



PRODUCT OVERVIEW

The DMR30-DCA1 digital panel meter performs precision DC current measurements when used in conjunction with an external shunt resistor, with selectable ranges from +/-1A to +/-1200A. This meter features a highly visible, 0.45" (11.4mm) high, 5 character + sign alphanumeric LED display which can provide up to 4 digits of measurement resolution. Configuration is made easy by a contactless touch-sensor front-panel user interface, eliminating the need for jumpers, potentiometers, or DIP switches. The meter is powered from an external 9-32VDC supply and typically requires only 40mA when operated at 12V. The measurement inputs provide +/-48V of common mode input range, simplifying both high and low-side current measurements. An isolated solid-state relay can be set to close at user-defined trip-points, providing external signaling capability. The meter features a rugged polycarbonate housing that is mountable in a round hole using the supplied nut and gasket, or by using 3 #4-40 (M3) screws. The DMR30-DCA1's features make it ideal for use in laboratory instrumentation, factory automation, and other applications requiring precise DC current monitoring.

Features

- Supports external shunt resistors from 1A to 1200A
- Supports both +/-50mV and +/-100mV shunt resistors
- Bright 0.45" (11.4mm) LED display visible up to 20 feet (6 meters)
- Long-life contactless touch-sensor controls
- Peak and valley measurement modes
- Digital filter option for measurements in noisy environments
- Solid-state alarm relay with programmable trip-point and hysteresis
- Convenient mounting options
- Operates from 9VDC to 32VDC
- Low current consumption; 40mA typical at 12VDC
- Two year warranty

ORDERING INFORMATION:

DMR30-DCA1-1-DC4-R-C	DC shunt ammeter, alarm output, red display
DMR30-DCA1-1-DC4-G-C *	DC shunt ammeter, alarm output, green display
DMR30-DCA1-1-DC4-B-C *	DC shunt ammeter, alarm output, blue display

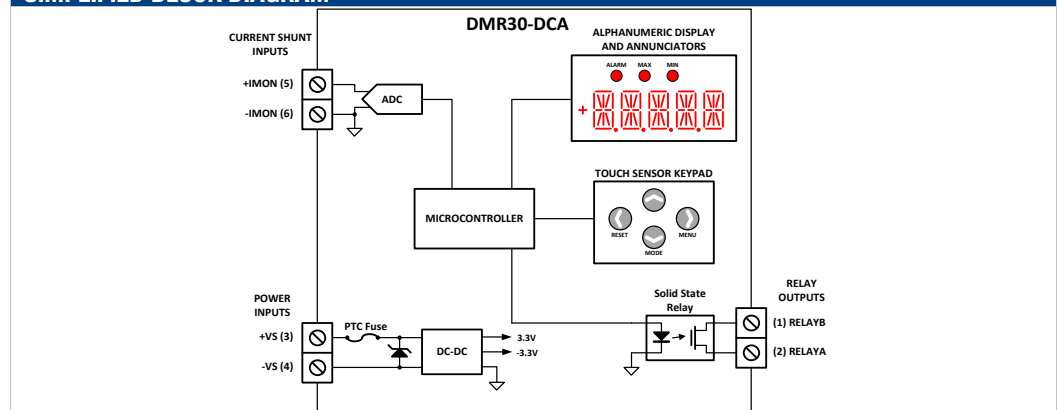
*Contact factory for availability.

ACCESSORIES:

Shunt Resistors

Murata Model #	Full-scale Amps / Output Voltage	Nominal Resistance (mΩs at 25°C)
3020-01097-0	5A / 50mV	10
3020-01107-0	10A / 100mV	10
3020-01098-0	20A / 50mV	2.5
3020-01096-0	50A / 50mV	1
3020-01099-0	100A / 50mV	0.5
3020-01108-0	100A / 100mV	1
3020-01100-0	150A / 50mV	0.33
3020-01101-0	200A / 50mV	0.25
3020-01102-0	300A / 50mV	0.167
3020-01103-0	500A / 50mV	0.1
3020-01104-0	800A / 50mV	0.0625
3020-01105-0	1000A / 50mV	0.05
3020-01106-0	1200A / 50mV	0.0417

SIMPLIFIED BLOCK DIAGRAM



For full details go to
www.murata-ps.com/rohs

PERFORMANCE AND FUNCTIONAL SPECIFICATIONS (typical @ Ta= 25°C, Vsupply=12VDC, Range = 20A, Display Format = 99999 unless otherwise noted)

Measurement Performance	Min	Typ	Max	Units
Measurement Ranges	20 settings from 1A through 1200A		A	
Accuracy		0.1	0.2	% F.S.
Temperature Stability:		0.005		%F.S./°C
Input Impedance		10		kΩ
Common Mode Rejection Ratio (DC)		100		dB
Absolute Maximum input voltage (+IMON to -IMON)	-30		+30	V
Absolute Maximum common-mode voltage (either +IMON or -IMON to -VS)	-48		48	V
Power Supply Characteristics	Min	Typ	Max	Units
Operating Supply Voltage	9		32	VDC
Absolute Maximum Supply Voltage	-1		34	VDC
Operating Supply Current				
12V operation		40		mA
24V operation		25		mA

USER INTERFACE

Display Type and Size	5 Character+sign LED, 11.4mm (0.45in) Height 3 LED Annunciators ('Alarm', 'Max', 'Min')
User Controls	Four capacitive touch sensors <UP> <DOWN> <LEFT> <RIGHT>
Display Modes	Normal, Max Current, Min Current
Over-range Indication	Flashing Value
Display Update Rate	2.5 updates/sec.
Decimal Point Selection	Automatically Set
Main Menu Password	<RIGHT> <UP> <RIGHT> <UP> <RIGHT>

RELAY OUTPUT	Min.	Typ.	Max.	Units
'Off'-state voltage (measured across RELAYA to RELAYB) terminals	-40		+40	V
'On'-state current	-250		250	mA
'On' state resistance		1		Ω

TERMINAL BLOCKS (TB1, TB2, TB3)

Wire Size	14-24 AWG
Insulation Strip Length	6mm (0.24 in.)
Screw Tightening Torque	0.4 N-m (3.5 lb-in)

PHYSICAL/ENVIRONMENTAL

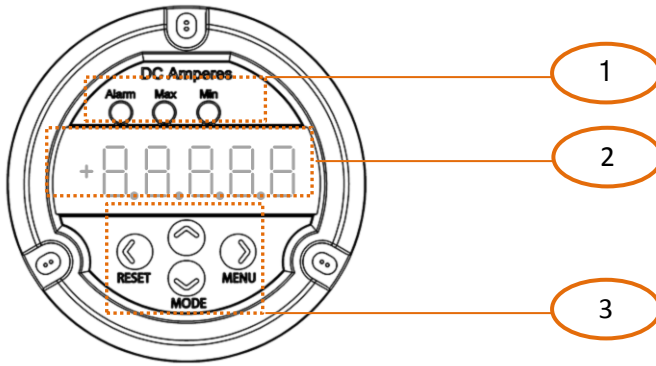
	Min.	Typ.	Max.	Units
Operating Temperature	0		+50	°C
Storage Temperature	-40		+75	°C
Humidity (non-condensing)	0		85	%
Dimensions	See Mechanical Specifications Drawing			
Weight	64g (2.2 oz.)			

OPERATION:

Measurement Type and Capabilities

- DMR30-DCA1 digital ammeters employ a precision ADC and a low-power microcontroller to measure and display DC current when used with a suitable external current shunt resistor (not included).
- These meters provide 20 user-selectable measurement ranges from 1A through 1200A.
- The meter's measurement chain supports a common-mode input voltage range of up to +/-48V in relation to the power supply return (-VS connector), simplifying high-side sensing applications.
- User-selectable number of display digits supports applications where additional digits may cause excessive visual distraction.
- A digital filter option with three selectable settings (OFF, FAST, SLOW) help optimize for operations in electrically noisy environments.

FRONT PANEL & FRONT PANEL LAYOUT AND FUNCTION



1. **Annunciator LEDs:** This cluster of 3 LEDs indicate various meter states, such as alarm status, measurement mode, and unit.
2. **Display:** This is a 5-character + sign alphanumeric LED display is used to indicate measurements, informational prompts, and meter setup parameter values.
3. **Touch-Sensor Control Buttons:** Four capacitive touch-sensors are provided to support meter control and configuration. These four buttons will be referred to in this document as <UP>, <DOWN>, <LEFT>, and <RIGHT> reflecting their printed arrow directions.

Default Measurement Mode

DMR30 meters operate by default in 'normal mode', in which the meter displays the current value of the measured input value. If the measured input value falls outside of the meter's acceptable measurement range, either over-range or under-range, the display will flash. If the meter's alarm functions are enabled, the ALARM annunciator is lit whenever the alarm relay is activated (closed).

Alternate Measurement Modes

In addition to displaying the current value of the measurement (normal mode), the meter can also display historical high and low values. To perform these operations, the meter offers MAX and MIN measurement modes:

1. In MAX mode, the meter displays the highest value which has been measured since the last time the user pressed the <LEFT> button (RESET). MAX mode is active when the MAX LED is illuminated.
2. In MIN mode, the meter displays the lowest value which has been measured since the last time the user pressed <LEFT> button (RESET). MIN mode is active when the MIN LED is illuminated.

These alternate measurement modes may be selected by repeatedly pressing the <DOWN> button until the desired mode LED is illuminated. The alternate modes may be disabled by repeatedly pressing the <DOWN> button until all mode LEDs are off and the meter is returned to normal operating in which it will display the current measurement.

Access to the alternate measurement modes may be disabled by setting the MODES setting to OFF using the configuration menu. If alternate modes are disabled, then pressing either the <DOWN> or <LEFT> buttons will result in an 'ERROR' message being briefly displayed before resuming normal operation.

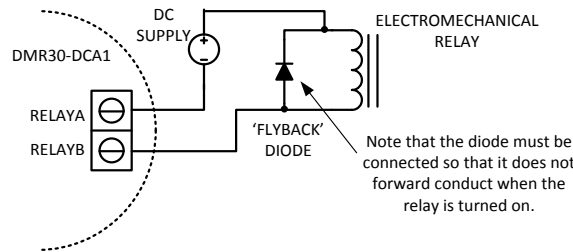
ELECTRICAL CONNECTIONS:

Screw terminal Location:	Terminal #	Name	Function
	1	RELAYB	Alarm Relay Output 'B'
	2	RELAYA	Alarm Relay Output 'A'
	3	+VS	Power Supply Positive Input (9VDC - 32VDC)
	4	-VS	Power Supply Negative Input (Return) (9VDC - 32VDC)
	5	+IMON	Measurement input terminal
	6	-IMON	Measurement input terminal

Note: It is important to tighten all screw-terminals to their torque specification of 4.5 lbf-in (0.51Nm). Proper tightening will help ensure reliable operation. Applications subject to vibration should use stranded wire.

Alarm Relay Connections (back to operation section)

DMR30-DCA1 provides a solid-state relay output that 'closes' upon detecting an alarm condition. This circuit is electrically isolated from the meter's measurement circuitry and power supply inputs providing a high degree of application flexibility. Caution is required when driving loads having high inrush current such as incandescent lamps, or inductive loads such as electromechanical relays since associated current and voltage spikes may damage the meter. When used to drive an inductive load, a 'flyback' diode should be connected across the relay coil to suppress high transient voltages that may otherwise damage the Meter.



Notes:

- The alarm relay circuit's isolation is not intended for use as a safety isolation barrier, the maximum voltage between the alarm relay terminals (ALARMA or ALARMB) and the measurement input terminals (+IMON, -IMON) or power supply terminals (+VS, -VS) must be limited to +/-48VDC.
- The alarm relay is intended to provide an informational signal of over-range/under-range conditions of the process variable being monitored; for example driving a piezoelectric siren or LED lamp to signal the condition.
- **The DMR30's alarm output relay must not be used as an input for any kind of control loop or safety limiting function.**

Power Supply Connections

The meter is powered by connection of an external 9VDC to 32VDC source to the +VS and -VS terminals. Additionally:

- **Isolation:** Power supply input circuitry is electrically isolated from the meter's measurement electronics, so that the meter's negative or return measurement input terminal (-IMON) does not need to be connected to the meter's power return terminal (-VS), and may vary as much as +/-48V from this connection. Please note that the meter's isolation barrier is intended only to simplify measurements, and not for safety purposes – the maximum voltage between the power supply terminals (+VS or -VS) and the measurement input terminals (+IMON, -IMON) must be limited to +/-48VDC.

Please note that the meter's isolation barrier is intended only to simplify measurements, and not for safety purposes – the maximum voltage between the measurement input terminals and the power supply terminals must be less than 48V.

- **Protection:** protection is incorporated against momentary applications of both overvoltage and reverse polarity to the power supply (+VS, -VS) terminals. Depending on regulatory and application requirements it may also be necessary for the user to add external fusing.

ELECTRICAL CONNECTIONS continued:

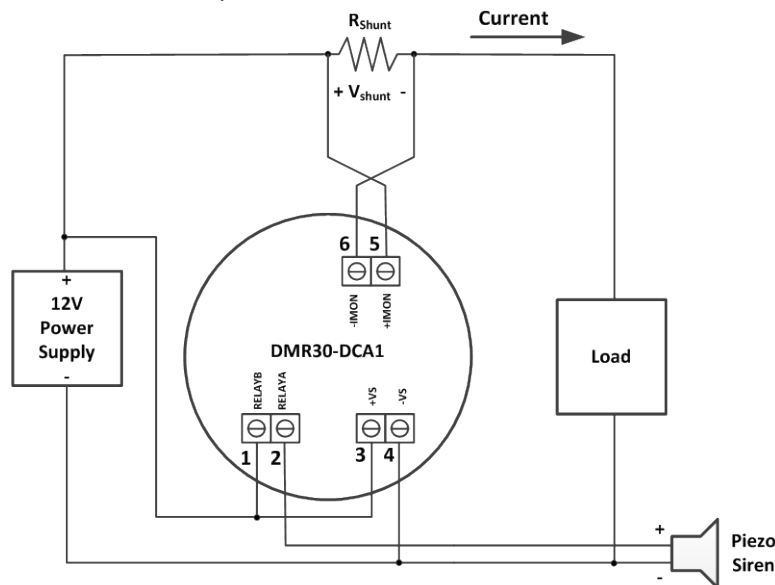
Measurement Inputs

The DMR30-DCA1 must be used with external sense or shunt resistor to measure current. This sense resistor is placed in series with the current path, and the meter's +IMON and -IMON terminals are connected to the resistor sense terminals. The meter's +IMON and -IMON terminals measure the voltage developed across this external sense resistor, typically on the order of 50-100mV. See connection example below for details.

APPLICATION CONNECTION EXAMPLE

The following illustrates an example of wiring the DMR30-DCA1. In this circuit, a 12VDC power supply is used to power a load, and the load's current draw is monitored by a shunt resistor (external to the DMR30). The meter is also powered by the same 12VDC supply. The load current passing through the shunt resistor develops a voltage (V_{shunt}) which is then in turn monitored by the meter through its +IMON and -IMON input terminals. The connection of these terminals must be made so that positive monitored voltage corresponds to positive current, or the meter will indicate current with the wrong polarity. Finally, a piezoelectric siren is also powered from the 12 VDC source, being switched through the meter's RELAYA and RELAYB output terminals.

Example 1. Current Measurement with External Alarm



MENU AND CONFIGURATION

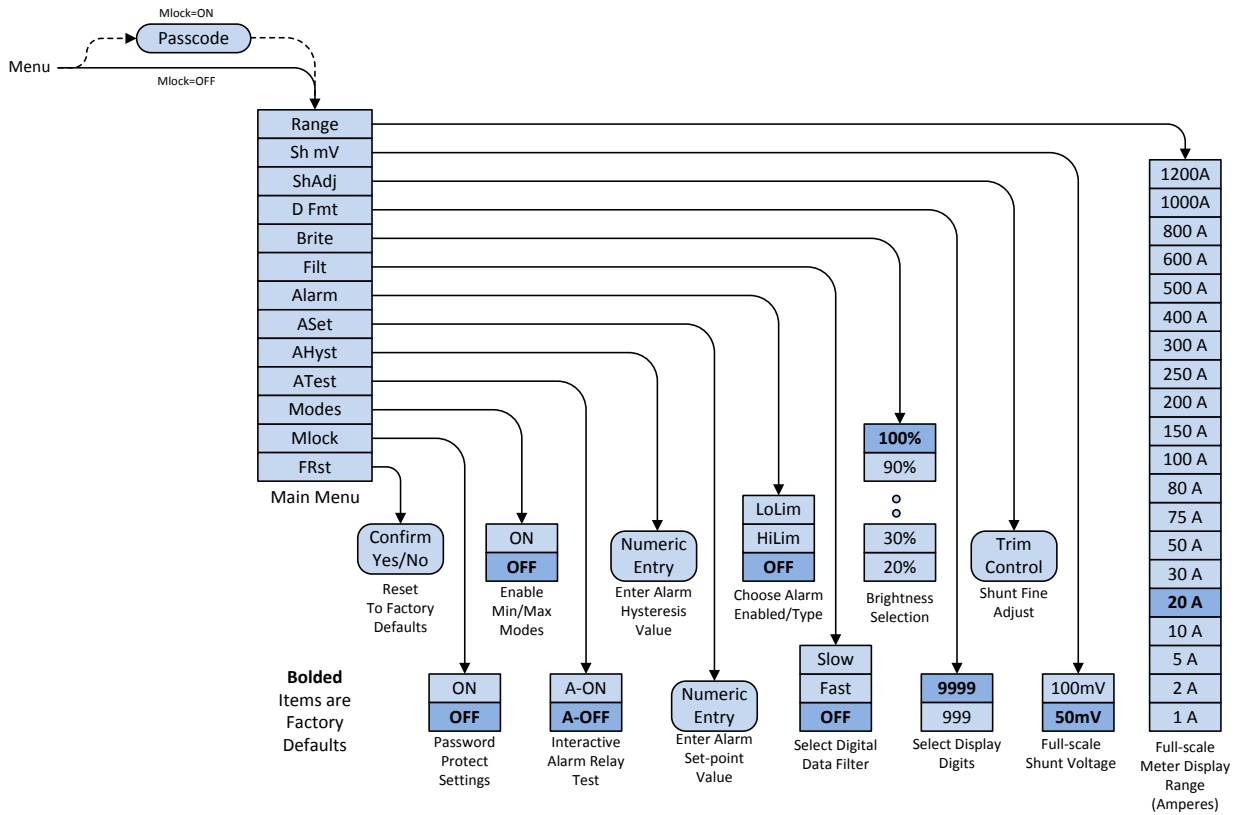
The DMR30 family incorporates an interactive menu system to support meter configuration, eliminating the need for jumpers, dipswitches or trim-pots, and also makes configuration easy after it has been installed in an application.

Entering and Navigating the Menu System

Pressing the <RIGHT> button will cause the meter to enter the main menu, and display the first main menu entry – RANGE. To prevent accidental changes to the meter's configuration, entry to the main menu may optionally be password protected. If the password protection option is enabled (See [MLOCK](#) menu entry for details), then the user will be prompted to enter a series of 5 button-touches to enter the main menu. Once in the main menu, the meter will display the currently selected entry. The <UP> and <DOWN> buttons may be used to change the selection.

MENU AND CONFIGURATION (continued)

MENU DIAGRAM: DMR30-DCA1 ([back to rear panel details](#))



USING THE MENU

When the meter is displaying a main menu item, pressing the **<RIGHT>** button will display the submenu associated with that menu item. For example, if **D Fmt** is the currently selected main menu item, then pushing the **<RIGHT>** button will display the data format submenu, and display the currently selected data format. Exiting the main menu and return to measurement mode may be done in two ways. The first is to press the **<LEFT>** button. The second method is to simply do nothing – if the meter is in the menu system and no button presses are registered for approximately 60 seconds, the meter will automatically return to measurement mode. The **<LEFT>** arrow also may be used to return from a submenu back to the main menu.

MENU AND CONFIGURATION (continued)

Main Menu

The DMR30-DCA1 has the following MAIN MENU configuration options:

- **Range** – Measurement range selection options. Options may be scrolled through using the <UP> and <DOWN> buttons. When the desired range setting is displayed, pressing the <RIGHT> button will update the Range option to the displayed value and return to the main menu, while pressing the <LEFT> button will return to the MAIN MENU without updating the value. The following ranges are supported:

1A, 2A, 5A, 10A, 20A, 30A, 50A, 75A, 80A, 100A, 150A, 200A, 250A, 300A, 400A, 500A, 600A, 800A, 1000A, 1200A

- **SH mV**: The Sh mV submenu lets the user specify the full-scale output voltage of the shunt resistor to be used with the DMR30-DCA1. The <UP> and <DOWN> buttons scroll through the two available options of 50 mV and 100mV. To select the displayed option, press the <RIGHT> button. To return to the MAIN MENU without changing the option value, press the <LEFT> button.
- **ShAdj** – The **ShAdj** submenu allows the user to adjust the meter's scale calibration to accommodate shunt resistance errors. In this submenu, the measurement is displayed at maximum resolution for the selected range, and the <UP> and <DOWN> buttons may be used to interactively change the meter's calibration over a range of approximately +/-1.5%. The buttons are level sensitive, so holding a button down will continually change the calibration factor, with the resulting adjusted measurement being displayed in real time. In this submenu, the MIN and MAX annunciators are used to indicate that the adjustment factor has hit its minimum value (MIN annunciator) or its maximum value (MAX annunciator). To accept a given adjustment and return to the main menu, press the <RIGHT> button. To exit the adjustment without updating the ShAdj value, press the <LEFT> button. The ShAdj value is combined with the meter's internal factory calibration factors but does not modify them. The ShAdj calibration may be reset to a neutral value by performing a factory-reset operation through the [FRst submenu](#). This will return the meter to factory calibration.
- **D Fmt** – Is used to select the number of digits used to display the measurement. The available options are 999 and 9999. The <UP> and <DOWN> buttons are used to scroll through these options. When the desired setting is displayed, pressing the <RIGHT> button will update the D Fmt option to the displayed value and return to the main menu, while pressing the <LEFT> button will return to the main menu without updating the option value.
- **BRIGHT** – Allows the user to adjust the brightness of the meter's display. By using the <UP> and <DOWN> buttons the display can be adjusted from 20% to 100% intensity in 10% increments. To aid in selecting an appropriate brightness level, the meter's brightness is adjusted in real time as the various menu options are displayed. Once a desired brightness setting has been found, this option may be updated by pressing the <RIGHT> button, which updates the option value and returns to the main menu. Pressing the <LEFT> button will return to the main menu with the brightness setting being unchanged.
- **FILT** – This option selects the degree of digital filtering that is applied to the measured signal. The available options are (1) OFF - in which no filtering is used, (2) Fast – in which a small amount of filtering is applied to the signal, and (3) Slow – in which a larger amount of filtering is applied to the signal. The <UP> and <DOWN> buttons are used to scroll through the filter options. Pressing the <RIGHT> button will update the option to the displayed value and return to the main menu. Pressing the <LEFT> button will return to the main menu without updating the option.
- **ALARM** – Controls the operation of the alarm relay output. This submenu has three available options; (1) OFF, where the alarm output is disabled and always off, (2) HiLim, where the alarm relay is turned on when the measured current is greater than the alarm set-point value, and (3) LoLim, where the alarm output is turned on when the measured current is less than the alarm set-point value. The <UP> and <DOWN> buttons may be used to scroll through these options. To update the setting to the selected option and return to the MAIN MENU, press the <RIGHT> button. To return to the MAIN MENU without updating the setting, press the <LEFT> button..
- **ASET** – Is a numeric entry field used to set the alarm set-point value. On entry to this submenu, the current value of the alarm set-point is displayed and may be edited. Upon entering this option, the display will show the current alarm value, and set a blinking cursor at the sign character. The <UP> and <DOWN> buttons are used to set the sign or to increment/decrement the currently selected digit. The <RIGHT> button selects the next digit, or if at the rightmost digit, accepts the displayed value and returns to the MAIN MENU. The <LEFT> button can be used to move the cursor left, or if the cursor is set to the sign position, exits the submenu without changing the current alarm set-point value.

MENU AND CONFIGURATION (continued)

- AHYST** – Controls the alarm hysteresis value. When the alarm is set to HILIM mode, the hysteresis is subtracted from the alarm set-point to get a ‘turn-off’ threshold below which the alarm relay is opened. Similarly (but opposite), when the alarm is set to LOLIM mode, the hysteresis value is added to the set-point to provide a turn-off threshold above which the alarm relay is opened. The process for setting the alarm hysteresis value is similar to setting the alarm set-point value, with the buttons providing identical functionality. Unlike ASET values, however, AHyst values may only be set to values greater than or equal to zero
- ATEST** – Allows the user to interactively test the alarm relay circuit without needing to adjust either the alarm set-point or the signal applied to the meter inputs. On entering this menu option, the <UP> button will turn the alarm relay ON, while the <DOWN> button will turn the alarm relay OFF. Either the <LEFT> or <RIGHT> buttons will exit this submenu, set the alarm relay to the OFF condition, and return to the MAIN MENU. Note that the alarm relay is set to the OFF state when the meter is in the menu system regardless of either the meter input signal alarm settings.
- MODES** – Enables or disables the [Alternate Measurement Modes](#). When the Modes option is set to ON, the meter’s the MIN and MAX modes will be available from the front panel in operating mode. When this option is set to OFF, attempting to set the meter to an alternate measurement mode will result in an ERROR message being displayed.
- MLOCK**– Enables or disables password protection for the MAIN MENU. If Mlock option is set to ON, pressing the <RIGHT> button in operating mode results in a flashing cursor, prompting for the entry of a button-sequence password. The following password sequence must then be entered to access the MAIN MENU:

<RIGHT> <UP> <RIGHT> <UP> <RIGHT>

If the MLock option is set to OFF, pressing the <RIGHT> button in operating mode will immediately enter the MAIN MENU. Note that the password sequence is set at the factory and is not user-modifiable.

- FRST** - Resets the meter configuration to the factory default values. To reset the meter, scroll to the **YES** option using the <UP> button and then press the <RIGHT> button to confirm. To quit this submenu without resetting the meter, press the <LEFT> button.

DMR30-DCA1 Factory Default Configuration	
MAIN MENU Item	Default Value
Range	20 A
Sh mV	50mV
D Fmt	9999
Brite	100%
Filt	OFF
Alarm	OFF
Aset	0
Ahyst	0.0
Modes	ON
Mlock	OFF

TECHNICAL NOTES



1. Wiring:

Power supply and input wiring must be rated for the electrical and environmental conditions under which the meter will be operated. They must also comply with any regulatory or application-mandated requirements pertaining to the user's installation.

The terminal blocks can accommodate wire gauges ranging from #14 to #24 AWG. Wiring insulation should be stripped to 6mm (0.24"). All wires must be inserted into the terminal block openings such that the screw terminal does not pinch any insulation. It is important to tighten all screw-terminals to their torque specification of 4.5 lbf-in (0.51Nm). Proper tightening will help ensure reliable operation. Applications subject to vibration should use stranded wire. After final assembly, inspect all terminal block connections for shorts between adjacent conductors; this step is especially important when using stranded wire.

2. Protection and Fusing:

DMR30 meters' power supply leads (+VS, -VS) are protected against momentary overvoltage and reverse polarity conditions. Input terminals +IMON and -IMON are protected against noise and brief voltage transients. Protection, however, is not provided against sustained conditions exceeding the limits listed in the [Performance & Functional Specifications Table](#). External fusing must be supplied by the user in accordance to applicable safety and regulatory requirements for the system in which the DMR30 is installed.

3. Noisy Power Supplies

Some power supplies contain high-frequency switching devices that may conduct and/or radiate significant noise onto the low-level signal developed across the measurement inputs. Even though the DMR30 incorporates built-in input filtering, some portion of this noise may be amplified and subsequently measured by its sensitive input circuitry. Limiting runs of wire to <3m is strongly recommended. Also, in systems with noisy power supplies, connecting an external, non-polarized capacitor across the +VS and -VS inputs can help reduce measurement errors. In certain situations, the use of twisted pair or shield wiring may be required.

4. Self-Diagnostics

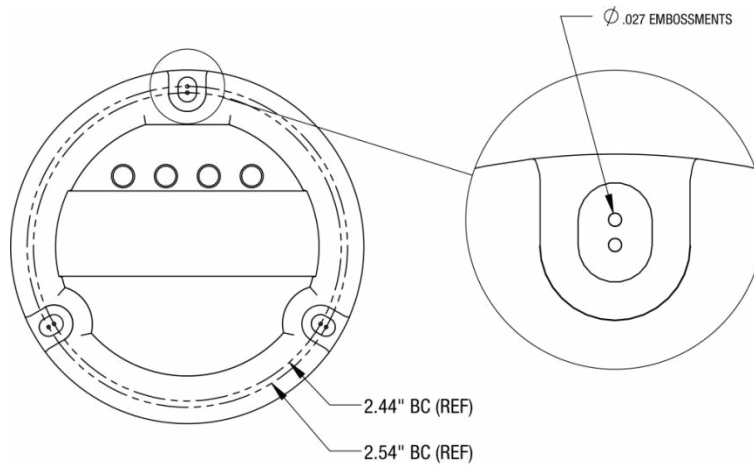
On power-on the meter performs a self-test and checks the integrity of calibration and configuration data stored in internal non-volatile memory. If the factory calibration data has been corrupted, the meter will display 'NoCal' on power-on and approximately once a minute thereafter to indicate that the meter is relying on default calibration factors and that displayed measurements may have more than the datasheet-specified amount of error. If the meter detects that its configuration data has been corrupted, it will display 'NoCFG' and attempt to reset itself to the default factory configuration.

PANEL INSTALLATION

PANEL CUTOUT OPTIONS

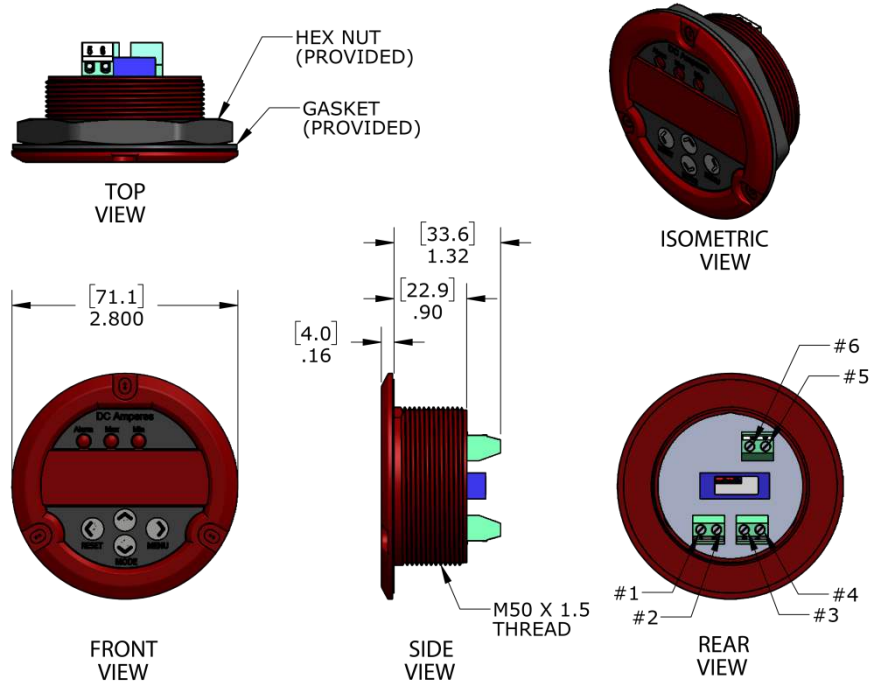
<p>Option 1 For mounting with single 50mm nut</p>	<p>Option 2 For mounting with 3x 64.5mmscrews</p>	<p>Option 3 For mounting with 3x 62mm screws</p>
<p>Panel (1/2" MAX THICK)</p> <p>Ø 2.020 MIN Ø 2.100 MAX</p> <p>IT IS RECOMMENDED THAT THIS HOLE BE AS SMALL AS POSSIBLE WITHIN THE RANGE SPECIFIED, ESPECIALLY IF MULTIPLE METERS ARE MOUNTED AND ALIGNED SIDE BY SIDE</p>	<p>Panel (7/8" MAX THICK)</p> <p>3x Ø.144-.156</p> <p>Ø 2.060 MIN Ø 2.250 MAX</p> <p>[27.94] 1.100</p> <p>[32.26] 1.270</p> <p>[48.39] 1.905</p> <p>[55.87] 2.200</p> <p>[64.52] Ø 2.540 B.C. REF</p> <p>THIS OPTION REQUIRES THREE HOLES TO BE OPENED IN HOUSING</p>	<p>Panel (7/8" MAX THICK)</p> <p>3x Ø.144-.156</p> <p>Ø 2.060 MIN Ø 2.250 MAX</p> <p>[26.86] 1.057</p> <p>[30.99] 1.220</p> <p>[46.45] 1.829</p> <p>[53.69] 2.114</p> <p>[61.98] Ø 2.440 B.C. REF</p> <p>THIS OPTION REQUIRES THREE HOLES TO BE OPENED IN HOUSING</p>

Housing Flange Modifications for Mounting Options 1 and 2



1. SELECT DESIRED BOLT CIRCLE MOUNTING (2.54" OR 2.44")
2. DRILL THRU FLANGE WITH 1/16" PILOT DRILL THREE PLACES
3. OPEN THREE HOLES TO DESIRED DIAMETER
(Ø .125 RECOMMENDED FOR 4-40 OR M3 HARDWARE)
4. REMOVE BURRS AS NECESSARY
5. RECOMMENDED ATTACHMENT HARDWARE: 4-40 OR M3

MECHANICAL SPECIFICATIONS



Murata Power Solutions, Inc.
 129 Flanders Rd. Westborough, Ma 01581, USA.
 ISO 9001 and 14001 REGISTERED



This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:

Refer to: <https://www.murata-ps.com/requirements/>

Murata Power Solutions, Inc. makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Specifications are subject to change without notice. ©2019 Murata Power Solutions, Inc.