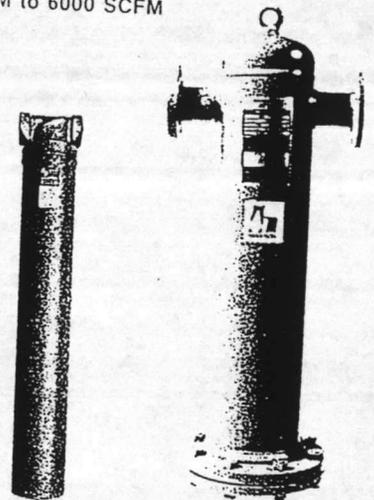
- Unique continuously stabilized filter media plus outer foam sleeve ensure 99.999+% efficiency for the life of the cartridge
- Removes: 100% of particles .025 micron and larger in size; some particles as small as .01 micron
- Cartridge replacement made easy by removable bowls or convenient bottom flange opening
- Rugged thru-bolt cartridge construction

The Patented* AEROLESCER Cartridge—designed for 99.999+% efficiency and long life

Oil aerosols moving through the filtering media (B), a maze of submicronic glass fibers with specific densities and diameters, are concentrated and coalesced into large droplets. High efficiency is achieved by stabilizing the filtering media between a rigid perforated cylinder (C) and an inner foam sleeve (A), which compensates for fluctuating flow rate and aerosol concentration. This design assures uniform distribution of oil aerosols which prevents liquid pocketing, fiber clotting, and subsequent air channeling. The coalesced oil droplets are collected by the outer foam sleeve (D). Having an enormous non-absorbing surface area; this sleeve allows oil droplets to drain to the bottom of the sleeve and then drop to the bottom of the housing for removal from the air system. When removing oil the life of the cartridge is indefinite.** The cartridge continuously coalesces and separates oil aerosols from your system.

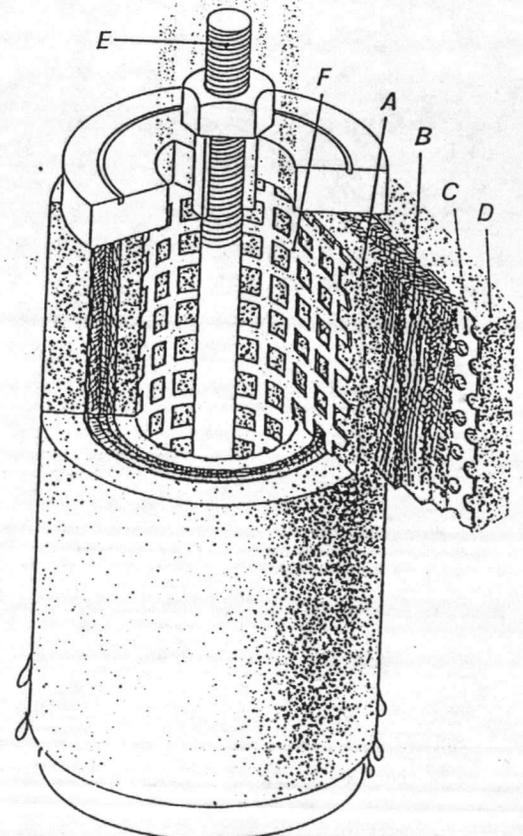
Thru bolt construction (E) assures structural strength and prevents liquid by-passing of the filter media. There is no reliance on adhesives to hold the unit together. An inside support (F) offers positive protection in case flow is accidentally reversed through the cartridge.

MODELS from
10 SCFM to 6000 SCFM



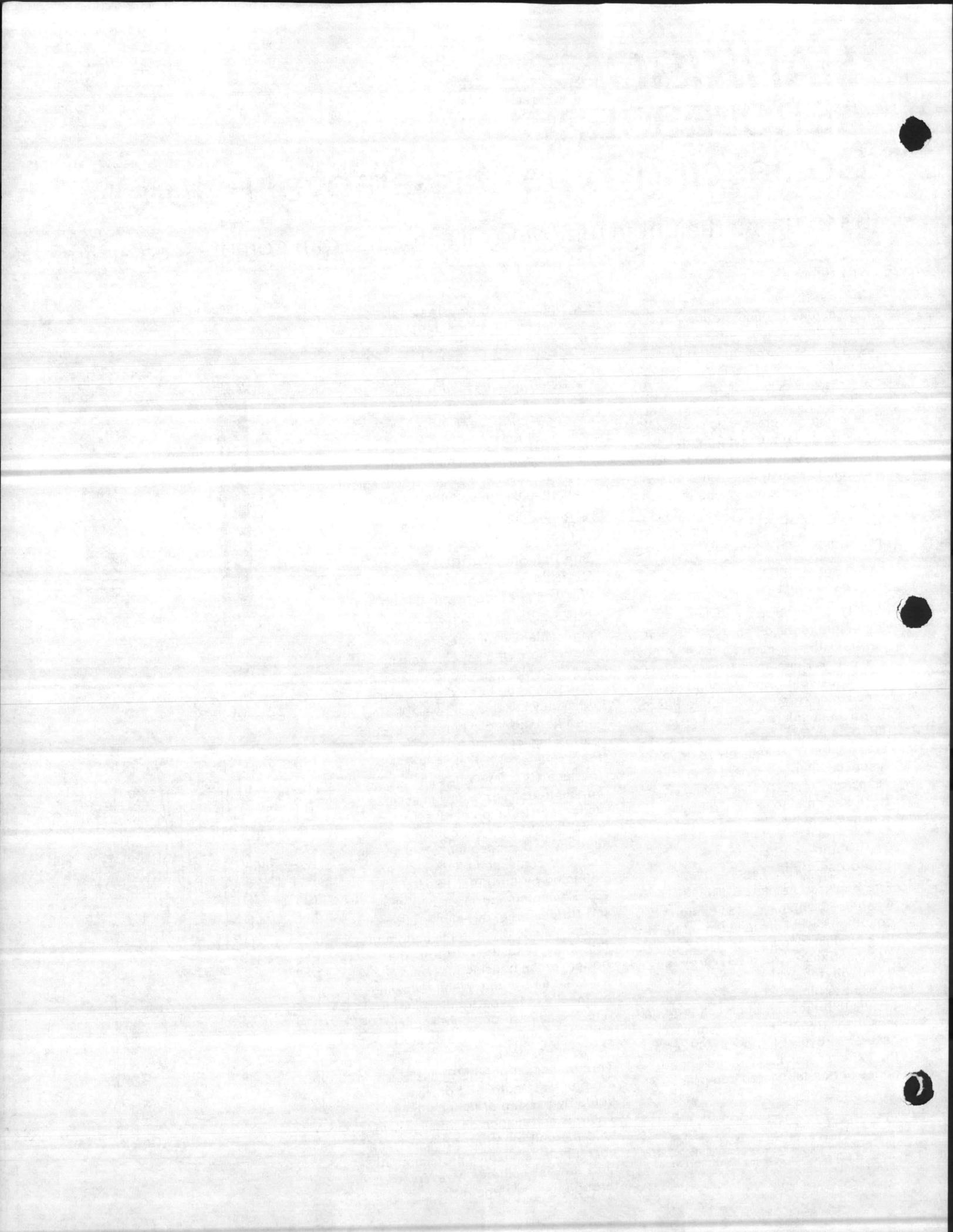
300 SCFM MODEL

900 SCFM MODEL



*U. S. Patent No. 3,802,160

**Excessive solid matter accumulation will limit life. Prefilters are available to prolong life. Request Bulletin 3100 covering HANKISON 3100 Series Air Line Filters.



Maximum Flow (SCFM)* at Various Inlet Pressures

2.2.1.3

MODEL NUMBER	20 PSIG 1.4 BAR	30 PSIG 2.1 BAR	40 PSIG 2.8 BAR	50 PSIG 4.1 BAR	80 PSIG 5.5 BAR	100 PSIG 6.9 BAR	120 PSIG 8.3 BAR	150 PSIG 10.3 BAR	200 PSIG 13.8 BAR	250 PSIG 17.3 BAR	300 PSIG 20.7 BAR
1302	3.0	3.9	4.8	6.5	8.2	10.0	11.7	14.3	18.7	23.1	27.4
1303	6.0	7.8	9.6	13.0	16.4	20.0	23.4	28.6	37.4	46.2	54.9
1304	15.1	19.5	23.8	32.5	41.3	50.0	58.6	71.7	93.6	116	137
1305	30.0	39.0	48.0	65.1	82.0	100	117	143	187	231	274
1306	60.0	78.0	96.0	130	164	200	234	286	374	462	549
1307	90.7	117	143	195	248	300	352	431	562	693	823
1317	150	195	238	326	412	500	587	718	936	1154	1372
1308	190	246	300	412	520	632	740	906	1180	1460	1720
1309	285	369	450	618	780	948	1110	1359	1770	2190	2580
1310	380	492	600	824	1040	1264	1480	1812	2360	2920	3440
1311	475	615	750	1030	1300	1580	1850	2265	2950	3650	4300
1312	760	984	1200	1648	2080	2528	2960	3624	4720	5840	6880
1313	1045	1353	1650	2266	2860	3476	4070	4983	6490	8030	9460
1314	1330	1722	2100	2884	3640	4424	5180	6342	8260	10220	12040
1315	1805	2337	2850	3914	4940	6004	7030	8607	11210	13870	16340

* Convert scfm to metric units as follows: 1 scfm = 1.736 m³/h.

When ordering Aerolescer filters do not choose by pipe size. Make selection by flow rate and operating pressure only.

Pressure drop: Initial pressure drop (dry) is 1 psid (.07 bar) nominal. At rated flow conditions, when removing liquids, pressure drop will normally range from 3 psid (.21 bar) to 6 psid (.41 bar) depending on the quality of the influent air. Further pressure drop will occur only as the cartridge(s) become contaminated with solid particles.

Cartridge replacement: It is recommended that filter cartridge(s) be replaced for maximum filtration efficiency if pressure drop exceeds 10 psid (.7 bar).

Max. temp.: Temperatures in excess of 120°F (49°C) are not recommended since filtration efficiency may decrease and certain filter assembly material may be adversely affected. Polycarbonate bowls have a max. operating temperature of 120°F.

HANKISON® AEROLESCER® Filters

MODEL NUMBER MANUAL DRAIN	AUTO DRAIN	NOMINAL AIR FLOW (SCFM) @ 100 PSIG	AIR INLET/OUTLET CONNECTION	HOUSING (BOWL/VESSEL) TYPE	WIDTH (INLET TO OUTLET) & HEIGHT (IN)	WT. (LB.)	MAX. OPERATING PRESSURE (PSIG)		REPLACEMENT FILTER CARTRIDGE No.
							MANUAL DRAIN	AUTO DRAIN	
1302-1		10	3/8" NPTF	8 oz. polycarbonate (4)	3 3/4 x 6 1/2	1 1/2	150	-	0713-2
1302-2	1302-3	10	3/8" NPTF	16 oz. polycarbonate (4)	3 3/4 x 10 1/2	2 1/2	150	150	0713-2
1302-4	1302-5	10	3/8" NPTF	16 oz. metal	3 3/4 x 9 3/8	3 3/8	300	175	0713-2
1302-6		10	3/8" NPTF	8 oz. metal c/w sight glass	3 3/4 x 6 3/8	2 1/2	250	-	0713-2
1303-1	1303-2	20	1/2" NPTF	16 oz. polycarbonate (4)	3 3/4 x 10 1/2	2 1/2	150	150	0713-3
1303-3	1303-4	20	1/2" NPTF	16 oz. metal	3 3/4 x 9 3/8	3 3/8	300	175	0713-3
1304-1	1304-2	50	3/4" NPTF	32 oz. metal	4 9/16 x 11 1/2	5 3/8	300	175	0713-4
1305-1	1305-2	100	1" NPTF	100 oz. metal	4 9/16 x 22 3/8	13 3/4	300	175	0713-5
1306-1	1306-2	200	1 1/2" NPTF	205 oz. metal	5 1/4 x 30 1/4	21	300	175	0713-6
1307-1	1307-2	300	1 1/2" NPTF	381 oz. metal	5 1/4 x 36 1/4	29 1/4	300	175	0713-7
1317-1	(3)	500	2 1/2" coupling (1)	8" pressure vessel	22 1/2 x 37 1/8	211	200 (2)	(3)	0713-12-2
1308-11	(3)	600	3" coupling (1)	8" pressure vessel	22 1/2 x 42 3/8	225	200 (2)	(3)	0713-11-2
1309-5	(3)	900	3" flange	10" pressure vessel	16 3/8 x 44 3/8	321	200 (2)	(3)	0713-11-3
1310-3	(3)	1200	4" flange	12" pressure vessel	20 x 51 3/8	324	200 (2)	(3)	0713-11-4
1311-4	(3)	1500	4" flange	12" pressure vessel	20 x 51 3/8	329	200 (2)	(3)	0713-11-5
1312-3	(3)	2400	6" flange	16" pressure vessel	24 x 52 3/8	495	200 (2)	(3)	0713-11-8
1313-2	(3)	3300	6" flange	20" pressure vessel	28 x 59 3/8	620	200 (2)	(3)	0713-11-11
1314-2	(3)	4200	6" flange	20" pressure vessel	28 x 59 3/8	625	200 (2)	(3)	0713-11-14
1315-2	(3)	6000	8" flange	24" pressure vessel	33 x 63 1/8	1135	200 (2)	(3)	0713-11-19

(1) Flanges are available.

(2) Units with maximum operating pressures of 300 psig (21 bar) are available. 500 scfm (1317) and larger models are ASME Code Constructed and Stamped (500 scfm) through 1311 (1500 scfm) use a Snap Trap[®] or model 505 Trip-L-Trap[®]. For automatic draining Hankison automatic drain traps are available. For models 1312 (2400 scfm) through 1315 (6000 scfm) use model 506 Trip-L-Trap[®]. For

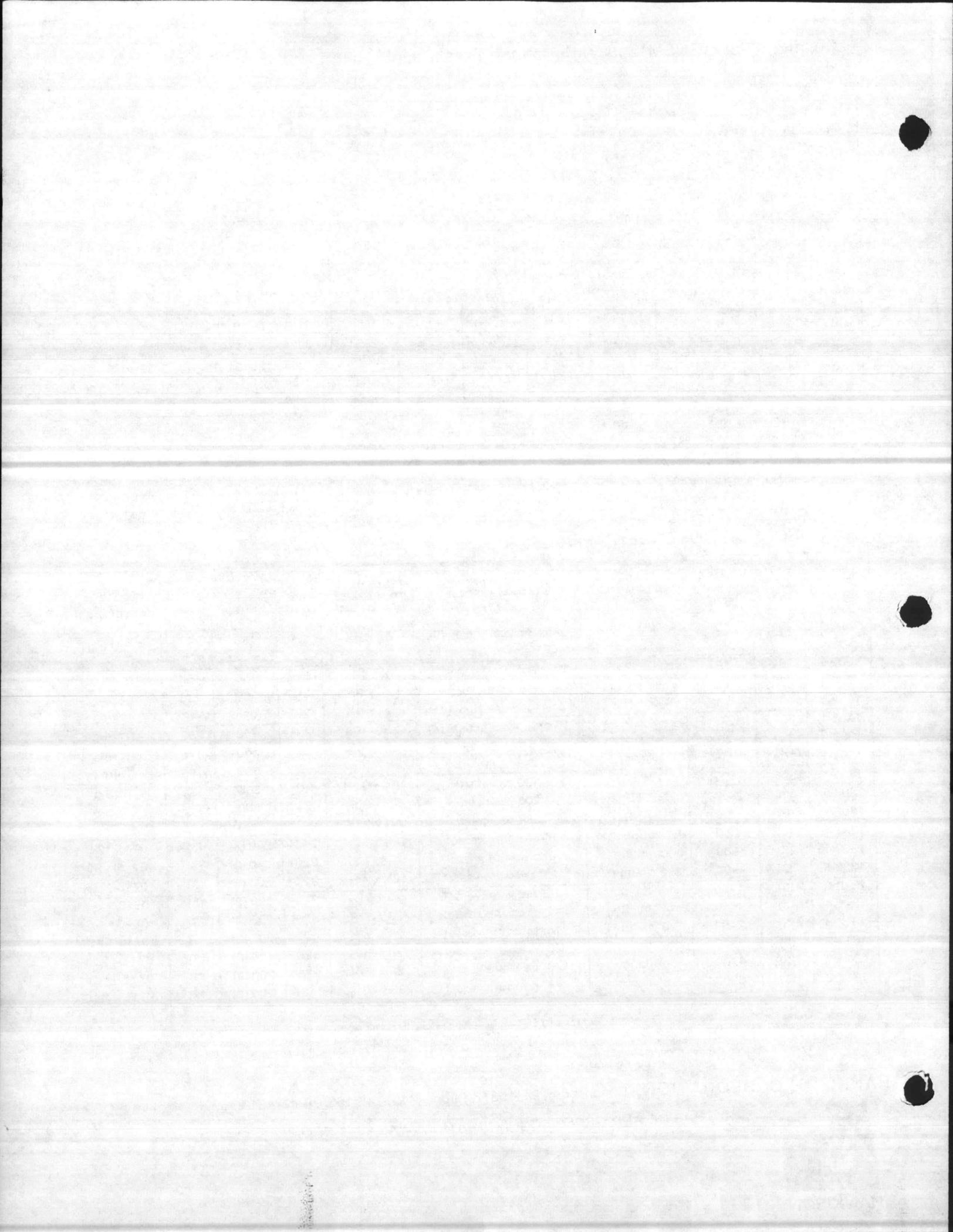
(3) Drain plugs are standard. For manual draining a valve is recommended. For automatic draining Hankison automatic drain traps are available. For models 1312 (2400 scfm) through 1315 (6000 scfm) use model 505 Trip-L-Trap[®]. For

(4) Polycarbonate bowls are furnished with bowl guards.

HANKISON CORPORATION, Canonsburg, Pa. 15317, Phone (412) 745-1555, Telex: 81-2452, Cable: HANKORP

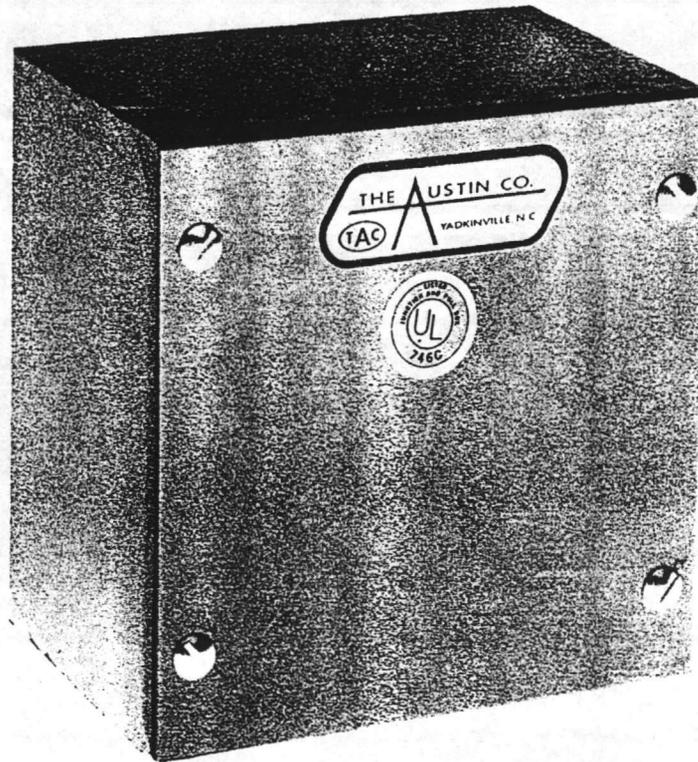
PRICE AND ORDERING INFORMATION AVAILABLE FROM:





Austin Screw Cover Gasketed Boxes

2.1.16.5



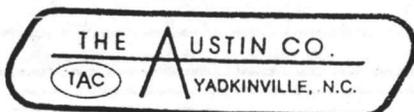
APPLICATION: Austin screw cover gasketed boxes are U.L. approved and listed for use as wiring boxes, pull boxes, terminal boxes, and junction boxes. They may be used in either indoor or outdoor applications where protection from moisture or dust is necessary.

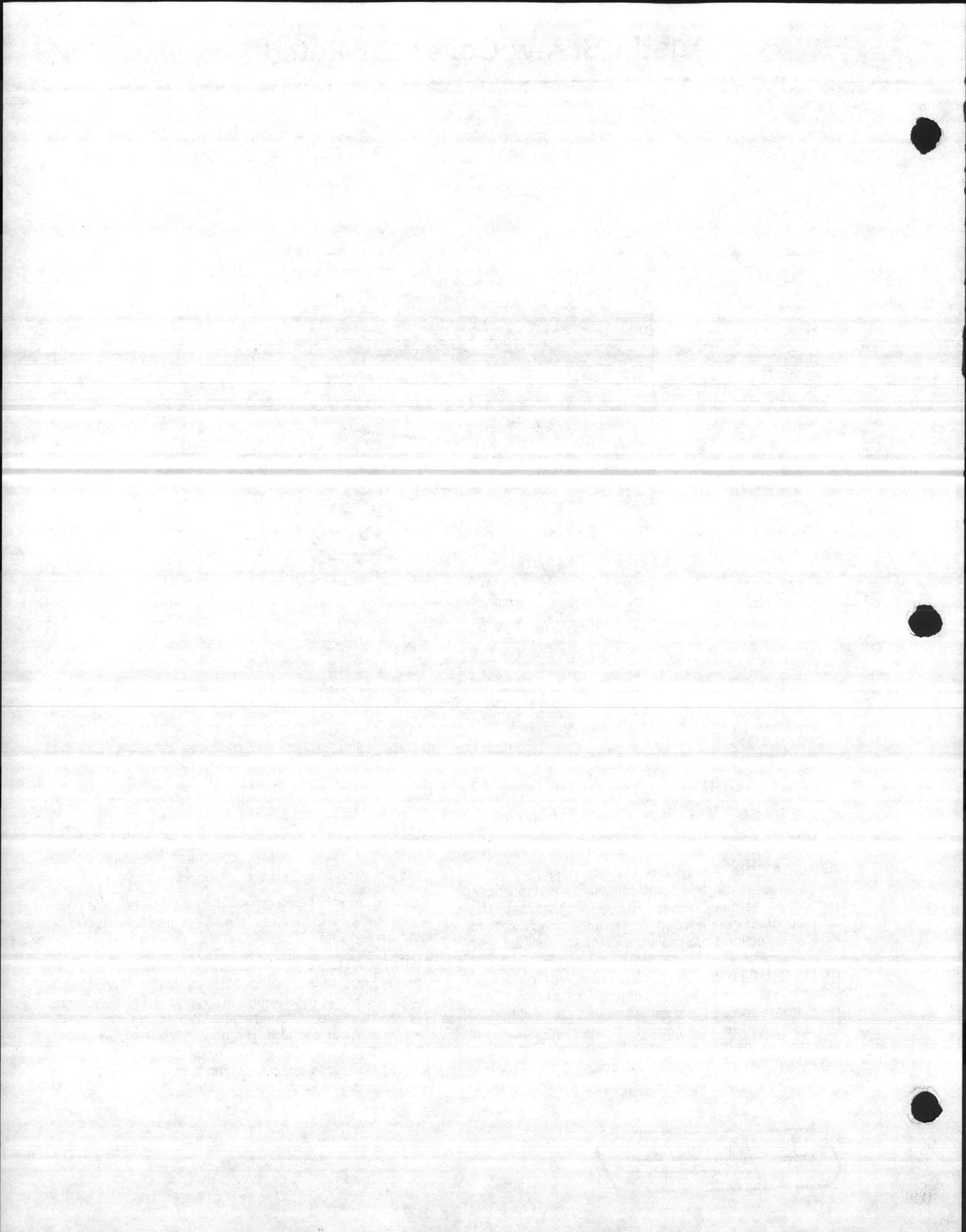
CONSTRUCTION: Austin screw cover gasketed boxes are fabricated, in accordance with U.L. specifications, from code gauge steel. All seams are continuously welded and ground smooth. A neoprene gasket is attached to the box with an oil resistant adhesive to prevent moisture or dust from entering the box. No

holes or mounting feet are provided.

FINISH: Austin screw cover gasketed boxes are provided standard in galvanized steel. A gray finish is available on request.

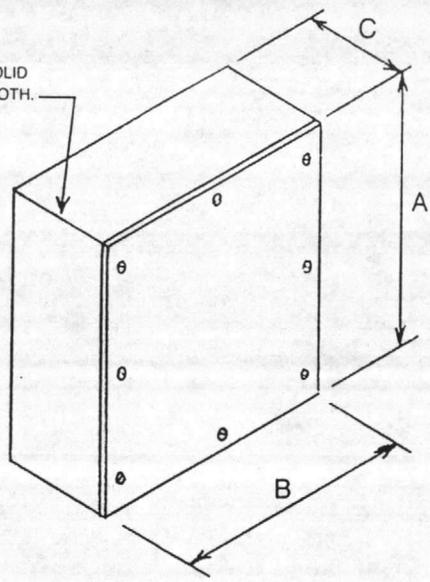
MODIFICATIONS: The Austin Company can provide special knockouts or knockout arrangements, cutouts, holes, hubs, special materials, special finishes, and custom box size or construction. We specialize in custom work of any kind in gray finish, galvanized steel, stainless steel, or aluminum. Please consult the factory for assistance on special pricing and delivery.





2.1.16.5

SEAMS WELDED SOLID
AND GROUND SMOOTH.

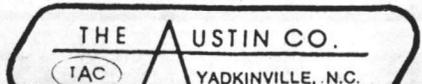


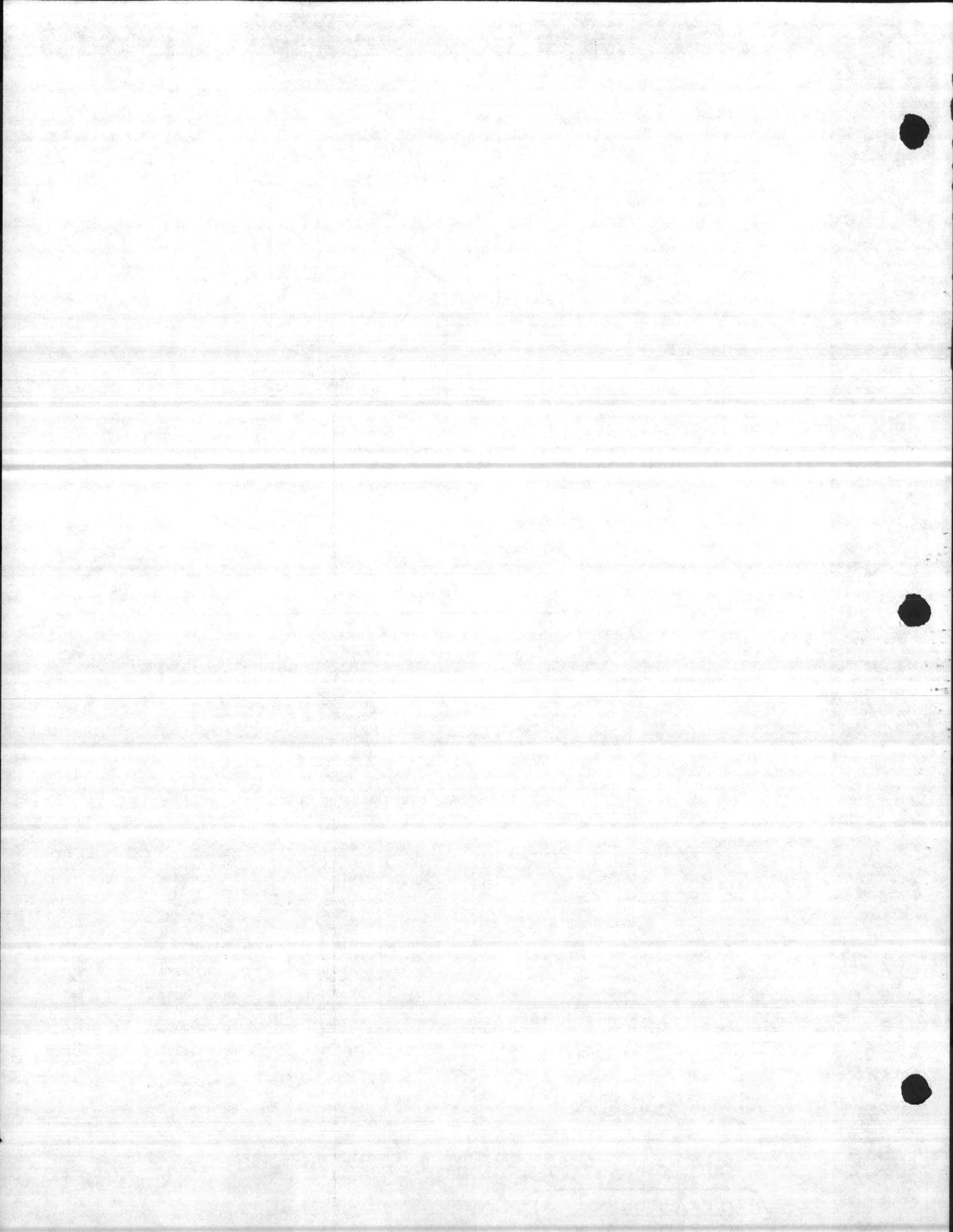
**Screw Cover Gasketed Boxes
Bundle Sizes**

Enclosure Size AxBxC	Standard Bundle	Catalog Number	Bundle Weight
4x4x4	10	AB-444GSB	20
6x6x4	10	AB-664GSB	30
8x8x4	10	AB-884GSB	50
10x10x4	10	AB-10104GSB	70
12x12x4	5	AB-12124GSB	45
6x6x6	10	AB-666GSB	40
8x8x6	10	AB-886GSB	60
10x10x6	10	AB-10106GSB	90
12x12x6	5	AB-12126GSB	55
18x18x6	3	AB-18186GSB	60
24x24x6	2	AB-24246GSB	78

Screw Cover Gasketed Boxes

Enclosure Size AxBxC	Catalog Number	Bundle Weight	Enclosure Size AxBxC	Catalog Number	Bundle Weight
4x4x4	AB-444GSB	2	18x18x8	AB-18188GSB	23
6x6x4	AB-664GSB	3	24x24x8	AB-24248GSB	42
8x6x4	AB-864GSB	4	30x24x8	AB-30248GSB	51
8x8x4	AB-884GSB	5	36x24x8	AB-36248GSB	60
10x8x4	AB-1084GSB	5	30x30x8	AB-30308GSB	88
10x10x4	AB-10104GSB	7	36x30x8	AB-36308GSB	102
12x10x4	AB-12104GSB	7	18x18x10	AB-181810GSB	25
12x12x4	AB-12124GSB	9	24x24x10	AB-242410GSB	48
6x6x6	AB-666GSB	4	30x24x10	AB-302410GSB	58
12x6x6	AB-1266GSB	7	36x24x10	AB-362410GSB	67
8x8x6	AB-886GSB	6	30x30x10	AB-303010GSB	96
10x10x6	AB-10106GSB	9	36x30x10	AB-363010GSB	111
12x12x6	AB-12126GSB	11	18x18x12	AB-181812GSB	28
15x12x6	AB-15126GSB	13	24x24x12	AB-242412GSB	53
15x15x6	AB-15156GSB	16	30x30x12	AB-303012GSB	103
18x18x6	AB-18186GSB	20	36x36x12	AB-363612GSB	137
24x18x6	AB-24186GSB	26	6x6x4 10Ga.	AB-664GSB10	7
24x24x6	AB-24246GSB	39	8x8x4 10Ga.	AB-884GSB10	10
8x8x8	AB-888GSB	7	12x12x6 10Ga.	AB-12126GSB10	23
12x12x8	AB-12128GSB	12			







2,1,4

DATA
SHEET

RECEIVER CONTROLLER

Direct or Reverse Acting Models

P541 RA = C3, C5, C6, C14, C13
P541 = C2

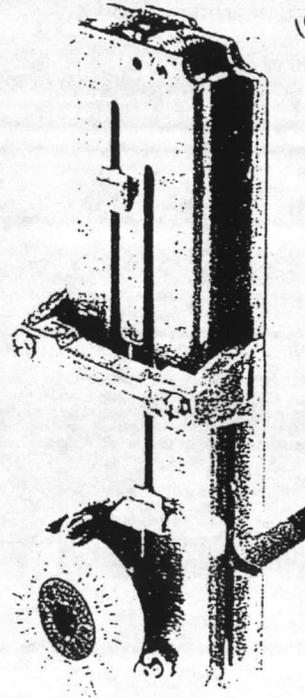
MODEL
P541

GENERAL DESCRIPTION

The Model P541 receiver-controllers are used with remote pneumatic transmitters to provide proportional control in pneumatic control systems. They are designed primarily for use with Robertshaw pneumatic transmitters; however, they may be used with any pneumatic device having a calibrated output of 3 to 15 psig, such as thermostats or humidistats. There are two models available: Model P541 (direct acting) and Model P541-RA (reverse acting).

The P541 direct acting model may be used as a low-limit controller, and the P541-RA reverse acting model may be used as a high-limit controller where applications require such devices.

The design of the P541 receiver controllers incorporates the pilot-bleed relay and pneumatic feedback principles usually found in industrial type instruments. These design features assure accuracy, linearity, and stability over the entire operating range.



SPECIFICATIONS

MODELS: P541, dual input with remote adjustment, direct acting.

P541-RA, dual input with remote adjustment, reverse acting.

SET POINT: Adjustable; graduated dial with 0.25 psi (.02 bar) divisions. Scales available for degrees, %RH, pressure, differential pressure, etc.

THROTTLING RANGE: Adjustable, 2 to 40% (.24 to 4.8 psi or .02 bar to 0.33 bar).

AUTHORITY (EFFECT OF RESET INPUT ON SET POINT: Adjustable, 10 to 300% of primary signal input.

CONTROL POINT ADJUSTMENT EFFECT ON SET POINT: $\pm 10\%$ of primary transmitter span.

ACTIVE CONNECTIONS: Main (M), Branch (B), Primary Signal Input (S), Control Point Adjustment (C), Reset Input (R); barbed connections for $\frac{1}{4}$ " (6.4 mm) O.D. polyethylene tubing.

When using either model as a limit controller, integral limit valve must be indexed to the "limit" position,

main air supply piped to port (C), and input from primary control device piped to (M). Branch (B) remains the output port.

MAIN AIR PRESSURE: 4 psig (.27 bar) to 22 psig (1.5 bar) operating; 30 psig (2.1 bar) maximum.

AMBIENT TEMPERATURE LIMITS: 40 to 140°F (4.4 to 60°C).

FINISH: Case, glass-filled Nylon.

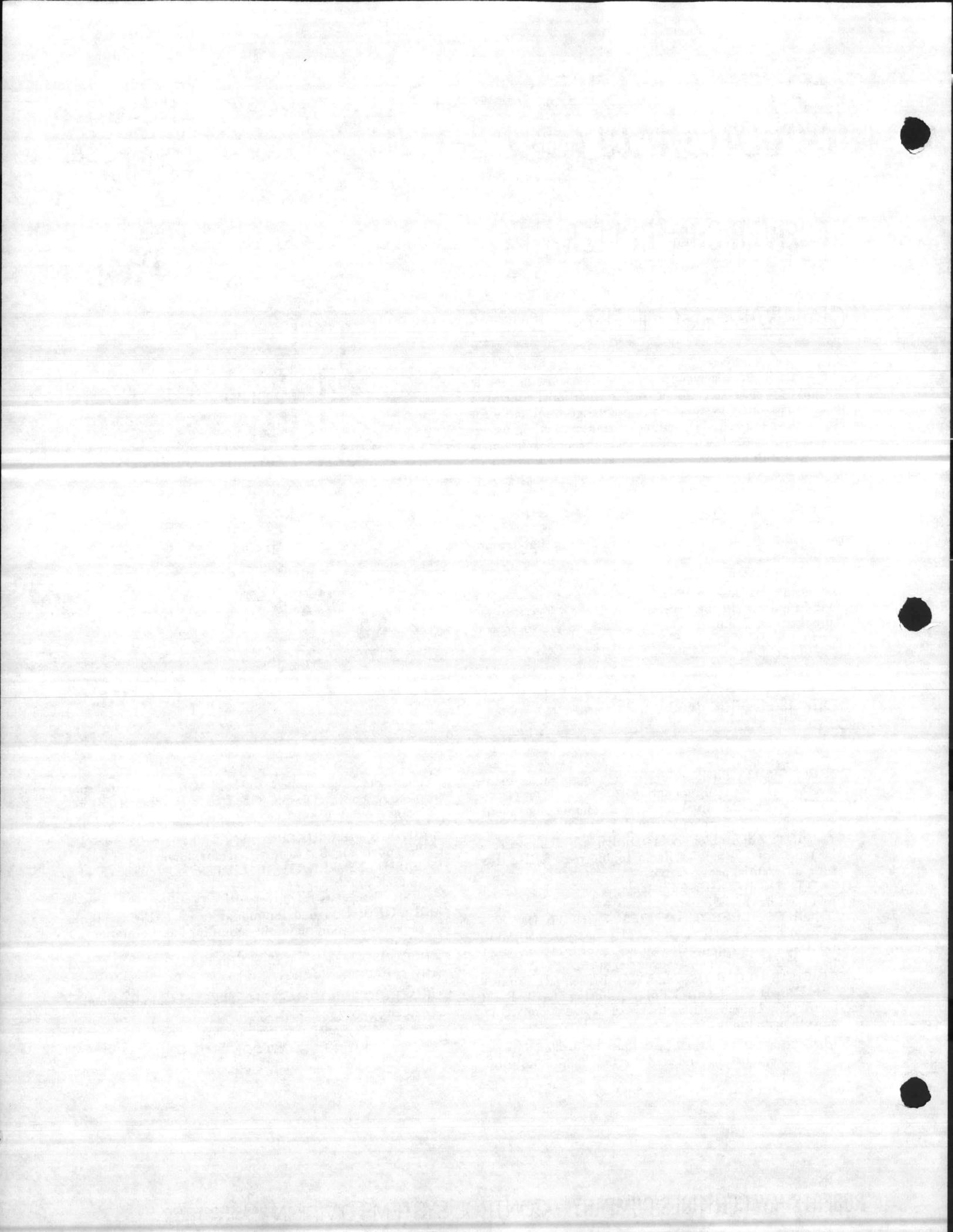
MOUNTING: Designed for mounting on MCS-S manifold socket. For non-manifold mounting, use mounting kit K504.

AIR CONSUMPTION: 1.25 SCFH (36 CIM).

AIR CAPACITY: 8 SCFH.

ORDERING INFORMATION: SPECIFY: Model Number

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.

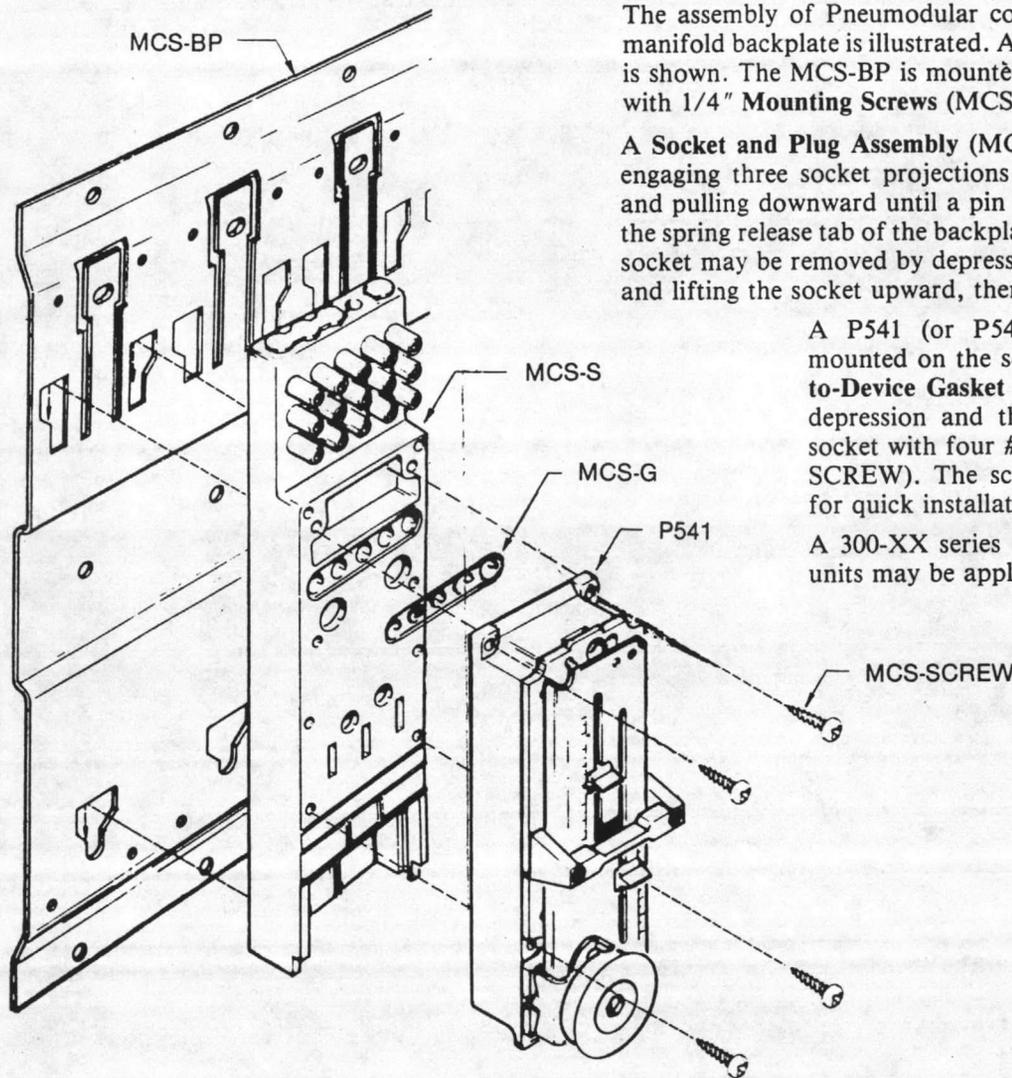


INSTALLATION INSTRUCTIONS

PNEUMODULAR® RECEIVER CONTROLLERS

P541
P541(R.A.)

SOCKET MOUNTING



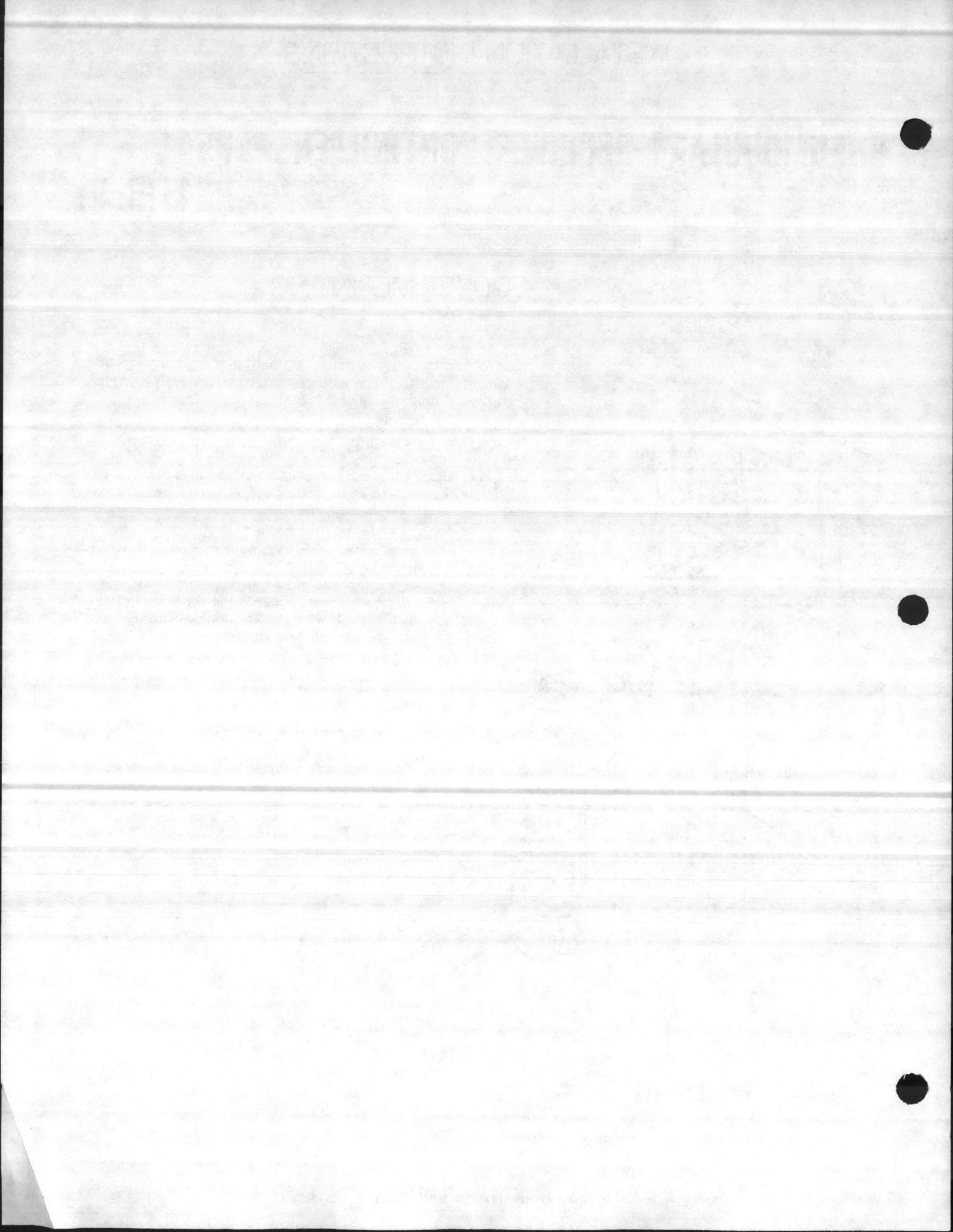
The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MCS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A P541 (or P541-R.A.) receiver controller is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the P541 to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

A 300-XX series adhesive scale with engineering units may be applied to the P541 set point dial.

FIGURE 1 — P541 SOCKET MOUNTING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® RECEIVER CONTROLLERS

DIRECT AND REVERSE ACTING

P541
P541-RA

CALIBRATION

The Model P541 series receiver controllers utilize input signals from remote sensing devices and adjusting devices to provide proportional control in pneumatic control systems. They are designed primarily for use with Robertshaw pneumatic transmitters; however, they may be used with any pneumatic device having a calibrated output of 3 to 15 psig (21 to 103 kPa), such as thermostats, humidistats or gradual switches. The P541 devices also may be applied as limit controllers. See Table I for model number descriptions and limit functions.

The P541 series controllers are pilot-operated and require a main air connection to port "M" (non-limit application) or port "C" (limit application) of 20 psig (138 kPa). These devices are not factory-calibrated.

TABLE I

MODEL	TYPE	LIMIT APPLICATION
P541	Direct Acting	Low Limit
P541-RA	Reverse Acting	High Limit

ADJUSTMENT

See Table II for adjustment types, ranges and descriptions. Determination of initial settings is an application engineering function and the values should be listed on control drawings or panel labels. Since changes of the throttling range or authority settings or the CPA signal pressure will affect the set point, these values are set first. See Figure 1 for device appearance and location of adjustments.

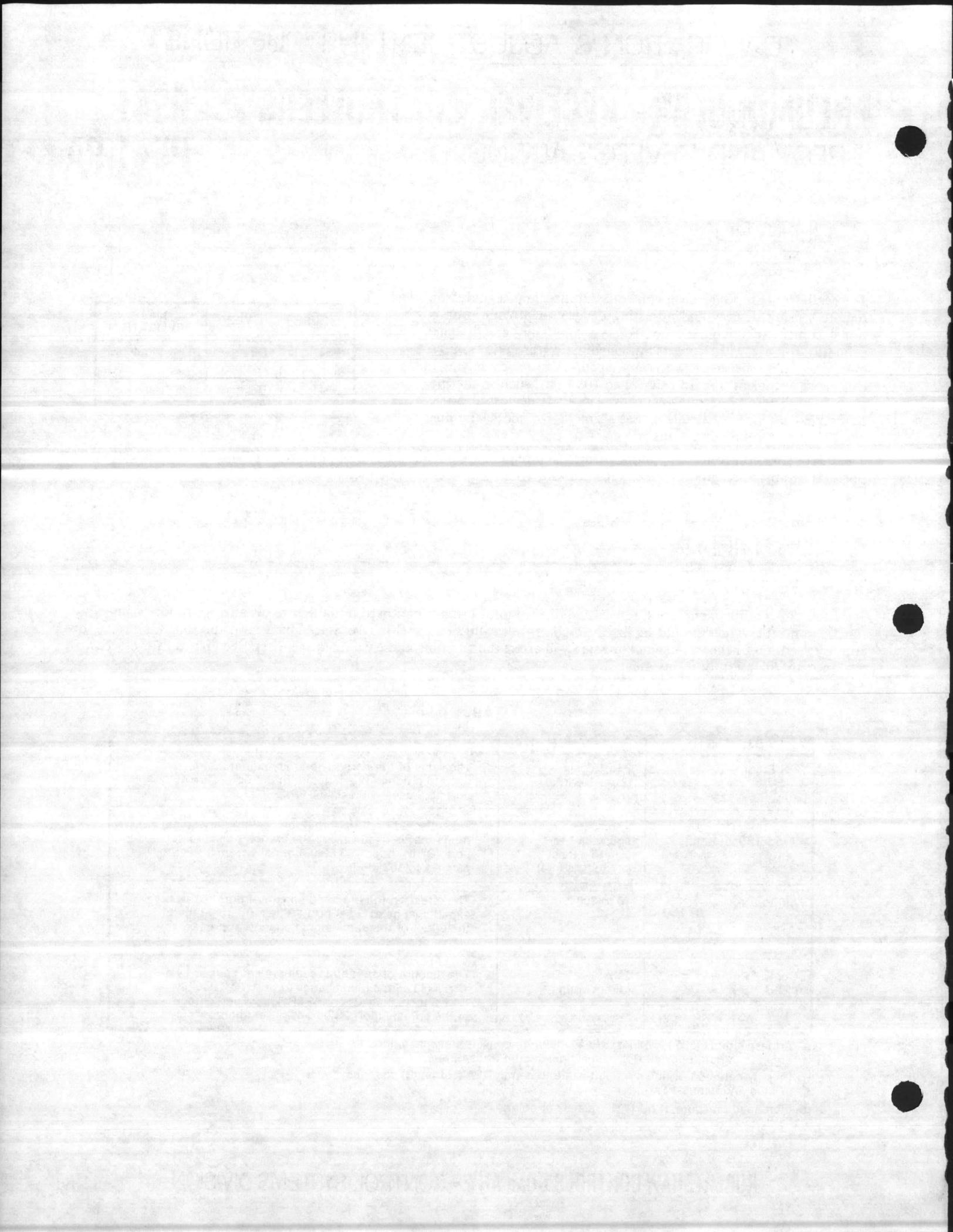
TABLE II

ADJUSTMENT	RANGE	DESCRIPTION
Set Point	3 to 15 psig ^a (21 to 103 kPa)	The value of the port "S" primary signal that is used to produce the midpoint branch pressure at port "B," usually 9 psig (62 kPa).
Throttling Range (Proportional Band)	2 to 40%, equivalent to 0.24 to 4.8 psi (1.7 to 33.1 kPa)	The selected portion of the port "S" primary signal range that is used to vary the branch pressure at port "B" by 12 psi (83 kPa), normally from 3 to 15 psig (21 to 103 kPa).
Authority	10 to 300%	The effect on the branch pressure at port "B" of a signal change at reset port "R" as a percentage of the effect of the same signal change at primary signal port "S."
Control Point ("CPA")	20% ^b (direct acting) ^c	The amount of set point readjustment caused by a 12 psi (83 kPa) signal change at port "C," usually from 3 to 15 psig (21 to 103 kPa), as a percentage of the primary (port "S") transmitter span.

a - Adhesive dials (300-XX series) are available to convert pressure values to engineering units for all Robertshaw pneumatic transmitters.

b - Usually centered on the set point value to permit CPA (set point) changes of plus and minus 10%.

c - Increased pressure at port "C" raises set point.



Throttling Range: The throttling range (proportional band) is set by positioning the T.R. slide to the desired value.

Authority: The authority is set by positioning the authority slide to the desired value. If the application does not require reset action (no signal to port "R"), a minimum authority setting (10%) is recommended.

Control Point Adjustment: The "CPA" feature of P541 series controllers is a fixed mechanical relationship, so that set point changes are directly proportional to CPA signal changes at port "C". No controller adjustment is required.

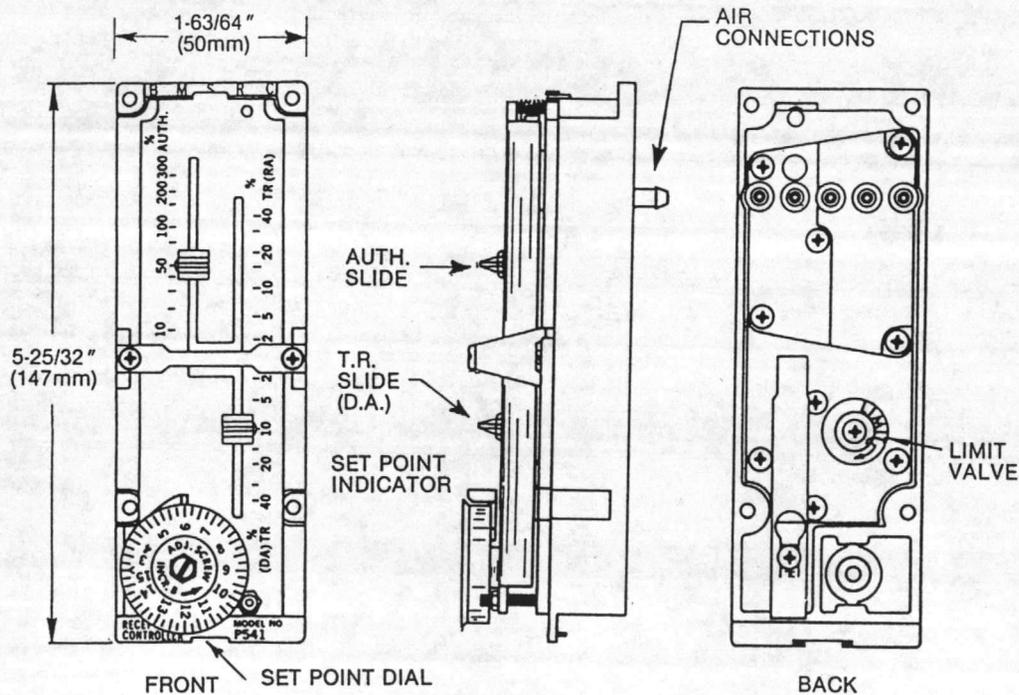


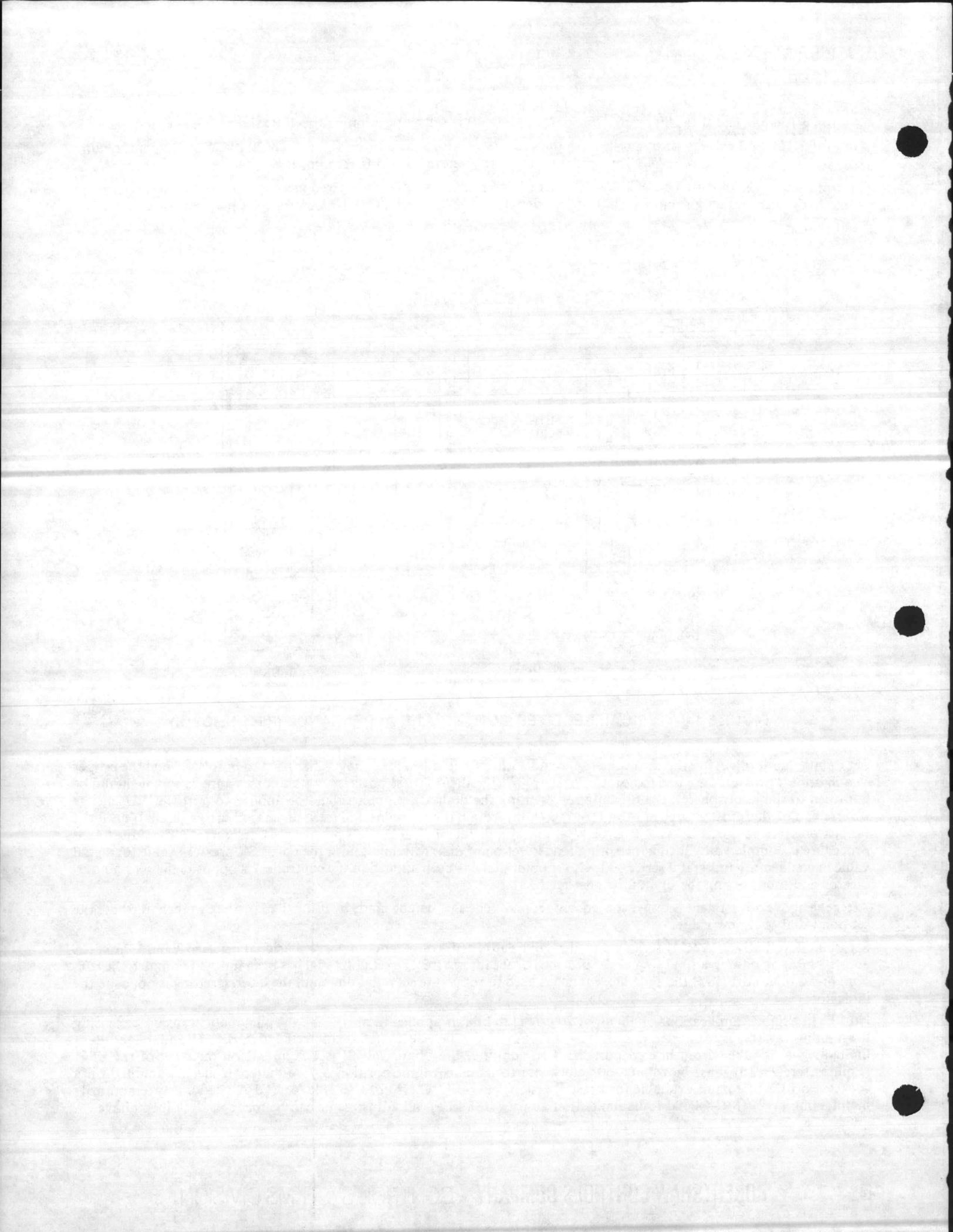
FIGURE 1 — TYPICAL RECEIVER CONTROLLER APPEARANCE (P541 SHOWN).

Set Point (standard): After the throttling range and authority have been set, main air applied to port "M" and the proper "calibration" pressures applied to ports "C" and "R" (if either of these ports is not used for an application, it should be left open to the atmosphere), the pressure representing the desired set point should be applied to port "S." Using the reverse end of thermostat wrench N2-4 (1/4", 6.4mm), rotate the set point dial (see "Increase" arrow on dial) until the branch pressure at port "B" is 9 psig (62 kPa) unless a different "calibration pressure" is designated. The adjustment procedure is completed by lifting the spring-loaded set point dial, rotating it until the port "S" pressure value (or signal value in engineering units, if a series 300-XX set point dial has been applied to the controller) is opposite the set point indicator and then seating the dial on its gear teeth.

After the above adjustment is done, subsequent set point changes can be made by using the 1/4" hex wrench to rotate the set point dial to a new value.

Set Point (alternative): A P541 series controller can be adjusted to any random port "S" signal between 3 and 15 psig (21 and 103 kPa) by adding a final step to the previous procedure: After the set point dial has been indexed to match the *random* pressure at port "S," the 1/4" hex wrench is used to rotate the set point dial until the *desired* setting is opposite the indicator.

NOTE: In "limit" applications, main air at 20 psig (138 kPa) is applied to port "C," the pneumatic transmitter sensing the limiting variable is connected to port "S," the control signal to be limited is connected to port "M" and the resultant limited signal is taken from branch port "B." In addition, the "limit valve" (see Figure 1) on the back of the P541 (Phillips screwhead) must be rotated 60° clockwise to its detent limit position *before* the controller is mounted on a socket. Port "R" remains available for "reset" action, but port "C" is *not* available for "CPA" action. By temporarily maintaining port "M" (signal to be limited) at 20 psig (138 kPa), all adjustments can be made as described above.





2.1.13

C1+10

DATA
SHEET

ELECTRIC-PNEUMATIC RELAY

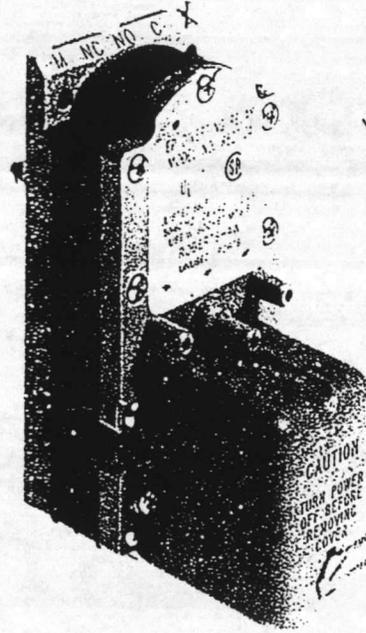
MODELS

R527
R528

GENERAL DESCRIPTION

The R527 and R528 Series electric-pneumatic relays are 3-way, 2-position, electrically activated air valves for use in pneumatic control systems where the application requires a variety of switching, diverting, or interlocking functions, actuated by an electrical circuit. The Model R527 series devices switch one SPDT pneumatic circuit. The Model R528 series devices are designed with DPDT pneumatic switching (2 independent SPDT pneumatic circuits).

In both the R527 and R528, an electric coil, when energized, initiates pneumatically actuated switching from "normal" to "energized" position. The "energized" position also may be manually selected, using a small screwdriver, as needed during installation or troubleshooting.



SPECIFICATIONS

MODELS:

- R527-24: 24 Vac coil, SPDT pneumatic switching
- R527-24DC: 24 Vdc coil, SPDT pneumatic switching
- R527-110: 110 Vac coil, SPDT pneumatic switching
- R527-230: 208-240 Vac coil, SPDT pneumatic switching
- R528-24: 24 Vac coil, DPDT pneumatic switching
- R528-24DC: 24 Vdc coil, DPDT pneumatic switching
- R528-110: 110 Vac coil, DPDT pneumatic switching
- R528-230: 208-240 Vac coil, DPDT pneumatic switching

ACTION: R527 series: coil de-energized, NO & C are connected; coil energized, NC & C are connected.

R528 series: coil de-energized, NO & C are connected, NO2 & C2 are connected; coil energized, NC & C are connected, NC2 & C2 are connected.

On all models, ports not connected to Common (C) or (C2) are blocked. On all R528 Models, both pneumatic switching circuits are activated simultaneously.

MAIN AIR PRESSURE: 20 psig (1.4 bar) operating, 30 psig (2.1 bar) maximum.

MAXIMUM AMBIENT TEMPERATURE: 140° F (60° C).

GENERAL INSTRUCTIONS

FINISH: Glass-filled Nylon.

ACTIVE CONNECTIONS: R527 series: Common (C), Normally Open (NO), Normally Closed (NC).

R528 Series: Common (C), Normally Open (NO), Normally Closed (NC); Common 2 (C2), Normally Open 2 (NO2), Normally Closed 2 (NC2), nipples for 1/4" (6.4 mm) O.D. polyethylene tubing.

Both series: Main (M).

AIR CONSUMPTION: 1 SCFH (28.8 CIM)

AIR CAPACITY: 60 SCFH

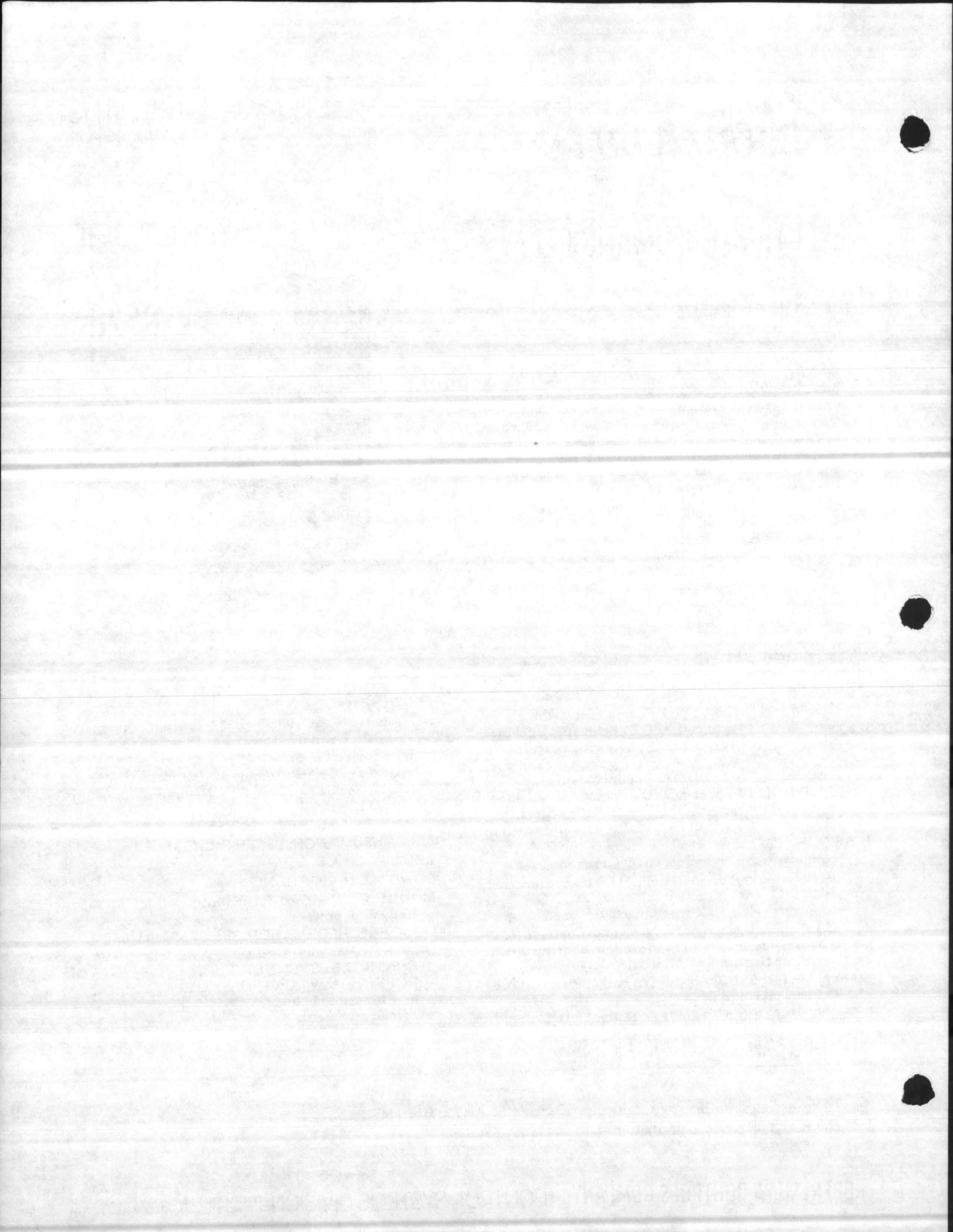
POWER CONSUMPTION: 2.2 VA.

MOUNTING: Designed for mounting on MCS-S manifold socket only.

ORDERING INFORMATION: Specify Model Number.

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.

1. To be used on clean, dry control air only. DO NOT USE ANY OTHER MEDIUM.
2. This relay will operate properly when mounted in any position.

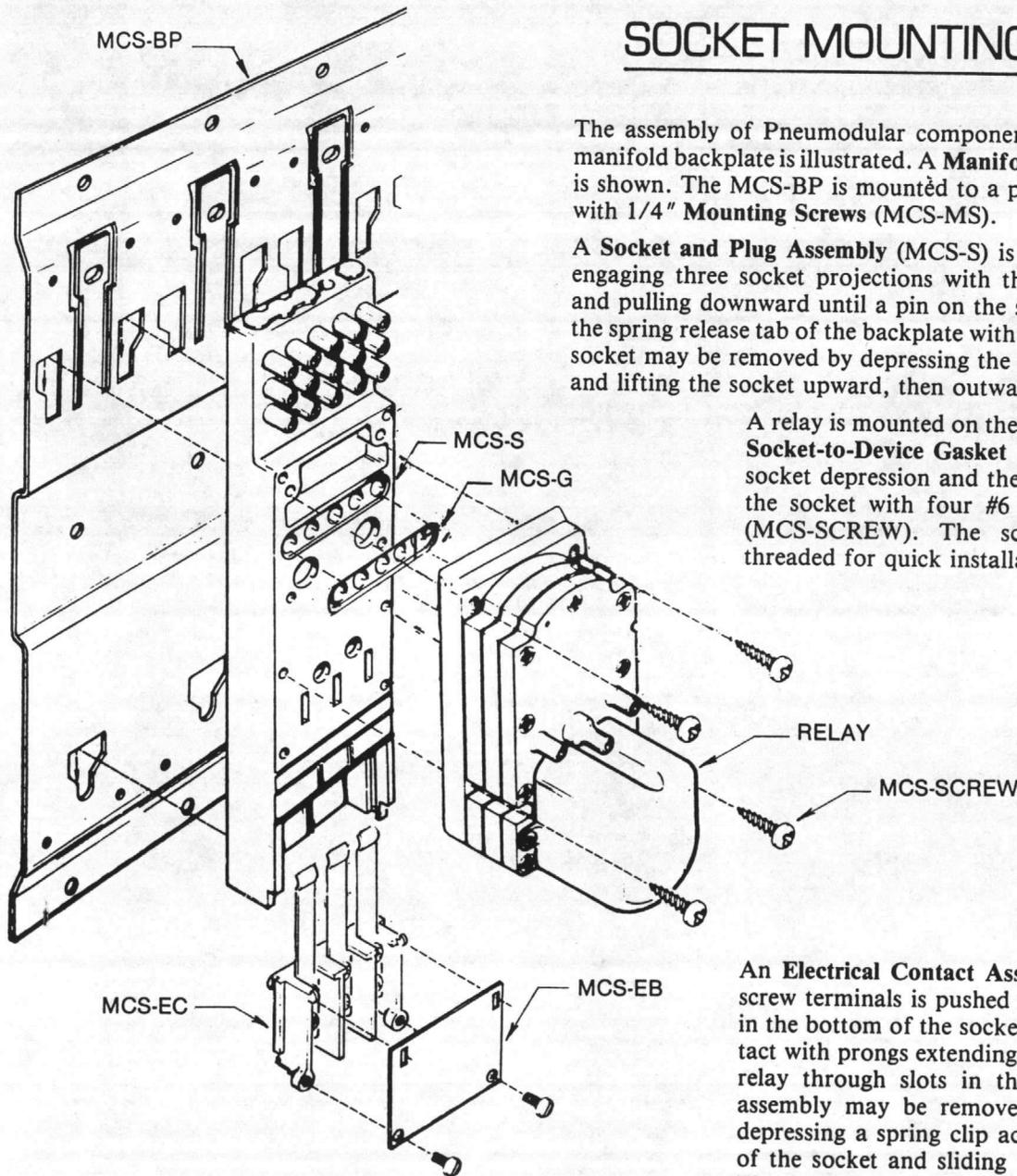


INSTALLATION INSTRUCTIONS

PNEUMODULAR® ELECTRIC-PNEUMATIC RELAYS

R527
R528

SOCKET MOUNTING



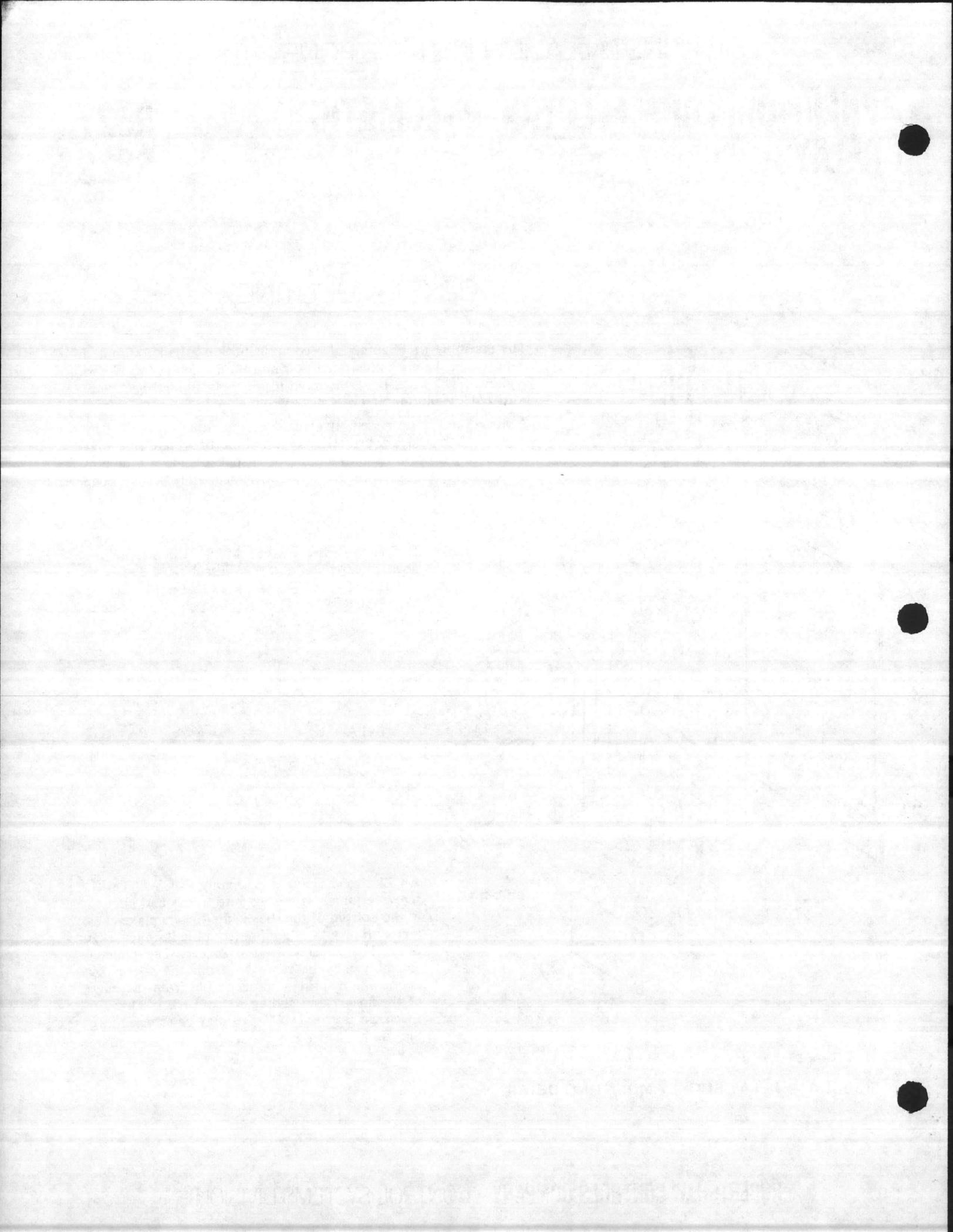
The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MCS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A relay is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the relay to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

An **Electrical Contact Assembly (MCS-EC)** with screw terminals is pushed into tracks and latched in the bottom of the socket. Its fingers make contact with prongs extending from the installed E/P relay through slots in the socket. The contact assembly may be removed from the socket by depressing a spring clip accessible from the *back* of the socket and sliding it from the tracks. An **Electrical Barrier (MCS-EB)** may be screwed into the contact assembly, if required.

FIGURE 1 — RELAY SOCKET MOUNTING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® ELECTRIC-PNEUMATIC RELAYS **R527**

SINGLE & DUAL SWITCHING **R528**

CALIBRATION

The Model R527 series and R528 series electric-pneumatic relays are three-way, two-position, electrically activated air valves for use in pneumatic control systems where applications require a variety of switching, diverting or interlocking functions. The R527 series devices switch one SPDT pneumatic circuit. The R528 series devices simultaneously switch two SPDT pneumatic circuits for DPDT action. See Table I for model number descriptions and switching action.

The R527 and R528 relays are pilot-operated and require a main air connection to port "M" of 20 psig (138 kPa). They do not require calibration.

TABLE I

MODEL	COIL VOLTAGE	TYPE	SWITCHING ACTION	
			DE-ENERGIZED ("NORMAL")	ENERGIZED
R527-24	24 VAC	SPDT	Ports NO & C connected	Ports NC & C connected
R527-24DC	24 VDC			
R527-110	115 VAC			
R527-230	208-240 VAC			
R528-24DC	24 VDC	DPDT	Ports NO & C connected; ports NO2 & C2 connected	Ports NC & C connected; ports NC2 & C2 connected
R528-110	115 VAC			
R528-230	208-240 VAC			

On all models, ports not connected to Common (C) or (C2) are blocked.
On all R528 models, both pneumatic switching circuits are activated simultaneously.

ADJUSTMENT

The R527 and R528 electric-pneumatic relays do not require adjustment.

Manual Operation: These relays feature a slotted "AUTO-MAN" switch (automatic and "on" positions) on their covers to permit manual system operation when electrical power is not connected.

Coil Replacement: Replacement relay solenoid coils are listed in Table II. The replacement procedure is as follows:

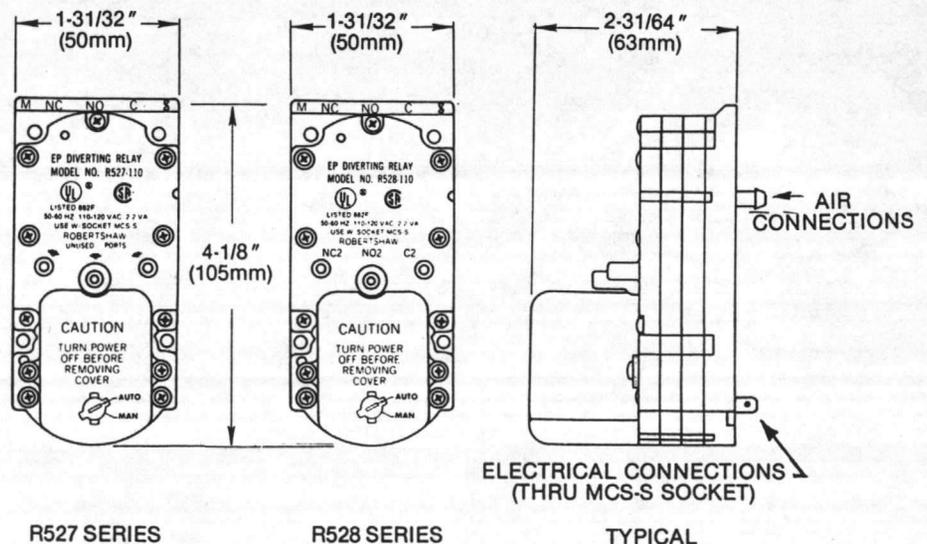


FIGURE 1 - ELECTRIC-PNEUMATIC RELAY APPEARANCE

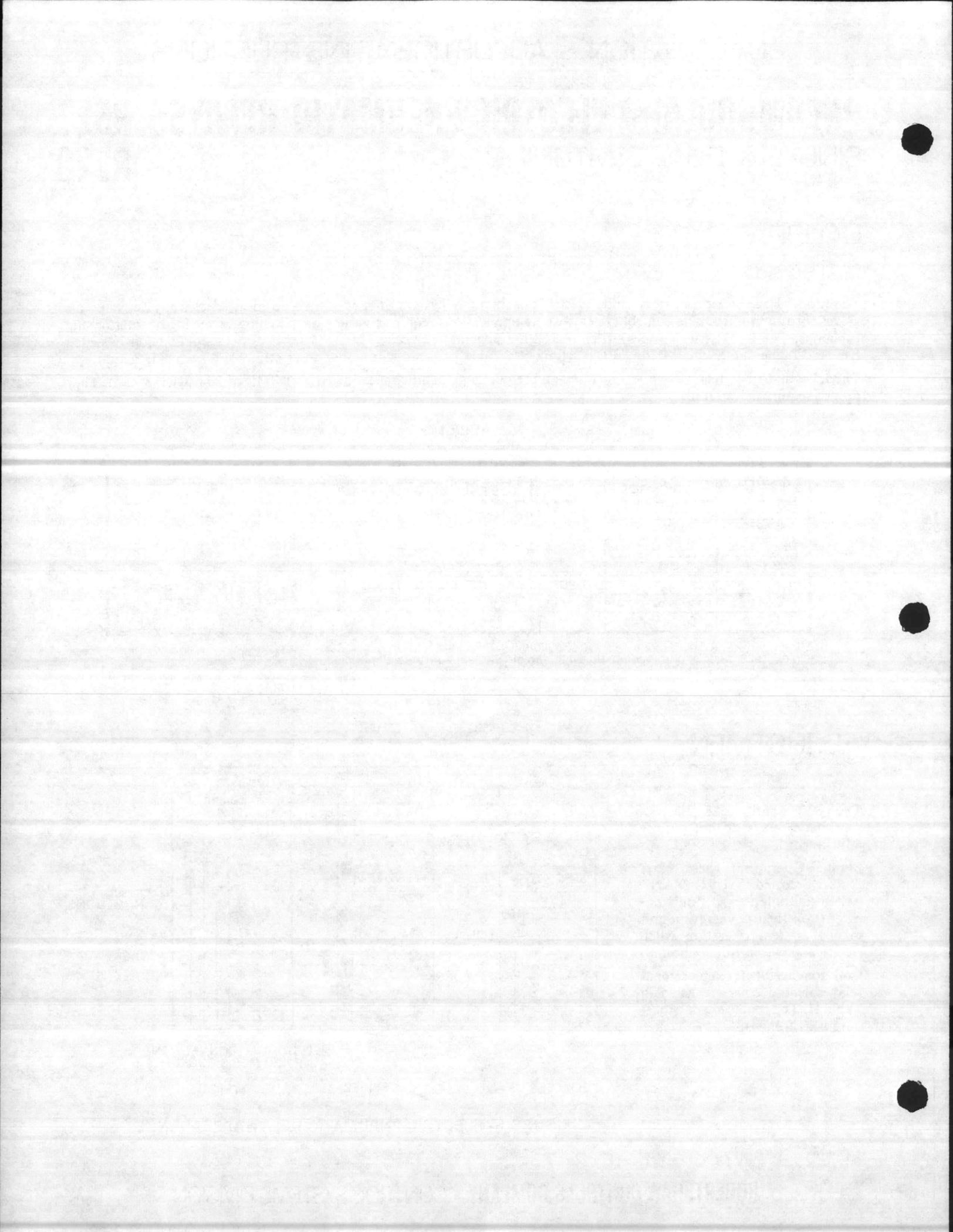
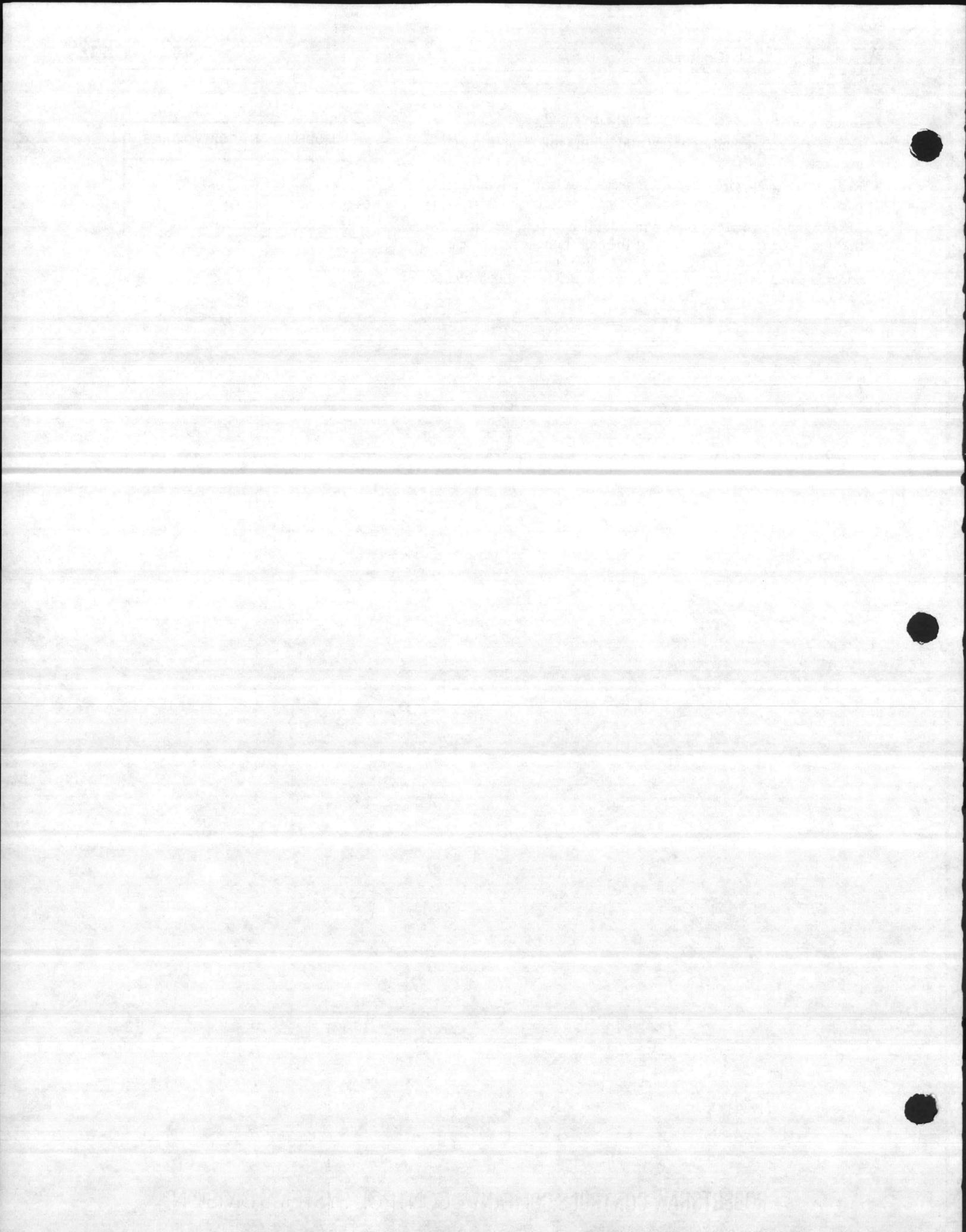


TABLE II

1. Remove the two cover screws and the solenoid cover.
2. Loosen the coil mounting screw and lift the coil from its mounting post.
3. Remove the relay wire "quick connect" lugs from the coil terminals.
4. Reverse the above procedure to install the new coil, making sure that the projection on the back of the coil frame is firmly seated in its relay body detent. The clearance between the relay leakport and the solenoid leakport plug must be 0.005 to 0.008 inches (0.13 to 0.20mm) when the relay is de-energized.

MODEL	COIL VOLTAGE
K527-24	24 VAC
K527-24DC	24 VDC
K527-110	115 VAC
K527-230	208-240 VAC





2,1,13
C4

DATA SHEET

MODEL R504

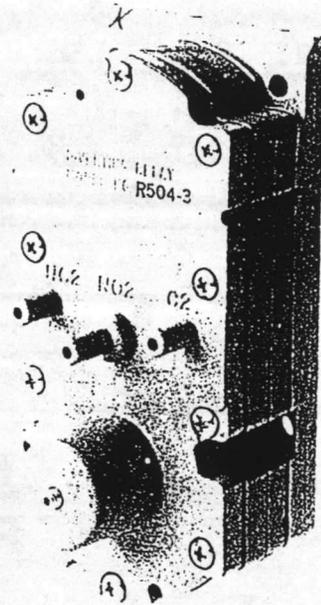
DIVERTING RELAYS

NON-ADJUSTABLE

GENERAL DESCRIPTION

The Model R504 Diverting Relays are snap-acting devices designed for a variety of switching and interlocking functions in pneumatic control systems where applications may require one or more of the following functions: feeding and exhausting branch lines, diverting a supply line to either one of two branch lines, diverting either one of two supply lines to one branch line.

These relays should be used only where there are positive changes in the signal pressure such as changes in summer-winter changeover pressure, day-night changeover pressure, or any other two-position pneumatic signal.



Model R504-3 Shown

SPECIFICATIONS

- MODELS: R504-1: SPDT pneumatic switching @ 4-8 psig (.3-.6 bar)
 R504-2: SPDT pneumatic switching @ 18-22 psig (1.2-1.5 bar)
 R504-3: DPDT pneumatic switching @ 4-8 psig (.3-.6 bar)
 R504-4: DPDT pneumatic switching @ 18-22 psig (1.2-1.5 bar)

(On Models R504-3 and R504-4, both switches are activated simultaneously; on all models, all ports not connected to common (C) are blocked).

- ACTION: R504-1: Below 4 psig: NO & C are connected.
 Above 8 psig: NC & C are connected.
 R504-2: Below 18 psig: NO & C are connected.
 Above 22 psig: NC & C are connected.
 R504-3: Below 4 psig: NO & C are connected, NO2 & C2 are connected.
 Above 8 psig: NC & C are connected, NC2 & C2 are connected.
 R504-4: Below 18 psig: NO & C are connected, NO2 & C2 are connected.
 Above 22 psig: NC & C are connected, NC2 & C2 are connected.

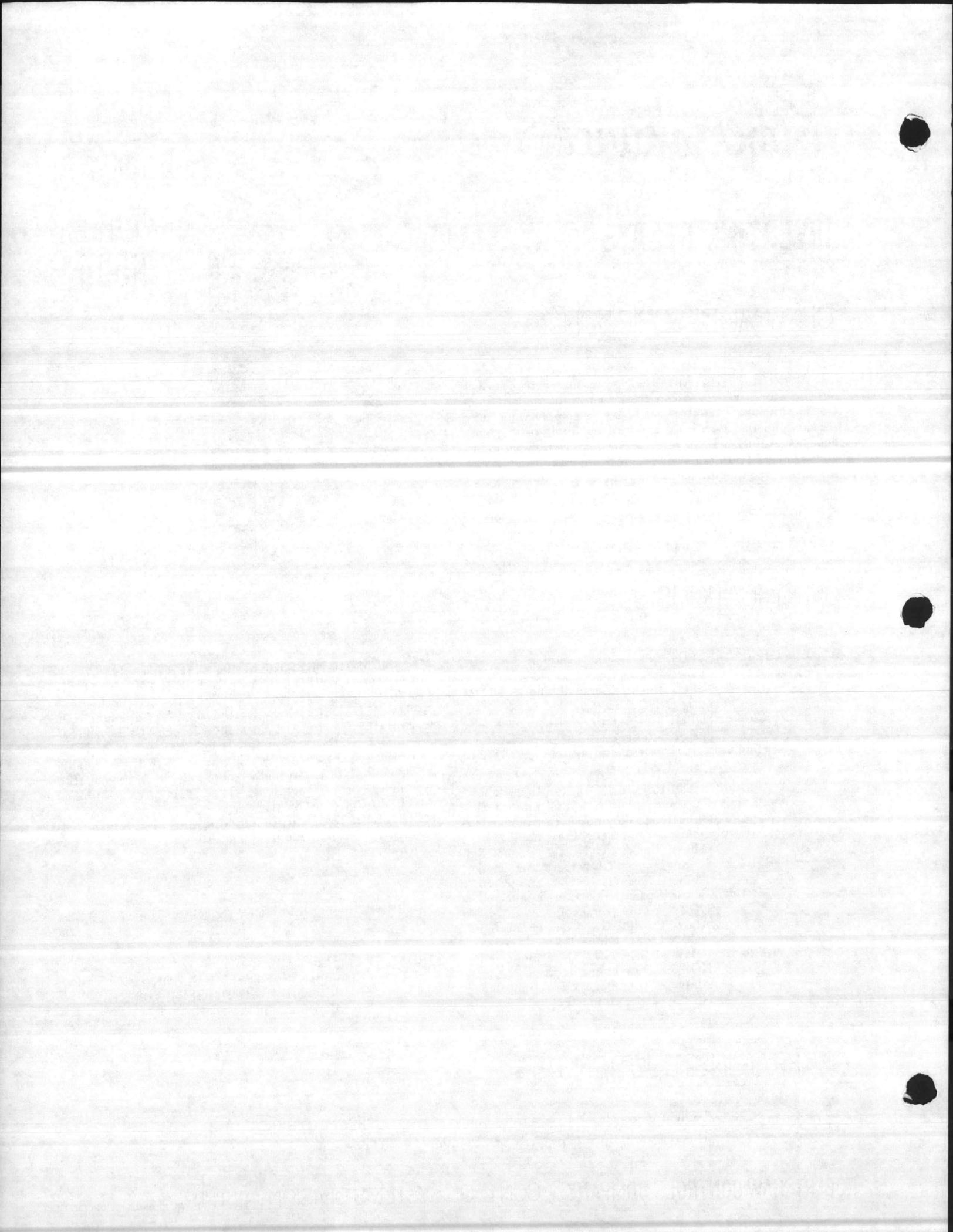
- MAXIMUM AIR PRESSURE: 30 psig (2.1 bar)
 MAXIMUM AMBIENT TEMPERATURE: 140°F (60°C)
 FINISH: Glass filled Nylon.
 ACTIVE CONNECTIONS: R504-1, R504-2: Common (C), Normally Open (NO), Normally Closed (NC), Signal (S), R504-3, R504-4: Common (C), Normally Open (NO), Normally Closed (NC); Common 2 (C2), Normally Open 2 (NO2), Normally Closed 2 (NC2), Signal (S), nipples for 1/4" (6.4 mm) O. D. polyethylene tubing.
 AIR CAPACITY: 60 SCFH
 MOUNTING: Designed for mounting on MCS-S manifold socket. For non-manifold mounting, use mounting kit K503.

ORDERING INFORMATION: Specify: Model Number

ORDER FROM: Local Office of
 CONTROL SYSTEMS DIVISION
 ROBERTSHAW CONTROLS COMPANY
 or office noted below.

GENERAL INSTRUCTIONS

1. To be used on clean, dry control air only. DO NOT USE ANY OTHER MEDIUM.
2. This relay will operate properly when mounted in any position.



PNEUMODULAR® RELAYS

SOCKET MOUNTING

The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MCS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A relay is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the relay to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

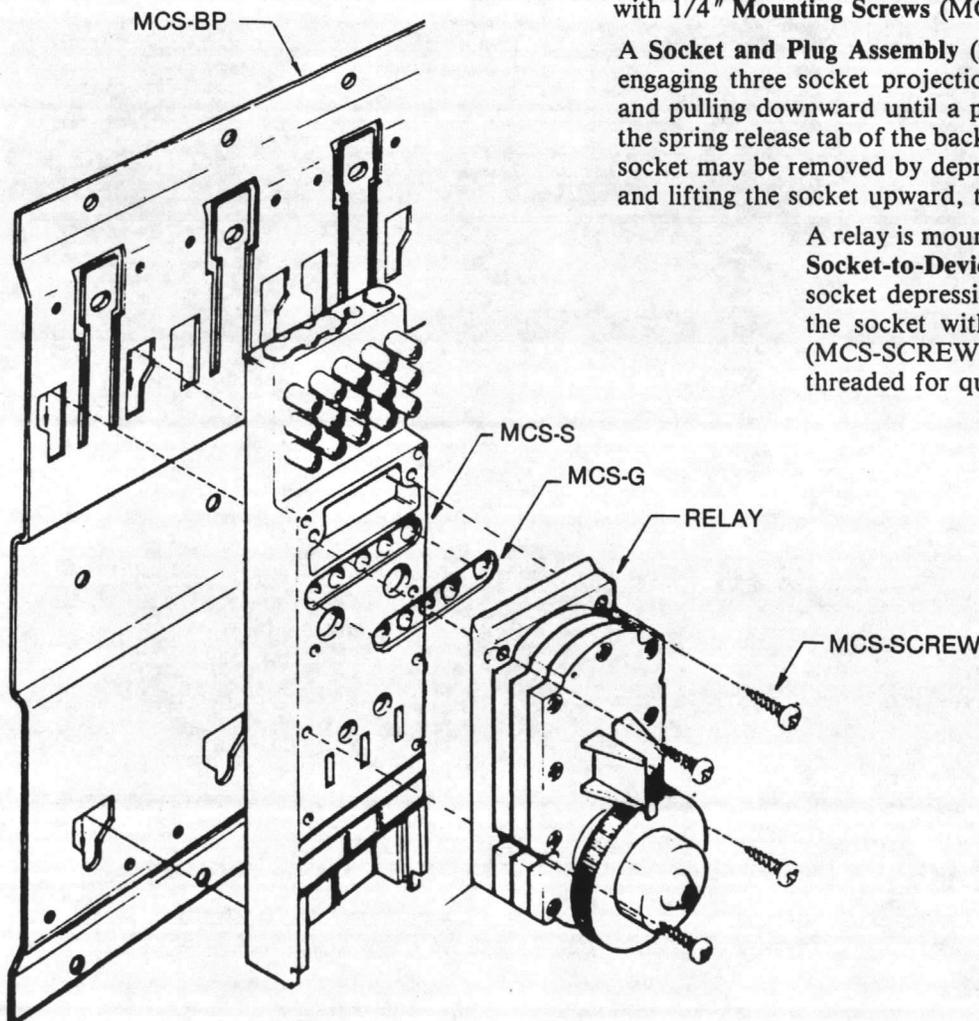
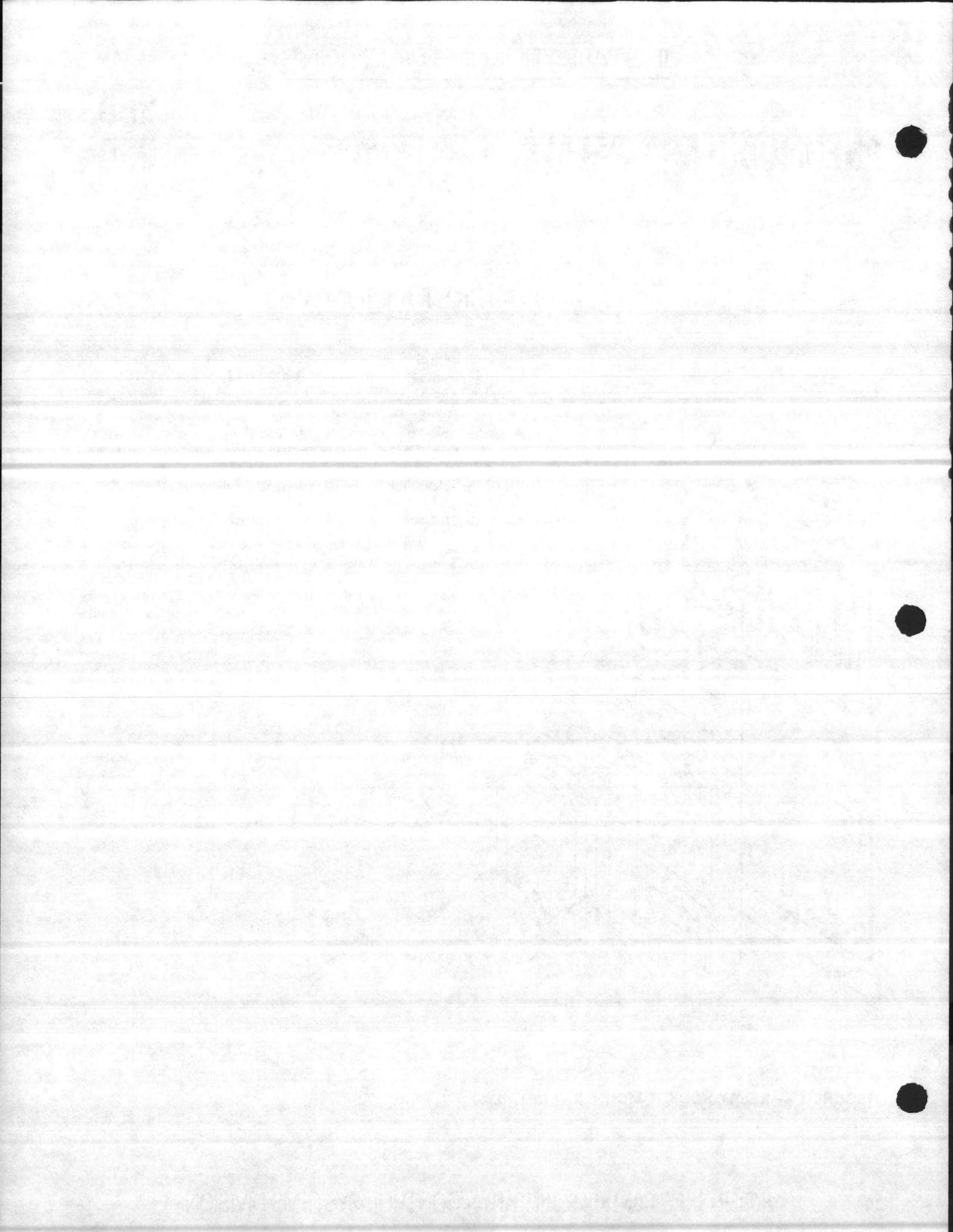


FIGURE 1 — RELAY SOCKET MOUNTING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® DIVERTING RELAYS

FIXED-DIFFERENTIAL

R504

SERIES

CALIBRATION

The Model R504 series diverting relays are snap-acting devices that should be used only where there are positive changes in signal pressure at port "S" to above and below the switching range. See Table I for model number descriptions. The switching ranges are preset for standard system changeover pressures and are not intended to be field calibrated.

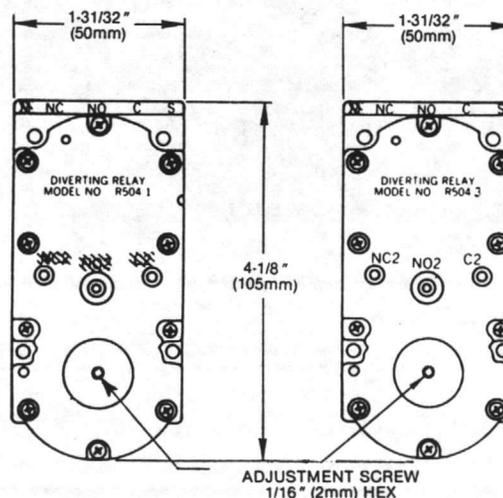
TABLE I

MODEL	TYPE	SWITCHING RANGE & ACTION
R504-1	SPDT	Port S below 4 psig (28 kPa): ports NO & C are connected. Port S above 8 psig (55 kPa): ports NC & C are connected.
R504-2	SPDT	Port S below 18 psig (124 kPa): ports NO & C are connected. Port S above 22 psig (152 kPa): ports NC & C are connected.
R504-3	DPDT	Port S below 4 psig (28 kPa): ports NO & C are connected, NO2 & C2 are connected. Port S above 8 psig (55 kPa): ports NC & C are connected, NC2 & C2 are connected.
R504-4	DPDT	Port S below 18 psig (124 kPa): ports NO & C are connected, NO2 & C2 are connected. Port S above 22 psig (152 kPa): ports NC & C are connected, NC2 & C2 are connected.

NOTE: On Models R504-3 and R504-4, both switches are activated simultaneously; on all models, all ports not connected to common (C) are blocked.

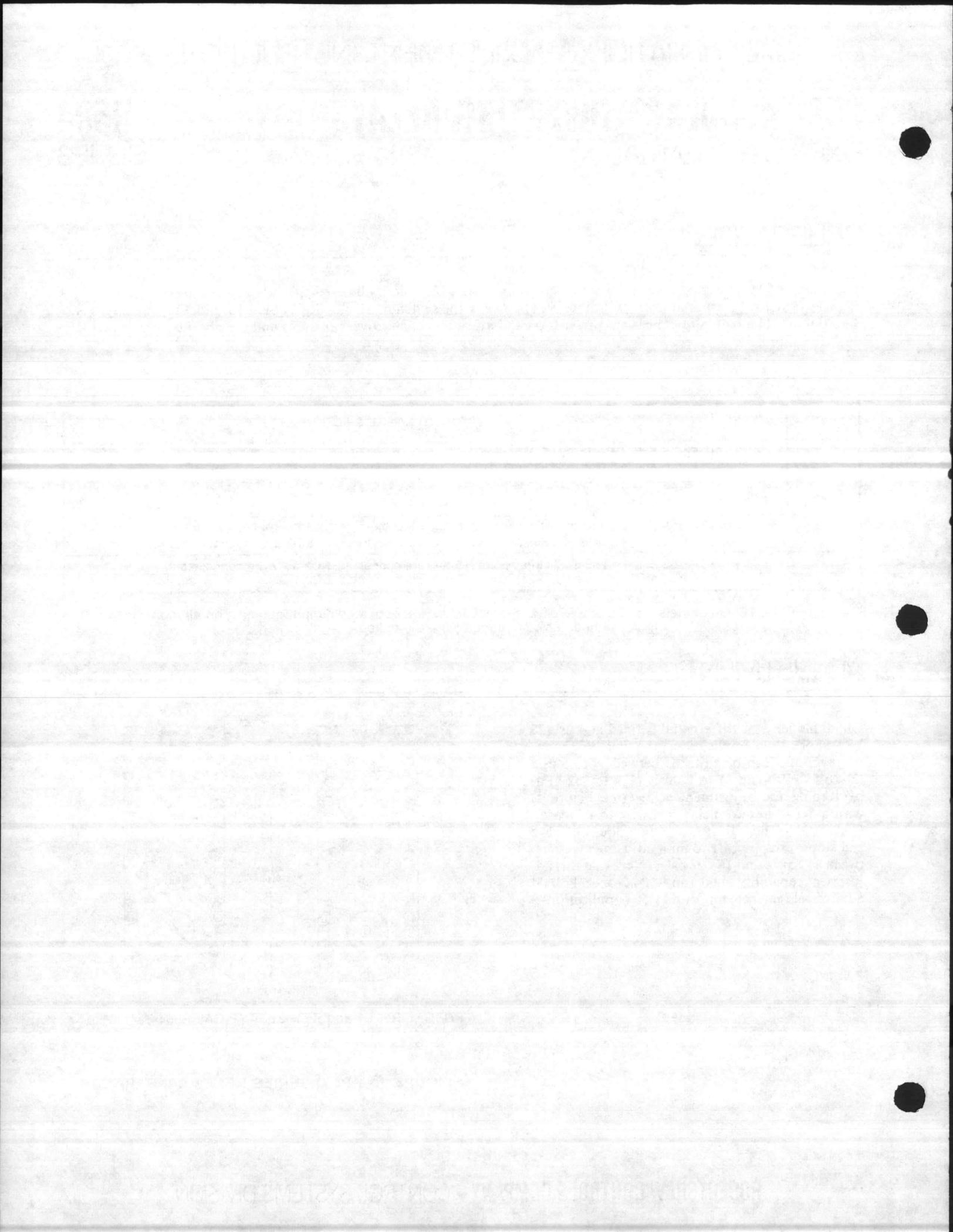
ADJUSTMENT

On all models, the differential is fixed at 4 psi (28 kPa). For special applications, the switching range of any model can be adjusted between 4 to 8 psig (28 to 55 kPa) and 18 to 22 psig (124 to 152 kPa) by turning the adjustment screw (see Figure 1) with a 5/64" hex wrench (clockwise to increase). **CAUTION:** The adjustment screw does not have end stops; exercise care to limit adjustments to between 4 - 8 psig and 18 - 22 psig. (Note that this adjustment capability makes an R504-3 or an R504-4 a universal replacement for all R504 applications.)



TYPICAL R504-1 and R504-2 TYPICAL R504-3 and R504-4

FIGURE 1 — R504 SERIES RELAY APPEARANCE





2, 1, 9
G1 + G2

DATA SHEET

MODEL
~~A251~~
A252
~~A253~~

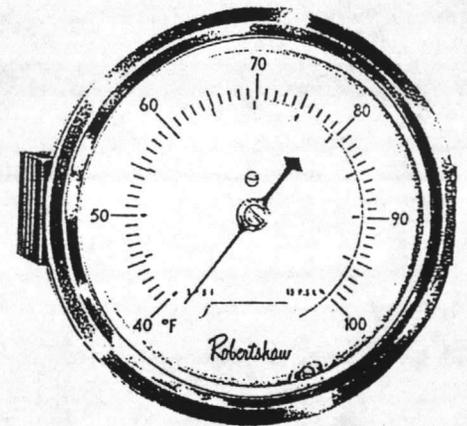
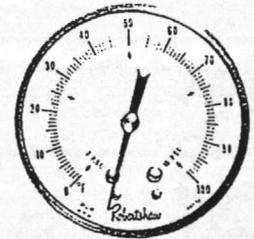
RECEIVER GAUGES

GENERAL DESCRIPTION

Robertshaw Receiver Gauges are available in 2", 2½", and 3½" sizes. The input to all of these gauges is a 3 to 15 psi air signal.

The A251 (2½") and A252 (3½") gauges are flush mounting types and they can be provided with any of a number of field-installed "DONUT" type dials to cover a multiplicity of applications. The dials, listed below, are selected and ordered for the specific application and mounted in place in the field. The A251 and A252 gauges have zinc plated steel cases with chrome plated snap out rings. They are activated by a bourdon tube through sturdy brass gears. A U-clamp mounting arrangement is standard for use in mounting these gauges on a panel. An adjustable pointer allows accurate zero adjustment on both models.

The A253 (2") Receiver Gauge is a stem mounting, back-connected type of gauge and is used on those applications not requiring flush mounting on a panel. This gauge is supplied with a 0 to 100°F dial. For other ranges, appropriate add-on dials are listed below. The case is gray Lexan® and these gauges also use a bourdon tube to actuate a brass gear movement.



SPECIFICATIONS

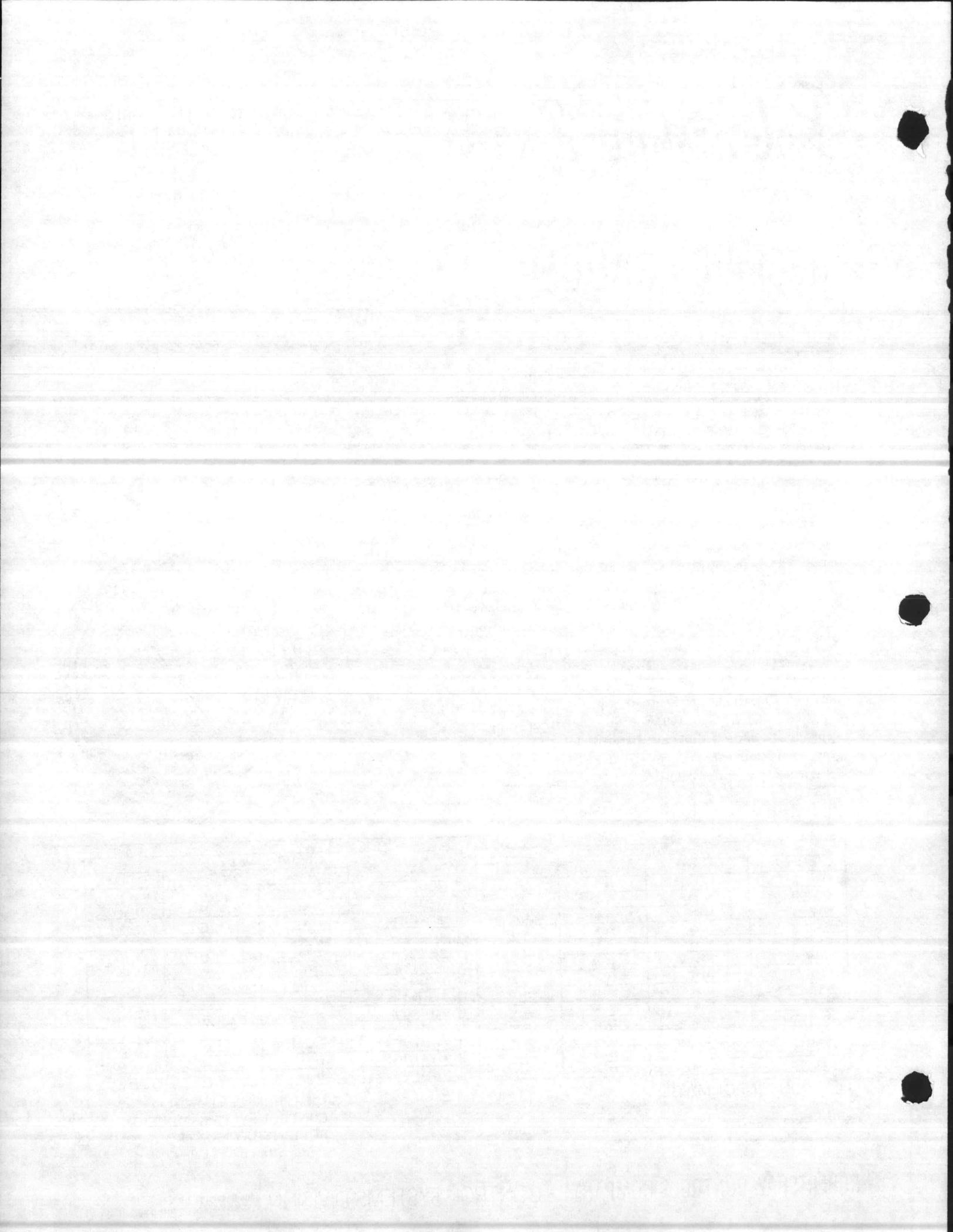
RANGE	DIALS AVAILABLE		
	2" for A253	2½" for A251	3½" for A252
0 to 100°F	basic dial supplied	24 - 50	25 - 50
40 to 140°F	23 - 51	24 - 51	25 - 51
40 to 240°F	23 - 52	24 - 52	25 - 52
-40 to 160°F	23 - 53	24 - 53	25 - 53
-25 to 125°F	23 - 54	24 - 54	25 - 54
50 to 90°F	23 - 56	24 - 56	25 - 56
62 to 92°F	23 - 57	24 - 57	25 - 57
30% to 80% RH	23 - 58	24 - 58	25 - 58
0 to 7" WC	23 - 60	24 - 60	25 - 60
20 to 45 BTU/lb.	23 - 61	24 - 61	25 - 61
-0.5 to 0.5 WC	23 - 62	24 - 62	25 - 62
0 to 3" WC	23 - 63	24 - 63	25 - 63
0 to 10" WC	23 - 64	24 - 64	25 - 64

RANGE	DIALS AVAILABLE		
	2" for A253	2½" for A251	3½" for A252
30 to 80°F	23 - 65	24 - 65	25 - 65
-0.5 to .20 IN WC	23 - 66	24 - 66	25 - 66
-10 to 40 PSIG	23 - 67	24 - 67	25 - 67
0 to 150 PSIG	23 - 68	24 - 68	25 - 68
0 to 300 PSIG	23 - 69	24 - 69	25 - 69
0 to 50 PSIG	23 - 70	24 - 70	25 - 70
0 to 100 PSIG	23 - 71	24 - 71	25 - 71
0% to 100% RH	23 - 72	24 - 72	25 - 72
87.5 to 57.5°F	23 - 75	24 - 75	25 - 75
0 to 20 FPM x 100	23 - 80	24 - 80	25 - 80
0 to 30 FPM x 100	23 - 81	24 - 81	25 - 81
0 to 40 FPM x 100	23 - 82	24 - 82	25 - 82
0 to 55 FPM x 100	23 - 83	24 - 83	25 - 83

ORDERING INFORMATION:

SPECIFY: 1. Model Number & Range. Dial must be ordered separately (except for A253 in 0 to 100°F range)

ORDER FROM: Local office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted below.



INSTALLATION INSTRUCTIONS

RECEIVER GAUGES

A251 A252 A253

GENERAL DESCRIPTION

These receiver gauges are used to indicate the value of a standard 3 to 15 psig (21 to 103 kPa) pneumatic transmitter signal in units of the sensed variable. Nominal gauge diameters are 2-1/2" (64mm) for model A251, 3-1/2" (89mm) for model A252 and 2" (51mm) for model

A253. Models A251 and A252 are flush mounting with barbed ports; model A253 is stem mounting with a threaded port. Available dials listed in Table I are ordered separately and field installed.

TABLE I — DIALS AVAILABLE							
RANGE	2" for A253	2-1/2" for A251	3-1/2" for A252	RANGE	2" for A253	2-1/2" for A251	3-1/2" for A252
0 to 100°F	basic dial supplied	24-50	25-50	30 to 80°F	23-65	24-65	25-65
40 to 140°F	23-51	24-51	25-51	.05 to .20 IN WC	23-66	24-66	25-66
40 to 240°F	23-52	24-52	25-52	-10 to 40 PSIG	23-67	24-67	25-67
-40 to 160°F	23-53	24-53	25-53	0 to 150 PSIG	23-68	24-68	25-68
-25 to 125 °F	23-54	24-54	25-54	0 to 300 PSIG	23-69	24-69	25-69
50 to 90°F	23-56	24-56	25-56	0 to 50 PSIG	23-70	24-70	25-70
62 to 92°F	23-57	24-57	25-57	0 to 100 PSIG	23-71	24-71	25-71
30% to 80% RH	23-58	24-58	25-58	0% to 100% RH	23-72	24-72	25-72
0 to 7" WC	23-60	24-60	25-60	87.5 to 57.5°F	23-75	24-75	25-75
20 to 45 BTU/lb.	23-61	24-61	25-61	0 to 20 FPM x 100	23-80	24-80	25-80
-0.5 to +0.5" WC	23-62	24-62	25-62	0 to 30 FPM x 100	23-81	24-81	25-81
0 to 3" WC	23-63	24-63	25-63	0 to 40 FPM x 100	23-82	24-82	25-82
0 to 10" WC	23-64	24-64	25-64	0 to 55 FPM x 100	23-83	24-83	25-83

INSTALLATION

Dial: Remove the friction fit gauge bezel with a thin bladed tool. Align the self-adhesive dial with the pressure reference marks on the gauge face and press in place. Replace the bezel.

Models A251 and A252: Provide the required panel

cutout and secure the gauge to the panel face with the U-clamp (furnished).

Model A253: Thread the gauge into a 1/8" female NPT fitting.

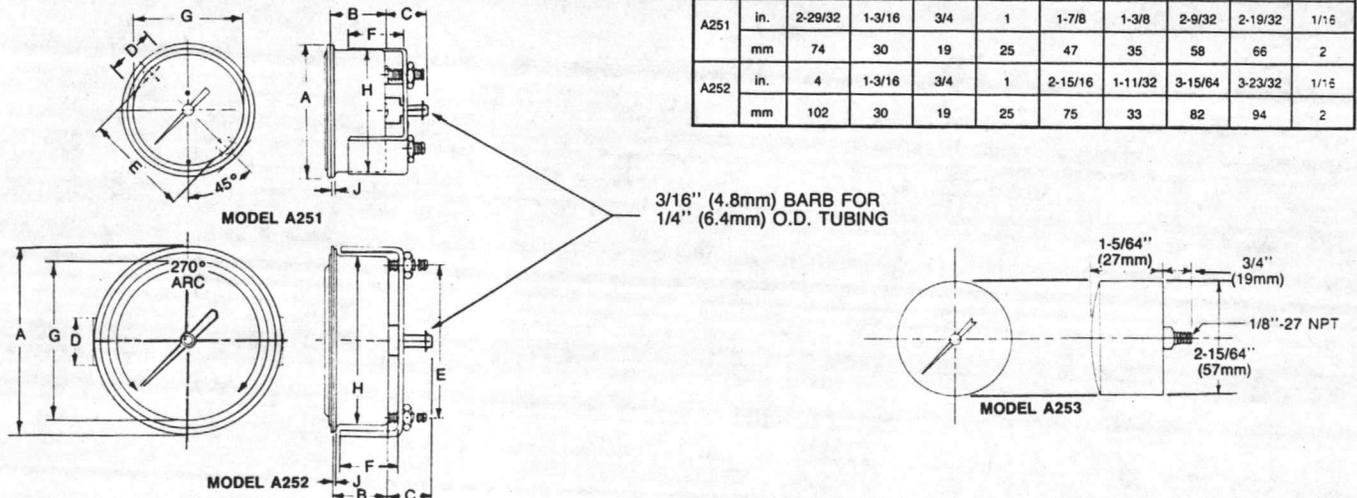
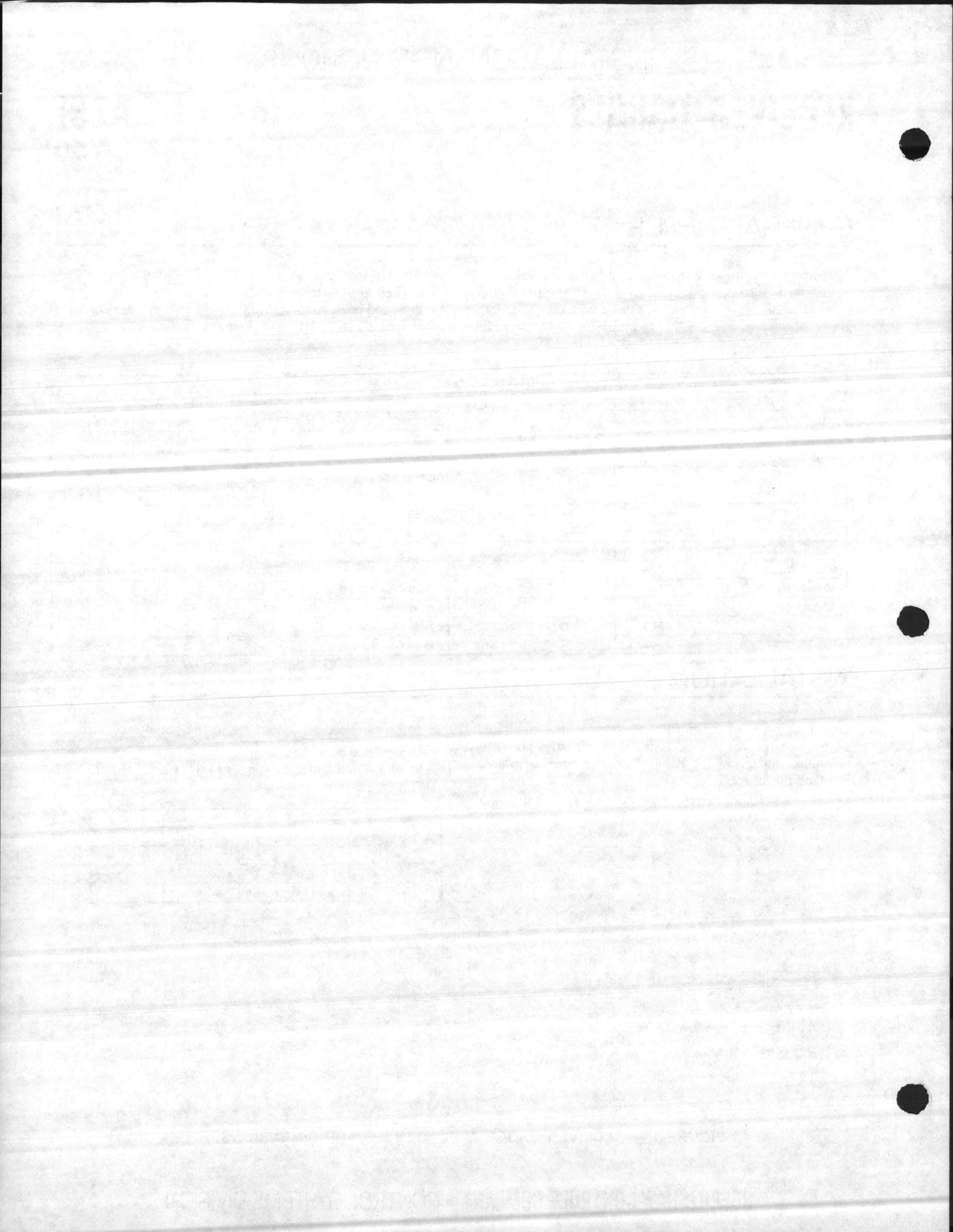


FIGURE 1 — RECEIVER GAUGE APPEARANCES AND DIMENSIONS.



CALIBRATION & ADJUSTMENT INSTRUCTIONS

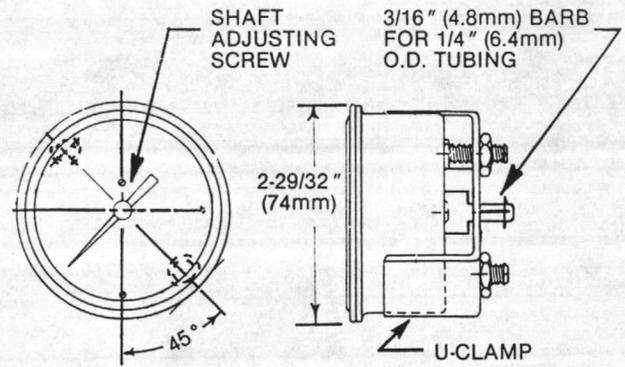
RECEIVER GAUGES

A251
A252
A253

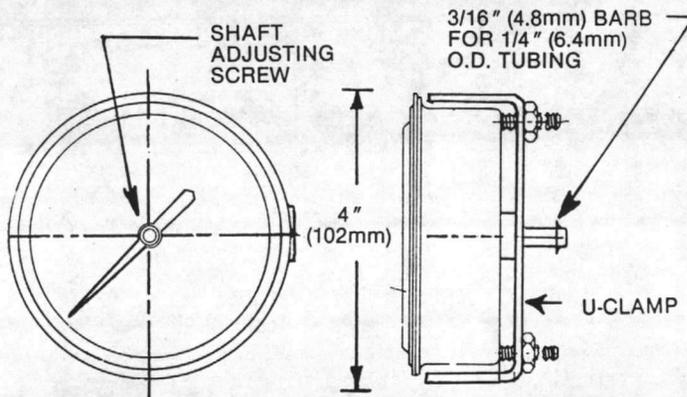
CALIBRATION

These receiver gauges are available in nominal dial diameters of 2" (51mm, Model A253), 2-1/2" (64mm, Model A251) and 3-1/2" (89 mm, Model A252). The input to each of these gauges is a 3 to 15 psig (21 to 103 kPa) pneumatic transmitter signal representing a sensed range of engineering units, such as degrees of temperature. A matching self-adhesive dial must be selected (see Data Sheet) and affixed to the dial face.

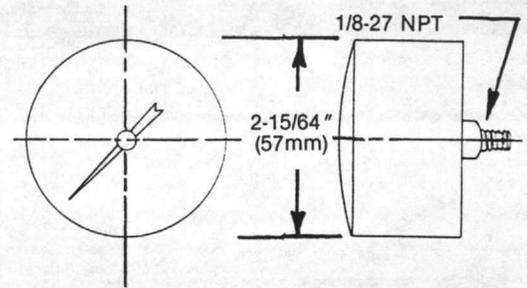
These gauges are factory calibrated so that the pointer rotates 270° in response to the 3 to 15 psig (21 to 103 kPa) input signal; this rotation is non-adjustable. The position of the pointer can be re-set, if necessary (see Adjustment).



MODEL A251



MODEL A252



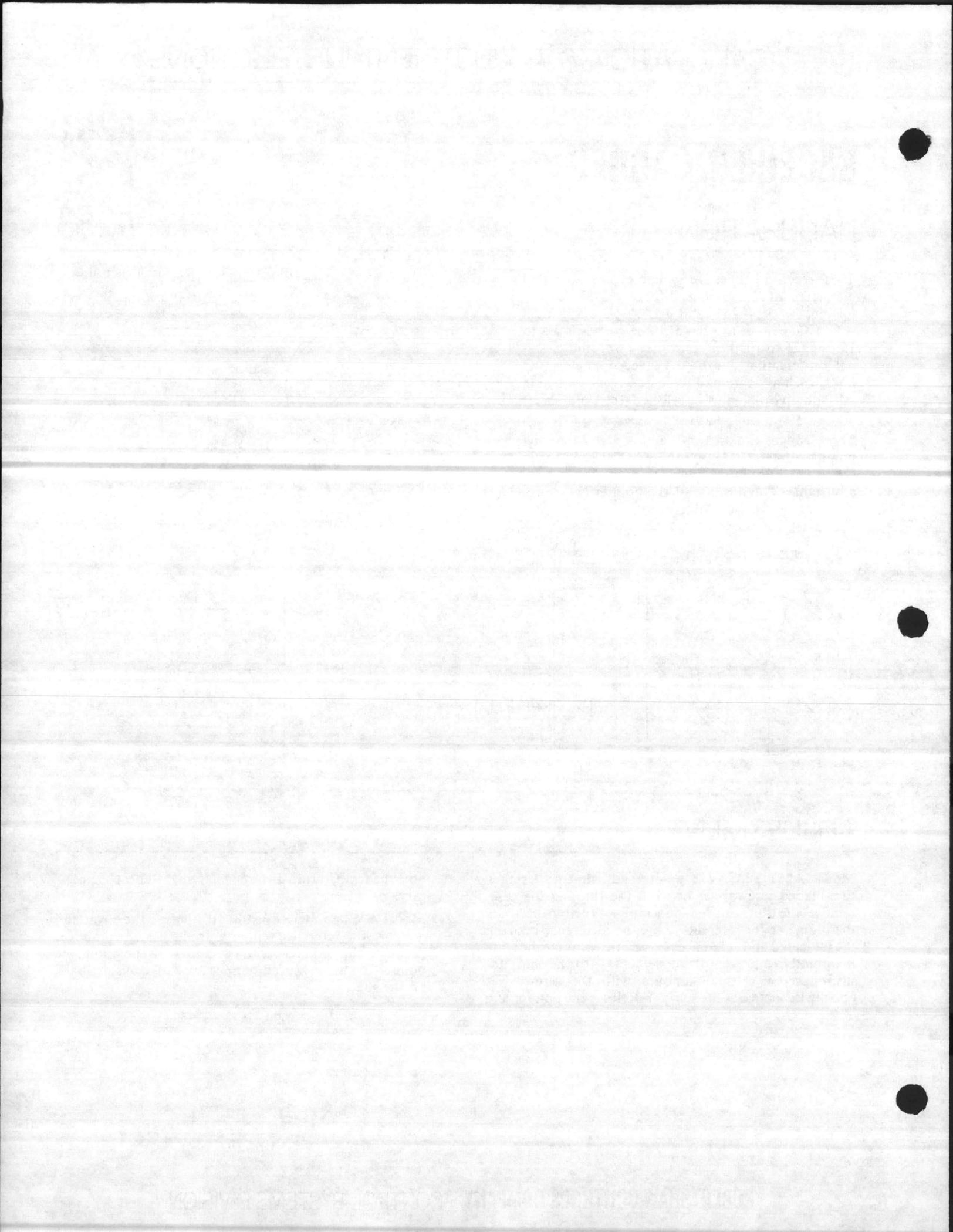
MODEL A253

ADJUSTMENT

Model A251 and A252 pointer adjustment: Using a thin-bladed screwdriver between the rim and the case, remove the rim and lens assembly. With an accurate thermometer for reference, note the difference between the indicated and reference temperatures. While holding the pointer to prevent its movement, turn the shaft adjusting screw a small amount with the screwdriver (clockwise increases the setting). Release the pointer and

note the temperature difference, if any. Repeat as necessary.

Model A253 pointer adjustment: Remove the cover and measure the reference temperature as described above. Remove the pointer with a puller. Reposition the pointer to the measured temperature and push it back on the shaft.





2,1,14

PCP-6

DATA
SHEET

MODEL

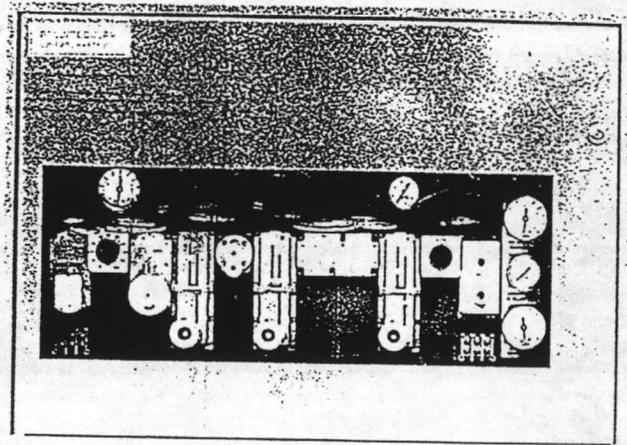
PCP-6

PCP-12

CONTROL PANEL CABINETS

GENERAL DESCRIPTION

The Models PCP-6 and PCP-12 control panel enclosures are designed for convenient mounting and protection of Pneumodular Control System devices. The "two-section" construction of these enclosures allows for early rough-in of the base enclosure, and addition of the devices, door, and accessories at a later appropriate time during the various installation phases of a project. The doors may be hinged either left or right, to meet various requirements. Additionally, there are two door styles, a metal door, and a door with a Plexiglas insert, which allows for visibility while maintaining security of the various panel-mounted components. Each side of the enclosure has convenient knockouts for rigid, soft or flexible tubing, or electrical equipment connections.



MODEL PCP-12WL
Shown with Plexiglas window in panel door

SPECIFICATIONS

MODEL NO'S:

- PCP-6BD: Solid door, left or right hinged
- PCP-6WL: Window door, left hinged
- PCP-6WR: Window door, right hinged
- PCP-12BD: Solid door, left or right hinged
- PCP-12WL: Window door, left hinged
- PCP-12WR: Window door, right hinged

DIMENSIONS:

- PCP-6 Series: 18" W x 21" H x 7" D
(457 x 533 x 178 mm)
- PCP-12 Series: 30" W x 21" H x 7" D
(762 x 533 x 178 mm)

CONSTRUCTION:

16-gauge steel throughout. Doors have spring-loaded pivot hinge and key-operated latch to prevent tampering.

FINISH: Brown baked semi-gloss enamel.

ACCESSORIES:

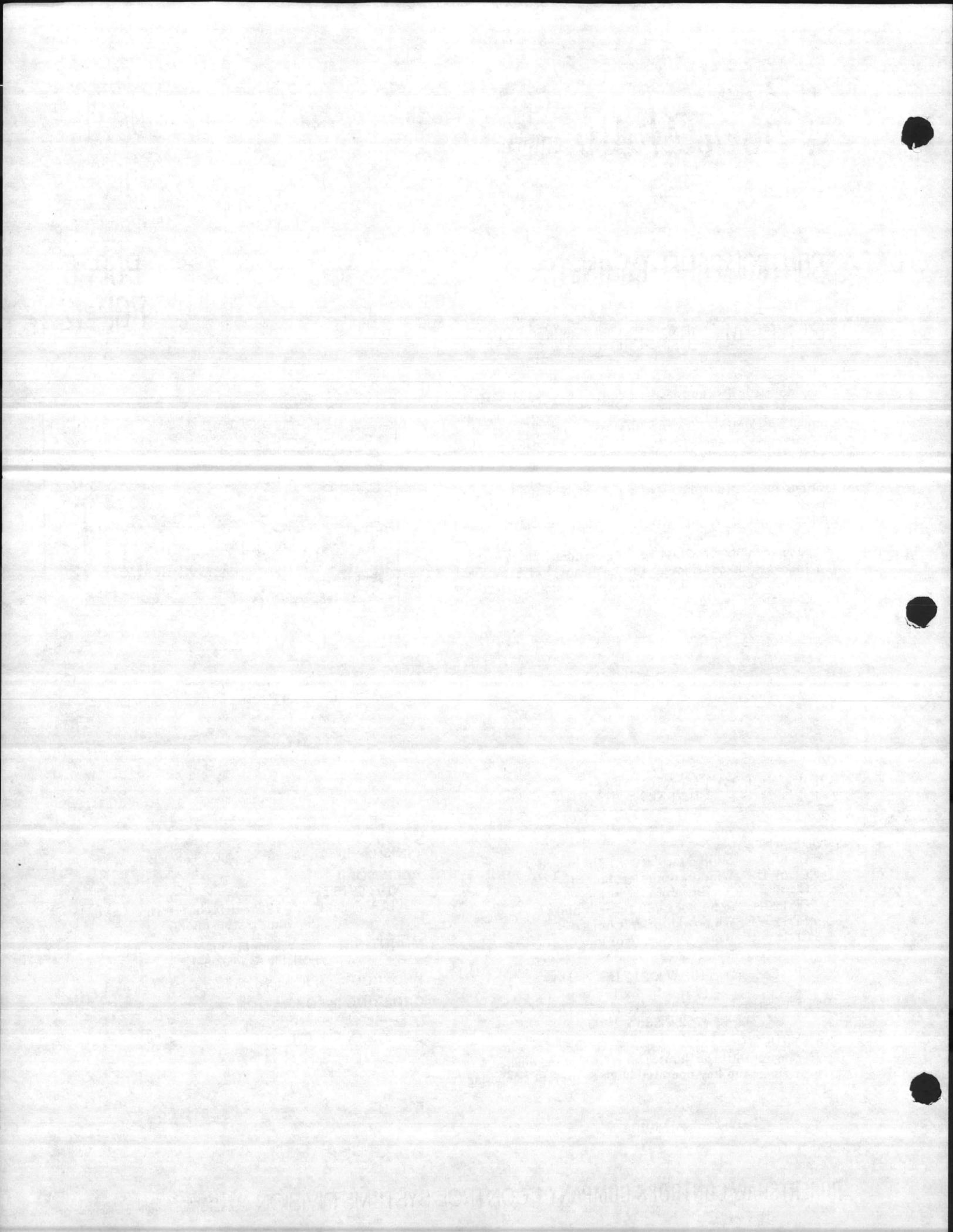
- N100-9915 key lock.
- PLEX-6 and PLEX-12 Plexiglas inserts (must be ordered for window-style doors).

MOUNTING: Surface-mounted, or free-standing using available panel stand.

KNOCKOUTS: Provided on four sides of cabinet.

ORDERING INFORMATION:

1. Model Number
2. Accessories required



INSTALLATION INSTRUCTIONS

PNEUMODULAR® CONTROL PANEL CABINETS

**PCP-6
PCP-12**

The PCP control panels are fabricated in such a way as to permit the mounting of the outer shell or ring to the wall at any time during the construction period. Three 5/16" mounting holes are provided: 2 round and 1 key slotted. The key slotted hole is on the top center to facilitate alignment. This allows all conduit connections and wiring, tubing, etc. to be roughed into the panel without fear of damaging panel-mounted components. The bezel with back pan and the door with all pneumatic devices installed and pneumatic connections made can then be slipped into place and held to the ring by four wing nuts. The removable door is attached to the bezel by means of a spring-loaded top hinge pin.

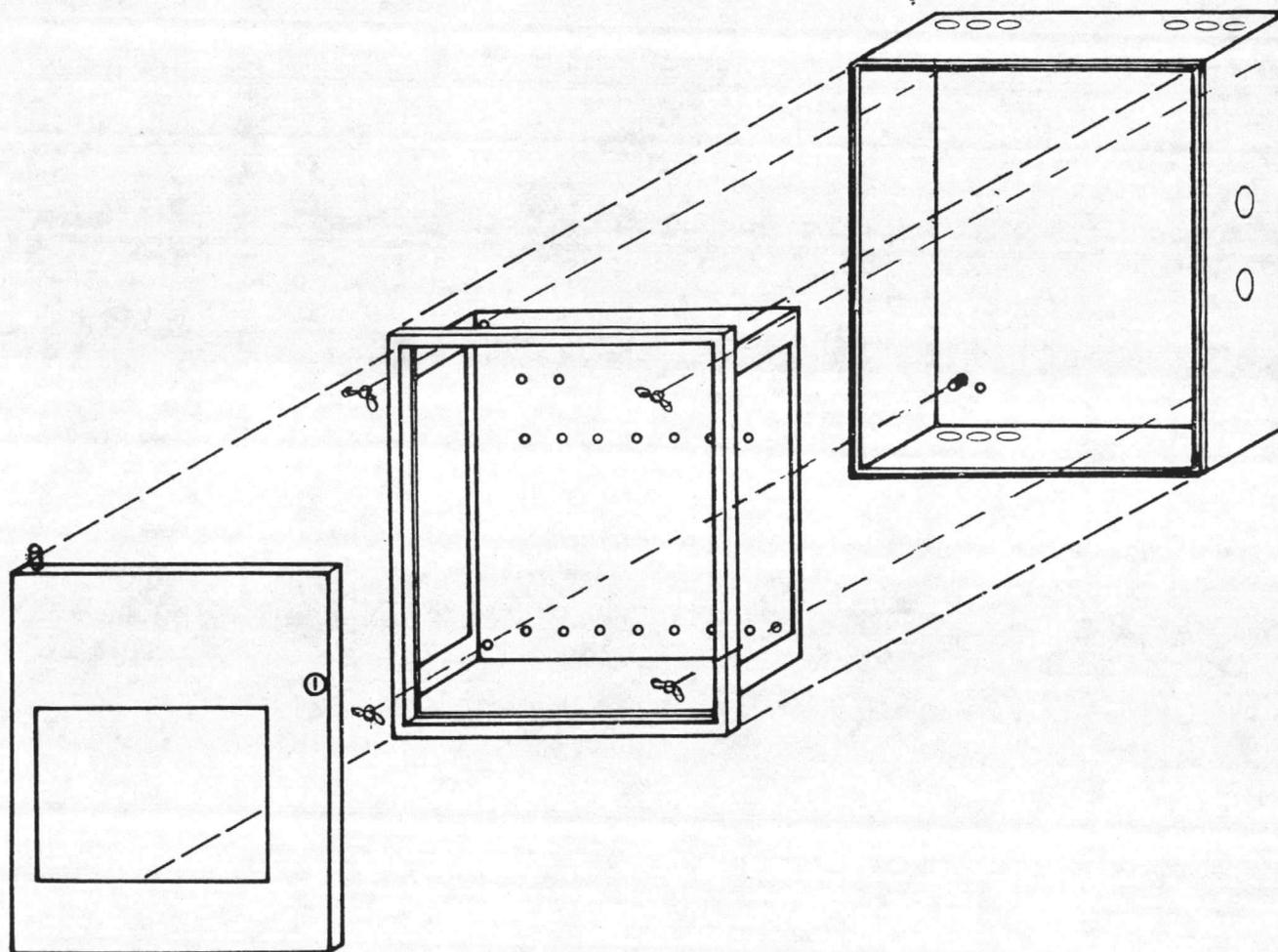
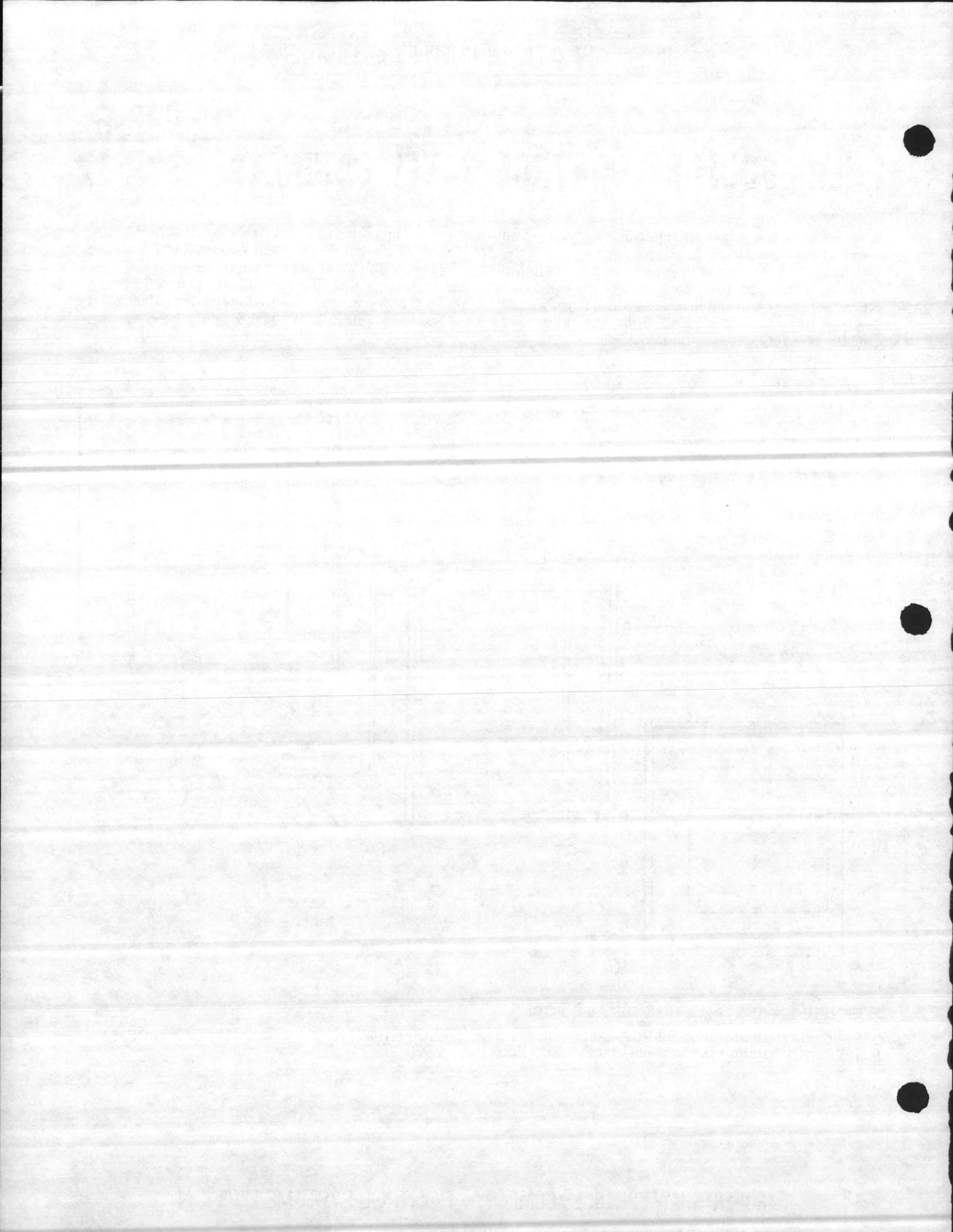


FIGURE 1 — INSTALLATION DETAILS FOR:

Pneumodular control panel PCP-6WL: 6-place, window door, left hinge, 18" W x 21" H x 7"D. (PCP-12WL construction is identical, except 30" wide.)



BACKPLATE MOUNTING [TYPICAL]

A 12-place Manifold Backplate MCS-BP12 is attached to the bezel backplate of the 12-place Pneumodular Control Panel PCP-12BD with ten screws MCS-MS spaced 4" to 6" along the top and bottom of the BP, using the predrilled holes on 2" centers (see Figure 2). Note that the BP is shifted one inch from the center toward the left to provide space for wiring to terminals on the bottom edges of sockets.

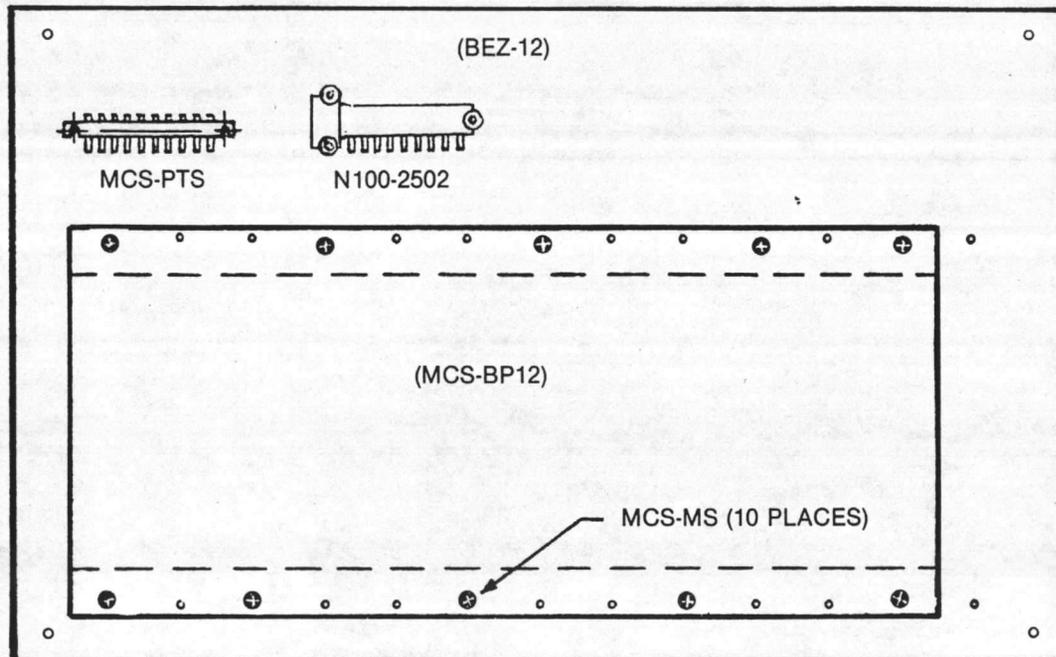


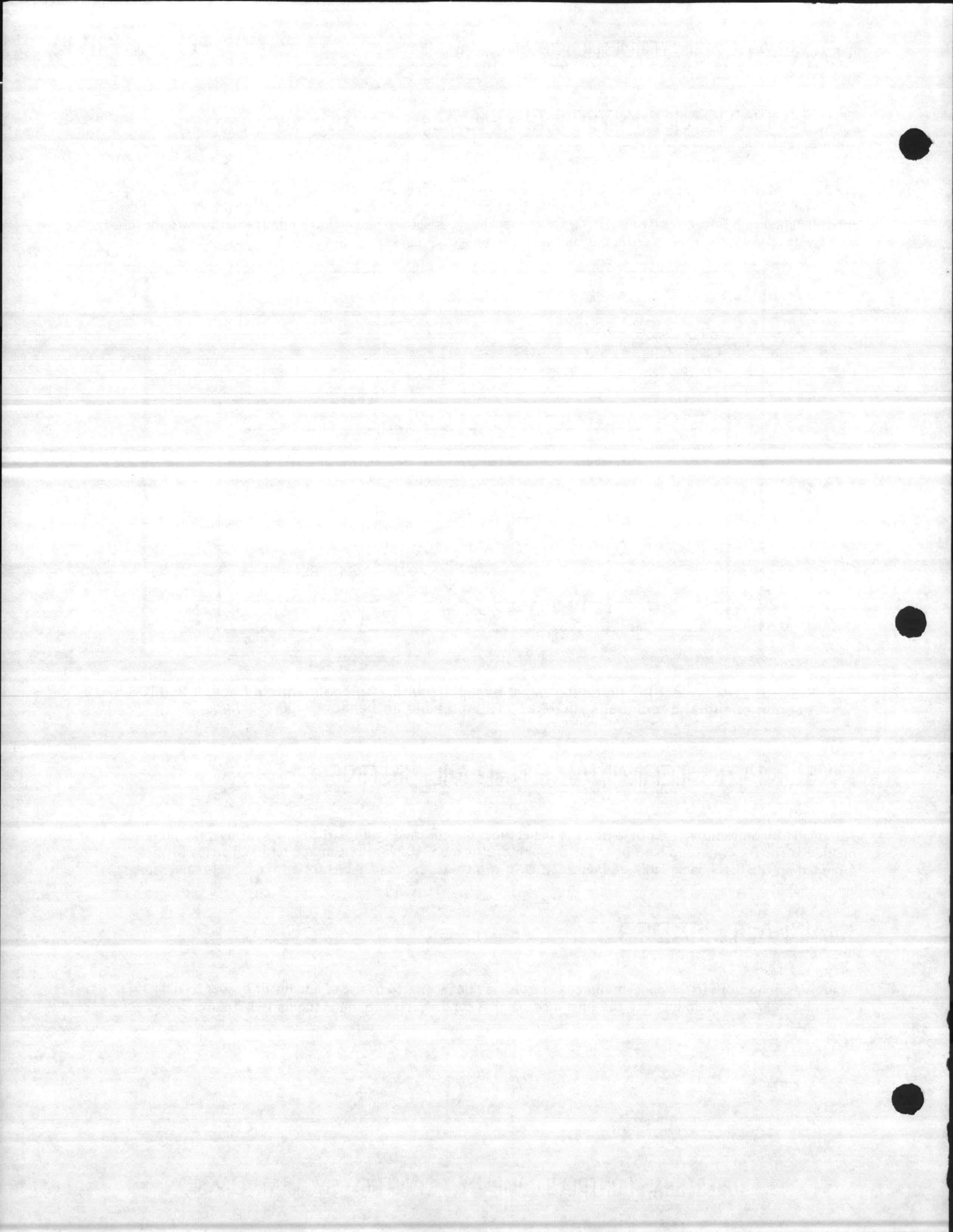
FIGURE 2 — Typical Pneumodular bezel backplate with 12-place manifold backplate (MCS-BP12), 10-point pneumatic terminal strip (MCS-PTS) and main air header (N100-2502).

PNEUMATIC TERMINAL STRIP MOUNTING

Although air connections from field tubes to panel tubes may be made with barbed brass fittings, the preferred method is for the connections to be made through one or more 10-place pneumatic terminal strips MCS-PTS mounted on the bezel backplate (see Figure 2). Drill two 0.136" holes (#29 bit) for #8 x 1" sheet metal screws.

MAIN AIR HEADER

Main Air connections to the panel mounted controls may be facilitated by use of a main air header (N100-2502), which has a 3/8" FPT input port and nine output ports for 1/4" polyurethane tubing (see Figure 2).





2.1.13

C7

DATA SHEET

MODEL

S520

S530

S540

SELECTOR SWITCHES TWO-THREE-FOUR POSITION

GENERAL DESCRIPTION

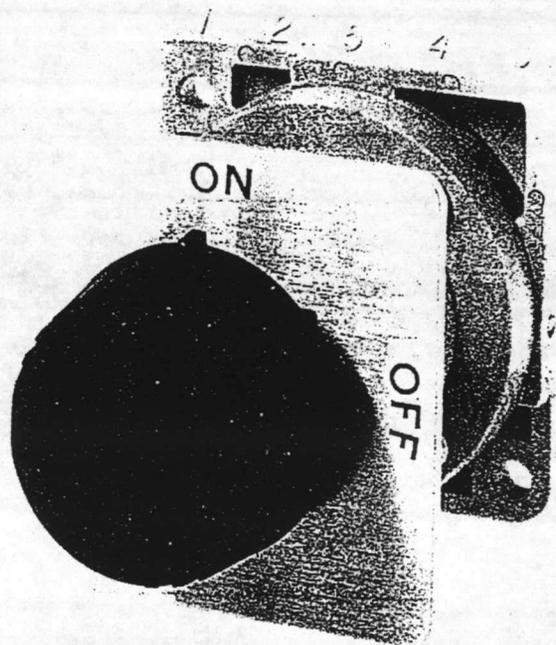
These selector switches are manually operated pneumatic devices designed for use in pneumatic control systems where applications require manual switching or diverting of pneumatic signals. A wide variety of switching or diverting functions is possible. Manual switch positions are as follows:

S520 and S521 – two-position

S530 and S531 – three-position

S540 and S541 – four-position

Various dials are available for each model and for specific switch applications.



S520 SHOWN

SPECIFICATIONS

MODEL	SWITCH POSITIONS	NUMBER OF PORTS USED	ISOLATED PORTS*
S520	2	4	Port 5 Blocked
S521	2	5	Blocked
S530	3	4	Blocked
S531	3	4	Exhausted
S540	4	5	Blocked
S541	4	5	Exhausted

CONNECTIONS: Ports numbered 1 through 5, barbed connections for 1/4" (6.4 mm) O. D. Polyethylene or 5/32" I. D. Polyurethane tubing.

*See Switch Positions and Air Flow diagram on rear of sheet.

MAXIMUM AIR PRESSURE: 30 psig (2.1 bar)
MAXIMUM AMBIENT TEMPERATURE: 140°F (60°C)
AIR CAPACITY: 40 SCFH

FINISHES: Case – glass-filled Nylon.
Dials – anodized aluminum.
Knob – black sunburst, with pointer.

MOUNTING: Designed for mounting on MCS-S manifold socket, on control panel door, or with available surface mounting brackets.

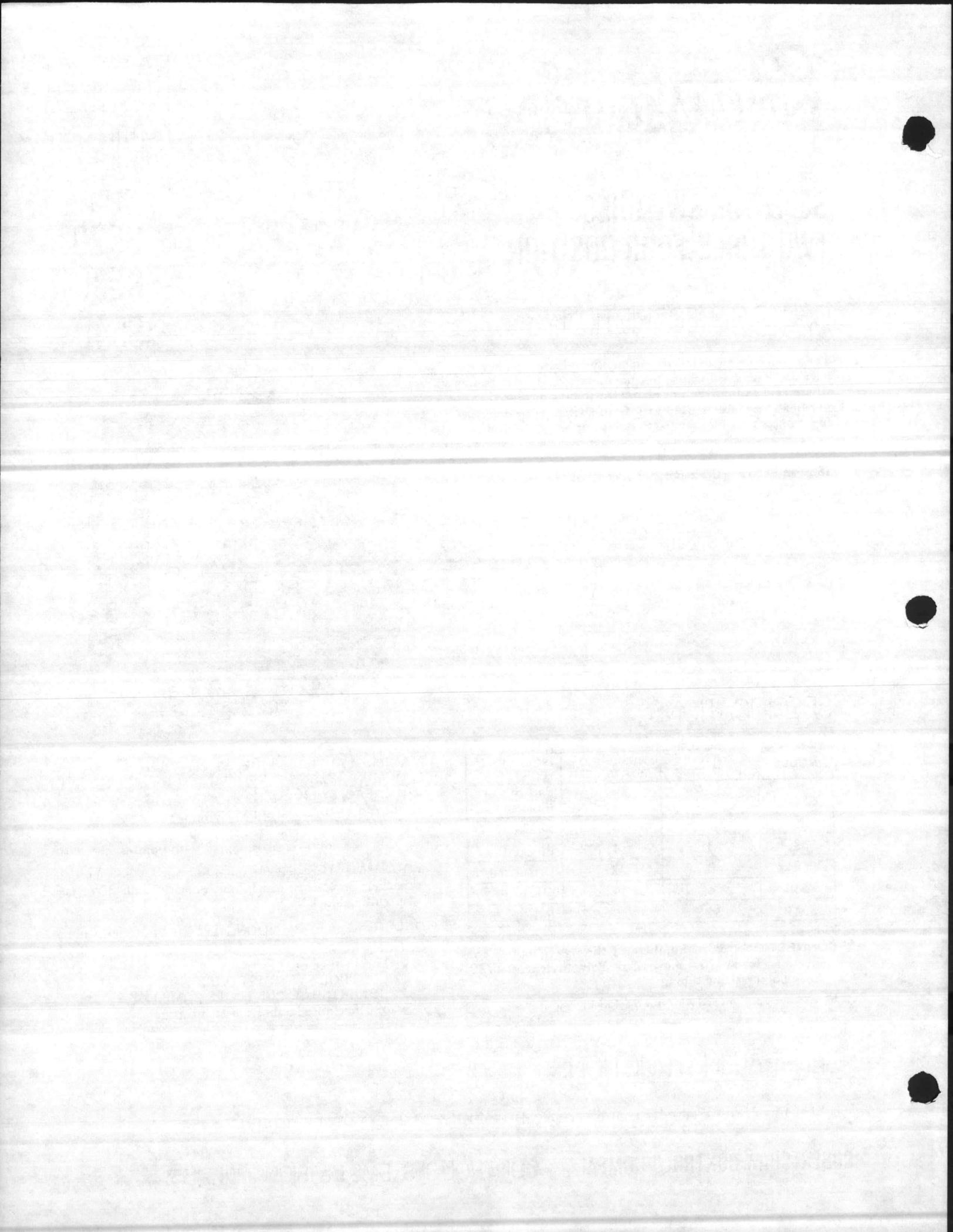
ORDERING INFORMATION: SPECIFY: Model Number

ORDER FROM:

Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted at bottom of this page.

GENERAL INSTRUCTIONS

1. To be used with clean, dry control air only. DO NOT USE WITH ANY OTHER MEDIUM.



INSTALLATION INSTRUCTIONS

PNEUMODULAR® SWITCHES

S510 S511
S520 S530 S540
S521 S531 S541

SOCKET MOUNTING

The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MGS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A switch is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the relay to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

Dial Installation: With knob removed and locknut run back for clearance, turn dial to fit over projections on front of switch body. Align and engage vertical notch in dial with tab behind top switch body projection. Tighten locknut against back of dial. Replace knob.

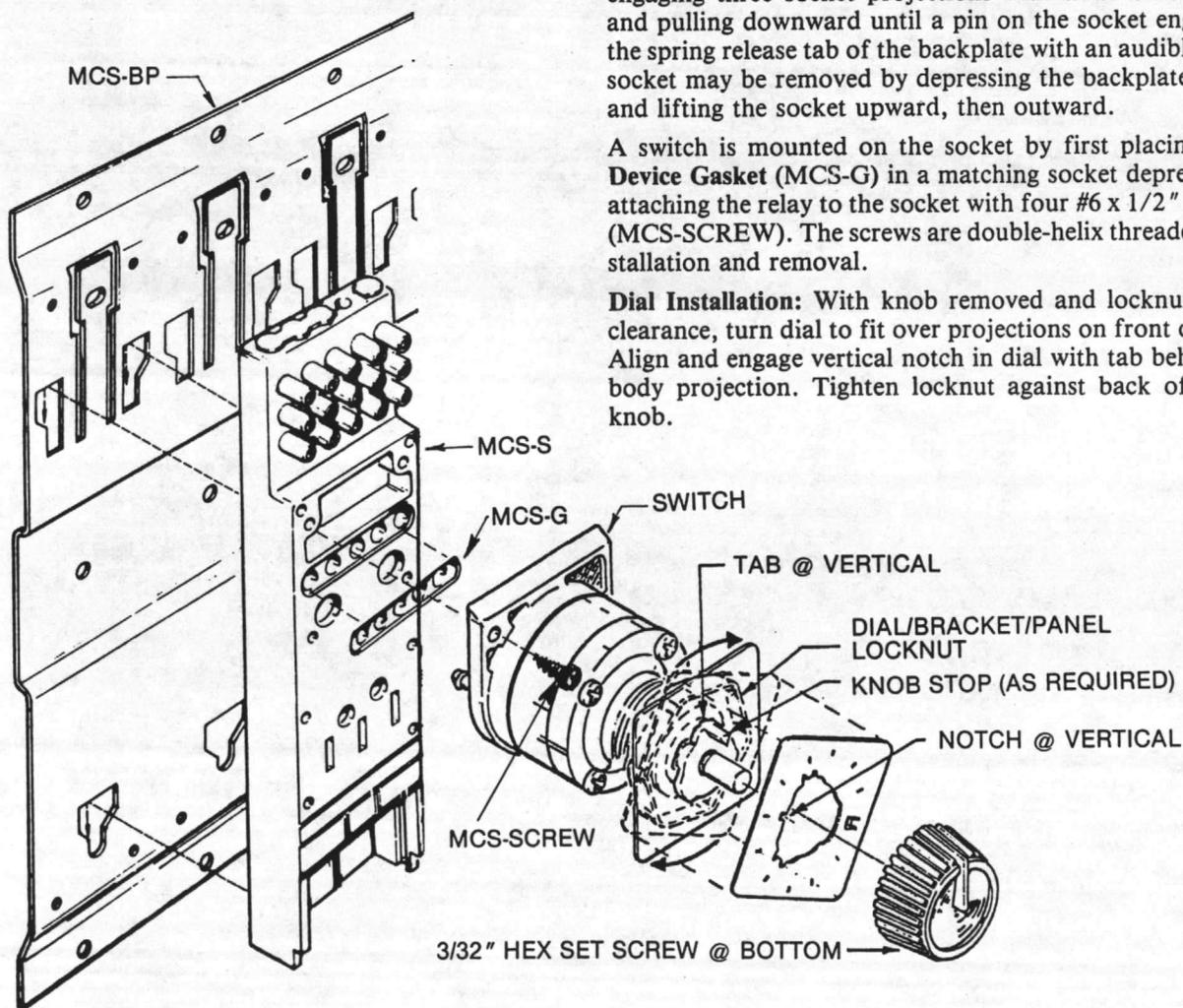
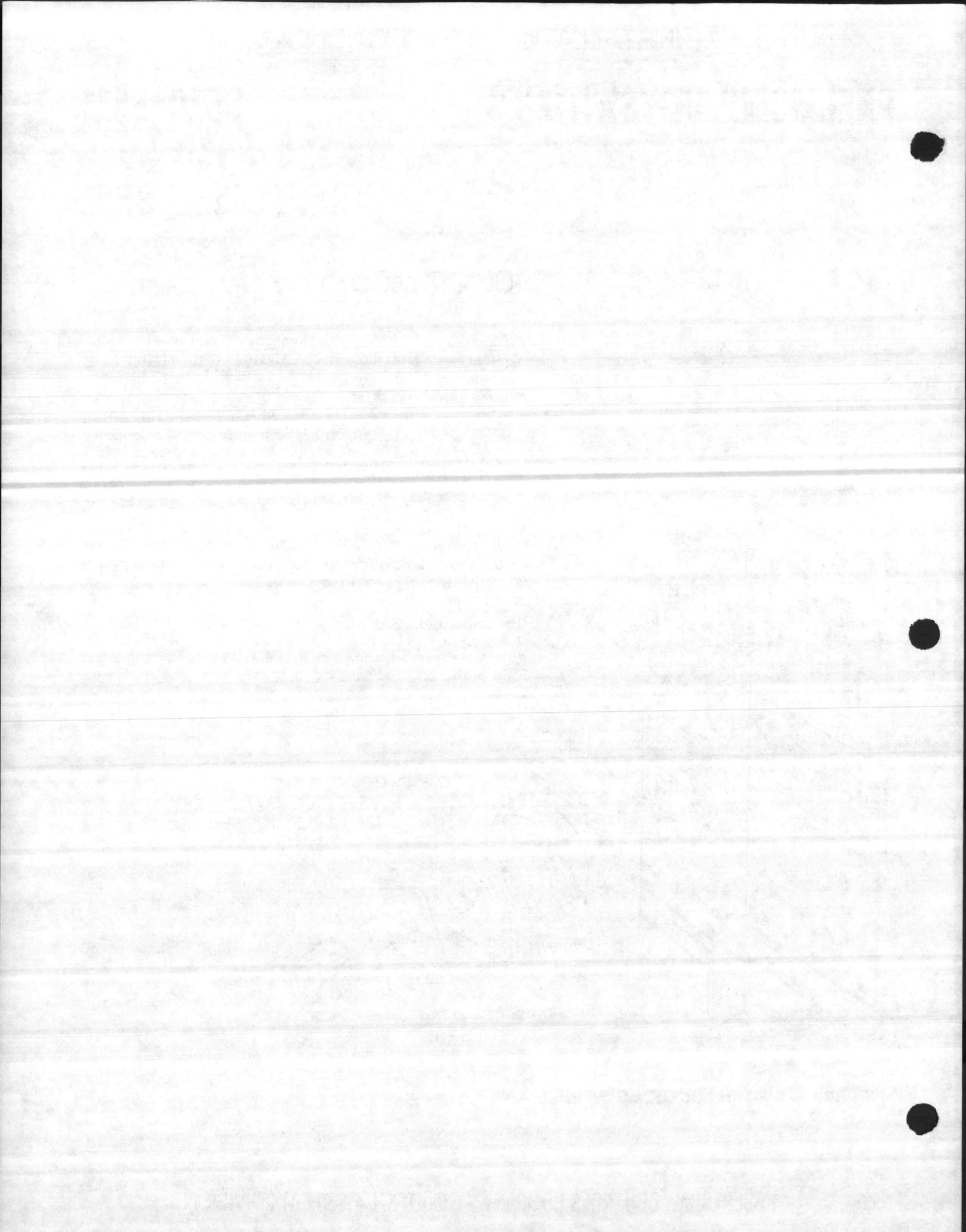


FIGURE 1 — SWITCH SOCKET MOUNTING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® SELECTOR SWITCHES TWO-THREE-FOUR POSITION

S520 & S521
S530 & S531
S540 & S541

CALIBRATION

The Model S520, S530 and S540 series of selector switches is designed to allow manual selection or diversion of air signals in a wide variety of pneumatic control system applications. See Table I and Figure 1 for switch descriptions and port connections. These switches do not require calibration.

TABLE I

MODEL	SWITCH POSITIONS	NUMBER OF PORTS USED	ISOLATED PORTS
S520	2	4	Port 5 Blocked
S521	2	5	Blocked
S530	3	4	Blocked
S531	3	4	Exhausted
S540	4	5	Blocked
S541	4	5	Exhausted

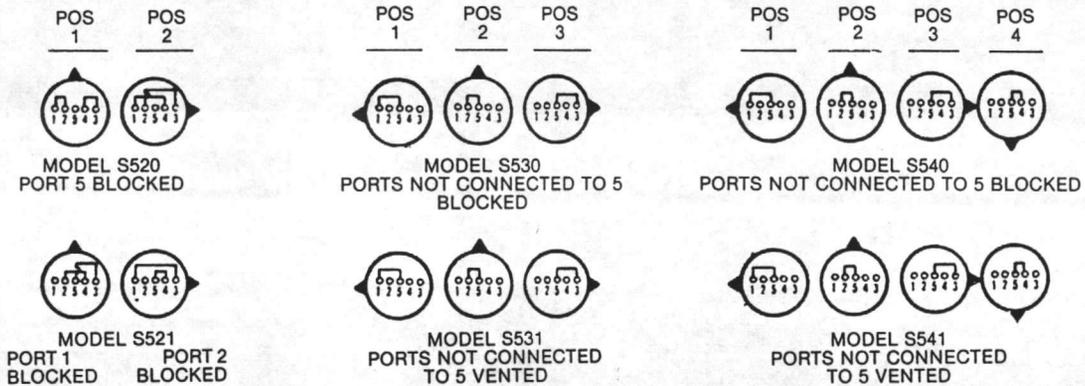


FIGURE 1 — SELECTOR SWITCH POSITIONS & PORT CONNECTIONS

ADJUSTMENT

These selector switches do not require adjustment. See Figure 2 for appearance. (NOTE: The S540 and S541 switches rotate through 360° without stops. Record indicator position before removing knob.)

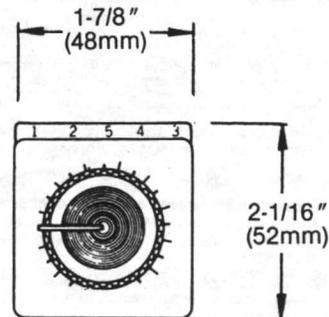
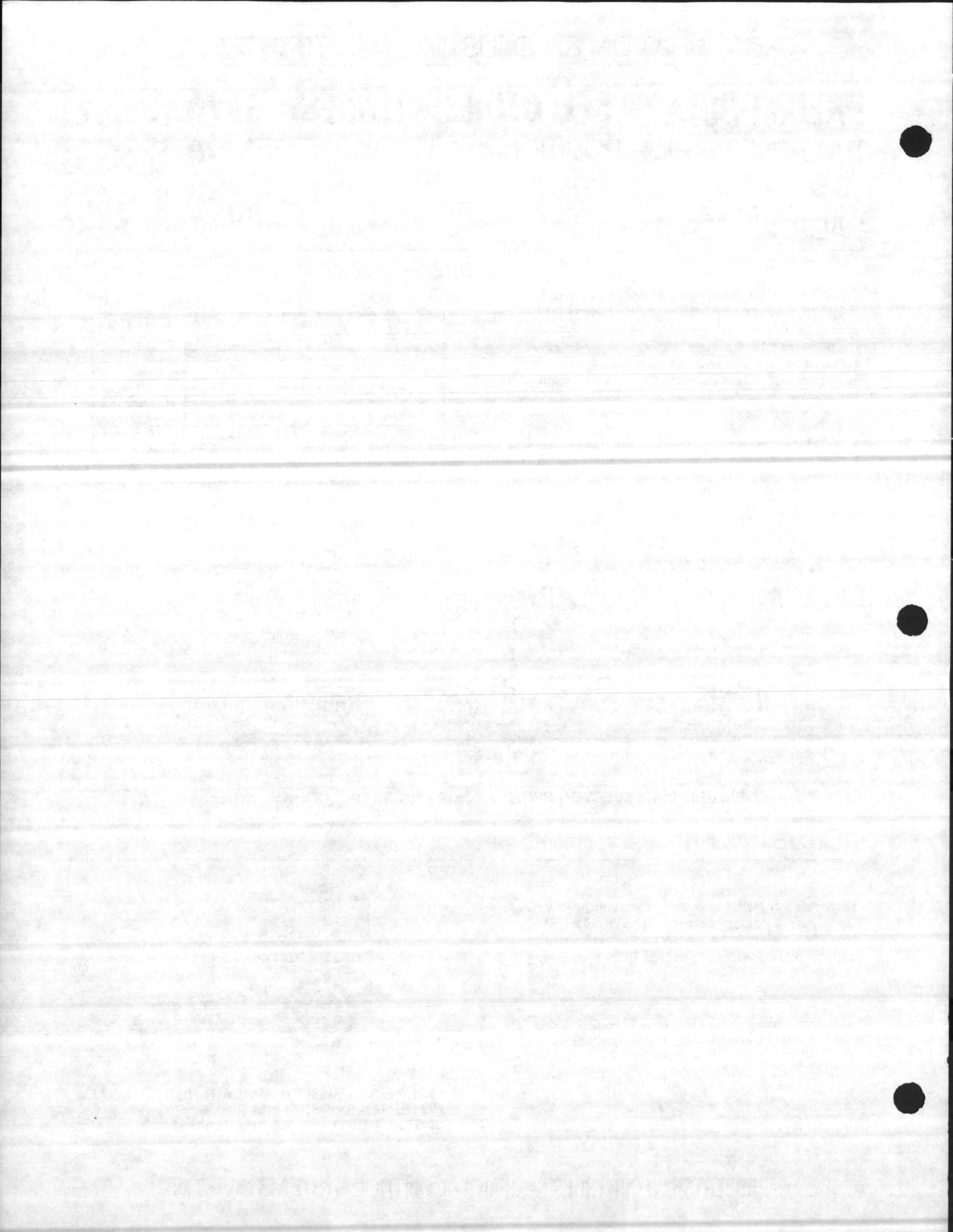


FIGURE 2 — SWITCH APPEARANCE (TYPICAL)
NOTE: Port 5 of S520 and Port 4 of S530 & S531 are not functional





DATA SHEET

MODEL

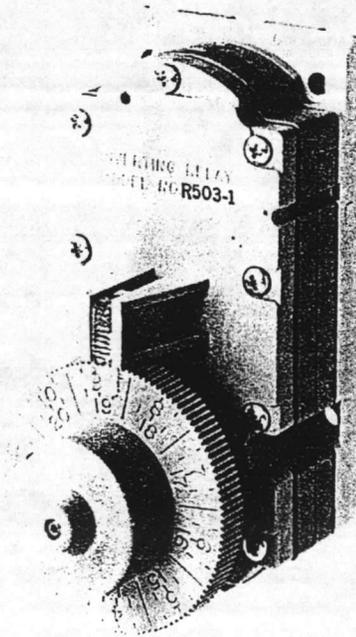
DIVERTING RELAY (ADJUSTABLE)

R503-1 R503-2

GENERAL DESCRIPTION

The R503 series Diverting Relays are snap-acting devices designed for a variety of switching and interlocking functions in pneumatic control systems where applications require one or more of the following functions: feeding and exhausting branch lines; diverting a supply line to either one of two branch lines; diverting either one of two supply lines to one branch line.

Its primary function is to convert a proportional pneumatic signal, at a predetermined setting, into a positive signal for a final control device.



Model R503-1 Shown

SPECIFICATIONS

MODELS: R503-1: 0.2 to 0.4 psi (.01 to .03 bar) differential.
R503-2: 2 to 4 psi (.14 to .28 bar) differential.

ACTION (both models): Signal above set point: NC and C are connected. Signal below set point: NO and C are connected. Differential to reset is subtracted from set point.

ADJUSTMENT: Adjustment knob operates over two revolutions. A moving pointer slide is provided to indicate both inner and outer scales.

MAIN AIR PRESSURE: 15 to 25 psig (1.03 to 1.7 bar) operating. 30 psi (2.1 bar) maximum

ACTIVE CONNECTIONS: Main (M), Signal (S), Common (C), Normally Closed (NC), Normally Open (NO), barbed nipples for 1/4" (6.4 mm) O. D. Polyethylene tubing.

MAXIMUM AMBIENT TEMPERATURE: 140°F (60°C)

FINISH: Glass-filled Nylon.

AIR CONSUMPTION: 1 SCFH (28.8 CIM)

AIR CAPACITY: 8 SCFH

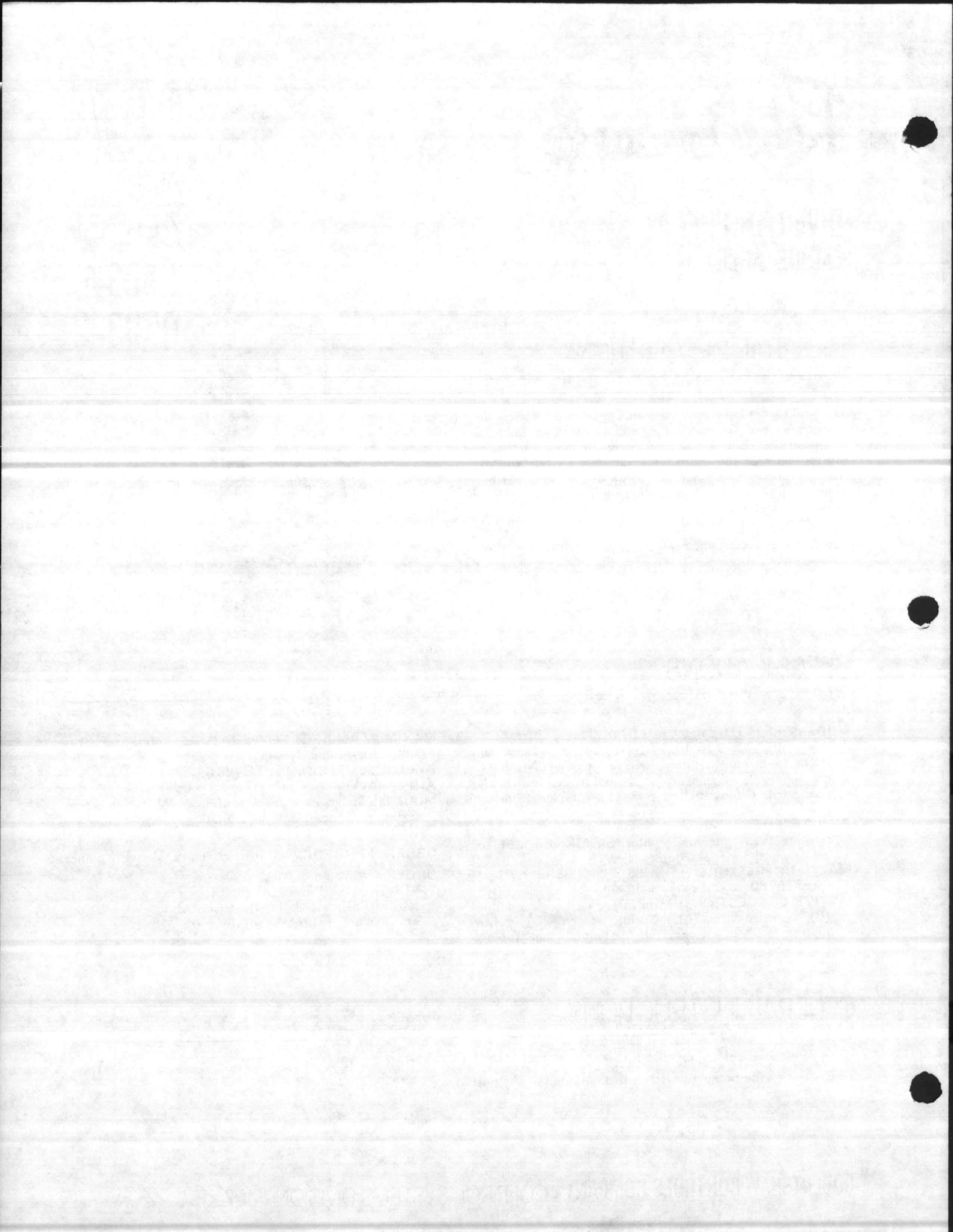
MOUNTING: Designed for mounting on MCS-S manifold socket. For non-manifold mounting, use mounting kit K503.

ORDERING INFORMATION: Specify: Model Number

ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted at bottom of this page.

GENERAL INSTRUCTIONS

1. To be used with clean, dry control air only. DO NOT USE ANY OTHER MEDIUM.
2. This relay will operate properly when mounted in any position.



PNEUMODULAR® RELAYS

SOCKET MOUNTING

The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MCS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A relay is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the relay to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

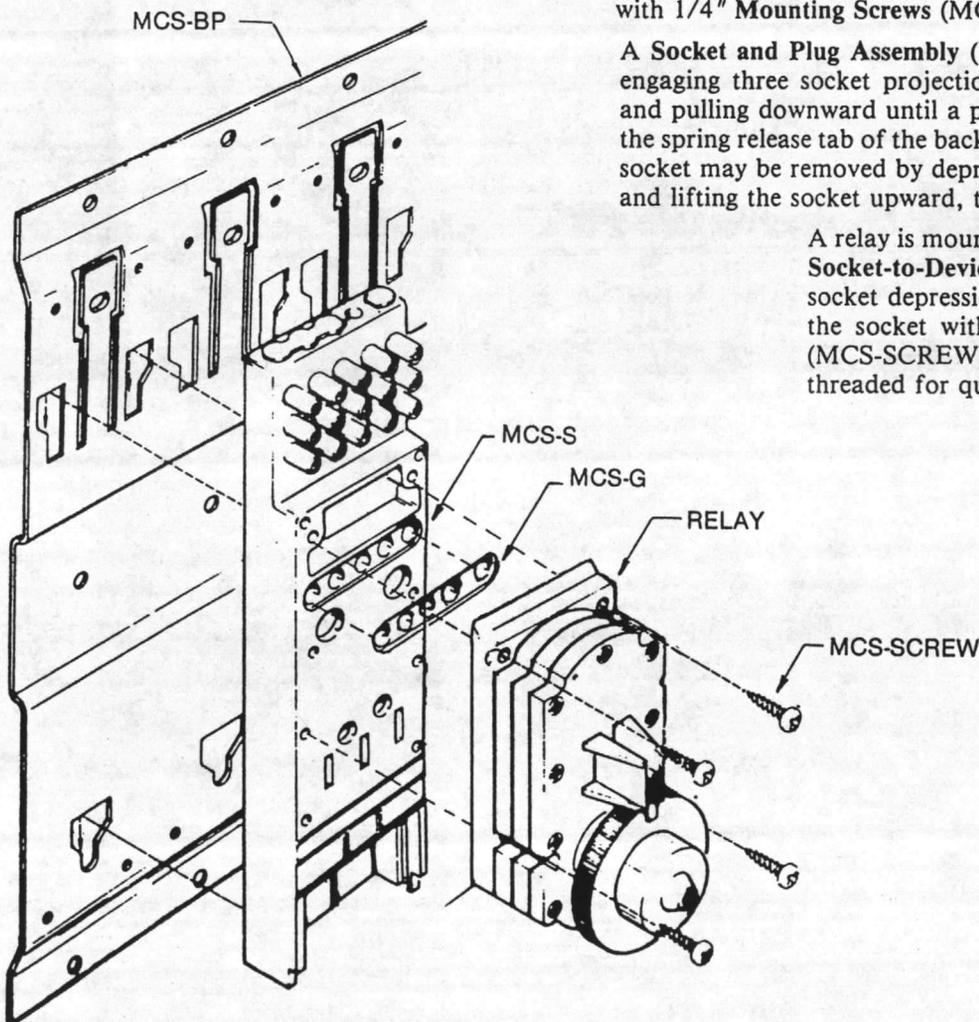
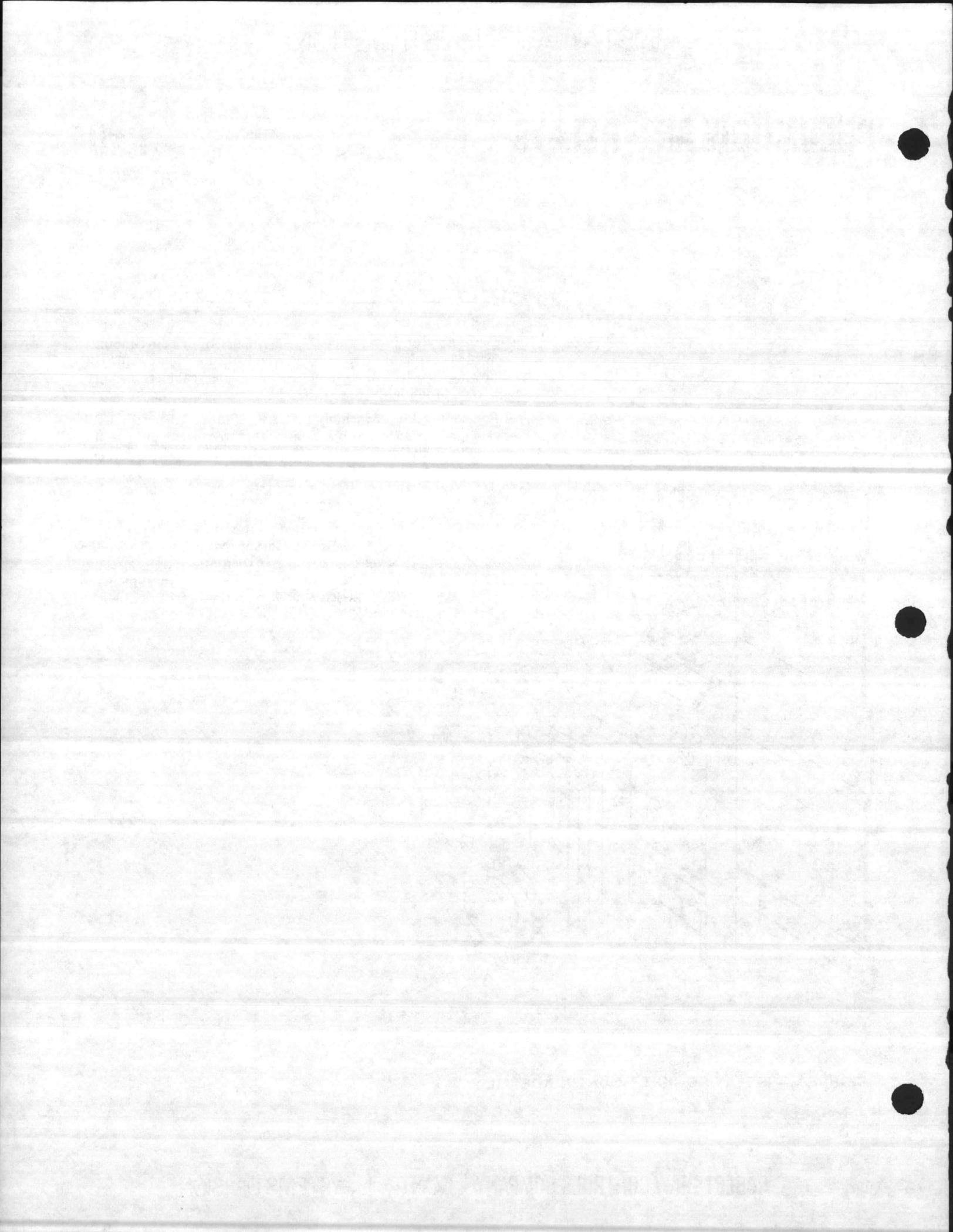


FIGURE 1 — RELAY SOCKET MOUNTING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® DIVERTING RELAYS ADJUSTABLE SET POINT

R503-1 R503-2

CALIBRATION

The Model R503-1 and R503-2 diverting relays are snap-acting devices designed to convert a proportional pneumatic signal, at a predetermined setting, to a positive (two-position) pneumatic switching action. These relays are pilot-operated and require a main air connection to port "M" of 15 to 25 psig (103 to 172 kPa). See Table I for model number descriptions.

The R503-1 and R503-2 relays should not require field calibration; however, if a relay does not transfer port "NC" to port "C" at its dial setting, the relay can be recalibrated by turning the "zero adjust" screw with a 5/64" hex wrench (clockwise to increase).

TABLE I

MODEL	R503-1	R503-2
TYPE	SPDT	SPDT
DIFFERENTIAL	0.2 to 0.4 psi (1.4 to 2.8 kPa)	2 to 4 psi (14 to 28 kPa)
SET POINT RANGE	3* to 20 psig (21 to 138 kPa)	4.5* to 20 psig (31 to 138 kPa)
SWITCHING ACTION	Port S at set point minus diff.: ports NO & C are connected.	Port S at set point minus diff.: ports NO & C are connected.
	Port S at set point: ports NC & C are connected.	Port S at set point: ports NC & C are connected.

* DO NOT SET below this value.

NOTE: Ports not connected to common (C) are blocked. On a loss of main air pressure, ports NO & C will be connected regardless of signal pressure at port S.

ADJUSTMENT

The relay set point is changed by rotating the serrated set point adjustment knob (see Figure 1). The knob operates through two revolutions and the set point indicator shifts to indicate the effective portion of the concentric scales.

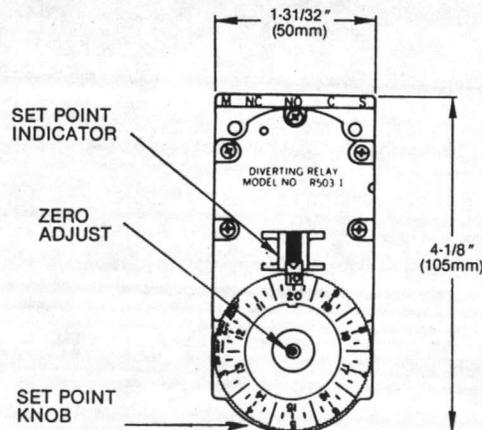
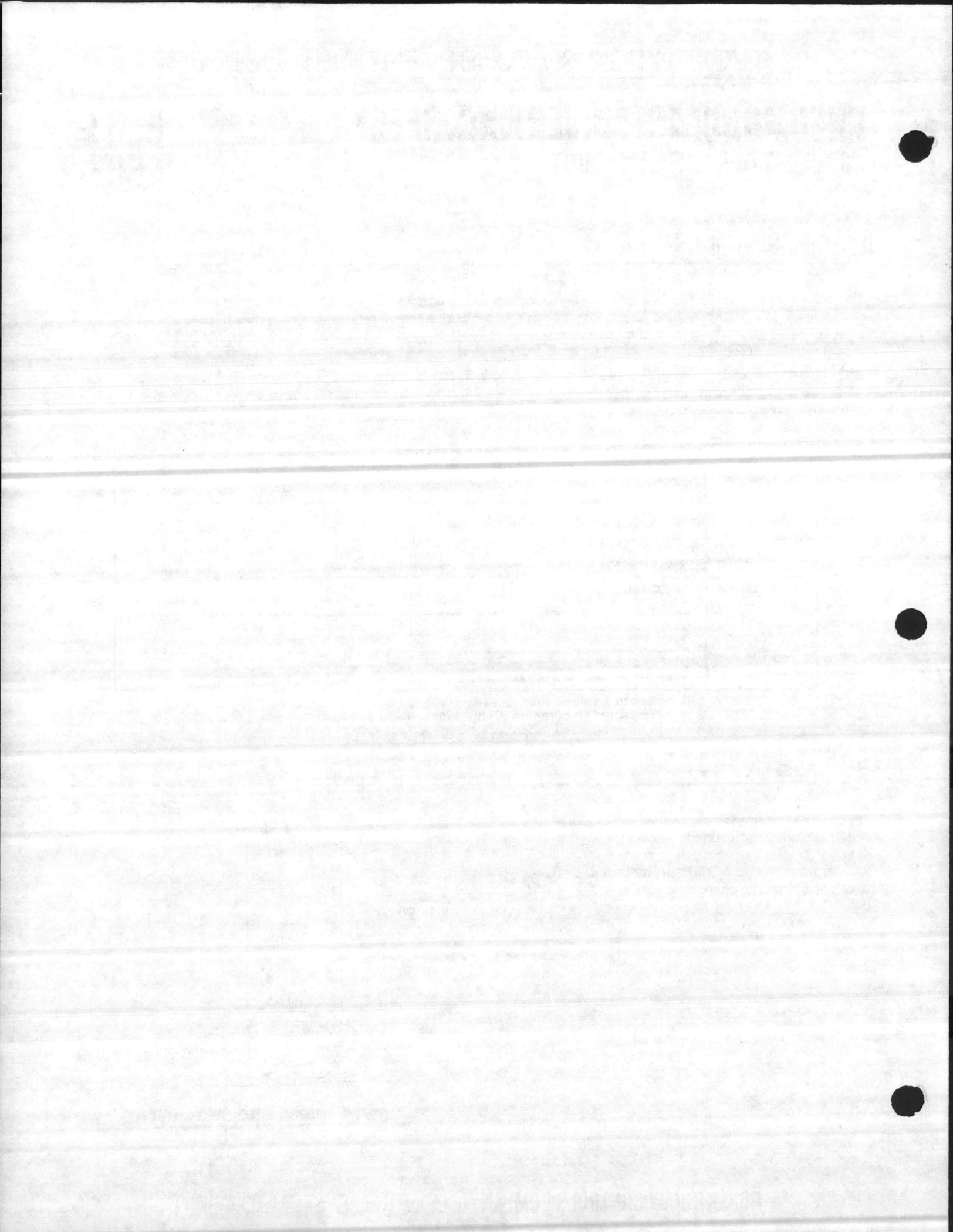


FIGURE 1 — R503-1 AND R503-2 RELAY APPEARANCE (TYPICAL)





2.1.13
C8 & C9

DATA SHEET

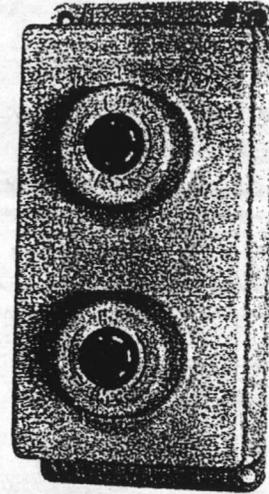
MODEL R571

PRESSURE ELECTRIC SWITCH

GENERAL DESCRIPTION

The Model R571 Pressure Electric Switches are used in pneumatic control systems where the conversion of gradual air pressure changes to positive electrical switching action is required. Typical applications are: Starting/stopping unit ventilator and fan coil motors, unit heaters and air handling unit fans.

The R571 incorporates a non-metallic diaphragm, which is displaced by air pressure changes, that actuates an electrical contact mechanism.



 UNDERWRITER'S LABORATORIES LISTED

SPECIFICATIONS

MODELS: R571-1; 2 psi (.1 bar) fixed differential.
R571-2; 2-20 psi (.1 to 1.4 bar) adjustable differential.

SWITCH ACTION: Single pole double throw

SET POINT RANGE: 3-25 psig (.21-1.7 bar)

MAXIMUM PRESSURE: 30 psig (2.1 bar)

MOUNTING: Designed for mounting on MCS-S manifold socket only.

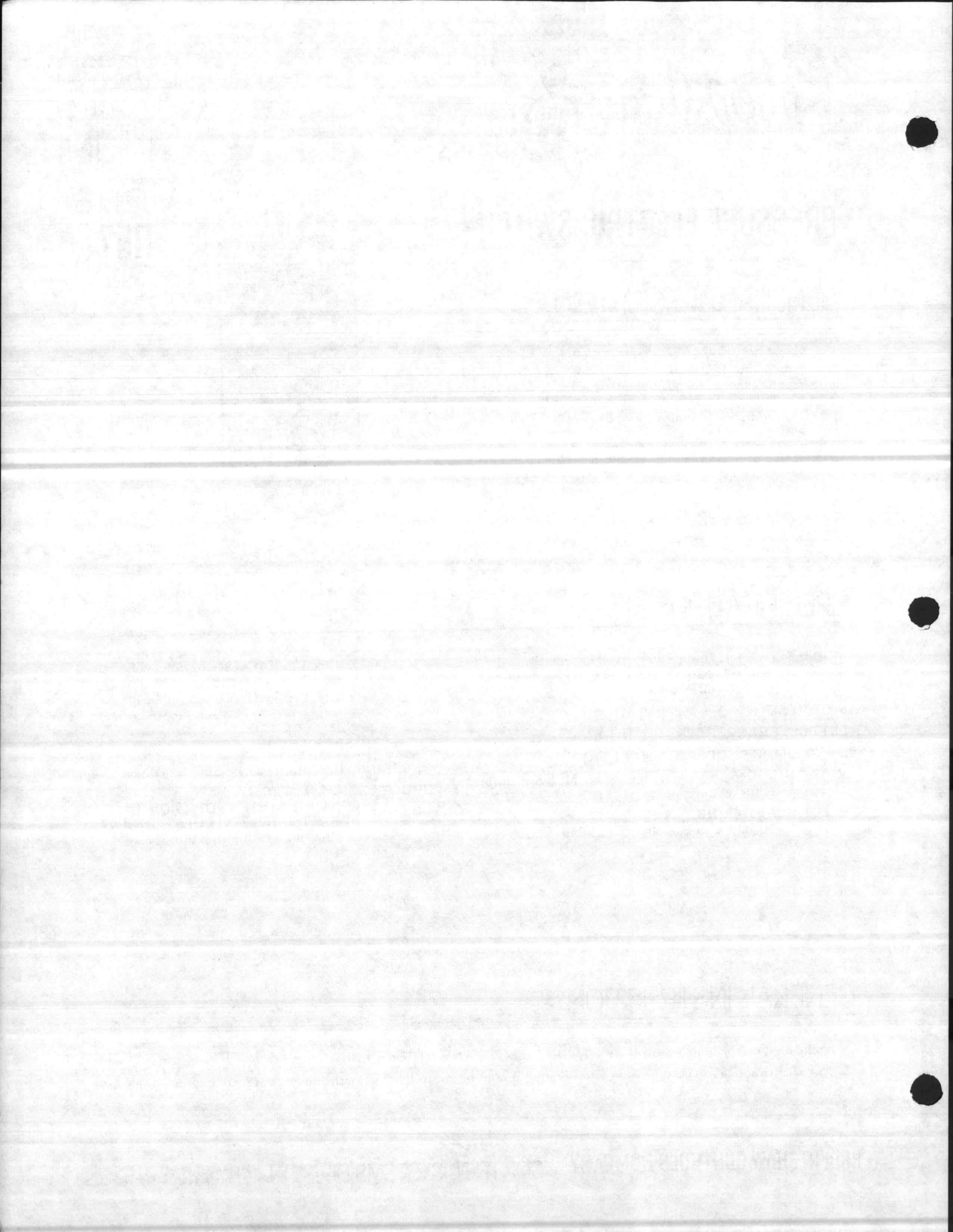
ELECTRICAL RATING:
10 amps non-inductive @ 125-250 VAC

½ HP @ 125 VAC (8 amps full load;
48 amps locked rotor)
¾ HP @ 250 VAC (6 amps full load,
36 amps locked rotor)

ORDERING INFORMATION: Specify Model Number
ORDER FROM: Local Office of
CONTROL SYSTEMS DIVISION
ROBERTSHAW CONTROLS COMPANY
or office noted at bottom of this page

GENERAL INSTRUCTIONS

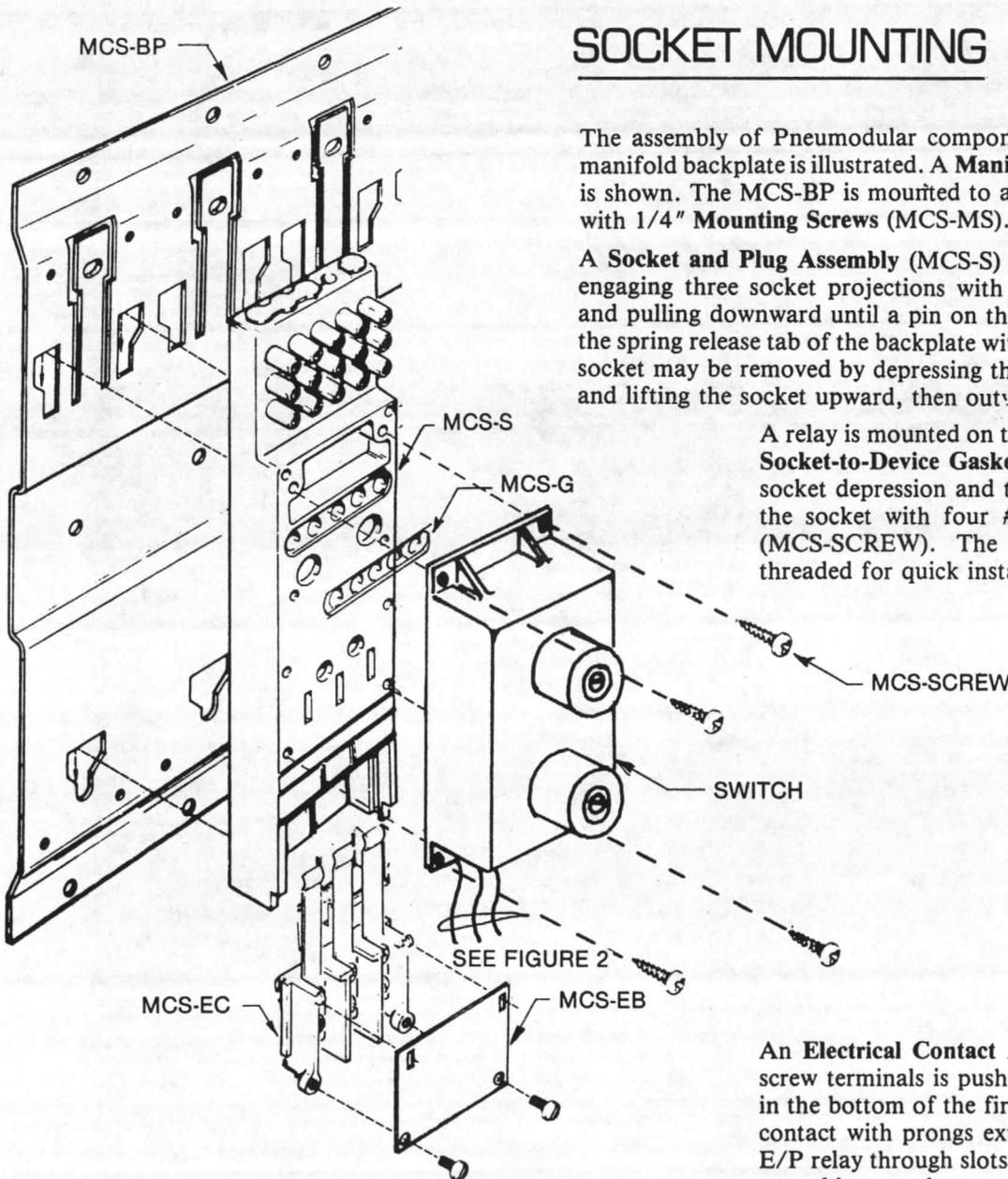
1. To be used on clean, dry control air only. DO NOT USE ANY OTHER MEDIUM.
2. Any electrical loads exceeding the switch's rating should be controlled by intermediate relays, contactors, or motor starters.



PNEUMODULAR® PRESSURE ELECTRIC SWITCHES

R571 R572

SOCKET MOUNTING



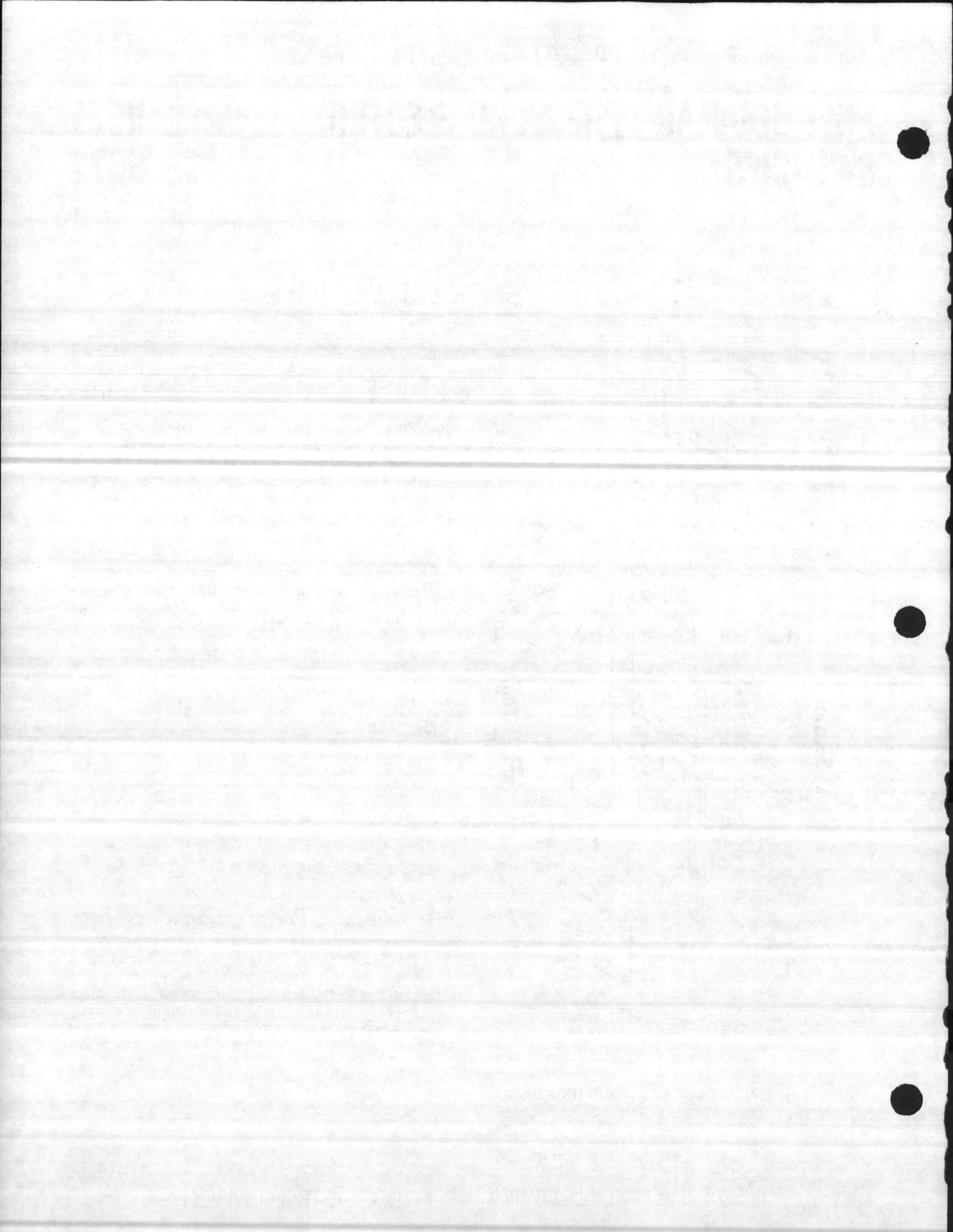
The assembly of Pneumodular components on a panel mounted manifold backplate is illustrated. A **Manifold Backplate (MCS-BP)** is shown. The MCS-BP is mounted to a panel (cabinet) backplate with 1/4" **Mounting Screws (MCS-MS)**.

A **Socket and Plug Assembly (MCS-S)** is mounted on the BP by engaging three socket projections with three backplate openings and pulling downward until a pin on the socket engages a hole in the spring release tab of the backplate with an audible "click." The socket may be removed by depressing the backplate spring release and lifting the socket upward, then outward.

A relay is mounted on the socket by first placing a **Socket-to-Device Gasket (MCS-G)** in a matching socket depression and then attaching the relay to the socket with four #6 x 1/2" **Plastite Screws (MCS-SCREW)**. The screws are double-helix threaded for quick installation and removal.

An **Electrical Contact Assembly (MCS-EC)** with screw terminals is pushed into tracks and latched in the bottom of the first socket. Its fingers make contact with prongs extending from the installed E/P relay through slots in the socket. The contact assembly may be removed from the socket by depressing a spring clip accessible from the *back* of the socket and sliding it from the tracks. An **Electrical Barrier (MCS-EB)** may be screwed into the contact assembly, if required.

FIGURE 1 — SWITCH SOCKET MOUNTING DETAIL



TWO-SWITCH WIRING

The second switch of two-switch (DPDT) pressure electric switches is provided with three 6-inch (152mm), color-coded wires. These wires may be connected in one of the following ways:

- a. If a non-electric device is socket-mounted adjacent to the two-switch device, an additional MCS-EC contact assembly can be added for the wires as shown in Figure 2; however, the MCS-EC contact blades should be cut off to prevent electric shock through the exposed slots of the socket on which it is mounted.
- b. If electrical troughing such as Panduit is required to be installed below the sockets, wire nut connections can be made inside the trough in lieu of using the extra MCS-EC.
- c. Extra electrical terminals can be added below the two-switch device socket.
- d. Wire nut connections can be made directly to other panel devices or to the panel terminal strip.

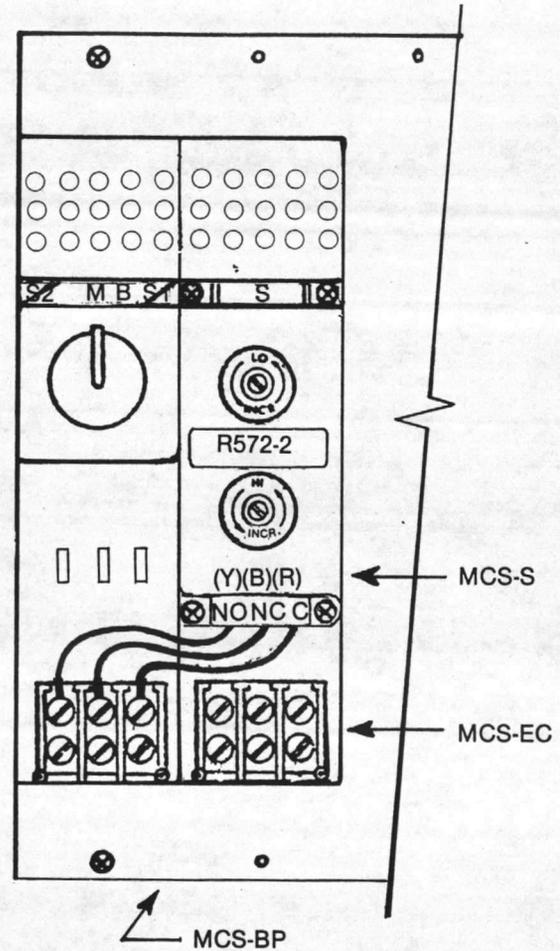
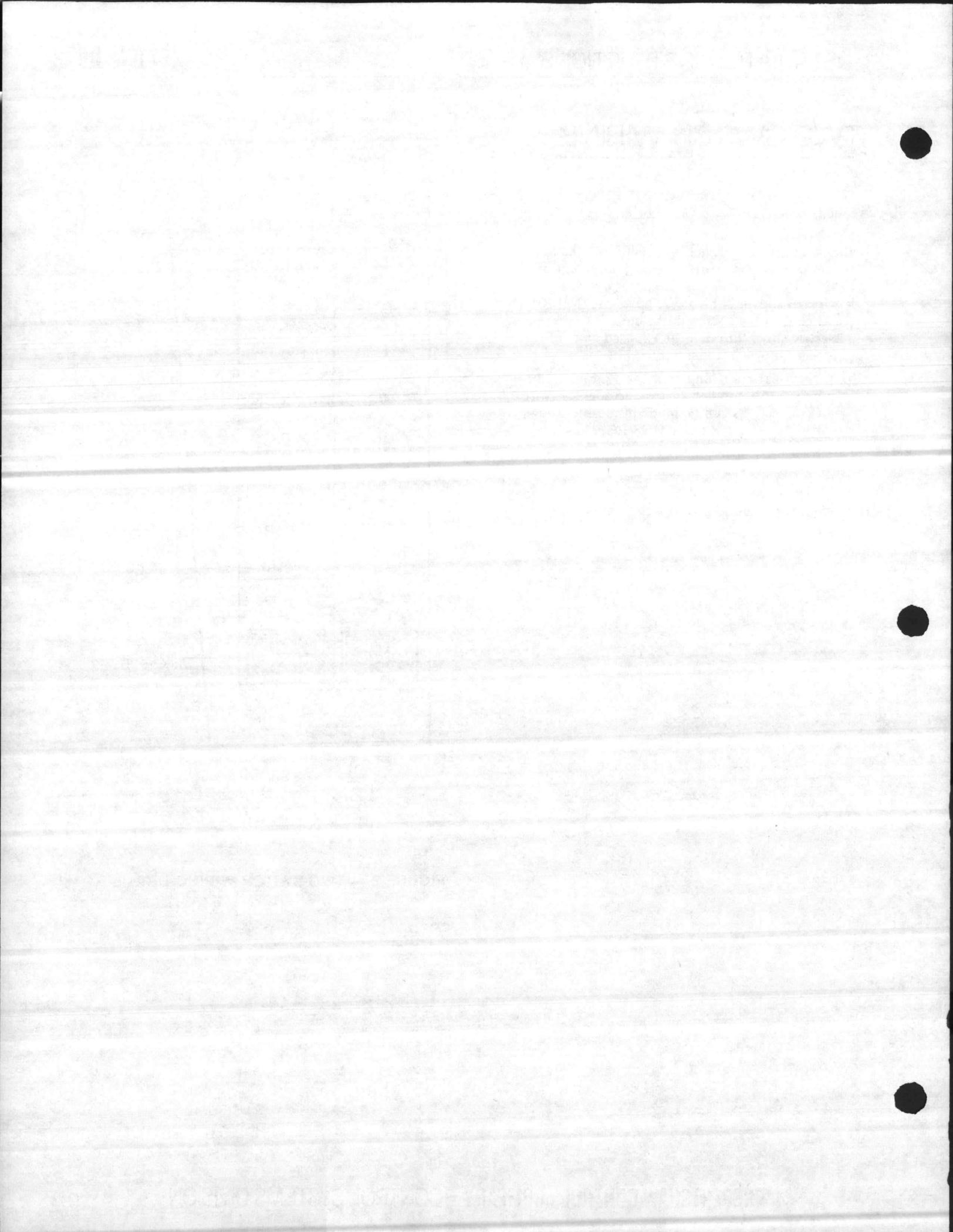


FIGURE 2 — TWO-SWITCH WIRING DETAIL



CALIBRATION & ADJUSTMENT INSTRUCTIONS

PNEUMODULAR® PRESSURE ELECTRIC SWITCHES

R571 R572

CALIBRATION

The Model R571 and R572 series pressure electric switches are used in pneumatic control systems where an application requires the conversion of air pressure changes, either gradual or two-position, to positive electrical switching action. See Table I for model number descriptions and factory-calibrated switching ranges. Note that the calibrated low switch point for all models is 5 psig (34 kPa).

TABLE I

MODEL	TYPE	DIFFERENTIAL	SWITCHING ACTION*		FACTORY CALIBRATION
			BELOW LOW SET POINT ("NORMAL")	ABOVE LOW SET POINT PLUS DIFFERENTIAL	
R571-1	SPDT	Fixed, 2 psi (14 kPa)	NC to C	NO to C	5 to 7 psig (34 to 48 kPa)
R571-2	SPDT	Adjustable, 2 to 20 psi (14 to 138 kPa)	NC to C	NO to C	5 to 10 psig (34 to 69 kPa)
R572-1	DPDT	Fixed, 3 psi (21 kPa)	NC to C, B to R	NO to C, Y to R	5 to 8 psig (34 to 55 kPa)
R572-2	DPDT	Adjustable, 3 to 20 psi (21 to 138 kPa)	NC to C, B to R	NO to C, Y to R	5 to 10 psig (34 to 69 kPa)

The *set point* of all models is adjustable from 3 to 25 psig (21 to 172 kPa).

*The switches of DPDT models are transferred simultaneously.

ADJUSTMENT

If a factory-calibrated switching range listed in Table I is not suitable for an application, it can be changed as described below. When adjustments are made by pressure readings the device should be placed in a vertical position as though socket-mounted in a cabinet. See Figure 1 for device appearance.

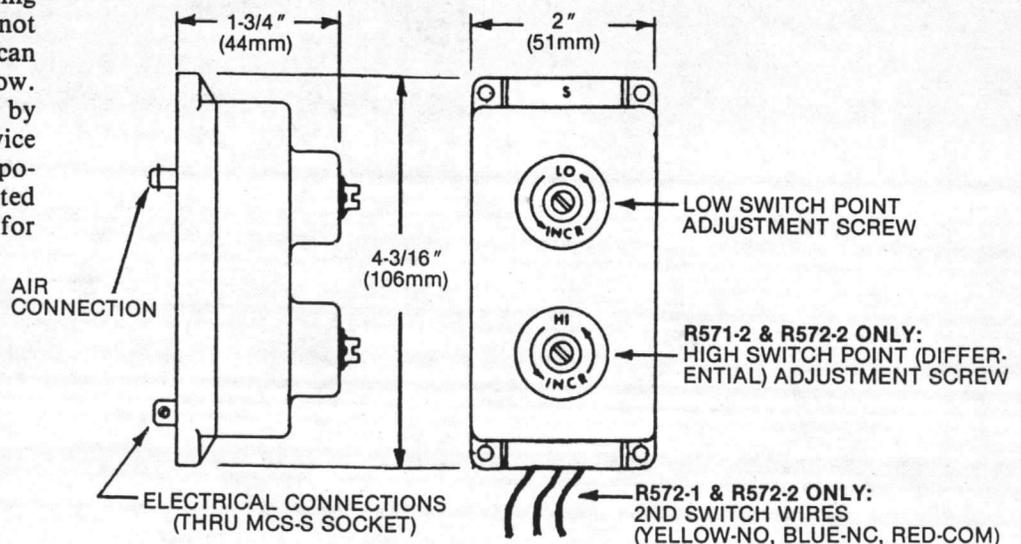
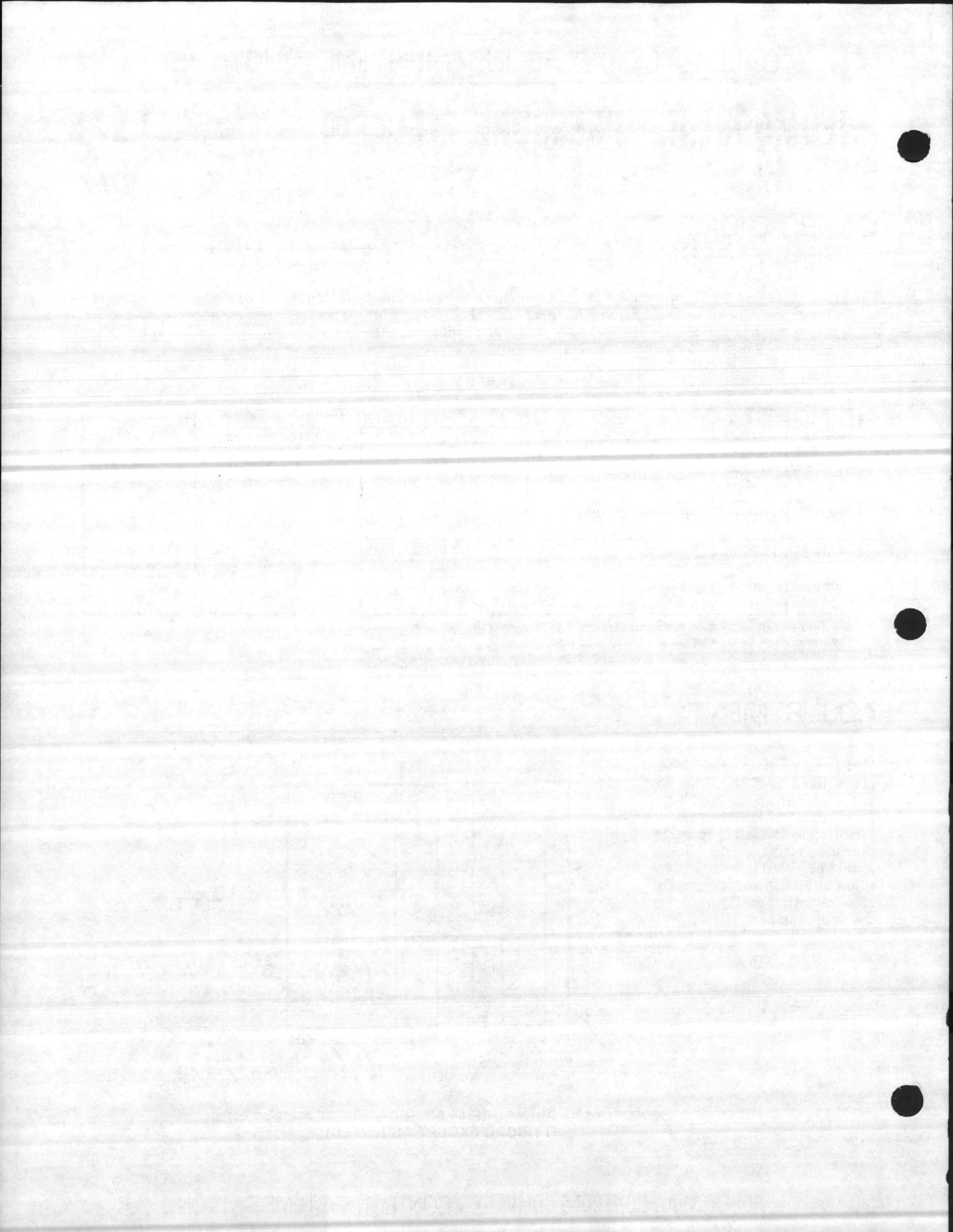


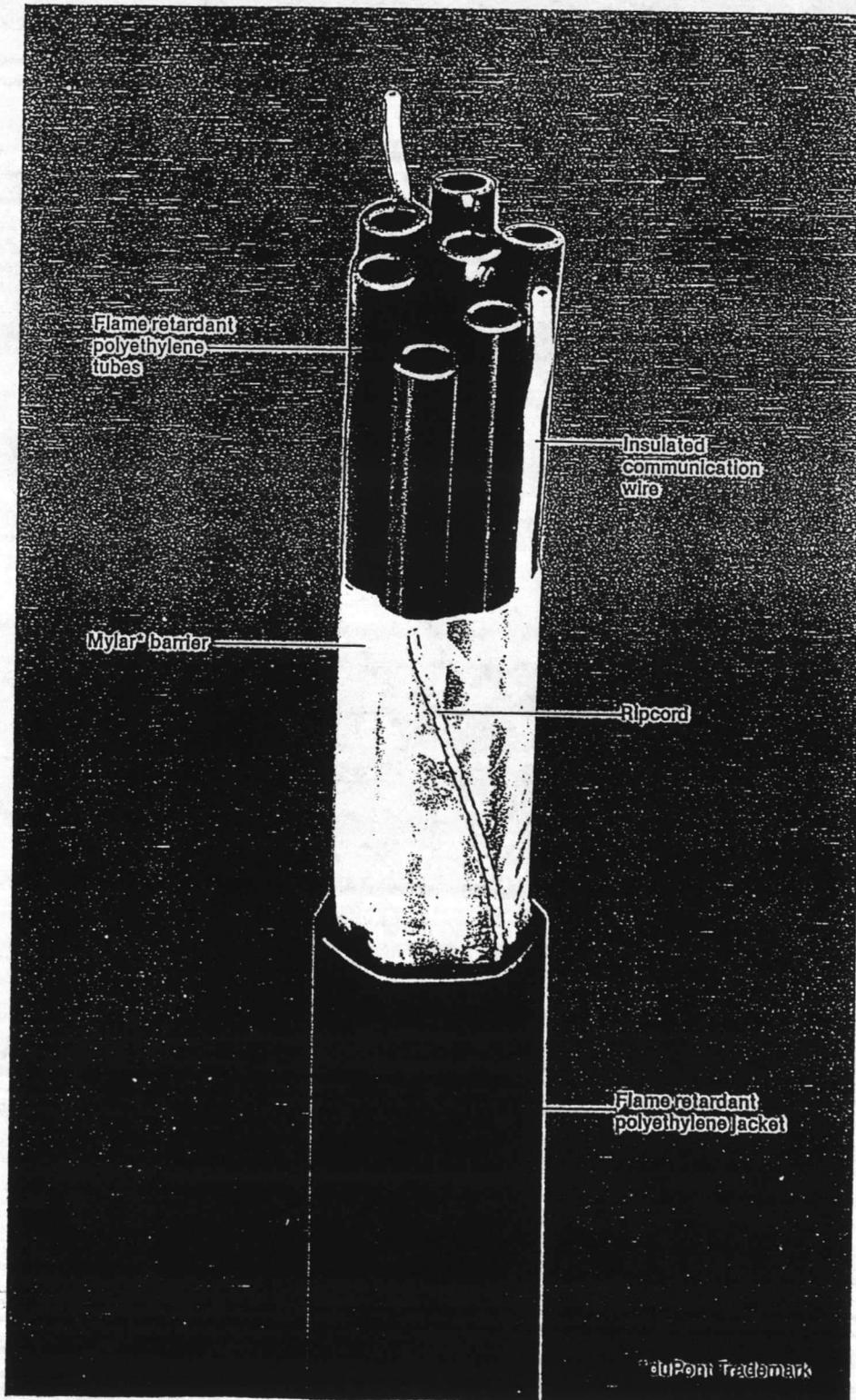
FIGURE 1 — PRESSURE ELECTRIC SWITCH APPEARANCE (TYPICAL EXCEPT AS NOTED)



Dekoron®

2.2.2

Type 1224 "FR"
Flame Retardant Poly-Cor
Multiple Tube Bundle



Application

Type 1224 "FR" is the ideal all plastic instrument tubing bundle for installations where flame spread and smoke generation must be controlled. In case of fire, Type 1224 "FR" will not propagate fire.

Flame Retardant (FR) Materials

Tubing contained within the Dekoron 1224 "FR" bundle is manufactured to the same material specifications as Dekoron 1219 "FR" single line tubing. In addition to longevity tests such as heat aging, ultraviolet light protection and stress crack resistance, bundles are tested for fire safety properties such as flame-spread, smoke generation and off-gassing. Type 1224 "FR" is manufactured from a proprietary flame retardant polyethylene compound that has a UL 94-V2 flammability classification.

Tube Identification

Number-coded tubes eliminate costly guesswork in hook up, and two 22 Ga. PVC insulated communication conductors are included to help coordinate bundle installation.

Low Initial and Installed Cost

Since Type 1224 "FR" has been designed with fire safety in mind, it may be considered for applications replacing expensive metallic or exotic plastic tubing. And, as with all Dekoron bundles, many tubes are installed at one time, saving installation time and labor costs.

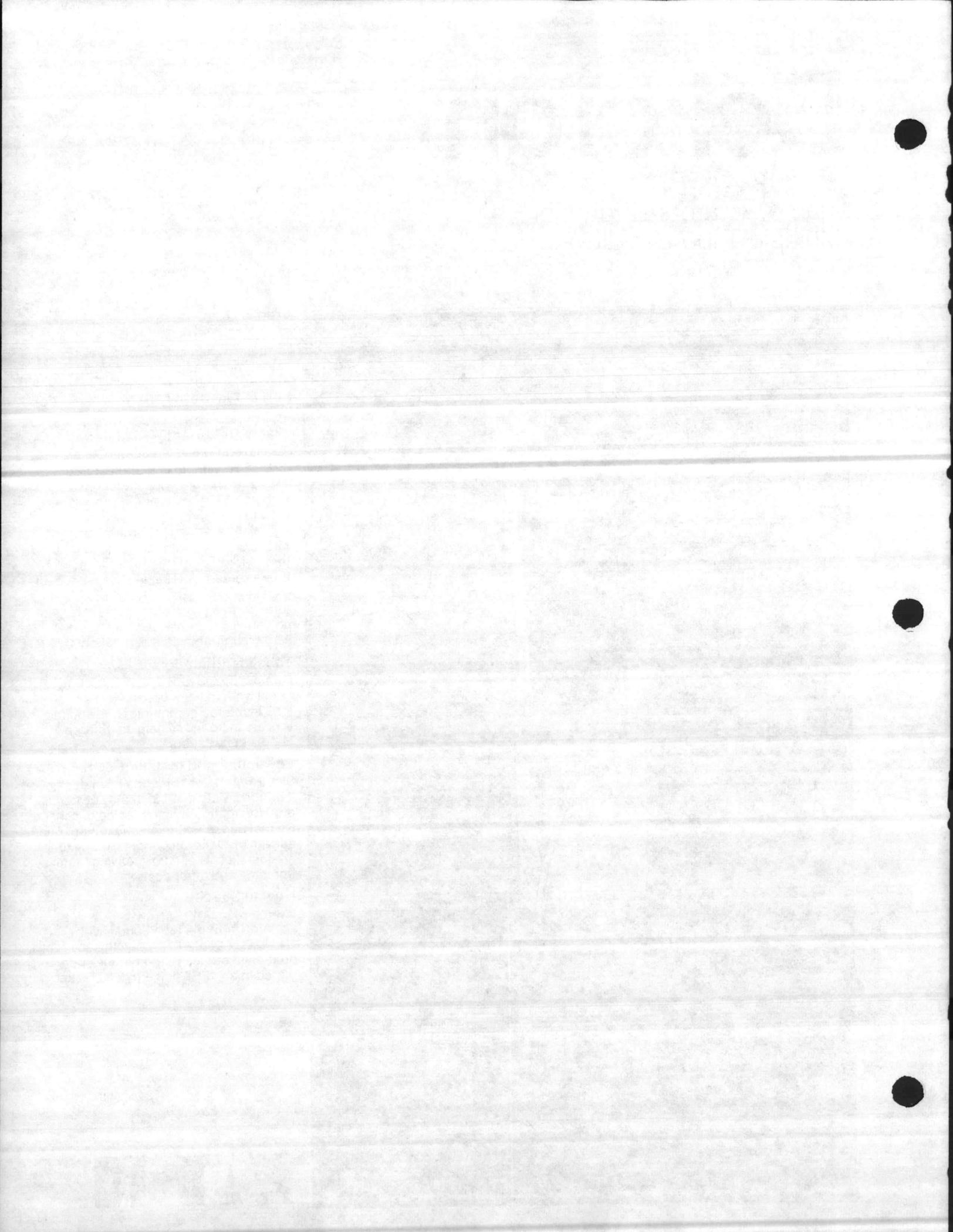
How to Specify

Example: 1224-40700

Dekoron multiple tube bundle with (7) 1/4" O.D. x .040" "FR" polyethylene tubes, positioned adjacent and parallel, contained in an "FR" polyethylene jacket.

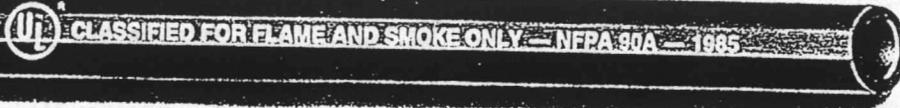
Eaton Trademark

EATON



"FR" Tubing (Flame Retardant)

2.2.2



Developed specifically for controlling flame spread and smoke generation, Dekoron 1219 FR (flame retardant) Tubing can be installed in accordance with NFPA, Standard 90A "Installation of Air Conditioning and Ventilation Systems 1985."

Dekoron 1219 FR Tubing is made of an exclusive "linear" low-density polyethylene based formulation that is UL recognized. It combines the physical characteristics and long-term stability of low density polyethylene with flame retardant properties. Look for UL Classification marking on product.

Advantages

Dekoron 1219 FR Tubing prevents fire propagation, as it rapidly extinguishes after being removed from an open flame. "FR" Tubing is very similar to Dekoron "P" Tubing for flexibility, lightweight, abrasion resistance, high tensile strength and rugged environmental performance. To guarantee stress crack resistance, both the standard ASTM D 1693 test for stress cracking of base materials and a modified test on finished tubing are performed.

Easy to Install

Installation is simple and quick. Being flexible and lightweight, Dekoron 1219 FR Tubing can be installed by hand.

How to Specify

Example: 1219-440B3 Dekoron 1219 FR tubing with red stripe, 1/4" O.D. x .040" wall, 250 ft. lengths.

Availability

Four standard sizes in coils. Black or seven standard color stripes and shipped in convenient master pack quantities. 5/32" O.D. tubing supplied in black only.

Standard Lengths

- 5/32" — 500-foot lengths
- 1/4" — 250-, 500-, and 1,000-foot lengths
- 3/8" — 250- and 500-foot lengths
- 1/2" — 250-foot lengths

Note

Authorities having jurisdiction should be consulted before installation.

Specifications

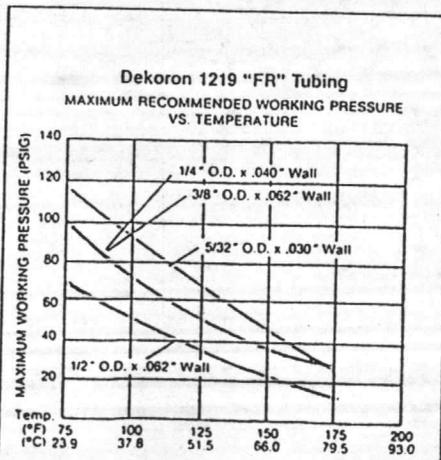
The proper letter from the color chart below should be substituted for the "X" in the part number to indicate the color stripe desired. If no color letter is indicated, black will be supplied.

O.D. Inches	I.D. Inches	WALL Inches	NET WT. lbs./100	UNIT LENGTH Feet	PART NUMBER
5/32	.096	.030	0.57	500	1219-13004*
1/4	.170	.040	1.26	250	1219-440X3
				500	1219-440X4
				1,000	1219-440X5
3/8	.250	.062	2.90	250	1219-662X3
				500	1219-662X4
1/2	.375	.062	4.06	250	1219-862X3

*Black Only

Physical Properties of "FR" Tubing

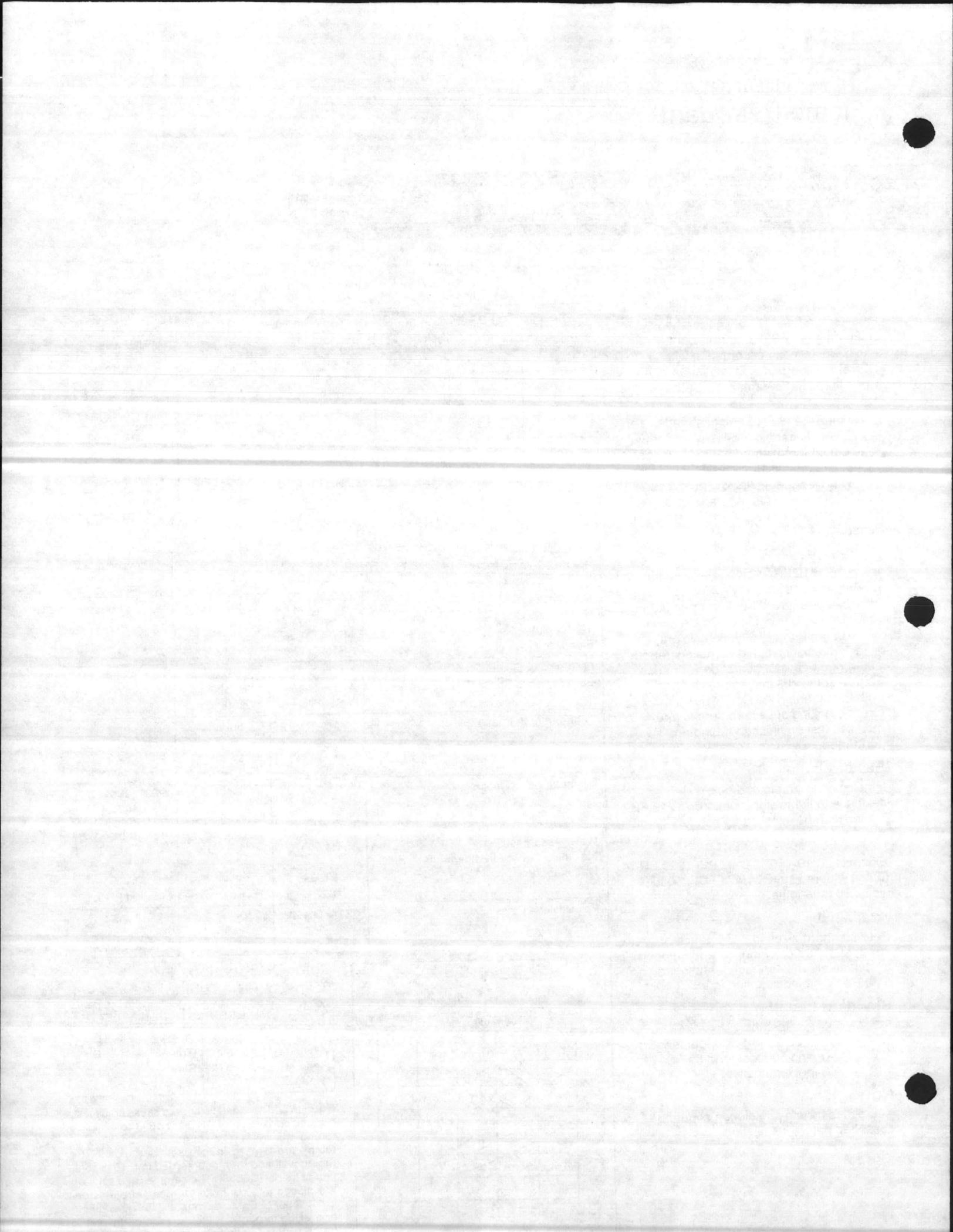
PROPERTY	TEST METHOD	UNITS	TYPICAL VALUE
Melt Index (max.)	ASTM D 1238	dg/min.	1.0
Density, 23°C	ASTM D 792	g/c.c.	1.10
Tensile Strength	ASTM D 638	PSI	1900
Elongation (pull at 20" min.)	ASTM D 638	%	400
Flexural Modulus of Elasticity	ASTM D 790	PSI	33,000
Environmental Stress Crack Resistance	ASTM D 1693 See Note	% failures at 48 hrs.	0
Tube Strength (max.)	—	pounds	5/32" tube = 14 1/4" tube = 30 3/8" tube = 67 1/2" tube = 95
Minimum Bend Radius	—	inches	5/32" tube = 1/2 1/4" tube = 3/4 3/8" tube = 1-1/2 1/2" tube = 1-7/8
Water Absorption	ASTM D 570	%	.08
Maximum Service Temperature — Black	—	°F	175
Flammability	UL 94 UL 910	—	V-2 Classified/NFPA 90A
Polyethylene Classification	ASTM D 1248	—	Type I Class C Category 4



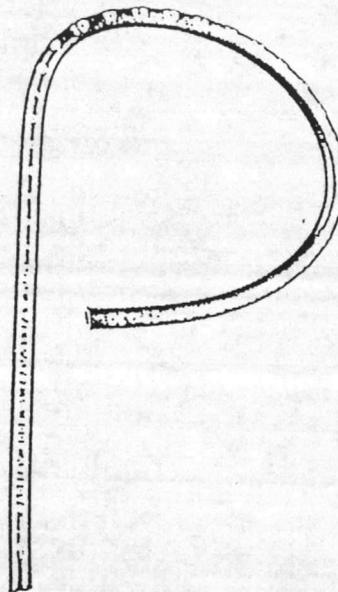
Color Designations For Striped "FR" Tubing

STRIPE	LETTER	STRIPE	LETTER
All Black	O	Yellow	D
White	A	Green	E
Red	B	Blue	F
Orange	C	Violet	G

Note: In addition to the standard stress crack test, a modified version of ASTM D 1693 to evaluate tubing quality is also performed. Sections of tubing are bent to induce severe stress in the tubing wall and then submerged in a 10% solution of Igepal (C0630). The samples and solution are placed in a controlled temperature environment at 50°C. Samples must exhibit no cracking or crazing throughout the duration of the test to be considered satisfactory for extended use.



Parflex Engineering Bulletin



New FRPE Tubing Flame Resistant Polyethylene

Parker Parflex FRPE (Flame Resistant Polyethylene) tubing is specifically designed and manufactured to meet the stringent flame resistant standards in the heating-ventilating-air conditioning-energy conservation industry.

Series FRPE tubing is manufactured from a distinctive compound which meets the UL94V-2 flame classification. It also meets the flame spread, fuel contribution and smoke density requirements of the ASTM E84-81a tunnel test.

Supplied in black. Number-coded 1 through 30.

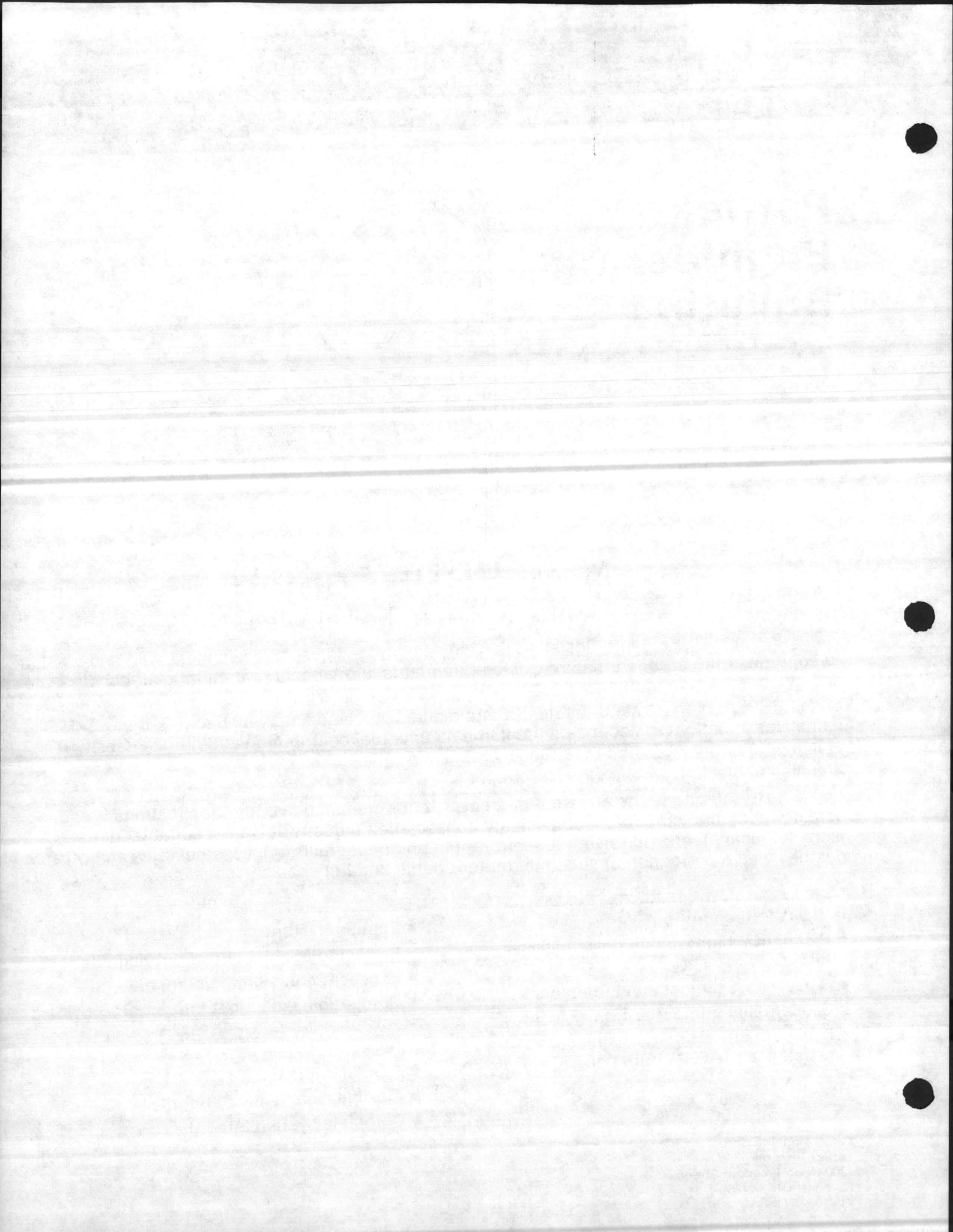
Parflex FRPE tubing is the preferred product type for pneumatic control applications in the heating-ventilating-air conditioning-energy conservation industry. It is also suitable for use in petrochemical plants, petroleum refineries, pulp and paper mills, mines, steel mills and other industries where protection against intermittent flame and hot sparks is necessary.

Features

- UL94V-2 Recognition
- Distinctive, high quality polyethylene formulation
- Closely-held dimensional tolerances
- Sequentially numbered from 1 to 30
- Minimum environmental stress crack resistance of 1600 hours per ASTM D-1693

Benefits

- Flame resistant
- Protected against ultraviolet degradation
- Excellent abrasion resistance
- Compatible with most industrial environments
- Durable
- Tube identification
- Flexible, light, easy to handle
- Complete system integrity



New Series FRPE Tubing

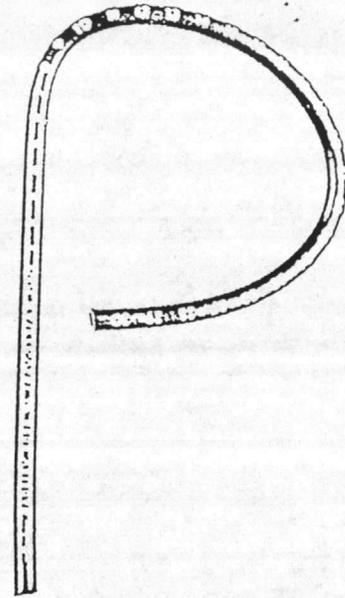
2.2.2

Construction: Specifically formulated polyethylene tubing designed and manufactured to close tolerances. Resistance to flame, abrasion and stress crack.

Applications: Pneumatic control systems.

Temperature Range: -85°F (-65°C) to +150°F (+66°C)

Fittings: Barbed fittings: Parker Dubl-Barb.
Compression fittings: Parker NTA, Compress-Align or Poly-Tite.
Parker Presto-Lok fittings.



Specifications:

U.S. Designations

Part No.	O.D. ins	I.D. ins	Wall ins	Recommended Working Pressure psig	Burst Pressure psig	Minimum Bend Radius ins	Weight lbs Per 100 ft
1FRPE2.5	5/32	.096	.030	180	900	1/2	.56
1FRPE3	3/16	.1275	.030	130	650	3/4	.70
1FRPE4	1/4	.170	.040	130	650	3/4	1.2
1FRPE6	3/8	.250	.062	180	900	1 1/2	2.9
1FRPE8	1/2	.375	.062	130	650	1 3/4	4.0

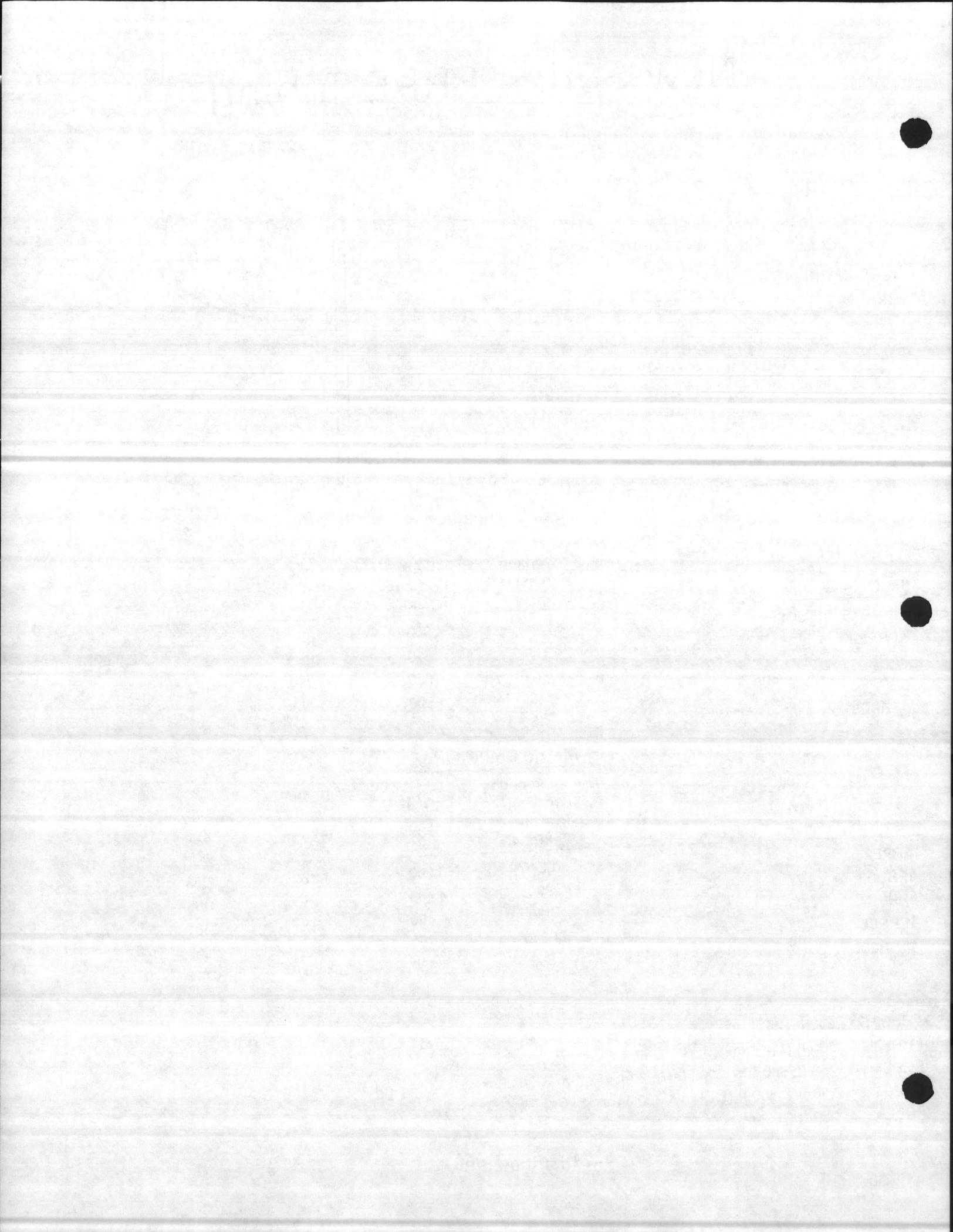
Metric Equivalents

Part No.	O.D. mm	I.D. mm	Wall mm	Recommended Working Pressure kPa	Burst Pressure kPa	Minimum Bend Radius mm	Weight Kg Per m
1FRPE2.5	3.96	2.44	.76	1,240	6,200	1.27	.0083
1FRPE3	4.77	3.25	.76	890	4,480	1.91	.0185
1FRPE4	6.35	4.32	1.02	890	4,480	1.91	.0431
1FRPE6	9.53	6.35	1.58	1,240	6,200	3.81	.0602
1FRPE8	12.70	9.53	1.58	890	4,480	4.45	.0104

Standard Coils

1FRPE2.5	500 ft (152.4 m)
1FRPE3	500 ft (152.4 m)
1FRPE4	250 ft, 500 ft & 1,000 ft (76.2 m, 152.4 m & 304.8 m)
1FRPE6	250 ft & 500 ft (76.2 m & 152.4 m)
1FRPE8	250 ft (76.2 m)

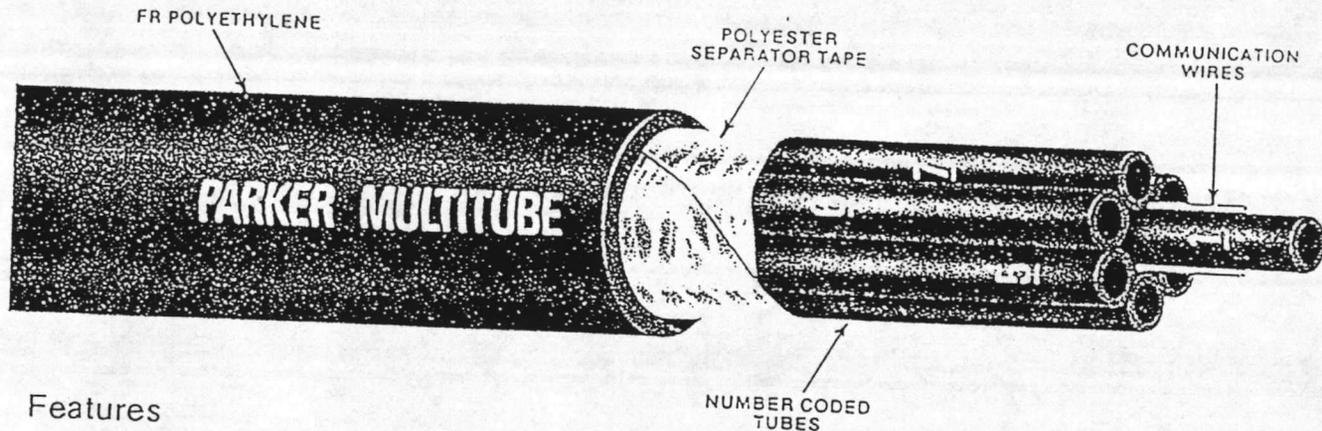
— Distributed By: —



Parker Multitube® FRPT Multiple Polyethylene

Instrument and
Control Tubing

Bulletin 4200 FRPT
October 3, 1983



Features

General — Parker Instrument & Control Tubing is designed for general use both indoors and outdoors. Instrument Tubing is used for the transmission of pneumatic signals whether they be to monitor or control a process. Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble free product.

Tubing Identification — Accomplished by printing each individual flame resistant polyethylene tube at two inch (2") intervals. Clear, readable numbers on each tube eliminates confusion, guesswork and costly delays caused by trial and error air testing to locate tube ends.

Communications Wire — Two insulated 22 AWG wires are included in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points. This provides an aid to the installer while connecting and calibrating instruments.

Sequential Footage Marking — Sequential footage marks are printed every two feet on the surface of the jacket. The numbers start at the inside end on the reel so that the number on the outside end is a measurement of the footage remaining on the reel. Sequential footage

Specification Summary

A pneumatic instrument tubing assembly consisting of multiple flame resistant polyethylene tubes with each tube printed at two inch (2") intervals. The tubes are run with two insulated 22 AWG communication wires

See Reverse Side for Physical, Material, and Test Specifications

marks are printed on all lengths over 500 feet that are cut and shipped from stock upon customers request.

Flame Resistant Polyethylene Instrument Tubing — is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. It has excellent low temperature flexibility and outstanding resistance to environmental stress cracking. Flame Resistant Polyethylene tubing is inherently corrosion resistant to most chemicals. The tubing contains approximately 2.5% carbon black, thoroughly dispersed, and it recommended for outdoor exposure.

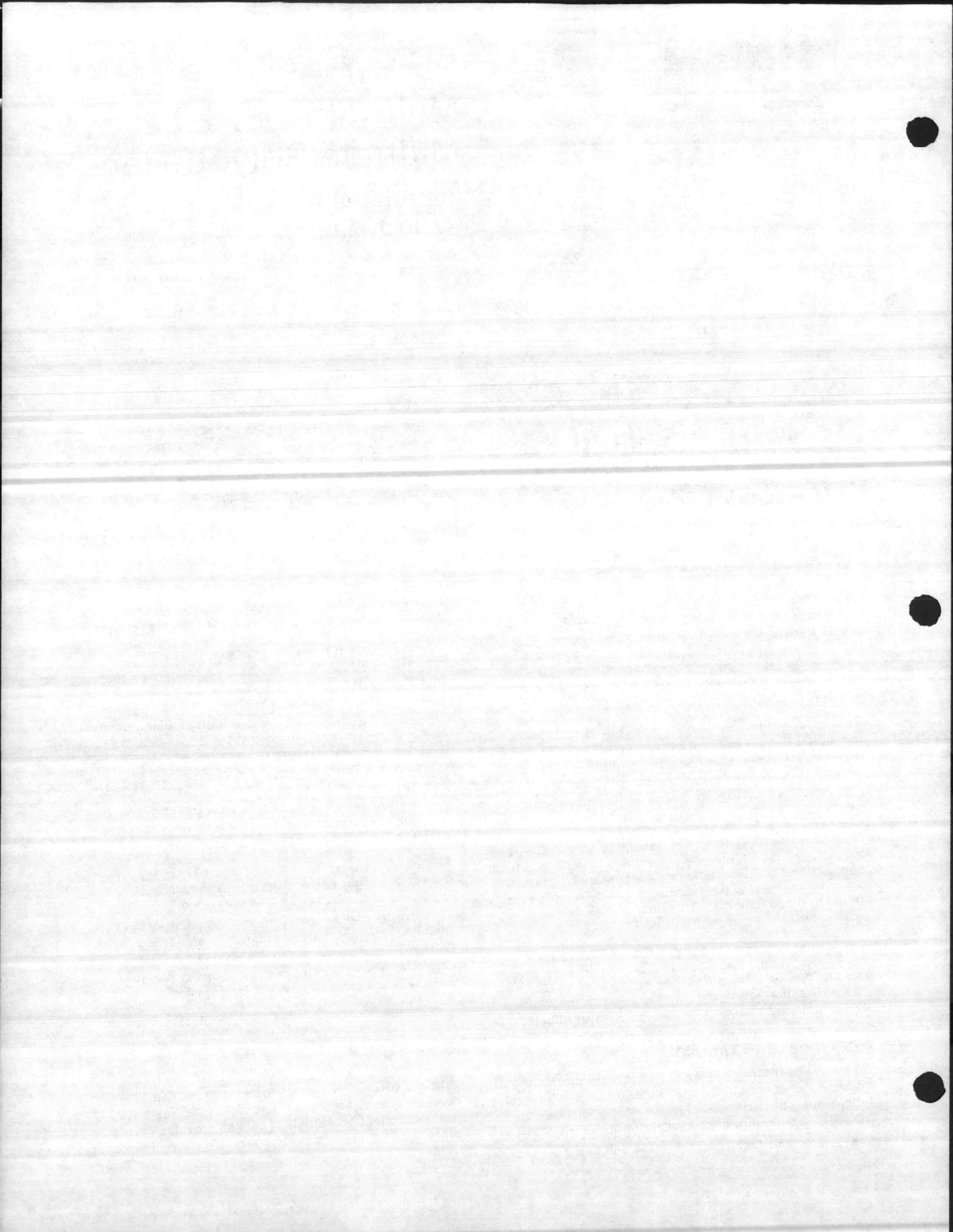
FR Polyethylene Jacket - Black, weather resistant, high molecular weight flame resistant polyethylene compound which meets the UL94V-2 flame classification.

FR Polyethylene has excellent low temperature flexibility. Also it is resistant to most chemicals and its low friction factor makes it easier to pull through conduit.

Other Jackets - Upon request, low density polyethylene, PVC, TPR and other jackets will be supplied.

with a protective polyester tape wrapped over this core assembly. An overall black, weather resistant, flame resistant polyethylene jacket provides corrosion protection (Other jackets can be supplied upon request).

See Reverse Side for Physical, Material, and Test Specifications



Physical Specifications*

Description	Catalog Number	Number of Tubes	Outer Jacket Thickness (Inches)	Overall O.D. (Inches)	Min. Bend Radius (Inches)	Maximum Pulling Tension (Lbs.)	Net Wt. (Lb./100 ft.)	Standard Length (Ft.)
FR Polyethylene Tubes	2FRPT4	2	0.45	59	1.5	90	8.6	3000
	3FRPT4	3	0.45	60	1.5	110	11.4	3000
	4FRPT4	4	0.63	74	2.0	140	12.8	3000
	5FRPT4	5	0.63	88	2.0	170	15.1	3000
	7FRPT4	7	0.63	89	2.5	195	17.5	3000
	8FRPT4	8	0.63	97	2.5	235	19.5	2500
	10FRPT4	10	0.63	1.14	3.0	260	22.8	2500
	12FRPT4	12	0.63	1.14	3.5	300	25.4	2000
	14FRPT4	14	0.63	1.25	4.0	340	28.8	1500
	19FRPT4	19	0.63	1.40	5.0	425	36.8	1500
37FRPT4	37	.094	1.96	9.0	880	74.5	1000	
FR Polyethylene Tubes	2FRPT6	2	0.63	.89	2.0	160	13.9	2000
	3FRPT6	3	0.63	.89	2.0	195	17.9	2000
	4FRPT6	4	0.63	1.05	2.5	265	21.1	2000
	5FRPT6	5	0.63	1.16	3.0	295	24.6	2000
	7FRPT6	7	.078	1.31	4.0	365	29.7	2000
	10FRPT6	10	.094	1.72	5.0	515	44.2	1500
	12FRPT6	12	.110	1.80	6.0	685	60.8	1500
	19FRPT6	19	.110	2.13	10.0	900	85.5	1000

* All values are nominal

† For longer length, please consult factory

‡ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

Temperature and Pressure Recommendations — Type FRPT

Tubing Size	Recommended Operating Temperature Maximum	Burst Pressure (PSI) at Temperature				
		75°F	100°F	125°F	150°F	175°F
1/2" x .040"	150°F	650	475	350	250	175
3/8" x .062"	150°F	900	650	475	325	200

Although flame resistant polyethylene tubing is satisfactory for short time temperature rises to 175°F at a maximum recommended operating pressure of 50 psi (3 to 1 design factor), the recommended maximum design temperature for continuous use is 150°F.

Material Specifications

Flame Resistant Polyethylene Tubing — Black, low density, flame resistant polyethylene compound meeting UL94 V-2 flame classification. Environmental stress crack resistance exceeds 2000 hours when tested in accordance with ASTM D-1693. Continuous service temperature range is -85 °F. (-65 °C.) to +150 °F (66 °C.)

FR Polyethylene Jacket — Black, weather resistant, high molecular weight flame resistant polyethylene compound which meets the UL94 V-2 flame classification.

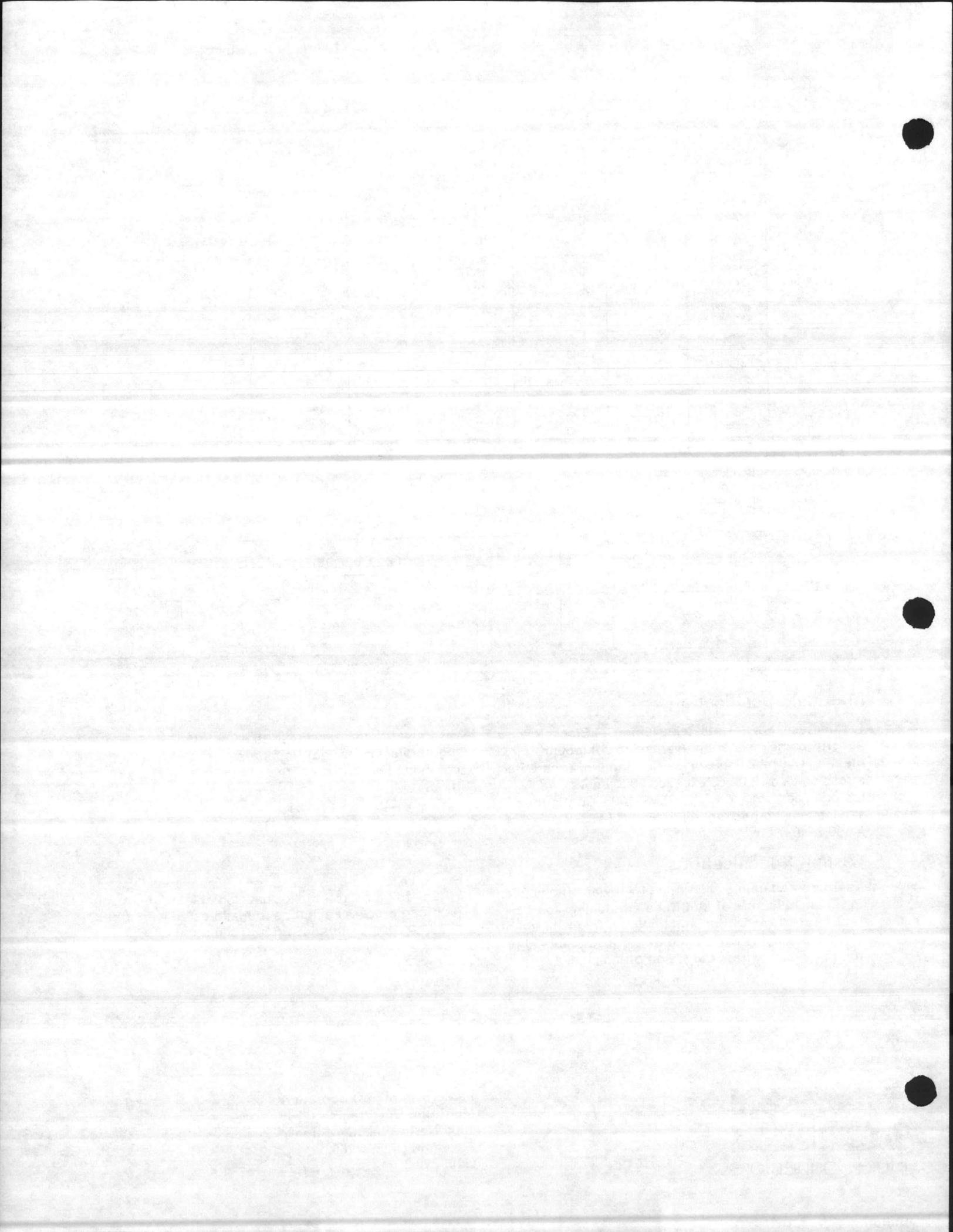
Testing Specifications

Testing — All flame resistant polyethylene tubes used in the manufacture of Multitube are subject to rigorous Q.A. inspection and testing prior to shipment. Each tube is pressure tested at not less than 150 psi for 15 minutes without any sign of leakage.

When Multitube assemblies have completed the manufacturing process each tube is again tested with dry CO₂ at 125 psi for 15 minutes prior to shipment.



Parker Hannifin Corporation
Multitube Operations
1300 North Freedom Street
Ravenna, Ohio 44266
(216) 296-2871



DYNACON INC

Post Office Box 29220, Richmond, Virginia 23126
 5801 Science Avenue, Richmond, Virginia 23128
 (804) 267-0376

BARB FITTINGS

PUBLICATION NO. 85-BF-1040
 Issue Date: February 22, 1985
 Supercedes: New

GENERAL DESCRIPTION

Dynacon Barb Fittings are compact one-piece, 28495 wash-on fittings for quick and economical connection of polyethylene tubing. Double barbs at each connection point assure positive seal when used with the proper size tube.

Each style fitting is supplied in individual boxes with the quantity of fittings per box as shown below.

PRICING PER FITTING IS PROVIDED FOR REFERENCE ONLY. FITTINGS MUST BE PURCHASED IN MULTIPLES OF BOX QUANTITIES SHOWN.

ORDERING PROCEDURE. To order 200 of Dynacon part BC-44 (1/4 x 1/4 union) under Prepayment Terms, specify "4 Boxes of Part BC-44 @ \$5.00."

UNION Tube to Tube



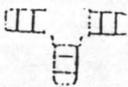
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell	Johnson	Robertshaw Powers		PER FTG.	PER BOX	PER FTG.	PER BOX
BC-44	1/4 x 1/4	1607B	F300-26	N4-105 141-201	50	.11	5.50	.10	5.00
BC-66	3/8 x 3/8	1608B	F300-27	N4-106 141-216	50	.15	7.50	.12	6.00
BC-88	1/2 x 1/2	1617B	F300-36	N4-107 141-218	25	.18	4.50	.17	4.25
BC-55	5/32 X 5/32	1628B	F300-31	N4-108 141-247	50	.14	7.00	.11	5.50

UNION REDUCER Tube to Tube



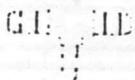
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell	Johnson	Robertshaw Powers		PER FTG.	PER BOX	PER FTG.	PER BOX
BC-64	3/8 x 1/4	1610B	F300-21	N4-110 141-217	50	.13	6.50	.12	6.00
BC-86	1/2 x 3/8	1611B	F300-19	N4-111 141-219	25	.20	5.00	.18	4.50
BC-45	1/4 x 5/32	1606B	F300-30	N4-112 141-246	50	.22	11.00	.18	9.00

UNION TEE Tube to Tube to Tube

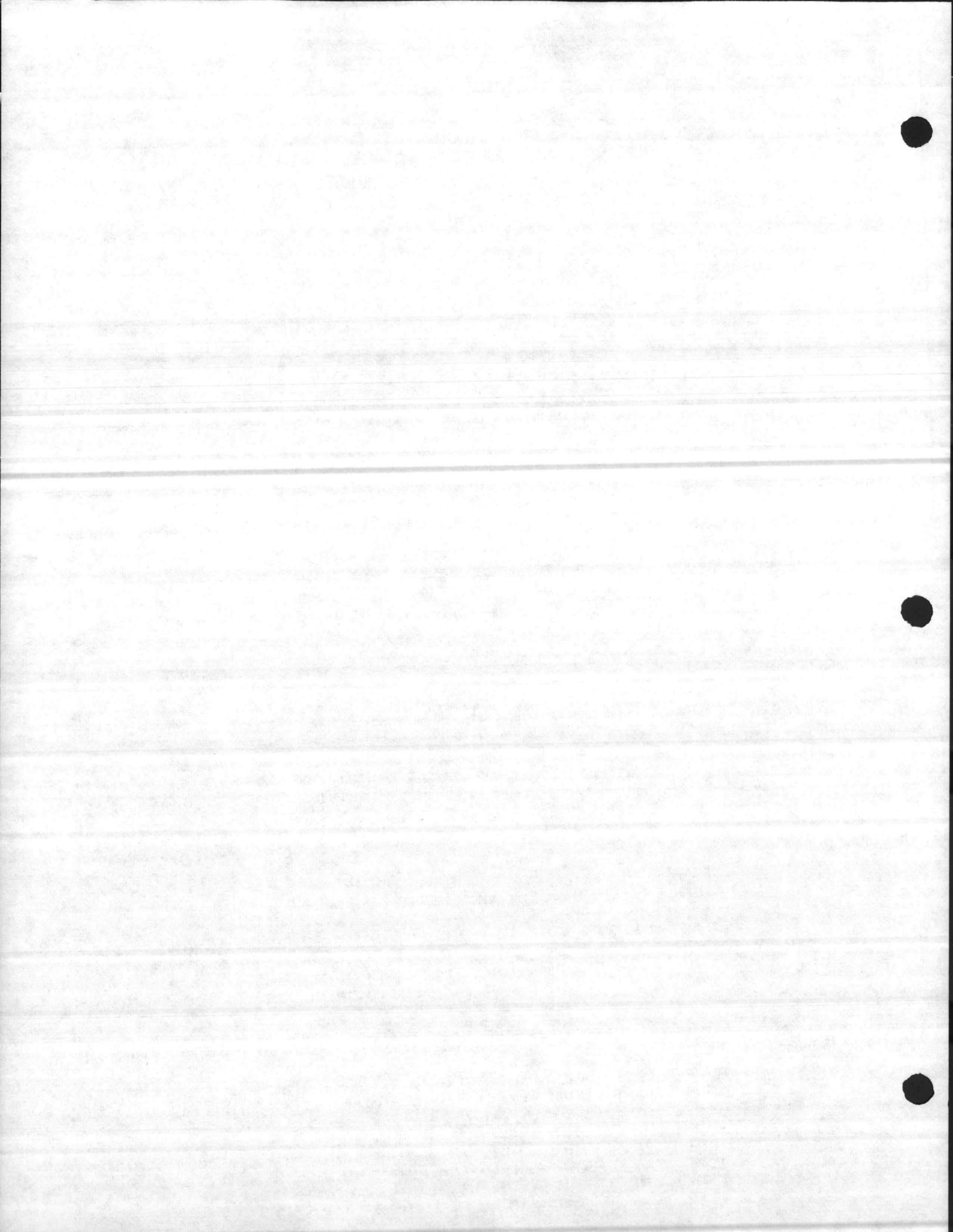


DYNACON PART NO.	Tube Size (* OD)	Equivalent To			BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell	Johnson	Robertshaw Powers		PER FTG.	PER BOX	PER FTG.	PER BOX
BT-555	5/32 x 5/32 x 5/32	1637B	F700-83	N4-127 141-245	100	.36	36.00	.32	32.00
BT-444	1/4 x 1/4 x 1/4	1612B	F700-73	N4-129 141-203	100	.23	23.00	.21	21.00
BT-666	3/8 x 3/8 x 3/8	1613B	F700-75	N4-131 141-204	100	.39	39.00	.36	36.00
BT-888	1/2 x 1/2 x 1/2	1620B	F700-65	N4-134 141-221	50	.49	24.50	.46	23.00

REDUCER TEE Tube to Tube to Tube



DYNACON PART NO.	Tube Size (* OD)	Equivalent To			BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell	Johnson	Robertshaw Powers		PER FTG.	PER BOX	PER FTG.	PER BOX
BT-445	1/4 x 1/4 x 5/32	1630B	F700-84	N4-128	100	.44	44.00	.40	40.00
BT-664	3/8 x 3/8 x 1/4	1615B	F700-74	N4-130 141-214	100	.46	46.00	.42	42.00
BT-884	1/2 x 1/2 x 1/4	1616B	F700-67	N4-132 141-223	50	.52	26.00	.50	25.00
BT-886	1/2 x 1/2 x 3/8	1618B	F700-66	N4-133 141-222	50	.55	27.50	.52	26.00
BT-665	3/8 x 3/8 x 5/32	1631B	F700-85	N4-137	100	.48	48.00	.46	46.00



Physical Specifications*

Description	Catalog Number	Number of Tubes	Outer Jacket Thickness (Inches)	Overall O.D. (Inches)	Min. Bend Radius (Inches)	Maximum Pulling Tension (Lbs.)	Net Wt. (Lb./100 ft.)	Standard Standard Length (Ft.)
FR Polyethylene Tubes 1/4" O.D. X 0.040" Wall	2FRPT4	2	.045	.59	1.5	90	8.6	3000
	3FRPT4	3	.045	.60	1.5	110	11.4	3000
	4FRPT4	4	.063	.74	2.0	140	12.8	3000
	5FRPT4	5	.063	.88	2.0	170	15.1	3000
	7FRPT4	7	.063	.89	2.5	195	17.5	3000
	8FRPT4	8	.063	.97	2.5	235	19.5	3000
	10FRPT4	10	.063	1.14	3.0	260	22.8	2500
	12FRPT4	12	.063	1.14	3.5	300	25.4	2000
	14FRPT4	14	.063	1.25	4.0	340	28.8	1500
	19FRPT4	19	.063	1.40	5.0	425	36.8	1500
	37FRPT4	37	.094	1.96	9.0	880	74.5	1000
	FR Polyethylene Tubes 3/8" O.D. X 0.062" Wall	2FRPT6	2	.063	.89	2.0	160	13.9
3FRPT6		3	.063	.89	2.0	195	17.9	2000
4FRPT6		4	.063	1.05	2.5	265	21.1	2000
5FRPT6		5	.063	1.16	3.0	295	24.6	2000
7FRPT6		7	.078	1.31	4.0	365	29.7	2000
10FRPT6		10	.094	1.72	5.0	515	44.2	1500
12FRPT6		12	.110	1.80	6.0	685	60.8	1500
19FRPT6		19	.110	2.13	10.0	900	85.5	1000

* All values are nominal

† For longer length, please consult factory

‡ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

Temperature and Pressure Recommendations — Type FRPT

Tubing Size	Recommended Operating Temperature Maximum	Burst Pressure (PSI) at Temperature				
		75°F	100°F	125°F	150°F	175°F
1/4" x .040"	150°F	650	475	350	250	175
3/8" x .062"	150°F	900	650	475	325	200

Although flame resistant polyethylene tubing is satisfactory for short time temperature rises to 175°F at a maximum recommended operating pressure of 50 psi (3 to 1 design factor), the recommended maximum design temperature for continuous use is 150°F.

Material Specifications

Flame Resistant Polyethylene Tubing — Black, low density, flame resistant polyethylene compound meeting UL94 V-2 flame classification. Environmental stress crack resistance exceeds 2000 hours when tested in accordance with ASTM D-1693. Continuous service temperature range is -85 °F. (-65 °C.) to +150 °F (66 °C.)

FR Polyethylene Jacket — Black, weather resistant, high molecular weight flame resistant polyethylene compound which meets the UL94 V-2 flame classification.

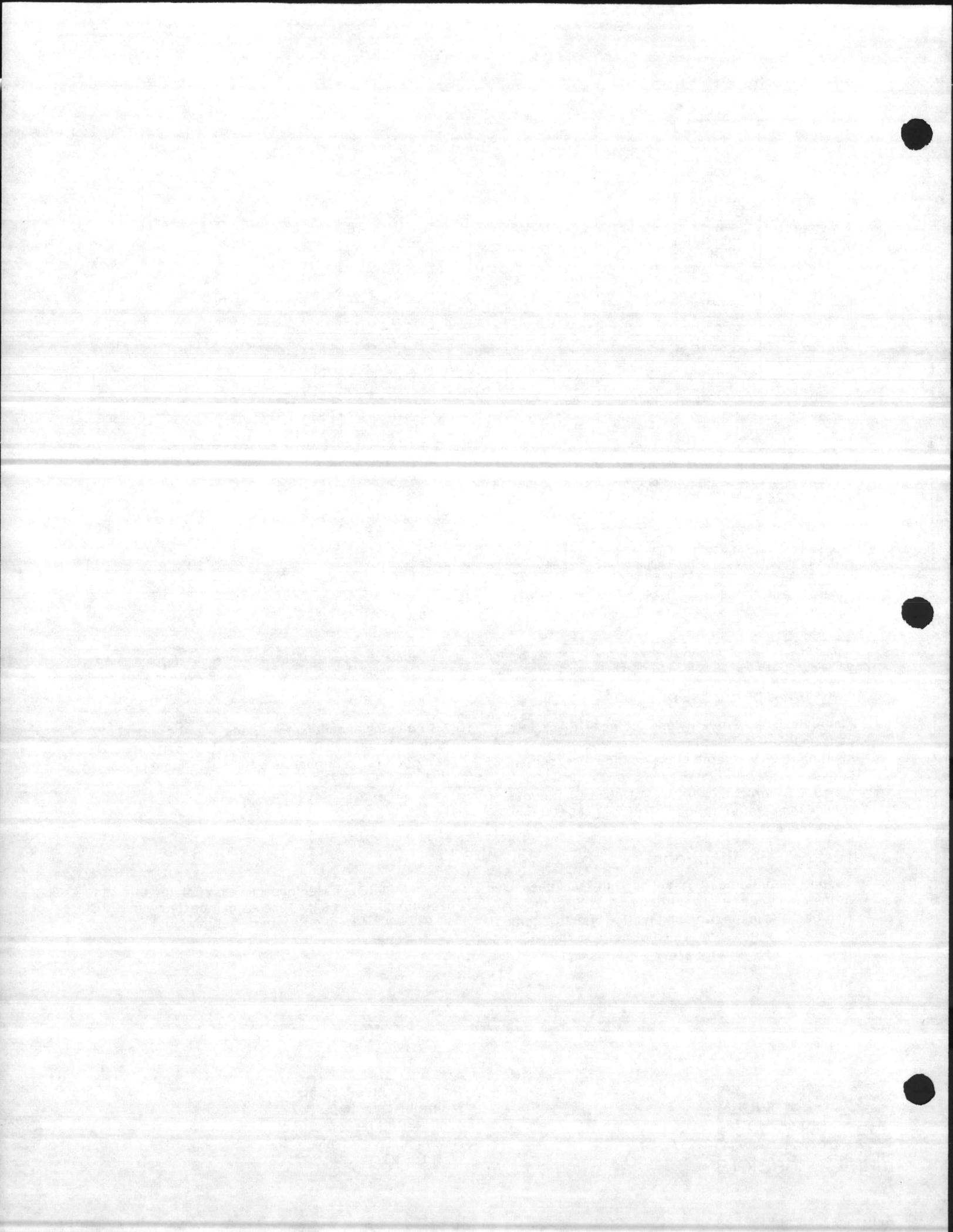
Testing Specifications

Testing — All flame resistant polyethylene tubes used in the manufacture of Multitube are subject to rigorous Q.A. inspection and testing prior to shipment. Each tube is pressure tested at not less than 150 psi for 15 minutes without any sign of leakage.

When Multitube assemblies have completed the manufacturing process each tube is again tested with dry CO₂ at 125 psi for 15 minutes prior to shipment.



Parker Hannifin Corporation
Multitube Operations
1300 North Freedom Street
Ravenna, Ohio 44266
(216) 296-2871



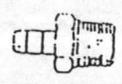
2.2.2.2

ELBOW
Tube to Tube



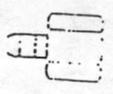
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
EL-44	1/4 x 1/4	1642	F700-39	N4-141	141-230	100	.23	23.00	.22	22.00
EL-66	3/8 x 3/8		F700-38	N4-142	141-231	100	.27	27.00	.26	26.00
EL-88	1/2 x 1/2		F700-37		141-232	50	.53	26.50	.48	24.00

CONNECTOR
Tube to Male Pipe



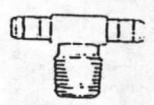
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
BMC-42	1/4 x 1/8 MPT	1590BT	F100-21	N4-100	141-202	100	.18	18.00	.17	17.00
BMC-52	5/32 x 1/8 MPT	1599BT	F100-21	N4-101		100	.38	38.00	.35	35.00
BMC-44	1/4 x 1/4 MPT	1633BT				100	.25	25.00	.23	23.00
BMC-62	3/8 x 1/8 MPT	1591BT	F100-35			100	.23	23.00	.20	20.00
BMC-64	3/8 x 1/4 MPT	1592BT			141-209	50	.25	12.50	.23	11.50

CONNECTOR
Tube to Female Pipe



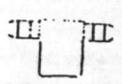
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
BFC-42	1/4 x 1/8 FPT	1594B			141-211	100	.26	26.00	.23	23.00
BFC-62	3/8 x 1/8 FPT					25	.26	6.50	.24	6.00
BFC-64	3/8 x 1/4 FPT					25	.40	10.00	.38	9.50

BRANCH TEE
Tube to Tube to Male Pipe



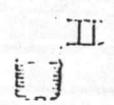
DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
BNT-442	1/4 x 1/4 x 1/8 MPT		F700-79	N4-126	141-220	25	.48	12.00	.44	11.00
BNT-662	3/8 x 3/8 x 1/8 MPT	1601BT			141-224	50	.53	26.50	.49	24.50
BNT-664	3/8 x 3/8 x 1/4 MPT				141-215	25	.58	14.50	.54	13.50

BRANCH TEE
Tube to Tube to Female Pipe

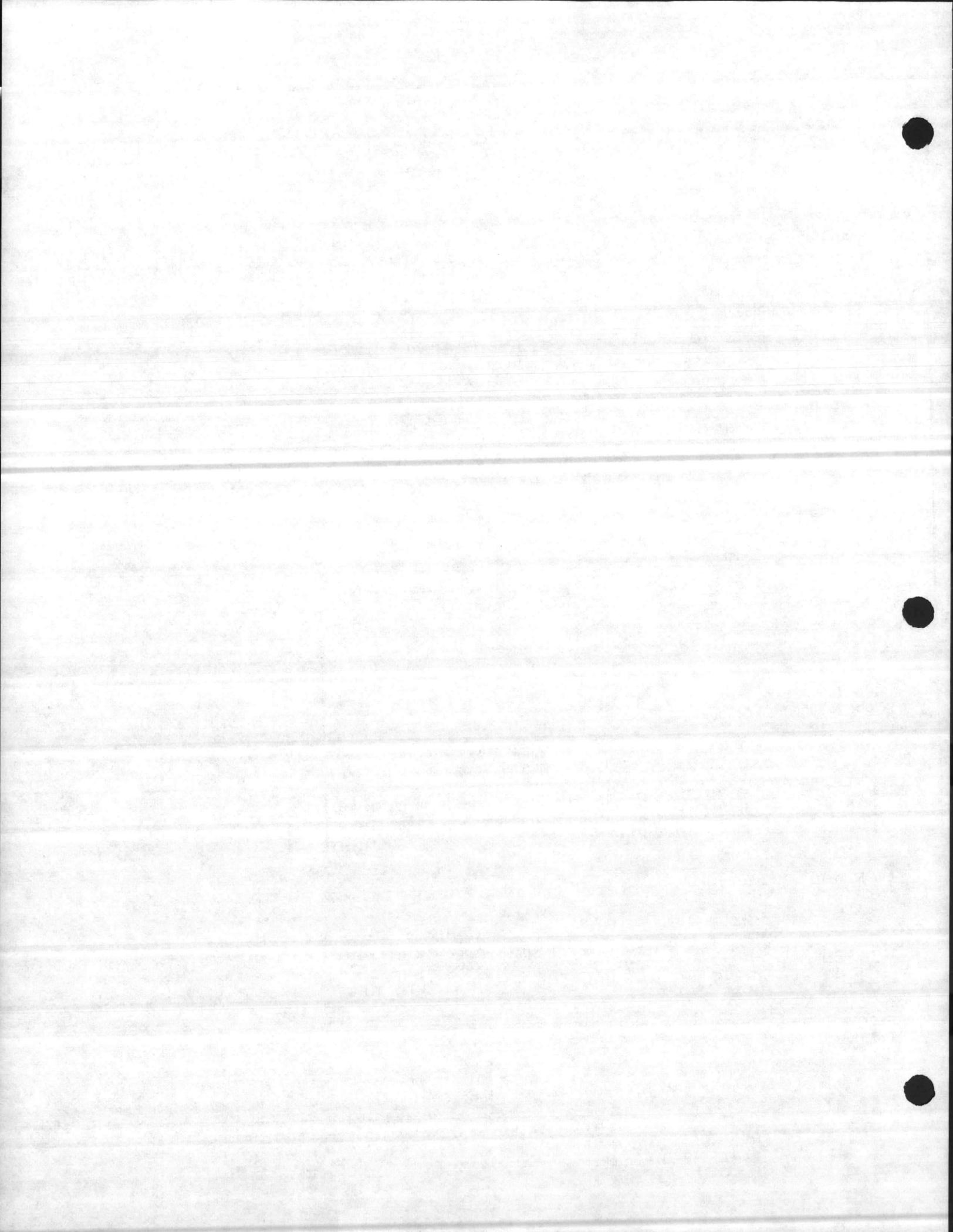


DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
BFT-442	1/4 x 1/4 x 1/8 FPT	1614B	F700-76	N4-135	141-227	50	.50	25.00	.48	24.00

ELBOW
Tube to Male Pipe



DYNACON PART NO.	Tube Size (* OD)	Equivalent To			30-DAYS NET		PREPAYMENT			
		Honeywell	Johnson	Robertshaw Powers	BOX QTY	PER FTG.	PER BOX	PER FTG.	PER BOX	
BKL-42	1/4 x 1/8 MPT	1595BT	F500-41	N4-120	141-200	100	.24	24.00	.23	23.00
BKL-44	1/4 x 1/4 MPT					50	.34	17.00	.32	16.00
BKL-62	3/8 x 1/8 MPT	1596BT	F500-36		141-205	100	.32	32.00	.30	30.00
BKL-64	3/8 x 1/4 MPT				141-206	25	.36	9.00	.34	8.50



DYNACON INC

Post Office Box 29220, Richmond, Virginia 23229
 5801 School Avenue, Richmond, Virginia 23228
 (804) 267-0376

COMPRESSION FITTINGS

PUBLICATION NO. 85-CF-1050
 Issue Date: September 6, 1985
 Supercedes: May 1, 1985

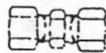
GENERAL DESCRIPTION

Dynacon BRASS Compression Fittings are designed for use with copper, brass and aluminum tubing (not recommended for steel tubing). Manufactured for low and medium pressure tubing connections where excessive vibration or tube movement is not involved. Fittings are approved by Underwriters Laboratories for flammable liquids and meet the specifications and standards of SAE J-512, ASA and ASME.

Each style fitting is supplied in individual boxes with the quantity of fittings per box as shown below.

PRICES PER FITTING ARE PROVIDED FOR REFERENCE ONLY.
 FITTINGS MUST BE ORDERED IN MULTIPLES OF BOX QUANTITIES SHOWN.

UNION (COUPLING) Tube to Tube



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT		
		Honey- well	Johnson	Robert- shaw	MCC- Powers		Barber Colman	PER FTG.	PER BOX	PER FTG.	PER BOX
CC-33	3/16 x 3/16	1420			044-147	C-231	25	.32	8.00	.30	7.50
CC-44	1/4 x 1/4	1421	F800-3	N4-311	044-148	C-233	50	.30	15.00	.27	13.50
CC-64	3/8 x 1/4	1428	F800-4	N4-315		C-234	25	.38	9.50	.36	9.00
CC-66	3/8 x 3/8	1423	F800-5	N4-312	044-150	C-235	50	.39	19.50	.38	19.00

MALE CONNECTOR Tube to Male Pipe

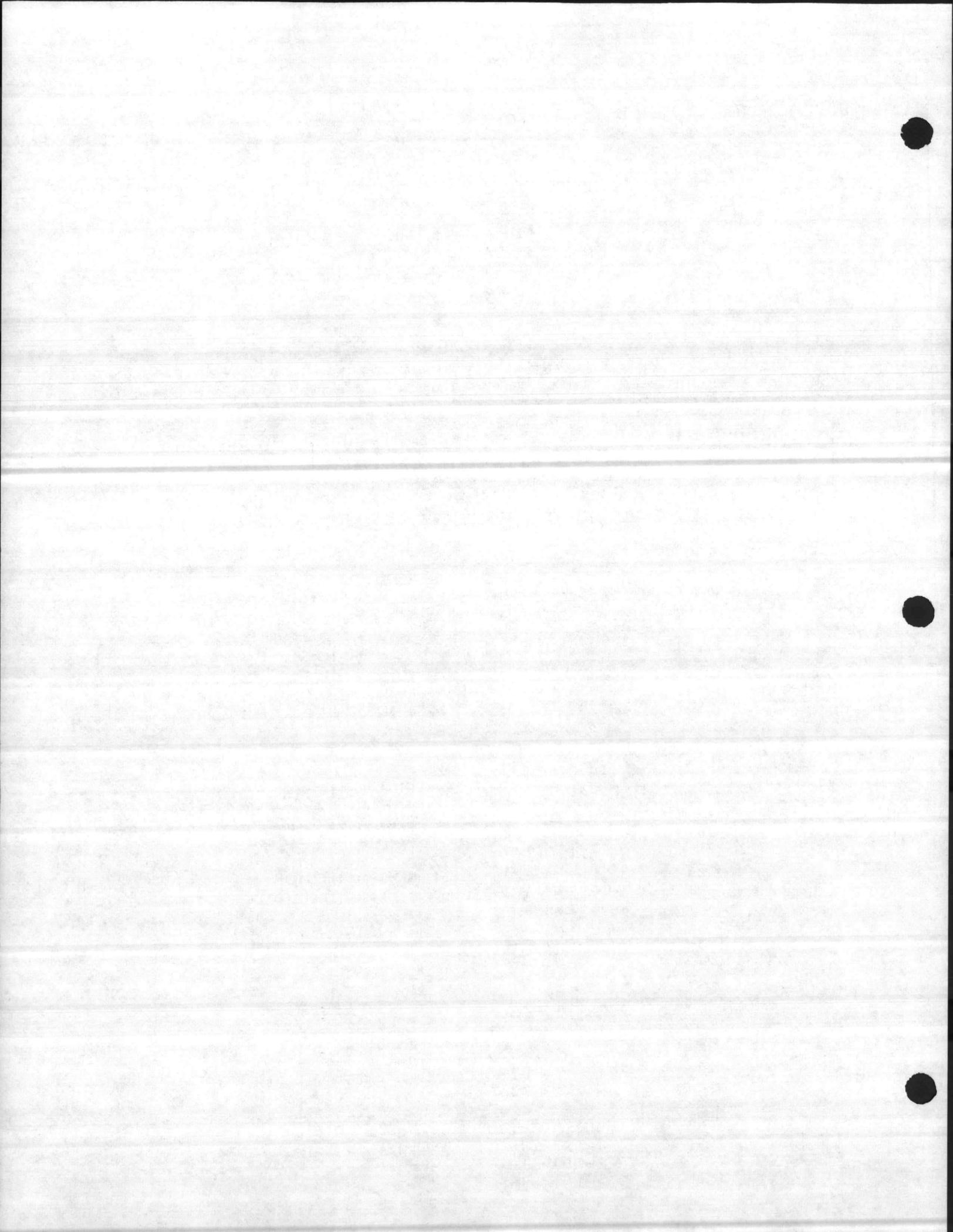


DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT		
		Honey- well	Johnson	Robert- shaw	MCC- Powers		Barber Colman	PER FTG.	PER BOX	PER FTG.	PER BOX
CMC-32	3/16 x 1/8 NPT	1433T	F200-2		044-126	C-132	50	.22	11.00	.20	10.00
CMC-42	1/4 x 1/8 NPT	1435T	F200-3	N4-300	044-128	C-133	50	.22	11.00	.20	11.00
CMC-44	1/4 x 1/4 NPT	1436T	F1000-36	N4-301	044-129	C-134	50	.27	13.50	.25	12.50
CMC-46	1/4 x 3/8 NPT	1437T		N4-302			10	.36	3.60	.34	3.40
CMC-62	3/8 x 1/8 NPT	1442T	F200-4	N4-303	044-135	C-135	25	.28	7.00	.26	6.50
CMC-64	3/8 x 1/4 NPT	1443T	F200-5	N4-304	044-137	C-136	25	.30	7.50	.28	7.00
CMC-66	3/8 x 3/8 NPT	1445T	F200-6	N4-305	044-138	C-137	25	.38	9.50	.36	9.00
CMC-68	3/8 x 1/2 NPT			N4-306			25	.46	11.50	.44	11.00

FEMALE CONNECTOR Tube to Female Pipe



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT		
		Honey- well	Johnson	Robert- shaw	MCC- Powers		Barber Colman	PER FTG.	PER BOX	PER FTG.	PER BOX
CFC-42	1/4 x 1/8 FPT	1459		N4-316		C-146	25	.22	5.50	.20	5.00
CFC-44	1/4 x 1/4 FPT	1460		N4-319		C-147	10	.33	3.30	.31	3.10
CFC-62	3/8 x 1/8 FPT	1464		"			10	.29	2.90	.27	2.70
CFC-64	3/8 x 1/4 FPT	1465				C-149	10	.41	4.10	.38	3.80



2-2-2-2

BRASS NUT



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX
CN-4	1/4	1412	F1000-25	N4-374		100	.06	6.00	.06	6.00
CN-6	3/8	1414		N4-375		100	.06	6.00	.06	6.00

BRASS SLEEVE (FERRULE)



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX
CF-4	1/4	1403	T800-6001	N4-363		200	.02	4.00	.016	3.20
CF-6	3/8	1405	F1000-13	N4-364		200	.025	5.00	.02	4.00

DELTRIN SLEEVE (FERRULE)
Use with "CI" Brass Insert



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX
CD-4	1/4	1571	F1000-9	N4-367	C-381	200	.015	3.00	.012	2.40
CD-6	3/8	1572	F1000-10	N4-368	C-382	200	.02	4.00	.015	3.00
CD-8	1/2	1573	F1000-11		C-383	100	.04	4.00	.038	3.80

BRASS INSERT
Use with "CD" Delrin Sleeve



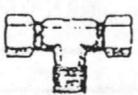
DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX
CI-4	1/4	1575	F1000-198	N4-378	C-384	200	.022	4.40	.02	4.00
CI-6	3/8	1576	F1000-184	N4-379	C-385	200	.032	6.40	.03	6.00
CI-8	1/2	1577	F1000-8		C-386	100	.06	6.00	.048	4.80

SEAL PLUG

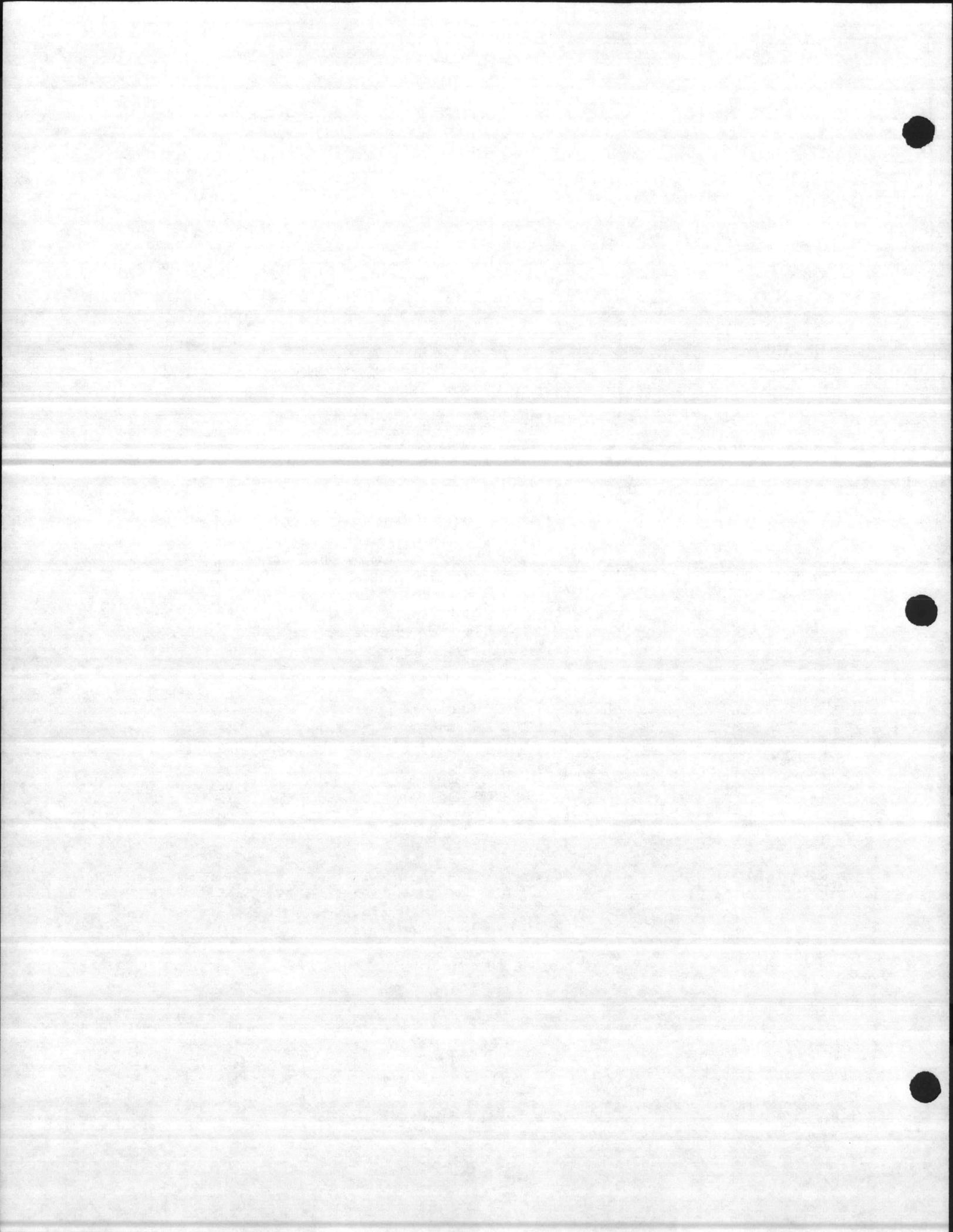


DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT	
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX
CX-4	1/4	1508	F1000-14	N4-147	C-376	50	.20	10.00	.16	8.00

MALE BRANCH TEE
Tube to Tube to Male Pipe



DYNACON PART NO.	Tube Size (" OD)	Equivalent To				BOX QTY	30-DAYS NET		PREPAYMENT		
		Honeywell Johnson	Robertshaw	MCC-Powers	Barber Colman		PER FTG.	PER BOX	PER FTG.	PER BOX	
CR2-442	1/4 x 1/4 x 1/8 NPT	15517	F700-4	N4-354	044-212	C-361	10	.70	7.00	.68	6.80



2-2-2-2



DETROIT CONTROLS INC.

P. O. Box 221
Southfield, Michigan 48037

Photos For
Reference Only

DCI Part

Description



Tyraps - Wire Ties

DC-119W	7 1/2" White 100 Per Package
DC-119B	7 1/2" Black 100 Per Package

Soft Copper Tubing
Furnished in 50' Foot Coils (Refrigeration Type)

DC-1001	1/8 O.D., .030 Wall 1.74 Wt/Ft
DC-1011	3/16 O.D., .030 Wall 2.88 Wt/Ft
DC-1021	1/4 O.D., .030 Wall 4.02 Wt/Ft
DC-1031	5/16 O.D., .032 Wall 5.45 Wt/Ft
DC-1041	3/8 O.D., .032 Wall 6.70 Wt/Ft

Hard Copper Tubing
10' Foot Lengths Seamless
Shipped in Easy To Handle Tubes

DC-1091	3/16 O.D. .041 Wall 500 ft. Min. Order
DC-1101	1/4 O.D. .036 Wall 500 ft. Min. Order
DC-1111	3/8 O.D. .027 Wall 250 ft. Min. Order
DC-1121	1/2 O.D. .045 Wall Any Quantity

Polyethylene Tubing

This tubing is the standard for temperature control installation, and is suitable for all general purpose work. It is of the highest quality and is tested to meet high standards. All tubing should be marked FR to conform to Flame Retardent specifications.

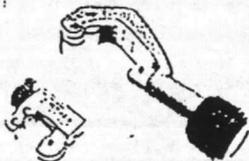
DC-1201	1219-44003	1/4 O.D. x .040 Wall, 250' Lengths, Black
DC-1211	1219-66203	3/8 O.D. x .062 Wall, 250' Lengths, Black
DC-1221	1219-86203	1/2 O.D. x .062 Wall, 250' Lengths, Black

Other Colors & Spool Sizes Available on Request



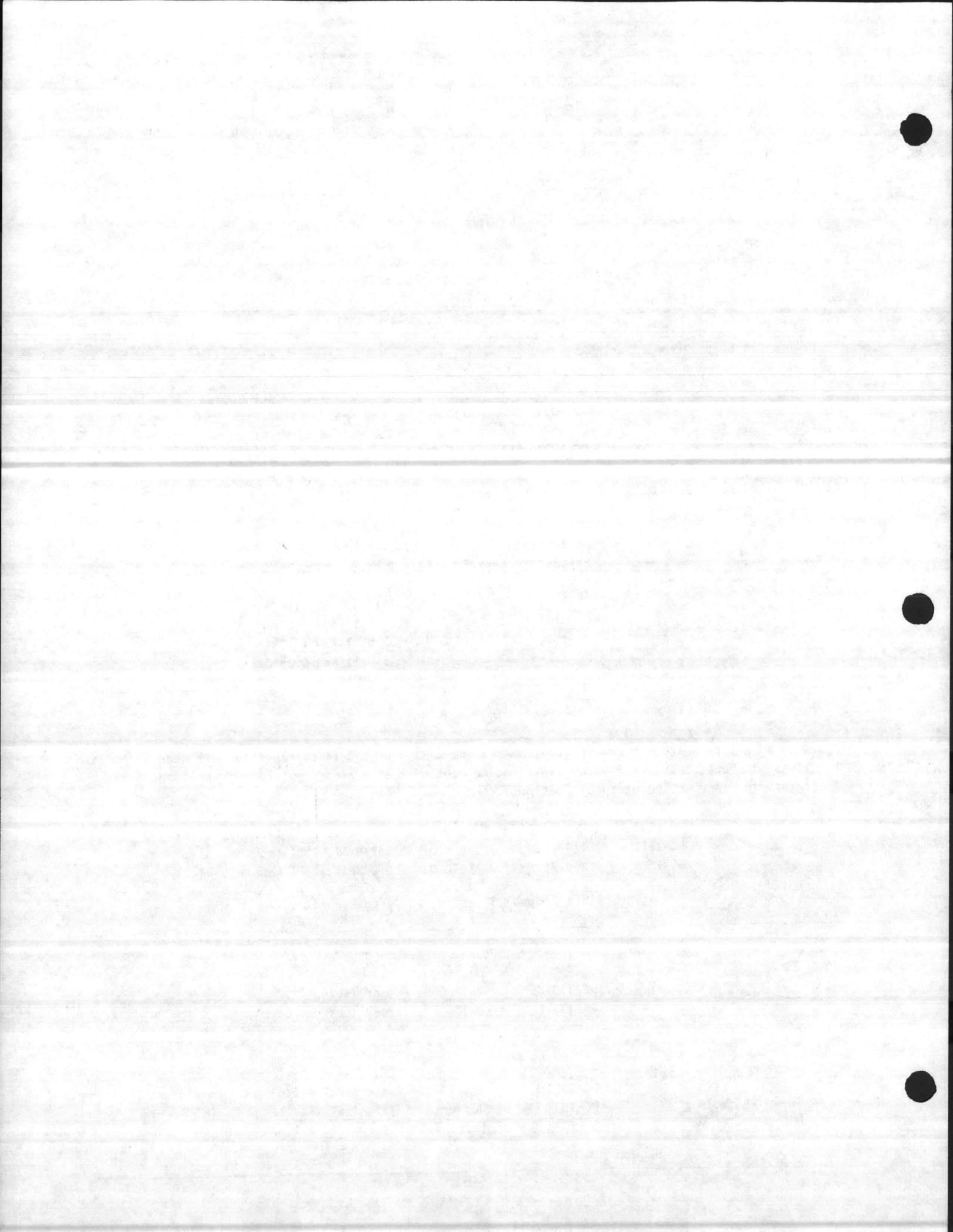
Tubing Benders for Copper

DC-1301	1/4" O.D. Copper Tubing
DC-1311	3/8" O.D. Copper Tubing



Tubing Cutters for Copper

DC-1321	Small Tube Cutter 1/8" - 5/8" O.D. (mini)
DC-1331	Universal Cutter 1/8" - 1 1/8" O.D. (std)
DC-1341	Large Tube Cutter 1/4" - 1 5/8" O.D.

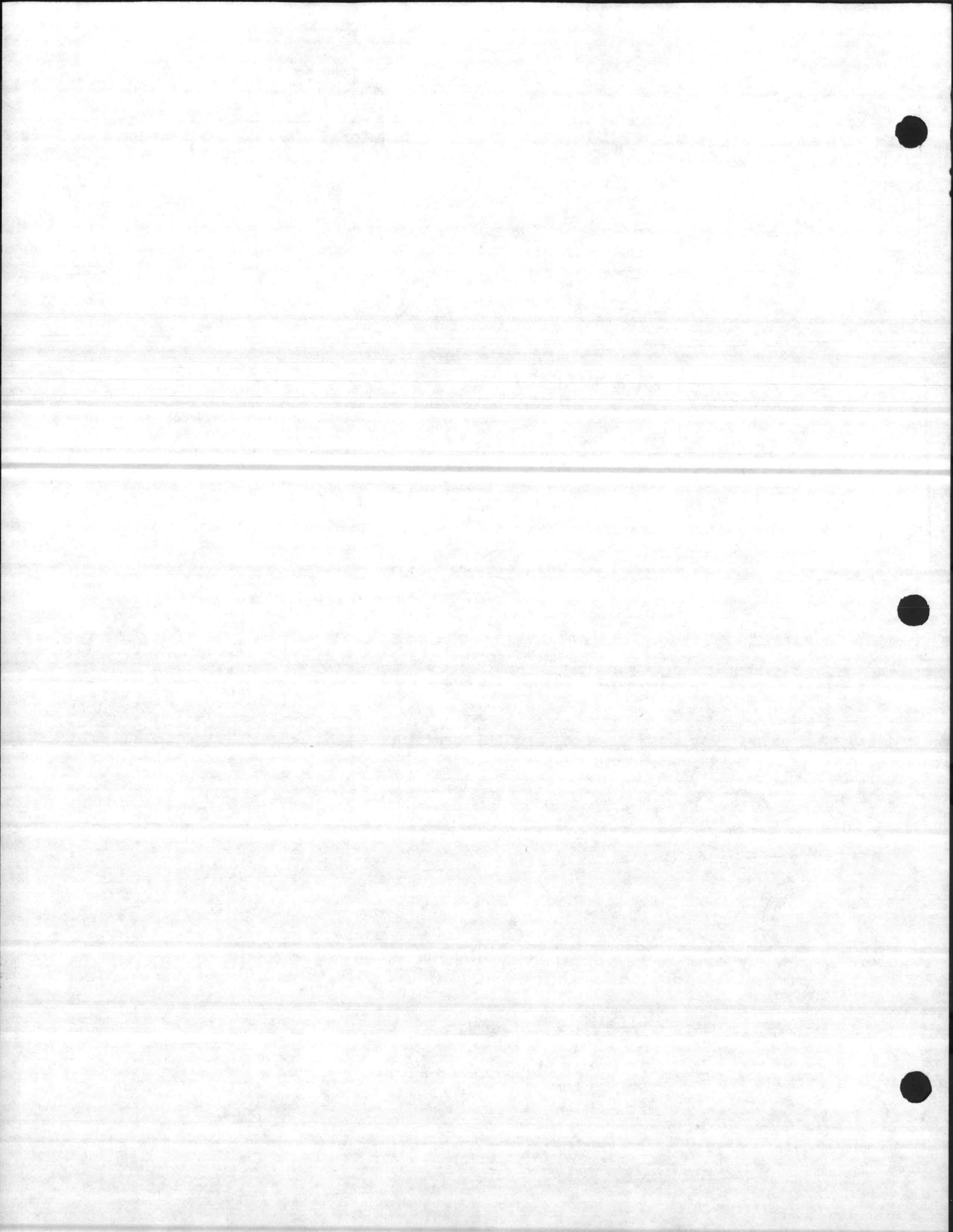




DETROIT CONTROLS INC.

P. O. Box 221
Southfield, Michigan 48037

Photos For Reference Only	OCI Part	Description	Johnson	Honeywell
	2 * N4-141	1/4 x 1/4	F500-39	
	2 * N4-142	3/8 x 3/8	F500-38	1642
	N4-142.1	1/2 x 1/2	F500-37	
Barb 90° E11				
	2 * N4-147	1/4	F1000-323	
	2 * N4-147.1	3/8	F1000-241	
Barb Plug				
	N4-148	1/4 x 1/4 O.D. Solder		
Barb/Copper Tube Connector				
	N4-200	3/16 O.D.	F300-1	1002
	1 * N4-201	1/4 O.D.	F300-2	1003
	1 * N4-202	3/8 O.D.	F300-3	1005
Solder Coupling				
	1 * N4-206	3/8 O.D. x 1/4 O.D.	F300-4	1025
Solder Reducing Coupling				
	1 * N4-210	1/4 O.D.		1172
	1 * N4-211	3/8 O.D.		1174
Solder 90° E11				
	N4-217	3/16 O.D.	F700-17	1251
	1 * N4-218	1/4 O.D.	F700-18	1252
	1 * N4-219	3/8 O.D.	F700-20	1254
Solder Tees				



Low Smoke and Flame Spread NEC 760-4 (d)

2-3-4

Multi-Conductors

Fire Protective Signal Cable

VOLTAGE	TEMPERATURE	CONSTRUCTION	APPLICATION	SPECIFICATIONS
300V	200°C (FEP)	COND. Solid bare copper INSUL. FEP or FLG JACKET FEP or FLG	FOR Fire control stations, smoke detection, voice communication & all associated systems. COLOR CODE Chart #1	LISTED SUBJECT 1424 NEC-SECT. 760-4(d)



Fluoropolymer Resin-FEP Unshielded-Solid

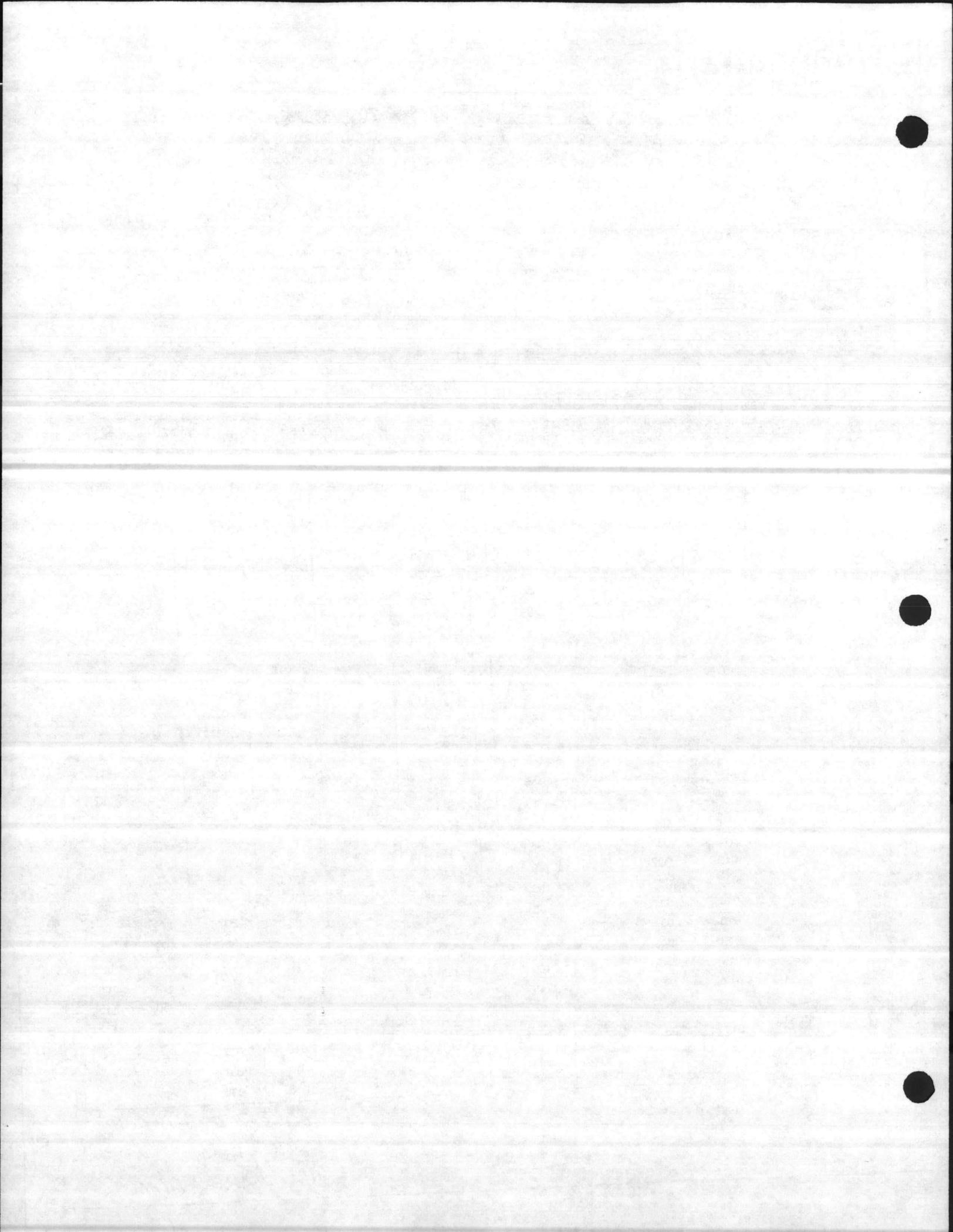
Part No.	No. of Cond.	Nom. Insul. Thick. (In.)	Nom. Jkt. Thick. (In.)	Nom. O.D. (In.)	Approx. Wt. (Lbs.)
#22 AWG (SOLID)					
M64652	4	.013	.037	.197	31
M64653	5	.013	.037	.212	36
M64654	6	.013	.037	.227	41
M64655	7	.013	.037	.227	45
M64656	8	.013	.037	.243	50
M64657	9	.013	.037	.259	55
M64658	10	.013	.042	.288	64
#18 AWG (SOLID)					
M64672	4	.013	.037	.214	39
M64673	5	.013	.037	.231	45
M64674	6	.013	.037	.248	52
M64675	7	.013	.037	.248	57
M64676	8	.013	.037	.266	64
M64677	9	.013	.042	.294	75
M64678	10	.013	.042	.316	82
#14 AWG (SOLID)					
M64690	2	.013	.037	.206	32
M64691	3	.013	.037	.216	40
M64692	4	.013	.037	.233	49
M64693	5	.013	.037	.252	58
M64694	6	.013	.037	.272	68
M64695	7	.013	.037	.272	75
M64696	8	.013	.042	.302	88
M64697	9	.013	.042	.323	100
M64698	10	.013	.042	.350	115
#12 AWG (SOLID)					
M64710	2	.013	.037	.228	41
M64711	3	.013	.037	.240	53
M64712	4	.013	.037	.260	66

Fluoropolymer Resin-FLG (EUBD-Gar) Unshielded-Solid

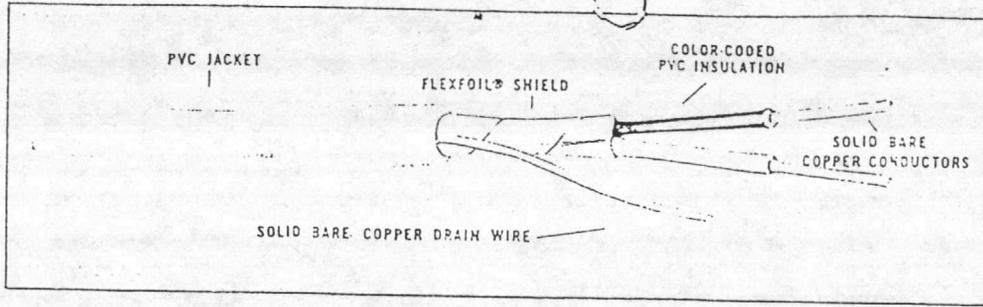
Part No.	No. of Cond.	Nom. Insul. Thick. (In.)	Nom. Jkt. Thick. (In.)	Nom. O.D. (In.)	Approx. Wt. (Lbs.)
#22 AWG (SOLID)					
M44652	4	.013	.037	.197	31
M44653	5	.013	.037	.212	36
M44654	6	.013	.037	.227	41
M44655	7	.013	.037	.227	45
M44656	8	.013	.037	.243	50
M44657	9	.013	.037	.259	55
M44658	10	.013	.042	.288	64
#20 AWG (SOLID)					
M44672	4	.013	.037	.214	39
M44673	5	.013	.037	.231	45
M44674	6	.013	.037	.248	52
M44675	7	.013	.037	.248	57
M44676	8	.013	.037	.266	64
M44677	9	.013	.042	.294	75
M44678	10	.013	.042	.316	82
#18 AWG (SOLID)					
M44690	2	.013	.037	.206	32
M44691	3	.013	.037	.216	40
M44692	4	.013	.037	.233	49
M44693	5	.013	.037	.252	58
M44694	6	.013	.037	.272	68
M44695	7	.013	.037	.272	75
M44696	8	.013	.042	.302	88
M44697	9	.013	.042	.323	100
M44698	10	.013	.042	.350	115
#16 AWG (SOLID)					
M44710	2	.013	.037	.228	41
M44711	3	.013	.037	.240	53
M44712	4	.013	.037	.260	66

24 & 22 GA WIRE
NOT ALLOWED FOR
ALL WIRE TYPES.

AK



UL POWER LIMITED FIRE PROTECTIVE SIGNAL CIRCUIT CABLE

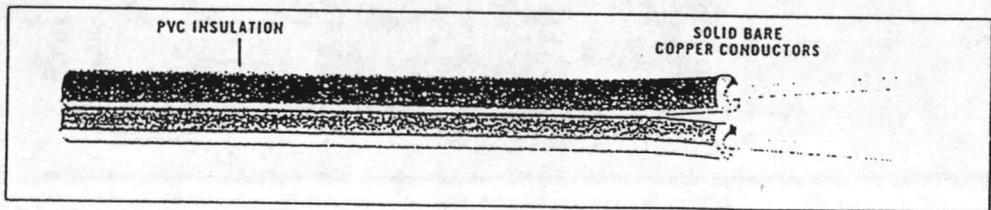


**Shielded Cables
PVC Jacket**

Stock Color: Red
 Construction: Solid bare copper conductor, color-coded PVC insulation, conductors cabled, wrapped with flexfoil mylar supported aluminum foil shield with foil facing outside, drain wire, PVC jacket overall.
 Specifications: +105°C suggested working voltage 300V. ENTIRE CABLE PASSES VW-1 VERTICAL FLAME TEST.
 Applications: These cables are for use in power limited circuits in accordance with NEC Article 760 and as a Power Limited Circuit Cable in accordance with Article 725 Class 2 and Class 3 Circuits. These cables pass the UL 70,000 BTU flame and tray cable test collateral to IEEE 383 flame test and are suitable for tray cable installation. All cables are listed with the California State Fire Marshall.
 Put-up: 500' and 1,000'

COLOR CODE OF CONDUCTORS:	
COND.	COLOR
1.	Black
2.	Red
3.	White
18 AWG 1. White 2. Red	
22-AWG 1. Black 2. Green 3. Orange 4. Blue	

CATALOG NUMBER	NO. OF COND.	COND. SIZE	COND. STRAND.	SIZE OF DRAIN	NOM. INSUL. THICK. (INCHES)	PERCENT SHLD. COVERAGE	NOM. JKT. THICK. (INCHES)	SUGG. WORK. VLTG.	NOM. O.D. (INCHES)
C0415	2	19	Solid	22 (solid)	.017	100	.037	300V	.219
C0416	3	19	Solid	22 (solid)	.017	100	.037	300V	.230
C0417	2	18	Solid	20 (solid)	.017	100	.037	300V	.227
C0418	3	18	Solid	20 (solid)	.017	100	.037	300V	.240
C0419	2 PR	18	Solid	20 (solid)	.017	100	.043	300V	.234 x .367
C0420	2 NO SHLD	18	Solid		.017	100	.037	300V	.274
	4 SHLD	22		22 (solid)	.013				

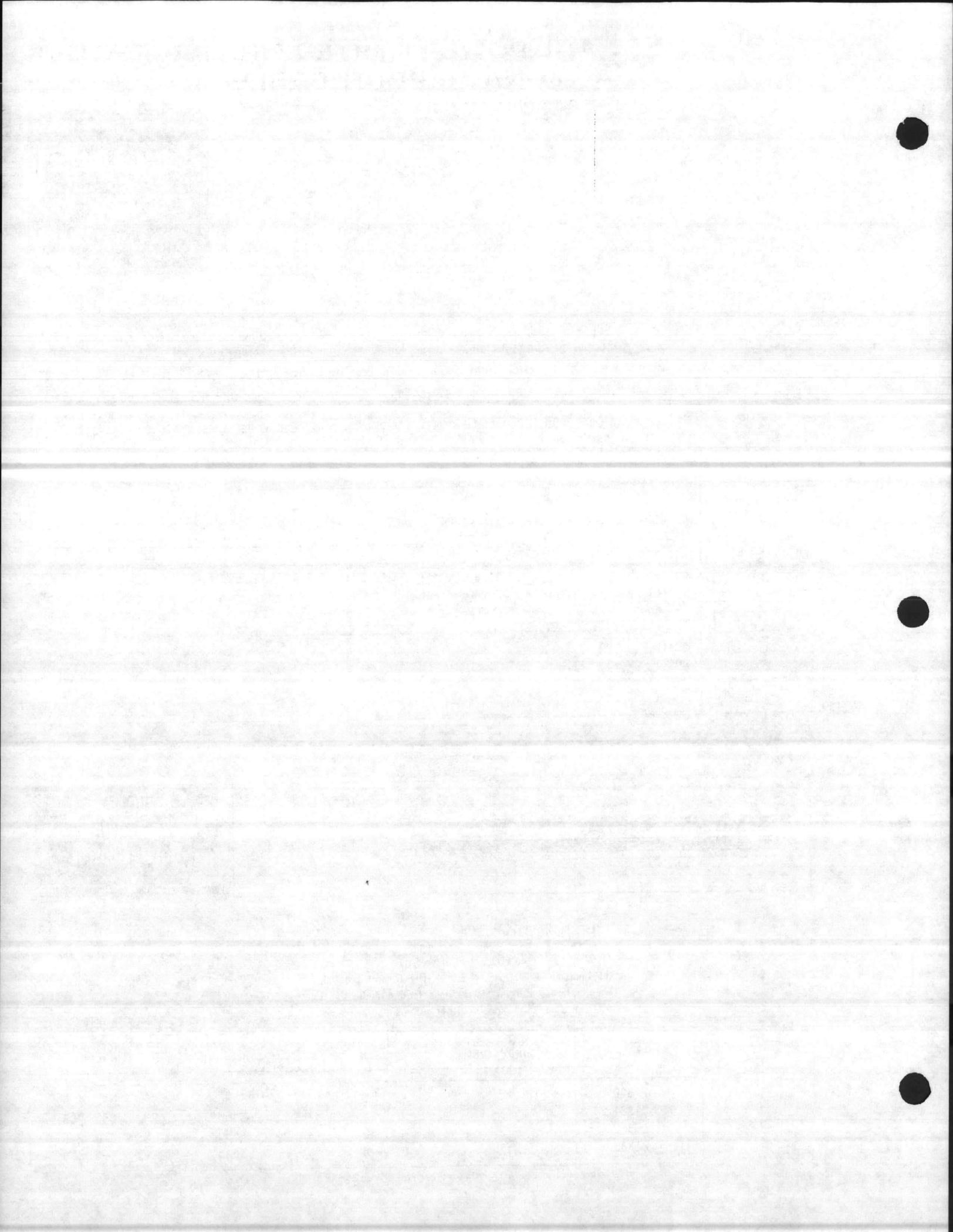


**Audio Cable
Low Energy
Safety Control
Wire**

Stock Color: Black.*
 Construction: Bare copper solid conductors, PVC insulation, conductors parallel, rip-type construction, ridge on one conductor for polarity.
 Specifications: +105°C, N.F.P.A.-N.E.C. approved UL Power Limited Fire Protective signaling circuit cable.
 Applications: Burglar alarm, fire detection, audio signal circuit wiring.
 Put-up: 500' spools. (Other put-ups also available.)

CATALOG NUMBER	NUMBER OF CONDUCTORS	CONDUCTOR SIZE	CONDUCTOR STRANDING	NOM. O.D. (INCHES)
• C1380	2	18	Solid	.105 x .205
•• C1381	3	18	Solid	.105 x .285
• C1382	2	16	Solid	.115 x .220
•• C1383	3	16	Solid	.115 x .320

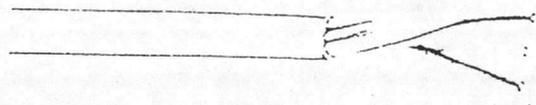
*Consult factory for production requirements on other colors.



2.3.4

PLENUM CABLES

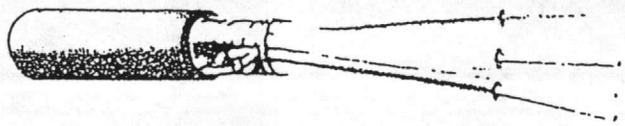
ARTICLE 760 QF NATIONAL ELECTRIC CODE
Fire Protection Signaling Systems



- Construction:** Solid bare copper conductors, color coded FEP TEFLON*, or Halar* insulation, overall RED tinted FEP TEFLON*, Halar* or Kynar* jacket.
- Specifications:** U.L. listed as Power Limited Fire Protective Signaling Circuit Cable. Also U.L. classified as to fire and smoke characteristics only in accordance with N.E.C. 760-4(d). Can also be used in class 2 and 3 power limited circuits.
- Applications:** For fire protective signaling systems and equipment operating at 300 volts or less. May be installed in air plenums or ducts without conduit.

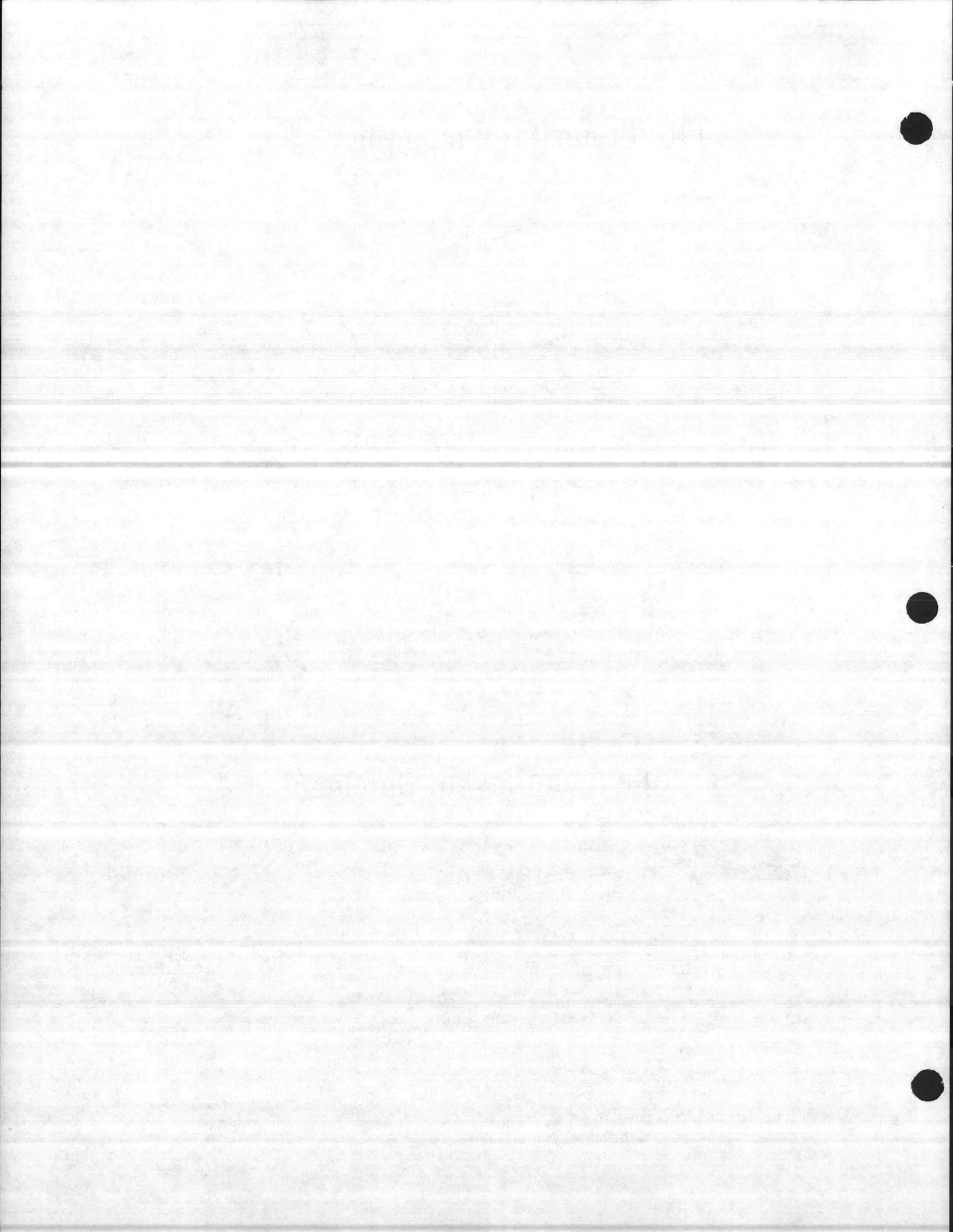
KING NUMBER	NUMBER OF CONDUCTORS	AWG	NOMINAL INSULATION THICKNESS	NOMINAL JACKET THICKNESS	NOMINAL O.D.
K6100	4: Conductors	22 (solid)	.012	.035	.189
K6101	6: Conductors	22 (solid)	.012	.035	.218
K6102	8: Conductors	22 (solid)	.012	.035	.233
K6103	10: Conductors	22 (solid)	.012	.035	.267
K6104	2: Conductors	18 (solid)	.012	.035	.199
K6105	3: Conductors	18 (solid)	.012	.035	.210
K6106	4: Conductors	18 (solid)	.012	.035	.226
K6107	6: Conductors	18 (solid)	.012	.035	.263
K6108	8: Conductors	18 (solid)	.012	.040	.283
K6109	2: Conductors	16 (solid)	.012	.035	.220
K6110	4: Conductors	16 (solid)	.012	.035	.251
K6111	2: Conductors	14 (solid)	.015	.035	.246
K6112	2: Conductors	12 (solid)	.015	.035	.302

Aluminum Mylar-Shielded
Articles 760



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG	SHIELD	INSULATION THICKNESS	JACKET THICKNESS	NOMINAL O.D.
K6113	2 Conductors	18 (solid)	Overall	.012	.035	.200
K6114	3 Conductors	18 (solid)	Overall	.012	.035	.215
K6115	4 Conductors	18 (solid)	Overall	.012	.035	.231
K6116	6 Conductors	18 (solid)	Overall	.012	.035	.265
K6117	2 Conductors	16 (solid)	Overall	.012	.035	.225
K6118	4 Conductors	16 (solid)	Overall	.012	.040	.260
K6119	2 Conductors	14 (solid)	Overall	.012	.035	.250
K6120	2 Conductors	12 (solid)	Overall	.015	.035	.300

King Wire stocks New York City Board of Standards and Appeals approved wire for LOCAL LAW 5.
Call King for your specific requirements.





Power Limited 105C-300V Fire Protective Signaling Circuit Cables
Subject 1424 (NEC Articles 760 and 725)

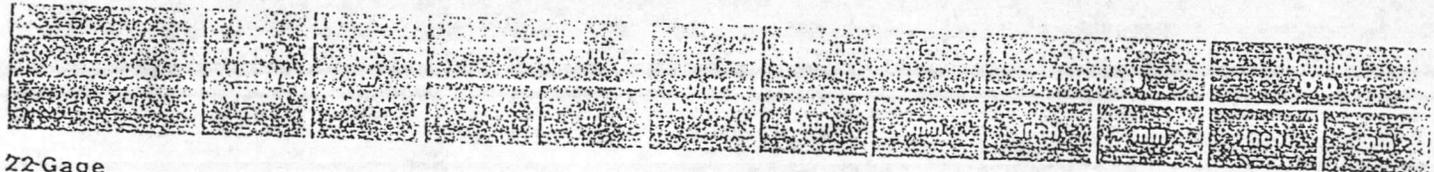


LISTED

Power limited fire protective signaling circuit cable for use in accordance with NEC article 760 power limited circuits. Also suitable for use as a power limited circuit cable for use in accordance with NEC article 725 class 2 or 3 circuits, but these cables are marked as suitable for appropriate tray cable installations.

All cables in this section pass the U.L. 70,000 BTU flame test which is comparable to IEEE 383 flame test. All cables in this section are listed by the California State Fire Marshall listing service. Component Recognized AWM 2464, 80C—300 V.

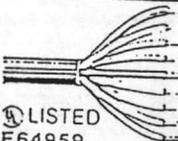
Fire Alarm and Tray Cables



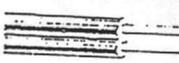
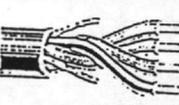
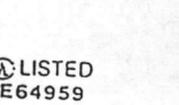
22-Gage
Solid Tinned Conductors

Product Description

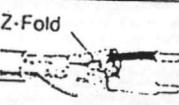
Tinned copper, PVC insulated, conductors cabled, Black PVC jacket. Color code chart No. 1, Technical Information Section.

	9576†	6	U-500 U-1000	U-152.4 U-304.8	17.9 34.9	.013	.33	.039	.99	.234	5.94
	9577†	9	U-500 U-1000	U-152.4 U-304.8	23.6 46.1	.013	.33	.039	.99	.267	6.78
	9584†	12	500 1000	152.4 304.8	31.3 63.8	.013	.33	.043	1.09	.302	7.67

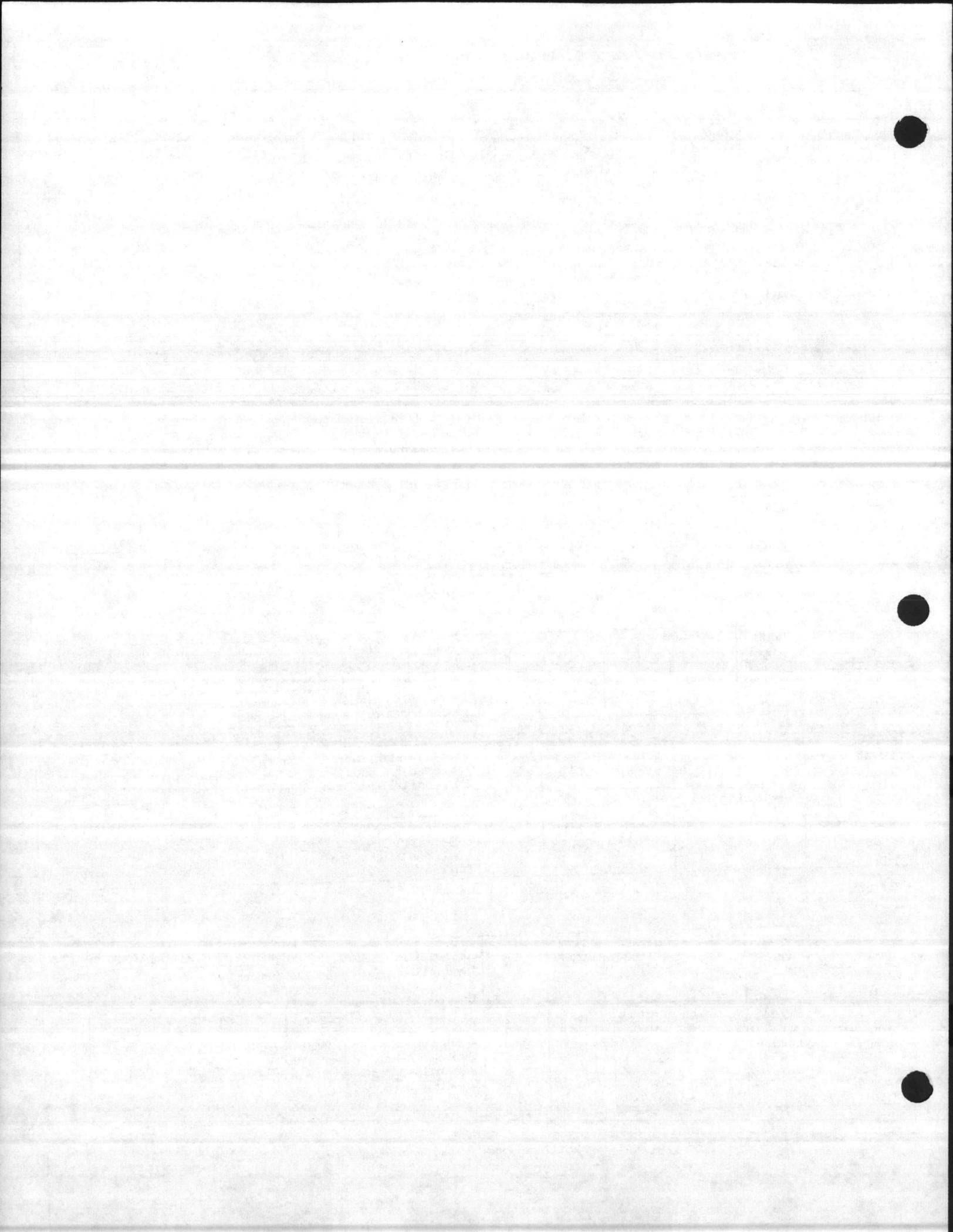
19-Gage
Solid Conductors

	9596†	2	U-500 500 1000	U-152.4 152.4 304.8	9.3 9.0 18.2	.030	.76	—	—	.101 x .191	2.56 x 4.85
	Product Description: One conductor tinned copper, one conductor bare, parallel, red PVC insulation.										
	9597†	4	U-500 500 U-1000 1000	U-152.4 152.4 U-304.8 304.8	20.8 21.6 40.7 41.7	.016	.41	.040	1.02	.248	6.29
	Product Description: Bare copper, PVC insulated, conductors cabled, red PVC jacket. Color code: 1st Black, 2nd Red, 3rd Yellow, 4th Blue.										
	9598†	6	U-500 500 U-1000 1000	U-152.4 152.4 U-304.8 304.8	29.5 30.3 58.1 62.1	.016	.41	.042	1.07	.290	7.36
	Product Description: Bare copper, PVC insulated, conductors cabled, red PVC jacket. Color code: 1st Black, 2nd Red, 3rd Yellow, 4th Blue, 5th Brown, 6th Orange.										

18 Gage
Solid Conductors

	9571†	2	U-500 U-1000	U-152.4 U-304.8	14.4 28.2	.017	.43	.037	.94	.244	6.20
	Product Description: Solid bare copper, PVC insulated, conductors cabled, red PVC jacket. Color code: Black, Red.										
	9574†	2	U-500 U-1000	U-152.4 U-304.8	16.2 31.3	.017	.43	.037	.94	.228	5.79
	Product Description: Solid bare copper, PVC insulated, conductors cabled with Beldfoil aluminum-polyester shield and #22 AWG stranded tinned drain wire, red PVC jacket. Color code: Black, Red.										

† Passes the VW-1 Vertical Wire Flame Test.
Passes the U.L. 70,000 BTU Flame Test and Is Listed by the California Fire Marshall.

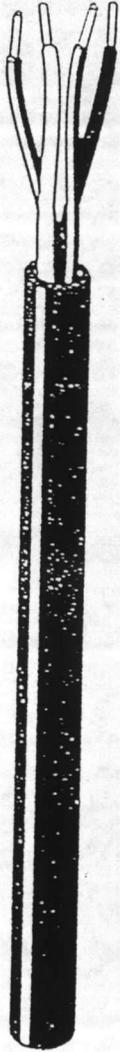


Plen-Tek® Fire Protective Signaling Circuit Cables

Inshielded Multiple Pair Cables

Insulated & Jacketed with Tek-Flex®

APPLICATION:
 For use in accordance with Article 760, Section A and C and Article 725 Class 2 and 3 Circuits. For floor warden and fire control stations, smoke detection, voice communications, supervisory and all associated systems.



CATALOG NUMBER	NUMBER OF PAIRS	AWG. STRANDING	INSULATION NOMINAL THICKNESS (in.)	JACKET NOMINAL THICKNESS (in.)	NOMINAL OVERALL DIAMETER (in.)	WEIGHT PER KFT (lbs.)
247035	2	22 AWG SOLID	0.013	0.037	0.243	31
247036	3	SOLID	0.013	0.037	0.256	39
247037	4	SOLID	0.013	0.042	0.288	51
247038	5	SOLID	0.013	0.042	0.313	60
247039	6	SOLID	0.013	0.042	0.338	68
<hr/>						
		20 AWG				
247040	2	SOLID	0.013	0.037	0.265	39
247041	3	SOLID	0.013	0.042	0.290	53
247042	4	SOLID	0.013	0.042	0.315	64
247043	5	SOLID	0.013	0.042	0.342	77
247044	6	SOLID	0.013	0.042	0.371	89
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		18 AWG				
247045	2	SOLID	0.013	0.042	0.303	53
247046	3	SOLID	0.013	0.042	0.319	69
247047	4	SOLID	0.013	0.042	0.348	85
247048	5	SOLID	0.013	0.042	0.379	101
247049	6	SOLID	0.013	0.052	0.432	128
<hr/>						
		16 AWG				
247050	2	SOLID	0.013	0.042	0.337	70
247051	3	SOLID	0.013	0.042	0.356	92
247052	4	SOLID	0.013	0.052	0.409	125
247053	5	SOLID	0.013	0.052	0.446	150
247054	6	SOLID	0.013	0.052	0.484	174
<hr/>						
		14 AWG				
247055	2	SOLID	0.016	0.052	0.421	110
247056	3	SOLID	0.016	0.052	0.445	144
247057	4	SOLID	0.016	0.052	0.486	181
247058	5	SOLID	0.016	0.052	0.532	218
247059	6	SOLID	0.016	0.052	0.580	256
<hr/>						
		12 AWG				
247060	2	SOLID	0.016	0.052	0.476	149
247061	3	SOLID	0.016	0.052	0.504	201
247062	4	SOLID	0.016	0.052	0.553	255

* For NEC 760 and 725, Class J Circuits Only

TEMPERATURE RATING:
125°C minimum

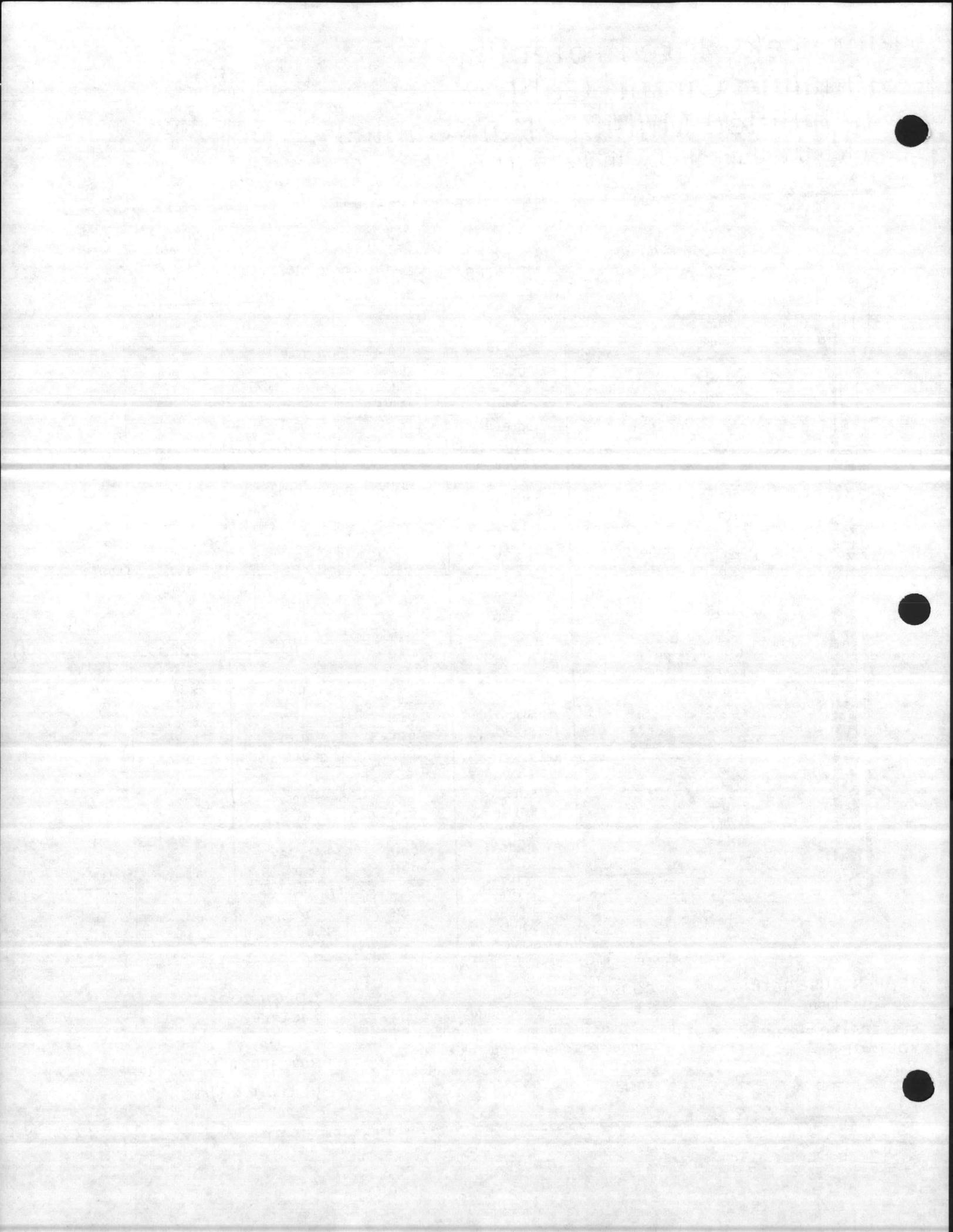
SUGGESTED WORKING VOLTAGE:
300V

CONSTRUCTION:
 Solid bare copper conductors, Tek-Flex insulation, color coded, conductors cabled, red Tek-Flex jacket, and marker tape beneath jacket.

COLOR CODE:
See Chart 2

PUT-UP:
Bulk, 1000 ft. & 500 ft. reels.

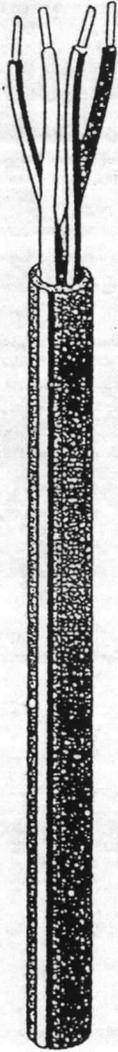
UL Listed & Classified



APPLICATION:

For use in accordance with Article 760, Section A and C and Article 725, Class 2 and 3 Circuits. For floor warden and fire control stations, smoke detection, voice communications, supervisory and all associated systems.

23-4
Plen-Tek® Fire Protective Signaling Circuit Cables
Unshielded Multiple Pair Cables
 Insulated & Jacketed with Teflon® FEP



CATALOG NUMBER	NUMBER OF PAIRS	AWG. STRANDING	INSULATION NOMINAL THICKNESS (in.)	JACKET NOMINAL THICKNESS (in.)	NOMINAL OVERALL DIAMETER (in.)	WEIGHT PER KFT (lbs.)
246035	2	22 AWG				
246036	3	SOLID	0.013	0.037	0.243	36
246037	4	SOLID	0.013	0.037	0.256	45
246038	5	SOLID	0.013	0.042	0.288	58
246039	6	SOLID	0.013	0.042	0.313	68
					0.338	78
		20 AWG				
246040	2	SOLID	0.013	0.037	0.265	44
246041	3	SOLID	0.013	0.042	0.290	60
246042	4	SOLID	0.013	0.042	0.315	73
246043	5	SOLID	0.013	0.042	0.342	86
246044	6	SOLID	0.013	0.042	0.371	99
		18 AWG				
246045	2	SOLID	0.013	0.042	0.303	60
246046	3	SOLID	0.013	0.042	0.319	77
246047	4	SOLID	0.013	0.042	0.348	94
246048	5	SOLID	0.013	0.042	0.379	112
246049	6	SOLID	0.013	0.052	0.432	143
		16 AWG				
246050	2	SOLID	0.013	0.042	0.337	78
246051	3	SOLID	0.013	0.042	0.356	101
246052	4	SOLID	0.013	0.052	0.409	138
246053	5	SOLID	0.013	0.052	0.446	164
246054	6	SOLID	0.013	0.052	0.484	191
		14 AWG				
246055	2*	SOLID	0.016	0.052	0.421	122
246056	3*	SOLID	0.016	0.052	0.445	159
246057	4*	SOLID	0.016	0.052	0.486	198
246058	5*	SOLID	0.016	0.052	0.532	238
246059	6*	SOLID	0.016	0.052	0.580	278
		12 AWG				
246060	2*	SOLID	0.016	0.052	0.476	164
246061	3*	SOLID	0.016	0.052	0.504	218
246062	4*	SOLID	0.016	0.052	0.553	275

* For NEC 760 and 725, Class 3 Circuits Only.

TEMPERATURE RATING:
200°C

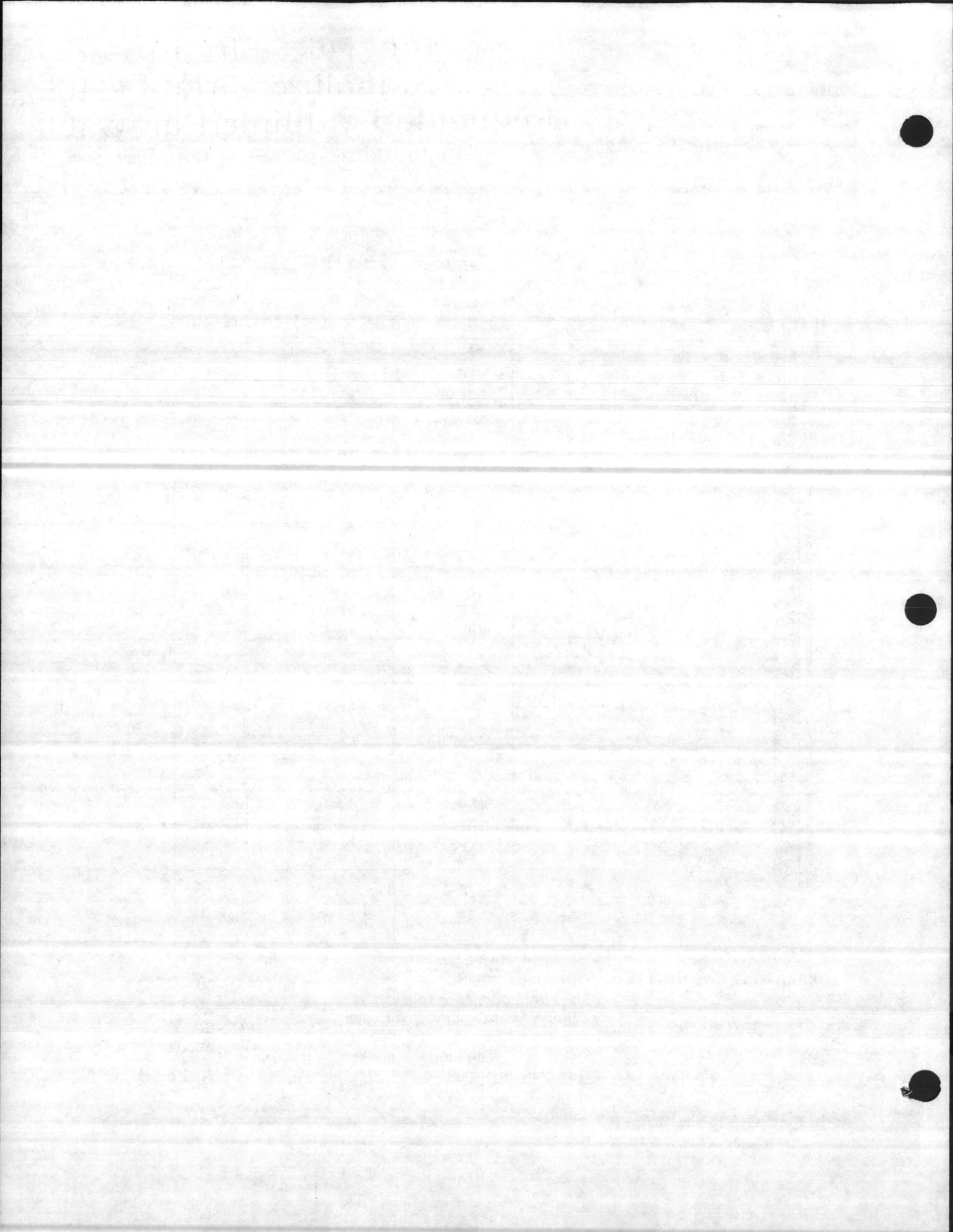
SUGGESTED WORKING VOLTAGE:
300V

CONSTRUCTION:
Solid bare copper conductors, Teflon FEP insulation, color coded, conductors cabled, red Teflon FEP jacket, with separator and marker tape beneath jacket.

COLOR CODE:
See Chart 2

PUT-UP:
Bulk, 1000 ft. & 500 ft. reels.

UL Listed & Classified



APPLICATION:

For use in accordance with Article 760, Section A and C and Article 725, Class 2 and 3 Circuits. For floor warden and fire control stations, smoke detection, voice communications, supervisory and all associated systems.

Plen-Tek® Fire Protective Signaling Circuit Cable
Shielded Multiple Conductor
 Insulated & Jacketed with Teflon® FE



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG STRANDING	INSULATION NOMINAL THICKNESS (In.)	JACKET NOMINAL THICKNESS (In.)	NOMINAL OVERALL DIAMETER (In.)	DRAIN WIRE AWG	WEIGHT PER KFT (lbs.)
246063	4	22 AWG SOLID	0.013	0.037	0.204	34	26
246064	5	SOLID	0.013	0.037	0.219	22	39
246065	6	SOLID	0.013	0.037	0.234	22	45
246066	7	SOLID	0.013	0.037	0.234	22	48
246067	8	SOLID	0.013	0.037	0.250	22	53
246068	9	SOLID	0.013	0.037	0.266	22	59
246069	10	SOLID	0.013	0.042	0.295	22	68
246070	4	20 AWG SOLID	0.013	0.037	0.220	22	42
246071	5	SOLID	0.013	0.037	0.237	22	49
246072	6	SOLID	0.013	0.037	0.254	22	55
246073	7	SOLID	0.013	0.037	0.254	22	60
246074	8	SOLID	0.013	0.037	0.272	22	67
246075	9	SOLID	0.013	0.042	0.300	22	78
246076	10	SOLID	0.013	0.042	0.322	22	86
246077	2	18 AWG SOLID	0.013	0.037	0.213	20	37
246078	3	SOLID	0.013	0.037	0.223	20	45
246079	4	SOLID	0.013	0.037	0.240	20	54
246080	5	SOLID	0.013	0.037	0.259	20	63
246081	6	SOLID	0.013	0.042	0.289	20	77
246082	7	SOLID	0.013	0.042	0.289	20	84
246083	8	SOLID	0.013	0.042	0.309	20	93
246084	2	16 AWG SOLID	0.013	0.037	0.234	18	48
246085	3	SOLID	0.013	0.037	0.245	18	59
246086	4	SOLID	0.013	0.037	0.265	18	72
246087	5	SOLID	0.013	0.042	0.297	18	89
246088	6	SOLID	0.013	0.042	0.320	18	102
246089	7	SOLID	0.013	0.042	0.320	18	113
246090	8	SOLID	0.013	0.042	0.344	18	126
246091	2	14 AWG SOLID	0.016	0.037	0.272	16	67
246092	3	SOLID	0.016	0.042	0.279	16	89
246093	4	SOLID	0.016	0.042	0.322	16	108
246094	2	12 AWG SOLID	0.016	0.042	0.316	14	96
246095	3	SOLID	0.016	0.042	0.333	14	123
246096	4	SOLID	0.016	0.042	0.362	14	151

TEMPERATURE RATING:
200°C

SUGGESTED WORKING VOLTAGE:
300V

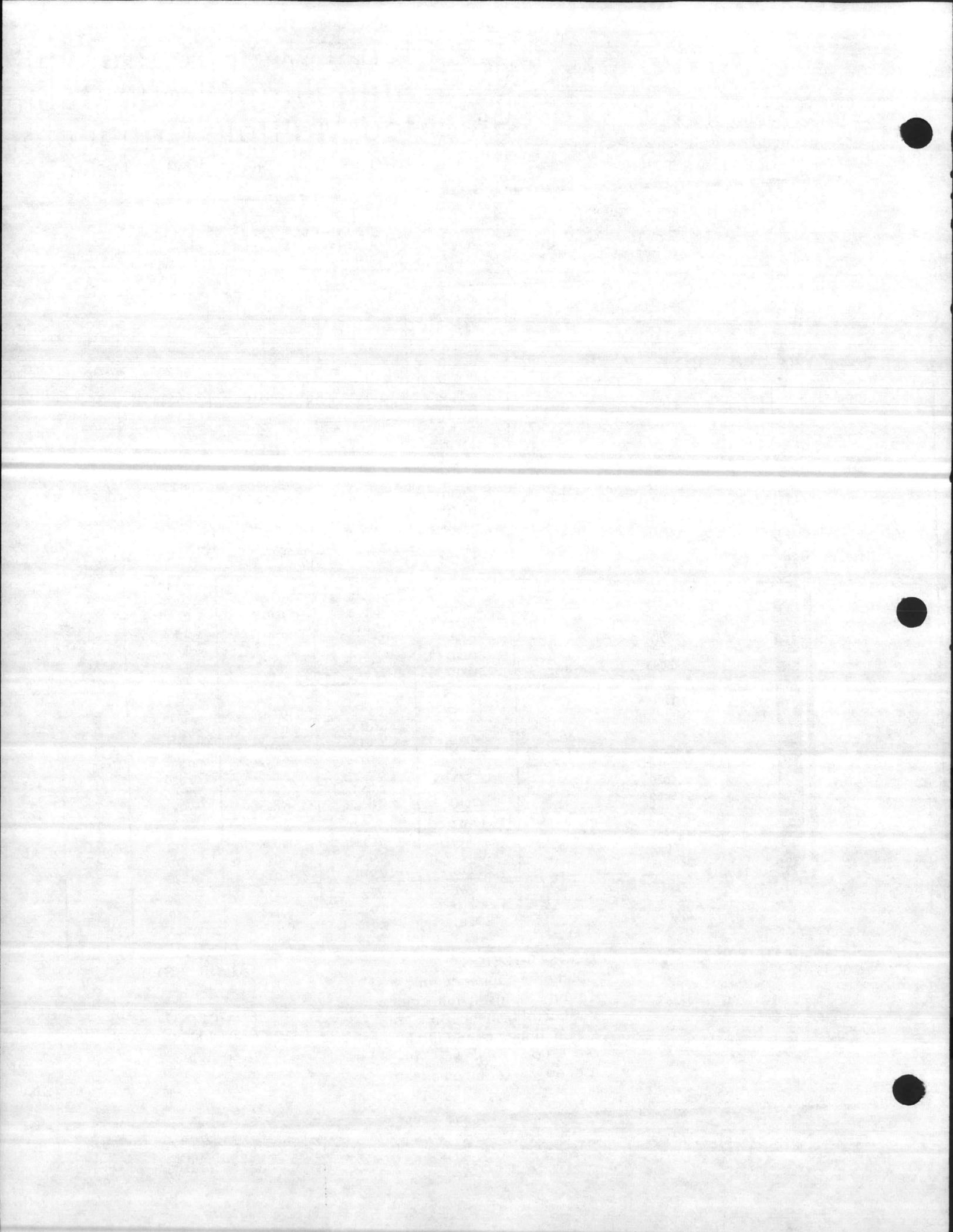
CONSTRUCTION:
Solid bare copper conductors, Teflon FEP insulation, color coded, conductors cabled, Berk Foil shield, tinned copper drain wire, red Teflon FEP jacket, with separator and marker tape beneath jacket.

COLOR CODE:
See Chart 1

PUT-UP:
Bulk, 1000 ft. & 500 ft. reels

UL Listed & Classified

** For NEC 760 and 725, Class 3 Circuits Only*



Plen-Tek® Fire Protective Signaling Circuit Cables

Shielded Multiple Conductors

Insulated & Jacketed with Tek-Flex®

APPLICATION:
 For use in accordance with Article 760, Section A and C and Article 725 Class 2 and 3 Circuits. For floor warden and fire control stations, smoke detection, voice communications, supervisory and associated systems.



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG. STRANDING	INSULATION NOMINAL THICKNESS (in.)	JACKET NOMINAL THICKNESS (in.)	NOMINAL OVERALL DIAMETER (in.)	DRAIN WIRE AWG	WEIGHT PER KFT (lbs.)
247063	4	22 AWG SOLID	0.013	0.037	0.204	22	30
247064	5	SOLID	0.013	0.037	0.219	22	35
247065	6	SOLID	0.013	0.037	0.234	22	39
247066	7	SOLID	0.013	0.037	0.234	22	43
247067	8	SOLID	0.013	0.037	0.250	22	47
247068	9	SOLID	0.013	0.037	0.266	22	52
247069	10	SOLID	0.013	0.042	0.295	22	60
247070	4	20 AWG SOLID	0.013	0.037	0.220	22	37
247071	5	SOLID	0.013	0.037	0.237	22	43
247072	6	SOLID	0.013	0.037	0.254	22	49
247073	7	SOLID	0.013	0.037	0.254	22	54
247074	8	SOLID	0.013	0.037	0.272	22	60
247075	9	SOLID	0.013	0.042	0.300	22	70
247076	10	SOLID	0.013	0.042	0.322	22	77
247077	2	18 AWG SOLID	0.013	0.037	0.213	20	33
247078	3	SOLID	0.013	0.037	0.223	20	40
247079	4	SOLID	0.013	0.037	0.240	20	49
247080	5	SOLID	0.013	0.037	0.259	20	57
247081	6	SOLID	0.013	0.042	0.289	20	69
247082	7	SOLID	0.013	0.042	0.289	20	76
247083	8	SOLID	0.013	0.042	0.309	20	85
247084	2	16 AWG SOLID	0.013	0.037	0.234	18	43
247085	3	SOLID	0.013	0.037	0.245	18	54
247086	4	SOLID	0.013	0.037	0.265	18	66
247087	5	SOLID	0.013	0.042	0.297	18	81
247088	6	SOLID	0.013	0.042	0.320	18	94
247089	7	SOLID	0.013	0.042	0.320	18	104
247090	8	SOLID	0.013	0.042	0.344	18	116
247091	2*	14 AWG SOLID	0.016	0.037	0.272	16	62
247092	3*	SOLID	0.016	0.042	0.279	16	80
247093	4*	SOLID	0.016	0.042	0.322	16	100
247094	2*	12 AWG SOLID	0.016	0.042	0.316	14	89
247095	3*	SOLID	0.016	0.042	0.333	14	114
247096	4*	SOLID	0.016	0.042	0.362	14	141

TEMPERATURE RATING:
125°C minimum

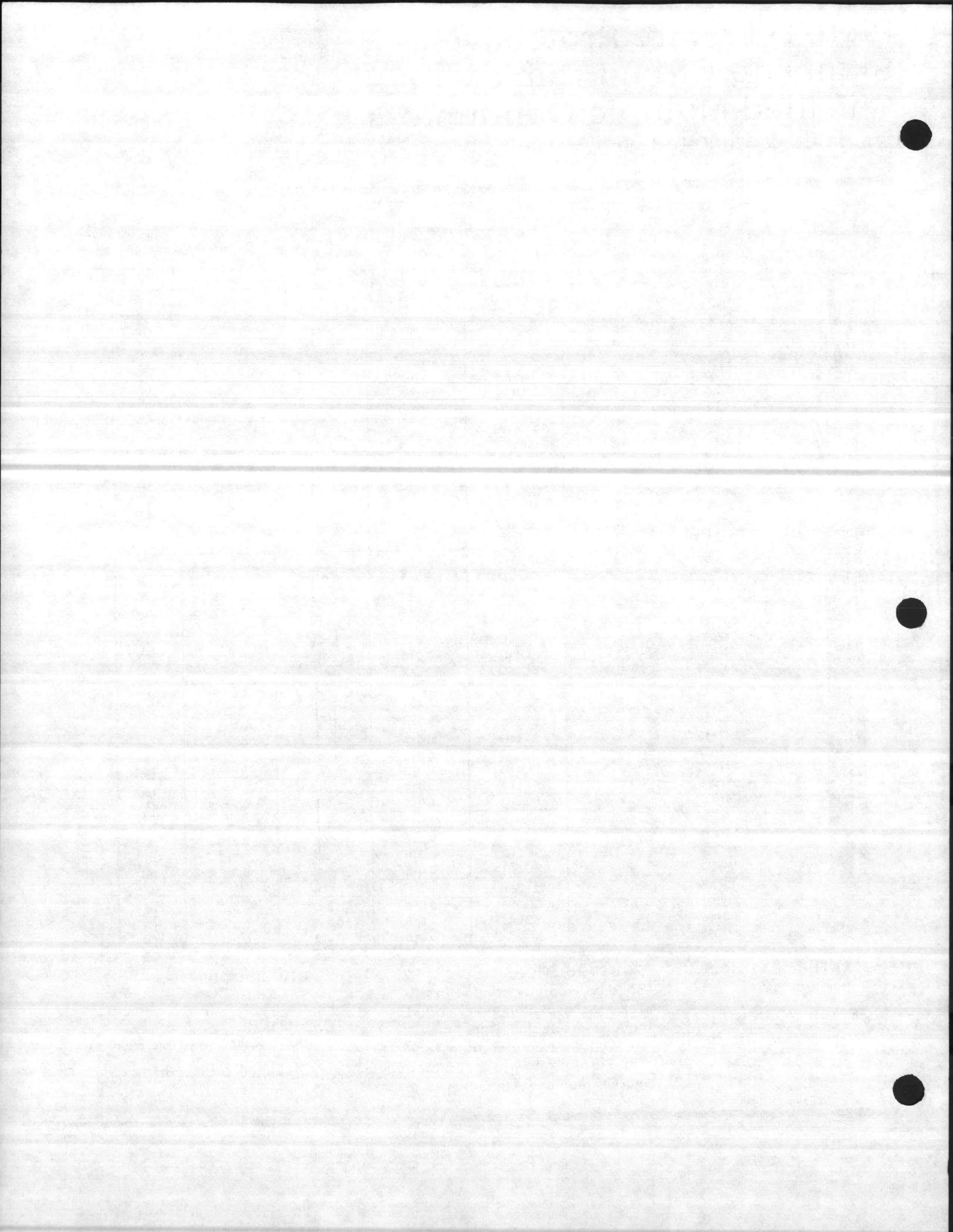
SUGGESTED WORKING VOLTAGE:
300V

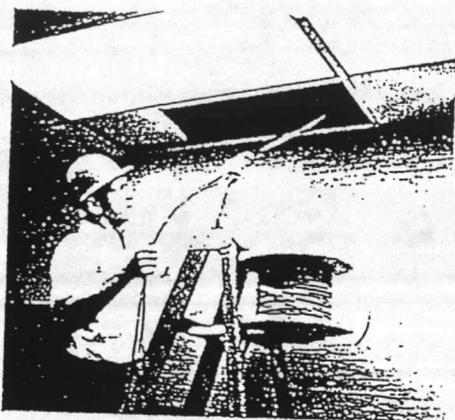
CONSTRUCTION:
 Solid bare copper conductors, Tek-Flex insulation, color coded, conductors cabled, Berk Foil shield, tinned copper drain, red Tek-Flex jacket, with separator and marker tape beneath jacket.

COLOR CODE:
See Chart 1

PUT-UP:
Bulk, 1000 ft. & 500 ft. reels.

UL Listed & Classified
 * For NEC 760 and 725 Class 3 Circuits Only

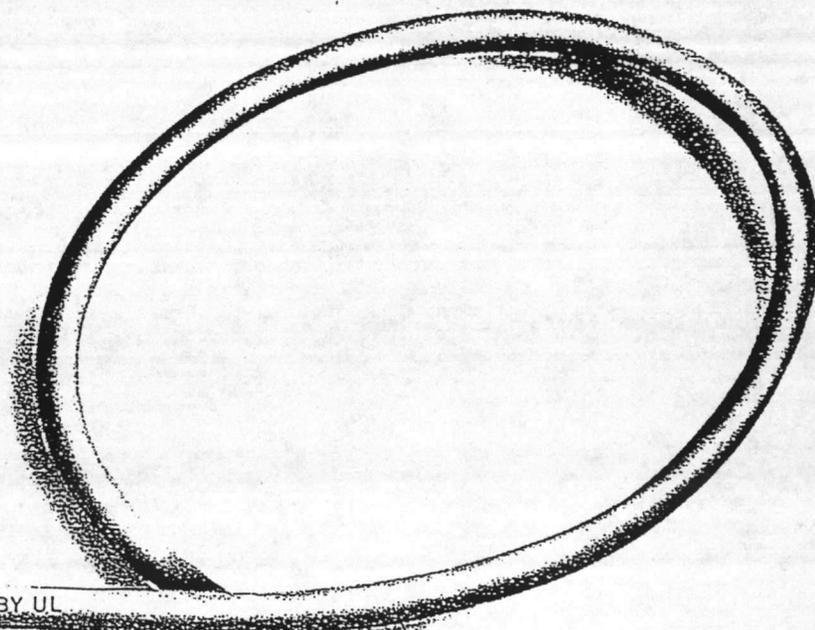




2-3-4

LOW INSTALLATION COSTS

Easy-to-handle Dekoron plenum cable can be installed quickly. Because of its unique jacket construction, Dekoron cable is more flexible than currently used rigid-jacketed cables. Installers can feed it through plenum areas with ease. No snap back to worry about. And, of course, you do not need conduit. Saves installation time and costs.



DEKORON® PLENUM CABLE CABLE CLASSIFIED BY UL

EASY-TO-READ JACKET

Dekoron plenum cable jacket features a printed ID marking system that provides easy readability. Other cable uses a hard-to-read marker strip. Printed jacket makes it easy to identify the UL classification for each cable.

UL CLASSIFIED

Duct and plenum cable without conduit is covered by three NEC Articles — 725, 760 and 800. Each article covers a specific application area. Dekoron plenum cable meets all performance characteristics of the three articles and is ideal for the following applications.

ARTICLE 760-4(d) FIRE PROTECTIVE SIGNALING SYSTEMS

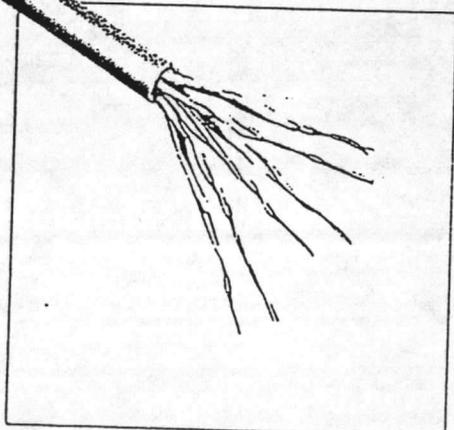
- Fire Alarms
- Sprinkler Control Systems
- Smoke Detection Systems

ARTICLE 725-2(b) CLASS 1, CLASS 2, and CLASS 3 REMOTE-CONTROL, SIGNALING, AND POWER LIMITED CIRCUITS

- Public Address Systems
- Computer Interconnects
- Point-of-Sale Terminals
- Burglar Alarms
- Office Network Systems
- Environmental Control Systems

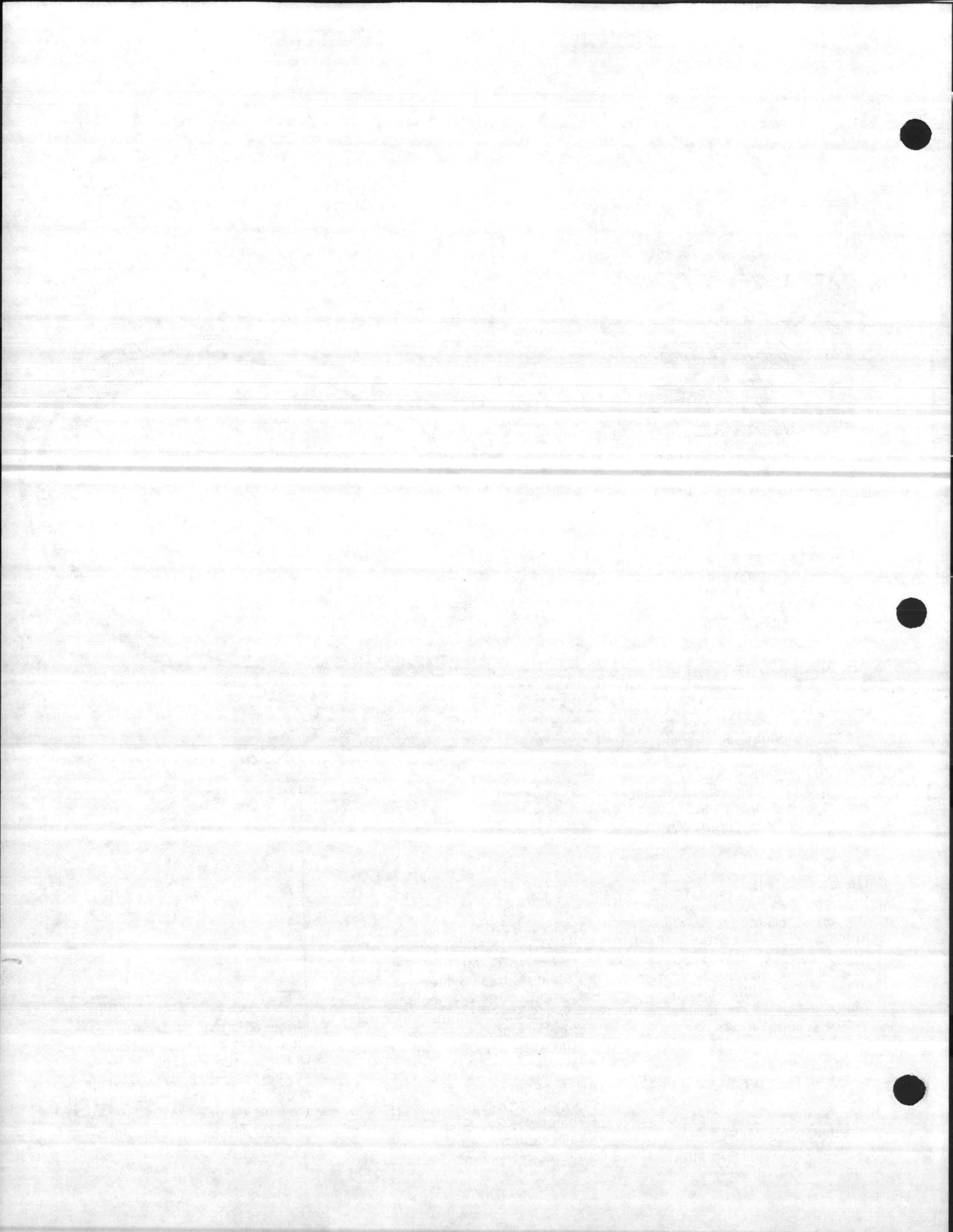
ARTICLE 800-3(d) COMMUNICATION CIRCUITS

- Telephone Systems
- Telegraph Systems
- Intercom Systems



EASY-TO-STRIP JACKET

Most cable using rigid fluorocarbon jackets are hard to strip back. Dekoron plenum cable with specially compounded elastomeric jacket allows cable to be easily stripped — prevents damage to conductors. In addition, a rip cord is provided.





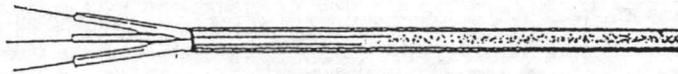
POWER LIMITED CIRCUIT CABLE

Meets Article 725 of the NEC. Also marked as Tray Cable suitable for class 2 & 3 circuits. Passes the UL 70,000 BTU Flame and Tray Cable test which is comparable to the IEEE 383 Flame Test.

2.3.4

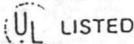
UL SUBJECT 13
105° C-300V

THREE CONDUCTOR UNSHIELDED CABLES



DESCRIPTION: Tinned copper, vinyl insulated, conductors cabled, chrome vinyl jacket.

Color code: Black, Red, White



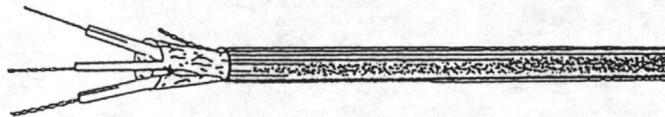
300V
and
UL 2464
AWM



CSA TR-64
Appliance
Wiring
Material

UL TYPE NO.	AWG (STRANDING)	INSULATION THICKNESS	NOM. JKT. THICKNESS	NOMINAL O.D.
3150	22 (7x30)	.016	.038	.210
3151	20 (10x30)	.016	.038	.225
3152	18 (16x30)	.016	.038	.246
3153	16 (26x30)	.016	.038	.274
3154	14 (41x30)	.022	.043	.342

THREE CONDUCTOR SHIELDED CABLES



DESCRIPTION: Tinned copper, vinyl insulated, conductors cabled, overall aluminum mylar shield and drain wire, chrome vinyl jacket.

Color code: Black, Red, White

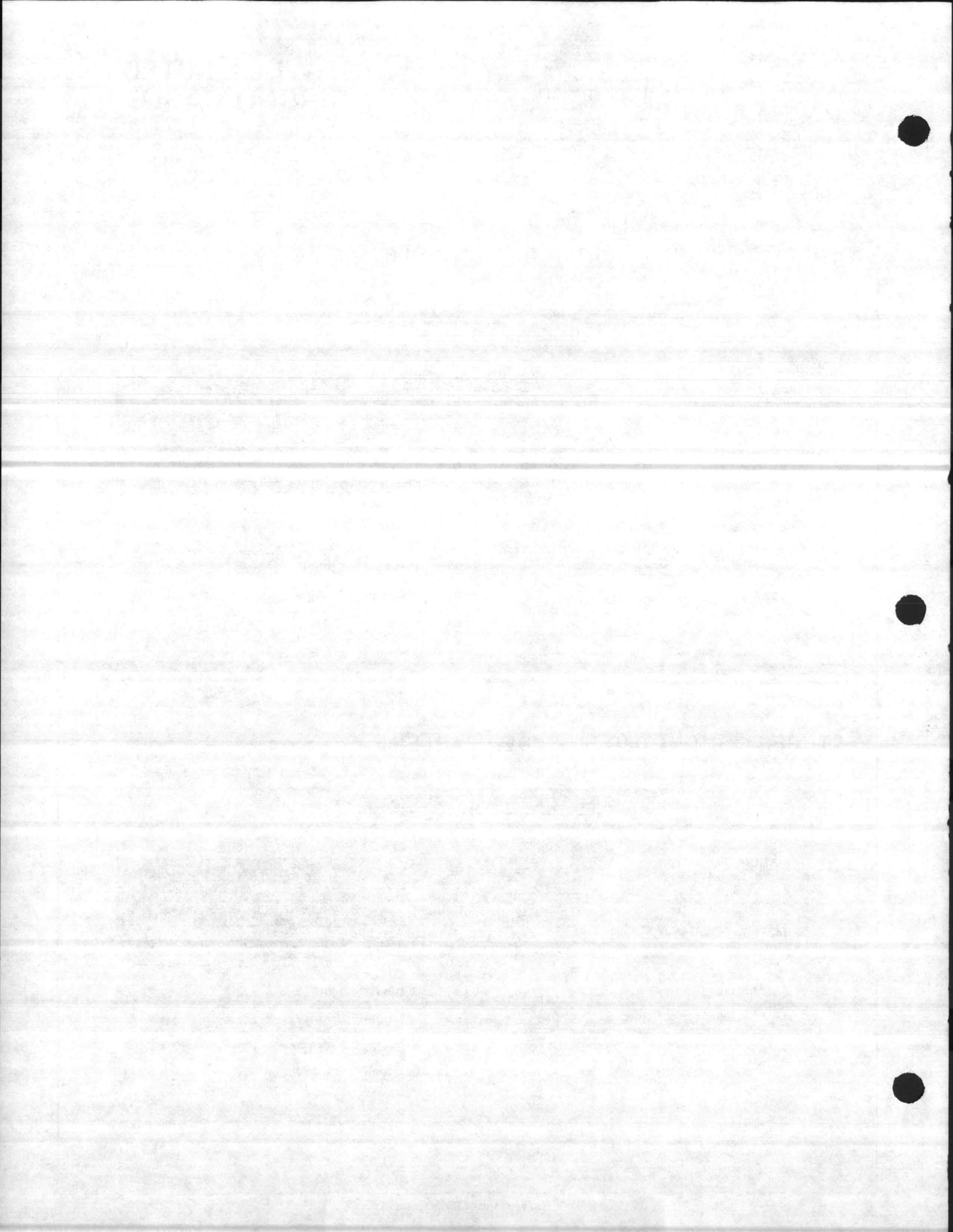


300V
and
UL 2464
AWM



CSA TR-64
Appliance
Wiring
Material

UL TYPE NO.	AWG (STRANDING)	INSULATION THICKNESS	NOM. JKT. THICKNESS	NOMINAL O.D.
3160	22 (7x30)	.016	.038	.212
3161	20 (10x30)	.016	.038	.227
3162	18 (16x30)	.016	.038	.248
3163	16 (26x30)	.020	.038	.276
3164	14 (41x30)	.020	.043	.344



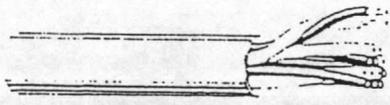
2.3.4

**Low Smoke and Flame Spread
NEC 725-2 (b)**

Multi-Pairs

Power Limited Circuit Cable
(Remote Control)

VOLTAGE	TEMPERATURE	CONSTRUCTION	APPLICATION	SPECIFICATIONS
150 (Sug. Wkg. Voltage)	200°C (FEP)	COND: Solid bare copper INSUL: FEP or FLG JACKET: FEP or FLG	FOR: Bldg. Energy Management, public address systems (P.A.), business interconnects, security systems, remote control cables. COLOR CODE: Chart #6	 LISTED SUBJECT 13 NEC SECT. 725-2(b)



Fluoropolymer Resin-FEP

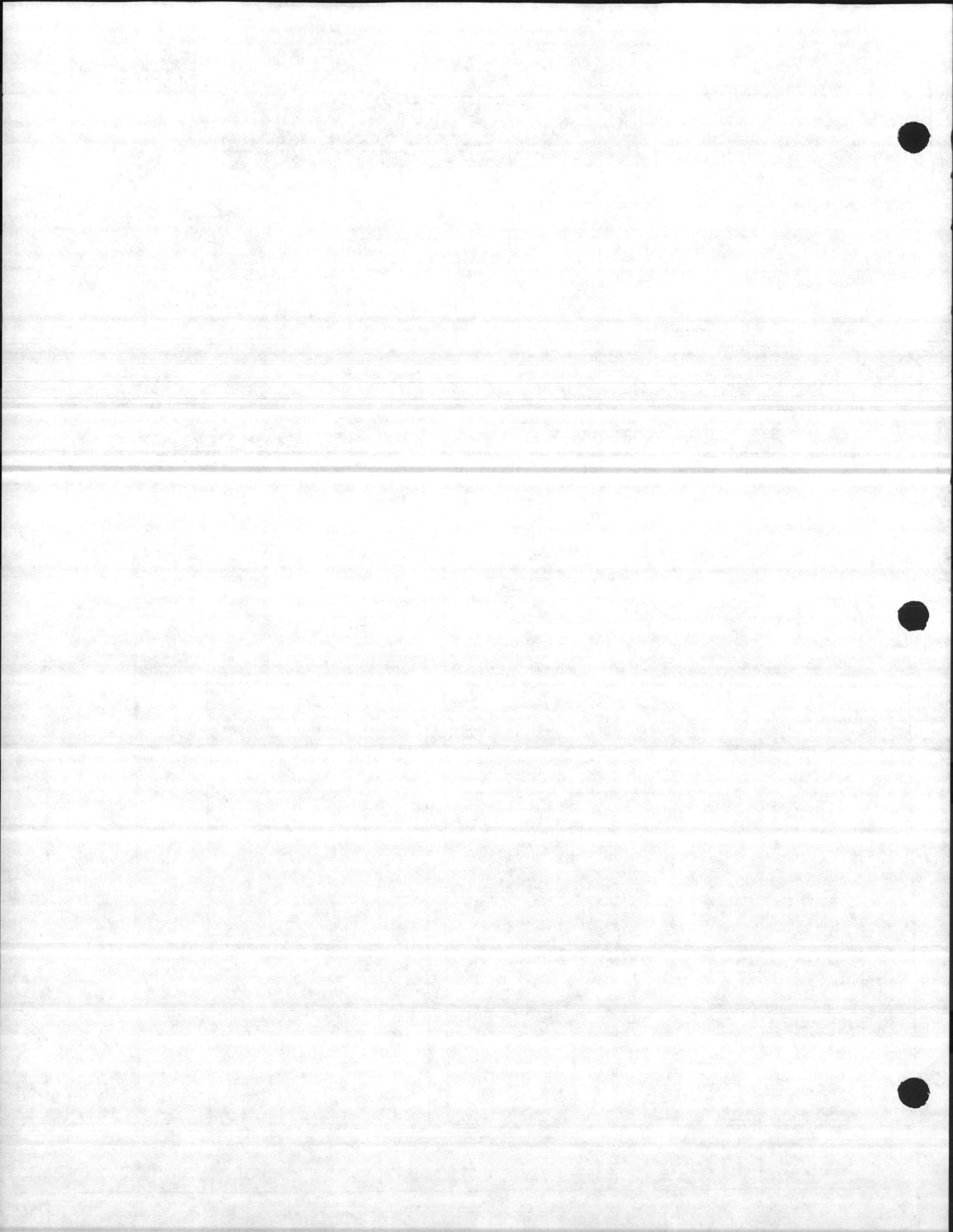
Unshielded-Solid

Part No.	No. of Pairs	Nom. Insul. Thick (in.)	Nom. Jkt. Thick (in.)	Nom. O.D. (in.)	Approx. Wt/M (lbs.)
#24 AWG (SOLID)					
M63330	2	.007	.017	.143	13
M63331	3	.007	.017	.151	18
M63332	4	.007	.017	.165	22
M63333	5	.007	.017	.181	26
M63334	6	.007	.017	.197	31
#22 AWG (SOLID)					
M63350	2	.007	.017	.159	18
M63351	3	.007	.017	.168	23
M63352	4	.007	.017	.184	30
M63353	5	.007	.017	.202	36
M63354	6	.007	.017	.221	42
#20 AWG (SOLID)					
M63370	2	.007	.017	.181	24
M63371	3	.007	.017	.192	33
M63372	4	.007	.017	.211	41
M63373	5	.007	.017	.233	51
M63374	6	.007	.017	.255	60
#18 AWG (SOLID)					
M63390	2	.007	.017	.207	33
M63391	3	.007	.017	.220	46
M63392	4	.007	.017	.242	59
M63393	5	.007	.017	.267	72
M63394	6	.007	.017	.293	86
#16 AWG (SOLID)					
M63410	2	.007	.017	.242	48
M63411	3	.007	.017	.258	67
M63412	4	.007	.017	.285	87
M63413	5	.007	.017	.315	107
M63414	6	.007	.022	.356	132

Fluoropolymer Resin-FLG (Fluoro-Gen™)

Unshielded-Solid

Part No.	No. of Pairs	Nom. Insul. Thick (in.)	Nom. Jkt. Thick (in.)	Nom. O.D. (in.)	Approx. Wt/M (lbs.)
#24 AWG (SOLID)					
M43330	2	.007	.017	.143	13
M43331	3	.007	.017	.151	18
M43332	4	.007	.017	.165	22
M43333	5	.007	.017	.181	26
M43334	6	.007	.017	.197	31
#22 AWG (SOLID)					
M43350	2	.007	.017	.159	18
M43351	3	.007	.017	.168	23
M43352	4	.007	.017	.184	30
M43353	5	.007	.017	.202	36
M43354	6	.007	.017	.221	42
#20 AWG (SOLID)					
M43370	2	.007	.017	.181	24
M43371	3	.007	.017	.192	33
M43372	4	.007	.017	.211	41
M43373	5	.007	.017	.233	51
M43374	6	.007	.017	.255	60
#18 AWG (SOLID)					
M43390	2	.007	.017	.207	33
M43391	3	.007	.017	.220	46
M43392	4	.007	.017	.242	59
M43393	5	.007	.017	.267	72
M43394	6	.007	.017	.293	86
#16 AWG (SOLID)					
M43410	2	.007	.017	.242	48
M43411	3	.007	.017	.258	67
M43412	4	.007	.017	.285	87
M43413	5	.007	.017	.315	107
M43414	6	.007	.022	.356	132

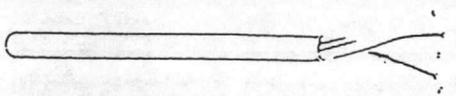


PLENUM CABLES

ARTICLE 725 OF NATIONAL ELECTRIC CODE REMOTE CONTROL SIGNALING & POWER LIMITED CIRCUITS



- Construction:** Bare copper conductors, FEP TEFLON[®] or Halar[®] insulation; color coded FEP TEFLON[®], Halar[®] or Kynar[®] jacket. Non-shielded.
- Specification:** U.L. listed as Power Limited Circuit Cable for Class 2 Circuits and also classified as to fire and smoke characteristics only in accordance with N.E.C. 725-2 (B).
- Applications:** Remote control, signaling and power limited circuits that are not an integral part of a device or appliance. Communication systems, computer systems, background music, etc. may be installed in air plenum and ducts without conduit.

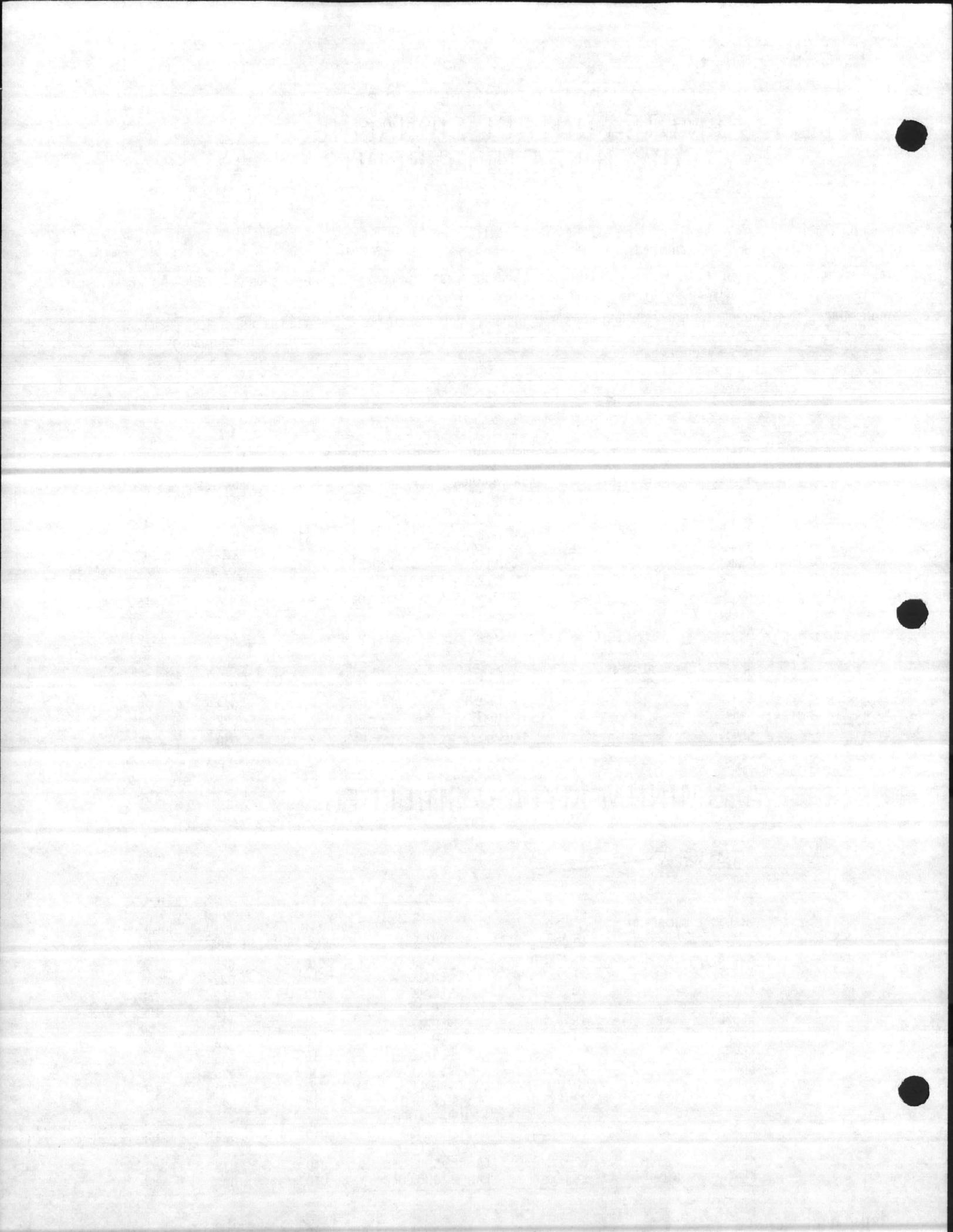


CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG. SIZE & CONSTRUCTION	CONDUCTOR INSULATION THICKNESS	JACKET THICKNESS	NOM. O.D.
K6001	2	22 (7x30)	.010	.022	.150
K6002	3	22 (7x30)	.010	.022	.156
K6003	4	22 (7x30)	.010	.022	.179
K6004	5	22 (7x30)	.010	.022	.185
K6005	6	22 (7x30)	.010	.022	.190
K6006	8	22 (7x30)	.010	.022	.205
K6007	10	22 (7x30)	.010	.025	.250
K6008	2	18 (7x26)	.010	.022	.179
K6009	3	18 (7x26)	.010	.022	.190
K6010	4	18 (7x26)	.010	.022	.210
K6011	6	18 (7x26)	.010	.022	.244
K6012	8	18 (7x26)	.010	.025	.275
K6013	2	16 (19x29)	.010	.022	.200
K6014	4	16 (19x29)	.010	.022	.238
K6015	2	14 (19x27)	.013	.030	.265

ALUMINUM MYLAR[®] SHIELDED



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG STRANDING	SHIELD	NOMINAL INSULATION THICKNESS	NOMINAL JACKET THICKNESS	NOMINAL O.D.
K6016	2	22 (7x30)	OVERALL	.010	.022	.158
K6017	4	22 (7x30)	OVERALL	.010	.022	.165
K6018	2	20 (7x28)	OVERALL	.010	.022	.168
K6019	2	18 (7x26)	OVERALL	.010	.022	.192
K6020	3	18 (7x26)	OVERALL	.010	.022	.200
K6021	4	18 (7x26)	OVERALL	.010	.022	.205
K6022	2	16 (19x29)	OVERALL	.010	.025	.210
K6023	4	16 (19x29)	OVERALL	.010	.025	.240
K6024	2	14 (19x27)	OVERALL	.013	.030	.260
K6025	4	22 (7x30)	2 SHIELDED	.010	.022	.176
			2 UNSHIELDED			
K6026	4	20 (7x28)	2 SHIELDED	.010	.022	.198
			2 UNSHIELDED			
K6027	2 PAIR	22 (7x30)	EA. PR. SHIELDED	.010	.022	.200
K6028	3 PAIR	22 (7x30)	EA. PR. SHIELDED	.010	.022	.260



Special Application



BELDEN

Power Limited 105C-300V Tray Cables (UL LISTED) (E)
 U.L. Subject 13 (NEC Article 725)

Tray-rated cable. Power limited tray cable, U.L. subject 13, 105C-300V. Appliance Wiring Material style 2464, 80C-300V. Certified to CSA standards as Appliance Wiring Material. Meets Article 725 of the

NEC, Class 2 and 3 requirements. Passes the U.L. 70,000 BTU flame test which is comparable to the IEEE 383 Flame Test. Sunlight Resistant Jacket.

Description	Trade U.L. Style Number	Standard Lengths		Str. Unit Spacing	AWG (Stranding)	Insulation Thickness		Jacket Thickness		Nominal O.D.	
		ft.	m.			in.	mm.	in.	mm.	in.	mm.

Two-Conductor Unshielded Cables

Product Description

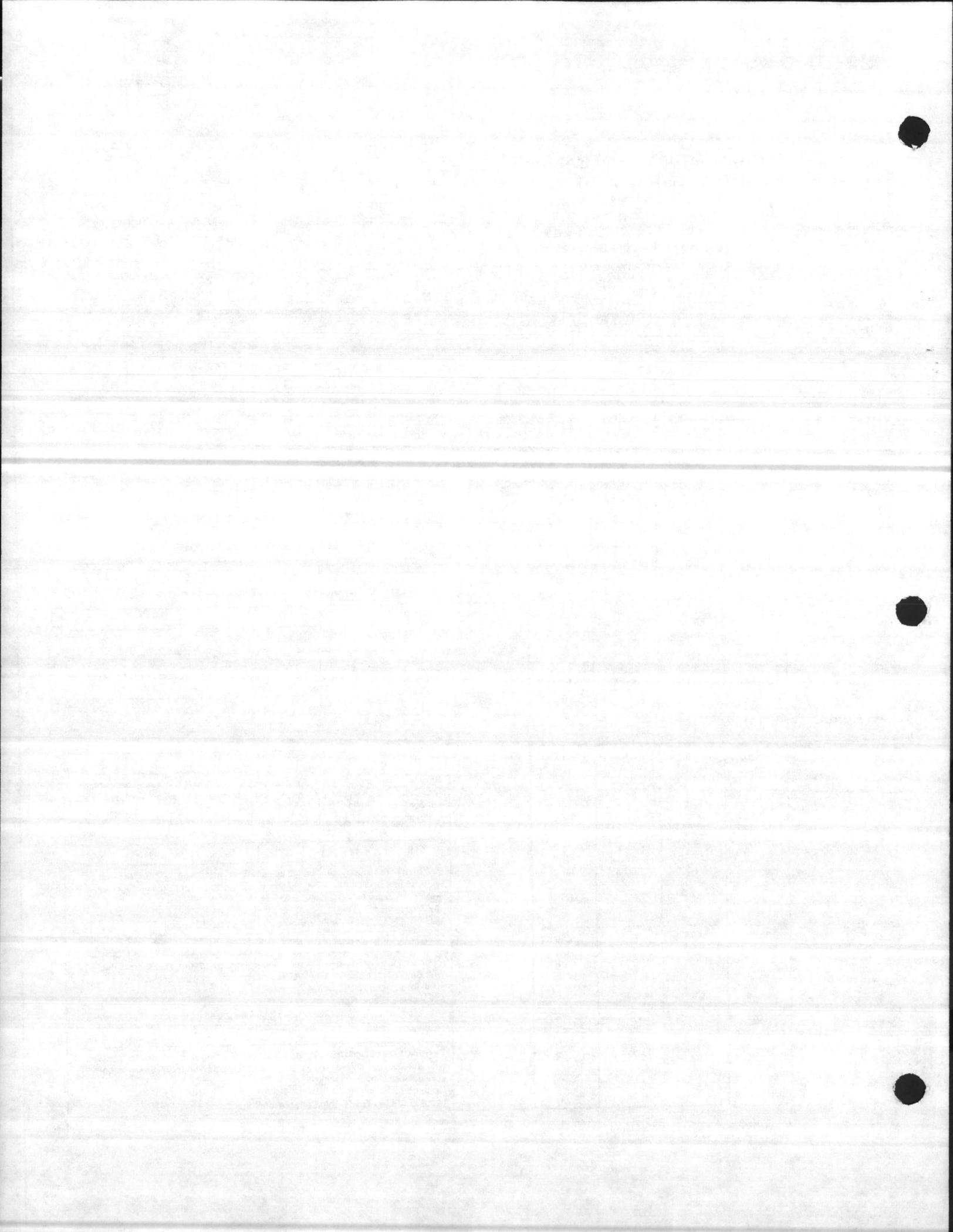
Tinned copper, PVC insulated, conductors cabled, chrome sunlight-resistant PVC jacket. Color code: Black, Red.

<p>UL LISTED E34972 300V and Appliance Wiring Material</p>	9407†	U-500 U-1000	U-152.4 U-304.5	10.2 19.3	22 (7x30)	.016	.41	.038	.97	.200	5.08	U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9408†	100 U-500 U-1000	30.5 U-152.4 U-304.5	2.6 11.8 22.6	20 (10x30)	.016	.41	.038	.97	.214	5.44	U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9409†	100 U-500 U-1000	30.5 U-152.4 U-304.5	3.3 14.4 27.8	18 (16x30)	.016	.41	.038	.97	.230	5.84	U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9410†	100 U-500 U-1000	30.5 U-152.4 U-304.5	4.3 19.3 38.0	16 (26x30)	.016	.41	.038	.97	.260	6.60	U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9411†	100 U-500 1000	30.5 U-152.4 304.5	6.4 29.7 69.9	14 (41x30)	.022	.56	.043	1.09	.324	8.23	U.L. LISTED as suitable for Class 2 and 3 circuits.
	9412†	100 500 1000	30.5 152.4 304.5	9.6 50.5 97.1	12 (65x30)	.032	.81	.052	1.32	.424	10.77	U.L. LISTED as suitable for Class 2 and 3 circuits.

Two-Conductor Shielded Cables

<p>Beldfoil® 100% Shield Coverage UL LISTED E34972 300V and Appliance Wiring Material</p>	9322†	100 U-500 U-1000	30.5 U-152.4 U-304.5	2.6 11.4 22.0	22 (7x30)	.016	.41	.038	.97	.202	5.13	Product Description: Tinned copper, PVC insulated, conductors cabled with Beldfoil tape shield, 22 AWG stranded tinned copper drain wire, chrome sunlight-resistant PVC jacket. Color code: Black, Red. U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9320†	100 U-500 U-1000	30.5 U-152.4 U-304.5	3.0 13.1 25.4	20 (10x30)	.016	.41	.038	.97	.216	5.49	Product Description: Tinned copper, PVC insulated, conductors cabled with Beldfoil tape shield, 22 AWG stranded tinned copper drain wire, chrome sunlight-resistant PVC jacket. Color code: Black, Red. U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9318†	100 U-500 U-1000	30.5 U-152.4 U-304.8	3.8 16.8 32.8	18 (16x30)	.016	.41	.038	.97	.236	5.99	Product Description: Tinned copper, PVC insulated, conductors cabled with Beldfoil tape shield, 20 AWG stranded tinned copper drain wire, chrome sunlight-resistant PVC jacket. Color code: Black, Red. U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.
	9316†	100 U-500 U-1000	30.5 U-152.4 U-304.5	4.9 22.6 44.2	16 (26x30)	.016	.41	.038	.97	.262	6.65	Product Description: Tinned copper, PVC insulated, conductors cabled with Beldfoil tape shield, 18 AWG stranded tinned copper drain wire, chrome sunlight-resistant PVC jacket. Color code: Black, Red. U.L. LISTED as Tray Cable suitable for Class 2 and 3 circuits.

† Passes the VW-1 Vertical Wire Flame Test.
 Passes the U.L. 70,000 BTU Flame Test.



**Multi-Conductor
Unshielded**



BELDEN

Control and Audio Cables

Description	Trade & U.C. Style Number	No. of Cond.	Standard Dimensions		Str. U.C. No. per Cond.	Insulation Thickness		Jacket Thickness		Nominal O.D.	
			U.C.	mm		Inch	mm	Inch	mm	Inch	mm

**19 Gage
Solid Conductors
PVC Insulated**

Product Description
Bare copper, PVC insulated, conductors cabled. Chrome PVC jacket.
Suggested working voltage: 300.

	8487† 80C	3	U-500	U-152.4	13.0	.015	.38	.025	.64	.192	4.88
			500	152.4	12.8	Color code: Brown, Gray, Tan.					
			U-1000	U-304.8	25.0						
			1000	304.8	25.8						

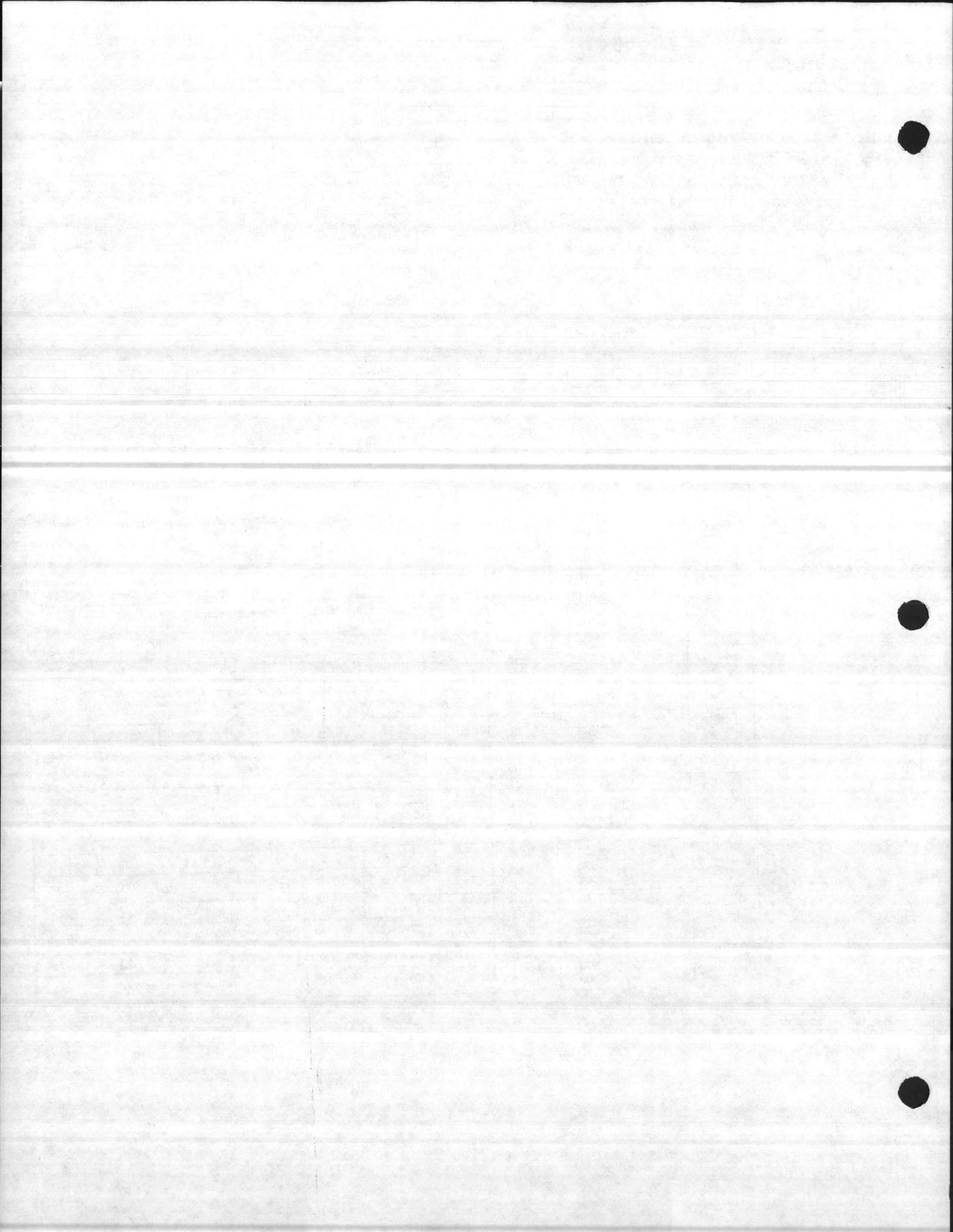
**18 Gage
Stranded Conductors (16x30)
PVC Insulated**

Product Description
Tinned copper, PVC insulated, conductors cabled. Chrome PVC jacket.

	8489†	4	100	30.5	5.1	.018	.46	.032	.81	.264	6.71
			250	76.2	11.8	Color code chart No. 1, Technical Information Section. For Plenum version, see 88489 on page 122.					
			U-500	U-152.4	23.1						
			500	152.4	23.9						
			U-1000	U-304.8	45.2						
			1000	304.8	48.3						
	8465†	5	100	30.5	6.1	.018	.46	.037	.94	.286	7.26
			U-500	U-152.4	28.7	Color code chart No. 1, Technical Information Section.					
			500	152.4	29.2						
			U-1000	U-304.8	56.3						
			1000	304.8	60.3						
	8467†	7	100	30.5	8.0	.018	.46	.037	.94	.324	8.23
			250	76.2	20.0	Color code chart No. 1, Technical Information Section.					
			500	152.4	38.6						
			1000	304.8	81.0						
	8469†	9	100	30.5	10.1	.018	.46	.037	.94	.379	9.63
			250	76.2	25.7	Color code chart No. 1, Technical Information Section.					
			500	152.4	51.8						
			1000	304.8	103.7						
	8466†	12	100	30.5	12.6	.018	.46	.040	1.02	.412	10.46
			250	76.2	31.3	Color code chart No. 2R, Technical Information Section.					
			500	152.4	64.1						
			1000	304.8	126.1						
	8468†	15	100	30.5	17.6	.018	.46	.045	1.14	.505	12.83
			500	152.4	87.9	Color code chart No. 2R, Technical Information Section.					
			1000	304.8	172.8						
	8619†	19	100	30.5	20.0	.018	.46	.045	1.14	.505	12.83
			500	152.4	99.3	Color code chart No. 2R, Technical Information Section.					
			1000	304.8	195.0						
	9626†	25	100	30.5	27.1	.018	.46	.060	1.52	.620	15.75
			500	152.4	134.9	Color code chart No. 2R, Technical Information Section.					
			1000	304.8	270.8						

300V 60C

†Passes the VW-1 Vertical Wire Flame Test.



For use on Class 2 circuits as described in Article 725 of the National Electric Code and for use with intercom systems, remote control, burglar alarms and other low voltage systems.

2.3.4

PLENUM Power Limited Circuit Cables

Plen-Tek Power Limited Circuit Cables Class 2

Article 725-2(b) includes remote signaling and power limited circuits that are not an integral part of a device or appliance. This exception permits use of fluoropolymer materials for direct installation without conduit in air-handling spaces. UL Listed and Classified, Subject 13.

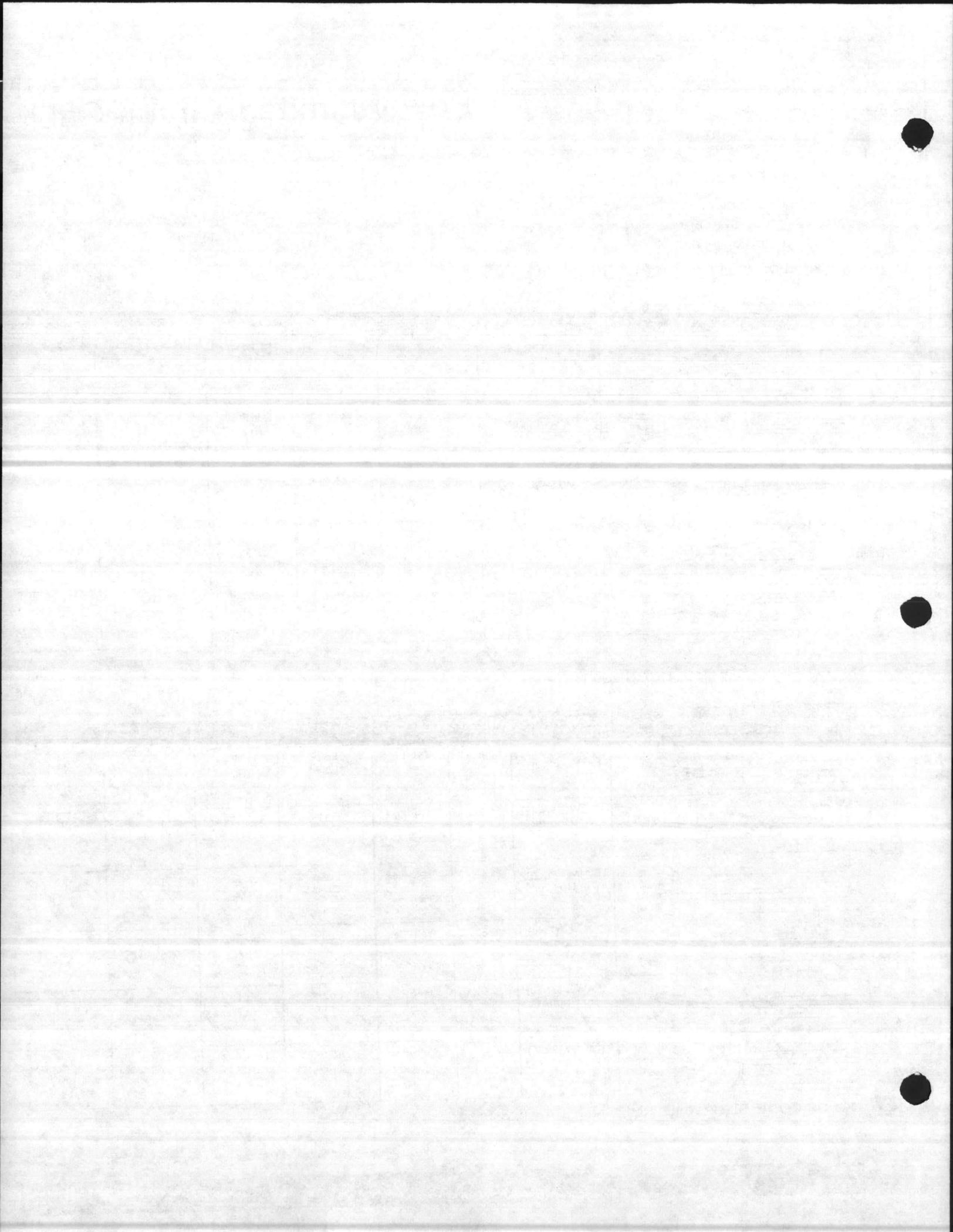
UNSHIELDED PLENUM MULTICONDUCTOR

PART NUMBER	COND. STRAND TYPE	NO. OF CONDS.	DIELECTRIC	JACKET MATERIAL	NOMINAL O.D.	WEIGHT/KFT
252388	16 AWG Solid Bare Copper	2	Tek-Flex	Tek-Flex .017"	.168"	27
252349	18 AWG Solid Bare Copper	2	Tek-Flex	Tek-Flex .017"	.146"	20
257147	18 AWG (7x26) Tin Copper	2	Tek-Flex	Tek-Flex .017"	.158"	21
252351	18 AWG Solid Bare Copper	4	Tek-Flex	Tek-Flex .017"	.164"	34
252353	18 AWG Solid Bare Copper	6	Tek-Flex	Tek-Flex .017"	.200"	48

SHIELDED PLENUM MULTICONDUCTOR

PART NUMBER	COND. STRAND TYPE	NO. OF CONDS.	DIELECTRIC	SHIELD	JACKET MATERIAL	NOMINAL O.D.	WEIGHT/KFT
252564	18 AWG Solid Bare Copper	2	Tek-Flex	Foil + Drain	Tek-Flex .017"	.148"	24
257582	18 AWG (7x26) Tin Copper	2	Tek-Flex	Foil + Drain	Tek-Flex .017"	.160"	25
257584	18 AWG (7x26) Tin Copper	4	Tek-Flex	Foil + Drain	Tek-Flex .017"	.185"	40
257484	22 AWG (7x30) Tin Copper	2	Tek-Flex	Foil + Drain	Tek-Flex .017"	.127"	15
258484	22 AWG (7x30) Tin Copper	2	FEP	Foil + Drain	FEP .017"	.127"	17
257486	22 AWG (7x30) Tin Copper	4	Tek-Flex	Foil + Drain	Tek-Flex .017"	.146"	23

COLOR CODE: Black, White, Red, Green, Brown, Blue



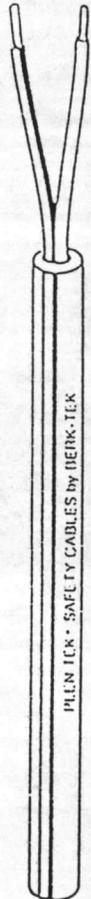
Plen-Tek® Power Limited Circuit Cable Class 2 — Unshielded Multi-Conductor Cables

Insulated & Jacketed with Teflon® FEP

APPLICATION:

For use on Class 2 circuits as described in Article 725 of the National Electric Code and for use with intercom systems, remote control, burglar alarms, and other low voltage systems

18 AWG SOLID



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG. STRANDING	INSULATION NOMINAL THICKNESS (in.)	JACKET NOMINAL THICKNESS (in.)	NOMINAL OVERALL DIAMETER (in.)	WEIGHT PER KFT (lbs.)
253349	2	18 AWG				
253350	3	SOLID	0.010	0.017	0.142	18
253351	4	SOLID	0.010	0.017	0.150	24
253352	5	SOLID	0.010	0.017	0.164	31
253353	6	SOLID	0.010	0.017	0.180	38
253354	7	SOLID	0.010	0.017	0.196	45
253355	8	SOLID	0.010	0.017	0.196	51
253356	9	SOLID	0.010	0.017	0.213	57
253357	10	SOLID	0.010	0.017	0.229	64
253358	11	SOLID	0.010	0.017	0.250	71
253359	12	SOLID	0.010	0.017	0.250	77
253360	13	SOLID	0.010	0.017	0.256	83
253361	14	SOLID	0.010	0.017	0.272	90
253362	15	SOLID	0.010	0.017	0.272	96
253363	16	SOLID	0.010	0.017	0.288	103
253364	17	SOLID	0.010	0.017	0.288	109
253365	18	SOLID	0.010	0.017	0.304	115
253366	19	SOLID	0.010	0.017	0.304	121
253367	20	SOLID	0.010	0.017	0.304	127
253368	21	SOLID	0.010	0.017	0.321	134
253369	22	SOLID	0.010	0.017	0.321	140
253370	23	SOLID	0.010	0.022	0.347	152
253371	24	SOLID	0.010	0.022	0.347	158
253372	25	SOLID	0.010	0.022	0.366	165
253373	26	SOLID	0.010	0.022	0.366	171
253374	27	SOLID	0.010	0.022	0.366	177
253375	28	SOLID	0.010	0.022	0.376	183
253376	29	SOLID	0.010	0.022	0.390	190
253377	30	SOLID	0.010	0.022	0.390	196
253378	31	SOLID	0.010	0.022	0.390	202
253379	32	SOLID	0.010	0.022	0.406	209
253380	33	SOLID	0.010	0.022	0.406	215
253381	34	SOLID	0.010	0.022	0.406	221
253382	35	SOLID	0.010	0.022	0.422	228
253383	36	SOLID	0.010	0.022	0.422	234
253384	37	SOLID	0.010	0.022	0.422	240
253385	38	SOLID	0.010	0.022	0.422	246
253386	39	SOLID	0.010	0.022	0.439	253
253387	40	SOLID	0.010	0.022	0.439	259
					0.439	265

TEMPERATURE RATING:
200°C

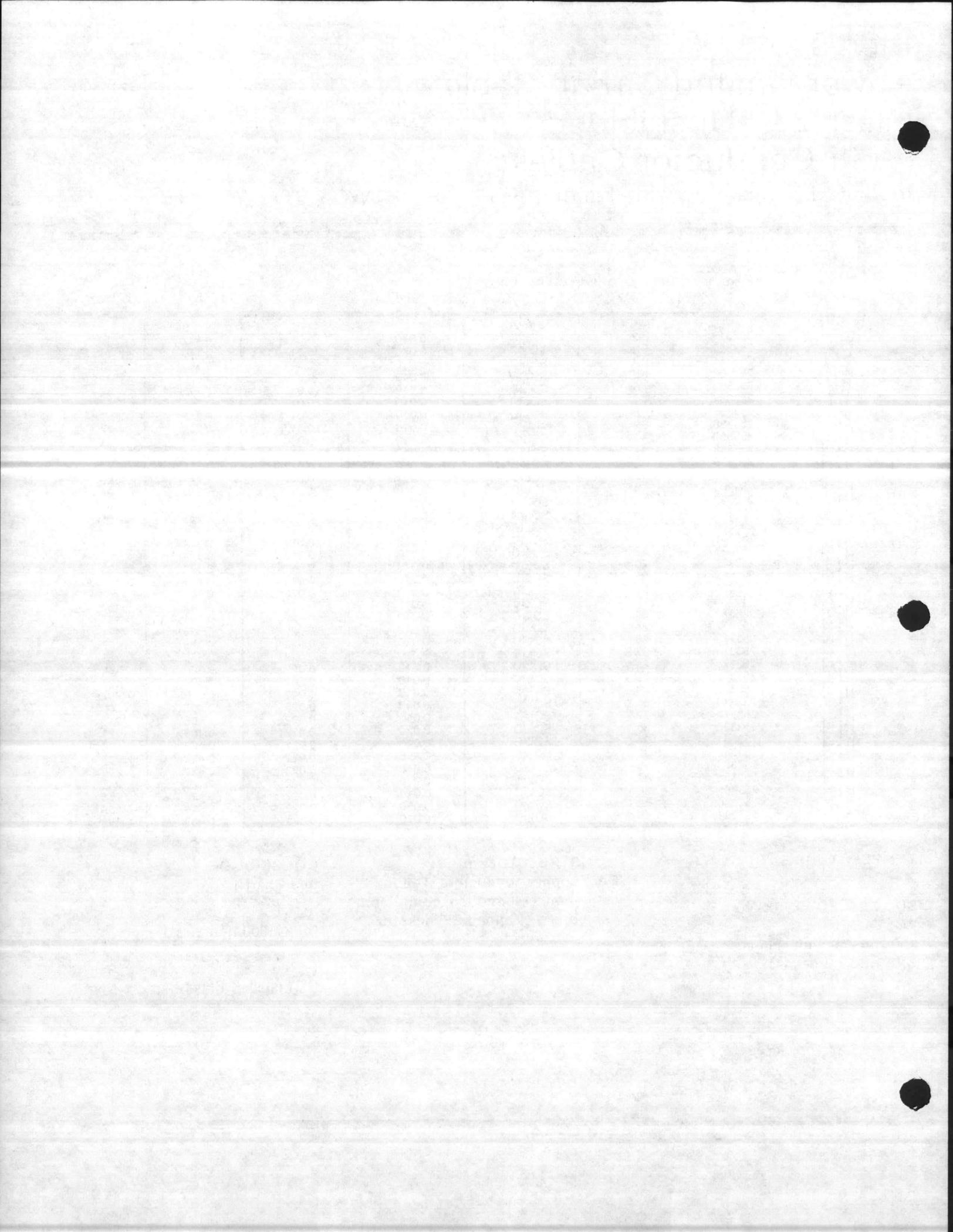
SUGGESTED WORKING
VOLTAGE:
150 volts maximum in accordance
with NEC guidelines.

CONSTRUCTION:
Bare copper conductors, Teflon FEP
insulation, color coded, conductors
cabled, gray Teflon FEP jacket.

COLOR CODE:
See Chart 1

PUT UP:
Bulk, 1000 ft. & 500 ft. reels

UL Listed & Classified



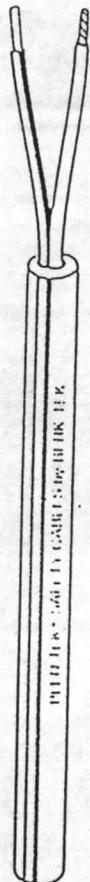
APPLICATION:

For use on Class 2 circuits as described in Article 725 of the National Electric Code and for use with intercom systems, remote control, burglar alarms, and other low voltage systems.

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Plen-Tek® Power Limited Circuit Cable Class 2 — Unshielded Multi-Conductor Cables Insulated & Jacketed with Tek-Flex®

18 AWG SOLID



CATALOG NUMBER	NUMBER OF CONDUCTORS	AWG. STRANDING	INSULATION NOMINAL THICKNESS (in.)	JACKET NOMINAL THICKNESS (in.)	NOMINAL OVERALL DIAMETER (in.)	WEIGHT PER KFT (lbs.)
252349	2	18 AWG SOLID	0.010	0.017	0.142	17
252350	3	SOLID	0.010	0.017	0.150	23
252351	4	SOLID	0.010	0.017	0.164	29
252352	5	SOLID	0.010	0.017	0.180	35
252353	6	SOLID	0.010	0.017	0.196	42
252354	7	SOLID	0.010	0.017	0.196	48
252355	8	SOLID	0.010	0.017	0.213	54
252356	9	SOLID	0.010	0.017	0.229	61
252357	10	SOLID	0.010	0.017	0.250	67
252358	11	SOLID	0.010	0.017	0.258	73
252359	12	SOLID	0.010	0.017	0.272	79
252360	13	SOLID	0.010	0.017	0.272	85
252361	14	SOLID	0.010	0.017	0.288	91
252362	15	SOLID	0.010	0.017	0.288	98
252363	16	SOLID	0.010	0.017	0.304	103
252364	17	SOLID	0.010	0.017	0.304	110
252365	18	SOLID	0.010	0.017	0.304	115
252366	19	SOLID	0.010	0.017	0.321	121
252367	20	SOLID	0.010	0.017	0.321	128
252368	21	SOLID	0.010	0.022	0.347	133
252369	22	SOLID	0.010	0.022	0.347	144
252370	23	SOLID	0.010	0.022	0.368	150
252371	24	SOLID	0.010	0.022	0.368	157
252372	25	SOLID	0.010	0.022	0.368	162
252373	26	SOLID	0.010	0.022	0.376	168
252374	27	SOLID	0.010	0.022	0.390	174
252375	28	SOLID	0.010	0.022	0.390	181
252376	29	SOLID	0.010	0.022	0.390	187
252377	30	SOLID	0.010	0.022	0.406	192
252378	31	SOLID	0.010	0.022	0.406	199
252379	32	SOLID	0.010	0.022	0.406	205
252380	33	SOLID	0.010	0.022	0.422	211
252381	34	SOLID	0.010	0.022	0.422	217
252382	35	SOLID	0.010	0.022	0.422	223
252383	36	SOLID	0.010	0.022	0.422	229
252384	37	SOLID	0.010	0.022	0.439	234
252385	38	SOLID	0.010	0.022	0.439	241
252386	39	SOLID	0.010	0.022	0.439	247
252387	40	SOLID	0.010	0.022	0.439	253

TEMPERATURE RATING:
125°C minimum

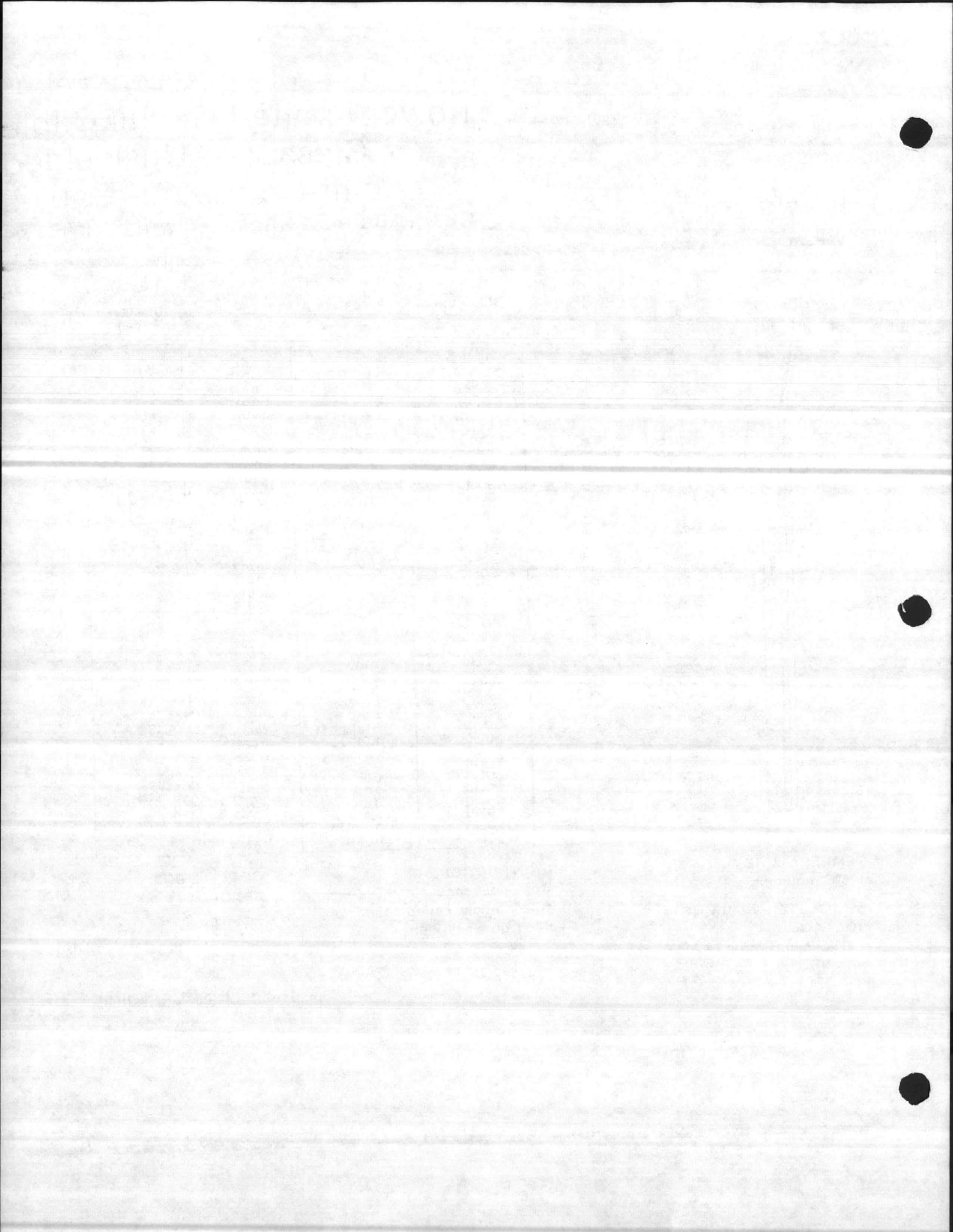
SUGGESTED WORKING VOLTAGE:
150 volts maximum in accordance with NEC guidelines.

CONSTRUCTION:
Bare copper conductors, Tek-Flex insulation, color coded, conductors cabled, gray Tek-Flex jacket.

COLOR CODE:
See Chart 1

PUT UP:
Bulk, 1000 ft. & 500 ft. reels

UL Listed & Classified

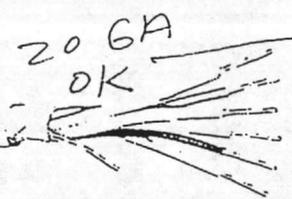


Electronic Cables & Wires

Shielded, Overall

Tinned conductors, poly insulation, mylar/aluminum shield over with drain wire, PVC outer jacket.

No. of Cond.	AWG Size	Conductor Stranding	AWG of Drain Wire	Nom. Ins. Thickness	Nom. Jacket Thickness	Nom. O.D.
2	22	7/30	24	.015	.025	.170
3	22	7/30	24	.015	.025	.180
4	22	7/30	24	.015	.025	.195
5	22	7/30	24	.015	.025	.210
6	22	7/30	24	.015	.025	.225
7	22	7/30	24	.015	.025	.225
8	22	7/30	24	.015	.025	.245
9	22	7/30	24	.015	.025	.260
10	22	7/30	24	.015	.025	.280
11	22	7/30	24	.015	.025	.280
12	22	7/30	24	.015	.025	.300



2	20	7/28	22	.015	.025	.185
3	20	7/28	22	.015	.025	.205
4	20	7/28	22	.015	.025	.215
5	20	7/28	22	.015	.025	.220
6	20	7/28	22	.015	.025	.250
7	20	7/28	22	.015	.025	.265
8	20	7/28	22	.015	.025	.280
9	20	7/28	22	.015	.025	.320
10	20	7/28	22	.015	.025	.335
11	20	7/28	22	.015	.025	.370
12	20	7/28	22	.015	.025	.385

2	18	16/30	20	.018	.030	.225
3	18	16/30	20	.018	.030	.240
4	18	16/30	20	.018	.030	.250

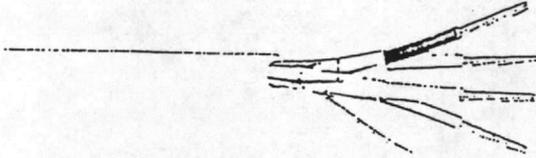
2	16	26/30	18	.030	.030	.310
3	16	26/30	18	.030	.030	.325

2	14	19/27	16	.030	.035	.350
3	14	19/27	16	.030	.035	.365

2	12	19/25	14	.037	.040	.410
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Shielded, Each Pair

Tinned conductors, poly insulation, mylar/aluminum shield with drain over EACH pair, PVC outer jacket.



NO OF COND. COND.	COND. SIZE	COND. STRAND.	NOM. INSULATION THICKNESS (INCHES)	NOM. JACKET THICKNESS (INCHES)	PERCENT SHIELD COVERAGE	SUGGESTED WORKING VOLTAGE	NOM. O.D. (INCHES)
4	22	7/30	.010	.025	100	400V	.185

Shielded, One Pair - One Pair Unshielded (Type PI-PO Pair In, Pair Out)

Tinned conductors, poly insulation, mylar/aluminum shield with drain over ONE pair only, PVC outer jacket.

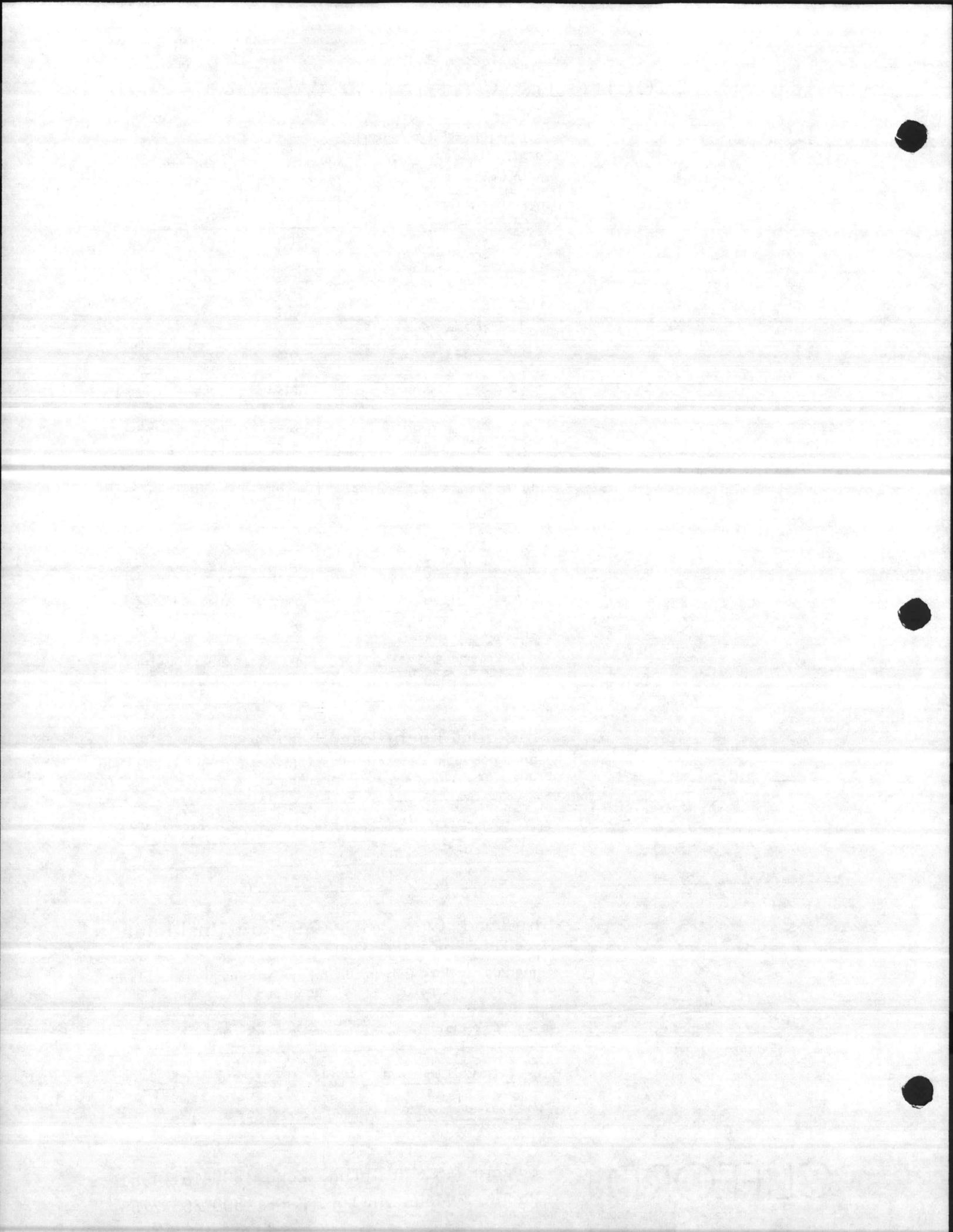


NO OF COND.	CONDUCTOR SIZE	COND. STRAND.	NOM. INSULATION THICKNESS (INCHES)	NOM. JACKET THICKNESS (INCHES)	PERCENT SHIELD COVERAGE	NOM. O.D. (INCHES)
4	2-22 shielded 2-22 unshielded	7/30	.010	.020	100	.185
4	2-20 shielded 2-20 unshielded	10/30	.015	.025	100	.215

CLIFFORD

Eastern & Central Time Zones: 800-451-4381

Pacific & Mountain Time Zones: 800-255-2253





COMMUNICATION AND CONTROL CABLE

2.3.4



UL 2509, UL 2576

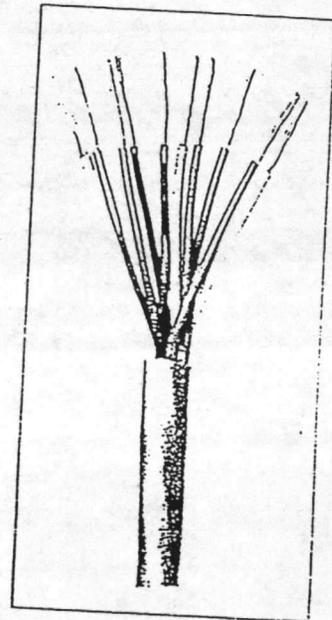
Multiconductor 80°PVC—150 Volts, 300 Volts.

SOLID

Alpha No.	No. of Cond.	Conductor AWG	Strand	Nom. Ins. Thickness Inches	mm	Nom. Jkt. Thickness Inches	mm	Nominal O.D. Inches	mm	Voltage Ratings
1793	22	22	1	.010	.25	.032	.81	.154	3.91	150V
1797	2	18	1	.016	.41	.020	.50	.190	4.83	300V
1798	3	18	1	.016	.41	.020	.50	.200	5.08	300V
1798/4	4	18	1	.016	.41	.020	.50	.220	5.59	300V
1799	2	16	1	.016	.41	.020	.50	.215	5.46	300V

STRANDED

Alpha No.	No. of Cond.	Conductor AWG	Strand	Nom. Ins. Thickness Inches	mm	Nom. Jkt. Thickness Inches	mm	Nominal O.D. Inches	mm	Voltage Ratings
1893	2	22	7/30	.010	.25	.032	.81	.164	4.17	150V
1894	3	22	7/30	.010	.25	.032	.81	.169	4.29	150V
1894/4	4	22	7/30	.010	.25	.032	.81	.194	4.93	150V
1895	2	20	10/30	.016	.41	.020	.50	.180	4.57	300V
1896	3	20	10/30	.016	.41	.020	.50	.190	4.83	300V
1896/4	4	20	10/30	.016	.41	.020	.50	.215	5.46	300V
1896/5	5	20	10/30	.016	.41	.020	.50	.233	5.92	300V
1896/6	6	20	10/30	.016	.41	.020	.50	.255	6.48	300V
1896/7	7	20	10/30	.016	.41	.020	.50	.255	6.48	300V
1896/8	8	20	10/30	.016	.41	.020	.50	.270	6.86	300V
1896/9	9	20	10/30	.016	.41	.020	.50	.300	7.62	300V
1896/10	10	20	10/30	.016	.41	.020	.50	.335	8.51	300V
1896/12	12	20	10/30	.016	.41	.020	.50	.350	8.89	300V
1896/15	15	20	10/30	.016	.41	.020	.50	.395	10.03	300V
1897	2	18	16/30	.016	.41	.020	.50	.200	5.08	300V
1898	3	18	16/30	.016	.41	.020	.50	.210	5.33	300V
1898/4	4	18	16/30	.016	.41	.020	.50	.240	6.10	300V
1898/5	5	18	16/30	.016	.41	.020	.50	.262	6.65	300V
1898/6	6	18	16/30	.016	.41	.020	.50	.290	7.37	300V
1898/7	7	18	16/30	.016	.41	.020	.50	.286	7.26	300V
1898/8	8	18	16/30	.016	.41	.025	.63	.315	8.00	300V
1898/9	9	18	16/30	.016	.41	.025	.63	.346	8.79	300V
1898/10	10	18	16/30	.016	.41	.025	.63	.370	9.40	300V
1898/12	12	18	16/30	.016	.41	.025	.63	.385	9.78	300V
1898/15	15	18	16/30	.016	.41	.030	.76	.445	11.30	300V
1898/19	19	18	16/30	.016	.41	.030	.76	.470	11.94	300V
1898/25	25	18	16/30	.016	.41	.035	.88	.558	14.17	300V
1899	2	16	26/30	.016	.41	.020	.50	.225	5.72	300V
1899/3	3	16	26/30	.016	.41	.020	.50	.245	6.22	300V
1899/4	4	16	26/30	.016	.41	.020	.50	.270	6.86	300V
1891+	2	14	41/30	.020	.50	.020	.50	.260	6.60	350V
1891/3+	3	14	41/30	.020	.50	.020	.50	.280	7.11	350V
1892+	2	12	65/30	.020	.50	.020	.50	.300	7.62	350V
1892/3+	3	12	65/30	.020	.50	.020	.50	.320	8.13	350V



DESCRIPTION

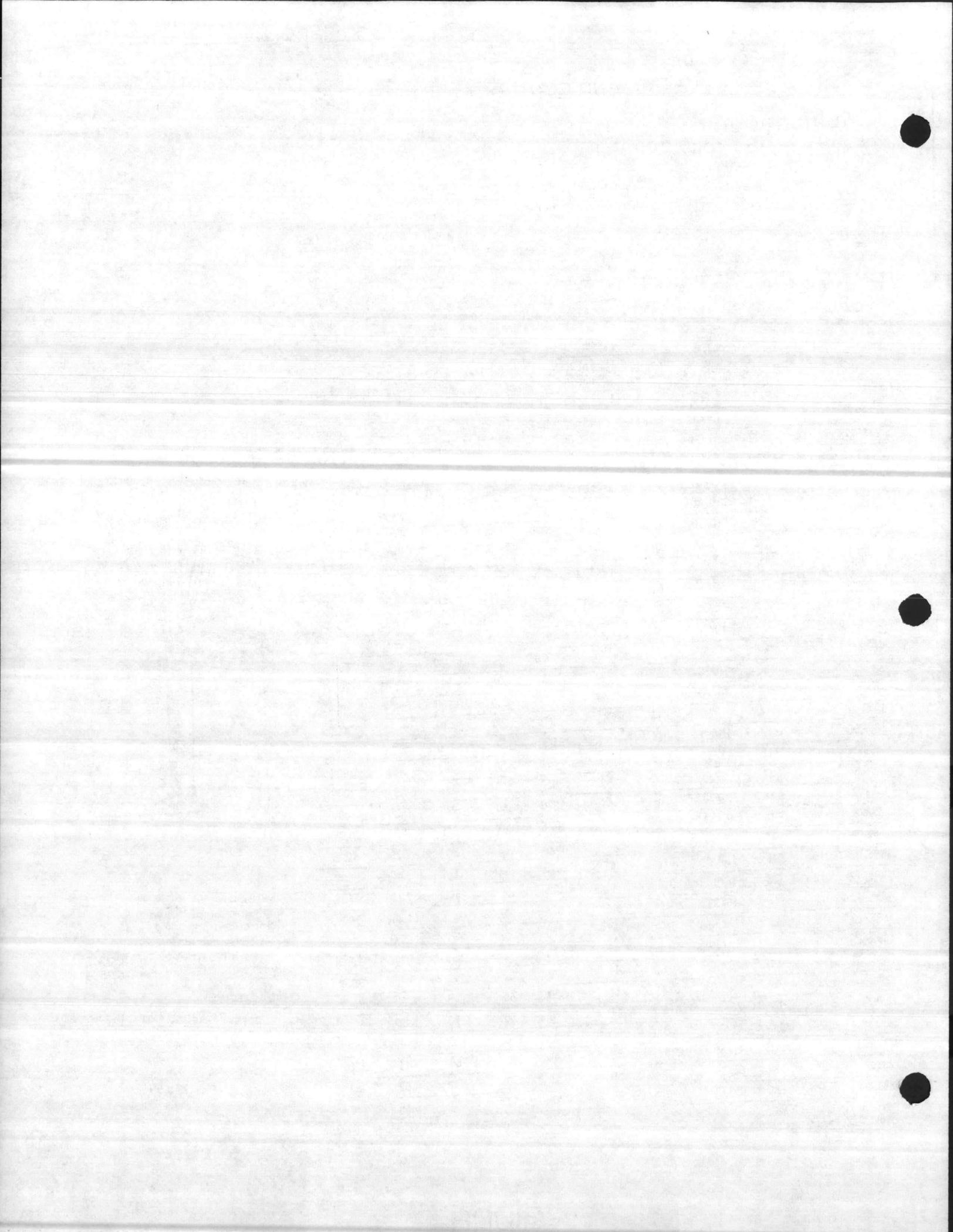
- Each conductor tinned copper
- Color coded polyvinylchloride insulation
- Gray polyvinylchloride jacket
- Items with .010" ins. per UL 2576
- Items with .016" ins. per UL 2509

CHARACTERISTICS

- Temperature Range: -20°C to +80°C (UL 80°C)

*These items not listed by UL.
COLOR CODE: Chart D Page 58

STANDARD PUT-UP: 100 Ft., 500 Ft., 1000 Ft.





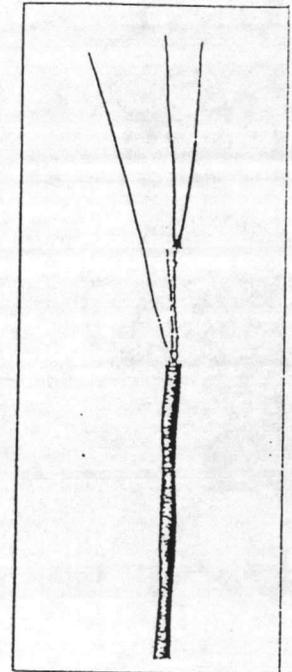
Multiconductor Foil Shield 60°C PE/PVC—300 Volts

*UL 2092, 2093, 2094

Alpha No.	No. of Cond.	Conductor AWG	Strand	Nom. Ins. Thickness Inches	mm	Nom. Wall Thickness Inches	mm	Nominal O.D. Inches	mm	Cond. Color Code
2400	2	24	7/32	.016	.41	.020	.50	.160	4.06	1, 3
2401	2	22	7/30	.016	.41	.020	.50	.170	4.32	1, 3
2402	2	22	7/30	.016	.41	.020	.50	.170	4.32	1, 2
2403	3	22	7/30	.016	.41	.020	.50	.185	4.70	1, 2, 3
2404	4	22	7/30	.016	.41	.020	.50	.210	5.33	1, 2, 3, 4
2411	2	20	10/30	.016	.41	.020	.50	.186	4.72	1, 3
2412	2	20	10/30	.016	.41	.020	.50	.186	4.72	1, 2
2413	3	20	10/30	.016	.41	.020	.50	.205	5.21	1, 2, 3
2414	4	20	10/30	.016	.41	.020	.50	.225	5.72	1, 2, 3, 4
2421	2	18	16/30	.016	.41	.020	.50	.210	5.33	1, 3
2422	2	18	16/30	.016	.41	.020	.50	.210	5.33	1, 2
2423	3	18	16/30	.016	.41	.020	.50	.230	5.84	1, 2, 3
2424	4	18	16/30	.016	.41	.020	.50	.255	6.48	1, 2, 3, 4
2432	2	16	26/30	.016	.41	.020	.50	.245	6.22	1, 2
2433	3	16	26/30	.016	.41	.020	.50	.270	6.86	1, 2, 3
2442†	2	12	41/30	.020	.50	.030	.76	.310	7.87	1, 3
2444†	2	12	65/30	.020	.50	.030	.76	.350	8.89	1, 3

COLOR CODE: 1—Black; 2—Red; 3—Clear; 4—Green.
*2 Cond.—UL 2092, 3 Cond.—UL 2093, 4 Cond.—UL 2094.
†NOT UL LISTED.

STANDARD PUT-UP: 100 FT., 500 FT., 1000 FT.



DESCRIPTION

- Each conductor stranded tinned copper
- Color coded polyethylene insulation
- Conductors cabled
- Wrapped Mylar supported aluminum foil shield
- Drain wire
- Gray polyvinylchloride jacket

CHARACTERISTICS

- Suggested Temperature Range: -20°C to +80°C (UL +60°C)
- Voltage Rating: 300 volts
- Light weight
- Small cable diameter
- Provides 100% shield coverage

Miniature Foil Shield 105°C PP/PVC—200 Volts

TWO CONDUCTOR

Alpha No.	Conductor AWG	Strand	Nom. Jkt. Thickness Inches	mm	Nominal O.D. Inches	mm
2460†	22	Solid	.018	.45	.118	3.00
2461†	22	7/30	.020	.50	.135	3.43

COLOR CODE: Black, Red.
†NOT UL LISTED.

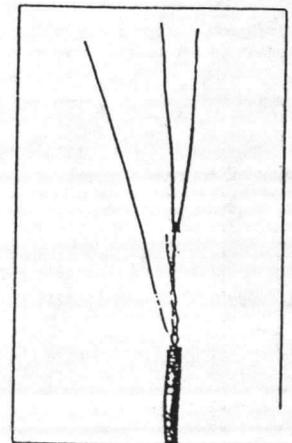
STANDARD PUT-UP: 100 FT., 500 FT., 1000 FT.

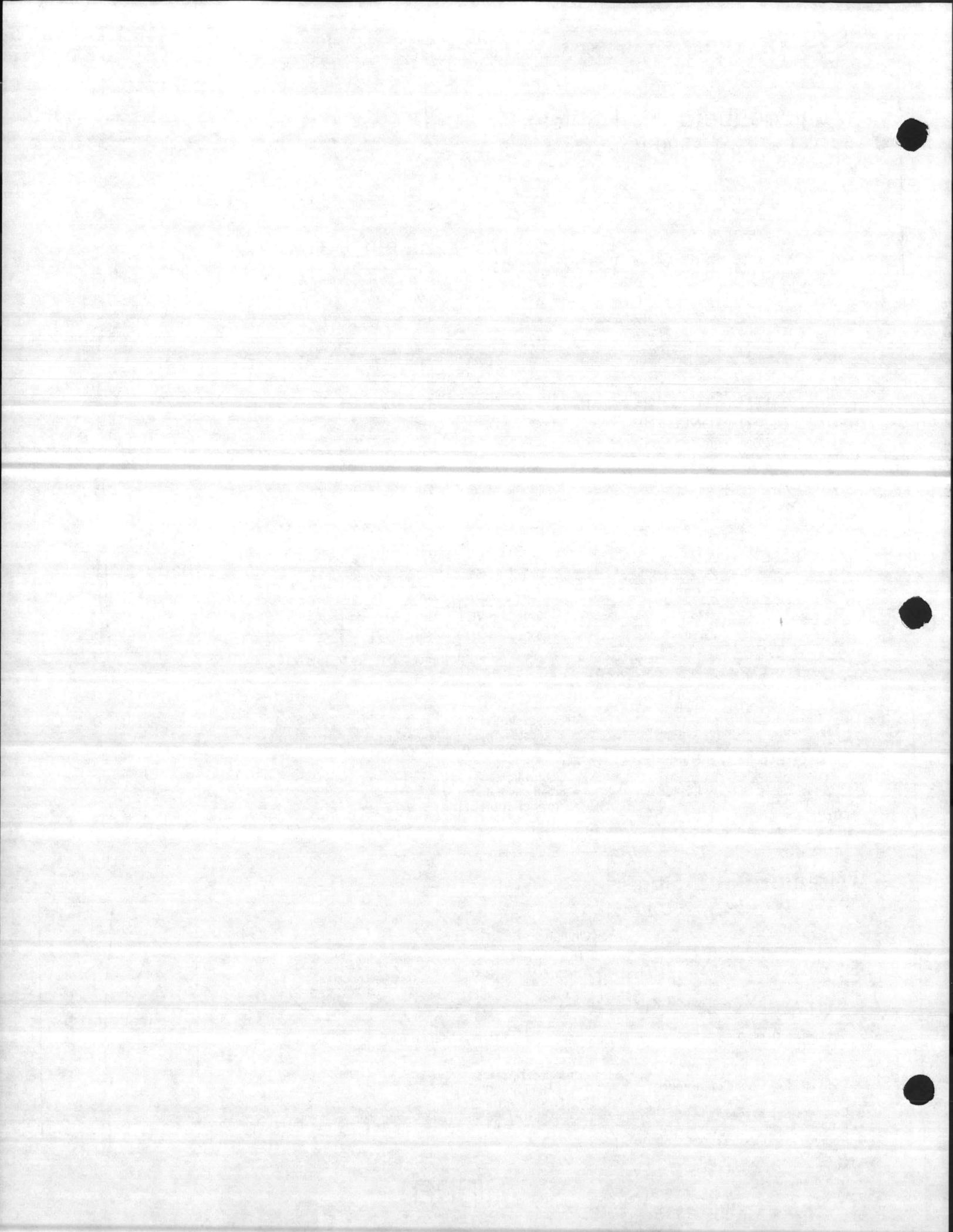
DESCRIPTION

- Each conductor solid or stranded tinned copper
- Color coded polypropylene insulation
- Nominal Ins. thickness .008" (.20 mm)
- Aluminum-Mylar foil shield with drain wire
- Gray polyvinylchloride jacket

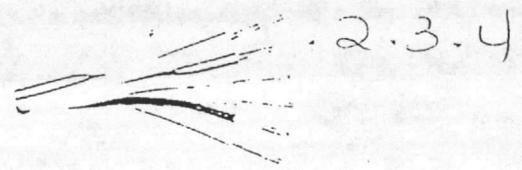
CHARACTERISTICS

- Temperature Range: -20°C to +105°C
- Suggested Working Voltage: 200 Volts





Electronic Cables & Wires



Multi-Conductor Unshielded

Tinned conductors, Poly insulation, PVC outer jacket.

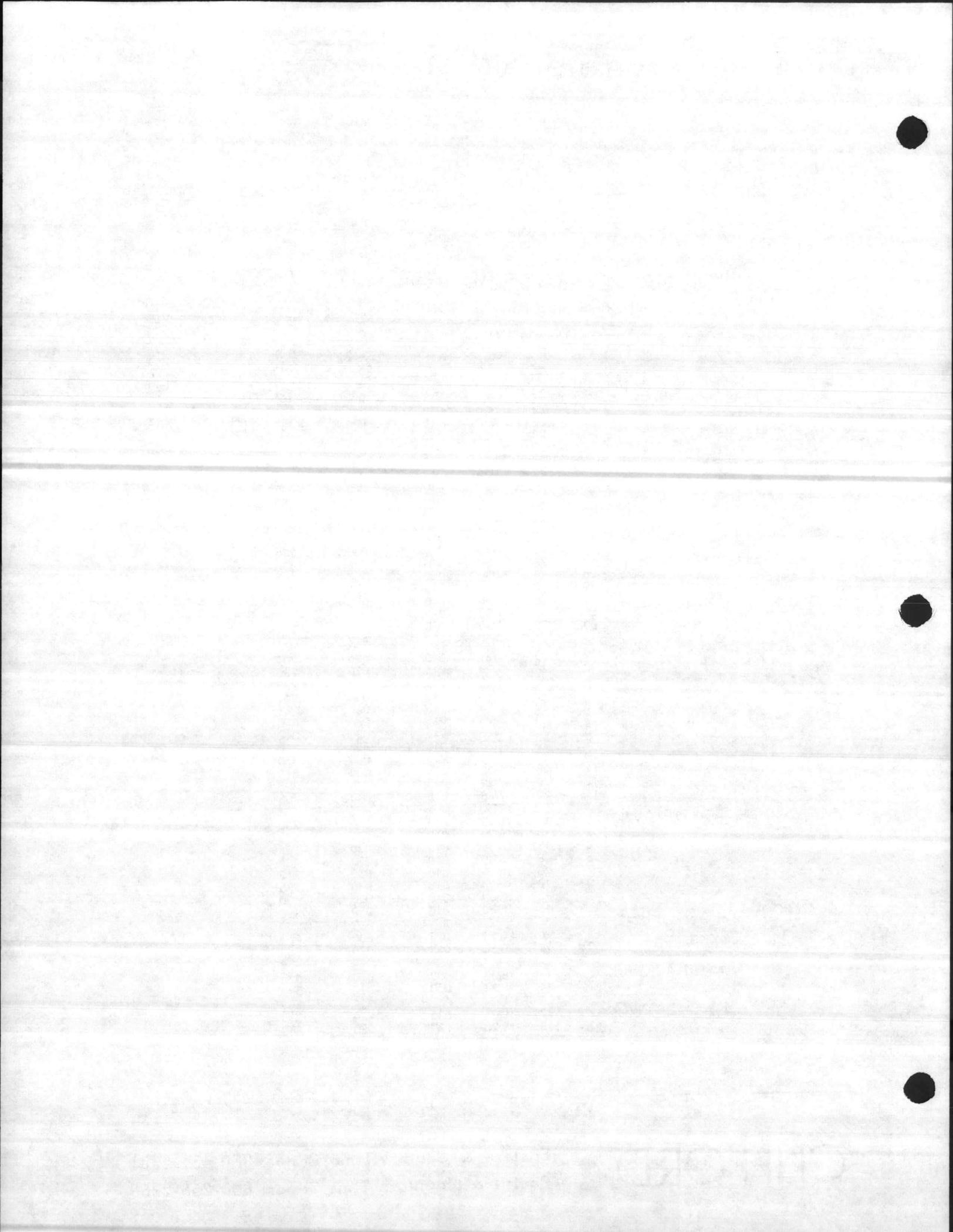
	No of Cond.	Cond Size	Cond. Strand.	Nom Ins Thickness (Inches)	Nom Jacket Thickness (Inches)	Approx OD (Inches)	
22 AWG	2	22	7/30	.012	.025	.165	
	3	22	7/30	.010	.030	.170	
	4	22	7/30	.010	.030	.180	
	5	22	7/30	.010	.030	.195	
	6	22	7/30	.010	.030	.210	
	7	22	7/30	.010	.030	.210	
	8	22	7/30	.010	.030	.230	
	9	22	7/30	.010	.030	.245	
	10	22	7/30	.010	.030	.265	
	11	22	7/30	.010	.030	.270	
	12	22	7/30	.010	.030	.270	
	15	22	7/30	.010	.030	.290	
	18	22	7/30	.010	.030	.315	
	20	22	7/30	.010	.030	.330	
	25	22	7/30	.010	.030	.365	
	30	22	7/30	.010	.030	.400	
40	22	7/30	.010	.040	.450		
50	22	7/30	.010	.040	.500		
60	22	7/30	.010	.040	.535		
20 AWG	2	20	7/28	.015	.030	.200	
	3	20	7/28	.015	.030	.230	
	4	20	7/28	.015	.030	.230	
	5	20	7/28	.015	.030	.256	
	6	20	7/28	.015	.030	.265	
	7	20	7/28	.015	.030	.300	
	8	20	7/28	.015	.030	.310	
	9	20	7/28	.015	.030	.350	
	10	20	7/28	.015	.030	.350	
	11	20	7/28	.015	.030	.370	
	12	20	7/28	.015	.030	.390	
	14	20	7/28	.015	.040	.405	
	18 AWG	2	18	16/30	.018	.030	.236
		3	18	16/30	.018	.030	.245
4		18	16/30	.018	.030	.265	
5		18	16/30	.018	.030	.285	
7		18	16/30	.018	.030	.310	
9		18	16/30	.018	.030	.375	
12		18	16/30	.018	.030	.400	
15		18	16/30	.018	.030	.420	
16 AWG	2	16	26/30	.023	.030	.265	
	3	16	26/30	.023	.030	.280	
14 AWG	2	14	19/27	.030	.030	.335	
	3	14	19/27	.030	.030	.340	
12 AWG	2	12	19/25	.030	.030	.375	
	3	12	19/25	.030	.030	.380	

CLIFFORD

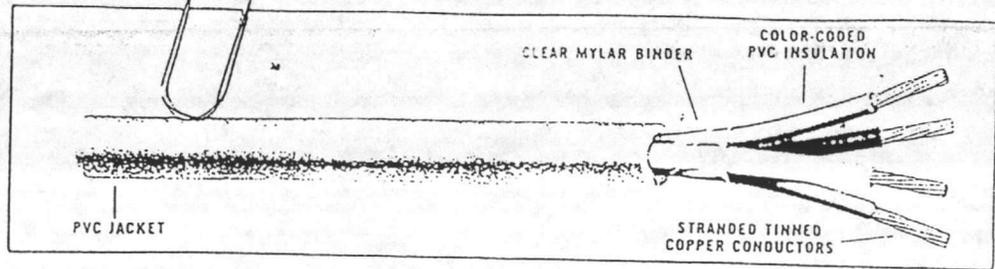
Eastern & Central Time Zones: 800-451-4381

Pacific & Mountain Time Zones: 800-255-2253

or call collect: 802-234-9921



**Control Cable
Multi-Conductor
Unshielded
PVC Jacket**



Stock Color: Chrome gray jacket.

Construction: Tinned copper conductors, color-coded PVC insulation, mylar binder overall (no mylar binder on Cat. Nos. C2404, C2420, C2421, C2422), PVC jacket, conductors cabled.

Specifications: -20°C to +60°C. Suggested working voltage — 18 gauge — 400V; 16 gauge — 12 gauge — 600V. ENTIRE CABLE PASSES VW-1 VERTICAL FLAME TEST.

Applications: Interconnecting cables for electronic equipment, control circuits, broadcast and studio use, temperature control systems.

Put-up: 100', 500' and 1000' spools. (Other put-ups also available.)

CATALOG NUMBER	NUMBER OF CONDUCTORS	CONDUCTOR SIZE	CONDUCTOR STRANDING	NOM. INSULATION THICKNESS (INCHES)	NOM. JACKET THICKNESS (INCHES)	NOM. O.D. (INCHES)
----------------	----------------------	----------------	---------------------	------------------------------------	--------------------------------	--------------------

COLOR CODE OF CONDUCTORS

CONDUCTOR.....	COLOR
1.....	Black
2.....	White
3.....	Red
4.....	Green
5.....	Orange
6.....	Blue
7.....	White/Black
8.....	Red/Black
9.....	Green/Black
10.....	Orange/Black
11.....	Blue/Black
12.....	Black/White
13.....	Red/White
14.....	Green/White
15.....	Blue/White
16.....	Black/Red
17.....	White/Red
18.....	Orange/Red
19.....	Blue/Red
20.....	Red/Green
21.....	Orange/Green
22.....	Black/White/Red
23.....	White/Black/Red
24.....	Red/Black/White
25.....	Green/Black/White

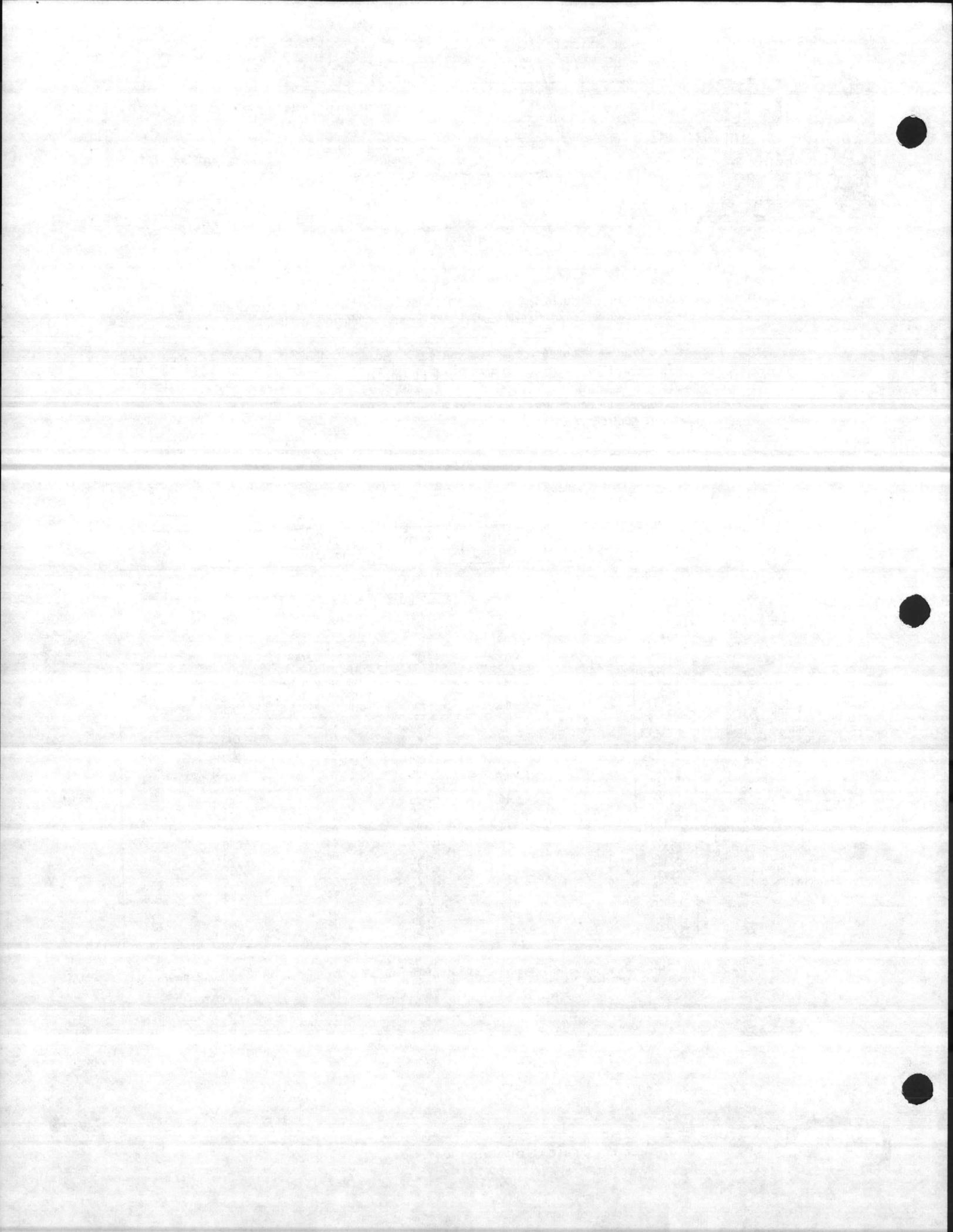
Per IPCEA Color Code.

UL listed						
C2404	4	18	16/30	.018 (UL-2464)	.030	.265
C2420	5	18	16/30	.018 (UL-2274)	.037	.300
C2421	7	18	16/30	.018 (UL-2276)	.037	.324
C2422	9	18	16/30	.018 (UL-2278)	.037	.379
C2412	12	18	16/30	.018 (UL-2281)	.040	.430
C2423	15	18	16/30	.018 (UL-2284)	.045	.485
C2424	19	18	16/30	.018 (UL-2288)	.045	.510
C2433	25	18	16/30	.018 (UL-2598)	.060	.625
C2425	4	16	19/29	.030	.045	.375
C2434	5	16	19/29	.030	.045	.410
C2426	7	16	19/29	.030	.045	.445
C2435	9	16	19/29	.030	.045	.510
C2427	12	16	19/29	.030	.060	.610
C2428	15	16	19/29	.030	.060	.675
C2429	19	16	19/29	.030	.065	.725
C2436	25	16	19/29	.030	.065	.830
C2430	4	14	19/27	.045	.045	.480
C2437	5	14	19/27	.045	.060	.555
C2431	7	14	19/27	.045	.060	.605
C2438	9	14	19/27	.045	.065	.715
C2432	12	14	19/27	.045	.065	.800
C2439	15	14	19/27	.045	.080	.920
C2440	4	12	65/30	.045	.045	.540
C2442	7	12	65/30	.045	.060	.675
C2444	10	12	65/30	.045	.080	.900

First color in stripe combination is body color. Second or third colors are stripes. Example: White/Black/Red. Other striped combinations available to order.

Color Code Chart 1, P. 14





ELECTRICAL METALLIC TUBING (E.M.T.) Specifications

When you specify Allied E.M.T., you can be sure of full value. Full protection for the electrical system, economical installation, and total code compliance for the raceway system.

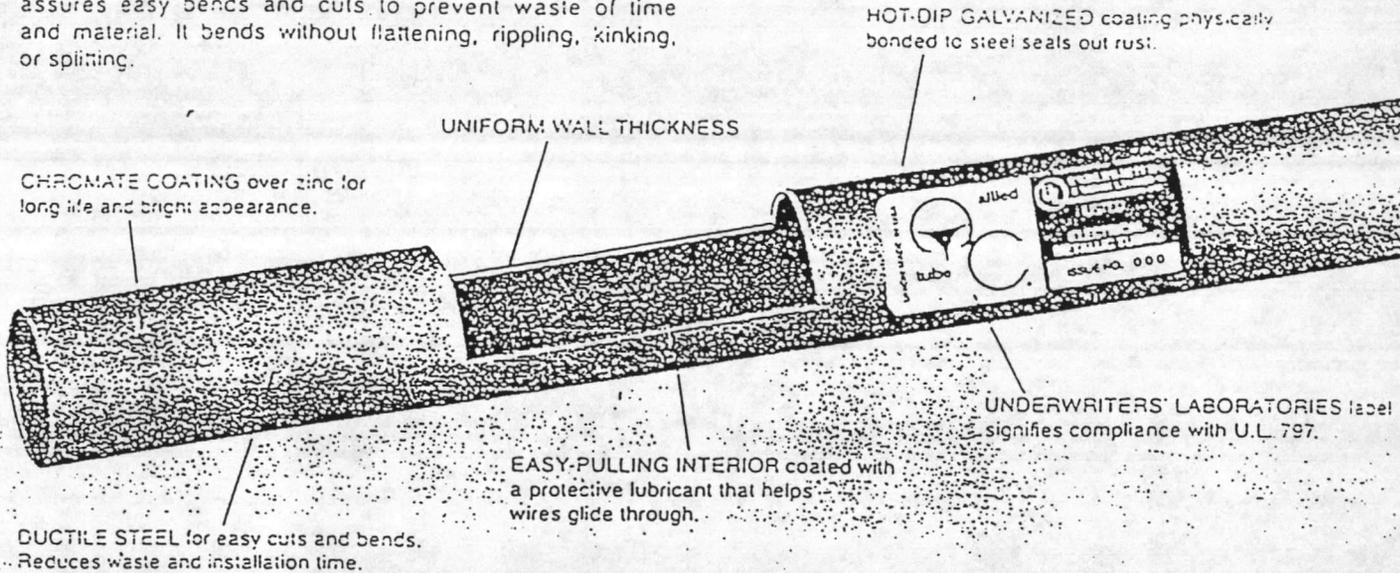
Allied E.M.T. is easy to cut, bend and join. It provides smooth, continuous raceways for fast wire pulling. (Allied E.M.T. is also known by the descriptive brand name E-Z Pull™ thinwall.)

Allied E.M.T. resists rust, impact, and chemical attack. It provides radiation protection and magnetic shielding. It is manufactured from the highest grade mild strip steel—steel that combines damage-resistant strength with ductility that assures easy bends and cuts to prevent waste of time and material. It bends without flattening, rippling, kinking, or splitting.

The exterior of Allied E.M.T. is first hot-dip galvanized by the patented Allied Flo-Coat® process and then chromated. These two uniformly applied coats form an uninterrupted double barrier against rust.

The interior wall of Allied E.M.T. is coated with a specially formulated silicone epoxy-ester lubricant for easier fishing and wire pulling, even through multiple 90° bends.

Recognized as an equipment grounding conductor (NEC Article 250-91b).



Specifying Allied E.M.T.

To specify Allied E.M.T., include the following: All thinwall conduit (Electrical Metallic Tubing) shall be as manufactured by Allied Tube & Conduit Corporation. This tubing shall be galvanized steel, bear an Underwriters' Laboratories Label, and shall conform to Federal

Specification WWC-563 (latest revision) and American National Standards Institute (A.N.S.I.) Specification C80.3. Installation of E.M.T. shall be in accordance with Article 348 of the National Electrical Code and U.L. General Information Card #FJMX.

Weights and Dimensions for Electrical Metallic Tubing

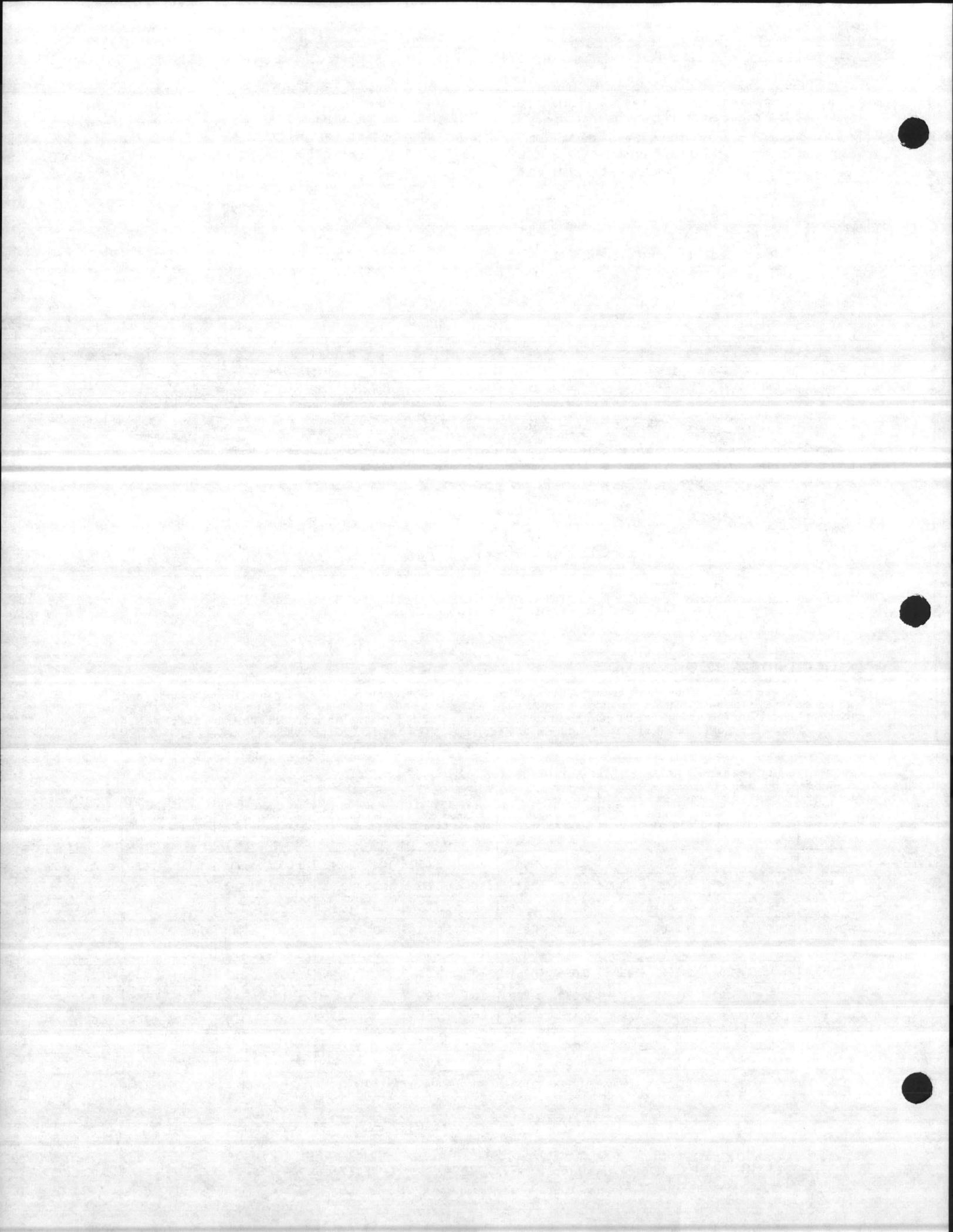
Trade Size, Inches	Approx. Wt. per 100 FT. (30.5m)		Nominal Outside Dia.		Nominal Wall Thickness		Length of Finished Conduit		Quantity in Primary Bundle		Quantity in Master Bundle		Approx. Wt. of Master Bundle		Volume of Master Bundle	
	lb	kg	In.	mm	In.	mm	ft	m	ft	m	ft	m	lb	kg	cu ft	cu m
1/2"	29	13.15	0.706	17.9	0.042	1.067	10	3.05	100	30.48	5,000	1,524	1,450	658	23.3	0.659
3/4"	45	20.41	0.922	23.4	0.049	1.245	10	3.05	100	30.48	5,000	1,524	2,250	1,021	33.0	0.934
1"	65	29.48	1.163	29.5	0.057	1.448	10	3.05	50	15.24	2,500	762	1,625	737	31.8	0.900
1 1/4"	96	43.55	1.510	38.4	0.065	1.651	10	3.05	50	15.24	2,000	610	1,920	871	45.2	1.279
1 1/2"	111	50.35	1.740	44.2	0.065	1.651	10	3.05	50	15.24	1,500	457	1,665	755	39.0	1.104
2"	141	63.96	2.197	55.8	0.065	1.651	10	3.05	30	9.14	1,000	305	1,410	640	41.7	1.181
2 1/2"	215	97.52	2.875	73.0	0.072	1.829	10	3.05	—	—	610	186	1,312	595	46.7	1.322
3"	250	117.94	3.500	88.9	0.072	1.829	10	3.05	—	—	520	159	1,552	704	56.0	1.586
3 1/2"	325	147.42	4.000	101.6	0.083	2.108	10	3.05	—	—	370	113	1,203	546	48.6	1.375
4"	390	175.90	4.500	114.3	0.083	2.108	10	3.05	—	—	300	91	1,170	531	54.2	1.535

*Outside diameter tolerances: ± .005 in. (0.13 mm) for trade sizes 1/2" through 2"; ± .010 in. (0.25 mm) for trade size 2 1/2"; ± .015 in. (0.38 mm) for trade size 3"; ± .020 in. (0.51 mm) for trade sizes 3 1/2" and 4". Length tolerance: ± .25" ± .35 mm. 1/2" and 3/4" end-to-end galvanized.



16100 S. Lathrop, Harvey, IL 60426 Phone: (312) 339-1610, Telex: 25-4352
Primary manufacturing facilities in Harvey, IL, and Philadelphia, PA.

Form # ATC-L-1127
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Flexible Steel Metallic Conduit

Refer to pages 1-1-4 for Zone Designations

2-3-4

Size	Lbs. Per 100 Feet	Feet Per Coil
2"	26	250
2 1/2"	47	100
3"	56	100
3 1/2"	102	50
4"	125	50
4 1/2"	162	50
5"	213	25
5 1/2"	263	25
6"	313	25

Refer to Branch Price Sheet for Prices.



Flexible Aluminum Metallic Conduit

Prices vary according to zones and are F.O.B. Southern California.

Size	Lbs. Per 100 Feet	Feet Per Coil	Size	Lbs. Per 100 Feet	Feet Per Coil
1/2"	9	250	2"	73	25
3/4"	16	100	2 1/2"	90	25
1"	21	100	3"	108	25
1 1/4"	35	50	3 1/2"	125	25
1 1/2"	43	50	4"	142	25
1 3/4"	56	25			

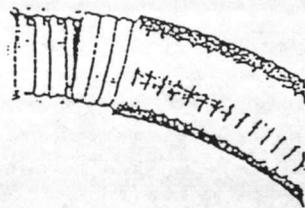
Refer to Branch Price Sheet for Prices.

Refer to Branch Price Sheet for Prices.



Electri-Flex Flexible Liquidtight Conduit

Moisture-proof and oil-proof polyvinyl chloride cover, black, grey or white, is extruded over galvanized steel flexible tubing.



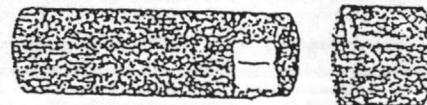
Type EF	Size	Ft. Per Coil	Less Coil (Per 100 Ft.)	Coil to 1000 Feet (Per 100 Ft.)	Size	Ft. Per Coil	Less Coil (Per 100 Ft.)	Coil to 1000 Feet (Per 100 Ft.)
1/2"	1/2"	250	\$ 64.50	\$ 57.20	1 1/2"	50	\$ 265.60	\$ 241.25
3/4"	3/4"	200	73.30	64.55	2"	50	324.20	292.40
1"	1"	175	98.10	86.40	2 1/2"	50	602.50	545.40
1 1/4"	1 1/4"	100	147.65	130.30	3"	25	857.40	778.75
1 1/2"	1 1/2"	100	192.65	170.25	4"	25	1207.65	1095.40

Fibre Conduit Tapered End

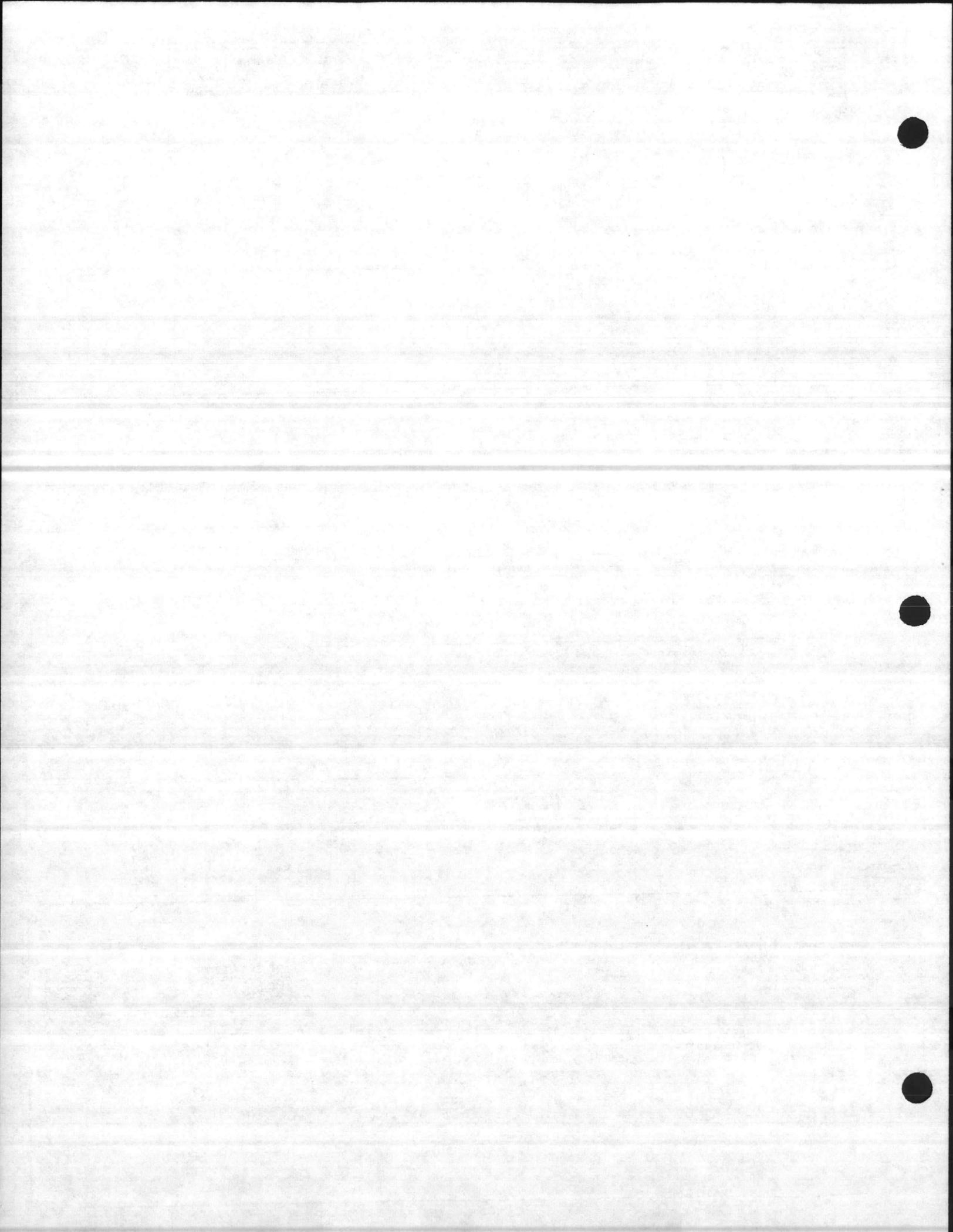
Class 500—Multi purpose for EB or DB service
 Class 1200—Extra strength for DB service
 Class 2000—Severe DB service
 Meet Federal, NEMA and UL requirements
 In 8 and 10 foot lengths with one coupling

Available couplings include flush style plastic (Factory installed) internal lock for internal joining available

Refer to pages 1-1-4 for Zone Designations



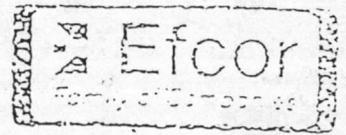
Size	Class 500 Lbs. Per 100 Feet	Zone 1 Class 500 (Per 100 Ft.)	Zone 2 Class 500 (Per 100 Ft.)	Class 1200 Lbs. Per 100 Feet	Zone 1 Class 1200 (Per 100 Ft.)	Zone 2 Class 1200 (Per 100 Ft.)	Class 2000 Lbs. Per 100 Feet	Zone 1 Class 2000 (Per 100 Ft.)	Zone 2 Class 2000 (Per 100 Ft.)
2"	115	\$ 44.00	\$ 50.50	130	\$ 69.00	\$ 79.00	166	\$ 85.00	\$ 97.75
3"	140	57.00	65.55	170	93.00	105.00	270	126.00	141.90
4"	200	85.00	97.75	260	132.00	147.00	380	177.00	197.05
5"	340	130.00	149.50	450	213.00	237.00	660	297.00	336.05
6"	425	155.00	178.50	560	263.00	295.00	810	363.00	409.05



C1

Liquidtight Conduit Box Connectors for Flexible Metallic Liquidtight Conduit

Price Schedule EFC 1284 - December 3, 1964



STRAIGHT-MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS



UL (SF)

1/2" to 2"

2 1/2" to 6"

CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
11-80	1/2	13	25	100	232.90	151.90	145.50
11-50	3/4	19	25	100	222.90	151.90	145.50
11-75	1	13	10	50	319.20	249.30	199.50
11-100	1 1/4	13	5	25	457.00	364.60	291.90
11-100B	1 1/4	23	5	25	802.10	626.60	501.30
11-150	1 1/2	12	2	10	1143.10	893.00	714.40
11-200	2	9	—	5	2089.00	—	1305.60
11-250	2 1/2	15	—	5	10091.60	—	6307.40
11-300	3	21	—	5	11394.30	—	7121.40
11-350	3 1/2	27	—	5	13352.00	—	8345.00
11-400	4	31	—	5	13352.00	—	8345.00
11-500	5	14	—	1	—	—	14917.70
11-600	6	15	—	1	—	—	35336.10

STRAIGHT MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS INSULATED



UL (SF)

1/2" to 2"

2 1/2" to 6"

CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
11-36B	1/2	13	25	100	250.10	195.40	156.20
11-50B	3/4	19	25	100	250.10	195.40	156.20
11-75B	1	13	10	50	364.70	284.90	227.90
11-100B	1 1/4	13	5	25	583.70	440.40	352.30
11-125B	1 1/2	23	5	25	883.10	689.90	551.90
11-150B	1 1/2	12	2	10	1257.70	982.60	786.00
11-200B	2	9	—	5	2346.10	—	1455.30
11-250B	2 1/2	15	—	5	11955.80	—	7491.10
11-300B	3	21	—	5	13344.90	—	8340.60
11-350B	3 1/2	27	—	5	15917.80	—	9948.60
11-400B	4	31	—	5	15917.80	—	9948.60
11-500B	5	14	—	1	—	—	19939.50
11-600B	6	15	—	1	—	—	36191.00

90°-MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS



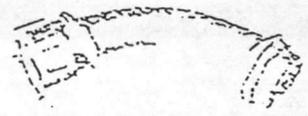
(SF)

1/2" to 2"

2 1/2" to 5"

CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
12-38	1/2	13	10	50	345.00	259.50	215.60
12-50	3/4	16	10	50	345.00	259.50	215.60
12-75	1	25	10	50	528.30	412.70	330.20
12-100	1 1/4	17	5	25	1067.40	833.90	667.10
12-100B	1 1/4	33	5	25	1636.80	1278.70	1023.00
12-150	1 1/2	20	2	10	1990.50	1555.20	1244.10
12-200	2	15	—	5	2912.20	—	1823.80
12-250	2 1/2	9	—	1	—	—	7917.20
12-300	3	15	—	1	—	—	9597.50
12-400	4	29	—	1	—	—	12269.60
12-500	5	60	—	1	—	—	26353.90

90°-MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS INSULATED



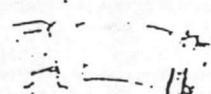
UL (SF)

1/2" to 2"

2 1/2" to 5"

CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
12-38B	1/2	13	10	50	413.70	323.20	258.50
12-50B	3/4	16	10	50	413.70	323.20	258.50
12-75B	1	25	10	50	626.00	489.10	391.20
12-100B	1 1/4	17	5	25	1188.50	928.50	742.60
12-100B	1 1/4	33	5	25	1723.70	1348.70	1077.30
12-150B	1 1/2	19	2	10	2129.70	1663.60	1331.00
12-200B	2	15	—	5	3173.20	—	1983.20
12-250B	2 1/2	9	—	1	—	—	9277.40
12-300B	3	15	—	1	—	—	11149.50
12-400B	4	29	—	1	—	—	14411.30
12-500B	5	60	—	1	—	—	28922.80

45°-MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS



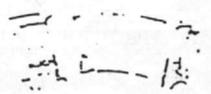
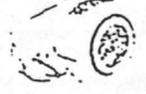
UL (SF)

1/2" to 2"

2 1/2" to 5"

CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
13-38	1/2	12	10	50	345.00	259.50	215.60
13-50	3/4	14	10	50	345.00	259.50	215.60
13-75	1	21	10	50	528.30	412.70	330.20
13-100	1 1/4	16	5	25	1067.40	833.90	667.10
13-100B	1 1/4	31	5	25	1636.80	1278.70	1023.00
13-150	1 1/2	18	2	10	1990.50	1555.20	1244.10
13-200	2	15	—	5	2912.20	—	1823.80
13-250	2 1/2	9	—	1	—	—	8070.70
13-300	3	15	—	1	—	—	9779.80
13-400	4	29	—	1	—	—	12782.60
13-500	5	60	—	1	—	—	26353.90

45°-MALLEABLE IRON-LIQUID-TIGHT CONDUIT CONNECTORS INSULATED

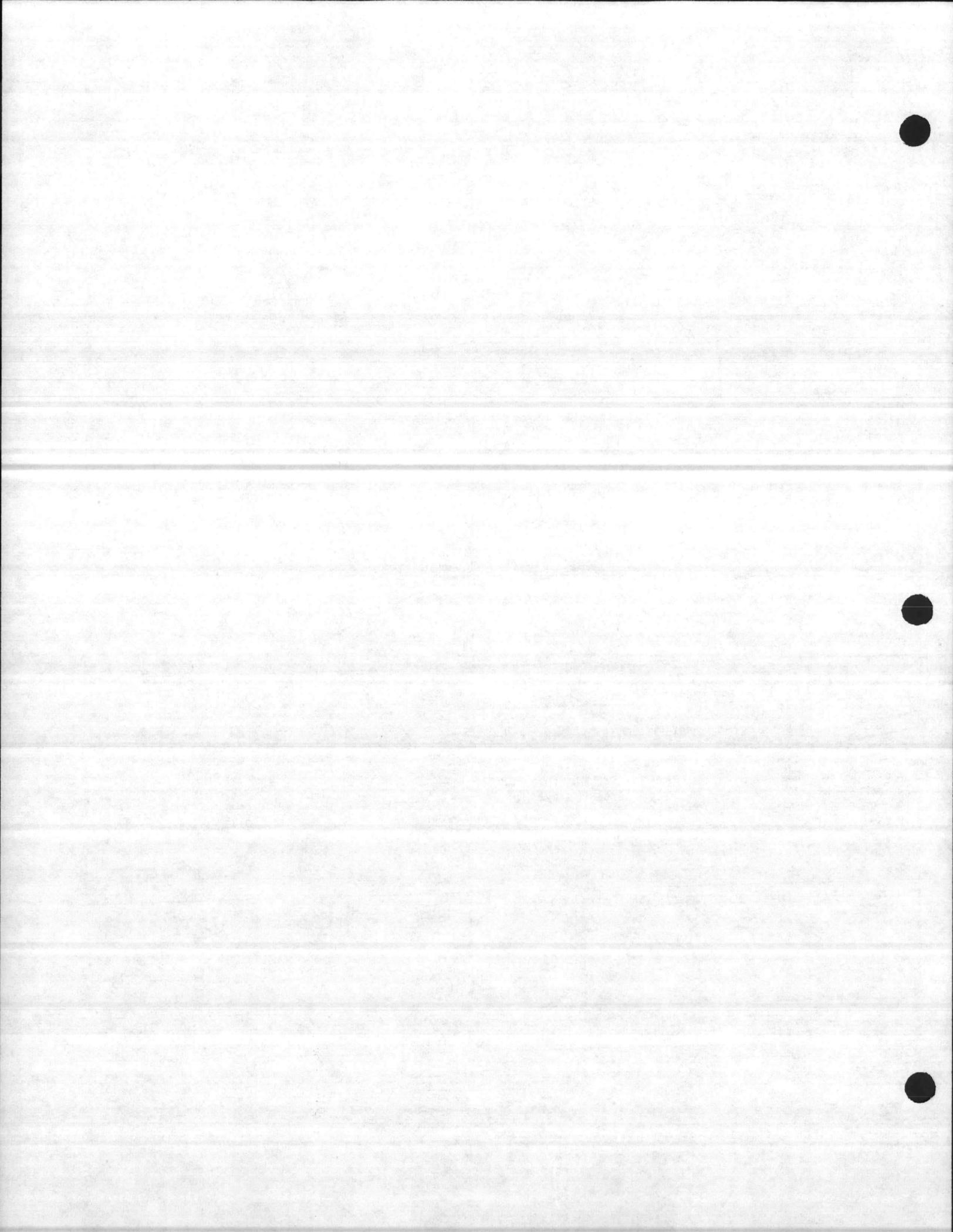


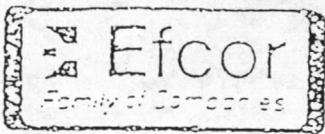
UL (SF)

1/2" to 2"

2 1/2" to 5"

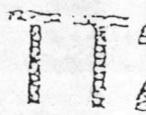
CATALOG NUMBER	SIZE	WGT PER STD PKG	PACKAGING		NET PRICE PER 100		
			UNIT CTN	STD PKG	LESS UNIT CTN	UNIT CTN	STD PKG
13-38B	1/2	12	10	50	413.70	323.20	258.50
13-50B	3/4	14	10	50	413.70	323.20	258.50
13-75B	1	21	10	50	626.00	489.10	391.20
13-100B	1 1/4	16	5	25	1188.50	928.50	742.60
13-100B	1 1/4	31	5	25	1723.70	1348.70	1077.30
13-150B	1 1/2	18	2	10	2129.70	1663.60	1331.00
13-200B	2	15	—	5	3173.20	—	1983.20
13-250B	2 1/2	9	—	1	—	—	9277.40
13-300B	3	15	—	1	—	—	11149.50
13-400B	4	29	—	1	—	—	14411.30
13-500B	5	60	—	1	—	—	28922.80



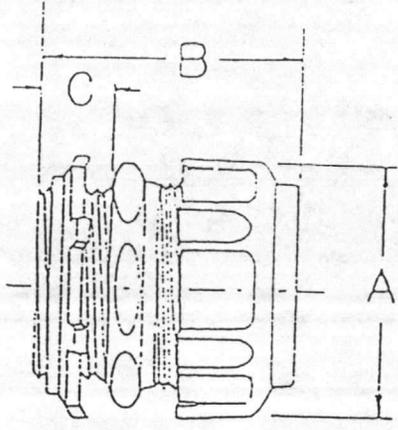


Technical Data Steel EMT

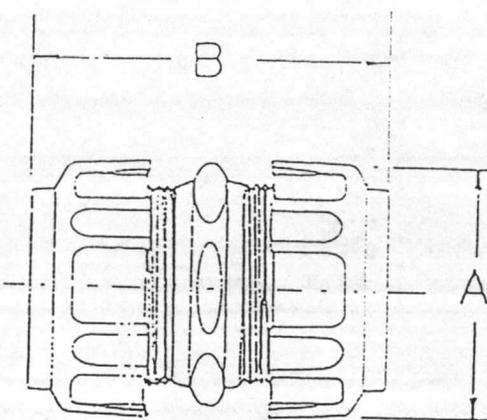
2.3.4



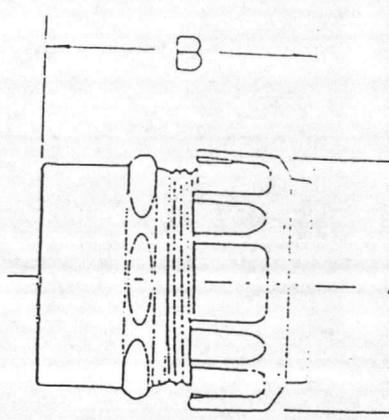
EMT COMPRESSION CONNECTORS



EMT COMPRESSION COUPLINGS



RIGID IMC to EMT COMPRESSION COMBINATION COUPLING

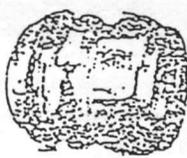


Compression (no thread) fittings for EMT are designed for optimum reliability of installation, ground continuity, and for resistance to weather and environmental conditions. Central in its design is a special steel alloy girth ring which allows the fitting to meet or exceed UL pull-out requirements. Hex snapped compression nuts simplify installation. acceptance with good electrical practice, all installations should be made wrench-tight. Hub threads are clean-cut for easy acceptance of locknuts and bushings. Bodies machined from tubular steel with steel or malleable iron nut.

EMT to Rigid IMC Combination Couplings. For coupling EMT to threaded Rigid Conduit or IMC of equal trade size. With compression fitting for EMT, to assure ground continuity. Plated steel body with steel or malleable iron nut.

STEEL-EMT COMPRESSION CONNECTORS

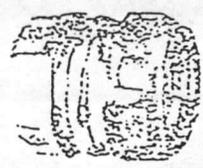
UL FILE E15835
1 1/2" to 2" LISTED RAIN & CONCRETE TIGHT
SP 2 1/2" to 4" LISTED CONCRETE TIGHT
28299



CATALOG NUMBER	TRADE SIZE	NOMINAL DIMENSIONS			
		A	B	C	D
20700	20900	1/2	1 1/4	1 1/4	7/8
20701	20901	3/4	1 3/4	1 3/4	1 1/8
20702	20902	1	1 3/4	1 3/4	1 1/8
20703	20903	1 1/4	2 1/4	1 3/4	1 1/8
20704	20904	1 1/2	2 1/4	2	1 1/8
20705	20905	2	3 1/4	2 1/4	1 1/8
20706	20906	2 1/2	3 3/4	2 3/4	1 3/8
20707	20907	3	4 1/4	3 1/4	1 3/8
20708	20908	3 1/2	4 1/4	3 1/4	1 3/8
20709	20909	4	5 1/4	4	1 3/8

STEEL-EMT COMPRESSION COUPLINGS

UL FILE E15835
1 1/2" to 2" LISTED RAIN & CONCRETE TIGHT
SP 2 1/2" to 4" LISTED CONCRETE TIGHT
28299



CATALOG NUMBER	TRADE SIZE	NOMINAL DIMENSIONS			
		A	B	C	D
20800	1/2	1 1/4	1 1/4	—	—
20801	3/4	1 3/4	1 3/4	—	—
20802	1	1 3/4	1 3/4	—	—
20803	1 1/4	2 1/4	2 1/4	—	—
20804	1 1/2	2 1/4	2 1/4	—	—
20805	2	3 1/4	3 1/4	—	—
20806	2 1/2	3 3/4	3 3/4	—	—
20807	3	4 1/4	4 1/4	—	—
20808	3 1/2	4 1/4	4 1/4	—	—
20809	4	5 1/4	5 1/4	—	—

STEEL-EMT TO RIGID/IMC COMBINATION COUPLINGS

UL FILE E15835
1 1/2" to 2" LISTED RAIN & CONCRETE TIGHT



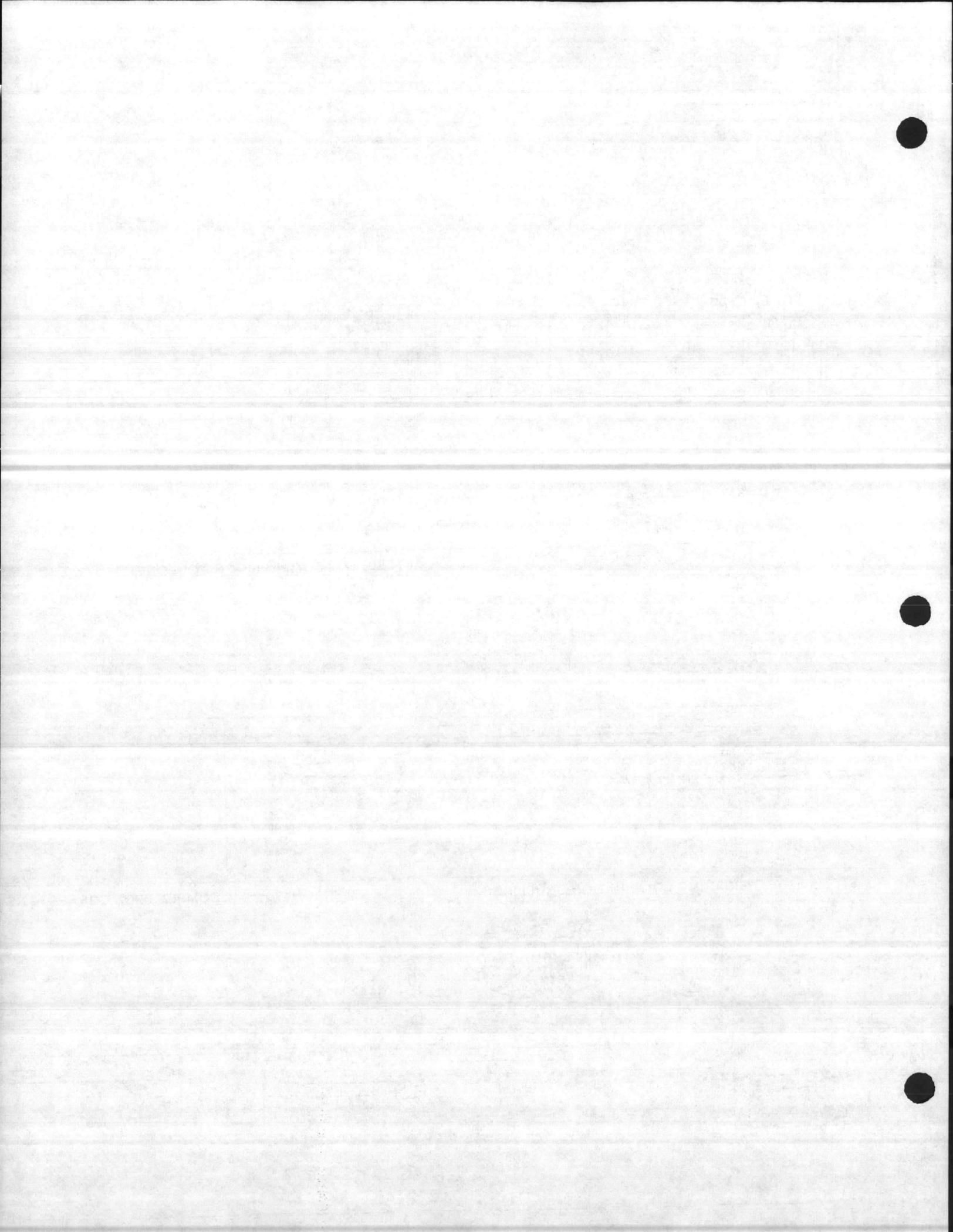
CATALOG NUMBER	TRADE SIZE	NOMINAL DIMENSIONS			
		A	B	C	D
20850	1/2	1 1/4	1 1/4	—	—
20851	3/4	1 3/4	1 3/4	—	—
20852	1	1 3/4	1 3/4	—	—
20853	1 1/4	2 1/4	2 1/4	—	—
20854	1 1/2	2 1/4	2 1/4	—	—
20855	2	3 1/4	3 1/4	—	—

MALLEABLE IRON-90° EMT COMPRESSION CONNECTORS

UL FILE E15835
1 1/2" to 2" LISTED RAIN & CONCRETE TIGHT
SP 28299



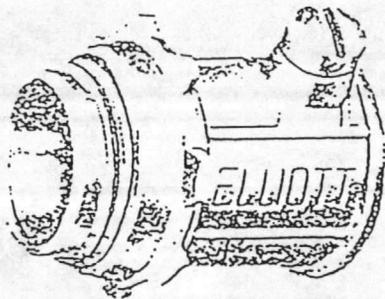
CATALOG NUMBER	TRADE SIZE	NOMINAL DIMENSIONS			
		A	B	C	D
20725	1/2	1 1/4	1 1/4	—	—
20726	3/4	1 3/4	1 3/4	—	—
20727	1	1 3/4	1 3/4	—	—



SUGGESTED RESALE NET PRICE LIST

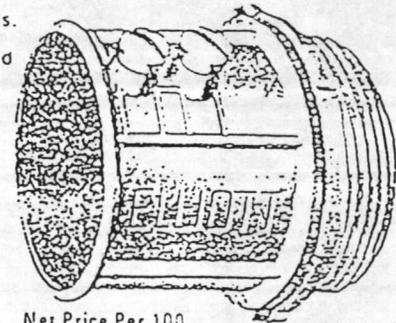
E.M.T. Connectors and Couplings
for use with Electrical Metallic Tubing
 (threadless thin wall conduit)

COMPLETE
 RANGE
 OF SIZES:
 1/2" UP TO 4"



STAKED SCREWS

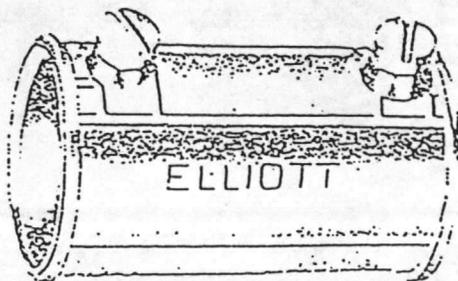
- * EXTRA LONG THREADS for positive connections.
- * NO HEAVY WRENCHES or special pliers needed
- * STRENGTH OF FITTINGS far exceeds U.L. requirements.
- * CONCRETE-TIGHT
- * CASE HARDENED SCREWS



Net Price Per 100

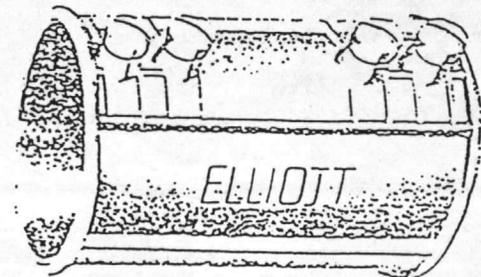
E.M.T. CONNECTORS
 Set Screw Type

Catalog Number	E.M.T. Size	Weight Per Std. Pkg.	Unit Pkg.	Std. Pkg.	Less Unit Pkg.	Unit Pkg.	Std. Pkg.
921	1/2"	18	50	500	28.70	22.40	17.95
922	3/4"	22	25	250	48.00	37.50	30.05
923	1"	31	20	200	77.10	60.20	48.20
924	1 1/4"	32	10	100	133.40	104.20	83.40
925	1 1/2"	20	5	50	201.00	157.00	125.55
926	2"	16	3	30	269.70	210.70	162.60
927	2 1/2"	11	12	12	857.50	-	536.05
928	3"	15	12	12	1029.00	-	643.50
928-B	3 1/2"	11	6	6	1461.00	-	913.55
929	4"	12	6	6	1541.00	-	963.25



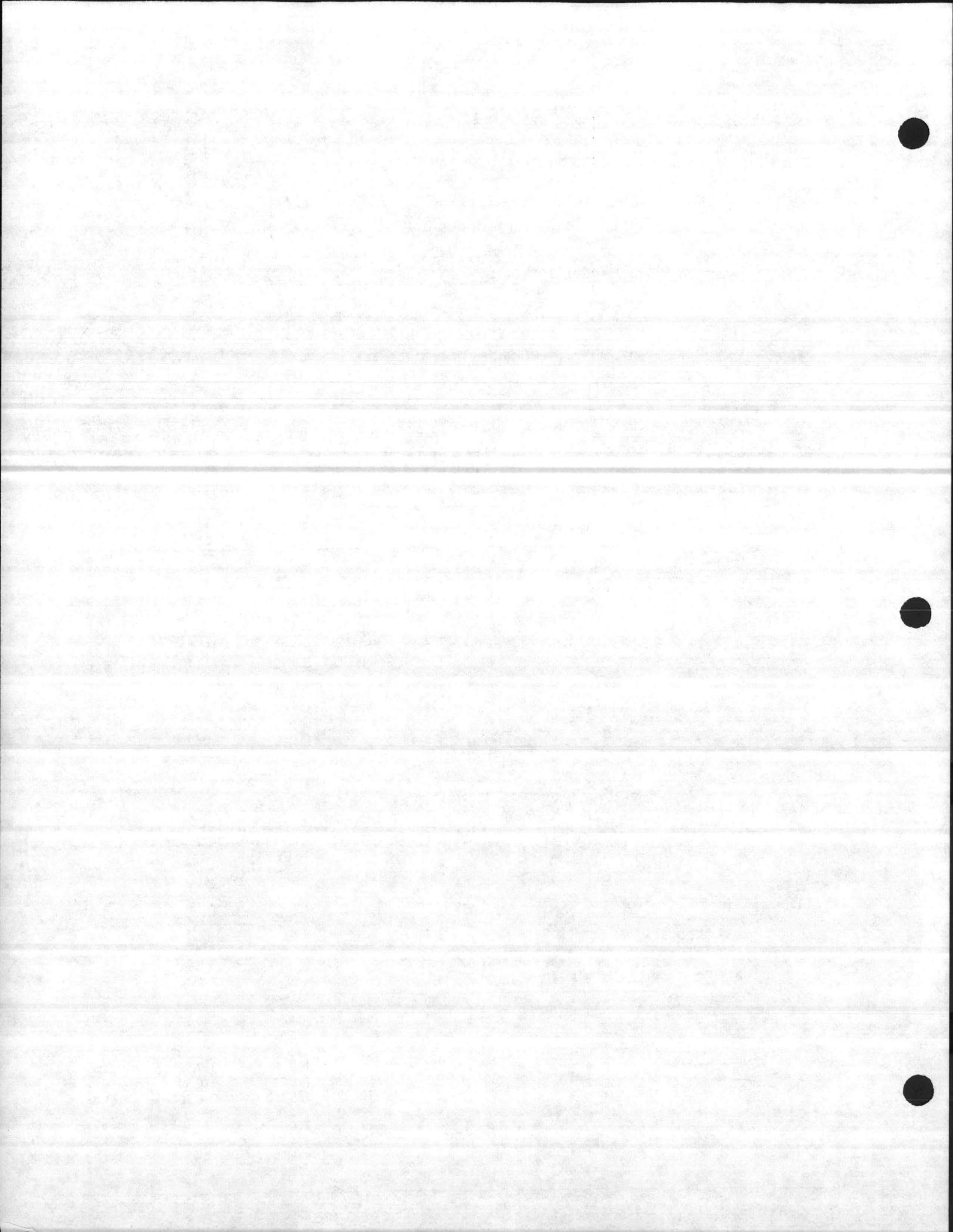
STAKED SCREWS

E.M.T. COUPLINGS
 Set Screw Type



Net Price Per 100

Catalog Number	E.M.T. Size	Weight Per Std. Pkg.	Unit Pkg.	Std. Pkg.	Less Unit Pkg.	Unit Pkg.	Std. Pkg.
931	1/2"	22	50	500	31.50	24.60	19.75
932	3/4"	26	25	250	51.90	40.50	32.45
933	1"	34	20	200	86.50	67.60	54.10
934	1 1/4"	35	10	100	150.40	117.50	94.00
935	1 1/2"	23	5	50	218.00	170.30	136.25
936	2"	19	3	30	289.50	226.30	181.05
937	2 1/2"	13	12	12	716.30	-	447.70
938	3"	15	12	12	804.50	-	502.90
938-B	3 1/2"	10	6	6	978.70	-	511.70
939	4"	11	6	6	1072.00	-	573.75

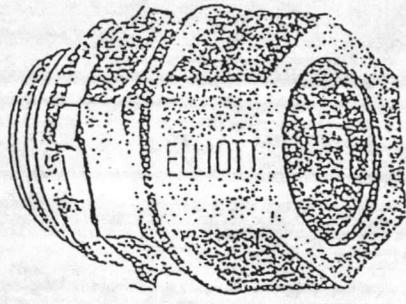


2.3.4

SUGGESTED RESALE NET PRICE LIST

E.M.T. Connectors and Couplings
for use with Electrical Metallic Tubing
 (threadless thin wall conduit)

COMPLETE RANGE OF SIZES: 1/2" UP TO 4"



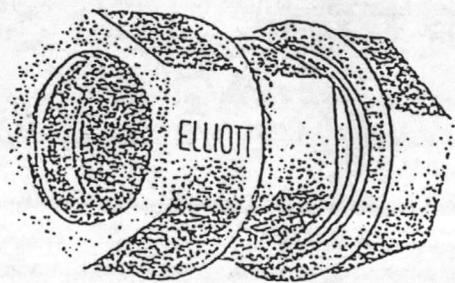
E.M.T. CONNECTORS

Compression Type

- * EXTRA LONG THREADS for positive connections.
- * NO EXTRA WRENCHES or special pliers needed.
- * STRENGTH OF FITTINGS far exceeds U.L. requirements.
- * CONCRETE-TIGHT
- * STEEL LOCK-NUT

Net Price Per 100

Catalog Number	E.M.T. Size	Weight Per Std. Pkg.	Unit Pkg.	Std. Pkg.	Less Unit Pkg.	Unit Pkg.	Std. Pkg.
901	1/2"	24	25	250	46.10	35.00	28.85
902	3/4"	30	25	250	63.90	49.90	39.95
903	1"	23	10	100	106.80	83.50	66.80
904	1 1/4"	20	5	50	198.20	155.30	124.30
905	1 1/2"	24	5	50	229.60	225.30	181.05
906	2"	8	10	10	416.80	-	250.55
907	2 1/2"	12	12	12	1357.00	-	848.35
908	3"	18	12	12	1296.00	-	1185.20
908-B	3 1/2"	10	6	6	2645.00	-	1653.40
909	4"	12	6	6	2951.00	-	1844.55



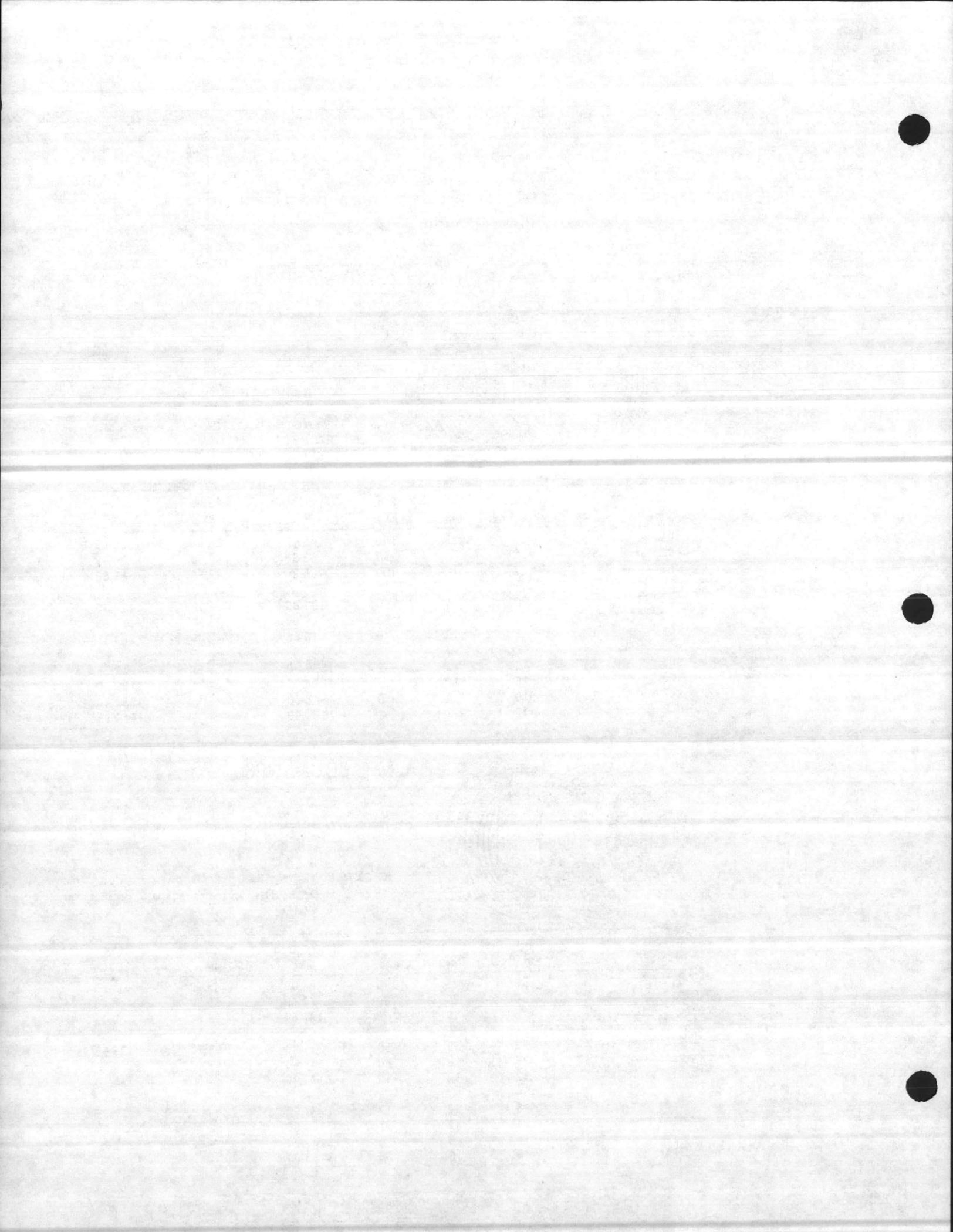
E.M.T. COUPLINGS

Compression Type

- * NO EXTRA WRENCHES or special pliers needed.
- * STRENGTH OF FITTINGS far exceeds U.L. requirements.
- * CONCRETE-TIGHT

Net Price Per 100

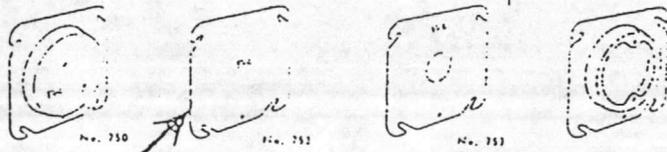
Catalog Number	E.M.T. Size	Weight Per Std. Pkg.	Unit Pkg.	Std. Pkg.	Less Unit Pkg.	Unit Pkg.	Std. Pkg.
911	1/2"	30	25	250	56.00	43.70	35.00
912	3/4"	30	20	200	77.40	50.50	48.40
913	1"	25	10	100	127.60	99.70	79.75
914	1 1/4"	22	5	50	217.00	169.50	135.65
915	1 1/2"	26	5	50	311.50	243.30	194.70
916	2"	12	10	10	423.00	-	264.40
917	2 1/2"	15	12	12	1732.00	-	1082.65
918	3"	24	12	12	2220.00	-	1430.05
918-B	3 1/2"	14	6	6	3103.00	-	1939.70
919	4"	16	6	6	3463.00	-	2164.70



STEEL CASES

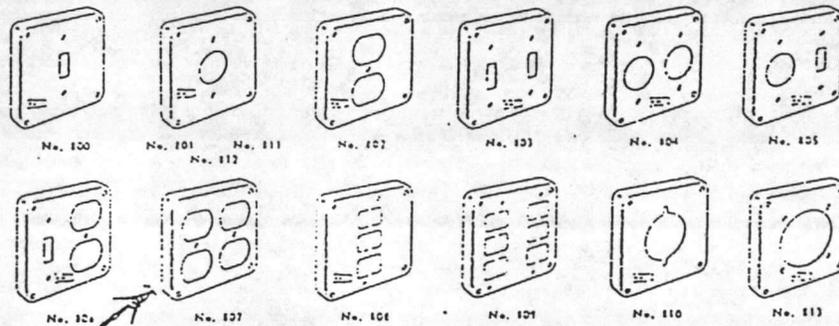
RACO All-Steel Equipment Inc.
P. O. Box 871, Aurora, Illinois 60507

RACO All-Steel Equipment Inc.
P. O. Box 871, Aurora, Illinois 60507



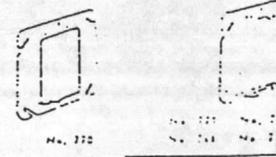
Devices with tapped
3/8" centers
No. 754 No. 759
No. 757 No. 767
No. 758

Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
752	52C1	Flat, blank	50	32.7
753	52C4	Flat, 1/2" CO	50	32.7
757	52C3-1/2	Raised 1/2" open	25	27.0
754	52C3-1/4	Raised 1/4" open	100	24.4
759	52C3-3/4	Raised 3/4" open	25	32.0
757	52C3-1	Raised 1" open	25	32.0
758	52C3-1 1/2	Raised 1 1/2" open	25	32.0
756	52C2	Raised 1/2" blank	100	41.1

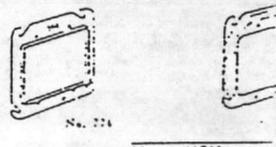


EXPOSED WORK - RAISED 1/2"

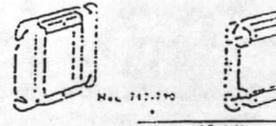
Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
100	52-11	One toggle switch	25	44.4
101	52-15	One single receptacle 1-13/32" D.	25	42.0
102	52-1D	One duplex receptacle	25	46.0
103	52-21	Two toggle switches	25	43.9
104	52-25	Two single receptacles 1-13/32" D.	25	39.4
105	52-51	One single recept. 1-13/32" D. and one toggle switch	25	42.4
104	52-01	One duplex receptacle and one toggle switch	25	39.4
107	52-2D	Two duplex receptacles	25	34.9
106	52-5D	Three gang exposed device	25	51.3
109	52-4D	Six gang exposed device	25	54.0
110	—	15 1/2 Amp. Single Receptacle 2-9/64" D.	25	38.0
111	—	22 Amp. Inst. Lock Single Receptacle 1-31/32" D	25	40.6
112	—	22 Amp. Receptacle 1-19/32" D	25	41.3
113	—	25 1/2 amp. Amp. Receptacle 2-1/8" D	25	35.4



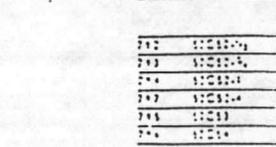
Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
770	52C14			
771	52C15			
772	52C16			
773	52C17			
774	52C18			
775	52C19			
777	52C20			



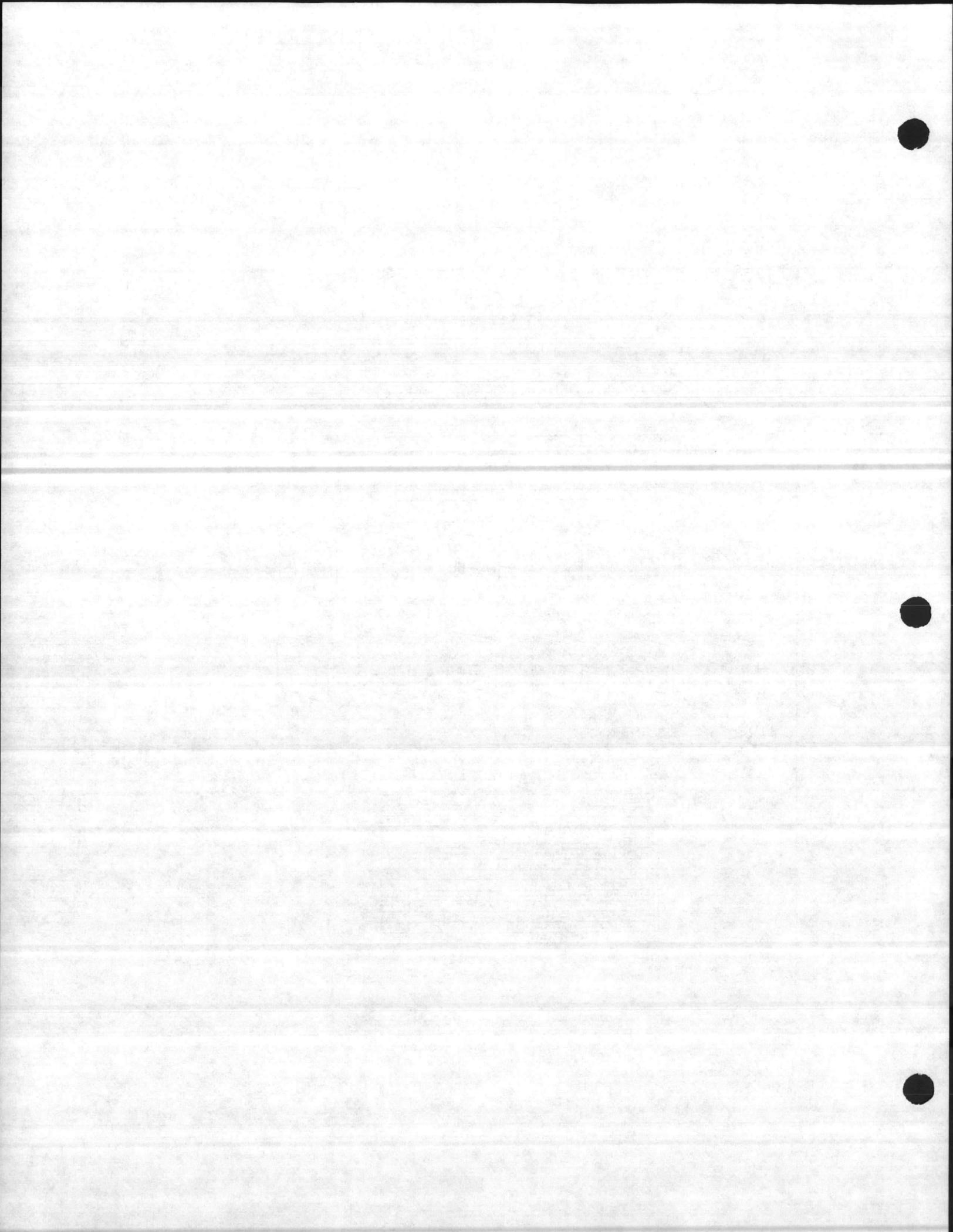
Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
776	52C21			
777	52C22			
778	52C23			
779	52C24			
780	52C25			
781	52C26			
782	52C27			



Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
782	52C28			
783	52C29			
784	52C30			
785	52C31			
786	52C32			



Case No.	Universal No.	DESCRIPTION	Std. Pkg.	Wt. Per C.
787	52C33			
788	52C34			



2.3.4

RACO All-Steel Equipment Inc.
P. O. Box 875, Aurora, Illinois 60507

2 1/2" x 1 1/2" HANDY BOX COVERS



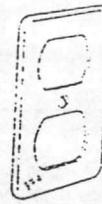
No. 860



No. 861



No. 863



No. 864



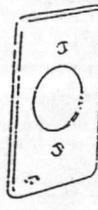
No. 865



No. 866



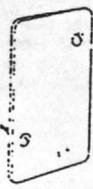
No. 867



No. 868

Raco No.	Universal No.	DESCRIPTION	Std. Pkg.	Unit Pkg.	Wt. Per C
860	58C1	Blant	100	25	11.7
861	58C6	1/2" KO	100	25	11.7
863	58C5	Single Receptacle 1-13/32" D.	100	25	12.0
864	58C7	Doubles Receptacle	100	25	8.7
865	58C30	Toggle Switch	100	25	11.2
866	58C40	Despard, J Device	50	10	18.0
867	58C4	For 20 Amp. Receptacle 1-19/32" D.	100	25	9.4
868		30 Amp. Twist-Lock Single Receptacle 1-23/32"	100	25	8.7

3 1/4" x 1 1/2" HANDY BOX & COVER



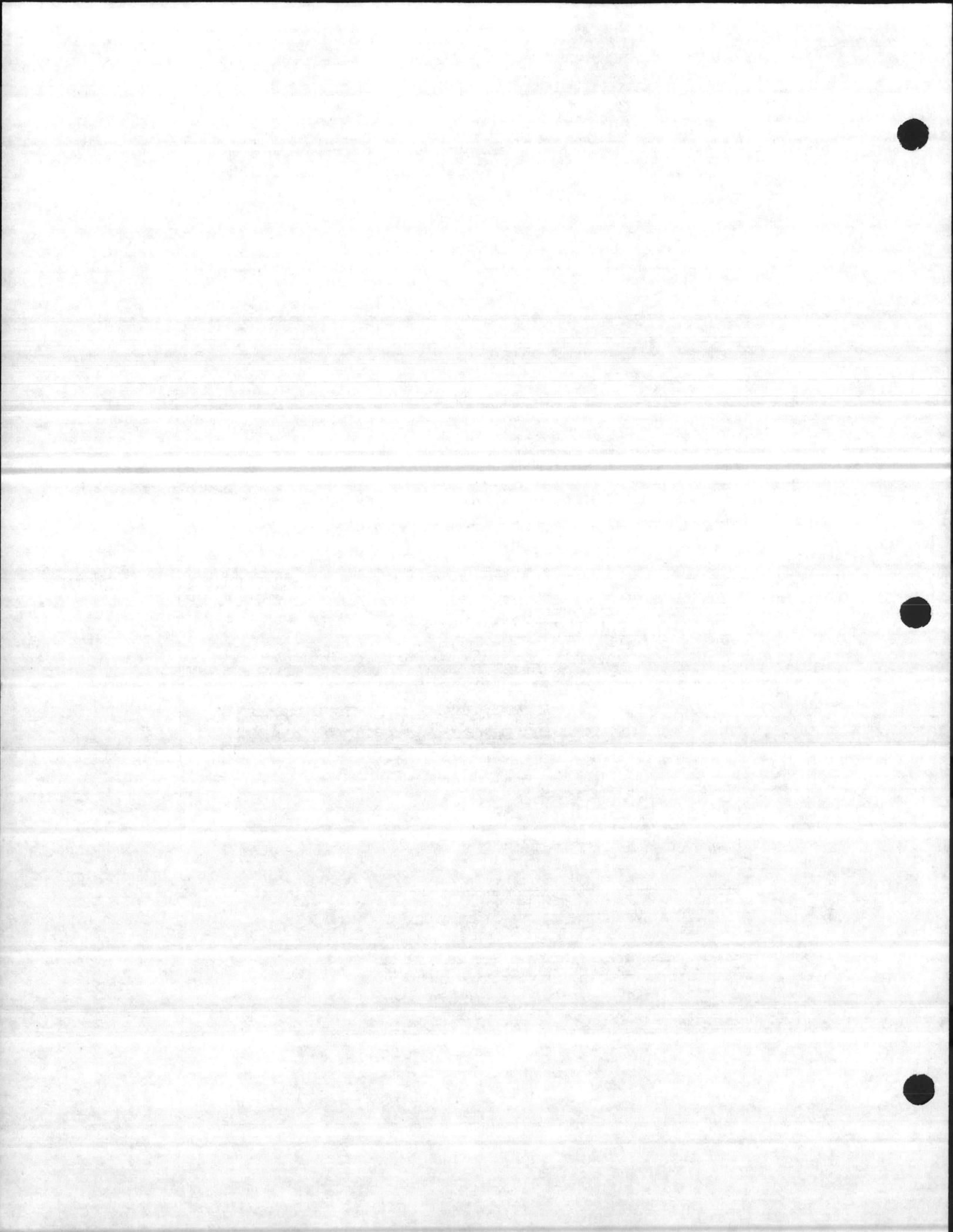
No. 880



No. 840

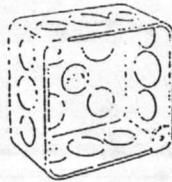
1 1/2" DEEP

Raco No.	Universal No.	KNOCKOUTS			Std. Pkg.	Wt. Per C
		EACH END	EACH SIDE	BOTTOM		
840	4800	1-1/2"	3-1/2"	3-1/2"	50	17.1
880	48-C-1	Blant For 840 Box			50	11.0

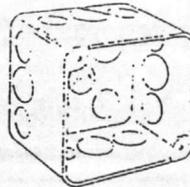


FLENUM BOXES

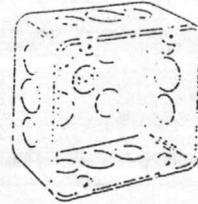
RACO All-Steel Equipment Inc.
P. O. Box 877, Aurora, Illinois 60507



No. 226



No. 239



No. 264

KNOCKOUTS

Box No.	KNOCKOUTS		Sd. Pkg.	Wt. Per C
	SIDES	BOTTOM		
	Conduit	Conduit		

4" SQUARE — 1 1/2" DEEP

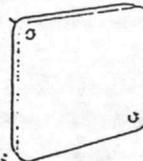
226	8 — 1/2", 4 — 1/2"	3 — 1/2", 2 — 3/4"	50	69.9
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4" SQUARE — 2 1/4" DEEP

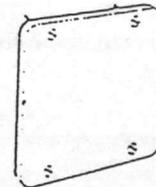
239	8 — 1/2", 4 — 1/2"	3 — 1/2", 2 — 3/4"	25	85.4
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4-11/16" SQUARE — 2 1/4" DEEP

264	8 — 1/2", 4 — 1/2"	3 — 1/2", 2 — 3/4"	25	108.9
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No. 762



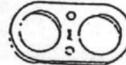
No. 816

COVERS WITH GASKETS AND SCREWS

762	Blant. for 4" Square	50	36.6
816	Blant. for 4 1/2" Square	50	40.5

ACCESSORIES FOR 4" & 4-11/16" SQUARE BOXES

CONDUIT SPACERS

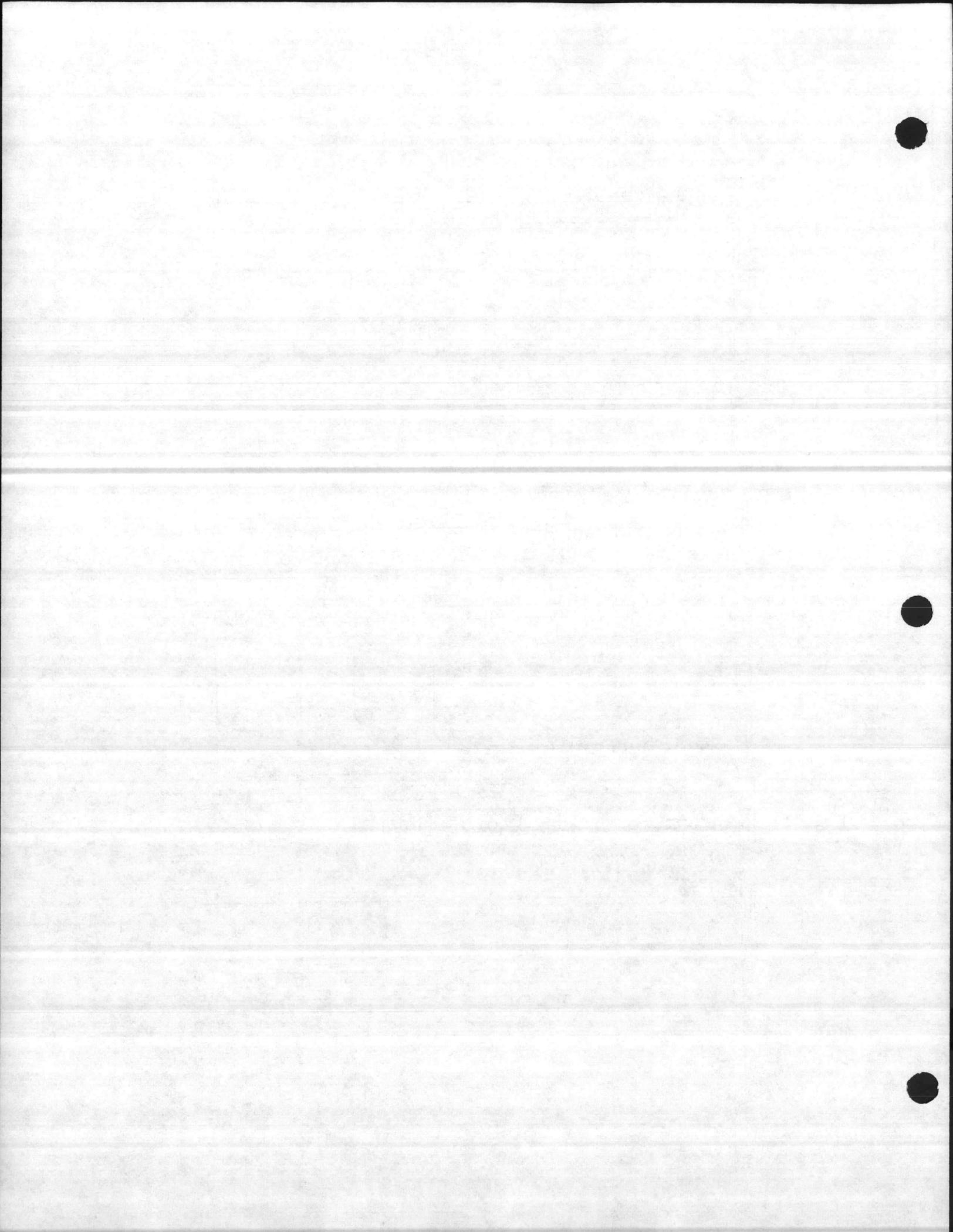


No. 979
No. 981
No. 984



No. 910

Box No.	Conduit Size	Sd. Pkg.	Weight Per C
171	1/2"	100	3.4
188	1/2"	100	4.1
181	3/4"	100	4.7
184	1"	100	6.0



2,3,4

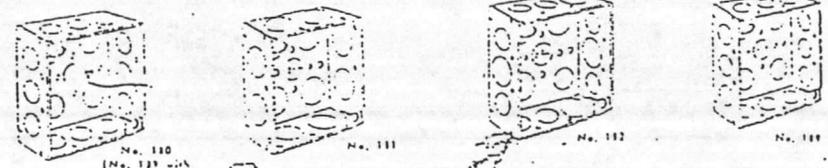
RACO All-Steel Equipment Inc.
P. O. Box 871, Aurora, Illinois 62021

RACO All-Steel Equipment Inc.
P. O. Box 871, Aurora, Illinois 62021

SOFTIE BARS

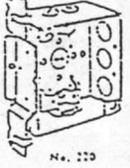
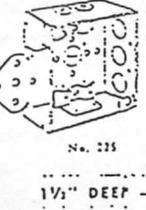
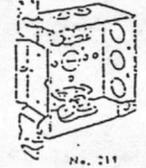
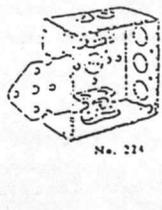
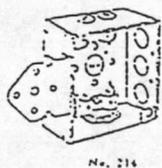
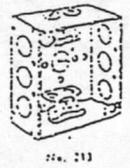
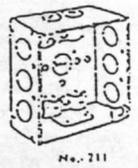
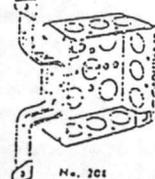
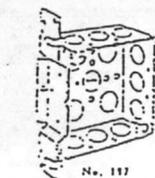
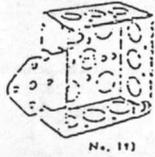
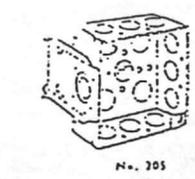
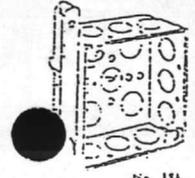
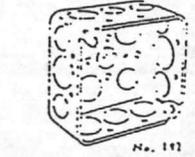


KNOCKOUTS		Std. Per Fig. C	Wt. Per C
SIDES	BOTTOM		
Conduit	Conduit		
1-1/2"	50	13.7	



1 1/2" DEEP WELDED — CONDUIT KO'S — ONE SCREW EAR

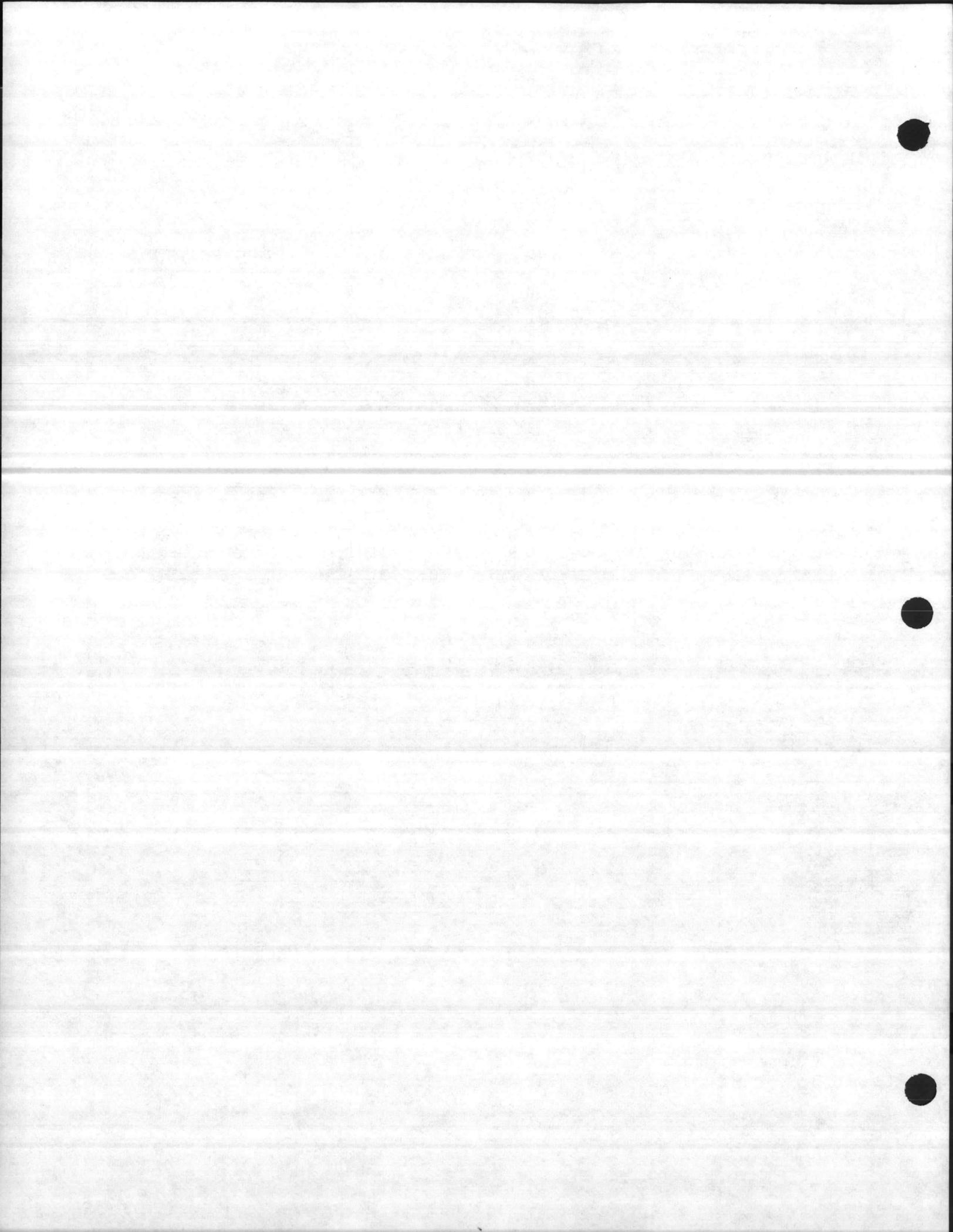
Part No.	Universal No.	KNOCKOUTS		Std. Per Fig. C	Wt. Per C
		SIDES	BOTTOM		
110		12-1/2"	5-1/2"	50	11.1
111	S2151-1/2	1-1/2"	1-1/2" x 1-1/2"	50	12.2
112	S2151-SP	1-1/2" x 1-1/2"	1-1/2" x 1-1/2"	50	12.2
113	S2151-1/2	12-1/2"	5-1/2"	50	11.1



1 1/2" DEEP — CABLE CLAMPS

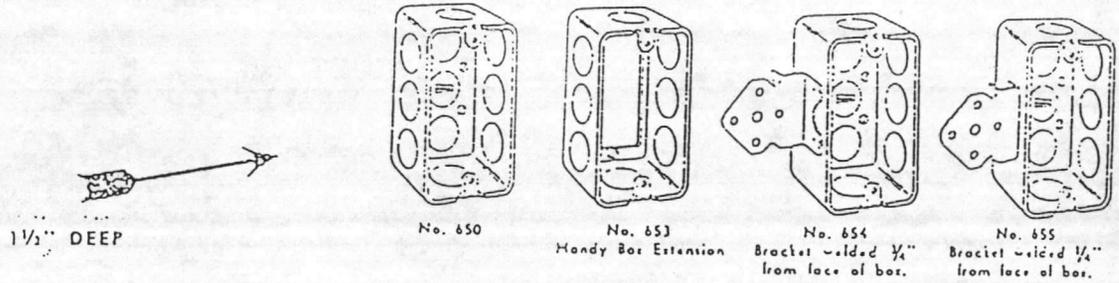
KNOCKOUTS		Std. Per Fig. C	Wt. Per C
SIDES	BOTTOM		
Conduit	Conduit		
5-1/2"	50	22.5	
1-1/2" x 1-1/2"	50	21.3	
1-1/2" x 2-1/2"	50	21.4	
5-1/2"	25	11.1	
1-1/2" x 1-1/2"	25	11.2	
1-1/2" x 2-1/2"	25	11.1	
5-1/2"	25	11.1	
5-1/2"	25	11.2	
5-1/2"	25	11.1	
5-1/2"	25	11.2	

Part No.	Universal No.	ACCESSORIES						Std. Per Fig. C	Wt. Per C
		KNOCKOUTS		SIDES		BOTTOM			
		Clamps	Str.	Conduit	Cable	Conduit	Cable		
211	S2151-L	2-L	—	1-1/2"	x	1-1/2"	x	50	11.2
213	S2151-R	2-R	—	1-1/2"	x	1-1/2"	x	50	11.2
214	S2151-1.2M	2-M	1	1-1/2"	x	1-1/2"	x	25	11.0
219	S2151-1.4M2	2-M	2-M	1-1/2"	x	1-1/2"	x	25	10.7
220	S2151-1.4M	2-M	2-M	1-1/2"	x	1-1/2"	x	25	11.2
221	—	2-R	2-M	1-1/2"	x	1-1/2"	x	25	11.1
222	—	2-M	2-M	1-1/2"	x	1-1/2"	x	25	11.1
224	S2151-1.3-X	2-X	1	1-1/2"	x	1-1/2"	x	25	11.1
225	S2151-1.4-L	2-L	1	1-1/2"	x	1-1/2"	x	25	11.2

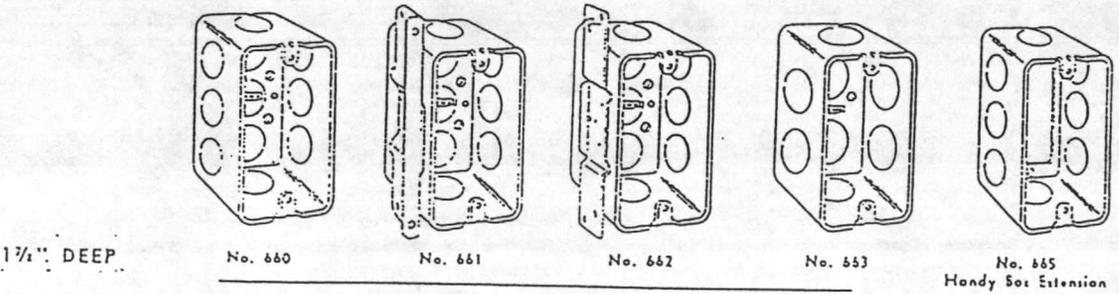


4" x 2 1/2" HANDY BOXES

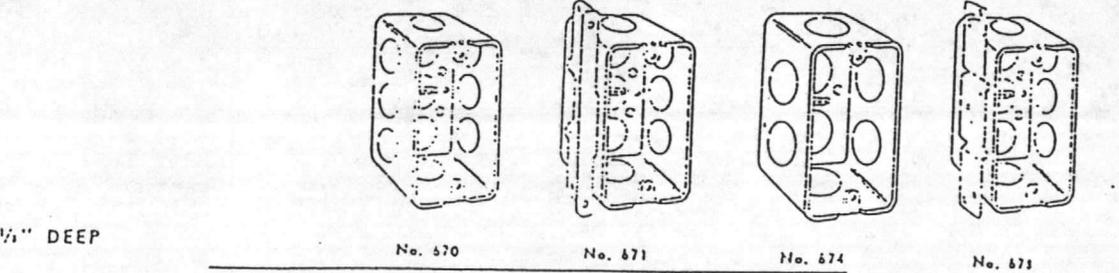
RACQ All-Steel Equipment Inc.
P. O. Box 471, Aurora, Illinois 60507



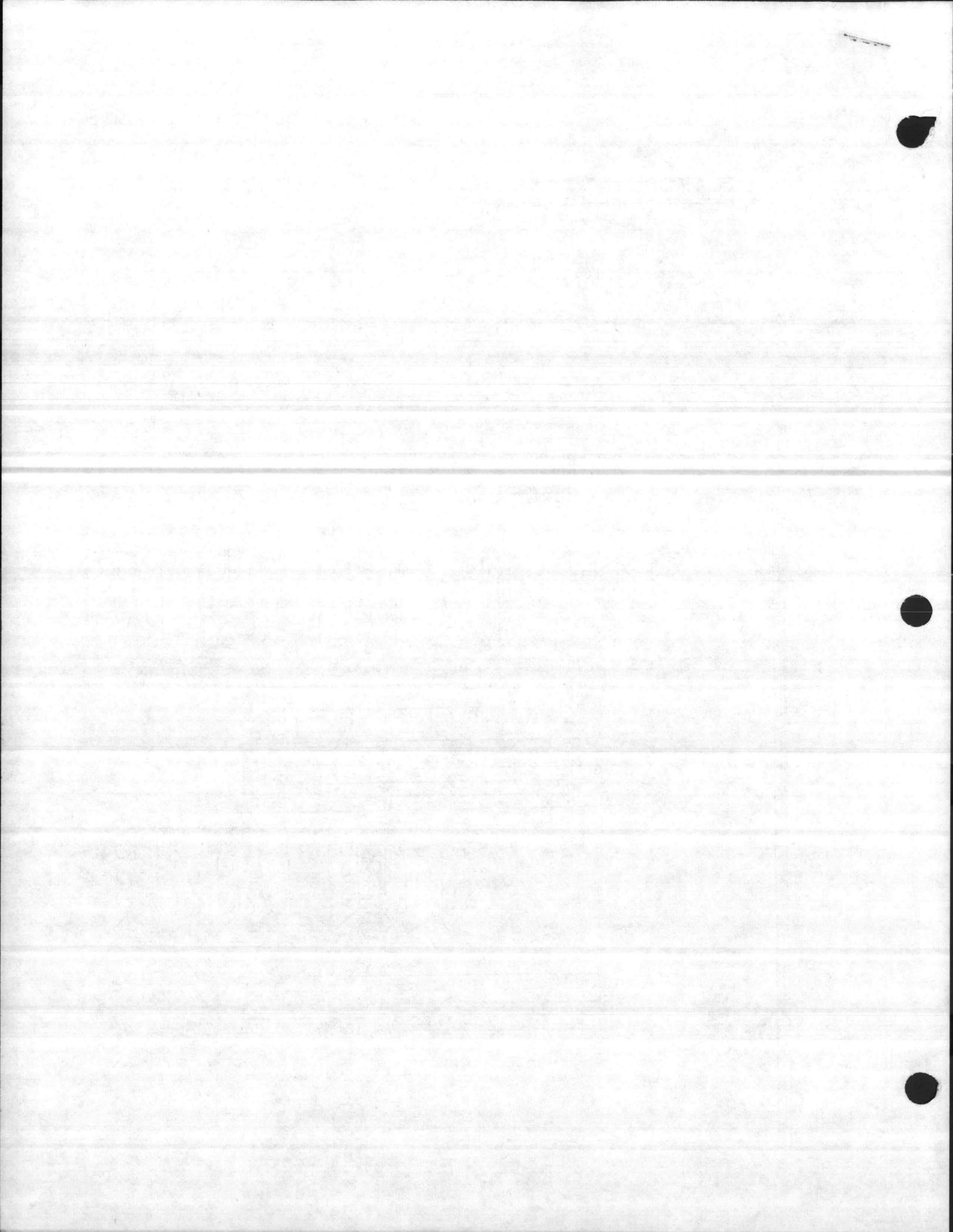
Race No.	Universal No.	Brkt.	KNOCKOUTS			Std. Pkg.	Wt. Per C
			EACH END	EACH SIDE	BOTTOM		
650	58351-1/2	—	1-1/2"	3-1/2"	3-1/2"	50	47.2
653	59351	—	1-1/2"	3-1/2"	—	50	37.5
654	58351-B-1/2	B	1-1/2"	3-1/2" One Side	3-1/2"	50	55.0
655	58351-B-1/4	B	1-1/2"	3-1/2" One Side	3-1/2"	50	55.0



Race No.	Universal No.	Brkt.	KNOCKOUTS			Std. Pkg.	Wt. Per C
			EACH END	EACH SIDE	BOTTOM		
660	58361-1/2	—	1-1/2"	3-1/2"	3-1/2"	50	53.8
661	58361-A-1/2	A	1-1/2"	3-1/2" One Side	3-1/2"	50	71.7
662	58361-FA-1/2	FA	1-1/2"	3-1/2" One Side	3-1/2"	50	63.8
663	58361-3/2	—	1-3/4"	2-3/4"	2-3/4"	50	54.6
665	59361-1/2	—	1-1/2"	3-1/2"	—	50	44.0



Race No.	Universal No.	Brkt.	KNOCKOUTS			Std. Pkg.	Wt. Per C
			EACH END	EACH SIDE	BOTTOM		
670	58371-1/2	—	1-1/2"	3-1/2"	3-1/2"	50	59.4
671	58371-A-1/2	A	1-1/2"	3-1/2" One Side	3-1/2"	50	76.7
674	58371-3/4	—	1-3/4"	2-3/4"	2-3/4"	50	59.4
675	58371-FA-1/2	FA	1-1/2"	3-1/2" One Side	3-1/2"	50	71.6



SHUNTFLO[®]

Direct Reading Axial-Turbine Meter

For Steam, Air or Gas

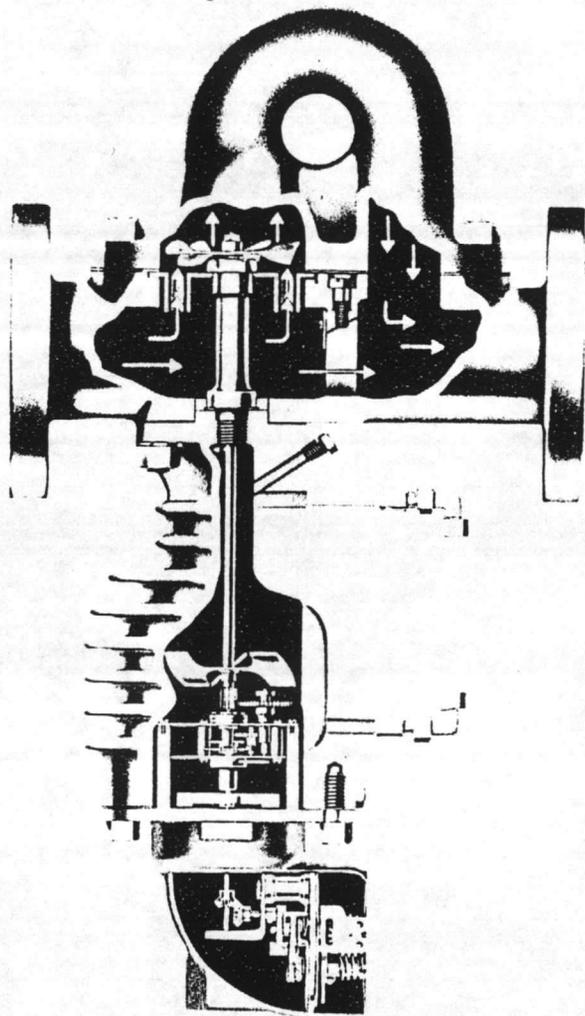


Fig. 1 - Shuntflo Open View

B I F Shuntflo meters are found wherever accurate records must be kept of steam, air or gas production or usage.

The Series 400 Shuntflo is a totalizing meter designed to measure the flow of steam, air or gas up to 300 psig and 750° F. Self-contained and self-operating, it requires no mercury, pressure piping, compressed air or electricity.

OPERATION

As gas flows through the meter body, a portion of flow is diverted to drive the fan shaft assembly,

rotating on a jewel bearing. A second set of blades on the fan shaft, rotating in damping fluid, acts as a damper or governor.

Rotational speed of the shaft is proportional to the rate of flow at all rates within the normal range of the meter. Therefore, the number of turns made by the shaft is a measure of the total flow.

Suitable gearing reduces the rotational speed to a driving magnet in the damping chamber. A counter box, located below the damping chamber contains a following magnet and totalizer.

FEATURES

Open upper limit — Meter has an overload capability allowing it to register accurately at rates up to 150 percent of rated capacity on steam service. Overloads of up to 200% can be handled for up to ten minutes duration once every 12 hours.

Direct reading — Counter is geared to read directly in pounds of steam or cubic feet of gas or air. Since there is no need to use multipliers there is less chance of reading and computation errors. Both cyclometer, dial and pointer type counters are available.

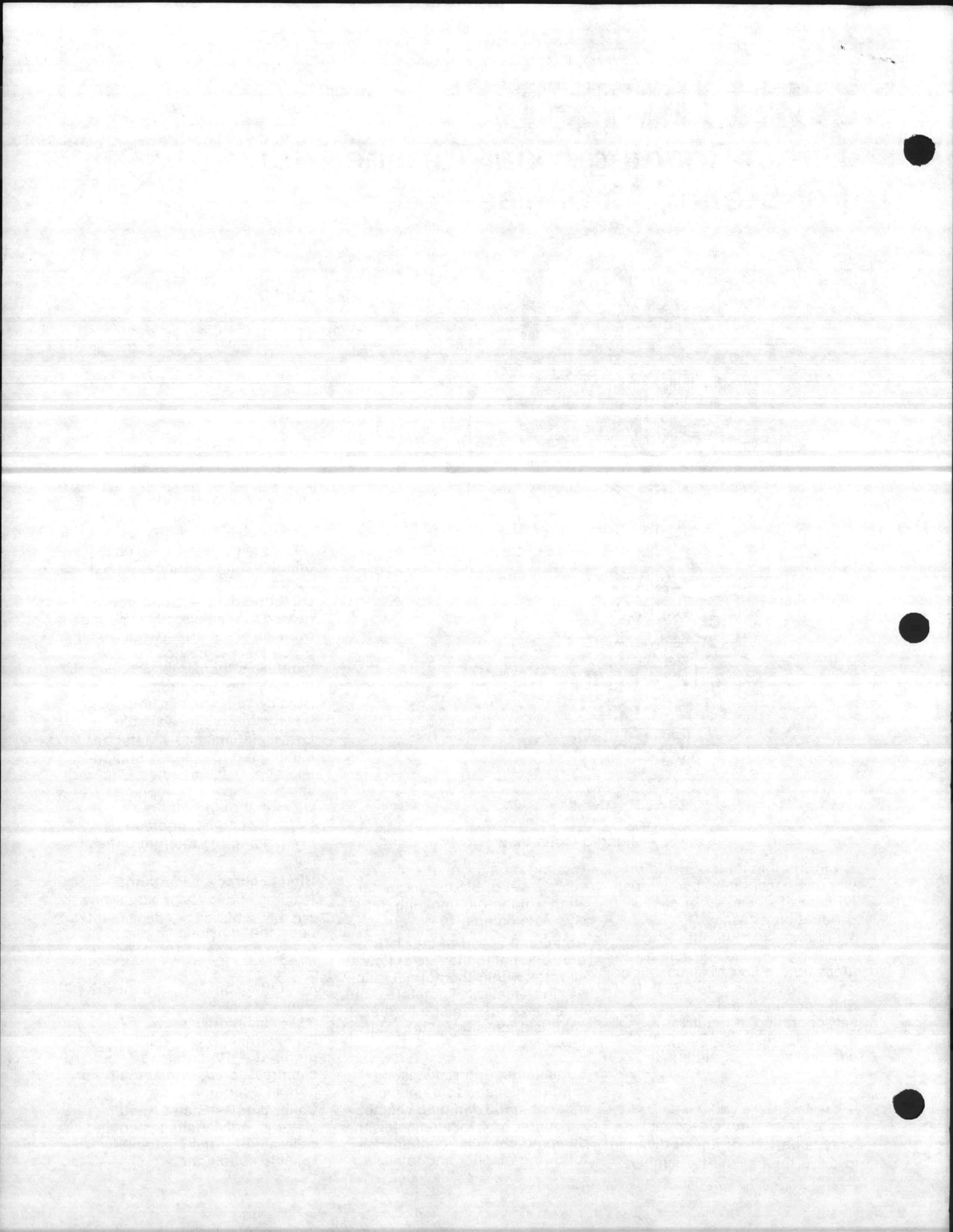
Low maintenance — Meter has a minimum of parts. Installation takes only a few minutes. Counter can be removed or replaced without shutting off flow. Capacity can be modified by exchanging the internal orifice plate.

High accuracy, wide range — Accuracies of $\pm 2\%$ of actual flow can be achieved — dependent upon the individual application — over a range of 10:1 for meters 2" and up.

No stuffing box — Magnetic drive eliminates leakage found in mechanical drive units.

No external power source required — Requires no compressed air, or electricity for normal operation.

Calibration — Each Shuntflo Meter is individually tested and calibrated for the customer's specific conditions.



Accessories

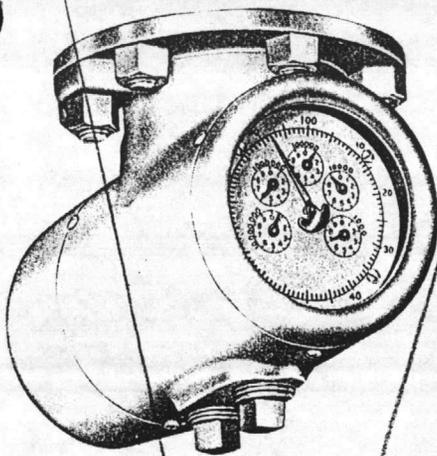


Fig. 2 - Pressure Compensating Counter

***Pressure Compensating Counter:**
The Model 406-01 Counter automatically and continuously corrects Shuntflo Meter readings for line pressure variations, thereby giving a more precise accounting of steam, air or gas consumption. Self-contained and self-operated, it can replace the standard Counter on any Shuntflo Meter.

An integrating disc (Fig. 3) in the Counter is driven by the primary Shuntflo Meter and in turn drives the integrating wheel and related change gears. Automatic correction for the flow metering effects of variations in line pressure is accomplished by a pressure element (bellows) which moves the integrating wheel in relation to the integrating disc. The Pressure Compensating Counter can be quickly installed without disassembly of the meter proper. Pressure tube, fittings and shut-off valve are included. Available pressure ranges are shown below:

Min Gauge Pressure (psig)	Max Gauge Pressure (psig)
0	to 30
10	to 60
20	to 90
30	to 120
40	to 150
50	to 180
60	to 210
70	to 300

*Patented in United States; patent pending in Great Britain

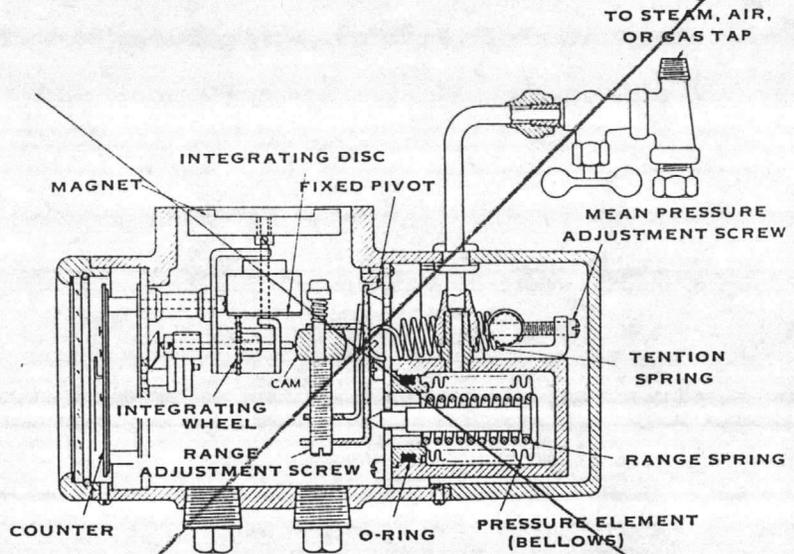


Fig. 3 - Pressure Compensating Counter

Combined Counter And Contactor:

This Counter combines the standard register Counter of the Shuntflo with an Electric Contactor to operate a remote totalizer or demand meter. A shaft, connected to the standard gearing of the counter and geared to give direct or desired ratio of shaft revolutions to revolutions of the large dial hand, imparts a calculated number of impulses to the contactor by means of cams.

It is thus possible to give one contact for each hundred pounds of steam, to operate a totalizer; or to give 67 contacts per interval at a rated capacity; to operate a demand meter. The Counter-Contactor can be quickly installed without disassembly of the meter proper. The dust-tight aluminum housing is provided with a 1/2 inch NPT female conduit connection.

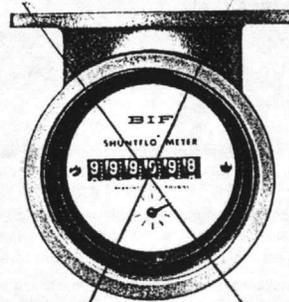


Fig. 4 - Cyclometer Counter

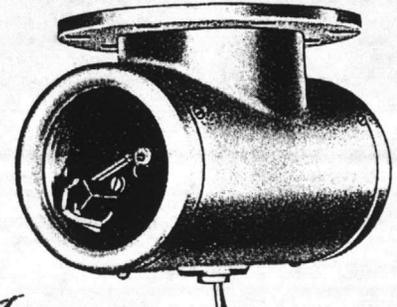
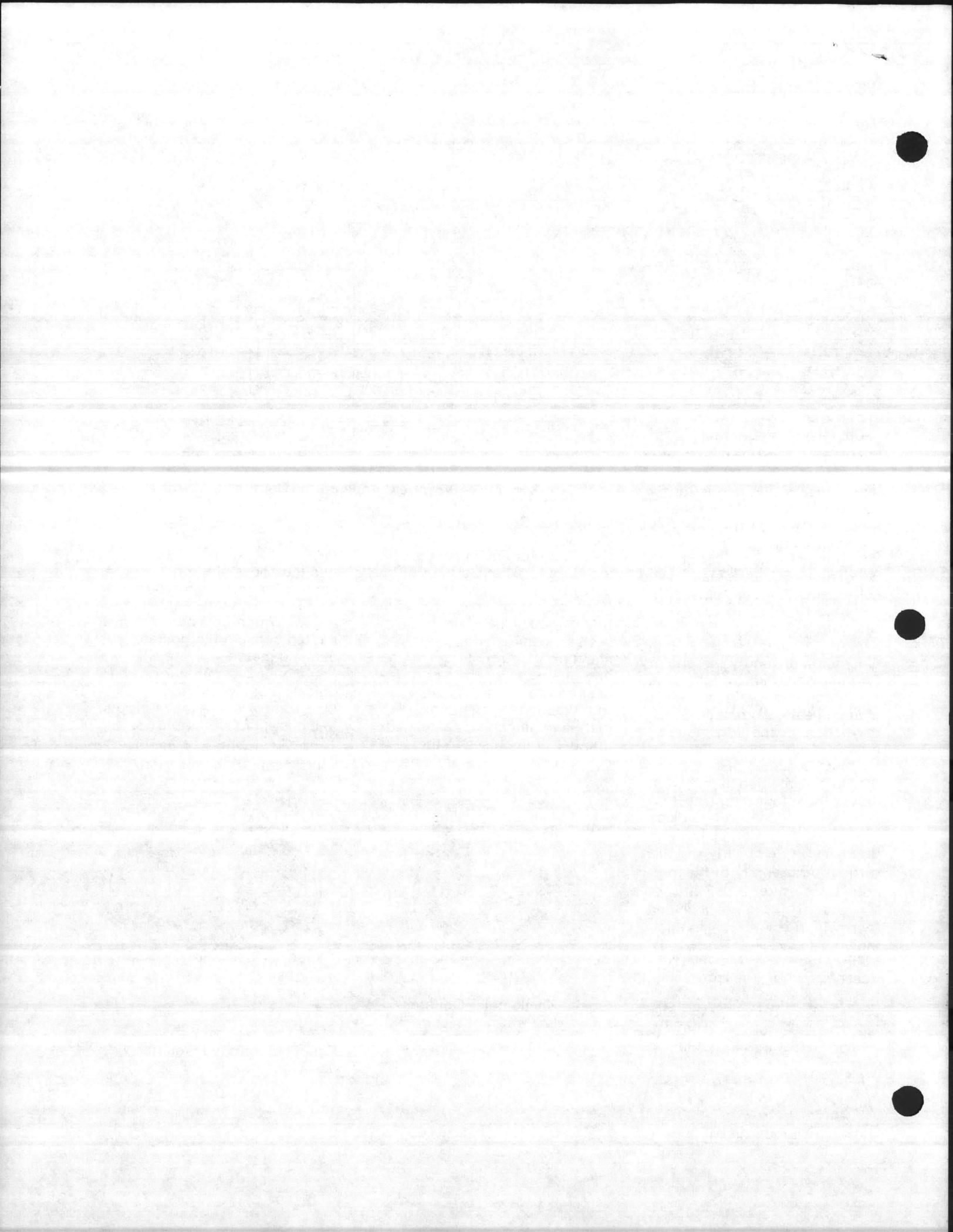


Fig. 5 - Combined Counter and Contactor Rearview.



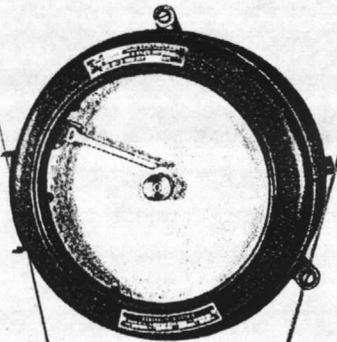


Fig. 6 - Demand Meter

Demand Meter, Model 9351-09:

An impulse type Recorder, General Electric, Type G9, GS9 or GS12 as commonly used by electric companies. The Demand Meter records short interval averages rather than instantaneous flow.

It counts impulses received during a pre-determined time interval and records the total on a chart. The pen moves a certain distance for each impulse received, and returns to zero at the end of the time interval. Total length of the line is determined by the total number of impulses during the interval, indicating the total flow for that interval.

Standard Demand Meters have 15 or 30 min. intervals, 3-wire operation, 7, 16 or 32 day chart rotation. Special arrangements have 5 or 60 min. intervals, 2-wire operation and 2 speed chart drives for 1 and 7, 7 and 16, 7 and 32 day rotation.

A common chart arrangement is to show rated capacity at 67 contacts per interval. This will allow 33 units to indicate, if necessary, any overload on the meter within that range. The full range of the chart, 100 contacts per interval, may be used to show rate capacity.

Remote Totalizer (Fig. 7): Electrically operated, has five digits, is enclosed in a metal case. Wall or flush panel mounted, it is actuated by a contactor device in the Counter.

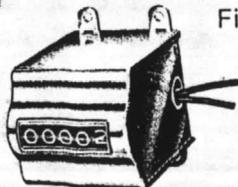


Fig. 7 - Remote Totalizer

Gauge Glass Assembly

Shuntflo Meters measuring the flow of air or gas require this installation. It is a visual liquid level indicator to show the presence of damping fluid in the meter.

Extra Orifices

Capacity changes, because of seasonal flow conditions, new plant demands, additional heating or equipment, may be effected by changing orifice plates. These can be provided with calculation for installation in the field, or may be provided, with calibration as extra plates with a new meter.

Engineering Specifications

Loss of pressure —

Approximately 20 inches of water for meters with line pressure of 50 psig or less. Approximately 80 inches of water for meters with line pressure over 50 psig.

Damping Liquid — For steam service, the damping liquid is water, replenished and maintained by condensation during operation,* for air or gas service, damping liquid may be kerosene, water, anti-freeze solution, or other liquid compatible with the gas being metered. A gauge glass is recommended for visual check of the liquid on gas installation.

Meters are factory calibrated using the same damping fluid.

Space requirements — Accurate metering requires straight sections of pipe upstream and downstream of the meter.

Straight sections must be of the same nominal size as the meter, and at least as long as shown in the table below.

Materials of Construction — All parts subject to pressure are high tensile gray iron, bronze or cast steel.

Pressure and temperature capabilities — The Shuntflo meter provides excellent service for pressures to 250 psig and temperatures to 450°F. Heavy duty meters are available for pressures to 300 psig and temperatures to 750°F.

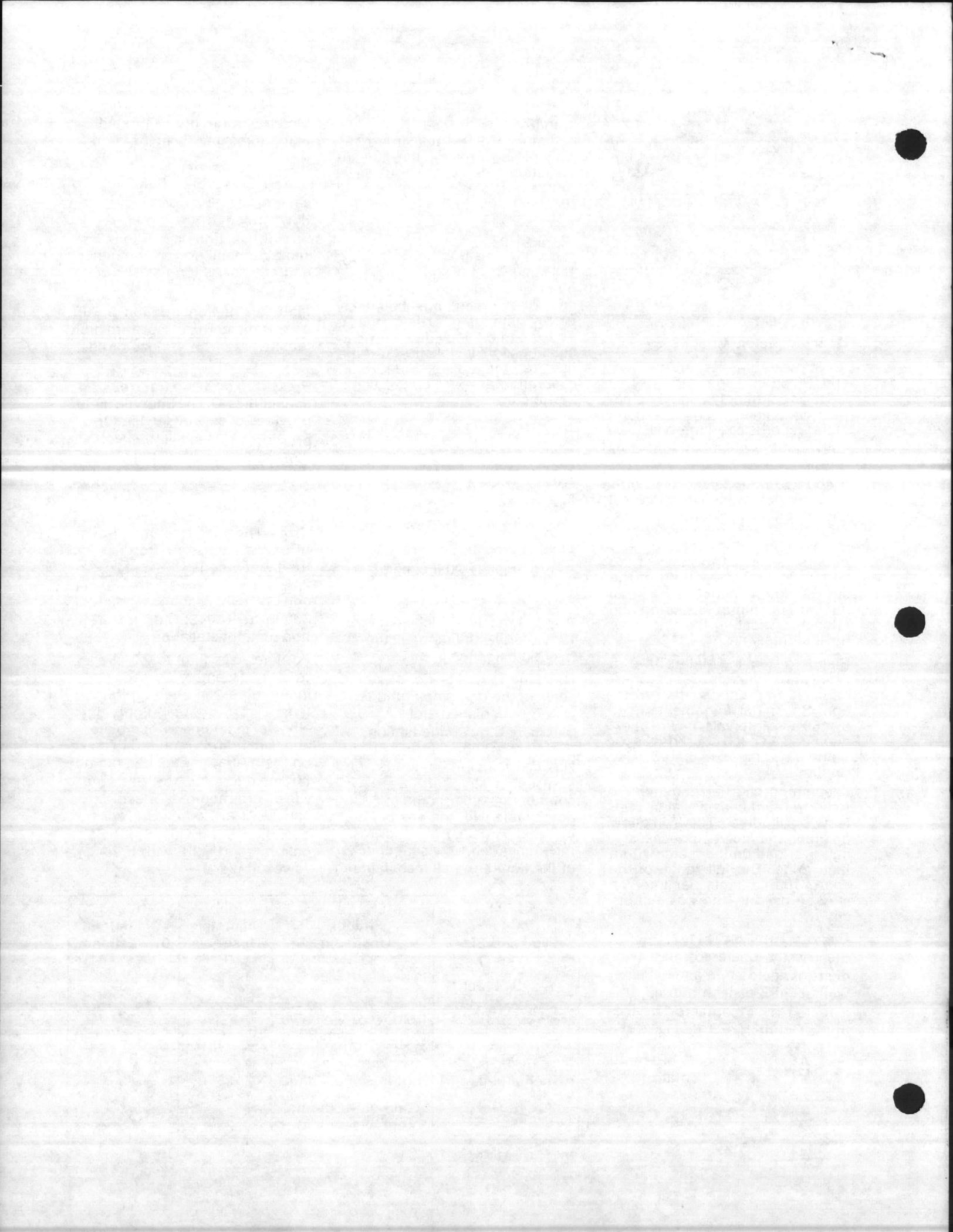
Size—The 1 in. steel meter has threaded ends, 1 in. iron has 250 lb. flanged ends.

2, 3, and 4 in. sizes have flanged ends (250 lb. cast iron ANSI Std., 300 lb. steel ANSI Std.) for horizontal installation.

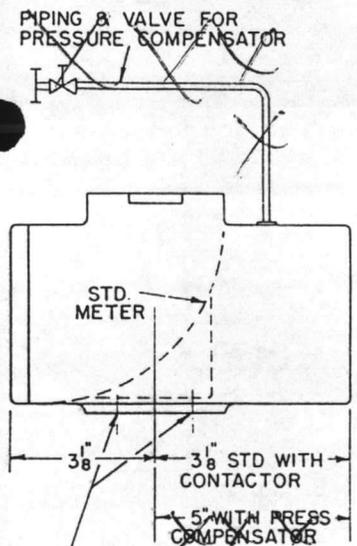
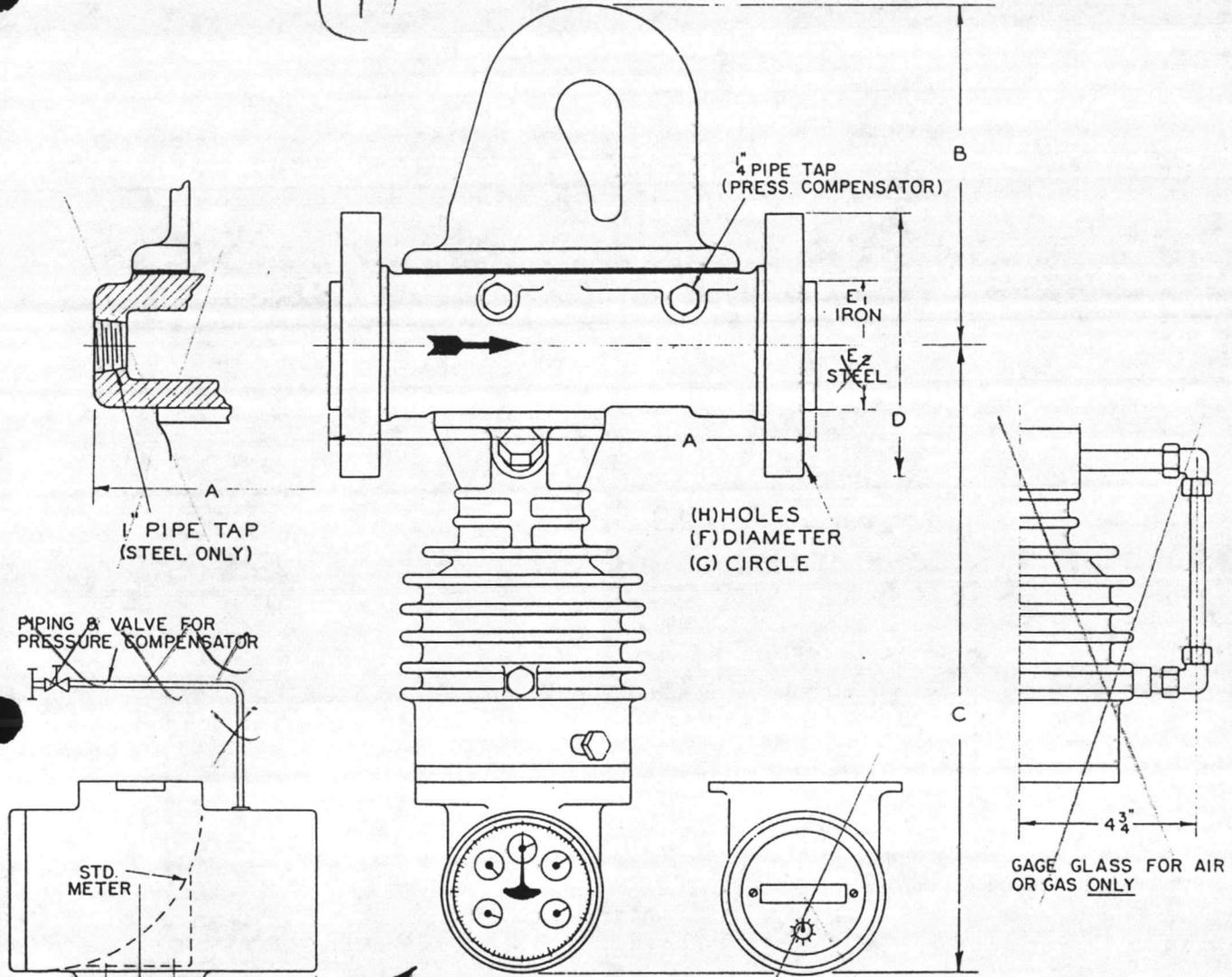
For line sizes 5 in. to 24 in. a by-pass assembly is used, including a 2 in. meter, high tensile iron (or steel) flanged elbows, main line orifice plate, and 2 in. fittings required to make up the by-pass assembly, but not the main line flanges. Shut-off valves are required. These valves can be furnished by B I F or the customer but meter must be calibrated at B I F with the valves in place.

Meter Type and Size	Fittings Upstream	Pipe Diameters Upstream	Pipe Diameters Downstream
In-Line (1, 2, 3, 4 inch)	Any	12	6
By-Pass (5 inch and larger)	1 elbow or 2 elbows same plane	10	5
	2 or more elbows not in same plane	25	5
	Gate Valve (if not kept wide open)	25	5

*After initial filling.



THOS
(1)



TWO - 1/2" NPT (FEMALE) FOR ELECTRICAL CONNECTIONS WHEN CONTACTOR IS USED.
2 POLE - NO.
3 POLE - 1 NO., 1 NC CONTACT

SERVICE: **STEAM**

MODEL NO.: **0402-02**

MATL. OF CONSTRUCTION: CAST IRON 250# FLG.
CAST STEEL 300# FLG.

SIZE & TYPE	A	B	C	D	E1	E2	F	G	H	WT. LB.
1" THD.	9.25	7.88	14.25	3.25	0	0	0	0	0	65
1" FLG.	12.00	7.88	14.25	4.88	2.69	-	.75	3.50	4	70
2" FLG.	12.00	7.50	14.62	6.50	4.19	3.62	.75	5.00	8	75
3" FLG.	12.00	8.00	15.38	8.25	5.69	5.00	.88	6.62	8	100
4" FLG.	14.00	8.50	16.00	10.00	6.94	6.19	.88	7.88	8	150

FOR OPTIONAL VARIABLES SPECIFIC TO CUSTOMERS ORDER REFER TO ORDER DATA SHEET.

ADD 400-1 (A)
Printed in U.S.A.

4/80 SUPERSEDES 12/69

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