

CAUTION: This manual is effective for DSX's with serial numbers of 758378 and subsequent.

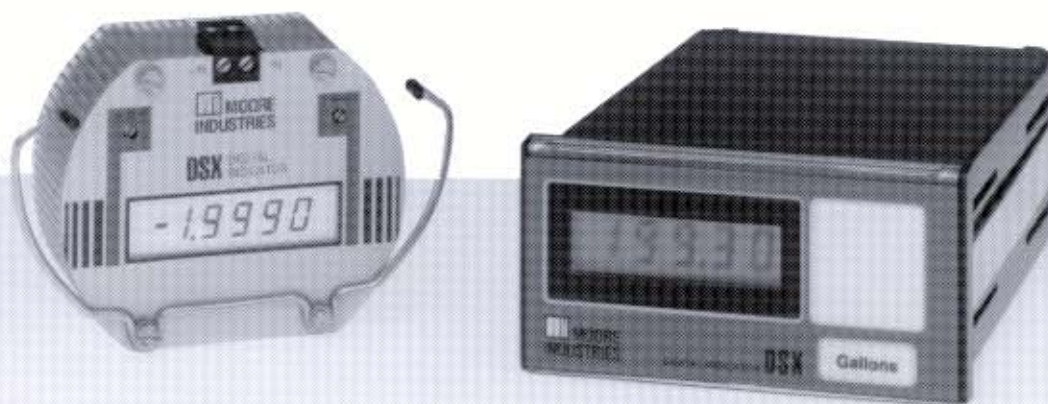


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Introduction

Moore Industries' Digital Indicator (DSX) is a compact, loop-powered, digital indicator. It accepts a 4-20 mA current input and displays a corresponding engineering unit read-out on its front panel liquid crystal display (LCD).

This manual contains a brief description of Moore Industries' DSX; the unit's specifications, a simple calibration procedure; and installation and operation information.

Notes and Cautions, where they appear in text or illustrations, are used to call attention to practices that may result in inconvenience to the user (Notes) or damage to the DSX (Cautions).

Description

The DSX is ideal for use either in field mounted or control room applications. It is available in two housing styles: Moore Industries' hockey-puck (HP) and panel-mount (PM) housings. Refer to the Installation Section of this manual for the dimensions of the DSX.

The unit is typically connected to some type of process measurement instrument, such as a flow meter or temperature transmitter. The user determines the format of the LCD readout by setting a series of internal printed circuit (PC) board jumpers. Units may also be ordered pre-set by the factory.

Controls and Indicators

The LCD. The chief characteristic of the front panel of both the HP and PM versions of the DSX is the LCD. The type used is referred to as a "three-and-one-half digit" display, which means that the three right-most digits in the display express values of "000" through "999" (excluding the trailing "Dummy Zero" Option, discussed next). The left-most digit displays a "1" when active. Negative values are expressed with a negative symbol.

The Dummy Zero (DZ) Option. A permanently displayed dummy zero can be enabled by setting an internal jumper. This is useful for scaling readouts in some applications.

With the dummy zero enabled, values from -19990 to +19990 can be expressed on the LCD.

There are three decimal point positions available. See Figure 1; a facsimile and explanation of the DSX front panel.

The Calibration Section of this manual describes how to set the jumpers that control the format of the display during DSX operation.

Zero and Span. Two potentiometers, labeled "ZERO" and "SPAN", afford the user the capability of "fine tuning" the unit's reference zero and span.

In HP-style units, these potentiometers are on the front panel; accessible without any unit disassembly. In PM-style versions, they are located on the same internal pc board as the LCD-controlling jumpers, protected by the unit's front cover (easily removable without tools).

Table 1 lists the performance and operational specifications for the DSX.

Enclosures

The HP-style DSX can use a variety of field enclosures and with a variety of mounting options.

Units may be ordered as "stand alone" devices, with flanges for mounting on relay track, or with spring clips for installation in single- or multi-unit explosion-proof housings (explosion-proof housings available in low or high dome, with or without glass covers).

Moore Industries' explosion-proof housings may be surface mounted, or can be ordered with pipe-mount hardware.

Consult the DSX data sheet or contact your Moore Industries Sales Representative for more information.

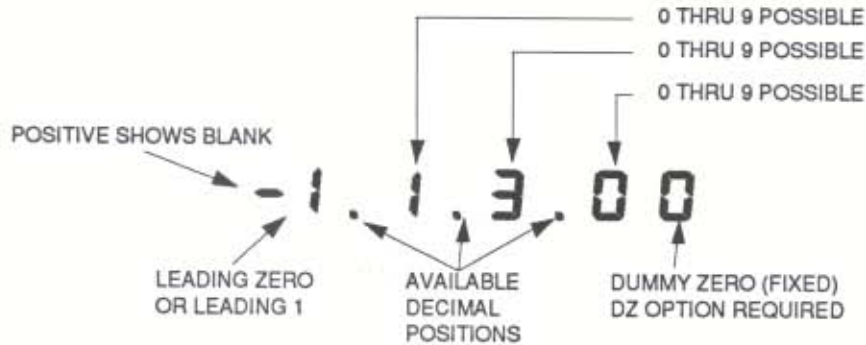


Figure 1. DSX LCD

Table 1. DSX Performance and Operational Specifications

Characteristics	Specifications
Input	4-20 mA.
Output	Liquid Crystal Display. 8.9 mm (0.35 in) high, black characters on a reflective background. 3.5 active digits with negative sign and optional trailing Dummy Zero (DZ Option) available. Decimal point customer-selectable for any of three positions between digits.
Power	1.0 V, Loop Powered. Voltage drop 1 V maximum, up to 100% of span.
Performance	Range: -19990 to 19990 (with DZ Option); minimum 125 count span. Three least significant digits "blank out" when display is driven past ± 1999 (± 19990 with DZ Option). Accuracy: 0 to 100%, $\pm 0.1\%$ of span ± 1 count. Adjustability: User-set Zero and Span potentiometers afford zero offsets of $\pm 100\%$ of adjusted display range maximum. Update Rate: 2.5 times per second, nominal. Response: 15 seconds, nominal, from power-on to full-span step input. Normal Mode Rejection (above 47 Hz): 46 dB.
Environmental Ratings	Ambient Operating Temperature Range: Accuracy rating valid in temperatures from 0 to 70 °C (32 to 158 °F). LCD may malfunction at temperatures below -20 °C (-4 °F) or above 80 °C (176 °F). Storage Temperature Range: -40 to 85 °C (-40 to 185 °F). Effect of Temperature on Unit Accuracy: Less than $\pm 0.02\%$ of span per °C change.
Weight	HP-style: 4.9 oz. PM-style: 8.2 oz.
NOTE: Refer to the Installation Section for the dimensions of the DSX.	

Serial Number. A complete history of every product Moore Industries sells and services is kept at the factory, filed according to unit serial number.

If ever a DSX requires service information, provide the factory with the serial number of the unit, and our skilled technicians will be happy to help you.

The serial number for the HP-style DSX is located on a metal tag attached to the front panel. On PM-style units, the label is affixed to the top of the housing.

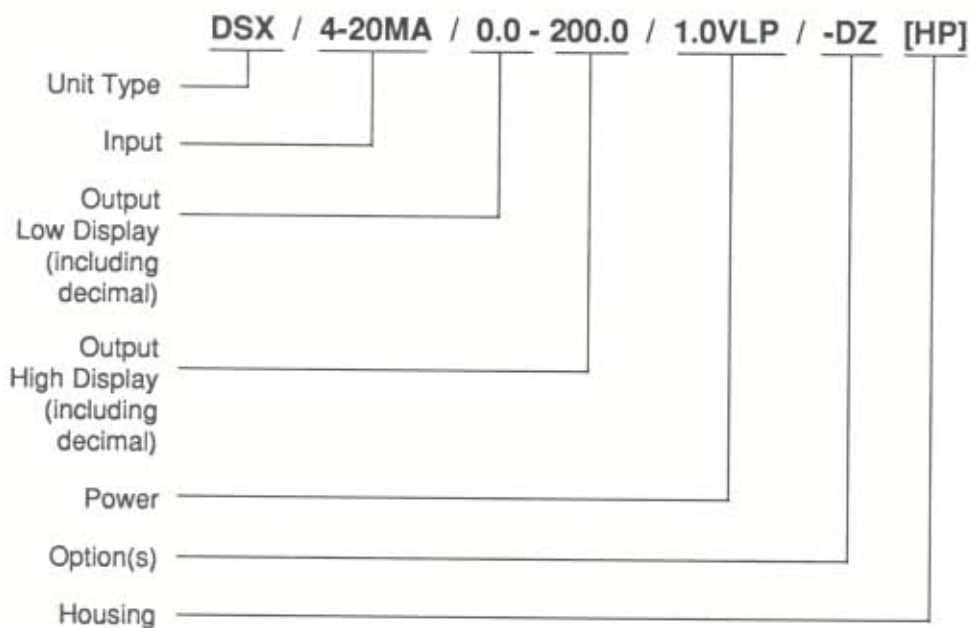
Model Number. Moore Industries' model numbers identify the type of instrument, its functional characteristics, operating parameters, any options ordered, and the housing type used.

If all documentation for a unit is missing, the model number can be used to obtain configuration information about the DSX.

The model number for both styles of DSX is located on the same label as the serial number.

The example below identifies the significance of each field in a typical DSX model number.

EXAMPLE



DSX

Calibration

Each DSX is manufactured, checked, and tested according to Moore Industries' strict quality control guidelines. It is recommended, however, that a simple bench check of jumper settings and operating levels be performed prior to the unit's being incorporated in your application.

Disassembly

To verify or change the jumper settings, or to adjust the Zero and Span potentiometers on the PM-style DSX, the unit must be partially disassembled. You will need a small nut driver or slotted-head screwdriver to disassemble either type of DSX.

Figure 2 illustrates the removal of the back panel from HP-style units, and figure 3 shows the removal of the front cover from PM-style units.

Remove the front cover of PM-style DSX's by hand, or insert the screwdriver into the slot along the bottom edge of the cover, and carefully pry it off. Do not damage the plastic.

Calibration Equipment

To calibrate the DSX, or to check or change the settings of the internal jumpers, the equipment listed in Table 2, below, is needed. This equipment is not supplied with the unit.

Calibration Setup

Determine the span and zero of the application in which the DSX will be used. Refer to table 3, and use the pliers to set the jumpers according to the requirements of your application.

Connect the current source to the DSX as shown in Figure 4, on the next page. If desired, connect the milliammeter to monitor/confirm the level of current in the calibration loop.

Table 2. DSX Calibration Equipment

Equipment	Specification
Adjustable Current Source	Capable of 4-20 mA, dc output.
Milliammeter	Fluke Model 8800 or equivalent, capable of measurements in the 4-20 mA range.
Pliers	Small, technician's type, used for jumper positioning.
Screwdriver	Slotted-head, width not larger than 2.54 mm (0.1 in).

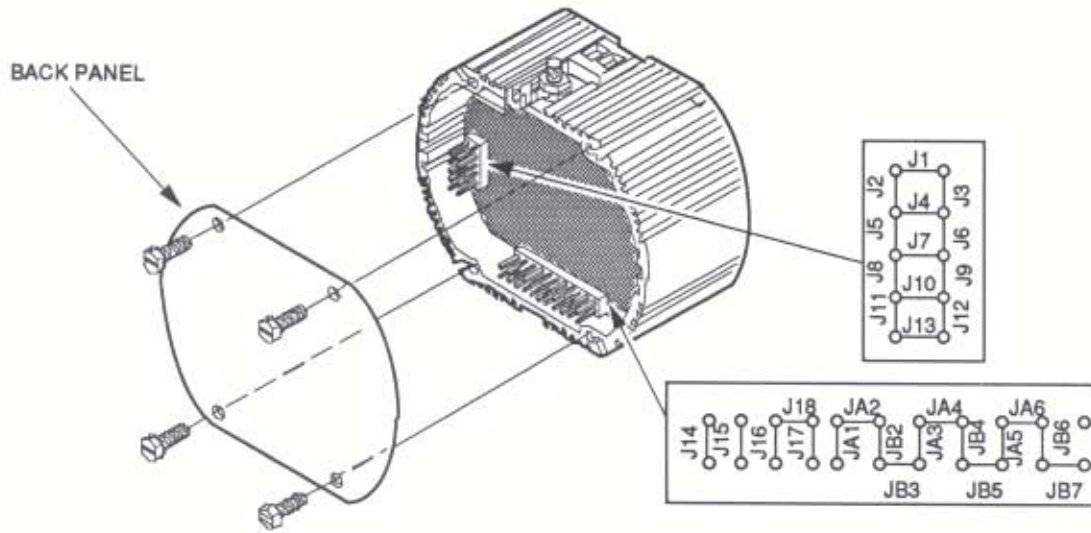


Figure 2. Disassembling the HP-Style DSX

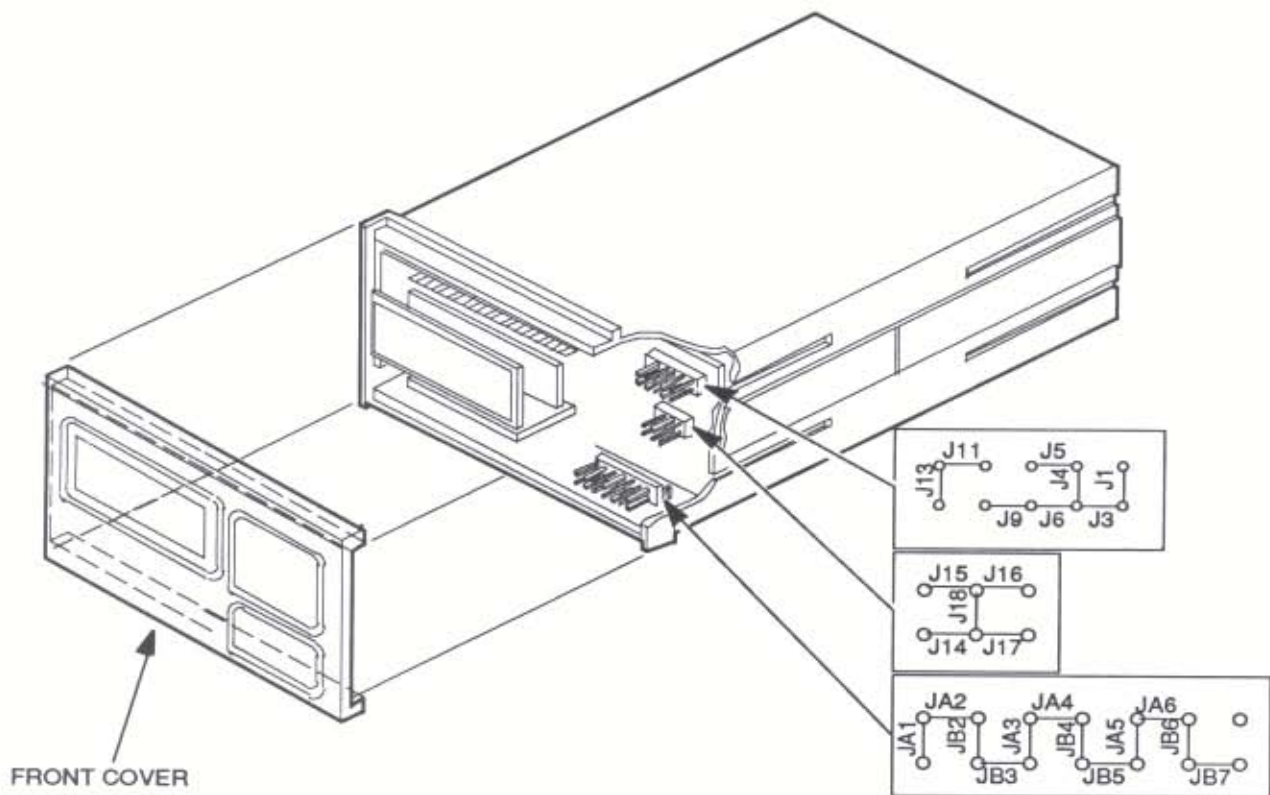


Figure 3. Disassembling the PM-Style DSX

Table 3. Setting the DSX Jumpers

For This Parameter:		Install These Jumper(s):
Decimal Position	No Decimal Point	J1, J5, J9
	X X X . X 0	J3, J5, J9
	X X . X X 0	J1, J4, J9
	X . X X X 0	J1, J5, J6
Dummy Zero	ON	J13
	OFF	J11
Span Range (in "counts")	>2000	J18
	1000-2000	J17
	500-1000	J16
	250-500	J15
	125-250	J14
Offset Range	-1.32, -0.91	JA1, JB2
	-0.91, -0.5	JA2, JB3
	-0.5, -0.08	JA3, JB4
	-0.08, +0.34	JA4, JB5
	0.34, 0.75	JA5, JB6
	0.75, 1.15	JA6, JB7
<p>Note: To determine unit's Offset Range, subtract the minimum display value (d1) from the maximum display value (d2). The result is the Display Span. Next, divide (d1) by the Display Span. The result is the Offset Range. Use the Zero potentiometer to trim the unit's offset.</p>		

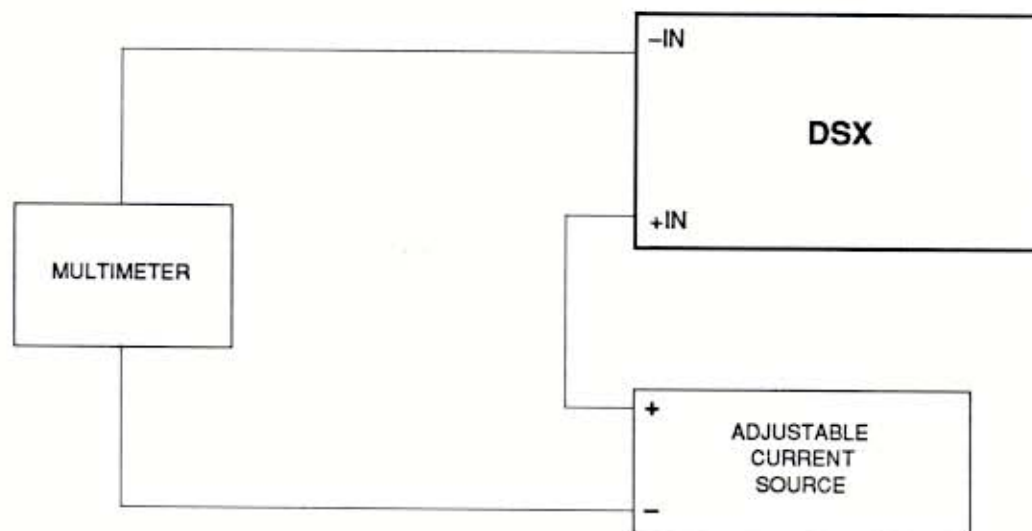




Figure 4. The DSX Calibration Setup

Calibration Procedure

With appropriate jumpers installed according to the table:

1. Set SPAN, labeled  and ZERO, labeled  ...fully counterclockwise (fifteen turns).
2. Apply appropriate power to setup, and allow approximately 1 minute for stabilization.
3. Set input current to 4 mA level.
4. Turn ZERO potentiometer slowly clockwise until desired value is displayed.
5. Set input current to 20 mA level.
6. Turn SPAN potentiometer slowly clockwise until desired value is displayed.
7. Repeat steps 3 through 6, adjusting both potentiometers until display is stable at both zero and full-scale.

Installation

In this manual, the installation of the DSX is divided into two phases: the physical mounting of the unit(s), and their connection to the other devices in the process loop.

Mounting

Figures 5 and 6, respectively, give the dimensions for the HP- and PM-style versions of the DSX. The HP-style unit shown includes the dimensions for the flange mounting hardware option.

Always mount the device in an area protected from dust, moisture, and corrosives.

Consult the Two-wire Enclosures data sheet in the Moore Industries catalogue, or contact your Moore Industries Sales Representative for dimensions and information on multi-hub, explosion-proof enclosures and mounting hardware for HP-style units.

DSX

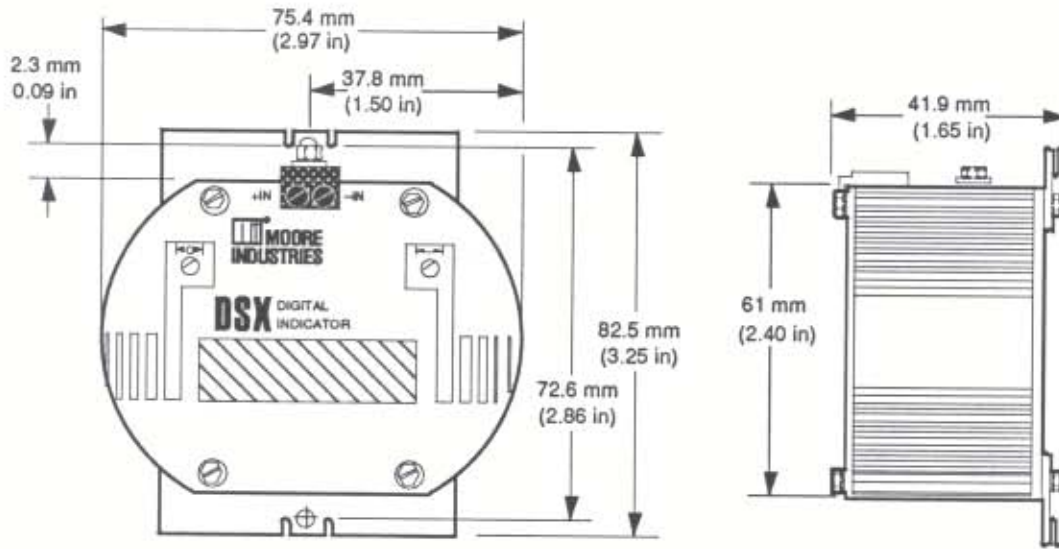


Figure 5. HP-Style DSX Outline Dimensions

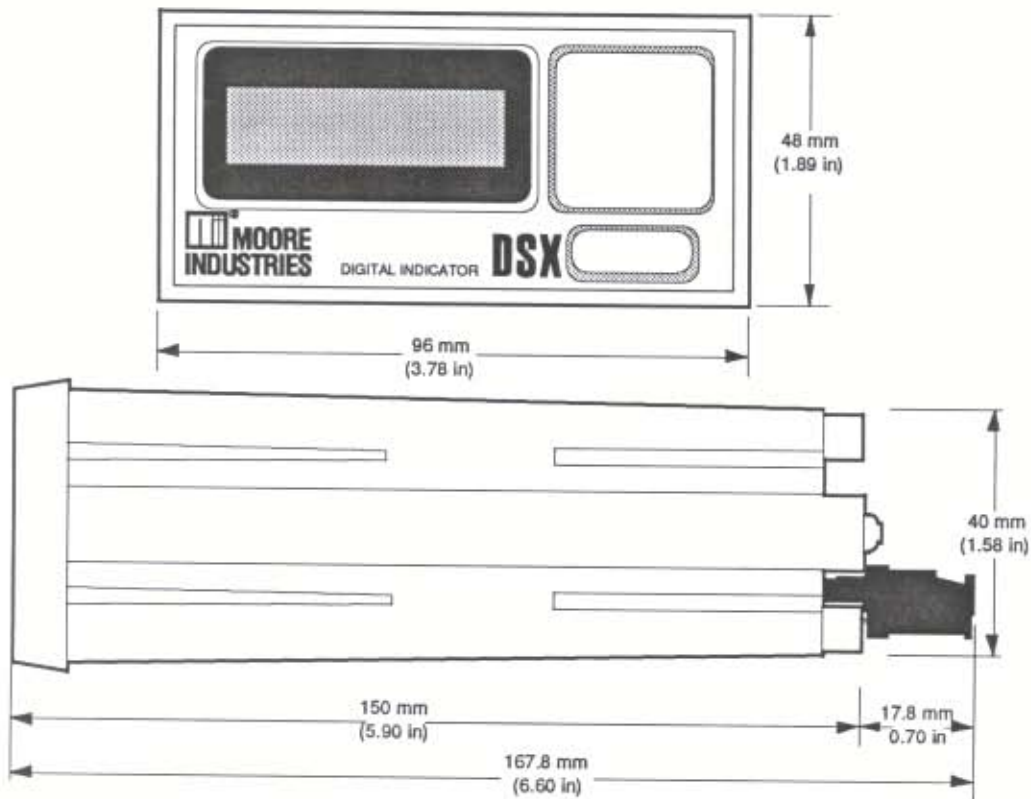


Figure 6. PM-Style DSX Outline Dimensions

Mounting HP-style DSX's. If equipped with spring clips, the HP-style DSX is mounted inside an explosion-proof enclosure. The clips provide adequate tension to hold the unit in place once seated in the enclosure. No tapping or drilling is required.

Simply squeeze the clips inward, toward each other, place the unit inside the enclosure, and slowly release the clips.

HP-style units to be installed on relay track are equipped with mounting flanges, and can be slid along the track into place before securing.

Mounting PM-style DSX's. The PM-style DSX is designed for mounting in a flat panel cutout. Figure 7 shows the cutout dimensions required for mounting one, two, three, or four units. Panel thickness should not exceed 5.08 mm (0.2 in).

1. Use a small Phillips-head screwdriver to remove the two screws that secure the U-bracket to back panel of unit.
2. Slide DSX back panel into, and through cutout, seating front cover against mounting panel.
3. Tighten the two U-bracket screws on the back panel of unit. Mounting bracket is "flared" slightly outward, and as DSX mounting screws are tightened, bracket slides forward, pinching panel between bracket ends and DSX housing front lip.

CAUTION

Over-tightening mounting screws may cause damage to the plastic housing.

4. If units are to be stacked, repeat steps 1 through 3 for each, working upward in the panel cutout.

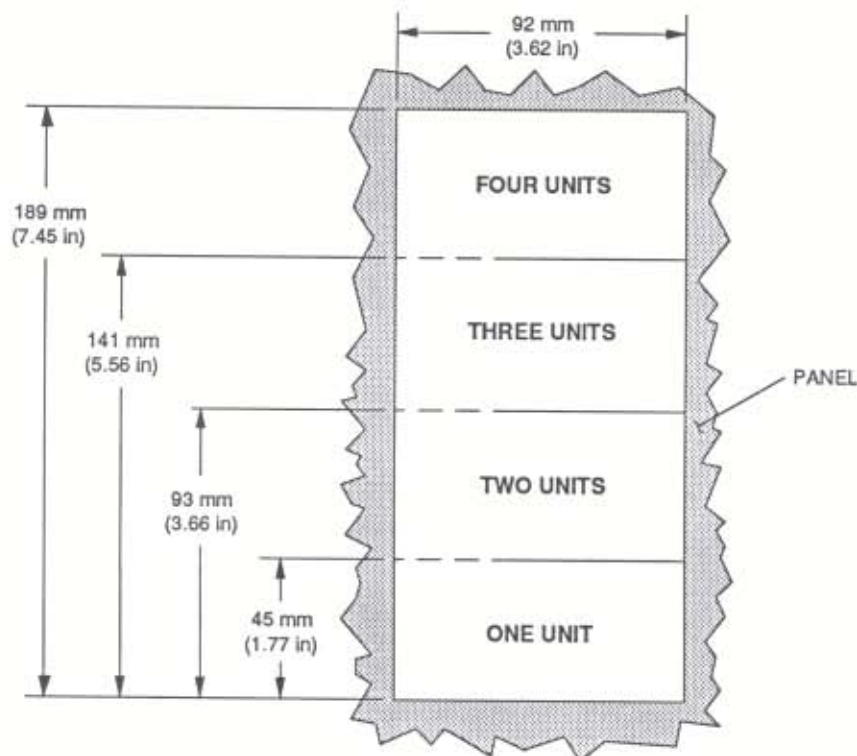


Figure 7. Panel Cutout Dimensions for Installing PM-style DSX

DSX

Electrical Connections

The DSX connection terminals for both PM- and HP-style units are labeled "+IN" for connection to the positive terminal of the loop power supply, and "-IN" for connection to the positive output of the transmitting device in the loop. See Figure 8.

HP-style units' terminals are located along the top edge of the housing. A ground screw, also labeled, is adjacent to the connection terminals.

The connection terminals on the PM-style DSX are located on the back edge of the PC board. The connector itself is located on the unit's back panel. Since its case is made of non-conductive plastic, grounding is not necessary.

When installing this type of DSX, make sure that wires are not crimped when sliding the unit into the panel cutout.

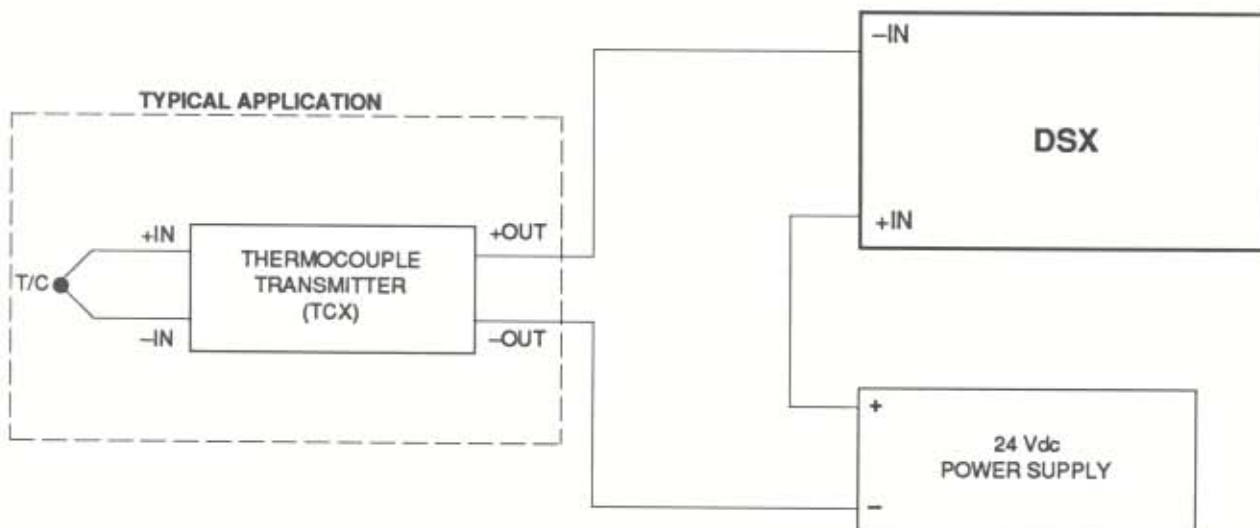


Figure 8. Typical DSX Application Hookup.

Operation

Once calibrated and installed, the DSX requires no further user intervention. Supplied with loop power, the unit immediately begins to display the current in the loop in the engineering units selected (refer to the Calibration section of this manual).

A set of adhesive-backed labels with pre-printed engineering units for typical DSX applications is included with each unit. Additional labels are available from the factory.

If the parameters of your application change, or if it otherwise becomes necessary to reconfigure the display of the DSX, it is recommended that the calibration procedures in this manual be performed on the unit prior to its being placed back into service.

Maintenance

Field maintenance for the DSX is limited to keeping the electrical terminals clean and secure. Each unit should be visually inspected at least once every six months to ensure that the terminals are free of dirt and oxidation, and that the electrical wires are in good condition.

Troubleshooting

If the DSX fails to operate, or functions erratically, make sure all connections are secure, and that connection wiring is not damaged.

Verify that the loop's input to the device has not changed since the internal jumpers were set.

If the unit has sustained damage, or otherwise continues to malfunction, contact the Customer Service Department of Moore Industries.

RETURN PROCEDURES

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

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

Warranty Repair –

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

Non-Warranty Repair –

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

2. Provide us with the following documentation:
 - a) A note listing the symptoms that indicate the unit needs repair
 - b) Complete shipping information for return of the equipment after repair
 - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

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

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