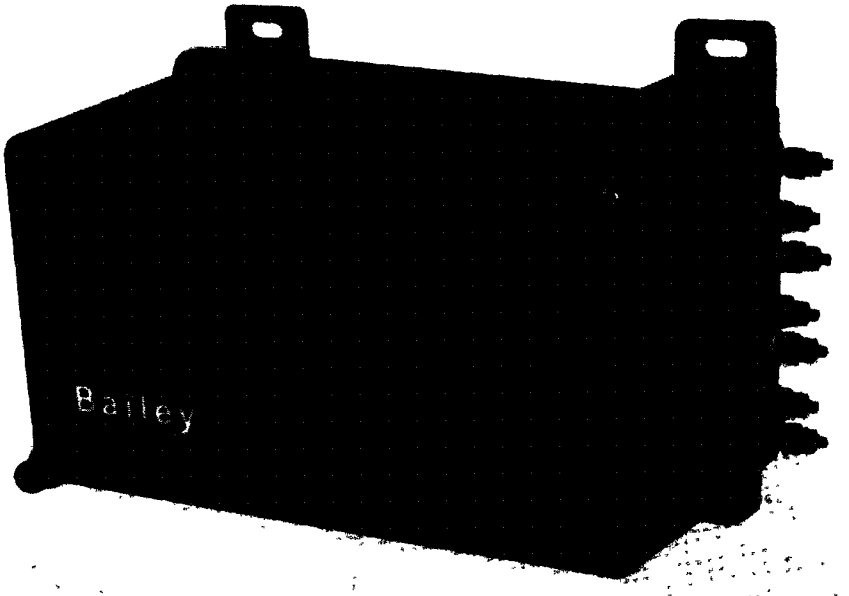
MINI-LINE 520*
Function Generator
Type FG



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Form P92 12A L tho n U S A 578

*Reg U S Pat Off ce

Babcock & Wilcox
Bailey Meter Company, U.S.A

WARNING

NSTRUCT ON MANUALS

DO NOT NSTALL MA NTA N OR OPERATE TH S EQU PMENT W THOUT READ NG, UNDERSTAND NG AND FOLLOW NG PROPER Babcock & W lcox Ba ey Meter Co U S A NSTRUCT ONS AND MANUALS OTHERW SE NJURY OR DAMAGE MAY RESULT

ATTENTION

MANUELS D OPERAT ON

NE PAS METTRE EN PLACE RÉPARER OU FA RE FONCT ONNER CE MATÉR EL SANS AVO R LU, COM PR S ET SU V LES NSTRUCT ONS RÈGLEMENTA RES DE Babcock & W cox Ba ley Meter Company U S A TOUTE NÉGL GENCE À CET ÉGARD POURRA T ÊTRE UNE CAUSE D ACC DENT OU DE DÍ FA LLANCE DU MA TÉR EL

INDEX

INSTALLATION

WARNING THIS UNIT SHOULD NOT BE IN STALLED IN AN ENVIRONMENT CONTAIN ING CHLORINATED OR AROMATIC HYDRO CARBONS THESE ELEMENTS WILL DAM AGE THE POLYCARBONATE COVER THE COVER WILL ALSO BE DAMAGED BY AMINOS, ALKALIES AND AMMONIA

AVERTISSEMENT CET ENSEMBLE NE DOIT PAS ETRE INSTALLE DANS UN ENVIRONNE MENT CONTENANT DES HYDROCARBURES AROMATIQUES OU CHLORES CES ELE MENTS ENDOMMAGERAIENT LE COUVER CLE EN POLYCARBONATE L'AMMONIAQUE, L'ALCALI ET LES AMINES ENDOMMAGENT EGALEMENT LE COUVERCLE

Unpacking and Storage

1 Check for any obvious damage to shipping carton or contents Report any damage to carrier

2 Make certain that unit is correct range for intended service (refer to identification label)

3 If unit is to be stored repack in original container and store in an area free of corrosive vapors and extremes in temperature and humidity Storage temperatures should fall within limits of 20°F and +160°F (29°C and +72°C)

Mo nd External Connections

The Function Generator is designed for wall or surface mounting and should be mounted as follows

1 Attach unit to wall, panel or relay rack as shown in Figure 1 and secure with three 1/4 inch cap screws, nuts and lockwashers

NOTE Unit must be mounted as indicated in order to function properly

2 Make necessary adjustments for particular service as outlined under "Placing In Service", "Adjusting for Service (Nulling Procedure)"

3 Make external connections to mounting base (Figures 1 and 2) Connections are 1/8" 27 NPT female

4 Adjust air supply to mounting base to 18 to 20 psig (124 to 138 kPa) See "Quality Stand ard for Instrument Air", 1975, ISA S7 3 at the end of this section

NOTE If tubing elbows are desired, the following fittings are recommended

E2, E4 and output - 1/8 NPT male to tubing elbow

E1, E3, E3R and S 1/8 NPT x 1" nipples and 1/8 NPT female to tubing elbows

To facilitate assembly, install the E2 and output tubing bellows first

Quality Standard for Instrument Air, 1975, ISA-S7.3

4.1.1 Outdoor installations (where any part of the instrument air system is exposed to the outdoor atmosphere)

The dew point at the pressure shall be at least 10°C (18°F) below the minimum ambient temperature recorded at the plant site.

4.1.2 Indoor installations (Where the entire instrument air system is installed indoors)

The dew point at line pressure shall be at least 10°C (18°F) below the minimum temperature to which any part of the instrument air system is exposed at any season of the year. In no case should the dew point at the pressure exceed 2°C (approximately 35°F).

4.2 Particle Size

The maximum particle size in the air stream at the instrument shall be three (3) microme'ers.

4.3 Oil Content

The maximum total oil or hydrocarbon content exclusive of noncondensables shall be as close to zero (0) w/w or v/v as possible and under no circumstances shall it exceed one (1) ppm w/w or v/v under normal operating conditions.

4.4 Contaminants

The instrument air shall be free of all corrosive contaminants and hazardous gases flammable or toxic which may be drawn into the instrument air stream. If contamination exists in the compressor intake area the air should be taken from an elevation or remote location free from contamination or processed to remove such contamination. Any cross connections or process connections to the instrument air piping shall be so sited to preclude contamination of the air system. A regular periodic check should be made to assure high quality instrument air.

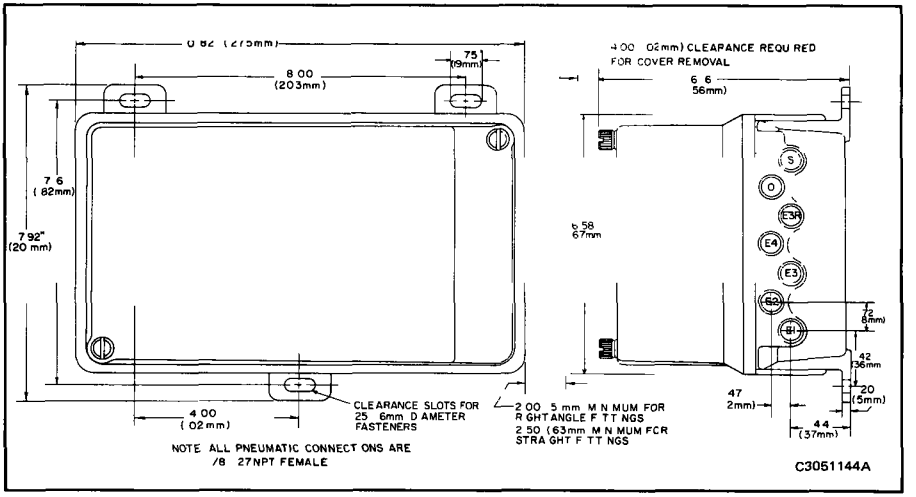


FIGURE 1 External Mounting Dimensions, Type FG Function Generator.

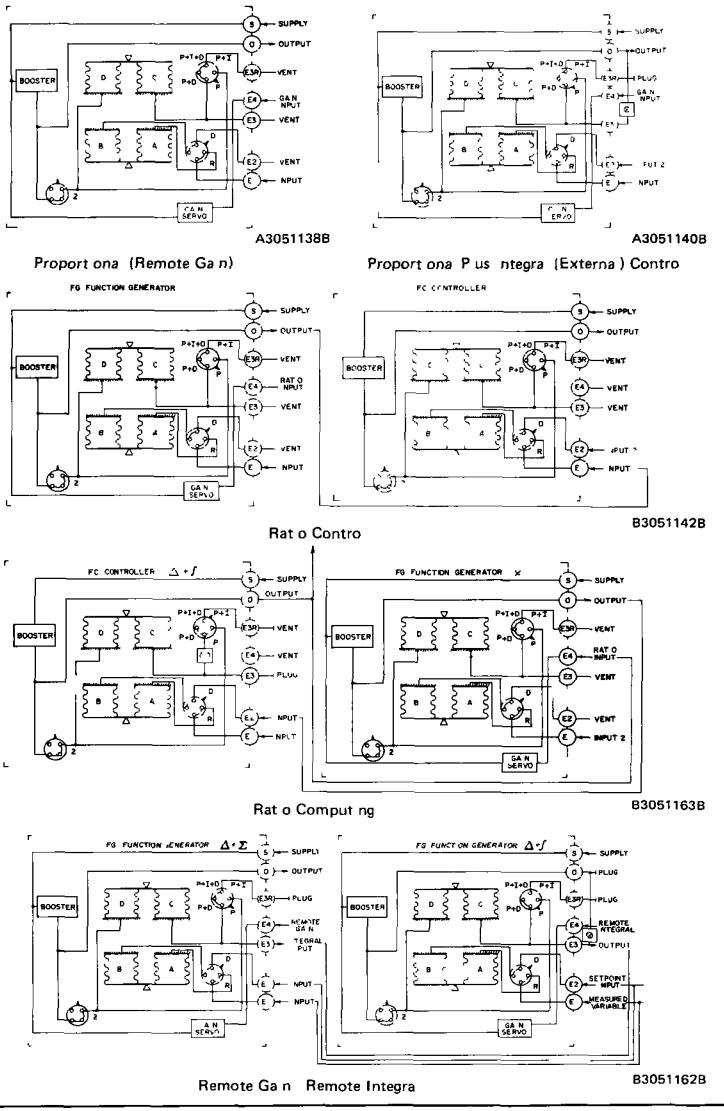


FIGURE 2 Tub ng Connect ons and Switch Settings for Type FG Funct on Generator

PLACING IN SERVICE

Function Generators which have been specially calibrated at the factory for a particular service (low rise cam, gain 8 to 1 2), can be placed directly in operation

IMPORTANT If this factory calibration has been changed (e g , thru bellows rotation) the unit must be recalibrated as outlined under "Complete Calibration"

If integral control action is required a volume chamber and bleed valve must be placed in series between the booster relay and the "C" bellows Derivative action may be provided by placing a volume chamber and bleed valve in the input signal line (Figure 8)

In any case, calibration should be verified by applying several input pressures for which the desired output pressures are known If incorrect output pressures result the unit must be recalibrated

Repeat the application of input pressures with known outputs If output pressures are now correct the unit may be placed in service If output pressures remain incorrect, the calibration has shifted and must be reset

Adjusting For Service (Nulling Procedure)

1 Disconnect spring (Parts Drawing P92 12 1, Item 19) from end of connecting rod (Item 16) and remove rod from cylinder Rotate rod 180° clockwise to allow for free gain arm movement

2 Loosen two hex head cap screws (Item 47) and move nozzle support (Item 5) all the way to the left

3 Place function switch in "P" position, direct/reverse switch in "D" position and by pass switch in position "1"

4 Apply 18 to 20 psig (124 to 138 kPa) supply to "S" connection

5 Apply 3 0 + 01 psig (62 + 07 kPa) input to "E1" connection, inputs to E_2, E_3, E_4 at 0 0 psig

6 Move gain arm to position 10 on gain scale decal and adjust A/B bias screw until output equals 3 0 + 01 psig (20 6 + 07 kPa)

7 Move gain arm to position 1 on gain scale decal and adjust C/D bias screw until output equals 3 0 + 01 psig

8 Repeat step 5 and 6 until difference between output at gain setting 10 and output at gain setting 1 is less than 0 2 psig (1 4 kPa)

9a Move gain from 1 to 10 and note any change in output between these settings At point of greatest deviation, adjust error three times the error, in direction of error, using null adjustment screw on gain arm

b Set gain to 1 and readjust C/D bias screw to required pressure

c Set gain to 10 and readjust A/B bias screw to required pressure

10 Repeat steps 7 thru 9c until gain arm can be moved from gain setting of 1 to 10 with output remaining constant at 3 0 + 12 psig (20 6 + 83 kPa) +1 0% of span

11 When output signal remains at 3 0 ± 12 for gain settings from 1 to 10, nulling procedure is complete

12 Remove supply pressure to "S" connection

13 Reconnect spring (19) to end of connecting rod (16)

ROUTINE MAINTENANCE

1 Air supply to Controller must be kept free of dirt, oil and moisture for satisfactory operation Inspect felt filters in mounting base and replace them if they are dirty Frequency of filter replacement will depend on the quality of supply air See "Quality Standard for Instru ment Air", ISA S7 3, 1975 under "Installation"

NOTE These filters are included as added pro tection only and are not intended to take place of required clean air supply

2 When necessary, replace felt pad air filters in E1, E2, E3R and S connections (Figure 4) as follows

a Turn off supply air and disconnect supply air and output lines noted in (2) above

b Remove fittings

c Remove wire mesh discs and felt pads with pick or similar instrument

d Replace felt pads and wire mesh discs

e Replace fittings

f Reconnect supply air and output lines to mounting base

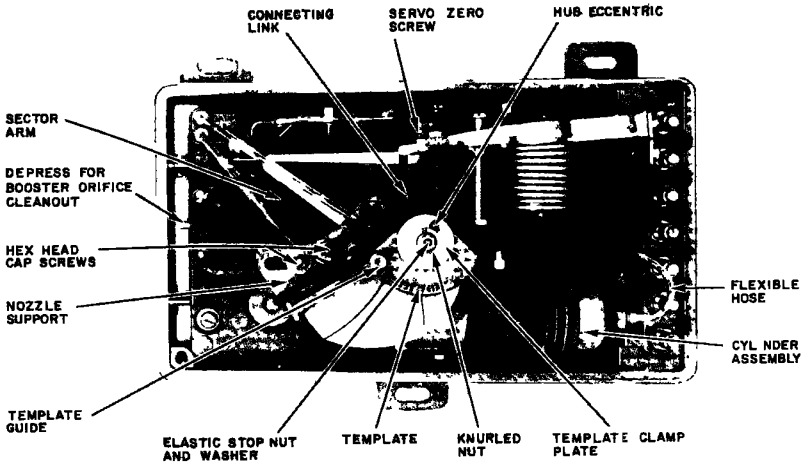
3 All pressure connections must be kept air tight Check all air pressure connections for leakage with suitable leak detector solution

4 Inspect nozzle tip (Figure 8) and vane for deposits of oil, dirt, etc Clean with a suitable solvent

5 Clean booster using orifice cleanout plung er, WHEN EQUIPMENT IS NOT OPERATING

WARNING USE OF THE BOOSTER CLEAN OUT DEVICES WHEN EQUIPMENT IS OPERA TING ON LINE CAUSES PNEUMATIC SIGNAL "BUMP" WHICH COULD CAUSE SERIOUS SYSTEM UPSET

AVERTISSEMENT L'EMPLOI DU DISPOSITIF DE NETTOYAGE DU SURPRESSEUR PEN DANT QUE L'EQUIPEMENT EST EN FONC TIONNEMENT DIRECT PROVOQUE UN "CONGNEMENT" DU SIGNAL PNEUMA TIQUE ET RISQUE DE CAUSER UN DERE GLAGE SERIEUX DU SYSTEM



F GURE 3 Function Generator Adjustments

a To clean booster orifice push cleanout plunger (Figure 3)

b Check output bleed orifice located just below orifice cleanout plunger for normal small air bleed

c If necessary, clean out any obstructions by manipulating cleanout wire

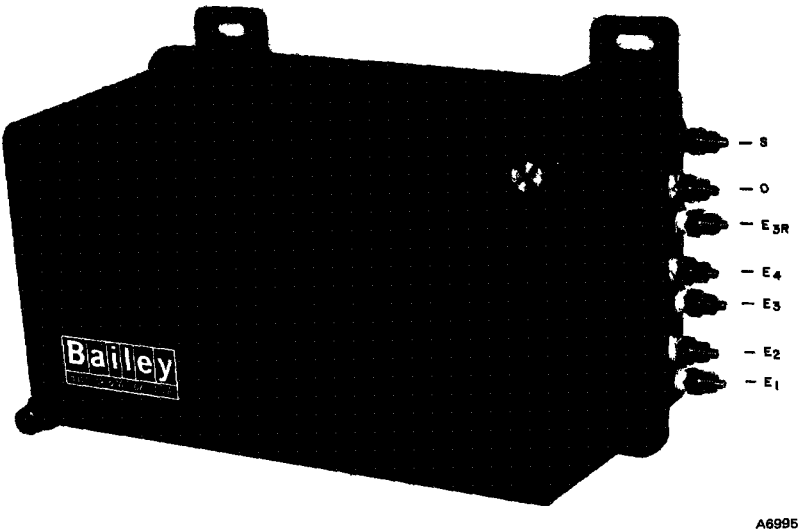


FIGURE 4 External Connection Ports

COMPLETE CALIBRATION

It the unit has been disassembled for any reason, or factory calibration has been disturbed, or the unit cannot be correctly adjusted as out lined under "Placing In Service', it must be completely recalibrated as outlined under "Basic Alignment"

No calibration of the booster is required

NOTE For maximum accuracy, the Function Generator should be calibrated in the same position as that of final installation

Also, it is suggested that an extra controller mounting assembly (part no 5327136-1) be used when calibrating in order to eliminate disruption of piping

The Function Generator consists of two major assemblies, the Controller and the Gain Servo Assembly Each assembly must be cali brated separately If it has been necessary to repair or replace parts in either assembly, the basic alignment of the unit can be re-established by following the applicable procedure outlined below After the individual section has been realigned, it will be necessary to repeat the steps outlined under "Placing n Service" to adjust the complete Function Generator for the required service

Basic Alignment (Parts Drawing P92 11 1)

1 Remove plastic cover from unit

2 Remove plastic plugs from seven ports in controller mount

3 Check to be sure that A/B and C/D beams are parallel to each other and to edge of control ler base, and that hinge (item 33) is straight

4 Check alignment of linkage pivot pin (42) End of pivot pin should be in line with dimple in shaft of range adjustment (50)

5 Check to see that nozzle on C/D beam is in center of vane (2), and vane body (4) is in contact with pivot pin (42)

6 Check to be sure that A/B and C/D bias adjustments springs (20) are parallel to edge of controller base, and that A/B and C/D bias spring assembly locknuts (65) are tight

7 Place direct/reverse switch (25) in "D" position

8 Place P/P+I switch, located next to integ ral valve chamber on controller base, in "P" position

9 Place on-off switch, located next to booster assembly, in "1" position

10 Apply 9 psig (62 kPa) + 01 to E4 port

11 Check to see that servo beam is approxi mately parallel to the servo mounting base (22) If necessary, loosen two nuts retaining servo spring assembly (17) and reposition nuts on spring assembly until servo beam is parallel to mounting base Re-tighten nuts

12 Adjust E4 input to 15 5 psig (106 9 kPa) ± 01

13 Loosen nut retaining stop screw (45) and adjust position of screw until screw head just contacts servo beam Re tighten nut to re tain stop screw

14 Adjust E4 input to 2 0 psig (13 8 kPa) + 01

15 Adjust position of elastic stop nut (25) until nut just contacts underside of servo beam

16 Turn on supply pressure to provide 18 psig (124 kPa) to unit

Leak Test

1 Rotate pinion gear to gain of 1

2 Adjust E1 and E4 inputs to 15 psig (103 4 kPa) + 01

3 Adjust C/D bias screw on unit until output equals 15 psig + 01

4 Using liquid leak detector, check unit for leaks Check all O rings, gasketed joints, bellows ends and tubing connections

Low Rise Template Calibration

1 Disconnect air supply to "S" connection

2 Loosen knurled nut (Parts Drawing P92 12 1, item 8) on template hub approximately one turn Grasp hub (7) to prevent it from turning and adjust eccentric screw on hub until hub driven arm is approximately in mid position of its adjustment range Do not re tighten knurled nut

3 Adjust E4 input to 9 psig + 01

4 Adjust zero screw (40) to provide a clearance of approximately 1/16 inch (1 6 mm) between zero adjustment arm (15) and servo beam (24)

5 Check to see that servo beam is approximately parallel to servo mounting base (22) If necessary, loosen two nuts retaining servo spring assembly (17) and reposition nuts on spring assembly until servo beam is parallel to mounting base Retighten nuts

6 Adjust zero screw (40) on servo beam until center line of driven arm on template hub is approximately parallel to servo mounting base

NOTE Do not turn zero screw more than three turns in either direction If required parallel between servo beam and servo mounting base can not be obtained with less than three turns of zero screw, reset screw to provide a clearance of 1/16 inch (1 6 mm) between zero adjustment arm and servo beam Repeat step 5, above

7 Install low rise template between clamp disc and template hub and push template into hub assembly until template bottoms against center bushing in hub Install template in hub assembly so that word "direct" on template can be read correctly Rotate template until mid-travel markings are aligned with nozzle on nozzle support (5) Lightly tighten knurled nut to retain template

8 Apply 18-20 psig to "S" connection

9 Recheck alignment of nozzle with mid travel markings on template If necessary, loosen knurled nut on hub assembly and reposition template to align nozzle and template mid-travel line

10 Adjust E4 input as required to rotate template until largest radius line on template is in line with nozzle Loosen nozzle retaining screw (46) and adjust nozzle (6) to provide 002 (05 mm) to 005 (13 mm) inch clearance between nozzle and template Re tighten retaining screw

11 Adjust E1 input to 10 psig + 01 and E4 input to 9 psig + 01

12 Slightly loosen two hex head cap screws retaining nozzle support on gain arm and rotate gain arm until output equals 10 psig + 01 Retighten cap screws to retain nozzle support in this position and recheck output If necessary, loosen two cap screws and readjust gain arm setting Repeat until output is 10 psig + 01, with nozzle support secured on gain arm

13 Adjust E1 and E4 inputs to 3 psig + 01 Output should equal 3 psig + 06 If output is 3 psig + 06, proceed to step 14 If output is not 3 psig + 06, recheck null adjustment of unit by repeating "Null Procedure"

14 Change E4 input from 3 psig to 9 psig + 01, 15 psig + 01, and then back to 9 psig + 01 and observe output at each point Output must remain constant at 3 psig + 06 (± 05% of span)

15 If output remains constant at 3 psig ± 06, proceed to step 17

If output varies as E4 input is changed from 3 to 15 psig (20 7 to 103 kPa), adjust E4 to 3 psig ± 01 Adjust null screw on gain arm until output equals 3 psig +0 06 If output is higher than 3 psig, turn null screw clockwise If output is lower than 3 psig, turn null screw counter clockwise

16 Repeat steps 14 and 15 until output remains constant at 3 psig +0 06 as E4 input is changed from 3 to 15 psig

17 *Adjust E1 input to 10 psig ± 01 Adjust* E4 input to 9 psig + 01

18 If necessary, adjust C/D bias screw until output equals 10 psig + 01

19 Adjust E4 input to 3 psig + 01

20 Adjust eccentric screw on template hub assembly until output equals 8 60 psig (59 3 kPa) ±0 12 (.83), and nozzle is aligned as closely as possible with minimum radius line on template

NOTE *Adjust eccentric screw to correct output* signal pressure rather than nozzle position on template

21 Adjust E4 input to 15 psig + 01

22 With E4 input adjusted to 15 psig + 01, output should equal 11 40 psig (78 6 kPa) + 12 (83) and nozzle should be aligned as closely as possible with maximum radius line on template

If output pressure is lower than 11 40 psig +0 12, loosen knurled nut on template hub, rotate template a few degrees counterclockwise, *and lightly retighten knurled nut*

If output pressure is higher than 11 40 psig +0 12, loosen knurled nut on template hub, *rotate template a few degrees clockwise, and* lightly retighten knurled nut

23 *Following any rotation of template, adjust* E4 input to 9 psig + 01 Adjust zero screw on servo beam until output equals 10 psig +0 12 and nozzle is aligned as closely as possible with mid radius line on template

NOTE Adjust zero screw to correct output pressure rather *than nozzle position on template*

24 Repeat steps 19 through 23 until out put signal pressures are correct within +0 12 psig (+1 0% of span) and nozzle is aligned as closely as possible with radius line on template, for each E4 input

25 When output pressure for each E4 input *is correct, securely tighten* knurled nut to retain template Recheck calibration by repeating steps 19 through 23 If necessary "touch up" calibration with knurled nut tightened

26 When output pressure for each E4 input is correct with knurled nut and all other fasteners tightened securely, low rise template calibration is complete

NOTE If reverse action of E4 input is desired, template must be installed in hub assembly so that word reverse on template can be read cor rectly Also, outputs required for E4 inputs of 3 psig and 15 psig will be reversed from order listed in steps 19 thru 22 Finally, direction template must be rotated in order to correct output pressure when E4 15 psig, will be *opposite of that listed in step 21 For example,* if output is lower than 11 40 psig +0 12 when E4 input is 15 psig, template must be rotated counterclockwise, and vice versa

High Rise Template Calibration

1 *Disconnect air supply to* "S" connec tion

2 Loosen knurled nut (Parts Drawing P92 12 1, item 8) on template hub approximately one turn Grasp hub (7) to prevent it from turning and adjust eccentric screw on hub until *hub driven arm is approximately in mid position* of its adjustment range Do not retighten knurled nut

3 Adjust E4 input to 9 psig + 01

4 Adjust zero screw (40) to provide a clear *ance of approximately* 1/16 inch (1 6 mm) between zero adjustment arm (15) and servo beam (24)

5 Check to see that servo beam is approxi mately parallel to servo mounting base (22) If necessary, loosen two nuts retaining servo spring assembly (17) *and reposition nuts on* spring assembly until servo beam is parallel to mounting base Retighten nuts

6 Adjust zero screw (40) on servo beam until center line of driven arm on template hub is approximately parallel to servo mounting base

NOTE Do not turn zero screw more than three turns in either direction If required parallel be tween servo beam and servo mounting base can not be obtained with less than three turns of the zero screw, reset zero screw to provide clearance of 1/16 inch (1 6 mm) between zero adjustment *arm and servo beam Repeat step 5, above*

7 Install high rise template between clamp disc and template hub and push template into hub assembly until template bottoms against center bushing in hub Install template in hub assembly so that part number on template can be read correctly Rotate until the mid travel mark ings on template are aligned with nozzle on nozzle support (5) Lightly tighten knurled nut to retain template

8 Apply 18 20 psig air supply to "S" connec tion

9 Recheck alignment of nozzle with mid travel markings on template If necessary, loosen knurled nut on template hub assembly and re position template to align nozzle and template mid travel line

10 Adjust E4 input as required to rotate template until largest radius line on template is in line with nozzle Loosen nozzle retaining screw (46) and adjust nozzle (6) to provide 002 (05 mm) to 005 (13 mm) inch clearance between nozzle and template Re tighten re taining screw

11 Adjust E1 input to 7 psig + 01 and E4 input to 9 psig + 01

12 Slightly loosen two hex head cap screws retaining nozzle support on gain arm and rotate gain arm until output equals 10 psig + 01 Re tighten cap screws to retain nozzle support in this position and recheck output If necessary, loosen two cap screws and readjust gain arm set ting Repeat until output is 10 psig + 01 with nozzle support secured on gain arm

13 Adjust E1 and E4 input to 3 psig ± 01 Output should equal 3 psig + 06 If output is 3 psig + 06, proceed to step 14 If output is not 3 psig + 06, recheck null adjustment of unit by repeating "Nulling Procedure"

14 Change E4 input from 3 psig to 9 psig + 01, 15 psig + 01, and then back to 9 psig + 01 and observe output at each point Output must remain constant at 3 psig +0 06 (+0 5% of span)

15 If output remains constant at 3 psig +0 06, proceed to step 17

If output varies as E4 input is changed from 3 to 15 psig, adjust E4 input to 3 psig ± 01 Adjust null screw on gain arm until output test gage indicates 3 psig +0 06 If output is higher than 3 psig, turn null screw clockwise If output is lower than 3 psig, turn null screw counter clockwise

16 Repeat steps 14 and 15 until output re mains constant at 3 psig +0 06 as E4 input is changed from 3 to 15 psig

17 Adjust E1 input to 7 psig + 01 Adjust E4 input to 9 psig + 01

18 If necessary, adjust C/D bias screw until output equals 10 psig + 01

19 Adjust E4 input to 3 psig + 01

20 Adjust eccentric screw on template hub assembly until output equals 5 0 psig +0 12, and nozzle is aligned as closely as possible with minimum radius line on template

NOTE Adjust eccentric screw to correct output signal pressure rather than nozzle position on template

21 Adjust E4 input to 15 psig + 01

22 With E4 input adjusted to 15 psig + 01 output should equal 15 0 psig +0 12 and nozzle should be aligned as closely as possible with maximum radius line on template

If output pressure is lower than 15 0 psig +0 12, loosen knurled nut on template hub, rotate template a few degrees counterclockwise, and lightly retighten knurled nut

If output signal pressure is higher than 15 0 psig 0 12, loosen knurled nut in template hub, rotate template a few degrees clockwise, and lightly retighten knurled nut

23 Following any rotation of template, ad just E4 input to 9 psig + 01 Adjust zero screw on servo beam until output equals 10 psig +0 12, and nozzle is aligned as closely as possible with mid radius line on template

NOTE Adjust zero screw to correct output signal pressure rather than nozzle position on template

24 Repeat steps 19 through 23 until output pressures are correct within +0 12 psig (±1 0% of span) and nozzle is aligned as closely as pos sible with radius line on template, for each E4 input

25 When output pressure for each E4 input is correct, high rise template calibration is com plete

26 Securely tighten knurled nut to retain template Recheck calibration by repeating steps 19 through 23 If necessary "touch up" cali bration with knurled nut tightened

Template Shaping Routine

Necessary Tools

1 Table showing desired input/output rela tionship

2 Fine tip pen and pencil for marking blank template

3 Engineering curve for drawing desired curve

4 Sharp scissors for accurate cutting of template

5 Hand regulator for manual operation of gain servo air cylinder

Preparation for Template Shaping

1 Mount Function Generator and complete piping as outlined under "Installation" Com plete "Nulling Procedure' under "Placing In Service"

2 Apply mid range pressure to E4 connec tion, 9 psig (62 kPa) for 3 to 15 psig (20 7 to 103 kPa) range and adjust servo zero screw (Parts Drawing *P92 12 1*, item *40)* to make driver arm of template hub perpendicular to connecting link Adjust hub eccentric to mid position

3 Loosen elastic stop nut, washer, knurled nut and template clamp plate, and install tem plate, printed side up, so that mid travel mark lines up with nozzle hole

4 Tighten knurled nut

5 Change E4 signal from 3 to 15 psig and check that template swing is approximately 80° or 0 to 100% of travel lines If not, adjust eccen tric in template hub

6 Readjust servo zero screw, if necessary, to realign template mid travel mark with nozzle hole

7 Disconnect flexible hose (item 31) from cylinder base and plug or clamp hose

8 Connect hand regulator to cylinder and apply pressure Piston movement may be slug gish and exact positioning may require nozzle support to be lightly tapped Cylinder input is now external Servo feedback is, therefore, in operative allowing nozzle to be positioned any where on template

9 Loosen two hex head cap screws (item 47) retaining nozzle support to sector arm and rotate sector arm to position where it will operate over proper gain range

10 Retighten screws

11 *Determine extreme output conditions* from a table of input/output values and apply desired input for each extreme condition

12 Adjust cylinder pressure to obtain desired output to make sure gain span is within 34° sector arm swing

13 Change input signal in 10% steps (5% steps *may be required* for complex template shapes and steep slopes) At 3 psi (20 7 kPa) adjust cylinder input pressure to whatever pres sure is necessary to read required output

14 Mark with pencil thru template guide and repeat process for each increment of input/ output table

15 When all points have been plotted, remove template from hub

16 Use engineering curve and fine tip pen to connect penciled marks in a smooth curve When drawing template curve remember that nozzle must be slightly more obstructed by template with larger radius in order to maintain greater back pressure Therefore, make scribed line pass about 005 outside center of marks at maximum and 005 inside at minimum Line should be centered on dots at center of curve

17 Replace template under hub clamp plate making sure template is tight against bushing

18 With 9 psi signal at E4, align template mid travel mark with nozzle hole Servo zero screw can be used to make this adjustment exact

19 Disconnect hand regulator from cylinder and reconnect tubing

The Function Generator should now be functional Minor adjustment to the servo zero should complete the calibration if the template has been cut accurately

TROUBLESHOOTING

If the Function Generator is inoperative or if operation is faulty, check the calibration as outlined under "Complete Calibration", and perform operations listed under "Routine Maintenance" If operation is still faulty perform a visual check for loose screws, damaged or broken parts, leaks etc The Fault Correction Chart lists most common problems and correc tive actions

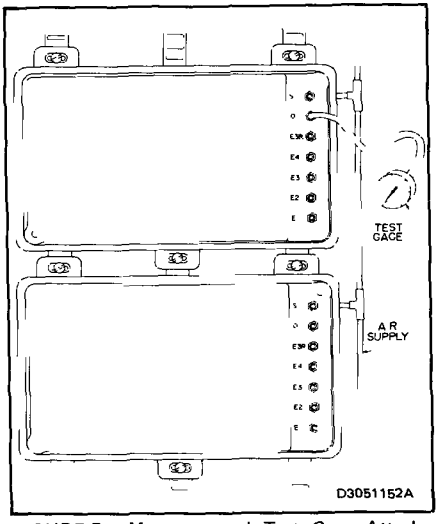


FIGURE 5 Mount ng and Test Gage Attach ment

Test Gage Kit (Figure 5)

A test gage (part no 5328485 1) is available as an accessory to aid in troubleshooting the pneumatic control system The kit consists of a gage, tubing and a test probe Slowly attach the test gage probe to a test jack and read pressure After reading, remove probe and replace jack cap and unit cover

WARNING TEST GAGE SHOULD NORMALLY BE USED ONLY TO TROUBLESHOOT A FAULTY SYSTEM THAT IS NOT IN AN OPERATING MODE PROBE INSERTION CAUSES A PNEUMATIC SIGNAL "BUMP" WHICH COULD CAUSE SERIOUS SYSTEM UPSET

AVERTISSEMENT IL NE FAUT UTILISER LA JAUGE D'ESSAI QUE POUR DETECTER UNE PANNE SUR UN CIRCUIT DEFECTUEUX QUI N'EST PAS EN COURS DE FONCTION NEMENT L'INSERTION DE LA SONDE PRO VOQUE UN "COGNEMENT" DU SIGNAL PNEUMATIQUE QUI RISQUE DE CAUSER UN DEREGLAGE SERIEUX DU SYSTEME

Pneumatic Booster (Figure 6)

No calibration or adjustment of the booster is required

In normal operation the booster is inaudible However, if the core and the valve plug seat of the output section are not aligned or the valve plug is not seated properly, the booster will produce a hissing sound If this occurs the booster should be removed from the unit and replaced

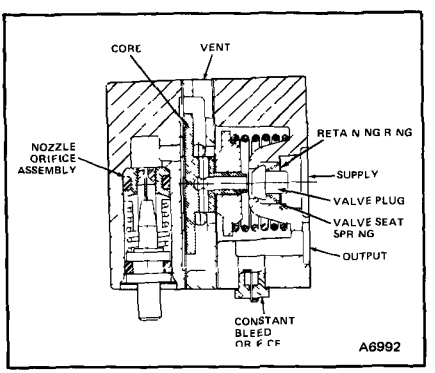


FIGURE 6 - Pneumatic Booster

FAULT CORRECTION CHART

Fault	Cause	Correction
Contro er noperab e	a No a r supp y b Booster or f ce c ogged c Vane not touch ng nozz e d D rty a supp y e ncorrect sw tch pos t on f Worn b se grommet (mount ng base a r va ves c osed)	a Check supp y connect on b P ess or f ce c eanout p unger (See Note 1) c Adjust C/D b as d Check operat on of booster e See F gure 2 nd correct f Rep ace grommet
Contro er unstab e	a Fasteners loose b nsuff c ent pre oad on nkage p vot p n	a Tighten fasteners b S gnt y pena center of va e K
Be ows cannot be ba anced	a Beam h nge bent b Damaged be ows	a Rep ace h nge b Rep ace be ows
Contro er output goes to zero	a Booster or f ce c ogged	a Press or f ce c eanout p unger (See Note 1)
Contro er output goes to supp y pressure	a B ocke passages from booster un t to nozz e	a C ean and b ow out passages
Poor accuracy	a Be ows not ba anced b Vane pad not centered at nu pressures	a Ba ance be ows b Center vane pad
Poor sens t v ty	a Vane pad not perpend cu ar to nozz e b Booster b eed or f ce c ogged c Vane pad not centered at nu pressures d Leakage n nput nes or test jacks	a Repos t on nkage b C ea by man pu at ng or f ce w re c Center vane pad d Check w th eak detector and repa r
S ow response	a Rest ctors under D/R sw tch c ogged	a C ea D/R sw tch
H gh hysteres s	a Loose fasteners nc ud ng be ows set screws	a T ghten be ows set screw
Ga n cha ges (h gh v brat on)	a Range ga n) adjust shaft nsuff c e t y torqued	a Retorque (See Note 2)
Set po nt changes w th ntegra adjustme t	a Leak at ntegra va ve E3 connect on or C be ows	a Check and repa r
Integra t me not equa n both d rect ons	a Leak beyond ntegra va ve (C be ows) or E3 connect on	a Check and repa r
Der vat ve t me not equa n both d rect ons	a Leak at der vat ve va ve or D be ows	a Check and repa r passage or be ows
Booster outpu t pressure does not mmed ate y ncrease when nozz e back pressure s ncreased	a C ogge or f ce b Leakage around sect ons of cast ng c D rty f ters n mount ng base	a Press o f ce c eanout p unger (See Note 1) b Remove booster and retorque screws c Remove and rep ace f ters
Booster output pressure does not mmed ate y decrease when nozz e back pressure s redu ced	a B ocked a r passages from booster un t to nozz e b nterna eakage of booster	a C ea a r passages b Rep ace boo ster

Notes 1 Press or f ce c ea out p unger on y when equ pment s not ope at ng See WARN NG under 'Rout ne Ma ntenance
2 Overto qu ng w ncrease hu hysteres s

FAULT CORRECTION CHART (continued)

Fault	Cause	Correction
Gain Servo Cylinder - Remains extended - Extends fast, retracts slow Does not retract fully	a) Supply pressure too high b) Leakage past orifice assembly c) Nozzle neuplugged d) Cylinder preload spring not tight enough e) Contamination in cylinder	a) Correct to 18 to 20 psig (124 to 138 kPa) b) Check O ring and O ring seating surface c) Clean or blowout d) Readjust e) Replace cylinder/piston ass'y
Remains retracted Retracts fast, extends slow Will not extend fully	a) Low supply or clogged filter in supply port b) Valve stem in supply port controller mount is not actuated fully c) Leakage from nozzle back pressure chamber or passage d) Plugged orifice in cylinder base e) Piston/cylinder clearance too great f) Preload spring too tight g) Mushaped nozzle face h) Nozzle not preloaded against template	a) Correct to 18 to 20 psig, install new filter pad (supply) b) Check controller is pushed as far as possible into mount c) Check for leaks at orifices Plug tube fittings, cylinder base d) Clean orifice in cylinder base e) Replace cylinder/piston ass'y f) Readjust g) Replace nozzle h) Preload nozzle against template at minimum radius, check nozzle template gu de clearance
Hysteresis and non repeatability (See Note 3)	a) Loose bellows assy b) Interference between bellows beam and temp ate ass'y linkage c) Interference between template and nozzle or temp ate gu de d) Connecting rod preloaded too high	a) Tighten bellows set screw b) Straighten linkage to eliminate binding c) Remove burrs from temp ate and/or adjust temp ate gu de d) Adjust rod pivot preload
Instability (See Note 3)	a) Piston/cylinder interference b) Gain arm bearing preload too high c) Nozzle/temp ate guide clearance	a) Replace cylinder/piston ass'y b) Readjust c) Readjust nozzle/temp ate gu de clearance

Note 3 Instability, hysteresis and non repeatability are interrelated Causes and correct ons therefore, will also be interrelated

OPERATION

Operation of the function generator is shown schematically in Figure 8 and in block form in Figure 7

Gain Control Mechanism

The gain adjusting servo uses a piston within an air cylinder to provide the power necessary to move the controller sector arm The air cylinder is controlled by the gain servo nozzle which is attached to the sector arm The servo nozzle and air cylinder provide a closed loop motion servo which positions the sector arm so that the nozzle is at the edge of the temp ate The nozzle functions like the roller on a conventional tem plate follower except that it is not limited by steep template rises or abrupt contour changes The nozzle also produces no force against the template permitting it to be made of easily cut polyester film The template is positioned by the E4 gain control signal acting through the gain servo bellows beam and connecting link Shape determines the sector arm position as a function of the gain control signal A built in guide permits marking of a blank template, exactly in line with the nozzle to facilatate custom shaping

Controller Mechanism

The controller A/B beam moves in propor tion to the difference in pressure between the A and B bellows This pressure difference pro vides a subtraction function or a comparison of one signal to a set point The A/B beam motion is coupled to a vane through an adjustable four bar linkage This linkage allows vane motion to ward or away from the controller nozzle pro viding adjustable gain Gain of the four bar linkage depends upon A/B beam and sector arm position

For a given sector arm position a movement of the A/B beam will produce a movement at the vane toward the nozzle proportional to gain at that sector arm position Conversely, for a given A/B beam position, rotation of the sector arm will produce a movement at the vane pro portional to the degree of unnulling (Null con dition is defined as the state at which a sector arm movement will have no affect on vane position or output) In either case, vane motion toward or away from the controller nozzle will cause a corresponding increase or decrease in nozzle backpressure

Backpressure change is amplified by a booster and fed to the D bellows and to the output con nection as a 3 15 psig (20 7 to 103 kPa) signal At the D bellows, the signal repositions the C/D beam to restore the nozzle to its at balance distance from the vane

Derivative action can be obtained by plac ing an external bleed valve/volume chamber in the input signal line (Figure 8) Integral action can be obtained by placing an external bleed valve/volume chamber between the output and C bellows (Figure 8)

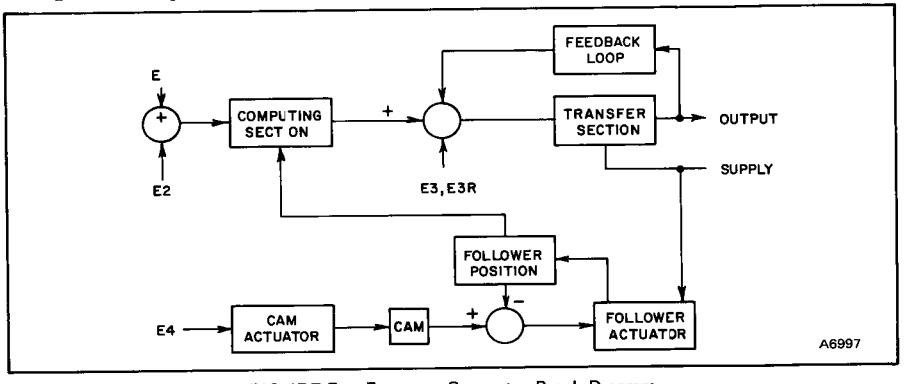


FIG JRE 7 Function Generator B ock D agram

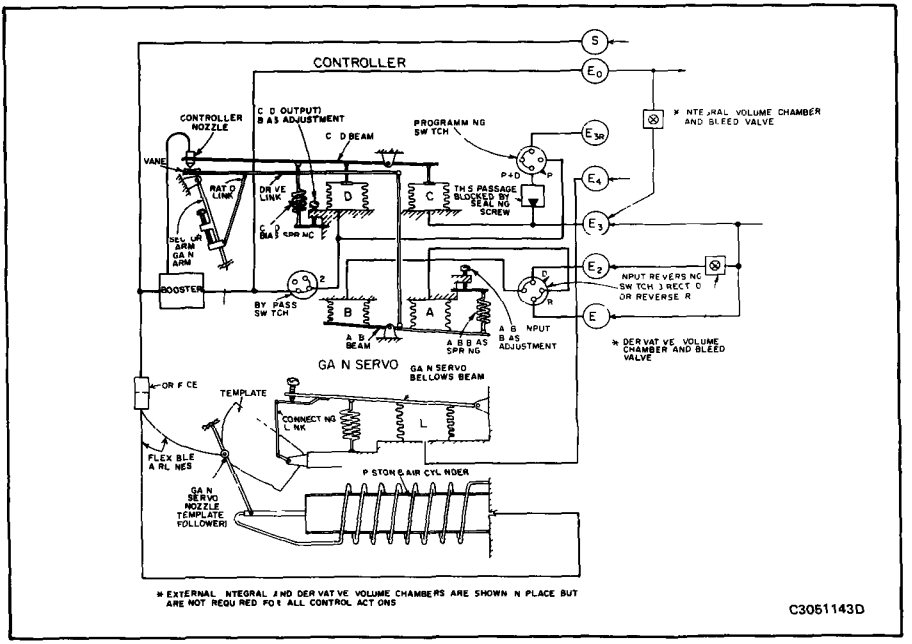


FIGURE 8 – Schemat'c Diagram of Pneumatic Function Generator, Type FG

EXPLANATION OF NOMENCLATURE

Digit 1 2 3	Description
FG 1 1	Pneumat c Funct on Generator Proport ona Contro Act on 3 to 15 ps g 20 6 to 103 kPa)
1	L near Temp ate Character st c
5	Custom zed Temp ate Character st c

SPECIFICATIONS

Accuracy†	+/-% of output span ca be ca b ated to + 50% of output span)
Input Signal Range	3 15 ps g (20 7 to 103 kPa
External Connections	1/8 nch 27 NPT fema e connect ons
Normal Operating Conditions	Amb ent Temperature 40° to 140°F (4 4 to 60 C) Amb ent Temperature Effect +2% max mum of output span over 100°F (55 6°C) temperature span
Repeatability	0 25%
Deadband	0 25% of output span
Air Supply	18 20 ps 124 to 138 kPa) supp y pressure nom na
Air Consumption	15 scfm (708 x 10^{-4} M^3/S at ba ance
Supply Pressure Effect	- 15% of output span per 1 ps g
Supply and Exhaust Capacity	1 0 scfm 4 72 x 10^{-4} M^3/S) for 1 ps (6 89 kPa) change n output at m drange 9 ps g (62 kPa)

Position Sensitivity	+1% of span for 30° rotat on n any d rect on from preferred mount ng pos t on
Vibration	Tested n accordance w th M L STD 1678 (sh ps
Mounting	ndoor wa or rack mounted n the nd cated pos t on on y
Materials	Bronze be ows a um num be ows beams and frame, Buna N O-r ngs Bery um *Copper nkage polyester f m templates*
Weight	Net 9 3 bs (4 22 kg) Sh pp ng 12 bs 5 45 kg)
Gain Range	1 to 10 0
Factory Calibration	Standard Low r se temp ate nsta ed to prov de ga n change of 0 8 to 1 2 d rect act ng 3 ps g (20 kPa nu Spec a Ca brat on not spec f ed as standard nput vs output or nput vs ga n data must be furn shed for custom temp ate shap ng (spec a funct ons)

†As def ned by SAMA Standard PMC20 1

NOTE A data at m drange refer ence cond t on Temperature 75°F 41 5° C) +5°F +5 6°C)

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

REPLACEMENT PARTS

Ordering Individual Parts

The following drawings are Parts Drawings for the Type FG Pneumatic Function Generator and its spare parts kits Items with part numbers may be ordered separately Items with kit numbers (without separate part numbers) must be ordered by the kit number in which they are included

Normally, these drawings apply to the unit furnished However, there may be individual differences in specific units because of

a design changes made since the printing of this instruction section, or

b special design of the unit to make it suitable for a special application

Therefore, when ordering individual parts or kits, assure the receipt of correct replacements by specifying on the order

a complete nomenclature and series number of equipment for which parts are desired, and

b the Parts Drawing number and title on which each part is illustrated

Recommended Spare Parts

The following listed spare parts kits should be stocked in the quantities listed

KIT NO	NAME	QUANTITY
258141 1	BOOSTER	1
258142 1	A B BELLOWS	1
258143 1	C D BELLOWS	1
258146 1	F LTER	1
258152 1	COVER	1
258148 1	O RING REPLACEMENT	1
258150 1	CYL NDER	1

Accessories

The following accessories are recommended

PART NO	NAME	QUANTITY	COMMENTS
5327136 1	Contro er Mount	1	P ug n mount to be used for ca brat ng contro er base assem blies
5328485 1	Test Probe K t	1	Assemb y (gage, tub ng test connector) for con tro s g a mon tor ng, and adjustment, ca bra t on and performance checks
5324066 1	Va ve Core	1	Extra a r trapp ng valve for output con nect on

Options

PART NO	NAME	QUANTITY	COMMENTS
5316733 1	Vo ume Chamber and B eed Va ve	1	For add ng externa ntegra (reset) or der vat ve rate)

Bailey Meter Company, Wickliffe Ohio 44092, a subsidiary of Babcock & Wilcox, U S A

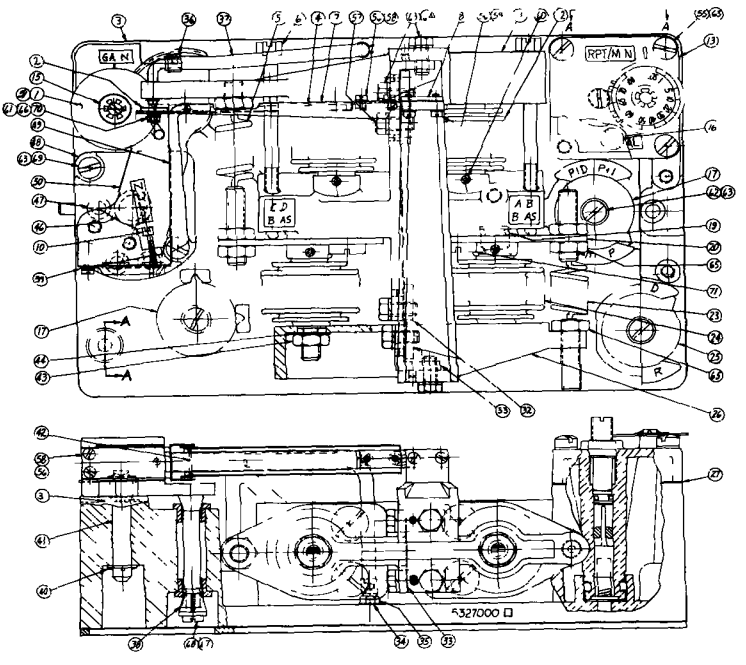
Bailey Meter Australia Pty Ltd, Regents Park, N S W, Australia
Bailey do Brasil, Sao Paulo Brazil
Bailey Meter GMBH Mannheim West Germany

Bailey Meter Company Ltd Pointe-Claire Quebec, Canada
Bailey Japan Company, Ltd Nirayama cho, Japan
Representatives in Other Principal Cities

Bailey Control Systems

Parts Drawing
P92-11-1

CONTROLLER ASSEMBLY
PART NO. 5327000-□



D5327000J

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company U S A

Parts Drawing P92-11-1 Controller Assembly

ITEM	PART NO	NAME
1	5327774 1	SCALE MOUNT NG PLATE SEE TABLE
2	K T NO 258144 1	ADJUSTABLE VANE END
3	SEE TABLE	CONTROLLER BASE ASSEMBLY
4	5327058 1	VANE BODY
5	SEE TABLE	C D B AS SPR NG ASSEMBLY
6	5326981 1	B AS ADJUSTMENT SCREW, 2 REQD
7	5326980 1	DR VE L NK
8	5327055 1	H NGE CLAMP 2 REQD
9	1962928 1	SERV CE LEGEND
10	5326974 1	NULL ADJUST MENT SCREW
11	5326975 1	C D BEAM ASSY
12	K T NO 258143 1	C D BELLOWS ASSEMBLY, 2 REQD
13	5327790 1	NTEGRAL VALVE ASSEMBLY, SEE TABLE
15	197480 18	RETA N NG R NG, SEE TABLE
16	452219 3	SEAL NG SCREW, SEE TABLE
17	5320657 1	ON-OFF SW TCH ASSY 2 REQD
19	K T NO 258148 1	O R NG, 4 REQD
20	5326956 1	SPR NG B AS ADJUSTMENT 2 REQD
23	5326957 1	A B BIAS SPR NG ASSEMBLY
24	K T NO 258142 1	A B BELLOWS ASSY 2 REQD
25	5320658 1	D RECT REVERSE SW TCH ASSY
26	5326976 1	A B BEAM
27	5326959 1	VOLUME CHAMBER SEAL SEE TABLE
31	19734 18	WASHER, SEE TABLE
32	5326970 1	CLAMP PLATE, 4 REQD
33	5326969 1	SPR NG H NGE
34	26126 1	SEAL WASHER
35	26002 1	TUBE F TT NG
36	1951049 3	COMPRESS ON CL P 2 REQD
37	1951567 1	NOZZLE TUBING
38	5316156 1	RANGE ADJUST MENT SHAFT CLAMP
39	5327771 1	RAT O L NK SUPPORT
40	197480 25	RETA N NG R NG, SEE TABLE
41	5326995 1	P N ON SEE TABLE
42	5315891 1	P N
43	K T NO 258142 1 AND K T NO 258143 1	TH N NUT, 4 REQD
44	K T NO 258142 1 AND K T NO 258143 1	SPR NG WASHER 4 REQD
45	67125 10	GROMMET
46	K T NO 258141 1	O R NG
47	K T NO 258141 1	O R NG 3 REQD
48	KIT NO 258141 1	PNEUMATIC BOOSTER
49	5326986 1	RAT O L NK
50	5326992 1	RANGE ADJUSTMENT
51	5327064 2	ADJUSTMENT SCALE SEE TABLE
53	5327114 1	CLAMP PLATE 2 REQD
55		190 32x 750 LG F L HD STN STL MACH SCR, SEE TABLE
56		086 STN STL REG SPRG LKWSHR, 6 REQD
57		190 32x 500 LG HEX HD STN STL SEMS EXT 4 REQD
58		086 56x 125 LG PAN HD STN STL MACH SCR, 4 REQD
59		086 56x 250 LG PAN HD STN STL MACH SCR 2 REQD
60	K T NO 258142 1 AND K T NO 258143 1	112-40x 188 LG HEX SOC HDLS STN STL CONE PT SET SCR, 4 REQD
61	K T NO 258144 1	086 BRASS FLAT WASHER
62		190 32x 375 LG F L HD STN STL MACH SCR, 3 REQD
63		190 STN STL REG SPRG LKWSHR SEE TABLE
64		190 32x 375 LG HEX HD STN STL CAP SCR 8 REQD
65		250 28 STN STL REG HEX JAM NUT, 6 REQD
66	K T NO 258144 1	1202-00 STN STL SHKPRF LKWSHR
67		138 32x 312 LG PAN HD STN STL MACH SCR
68		138 STN STL TYPE A PLA N N WASHER
69		190 32x1 375 LG F L HD STN STL MACH SCR 2 REQD
70	K T NO 258144 1	086 56 BRASS HEX NUT
71		250 20x 500 LG PAN HD STN STL MACH SCR 4 REQD

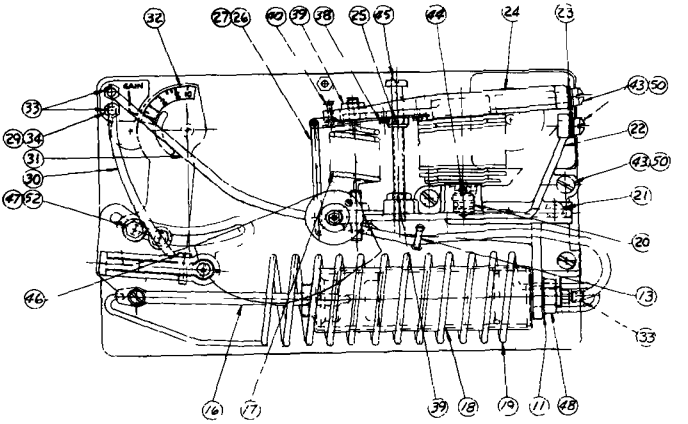
NOTE TEMS W TH PART NUMBERS MAY BE ORDERED SEPARATELY TEMS W TH K T NUMBERS W THOUT SEPARATE PART NUMBERS) MUST BE ORDERED BY THE K T NUMBEF N WH CH THEY ARE NCLUDED

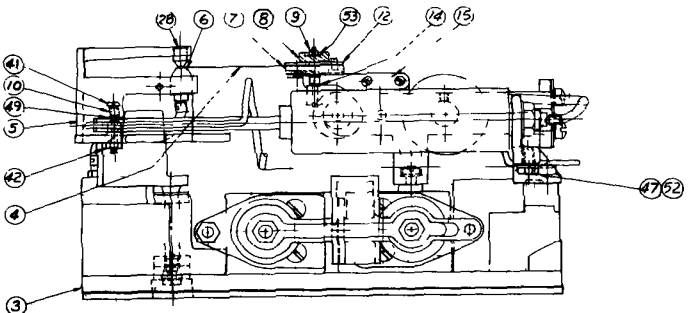
PART NO	ITEMS 1,15,31,40,41,51	ITEM 3	ITEM 5	ITEMS 13,27	ITEM 16	ITEM 55	ITEM 63
5327000 1 (PROP ACT ON)	1	5326961 1	5327115 1	OM T	1	OM T	13
5327000 2 (P + I ACT ON)	1	5326961 1	5327115 1	1	OM T	4	17
5327000 3 (PROP ACT ON FOR FUNCT ON GENERATOR)	OM T	5326961 2	5327711 1	OM T	1	OM T	13

Bailey Control Systems

Parts Drawing
P92-12-1

GAIN SERVO ASSEMBLY
PART NO. 5327700-□





D5327700C

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company U S A.

[illegible]-1 Gain Servo Assembly

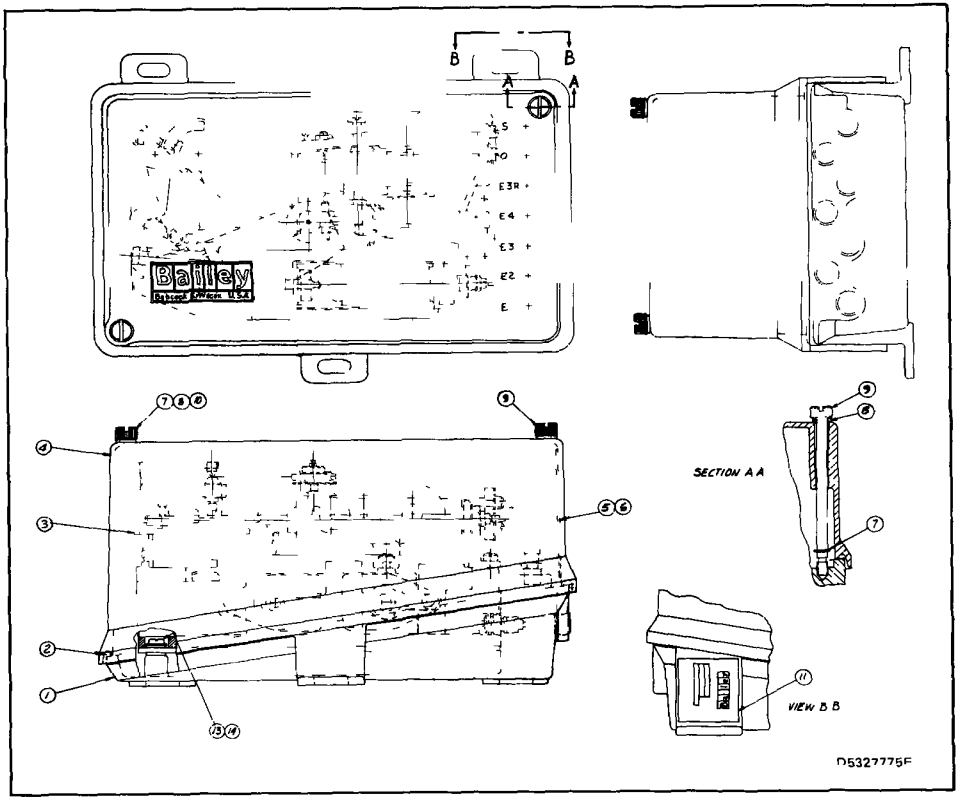
ITEM	PART NO	NAME
3	5327000 3	CONTROLLER ASSY
4	5327741 1	LOW R SE CAM
5	5327713 1	NOZZLE SUPPORT
6	5327729 1	NOZZLE
7	5327743 1	CAM HUB ASSY
8	5327735 1	KNURLED NUT
9	197120 26	ELAST C STOP NUT
10	5327715 1	PRELOAD SPR NG
11	19734-41	SMALL WASHER
12	5327718 1	CLAMP PLATE
13	1943785-3	CABLE T E
14	451871 2	WASHER
15	5327738 1	ZERO ADJUSTMENT ARM
16	5327689 1	CONNECT NG ROD
17	5327733 1	SPR NG ASSY
18	K T NO 258150A1	CYL NDER ASSY
19	5327690 1	SPR NG
20	K T NO 258151A1	O R NG
21	K T NO 258148A1	O R NG
22	5327707 1	MTG BASE
23	5327730 1	H NGE ASSY
24	KIT NO 258151A1	BEAM & BELLOWS ASSY
25	197120 5	ELAST C STOP NUT
26	5327726 1	L NK
27	5327725 1	FLAT SPR NG
28	5327727 1	CAM GUIDE
29	K T NO 258150A1	TUBE F TT NG 4 REQD
30	1951567 2	NOZZLE TUB NG
31	1951567 3	NOZZLE TUB NG
32	5327698 1	GAIN DECAL
33	K T NO 258150A1	COMPRESS CL P, 4 REQD
34	K T NO 258150A1	SEAL WASHER, 4 REQD
38		086 56x 188 LG PAN HD STL SEMS NT 2 REQD
39		190 32 STL HEX NUT 4 REQD
40		086 56x 375 LG PAN HD STL MACH SCR
41		112-40x 875 LG PAN HD STL MACH SCR
42		112-40 STL HEX NUT
43		190 32x 375 LG F L HD STN STL MACH SCR, 7 REQD
44	K T NO 258151A1	112-40x 188 LG HEX SOC HDLS STN STL CONE PT SET SCR
45		190 32x2 500 LG PAN HD STL MACH SCR
46		112-40x 500 LG PAN HD STN STL SEMS EXT
47		190-32x 375 LG HEX HD STN STL CAP SCR, 3 REQD
48		375 16 SEM F N STN STL REG HEX JAM NU
49		125x 281x 025 PLA N BRASS WASHER
50		190 STN STL REG SPR NG LOCKWASHER 8 REQD
52		203x 406x 040 PLA N STL WASHER, 3 REQD
53		094x 250x 032 PLA N BRASS WASHER

Note tems w th part numbers may be orderec separate y tems w th k t numbers (w thout separate part numbers) must be ordered by the k t number n wh ch they are nc uded

Bailey Control Systems

Parts Drawing
P92-12-2

TYPE FG FUNCTION GENERATOR
PART NO. 5327775-□



SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

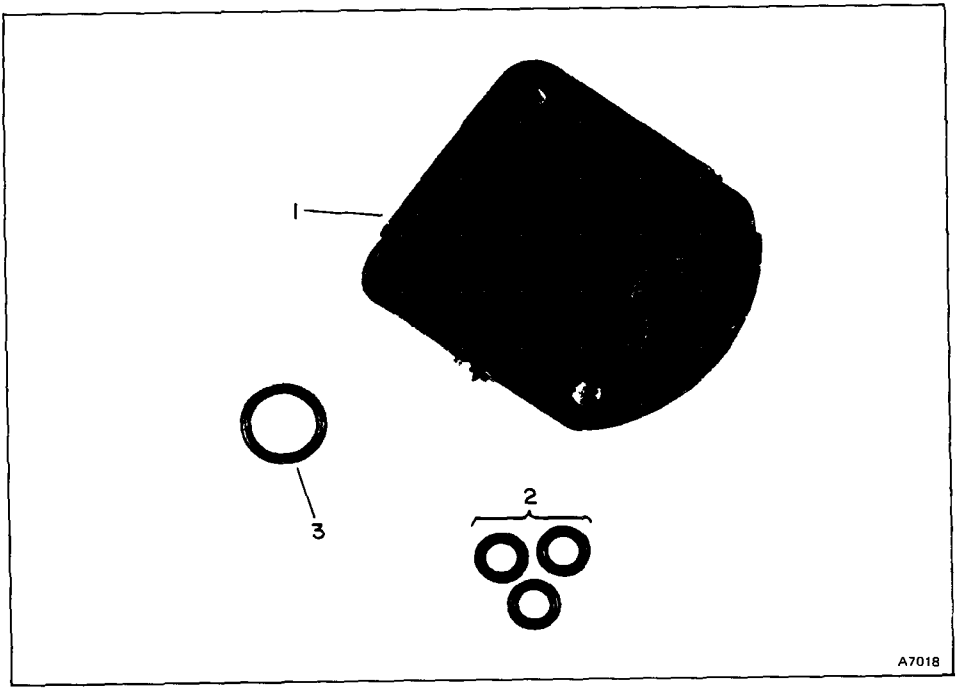
ITEM	PART NO	NAME	ITEM	PART NO	NAME
1	5327136 1	CONTR MOUNT	8	K T NO 258152A1	O R NG GASKET 2 REQD
2	K T NO 258152A1	SEAL NG CORD 34 '	9	K T NO 258152A1	SCREW, COVER
3	5327700 1	GA N SERVO ASSY	10	K T NO 258152A1	SCREW COVER
4	K T NO 258152A1	COVER	11	1962929 1	NAMEPLATI
5	5327741 2	H GH R SE CAM	13		219x 500x 049 PLA N STN STL WASHER
6	5327741 3	BLANK CAM 2 REQD	14		190 32x 500 LG PAN HD STN STL MACH SCR
7	KIT NO 258152A1	RETA N NG R NG, 2 REQD			

Note tems w th part numbers may be ordered separate y tems w th k t numbers (w thout separate part n mbers) m st be ordered by the k t number n wh ch they are nc uded

Bailey Control Systems

Parts Drawing
P92-11-3

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG BOOSTER SPARE PARTS KIT NO. 258141-1

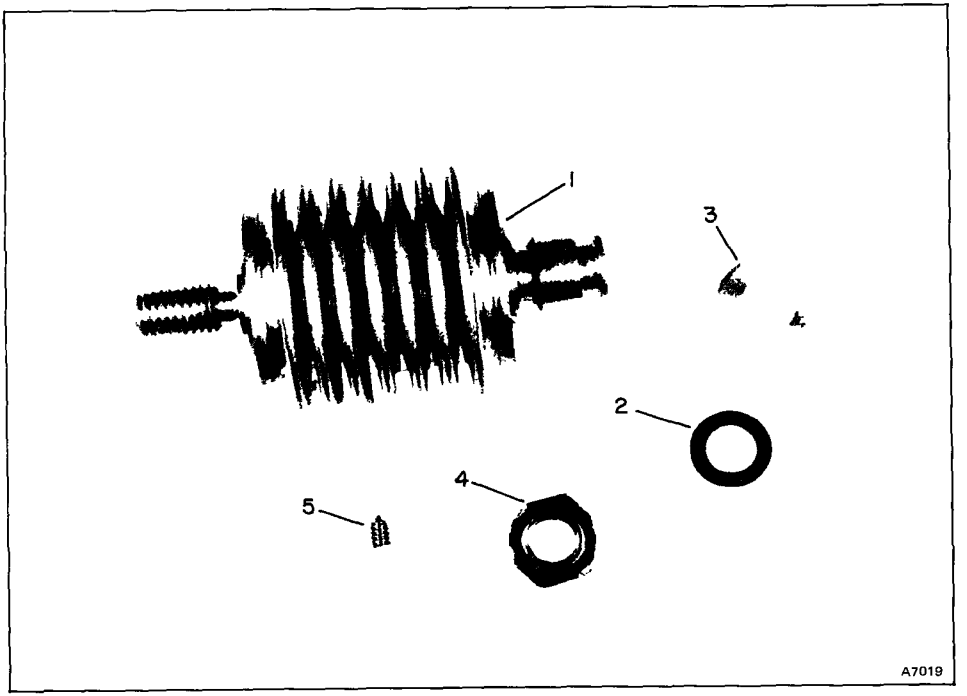


ITEM	NAME	QUANTITY
1	BOOSTER	1
2	O RING	3
3	O R NG	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company U S A

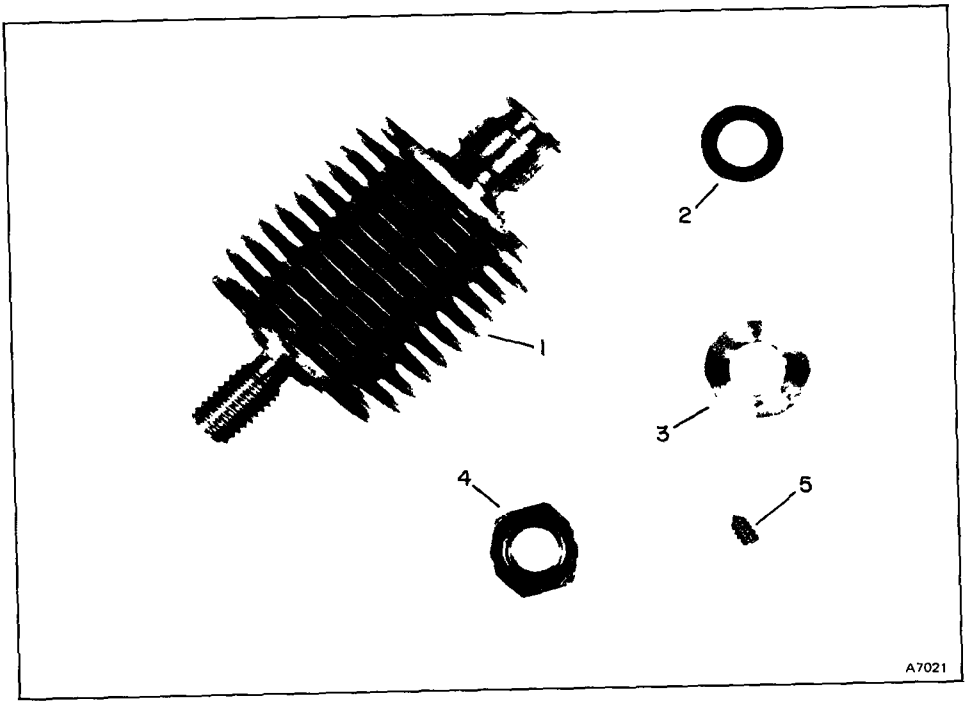
MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG A-B BELLOWS SPARE PARTS KIT NO. 258142-1



ITEM	NAME	QUANTITY
1	BELLOWS ASSEMBLY	1
2	O R NG	1
3	SPR NG WASHER	1
4	THIN NUT	1
5	112-40x 188 LG HEX SOC HDLS STN STL CONE PT SET SCR	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER TYPE FC AND FUNCTION GENERATOR, TYPE FG C-D BELLOWS SPARE PARTS KIT NO. 258143-1

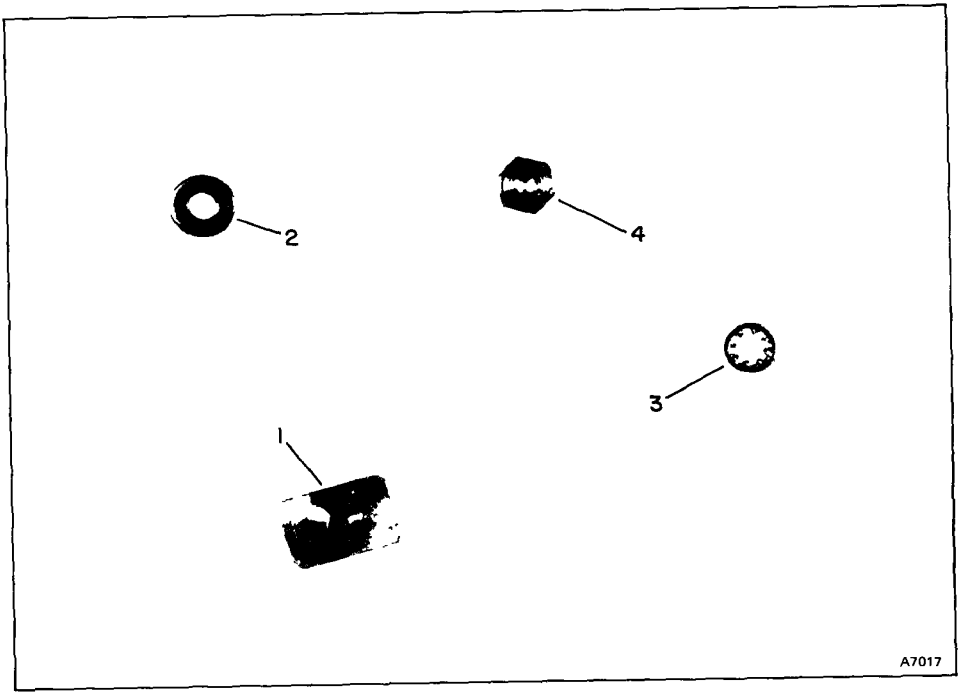


ITEM	NAME	QUANTITY
1	BELLOWS ASSEMBLY	1
2	O RING	1
3	SPRING WASHER	1
4	THIN NUT	1
5	112-40x 188 LG HEX SOC HDLS STN STL CONE PT SET SCR	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Form PD P92 11 5 Litho n U S A 378

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG VANE PAD SPARE PARTS KIT NO. 258144-1

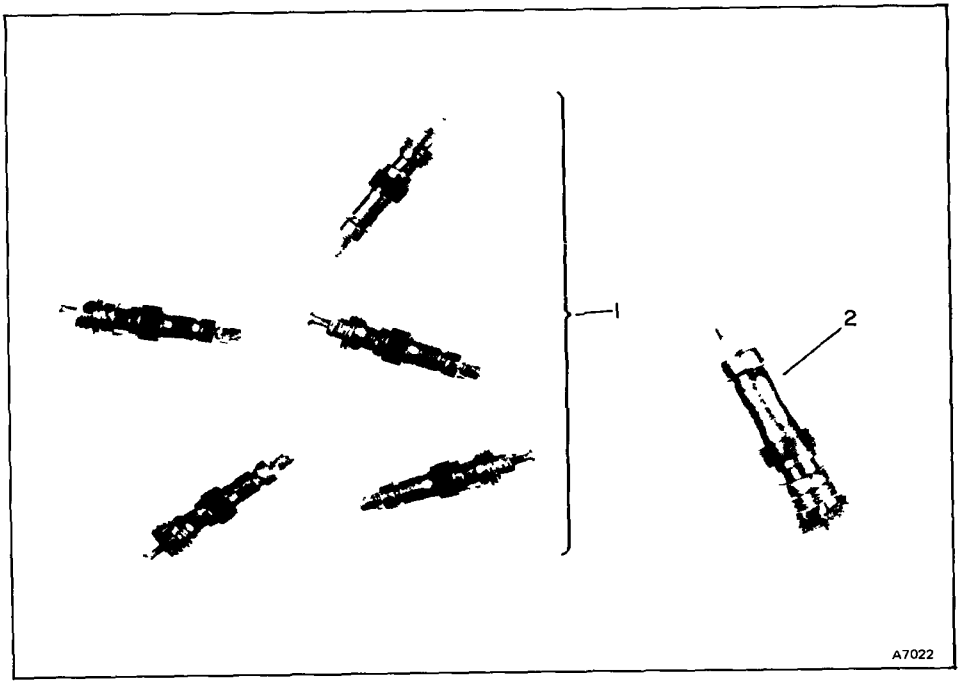


ITEM	NAME	QUANTITY
1	ADJUSTABLE VANE END	1
2	086 BRASS FLAT WASHER	1
3	1202-00 STN STL S'PROOF L'WASHER	1
4	086 56 BRASS HEX NUT	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Form PD P92 11 6 L tho n U S A 378

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG VALVE CORE SPARE PARTS KIT NO. 258145-1



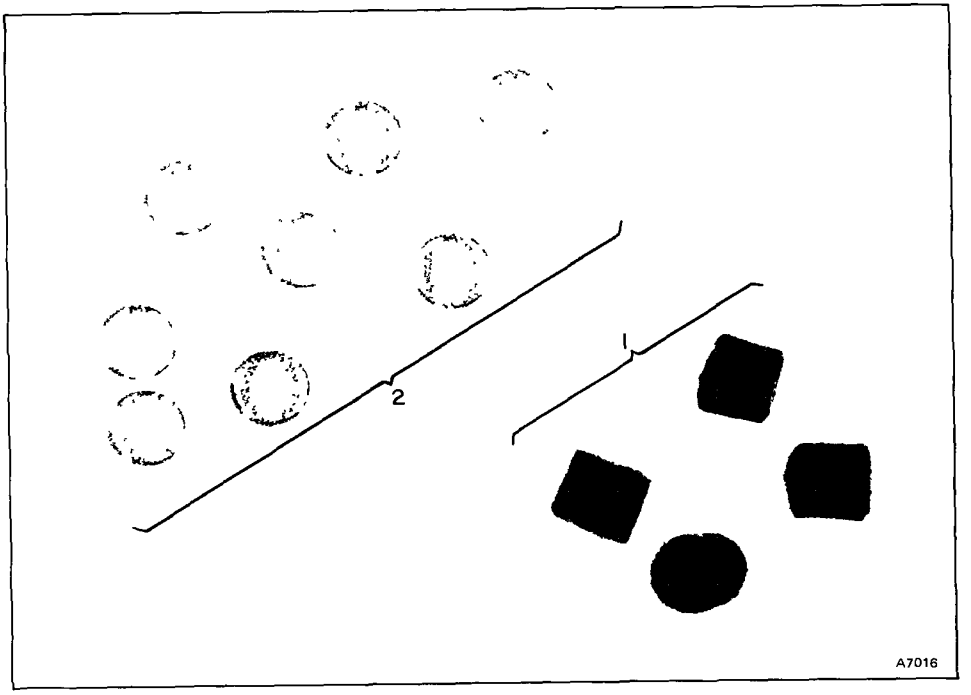
ITEM	NAME	QUANTITY
1	VALVE CORE	5
2	VALVE CORE	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Bailey Control Systems

Parts Drawing
P92-11-8

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG FILTER SPARE PARTS KIT NO. 258146-1

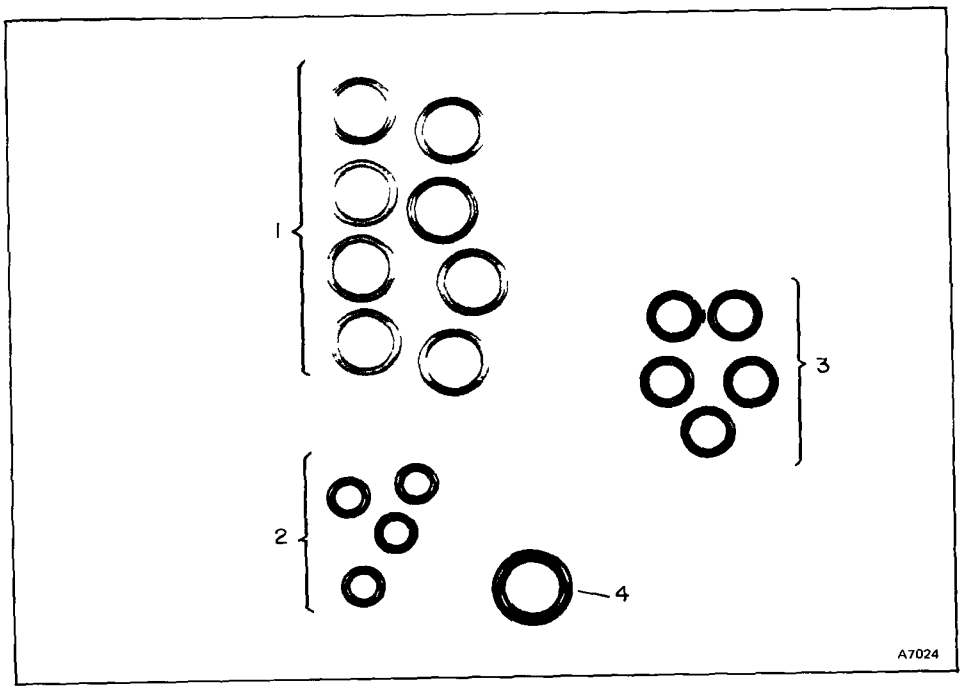


ITEM	NAME	QUANTITY
1	FELT PAD	4
2	W RE MESH D SC	8

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company, U S A

MINI-LINE 520 PNEUMATIC COMPUTER/CONTROLLER, TYPE FC AND FUNCTION GENERATOR, TYPE FG O-RING SPARE PARTS KIT NO. 258148-1



ITEM	NAME	QUANTITY
1	O R NG	8
2	O R NG	4
3	O RING	5
4	O R NG	1

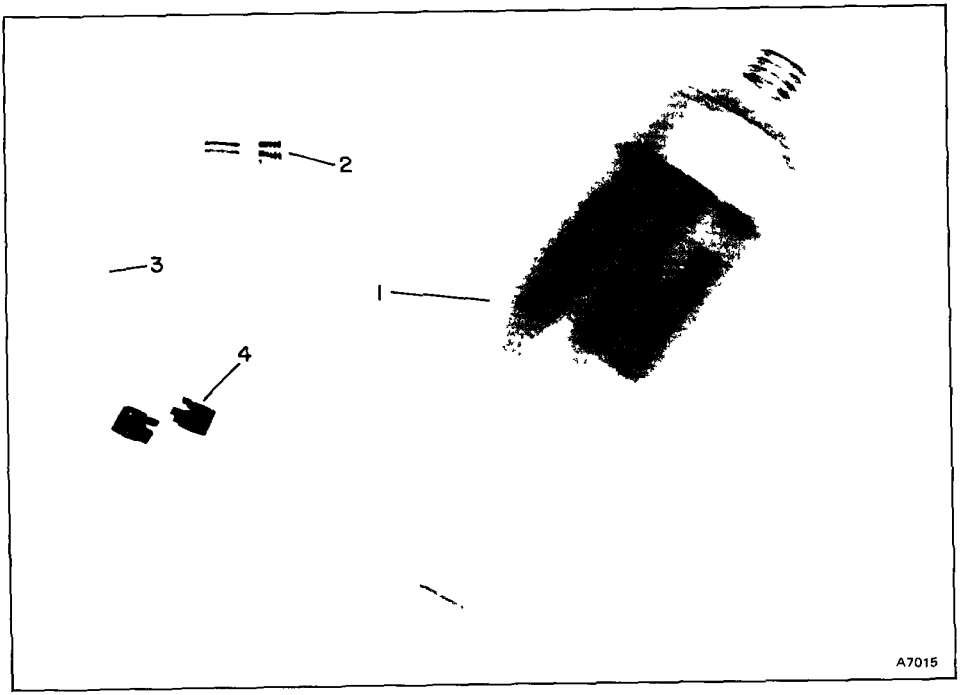
SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company U S A

Bailey Control Systems

Parts Drawing
P92-12-3

MINI-LINE 520 PNEUMATIC FUNCTION GENERATOR, TYPE FG
CYLINDER SPARE PARTS
KIT NO. 258150-1



ITEM	NAME	QUANTITY
1	CYL NDER ASSEMBLY	1
2	TUBE F TT NG	1
3	SEAL WASHER	1
4	COMPRESS ON CL P	2

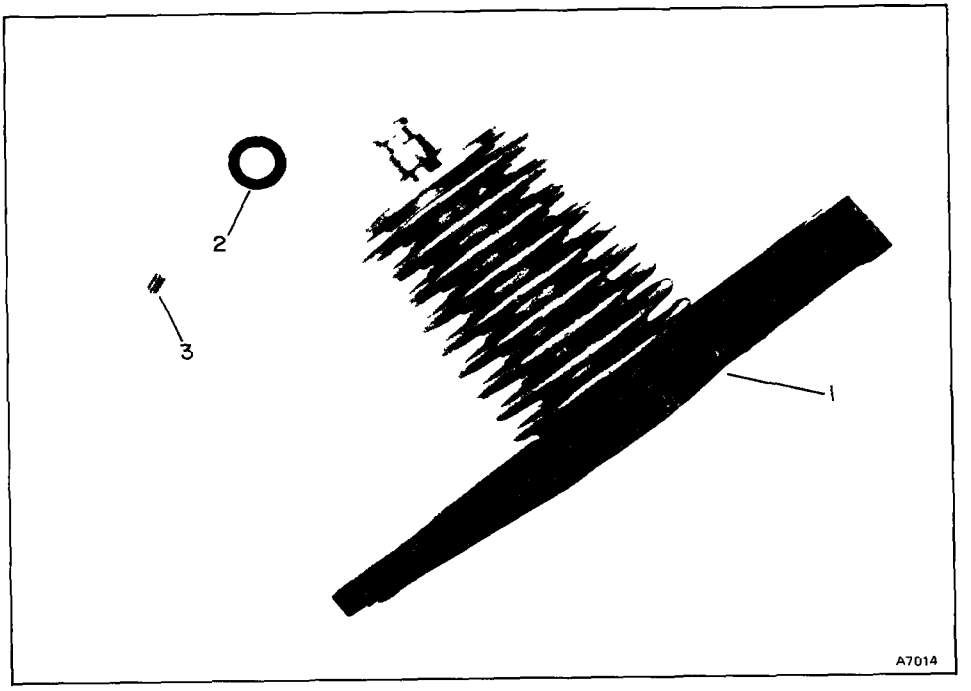
SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company U S A

Bailey Control Systems

Parts Drawing
P92-12-4

MINI-LINE 520 PNEUMATIC FUNCTION GENERATOR TYPE FG
BELLOWS SPARE PARTS
KIT NO. 258151-1

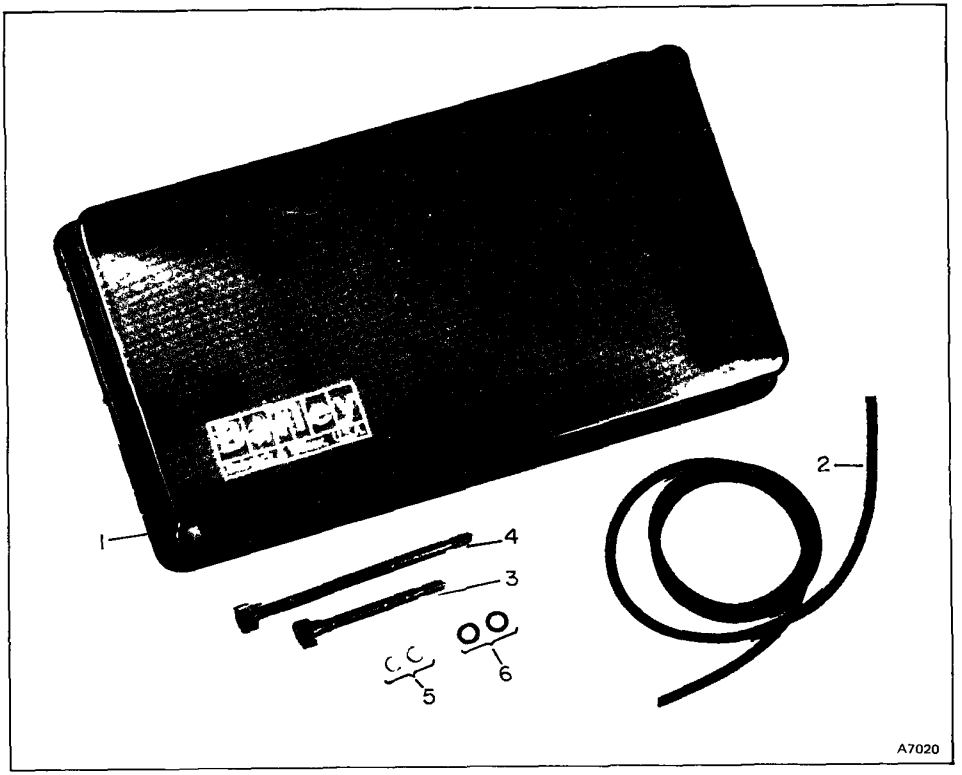


ITEM	NAME	QUANTITY
1	BELLOWS BEAM ASSEMBLY	1
2	O RING	1
3	112-40x 188 LG HEX SOC HDLS STN STL CONE PT SET SCR	1

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING

Babcock & Wilcox
Bailey Meter Company, U.S.A

MINI-LINE 520 PNEUMATIC FUNCTION GENERATOR, TYPE FG
COVER SPARE PARTS
KIT NO. 258152-1



ITEM	NAME	QUANTITY
1	COVER	1
2	SEAL NG CORD	1
3	COVER SCREW	1
4	COVER SCREW	1
5	RETA NING RING	2
6	O R NG GASKET	2

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING