



— MODEL — **X117C**

Valve Position Transmitter

DESCRIPTION

The Model X117C Valve Position Transmitter is designed to provide analog signal (4 - 20 mA, 2 wire) output of valve position for Cla-Val Main Valves. A stem extension is fitted to the main valve stem with the position transmitter mechanically linked to it. The valve stem is mechanically linked to the electronics for an output signal that is in direct proportion to valve position. Optional limit switches (2 SPDT or 2 DPDT) are provided on the Model X117CLS for signaling when valve has reached fully open or closed position. Provisions are made for bleeding air from valve cover through a small bleed screw and washer located on one wrench flat of adapter.

INSTALLATION

Normally, the X117C is supplied mounted on the Cla-Val main valve. If X117C has not been installed at factory, then install stem, adapter, mounting bracket and transmitter (in order) as shown on drawing 16767. Necessary field setting of the X117C requires some adjustment to the position of the transmitter relative to the stem and the spool, so you may need to loosen transmitter on the bracket. Refer to Drawing No. 16767.

OPERATION

The signal from the position sensing linkage mechanism is converted to a two-wire 4 to 20 mA current output appearing at the output terminals. The voltage compliance range is 12.5 to 40 Volts DC. Initial resistance will range from 975 ohms at transmitter full overtravel (Valve open) to 500 ohms at transmitter free position (Valve closed)

Wiring

Orient transmitter and bracket to conduit. Loosen jam nut holding transmitter and bracket to adapter for connecting transmitter to field wiring conduit. Tighten jam nut after connection is made. After unthreading housing from transmitter connect wires to OUTPUT screw terminals. **DO NOT USE HOUSING AS WIRING PULLBOX.**

Use good field wiring practices for low voltage DC analog instrumentation wiring (suggest 18-gage multistrand wire minimum). Avoid potential ground loops. See drawing for typical wiring connections. Calibration of transmitter should be done with a temporary hookup of test equipment before final wiring connections are made. The enclosure is NEMA rated 1, 3, 4, 4X, 6, 6P, 7, 9, and 13. Appropriate measures should be taken to avoid internal condensation.

CALIBRATION

1. When properly adjusted, the transmitter arm TOTAL arc of travel, as valve moves from full closed to full open will be approximately 60 to 70 degrees. Thus, the transmitter-actuating arm will be horizontal when the valve is halfway open (approximately 30 degrees up and 30 degrees down). At valve closed position the transmitter will have a 4 mA output and at fully open position the transmitter will have a 20 mA output.

2. You will need the following tools to calibrate and align the X117C:
- A.) A small flat blade screwdriver to fit the span and null potentiometers.
 - B.) A ruler for measuring location of transmitter arm and valve actuating stem and spool.



- C.) A 4-20 mA calibration/tester or multiamp-tester/meter or some means of measuring the 4-20 mA transmitter output,
- D.) A small (9/64 inch) hexagon key wrench to fit the transmitter adjustable roller arm,
- E.) A small (3/32 inch) hexagon key wrench to fit the spool setscrew,
- F.) Hand tools to tighten X117C assembly after calibration is complete.

IMPORTANT CAUTION: The transmitter does not have overtravel stops. Use care to insure that rotary travel does not exceed 80 degrees from "center" (free) position in either direction during start up and operation. Damage to the transmitter could occur.

3. Make preliminary mechanical settings. (Refer to Drawing No. 16767) Be sure that the valve is in the fully closed position. See Technical Manual for main valve for information on this. Be sure that line isolation or block valves are closed. Be sure that the Function Switch in the transmitter is in the "CW" position.

4. Adjust bracket and transmitter to preliminary centerline distance "C" for valve size. See Table. This is distance between valve actuating stem centerline (actuates vertically up and down) and transmitter actuating arm pivot centerline (rotates vertically up and down). Install spool on actuating stem.

5. Position the actuating arm. With valve in closed position, loosen setscrews on spool and actuating arm. First, completely loosen actuating arm adjusting screw to allow the knurled shaft of the transmitter to return to "center" (free) position. Then, adjust actuating arm in or out on the knurled shaft so that the actuating arm roller is making good contact with the lower lip of the spool and does not contact the center of the spool. The actuating arm should be about 30 degrees down from pivot horizontal centerline.

After loosening the setscrew, move the spool by hand (up and down) to check that the roller and spool are in alignment throughout entire valve stroke. The actuating arm should not be moved more than 30 degrees up or down from horizontal centerline of knurled shaft. The centerline of the roller should not be past the lower lip or rim of the spool at any valve position. You may have to adjust the length of the actuating arm when doing this.

You will feel the spring restoring force of the transmitter as you do this step. This restoring force allows the roller to maintain contact with the lower lip of the spool throughout the entire valve stroke. The spool must now be adjusted into place by moving the spool slightly (approximately 1/4") upward to engage this spring force. Tighten spool setscrew when the actuating arm is angled about 30 degrees downward.

6. Remove transmitter cover and temporarily connect calibration wiring equipment (milliamp meter and power supply or portable instrumentation calibrator/tester to transmitter screw terminals.).

Refer to calibration equipment and adjust potentiometer marked "NULL" until the meter reads 4 mA. A clockwise turn increases output. Use care in adjusting the potentiometer by not pressing in on the adjusting stem while turning the screwdriver. This will affect the reading.

ALTERNATE METHOD: Loosen setscrew on spool and adjust until its centerline is lined up with centerline of transmitter actuating arm pivot centerline (actuating stem and actuating arm should be at 90 degrees to each other). Mark top and bottom of spool location on stem at this 'halfway' position. Determine valve stroke by multiplying .281 times the valve seat diameter. Measure half the valve stroke down from bottom of the spool and mark the stem. Move the spool down until the bottom of the spool is aligned with the new mark on the stem. Tighten the spool setscrew. Loosen the screw that holds roller arm in place and move roller arm end into spool. Adjust location of transmitter on bracket so that roller is in place inside spool and slightly touching the bottom lip or rim of spool. The transmitter spring restoring force helps locate the roller on the lower lip of the spool throughout the entire valve stroke. The roller arm should be at an angle of between 30 and 40 degrees below the horizontal centerline of the pivot arm.

7. For the most accurate calibration it is necessary to open valve fully. **CAUTION:** This will either allow a high flow rate through the valve, or the downstream pressure will quickly increase to the inlet pressure. In some cases, this can be very harmful. Where this is the case, and there are no block valves in the system to protect the downstream piping, it should be realized that steps should be taken to remedy this situation before proceeding further. Normally, block valves are to be used to protect downstream piping while the valve is in the open position. Close downstream block valve. Vent cover chamber to atmosphere. Slightly open inlet block valve. Allow valve to open while fluid is vented from cover chamber. When flow stops valve is in the fully open position. Note: continuous leakage from cover chamber could mean additional troubleshooting of the main valve or pilot system must be done.

8. With valve in fully open position, inspect position of spool and roller arm. Actuating arm roller should be making good contact with the lower lip or rim of the spool and the centerline of the roller should not be past the lower lip or rim of the spool (see Step 5). Adjust if necessary.

Refer to calibration equipment (see Step 6) and adjust potentiometer marked "SPAN" until the meter reads 20 mA. A clockwise turn increases output. Use care in adjusting the potentiometer by not pressing in on the adjusting stem while turning the screwdriver. This can affect the reading.

ALTERNATE METHOD: If it is not possible to cycle valve position without damage, then with valve remaining in the "valve closed" position loosen the spool piece setscrew and slide spool upward to the original "halfway" marks on the stem. Adjust the "SPAN" potentiometer until the meter reads 12 mA. Slide the spool piece down until the meter reads 4 mA and tighten setscrew on spool. This method is less accurate than fully cycling valve but will work.

9. There is some interplay between: 1.) The "span" and "null" settings, 2.) The 4 to 20 mA signal and, 3.) The actual valve open and closed positions. Repeat steps above. Cycle valve from open to closed positions and check settings as necessary to achieve desired valve position signal accuracy.

10. Remove all calibration equipment and attach permanent wiring. Recheck wiring and output signals at remote location. See **Wiring** section. Reinstall housing on transmitter. Recheck and tighten all fasteners. Bleed air from main valve cover through small bleed screw and washer located on one wrench flat of adapter.

ADJUSTING OPTIONAL LIMIT SWITCHES

These switches are supplied with X117CLS models and are factory set to operate at valve closed position.

1. Lift cam follower arm.
2. Move cam wheel axially to disengage teeth on wheel from teeth on shaft disc.
3. Turn cam wheel to desired position. Turning in direction of shaft rotation advances operate point. Pretravel **decreases** and overtravel thereby **increases**. Each notch on the cam wheel represents an operating point change of 7 degrees 20 seconds arc. The symbols on the cam wheel simplify changing rotation from clock wise to counterclockwise to center neutral, or vice versa.

The switch operates on clockwise **and** counterclockwise rotation, the pointer on the cam follower lines up with symbol [\] or symbol [/] on the cam wheel. Maximum pretravel of 15 degrees occurs when symbol [/] lines up. Maximum pretravel of 80 degrees occurs when symbol [\] lines up. Operation is in the direction of the inclined surface of the symbol when [\] or [/] lines up with the pointer on the cam follower.

4. When cam wheel has been rotated to desired location, release cam wheel to engage with mating shaft disc.
5. Release cam follower arm.

MAINTENANCE

The X117C and X117CLS are constructed of durable materials which normally requiring no lubrication or periodic maintenance. The two 'O' rings (2) (p/n 00951E) in the adapter (5) that seal against the stainless steel actuating stem (1) will need replacement if signs of leakage at the stem occur.

For replacement circuit board use p/n 3080206A. When installing a new circuit board be sure that the small black and white plastic bearing piece connecting the X117C main shaft to the circuit board mounted potentiometer shaft remains in the transmitter housing. It is not part of the replacement circuit board.

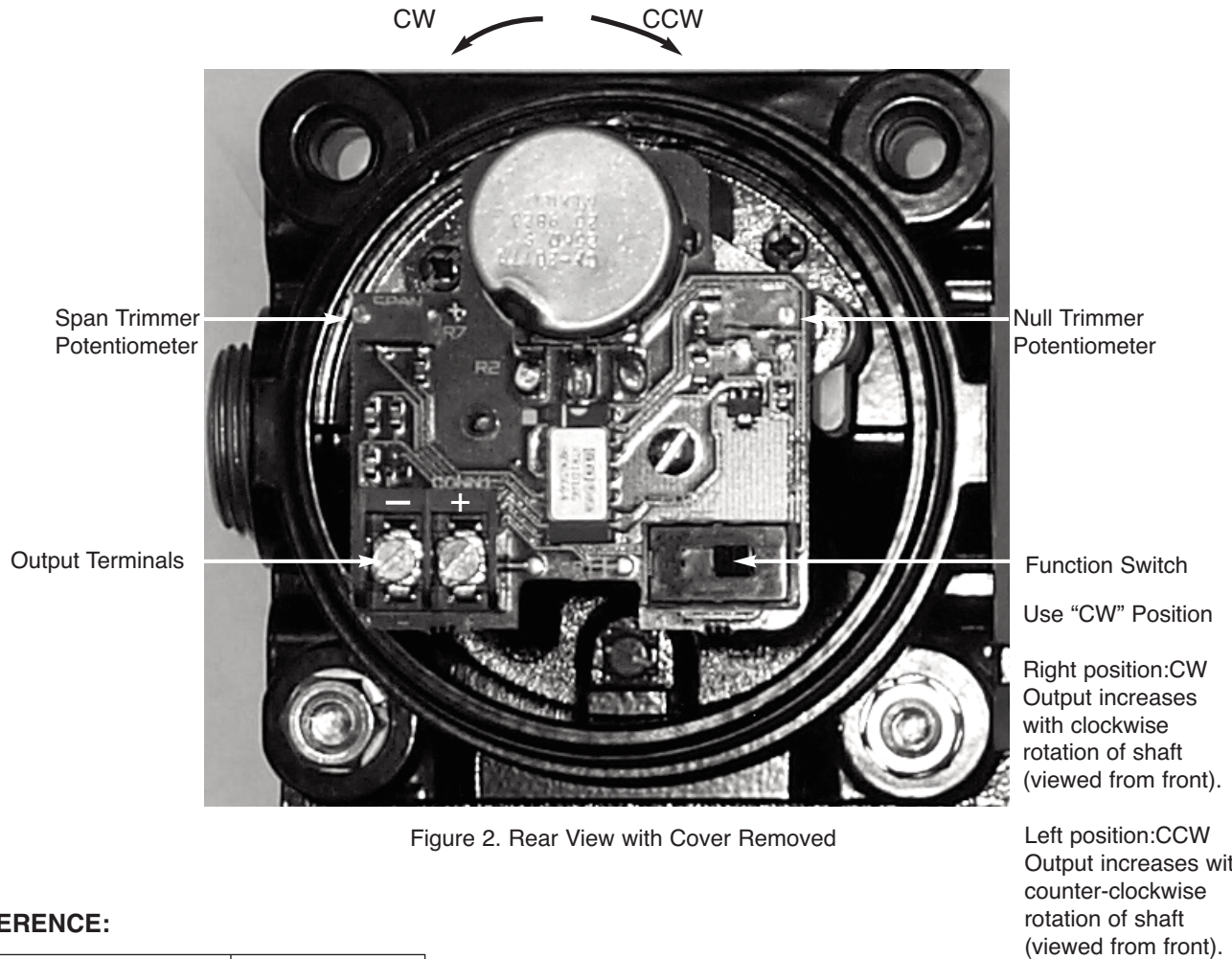


Figure 2. Rear View with Cover Removed

REFERENCE:

Valve Size (inch)		"C" Dim. (inch)
100 Series	600 Series	
1 1/4 & 1 1/2		.60
2		.75
2 1/2		.88
3	4	1.00
4	6	1.13
6	8	1.50
8	10	1.88
10	12	2.00
12	16	2.87
14		3.00
16	20 & 24	3.25

SPECIFICATIONS:

Voltage compliance range: 12.5 to 40 VDC

Maximum load resistance:

$$R_L \text{ Max.} = \frac{V \text{ Supply} - 12.5}{20 \text{ mA}}$$

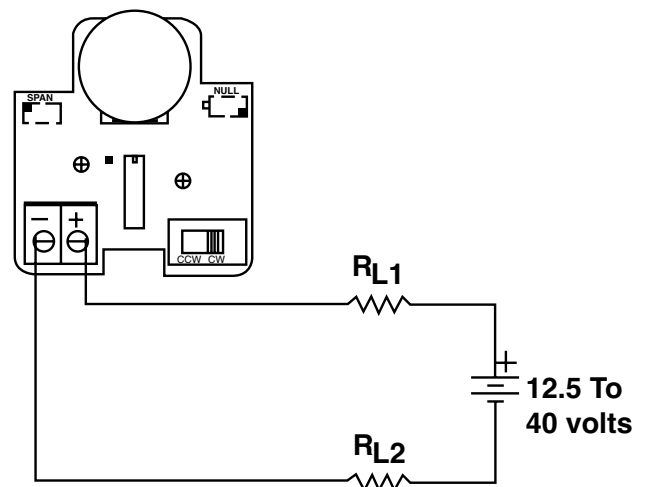
Current signal output: 4-20mA

Span: Adjustable from 15° to 90° of angular rotation

Null: 4 mA position may be set at any angular position

R_{L2} is current monitoring instrumentation load

Typical Wiring Connections:

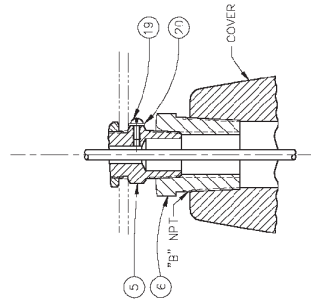
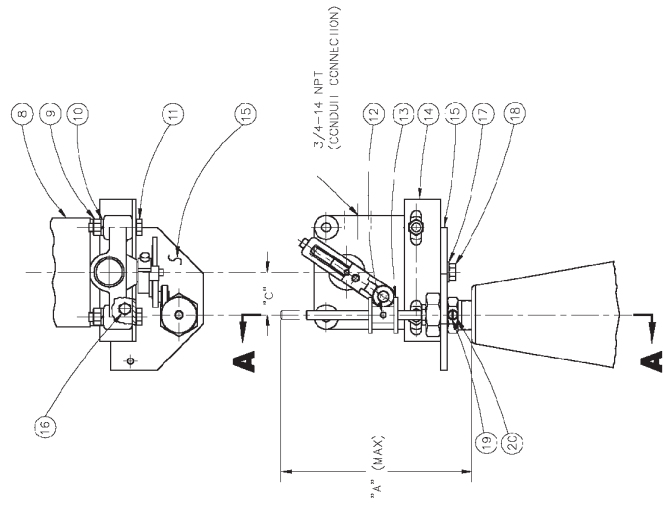


FORM NO. 16767 8" 16" C

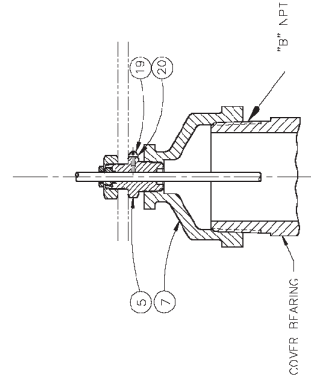
REV.	DESCRIPTION	DATE	APPROVED
A	BASE REVISION FILE.		
C	REDRAWN CN CAD, ADDED ITEMS 19 & 20. (LCC 166/1)	8-20-97	MW

CATALOG NUMBER	SWITCH
X117C	ANALOG OUTPUT ONLY, SHOR HOUSING
X117C S	ANALOG, 15 AMP, SPOT EXPOSITION PROOF

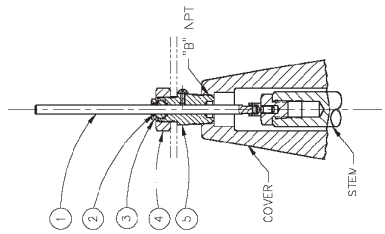
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8", 10", 12" & 14" SIZES ONLY



16" SIZE ONLY



2" IHRU 6" SIZES
(6" SIZE SHOWN)

SECTION A - A
(ROTATED 90° C.C.W.)

VALVE SIZE	1 1/4"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"
"A" MAX	13.19	7.16	7.6	7.34	7.00	6.69	6.91	6.88	9.09	9.16	10.78
"B" NPT	1/4"	1/2"	1/2"	1/2"	5/4"	5/4"	1"	1"	1 1/4"	1 1/2"	2"
"C"	.60	.75	.88	.90	1.13	.50	1.88	2.00	2.88	3.00	3.25

ITEM NO.	QTY	DESCRIPTION
20	1	WASHER, FIBER
19	1	SCREW, RDH- 8-32 X 3/8"
18	2	NUT, ILCX 1/4-20
17	2	WASHER, SPRING LOCK, 1/4"
16	2	BOLT, HEX 1/4-20 X 3/4"
15	1	PLATE, SWITCH MFG.
14	1	BRACKET, ANGLE MFG.
13	1	ROLLER GUIDE
12	1	SET SCREW, 10-32 UNF
11	2	BOLT, HEX 5/16-18 X 1 1/2"
10	2	WASHER, SPRING LOCK 5/6
9	2	NUT, HEX 5/16-18
8	1	MICRO SWITCH ASSEMBLY
7	1	REDUCER, BELL PIPE (16" SIZE ONLY)
6	1	BUSHING, PIPE, ILCX (6" TIIRU 14" SIZES ONLY)
5	1	ADAPTER
4	1	NUT, ILCX (ASF JAM)
3	1	BUSHING, GLAND
2	2	O-RING
1	1	STEM ASSEMBLY

CONTRACT NO. _____

DATE _____

APPROVALS _____

DESIGNED BY: _____

CHECKED BY: _____

DATE: 12-17-97

REVISED: CH1 1-19-98

FIG. NO. 86184

DATE: 16/6/

REV. C

SCALE: _____

WORK N.T.S.

REV. 1 OF 1

MW 8-25-97

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE TO CENTER
UNLESS NOTED OTHERWISE
SURFACE FINISH: 32
BREAK CORNERS: .015 MAX
DIMENSIONS: .015 MAX
--DO NOT SCALE DIMENSIONS--



X117C SERIES POS. TRANSMITTER
4 TO 20 MA, DC OUTPUT SIGNAL
WITH LIMIT SWITCH