SERIES 1431/41-02/03

INTELLIGENT ABSOLUTE RESOLVER INTERFACE MODULE

USER'S MANUAL

Catalog Number 140C-393M

This Manual is written to explain the
operation of the following AMCI Modules
for the Square D SY/MAX® I/O System:

1431-02
1441-02
1431-03
1431-03

Important User Information

The products and application data described in this manual are useful in a wide variety of different applications. Therefore, the user and others responsible for applying these products described herein are responsible for determining the acceptability for each application. While efforts have been made to provide accurate information within this manual, AMCI assumes no responsibility for the application or the completeness of the information contained herein.

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All equipment being returned to AMCI for repair or replacement, regardless of warranty status, must have a Return Merchandise Authorization number issued by AMCI. Call (203) 585-1254 with the model number and serial number (if applicable) along with a description of the problem. A "RMA" number will be issued. Equipment must be shipped to AMCI with transportation charges prepaid. Title and risk of loss or damage remains with the customer until shipment is received by AMCI.

24 Hour Technical Support Number

24 Hour technical support is available on this product.

For technical support, call (203) 583-7271.

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1.0 OBJECTIVE

The objective of this manual is to explain the installation, operation, programming, and servicing of the Series 1400 Absolute Resolver Encoder Modules for the Square D Sy/Max Series I/O Chassis. It is strongly recommended that you read through the following instructions. If there are any unanswered questions after reading this manual, contact the factory. An applications engineer will be available to assist you.

2.0 INTRODUCTION

The Series 1400 Absolute Resolver Encoder Modules are single or multi-axes modules that plug directly into any Square D Sy/Max Register slot. Each module occupies only one slot in the chassis. Since the Absolute Resolver Encoder Module plugs into the chassis, no external wiring is needed to interface the module to the PC. The only wiring necessary for operation of the module is the wiring connections from the transducer to the module.

On the front panel, a six digit LED display and sealed keyboard allows the monitoring of transducer position and speed. Scale Factor, Offsets, and Tachometer Response are programmable from the keyboard. Each module is equipped with hardware fault and broken wire indication. Position and Tachometer information for all of the module's axes is available to the programmable controller.

3.0 SERIES 1400 FAMILY

The following table lists the model numbers of the ten different Absolute Resolver Encoder Modules presently available in the Series 1400 Family as well as a brief description of each module.

1431	10 bit, one axis, single turn encoder
1432	10 bit, two axes, single turn encoder
1433	10 bit, three axes, single turn encoder
1434	10 bit, four axes, single turn encoder
1441	13 bit, one axis, single turn encoder
1442	13 bit, two axes, single turn encoder
1443	13 bit, three axes, single turn encoder
1444	13 bit, four axes, single turn encoder
1461	18 bit, one axis, multi-turn encoder
1462	18 bit, two axes, multi-turn encoder

This manual will deal with the programming and operation of the 143x and 144x modules. For instructions on the other modules, refer to the Series 1461/2 User's Manual.

4.0 INSTALLATION

4.1 POWER REQUIREMENTS

A Series 1400 Absolute Resolver Encoder Module draws it's systems power from the I/O chassis backplane. A 4 axes module draws from the I/O chassis backplane 950 mAmps from the +5 Vdc Supply (4.75 W total). Add this to the power requirements of all other cards in the chassis to avoid exceeding backplane or supply capacity.

4.2 INSTALLING THE MODULE

WARNING: Remove the system power before removing or installing a module in the I/O chassis. Failure to observe this warning can result in damage to the module's circuitry and/or undesired operation with possible injury to personnel.

CAUTION: The Grounding Screw on the bottom of the module must be must be screwed into the chassis tightly in order to insure safe and proper operation.

The Series 1400 Modules can be installed in any available Register Slot in a Square D I/O Rack. These I/O Racks are the Square D register rack (8030 RRK except the first slot) or the register slot of the Square D digital I/O racks (8030 CRK, DRK, GRK, or HRK). The number of registers that must be assigned to the slot is dependent on the type of module that is installed. Refer to Section 9 Addressing the 1400 Module for more information.

The following Keying Pins should be installed in the register slot connector that the Series 1400 Module will reside in. This will insure that only an AMCI Series 1400 Module can be plugged into the slot.

Keying Pin 1: Between slot (03-04) and slot (05-06)
Keying Pin 2: Between slot (29-30) and slot (31-32)
Keying Pin 3: Between slot (91-92) and slot (93-94)

Keying Pins 1 and 3 are standard pins that are used to insure that only register modules can be plugged into the connector. Keying Pin 2 is the pin that keys the connector to accept a Series 1400 Module only.

4.3 INSTALLING THE TRANSDUCER CABLE

The transducer cable is used to carry the low-power position signals from the transducer to the module. Because these signals are low-power, they are sensitive to EMI Noise that can be generated by high power lines and devices. If Noise is injected into the Transducer Cable from outside devices, the module's transducer fault detection may be tripped. To prevent EMI Noise from being induced into the cable, the cable must be placed in a shielded conduit away from any high power lines or devices and the cable itself must incorporate a shield. If you are manufacturing your own transducer cable, the prints given at the end of this manual must be followed. Note that the cable shield is connected at the module's end and not at the transducer connectors. This is to avoid ground loops that may cause damage to the module.

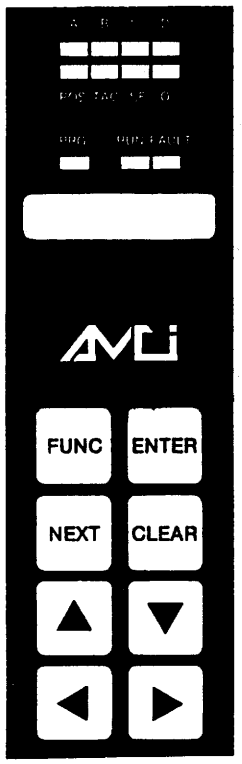
5.0 FUNCTIONAL DESCRIPTION

The following sections describe the functions and programmable parameters available on the Series 1400 Modules. For information on programming the parameters, please refer to Section 8.0 "PROGRAMMING THE 1400 ABSOLUTE RESOLVER ENCODER MODULE".

5.1 FRONT PANEL DESCRIPTION:

STATUS DISPLAY

The three LED's show the status of the module including:
- PROGRAM Mode.
- RUN Mode.
- FAULT Indication.



FUNCTION DISPLAY

The eight LEDs above the display are the FUNCTION INDICATORS. A blinking digit on the display denotes the CURSOR.

KEYBOARD

Used to display or modify the 1400 functions and parameters.

5.2 FUNCTION INDICATORS

Above the digital display are eight LED indicators that define the function showing on the display.

	LEDs ON	FUNCTION or PARAMETER
#	POS	Transducer's Shaft Position.
#	TAC	Tachometer. (speed of rotation in RPM)
*	TAC + A	Tachometer Response Time in mSecs.
*	SF	Scale Factor. (counts per revolution)
*	OF + A	Circular Position Offset.
*	OF + B	Linear Position Offset

\# The Position and Tachometer data is available to the PC.
* These are programmable parameters.

5.3 FUNCTION AND PARAMETER DESCRIPTIONS

This section describes the functions and parameters available with the 1400 Modules. For programming information, refer to Section 8.0: "PROGRAMMING THE 1400 ABSOLUTE RESOLVER ENCODER MODULE".

5.3.1 POSITION FUNCTION

This function shows the current position of the transducer's shaft. This display is affected by three programmable parameters: Scale Factor, Circular Offset, and Linear Offset. The Position data is available to the programmable controller.

5.3.2 TACHOMETER FUNCTION

The Tachometer Function shows the operator the speed of rotation of the transducer's shaft in RPM, Revolutions Per Minute. The time between updates, which is the time it takes to determine a new speed and show it on the display, and the resolution of the Tachometer are programmable through the Tachometer Response Parameter. The Tachometer data is available to the programmable controller.

5.3.3 TACHOMETER RESPONSE PARAMETER

The tachometer response can be programmed to any one of four update periods, (time between tachometer updates), and one of two resolutions. This allows the user to tailor the tach's response to the systems needs.

The four tachometer update periods are 32 mSecs, 60 mSecs, 120 mSecs, and 240 mSecs. The two resolutions, available with a 240 mSec update time only, are to 1 RPM or to 0.1 RPM. With the other three update periods the only resolution available is to 1 RPM.

The maximum speed that can be displayed by the module or sent to the PC depends on the chosen tachometer response and resolution. When the Tachometer Response is set to 240 mSecs, and 0.1 RPM resolution, the maximum speed that can be displayed is 999.9 RPM. When the Tachometer Response is set to 240 mSecs, and 1 RPM resolution, the maximum speed that can be displayed is 1000 RPM. When the Tachometer Response is set to 120 mSecs or faster, the maximum speed that can be displayed is 2000 RPM. Exceeding these speeds will cause the module to display and send erroneous data to the PC.

5.3.4 SCALE FACTOR PARAMETER

The Scale Factor parameter is used to set the resolution with which the module determines the position of the transducer's shaft. The Scale Factor can be programmed between 2 and 1024 for the 10 bit resolution modules and between 2 and 8192 for the 13 bit Modules. With the Scale Factor programmed to 360 the module will display the position data, and send it to the PC, in degrees. With the Scale Factor programmed to 1024 the module will display the position data, and send it to the programmable controller, with 10 bit resolution.

5.3.5 CIRCULAR OFFSET PARAMETER

The Circular Offset parameter allows you to change the displayed position of the transducer's shaft without changing the RANGE of values that the unit displays and sends to the programmable controller. This offset is most commonly used to force the position to the correct count after the machine has been aligned. For example: One rotation of the transducer's shaft produces counts between 000 and 720. (SF = 720) When the machine is aligned to mechanical zero the transducers position should equal 45. However, when the machine is aligned, the module reads a position of 695. An Offset must be programmed in to force the position to 45. The formula for determining the Offset is:

Scale Factor	-	Actual Position	+	Desired Position	=	OFFSET
720	-	695	+	45	=	70

The maximum value of the Offset is: (Scale Factor - 1).

If the Calculated Offset is greater than the Scale Factor, the Actual Offset equals (Calculated Offset - Scale Factor).

If the user wishes to force the position to zero, the user can use the AUTO ZERO function. This function performs all the calculations needed to determine the required offset and stores this value in EEPROM memory. To use the AUTO ZERO Function, the user must be displaying the transducers position value (POS LED on). The user then presses the [CLEAR] key and the unit calculates and stores the required offset. The calculated offset can be displayed with the Offset parameter.

When the user enters a new value for the Scale Factor parameter, the Offset is reset to zero.

5.3 FUNCTION AND PARAMETER DESCRIPTIONS (cont'd)

5.3.6 LINEAR OFFSET PARAMETER

The Linear Offset Parameter is used to change the RANGE of position values that the unit displays and sends to the programmable controller. This offset is most commonly used when the transducer is measuring linear distances such as with a X-Y table application. For example: The encoder is used to measure a total distance of 5.00 inches with a 0.01 inch resolution. This means that the total counts over full scale is 500, (5.00 inches * 100 counts/inch), and the user programs the Scale Factor to this value. The 5.00 inches that the encoder measures is in the range of 7.50 to 12.50 inches on the machine. The user decides to use the Linear Offset to force the module to send its position data to the programmable controller in the correct format instead of using the programmable controller to add an offset to the position value from the module. The formula for the Linear Offset is as follows:

Minimum Desired Value	*	Resolution	=	LINEAR OFFSET.
7.50 inches	*	100 counts/inch	=	750

The maximum position value that can be displayed is 9999. Therefore the maximum value of the Linear Offset is 9999 - (SF-1).

The Linear Offset is reset to zero when the Scale Factor is changed.

5.4 FAULT DIAGNOSTICS

Three single LED indicators below the digital display are used for Status indicators.

RUN: A blinking green LED indicates that the module is powered and functioning.

FAULT: A red LED lights when one of the following faults is detected:

Transducer Fault is indicated by "X_Err.1" on the digital display, if the selected function is POS or TAC. The "X" is the number of the axis that has the fault. A broken or improperly wired transducer cable or a damaged transducer will cause this fault. Another potential cause of this fault is excessive amounts of EMI Noise that is induced into the transducer cable by an external source. A flashing "X_Err.1" on the digital display indicated that the fault can be cleared by using the [CLEAR] key on the keyboard.

5.4 FAULT DIAGNOSTICS (cont'd)

EEPROM Memory Fault is indicated by "Err2" on the digital display. This message is displayed regardless of the function selected. This fault, indicating corrupted data stored in the Users Program, means that the programmed parameters may be incorrect. The user can recover from this fault by pressing the [CLEAR] key. All parameters will be set to their default values. If the "Err.2" message remains on the display after the [CLEAR] Key has been pressed, this indicates a program storage failure and the module must be returned for repairs.

PRG: A lit yellow LED indicates that the module is in Program Mode. While in Program Mode, all of the Programmable Parameters can be inspected and altered.

6.0 PROGRAM MODE

WARNING: Remove the system power before removing or installing a module in the I/O chassis. Failure to observe this warning can result in damage to the module's circuitry and/or undesired operation with possible injury to personnel. Please refer to Section 4.0 INSTALLATION for additional information.

A slide switch (SW1) is located on the upper part of the module's PC Board behind the display. Placing the switch in the "ON" position, (pushed towards the front of the unit), will put the 1400 Module in Program Mode and light the yellow LED. Removing the two pin header that is next to SW1 will disable Program Mode regardless of the position of SW1. While in Program Mode all of the Programmable Parameters can be changed.

The Programmable Parameters are:

Tachometer Response.
Scale Factor.
Circular Offset
Linear Offset.

The uses of these parameters and the keystrokes needed to program these parameters are explained in Section 8.0 "PROGRAMMING THE 1400 ABSOLUTE RESOLVER ENCODER MODULE".

7.1 DISPLAY MODE of operation:

The Program Mode Switch (SW1) in the "off" position.
(Pushed towards the back of the unit.)

This Mode of operation allows the user to inspect all of the present values in the parameters but does not allow the changing of programmed values.

KEY	COMMENTS
[FUNCTION], [◀], [▶]	These keys are used to select the function shown on the digital display. The function displayed is determined by the Function Indicators. See Section 5.1 FUNCTION INDICATORS.
[NEXT]	This key is used to switch between axes on a multi-axes module.
[CLEAR]	This key is used to recover from fault conditions. The nature of the error is determined by the message on the display See Section 5.3 FAULT DIAGNOSTICS.
[ENTER], [▲], [▼]	These keys are not used in Display Mode.

7.0 KEYBOARD DESCRIPTION (cont'd)

7.2 PROGRAM MODE of operation:

The Program Mode Switch, SW1, in the "on" position. (Pushed towards the front of the unit.)

This mode of operation allows the user to inspect and change all of the programmable parameters.

KEY	COMMENTS
[FUNCTION]	This key is used to select the function shown on the digital display. The function displayed is determined by the Function Indicators. See Section 5.1 FUNCTION INDICATORS.
[CLEAR]	1) This key is used to recover from fault conditions. See Section 5.3 FAULT DIAGNOSTICS. 2) If the POS function is displayed, pressing this Key will AUTO ZERO the transducer. The unit will automatically calculate and store the required offset to make the Position value equal to zero.
[ENTER]	1) When pressed, this key will store the displayed data in EEPROM Memory. Only data that is displayed with a blinking cursor can be stored. When the Scale Factor is changed, the Offset will be reset to zero.
[NEXT]	This key is used to switch between axes on a multi-axes module.
[▲], [▼]	These keys are used to increment, [▲], or decrement, [▼], the number under the blinking cursor.
[◀], [▶]	1) If the blinking cursor is active, these keys move the blinking cursor to the left or the right of the display. 2) If the blinking cursor is not active, pressing these keys selects a new function.

8.0 PROGRAMMING THE 1400 ABSOLUTE RESOLVER ENCODER MODULE

The following steps explain the programming of the 1400 Absolute Resolver Encoder Module. In all of the following examples the Module must be in the Program Mode before the keystrokes can be entered in the given sequence. Please refer to Section 6.0 PROGRAM MODE for more information.

The following conventions are used when describing the Keystrokes used to program the different functions.

[KEY]: Used to show the key pressed on the module. The key's name will be inside the brackets. If an asterisk appears before a key, (Example: *[FUNCTION]), the key must be pressed until the display is showing the proper function. If a "X" and a number follow a key, (Example: [▲]X3), the key must be pressed the shown number of times. (In this example, the [▲] key would be pressed 3 times.

"Display": Information shown on the 6 digit display. A blinking cursor is shown by a underline.

IND1 + IND2: Indicator LEDs that indicate the parameter or function being programmed or displayed.

The following keystroke examples use the least number of key-strokes. However, any series of keystrokes is valid as long as the data is correct before the [ENTER] key is pressed.

8.1 TACHOMETER RESPONSE:

The user's machine will be running at 1500 RPM. Because of this, you want the tachometer to update every 32 mSecs. The tachometer response is presently at it's default value of 240 mSecs with a 1 RPM resolution.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	TAC + A	"1_0240"	Present Value.
[▲]	TAC + A	"1_240.0"	240 mSec, .1 RPM resolution
[▲]	TAC + A	"1_0032"	Desired Value.
[ENTER]	TAC + A	"1_0032"	Value stored in EEPROM Blinking cursor removed.

8.2 SCALE FACTOR:

You want to program a Scale Factor of 720, which is a resolution of one count per every half of a degree rotation, for the second transducer on a 1433. Presently, the default Scale Factor of 360 is programmed in.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	SF	"1_xxxx"	Transducer 1 Scale Factor
[NEXT]	SF	"2_0360"	Transducer 2 Scale Factor
[▶], [▼]X4 [▶], [▲]X4	SF	"2_0720"	Desired Scale Factor
[ENTER]	SF	"2_0720"	Value stored in EEPROM Blinking cursor removed.

8.3 CIRCULAR OFFSET

You want to program in a Circular Offset of 70 counts. The default value of 0000 is presently in memory.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	OF + A	"1_0000"	Present Offset.
[▶]X2, [▼]X3	OF + A	"1_0070"	Desired Offset.
[ENTER]	OF + A	"1_0070"	Value stored in EEPROM Blinking cursor removed.

8.4 AUTO ZERO:

The machine is at mechanical zero. You want to preset the transducers position to 0000. Instead of calculating the required offset, you can use the Auto Zero function.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	POS	"1_xxxx"	xxxx = Present Position.
[CLEAR]	POS	"1_0000"	Position reset to zero.
*[FUNCTION]	OF + A	"1_yyyy"	yyyy = Calculated Offset.

8.0 PROGRAMMING THE 1400 ABSOLUTE RESOLVER ENCODER MODULE (cont'd)

8.5 LINEAR OFFSET

You want to program in a Linear Offset of 1000 counts for the third transducer of a 1444. The default value of 0000 is presently in memory.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	OF + B	"1_xxxx"	Transducer 1 Linear Offset
[NEXT]	OF + B	"2_xxxx"	Transducer 2 Linear Offset
[NEXT]	OF + B	"3_0000"	Transducer 3 Linear Offset
[▲], [ENTER]	OF + B	"3_1000"	Value Stored in EEPROM. Blinking Cursor removed.

9.0 ADDRESSING THE 1400 MODULE

Before a Series 1400 Module can communicate with a Square D programmable controller, you must assign register numbers to the slot that the module is plugged into. The number of registers that must be assigned to the slot is dependent on the type of 1400 Module. The following table lists the ten 1400 Modules and the required number of registers.

Module Number	# of Registers
1431/41	2
1432/42	4
1433/43	6
1434/44	8
1461	3
1462	6

The process of assigning register numbers to the slots is called RACK ADDRESSING. Rack Addressing is accomplished from your CRT Programmer. The actual steps involved in Rack Addressing are different for each model of Square D processors. Please refer to the appropriate instruction bulletin for each type of SY/MAX programmer.

The Series 1400 Modules appear as INput modules to the SY/MAX controller. When the Rack addresses are specified on the CRT Programmer, using the CPU or REMOTE RACK ADDRESS ASSIGNMENT Displays, the "MODULE INFO" comment should read "IN D5" if the module is operating correctly. "D5" is the hexidecimal code specified by Square D for third party Input Modules.

10.0 1400 MODULE REGISTER DATA FORMAT

Up to eight registers are used by the Series 1400 Modules for communication with the SY/MAX Processor. The 16 Data Bits are used to either store the Position and Tachometer values or report error diagnostic information. The format of the data in the 16 Data Bits for the single turn 1400 Modules is shown below. All Position and Tachometer values are in Binary. 1431/41 Modules will only use the first two registers listed. 1432/42 Modules will use the first four registers listed. 1433/43 modules will use the first six registers listed and 1434/44 Modules will use all eight registers listed.

BIT	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
REG. 1	E*	0	0	13 or 10 BIT POSITION VALUE TRANS. 1												
REG. 2	E*	0	0	0	0	11 BIT TACHOMETER VALUE TRANS. 1										
REG. 3	E*	0	0	13 or 10 BIT POSITION VALUE TRANS. 2												
REG. 4	E*	0	0	0	0	11 BIT TACHOMETER VALUE TRANS. 2										
REG. 5	E*	0	0	13 or 10 BIT POSITION VALUE TRANS. 3												
REG. 6	E*	0	0	0	0	11 BIT TACHOMETER VALUE TRANS. 3										
REG. 7	E*	0	0	13 or 10 BIT POSITION VALUE TRANS. 4												
REG. 8	E*	0	0	0	0	11 BIT TACHOMETER VALUE TRANS. 4										

Because both the Position and Tachometer values are less than 16 bits in length, both have preceding zero's to complete the 16 bit register.

When a transducer fault is detected, the module will transmit 8000h (Bit 16 set) in the words of the effected channel. For example, if channel 3 has a fault, 8000h will be transmitted in words 5 and 6. When a E^2PROM error is detected, 8000h (Bit 16 set) will be transmitted in all of the words sent to the processor. For more information on Fault conditions, refer to 5.3 FAULT DIAGNOSTICS, PGs 6-7.

11.0 SPECIFICATION

Module Location
Any SY/MAX® Register Slot

Position Transducer
AMCI Brushless Resolver

Transducer Input
Transformer Isolated

Position Resolution
143x: Programmable to 1 part in 1024
144x: Programmable to 1 part in 8192

1461/2: Programmable to 1 part in 1024 per turn

1463: Programmable to 1 part in 1024 per turn (10,000,000 Counts max.)

New Position Throughput Time
400 uSec: 1431, 32, 41, 42, 61
800 uSec: 1433, 34, 43, 44, 62, 63

Programmable Parameters
Scale Factor (Full Scale Counts)
Number of Turns (146x only)
Decimal Point Position (146x only)
Circular Offset
Linear Offset
Tachometer Response time (143x/4x only)
Tachometer Resolution (143x/4x only)

Number of Turns (146x only)
1461/2:

100 Turn Transducer:
1, 2, 4, 5, 10, 20, 25, 50, or 100 turns

180 Turn Transducer:
1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, or 180 turns

1463:

10,000 Turn Transducer:
200, 400, 500, 1000, 2000, 2500, 5000, or 10000 turns

Position Offset
Circular Offset programmable from 0 to Full Scale Count
Linear Offset programmable from 0 to:
(9999 - Full Scale Count) 143x, 144x
(999999 - Full Scale Count) 1461/2
(9999999 - Full Scale Count) 1463

Programmable Tachometer Response Time
32, 60, 120, or 240 mSec: (143x/4x only)
Set to 32 mSec: (146x)

Tachometer Resolution
1 RPM at 32, 60, or 120 mSec response times
Programmable to 1 RPM or 0.1 RPM at 240 mSec response time

Tachometer Range
1 to 2000 RPM at 32, 60, and 120 mSec response time
1 to 1000 or 0.1 to 999.9 at 240 mSec response time

Data Available to Processor
Transducer's Shaft Position, Shaft Velocity, and Fault Diagnostics

Program Input
Module's self-contained keyboard and display

Program Storage
EEPROM Memory

DC Supply Voltage from Backplane
+ 5 Volts @ 0.95A max. (4 axis Module)

Module's +5V DC Supply Fuse
1.5A Fast Blow (Littelfuse 22501.5)

Environmental Conditions
Operating Temperature: 0 to 60° C.
Relative Humidity: 5 to 95% (without condensation)
Storage Temperature: -40 to 85° C.

Connector Keying
Pin 1: Between slot (03 - 04) and slot (05 - 06)
Pin 2: Between slot (29 - 30) and slot (31 - 32)
Pin 3: Between slot (91 - 92) and slot (93 - 94)

APPENDIX A
ADDITIONAL INSTRUCTIONS
1431/41 - 02

The 1431-02 or 1441-02 have three features that add to the capabilities of the standard single axis modules. These three features are a Brake Wear Monitor, a Temporary Position Offset that is programmable from the SY/MAX Processor, and programmable compatibility with the Autotech RL-100 Series transducers.

The Brake Wear Monitor measures the time between an input to the module becoming active and the stopping of the transducer's shaft. The Brake Wear Monitor is designed to be used in press brake applications. The Brake Wear Monitor can measure a stopping time of 24 mSec to 9.999 Sec with a 1 mSec resolution. The accuracy of the Brake Wear Monitor is 8 mSec. The stopping time of the transducer is available to the processor through an additional register.

The Brake Wear Monitor is a monitoring feature only. Any decisions with regards to the press brake functioning properly must be made by the processor through the proper ladder logic program.

The second added feature allows the SY/MAX processor to program the Temporary Offset that is added to the Circular Position Offset. This allows the processor to fine tune the Position reading from the 1431/41-02. The Temporary Position Offset is programmed through a register assigned to the 1431/41-02 Module. The Temporary Offset is not stored in the module's E^2PROM memory and is set to zero on power up.

Finally, the 1431/41-02 allows you to use an Autotech RL-100 as the resolver input transducer. You can select either an AMCI manufactured transducer or an Autotech manufactured transducer from the keyboard of the 1431-02. **NOTE: Because of the design of the Autotech transducer, Transducer Fault Diagnostics is not available if you select the Autotech transducer.**

ADDRESSING THE 1431/41-02 MODULE

Before a Series 1431/41-02 Module can communicate with a Square D programmable controller, you must assign registers to the slot that the module is plugged into. The 1431/41-02 requires 4 registers. This is two more than the standard single axis modules require. These additional registers are for the Stop Time value and the Programmable Offset.

Module Number	# of Registers
1431/41	2
1431/42-02	4

The process of assigning register numbers to the slots is called RACK ADDRESSING. Rack Addressing is accomplished from your CRT Programmer. The actual steps involved in Rack Addressing are different for each model of Square D processors. Please refer to the appropriate instruction bulletin for each type of SY/MAX programmer.

The Series 1400 Modules appear as INput modules to the SY/MAX controller. When the Rack addresses are specified on the CRT Programmer, using the CPU or REMOTE RACK ADDRESS ASSIGNMENT Displays, the "MODULE INFO" comment should read "IN D5" if the module is operating correctly. When the Status Field is examined on the CRT programmer in the "DATA" mode, Registers 1 to 3 show a status field of D500h. Register 4 shows a status field of 9500h. D500h is the hexidecimal code specified by Square D for Read Only Registers on third party Input Modules. 9500h is the hexidecimal code specified by Square D for Write Only Registers on third party Input Modules.

1431/41-02 MODULE REGISTER DATA FORMAT

BIT	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
REG. 1	0	0	0	13 or 10 BIT POSITION VALUE Axis 1												
REG. 2	0	0	0	0	0	11 BIT TACHOMETER VALUE Axis 1										
REG. 3	Stop Time in mSec. Max Value = 9999															
REG. 4	Temporary Offset. Max. Val. = SF-1															

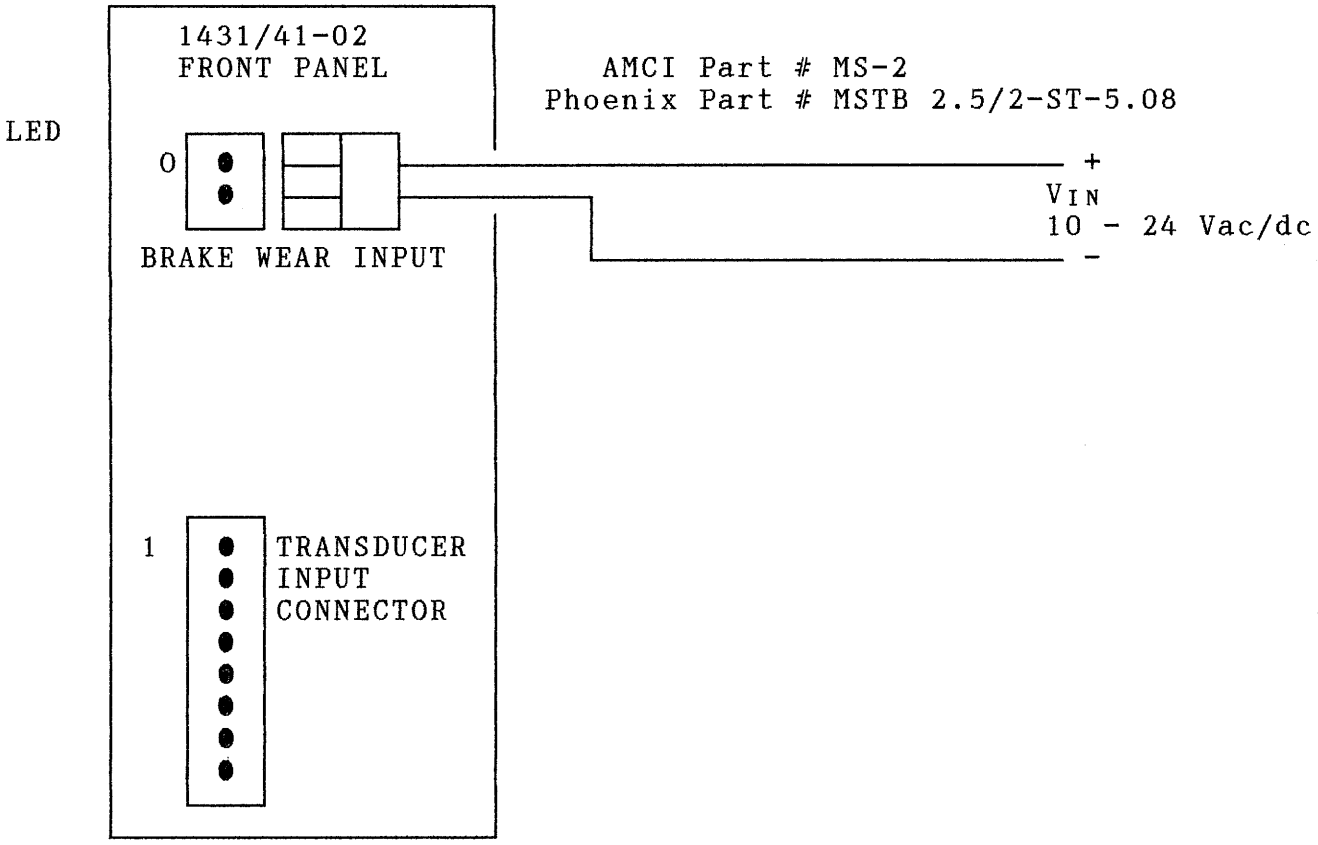
All values are in Binary Format.

Because both the Position and Tachometer values are less than 16 bits in length, both have preceding zero's to complete the 16 bit register.

When a transducer fault or E^2PROM error is detected, the module will transmit 8000h (Bit 16 set) in the first three registers. For more information on Fault conditions, refer to 5.3 FAULT DIAGNOSTICS, Pgs 6-7.

Note: Because of the design of the Autotech transducer, the 1431/41-02 can not detect transducer faults when Autotech Transducers are used with the module. If a fault condition exists, the 1431/41-02 will send random numbers to the controller.

The following connections are for the Brake Wear input on the 1431/41-02.



NOTES:
1) The LED will come on when an AC or DC Voltage with the proper polarity is applied to the input.
2) If a DC Voltage is applied with the opposite polarity shown, the Input will still be active but the LED will not come on.
3) 10 mAmps is the minimum current needed to turn the input on.

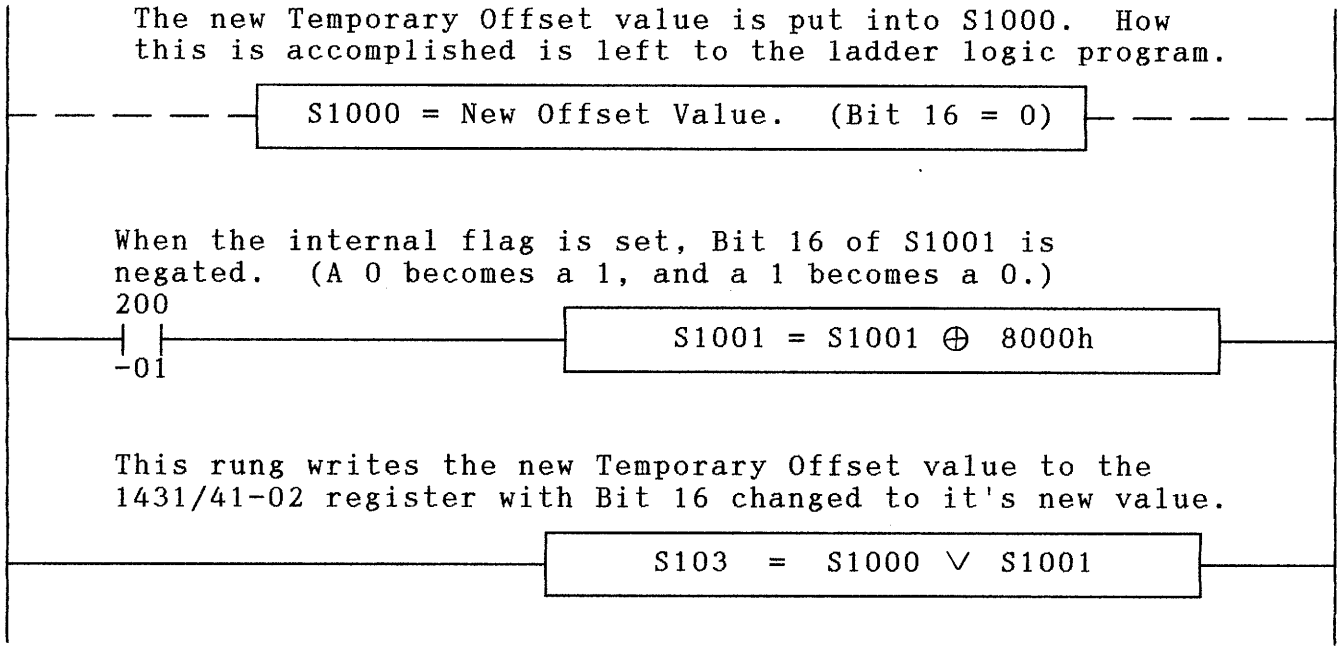
STOP TIME DISPLAY

The stopping time of the transducer can be shown on the module's display. This is done by pressing the [FUNC] key until the indicator LED's show "POS + A". The alpha-numeric display will show "S. X.XXX" where X.XXX is the stopping time in seconds.

The Temporary Offset is programmed by writing the new offset in the fourth register assigned to the 1431/41-02. Bit 16 of the register (called the ENABLE bit) controls the transfer. The 1431/41-02 stores the value of Bit 16 in it's memory. When the 1431/41-02 senses that Bit 16 has changed state, (0 becomes a 1 or a 1 becomes a 0), the module accepts the value in the register as the new Temporary Offset. If the new Temporary Offset in the register is greater than the programmed Scale Factor, the new Temporary Offset will be ignored.

The following example shows a segment of a ladder logic program that writes a new Temporary Offset to a 1431/41-02 when an external input becomes active. This programming scheme uses 3 registers.

S103: Last Register assigned to the 1431/41-02. This register holds the Temporary Offset data to the module.
S1000: Register that holds the new offset value.
S1001: Register used to store the present status of the ENABLE bit. (Bit 16 of the S103 Register.) This register should be set to 8000h on power up during the first scan and then not changed by the ladder program again except as shown below. Using this register for any other purpose may cause an error in writing the proper Temporary Offset to the 1431/41-02.
S200-01: Internal single bit flag used signal that the offset should be written to the 1431/41-02 Module.



NOTES:
1) The Temporary Offset values must be in a Binary Format.
2) The valid range of the Temporary Offset is 0 to (Scale Factor - 1)
3) If the Value of the Temporary Offset is greater than or equal to the Scale Factor, the new Temporary Offset is ignored and the 1431/41-02 will continue to use the preset value for the Temporary Offset.
4) The Temporary Offset is not stored on power-down.
5) The Temporary Offset is set to zero after power-up or when the Scale Factor is programmed from the Keyboard.
6) The Temporary Offset is not changed when you program the Circular or Linear Offsets or when you use the Auto Zero Feature.

INPUT TRANSDUCER SELECTION

The 1431/41-02 can be used with both AMCI manufactured, and Autotech manufactured transducers. The 1431/41-02 will work with the RL-100 models of Autotech transducers. Because of the differences in the design of the transducers, an additional parameter has been added that must be programmed from the keyboard. The following keystrokes are used to switch between an AMCI and an Autotech transducer.

NOTE: Because of the design of the Autotech transducer, Transducer Fault Diagnostics is not available if you select the Autotech transducer.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	POS + B	"rES 1"	AMCI Transducer selected.
[▲]	POS + B	"rES 2"	Autotech transducer selected
[ENTER]	POS + B	"rES 2"	Value stored in EEPROM Blinking cursor removed.

Along with the extra features offered on the 1431/41-02 modules, (See Appendix A), the 1431/41-03 modules offer remote display capability. You can make connection to the remote display through a fiber optic or RS-485 compatible link.

Front Panel Description

There are two additional connectors on the front panel of the 1431/41-03 modules.

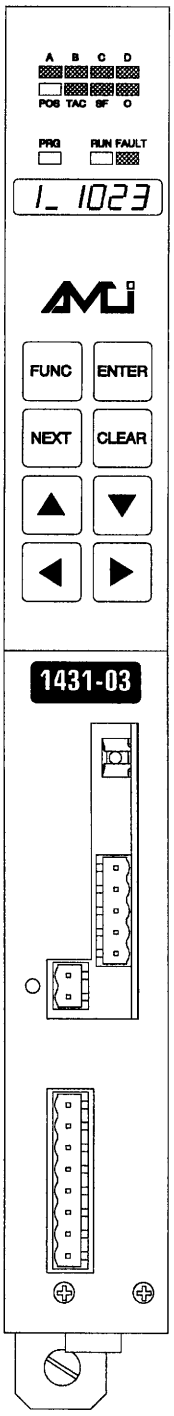


Fig B.1 1431/41-03 Front Panel

Fiber Optic Transmitter - Mates with Fiber Optic Cable, AMCI Part # CDP-(x) where (x) is length in meters. Maximum cable length is 75 meters (245 feet).

RS-485 Connector - Mates with RS-485 Cable AMCI Part # CDC-(x) where (x) is length in meters. Maximum Cable length is 300 meters (1000 feet). This RS-485 compatible link is electrically isolated and requires an external supply. **When connected to AMCI's 6100F Remote Display, the 6100F supplies the external power.**

Fiber Optic Cable Installation

All fiber optic cables for use with the 1431/41-03 Modules must be manufactured by AMCI. The part number for the fiber optic cable is CDP-(x) where (x) is the length in meters. You must not splice these cables in the field. If your installation requires a splice in the cable run, order two or more cables from AMCI of the proper lengths.

Because splices in a cable cause light loss, the number of splices in a cable run effects its maximum length. The following table lists the maximum run lengths based on the number of splices. The connections to the fiber optic transmitter and receiver are not considered splices.

Number of Splices	Maximum Cable Run Length
0	75 meters (245 feet)
1	66 meters (215 feet)
2	57 meters (185 feet)
3	48 meters (155 feet)
4	35 meters (115 feet)

Fig B.2 Maximum Fiber Optic Cable Run Lengths

Complete installation information, including splice connectors can be found in the 6100F User's Manual.

RS-485 Cable Installation

A wiring diagram of the CDC-(x) {(x) = Length in Meters}, is shown in Fig. B.3. Maximum cable length is 300 Meters (1000 Feet).

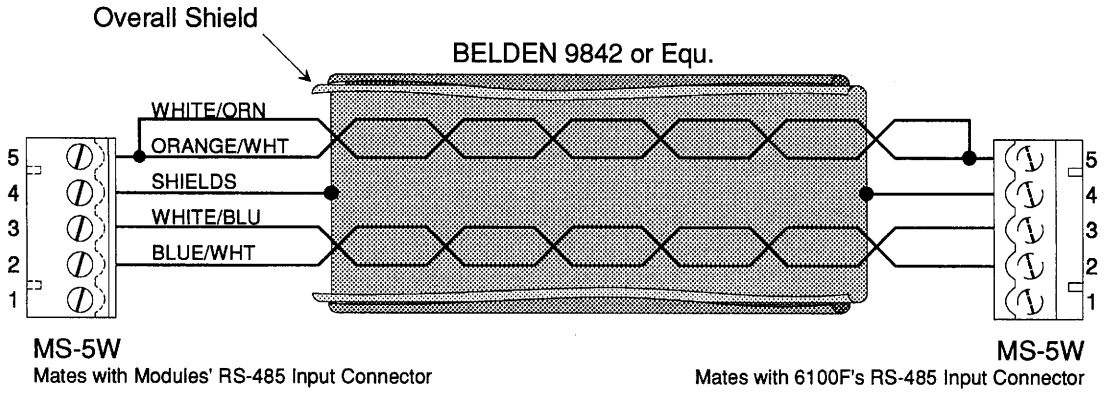


Fig B.3 CDC-(x) Wiring Diagram

If you splice the CDC-(x) Cable, it should be done in a grounded junction box. THE SHIELD MUST BE ISOLATED FROM THE JUNCTION BOX. If this practice is not followed, you may form a ground loop between the 6100F and the junction box that may effect the RS-485 Communications or damage the 6100F.

Additional Displays and Keyboard Programming

A 1431/41-03 Module has two additional parameters that you must program if you use the fiber optic communication link. These two parameters are Number of Splices and Fiber Optic Run Length. A module uses these parameters to set the power output of the fiber optic transmitter. If these two parameters are not programmed correctly, the fiber optic link may not operate. The modules also have one additional error message that is displayed if the remote display board inside the module is not communicating with the main board of the module.

Fig B.4 # of Splices

Number of Splices - Must be set to the number of splices in the fiber optic cable over the entire cable run. This parameter accepts values between 0 and 4. When this Parameter is changed, the Fiber Optic Cable length is reset to zero.

In this programming example, you change the Number of Splices to 2 from its default of 0.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	A + B	"SPL _0"	Default Value.
[▲]X2, [ENTER]	A + B	"SPL _2"	Value stored in E^2PROM. Blinking Cursor removed.

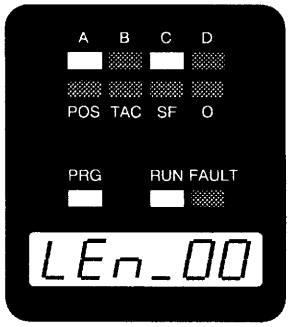


Fig B.5 FO Run Length

Fiber Optic Run Length - Must be set to the total length of cable between the 1431/41-03 module and the 6100F Remote Display. This parameter is programmed in meters and its maximum value depends on the number of splices. Refer to Figure B.2 Maximum Fiber Optic Cable Run Lengths, Pg B-2 for a list of maximum cable lengths. Programming a length of zero disables the fiber optic link.

Additional Displays and Keyboard Programming (cont'd)

Fiber Optic Run Length (cont'd)

In this programming example, you change the Length to 30 meters (100 feet) from its default of 0.

PRESS	IND. LEDS	DISPLAY	COMMENTS
*[FUNCTION]	A + C	"LEn _ 00"	Default Value.
[▲]X3, [ENTER]	A + B	"LEn _ 30"	Value stored in E^2PROM. Blinking Cursor removed.

Additional Error Messages

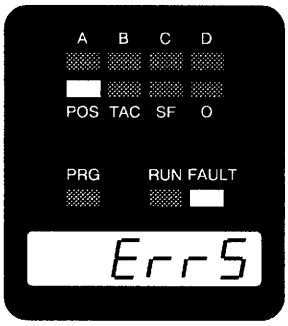


Fig B.6 RD Board Fault

Error Class 5:

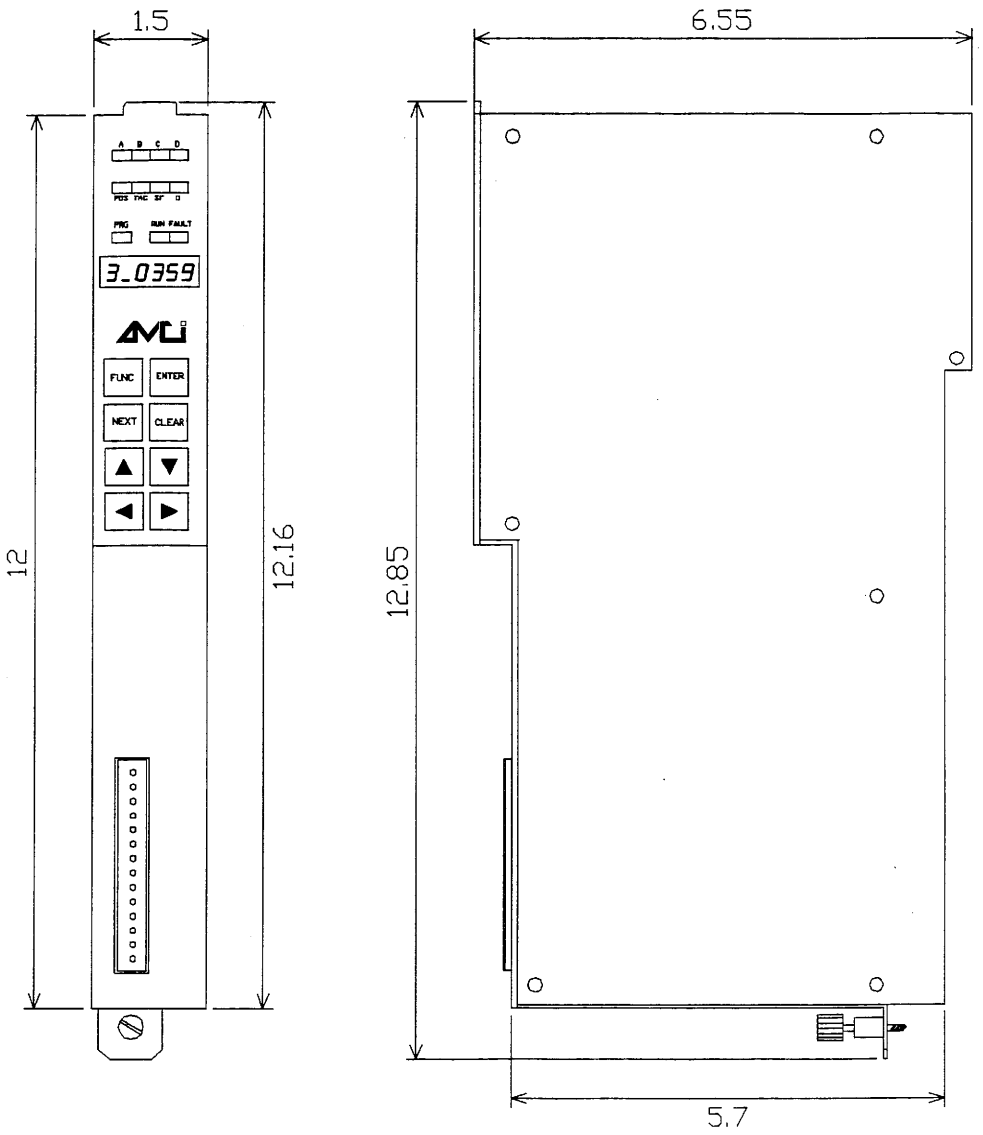
Remote Display Board Fault. - Occurs when there is a communications fault between the remote display board inside the module and the modules' main board. If this error occurs, cycle power to the module. If the error message remains, the module must be returned for repairs. See inside front cover *Returns Policy:* for additional information.

Error Messages are transmitted to the 6100F and are shown on the its display. For a complete list of error messages that a 6100F displays, refer to the 6100F User's Manual.

Brake Wear Monitor Connector Changes

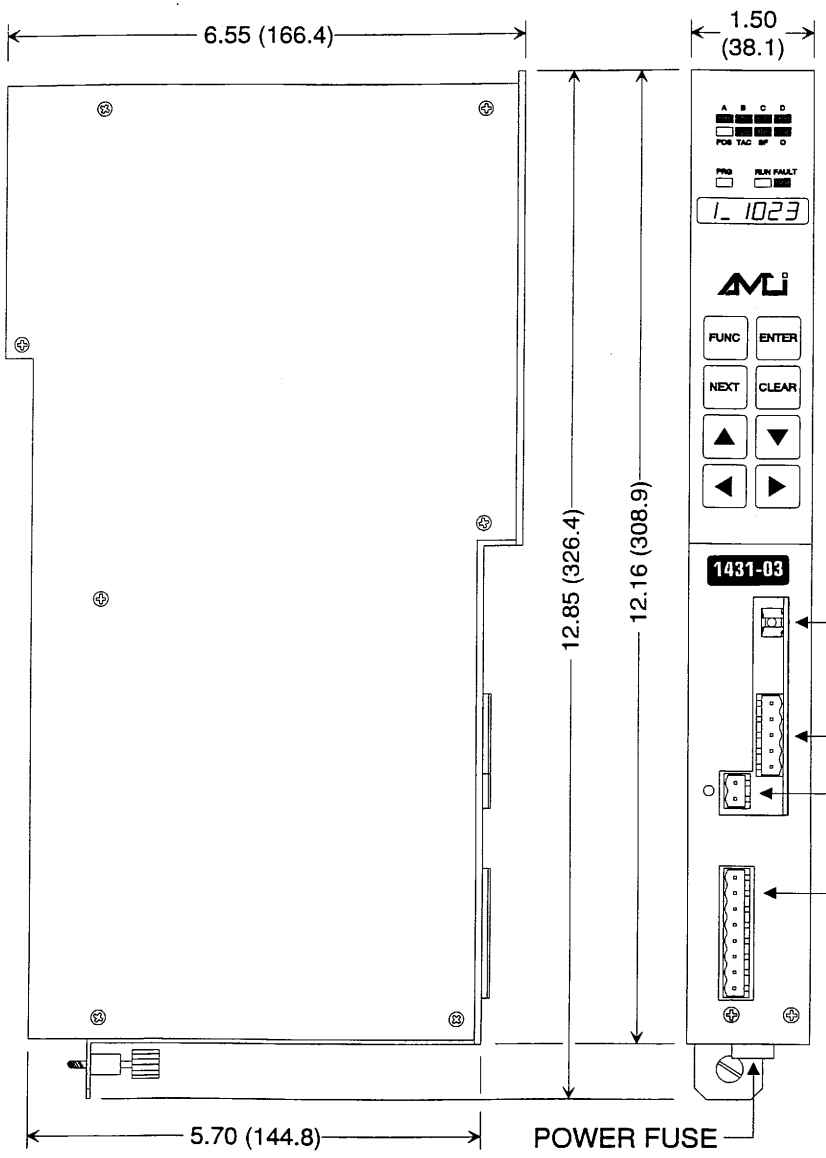
Because of the positioning of the RS-485 Input Connector on the modules' front panel, a MS-2 Connector cannot be used as the Brake Wear Monitor Input Connector. A MS-2W should be used. Refer to Print B1188.

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.



TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	SERIES 1400	SCALE NONE	DRAWN BY DWA / APPROVED BY
FRACTIONAL ±	TITLE OUTLINE DRAWING		
ANGULAR ±	DATE 5/30/91	DRAWING NUMBER B1153	

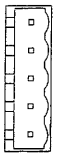
P-1



DATE	SYM	REVISION RECORD	AUTH	DR	CK

FIBER OPTIC TRANSMITTER - For use with 6100F Remote Displays.
Mates with Fiber Optic Cable AMCI # CDP-(x) where (x) is length in meters.

RS-485 CONNECTOR - For use with 6100F Remote Displays.
Mates with:
Phoenix #: MVSTBW 2.5/5-ST-5.08
AMCI #: MS-5W

5		+ Vn
4		SHIELD
3		+ Tx
2		- Tx
Pin 1		No Connection

NOTE: + Vn is supplied by the 6100F Remote Display.
See Print A1083 for RS-485 Cable AMCI # CDC-(x) where (x) is length in meters.

BRAKE WEAR MONITOR CONNECTOR
Mates with:
Phoenix #: MVSTBW 2.5-8-ST-5.08
AMCI #: MS-2W

Pin 1		+ V_{IN}
2		- V_{IN}

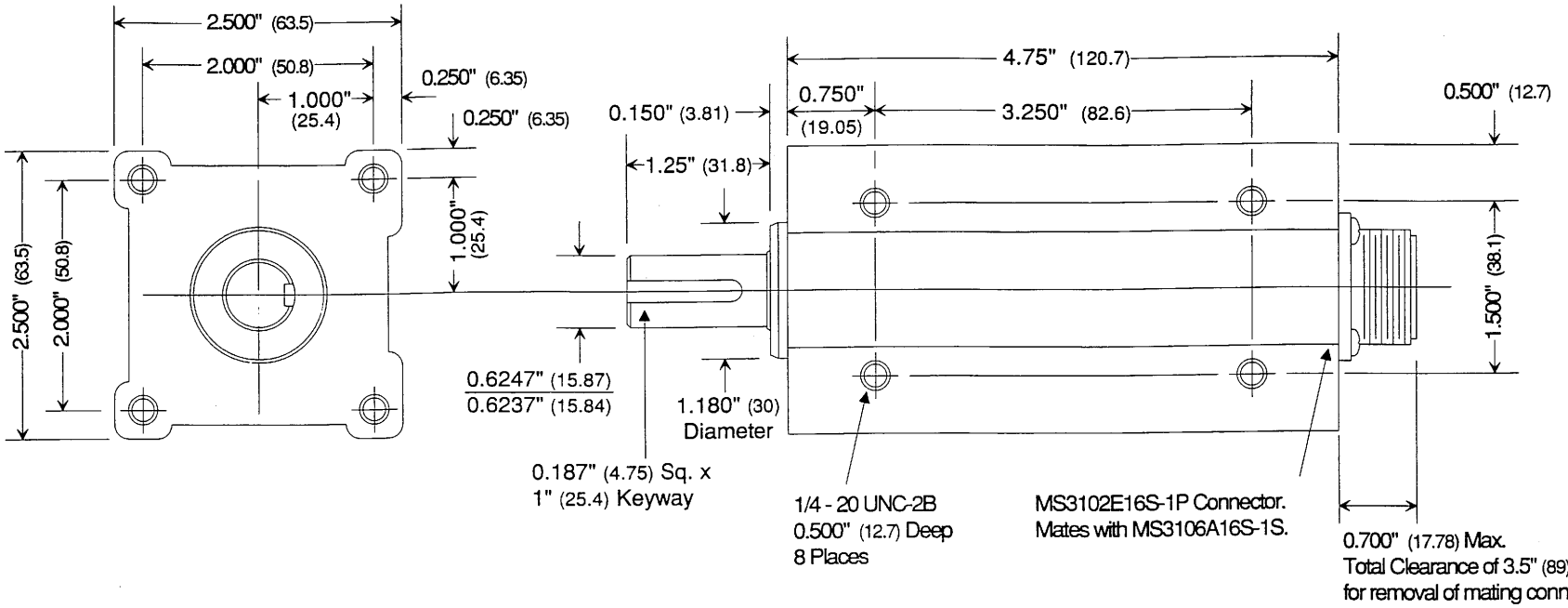
V_{IN} must be in the range of 10 to 24 Vac/dc. Input current is 10 mAmps. If a DC voltage is applied opposite to the polarity shown, the input activates but the indicator LED will not come on.

TRANSDUCER INPUT CONNECTOR
Mates with:
Phoenix #: MVSTBW 2.5/8-ST-5.08
AMCI #: MS-8W
See the following for Cable Pin-outs:
B1193: C1TW-(x)
B1195: Connenction to Autotech SAC-RL100-M11
B1196: Connection to Autotech SAC-RL100-010

POWER FUSE
Littelfuse # 22501.5
AMCI # SKF-5

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	1431-03	SCALE NONE	DRAWN BY DWN
FRACTIONAL ±	TITLE Outline and Connector Pin-out		APPROVED BY ER
ANGULAR ±	DATE 3/1/93	DRAWING NUMBER B1188	

DATE	SYM	REVISION RECORD	AUTH	DR	CK
1/93	A	Added Connector Removal Dimensions.	DWN		



MECHANICAL SPECIFICATIONS

Max. Starting Torque @ 25°C	8 oz.in.
Moment of Inertia	20 oz-in-sec²
Max. Shaft Loading:	
Radial	400 lbs.
Axial	200 lbs.
Weight	4 lbs.

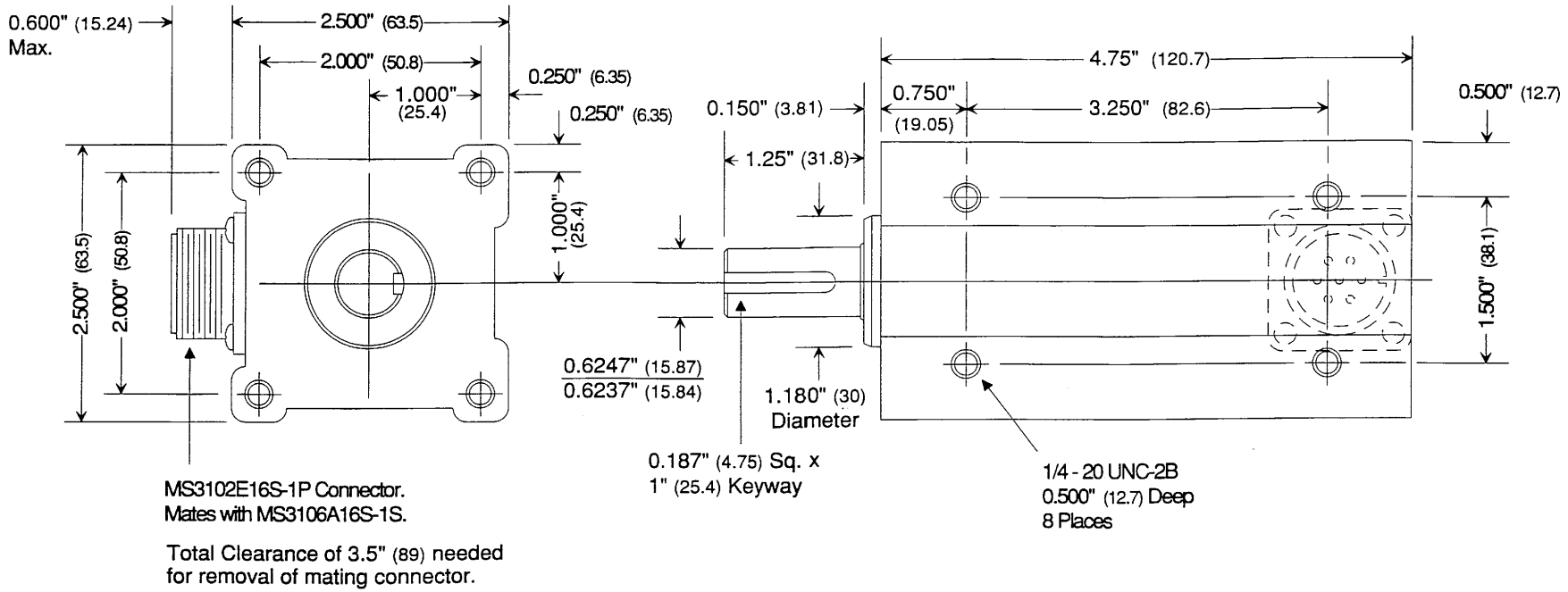
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20 to 125°C.
Shock	50 G's for 11 mSec.
Vibration	5 to 2000 Hz @ 20 G's
Nema Rating	Nema 13

( ) = Dimensions in millimeters

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	HT-20	SCALE 1:1	DRAWN BY DWN
FRACTIONAL ±	TITLE OUTLINE DRAWING		APPROVED BY WXE
ANGULAR ±	DATE 3/9/90	DRAWING NUMBER B1001 REV. A	

DATE	SYM	REVISION RECORD	AUTH	DR	CK
12/91	A	Added Height Dimension.	DWN		
1/93	B	Added Connector Removal Dimensions.	DWN		



MECHANICAL SPECIFICATIONS

Max. Starting Torque @ 25°C	8 oz.in.
Moment of Inertia	20 oz-in-sec²
Max. Shaft Loading:	
Radial	400 lbs.
Axial	200 lbs.
Weight	4 lbs.

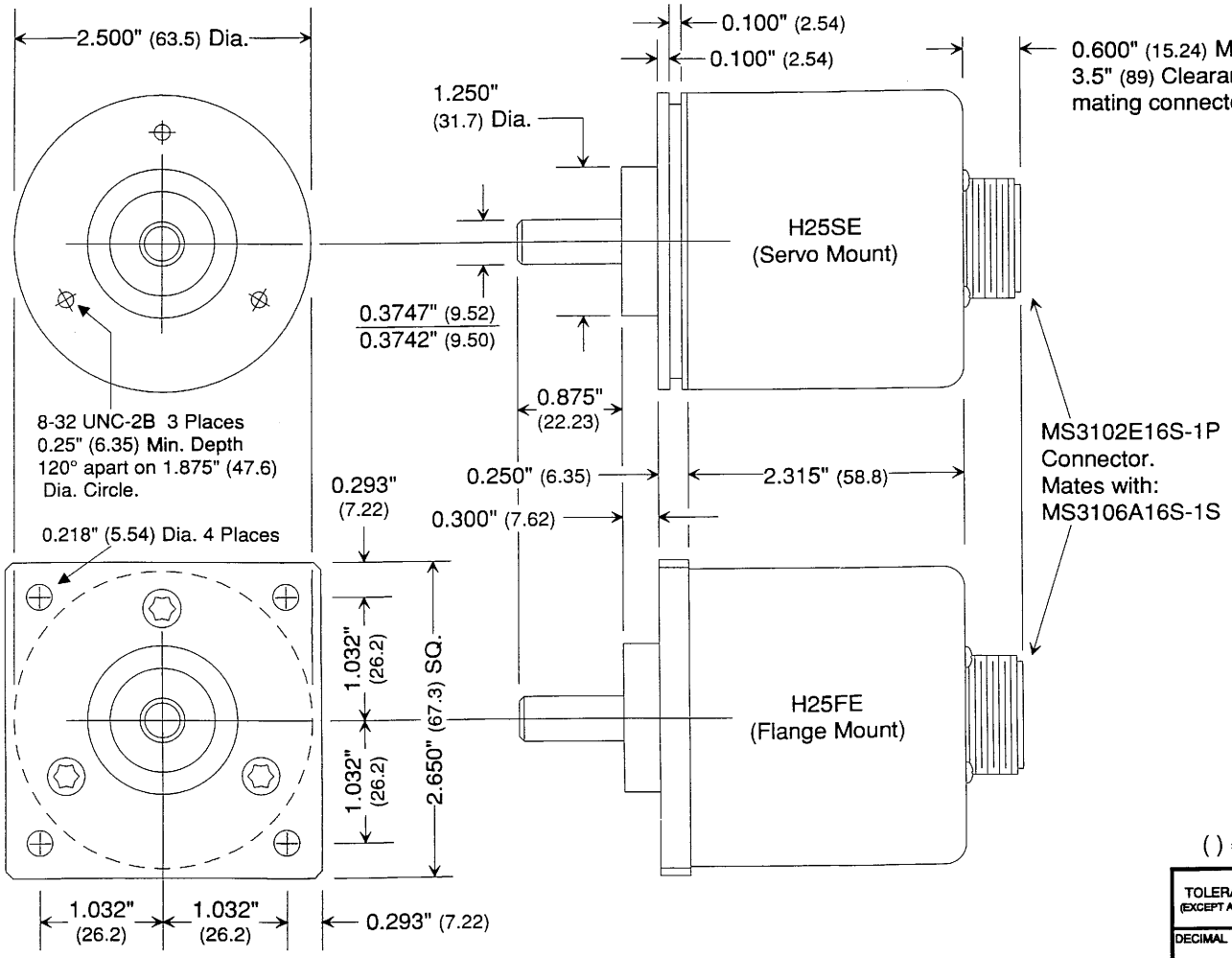
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20 to 125°C.
Shock	50 G's for 11 mSec.
Vibration	5 to 2000 Hz @ 20 G's
Nema Rating	Nema 13

( ) = Dimensions in millimeters

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	HT-20/S	SCALE 1:1	DRAWN BY DWN
			APPROVED BY WXE
FRACTIONAL ±	TITLE OUTLINE DRAWING		
ANGULAR ±	DATE 5/1/90	DRAWING NUMBER B1115 REV. B	

DATE	SYM	REVISION RECORD	AUTH	DR	CK
8/91	A	Changed Mounting Holes (SE)	WXE		
9/91	B	Added 1.875" Circle (SE)	DWN		
1/93	C	Changed Can Length, Flange			
		Width. Added Specifications	DWN		



MECHANICAL SPECIFICATIONS

Max. Starting Torque @ 25°C	1.5 oz.in.
Moment of Inertia	4 oz-in-sec^2
Max. Shaft Loading:	
Radial	40 lbs.
Axial	20 lbs.
Weight	1 lb.

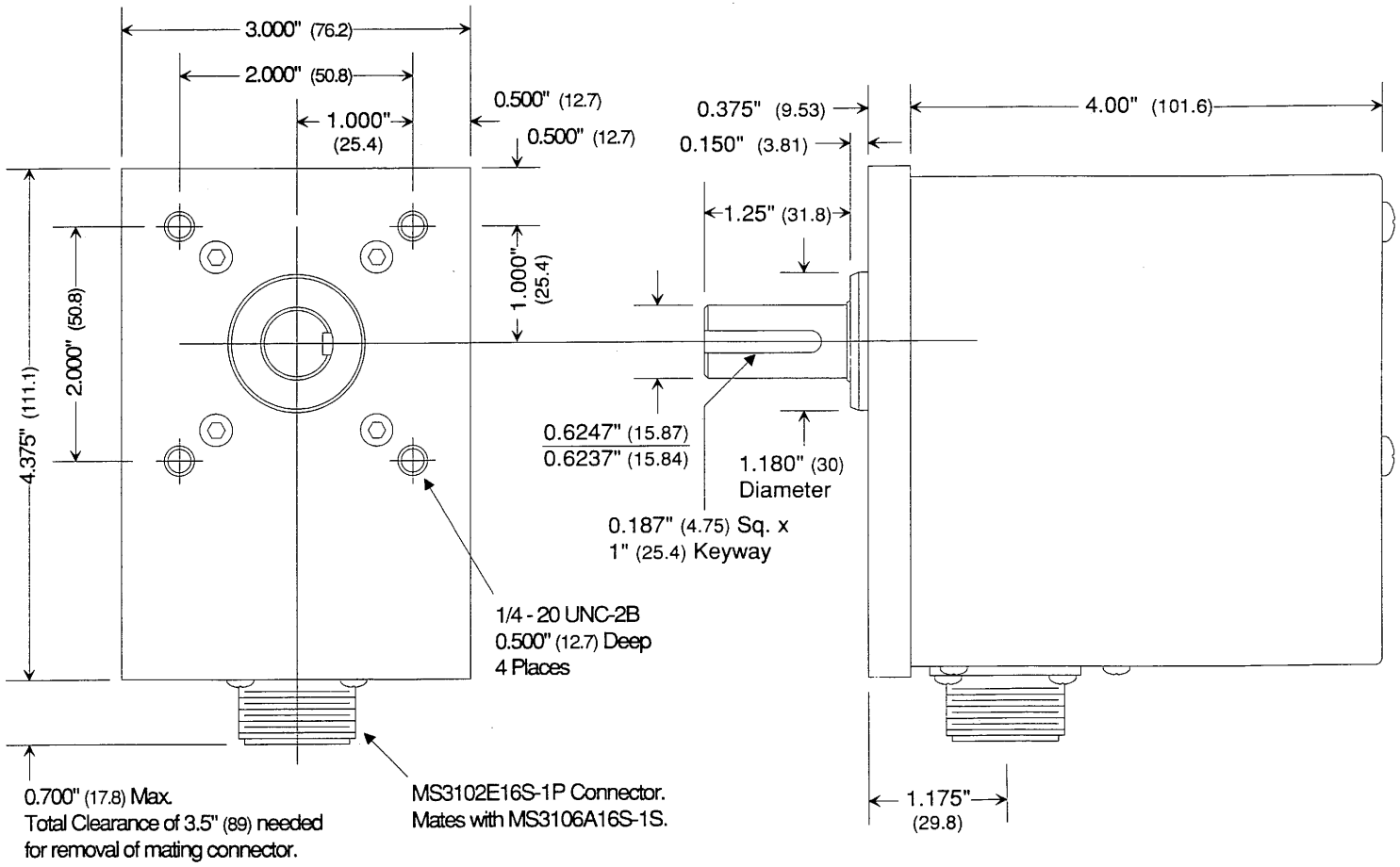
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20 to 125°C.
Shock	50 G's for 11 mSec.
Vibration	5 to 2000 Hz @ 20 G's
Nema Rating	Nema 13

( ) = Dimensions in millimeters

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	H25SE / FE	SCALE 1:1	DRAWN BY DWN
FRACTIONAL ±	TITLE OUTLINE DRAWING		APPROVED BY WXE
ANGULAR ±	DATE 1/2/87	DRAWING NUMBER B1041 REV. C	

DATE	SYM	REVISION RECORD	AUTH	DR	CK
1/93	A	Added Specifications	DWN		



MECHANICAL SPECIFICATIONS

Max. Starting Torque @ 25°C	8 oz.in.
Moment of Inertia	20 oz-in-sec²
Max. Shaft Loading:	
Radial	400 lbs.
Axial	200 lbs.
Weight	3 lbs.

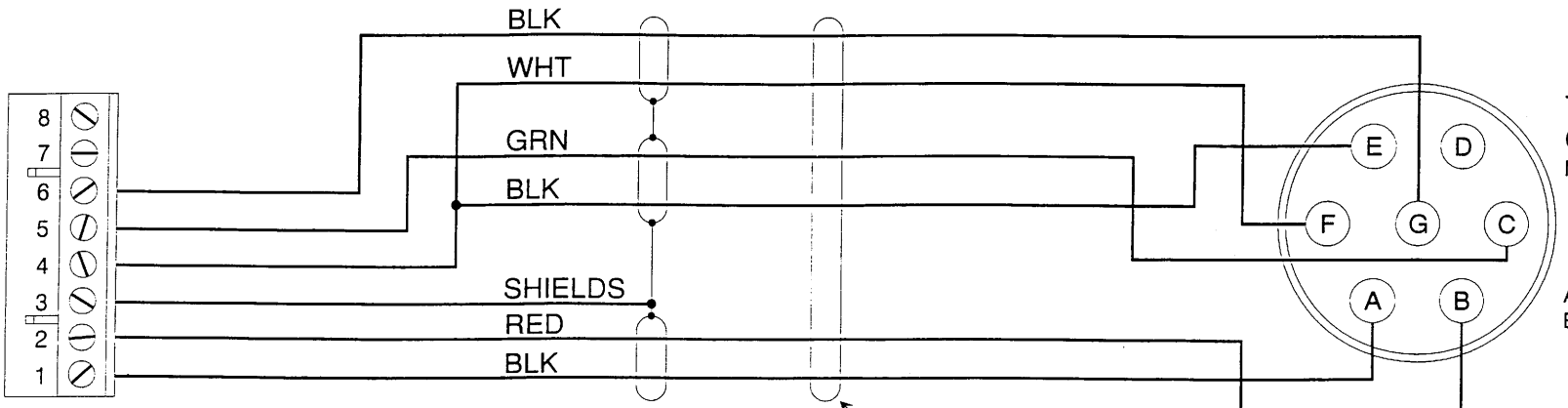
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20 to 125°C.
Shock	50 G's for 11 mSec.
Vibration	5 to 2000 Hz @ 20 G's
Nema Rating	Nema 13

( ) = Dimensions in millimeters

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	HT-20-(x) (x) = Full Scale Turns	SCALE 1 : 1	DRAWN BY DWN
			APPROVED BY W X E
FRACTIONAL ±	TITLE OUTLINE DRAWING		
ANGULAR ±	DATE 6/1/87	DRAWING NUMBER B1051 REV. A	

DATE	SYM	REVISION RECORD	AUTH	DR	CK
2/90	A	Added CW/CCW Note	DWN		
6/90	B	Changed "Mates to all..."	DWN		
8/91	C	Added 9730 Note	DWN		
2/92	D	Added 14/24/19/2900 Note	DWN		
3/92	E	Added C1TW-(x) to above Note	DWN		



Transducer Connector

Mates with:

HT-20	B1001
HT-20/S	B1115
H25F/SE	B1041
HT-20-(x)	B1051

AMCI Part #: MS-16
Bendix #:
MS3106A16S-1S

Module Connector

Mates to all Single Channel Resolver Input and Limit Switch Modules.
For all iPLC-1 and iPCE-1 Products refer to Print B1013
AMCI Part #: MS-8
Phoenix #: MSTB 1.5/8-ST-5.08

BELDEN 9873 Cable

For Cable lengths greater than 100' (30 meters) use BELDEN 9730.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins C&E)

14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate. **IF YOUR MODULE HAS THE REMOTE DISPLAY OPTION**, the cable must be a C1TW-(x). Refer to Print B1193.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	C1T-(x) (x) = Length in Feet	SCALE None	DRAWN BY DWN / APPROVED BY
FRACTIONAL ±	TITLE Transducer Cable Drawing		
ANGULAR ±	DATE 1/11/90	DRAWING NUMBER B1110 REV. E	

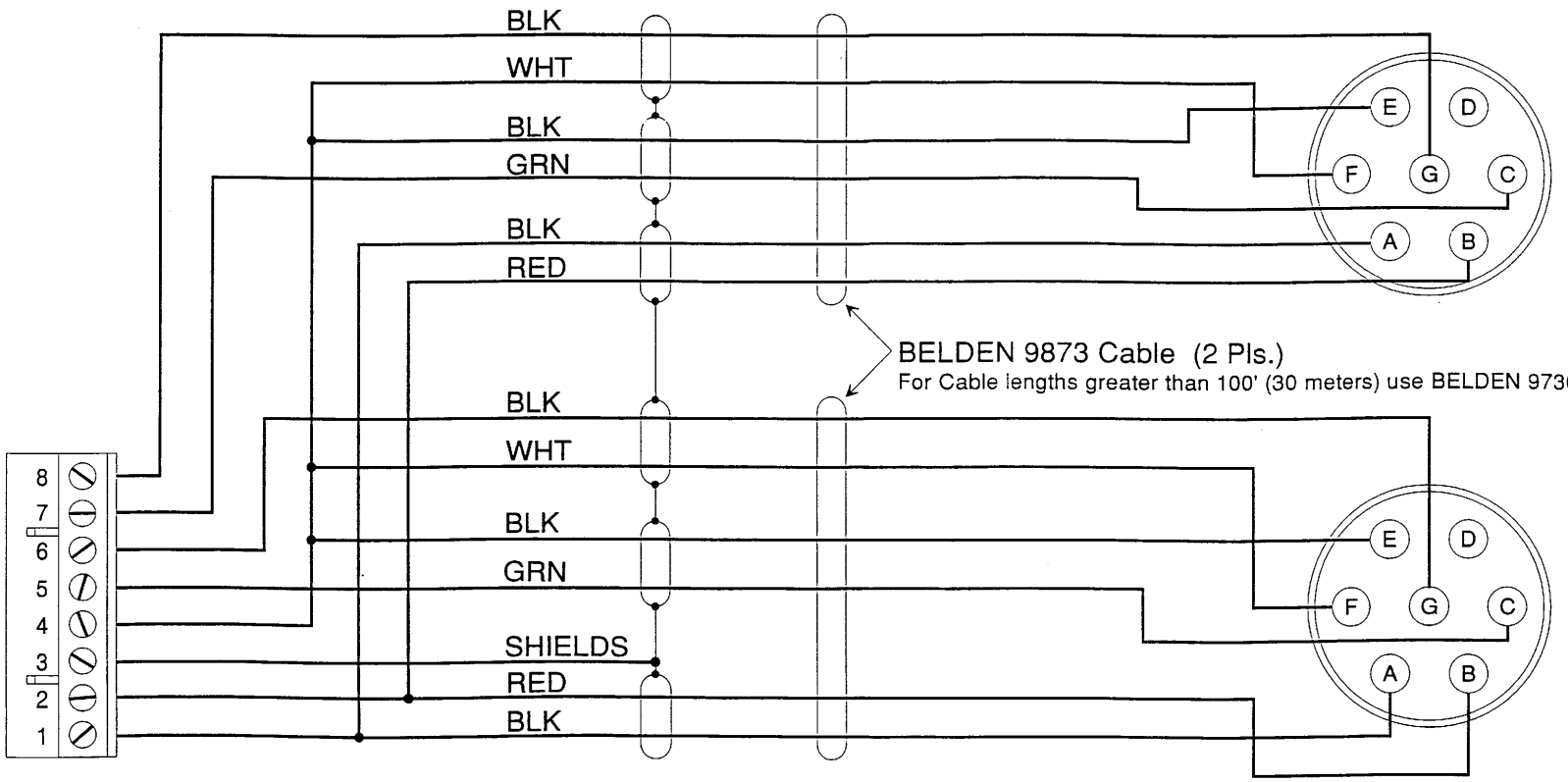
14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins C&E)

DATE	SYM	REVISION RECORD	AUTH	DR	CK
1/90	A	Name Change.	DWN		
8/91	B	Added 9730 Note	DWN		
2/92	C	Added 14/24/19/2900 Note.	DWN		



Transducer B Connector

Mates with:

HT-20	B1001
HT-20/S	B1115
H25F/SE	B1041
HT-20-(x)	B1051

AMCI Part #: MS-16

Bendix #: MS3106A16S-1S

Transducer A Connector

Mates with:

HT-20	B1001
HT-20/S	B1115
H25F/SE	B1041
HT-20-(x)	B1051

AMCI Part #: MS-16

Bendix #: MS3106A16S-1S

Module Connector

Mates with:

Two Channel Resolver Input and Limit Switch Modules.
iPLC-2 Intelligent Programmable Limit Controllers.
iPCE-2 Intelligent Programmable Controller Encoders.

AMCI Part #: MS-8

Phoenix #: MSTB 1.5/8-5.08

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	C2T-(x) (x) = Length in Feet	SCALE None	DRAWN BY DWN / APPROVED BY WXC
FRACTIONAL ±	TITLE Transducer Cable Drawing		
ANGULAR ±	DATE 3/10/87	DRAWING NUMBER B1046 REV. C	

ADVANCED MICRO CONTROLS INC.

C3T-(x)
(x) = Length in Feet

SCALE: None

DRAWN BY: DWN

APPROVED BY: WXE

TITLE: Transducer Cable Drawing

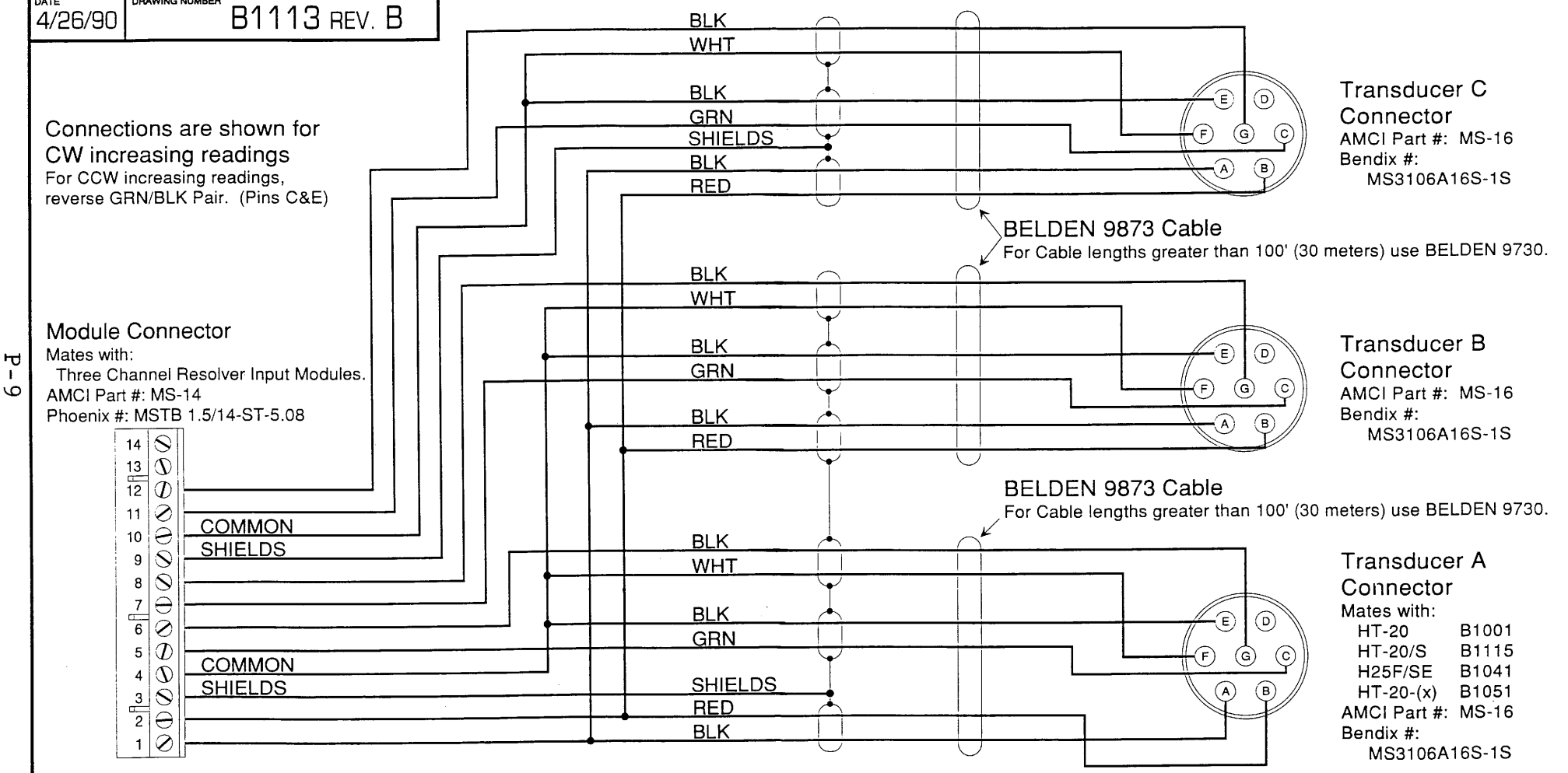
DATE: 4/26/90

DRAWING NUMBER: B1113 REV. B

DATE	SYM	REVISION RECORD	AUTH	DR	CK
8/91	A	Added 9730 Note	DWN		
2/92	B	Added 14/1900 Note.	DWN		

14/1900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.



ADVANCED MICRO CONTROLS INC.

C4T-(x)
(x) = Length in Feet

SCALE: None

DRAWN BY: DWN

APPROVED BY: W X E

TITLE: Transducer Cable Drawing

DATE: 6/10/87

DRAWING NUMBER: B1052 REV. C

DATE	SYM	REVISION RECORD	AUTH	DR	CK
1/90	A	Name Change	DWN		
8/91	B	Changed Layout + 9730 Note	DWN		
2/92	C	Added 14/1900 Note.	DWN		

14/1900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins C&E)

Transducer Connectors Mate with:

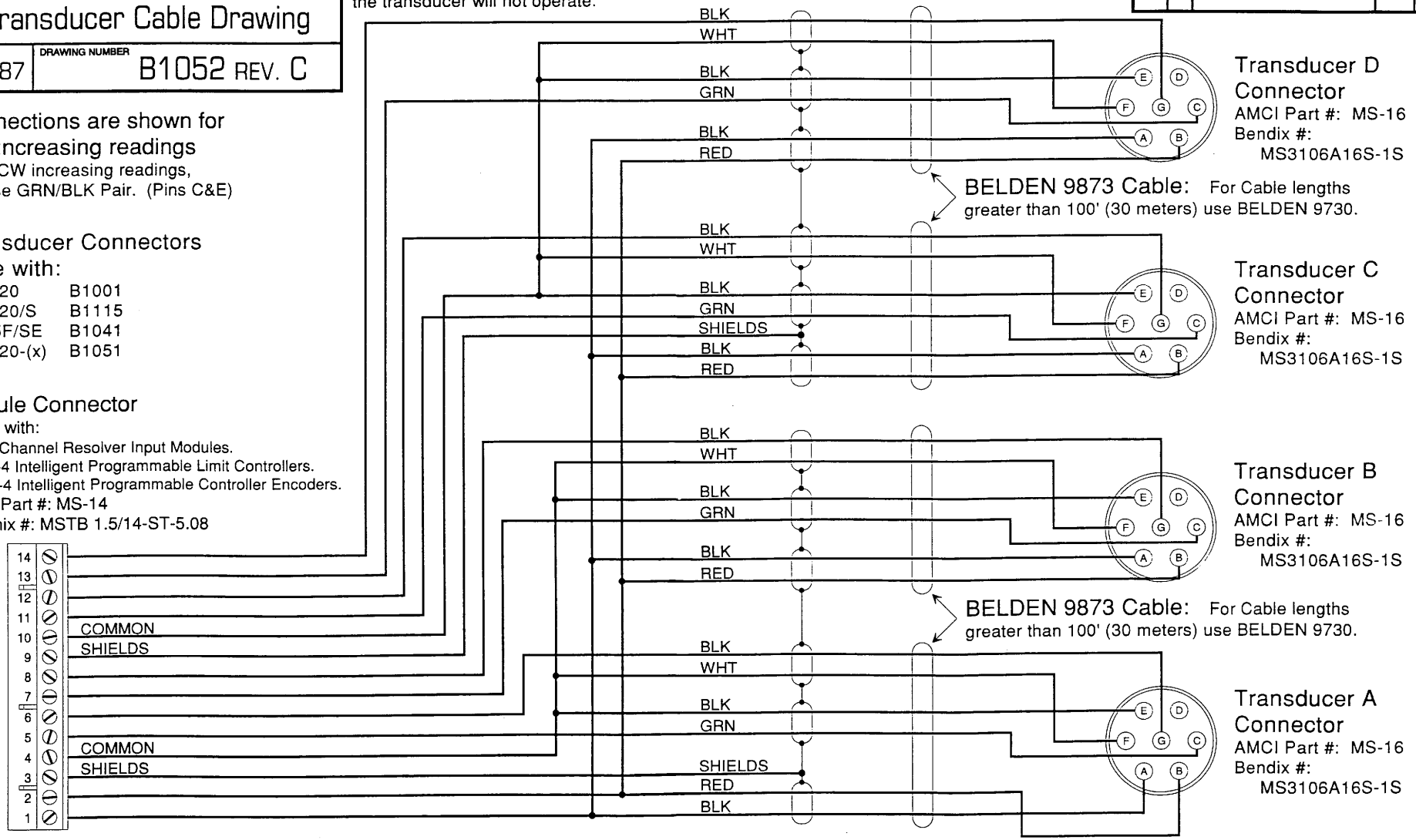
HT-20	B1001
HT-20/S	B1115
H25F/SE	B1041
HT-20-(x)	B1051

Module Connector

Mates with:

Four Channel Resolver Input Modules.
iPLC-4 Intelligent Programmable Limit Controllers.
iPCE-4 Intelligent Programmable Controller Encoders.

AMCI Part #: MS-14
Phoenix #: MSTB 1.5/14-ST-5.08



Transducer D Connector
AMCI Part #: MS-16
Bendix #: MS3106A16S-1S

BELDEN 9873 Cable: For Cable lengths greater than 100' (30 meters) use BELDEN 9730.

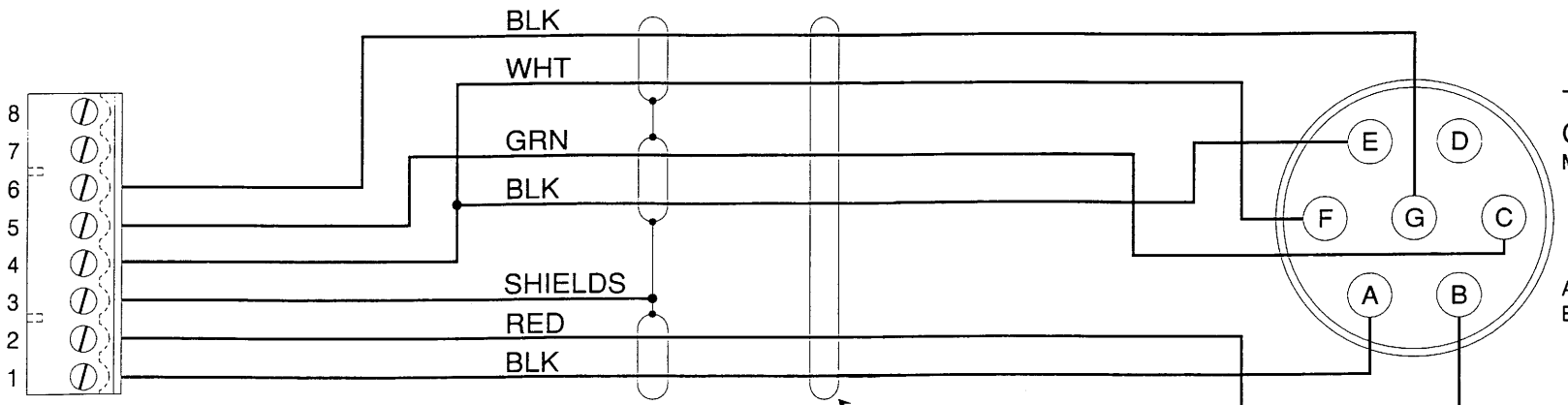
Transducer C Connector
AMCI Part #: MS-16
Bendix #: MS3106A16S-1S

Transducer B Connector
AMCI Part #: MS-16
Bendix #: MS3106A16S-1S

BELDEN 9873 Cable: For Cable lengths greater than 100' (30 meters) use BELDEN 9730.

Transducer A Connector
AMCI Part #: MS-16
Bendix #: MS3106A16S-1S

DATE	SYM	REVISION RECORD	AUTH	DR	CK



Module Connector
Mates to all Single Channel Resolver Input and Limit Switch Modules.
For all iPLC-1 and iPCE-1 Products refer to Print B1013
AMCI Part #: MS-8W
Phoenix #: MVSTBW2.5/8-ST-5.08

BELDEN 9873 Cable
For Cable lengths greater than
100' (30 meters) use BELDEN 9730.

Transducer Connector
Mates with:

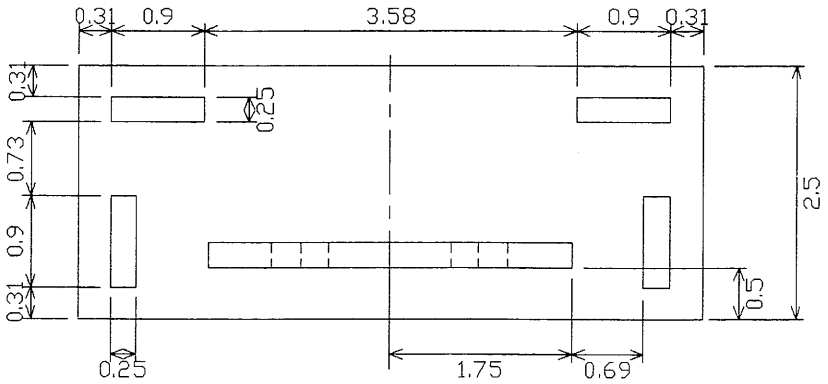
HT-20	B1001
HT-20/S	B1115
H25F/SE	B1041
HT-20-(x)	B1051

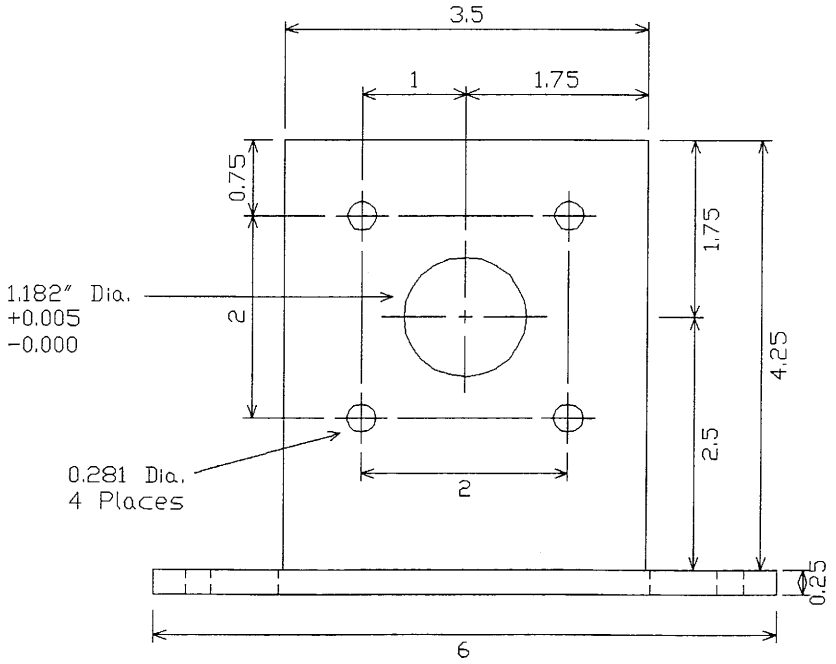
AMCI Part #: MS-16
Bendix #:
MS3106A16S-1S

Connections are shown for CW increasing readings
For CCW increasing readings, reverse GRN/BLK Pair. (Pins C&E)

14/24/19/2900 Users:
Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	C1TW-(x) (x) = Length in Feet	SCALE None	DRAWN BY DWN / APPROVED BY ER
FRACTIONAL ±	TITLE Transducer Cable Drawing		
ANGULAR ±	DATE 3/4/93	DRAWING NUMBER B1193	





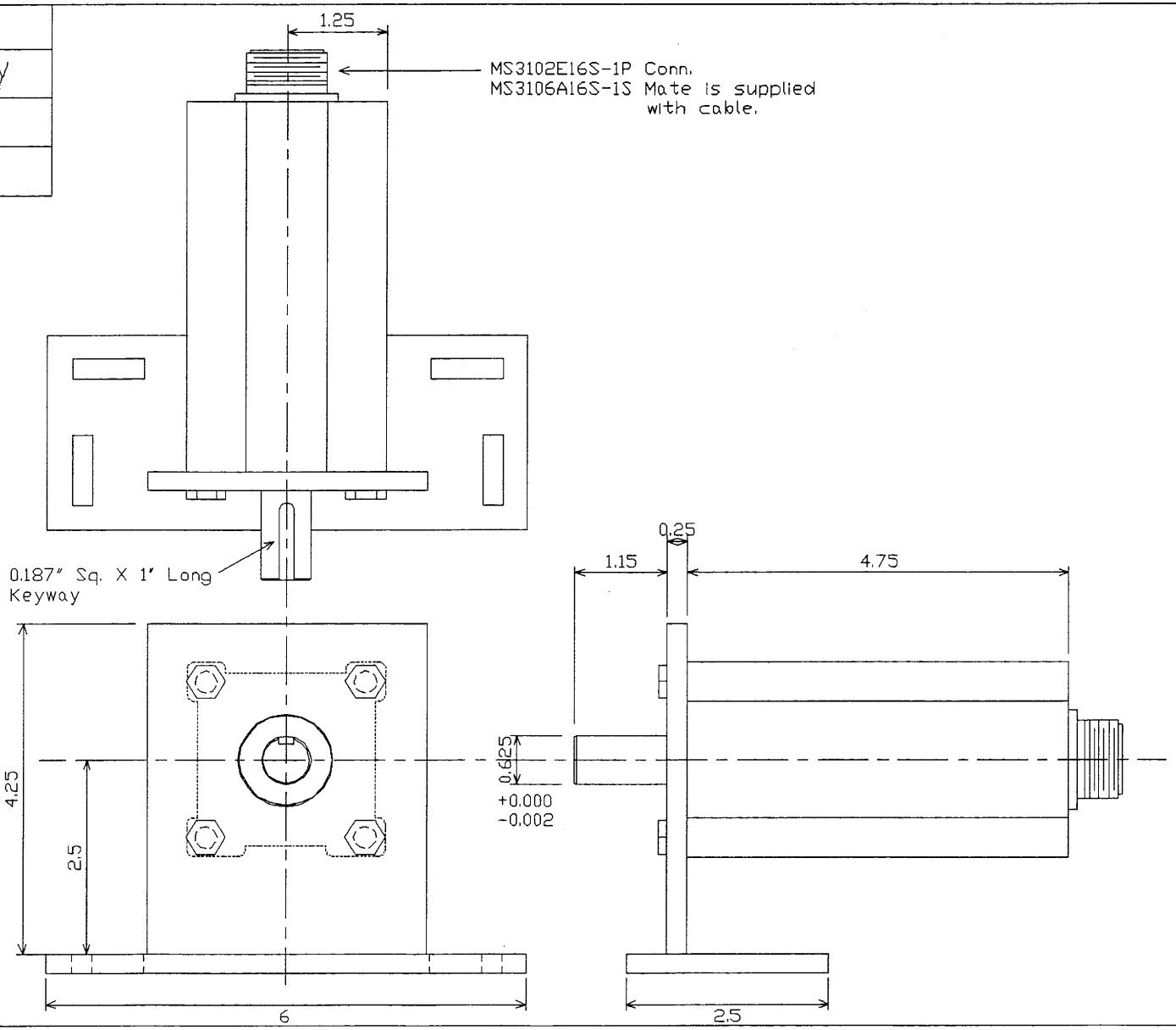
	ADVANCED MICRO CONTROLS, INC.		
	22115600 HT/HTT TRANS.	SCALE	DRAWN BY DWN
	TITLE: TRANSDUCER MT. BRACKET		
	DATE: 6/14/91	DRAWING NUMBER: B1156	

ADVANCED MICRO CONTROLS, INC.

22115600 HT/HTT TRANS.	SCALE	DRAWN BY DWN

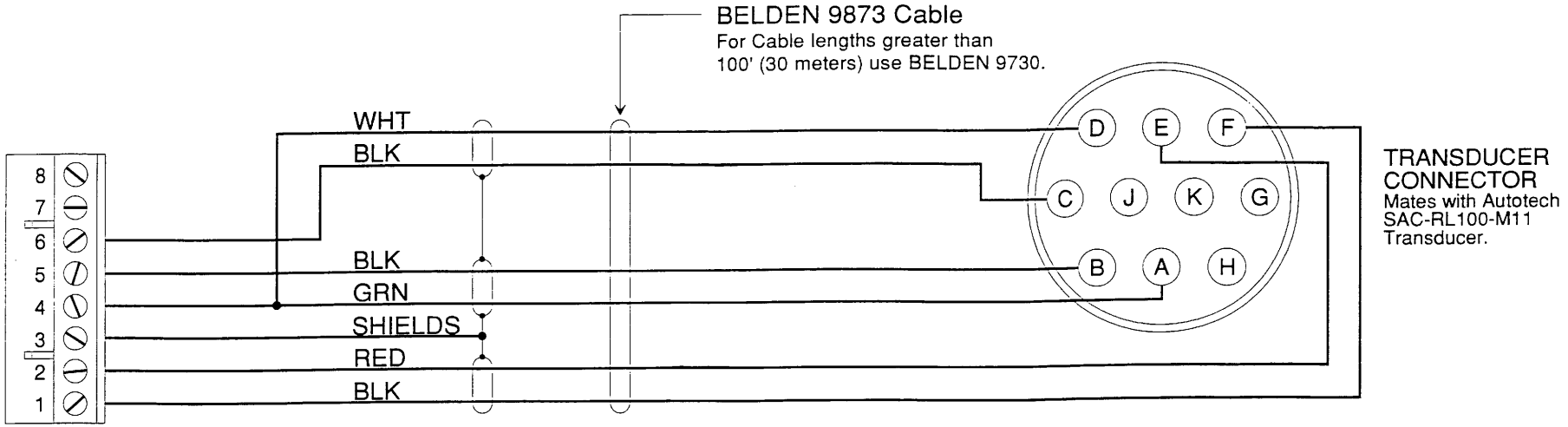
TITLE: HT-20 IN 22115600 MTG. BKT.

DATE	DRAWING NUMBER
6/14/91	B1157



DATE	SYM	REVISION RECORD	AUTH	DR	CK
8/91	A	Added 9730 Cable Note	DWN		
1/92	B	Added CW/CCW Note	DWN		
3/93	C	Added RM-3 & 14/24... Notes	DWN		

THIS PRINT IS FOR USE WITH AMCI MODULES SPECIFICALLY DESIGNED TO USE THE AUTOTECH SAC-RL100-M11 TRANSDUCER. ALL OTHER AMCI MODULES REQUIRE A RM-3 REFERENCE MODULE. REFER TO PRINT B1180.



Module Connector

Mates with Transducer Input Connector
AMCI Part #: MS-8
Phoenix #: MSTB 1.5/8-ST-5.08

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT THE SHIELDS OF THE CABLE TO PIN G OF THE TRANSDUCER CONNECTOR.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins A&B)

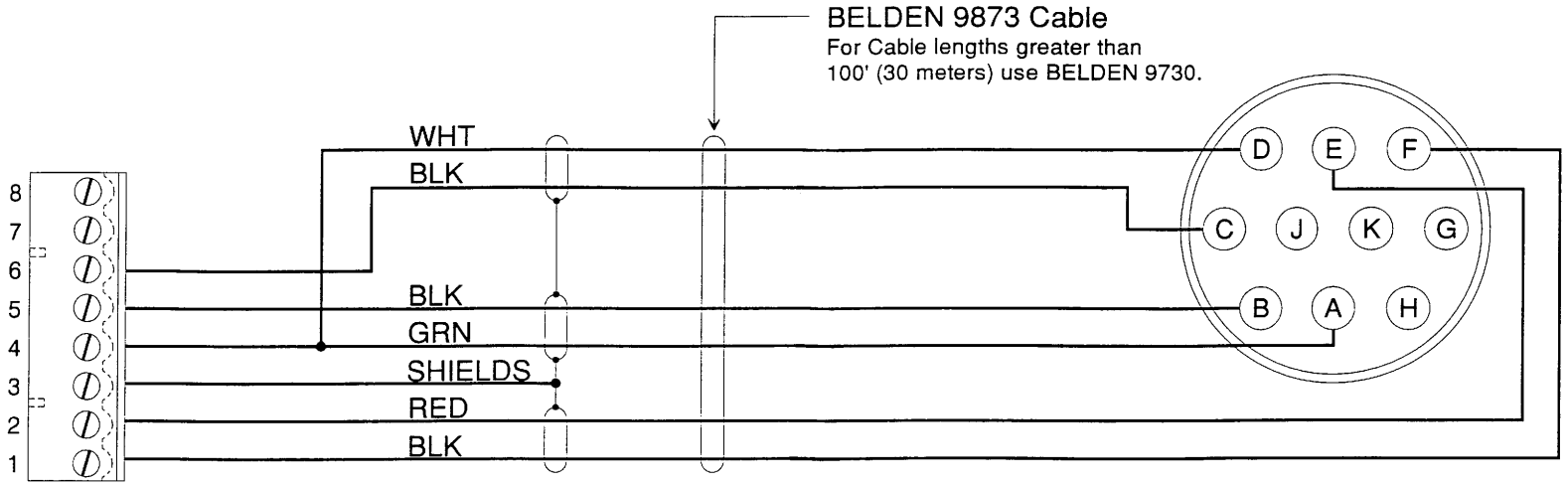
14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate. **IF YOUR MODULE HAS THE REMOTE DISPLAY OPTION**, the Module Connector must be a MS-8W
Refer to Print B1195.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	AUTOTECH SAC-RL100-M11	SCALE	DRAWN BY DWN APPROVED BY TRS
FRACTIONAL ±	TITLE TRANSDUCER CABLE DRAWING		
ANGULAR ±	DATE 6/13/91	DRAWING NUMBER B1155 REV. C	

DATE	SYM	REVISION RECORD	AUTH	DR	CK

THIS PRINT IS FOR USE WITH AMCI MODULES SPECIFICALLY DESIGNED TO USE THE AUTOTECH SAC-RL100-M11 TRANSDUCER. ALL OTHER AMCI MODULES REQUIRE A RM-3 REFERENCE MODULE. REFER TO PRINT B1197.



TRANSDUCER CONNECTOR
Mates with Autotech SAC-RL100-M11 Transducer.

Module Connector

Mates with Transducer Input Connector
AMCI Part #: MS-8W
Phoenix #: MVSTBW 2.5/8-ST-5.08

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT THE SHIELDS OF THE CABLE TO PIN G OF THE TRANSDUCER CONNECTOR.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins A&B)

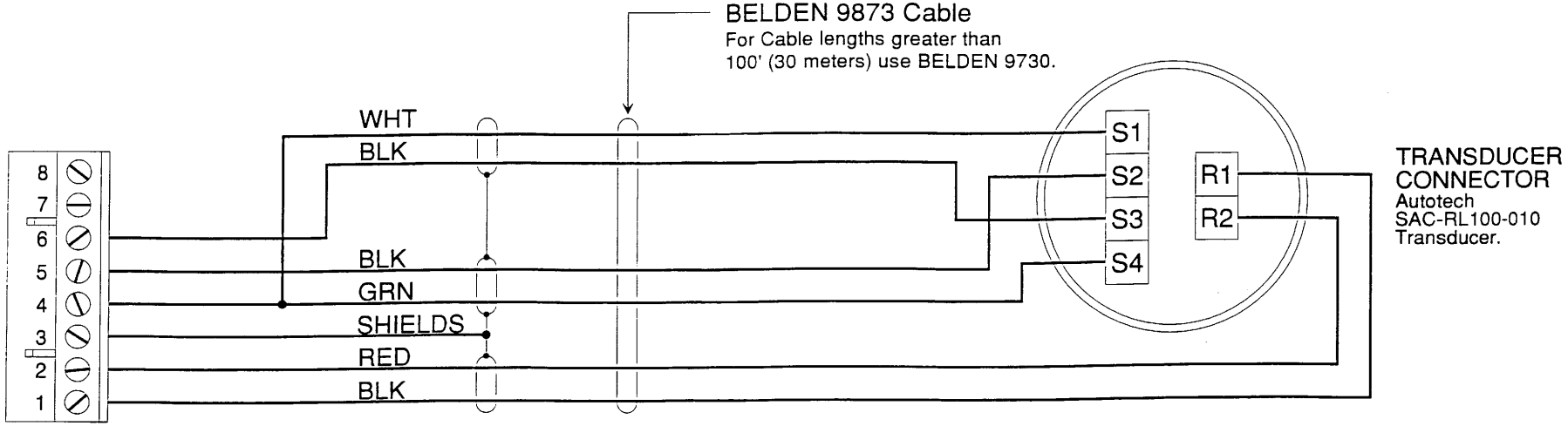
14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	AUTOTECH SAC-RL100-M11	SCALE	DRAWN BY DWN APPROVED BY ER
FRACTIONAL ±	TITLE TRANSDUCER CABLE DRAWING w/ MS-8W		
ANGULAR ±	DATE 3/8/93	DRAWING NUMBER B1195	

THIS PRINT IS FOR USE WITH AMCI MODULES SPECIFICALLY DESIGNED TO USE THE AUTOTECH SAC-RL100-010 TRANSDUCER. ALL OTHER AMCI MODULES REQUIRE A RM-3 REFERENCE MODULE. REFER TO PRINT B1179.

DATE	SYM	REVISION RECORD	AUTH	DR	CK
8/91	A	Added 9730 Cable Note	DWN		
1/92	B	Added CW/CCW Note	DWN		
3/93	C	Added RM-3 & 14/24... Notes	DWN		



Module Connector

Mates with Transducer Input Connector
AMCI Part #: MS-8
Phoenix #: MSTB 1.5/8-ST-5.08

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT THE SHIELDS OF THE CABLE TO THE GREEN GND SCREW OF THE TRANSDUCER.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins S2&S4)

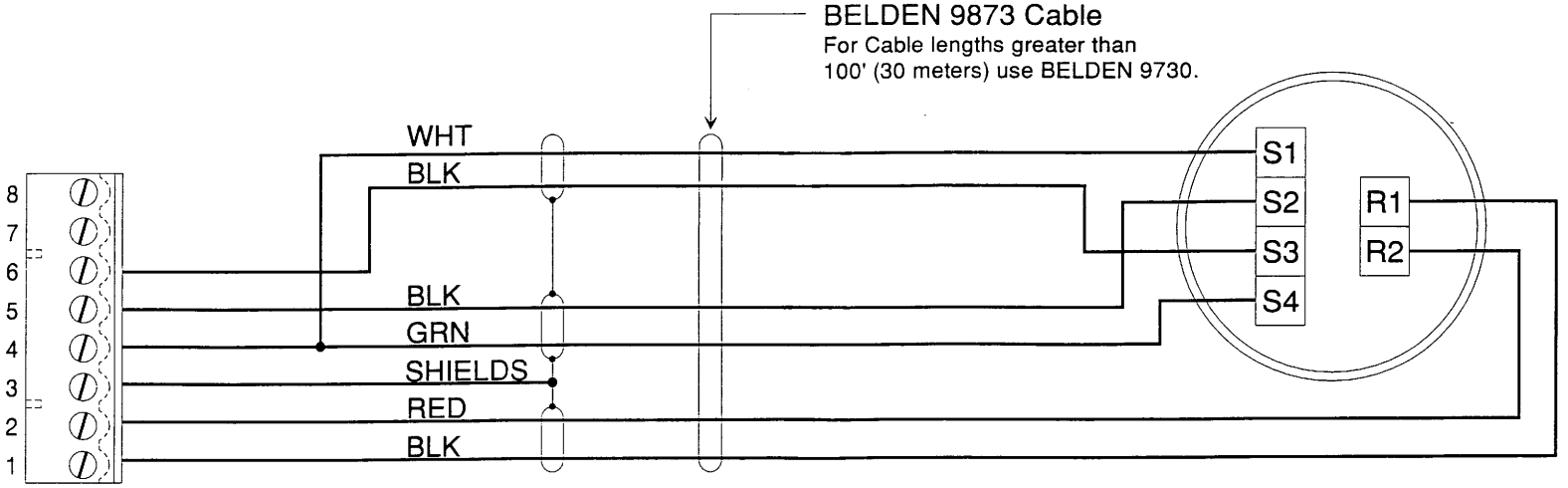
14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate. **IF YOUR MODULE HAS THE REMOTE DISPLAY OPTION**, the Module Connector must be a MS-8W
Refer to Print B1196.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	AUTOTECH SAC-RL100-010	SCALE	DRAWN BY DWN
			APPROVED BY JR
FRACTIONAL ±	TITLE TRANSDUCER CABLE DRAWING		
ANGULAR ±	DATE 6/13/91	DRAWING NUMBER B1154 REV. C	

DATE	SYM	REVISION RECORD	AUTH	DR	CK

THIS PRINT IS FOR USE WITH AMCI MODULES SPECIFICALLY DESIGNED TO USE THE AUTOTECH SAC-RL100-010 TRANSDUCER. ALL OTHER AMCI MODULES REQUIRE A RM-3 REFERENCE MODULE. REFER TO PRINT B1198.



Module Connector

Mates with Transducer Input Connector
AMCI Part #: MS-8W
Phoenix #: MVSTB 2.5/8-ST-5.08

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT THE SHIELDS OF THE CABLE TO THE GREEN GND SCREW OF THE TRANSDUCER CONNECTOR.

Connections are shown for CW increasing readings

For CCW increasing readings, reverse GRN/BLK Pair. (Pins S2&S4)

14/24/19/2900 Users:

Pin 1 of the Transducer Input Connector is located towards the top of the module, NOT the bottom as this drawing may imply. Reversing the wires on the Module Connector will not harm the module or the transducer, but the transducer will not operate.

TOLERANCES (EXCEPT AS NOTED)	ADVANCED MICRO CONTROLS INC.		
DECIMAL ±	AUTOTECH SAC-RL100-010	SCALE	DRAWN BY DWN APPROVED BY ER
FRACTIONAL ±	TITLE: TRANSDUCER CABLE DRAWING w/ MS-8W		
ANGULAR ±	DATE 3/8/93	DRAWING NUMBER B1196	

ADVANCED
MICRO CONTROLS INC.
PLYMOUTH INDUSTRIAL PARK, TERRYVILLE, CT 06786
TEL. (203) 585-1254 FAX. (203) 584-1973