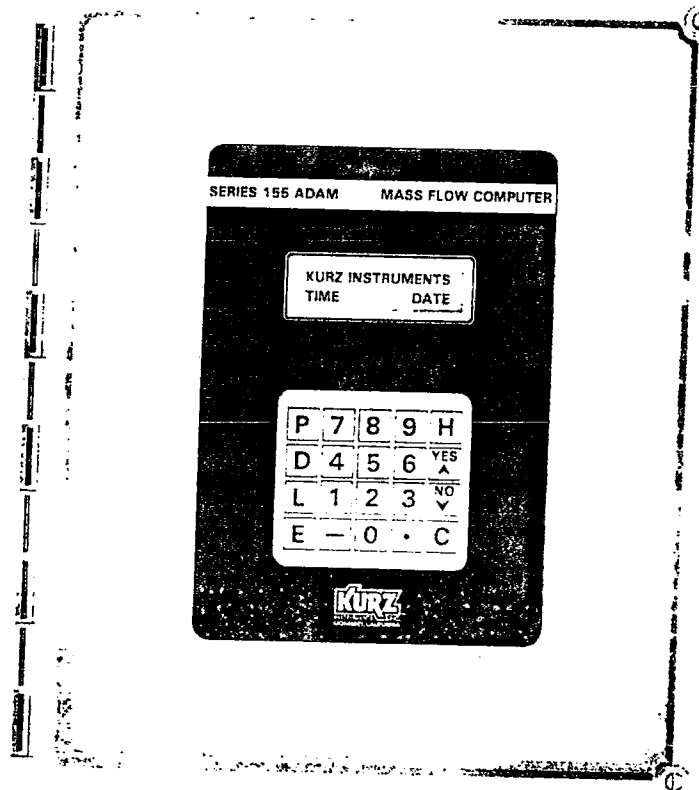


Kurz Instruments, Inc.

ADAM Series 155

Models A and B



ADDENDUM



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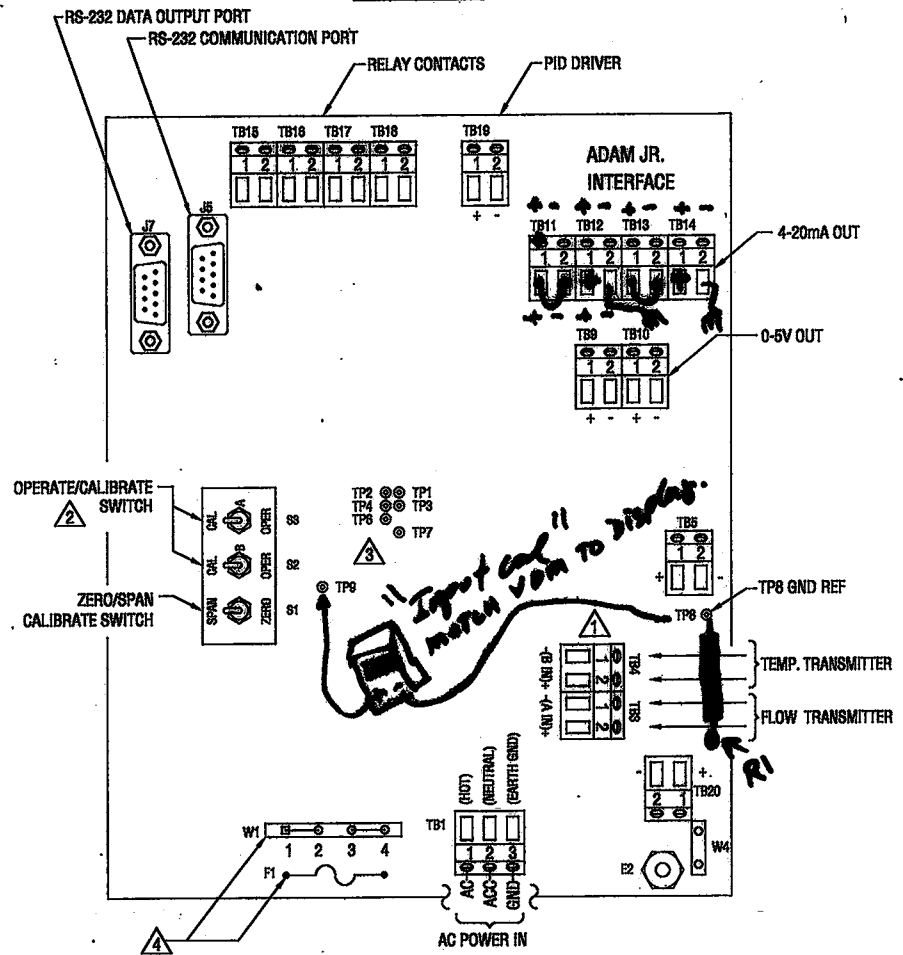
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Document Title: Adam Series 155 Mass Flow Computer/Transmitter Addendum
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OPTIONAL CONNECTIONS

ADAM JR. - *Layout*



- 1 TB3-1 THRU TB4-1 (CHANNEL A THRU B) INPUTS 0-5 VDC MAX. TB3-2 THRU TB4-2 (CHANNEL A THRU B) OUTPUTS 18 TO 24 VDC.
- 2 SWITCH POSITION
 - ⊖ CHANNEL CALIBRATE
 - ⊕ OPERATE MODE
- 3 TP1 +2.500 REF
 TP2 +5V
 TP3 -9V
 TP4 +10V
 TP6 +12V
 TP7 +15V
 TP8 GND REF
 TP9 INPUT CAL
- 4

1	2	3	4
115VAC (STD.)			
F1 IS 0.5 AMP			

1	2	3	4
230VAC (OPT.)			
F1 IS 0.5 AMP			
- 5. CONNECT INPUT/OUTPUT SHIELDS TO CONDUIT HUB BUS BAR GROUND STUDS (NOT SHOWN).
- 6. EXTERNAL INPUT OPTION
 TB20-1 INPUT A (+ EXT.)
 TB20-2 INPUT A (- EXT.)
 TB5-1 INPUT B (+ EXT.)
 TB5-2 INPUT B (- EXT.)

Rev. P

INTRODUCTION

This Addendum is the result of Kurz Instruments, Inc. commitment to provide the best possible product improvements for our customers. Use of the built in calibrator, input calibration, output calibration, setup of linearizers including Velocity/Temperature Mapping (VTM), and implementation of the zero and span drift check verification feature for Series 155, Models A and B Mass Flow Computers are presented in this document.

BUILT-IN FIELD CALIBRATOR

The Field Calibrator verifies system calibration by allowing the user or technician to insert the Current Sense Voltages listed in the *Calibration Data and Certification Document* through the use of an on board switch and variable resistor and the ADAM® software.

A calibrated digital voltmeter (DVM) with 4½ digits or better and $\pm 0.1\%$ accuracy is required for this procedure along with the appropriate *Calibration Data and Certification Document* for the instrument under test.

The *Calibration Data and Certification Document* lists the Current Sense Voltages in the column labelled "CSV VDC" (Current Sense Voltage Volts DC) for each calibration point.

Corresponding velocity or mass flow values for each calibration point are listed in the column labelled "Velocity SFPM". The first calibration point indicates a no-flow condition.

Before starting any procedure contained in this document, the following items should be noted or verified.

- ☆ Performance of this procedure requires knowledge of user or technician level security codes. To obtain these codes, contact Kurz Instruments, Inc. Customer Service.
- ☆ All wiring is properly connected.
- ☆ Input power is available and instrument is energized.
- ☆ These procedures are performed with power applied to the instrument; appropriate steps must be taken to prevent contact with potentially dangerous electrical energy or serious damage to personnel and/or equipment may result.
- ☆ When switch SW2 is placed in the "Calibrate" position, the unit is no longer monitoring actual flow rates. Verify that removal of this equipment from service will not compromise personnel or equipment safety. Switch SW2 must be placed in the "Operate" position when returning the instrument to service.

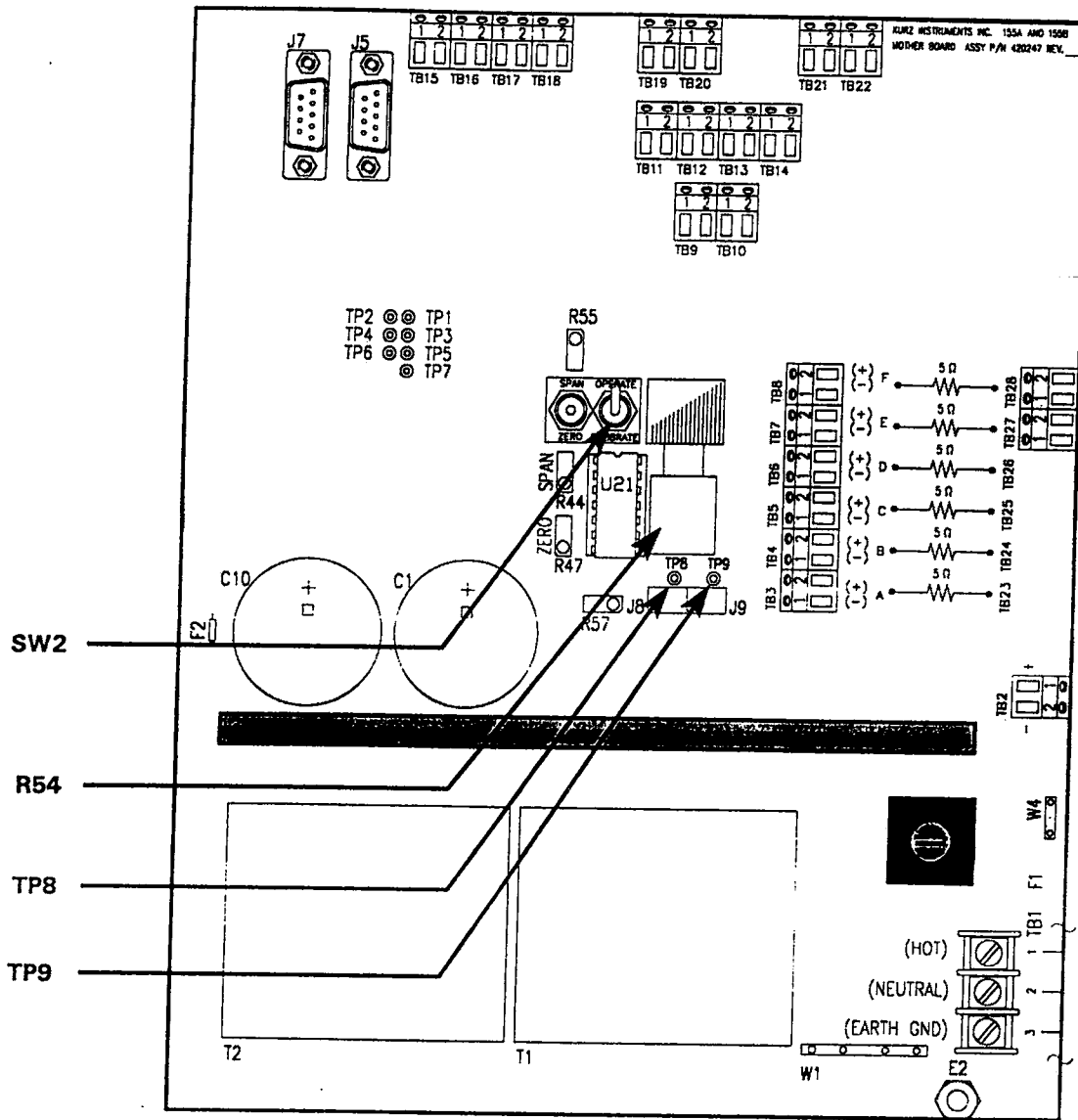


Figure 1. Mother Board, Models 155A and 155B, Component Location

INPUT CALIBRATION

Refer to Figure 2 for component location.

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1. Enter the Program Mode using technician level access code.
2. Press **[P]** until the message "PRESS ENTER TO CALIBRATE" appears on the front panel LCD, then press **[E]**.
3. Press the up (YES) or down (NO) arrow until the message "PRESS ENTER FOR INPUT CAL" appears on the front panel LCD, then press **[E]**.
4. Press **[P]** until you see the "SET ZERO VOLTS..." prompt for the channel you wish to calibrate. If you inadvertently pass the desired channel, pressing **[C]** once will return you to step 3.
5. When you see the message "SET ZERO VOLTS..." for the channel you wish to calibrate, place switch SW2 in the "CALIBRATE" position.
6. Connect DVM to TP8 (+) and TP9 (-)
7. Adjust R54 until the DVM indicates 0.000 VDC.
8. Press the up (YES) or down (NO) arrow until the front panel LCD indicates 0.000 volts. Then press **[E]**.
9. Adjust R54 until the DVM indicates 3.000 VDC.
10. Press the up (YES) or down (NO) arrow until the front panel LCD indicates 3.000 volts. Then press **[E]**.
11. This completes the input calibration process for one channel.
 - 11.1 If you wish to continue for the other channels (up to 3 for a Model A or 6 for a Model B) return to step 4.
 - 11.2 If you wish to perform output calibration, press **[C]**, then proceed to the section titled "SET OUTPUT CALIBRATION" of this addendum.

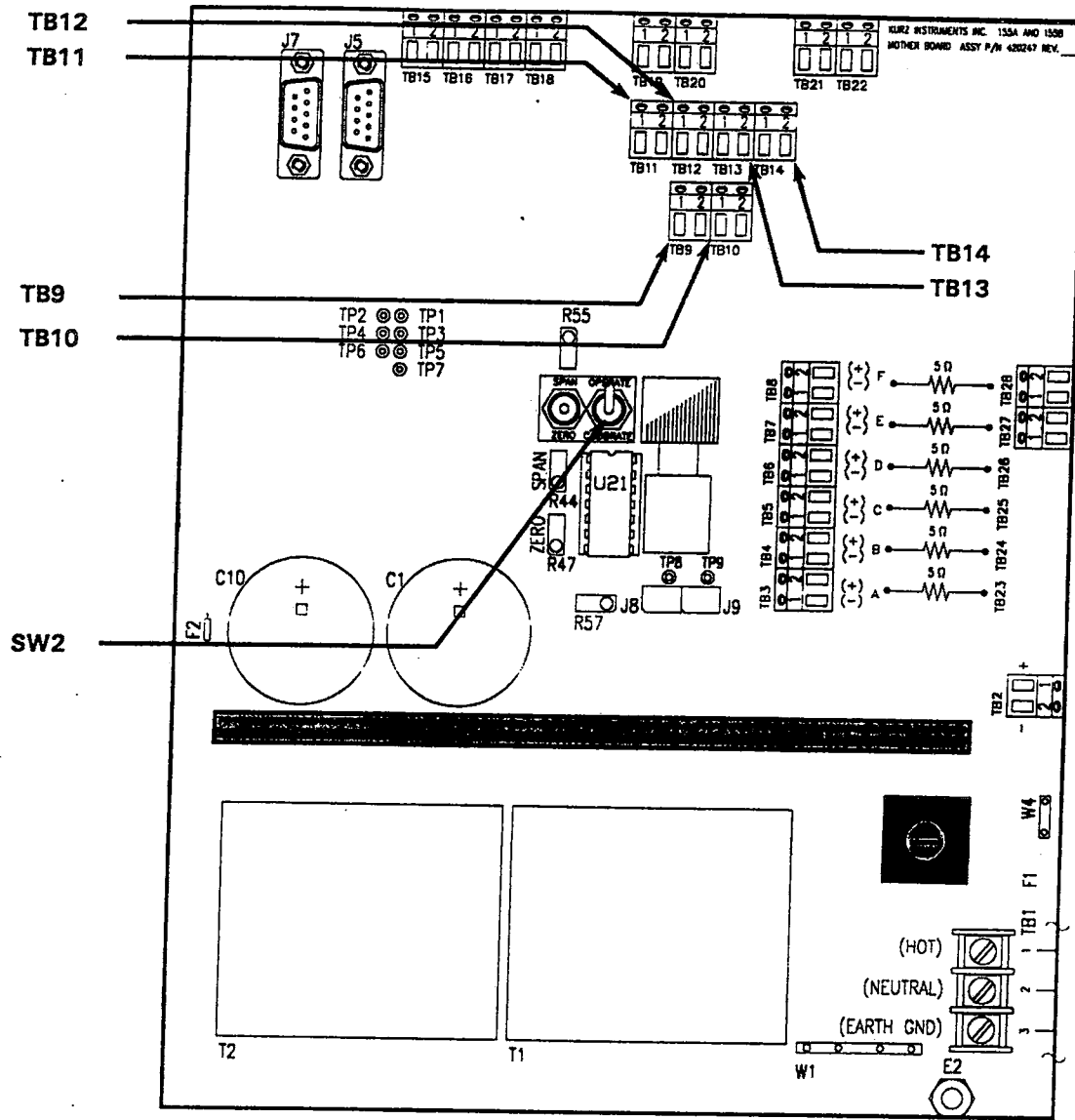


Figure 3. Mother Board, Models 155A and 155B, Output Calibration

BRAD FOLL

843 20 1234

155
JR

Kurz Instruments Inc.

155JR

Calibration:

Output and Input circuits must be matched to real voltage and currents which are done with these menus. See the subsequent section for a detailed description of how this is done for the 0-5 V or 4-20 mA output.

The input calibration uses various methods of substituting a zero or span voltage to the input channels of each 155 unit. See the field wiring diagram for identification of the switches used for this purpose. Generally, there is a calibrate/operate switch. When in calibration there is another switch which selects zero or span. The span voltage must be measured with a 4 ½ digit multimeter with 0.1% basic DC accuracy to calibrate the inputs. As input voltages are raised to about the 4th power to convert the raw input to a flow or velocity, this process is critical and must be performed by a competent operator with an accurate voltage standard.

QUICK CHECK

A_ connect V.O.M. across R1 (TP8) = is grd)

B_ Press "D" (approx. 9 times) To the screen reads =

A= XXXX SFPM

INPUT = X.XXXX V

C_ The voltage across "R1" and the Display must match, if not follow the procedure...

**FIELD CALIBRATION**

Refer to Figure 1 for component location.

1. Place switch SW2 in the CALIBRATE position.
2. Connect DVM to TP8(+) and TP9(-). The DVM monitors the adjustable input voltage to the Model 155 A or B.
3. Enter the Program Mode.
4. Press **[F]** until the message "PRESS ENTER TO SEE INPUT VOLTS" appears on the front panel LCD.
5. Press **[E]** to see the channel A flow and input voltage values.
6. Using the DC Voltage Current-Sense column of the *Calibration Data and Certification Document*, adjust R54, ^{BLVL POT} until DVM display indicates the voltage listed at calibration point 1 for the channel under test.
7. Verify that flow rate and voltage values indicated on the Series 155, Model A or B LCD are the same as those listed on the *Calibration Data and Certification Document* for that calibration point.

Note: If the flow and/or voltage values indicated on the Series 155, Model A or B LCD do not agree with listed values on your documentation, recalibration should be performed.
8. Repeat steps 6 and 7 for the remaining calibration points for channel A.
9. Repeat steps 6, 7, and 8 for the remaining channels of your instrument. Be sure to use the appropriate *Calibration Data and Certification Document* for each channel.
10. When testing is completed, press **[C]** until the Kurz Instruments, time and date message appears on the front panel LCD.

Note: Output signals from this instrument may be used for automatic control of other devices, BEFORE performing the next step, verify that returning the instrument to service will not present a hazard to personnel or equipment!
11. Return switch SW2 to the OPERATE position.
12. Verify that normal operation has been restored to the Series 155, Model A or B Mass Flow Computer and any processes that may be under its control.

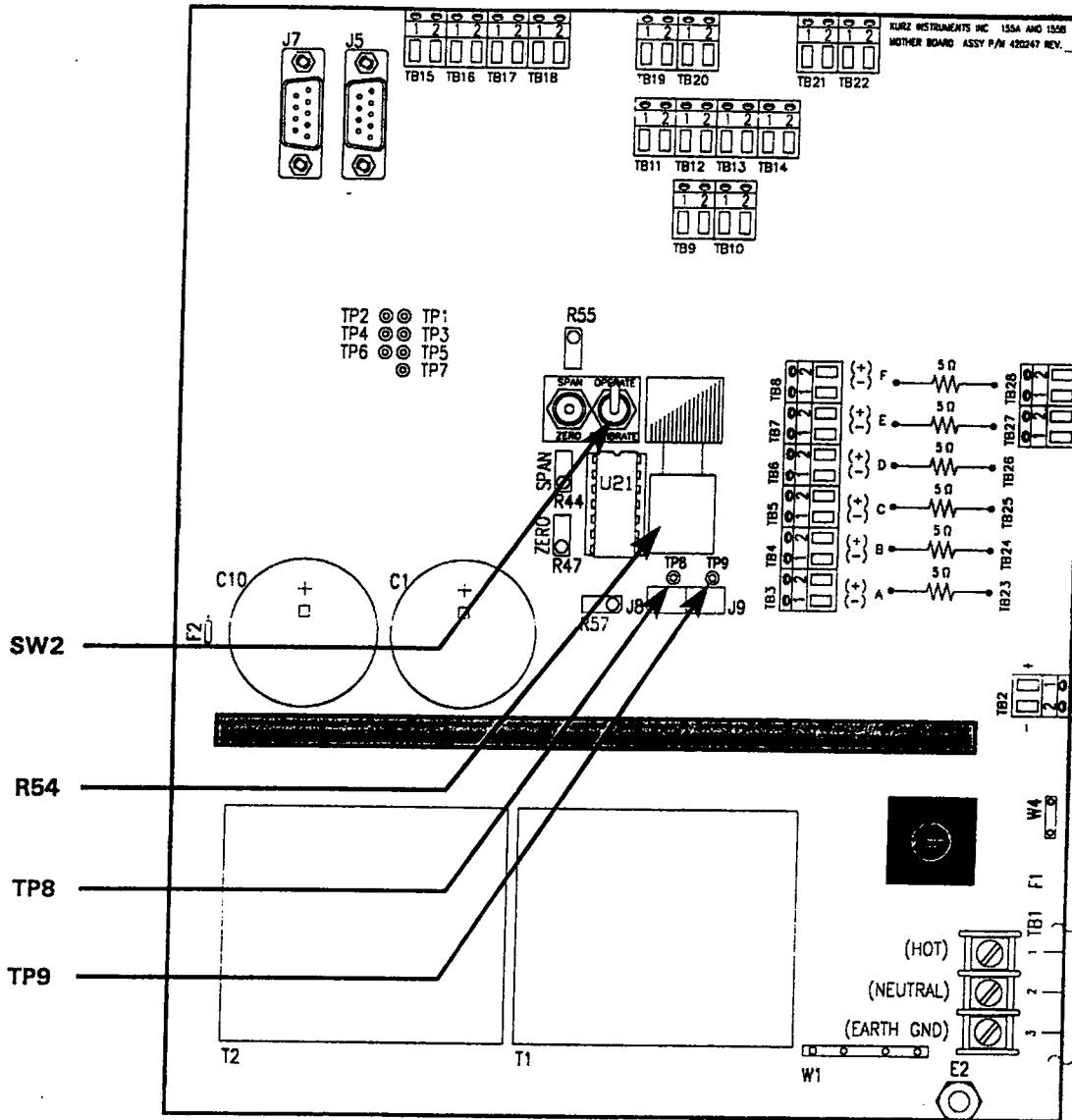
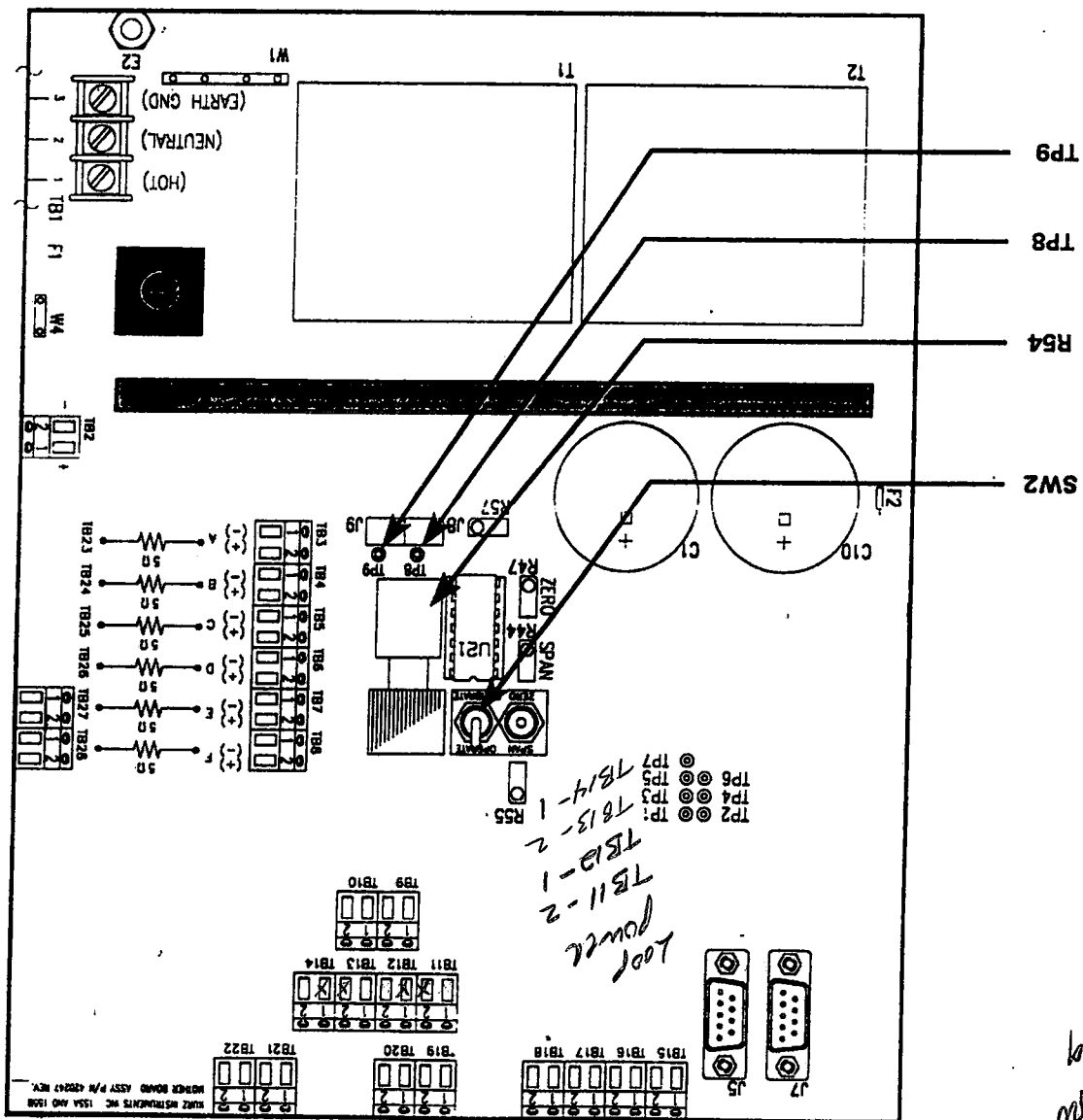


Figure 2. Mother Board, Models 155A and 155B, Input Calibration

Figure 2. Mother Board, Models 155A and 155B, Input Calibration



*See - users guide
 360157 Rev. A
 PC# 9*

*155A-B
 160P
 power*



Input Calibration

Please refer to the appropriate field wiring diagram in the Appendix for the following procedure. Each of the 155 models has a run or operate/calibrate switch or shunt defined on this drawing. (see the Installation section for a table of the drawings for each model)

Once in calibrate, another switch or shunt determines what voltage will be applied to the inputs. This voltage should be monitored with a precision multimeter with 4 ½ digit scale and 0.1% basic accuracy. Placing the volt meter ground at TPx and its positive lead on TPy you can read the exact voltage applied to the inputs.

Next, place the 155 in *Program Mode* and navigate to the Calibration menu

**PRESS ENTER TO
CALIBRATE**

You press the **E** key and you should see the next menu for input calibration, if not press the **^v** key until you do:

**PRESS ENTER FOR
INPUT CAL.**

Again you press the **E** key and you will now see this screen for the first input channel:

**SET 'ZERO' VOLTS
CH A =0.0000 V**

You must have the input switch in the ZERO position and the multimeter reading 0.000 V. If they all agree you press **E** to move to the span setting. If the readings are not near zero, say 0.0056 then enter this number on the keypad followed by the **E** key.

**SET 'SPAN' VOLTS
CH A =5.0000 V**

Which will read about 5 V when the input switch is in the SPAN position. Again you type in the actual voltage reading of the volt meter followed by the **E** key. You will now see the same menu screen for channel B:

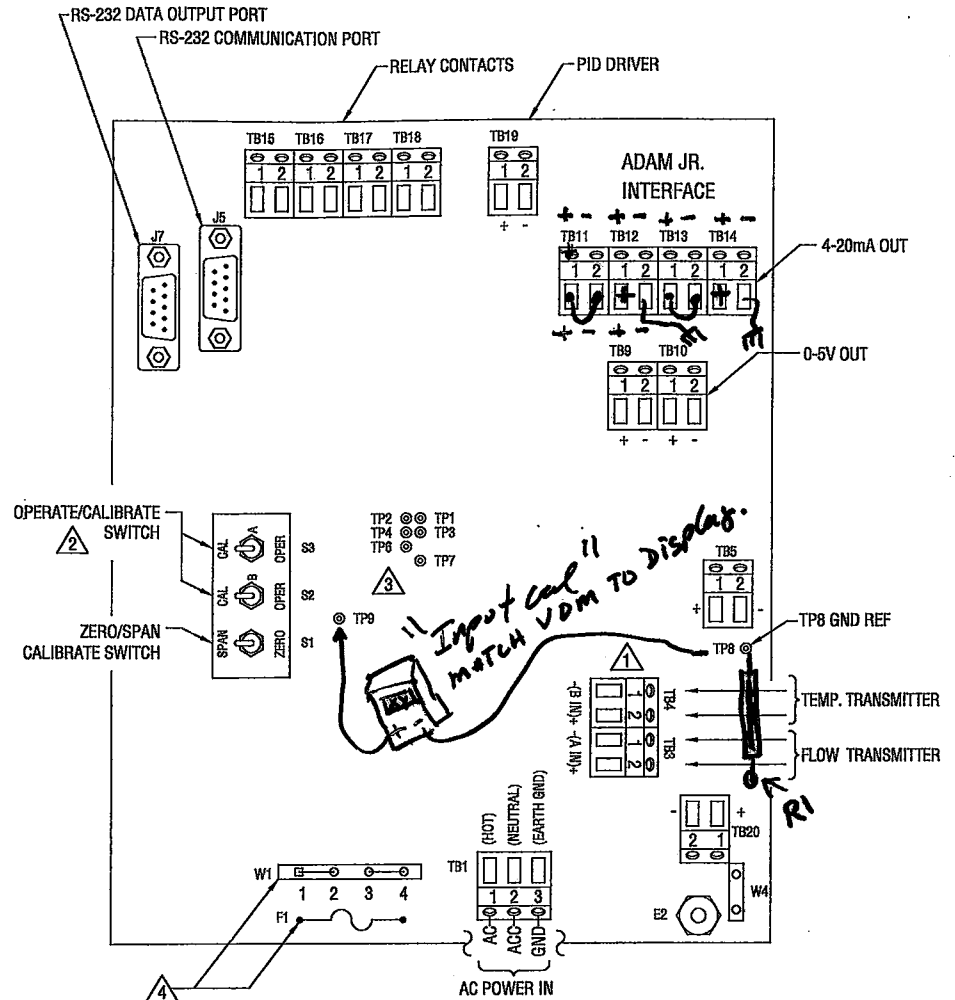
**SET 'ZERO' VOLTS
CH B =0.0000 V**

Now you repeat the process you did for channel A. This is done for all active input channels.

When you are done, you press the **C** key a few times to exit *Program mode* and place the operate/calibrate switch/shut back into the operate position.

OPTIONAL CONNECTIONS

ADAM JR.



1 TB3-1 THRU TB4-1 (CHANNEL A THRU B) INPUTS 0-5 VDC MAX. TB3-2 THRU TB4-2 (CHANNEL A THRU B) OUTPUTS 18 TO 24 VDC.

2 SWITCH POSITION

- ⊞ CHANNEL CALIBRATE
- ⊞ OPERATE MODE

3 TP1 +2.50V REF
 TP2 +5V
 TP3 -9V
 TP4 +10V
 TP6 +12V
 TP7 +15V
 TP8 GND REF
 TP9 INPUT CAL

4

1	2	3	4
115VAC (STD.)			
F1 IS 0.5 AMP			
0.5 SB			
230VAC (OPT.)			
F1 IS 0.15 AMP			

5. CONNECT INPUT/OUTPUT SHIELDS TO CONDUIT HUB BUS BAR GROUND STUDS (NOT SHOWN).

6. EXTERNAL INPUT OPTION

- TB20-1 INPUT A (+ EXT.)
- TB20-2 INPUT A (- EXT.)
- TB5-1 INPUT B (+ EXT.)
- TB5-2 INPUT B (- EXT.)

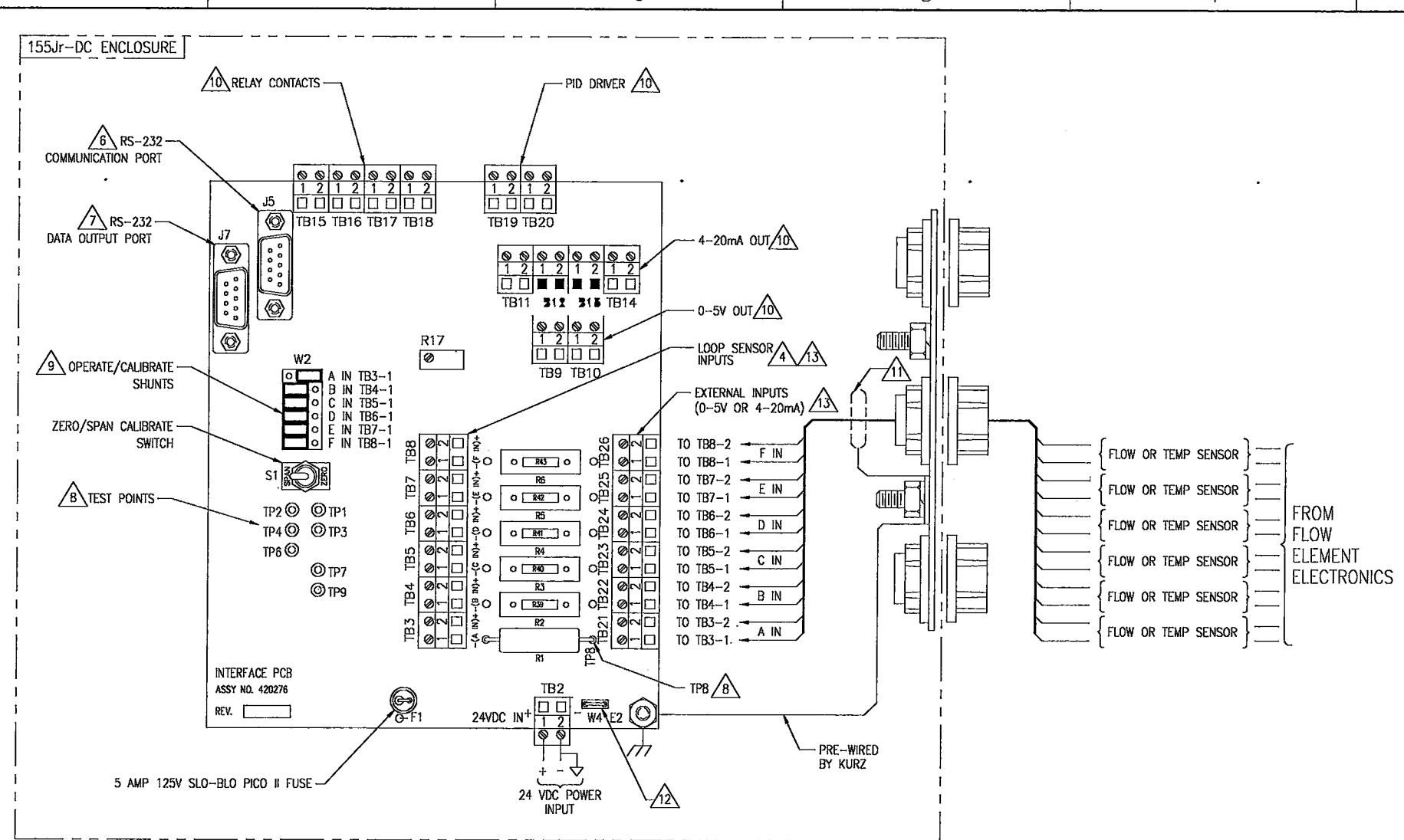
Rev. F

(SEE DWG 340155-29 IN MANUAL FOR MORE DETAIL)

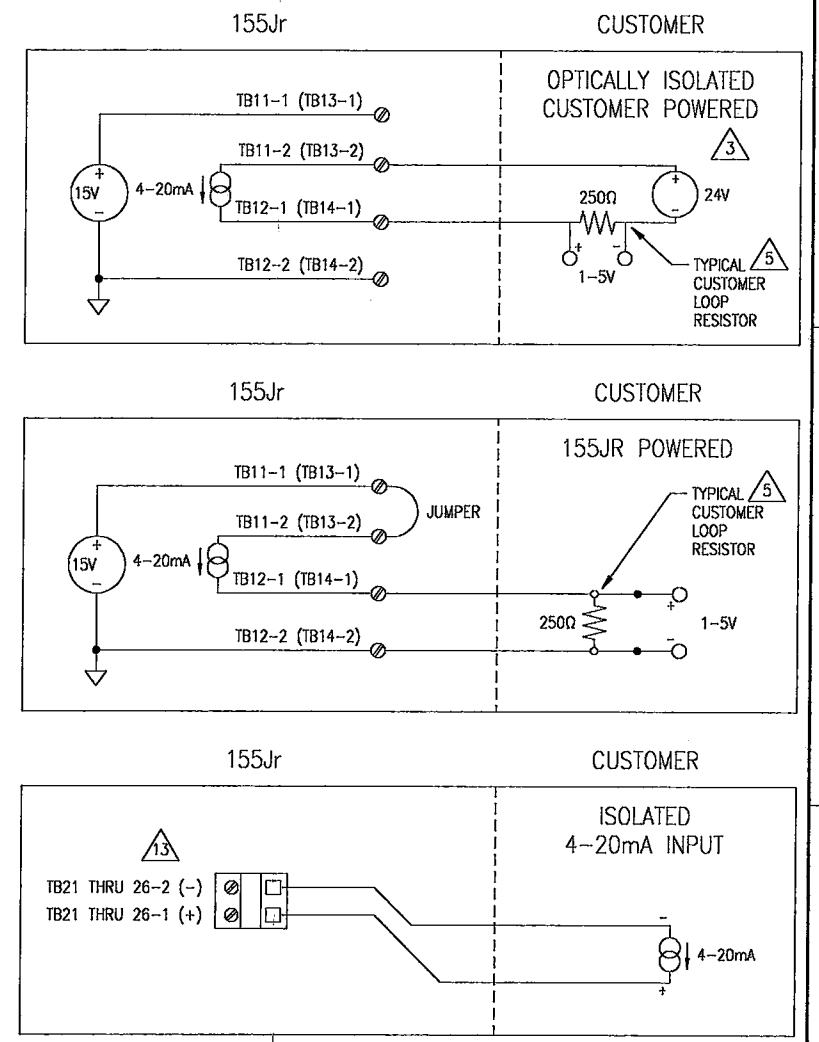
LABEL P/N 170134-2

REVISIONS					
REV.	DESCRIPTION	BY	CHKD	APRVD	DATE
A	INITIAL RELEASE	DFS	TW	BBB	05-22-1995
B	REVISED PER ECO # B47303	FGM	BBB	BBB	01-10-1996
C	REVISED PER ECO # B47301	ADK	BBB	BBB	08-12-1996
D	REVISED PER ECO # B47723	JLM	BBB	BBB	10-19-2000
E	REVISED PER ECO # B47814	JLM	BBB	BBB	06-14-2001

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SAMPLE DIAGRAMS, 4-20mA CONNECTIONS



- NOTES: UNLESS OTHERWISE SPECIFIED
- THIS WIRING DIAGRAM IS USED IN CONJUNCTION WITH PARENT NUMBERS 750101-DC, 750104-DC, 750105-DC, 750106-DC & 750107-DC.
 - REF. DESIGNATORS AND PIN NUMBERS ARE FOR REF. ONLY, AND MAY NOT APPEAR ON COMPONENTS
 - 15 TO 50 VDC.
 - FOR FLOW/TEMP. TRANSMITTER CONNECTION TO LOOP SENSOR INPUTS. CURRENT SENSE RESISTORS ARE REQUIRED FOR CHANNELS USED.
 - MAXIMUM LOOP SERIES RESISTOR VALUE=500 Ω.
 - RS-232 COMMUNICATIONS PORT:
- | J5 | PIN | CUSTOMER CONNECT |
|----|------|-------------------|
| | N/C | 1 9 PIN TO 9 PIN |
| | TXD1 | 2 CABLE, STRAIGHT |
| | RXD1 | 3 THROUGH |
| | DTR | 4 |
| | GND | 5 |
| | DSR | 6 |
| | RTS | 7 |
| | CTS | 8 |
| | N/C | 9 |

- RS-232 DATA OUTPUT PORT:
- | J7 | PIN | CUSTOMER CONNECT |
|----|------|-------------------|
| | N/C | 1 9 PIN TO 9 PIN |
| | TXD0 | 2 CABLE, STRAIGHT |
| | RXD0 | 3 THROUGH |
| | DTR | 4 |
| | GND | 5 |
| | DCD0 | 6 |
| | RTS0 | 7 |
| | CTS0 | 8 |
| | N/C | 9 |
- TEST POINTS:
- | TP | DESCRIPTION |
|-----|-------------------------|
| TP1 | +2.500 REF (ADJUST R17) |
| TP2 | +5V |
| TP3 | -9V |
| TP4 | +10V |
| TP5 | +12V |
| TP7 | +15V |
| TP8 | GND REF (LEAD ON R1) |
| TP9 | INPUT CAL. |

- OPTIONAL CONNECTIONS:
- | | |
|--------------|---------------------|
| TB9 - 1 (+) | 0-5V } ANALOG OUT 1 |
| TB9 - 2 GND | |
| TB10 - 1 (+) | 0-5V } ANALOG OUT 2 |
| TB10 - 2 GND | |
| TB11 - 1 | 4-20mA OUT 1 |
| TB11 - 2 | |
| TB12 - 1 | 4-20mA OUT 2 |
| TB12 - 2 | |
| TB13 - 1 | ALARM OUT 1 |
| TB13 - 2 | |
| TB14 - 1 | ALARM OUT 2 |
| TB14 - 2 | |
| TB15 - 1 | ALARM OUT 3 |
| TB15 - 2 | |
| TB16 - 1 | ALARM OUT 4 |
| TB16 - 2 | |
| TB17 - 1 | PID #1 |
| TB17 - 2 | |
| TB18 - 1 | PID #2 |
| TB18 - 2 | |
| TB19 - 1 (+) | 4-20mA OUT 1 |
| TB19 - 2 (-) | |
| TB20 - 1 (+) | 4-20mA OUT 2 |
| TB20 - 2 (-) | |

- INPUT CONNECTIONS:
- | | | |
|--------|---------|-------------------|
| TB3-1 | INPUT | INPUT CHANNEL (A) |
| TB21-1 | GND | |
| TB3-2 | +24 VDC | INPUT CHANNEL (B) |
| TB4-1 | INPUT | |
| TB22-1 | GND | INPUT CHANNEL (C) |
| TB4-2 | +24 VDC | |
| TB5-1 | INPUT | INPUT CHANNEL (D) |
| TB23-1 | GND | |
| TB5-2 | +24 VDC | INPUT CHANNEL (E) |
| TB6-1 | INPUT | |
| TB24-1 | GND | INPUT CHANNEL (F) |
| TB6-2 | +24 VDC | |
| TB7-1 | INPUT | |
| TB25-1 | GND | |
| TB7-2 | +24 VDC | |
| TB8-1 | INPUT | |
| TB26-1 | GND | |
| TB8-2 | +24 VDC | |
| TB26-2 | GND | |
| TB8-2 | +24 VDC | |

- CONNECT INPUT/OUTPUT SHIELDS TO GROUND BUS BAR.
- W4 JUMPER REQUIRED TO CONNECT DC GND TO EARTH GND (E2).

APPROVALS		KURZ INSTRUMENTS, INC.	
DRAWN BY D.F. SINGLETON	DATE 05-11-1995	WIRING DIAGRAM, HOOK-UP, 155 JR-DC	
CHECKED BY T. WILSON	DATE 05-22-1995		
APPROVED B. BUTON	DATE 05-22-1995		
DWG. SIZE B	DWG. NO. 340155-50	SCALE NONE PRINT 1:2	REV. E
		SHEET 1 OF 1	

OUTPUT CALIBRATION

Refer to Figure 3 for component location.

1. Enter the Program Mode.
2. Press **[P]** until you see the message "PRESS ENTER TO CALIBRATE" on the front panel LCD, then press **[E]**.
3. Press the up (YES) or down (NO) arrow until you see the message "PRESS ENTER FOR OUTPUT CAL" on the front panel LCD.
4. Press **[E]**, you should see the message "SET 'ZERO' VOLTS CH 1 = 0.000 VDC".
5. Connect DVM as indicated in Table 1 for 0-5 VDC or 4-20mA outputs.

LOOP POWER

OUTPUT	0-5 VDC	4-20mA SELF-POWERED	4-20 mA CUSTOMER POWERED
CHANNEL 1	TB9 1(+), 2(Gnd)	TB12 1(+), 2(-)	TB11 2(+), TB12 1(-)
CHANNEL 2	TB10 1(+), 2(Gnd)	TB14 1(+), 2(-)	TB13 2(+), TB14 1(-)

6. Press the up (YES) or down (NO) arrow until the DVM indication is 0.000 VDC (for 0-5 VDC output) or 4.000 mA (for 4-20 mA output).
7. Press **[E]**, you should see the message "SET 'SPAN' VOLTS CH 1 = 5.000 VDC".
8. Press the up (YES) or down (NO) arrow until the DVM indication is 5.000 VDC (for 0-5 VDC output) or 20.00 mA (for 4-20 mA output).
9. Press **[E]**. If your instrument is configured for another output channel the display will read "SET 'ZERO' VOLTS CH 2 = 0.000 VDC". If you wish to perform additional output calibration, repeat steps 4 through 8 for channel 2.

If there are no more output channels configured, you will see the message "PRESS ENTER FOR INPUT CALIBRATION".

10. To set up linearizer data at this time press **[C]** until you see the message "SET LINEARIZERS". Then proceed to the section of this document titled "SET LINEARIZERS".

To exit the Program Mode press **[C]** until you see the KURZ INSTRUMENTS logo.

SET LINEARIZERS

Note: Performance of this procedure requires a current copy of the Calibration Data and Certification Document for your instrument.

1. Enter the Program Mode.
2. Press **[P]** until you see the message "PRESS ENTER TO SET LINEARIZERS" on the front panel LCD, then press **[E]**.
3. Press **[E]** in response to the message "PRESS ENTER TO LINEARIZE CH A".
4. Press **[P]** to accept the current serial number if correct or, use the up (YES) or down (NO) arrow to scroll through the character set and press **[E]** for each desired character (letter, number, or symbol).
5. Press the up (YES) or down (NO) arrow until you see the desired engineering units as listed on the *Calibration Data and Certification Document* for channel A. Table 2 lists the available selections for instruments configured in English Units or in International Units.

English Units	International Units
SFPM	SMPS
SCFM	SCMM
DEGF	DEGC
SCFH	SCMH

6. Press **[E]** to enter the appropriate engineering units.
7. When the message "ENTER # OF CH A DATA POINTS..." appears, Press the up (YES) or down (NO) arrow until the correct number of points as listed on the *Calibration Data and Certification Document* is displayed.
8. Press **[E]** to enter the appropriate number of data points.
9. Using the number keys and decimal point as appropriate, enter the desired voltage for that data point and press **[E]**. You should see the message "NEW VALUE ACCEPTED", then the bottom line of the display prompts you to enter the flow value for that data point.
10. Using the number keys and decimal point as appropriate, enter the desired flow value for that data point and press **[E]**. You will then see a prompt to enter the voltage and flow information for the next data point. Continue to enter voltage and flow data for all of the data points listed on the *Calibration Data and Certification Document* for this channel.

11. Repeat these steps for each channel as required.

SET LINEARIZERS (VTM)

Velocity/Temperature Mapping (VTM) was developed by Kurz Instruments, Inc. to improve accuracy of its line of Thermal Mass Flow products in applications where large changes in velocity and temperature are encountered. VTM allows the customer to generate Data Sets at four different temperatures. Information from these Data Sets is used by ADAM® software to compensate for effects of temperature on flow calculations.

1. Enter the Program Mode.
2. Press **[P]** until you see the message "PRESS ENTER TO SET LINEARIZERS" on the front panel LCD, then press **[E]**.
3. Press **[E]** in response to the message "PRESS ENTER TO LINEARIZE CH A".
4. Press **[P]** to accept the current serial number if correct or, use the up (YES) or down (NO) arrow to scroll through the character set and press **[E]** for each desired character (letter, number, or symbol).
5. Press the up (YES) or down (NO) arrow until you see the desired engineering units as listed on the *Calibration Data and Certification Document* for channel A. The following options are available:
 - ☆ SFPM or SMPS
 - ☆ SCFM or SCMM
 - ☆ DEGF or DEGC
6. Press **[E]** to enter the appropriate engineering units.
7. Specify number of temperature Data Sets up to a maximum of four (TO, 1, 2, 3).
8. Press the up (YES) or down (NO) arrow until the desired temperature reference meter is indicated on the front panel display, then press **[E]**.
9. Using the numeric keys, specify the desired temperature in DEGF or DEGC for the TO linearization curve, then press **[E]**.
10. Specify the number of data points (up to 7) for channel A, then press **[E]**.
11. Specify the voltage for data point 1, then press **[E]**.
12. Specify the velocity for data point 1, then press **[E]**.
13. Continue to specify the calibration points in each data set for Channel A, then repeat these steps for each channel the system. You can have up to three (A-C) channels in the Model A and six (A-F) in the Model B.
14. When you have completed setting the linearizers press **[C]** as required to return to the Executive Mode.

Models 155C-1, 155E-1, 155E-RM

USER'S GUIDE ADDENDUM

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