



M1890-R PPR and M1890-S PSI

**(Programmable Position Transducer and
Programmable Selsyn Indicator)**

Instruction & Operation Manual

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Programmable Position Transducer and Programmable Selsyn Indicator

M1890-R and M1890-S

Instruction Manual

The M1890-R

Autotech would like to introduce you to a unique position encoder, the Programmable Position Transducer or PPT. The PPT is an absolute position sensing device that accepts resolver inputs, converts position data to 5-digit BCD output, and is prescalable and presettable over a wide range of electronic gear ratios. It operates in a single-or multi-turn mode with high accuracy and can resolve linear distances of 1 part in 100,000 whether it be 0.001" over 100" or 1 foot over 18.93 miles of travel. The versatile electronic design assures simple interface to other limit setting or control devices.

The PPT consists of two parts, one being a position sensor mounted on the machine shaft and the other a programmable unit mounted in the machine control panel. The position data from the sensor is converted to binary data by an internal ratiometric converter in the programmable unit, processed in the microprocessor together with other program variables and displayed on the front panel display. A parallel BCD output is also made available to provide information to other systems requiring positional data.

Prescalable, Presetable; Yet Absolute

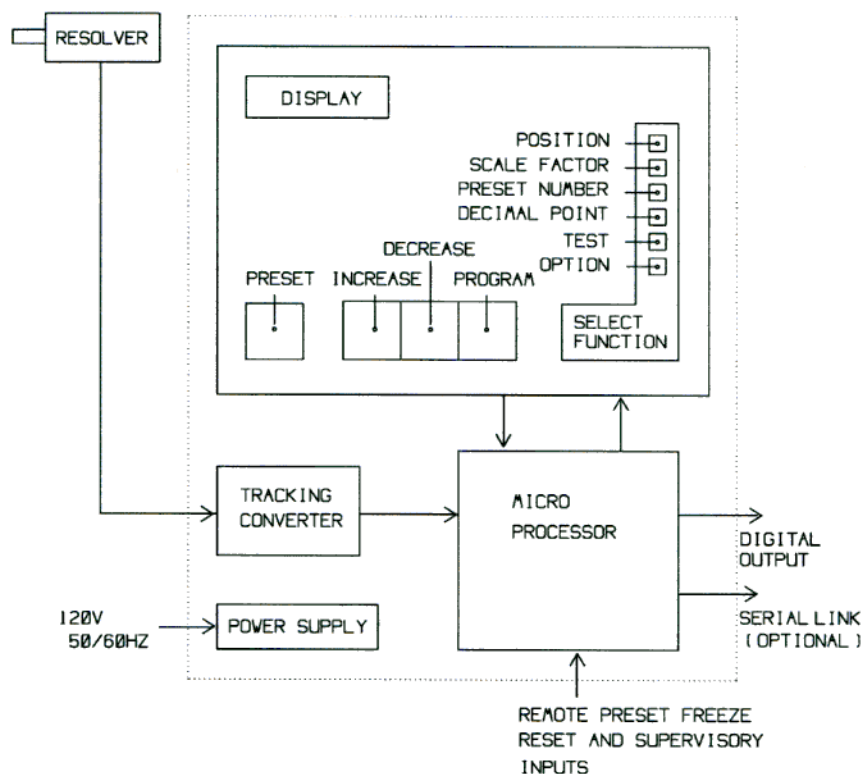
A wide range of easy to set programmable scale factors eliminates the need of mechanical gear trains and prescales the display to readout directly in engineering units. Any preset number can be jammed into the position "counter" by a front panel switch or an external signal, thus "offsetting" or "rezeroing" the machine in no time.

The PPT is unique in that it can be prescaled and preset and still is absolute over the entire range in single-turn operation. In multi-turn applications it keeps track of the true position, if the resolver movement does not exceed half a revolution after power loss.

Simple Front Panel Programming

The PPT is fully front panel programmable for all variables and yet secure against any unauthorized program changes. Opening of an external user-provided keyswitch inhibits any program changes on the front panel.

M1890-R Block Diagram



No Batteries, Nonvolatile Memory

Nonvolatile EEROM memory retains information indefinitely after power loss or machine shutdown, eliminating batteries and related hazards.

Replacing Electromechanical Selsyn Systems

In new installations, the M1890-R together with Autotech's brushless resolver series RL100 is a 100% solid-state replacement for electromechanical selsyn systems. In existing selsyn installations, model M1890-S can be used.

PC-Handshake for PLC Synchronization

On an external command, such as data transfer command from a programmable controller, the digital shaft angle position can be "frozen" at the input of the PC in order to ensure that the data is not sampled during transition from one angle to the next and that the PLC always reads a valid data.

Reliable Under Extreme Environments

The PPT combines the ruggedness of a brushless resolver and reliability of a solid-state control. The resolver can be mounted on a machine shaft in any hostile environments such as mechanical shock, vibrations, extreme humidity and temperature changes, oil mists, coolants, solvents, etc., and the programmable unit M1890 can be mounted up to 2500 feet away in control panel. The splashproof oil-tight front plate of the M1890 unit guarantees perfect operation even in unfavorable conditions like steel mills. The ratiometric converter assures high tracking speed (1800 RPM) and high noise immunity. The power-interruption relay with 1 form C contact can be used for remote indication, alarm or trip. The operation mode (single- or multi-turn) and resolution (8, 10 or 12 bit) can be selected from the front panel "Select Function Switch."

Add Limit Settings Externally

A parallel BCD output for Autotech's 1855 bus is provided, that permits setting of limits or trip points externally using 1855 series limit modules as shown in the diagram to the right.

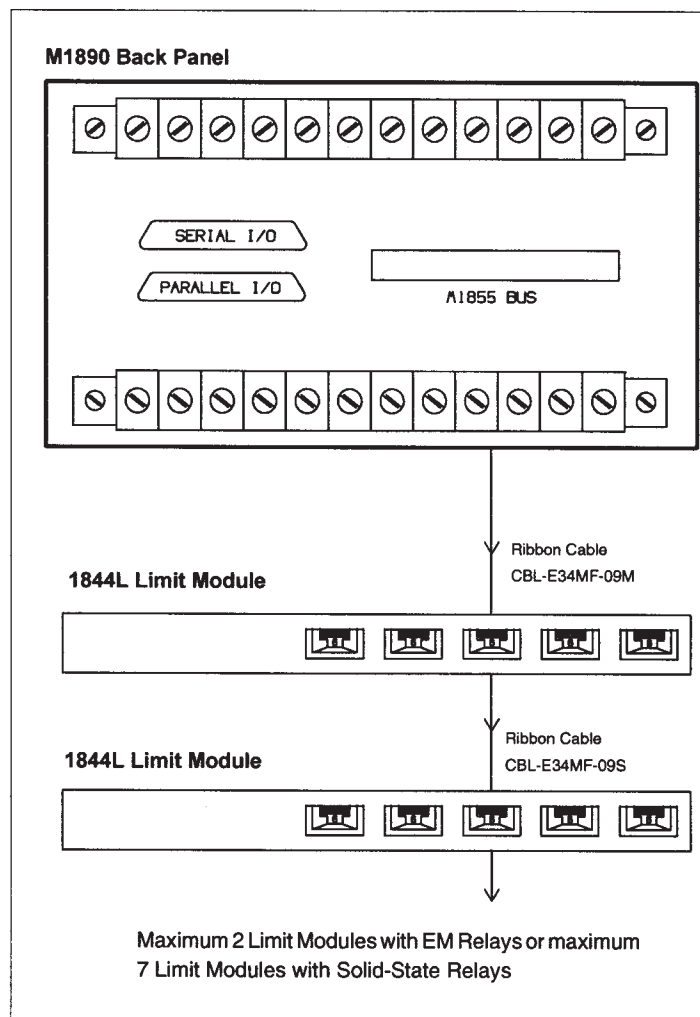
Options

The following optional features provide additional versatility to the unit:

- Serial link options (RS232, RS422 or others) for remote display, remote command panel or computer interface are available.
- Additional parallel port in either BCD or BINARY or GRAY Code format with choice of sourcing, sinking or the TTL type outputs.

Remote Display, 1890-D

This unit connects to the master 1890-R/1890-S unit via RS422 or RS232 serial port to provide remote indications if needed.

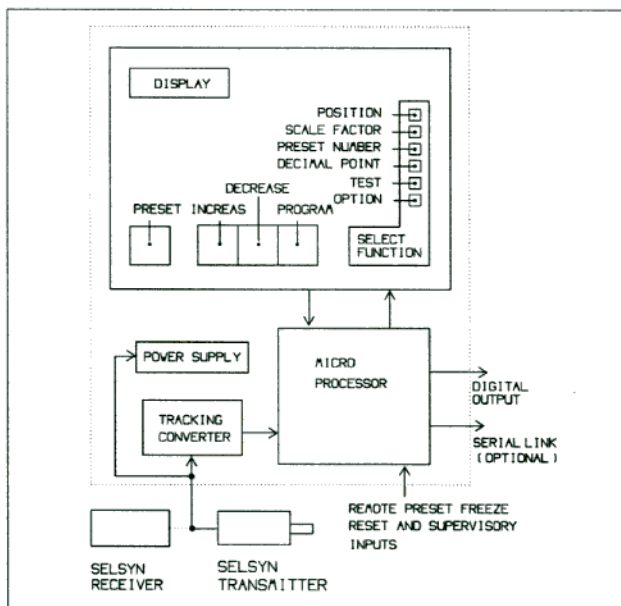


The M1890-S

Replacing Electromechanical Selsyn Systems

Autotech's M1890-S Programmable Selsyn Indicator (PSI) is designed to replace electromechanical selsyn torque receivers driving mechanical production meters. It is completely solid-state and fully compatible with existing selsyn systems. It can be connected directly to selsyn transmitter, differential pair, or in parallel with mechanical indicators without loading and needs no changes in the existing cables. The PSI derives its power from the selsyn reference voltage. The position information from the selsyn transmitter is converted to binary data by an internal ratiometric converter and processed in the microprocessor together with other program variables like scale factor, preset number, etc. The actual position is then displayed on the front panel 5-digit display and parallel BCD output is made available to provide information to other systems requiring positional data.

All the features described for 1890-R are also available for 1890-S model.



M1890-S Block Diagram

Specifications

Input Power: 105–135 V; 50/60 Hz, 35 VA max
Operating Temperature: –10 to +130°F

INPUT SIGNAL

M1890-R: A resolver; Autotech's RL100, E6R, E7R or E8R series

M1890-S: Selsyn Input,

Signal: 3-wire, 148K-ohm impedance, 48–90 V, L-L;

Reference: 2-wire, 105–135 V, 50/60 Hz, 35 VA max.

Tracking Speed:
 1800 RPM max

Resolution:
 8, 10 or 12 bit per revolution; 1 part in 100,000 total

PROGRAMMING:

Scale Factors:
 0.001 to 65,535.999 in increments of 0.001

Preset Numbers:
 0 to 99,999 for multi-turn
 0 to (Scale factor–0.001) for single-turn

Decimal Point: After any digit

Freeze, Preset, Reset and Supervisory Inputs:

Contact closure to signal reference or 5V logic;

Logic True: 0–1 VDC (4.7k internal pull-up resistors);

Logic False: 4–5 VDC

Power Interruption and Watch-dog Relay:

1 form C contact, 120 VAC, 1 A

PARALLEL POSITION OUTPUTS:

a) 1855 Parallel Bus (Standard):

Compatible with Autotech's 1855 bus; 5 digit BCD; 5V CMOS logic; Fan out of 1 driving LS TTL load; High True Logic

Logic True: 2.4 V @ 1.6 mA source current

Logic False: 0.4 V @ 1.6 mA sink current

Output Supply Current:

100 mA @ 5 VDC for logic;

750 mA @ 12 VDC for limit outputs

Data Update Rate: 4ms.

Data on 1855 Bus is frozen when freeze input goes true (30 msec).

Max. distance between M1890 and 1855 limit modules:
 3 ft. ribbon (isolated from other wiring) and 100 ft. shielded cable (with CBL-E34MF)

b) Additional Parallel Output (Optional):

Output Format: BCD, Binary or Gray Code

Output Interface: T, P, N or C

T: LS TTL (74LS645)

Logic True: 2 VDC @ 15 mA, 20µA leakage when tristated

Logic False: 0.35 V @ 24 mA, 0.4 mA leakage when tristated

Mux Input: Low active TTL level

(i.e., *Logic True:* 0–0.8 V max; *Logic False:* 2–5 V)

P: PNP source transistor;

Logic True: Transistor ON, 1.7 V drop @ 100 mA;

Logic False: Transistor OFF, 0.2 mA leak. @ 50 V max

N: NPN sink transistor;

Logic True: Transistor ON, 1.1 V max @ 100 mA;

Logic False: Transistor OFF, 0.1 mA leak. @ 50 V max

C: NPN sink transistor;

Logic True: Transistor OFF, 0.1 mA leak. @ 50 V

Logic False: Transistor ON, 1.1 V max @ 100 mA;

Data Update Rate: 4 mSec.

Data Transfer Signal: Logic high: 4 to 5 V

Logic low: 0 to 1 V (edge triggered)

Transmission Distance: 50 feet (max.)

c) Serial Output (Optional):

Output types: RS232 or RS422

Transmission Distance:

RS232: 50 feet (max.)

RS422: 2000 feet (max.), with shielded cable

Character Protocol: User Definable

Baud Rate: Field selectable 300, 600, 1200, 2400, 4800 and 9600 bps.

How to Order

M1890 Programmable Position Transducer and Selsyn Indicator

SAC-M1890-R $\begin{smallmatrix} \text{x} & \text{x} & \text{x} & \text{x} \\ 1 & 2 & 3 & 4 \end{smallmatrix}$ Programmable Position Transducer

SAC-M1890-S $\begin{smallmatrix} \text{x} & \text{x} & \text{x} & \text{x} \\ 1 & 2 & 3 & 4 \end{smallmatrix}$ Programmable Selsyn Indicator

SAC-M1890-D $\begin{smallmatrix} \text{x} & \text{x} & \text{x} & \text{x} \\ 1 & 2 & 3 & 4 \end{smallmatrix}$ Remote Display Only

1. Serial Option

- 1: no Serial Option
- 2: Serial Output RS422 port
- 3: Serial Output RS232 port

2. Parallel Output Option

- O: No parallel option
- P: Source transistor
- N: NPN Sink transistor (Low True Logic)
- C: NPN Sink transistor (High True logic)
- T: TTL with multiplexing

3. Parallel Option Format

- O: No parallel option
- D: Parallel Output, BCD format
- B: Parallel Output, Natural Binary
- G: Parallel Output, Gray code

4. Other Option

- O: None
- T: Tach Option

Interconnect Cable and Connectors for 1890 Series

CBL-10T22-DBxxx	With 25 Sub "D" Connector on one end only, for RS232 serial output (xxx = number of feet)
CBL-10T22-DCxxx	With 37 Sub "D" Connector on one end only, for RS422 serial output (xxx = number of feet)
CBL-29S22-DBxxx	With 25 Sub "D" Connector on one end only, for Parallel output (xxx = number of feet)
ECM-25PIN-M11	25 Pin Sub "D" male connector
ECM-37PIN-M11	37 Pin sub "D" male connector

Position Transducers

The M1890 requires a single turn resolver as an input device, such as Autotech's RL100, E6R, E7R, E8R series of resolvers. Please see position transducer section for How to Order information on these transducers and appropriate accessories, such as: interconnect cables, mounting brackets, couplings, etc.

Accessories for M1890 Series

5 1/2 Digit Single Preset Limit Modules

SAC-1855L-F₁O₂

1. *Limit Setting*

E: External Limit Setting

T: Front panel Thumbwheel Setting

2. *Limit output*

T: 100 mA Open collector Transistor

R: 10 Amp, DPDT Relay

A: 3 Amp, AC Solid-State Relay

D: 2 Amp, DC Solid-State Relay

Interconnect Cable for 1855L Modules

CBL-E34MF-09M	34 Conductor Master Male/Female Ribbon Cable, End-to-End Connectors @ 9"
CBL-E34MF-09S	34 Conductor Slave Male/Female Ribbon Cable, End-to-End Connectors @ 9"
CBL-E34MF-Txx	34 Conductor Transition Connector for Ribbon Cable to Screw Terminals (use for mating to other cable types), xx = Distance in inches between Ribbon Conductors and Screw Terminal
CBL-29S22-Mxxx	29 Conductor, twenty seven 22 AWG, two 12 AWG and overall foil shield w/30 pin MS Connector on one end, xxx = length in feet

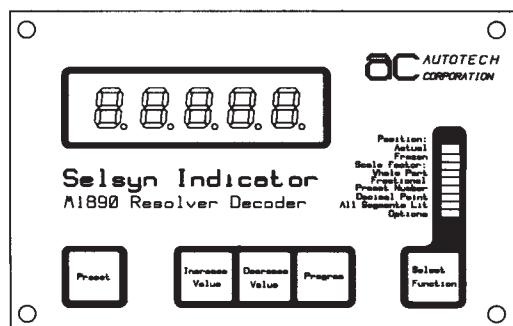
Installation and Operation

1. Functional Description

1.1 Transducer

The M1890-R is designed to operate with Autotech's RL100, E6R, E7R, E8R, RL101 or equivalent resolver, while the M1890-S accepts a Selsyn or comparable synchro as input.

1.2 Front Panel Indicators and Controls



a. Display — 5 digit, high brightness display indicates the position data.

b. Select Function Switch — Selects the function to be programmed. Each press moves the function indicator by one step as follows and the corresponding programmed value is indicated in the display window:

1) Position:

Actual value — displays actual value of the position.

Frozen Display (only at external freeze signal)— freezes the position display at an external signal; the unit still keeps track of the actual position.

2) Scale Factor:

Part — displays the “whole part” of the scale factor programmed or being programmed

Fractional — displays the “fractional” part of the scale factor programmed or being programmed

3) Preset Number: Displays the preset number programmed or being programmed

4) Decimal Point: Displays the location of the decimal point; pressing the “Increase Value” or “Decrease Value” keys, changes the location.

5) All Segments Lit: Just a test that all the segments of the display as well as the “Select Function Switch” are operational.

6) Options: These are the field programmable software options (see item 4.2).

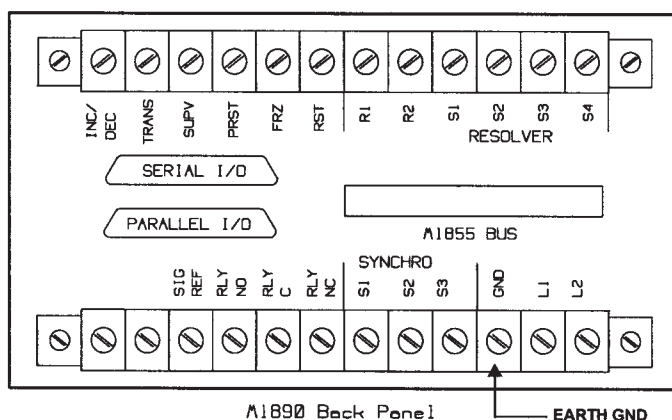
c. Increase Value Key — Pressing this key increases the value of the parameter to be programmed and the corresponding LED in the “Select Function Switch” starts flashing indicating that programming has been initiated.

d. Decrease Value Key — Pressing this key decreases the value of the parameter to be programmed and the corresponding LED in the “Select Function Switch” starts flashing indicating that the programming has been initiated.

e. Program Key — Pressing this key enters the program into the memory and the flashing LED in the “Select Function Switch” becomes steady indicating that the parameter has been accepted.

f. Preset Key — Pressing this key jams a pre-selected number as actual position. All further shaft movement is based on this new position. In a single-turn application, the preset number is equivalent to an offset.

1.3 Back Panel



All external inputs, resolver/synchro connections, AC power input and power loss relay output wiring is made to 2 twelve position terminal block on the rear of the unit.

a. Resolver Connections (M1890-R) — Resolver connections are made at the terminals labeled R₁, R₂, S₁, S₂, S₃ and S₄ on the upper terminal block.

b. Selsyn/Synchro Connections (M1890-S) — Selsyn/Synchro connections are made at the terminals labeled S₁, S₂ and S₃ on the lower terminal block.

c. Reset, Freeze, Preset and Supervisory Inputs may be contact closure between these input terminals and Sig. Ref. or 5 V logic —

Logic True: 0–1 VDC (4.7k internal pull-up resistors)

Logic False: 4–5 VDC

Reset input: resets the power loss timer relay

Freeze input: allows position information to be “frozen”.

The system continues to keep track of the actual position. A 30 millisecond delay between freeze command and “frozen” data is present due to software debounce.

Preset input: Jams a pre-selected number into the position “counter”.

Supervisory input: Allows unit to be programmed. When the user provided supervisory key switch is open, it inhibits the change of program by unauthorized personnel.

d. Transparent Input — A jumper connected between Trans and Sig. Ref. at rear terminal block will disable the PC-handshake circuit putting the parallel port in transparent mode.

e. INC/DEC Input — With the job supervisory jumper/key switch closed and select function switch in “actual position”, the displayed position value can be changed using “Increase Value” or “Decrease Value” Key. This provides an option to match the resolver position to the machine position without using preset key (offset).

f. Power Failure Output — This provides a power failure. A form C contact rated at 120 VAC, 1 Amp is provided at the lower terminal block (RLY ON/ RLY C/ RLY NC). A reset input is also provided. The relay is de-energized at power up and will be energized when reset. At power failure, the relay de-energizes again.

2. Operating Characteristics

Operation during power failure or power interruption and subsequent power-up:

a. Position information and selected variable data is stored indefinitely.

b. Automatic correction of post power-down shaft rotation, if the rotation is less than half a revolution in multi-turn mode. Unit is fully absolute in single-turn mode. On subsequent power-up, the unit will momentarily show the position at power-down time and then change to the current position.

c. A relay contact trip indication is provided as described in item 2.4. The relay is reset by a user provided momentary push button switch. The M1890 will continue its operation on subsequent power-up, regardless of whether this relay is reset. The relay contacts are just an indication that the system power was interrupted or the power failure occurred since the last time the relay was reset. The user may choose to use or ignore this indication depending on the application.

d. If display comes up flashing, some stored data was lost on power-down. All function values (e.g., decimal point) should be checked and reprogrammed if necessary. Re-

programming or pressing preset switch will stop display from flashing.

2.1 Scale Factor Range

a) **Multi-turn Mode:** *Whole part:* 1 to 65535
 Fractional part: 0.001 to .999

b) **Single-turn Mode:** *Maximum:* 65535.999
 Minimum: 2 (For Arbitrary
 Decimal Point Mode)
 0.001 (For True Decimal
 Point Mode)

2.2 Preset Number Range: 0 to 99,999

If a preset number less than one is desired the unit must be in the arbitrary decimal mode. Program the preset as a whole number with decimal set to extreme right. After the preset number has been programmed then reset decimal position to desired location. Presetting will now enter that value with decimal in the proper place. Obviously the preset number should not exceed the scale factor in the single-turn mode.

2.3 Decimal Point Position Range: After any digit

2.4 Interpretation of Position Display

The unit may be programmed for arbitrary or true decimal point by appropriate selection of option number. There is no rounding of data displayed. In multi-turn mode, the position information is modulo 100,000, i.e., after 99,999 comes 0. Likewise, a reverse motion past 0 displays 99,999 followed by 99,998, etc. In single-turn mode, the position is modulo scale factor, i.e., a scale factor of 360 (to give 360 counts/revolution) will count up to 359 and then go to 0.

2.5 Arbitrary Decimal Mode

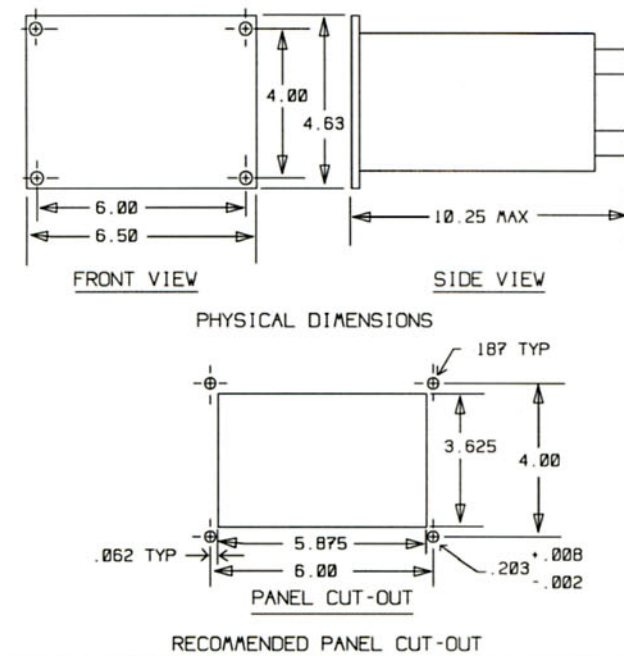
The position data is displaced as a whole number even though computations may contain a fractional part. The location of the decimal may be placed at a convenient place for read out in recognizable operator units. In this mode the decimal is not used in internal calculations.

2.6 True Decimal Point Mode

Both the whole part and the fractional part are displayed. Selecting the decimal point location allows a selection of which 5 digits are displayed of the 9 digits internally stored number.

← →
XX XXX . XXX XX

Outline Dimensions



3. Installation and Wiring

3.1 Position Transducer Mounting and Wiring

See Instruction Manual of the position transducer used in your particular application.

3.2 M1890 Mounting:

See figure, above, for outline dimensions and panel cutout. The front plate is provided with four 0.187 dia. holes and the unit can be mounted using 8-32 UNC screws. A gasket is provided to assure proper sealing from dust, etc. However, the user should determine if this alone is adequate for the application.

If supervisory, freeze or other key switches or push buttons are provided, provisions should be made for mounting them.

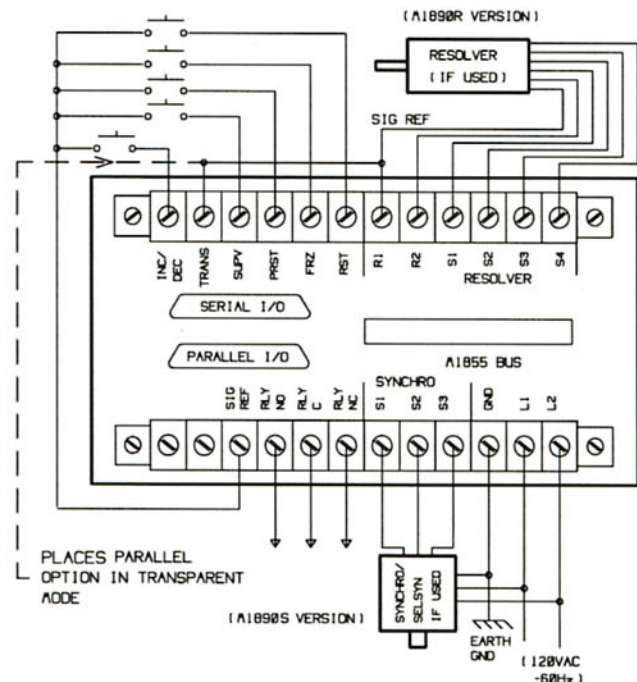
3.3 Wiring:

Wire the unit with earth ground to the ground terminal on the lower terminal block. This is electrically connected to the chassis. With the M1890-S, the L1 and L2 supply the Selsyn Reference. It may be necessary to reverse these two lines if the indicator is 180° off. All switch inputs use Sig. Ref. on terminal block as a return. Sig. Ref. is the same as circuit ground. If the supervisory key-switch is not to be used, and it is desirable to permanently enable from panel change of variables, wire a jumper between SUPV and Sig. Ref.

3.4 1855 Parallel Bus Wiring

The 1890 may become a source module for use with 1855 Series Modules. The maximum number depends upon the power consumption of each module. An edge connector is

Wiring



provided that supplies system power, BCD count information as well as logic control functions. The outputs are buffered short circuit-proof CMOS and interface directly with logic module 1855L. ALL outputs change state simultaneously. PC sync is not present with this output

Autotech cable CBL-E34MF-09M & S in 9" lengths are available for this expansion, or CBL-E34 MFT is available to interface to other cables.

3.4.1 1855 Bus Signal Drive Levels (CMOS, 5 VDC)

Fan-out 1 driving LS TTL load, (positive true logic)
 Logic True: 2.4V @ 1.6 mA source current
 Logic False: 0.4V @ 1.6 mA sink current

3.4.2 Supply Current (M1855 Bus)

5 VDC line: 100 mA (for logic functions)
 12 VDC line: 750 mA (for limit outputs)
 1855 limit module current consumption (output on):
 — 120 mA with relay output
 — 30 mA with SSR output

3.4.3 Data Update Rate on M1855 Bus

4 ms (for faster update rates, consult factory)

3.4.4 Freeze

Data on the 1855 Bus is frozen when the freeze input goes to Logic 0 or Sig. Ref.

3.4.5 Watchdog Timer

Sometimes called a Dead Man Timer. This is a hardware feature that detects failures in the microprocessor system and resets the microprocessor.

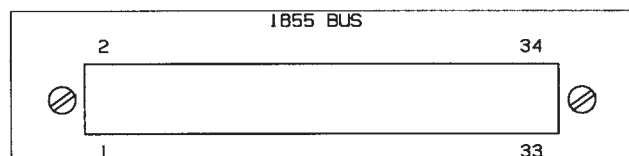
3.4.6 Maximum Distance

Between 1890 & 1855 limit modules or other devices is 3 ft. ribbon (isolated from other wiring) and 100 ft. using shielded cable (with CBL-E34MF).

3.4.7 Cable Numbers and Uses

Refer to the figures at the end of this section.

3.4.8 1855 System Bus Wiring Table



Edge Connector		Edge Connector	
Finger #	Function	Finger #	Function
1 (1B)	1 Bit	18 (9T)	20K Bit
2 (1T)	2 Bit	19 (10B)	40K bit
3 (2B)	4 Bit	20 (10T)	80K Bit
4 (2T)	8 Bit	21 (11B)	Do not use (tied low)
5 (3B)	10 Bit	22 (11T)	Do not use (tied low)
6 (3T)	20 Bit	23 (12B)	Enable (high true)
7 (4B)	40 Bit	24 (12T)	Not used
8 (4T)	80 Bit	25 (13B)	Not used
9 (5B)	100 Bit	26 (13T)	Do not use (tied low)
10 (5T)	200 Bit	27 (14B)	Do not used (tied low)
11 (6B)	400 Bit	28 (14T)	Not used
12 (6T)	800 Bit	29 (15B)	Logic ground (Sig. Ref.)
13 (7B)	1K Bit	30 (15T)	Logic ground (Sig. Ref.)
14 (7T)	2K Bit	31 (16B)	Relay ground
15 (8B)	4K Bit	32 (16T)	Relay ground
16 (8T)	8K Bit	33 (17B)	+VCC (5 VDC)
17 (9B)	10K Bit	34 (17T)	+12 VDC (unreg. relay voltage)

Note: (1B) indicates bottom pin on position 1, and (1T) indicates top pin on position 1 of the edge connector.

3.5 1890 Parallel Output Port

The 1890 Parallel Output Port offers the advantage of coupling position data to external systems with a variety of interfacing formats. In addition, this parallel output port offers PC-handshake, standard.

The advantages of the Parallel Output Port with PC-handshake are:

- Logic level edge triggered data transfer, both low to high and high to low.

- New stable data, updated every 4 mSec, is available at the output after an adjustable update period from the time the data transfer command is received. Previously latched stable data is continuously available at the output prior to the next transfer command. Standard: 200 μ sec – 30 msec; M option: 50 μ sec – 3 msec
- The 1890 display and 1855 bus data are unaffected by data transfer.
- Selectable PC-handshake mode or transparent mode by jumper on terminals at rear of unit.
- TTL, source or sink output interfacing.
- Interfacing to voltages other than 5 V.
- BCD, binary or gray code format.

Note: *T, P and C type outputs are positive true logic, N is negative true logic.*

3.5.1 PC-Handshake

Handshake/Transparent Modes

A jumper connected between TRNS and Sig. Ref. at rear terminal block will place the parallel port in the transparent mode.

Trimpot Adjustment for PLC Synchronization

The PLC synchronization circuit of the Parallel Port handshake has an adjustable time delay from 200 μ sec to 30 msec between the data transfer command from the PLC and the latch command to the output. This is used to provide most fresh data to the PLC at the time of its read command. The time delay is preset at the factory at 220 μ sec which is good for most applications. This setting could be adjusted by removing the top cover plate of the selsyn. CW rotation increases the time setting. Consider also data update rate (4 ms.) as per item 3.5.2.

3.5.2 Data Update Rate of M1890 Bus

4 ms. (for faster update rates, consult factory).

3.5.3 Analog Tachometer (Optional)

The analog tachometer provides a voltage or current output proportional to the measured RPM. The voltage output ranges from 0 to +10 VDC, full scale and the current output ranges from 4 to 20 mA full scale. In both cases, full scale is defined at 1000 RPM. RPM scale factor is as follows:

- 100 RPM/Volt for 0 to +10 VDC, 0 Volts = 0 RPM (Pin 24 on parallel output connector)
- 100 RPM/1.6 mA for 4 to 20 mA, 4 mA = 0 RPM (pin #1 on parallel output connector) Accuracy is 1 part in 256 or 0.39%. Update time is 4 msec.

Note: *Voltage or current mode must be selected at time of order of tach option.*

3.5.4 Digital Output Interface of Parallel Port

For TTL, PNP source transistor, NPN Sink Transistor with high true or low true logic and data transfer interface information, refer to Input/Output Interface Section.

3.5.5 Transmission Distances

Distances may vary with output selected (P, N, or T) and load current requirements. If requirements beyond 50 ft. arise, please consult the factory.

3.5.6 Cable numbers and uses

Refer to figures at the end of this section.

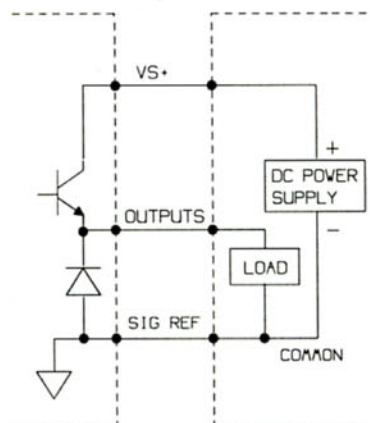
3.5.7 1890 Parallel Output Port Wiring Table

See the table, below. For typical wiring of N, C, P and T types of output, see diagrams to the right.

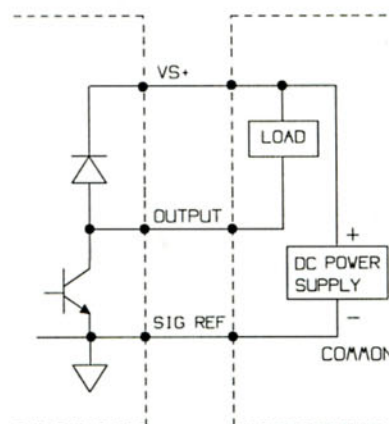
1890 Parallel Output Port Wiring Table				
DB-25S Connector Parallel Pin #	CBL-29S22-DXX* Cable Wire Color	Function		
		BDC	Binary	Gray
1	Brown	1 Bit	2 ⁰ Bit	G0
2	Red	2 Bit	2 ¹ Bit	G1
3	Orange	4 Bit	2 ² Bit	G2
4	Yellow	8 Bit	2 ³ Bit	G3
5	Green	10 Bit	2 ⁴ Bit	G4
6	Blue	20 Bit	2 ⁵ Bit	G5
7	Purple	40 Bit	2 ⁶ Bit	G6
8	Gray	80 Bit	2 ⁷ Bit	G7
9	White	100 Bit	2 ⁸ Bit	G8
10	Black	200 Bit	2 ⁹ Bit	G9
11	White/Brown	400 Bit	2 ¹⁰ Bit	G10
12	White/Red	800 Bit	2 ¹¹ Bit	G11
13	White/Orange	1K Bit	2 ¹² Bit	G12
14	White/Yellow	2K Bit	2 ¹³ Bit	G13
15	White/Green	4K Bit	2 ¹⁴ Bit	G14
16	White/Blue	8K Bit	2 ¹⁵ Bit	G15
17	White/Purple	10K Bit	2 ¹⁶ Bit	G16
18	White/Gray	20K Bit	2 ¹⁷ Bit	G17
19	White/Black/Gray	40K Bit		NC
20	White/Black	80K Bit		MC
21	White/Black/Brown	Multiplex Input		
22	White/Black/Red	Signal Reference		
23	White/Black/Orange	Data Transfer		
24	White/Black/Yellow	Analog Tachometer Output		
25	Black/12 Gauge	Vs (P Option: Collectors)		

Notes: *XX = number of feet

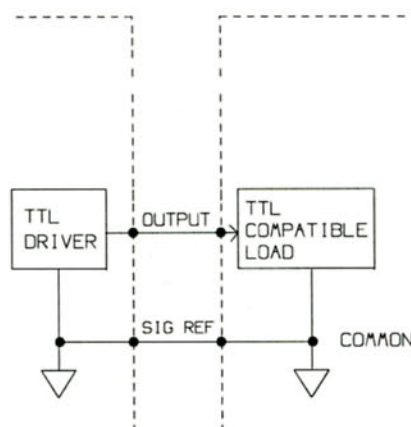
P Types of Outputs

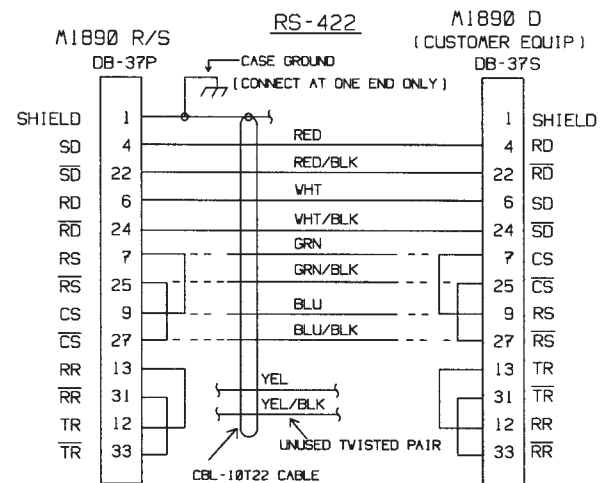
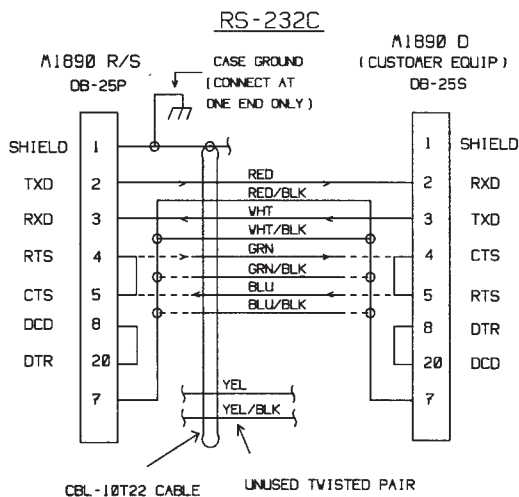


N and C Types of Outputs



TTL Type of Output





RS-232C Connector Wiring

Pin #	Designation	Label	M1890 DB-25P (DTE)	M1890D DB-25S (DCE)
1	Protective Ground	PGND		
2	Transmitted Data	TXD	Output	Input
3	Received Data	RXD	Input	Output
4	Request to Send	RTS	Output	Input
5	Clear to Send	CTS	Input	Output
7	Signal Ground	SGND		
8	Data Carrier Detect	DCD	Input	Output
20	Data Terminal Ready	DTR	Output	Input

RS-422 Connector Wiring

Pin #	Designation	Label	M1890 DB-37P (DTE)	M1890D DB-37S (DCE)
1	Shield			
19	Signal Ground	SGND		
4	Send Data	SD	Output	Input
22	Send Data Return			
6	Receive Data	RD	Input	Output
24	Receive Data Return			
7	Request to Send	RS	Output	Input
25	Request to Send Return			
9	Clear to Send	CS	Input	Output
27	Clear to Send Return			
13	Receiver Ready	RR	Input	Output
33	Terminal Ready Return			
31	Receiver Ready Return			
12	Terminal Ready	TR	Output	Input

3.6 Serial Port Interface (Optional)

3.6.1 Serial Port

The M1890 provides a simple serial communications output for remote computer interface or connection to the M1890-D display unit. The following are the features of the serial port:

- The character protocol & baud rates are user defined by the option codes. (See item 4.2)
- RS-232C or RS-422 option (factory ordered)

3.6.2 Message Protocol

The standard message protocol, as seen by the receiving station, consists of the five (5) ASCII position digits followed by the message termination characters CR/LF (Carriage Return/Line Feed), i.e.:

MSD / 2MSD / 3MSD / 4MSD / LSD / CR/LF

Example: If the displayed position is 12345 the message sent will be: "1", "2", "3", "4", "5", 13, 10; where "1" = ASCII code of 1.

Note: The position of the decimal point is ignored and is not included in the message. Five digits are always included, including leading zeroes.

3.6.3 Serial Freeze

Serial Data output is user controlled by the use of the (CTS) "Clear to Send" line. A logic zero (0) input on the CTS line will allow the character in progress to complete and then prevent further output by the M1890 until the CTS line is again returned to a logic one (1) state. Upon return to logic one (1) state, the previous message in progress is completed before a new message is started. With CTS in the logic one (1) state, the normal update rate of the serial output is 4 msec. If the "Serial Freeze" is not used, the CTS input should be connected to the RTS output at the M1890.

4. Programming

4.1 Programming Variables and Selection of Soft Options

Upon power-up, the unit displays "actual position". Press the Select Function switch on the unit to display the Scale Factor whole part. Press the increase or decrease switch until the desired value is displayed. Then press the program switch to permanently store the selected value. To facilitate selection of large numbers in a short time, the increase and decrease switches have three speeds: slow speed for the first 10 counts, medium speed from 10 to 800 counts, & high speed after 800 counts. Holding the switch in causes these speed changes, letting up on the switch causes speed to revert. Using the Select Function switch, unit may be stepped to Scale Factor Fractional Position. In a similar fashion select and program the preset number, decimal point position and option number. The option number selection is outlined in the Table below:

4.2. Option Number Value Selection

Each option has a numeric value as listed below. When all desired options have been selected, their numeric values are totaled. To program the selected options, the total of corresponding numeric values is programmed in the unit by following these steps:

- Press Select Function switch until Option indicator is illuminated.
- Enter the computed total option value using Increase Value or Decrease Value keys.
- Press Program switch.

Note: Total option value 0 yields blank display

Standard Options	
Mode	Option Value
Single-turn	0
Multi-turn	1
8 Bit Resolution	0
10 Bit Resolution	192
12 Bit Resolution	240
True Decimal Point	0
Arbitrary Decimal Point	256
Preset Number Change Allowed in Supervisor Mode Only	0
Preset Number Change Allowed Regardless of Supervisor Disables	512
Front Panel Preset Switch Enabled	0
Front Panel Preset Switch Disabled	1024

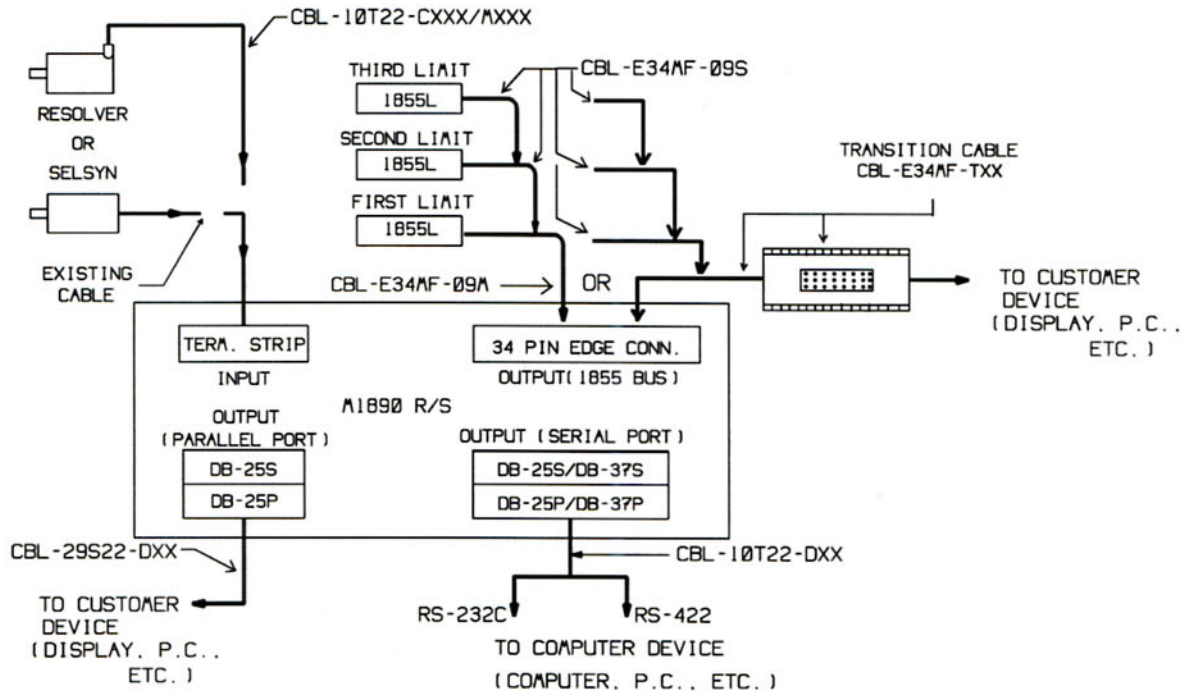
Serial Options: Word Format			
# ASCII Bits	Parity	Stop Bits	Option Value
7	None	2	2048
7	Even	2	8192
7	Even	1	6144
7	Odd	1	4096
7	Odd	2	14,336
8	Even	1	10,240
8	None	1	0 (Default)
8	Odd	1	12,288

Serial Options: Baud Rate	
Baud Rate	Option Value
1200 bps	0 (Default)
9600 bps	2
4800 bps	4
2400 bps	6
1200 bps	8
600 bps	10
300 bps	12

Example:

Desired Options	Option Value
Multi-Turn	1
12 Bit Resolution	240
True Decimal Point	0
Preset Number Change Allowed in Supervisor Mode Only	0
Front Panel Preset Switch Disabled	1024
Baud Rate 4800 BPS	4
7/Even/2 Stop Bit Format	8092
Total(Desired options numeric value)	9461

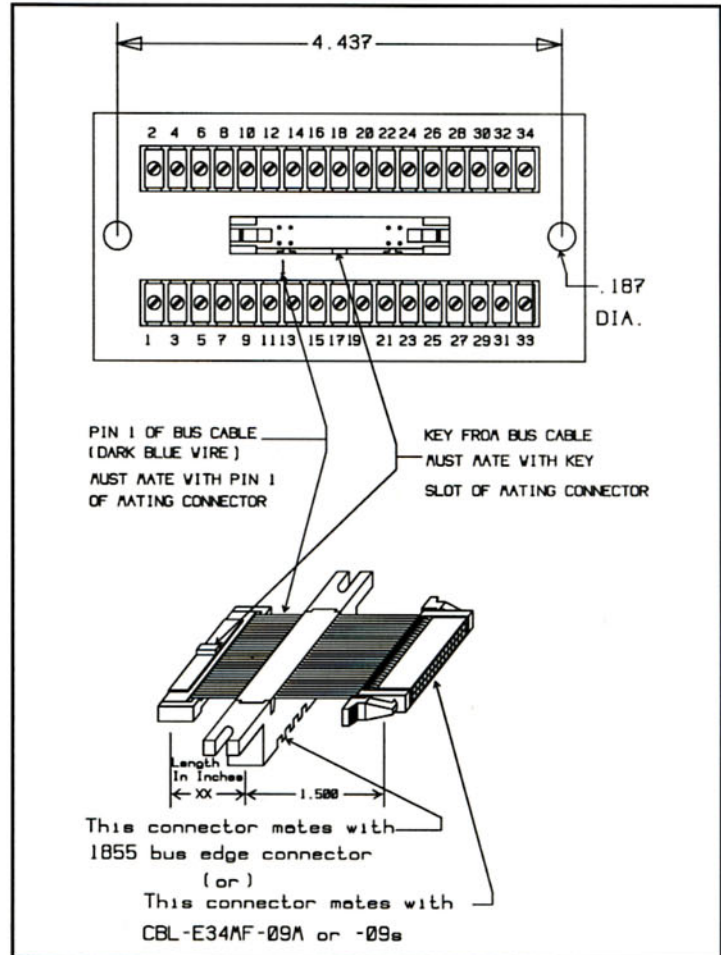
M1890 Cable Selection Drawing



Transition Connector CBL-E34MF-Txx

1855 Bus Definition			
Terminal #	Function	Terminal #	Function
1 (1B)	1 Bit	18 (9T)	20K Bit
2 (1T)	2 Bit	19 (10B)	40K Bit
3 (2B)	4 Bit	20 (10T)	80K Bit
4 (2T)	8 Bit	21 (11B)	Do not use (tied low)
5 (3B)	10 Bit	22 (11T)	Do not use (tied low)
6 (3T)	20 Bit	23 (12B)	Enable (high true)
7 (4B)	40 Bit	24 (12T)	Not used
8 (4T)	80 Bit	25 (13B)	Not used
9 (5B)	100 Bit	26 (13T)	Do not use (tied low)
10 (5T)	200 Bit	27 (14B)	Do not use (tied low)
11 (6B)	400 Bit	28 (14T)	Not used
12 (6T)	800 Bit	29 (15B)	Logic ground (Sig Ref)
13 (7B)	1K Bit	30 (15T)	Logic ground (Sig Ref)
14 (7T)	2K Bit	31 (16B)	Relay ground
15 (8B)	4K Bit	32 (16T)	Relay ground
16 (8T)	8K Bit	33 (17B)	+VCC (5 VDC)
17 (9B)	10K Bit	34 (17T)	+12 VDC (unreg. relay voltage)

Note: (1B) indicates bottom pin on position 1, and (1T) indicates top pin on position 1 of the edge connector.



Grounding and Shielding

NOTES:

[FAILURE TO OBSERVE ANY OF THESE REQUIREMENTS MAY CAUSE UNPREDICTABLE OPERATION AND WILL VOID WARRANTY]

1. All logic level wiring (including resolver and external power supply) must be done using **overall foil shielded** cables, with shields and equipment grounded as per above drawing. See How to Order section for suitable cables offered by Autotech.

2. Resolver shielded cable must consist of **twisted pairs**, and the twisted pairs must be wired as per wiring instructions. See How to Order section for a suitable resolver cable offered by Autotech.

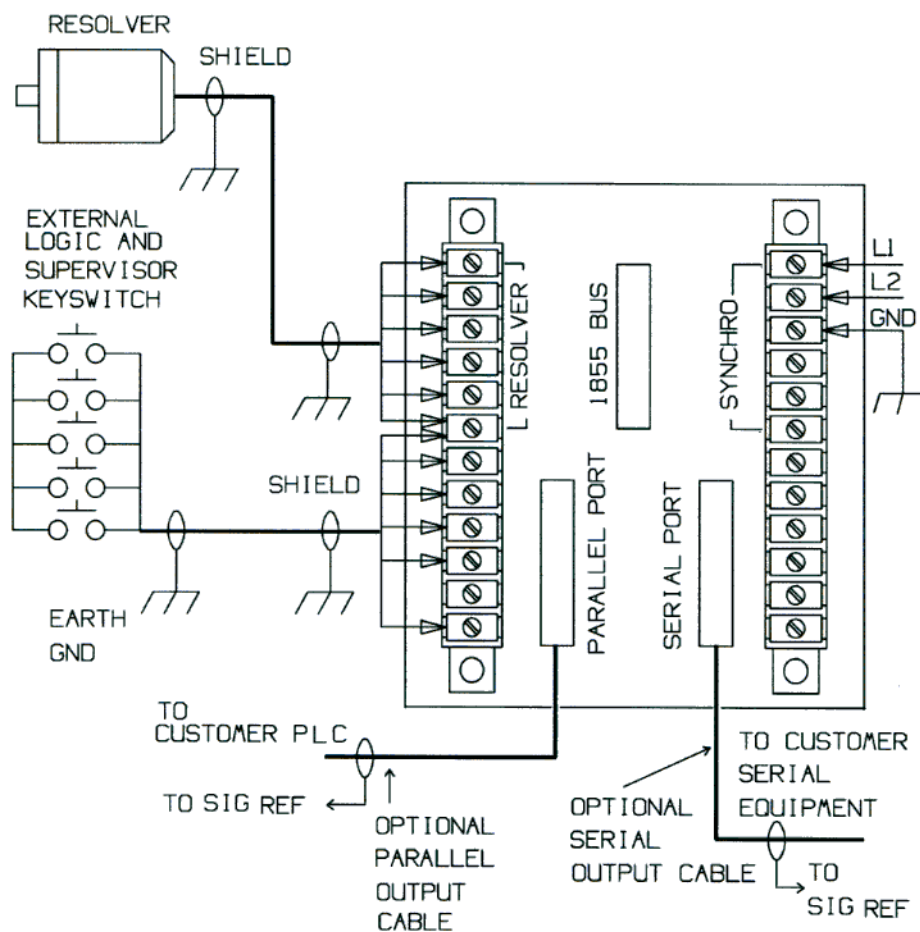
It is recommended that the resolver shielded cable be run in its own **separate** conduit.

3. All ground planes on which the M1890 and all external equipment are mounted must be held to the same RF potential, by good metallic connections to building frames, conduit or wiring trays.

4. All shielded cable must be kept at a minimum distance of 2 inches from all high voltage or inductive wiring.

5. All shielded cable must be kept at a minimum distance of 12 inches from all motor wiring controlled by AC or DC drives.

6. **Caution:** This equipment has an isolated Sig Ref (common). Failure to maintain this isolation between chassis ground (earth ground) and Sig Ref in external equipment (power supply or I/O cards) may cause electrical noise interference resulting in unpredictable operation of this equipment.



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