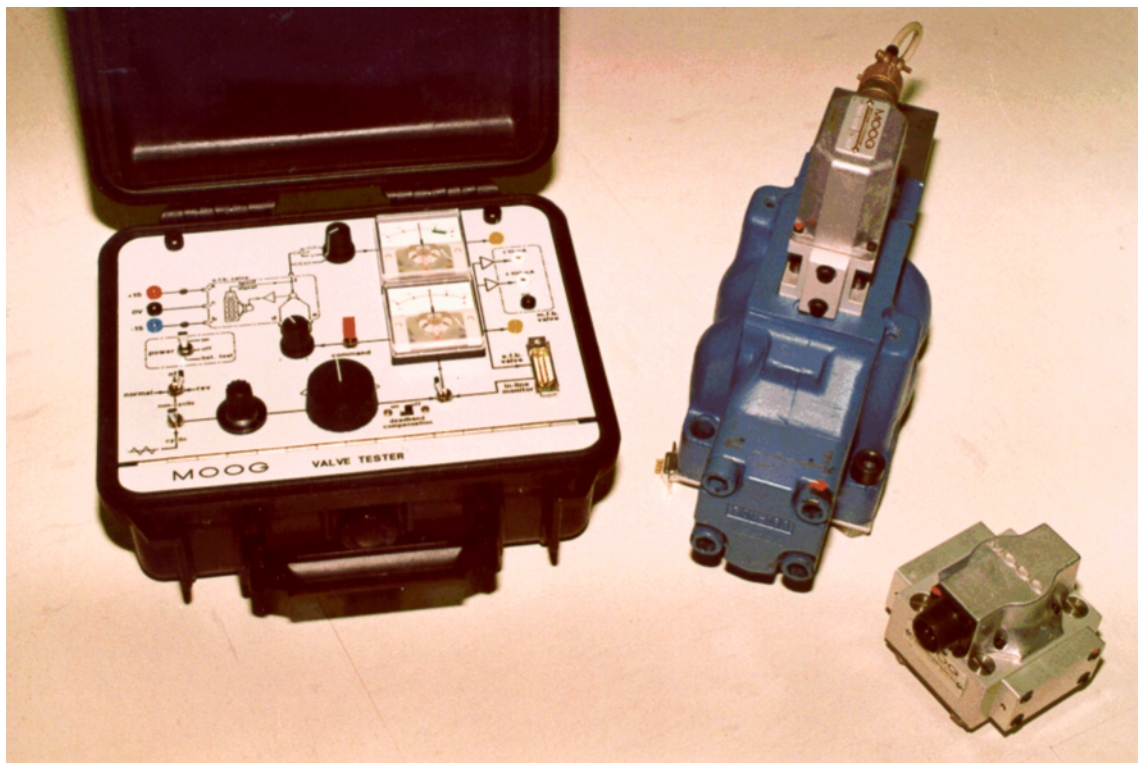


## APPLICATION NOTES

### PORTABLE VALVE TESTER

M040-104



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APPLICATION NOTES  
PORTABLE VALVE TESTER  
M040-104

CN 13.7.92

JJ 17.9.92

Rev C KC 2.2.01

B63326

1 of 15

## Contents

| Section | Title               | Page |
|---------|---------------------|------|
| 1.      | General Description | 3    |
| 2.      | Technical Details   | 4    |
| 3.      | Features            | 5    |
| 4.      | Panel Description   | 6    |
| 5.      | Operation           | 9    |
| 6.      | Application         | 14   |

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APPLICATION NOTES  
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M040-104

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Rev C KC 2.2.01

**B63326**

2 of 15

## 1. General Description

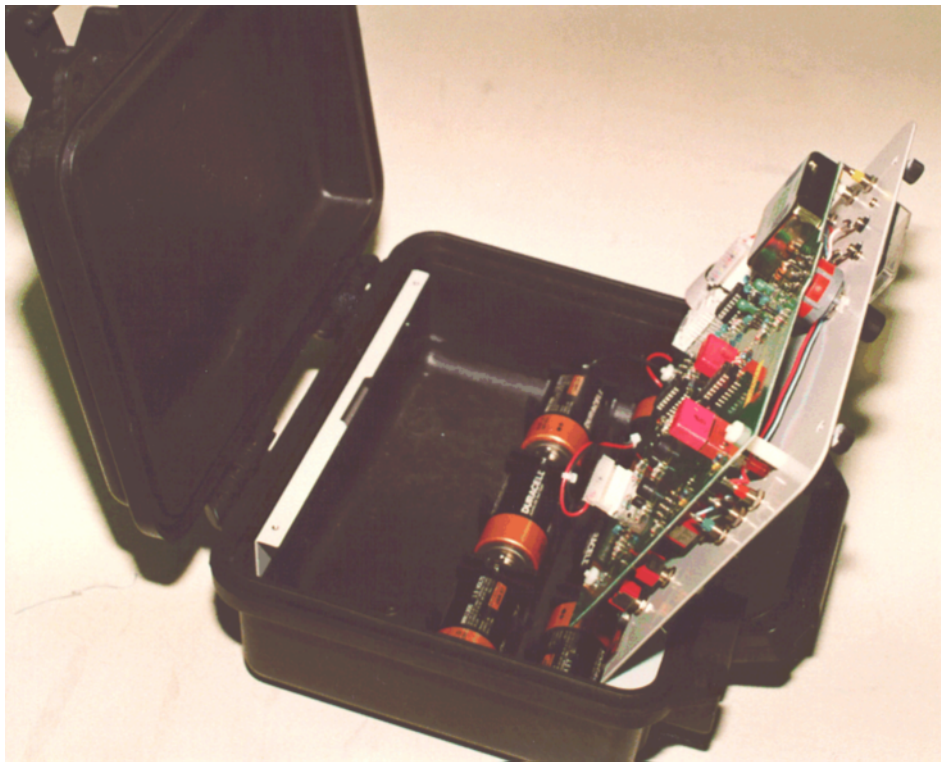
The Moog Portable Valve Tester (M040-104) has been developed from practical field experience to provide an essential aid to commissioning, servicing and troubleshooting control systems using:

### 1.1 Electrical feedback (e.f.b.) valves with integral electronics such as

- D64X, D66X proportional valves
- D769 servovalves

### 2.2 Mechanical feedback (m.f.b.) valves such as :

- 62 Series servovalves
- 760 Series servovalves
- 631 Series servovalves



## 2. Technical Details

|                         |   |   |                    |
|-------------------------|---|---|--------------------|
| Output                  | : | 0 to $\pm$ 10V and 0 to $\pm$ 10 mA<br>command for e.f.b. valves.<br>0 to $\pm$ 10mA and 0 to $\pm$ 60mA for m.f.b. valves              |                    |
|                         |   | $\pm$ 15 V at $\pm$ 200 mA regulated supply.  |                    |
| Power                   | : | Switched mode power supply powered<br>by six D cell primary batteries.  |                    |
| Battery                 | : | Six 1.5V D cell Duracell alkaline battery,<br>or equivalent. Battery life is approximately six hours.<br>Note : use only alkaline cells |                    |
| Dimensions              | : | 270 W x 245 D x 125 H<br>3.0 kg (includes batteries)  |                    |
| Accessories             | : | 1 x Operator's Manual   | P.N. B63326        |
| Optional<br>Accessories | : | m.f.b. valve cable, 1.5m,   | P.N. B63336        |
|                         |   | e.f.b. valve cable, 6 pin,<br>1.5m,   | P.N. B63337        |
|                         |   | 5 to 6 pin adapter pair   | P.N. D129-015-A001 |
|                         |   | e.f.b. valve cable, 12 pin,<br>1.5m,  | P.N. B63341        |
|                         |   | 12 pin socket to 6 pin plug adapter   | P.N. A48997-001    |
|                         |   | 12 pin plug to 6 pin socket adapter   | P.N. A48997-002    |

### 3. Features

- \* Suitable for D64X, D66X, proportional valves, D769 servovalve, and 62, 760, 631 etc. servovalves.
- \* Fully portable, light and compact with a rugged polycarbonate plastic carry case
- \* Power supply
  - batteries : commonly available D cell disposable type.
  - 'in-line' : the valve uses normal plant electronics supply.
- \* Economical price - less than the cost of a spare valve
- \* Analogue meters for ease of tracking command and spool position signals.
- \* Wide range of control options for commissioning and testing:
  - 'in-line' monitoring of normal valve control electronics
  - tester generated commands for 'ramp', plus/minus command magnitude, automatic cycling and polarity switching.
  - step input emergency shut-off switch
- \* Battery test via front panel meter.

|  |                       |                 |               |
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|  | PORTABLE VALVE TESTER | JJ 17.9.92      |               |
|  | M040-104              | Rev C KC 2.2.01 | 5 of 15       |

#### 4. Panel Description

##### 1 ON/BAT. TEST SWITCH

ON - in the up position the internal batteries power the  $\pm 15V$  power supply

OFF - in the centre position the  $\pm 15V$  power supply is off.

BAT.TEST- hold down to test battery on SPOOL SIGNAL/AUXILIARY METER **5**. The  $\pm 15V$  power supply is powered during this test.

##### 2 Test points for + 15V and -15 V power supply. Measure with a separate voltmeter.

##### 3 Power supply L.E.D.'s - ON if supply $> \pm 13 V$

##### 4 Input range selection switch for SPOOL SIGNAL/AUXILIARY METER **5** for e.f.b. valves

Position 1 for spool signal monitoring with D64X

Position 2 for spool voltage signal monitoring with D66X, D769

Position 3 for spool current signal monitoring with D66X.

##### 5 SPOOL SIGNAL/AUXILIARY METER for monitoring spool position signal and battery condition.

##### 6 VALVE COMMAND signal meter.


##### 7 Test point for METER **5** can be connected to external X-Y recorder, oscilloscope or digital voltmeter.

##### 8 'e.f.b. valve cable' connection point. The cable has two MS connectors, one for connecting to the valve and the other for connecting to the cable that normally connects the plant electronics to the valve (in-line).

##### 9 Valve command signal selection for input via PIN 'd' or PIN 'e'.


##### 10 COMMAND ON/OFF switch for isolating all valve commands during start up, in emergencies or to provide step inputs. It is used to isolate commands from the Tester or during in-line monitoring.

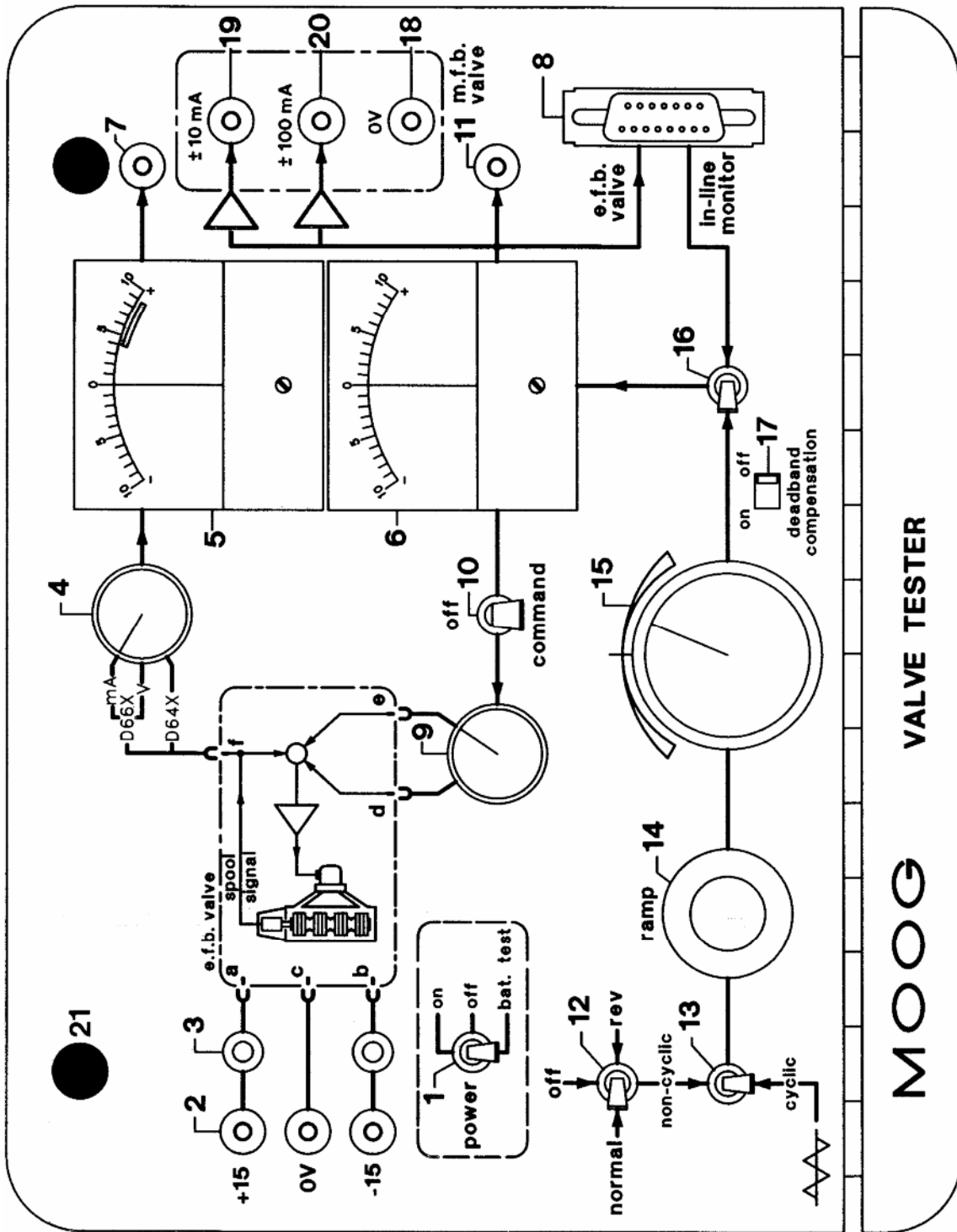
##### 11 Test point for METER **6** can be connected to external X-Y recorder, oscilloscope or digital voltmeter.

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|--|--|-----------------|---------|
| <br>N:\Library\DWG_NO\DOCUMENT\MANUALS\Word File\B63326 REV | APPLICATION NOTES<br>PORTABLE VALVE TESTER<br>M040-104 | CN 13.7.92      | B63326  |
|  |  | JJ 17.9.92      |         |
|  |  | Rev C KC 2.2.01 | 6 of 15 |

Panel Description (cont.)

- 12** Command polarity selection switch  
'NORMAL' for regular operation based on correct pin selection (switch **9**).  
'OFF' switches off the manual command at the 'RAMP' **14** rate selected.  
'REVERSE' - reverses the manual command at the 'RAMP' **14** rate selected.
- 13** Selects manual command or automatic cycling at the range **15** and 'RAMP' **14** selected.
- 14** RAMP varies the rate of increase of commands under either 'NORMAL/OFF/REV' switch **12** or automatic cycle. (see selector switch **13**).  
Where '10' = steepest ramp rate, ie. shortest ramp time.
- 15** Amplitude Potentiometer for manual valve control and automatic cycle peak to peak amplitude.
- 16** Selects Tester control or in-line monitoring. In-line monitoring enables the Tester to follow commands from the in-plant electronics/PLC and the plant power supply ( $\pm 15$  VDC).
- 17** DEADBAND COMPENSATION SWITCH can be used for valves with overlap to switch the command quickly through the deadband area.
- 18** OV (ground return) point for the m.f.b. valve test cable.
- 19**  $\pm 10$ mA current output point for m.f.b. valve testing. Meter **6** shows the actual current.
- 20**  $\pm 100$ mA current output point for m.f.b. valve testing. Meter **6** shows the actual current. Note that the maximum current available on this range setting is  $\pm 60$ mA
- 21** Screw fastener for hinged front panel to give access for cable storage and battery changing.

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|---|-----------------------|-----------------|---------|
|  | APPLICATION NOTES     | CN 13.7.92      | B63326  |
|   | PORTABLE VALVE TESTER | JJ 17.9.92      |         |
|   | M040-104              | Rev C KC 2.2.01 | 7 of 15 |



MOOG VALVE TESTER

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PORTABLE VALVE TESTER

M040-104

CN 13.7.92

JJ 17.9.92

Rev C KC 2.2.01

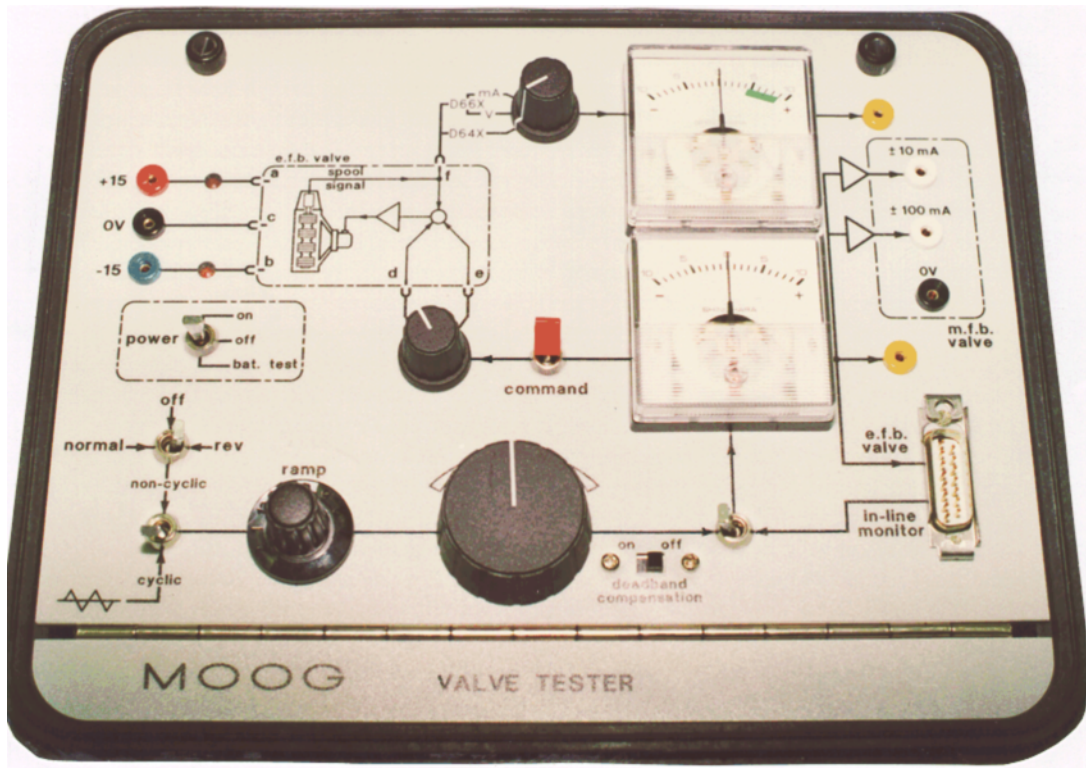
B63326

8 of 15

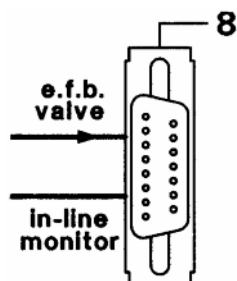


## 5. Operation

### 5.1 e.f.b. valve



The standard PV cable suits D66X voltage command valves, all D64X and D769 valves and D66X current command valves.



Plug the PV cable into connector **8** and slide the lock up to hold the connector securely in place.

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APPLICATION NOTES  
PORTABLE VALVE TESTER

M040-104

CN 13.7.92

JJ 17.9.92

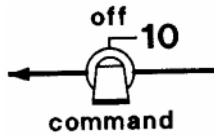
Rev C KC 2.2.01

B63326

9 of 15

## 5. Operation (Cont.)

Switch the COMMAND switch **10** to the OFF position.

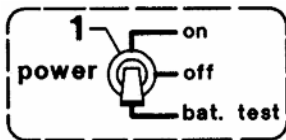


**This is important.** It ensures the valve being tested will not receive a command when powering up and so activate the plant it controls.

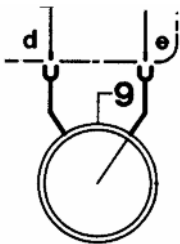
Connect the in-plant cable that is normally connected to the test valve to the IN-LINE socket connector of the PV cable. If the installed valve has five pins, use 5/6 PIN adapter (D129-015-A001).

Connect the test valve to the VALVE socket of the PV cable. If the valve has 5 pins, use a 6/5 PIN adapter (D129-015-A001).

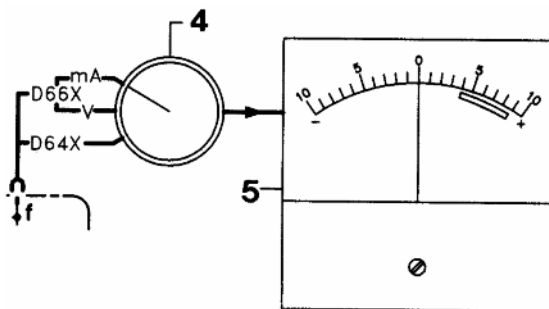
### BATTERY POWER



- Hold switch **1** down to test battery condition on meter **5**. This will also switch on the Tester.
- If the battery voltage is low, replace the batteries, gaining access via the front panel.
- Place switch **1** up to switch on the Tester.



Select valve command (switch **9**) at PIN d or e according to the existing installation.



Select input to meter **5**

- Position 1. spool signal for D64X, D769
- Position 2. spool signal for D66X, voltage, (V)
- Position 3. spool signal for D66X, current (mA)
  - select "in-line" and ensure wiring to the plant electronics is complete. (This is because the Valve Tester on its own does not provide the path necessary for the load current to flow)

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APPLICATION NOTES  
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CN 13.7.92

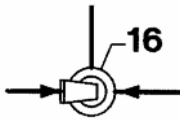
JJ 17.9.92

Rev C KC 2.2.01

**B63326**

10 of 15

## 5. Operation (Cont.)

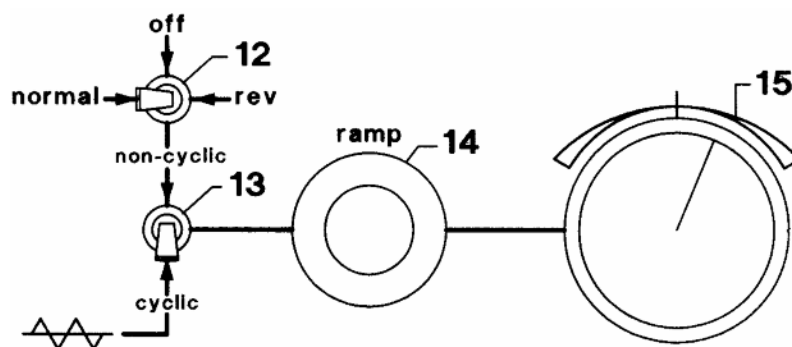


Select either the internally generated command or the command from the plant electronics via the IN-LINE MONITOR with switch **16**.

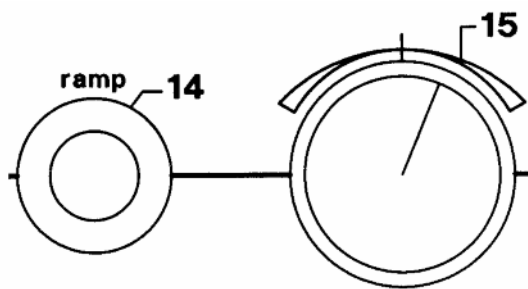
Tester generated command.

Switch **13** selects, in the down position, a continuous automatic cycling of the command, the rate of which is set by the RAMP potentiometer **14**. 10 is the quickest ramp. With switch **13** in the up position the command is a non-cyclic level set by potentiometer **15**.

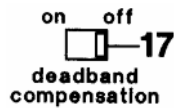
Switch **12** in the OFF position sets the non-cyclic command to zero. In the NORMAL position the output is positive when command potentiometer **15** is clockwise and negative when counter clockwise. The polarities are opposite when REV is selected.



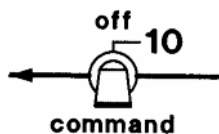
5. Operation (Cont.)



The command potentiometer **15** also sets the peak to peak amplitude of the automatic cycle signal. RAMP potentiometer **14** also controls the ramp of the static command when changing from NORMAL to REV.

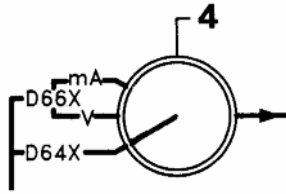


DEADBAND COMPENSATION SWITCH, **17** can be used for valves with overlap, to switch the command quickly through the deadband area. Compensation is approximately  $\pm 10\%$  of maximum command (ie.  $\pm 1V$  or  $\pm 1mA$ ).



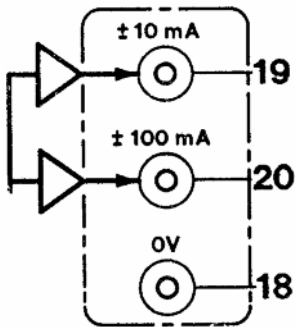
When the setup is complete the red command switch **10** can be turned on to allow control of the valve being tested.

5.2 m.f.b. valve



Set switch **4** to D64X. The command for m.f.b. current drive outputs is generated in the same way as the command for the e.f.b. valve via controls **12** to **15**. See page 11 for details.

Meter **6** shows the output current, either  $\pm 10\text{mA}$  or  $\pm 100\text{mA}$ , depending on which output point is connected to the valve. Note that on the  $\pm 100\text{mA}$  range setting the maximum current available is  $\pm 60\text{mA}$ .



Connect the black plug of the SV cable to the black OV point **18** and the white plug to either **19** or **20**, depending on the current requirement of the valve.

Note that the Tester cannot power and e.f.b. valve and test an m.f.b. valve simultaneously. Only one valve at a time can be tested.

## 6. Application

### 6.1 Commissioning

6.1.1 The valve tester is particularly useful during early stages of commissioning, prior to connection of plant electrical power and control. This means that the hydraulics can be fully tested at the earliest possible stage with the following checks:

- tests hydraulic functions
- preliminary speed and ramp rates established for initial setting of the in-plant electronics.
- machine can be progressed through its complete cycle under manual control.
- slow 'inching' for critical adjustments.
- emergency shut-off is available at all times via COMMAND ON/OFF switch **10**.

6.1.2 After the in-plant electronics have been installed and connected to the valve the portable tester provides:

- in-line monitoring of in-plant electronics with emergency isolation available via COMMAND ON/OFF switch **10**.
- manual control via the valve tester can be used if 'inching' or 'resetting' of the cycle is needed due to failure part way through the automatic operation.

### 6.2 Maintenance Monitoring

Routine maintenance of an e.f.b. valve requires only a periodic check that the valve is correctly following the command signals. The Tester provides a simple means of performing this check. It is achieved by plotting command versus spool position with an external X-Y recorder for a permanent record of performance.

Correct performance of an m.f.b valve can be gauged by observing the reaction of the controlled plant to varying valve drive levels. Actuator speed can be compared to valve drive to verify that the valve is correctly following the command signal.

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|  |  | JJ 17.9.92      |          |
|  |  | Rev C KC 2.2.01 | 14 of 15 |

### 6.3 Troubleshooting

The following tests can be carried out:

- e.f.b. and m.f.b. valve operation fully independent of in-plant electronics.
- monitoring of in-plant electronics during normal cycling.
- valve command and spool position can be simultaneously monitored for e.f.b. valves with 6 or 12 pin connectors.

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|  |  | JJ 17.9.92      |               |
|  |  | Rev C KC 2.2.01 | 15 of 15      |