DII DIFFERENTIAL CURRENT CONVERTER INSTALLATION INSTRUCTIONS

1. GENERAL SCALING

Before calibration of the DII is accomplished, it is important to observe some basic system scaling requirements. THE SCALING OF ANY PAIR OF INPUT TRANSMITTERS MUST BE IDENTICAL FOR PROPER SYSTEM OPERATION. An example follows.

Level: An enclosed, 12 foot tank with an air pad which can vary in pressure from 25" to 60" WC holds a fluid at a relative density of 1.10. Using pressure transmitters positioned in the air pad and at the bottom of the tank, the 4-20 mA scaling for both should be 0-220" WC to simultaneously include maximum air pad pressure and maximum tank level. A trip alarm might be required when tank level achieves 10 feet which is a differential pressure reading of 132" WC. This 60% of span can be used to yield a DII full scale (DII scaling: 0-9.60 mA input differential provides 4-20 mA output). Note that even though the air pad pressure is never expected to exceed 60" WC, the scaling for that transmitter must still be identical to the other which measures the sum of maximum air pad and maximum liquid height.

Failure to scale both input transmitters identically in any DII configuration will result in erroneous measurement of the entire system.

2. MOUNTING

When the cover is removed, there are 4 through holes that will accept #8x1" pan head sheet metal screws to mount the box. Make sure they do not interfere with the cover screws.

3. WIRING

Refer to the Wiring Diagram on bulletin DII-3. The DII accommodates all wiring from power source, transmitters and output load. As seen in the diagram, the power supply, nominally 24 VDC, furnishes power to both transmitters as well as the DII and the output. The two transmitters do not require separate two-wire loops.

Individual "loads" may be placed in each transmitter sub-loop in either of two positions as shown. This feature allows the user to monitor both transmitter signals as well as the DII output (representative of process differential). The Input Characteristics graph gives the maximum resistance allowed in each loop for a given transmitter lift-off and for various supply voltages.

For example, using PMC-PT-EL transmitters having a 10 volt lift-off voltage and a 24 VDC power supply, the total allowable loop load (including wire resistance) for each sub-loop is 375 ohms. Output voltage compliance is supply voltage minus 7 volts, which for the above conditions allows a load resistance of up to 850 ohms.

The entire system, comprising a DII and two PMC-PT-EL transmitters, is fully floating. Although it does not have galvanic isolation, this system can be grounded at any single point as shown in the diagram. The ground point selected must be compatible with the user's existing ground configurations relative to load or supply grounds. Only one ground within this system may exist.

Transmitter cables from PMC-PT-EL's are over 1/4 inch thick and do not allow small bend radii. It is recommended that these cables enter the DII enclosure and dress to the right and left bottom respectively. With 4 to 6 inches of outer sheath removed from the individual insulated conductors, these thinner wires can then be routed up to the appropriate terminal strip points. For PT-EL's, the red transmitter wires go to the + input points and the black transmitter wires are connected to the - input points, but allow for sub-loop loads as required. Supply and output wires are connected as shown in the diagram.

A ground post is provided above the right side of the terminal strip. An earth connection should be made to this point to facilitate the RFI immunity inherent in the design. This ground connection is to be considered a chassis earth and does not interfere with the placement of a system loop ground discussed earlier.

4. CALIBRATION

The DII output is 4.00 mA whenever the two mA inputs are equal. DII Span is defined as the differential mA input which yields a full scale, 20.00 mA DII output (i.e., a change of 16.00 mA in the output).

The calibration adjustments for the DII comprise six coarse Span switches, one fine Span potentiometer and a Zero potentiometer. The coarse Span switches are factory set to the range specified by the user.

If the coarse Span requires readjustment, the user can effect the change in the field. The switches control internal gain, with smaller differential inputs requiring higher gains to yield a DII full scale. Gain is increased by closing switches starting from switch 6 and working leftward to switch 1. Each succeeding leftward switch has double the gain change effect than the previous switch. The total switch setting resembles a digital binary number, e.g., 100110 with 64 combinations of gain settings. Minimum gain is accomplished with all switches open: 000000; maximum gain occurs with all switches closed: 111111.

The Coarse Span Programming Table gives switch settings for nominal differential mA inputs. Adjust the switches to that setting having a nominal differential mA input closest to your desired input span.

To perform fine calibration, wiring should be completed according to prior instructions. With both transmitters at the same output (any output between 4 mA and 20 mA, but preferably around mid-scale), adjust Zero to achieve a DII output of 4.00 mA.

Next, create the desired differential signal on the transmitters (e.g. 3.20 mA which has a 110011 switch setting) and adjust Span to achieve a DII output of 20.00 mA. Span and Zero are almost totally non-interactive, but for the most precision the above two steps should be repeated.

The DII is now calibrated to yield a 20 mA output for the specified differential input regardless where in the input range the differential occurs. For example, 7.20 mA minus 4.00 produces 20 mA out, and 20.00 mA minus 16.80 mA also produces 20 mA out.

5. MAINTENANCE

The DII is totally solid state, having endured factory burn-in and exhaustive tests. Except for normal care, the DII requires no particular concern: it is NEMA 4X protected, RFI protected, short circuit protected on inputs and output, reverse-polarity protected and reasonably rugged. If the power supply is inadvertently shorted, the DII will survive but the user's power supply is in jeopardy.

If any difficulty with the DII occurs, the factory should be contacted for advise and service. The modular nature of the DII construction allows the working portion to be returned for repair without the entire unit requiring removal.

PMC: DIFFERENTIAL D/P DATA REQUIRED FOR DII CALIBRATION

NOTE: Underlined bracket spaces must be filled in by the customer.

PT-EL MATCHED PAIR RANGE (__________)

PT-EL High Side Static Operating Pressure (__________)

PT-EL Low Side Static Operating Pressure (__________)

D/P at Average Operating Pressure (__________)

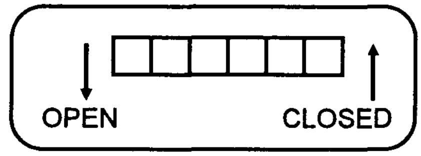
D/P at Trip or Alarm Pressure (__________)

DII mA Output for Average Operating Pressure (4 + __________)

Turn Down Ratio (__________)

Input mA Differential (__________)

DII Dip Switch Setting for (__________) span is (__________).



D/P Trip Pressure at Average Operating Inlet Pressure (__________)

SAMPLE PRESSURE SCREEN D/P CALCULATION

PT-EL MATCHED PAIR RANGE (100 PSI)

PT-EL High Side Static Operating Pressure (50 PSI)

PT-EL Low Side Static Operating Pressure (45 PSI)

D/P at Average Operating Pressure (5 PSI)

$\frac{5}{10} \times 16\text{ mA} = 8\text{ mA}$

D/P at Trip or Alarm Pressure (10 PSI)

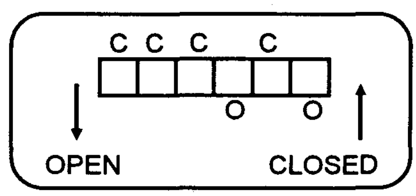
DII mA Output for Average Operating Pressure (4 + 8 = 12 mA)

Turn Down Ratio (10 PSI on 100 PSI) = 1 to 10 Approx. 1/10 of 16 mA span is 1.6 mA.

Input mA Differential (1.6 mA)

DII Dip Switch Setting for (1.6 mA) span is (111010). See span setting/dip switch chart.

D/P Trip Pressure at Average Operating Inlet Pressure (10 PSI)

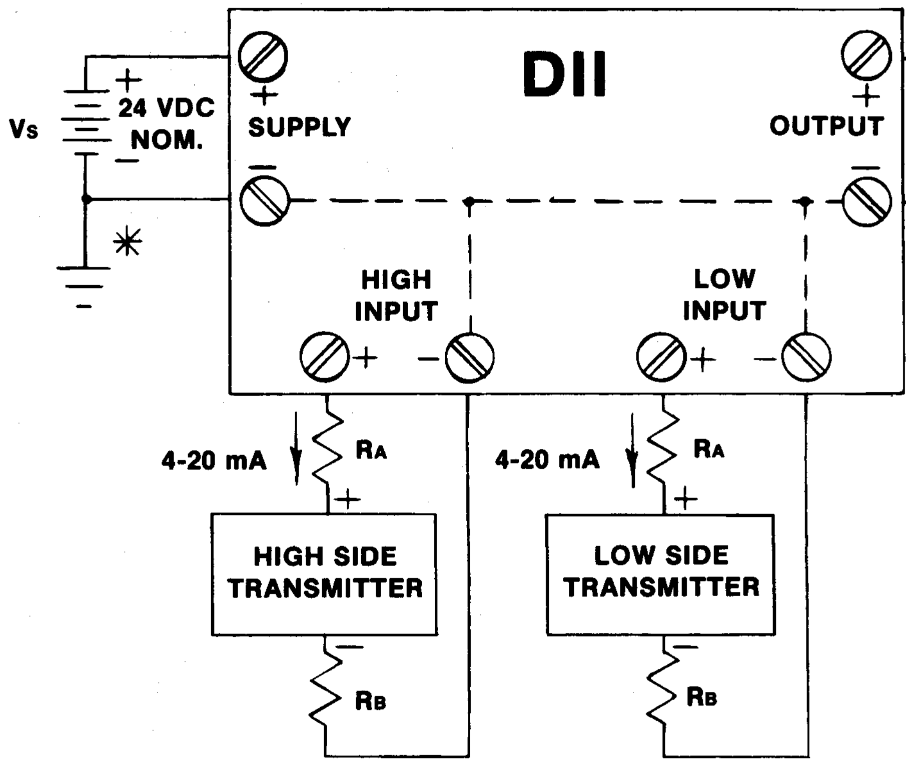


NOTE: A D/P trip pressure should be selected to yield a reliable segment of the 16 mA span.

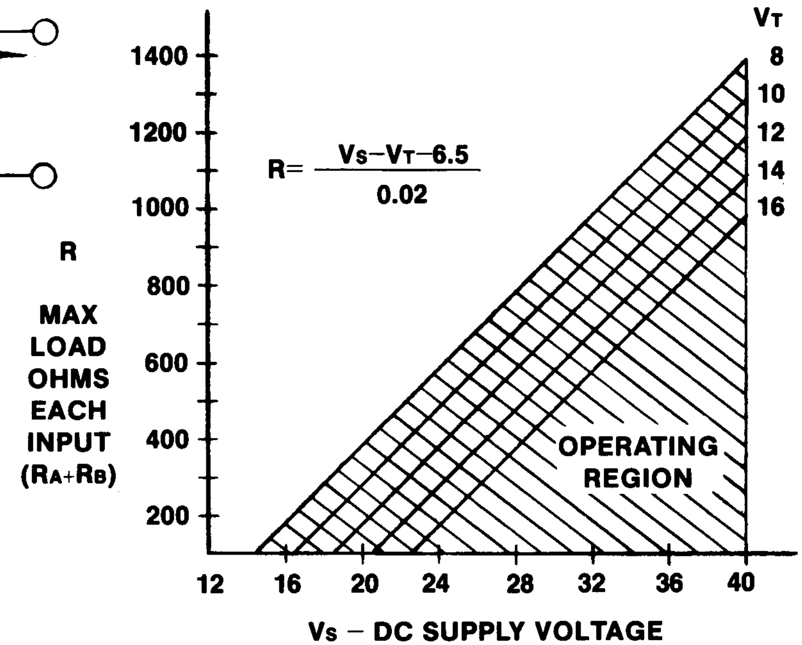
COARSE SPAN PROGRAMMING

Input mA Differential	Switch Settings	Input mA Differential	Switch Settings	Input mA Differential	Switch Settings	Input mA Differential	Switch Settings
0.50	111111	4.21	101111	7.99	011111	11.70	001111
0.73	111110	4.44	101110	8.21	011110	11.92	001110
0.95	111101	4.66	101101	8.44	011101	12.15	001101
1.18	111100	4.89	101100	8.66	011100	12.37	001100
1.43	111011	5.14	101011	8.92	011011	12.62	001011
1.66	111010	5.37	101010	9.14	011010	12.85	001010
1.88	111001	5.59	101001	9.37	011001	13.07	001001
2.11	111000	5.82	101000	9.59	011000	13.30	001000
2.37	110111	6.08	100111	9.85	010111	13.56	000111
2.60	110110	6.30	100110	10.08	010110	13.79	000110
2.82	110101	6.53	100101	10.30	010101	14.01	000101
3.05	110100	6.75	100100	10.53	010100	14.24	000100
3.30	110011	7.01	100011	10.78	010011	14.49	000011
3.52	110010	7.23	100010	11.01	010010	14.72	000010
3.75	110001	7.46	100001	11.23	010001	14.94	000001
3.97	110000	7.68	100000	11.46	010000	15.17	000000

WIRING DIAGRAM



INPUT CHARACTERISTICS



V_T–MINIMUM VOLTAGE REQUIRED BY TRANSMITTERS

RESISTIVE LOADS ARE OPTIONAL IN THE R_A AND R_B POSITIONS IN EITHER INPUT LOOP.

*Recommended user ground point. This electrically floating system does not provide galvanic isolation but may be grounded at any single point.

With loads at R_A points only, the earth connection shown results in grounding both supply and output negatives along with the low side of both transmitters. The R_A loads float.

With loads at R_B points only, the earth connection shown results in grounding both supply and output negatives along with the low side of each R_B load. The transmitters float. This approach is the most common.

PAPER MACHINE COMPONENTS, INC. Danbury, Connecticut, U.S.A.			
PART NAME DII SYSTEM CONFIGURATION			
MATERIAL		DATE FEB. 1990	SCALE
QUANTITY	DRAWN BY	ORIG. DWG.	ASSY. DWG.
BREAK ALL SHARP EDGES & CORNERS FRACT. DIM. ±1/64 DECIM. DIM. ±.005 ANGLES ±1/4° UNLESS OTHERWISE SPECIFIED		DWG. NO. 431-A	