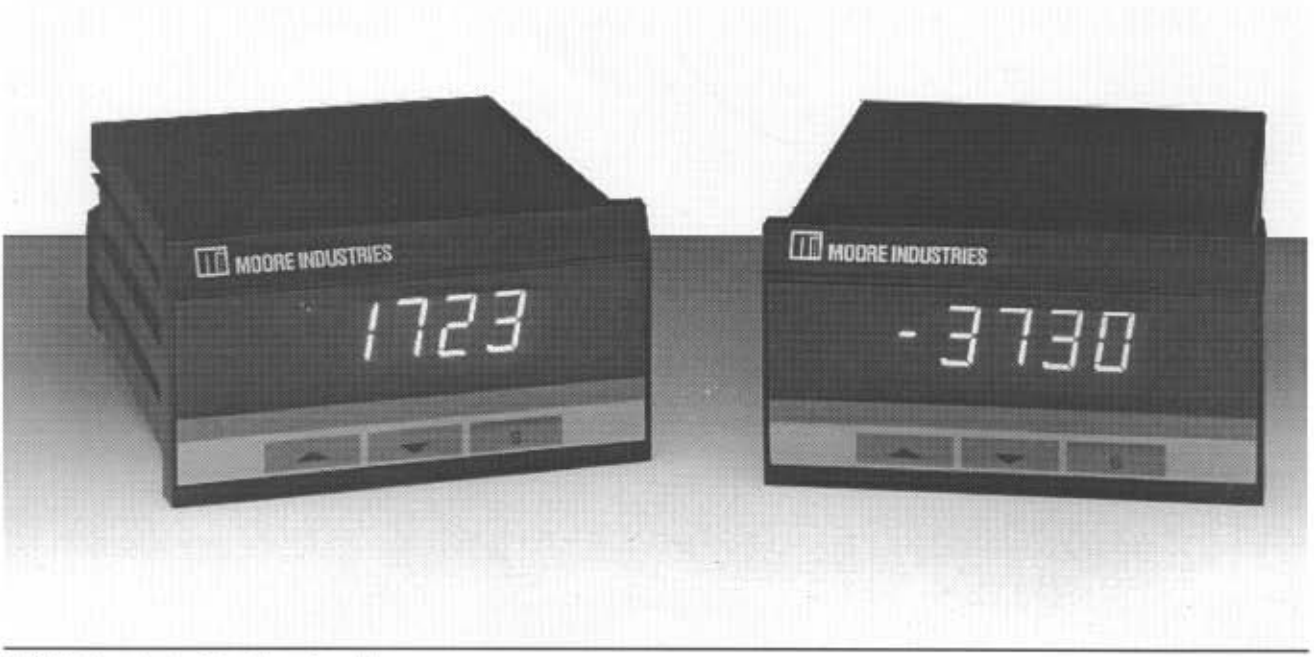
MOORE INDUSTRIES

USERS' MANUAL

ADD/DDD

AC/DC Programmable Digital Panel Meters

July 1993



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ADD/DDD

Description

This is the Users' Manual for the ADD and DDD, two units from Moore Industries' family of Programmable Digital Displays.

The ADD is factory-configured to accept either ac voltage or ac current inputs. It provides a digital display of actual input level, or can be scaled by the user in the field to display the input in engineering units.

The DDD is field-configurable to accept either dc voltage or dc current inputs and, like the ADD, to digitally display actual input or a scaled readout in user-set engineering units.

Both are panel-mount, digital meters in an impact-resistant, thermoplastic housing made to fit 1/8 DIN panel cutouts. Each comes standard with independent high and low alarm indicators, input overload warning, and a "Display Hold" feature that enables the user to manually "freeze" the display at a chosen readout.

Both types of meter are capable of accepting different types of input in several ranges. ADD's can be ordered with either of two voltage inputs, or current input. DDD's can be field-configured for one of two current, or three different voltage inputs.

Both types of meter are capable of displaying both actual and scaled input levels. The easy-to-use, 3-button keypad on the unit front-panel provides simple access to digital offset and scale programming. Users can install a push button or switch between two terminals on the connector and toggle between actual and scaled readouts.

All operating parameter information is stored in unit non-volatile memory—safe from power outage or surges, and protected from accidental changes by a security access code.

Transmitter Excitation is standard with the DDD; an added convenience in powering other devices on the loop. It provides an unregulated, 24Vdc (25mA) source.

Additional Options provide added output flexibility. Add an additional analog output (4-20mA or 0-10V), Binary Coded Decimal (BCD) output, or dual 5 amp relays for contact closure.

Specifications

Table 1, on the following page, summarizes the specifications for both the ADD and DDD.

Options

- ***AO Option – Analog Output*** provides an additional, fully adjustable, internal transmitter, factory-calibrated for 4-20mA or 0-10V output, proportional to the input. Unit disassembly not required for access to transmitter offset/scale adjustment.
- ***C Option – Contact Closure Output*** equips units with dual, Form C relays, rated 5A @ 125Vac maximum, 0.6A @ 11Vdc, 0.1A maximum @ 50Vdc inductive. Works with standard, front panel indication of alarms. Trip points tied to settings stored in unit memory.
- ***BCD Option – Binary Coded Decimal Output*** enables unit to be used with third-party software. Provides pseudo tri-state parallel output with 1500V peak isolation to the signal input.
- ***N4 Option – NEMA 4-Rated Front Panel*** affords splash protection in the form of a flexible, clear boot.
- ***RD Option – Red Display*** provides compatibility with existing meters and indicators. The standard display is green.

Data Tracking & Orders for Additional Panel Meters—Unit Model and Serial Numbers

Moore Industries uses a system of model and serial numbers to keep track of all manufacturing and testing data associated with each unit we sell or service.

If you ever need additional units, "construct" a model number from the bold-face selections in the Ordering Specifications section of Table 1. A model number example is provided at the table's end.

If service assistance is ever required for one of your units, make a note of the unit model number before contacting the factory. The model and serial number is printed on an adhesive tag affixed to the top panel of each unit.

ADD/DDD

Specifications

Display

ADD Range: 31/2 digits, –1999 to +1999 counts for 0-199.9Vac inputs; 4 digits, –9999 to +9999 counts for both 0-600Vac and 0-5.000A inputs; user-positioned decimal point
DDD Range: 4 digits, –9999 to +9999 counts for all inputs; user-positioned decimal point
Type: 7-segment, vacuum fluorescent readout; green (standard) or red; characters 13 mm (0.5 in) high
Indicators: "OFLO" when input is overrange; "HI" and "LO" messages when input trips alarm setting

Performance

ADD Accuracy (±1 count @ 45-1000Hz)**:** 0.1% of reading, ±0.05% of unit range for 0-199.9Vac inputs; 0.2% of reading, ±0.05% of unit range for 0-600.0Vac inputs; 0.2% of reading, 0.05% of unit range for 0-5.000A inputs

Performance (continued)

DDD Accuracy (±1 count @ 40-1000 Hz): 0.02% of input, ±0.01% of unit range
ADD Ambient Temperature Effect (@ –2 to 23°C)**:** ±80 ppm of reading per °C change for 0-199.9Vac inputs; ±75 ppm per °C change for 0-600.0Vac inputs; ±90 ppm per °C change for 0-0.500A inputs
DDD Ambient Temperature Effect (@ –2 to 23 °C)**:** ±90 ppm of reading per °C change for current inputs; ±75 ppm of reading per °C change for voltage inputs
Response Time: 500 msec for 25% step change
Display Update: Integrating differential A/D converter; ADD 2/sec, typical, 5/sec, maximum; DDD 3/sec, nominal

Performance (continued)

Overload Protection: 300V peak (750V peak for the 0-600.0VAC ADD, 7.5amps for the 0-5.000A ADD)
Normal Mode Rejection: 60dB @ 50/60 Hz, typical
Common Mode Rejection Ratio: 120dB @ 50/60 Hz, input-to-power line
Common Mode Voltage: ±2500V peak, input-to-line power

Transmitter Excitation

(DDD only) unregulated 24Vdc, 25mA (available in addition to analog output provided with -AO option)

Ratings

Ambient Temperature Operating Range: 0°C to 50°C (-32°F to 122°F)
Ambient Temperature Storage Range: -40°C to 85°C (-40°F to 185°F)
Ambient Relative Humidity Operating Range: 20 to 80%, non-condensing

Case

NEMA 12 splash-proof, high-impact plastic

Weight

553 g (1.22 lbs)

Ordering Specifications

Unit	Input	Display (Output)	Power	Options	Housing
ADD (AC Input)	**0-199.9VAC** (100kΩ impedance) **0-600.0VAC** (1MΩ impedance) **0-5.000A** (0.1Ω shunt, externally mounted)	**PRG** Field-programmable; Front panel keypad provides up to 3.2 times input span within the display range	**117AC** **230AC** ±10%, 10VA Internally fused; Internal jumpers (on DDD only) permit field reconfiguring	**-C** Dual, form C relays; 5A @ 125Vac maximum, 0.6A @ 110Vdc; 0.1A max @ 50Vdc inductive; 1500V peak isolation **-AO** Analog output, propor-tional to input display; –100 to 36% of span; field-selectable for 4-20mA or 0-10V; 10Vdc @ 17mA max, 20mA @ 17V compliance min; 0 to +35 °C operating range; adjustability via easy-access poten-tiometers; Stability 2% of span, max per °C change; Not available with -BCD option **-BCD** Binary Coded Decimal output. Used for interface with 3rd drivers; Output: logic low 0=0.45V max @ 1.6mA sink; logic high 1 = 2.4V min @ 50µA source; Not available with -AO option **-N4** Front panel fitted with flexible boot affords NEMA 4 protection **-RD** Display with red characters	**P** Panel mount, corrosion-resistant molded plastic, complete with mounting hardware
DDD (DC Input)	**4-20MA** (50Ω shunt) **0-20MA** (50Ω shunt) **1-5V** 1MΩ minimum impedance **0-5V** 1MΩ minimum impedance **0-10V** 1MΩ minimum impedance				

When ordering, specify: Unit / Input / Display / Power / Option(s) [Housing]
For example: DDD / 4-20MA / PRG / 117AC / -C -N4 [P]

For fastest assistance, also note the unit serial number, job number, and, if available, the purchase order number under which it was shipped. Providing this information to our team of highly skilled factory technicians and application specialists assists them in obtaining the answers you need as efficiently as possible.

Calibration

Prior to shipment, every ADD and DDD is fully tested by our trained factory technicians. Every product Moore Industries manufactures, sells, and services is guaranteed to meet our strict quality control standards.

Before placing your meter(s) into service, however, a quick bench-check of basic operation is recommended to ensure that the unit hasn't sustained any damage during transit.

Use this section to:

- Choose/verify the correct power input for the application in which the meter(s) is(are) going to be used.
- Connect the meter(s) to an appropriate source of power and program any offset or scaling (engineering units).
- With the meter(s) still connected to appropriate power, program desired alarm setpoints (4 of them), and deadband (hysterisis).
- Incorporate the unit(s) into a calibration setup, verify the correct calibration of the true input readout, perform a bench-check of unit basic function (alarm trip points and relay outputs, if appropriate), and calibrate the analog output of AO-equipped units.

Selecting Input Power —ADD

The ADD must be ordered from the factory with either 117 or 230 Vac powering. Check the unit model number tag for the power rating of the unit being calibrated. If its powering spec does not meet your requirements, make a note of the serial number, and if possible, the purchase order number under which the unit was shipped, and contact the factory.

NOTE:

ADD's can be field-configured to accommodate either (but not both) 117 or 230 Vac. The factory can supply you with the information you need to remove/install the soldered jumpers inside the unit to effect the change.

Selecting Input Power — DDD

Although the DDD is ordered with either 117 or 230 Vac powering (as with the ADD), re-configuring in the field is a relatively simple matter of re-positioning a set of removable jumpers inside the unit, and substituting one fuse for another.

Figure 1 shows how to disassemble the DDD. Refer to the figure and the following procedure to perform the disassembly, to position the jumpers as required, and to install the correct fuse.

1. **Use a Phillips-head screwdriver to remove the screws that secure the terminal block(s) to the unit, then remove the block(s) to expose the terminal strip tab(s) of the PC board(s).**
2. **Locate the PC board Phillips-head retaining screw(s), one for each board (terminal block). They are on the top and bottom panels of the housing, near the terminal strip tab(s) at the back of the unit. Remove each of these screws.**
3. **There are small, rectangular openings in either side of the housing, under the flared ends of the mounting bracket, toward the unit front panel. Plastic tabs in these holes secure the front panel to the housing. Use your finger tips or a standard-head screwdriver to push these tabs inward.**

CAUTION:

Do not break the plastic tabs. Push them in just enough to disengage the front panel.

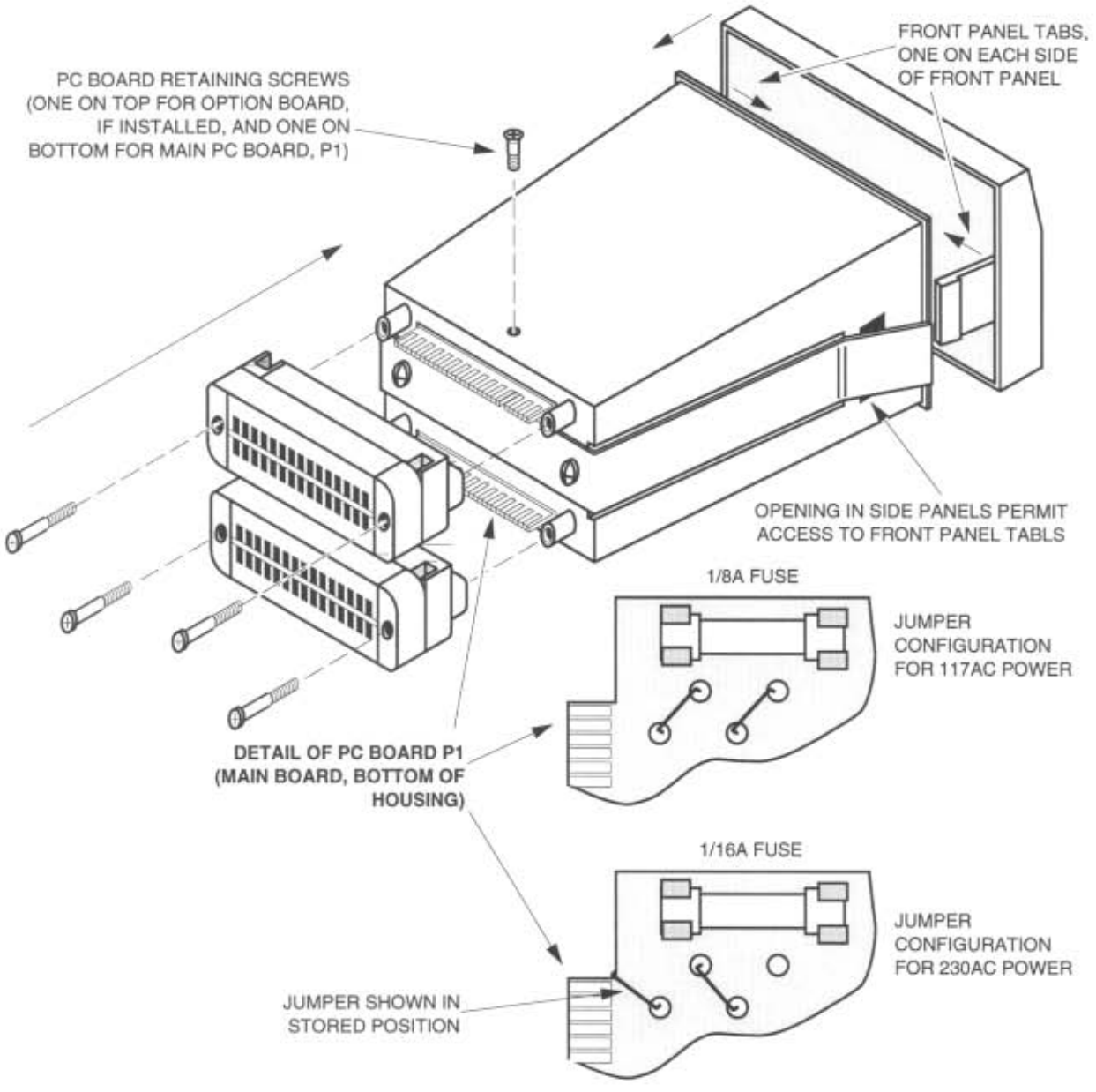
4. **Press gently on the rear terminal strip tabs with your fingers to slide the PC board(s)/front panel sub-assembly out of the housing.**

CAUTION:

The front panel is attached to the PC boards by a ribbon cable. The option PC board, when present is also attached by ribbon cable to PC board P1. Although it is not necessary to detach the panel or the board(s) to position the jumpers, the ribbon cables should be handled with care so as not to damage them or their board-mounted connectors.

(procedure continues)

Figure 1. *Disassembling the Panel Meters*



5. **Locate the jumpers on PC board P1. Refer to figure 1 for the correct positioning of the powering jumpers.**
6. **Make sure the correct fuse is installed on the board. For 117Vac, a 1/8Amp fuse, Moore Industries P/N 800-825-08, must be installed. For 230Vac operation, install a 1/16Amp fuse, P/N 800-825-16.**
7. **With the correct fuse installed and the jumper(s) positioned for the correct power, slide the PC board(s) back inside the housing in the grooves along the housing sides.**
8. **Re-install the PC board retaining screw(s) at the back of the housing.**

9. **Seat the front panel over the display, and** *GENTLY* **press it back into place. Squeeze the retaining tabs inward to fit them inside the housing, and lock them into the rectangular holes on either side .**

10. **Re-attach the terminal block(s).**

Programming Display Offset and Scale

This section describes how to program offset and scaling for both the ADD and the DDD. The process is a relatively simple matter of connecting an appropriate source of ac power to the unit and running through a setup program. No additional calibration equipment is needed. If you wish to test/verify the settings, turn to the bench-check procedure described later in this manual.

Before beginning to program your units, find out the following for the intended application:

- **Input Zero -** 0% input from your application
- **Input Full Scale** - 100% input from your application
- **Display Zero** - What you want the meter to read out when Input Zero is coming in
- **Display Full Scale** - What you want the meter to read out when Input Full Scale is coming in
- **Sensitivity** - Value from column 3 of Table 2, which is the number of display counts per Volt, Amp, or mA for the meter(s) you are calibrating.

Table 2. *Sensitivity Ratings for the ADD and DDD*

Meter	Input	Sensitivity
ADD	0-199.9Vac	10 counts/V
	0-600.0Vac	17 counts/V
	0-5.000A	2000 counts/A
DDD	4-20mA	500 counts/mA
	0-20mA	500 counts/mA
	1-5V	2000 counts/V
	0-5V	2000 counts/V
	0-10V	1000 counts/V

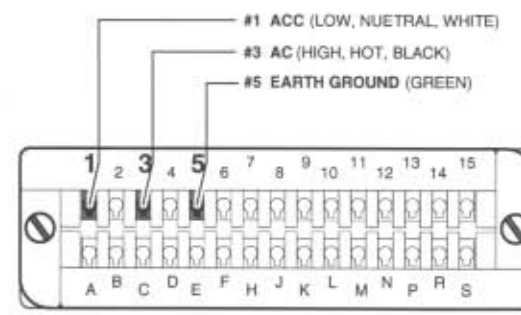
CAUTION:

Make sure that the unit being checked is rated for the power being used. Never supply 230Vac to a unit rated for 117Vac. Operating these panel meters with the wrong fuse for the power rating may cause internal damage.

Refer to the Power Selection sections, earlier in this manual, for instructions on selecting the proper ac voltage configuration for the unit being programmed.

Connect the power leads to the connector, then plug the meter in to an appropriate source of ac. Figure 2 shows the pin-outs.

Figure 2. *Power Connections*



CAUTION:

Exercise care in handling the unit being tested when connected to power.
Always disconnect ac power before changing any connections of equipment in the calibration setup.

Apply power in this order ***ONLY:***

1. **Connect the non-power end of the power wiring to the terminal block**
2. **Plug the terminal block in to the unit**
3. **Connect line power**

ADD/DDD

To connect a lead to a terminal on the connector block, use a standard-head screwdriver to loosen the screw corresponding to the terminal to which you need to connect a lead. Slide the stripped end of the lead wire into the terminal hole on the block face. While holding the wire in place, tighten the screw until the wire is held snugly.

After connecting the unit to power, allow 10-20 minutes for unit warm-up/stabilization. The display will show some superfluous value (unless input is actually connected) representing the current level of input.

To access the offset and scaling parameters in unit memory, you must enter an access code, and step through parameters for setting alarm trip points and hysterisis. The following procedure starts with the instructions for skipping over these functions, since they will be covered in a later section.

NOTE:

During the setup procedure, there is a two-minute limit between keypad entries. If no key is pressed for two minutes, the unit will flash the message rUn *and erase any changes made to that point.*

1. **Press the** S **key once. The display will flash** SETUP, **then** 0.
2. **Press the ▲ or ▼ keys until the display reads** 26, **which is the security code for accessing the setup programming.**
3. **Press the** S **key to enter the code.**

   The display will flash the message SP1H, **followed by the setting for High Alarm Setpoint #1.**
4. **Press the** S **key to temporarily accept the setting.**

   The display will then flash the next parameter to be programmed, followed by the setting stored in unit memory for that parameter.
5. **Repeat procedure described in steps 3 and 4 to access, and temporarily accept the settings for:**

   - SPL1 **(Low Alarm Setpoint #1),**
   - SPH2 **(High Alarm Setpoint #2),**
   - SPL2 **(Low Alarm Setpoint #2),**
   - **and** HYS **(Hysterisis).**

   The first display parameter related to the offset and scaling of the unit is the position of the decimal point in the display, dP. **When the** dP **message flashes, the next display will look something like:** 0.000.

   NOTE:

   By pressing and holding the S *key you can step through all of the parameters of the setup routine without having to view the settings. Make sure to release the* S *key when the* dP *message flashes, or you'll miss the offset/scaling portion of the setup routine and have to return to step 1.*
6. **Press the ▲ or ▼ to set the decimal point in the position you need for the engineering units in your application. Remember, this parameter does not effect the accuracy of the meter. Refer to the specifications table, earlier in this manual, for accuracy information.**
7. **When the decimal point is positioned as desired, press the** S **key to enter this setting into memory.**

   InLo **is the next parameter to flash. After the parameter, the next value shown is the setting (in counts) for Zero Input from your application.**
8. **Refer to table 3 to confirm the correct display for Zero Input (InLo) for your unit.**

   You can calculate your own InLo **setting, if it differs from any value listed in the table, by multiplying the Zero Input from your application by the rated Sensitivity for the unit, listed in Table 2, earlier in this manual.**

   Refer to the example at the end of this procedure for help in setting unit scaling and offset for those ranges not shown in Table 3.

Table 3. Count Equivalents for 0 and 100 % Input

	Zero Input	InLo	Full Scale Input	InHI
ADD				
0-199.9Vac	0V	000	200V	1999
0-600.0Vac	0V	0000	600V	6000
0-5.000A	0A	0000	5A	5000
DDD				
0-20mA	0mA	0000	20mA	9999
4-20mA	4mA	2000	20mA	9999
0-5V	0V	0000	5V	5000
1-5V	1V	1000	5V	5000
0-10V	0V	0000	10V	9999

9. **Press ▲ or ▼ to program the appropriate Zero Input value from the intended application.**

10. **Press the S key to enter the appropriate value into unit memory.**

    Next up is InHI, the Full Scale Input from your application.

11. **Enter the Full Scale Input setting, again referring to Table 3, or using the formula described in step 8 (see example following this procedure). Press ▲ or ▼ until the display shows the appropriate value for the Full Scale Input from your application.**

12. **Press the S key to enter the setting into memory.**

    The next parameter to set is dSPLo. The value that flashes after the dSPLo is the setting for the readout when the input to the unit is at the InLo level, described in steps 7 and 8.

13. **Press ▲ or ▼ to program the desired Displayed Zero into the unit.**

14. **Press the S key to enter the setting into memory.**

15. **Repeat the procedure described in steps 13 and 14 for the dSPHI parameter.**

16. **When the setting for dSPHI has been properly entered into unit memory (by pressing the S key), the procedure is complete, and the settings are all stored in the meter's non-volatile memory.**

    The display goes blank momentarily, flashes a rUn message, then begins to operate, complete with the programmed-in offset and scaling.

NOTE:

Unless the value for dSPHI is entered into memory (i.e., S is pressed when the value for dSPHI is being shown on the display), all of the programming for the unit will be aborted. None of the settings will be entered into memory.

***EXAMPLE* – Programming the Offset and Scaling for a DDD**

The display of a 4-20mA DDD (model number DDD/PRG/PRG/117AC/-C [P]) is to be programmed to display 000.0 when 5mA is input, and 100.0 when 15mA is input.

Steps 1 through 7 of the procedure are followed without incident. The decimal position chosen is XXX.X (step 7), the S key is pressed to program in the selection, and the message InLo flashes, followed by 000.0.

Referring to Table 3 (step 8), we quickly realize that our InLo is not listed. Looking back to Table 2, however, we discover that the rated sensitivity for our unit is 500 counts per mA. Using the formula from paragraph 2 of step 8, we multiply Zero Input by Sensitivity:

$5.0 \times 500 = 2500$

▲ (or ▼) is then held until the display reads 2500 (step 9). Then the S key is pressed (step 10) to enter this value into unit memory.

Next, the value for InHI is up. A re-check of Table 3 tells us that we have to calculate our own InHI (step 11):

$15.0 \times 500 = 7500$

(Example continues next page)

ADD/DDD

▲ (or ▼) is held until 7500 is displayed, then S is pressed (step 11-12).

In this example, the desired dSPLo is .0 (or 000.0), and the desired dSPHI is 100.0 (or 0100.0). Steps 13 through 16 are carried out according to the procedure. When the value for dSPHI is accepted by pressing S, the offset and scaling programming for this meter is complete.

Special Scaling Considerations and Restrictions

- **The minimum and maximum scaled/offset settings cannot exceed the capability of the display itself.** That is, you will not be able to scale 20mA to read out 999.99 on the DDD, because that meter is limited to a 4-digit display between -9999 and +9999.

  Further, you cannot use the same meter to scale 4mA to read out 00.00 and 20mA to read out 100.0 (decimal point in different positions).
- **No inverse scaling** is possible with the ADD or DDD. Input Zero must always be lower than Input Full Scale. Display Low must always be equal to, or lower than Display High.
- **The ADD and DDD cannot be scaled to more than 3.2 times the actual input span (in counts).** This limit is called the maximum Scaling Factor. To calculate Scaling Factor from your application:

1. **Subtract** InLo **from** InHI. **This is Input Span (in counts).**
2. **Subtract** DSPLo **from** DSPHI. **This is Display Span (in counts).**
3. **Divide Display Span by Input Span:**

$$\frac{DisplaySpan}{InputSpan} = ScalingFactor$$

The resulting Scaling Factor must be less than 3.2 for any application.

Calibrating Alarm Setpoints and Hysterisis

The next set of parameters to program into the meter(s) is the alarm setpoints and hysterisis. As in the case of offset and scaling, it is not necessary to hook up the meter to any calibration equipment when programming these functions. If you wish to test the settings, refer to the bench-check procedure, later in this manual.

NOTE:

*The values stored in unit memory for alarm trip display and hysterisis are based on the **scaled and offset display**, not the actual input. Therefore, it is a good idea to program offset and scaling (described in the preceding section) before entering alarm and hysterisis parameters.*

The ADD and DDD each have 4 alarm setpoints and a hysterisis value. There are two, separate high alarms (alarm trips when input exceeds setpoint) and two, separate low alarms (alarm trips when input drops below setpoint). In alarm, the unit display alternately flashes the alarm indication and the display value.

To program setpoints and hysterisis, make sure the unit is properly connected to an appropriate source of ac power (figure 2), and that sufficient time has been allotted for unit warm-up/stabilization (10-20 minutes).

1. **Press the** S **key once. The display will flash** SETUP, **then** 0.
2. **Press the ▲ or ▼ keys until the display reads** 26, **the security code for accessing the setup programming.**
3. **Press the** S **key to enter the code.**

   The display will flash SP1H, **followed by the setting for High Alarm Setpoint #1.**
4. **Press ▲ or ▼ until the display shows the desired setpoint for the #1 High Alarm (relative to the display, not the input).**
5. **Press** S **to enter setpoint #1 for the high alarm into memory.**

6. **Repeat the procedure described in steps 4 and 5 for:**

   - SPL1 - **the setpoint for Low Alarm #1,**
   - SPH2 - **the setpoint for High Alarm #2,**
   - SPL2 - **the setpoint for Low Alarm #2.**

   When the setting for SPL2 **has been programmed in (by pressing the** S **key), the message** HYS **will flash, followed by the setting for the alarm hysterisis.**

7. **Press ▲ or ▼ until the display shows the desired number of counts of hysterisis around the setpoints you programmed in steps 4 through 6.**

***EXAMPLE*–Setting Alarm Trip Points and Hysterisis**

A 4-20mA DDD is scaled for 0 to 1000 display; 4mA input equal to 0 display, and 20mA equal to 1000 display.

The application calls for low alarms at 25 and 50% of span, high alarms at 75 and 100% of span. That means the unit will alarm at 8, 12, 16, and 20 mA (25, 50, 75, and 100% of a 16mA span); 0250 and 0500 low alarms, 0750 and 1000 high alarms on the display (25, 50, 75 and 100% of a 1000-count display span).

The user also needs a deadband of 5% of span around each alarm setpoint. That's 0.8mA or 0050 counts on the display.

Once programmed with these values, the meter will show a low alarm at 0250 counts, and will reset at 0300 counts (8mA trip and 8.8mA reset).

It will show another low alarm at a displayed value of 0500 (12mA), and will reset at 0550 (12.8mA). High alarms will trip at 0750 and 1000, with reset points at 0700 and 0950, respectively.

8. **Press the** S **key to enter the hysterisis value into unit memory.**

9. **Press and hold** S **to scroll through the parameters for** dP, InLo, InHI, **and** dSPLo, **or return to, and complete the procedure for programming unit offset and scale, earlier in this manual.**

10. **Release the** S **button at the** dSPHI **readout, so that the setting for the Display Full Scale setting is shown on the display.**

11. **When the setting for** dSPHI **is on the display, press the** S **to enter the programming for the alarm setpoints and hysterisis into unit memory.**

NOTE:

You ***MUST VIEW AND ACCEPT*** *(press* S*) the value for* dSPHI *in order for the programming for all of the alarm setpoints, hysterisis, offset, and scaling to be entered into unit memory.*

When the setting for dSPHI **has been accepted, the unit display will go blank temporarily, then flash a the message** rUn. **When it begins to display numeric values again, it will be ready to be installed, complete with the programmed values saved in non-volatile memory.**

Refer to the operation section of this manual for information on how the unit display functions in alarm.

Bench-Checking the ADD and DDD

The analog-to-digital (A/D) converter used in both the ADD and DDD is fully tuned at the factory. Every unit shipped meets the accuracy specifications listed in Table 1 of this manual.

If desired, however, the A/D function of the meter can be verified or adjusted as part of a bench-check of basic unit functioning.

NOTE:

These procedures should be carried out in an environment considered appropriate for general testing of electronic equipment, rather than in the field. Use a technician's bench or a similar, lab-type area.

You will need the equipment listed in Table 4 to perform the ADD/DDD bench-check. This equipment is not included with the unit(s), but is usually available in areas suitable for testing this type of equipment.

ADD/DDD

Table 4. ADD/DDD Calibration Equipment

Current or Voltage Source (see note)	**For ADD:** Rotek model 811A or equivalent, adjustable, calibrated (±0.001% of span, 70Hz ±5Hz) power/energy source capable of stable, ac output in one of the following ranges, as appropriate for the unit being calibrated: **0 to 200Vac, 0 to 600Vac, or 0 to 10 Amps** **For DDD Measuring Current Inputs:** EDC model CR-103 or equivalent, calibrated (±0.005% of span) current generator capable of stable output from **0 to 20mA** **For DDD Measuring Voltage Inputs:** EDC model MV 105 or equivalent, calibrated (±0.005% of span) voltage source capable of stable output in one of the following ranges, as appropriate for the unit being calibrated: **0 to 5V or 0 to 10V**
Meter	Keithly model 197 or equivalent, calibrated current, voltage, or multimeter capable of verifying current or voltage input to the ADD or DDD being calibrated
Note:	Required for bench-checking actual input readings only. Not required for setting unit offset (zero) and scale.

Figure 3 shows the pin-outs to be used in setting up the calibration hookup.

NOTE:

The external, shunt resistor supplied with the 0-5A ADD is calibrated with the unit at the factory prior to shipment. Do not substitute another resistor.

With the unit connected as shown in figure 3:

1. **Connect the calibrated input source to the correct terminals of the unit connection block. Refer to Figure 3.**
2. **Press the S key. The display flashes SETUP, followed by 0.**
3. **Press ▲ or ▼ until the display reads 40, which is the access code for processor calibration.**

   CAUTION:

   Calibrating the actual input reading (from the next step onward) clears the display scaling and offset. Refer to the note at the end of this procedure for a tip on how to quickly restore the readout scaling.

(procedure continues)

4. **Press S to enter the code. The display will flash a HICAL message.**
5. **Set the input source to +full scale. Refer to the specifications table for the appropriate value for the unit being calibrated.**

   NOTE:

   The 0-5.000A ADD uses 6 amps as its full scale value.

6. **If calibrating the ADD skip to step 8. If calibrating the DDD, press the S key to enter the calibration.**

   The display will pause, then read LoCAL.

7. **Set the input source to negative full scale (application zero). Refer to the specifications table for the appropriate value for the unit being calibrated.**

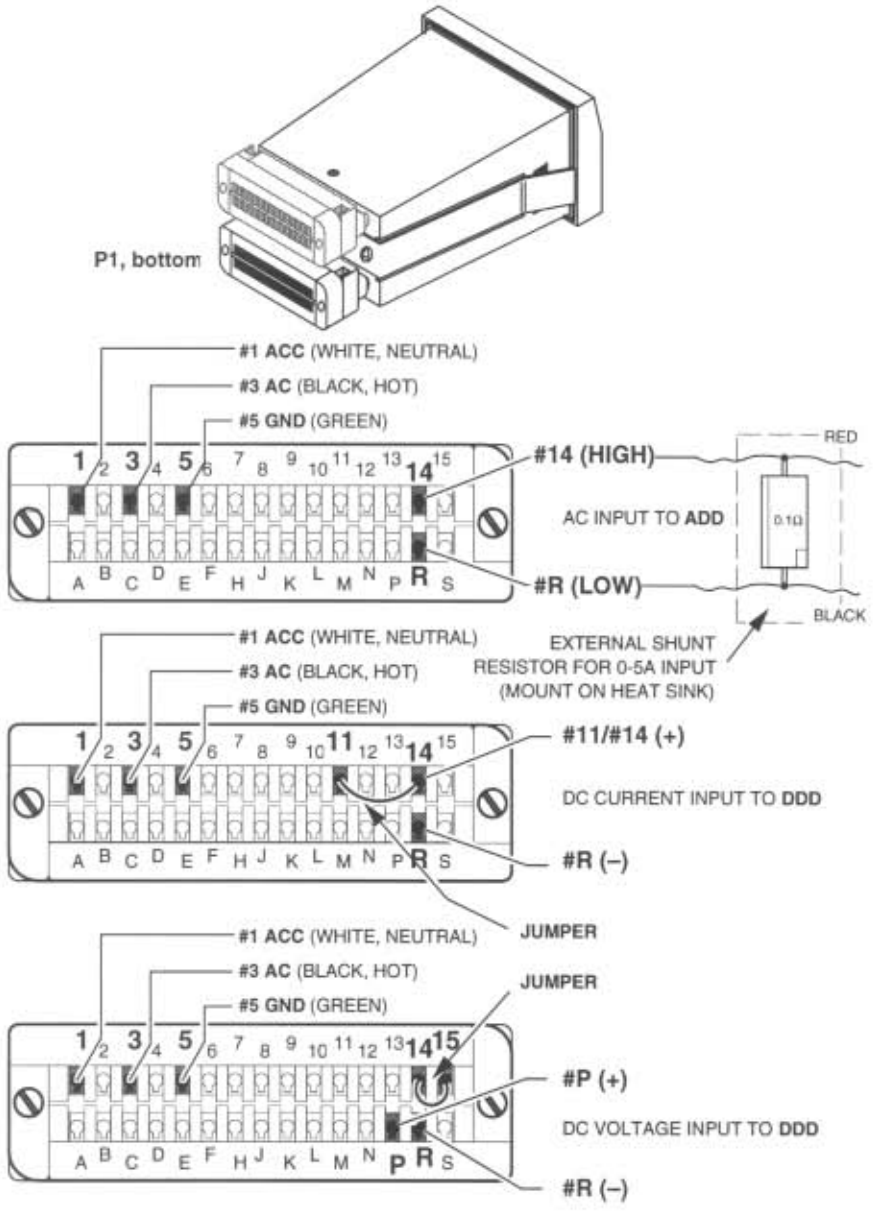
   NOTE:

   Calibration can be canceled by removing power at this point.

8. **Press the S to enter the calibration.**

   The unit display will go blank temporarily, then flash a rUn message. When it begins to display numeric values again, it will be ready to be installed, complete with the programmed values saved in non-volatile memory.

Figure 3. *Input Connections*



Restoring Readout Scaling:

Although the display offset and scaling (effected in the earlier procedure) is canceled by the calibration of the actual input conversion, the last values entered for display high and display low are maintained in unit nonvolatile memory.

To restore scaling, simply access the setup program and scroll through all of the parameters (26, then press and hold S) until dSPHI is shown. Accept the value for display high (refer to Offset and Scale Programming, earlier in this manual), and the meter's processor automatically re-enters the old settings.

ADD/DDD

Verifying Alarm Trip Point/Relay Output (-C option-equipped units only)

Figures 4 and 5 show the pin-outs for units equipped with the available output options. Check your unit model number for the options installed on your unit.

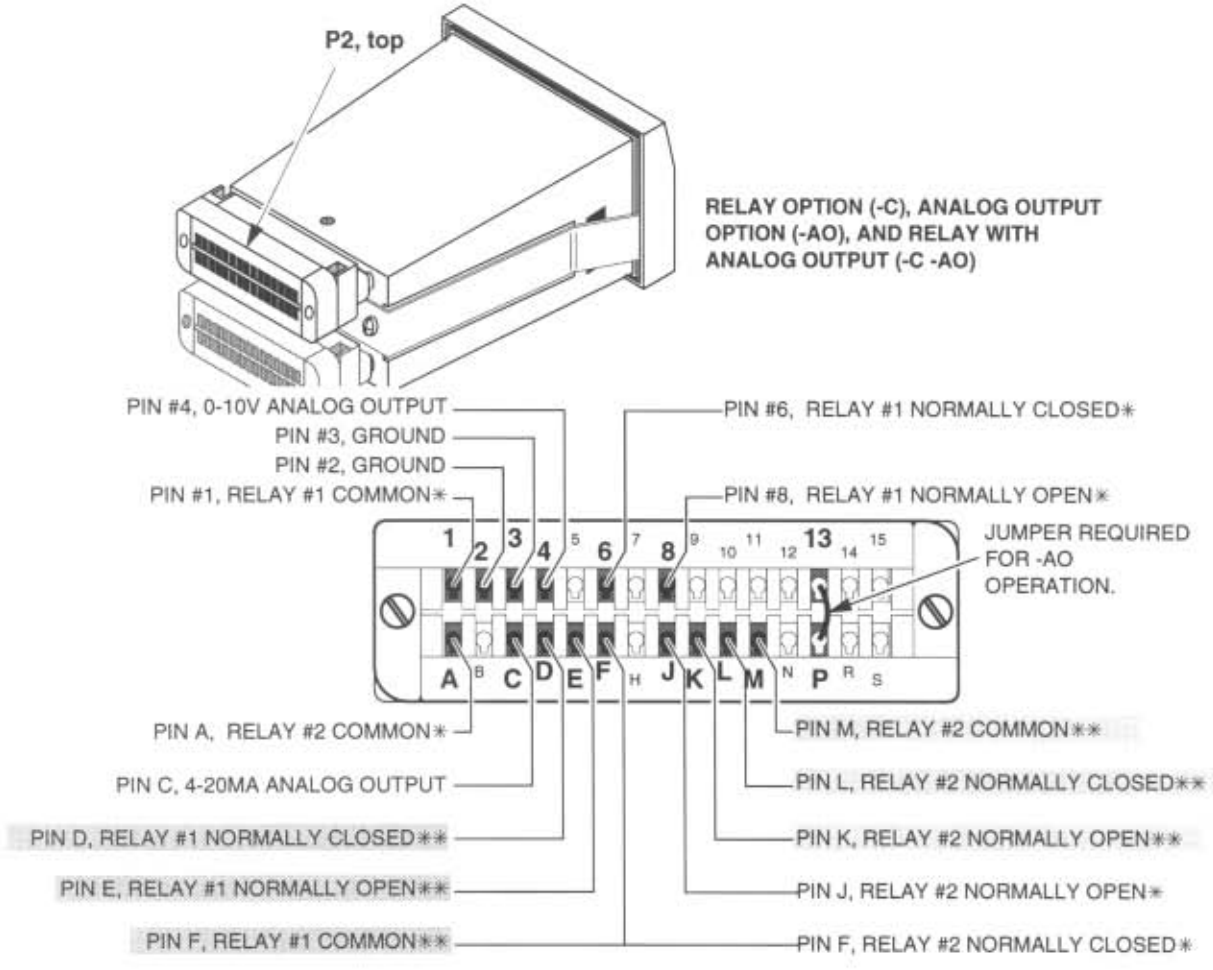
NOTE:

The relays used in the ADD and DDD are energized in an alarm condition (non-failsafe). "Normally Open" relay contacts are open in non-alarm (including power off). "Normally Closed" relay contacts are closed in non-alarm (including power off).

With the appropriate power and input connections completed as shown in figures 3 and 4 or 5:

1. **Raise the calibration input source to a level above one of the high alarm trip points set in the alarm setpoints calibration procedure, earlier in this manual.**

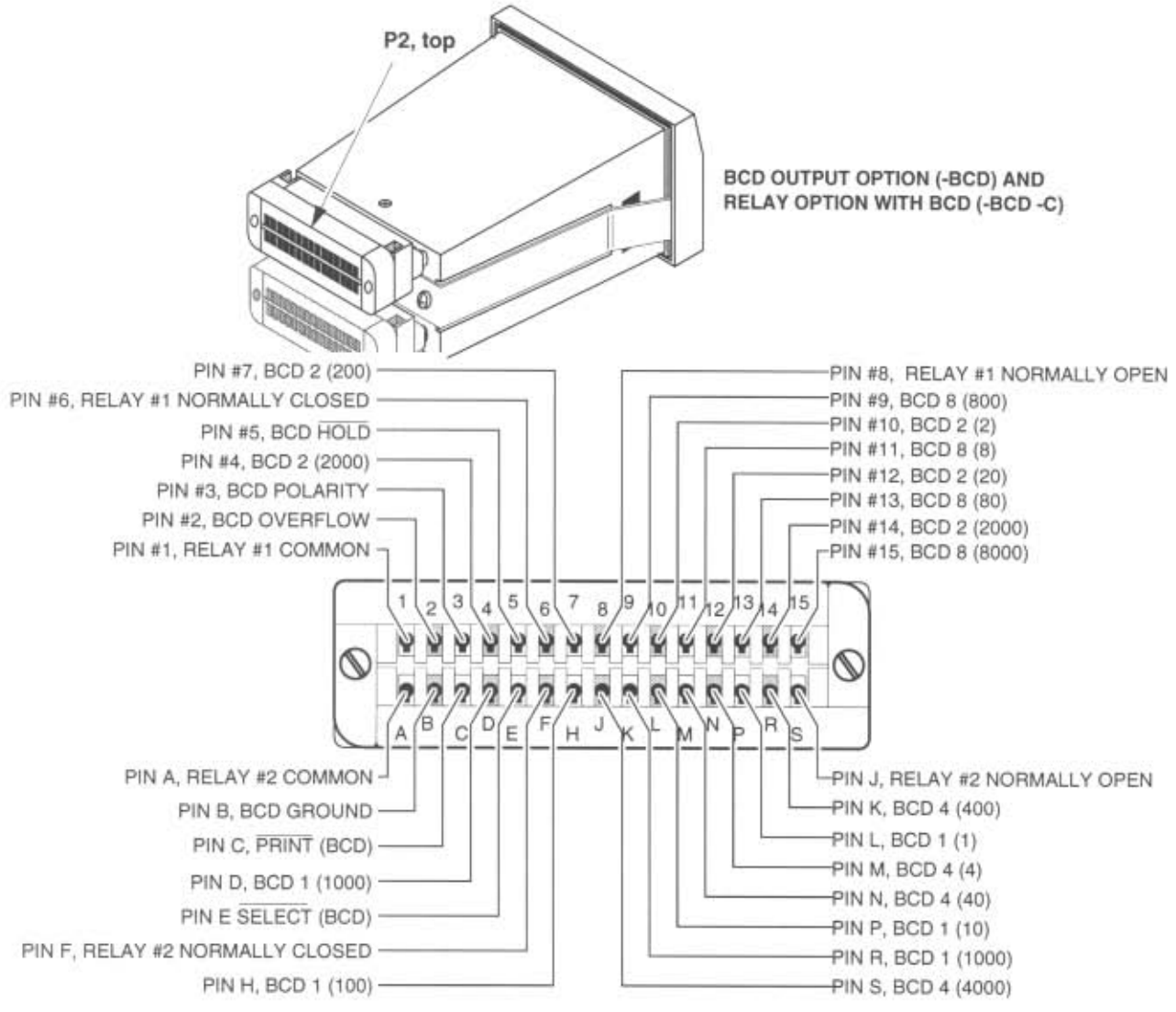
Figure 4. *Connector Pin-Outs for the -C, -AO, and -C with -AO Options*



* THESE PIN-OUTS APPLY WHEN THE -C OPTION IS PRESENT BY ITSELF.

** THESE PIN-OUTS APPLY WHEN THE -C OPTION IS PRESENT TOGETHER WITH THE -AO OPTION.

Figure 5. *Connector Pin-Outs for the -BCD and -BCD with -C Options*



The display will flash either HI **or** HI HI **(depending upon the input value you choose; refer to the operation section of this manual for an explanation of alarm displays), and the input level with any scaling.**

2. **Connect the multimeter, set to measure continuity, between the desired normally open or normally closed terminals and the appropriate alarm common terminal of the unit being checked. Refer to figures 4 or 5 for the appropriate pin-outs.**

NOTE:
Use the pin-outs in figure 4 for units equipped with only the -C option.

Remember that for relay output, units must be equipped with the -C option. Unless equipped with the -C option, the meters only indicate alarms with a visual readout.

(procedure continues)

If connected between normally open and common, the multimeter will indicate continuity (closed contacts, negligible resistance) as long as the input is maintained at an alarm level. If between a normally closed and common, the multimeter will indicate non-continuity (open contacts, infinite resistance).

3. **Lower input to a non-alarm level, and note that the display returns to normal readouts (no reset is necessary), and that the multimeter indicates a change of state at the connector block terminals.**

4. **Continue to lower the input to a point below the low alarm trip point setting, and repeat the procedure described in step 2.**

   If connected between normally open and common, the multimeter will indicate continuity (closed contacts, negligible resistance) as long as the input is maintained at an alarm level. If between a normally closed and common, the multimeter will indicate non-continuity (open contacts, infinite resistance).

5. **Raise input to a non-alarm level, and note that the display returns to normal readouts (no reset is necessary), and that the multimeter indicates a change of state at the connector block terminals.**

Calibrating Analog Output (-AO option-equipped units only)

4-20mA:

Refer to Figure 4 for the pin-outs used with this option. When all applicable connections have been made as illustrated in appropriate Figures 2 through 4, calibrate the Analog Output for current using this procedure:

1. **Connect a jumper between pins 13 and P on the P2 (top) pc board connector.**

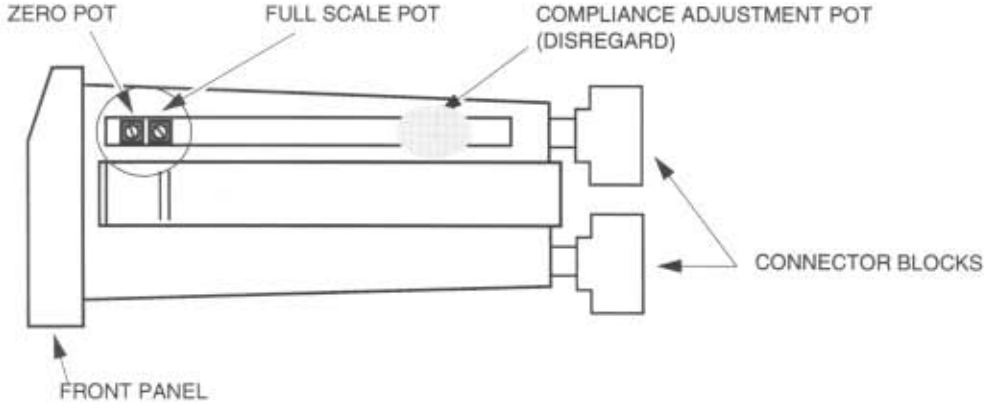
2. **Adjust the input to the ADD/DDD to the intended zero level (minimum, negative full scale) from the application.**

   For example, if the unit being tested is configured to provide current output proportional to 1-5V in, the input source would be set to 1V in this step.

3. **Connect the multimeter, configured to measure voltage (millivolts), to pins 1 (+) and 2 (–) on the option board, P2 (top terminal block).**

4. **Adjust the Zero Potentiometer (pot), shown in Figure 6 until the multimeter indicates that the voltage at pin 2 is approximately –100mV.**

Figure 6. *Locations of the -AO Option Adjustment Pots*



5. Move the multimeter to pins C (+) and 3 (–), and configure it for monitoring current.
6. Fine-tune the Zero pot until the multimeter indicates a current flow between 0 and +100µA (roughly zero).
7. Adjust the input to the ADD/DDD to the intended full scale level (maximum, 100%) from the application.

   For example, if the unit being tested is configured to provide current output proportional to 4-20mA in, the input source would be set to 20mA in this step.
8. Adjust the Full Scale pot, shown in figure 6, until the multimeter indicates 16mA of current. Turning the pot clockwise decreases current.
9. Adjust the Zero pot until the multimeter indicates 20mA. Turning clockwise will increase current.
10. Set input to the intended zero and verify that current, as indicated by the multimeter, is 4mA. Some slight adjustment of the zero pot may be necessary.
11. Repeat steps 7 through 10 until the multimeter indicates 4mA at zero input, 20mA at full scale.

0-10V:

Refer to Figure 4 for pin-outs used with this option. When all applicable connections have been made as illustrated in appropriate Figures 2 through 4, calibrate the Analog Output for voltage using this procedure:

1. Connect a jumper between pins 13 and P on the P2 (top) pc board connector.
2. Adjust the input to the ADD/DDD to the intended zero level (minimum, negative full scale) from the application.

   For example, if the unit being tested is configured to provide voltage output proportional to 4-20mA in, the input source would be set to 4mA in this step.
3. Connect the multimeter, configured to measure voltage (millivolts), to pins 1 (–) and 2 (+) on the option board, P2 (top terminal block).
4. Adjust the Zero pot, shown in figure 6, until the multimeter indicates that the voltage at pin 2 is approximately –100mV.
5. Move the multimeter to pins 4 (+) and 3 (–).
6. Fine-tune the Zero pot until the multimeter indicates a minimal positive voltage, (less than +10mV).
7. Adjust the input to the ADD/DDD to the intended full scale level (maximum, 100%) from the application.

   For example, if the unit being tested is configured to provide current output proportional to 4-20mA in, the input source would be set to 20mA in this step.
8. Adjust the Full Scale pot, shown in figure 6, until the multimeter indicates between 0 and 10V out at pin 4. Turning the pot clockwise decreases voltage.
9. Set input back to the intended zero and verify that voltage output, as indicated by the multimeter, is +10mV (roughly zero). Some slight adjustment of the Zero pot may be necessary.
10. Repeat steps 7 through 9 until the multimeter indicates 0V at zero input, 10V at full scale.

Installation

Figure 7 shows the outline dimensions for the ADD and DDD. Note that because the front panel is larger than the body of the meter, it is necessary to cut larger holes in the panel when mounting units one atop another. Refer to figure 8 for typical cutout dimensions.

To install the ADD or DDD:

1. **Loosen the two Phillips-head, mounting bracket screws located on the back of the unit (see figure 1).**
2. **Make the appropriate-sized cutout in your mounting panel, and from the display side of that mounting panel, slide the meter in to position in the cutout.**
3. **Holding the meter in place, from the back side of the mounting panel, position the meter's mounting bracket so that its flared ends "pinch" the mounting panel between the meter's front and the bracket ends (see figure 8).**
4. **Tighten the mounting bracket screws.**

CAUTION:

Over-tightening the mounting bracket screws will crack the ADD/DDD front panel.

Electrical Connections

Figures 2 through 5 illustrate the various pin-outs used by the ADD and DDD for power and input connections, and optional outputs.

Figure 7. *ADD/DDD Outline Dimensions*

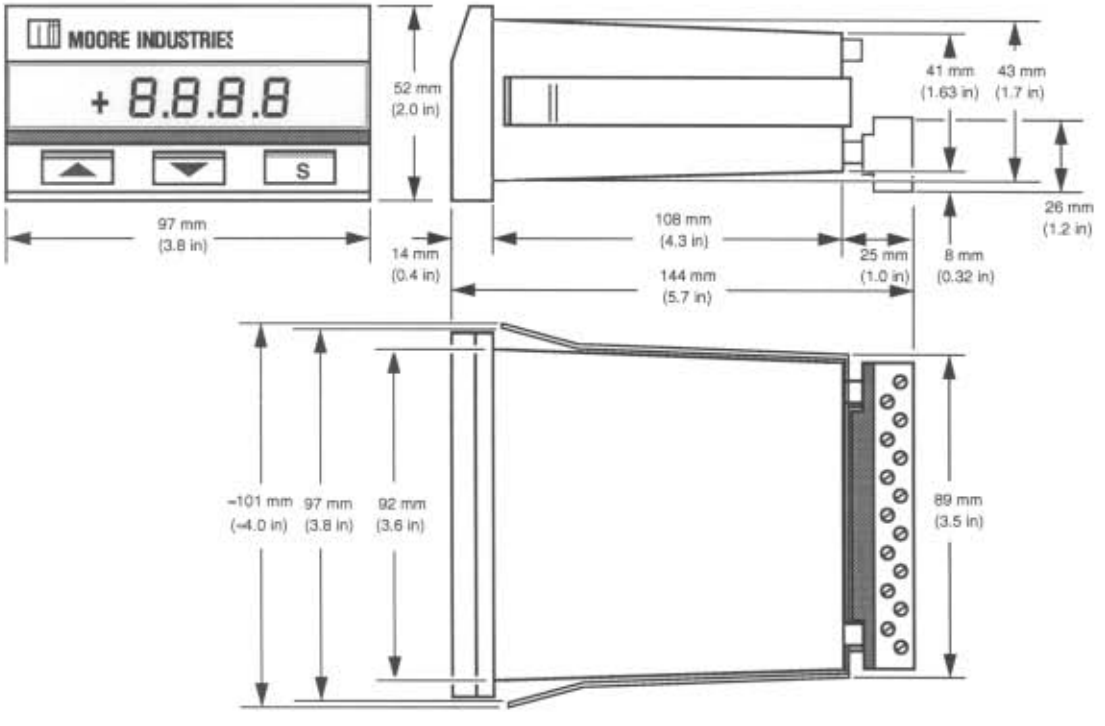


Figure 8. *Panel Cutout Dimensions for the ADD and DDD*

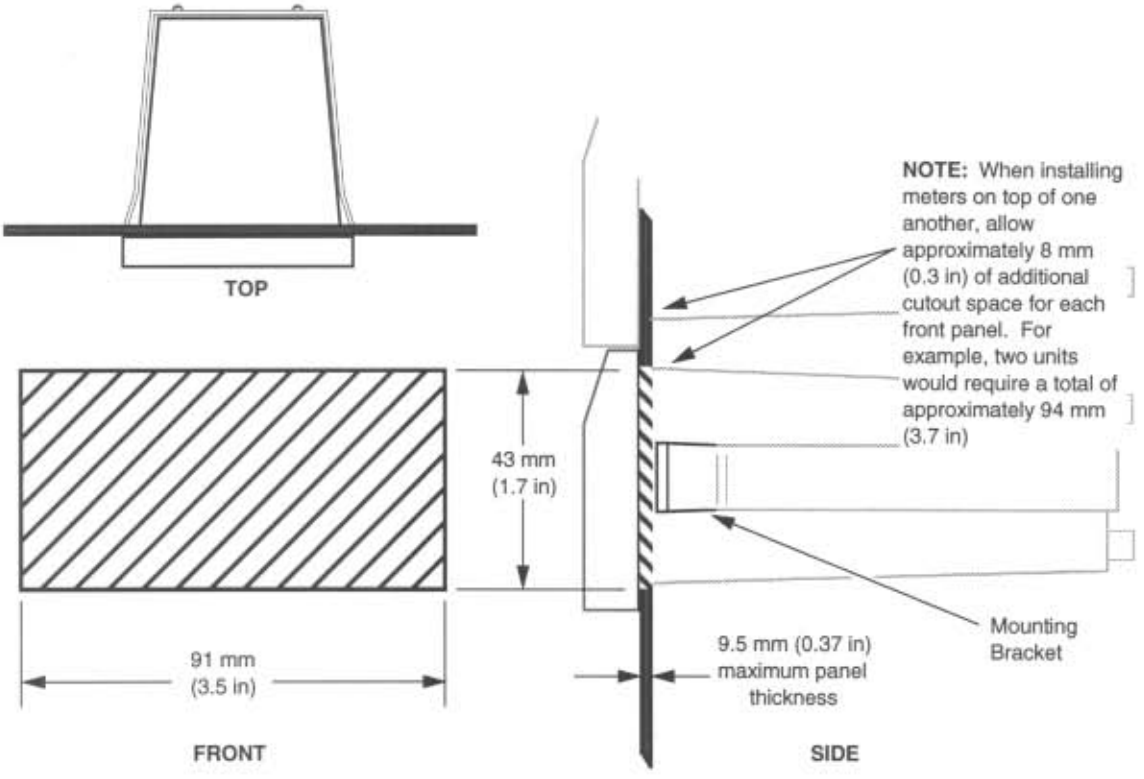


Table 5, on page 18, summarizes the pin-outs for the main PC board connector, P1.

Figure 9 gives the dimensions of the shunt resistor shipped with 0-5.000A ADD's.

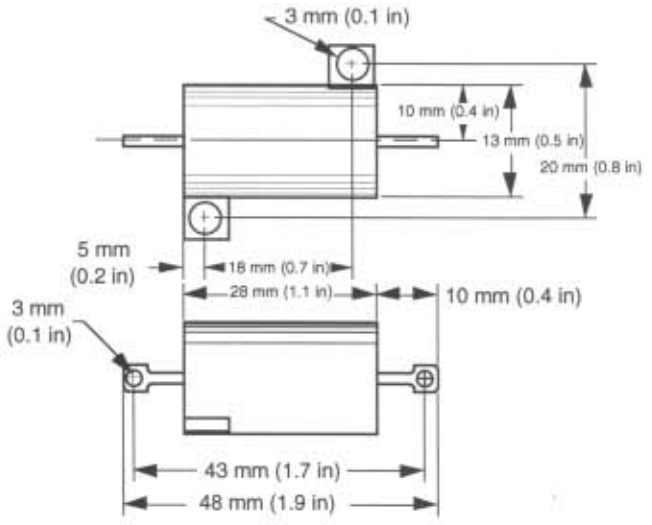
NOTES:

The external, shunt resistor supplied with the 0-5A ADD is calibrated with the unit at the factory prior to shipment. Do not substitute another resistor.

Also, the resistor ***MUST be*** *mounted on a surface that will dissipate heat.*

Figure 10 shows the connections for the transmitter excitation that is standard on the DDD.

Figure 9. *Current Shunt Outline Dimensions for the 0-5A ADD*



Note: Resistor is supplied with "pig-tail" wires suitable for hard wiring.

ADD/DDD

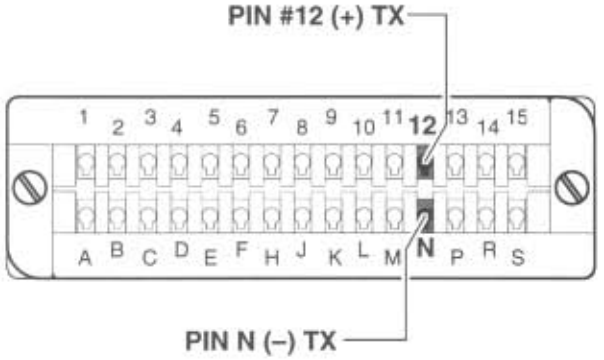
Table 5. *Pin-Outs for the Main PC board, P1, Connector*

ADD	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	GND (NOTE 2)	ACTUAL INPUT (NOTE 3)	✳	✳	▲ (NOTE 4)	TEST POINT (+5V)	TEST POINT (-15V)	TEST POINT (+15V)	✳	INPUT (HIGH) (NOTE 5)	✳
	A	**B**	**C**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	✳	INPUT GUARD (NOTE 6)	▼ (NOTE 7)	S (NOTE 8)	Display Hold	Display Hold	✳	POWER SUPPLY COMMON	✳	INPUT (LOW) (NOTE 5)	✳
DDD	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	GND (NOTE 2)	ACTUAL INPUT (NOTE 3)	✳	✳	▲ (NOTE 4)	TEST POINT (+5V)	+INPUT (HIGH) (NOTE 5)	**+TX**	✳	+INPUT (HIGH) (NOTE 5)	✳
	A	**B**	**C**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**
	✳	✳	✳	✳	✳	INPUT GUARD (NOTE 6)	▼ (NOTE 7)	S (NOTE 8)	Display Hold	Display Hold	✳	**-TX**	✳	-INPUT (LOW) (NOTE 5)	ANALOG GND

NOTES:
1. Refer to appropriate hookup illustration in the calibration section of this manual.
2. Tie to power input ground. Do not allow to float.
3. Connect this pin to pin K (Display Hold) to read out actual input level.
4. Connect this pin to pin K (Display Hold) to duplicate the function of the "▲" key.
5. Refer to appropriate hookup illustration in the calibration section of this manual.
6. If used, connect to shield. Leave the other end of the shield floating with respect to ground.
7. Connect this pin to pin K (Display Hold) to duplicate the function of the "▼" key.
8. Connect this pin to pin K (Display Hold) to duplicate the function of the "S" key.

✳ Do not use.

Figure 10. *Transmitter Excitation Connections, DDD only*



Operation

Once calibrated, properly installed, and supplied with appropriate power and input, the ADD and DDD operate unattended.

Display Hold

To stop display processing and "hold" the unit readout at the displayed value, connect pin K to pin L on the main processor PC board, P1.

Breaking the connection between the Hold pins restores normal processing/readouts.

Actual/Scaled Readouts

To bypass the digital offset and scaling feature of the ADD and DDD, connect pin K to pin 6 on the main processor PC board, P1.

Table 6. ADD and DDD Alarm Displays

Display	Indicates
H I	Input has risen above the trip point setting for SP1H. The readout will alternately flash this indication and the actual reading. The high alarm relay, on units equipped with the -C option will be energized.
L O	Input has dropped below the trip point setting for SP1L. The readout will alternately flash this indication and the actual reading. The low alarm relay, on units equipped with the -C option will be energized.
H I	Input has risen above the trip point setting for SP2H. The readout will alternately flash this indication and the actual reading. The high alarm relay, on units equipped with the -C option will be energized.
L O	Input has dropped below the trip point setting for SP2L. The readout will alternately flash this indication and the actual reading. The low alarm relay, on units equipped with the -C option will be energized.
H I H I	Input has risen above the trip point settings for both SP1H and SP2H. The readout will alternately flash this indication and the actual reading. The high alarm relay, on units equipped with the -C option will be energized.
L O L O	Input has dropped below the trip point settings for both SP1L and SP2L. The readout will alternately flash this indication and the actual reading. The low alarm relay, on units equipped with the -C option will be energized.
H I L O	Input has risen above the trip point setting for SP1H. It is also below the setting for SP2L. The readout will alternately flash this indication and the actual reading. Both relays, on units equipped with the -C option, will be energized.
L O H I	Input has dropped below the trip point setting for SP1L. It is also above the setting for SP2H. The readout will alternately flash this indication and the actual reading. Both relays, on units equipped with the -C option, will be energized.

As long as the pins are connected, the meter will read out the actual input level. Break the connection, and the unit returns to normal (scaled) processing and readouts.

Alarm Display

Table 6 lists the possible alarm displays and the corresponding -C option outputs.

BCD Output Notes

Refer to Figure 5.

- The "PRINT" pin, pin C, is low for valid BCD data. It goes high for 100 seconds while new data is being written to data lines. Use the falling edge for a print command ("PRINT" is sometimes referred to as "BUSY" in other manufacturers' documentation).
- When "POLARITY" pin, pin 3, is logic low, a positive reading is indicated.
- When "HOLD" pin, pin 5, receives a logic low for at least 10 milliseconds, the unit maintains the present BCD output until a logic high is applied. Processing continues while unit is in hold.

- When "SELECT" pin, pin E, receives a logic low for at least 10 milliseconds, the status of all 20 BCD lines is checked. If all lines are tri-state, the unit ties to BCD lines and "PRINT", pin C, goes low. If any BCD lines are active, the unit does not write and "PRINT" stays high.
- When reading is greater than full scale, OVERFLOW/ DATA VALID pin, pin 2, goes logic high.

Troubleshooting

The ADD and DDD are maintenance-free units. A periodic check for terminal tightness and general condition is all that is recommended to assure reliable unit function indefinitely.

False Alarms — When setting or changing unit offset and scale the alarms may be tripped because the setpoints are based on the display (not the actual input). Since the alarms reset automatically when display (input) goes into a non-alarm condition, these may be ignored.

If process input tends to vary in the vicinity of the setpoint, wavering into and out of an alarm condition, the alarm (and associated relays, in units equipped with the -C option) may "chatter". Counteract this by increasing the hysterisis setting (deadband).

Erroneous Readouts — The ADD and DDD are calibrated at the factory according to the input type ordered, e.g., 4-20mA or 0-200V. If the unit configuration is changed by the user in the field, to operate with another type of input, A/D re-calibration probably will be required. Refer to the procedure for calibrating the A/D converter to correct this problem.

If, after performing the scale and offset programming procedure as described, the readout of the unit is not appropriate or does not meet the accuracy specifications for the type of input being used, it probably means that the A/D converter needs calibration.

If problems persist, contact the factory.

Error Codes

ErrOr - Usually when scaling the display, it means that the scaling factor was not calculated correctly, or that the limitations of the scaling feature were exceeded. If this occurs, re-calibrate the actual input conversion and the display as described in the calibration section of this manual.

OFLO - Indicates input that is out of the unit's rated range. Lower the input to within the range specified in Table 1.

Supplement

Low Voltage Directive

The following guidelines must be followed in order to comply with EN 61010-1 (Low Voltage Directive). These items affect the AC versions of the following products: DCA, DPS-240, DPS1200, ECA, ECS, ECT, FCA, FDT, IST, PIT-4W, PWT, RBA, SCT, SMP, SPA-CE. If these products are to be used in a non-CE environment, this supplement may be disregarded.

WARNING:

If this unit is used in a manner not specified by Moore Industries, the protection provided by the equipment may be impaired.

Switches and Circuit Breakers

A switch or circuit breaker must be wired in series with the AC power conductors. This switch or circuit breaker must be located within three meters of the unit.

WARNING:

Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, ALL hazardous voltages must be de-energized.

The circuit breaker or switch will only remove power to the unit, hazardous voltages may still be connected to other terminals on the unit.

Installation Category

All terminals are rated CAT II, except for terminals with the -RF option. These terminals are rated CAT I.

Equipment Ratings

Moore Industries transmitters do not generate hazardous voltages. They measure voltage or current inputs, and generate low voltages and currents (<42Vdc and <50mAdc). Products connected to Moore Industries transmitters should be designed to receive these inputs.

Moore Industries alarms do not generate any hazardous voltages. Alarm contacts are wired in series with power sources and their intended loads. The correct load should be selected for the power source.

Supply Wiring

All power connections shall be made with 14 or 16 AWG (.083mm or .064mm) wire.

The end of each conductor should be stripped no more than 8mm. The end of the stripped wire should be tinned with solder or inserted into a ferrule and crimped before being placed into a terminal block.

Conductors connected to screw type connections must have a ring or spade lug crimped on the end of the wire.

Protective Earth Conductor

The Protective Earth Conductor shall be of equal or larger size wire than the other two power conductors.

The Protective Earth Conductor shall be the first conductor connected to the unit when the unit is being wired. It shall be the last conductor removed when the unit is being un-wired.

Supplement

Maximum Working Voltage

Table 1-s shows the maximum working voltage for Moore Industries' low voltage products.

Table 1-s. Maximum Working Voltage

Input Type	Maximum Working Voltage
Millivolt, Thermocouple, and RTD	48Vdc
DC Voltage Inputs	48Vdc
AC Voltage Inputs	264Vac
Analog Outputs	48Vdc
Relay Contacts	264Vac
117Vac Power Terminals	129Vac
240Vac Power Terminals	264Vac
Contact Closure Outputs	30Vdc

Accessories

Contact Moore Industries for information on suitable accessories for our products.

Mounting

When mounting the unit or installing it into an application, ensure that the unit can be easily removed for maintenance or repairs.

Cleaning and Maintenance

Maintenance on Moore Industries' products is limited to keeping the unit clean and the wire terminals free of oxidation. This is best accomplished by installing the unit in an area protected from dust, heat, moisture, and corrosive atmospheres. Yearly visual inspections should be performed to ensure that the unit is clean and the electrical connections are in good repair.

Replacement of Consumable Materials

No consumable materials are used in the Moore Industries products covered by EN 61010-1.

Symbols

Table 2-s shows the symbols used on Moore Industries' products, the corresponding IEC/ISO symbol, and its definition.

Table 2-s. Symbols on Moore Industries' Products

IEC/ISO Symbol	Symbol on Moore Industries Product	Definition
	+PS -PS DCC	Direct Current
	AC ACC	Alternating Current
	AC or DC	Direct and Alternating Current
	GND 	Protected Earth Terminal
		Protective Conductor Terminal
		Equipment protected throughout by double insulation or reinforced insulation (equivalent to Class II of IEC 536)
		Caution (See manual for information)
Not Specified	+IN -IN	Positive Input Negative Input
Not Specified	+OUT -OUT	Positive Output Negative Output
Not Specified	NO NC CM	Normally Open Normally Closed Common
Not Specified	UNO UNC	Upper Normally Open Upper Normally Closed
Not Specified	LNO LNC	Lower Normally Open Lower Normally Closed
Not Specified	TX	Transmitter Excitation

Supplement

ADD/DDD

December 1994

Application

This is a supplement to Moore Industries' Users' Manual for the ADD/DDD AC/DC Programmable/Digital Panel Meters dated July 1993, (P/N 601-719-00 A).

Item:

Reference to the **fuse part number**, on page 4, is incorrect. When ordering a 1/8A replacement fuse (for 117Vac operation), please specify Moore Industries' part number 800-837-16.

Item:

Table 2, on page 5, is incorrect. Please disregard the information on **Sensitity Ratings** that appears in that table. Use the following:

Table 2. Sensitivity Ratings for the ADD and DDD

Meter	Input	Sensitivity
ADD	0-199.9Vac	50 counts/V
	0-600.0Vac	16.6667 counts/V
	0-5.000A	2000 counts/A
DDD	4-20mA	500 counts/mA
	0-20mA	500 counts/mA
	1-5V	2000 counts/V
	0-5V	2000 counts/V
	0-10V	1000 counts/V

Item:

Table 3, on page 7, is incorrect. Please disregard the information on **Count Equivalents** for 0 and 100% Inputs that appears in that table. Use the following:

Table 3. Count Equivalents for 0 and 100% Inputs

	Zero Input	InLo	Full Scale Input	InHI
ADD				
0-199.9Vac	0V	000	200V	9999
0-600.0Vac	0V	0000	600V	10000
0-5.000A	0A	0000	5A	10000
DDD				
0-20mA	0mA	0000	20mA	9999
4-20mA	4mA	2000	20mA	9999
0-5V	0V	0000	5V	10000
1-5V	1V	2000	5V	10000
0-10V	0V	0000	10V	9999

(contines)

ADD/DDD

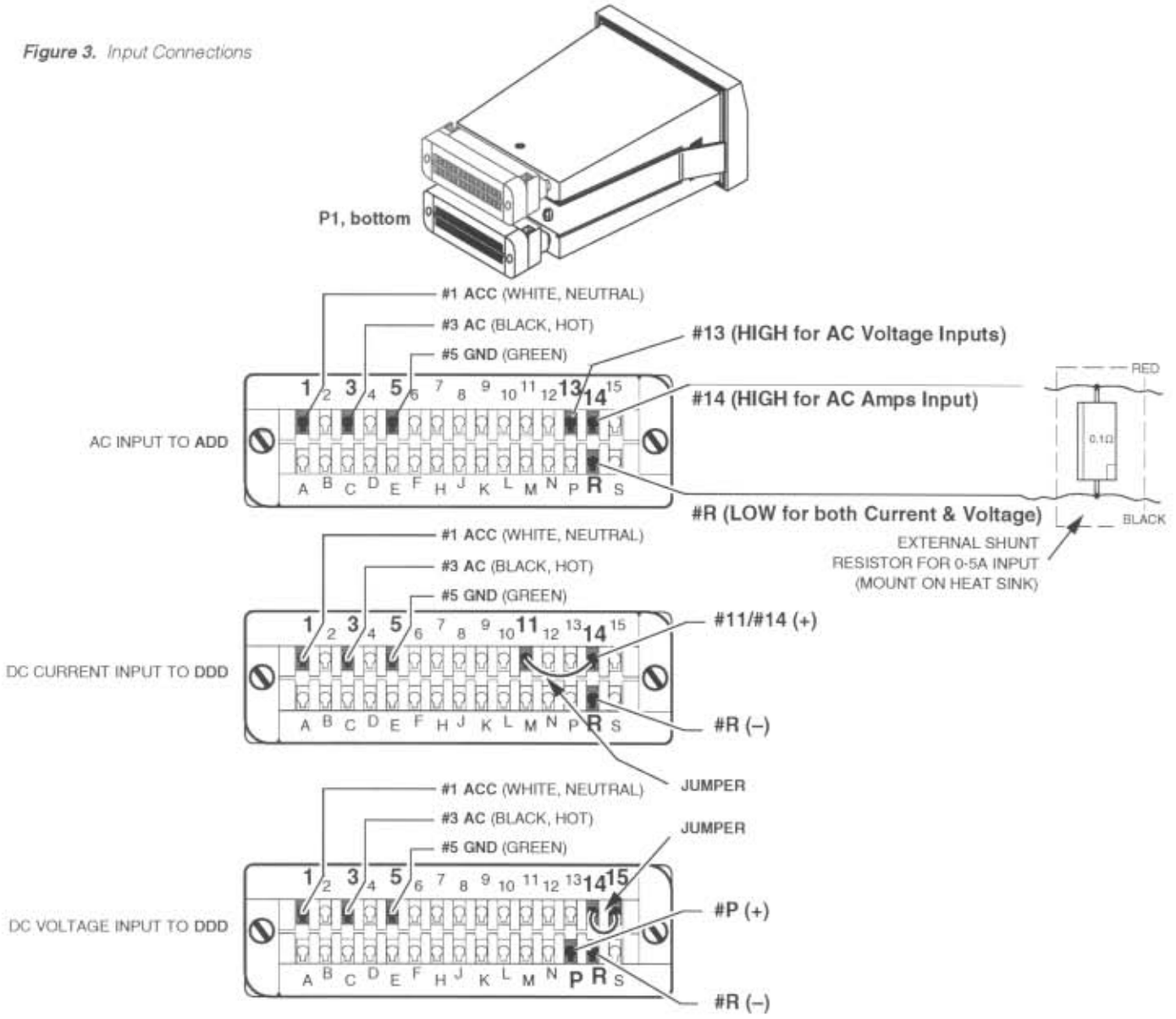
Supplement

December 1994

Item:

Figure 3, on page 11, which illustrates the **Input Connections**, is incomplete. Please disregard the illustration, and use the following:

Figure 3. *Input Connections*



Supplement

ADD/DDD

December 1994

Item:

Table 5, on page 18, which summarizes the **Pin Outs** for the panel meters, is incorrect. Please disregard the information in the table. Use the following:

Table 5. *Summary of Pin-Outs for the Main PC Board, P1*

ADD	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	GND (NOTE 2)	ACTUAL INPUT (NOTE 3)	✳	✳	▲ (NOTE 4)	TEST POINT (+5V)	TEST POINT (–15V)	TEST POINT (+15V)	INPUT (HIGH for V ac (NOTE 5)	INPUT (HIGH for Amps) (NOTE 5)	✳
	A	**B**	**C**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	✳	INPUT GUARD (NOTE 6)	▼ (NOTE 7)	S (NOTE 8)	Display Hold	Display Hold	✳	POWER SUPPLY COMMON	✳	INPUT (LOW for V or Amps) (NOTE 5)	✳
DDD	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	POWER (NOTE 1)	✳	POWER (NOTE 1)	✳	GND (NOTE 2)	ACTUAL INPUT (NOTE 3)	✳	✳	▲ (NOTE 4)	TEST POINT (+5V)	+INPUT (HIGH) (NOTE 5)	**+TX**	✳	+INPUT (HIGH) (NOTE 5)	✳
	A	**B**	**C**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**
	✳	✳	✳	✳	✳	INPUT GUARD (NOTE 6)	▼ (NOTE 7)	S (NOTE 8)	Display Hold	Display Hold	✳	**–TX**	✳	–INPUT (LOW) (NOTE 5)	ANALOG GND

NOTES:

1. Refer to appropriate hookup illustration in the calibration section of this manual.
2. Tie to power input ground. Do not allow to float.
3. Connect this pin to pin K (Display Hold) to read out actual input level.
4. Connect this pin to pin K (Display Hold) to duplicate the function of the "▲" key.
5. Refer to appropriate hookup illustration in the calibration section of this manual, or to Figure 10 for TX hookup.
6. If used, connect to shield. Leave the other end of the shield floating with respect to ground.
7. Connect this pin to pin K (Display Hold) to duplicate the function of the "▼" key.
8. Connect this pin to pin K (Display Hold) to duplicate the function of the "S" key.

✳ Do not use.

(contines)

ADD/DDD

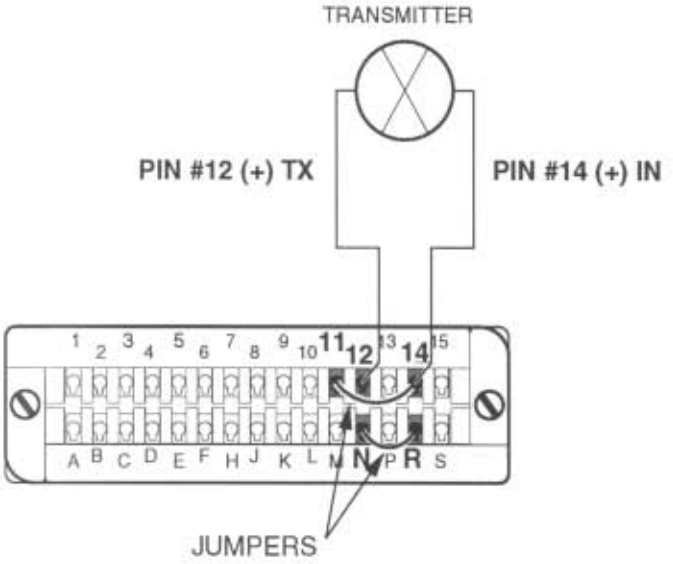
Supplement

December 1994

Item:

Please note that Figure 10, on page 18, which shows the **Transmitter Excitation Connections**, is incorrect. Please use the following illustration, which shows the P1 (bottom) connector; standard on the DDD:

Figure 10. *Transmitter Excitation Connections (DDD only)*



NOTE: MAKE THESE CONNECTIONS *IN ADDITION TO* THOSE SHOWN IN FIGURE 3, EARLIER IN THIS MANUAL.

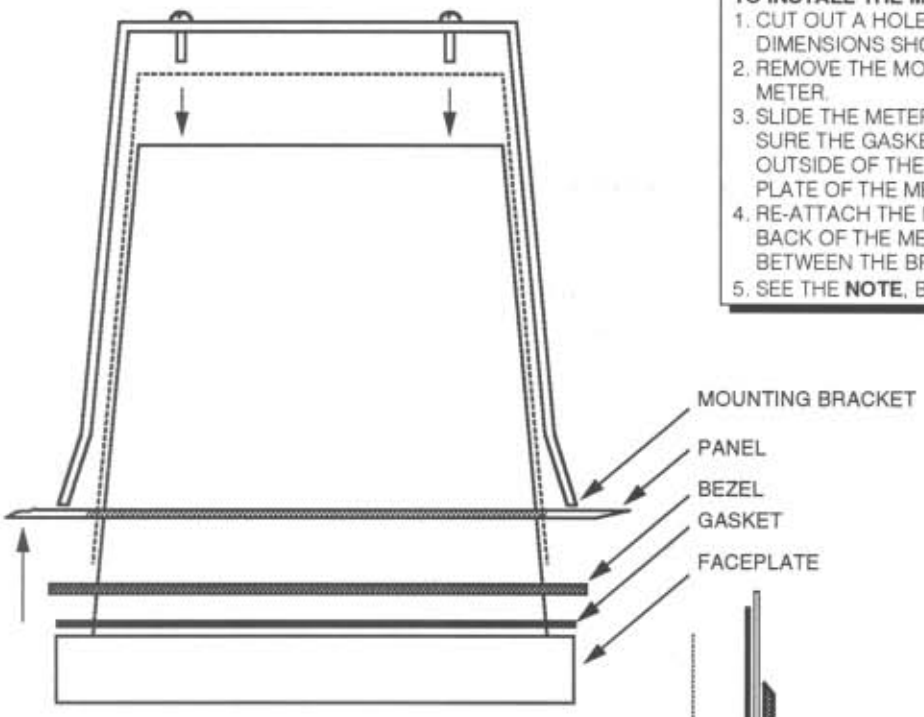
Supplement *ADD/DDD*

The dimension drawings shown on pages 16 and 17 of the Users' Manual (July 1993, No. 601-719-00 A) are inaccurate.

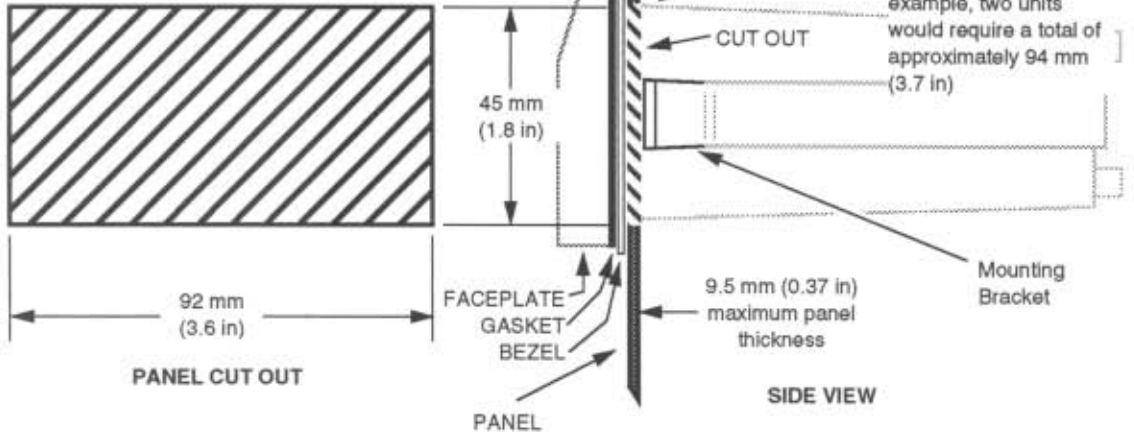
Where applicable, use the dimensions shown in the drawing below. When installing your panel meter(s), use the instructions in this illustration.

TO INSTALL THE METER IN A PANEL:

1. CUT OUT A HOLE IN THE PANEL USING THE DIMENSIONS SHOWN IN THE DRAWING BELOW.
2. REMOVE THE MOUNTING BRACKET FROM THE METER.
3. SLIDE THE METER INTO THE CUT OUT, MAKING SURE THE GASKET AND BEZEL ARE ON THE OUTSIDE OF THE PANEL, BETWEEN THE FACE-PLATE OF THE METER AND THE PANEL ITSELF.
4. RE-ATTACH THE MOUNTING BRACKET TO THE BACK OF THE METER, "PINCHING" THE PANEL BETWEEN THE BRACKET AND THE BEZEL.
5. SEE THE **NOTE**, BELOW.



TOP VIEW



PANEL CUT OUT

SIDE VIEW

NOTE: When installing meters on top of one another, allow approximately 8 mm (0.3 in) of additional cutout space for each front panel. For example, two units would require a total of approximately 94 mm (3.7 in)

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

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