

# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR FAIRCHILD MODEL 80D PNEUMATIC MULTISTAGE PRESSURE REGULATOR

## GENERAL INFORMATION

The Fairchild Model 80D multi-stage precision pneumatic pressure regulator is a two-stage, pilot operated regulator. The Model 80D combines the ultra high precision characteristics of an instrument regulator with the high flow capacity of the process regulator thereby producing a single regulator with the most desirable performance characteristics of the instrument and process regulators. The basic force balance system coupled with pilot control produces an extremely sensitive regulator which responds to the smallest change in output requirements.

### Specifications Model 80D

Flow capacity ..... 14 SCFM (23.8 m<sup>3</sup>/HR) 100 psig [7.0 BAR] (700kPa) supply; 20 psig [1.5 BAR] (150 kPa) set

Exhaust capacity ..... 2.5 SCFM (4.25 m<sup>3</sup>/HR) (Downstream pressure 5 psig [.35 BAR] (35 kPa) above set pressure)

### Pressure change under flow conditions

set pressure 10 psig [0.7 BAR] (70 kPa) supply 100 psig [7.0 BAR] (700 kPa) ..... less than 0.1 psig [.007 BAR] (.7 kPa) W.C. from dead end service to 10 SCFM (17 m<sup>3</sup>/HR)

Maximum supply pressure ..... 150 psig [10.0 BAR] (1000 kPa) for 20 psig (140 kPa) range  
250 psig [17.0 BAR] (1700 kPa) for 60-100 psig [4.2-10.0 BAR] (420-700 kPa) ranges

Maximum output pressure ... 150 psig [10.0 BAR] (1000 kPa)

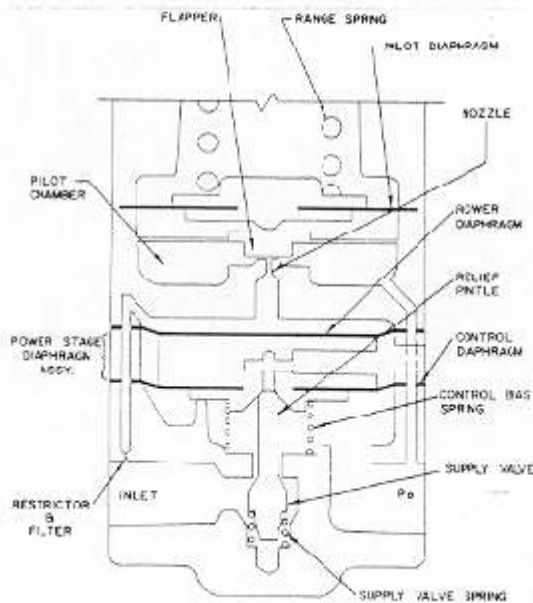
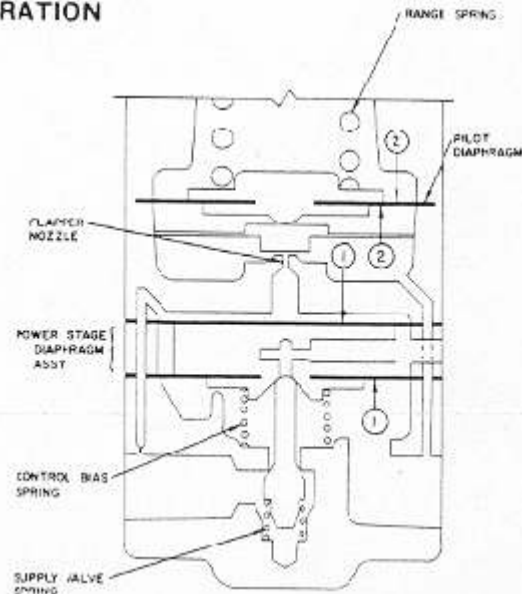
Pressure change due to ..... less than .2 psig [.014 BAR] (1.4 kPa) for 100 psig supply pressure condition [7.0 BAR] (700 kPa) range

Air consumption ..... less than 0.1 SCFM (.17 m<sup>3</sup>/HR)

Ambient temperature limits ..... -40°F to +200°F (-40°C to 93.3° C)

## PRINCIPLES OF OPERATION

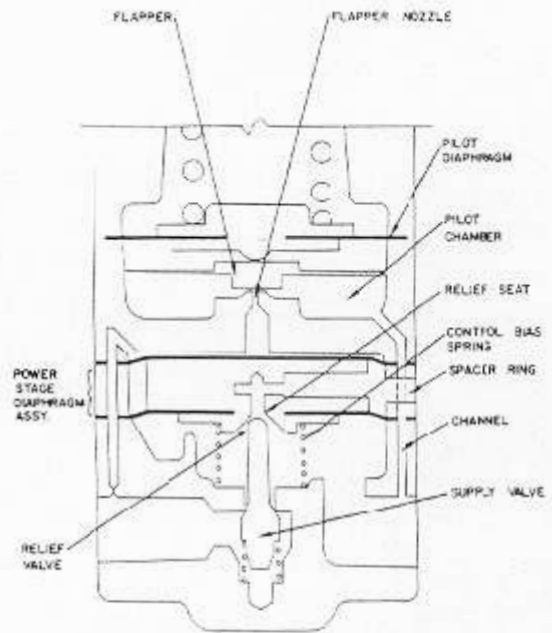
With supply pressure turned off and the adjusting knob turned completely out, allowing the range spring to be relaxed, the supply and relief valves are seated because of the upward force of the supply valve spring on the valve assembly. When supply air is introduced to the inlet port, air flows through the stainless steel filter and sapphire orifice to the top of the power stage diaphragm assembly, through the nozzle, and to the downstream side of the regulator. The action of the control bias spring furnishes the differential pressure across the nozzle to allow flow.



When the knob of the Model 80D is adjusted to a specific set point the range spring exerts a force against the pilot stage diaphragm. The resultant pressure  $P_o = K$ , where  $P_o$  is output pressure and  $K$  is the spring constant. This condition is achieved only when output pressure reaches the desired set point. Until then, the force moves the flapper against the pilot stage nozzle, reducing the nozzle flow. The nozzle back pressure increases and acts on the power stage diaphragm. This force acts against the control bias spring force, the supply valve spring force, and the force due to downstream pressure acting on the bottom of the control diaphragm, driving the power stage diaphragm assembly downward, opening the supply

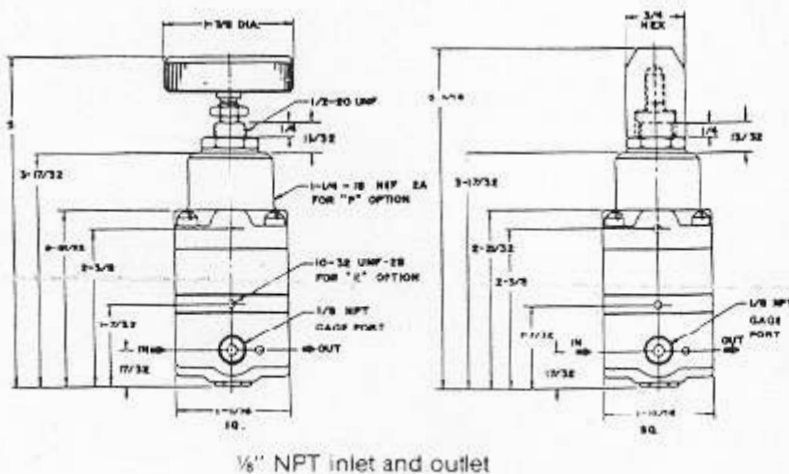
valve, and allowing air to flow to the outlet port. Downstream (outlet) pressure is transmitted to the pilot chamber, exerting pressure on the underside of the pilot diaphragm. The increase in pressure on the pilot diaphragm causes the diaphragm to move upward against the range spring force. This force moves the pilot diaphragm assembly upward, allowing the flapper to move upward and venting the nozzle to downstream. The flapper comes to a position so as to maintain a nozzle back pressure which acts downward on the power stage diaphragm, balancing the upward force of the downstream pressure on the control diaphragm and the force of the control bias and supply valve springs. Downstream air pressure acts on the bottom of the power stage diaphragm assembly, moving the assembly upward, allowing the supply valve to throttle and maintaining output pressure.

When set point is reached, the force acting on the bottom of the power stage diaphragm assembly is in balance with the force acting on the top of the assembly. If downstream pressure rises above set point, the increased pressure is transmitted through the channel to the pilot chamber, and exerts pressure on the underside of the pilot diaphragm. As the pilot diaphragm moves upward, supply air is vented through the flapper nozzle, reducing pressure on the top of the power stage diaphragm assembly to a lower value. Downstream pressure acts on the underside of the power stage diaphragm assembly. The increased



pressure, assisted by the control bias spring, forces the power stage diaphragm assembly to move upward, allowing the relief seat to move away from the relief valve. Exhaust takes place through the vent in the spacer ring.

## INSTALLATION



1/2" NPT inlet and outlet

Clean all pipe lines to remove dirt and scale before installation is made. Apply minimum amount of pipe compound to male threads of air line only. Start with third thread back and work away from end of line to avoid possibility of getting compound into regulator. Install regulator in air line; body is fitted with a 1/2" NPT for inlet and outlet connections. Regulator can be mounted in any position without affecting its operation. Inlet and outlet connections are labeled (look for arrows denoting direction of flow on underside of unit) and should be tightened securely. Avoid undersized fittings that will limit flow through the regulator and cause pressure drop downstream. NOTE: The Model 80D must be used on oil free air. The use of a filter to remove dirt and entrained liquid in the air line ahead of the regulator is required for correct performance. If an air line lubricator is used, it must be located downstream beyond the regulator to avoid interference with the regulator performance.

## ADJUSTMENTS

No Field adjustments are required.

### Note

Full range of pressure is secured over 4 1/2 turns of the adjusting screw.

## OPERATION

Relieve pressure on range spring before putting the 80D into service for the first time. To operate turn the adjusting screw slowly in a clockwise direction until required downstream pressure is obtained. Turned in

this direction, the screw compresses the range spring causing increased output pressure. For decreased output pressure, turn the screw counterclockwise.

**OPTIONS STANDARD UNIT**

	STD	E	S	U
Knob Assembly	EB-1142-1	EB-1142-1		EB-1142-1
Spacer Ring	EB-16682-1	EB-16682-2	EB-16682-1	EB-16682-1
Body & Valve Assembly	EB-13680-1	EB-13680-1	EB-13680-1	EB-13680-2
Body Assembly	EB-9531-1			EB-9531-5
Screw			EB-8159-14	
Nut			EB-1120	

**OPTIONS**

	STD	T
Knob Assembly	EB-1142-1	
Cap		EB-11029
Screw		EB-8159-14
Nut		EB-1120

**OPTIONS LARGE PORT UNIT**

	STD	E	S	U
Knob Assembly	EB-1142-1			
Spacer Ring		EB-16682-2		
Body & Valve Assembly	See Table			See Table
Screw			EB-8159-14	
Nut			EB-1120	

**OPTIONS**

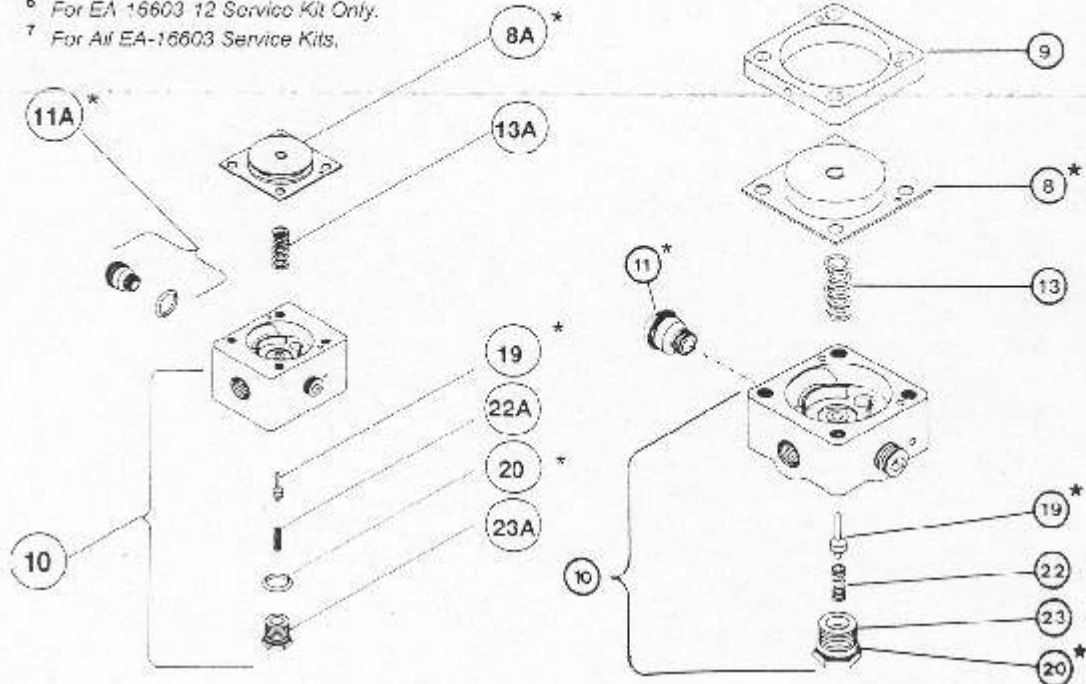
	STD	T	P
Knob Assembly	EB-1142-1		
Cap		EB-11029	
Screw		EB-8159-14	
Nut		EB-1120	
Bonnet Assembly	EB-9536-4		EB-9536-6

**All Ranges**

Body & Valve Assembly	Body	Port
EB-16616-5	16615-1	¼ NPT
EB-16616-6	16615-2	⅜ NPT
EB-16616-7	16615-3	¼ BSPT
EB-16616-8	16615-4	⅜ BSPT

Index	Part No.	Description
1	EB-1142-1	Knob Assembly
1A	EB-11029	Cap Nut
1B	EB-8159-14	Screw
2	EB-9536-4	Bonnet Assembly
3	EB-11020	Spring Seat
7 4	EB-12191	Diaphragm Assembly
6	EB-9547	Anvil
7	EB-9530-3	Pilot Body Assembly
3 8	EB-13681-2	Diaphragm Assembly
4 8	EB-13681-3	Diaphragm Assembly
5 8	EB-13681-4	Diaphragm Assembly
8	EB-16661-7	Diaphragm Assembly
2 8A	EB-16661-8	Diaphragm Assembly
1 8A	EB-16661-6	Diaphragm Assembly
9	EB-16682-1	Spacer Ring
10	See Table	See Table
2,3,4,5 11	EB-9348-3	Orifice Assembly
1,6 11A	EB-9348-5	Orifice Assembly
7 12	EB-12926-1	Diaphragm
13	EB-11580	Spring
13A	EB-11580	Spring
15	EB-1032-26	Screw
18	EB-1120	Nut
7 19	EB-13674	Pintle
7 20	EB-130-012-1-70	O-ring
22	EB-9212	Conical Spring
22A	EB-8039	Conical Spring
23	EB-13676	Plug
23A	EB-16617-1	Plug

- 1 For EA-16603-1 Service Kit Only.
- 2 For EA-16603-6 Service Kit Only.
- 3 For EA-16603-7 Service Kit Only.
- 4 For EA-16603-8 Service Kit Only.
- 5 For EA-16603-9 Service Kit Only.
- 6 For EA-16603-12 Service Kit Only.
- 7 For All EA-16603 Service Kits.



## Service Kit Installation

### Model 80 Service Kit (Standard Unit)

#### For All Units

1. Check parts in the EA-16603 service kit against parts marked with an asterisk in the exploded view and the associated table.

#### For Standard Units

2. Turn out range screw Assembly (1) to relieve tension on spring.

#### For Screw Adjust (S) Unit

2. Loosen Nut (18) and turn out Range Screw (1B) to relieve tension on spring.

#### For Tamper Proof (T) Unit

2. Remove Cap Nut (1A), loosen Nut (18) and turn out Range Screw (1B) to relieve tension on spring.

#### For All Units

3. Remove Four Bonnet Screws (15). Set aside range Spring (5) and Spring Cap (3).

**CAUTION: Spring (13) is in compression. Screws should be removed carefully, allowing the spring to expand.**

Set aside Spring (13), after removing Bonnet Assembly (2), Diaphragm Assembly (4), Pilot Body Assembly (7), Diaphragm (12), spacer Ring (9), and Diaphragm Assembly (8) from Body and Valve Assembly (10). Remove any pipe fittings in body ports.

4. Remove Orifice Assembly (11) and Gasket (21) from Body and Valve Assembly (10).
5. Unscrew Plug (23) from Body (10). Remove and discard Pintle (19) and retain Conical Spring (22).
6. Replace O Ring (20) on Plug (23) with O Ring from kit. Lubricate with silicone grease. Place Conical Spring (22) wide end down, into cup of Plug (23). Clean Body Assemblies (10) and (7) with a suitable solvent. Blow dry with compressed air.
7. Turn body (10) over, so that plug end faces up.
8. Place Pintle (19) from kit into plug end of body (10) valve end up. Hold the pintle securely which extends from the opposite end of Body (10) and insert Conical Spring (22) and Plug (20) into the plug end of Body (10). Screw the Plug (23) into Body (10) until it is tight.

**CAUTION: Insure that short end of pintle (19) fits into top of Conical Spring (22).**

9. Secure Orifice Assembly (11) and Gasket (21) from kit. Place Gasket (21) over threaded portion of ori-

fice assembly (11) and screw the assembly into the port on Body (10) opposite port marked GAUGE.

10. Place Spacer Ring (9) on Body (10) making sure that six holes in the Spacer Ring match the six holes in Body (10).
11. Secure Diaphragm Assembly (12) from service kit and place it on top of spacer Ring (9), making sure that six holes in the Diaphragm (12) match the six holes in the spacer Ring (9).
12. Place the Pilot Body Assembly (7) on top of Diaphragm (12), making sure that the six holes on the bottom of Pilot Body Assembly (7) match the holes in Diaphragm (12). Check that Anvil (7) is seated in the center hole of the spring plate.
13. Secure Diaphragm Assembly (4) from kit and place it in the recess of the Pilot Body Assembly (7). Place Range Spring (5) and Spring Cap (3) on top of Diaphragm Assembly (4).
14. Position Bonnet Assembly (2) over the Pilot Body Assembly (7) so that signal port in the Bonnet Assembly (2) is over the port marked with the arrow pointing into the unit.

**NOTE: Output port is on the side opposite Spacer Ring (9) which has the vent hole.**

15. Grasp the Spacer Ring (9) firmly and lift up, being careful that all parts above it remain in alignment. Set the stacked parts aside.
16. Secure Spring (13) from the kit and place it in the cup on Body (10), directly over the pintle (19).
17. Secure diaphragm Assembly (8) from the kit and place it on top of spring (13), making sure that holes in the Diaphragm match the six holes in Body (10), when the Spring (13) is compressed.
18. Carefully place the assembled stack set aside in step 17 on top to the Diaphragm Assembly (8), making sure large piston is on top and that six holes in the spacer Ring (9) match the holes in Diaphragm Assembly (8). Compress the Spring (13) and insert four Screws (15) into the Bonnet Assembly (2), until several threads are engaged on each screw.
19. Carefully tighten opposite screws until Spring (13) is compressed. Caution: insure that the screws do not cut the diaphragm as they are being tightened.
20. Complete tightening of the screws (15).
21. Lubricate Knob Assembly Screw (1) with Molycote type "G" grease. For Tamper Proof unit replace Cap (13) on regulator.
22. Reinstall the regulator in accord with instructions in the IOM and follow instructions in the operation section for placing the regulator back in service.

## Service Kit Installation

### Model 80 Service Kit (Large Port Unit)

#### For All Units

1. Check parts in the EA-14637 service kit against parts marked with an asterisk in the exploded view and the associated table.

#### For Standard Units

2. Turn out range screw Assembly (1) to relieve tension on spring.

#### For Screw Adjust (S) Unit

2. Loosen Nut (18) and turn out Range Screw (1B) to relieve tension on spring.

#### For Tamper Proof (T) Unit

2. Remove Cap Nut (1A), loosen Nut (18) and turn out Range Screw (1B) to relieve tension on spring.

#### For All Units

3. Remove Four Bonnet Screws (15). Set aside range Spring (5) and Spring Cap (3).

**CAUTION: Spring (13A) is in compression. Screws should be removed carefully, allowing the spring to expand.**

Set aside Spring (13A), after removing Bonnet Assembly (2), Diaphragm Assembly (4), Pilot Body Assembly (7), Diaphragm (12), spacer Ring (9) and Diaphragm Assembly (8A) from Body and Valve Assembly (10). Remove any pipe fittings in body ports.

4. Remove Orifice Assembly (11A) and Gasket (21) from Body and Valve Assembly (10).
5. Unscrew Plug (23A) from Body (10). Remove and discard Pintle (19) and retain Conical Spring (22A).
6. Replace O Ring (20) on Plug (23A) with O Ring from kit. Lubricate with silicone grease. Place Conical Spring (22A) wide end down, into cup of Plug (23A). Clean Body Assemblies (10) and (7) with a suitable solvent. Blow dry with compressed air.
7. Turn body (10) over, so that plug end faces up.
8. Place Pintle (19) from kit into plug end of body (10), valve end up. Hold the pintle securely which extends from the opposite end of Body (10) and insert Conical Spring (22A) and Plug (20) into the plug end of Body (10). Screw the Plug (23A) into Body (10) until it is tight.

**CAUTION: Insure that short end of pintle (19) fits into top of Conical Spring (22A).**

9. Secure Orifice Assembly (11A) and Gasket (21) from kit. Place Gasket (21) over threaded portion of ori-

fice assembly (11A) and screw the assembly into the port on Body (10) opposite port marked GAUGE.

10. Place Spacer Ring (9) on Body (10) making sure that six holes in the Spacer Ring match the six holes in Body (10).
11. Secure Diaphragm Assembly (12) from service kit and place it on top of spacer Ring (9), making sure that six holes in the Diaphragm (12) match the six holes in the spacer Ring (9).
12. Place the Pilot Body Assembly (7) on top of Diaphragm (12), making sure that the six holes on the bottom of Pilot Body Assembly (7) match the holes in Diaphragm (12). Check that Anvil (7) is seated in the center hole of the spring plate.
13. Secure Diaphragm Assembly (4) from kit and place it in the recess of the Pilot Body Assembly (7). Place Range Spring (5) and Spring Cap (3) on top of Diaphragm Assembly (4).
14. Position Bonnet Assembly (2) over the Pilot Body Assembly (7) so that signal port in the Bonnet Assembly (2) is over the port marked with the arrow pointing into the unit.

**NOTE: Output port is on the side opposite Spacer Ring (9) which has the vent hole.**

15. Grasp the Spacer Ring (9) firmly and lift up, being careful that all parts above it remain in alignment. Set the stacked parts aside.
16. Secure Spring (13A) from the kit and place it in the cup on Body (10), directly over the pintle (19).
17. Secure diaphragm Assembly (8A) from the kit and place it on top of spring (13A), making sure that holes in the Diaphragm match the six holes in Body (10), when the Spring (13A) is compressed.
18. Carefully place the assembled stack set aside in step 17 on top to the Diaphragm Assembly (8A), making sure large piston is on top and that six holes in the spacer Ring (9) match the holes in Diaphragm Assembly (8). Compress the Spring (13A) and insert four Screws (15) into the Bonnet Assembly (2), until several threads are engaged on each screw.
19. Carefully tighten opposite screws until Spring (13A) is compressed. Caution: insure that the screws do not cut the diaphragm as they are being tightened.
20. Complete tightening of the screws (15).
21. Lubricate Knob Assembly Screw (1) with Molycote type "G" grease. For Tamper Proof unit replace Cap (1B) on regulator.
22. Reinstall the regulator in accord with instructions in the IOM and follow instructions in the operation section for placing the regulator back in service.

## MAINTENANCE

It will not be necessary to perform maintenance of a routine nature on this unit if oil free air is used.

## TROUBLE SHOOTING

PROBLEM	CHECK
Leakage	Body screw tightness Diaphragm
High Bleed	Relief pintle and relief seat for damage or contamination
Difficult to Adjust	Adjusting screw and ball Seal Ring lubrication

## REPAIR PARTS LIST

Service Kit EA-16603 is available for maintenance of the Model 80D regulator.

Service Kit	Port Size	Pressure Range
EA-16603-7	1/8	0-20 psig
EA-16603-12	1/4, 3/8	0-20 psig
EA-16603-8	1/8	0-60 psig
EA-16603-1	1/4, 3/8	0-60 psig
EA-16603-9	1/8	0-100 psig
EA-16603-5	1/4, 3/8	0-100 psig

## LEGAL NOTICE:

The information set forth in the foregoing Installation, Operation and Maintenance Instructions shall not be modified or amended in any respect without prior written consent of Fairchild Industrial Products Company. In addition, the information set forth herein shall be furnished with each product sold incorporating Fairchild's unit as a component thereof.



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