Operating Instruction

for

Industrial Batching System,

Counter and Flow Indicator

for Panel Mounting

Model: DAG-AXV

MODEL DAG-AXV – 1/8 DIN ANALOG INPUT PANEL METERS

- *PROCESS, VOLTAGE, CURRENT, TEMPERATURE, AND STRAIN GAGE INPUTS*
- *5-DIGIT 0.56" RED SUNLIGHT READABLE DISPLAY*
- *VARIABLE INTENSITY DISPLAY*
- *16 POINT SCALING FOR NON-LINEAR PROCESSES*
- *PROGRAMMABLE FUNCTION KEYS/USER INPUTS*
- *9 DIGIT TOTALIZER (INTEGRATOR) WITH BATCHING*
- *OPTIONAL CUSTOM UNITS OVERLAY W/BACKLIGHT*
- *FOUR SETPOINT ALARM OUTPUTS (W/OPTION CARD)*
- *COMMUNICATION AND BUS CAPABILITIES (W/OPTION CARD)*
- *RETRANSMITTED ANALOG OUTPUT (W/OPTION CARD)*
- *PC SOFTWARE AVAILABLE FOR METER CONFIGURATION*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

GENERAL DESCRIPTION

The DAG-AXV Analog Panel Meters offer many features and performance capabilities to suit a wide range of industrial applications. Available in five different models to handle various analog inputs, including DC Voltage/Current, AC Voltage/Current, Process, Temperature, and Strain Gage Inputs. Refer to pages 4 through 6 for the details on the specific models. The optional plug-in output cards allow the opportunity to configure the meter for present applications, while providing easy upgrades for future needs.

The meters employ a bright 0.56" LED display. The unit is available with a red sunlight readable or a standard green LED. The intensity of display can be adjusted from dark room applications up to sunlight readable, making it ideal for viewing in bright light applications.

The meters provide a MAX and MIN reading memory with programmable capture time. The capture time is used to prevent detection of false max or min readings which may occur during start-up or unusual process events.

The signal totalizer (integrator) can be used to compute a time-input product. This can be used to provide a readout of totalized flow, calculate service intervals of motors or pumps, etc. The totalizer can also accumulate batch weighing operations.

The meters have four setpoint outputs, implemented on Plug-in option cards. The Plug-in cards provide dual FORM-C relays (5A), quad FORM-A (3A), or either quad sinking or quad sourcing open collector logic outputs. The setpoint alarms can be configured to suit a variety of control and alarm requirements.

Communication and Bus Capabilities are also available as option cards. These include RS232, RS485, Modbus, DeviceNet, and Profibus-DP. Readout values and setpoint alarm values can be controlled through the bus. Additionally, the meters have a feature that allows a remote computer to directly control the outputs of the meter. With an RS232 or RS485 card installed, it is possible to configure the meter using a Windows® based program. The configuration data can be saved to a file for later recall.

A linear DC output signal is available as an optional Plug-in card. The card provides either 20 mA or 10 V signals. The output can be scaled independent of the input range and can track either the input, totalizer, max or min readings.

Once the meters have been initially configured, the parameter list may be locked out from further modification in its entirety or only the setpoint values can be made accessible.

The meters have been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough yet reliable application solution.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

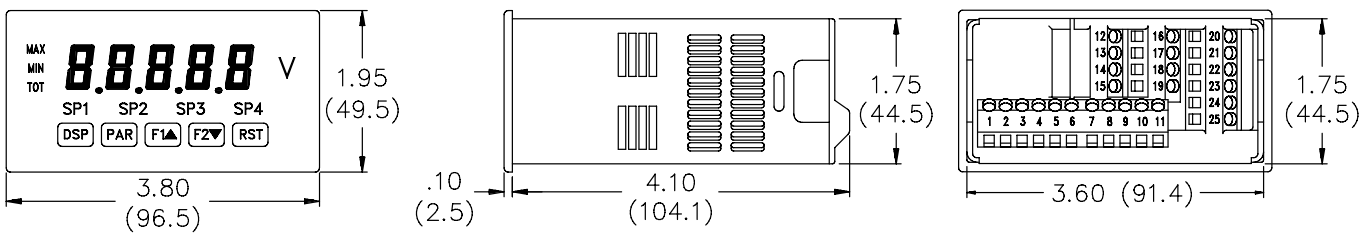
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

CAUTION: Read complete instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.



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Ordering Information

Model	Description	Supply	Limit values	Output	Interface
DAG-AXV	Normal signal display 5-digit, 14 mm high LED display, totalizing MIN/MAX memory 16-step linearization	0= 85-250 VAC 1= 11-36 VDC, 24	0= without 2= 2 changeover contacts 4= 4 N/O contacts 8= 4 transistor outputs NPN 9= 4 transistor outputs PNP	0= without 4= 0(4)-20 mA, 0-10 V	0= without 7= RS 232 8= RS 485 9= Device-NET

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Version: K03/0524

GENERAL METER SPECIFICATIONS

1. **DISPLAY**: 5 digit, 0.56" (14.2 mm) red sunlight readable or standard green LEDs, (-19999 to 99999)
2. **POWER**:
   AC Versions:
   AC Power: 85 to 250 VAC, 50/60 Hz, 15 VA
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
   DC Versions
   DC Power: 11 to 36 VDC, 11 W
   (derate operating temperature to 40° C if operating <15 VDC and three plug-in option cards are installed)
   AC Power: 24 VAC, ± 10%, 50/60 Hz, 15 VA
   Isolation: 500 Vrms for 1 min. to all inputs and outputs (50 V working).
3. **ANNUNCIATORS**:
   MAX - maximum readout selected
   MIN - minimum readout selected
   TOT - totalizer readout selected, flashes when total overflows
   SP1 - setpoint alarm 1 is active
   SP2 - setpoint alarm 2 is active
   SP3 - setpoint alarm 3 is active
   SP4 - setpoint alarm 4 is active
   Units Label - optional units label backlight
4. **KEYPAD**: 3 programmable function keys, 5 keys total
5. **A/D CONVERTER**: 16 bit resolution
6. **UPDATE RATES**:
   A/D conversion rate: 20 readings/sec.
   Step response: 200 msec. max. to within 99% of final readout value (digital filter and internal zero correction disabled)
   700 msec. max. (digital filter disabled, internal zero correction enabled)

   Display update rate: 1 to 20 updates/sec.
   Setpoint output on/off delay time: 0 to 3275 sec.
   Analog output update rate: 0 to 10 sec
   Max./Min. capture delay time: 0 to 3275 sec.
7. **DISPLAY MESSAGES**:
   "OLOL" - Appears when measurement exceeds + signal range.
   "ULUL" - Appears when measurement exceeds - signal range

   ". . . ." - Appears when display values exceed + display range.
   "- . . ." - Appears when display values exceed - display range.
8. **INPUT CAPABILITIES**: See specific product specifications, pages 4-6
9. **EXCITATION POWER**: See specific product specifications, pages 4-6
10. **LOW FREQUENCY NOISE REJECTION**:
    Normal Mode: > 60 dB @ 50 or 60 Hz ±1%, digital filter off
    Common Mode: >100 dB, DC to 120 Hz
11. **USER INPUTS**: Three programmable user inputs
    Max. Continuous Input: 30 VDC
    Isolation To Sensor Input Common: Not isolated.

    Response Time: 50 msec. max.
    Logic State: Jumper selectable for sink/source logic

INPUT STATE	SINKING INPUTS 22 KΩ pull-up to +5 V	SOURCING INPUTS 22 KΩ pull-down
Active	V_{IN} < 0.9 VDC	V_{IN} > 3.6 VDC
Inactive	V_{IN} > 3.6 VDC	V_{IN} < 0.9 VDC

12. **TOTALIZER**:
    Function:
    Time Base: second, minute, hour, or day
    Batch: Can accumulate (gate) input display from a user input
    Time Accuracy: 0.01% typical
    Decimal Point: 0 to 0.0000
    Scale Factor: 0.001 to 65.000
    Low Signal Cut-out: -19,999 to 99,999
    Total: 9 digits, display alternates between high order and low order readouts
13. **CUSTOM LINEARIZATION**:
    Data Point Pairs: Selectable from 2 to 16
    Display Range: -19,999 to 99,999
    Decimal Point: 0 to 0.0000

14. **MEMORY**: Nonvolatile E^2PROM retains all programmable parameters and display values.
15. **ENVIRONMENTAL CONDITIONS**:
    Operating Temperature Range: 0 to 50°C (0 to 45°C with all three plug-in cards installed)
    Storage Temperature Range: -40 to 60°C
    Operating and Storage Humidity: 0 to 85% max. RH non-condensing
    Altitude: Up to 2000 meters
16. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    UL Recognized Component, File #E179259, UL3101-1, CSA C22.2 No. 1010-1

    Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
    UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
    LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
    Type 4X Enclosure rating (Face only), UL50
    IECEE CB Scheme Test Certificate #UL/5854B/UL
    CB Scheme Test Report #02ME04503-04122002
    Issued by Underwriters Laboratories, Inc.
    IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part I
    IP65 Enclosure rating (Face only), IEC 529
    IP20 Enclosure rating (Rear of unit), IEC 529
    ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2		
Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m [1] 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms 150 KHz - 80 MHz
Simulation of cordless telephones	ENV 50204	Level 3; 10 V/m 900 MHz ±5 MHz 200 Hz, 50% duty cycle
Emissions to EN 50081-2		
RF interference	EN 55011	Enclosure class A Power mains class A

Notes:
1. Self-recoverable loss of performance during EMI disturbance at 10 V/m:
Measurement input and/or analog output signal may deviate during EMI disturbance.
For operation without loss of performance:
Unit is mounted in a metal enclosure (Buckeye SM7013-0 or equivalent)
I/O and power cables are routed in metal conduit connected to earth ground.
Refer to EMC Installation Guidelines section of the bulletin for additional information.
17. **CONNECTIONS**: High compression cage-clamp terminal block
    Wire Strip Length: 0.3" (7.5 mm)
    Wire Gage: 30-14 AWG copper wire
    Torque: 4.5 inch-lbs (0.51 N-m) max.
18. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 indoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
19. **WEIGHT**: 10.4 oz. (295 g)

MODEL DAG-AXV - PROCESS INPUT

DAG-AXV SPECIFICATIONS

SENSOR INPUTS:

INPUT (RANGE)	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONTINUOUS OVERLOAD	DISPLAY RESOLUTION
20 mA (-2 to 26 mA)	0.03% of reading +2 µA	0.12% of reading +3 µA	20 ohm	150 mA	1 µA
10 VDC (-1 to 13 VDC)	0.03% of reading +2 mV	0.12% of reading +3 mV	500 Kohm	300 V	1 mV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85%RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

EXCITATION POWER:

Transmitter Power: 24 VDC, ±5%, regulated, 50 mA max.

- *DUAL RANGE INPUT (20 mA or 10 VDC)*
- *24 VDC TRANSMITTER POWER*

OPTIONAL PLUG-IN OUTPUT CARDS

WARNING: Disconnect all power to the unit before installing Plug-in cards.

Adding Option Cards

The DAG-AXV can be fitted with up to three optional plug-in cards. The details for each plug-in card can be reviewed in the specification section below. Only one card from each function type can be installed at one time. The function types include Setpoint Alarms, Communications, and Analog Output. The plug-in cards can be installed initially or at a later date.

COMMUNICATION CARDS

A variety of communication protocols are available for the DAG series. Only one of these cards can be installed at a time. When programming the unit via RLCPro, a Windows® based program, the RS232 or RS485 Cards must be used.

DAGCDC10 - RS485 Serial
DAGCDC20 - RS232 Serial
DAGCDC30 - DeviceNet
DAGCDC40 - Modbus
DAGCDC50 - Profibus-DP

SERIAL COMMUNICATIONS CARD

Type: RS485 or RS232
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Data: 7/8 bits
Baud: 300 to 19,200
Parity: no, odd or even
Bus Address: Selectable 0 to 99, Max. 32 meters per line (RS485)
Transmit Delay: Selectable for 2 to 50 msec or 50 to 100 msec (RS485)

DEVICENET™ CARD

Compatibility: Group 2 Server Only, not UCMM capable
Baud Rates: 125 Kbaud, 250 Kbaud, and 500 Kbaud
Bus Interface: Phillips 82C250 or equivalent with MIS wiring protection per DeviceNet™ Volume I Section 10.2.2.
Node Isolation: Bus powered, isolated node
Host Isolation: 500 Vrms for 1 minute (50 V working) between DeviceNet™ and meter input common.

MODBUS CARD

Type: RS485; RTU and ASCII MODBUS modes
Isolation To Sensor & User Input Commons: 500 Vrms for 1 minute. Working Voltage: 50 V. Not isolated from all other commons.
Baud Rates: 300 to 38400.
Data: 7/8 bits
Parity: No, Odd, or Even
Addresses: 1 to 247.
Transmit Delay: Programmable; See Transmit Delay explanation.

PROFIBUS-DP CARD

Fieldbus Type: Profibus-DP as per EN 50170, implemented with Siemens SPC3 ASIC
Conformance: PNO Certified Profibus-DP Slave Device
Baud Rates: Automatic baud rate detection in the range 9.6 Kbaud to 12 Mbaud
Station Address: 0 to 126, set by the master over the network. Address stored in non-volatile memory.
Connection: 9-pin Female D-Sub connector
Network Isolation: 500 Vrms for 1 minute (50 V working) between Profibus network and sensor and user input commons. Not isolated from all other commons.

PROGRAMMING SOFTWARE

The DAG software is a Windows® based program that allows configuration of the DAG meter from a PC. Using the software makes it easier to program the DAG meter and allows saving the DAG program in a PC file for future use. On-line help is available within the software. A DAG serial plug-in card is required to program the meter using the software.

SETPOINT CARDS

The DAG-AXV series has 4 available setpoint alarm output plug-in cards. Only one of these cards can be installed at a time. (Logic state of the outputs can be reversed in the programming.) These plug-in cards include:

DAGCDS10 - Dual Relay, FORM-C, Normally open & closed
DAGCDS20 - Quad Relay, FORM-A, Normally open only
DAGCDS30 - Isolated quad sinking NPN open collector
DAGCDS40 - Isolated quad sourcing PNP open collector

DUAL RELAY CARD

Type: Two FORM-C relays
Isolation To Sensor & User Input Commons: 2000 Vrms for 1 min.
Working Voltage: 240 Vrms
Contact Rating:
One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 HP @120 VAC, inductive load
Total current with both relays energized not to exceed 5 amps
Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD RELAY CARD

Type: Four FORM-A relays
Isolation To Sensor & User Input Commons: 2300 Vrms for 1 min.
Working Voltage: 250 Vrms
Contact Rating:
One Relay Energized: 3 amps @ 240 VAC or 30 VDC (resistive load), 1/10 HP @120 VAC, inductive load
Total current with all four relays energized not to exceed 4 amps
Life Expectancy: 100K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD SINKING OPEN COLLECTOR CARD

Type: Four isolated sinking NPN transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: 100 mA max @ V_{SAT} = 0.7 V max. V_{MAX} = 30 V

QUAD SOURCING OPEN COLLECTOR CARD

Type: Four isolated sourcing PNP transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: Internal supply: 24 VDC ± 10% , 30 mA max. total
External supply: 30 VDC max., 100 mA max. each output

ALL FOUR SETPOINT CARDS

Response Time: 200 msec. max. to within 99% of final readout value (digital filter and internal zero correction disabled)
700 msec. max. (digital filter disabled, internal zero correction enabled)

LINEAR DC OUTPUT

Either a 0(4)-20 mA or 0-10 V retransmitted linear DC output is available from the analog output plug-in card. The programmable output low and high scaling can be based on various display values. Reverse slope output is possible by reversing the scaling point positions.

DAGCDL10 - Retransmitted Analog Output Card

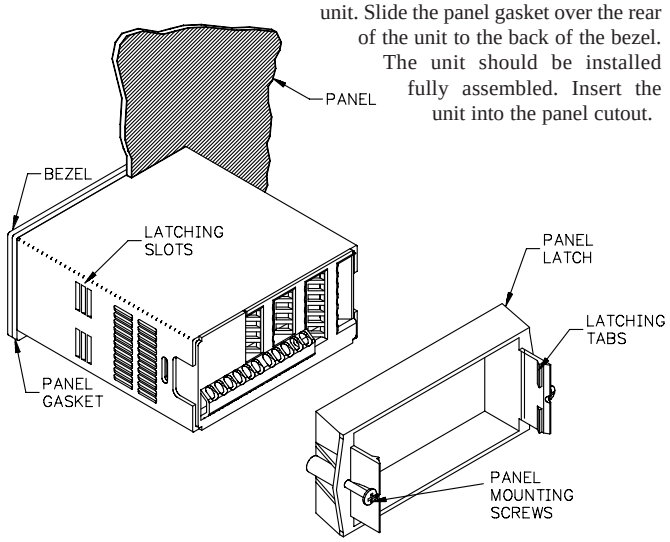
ANALOG OUTPUT CARD

Types: 0 to 20 mA, 4 to 20 mA or 0 to 10 VDC
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Accuracy: 0.17% of FS (18 to 28°C); 0.4% of FS (0 to 50°C)
Resolution: 1/3500
Compliance: 10 VDC: 10 KΩ load min., 20 mA: 500 Ω load max.
Update time: 200 msec. max. to within 99% of final output value (digital filter and internal zero correction disabled)
700 msec. max. (digital filter disabled, internal zero correction enabled)

1.0 Installing The Meter

Installation

The DAG meets NEMA 4X/IP65 requirements for indoor use when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.



While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

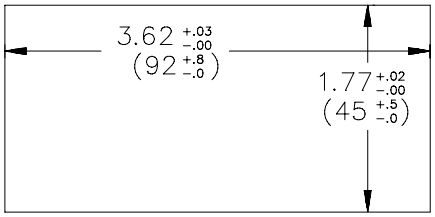
Installation Environment

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

PANEL CUT-OUT



2.0 Setting the Jumpers

The meter can have up to four jumpers that must be checked and / or changed prior to applying power. The following Jumper Selection Figures show an enlargement of the jumper area.

To access the jumpers, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Input Range Jumper

This jumper is used to select the proper input range. The input range selected in programming must match the jumper setting. Select a range that is high enough to accommodate the maximum input to avoid overloads. The selection is different for each meter. See the Jumper Selection Figure for appropriate meter.

Excitation Output Jumper

If your meter has excitation, this jumper is used to select the excitation range for the application. If excitation is not being used, it is not necessary to check or move this jumper.

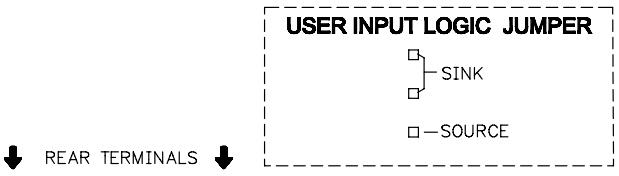
User Input Logic Jumper

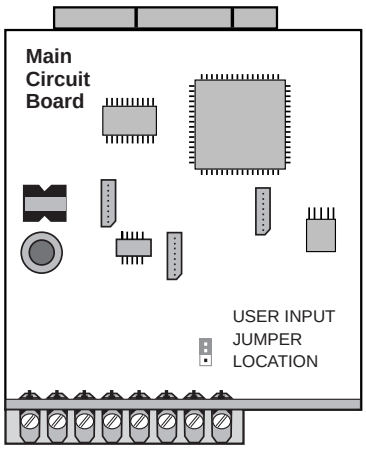
This jumper selects the logic state of all the user inputs. If the user inputs are not used, it is not necessary to check or move this jumper.

DAG-AXV Jumper Selection

JUMPER SELECTIONS

The ⌒ indicates factory setting.





3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

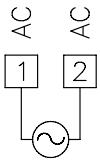
EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations.Listed below are some EMC guidelines for successful installation in an industrial environment.

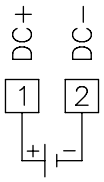
1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. With use of the lower input ranges or signal sources with high source impedance, the use of shielded cable may be necessary. This helps to guard against stray AC pick-up. Attach the shield to the input common of the meter. Line voltage monitoring and 5A CT applications do not usually require shielding.
3. To minimize potential noise problems, power the meter from the same power branch, or at least the same phase voltage as that of the signal source.
4. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
5. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
6. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC #FCOR0000)
   TDK # ZCAT3035-1330A
   Steward #28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC #LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom #1VR3
   Note: Reference manufacturer's instructions when installing a line filter.
7. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
8. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC#SNUB0000.

3.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC



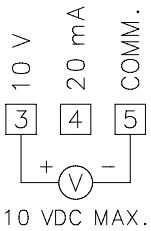
DC Power
Terminal 1: +VDC
Terminal 2: -VDC



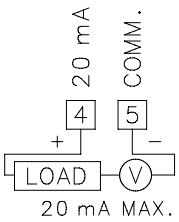
3.2 INPUT SIGNAL WIRING

DAG-AXV - INPUT SIGNAL WIRING

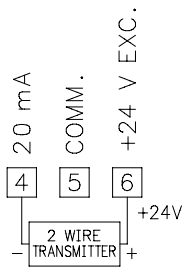
Voltage Signal (self powered)
Terminal 3: +VDC
Terminal 5: -VDC



Current Signal (self powered)
Terminal 4: +ADC
Terminal 5: -ADC

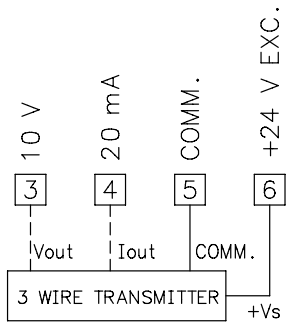


Current Signal (2 wire requiring excitation)
Terminal 4: -ADC
Terminal 6: +ADC



Current Signal (3 wire requiring excitation)
Terminal 4: +ADC (signal)
Terminal 5: -ADC (common)
Terminal 6: +Volt supply

Voltage Signal (3 wire requiring excitation)
Terminal 3: +VDC (signal)
Terminal 5: -VDC (common)
Terminal 6: +Volt supply



CAUTION: *Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated plug-in cards with respect to input common.*

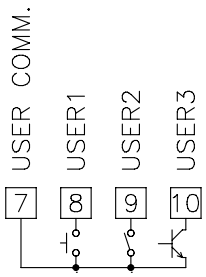
3.3 USER INPUT WIRING

Before connecting the wires, the User Input Logic Jumper should be verified for proper position. If not using User Inputs, then skip this section. Only the appropriate User Input terminal has to be wired.

Sinking Logic

Terminal 8-10: } Connect external switching device between
Terminal 7: } appropriate User Input terminal and User Comm.

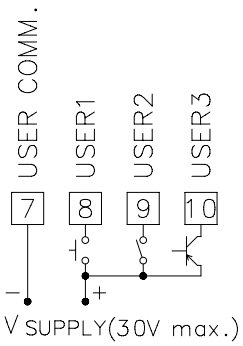
In this logic, the user inputs of the meter are internally pulled up to +5 V with 22 K resistance. The input is active when it is pulled low (<0 .9 V).



Sourcing Logic

Terminal 8-10: + VDC thru external switching device
Terminal 7: -VDC thru external switching device

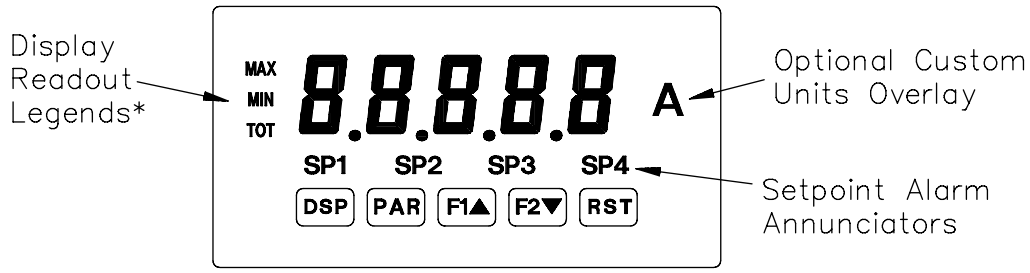
In this logic, the user inputs of the meter are internally pulled down to 0 V with 22 K resistance. The input is active when a voltage greater than 3.6 VDC is applied.



3.4 SETPOINT (ALARMS) WIRING
3.5 SERIAL COMMUNICATION WIRING
3.6 ANALOG OUTPUT WIRING

} ***See attachment "Serial Communication" for details.***

4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY



KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
DSP	Index display through max/min/total/input readouts	Quit programming and return to display mode
PAR	Access parameter list	Store selected parameter and index to next parameter
F1▲	Function key 1; hold for 3 seconds for Second Function 1**	Increment selected parameter value
F2▼	Function key 2; hold for 3 seconds for Second Function 2**	Decrement selected parameter value
RST	Reset (Function key)**	Hold with F1▲, F2▼ to scroll value by x1000

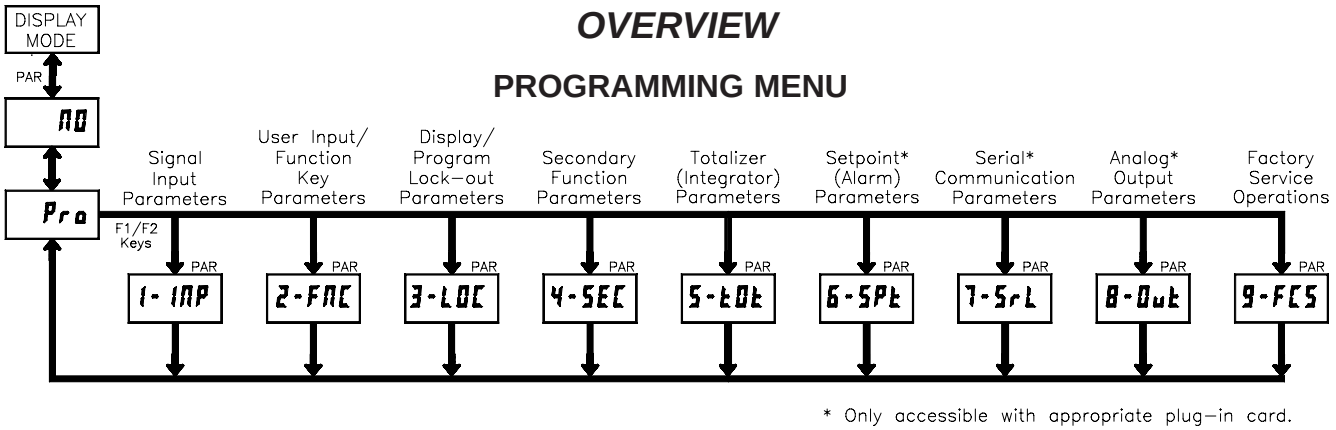
* Display Readout Legends may be locked out in Factory Settings.

** Factory setting for the F1, F2, and RST keys is NO mode.

5.0 PROGRAMMING THE METER

OVERVIEW

PROGRAMMING MENU



* Only accessible with appropriate plug–in card.

DISPLAY MODE

The meter normally operates in the Display Mode. In this mode, the meter displays can be viewed consecutively by pressing the **DSP** key. The annunciators to the left of the display indicate which display is currently shown; Max Value (MAX), Min Value (MIN), or Totalizer Value (TOT). Each of these displays can be locked from view through programming. (See Module 3) The Input Display Value is shown with no annunciator.

PROGRAMMING MODE

Two programming modes are available.

Full Programming Mode permits all parameters to be viewed and modified. Upon entering this mode, the front panel keys change to Programming Mode operations. This mode should not be entered while a process is running, since the meter functions and User Input response may not operate properly while in Full Programming Mode.

Quick Programming Mode permits only certain parameters to be viewed and/or modified. When entering this mode, the front panel keys change to Programming Mode operations, and all meter functions continue to operate properly. Quick Programming Mode is configured in Module 3. The Display Intensity Level "d-LEu" parameter is available in the Quick Programming Mode only when the security code is non-zero. For a description, see Module 9—Factory Service Operations. Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming Mode.

PROGRAMMING TIPS

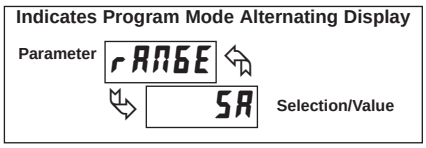
The Programming Menu is organized into nine modules (See above). These modules group together parameters that are related in function. It is recommended to begin programming with Module 1 and proceed through each module in sequence. Note that Modules 6 through 8 are only accessible when the appropriate plug-in option card is installed. If lost or confused while programming, press the **DSP** key to exit programming mode and start over. When programming is complete, it is recommended to record the meter settings on the Parameter Value Chart and lock-out parameter programming with a User Input or lock-out code. (See Modules 2 and 3 for lock-out details.)

FACTORY SETTINGS

Factory Settings may be completely restored in Module 9. This is a good starting point if encountering programming problems. Throughout the module description sections which follow, the factory setting for each parameter is shown below the parameter display. In addition, all factory settings are listed on the Parameter Value Chart following the programming section.

ALTERNATING SELECTION DISPLAY

In the module description sections which follow, the dual display with arrows appears for each programming parameter. This is used to illustrate the display alternating between the parameter (top display) and the parameter's Factory Setting (bottom display). In most cases, selections or value ranges for the parameter will be listed on the right.



STEP BY STEP PROGRAMMING INSTRUCTIONS:

PROGRAMMING MODE ENTRY (PAR KEY)

The Programming Mode is entered by pressing the **PAR** key. If this mode is not accessible, then meter programming is locked by either a security code or a hardware lock. (See Modules 2 and 3 for programming lock-out details.)

MODULE ENTRY (ARROW & PAR KEYS)

Upon entering the Programming Mode, the display alternates between Pro and the present module (initially no). The arrow keys (**F1▲** and **F2▼**) are used to select the desired module, which is then entered by pressing the **PAR** key.

PARAMETER (MODULE) MENU (PAR KEY)

Each module has a separate parameter menu. These menus are shown at the start of each module description section which follows. The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pro no. From this point, programming may continue by selecting and entering additional modules. (See **MODULE ENTRY** above.)

PARAMETER SELECTION ENTRY (ARROW & PAR KEYS)

For each parameter, the display alternates between the parameter and the present selection or value for that parameter. For parameters which have a list of selections, the arrow keys (**F1▲** and **F2▼**) are used to sequence through the list until the desired selection is displayed. Pressing the **PAR** key stores and activates the displayed selection, and also advances the meter to the next parameter.

NUMERICAL VALUE ENTRY (ARROW, RST & PAR KEYS)

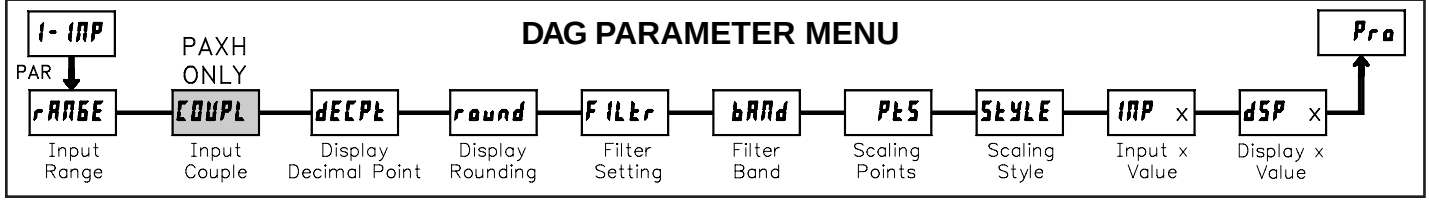
For parameters which require a numerical value entry, the arrow keys can be used to increment or decrement the display to the desired value. When an arrow key is pressed and held, the display automatically scrolls up or scrolls down. The longer the key is held, the faster the display scrolls.

The **RST** key can be used in combination with the arrow keys to enter large numerical values. When the **RST** key is pressed along with an arrow key, the display scrolls by 1000's. Pressing the **PAR** key stores and activates the displayed value, and also advances the meter to the next parameter.

PROGRAMMING MODE EXIT (DSP KEY or PAR KEY at Pro no)

The Programming Mode is exited by pressing the **DSP** key (from anywhere in the Programming Mode) or the **PAR** key (with Pro no displayed). This will commit any stored parameter changes to memory and return the meter to the Display Mode. If a parameter was just changed, the **PAR** key should be pressed to store the change before pressing the **DSP** key. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

5.1 MODULE 1 - SIGNAL INPUT PARAMETERS (1- INP)



Refer to the appropriate Input Range for the selected meter. Use only one Input Range, then proceed to Display Decimal Point.

DAG-AXV - INPUT RANGE

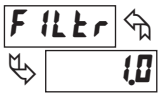
SELECTION	RANGE RESOLUTION
0.02A	±20.000 mA
10u	±10.000 V

Select the input range that corresponds to the external signal.

DISPLAY ROUNDING*

Rounding selections other than one, cause the Input Display to 'round' to the nearest rounding increment selected (ie. rounding of '5' causes 122 to round to 120 and 123 to round to 125). Rounding starts at the least significant digit of the Input Display. Remaining parameter entries (scaling point values, setpoint values, etc.) are not automatically adjusted to this display rounding selection.

FILTER SETTING*



0.0 to 25.0 seconds

The input filter setting is a time constant expressed in tenths of a second. The filter settles to 99% of the final display value within approximately 3 time constants. This is an Adaptive Digital Filter which is designed to steady the Input Display reading. A value of '0' disables filtering.

FILTER BAND*

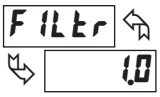
0.0 to 25.0 display units

The digital filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the digital filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a lar process change. The value of the band is in display units, independent of the Display Decimal Point position. A band setting of '0' keeps the digital filter permanently engaged.

DISPLAY ROUNDING*

Rounding selections other than one, cause the Input Display to 'round' to the nearest rounding increment selected (ie. rounding of '5' causes 122 to round to 120 and 123 to round to 125). Rounding starts at the least significant digit of the Input Display. Remaining parameter entries (scaling point values, setpoint values, etc.) are not automatically adjusted to this display rounding selection.

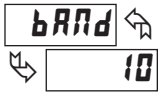
FILTER SETTING*



0.0 to 25.0 seconds

The input filter setting is a time constant expressed in tenths of a second. The filter settles to 99% of the final display value within approximately 3 time constants. This is an Adaptive Digital Filter which is designed to steady the Input Display reading. A value of '0' disables filtering.

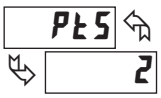
FILTER BAND*



0.0 to 25.0 display units

The digital filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the digital filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a large process change. The value of the band is in display units, independent of the Display Decimal Point position. A band setting of '0' keeps the digital filter permanently engaged.

SCALING POINTS*



2 to 16

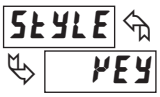
Linear - Scaling Points (2)

For linear processes, only 2 scaling points are necessary. It is recommended that the 2 scaling points be at opposite ends of the input signal being applied. The points do not have to be the signal limits. Display scaling will be linear between and continue past the entered points up to the limits of the Input Signal Jumper position. Each scaling point has a coordinate-pair of Input Value (*InP*) and an associated desired Display Value (*dSP*).

Nonlinear - Scaling Points (Greater than 2)

For non-linear processes, up to 16 scaling points may be used to provide a piece-wise linear approximation. (The greater the number of scaling points used, the greater the conformity accuracy.) The Input Display will be linear between scaling points that are sequential in program order. Each scaling point has a coordinate-pair of Input Value (*InP*) and an associated desired Display Value (*dSP*). Data from tables or equations, or empirical data could be used to derive the required number of segments and data values for the coordinate pairs. In the DAG-AXV software, several linearization equations are available.

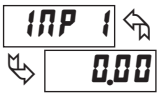
SCALING STYLE



PEY key-in data
APLY apply signal

If Input Values and corresponding Display Values are known, the Key-in (*PEY*) scaling style can be used. This allows scaling without the presence or changing of the input signal. If Input Values have to be derived from the actual input signal source or simulator, the Apply (*APLY*) scaling style must be used.

INPUT VALUE FOR SCALING POINT 1



- *19999* to *99999*

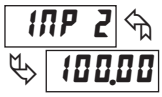
For Key-in (*PEY*), enter the known first Input Value by using the arrow keys. (The Input Range selection sets up the decimal location for the Input Value). For Apply (*APLY*), apply the input signal to the meter, adjust the signal source externally until the desired Input Value appears. In either method, press the **PAR** key to enter the value being displayed. The **DSP** key can be pressed without changing the previously stored *InP 1* value in the *APLY* style.

DISPLAY VALUE FOR SCALING POINT 1

- *19999* to *99999*

Enter the first coordinating Display Value by using the arrow keys. This is the same for *PEY* and *APLY* scaling styles. The decimal point follows the *dECPt* selection.

INPUT VALUE FOR SCALING POINT 2



- *19999* to *99999*

For Key-in (*PEY*), enter the known second Input Value by using the arrow keys. For Apply (*APLY*), adjust the signal source externally until the next desired Input Value appears. (Follow the same procedure if using more than 2 scaling points.)

DISPLAY VALUE FOR SCALING POINT 2

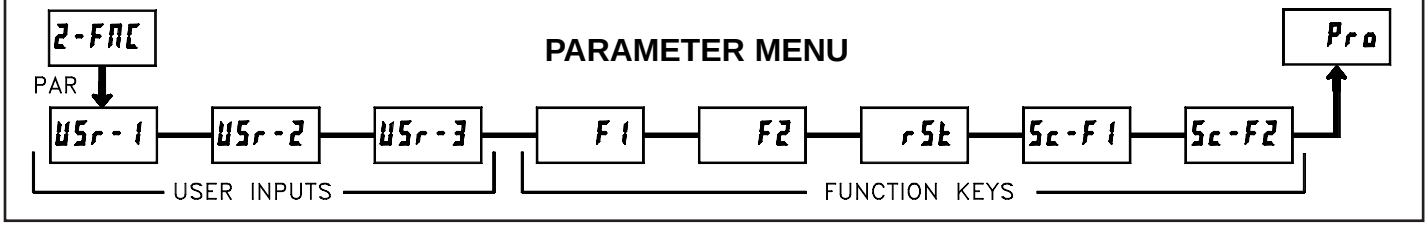
- *19999* to *99999*

Enter the second coordinating Display Value by using the arrow keys. This is the same for *PEY* and *APLY* scaling styles. (Follow the same procedure if using more than 2 scaling points.)

General Notes on Scaling

1. Input Values for scaling points should be confined to the limits of the Input Range Jumper position.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mA can not equal 0 and 10.)
   This is referred to as read out jumps (vertical scaled segments).
3. The same Display Value can correspond to more than one Input Value. (Example: 0 mA and 20 mA can equal 10.)
   This is referred to as readout dead zones (horizontal scaled segments).
4. The maximum scaled Display Value spread between range maximum and minimum is limited to 65,535. For example using +20 mA range the maximum +20 mA can be scaled to is 32,767 with 0 mA being 0 and Display Rounding of 1. (Decimal points are ignored.) The other half of 65,535 is for the lower half of the range 0 to -20 mA even if it is not used. With Display Rounding of 2, +20 mA can be scaled for 65,535 (32,767 x 2) but with even Input Display values shown.
5. For input levels beyond the first programmed Input Value, the meter extends the Display Value by calculating the slope from the first two coordinate pairs (*InP 1* / *dSP 1* & *InP2* / *dSP2*). If *InP 1* = 4 mA and *dSP 1* = 0, then 0 mA would be some negative Display Value. This could be prevented by making *InP 1* = 0 mA / *dSP 1* = 0, *InP2* = 4 mA / *dSP2* = 0, with *InP3* = 20 mA / *dSP3* = the desired high Display Value. The calculations stop at the limits of the Input Range Jumper position.
6. For input levels beyond the last programmed Input Value, the meter extends the Display Value by calculating the slope from the last two sequential coordinate pairs. If three coordinate pair scaling points were entered, then the Display Value calculation would be between *InP2* / *dSP2* & *InP3* / *dSP3*. The calculations stop at the limits of the Input Range Jumper position.

5.2 MODULE 2 - USER INPUT AND FRONT PANEL FUNCTION KEY PARAMETERS (2-FnC)



The three user inputs are individually programmable to perform specific meter control functions. While in the Display Mode or Program Mode, the function is executed the instant the user input transitions to the active state.

The front panel function keys are also individually programmable to perform specific meter control functions. While in the Display Mode, the primary function is executed the instant the key is pressed. Holding the function key for three seconds executes a secondary function. It is possible to program a secondary function without a primary function.

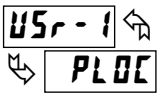
In most cases, if more than one user input and/or function key is programmed for the same function, the maintained (level trigger) actions will be performed while at least one of those user inputs or function keys are activated. The momentary (edge trigger) actions will be performed every time any of those user inputs or function keys transition to the active state.

***Note**: In the following explanations, not all selections are available for both user inputs and front panel function keys. Alternating displays are shown with each selection. Those selections showing both displays are available for both. If a display is not shown, it is not available for that selection. USr-1 will represent all three user inputs. F1 will represent all five function keys.*

NO FUNCTION

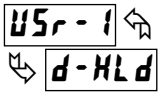
No function is performed if activated. This is the factory setting for all user inputs and function keys. No function can be selected without affecting basic start-up.

PROGRAMMING MODE LOCK-OUT



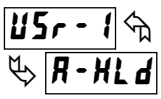
Programming Mode is locked-out, as long as activated (maintained action). A security code can be configured to allow programming access during lock-out.

HOLD DISPLAY



The shown display is held but all other meter functions continue as long as activated (maintained action).

HOLD ALL FUNCTIONS



The meter disables processing the input, holds all display contents, and locks the state of all outputs as long as activated (maintained action). The serial port continues data transfer.

ZERO (TARE) DISPLAY

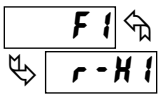
The Zero (Tare) Display provides a way to zero the Input Display value at various input levels, causing future Display readings to be offset. This function is useful in weighing applications where the container or material on the scale should not be included in the next measurement value. When activated (momentary action), rESEt flashes and the Display is set to zero. At the same time, the Display value (that was on the display before the Zero Display) is subtracted from the Display Offset Value and is automatically stored as the new Display Offset Value (OFFSt). If another Zero (tare) Display is performed, the display will again change to zero and the Display reading will shift accordingly.

RELATIVE/ABSOLUTE DISPLAY

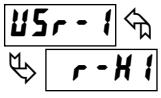
This function will switch the Input Display between Relative and Absolute. The Relative is a net value that includes the Display Offset Value. The Input Display will normally show the Relative unless switched by this function. Regardless of the display selected, all meter functions continue to operate based on relative values. The Absolute is a gross value (based on Module 1 **DSP** and **INP** entries) without the Display Offset Value. The Absolute display is selected as long as the user input is activated (maintained action) or at the transition of the function key (momentary action). When the user input is released, or the function key is pressed again, the input display switches back to Relative display. AbS (absolute) or rEL (relative) is momentarily displayed at transition to indicate which display is active.

RESET MAXIMUM

When activated (momentary action), rESEt flashes and the Maximum resets to the present Input Display value. The Maximum function then continues from that value. This selection functions independent of the selected display.

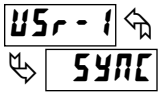


RESET, SELECT, ENABLE MAXIMUM DISPLAY



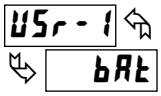
When activated (momentary action), the Maximum value is set to the present Input Display value. Maximum continues from that value while active (maintained action). When the user input is released, Maximum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Maximum function.

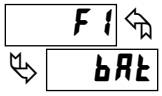
SYNCHRONIZE METER READING



The meter suspends all functions as long as activated (maintained action). When the user input is released, the meter synchronizes the restart of the A/D with other processes or timing events.

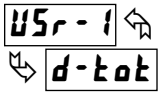
STORE BATCH READING IN TOTALIZER





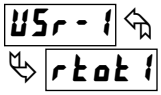
The Input Display value is one time added (batched) to the Totalizer at transition to activate (momentary action). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. When this function is selected, the normal operation of the Totalizer is overridden.

SELECT TOTALIZER DISPLAY



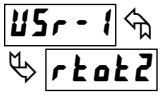
The Totalizer display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Totalizer continues to function including associated outputs independent of being displayed.

RESET TOTALIZER



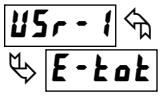
When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer then continues to operate as it is configured. This selection functions independent of the selected display.

RESET AND ENABLE TOTALIZER



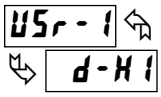
When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer continues to operate while active (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

ENABLE TOTALIZER



The Totalizer continues to operate as long as activated (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

SELECT MAXIMUM DISPLAY



The Maximum display is selected as long as activated (maintained action). When the user input is released, the Input Display returns. The **DSP** key overrides the active user input. The Maximum continues to function independent of being displayed.

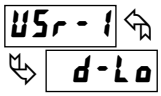
SETPOINT SELECTIONS

The following selections are accessible only with the Setpoint plug-in card installed. Refer to the Setpoint Card Bulletin shipped with the Setpoint plug-in card for an explanation of their operation.

Setpoint Card Only

- **LISt - Select main or alternate setpoints**
- **r-1 - Reset Setpoint 1 (Alarm 1)**
- **r-2 - Reset Setpoint 2 (Alarm 2)**
- **r-3 - Reset Setpoint 3 (Alarm 3)**
- **r-4 - Reset Setpoint 4 (Alarm 4)**
- **r-34 - Reset Setpoint 3 & 4 (Alarm 3 & 4)**
- **r-234 - Reset Setpoint 2, 3 & 4 (Alarm 2, 3 & 4)**
- **r-ALL - Reset Setpoint All (Alarm All)**

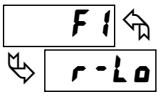
SELECT MINIMUM DISPLAY



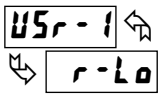
The Minimum display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Minimum continues to function independent of being displayed.

RESET MINIMUM

When activated (momentary action), rESEt flashes and the Minimum reading is set to the present Input Display value. The Minimum function then continues from that value. This selection functions independent of the selected display.

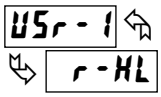


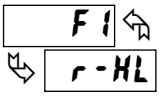
RESET, SELECT, ENABLE MINIMUM DISPLAY



When activated (momentary action), the Minimum value is set to the present Input Display value. Minimum continues from that value while active (maintained action). When the user input is released, Minimum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Minimum function.

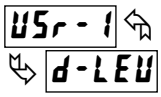
RESET MAXIMUM AND MINIMUM





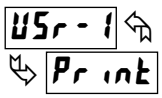
When activated (momentary action), rESEt flashes and the Maximum and Minimum readings are set to the present Input Display value. The Maximum and Minimum function then continues from that value. This selection functions independent of the selected display.

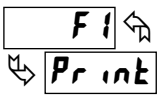
CHANGE DISPLAY INTENSITY LEVEL



When activated (momentary action), the display intensity changes to the next intensity level (of 4). The four levels correspond to Display Intensity Level (d-LEu) settings of 0, 3, 8, and 15. The intensity level, when changed via the User Input/ Function Key, is not retained at power-down, unless Quick Programming or Full Programming mode is entered and exited. The meter will power-up at the last saved intensity level.

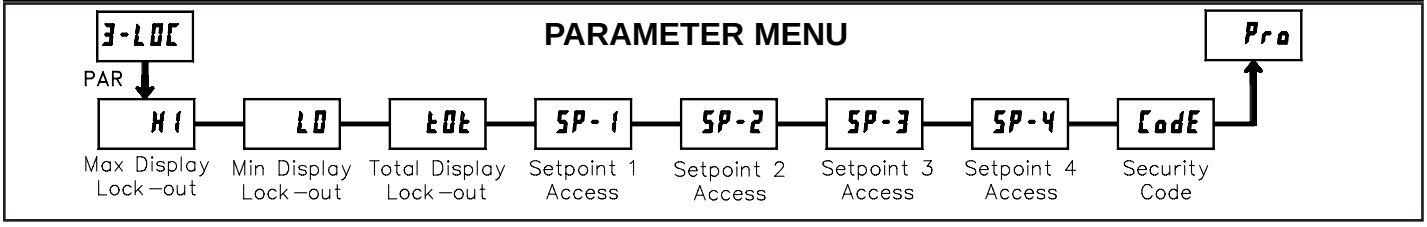
PRINT REQUEST





The meter issues a block print through the serial port when activated. The data transmitted during a print request is programmed in Module 7. If the user input is still active after the transmission is complete (about 100 msec), an additional transmission occurs. As long as the user input is held active, continuous transmissions occur.

5.3 MODULE 3 - DISPLAY AND PROGRAM LOCK-OUT PARAMETERS (3-LOC)



Module 3 is the programming for Display lock-out and "Full" and "Quick" Program lock-out.

When in the Display Mode, the available displays can be read consecutively by repeatedly pressing the **DSP** key. An annunciator indicates the display being shown. These displays can be locked from being visible. It is recommended that the display be set to LOC when the corresponding function is not used.

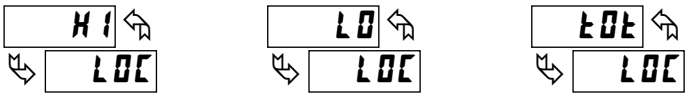
SELECTION	DESCRIPTION
rEd	Visible in Display Mode
LOC	Not visible in Display Mode

"Full" Programming Mode permits all parameters to be viewed and modified. This Programming Mode can be locked with a security code and/or user input. When locked and the **PAR** key is pressed, the meter enters a Quick Programming Mode. In this mode, the setpoint values can still be read and/or changed per the selections below. The Display Intensity Level (d-LEU) parameter also appears whenever Quick Programming Mode is enabled and the security code is greater than zero.

SELECTION	DESCRIPTION
rEd	Visible but not changeable in Quick Programming Mode
Ent	Visible and changeable in Quick Programming Mode
LOC	Not visible in Quick Programming Mode

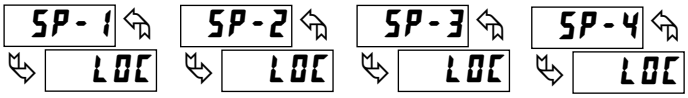
* *Factory Setting can be used without affecting basic start-up.*

MAXIMUM DISPLAY LOCK-OUT*
MINIMUM DISPLAY LOCK-OUT*
TOTALIZER DISPLAY LOCK-OUT*



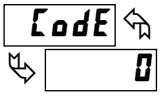
These displays can be programmed for LOC or rEd. When programmed for LOC, the display will not be shown when the **DSP** key is pressed regardless of Program Lock-out status. It is suggested to lock-out the display if it is not needed. The associated function will continue to operate even if its display is locked-out.

SP-1 SP-2 SP-3 SP-4 SETPOINT ACCESS*



The setpoint displays can be programmed for LOC, rEd or EnL (See the following table). Accessible only with the Setpoint plug-in card installed.

PROGRAM MODE SECURITY CODE*



By entering any non-zero value, the prompt CodE 0 will appear when trying to access the Program Mode. Access will only be allowed after entering a matching security code or universal code of 222. With this lock-out, a user input would not have to be configured for Program Lock-out. However, this lock-out is overridden by an inactive user input configured for Program Lock-out.

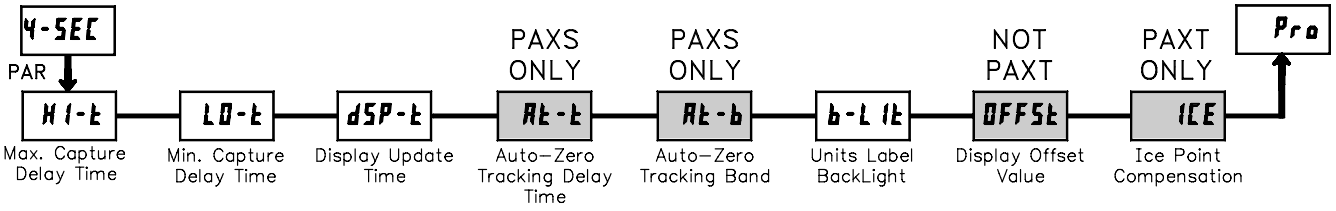
PROGRAMMING MODE ACCESS

SECURITY CODE	USER INPUT CONFIGURED	USER INPUT STATE	WHEN PAR KEY IS PRESSED	"FULL" PROGRAMMING MODE ACCESS
0	not PLOC	————	"Full" Programming	Immediate access.
>0	not PLOC	————	Quick Programming w/Display Intensity	After Quick Programming with correct code # at CodE prompt.
>0	PLOC	Active	Quick Programming w/Display Intensity	After Quick Programming with correct code # at CodE prompt.
>0	PLOC	Not Active	"Full" Programming	Immediate access.
0	PLOC	Active	Quick Programming	No access
0	PLOC	Not Active	"Full" Programming	Immediate access.

Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming (all meter parameters are accessible).

5.4 MODULE 4 - SECONDARY FUNCTION PARAMETERS (4-SEC)

PARAMETER MENU



MAX CAPTURE DELAY TIME*

H1-t / 0.0 — 0.0 to 3275.0 sec.

When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.

MIN CAPTURE DELAY TIME*

LO-t / 0.0 — 0.0 to 3275.0 sec.

When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.

DISPLAY UPDATE RATE*

dSP-t / 2 — 1 2 5 10 20 updates/sec.

This parameter determines the rate of display update. When set to 20 updates/second, the internal re-zero compensation is disabled, allowing for the fastest possible output response.

UNITS LABEL BACKLIGHT*

OFF — ON OFF

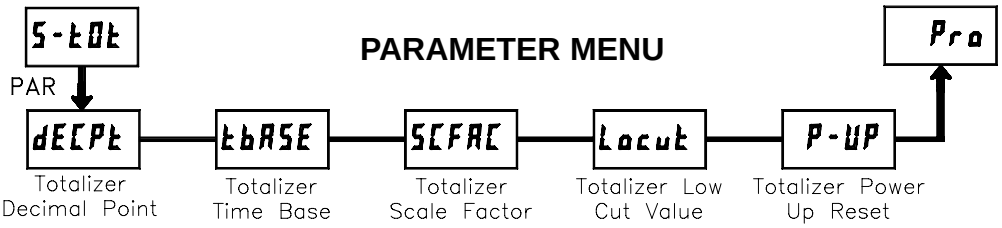
which can be installed in to the meter's bezel display assembly. The backlight for these custom units is activated by this parameter.

DISPLAY OFFSET VALUE*

OFFSt / 0.00 — -19999 to 19999

Unless a Zero Display was performed or an offset from Module 1 scaling is desired, this parameter can be skipped. The Display Offset Value is the difference from the Absolute (gross) Display value to the Relative (net) Display value for the same input level. The meter will automatically update this Display Offset Value after each Zero Display. The Display Offset Value can be directly keyed-in to intentionally add or remove display offset. See Relative / Absolute Display and Zero Display explanations in Module 2.

5.5 MODULE 5 - TOTALIZER (INTEGRATOR) PARAMETERS (5-tOt)



The totalizer accumulates (integrates) the Input Display value using one of two modes. The first is using a time base. This can be used to compute a time-temperature product. The second is through a user input or function key programmed for Batch (one time add on demand). This can be used to provide a readout of temperature integration, useful in curing and sterilization applications. If the Totalizer is not needed, its display can be locked-out and this module can be skipped during programming.

TOTALIZER DECIMAL POINT*

dECPt / 0.00 — 0 0.0 0.00 0.000 0.0000

For most applications, this matches the Input Display Decimal Point (dECPt). If a different location is desired, refer to Totalizer Scale Factor.

TOTALIZER TIME BASE

tbASE / .1M — SEC - seconds (÷ 1) hour - hours (÷ 3600) .1M - minutes (÷ 60) dAY - days (÷ 86400)

This is the time base used in Totalizer accumulations. If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER SCALE FACTOR*

SCFAC / 1.000 — 0.001 to 65.000

For most applications, the Totalizer reflects the same decimal point location and engineering units as the Input Display. In these cases, the Totalizer Scale Factor is 1.000. The Totalizer Scale Factor can be used to scale the Totalizer to a different value than the Input Display. Common possibilities are:

1. Changing decimal point location (example tenths to whole)
2. Average over a controlled time frame.

Details on calculating the scale factor are shown later.

If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER LOW CUT VALUE*

Locut / -19999 — -19999 to 99999

A low cut value disables Totalizer when the Input Display value falls below the value programmed.

TOTALIZER POWER UP RESET*

P-UP / nO — nO Do not reset buffer; rSt Reset buffer

The Totalizer can be reset to zero on each meter power-up by setting this parameter to reset.

***** *Factory Setting can be used without affecting basic start-up.*

TOTALIZER HIGH ORDER DISPLAY

When the total exceeds 5 digits, the front panel annunciator **TOT** flashes. In this case, the meter continues to totalize up to a 9 digit value. The high order 4 digits and the low order 5 digits of the total are displayed alternately. The letter "h" denotes the high order display.

TOTALIZER BATCHING

The Totalizer Time Base and scale factor are overridden when a user input or function key is programmed for store batch (bAt). In this mode, when the user input or function key is activated, the Input Display reading is one time added to the Totalizer (batch). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. This is useful in weighing operations, when the value to be added is not based on time but after a filling event.

TOTALIZER USING TIME BASE

Totalizer accumulates as defined by:

$$\frac{\text{Input Display} \times \text{Totalizer Scale Factor}}{\text{Totalizer Time Base}}$$

Where:
- Input Display - the present input reading
- Totalizer Scale Factor - 0.001 to 65.000
- Totalizer Time Base - (the division factor of tbASE)

Example: The input reading is at an average of 10.0°C per hour. The Totalizer is used to verify this average reading in a controlled time frame of 4 hours. Because the Input Display and Totalizer are both in tenths of °C, the Totalizer Scale Factor is 1. However, the Totalizer Time Base is hours (3600) divided by the 4 hours in the controlled time frame to yield a Totalizer Scale Factor of 0.250. By placing these values in the equation, the Totalizer will accumulate every second as follows:

$\frac{10.0 \times 0.250}{3600}$ = 0.00069 accumulates each second

This results in:
- 0.04167 accumulates each minute
- 2.5 accumulates each hour
- 10.0 reached at the end of 4 hours

TOTALIZER SCALE FACTOR CALCULATION EXAMPLES

1. When changing the Totalizer Decimal Point (dECPt) location from the Input Display Decimal Point (dECPt), the required Totalizer Scale Factor is multiplied by a power of ten.

Example: Input (dECPt) = 0.0

Totalizer dECPt	Scale Factor
0.00	10
0.0	1
0	.1
x10	.01
x100	.001

Input (dECPt) = 0.00

Totalizer dECPt	Scale Factor
0.000	10
0.00	1
0.0	.1
0	.01
x10	.001

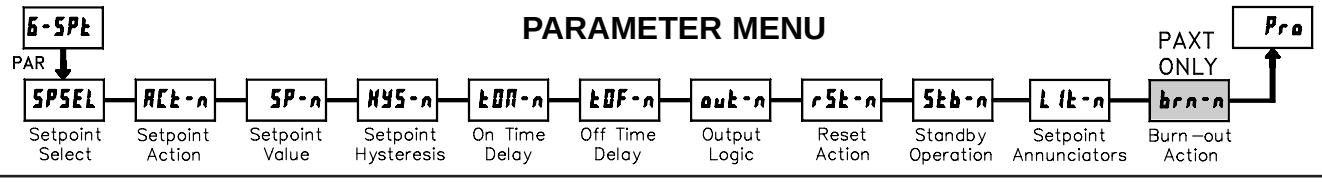
(x = Totalizer display is round by tens or hundreds)

2. To obtain an average reading within a controlled time frame, the selected Totalizer Time Base is divided by the given time period expressed in the same timing units.

Example: Average temperature per hour in a 4 hour period, the scale factor would be 0.250. To achieve a controlled time frame, connect an external timer to a user input programmed for rtotZ. The timer will control the start (reset) and the stopping (hold) of the totalizer.

Modules 6, 7, and 8 are accessible only with the appropriate plug-in cards installed. A quick overview of each Module is listed below. Refer to the corresponding plug-in card bulletin for a more detailed explanation of each parameter selection.

5.6 MODULE 6 - SETPOINT (ALARM) PARAMETERS (6-SPt)

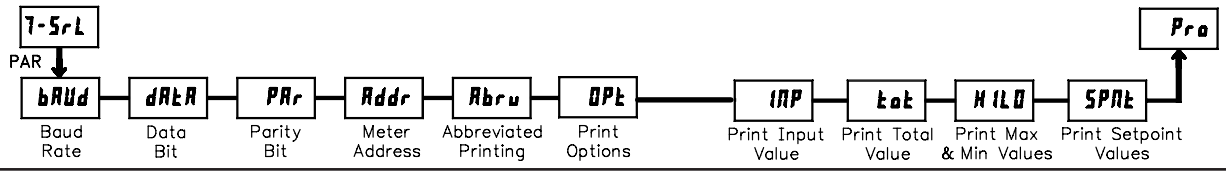


Repeat programming for each setpoint.

SPSEL - SELECT SETPOINT	no SP-1	SP-3
	SP-2	SP-4
ACt-n - SETPOINT ACTION	OFF	dE-H I
	Ab-H I	dE-LO
	Ab-LO	bAnd
	AU-H I	toLo
	AU-LO	toH I
SP-n - SETPOINT VALUE	-19999 to	99999
HYS-n - SETPOINT HYSTERESIS	1 to	65000

tON-n - ON TIME DELAY	0.0 to	3275.0 sec
tOF-n - OFF TIME DELAY	0.0 to	3275.0 sec
out-n - OUTPUT LOGIC	nor	rEu
rSt-n - RESET ACTION	AUto	LAtC2
	LAtC I	
Stb-n - STANDBY OPERATION	no	YES
L It-n - SETPOINT ANNUNCIATORS	OFF	rEu
	nor	FLASH

5.7 MODULE 7 - SERIAL COMMUNICATIONS PARAMETERS (7-SrL)

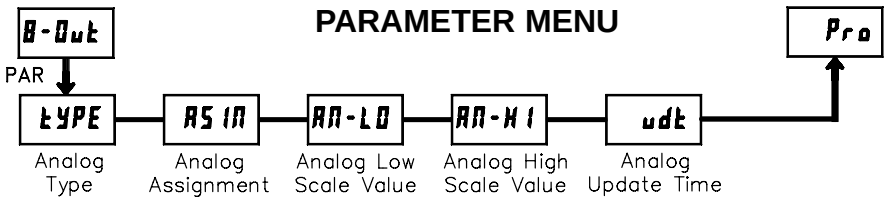


This module is for RS232 and RS485.

bAUd - BAUD RATE	300	4800
	600	9600
	1200	19200
	2400	
dAtA - DATA BITS	7	8
PAr - PARITY BIT	Odd	no
	EUEN	

Addr - METER ADDRESS	0 to	99
Abru - ABBREVIATED PRINTING	no	YES
OPt - PRINT OPTIONS	no	
	YES	
	INP	HILO
	tot	SPNt

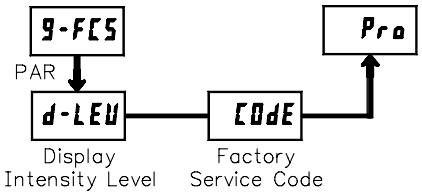
5.8 MODULE 8 - ANALOG OUTPUT PARAMETERS (8-Out)



tYPE - ANALOG TYPE	0-20	0-10
	4-20	
AS IN - ANALOG ASSIGNMENT	INP	LO
	H I	tot

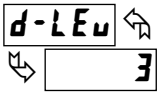
AN-LO - ANALOG LOW SCALE VALUE	-19999 to	99999
AN-H I - ANALOG HIGH SCALE VALUE	-19999 to	99999
udt - ANALOG UPDATE TIME	0.0 to	10.0 sec.

5.9 MODULE 9 - FACTORY SERVICE OPERATIONS (9-FCS)



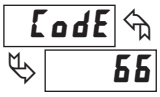
PARAMETER MENU

DISPLAY INTENSITY LEVEL



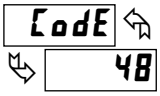
Enter the desired Display Intensity Level (0-15) by using the arrow keys. The display will actively dim or brighten as the levels are changed. This parameter also appears in Quick Programming Mode when enabled.

RESTORE FACTORY DEFAULTS



Use the arrow keys to display CodE 66 and press **PAR**. The meter will display rESEt and then return to CodE 50. Press **DSP** key to return to Display Mode. This will overwrite all user settings with the factory settings.

CALIBRATION



The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed in Module 1. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter.

When recalibration is required (generally every 2 years), it should only be performed by qualified technicians using appropriate equipment. Calibration does not change any user programmed parameters. However, it may affect the accuracy of the input signal values previously stored using the Apply (APLY) Scaling Style.

Calibration may be aborted by disconnecting power to the meter before exiting Module 9. In this case, the existing calibration settings remain in effect.

DAG-AXV - Input Calibration

***WARNING**: Calibration of this meter requires a signal source with accuracy of 0.01% or better and an external meter with an accurc of 0.005% or better.*

Before starting, verify that the precision signal source is connected to the correct terminals and ready. Allow a 30 minute warm-up period before calibrating the meter. no and **PAR** can be chosen to exit the calibration mode without any changes taking place.

Then perform the following procedure:

1. Use the arrow keys to display CodE 48 and press **PAR**.
2. Choose the range to be calibrated by using the arrow keys and press **PAR**. (no and **PAR** can be chosen to exit the calibration mode without any changes taking place.)
3. When the zero range limit appears on the display, apply the appropriate:
   - Voltage range: dead short applied
   - Current range: open circuit
4. Press **PAR** and ---- will appear on the display for about 10 seconds.
5. When the top range limit appears on the display, apply the appropriate:
   - Voltage range: 10 VDC
   - Current range: 20 mADC
6. Press **PAR** and ---- will appear on the display for about 10 seconds.
7. When no appears, press **PAR** twice.
8. If the meter is not field scaled, then the input display should match the value of the input signal.
9. Repeat the above procedure for each input range to be calibrated.

ANALOG OUTPUT CARD CALIBRATION

Before starting, verify that the precision voltmeter (voltage output) or current meter (current output) is connected and ready. Perform the following procedure:

1. Use the arrow keys to display CodE 48 and press **PAR**.
2. Use the arrow keys to choose OUt and press **PAR**.
3. Using the chart below, step through the five selections to be calibrated. At each prompt, use the DAG arrow keys to adjust the external meter display to match the selection being calibrated. When the external reading matches, or if this range is not being calibrated, press **PAR**.

SELECTION	EXTERNAL METER	ACTION
0.0_A	0.00	Adjust if necessary, press **PAR**
4.0_A	4.00	Adjust if necessary, press **PAR**
20.0_A	20.00	Adjust if necessary, press **PAR**
0.0u	0.00	Adjust if necessary, press **PAR**
10.0u	10.00	Adjust if necessary, press **PAR**

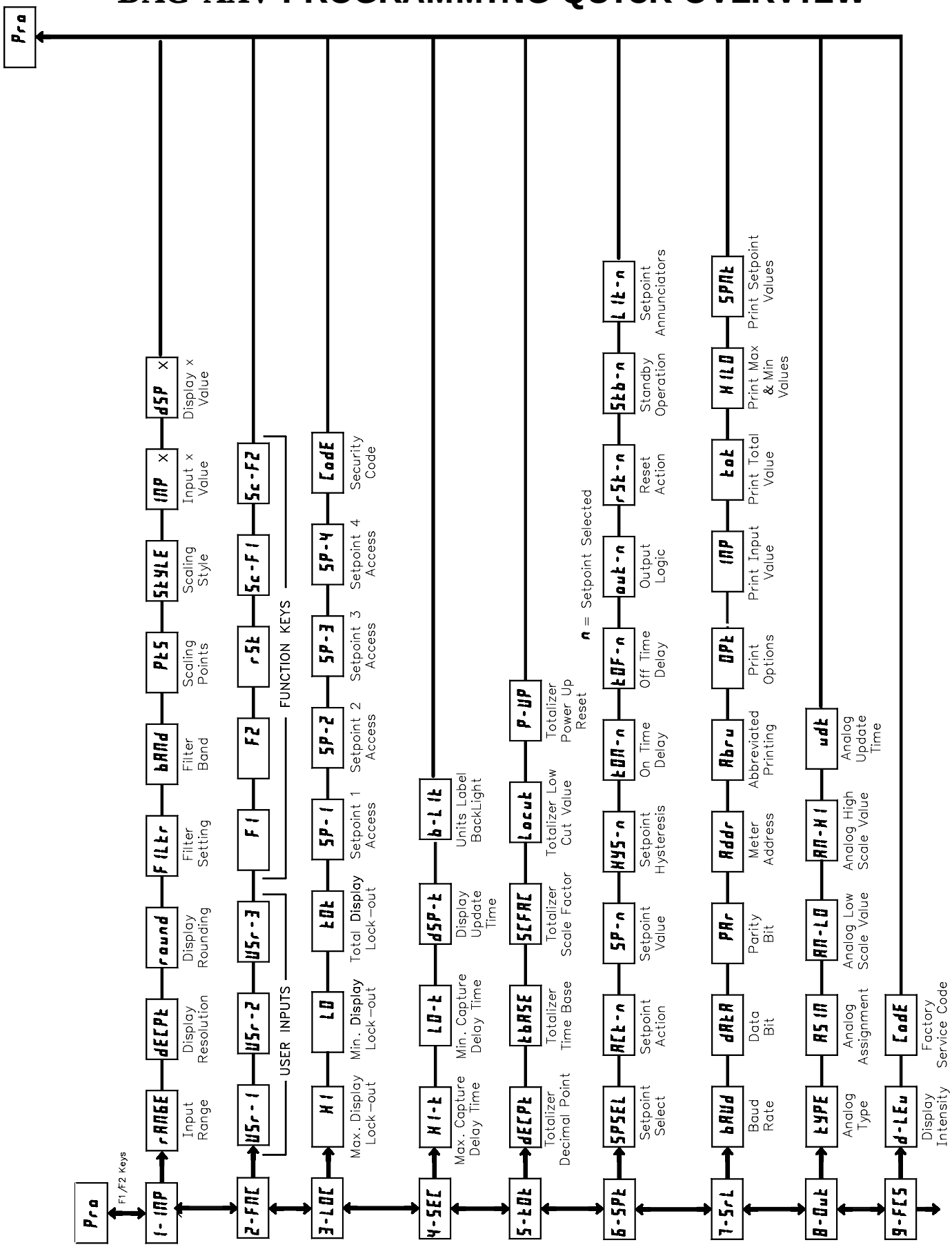
4. When no appears remove the external meters and press **PAR** twice.

TROUBLESHOOTING

PROBLEM	REMEDIES
NO DISPLAY	CHECK: Power level, power connections
PROGRAM LOCKED-OUT	CHECK: Active (lock-out) user input ENTER: Security code requested
MAX, MIN, TOT LOCKED-OUT	CHECK: Module 3 programming
INCORRECT INPUT DISPLAY VALUE	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level, Module 4 Display Offset is zero, press DSP for Input Display PERFORM: Module 9 Calibration (If the above does not correct the problem.)
“OLOL” in DISPLAY (SIGNAL HIGH)	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level
“ULUL” in DISPLAY (SIGNAL LOW)	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level
JITTERY DISPLAY	INCREASE: Module 1 filtering, rounding, input range CHECK: Wiring is per EMC installation guidelines
MODULES or PARAMETERS NOT ACCESSIBLE	CHECK: Corresponding plug-in card installation
ERROR CODE (Err 1-4)	PRESS: Reset KEY (If cannot clear contact factory.)
DISPLAY ZERO'S AT LEVELS BELOW 1% OF RANGE	PROGRAM: Module 4 as Hi-t: 0.0 LO-t: 3271.1 (to disable zero chop feature)

For further assistance, contact technical support at the appropriate company numbers listed.

DAG-AXV PROGRAMMING QUICK OVERVIEW



SERIAL COMMUNICATIONS PLUG-IN OPTION CARDS

DESCRIPTION

This bulletin serves as a guide for the installation, configuration and operation of the RS232 and RS485 cards for the DAG family of meters. Only one communication card can be used at a time.

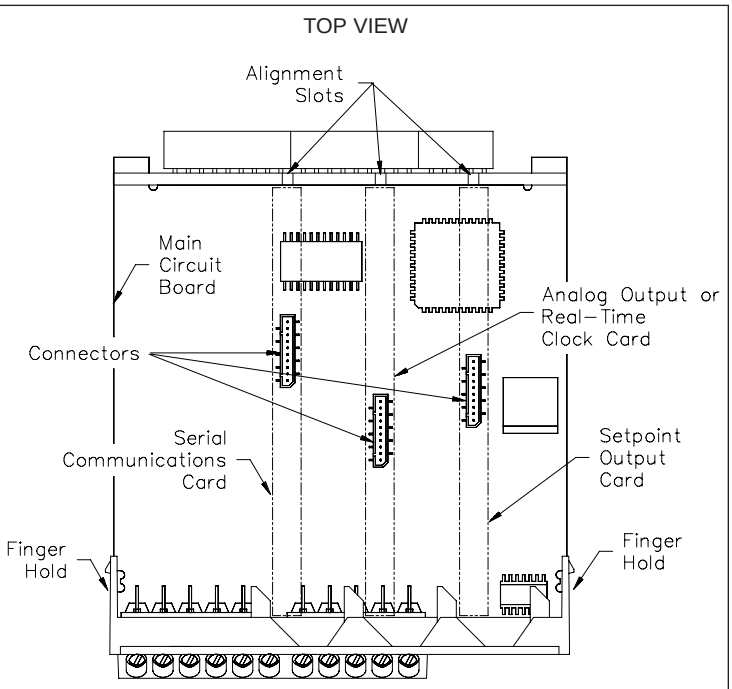
The DAG meter can be fitted with up to three different option cards. The slot bays of the option cards are dedicated to a particular card function. The option card functions are: serial communications, analog output and setpoint output. Only one card from each function category can be installed into the meter.

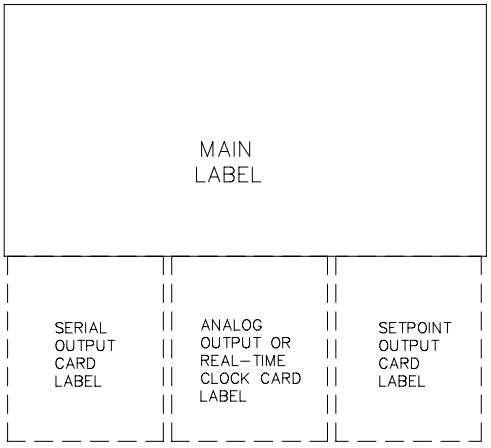
INSTALLING AN OPTION CARD

***Caution**: The option and main circuit cards contain static sensitive components. Before handling the cards, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the cards at a static controlled clean workstation. Also, handle the cards by the edges only. Dirt, oil or other contaminants that may contact the cards can adversely affect circuit operation.*

***Warning**: Exposed line voltage exists on the circuit boards. Remove all power to the meter AND load circuits before accessing the unit.*

1. Remove the main assembly from the rear of the case. Squeeze the finger holds on the rear cover, or use a small screwdriver to depress the side latches to release it from the case. It is not necessary to separate the rear cover from the main circuit card.
2. Locate the option card connector for the type of option card to be installed. Hold the unit by the rear connector, not the display board, when installing an option card.
3. Install the option card by aligning the option card connector with the slot bay in the rear cover. The cards are keyed by position with different main board connector locations. Be sure the connector is fully engaged and the tab on the option card rests in the alignment slot on the display board.
4. Slide the assembly back into the case. Be sure the rear cover latches fully into the case.
5. Apply the option card label to the bottom side of the meter. **Do not cover the vents on the top surface of the meter.** The surface of the case must be clean for the label to adhere properly. Apply the label to the area designated by the large case label.





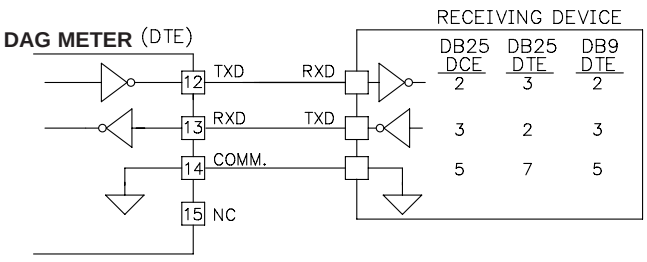
SPECIFICATIONS

RS485 Communication Card
- **Type**: RS485 multi-point balanced interface
- **Isolation To Sensor & User Input Commons**: 500 Vrms for 1 min.
  Working Voltage: 50 V. Not Isolated from all other commons.
- **Baud Rate**: 300 to 19.2k
- **Data Format**: 7/8 bits; odd, even, or no parity
- **Bus Address**: 0 to 99, max 32 meters per line
- **Transmit Delay**: Selectable; 2 - 50 msec or 50 - 100 msec

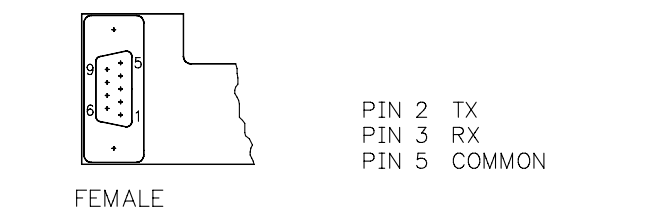
RS232 Communication Card
- **Type**: RS232 half duplex
- **Isolation To Sensor & User Input Commons**: 500 Vrms for 1 min.
  Working Voltage: 50 V. Not Isolated from all other commons.
- **Baud Rate**: 300 to 19.2k
- **Data Format**: 7/8 bits; odd, even or no parity

WIRING CONNECTIONS

RS232 Communications



Terminal Block Connection Figure



Extended Comms Connection Figure

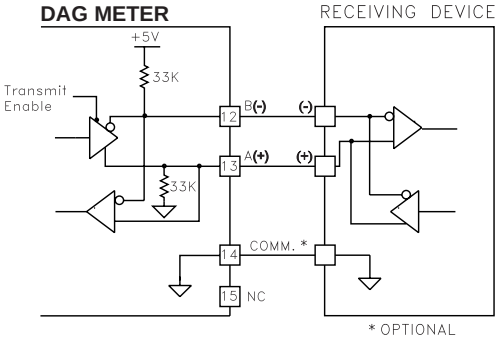
RS232 is intended to allow only two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The DAG emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection. Most printers emulate a DCE device while most computers emulate a DTE device.

Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

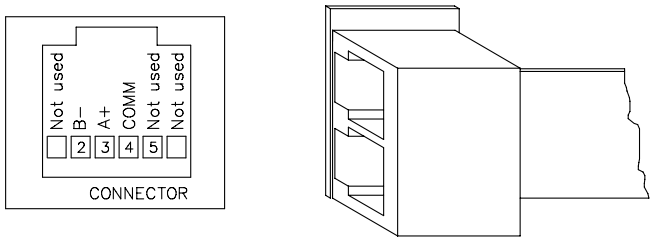
As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is “busy”. The receiving device asserts that it is busy by setting the RXD line into a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving device.

RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the DAG is limited to 19.2k baud). The same pair of wires is used to both transmit and receive data. An RS485 bus is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.



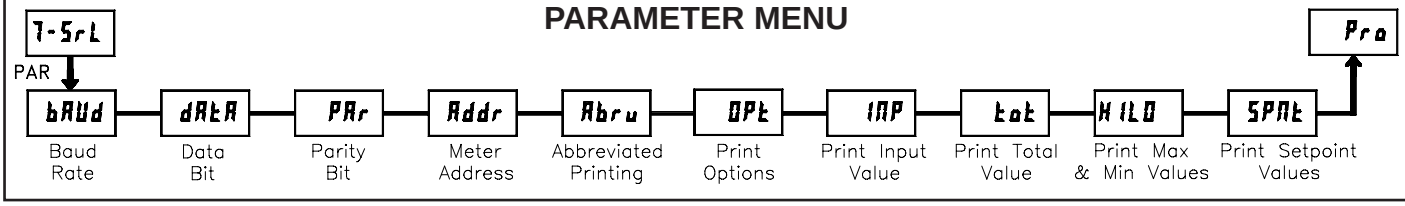
Terminal Block Connection Figure



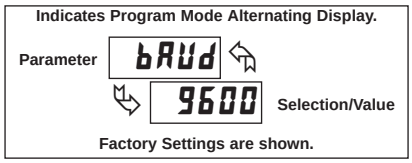
Extended Comms Connection Figure

MODULE 7 - SERIAL COMMUNICATIONS PARAMETERS (7-SrL)

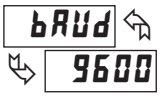
PARAMETER MENU



It is necessary to match the DAG meter's serial communications parameters to the host's parameters before communications can be established. This is accomplished by using the DAG front panel keys to enter 7-SrL.



BAUD RATE



300 1200 4800 19200
600 2400 9600

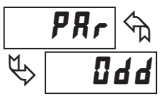
Set the baud rate to match that of other serial communications equipment. Normally, the baud rate is set to the highest value that all of the serial communications equipment is capable of transmitting.

DATA BIT

7 8

Select either 7 or 8 bit data word lengths. Set the word length to match that of other serial communication equipment. Since the meter receives and transmits 7-bit ASCII encoded data, 7 bit word length is sufficient to request and receive data from the meter.

PARITY BIT



Odd EVEN no

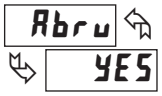
Set the parity bit to match that of the other serial communications equipment used. The meter ignores the parity when receiving data, and sets the parity bit for outgoing data. If no parity is selected with 7-bit word length the meter transmits and receives data with 2 stop bits. (For example: 10 bit frame with mark parity)

METER ADDRESS

0 to 99

Enter the serial node address. With a single unit on a bus, an address is not needed and a value of zero can be used (RS232 applications). Otherwise, with multiple bussed units, a unique address number must be assigned to each meter. The node address applies specifically to RS485 applications.

ABBREVIATED PRINTING



YES no

Select abbreviated transmissions (numeric only) or full field transmission. When the data from the meter is sent directly to a terminal for display, the extra characters that are sent identify the nature of the meter parameter displayed. In this case, select no. When the data from the meter goes to a computer, it may be desirable to suppress the node address and mnemonic when transmitting. In this case, set this parameter to YES.

PRINT OPTIONS

YES no

YES - Enters the sub-menu to select those meter parameters to appear in the block print. For each parameter in the sub-menu select YES for the parameter to appear with the block print, and no to disable the parameter.

*Setpoints 1-4 are setpoint plug-in card dependent.

Input Value	InP	YES	no
Max and Min Values	HILO	YES	no
Total Value	tot	YES	no
Setpoint values*	SPnt	YES	no

Sending Commands and Data

When sending commands to the meter, a string containing at least one command character must be constructed. A command string consists of a command character, a value identifier, numerical data (if writing data to the meter) followed by a the command terminator character * or $.

Command Chart

Command	Description	Notes
N	Node Address Specifier	Address a specific meter. Must be followed by one or two digit node address. Not required when node address = 0.
T	Transmit Value (read)	Read a register from the meter. Must be followed by register ID character.
V	Value change (write)	Write to register of the meter. Must be followed by register ID character and numeric data.
R	Reset	Reset a register or output. Must be followed by register ID character
P	Block Print Request (read)	Initiates a block print output. Registers are defined in programming.

Register Identification Chart

ID	Value Description	Register ID	Applicable Commands/Comments	
A	Input	INP	T, P	
B	Total	TOT	T, P, R	(Reset command resets total to zero)
C	Max Input	MAX	T, P, R	(Reset command resets MAX to current reading)
D	Min Input	MIN	T, P, R	(Reset command resets MIN to current reading)
E	Setpoint 1	SP1	T, P, V, R	(Reset command resets the setpoint output)
F	Setpoint 2	SP2	T, P, V, R	(Reset command resets the setpoint output)
G	Setpoint 3	SP3	T, P, V, R	(Reset command resets the setpoint output)
H	Setpoint 4	SP4	T, P, V, R	(Reset command resets the setpoint output)
I	Analog Output Register	AOR	T, V	(Applies to manual mode)
J	Control Status Register	CSR	T, V	

Command String Construction

The command string must be constructed in a specific sequence. The meter does not respond with an error message to illegal commands. The following procedure details construction of a command string:

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node address number of the meter is programmable. If the node address is 0, this command and the node address itself may be omitted. This is the only command that may be used in conjunction with other commands.
2. After the optional address specifier, the next character is the command character.
3. The next character is the register ID. This identifies the register that the command affects. The P command does not require a register ID character. It prints according to the selections made in print options.
4. If constructing a value change command (writing data), the numeric data is sent next.
5. All command strings must be terminated with the string termination characters * or $. The meter does not begin processing the command string until this character is received. See timing diagram figure for differences of * and $ terminating characters.

Command String Examples:

1. Node address = 17, Write 350 to Setpoint 1, response delay of 2 msec min
   String: N17VE350$
2. Node address = 5, Read Input value, response delay of 50 msec min
   String: N5TA*
3. Node address = 0, Reset Setpoint 4 output, response delay of 50 msec min
   String: RH*

Sending Numeric Data

Numeric data sent to the meter must be limited to 5 digits (-19,999 to 99,999). If more than 5 digits are sent, the meter accepts the last 5. Leading zeros are ignored. Negative numbers must have a minus sign. The meter ignores any decimal point and conforms the number to the scaled resolution. (For example: the meter's scaled decimal point position = 0.0 and 25 is written to a register. The value of the register is now 2.5 In this case, write a value = 25.0).

Note: Since the meter does not issue a reply to value change commands, follow with a transmit value command for readback verification.

Receiving Data

Data is transmitted by the meter in response to either a transmit command (T), a print block command (P) or User Function print request. The response from the meter is either a full field transmission or an abbreviated transmission. In this case, the response contains only the numeric field. The meter response mode is established in programming.

Full Field Transmission

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	12 byte data field; 10 bytes for number, one byte for sign, one byte for decimal point (The T command may be a different byte length)
19	<CR> carriage return
20	<LF> line feed
21	<SP>* (Space)
22	<CR>* carriage return
23	<LF>* line feed

** These characters only appear in the last line of a block print.*

The first two characters transmitted are the node address, unless the node address assigned =0, in which case spaces are substituted. A space follows the node address field. The next three characters are the register ID (Serial Mnemonic).

The numeric data is transmitted next. The numeric field is 12 characters long (to accommodate the 10 digit totalizer), with the decimal point position floating within the data field. Negative value have a leading minus sign. The data field is right justified with leading spaces.

The end of the response string is terminated with a carriage return <CR> and <LF>. When block print is finished, an extra <SP><CR> <LF> is used to provide separation between the blocks.

Abbreviated Transmission

Byte	Description
1-12	12 byte data field, 10 bytes for number, one byte for sign, one byte for decimal point
13	<CR> carriage return
14	<LF> line feed
15	<SP>* (Space)
16	<CR>* carriage return
17	<LF>* line feed

** These characters only appear in the last line of a block print.*

The abbreviated response suppresses the node address and register ID, leaving only the numeric part of the response.

Meter Response Examples:

1. Node address = 17, full field response, Input = 875
   17 INP 875 <CR><LF>
2. Node address = 0, full field response, Setpoint 2 = -250.5
   SP2 -250.5<CR><LF>
3. Node address = 0, abbreviated response, Setpoint 2 = 250, last line of block print
   250<CR><LF><SP><CR><LF>

(CSR) Control Status Register

The Control Status Register is used to both directly control the meter's outputs (setpoints and analog output), and interrogate the state of the setpoint outputs. The register is bit mapped with each bit position within the register assigned to a particular control function. The control function are invoked by writing to each bit position. The bit position definitions are:

bit 0: Setpoint 1 Output Status
- 0 = output off
- 1 = output on

bit 1: Setpoint 2 Output Status
- 0 = output off
- 1 = output on

bit 2: Setpoint 3 Output Status
- 0 = output off
- 1 = output on

bit 3: Setpoint 4 Output Status
- 0 = output off
- 1 = output on

bit 4: Manual Mode
- 0 = automatic mode
- 1 = manual mode

bit 5: Always stays 0, even if 1 is sent.

bit 7: Always stays 0, even if 1 is sent.

Although the register is bit mapped starting with bit 7, HEX < > characters are sent in the command string. Bits 7 and 5 always stay a zero, even if a "1" is sent. This allows ASCII characters to be used with terminals that may not have extended character capabilities.

Writing a "1" to bit 4 of CSR selects manual mode. In this mode, the setpoint outputs are defined by the values written to the bits b0, b1, b2, b3; and the analog output is defined by the value written to the AOR. Internal control of these outputs is then overridden.

In automatic mode, the setpoint outputs can only be reset off. Writing to the setpoint output bits of the CSR has the same effect as a Reset command (R). The contents of the CSR may be read to interrogate the state of the setpoint outputs.

Examples:

1. Set manual mode, turn all setpoints off:

		7	6	5	4	3	2	1	0:bit location
VJ<30>* or VJ0*	ASCII 0 =	0	0	1	1	0	0	0	0 or <30>

V is command write, J is CSR and * is terminator.

2. Turn SP1, SP3 outputs on and SP2, SP4 outputs off:

		7	6	5	4	3	2	1	0:bit location
VJ<35>* or VJ5*	ASCII 5 =	0	0	1	1	0	1	0	1 or <35>

3. Select Automatic mode:

		7	6	5	4	3	2	1	0:bit location
VJ<40>* or VJ@*	ASCII @ =	0	1	0	0	0	0	0	0 or <40>

Note: Avoid writing values <0A> (LF), <0D> (CR), <24> ($) and <2E> (*) to the CSR. These values are interpreted by the meter as end of command control codes and will prematurely end the write operation.

(AOR) Analog Output Register

The Analog Output Register controls the analog output of the meter. The manual mode must first be engaged by setting bit 4 of the Control Status Register. The range of values of this register is 0 to 4095, which corresponds to 0 mA, 0 V and 20 mA, 10 V; respectively. The table lists correspondence of the output signal with the register value.

Register Value	Output Signal*	
	I (mA)	V (V)
0	0.000	0.000
1	0.005	0.0025
2047	10.000	5.000
4094	19.995	9.9975
4095	20.000	10.000

**Due to the absolute accuracy rating and resolution of the output card, the actual output signal may differ 0.15% FS from the table values. The output signal corresponds to the range selected (20 mA or 10 V).*

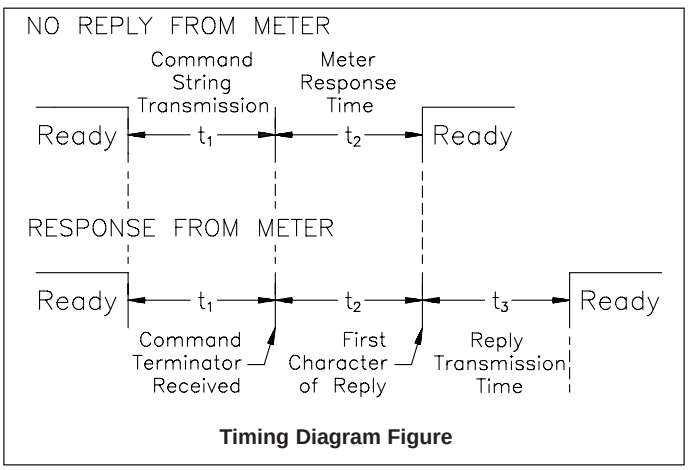
Writing to this register while the meter is in the manual mode causes the output signal to update immediately. While in the automatic mode, this register may be written to, but the output will not update until the meter is placed in manual mode.

Examples:

1. Set output to full scale:
   VI4095*
2. Set output to zero scale:
   VI0*

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). The meter ignores commands while transmitting data, but instead uses RXD as a busy signal. When sending commands and data to the meter, a delay must be imposed before sending another command. This allows enough time for the meter to process the command and prepare for the next command.



Timing Diagram Figure

At the start of the time interval t_1, the computer program prints or writes the string to the com port, thus initiating a transmission. During t_1, the command characters are under transmission and at the end of this period, the command terminating character (*) is received by the meter. The time duration of t_1 is dependent on the number of characters and baud rate of the channel.

t_1 = (10 * # of characters) / baud rate

At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies from 2 msec to 50 msec. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character. The standard command line terminating character is '*'. This terminating character results in a response time window of 50 msec minimum and 100 msec maximum. This allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with '$' results in a response time window (t_2) of 2 msec minimum and 50 msec maximum. The faster response time of this terminating character requires that sending drivers release within 2 msec after the terminating character is received.

At the beginning of time interval t_3, the meter responds with the first character of the reply. As with t_1, the time duration of t_3 is dependent on the number of characters and baud rate of the channel. t_3 = (10 * # of characters) / baud rate. At the end of t_3, the meter is ready to receive the next command.

The maximum serial throughput of the meter is limited to the sum of the times t_1, t_2 and t_3.

Communication Format

Data is transferred from the meter through a serial communication channel. In serial communications, the voltage is switched between a high and low level at a predetermined rate (baud rate) using ASCII encoding. The receiving device reads the voltage levels at the same intervals and then translates the switched levels back to a character.

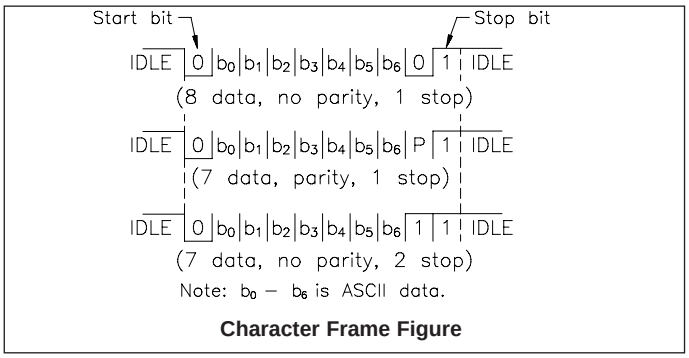
The voltage level conventions depend on the interface standard. The table lists the voltage levels for each standard.

LOGIC	INTERFACE STATE	RS232*	RS485*
1	mark (idle)	TXD,RXD; -3 to -15 V	a-b < -200 mV
0	space (active)	TXD,RXD; +3 to +15 V	a-b > +200 mV
* Voltage levels at the Receiver			

Data is transmitted one byte at a time with a variable idle period between characters (0 to ∞). Each ASCII character is "framed" with a beginning start bit, an optional error detection parity bit and one or more ending stop bits. The data format and baud rate must match that of other equipment in order for communication to take place. The figures list the data formats employed by the meter.

Start bit and Data bits

Data transmission always begins with the start bit. The start bit signals the receiving device to prepare for reception of data. One bit period later, the least significant bit of the ASCII encoded character is transmitted, followed by the remaining data bits. The receiving device then reads each bit position as they are transmitted. Since the sending and receiving devices operate at the same transmission speed (baud rate), the data is read without timing errors.



Character Frame Figure

Parity bit

After the data bits, the parity bit is sent. The transmitter sets the parity bit to a zero or a one, so that the total number of ones contained in the transmission (including the parity bit) is either even or odd. This bit is used by the receiver to detect errors that may occur to an odd number of bits in the transmission. However, a single parity bit cannot detect errors that may occur to an even number of bits. Given this limitation, the parity bit is often ignored by the receiving device. The DAG meter ignores the parity bit of incoming data and sets the parity bit to odd, even or none (mark parity) for outgoing data.

Stop bit

The last character transmitted is the stop bit. The stop bit provides a single bit period pause to allow the receiver to prepare to re-synchronize to the start of a new transmission (start bit of next byte). The receiver then continuously looks for the occurrence of the start bit.

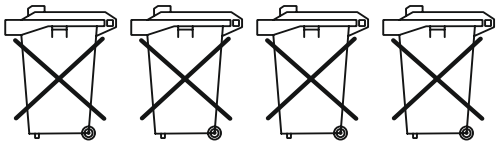
Disposal

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

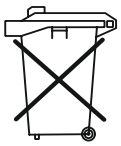
Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



Cd[1] Hg[2] Pb[3] Li[4]

1. „Cd" stands for cadmium
2. Hg" stands for mercury
3. „Pb" stands for lead
4. Li" stands for lithium

Electrical and electronic equipment



EU Declaration of Conformance

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Industrial Batching System, Counter and Flow Indicator Model: DAG-AXV

to which this declaration relates is in conformity with the following UK directives stated below:

2014/30/EU	**EMC Directive**
2014/35/EU	**Low Voltage Directive**
2011/65/EU	**RoHS** (category 9)

Also, the following standards are fulfilled:

EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

EN 61010-2-030:2010 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits

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