# The M1750 PLS

## The Modular Electronic Cam Switch

- A solid-state replacement of Electromechanical Cam Switches
- Simple, easy to understand thumbwheel programming
- Modular construction allows easy maintenance and field expansion
- Thumbwheel memory assures immunity to electrical noise
- Variety of input and output modules to suit different applications
- Rugged resolver, BCD encoder or time base generator as input device

**UL Listed**

## Introduction

Autotech's M1750 Programmable Limit Switch, with its modular construction and simple operator-machine interface, represents the easiest solid-state replacement of rotary cam switches or drum sequencers. We call it PLS "unlimited", because it can do things no common electromechanical sequencer or mechanically operated cam switch can do. When compared to mechanical switches, the M1750's superior accuracy, reliability and convenience of operation are outstanding. Such technology assures the Autotech customer a greater efficiency in manufacturing, helping him to increase production and lower costs.

### Principal of Operation

The M1750 PLS gets the shaft position data from a rotary transducer, which could be either an absolute digital encoder or a resolver. The output of a digital encoder is binary-coded-decimal (BCD), while the analog output of a resolver is converted to BCD by an R-to-D converter inside the PLS. The data received is processed in the buffer circuit, displayed in degrees (0–359) or counts (0–999) and compared to the programmed dwell-angle setpoints. When the process cycle reaches these setpoints, outputs are switched on or off, starting or stopping desired functions.
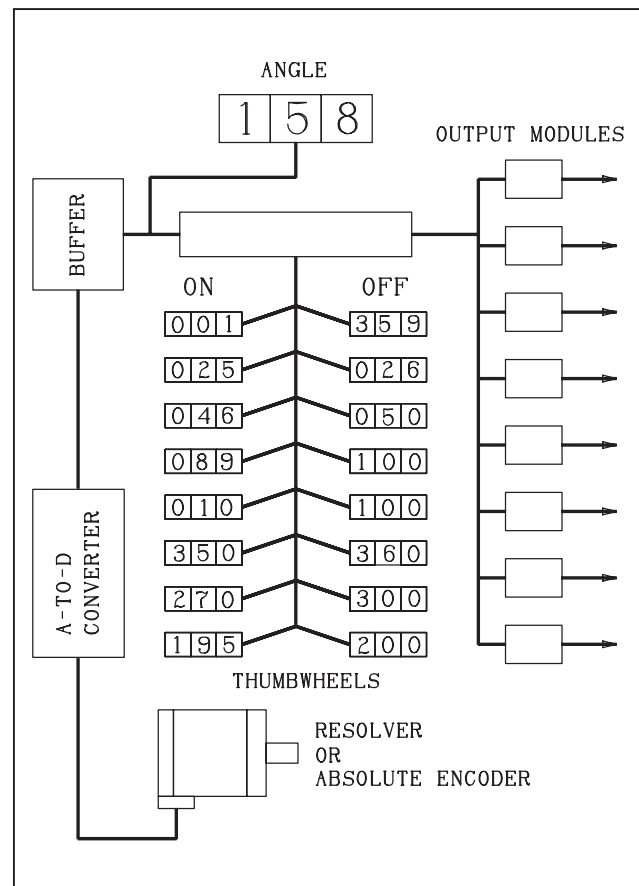
# Simplest Electronic Cam Switch

### Easy to Understand Thumbwheel Programming

The M1750 PLS combines the ease of thumbwheel programming with the convenience of an integrated limit switch. The thumbwheel programming is designed to duplicate the mental process used in setting up an electromechanical cam switch and thus permits an easy to understand operation. Just like a rotary cam switch, the M1750 PLS can be programmed through zero, e.g. "ON" at 350° and "OFF" at 10°.

### Operation at 1800 RPM, Programmable in Motion

The high speed ratiometric tracking converter guarantees perfect machine operation at speeds of up to 1800 RPM. All the program variables are immediately active in the process as they are entered by the user. This feature permits fine--tuning with machine in full motion.

### Entire Program Visible at a Glance

The thumbwheel programmed "ON" and "OFF" setpoints for all channels are visible at a glance, permitting simple operator to machine interface.

### Absolute Position, Up to 0.36° Resolution

The M1750 PLS operates with a resolver or an absolute digital encoder as position transducer, giving an absolute shaft position in both cases. This means that the system always keeps track of the true position, even upon machine movements after power outage. The resolver to digital decoder source modules are available with 360 or 1000 counts per revolution to achieve a resolution of 1° or 0.36°.

## Ultimate in Reliability, Serviceability

### Thumbwheels Provide Mechanical Memory

Even with all the advancements in technology, there is no substitute for reliability of mechanical memory provided by thumbwheels. The thumbwheel program memory does not require any battery back-up, nor is it affected by electrical noise or use over an extended period of time.

*Thumbwheel mechanical memory is not affected by external electrical interference.*

### Modular Construction

The entire logic is built on modules, which are independent of each other. In case of a problem, just plug-in a new module. The modular concept permits easy maintenance and increased design flexibility to match the system to your application.

### Short-Circuit Proof Resolver-PLS Connection

The electrical interface circuit connecting the resolver and the M1750 PLS protects against accidental shorts in the resolver/PLS wiring.

## RUGGED RESOLVER

### Reliable Under Extreme Environments

The M1750 PLS combines the ruggedness of a brushless resolver and the reliability of an advanced solid-state control. The rugged heavy duty NEMA 13 (IP54) resolver can be mounted on a machine shaft in any hostile environment, such as mechanical shock, vibration, extreme humidity and temperature changes, oil mists, coolants, solvents, etc., and the programmable control unit M1750 can be mounted up to 2500 ft. away in a control panel. The ratiometric converter assures high tracking speed of 1800 RPM and high noise immunity.

### Explosion Proof, FM Approved

The Autotech's series E8R resolver has FM approved explosion proof housing and meets the requirements as per Class I, Division I, Groups B, C and D

## Versatile

## SOURCE MODULES

### Resolver or Encoder Input

A standard source module with built-in Resolver-to-Digital converter, offset and digital display accepts resolver input and transforms the resolver signal to digital format for further processing in the comparator circuit. A digital display source module interfaces to an absolute BCD encoder and feeds this information to the comparator circuit. For time base generator input consult the factory.

### Full Revolution Digital Offset

A full revolution thumbwheel or external offset is provided on decoder source modules and permits easy alignment of "machine zero" with "resolver zero" to compensate for any mechanical misalignments, machine wear or speed variations. To fine-tune the machine operation for maximum precision, the offset can be adjusted with machine in full motion. The external offset entry from a programmable controller is especially useful for continuous compensation of speed changes.

### Program Control From External Programmable Controller

When using resolver as input device, a special purpose external offset resolver decoder module accepts BCD offset signal from a programmable controller to compensate con-

tinuously for any speed changes. The BCD position data from the decoder module or from the encoder terminals is also available for external devices such as programmable controllers or remote readouts.

## LOGIC MODULES

### Variety of Logic Functions

A variety of output logic functions are available to provide increased system flexibility:

**Dual Preset:** Allows for the settings of both "on" and "off" setpoints for each channel.

**Single Preset/Fixed One-Shot Timer:** Upon reaching the "ON" setpoint, a fixed one-shot timer (0.1 sec.) is activated.

**Single Preset/Variable One-Shot Timer:** Upon reaching the "ON" setpoint, a variable one-shot timer (0.1–6 sec.) is activated and the output stays on during the preset time.

**Single Preset/Digital Timer:** Upon reaching the "on" setpoint the output turns "on" and stays "on" for a duration set by the "time" thumbwheels. Time base setting is selectable by dip switches from 1 ms to 100 ms per count.

**ModZ:** Upon external signal, the position reference to the module is reset to zero and the module starts counting up from this new reference, switches output "ON" at the "ON" setpoint and switches "OFF" at the "OFF" setpoint. The cycle is repeated by resetting the counter. One M1750-PLS chassis can accommodate up to two ModZ modules with independent reset signals. This function is especially useful for gluing application.

## SYSTEM EXPANSION

### Field Expandable to Match the Application

The eight and twelve channel chassis are standard, but any desired number of logic modules can be inserted to meet the requirements. Also several M1750 PLS chassis can be wired in parallel to achieve a total of 48 channels for one position transducer.

### Variety of Plug-In Output Relays

The M1750 PLS is designed to operate with electromechanical relays (10 Amp) or open collector (100 mA @ 30V) or solid-state AC (3 Amp), DC (2 Amp) or AC/DC (0.35/0.5 Amp) output modules. Electromechanical relays and solid-state modules, however, cannot be mixed. The solid-state modules are optically isolated. All these relays are plug-in type for easy on-site replacement. The AC/DC relay has less than 0.1 mA leakage to interface directly to a programmable controller 110 VAC input card.

## MOUNTING

### Choice of Back Panel or NEMA Enclosure Mounting

The standard M1750 PLS chassis can be mounted inside the customer's control panel together with other controls or inside a NEMA 12 enclosure M1700-N with a solid cover or M1700-W with a Plexiglas see through window. The see through window allows the thumbwheel setpoints to be visible, while it protects the PLS inside. A locking handle on the cover assures program security. Inside the enclosure, there is a removable NEMA 1 plate covering the terminal blocks, while retaining easy access to the thumbwheels.

### Accessories

BCD outputs from main terminal block can be wired to a remote readout like Autotech's RD360 display unit or RD999 display/tachometer unit. Also one bit of BCD can be wired into Autotech's PS111 (zero speed switch) or PS112 (over/under speed switch) for detecting unsafe operation.

# Specifications

**Input Power:**
105--135 VAC, 50/60 Hz, 50W exclusive of load
(Optional 220 VAC)

**Operating Temperature:**
–10 to +130°F (--23 to +55°C)

**Position Transducer:**
Resolver, Autotech's series RL100, E6R, E7R, E8R and
RL101 or Absolute Digital Encoder, Autotech's DigiSolver part
# E5N-D0360-5MOMx

**System Resolution:**
1° or 0.36°

**Resolver-to-Digital Decoder Tracking Speed:**
1800 RPM

**Offset:**
**Offset Range:** Adjustable "0" to full revolution

**Offset Entry:** From front panel with thumbwheels or external
input, High true logic; Logic false : 0--1 VDC, Logic true :
4.5--5 VDC, Format: 10 or 12– lines. Current draw < 1 mA

**Offset Connector:** Unit comes with MS3110F-14-19P. The
mating receptacle MS3116F-14-19S is to be wired and sup-
plied by customer.

**Maximum Cable Length from Resolver to M1750:**
2500 feet shielded

## Outputs:

**Number of Output Channels Per Chassis:**
8 or 12 standard

**Maximum Number of Output Channels Per Transducer:**
48, (6 x 8 channel or 4 x 12 channel chassis in parallel)

**Output to Secondary Chassis or other External Devices:**
*Format:* 10 or 12-line BCD, High true logic;
Logic true *:* 2.5 V drop @ 1 mA source current,
Logic false : 0.4 VDC @ 2.4 mA sink current.

**Output Inhibit:**
Dry contact closure between C & D will disable all the outputs.

**ModZ Reset Signal:**
Dry contact closure or logic level low (0 to 1 VDC).

**Output Ratings:**
**KDD-012DC-10SIG:** 1NO+1NC relay contacts rated at
10 Amp (resistive) at 125 VAC

**KSS-120AC-ERI**: 3 Amp., 120 VAC, solid-state AC module,
max ON voltage: 1.5V; turn ON time: 150 $\mu$s (typ.); turn OFF
time: 8 ms (typ.); leakage: 10 mA (max)

**KSS-055DC-ERI**: 2 Amp., 3–40 VDC, solid-state DC module,
max ON voltage: 1.5 V; turn ON time: 15 $\mu$s (typ.);
turn OFF time: 100 $\mu$s (typ.); leakage: 100 $\mu$A (max.)

**KSS-AC/DC-ERI**: low leakage (<0.1 mA) AC/DC solid-state
module, 135 VAC (r.m.s.) @ 0.35 Amp. or 190 VDC (max)
@ 0.5 Amp. , turn ON voltage: 3 V; turn ON time: 10 $\mu$s (typ.)
turn OFF time: 100 $\mu$s (typ.) leakage: 100 micro A (max)

# Installation and Operation

## 1. Source Modules

### 1.1 M1750-359D Decoder Module

This module interfaces directly to RL100, E6R, E7R, E8R and RL101 resolvers. It converts the resolver input into BCD data corresponding to the shaft position. It has a 3-digit thumbwheel switch that is used to adjust for zero offset. The offset amount is always added to the BCD shaft position data and the total number (modulo 360) is displayed in the LED readout, fed to the "cam" modules and brought out on terminals to be fed to any secondary devices.

If the BCD incoming data was 340 and the offset number is 25, the display will be 5 (340+25=365, –360=5 ). Similarly, if the BCD incoming data was 10, the offset will have to be 350 to read 0 (10+350=360, –360=0 ).

If the number currently being displayed is say 100 and the offset is 40, changing the offset to 30 will decrease the display to 90 while increasing the offset to 50 will increase the display to 110. Thus machine timing can be retarded or advanced through the use of the offset settings.

It should be noted that while the offset value is being changed, the outputs of the system are affected simultaneously. Setting the thumbwheels may take a fraction of a second but it may be sufficient to affect an output. Therefore, care must be taken in determining when to change the settings.

### 1.2 M1750-999D Decoder Module

This module is identical to the M1750-359D module except that it resolves the resolver to 1 count in 1000, i.e., 0.36° and therefore works on a modulo 1000 principle instead of modulo 360 described above.

### 1.3 M1750-359DE & M1750-999DE Decoder

These modules are same as described in 1.1 and 1.2 above, except that instead of thumbwheel offset, these modules allow the machine zero reference to be digitally displaced with a 3-digit BCD number generated by a PLC or a computer.

### 1.4 Display Source Module

The display source module interfaces to an absolute BCD encoder (*not a resolver*), displays the encoder position information on the front display and feeds it to the comparator modules. This module is not provided with an offset.

## 2. Cam Modules

### 2.1 M1700-L11 Series Dual Preset

This module will energize its corresponding output device when the number in the ANGLE/COUNT display (machine status) falls between the settings for the ON SET POINT and the OFF SET POINT.

If the number set into the ON SET POINT is of numerically higher value than the number set into the OFF SET POINT, the output will energize when the input angle or count reaches the ON SET POINT and remain energized through zero until the OFF SET POINT setting is reached.

### 2.2 M1700-LV1 Series Single Preset/Variable One-Shot Timer

The M1700-LV1 will energize its corresponding output device for a time setting between 0.1 and 6 seconds (adjustable) when the number in the ANGLE/COUNT display reaches the number set by the ON SET POINT.

If the input number as displayed by ANGLE/COUNT display remains at the number set by the ON SET POINT, the output will remain energized only for the time set by the timing potentiometer.

### 2.3 M1700-LT1 Series Single Preset/Fixed One-Shot Timer

The M1700-LT1 is identical to M1700-LV1 except the time is fixed at 100ms+/–20%.

### 2.4 M1700-LTD1 Series Single Preset, Angle "ON" / Digital Time "OFF"

This module is similar to the variable one shot timer module as per item 2.2 above, but the time setting is through digital thumbwheel switches (1ms–100ms per count)

## 2.5 M1700-LP1 "Mod Z" Cam Module (Modified Zero)

"ModZ" Cam Module allows the cam to be reset to zero degrees (home position) upon external command such as output from a photoelectric sensor. This provides a convenient means of synchronizing the cam. For example, a packaging machine might have card board to be folded over and glued at precise distance from the leading edge. The boxes enter the machine from a conveyer belt at irregular intervals. A photoelectric sensor detects the leading edge of the box and resets the M1700-LP1 cam module to zero, and the output of the cam operates the glue gun at a precise interval.

The M1700-LP1 cam module is essentially a 3-digit BCD unidirectional preset counter with two limits and an external reset-to-zero signal. After the reset signal is received, the module starts counting up from zero until it reaches the "ON" limit setting where the output turns on. The module continues to count until the "OFF" limit setting is reached where the output turns off and remains off until the cycle is repeated by reset-signal. Each increment or decrement in the position/count display in the M1750 PLS is counted up by one in M1700-LP1 module.
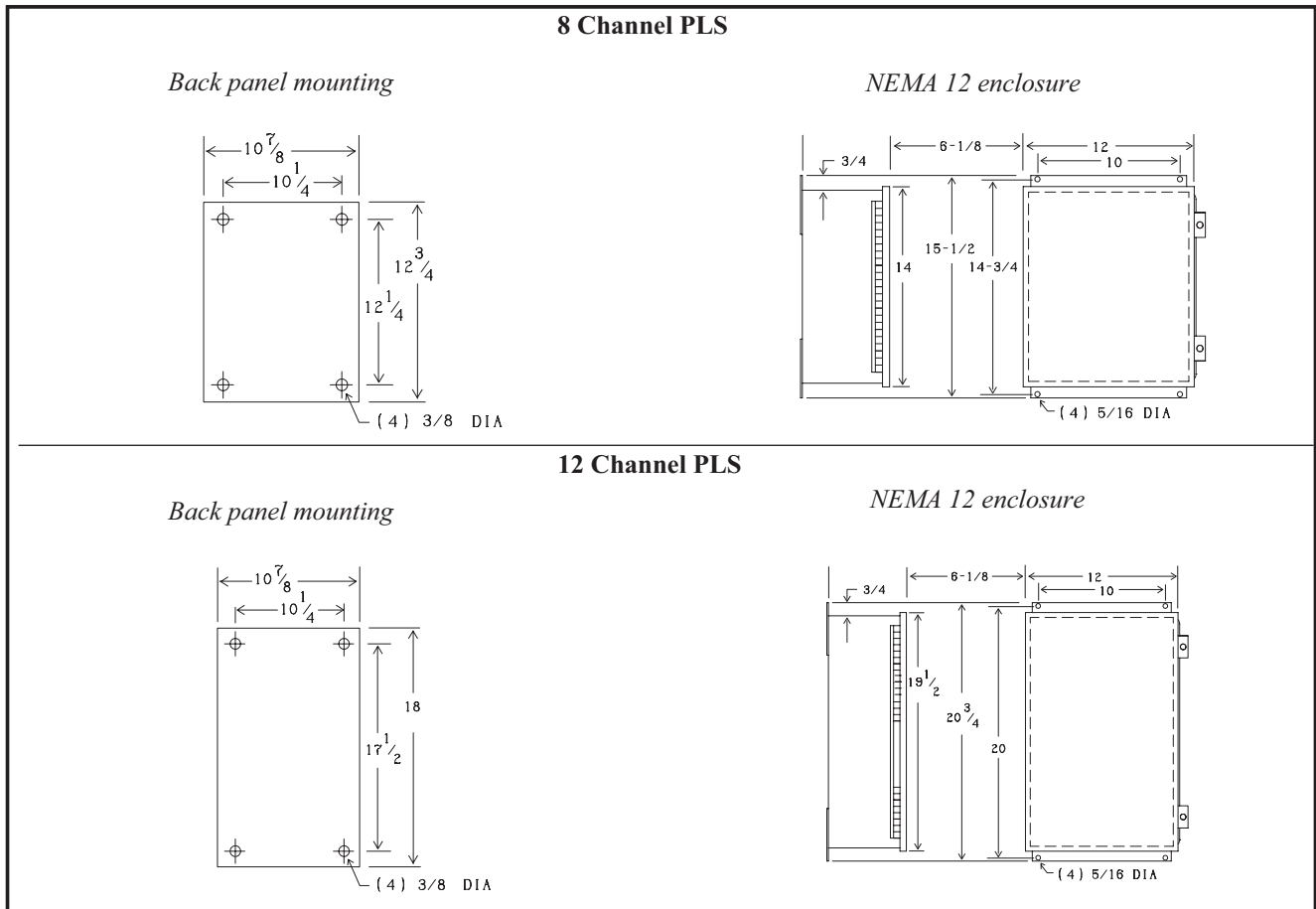
## 3. Mounting

### 3.1 Position Transducer Mounting & Wiring

See section for the position transducer used in your particular application

### 3.2 M1750 PLS Mounting

a.  Four mounting holes are provided on the M1750 base plate. Use #12 mounting screws. The M1750 can be mounted in an existing electrical enclosure with other controls or in the optional M1700-N or M1700-W NEMA12 enclosures. The M1700-W window enclosure has a see through Plexiglas window for program settings, a keylock to prevent unauthorized personnel from changing the settings and a NEMA 1 cover plate inside so that an operator when changing the settings is not exposed to any live wiring .
    To access the system modules And wiring terminals, five screws holding the two cover plates to the M1700 top plate have to be removed

b.  Two holes are provided in the NEMA 12 enclosures so that $1\frac{1}{4}$ inches conduit fittings can be mounted for wiring harnesses.



**8 Channel PLS**

*Back panel mounting*

*NEMA 12 enclosure*

**12 Channel PLS**

*Back panel mounting*

*NEMA 12 enclosure*

# 4. M1750 PLS Wiring

## 4.1 General Notes:

a. The wiring between the input device like RL100 Resolver and the M1750 PLS chassis can be done without any special tools since all the terminations use standard barrier connectors with semi clamp screws, eliminating the need for wire lugs.

b. When the M1750 is mounted in the NEMA 12 or similar enclosures, use separate conduit entrances for low voltage input wiring and 110 VAC output wiring.

c. Follow the shielding and grounding techniques outlined in the wiring instructions for each input device.

d. Input power 120 VAC is connected to the terminals marked L1 & L2. Connect earth ground wire (green) to GND Terminal.

e. Terminals 1 through 10, 13 & 14 carry the BCD signal generated either by the digital input devices (E5N) or internally generated in the M1750 by a Resolver/Decoder module. These BCD terminals and (–) signal reference terminal on all control chassis and accessories should be interconnected to each other. Terminal 12 is a 5VDC source and should be connected only to devices which require 5VDC power for its operation. Maximum drain on terminal 12 should not exceed 650mA. Typical drain of input devices and accessories is as follows:

*RD360* — 150mA
*RD999* — 150mA
*E5N* — 550mA
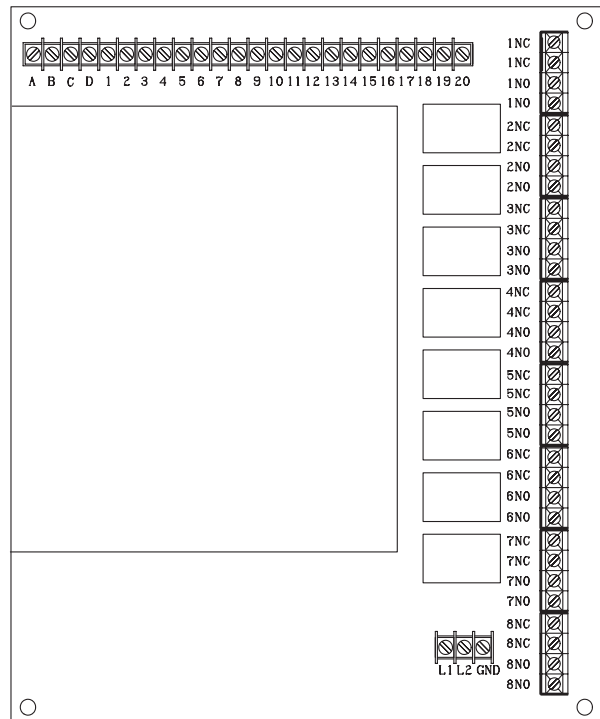
## 4.2 Master-Slave Chassis, Resolver and Accessories Wiring:

a. Switch S1 & S3 to change direction of ascending count.
b. Resolver terminals are connected only to the Master Chassis. **DO NOT CONNECT** these terminals to the slave chassis.

**Note**: Use shielded cable for connections between master M1750 & other devices. Tie shield to Sig Ref (–) (pin 11 on slave M1750 only). Do not connect other end.
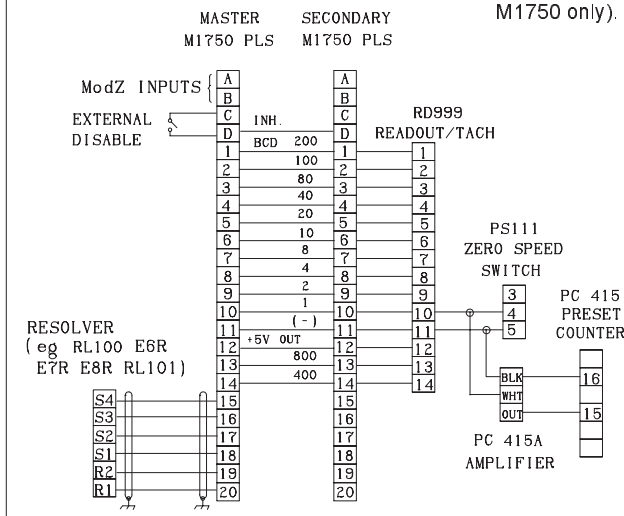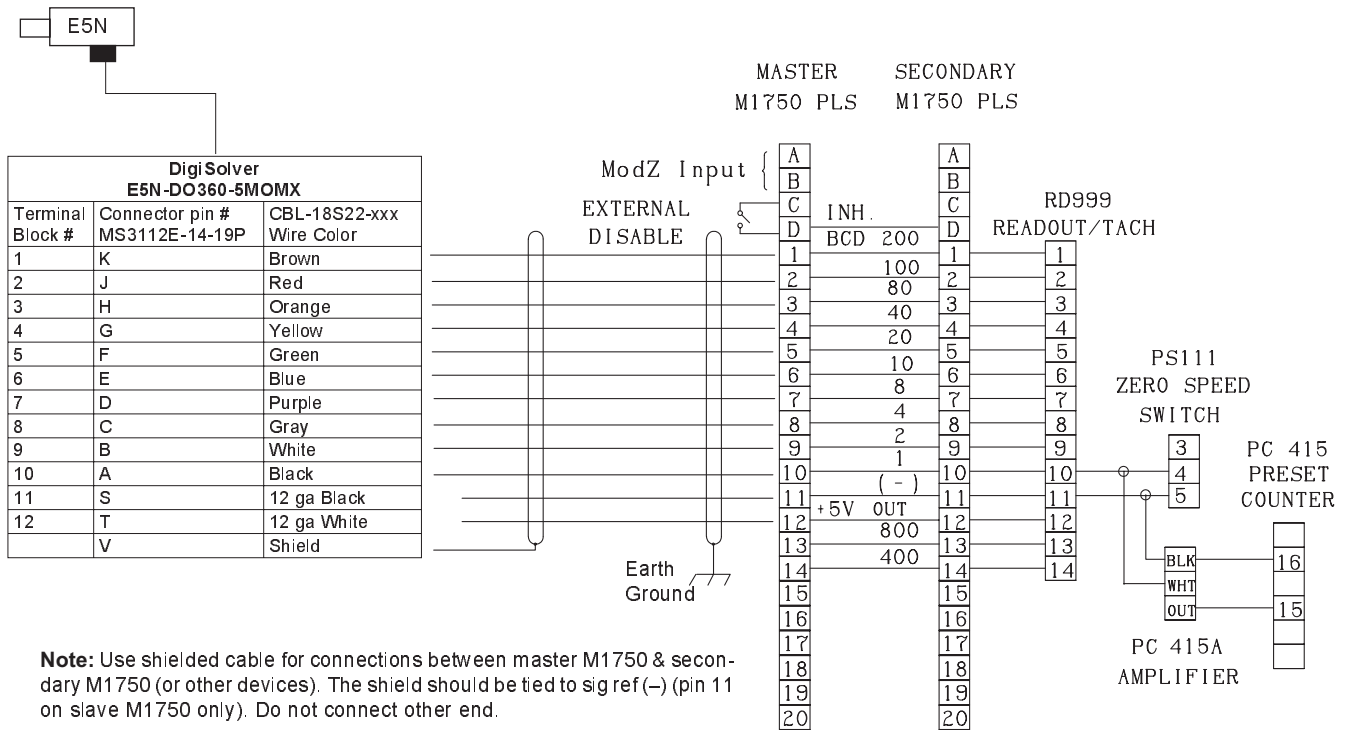


**Use CBL-10T22-XXX cable for connecting resolver to M1750**

| Resolver Terminal | Wire Color |
|---|---|
| R1 | Green/Black |
| R2 | Green |
| S1 | Yellow/Black |
| S2 | Blue/Black |
| S3 | Yellow |
| S4 | Blue |

| M1750 Terminal Functions | |
|---|---|
| M1750 Terminal | Function |
| A | ModZ |
| B | ModZ |
| C | (–) Sig Ref |
| D | External disable |
| 1 | 200 |
| 2 | 100 |
| 3 | 80 |
| 4 | 40 |
| 5 | 20 |
| 6 | 10 |
| 7 | 8 |
| 8 | 4 |
| 9 | 2 |
| 10 | 1 |
| 11 | (–) |
| 12 | +5 VDC out |
| 13 | 800 |
| 14 | 400 |
| M1750/Resolver | |
| 15 | S4 |
| 16 | S3 |
| 17 | S2 |
| 18 | S1 |
| 19 | R2 |
| 20 | R1 |

**NOTE:** Switch S1 and S3 to change direction of ascending count.

## 4.3 Master Slave Chassis, DigiSolver Encoder & Accessories Wiring



| DigiSolver E5N-DO360-5MOMX | | |
|---|---|---|
| Terminal Block # | Connector pin # MS3112E-14-19P | CBL-18S22-xxx Wire Color |
| 1 | K | Brown |
| 2 | J | Red |
| 3 | H | Orange |
| 4 | G | Yellow |
| 5 | F | Green |
| 6 | E | Blue |
| 7 | D | Purple |
| 8 | C | Gray |
| 9 | B | White |
| 10 | A | Black |
| 11 | S | 12 ga Black |
| 12 | T | 12 ga White |
| | V | Shield |

**Note:** Use shielded cable for connections between master M1750 & secondary M1750 (or other devices). The shield should be tied to sig ref (–) (pin 11 on slave M1750 only). Do not connect other end.

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## 4.4 Decoder Source Module with External Offset Wiring

The unit is supplied with a cable having plug MS3110F-14-19P. The mating receptacle, MS3116F-14-19S, is to be wired and supplied by the customer.

**Input Requirements**: *High true logic; Logic false:* 0-1VDC, *Logic true:* 4.5-5VDC; *Format*: 10 Line BCD or 12 Line BCD

| Plug-In Cable Information | |
|---|---|
| Pin # | Data |
| A | 200 Bit |
| B | 100 Bit |
| C | 80 Bit |
| D | 40 Bit |
| E | 20 Bit |
| F | 10 Bit |
| G | 8 Bit |
| H | 4 Bit |
| J | 2 Bit |
| K | 1 Bit |
| L | GND (Shield) |
| M | DO NOT USE |
| N | 800 Bit for 999DE |
| P | 400 Bit for 999DE |
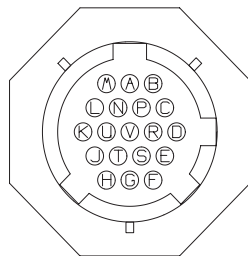
*19-pin MS Mating Connector*

## 4.5 "ModZ" Cam Module Wiring

If the 8-channel M1750 PLS requires 2 or less "ModZ" modules, a standard chassis can be used. Wiring is as follows:

| Cam Module Slot Number | Reset Terminals |
|---|---|
| 7 | A and C |
| 8 | B and C |

If more than 2 "ModZ" modules per chassis are needed, a special chassis is required, and the wiring is as follows:

| Cam Module Slot Number | Reset Terminals |
|---|---|
| 1 through 6 | D and C (1 through 6 reset with one common trigger) |

**Reset Signal:** Contact closure or logic level low (0 to 1VDC) at the corresponding terminal. Terminal C is zero signal reference.

## 4.6 Inhibit/Disable Wiring

A contact closure between terminals C & D or logic low signal at D will disable all the outputs. When the control chassis has any of the Resolver Decoder modules as a source module, terminal D is pulled to logic 0 internally; for a duration of about 500 msec during power supply turn on. Thus the outputs are disabled during the power turn on settling period. In an M1750 PLS system which has more than 1 control chassis, all terminals D should be connected to each other.
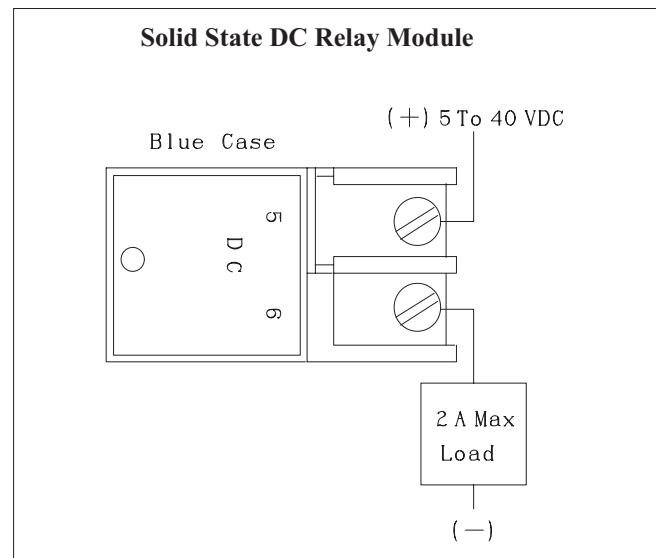
## 4.7 Output Wiring:

a. **Relay Output Wiring:** Relay outputs are identified according to the corresponding channel number whether the contacts are normally open (NO) or normally closed (NC). Relay outputs are de-energized when the M1700-L or M1700-LV Electronic Cam Module indicator light is dark and energized when the indicator light is illuminated.

For example, if a closed contact is desired when the M1700-L or M1700-LV Electronic Cam Module in channel 1 has detected its proper dwell setting, connect the output wiring to the two NO terminals.

b. **Solid State AC Output Module Wiring:** Connect the output wiring directly to the terminals on the red solid-state AC Output Module. The AC Output Module is a normally open 20–135VAC 3A switch. Do not connect this output module into DC circuits or into AC circuits above 135VAC. The indicator light on the AC output module illuminates when the AC output is "closed circuit".

When connecting the AC output module into logic circuits or into loads that are less than 3VA connect a 5.6k-ohm, 3w resistor is parallel with the load.

c. **Solid-State DC Output Module Wiring**: Connect the output wiring directly to the terminals on the DC Output Module. Observe polarity. Connect the most positive voltage in the load to the + terminal. The DC Output Module is a normally open 3VDC 2A switch. Do not connect this output module into AC circuits or into DC circuits above 40VDC. The indicator light on the DC output module illuminates when the DC output module is "closed circuit".



**Solid State DC Relay Module**

d. **Solid State AC/DC Output Module wiring**
Connect the output wiring directly to the terminals on the white solid-state AC/DC output module. When connected to AC circuits, it operates as a 0–135 VAC (r.m.s.), 0.35 Amp, normally open switch; while in DC circuits it is a normally open 190 VDC (peak), 0.5 Amp DC switch. With a very low leakage, it is specially suited for interface to PLCs . The indicator light on the module **illuminates** when the input to the module is present, and **does not** indicate output status.



**Solid State AC Relay Module**



**Solid State AC/DC Relay Module**
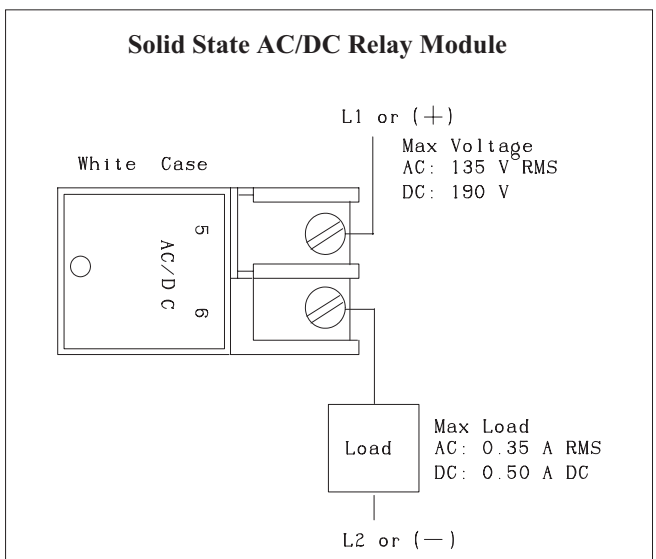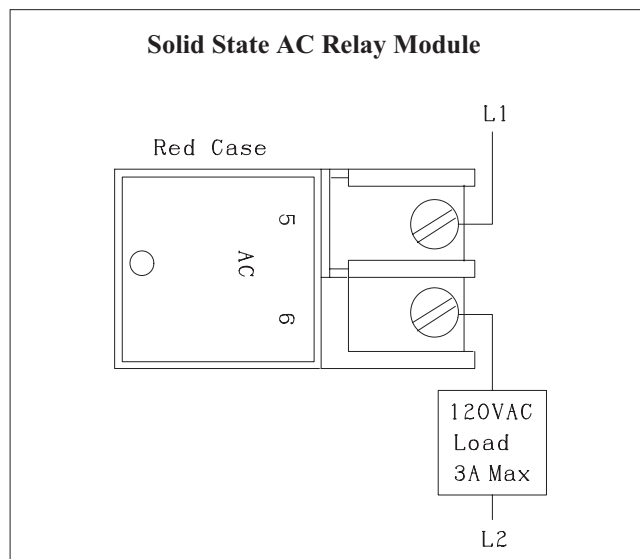
# How to Order

## 1. M1750 PLS

*1.1 Position Transducer:*

Select appropriate transducer from Autotech's part number RL100, E6R, E7R, or E8R.  For *How to Order* information, refer to the position transducer section.

*1.2  M1750-PLS for Back Panel Mounting:*

PLS Chassis:  see step 2
Source Module:  see step 3
Logic Modules:  see step 4
Top Plate:  see step 5
Output Relays:  see step 6

*1.3  NEMA 12 (IP52) Enclosure Mounting*

NEMA 12 (IP52) Enclosure:  see step 7

## 2.  PLS Chassis

*Select PLS chassis for desired number of channels and type of outputs:*

(a)  Electromechanical and solid-state outputs cannot be mixed on same chassis.

(b)  Solid-state AC, DC, or AC/DC outputs can be mixed on the same chassis.

(c)  Maximum of 6 x 8 channel or 4 x 12 channel chassis can be wired in parallel to the same transducer.

| | |
|---|---|
| **ASY-M1750-011** | 8 Channel PLS chassis for EM-relay outputs |
| **ASY-M1750-1200** | 12 channel PLS chassis for EM-relay outputs |
| **ASY-M1750-OC1** | 8 channel PLS chassis for Open Collector outputs |
| **ASY-M1750-12OC** | 12 channel PLS chassis for Open Collector outputs |
| **ASY-M1750-OSS** | 8 channel PLS chassis for solid-state relay outputs |
| **ASY-M1750-12SS** | 12 channel PLS chassis for solid-state relay outputs |

# 3. Source Module

*Select appropriate souce module:*

        (a) with resolver as position transducer, must use decoder source module in the master chassis.

        (b) Slave chassis must use display source module (ASY-M1750-DISP)

| | |
|---|---|
| **ASY-M1750-359D** | Resolver decoder source module, ratiometric, 360 counts, offset and display |
| **ASY-M1750-359DE** | Above source module with external offset |
| **ASY-M1750-999D** | Resolver decoder source module, ratiometric, 1000 counts, offset and display |
| **ASY-M1750-000DE** | Above source module with external offset |
| **ASY-M1750-DISP** | Display source module, no offset |

# 4. Logic Modules

*Select type and number of logic modules:*

| | |
|---|---|
| **ASY-M1700-L11** | Dual preset, Angle ON/Angle OFF module |
| **ASY-M1700-LT1** | Single preset, Angle ON/Fixed Time OFF module (0.1 sec.) |
| **ASY-M1700-LV1** | Single preset, Angle ON/Variable Time OFF module (0.1– 6 sec.) |
| **ASY-M1700-LTD1** | Single preset, Angle ON/Digital Time OFF module (1ms – 100ms/count) |
| **ASY-M1700-LP1** | ModZ Cam Module |

# 5. Top Plate

*Select top plate corresponding to the source module and number of channels:*

| | |
|---|---|
| **MTP-M1750-8DEC** | Top plate for decoder source module and 8 channel PLS |
| **MTP-M1750-12DEC** | Above top plate for decoder source module and 12 channel PLS |
| **MTP-M1750-8DIS** | Top plate for display source module and 8 channel PLS |
| **MTP-M1750-12DIS** | Above top plate for display source module and 12 channel PLS |

# 6. Output Relays

*Select type and number of output relays:*

| | |
|---|---|
| **KDD-012DC-10SIG** | 10 Amp, 125 VAC, DPDT EM-Relay |
| **KSS-120AC-ERI** | 3 Amp, 120 VAC, Solid-State AC Module |
| **KSS-055DC-ERI** | 2 Amp, 3–40 VDC, Solid-State DC Module |
| **KSS-AC/DC-ERI** | Low leakage <0.1 mA, AC/DC Solid-State Module, 135 VAC (r.m.s.) @ 0.35 Amp, or 190 VDC (max.) @ 0.5 Amp |

# 7. NEMA 12 (IP52) Enclosure

*Select appropriate NEMA 12 (IP52) enclosure, if required:*

| | |
|---|---|
| **ENC-M1700-NEMA** | NEMA 12 (IP52) enclosure without see through window for 8 channel PLS |
| **ENC-M1700-W11** | Above enclosure with see through window including NEMA 1 plate |
| **ENC-M1700-N12** | NEMA 12 (IP52) enclosure without see through window for 12 channel PLS |
| **ENC-M1700-W12** | Above enclosure with see through window including NEMA 1 plate |

# 8. Accessories

Select optional accessories, when required:

| | |
|---|---|
| **SAC-PS111-010** | Zero Speed Switch |
| **SAC-PS112-010** | Over and Under Speed Switch, 150–1500 PPM |
| **SAC-RD360-010** | Remote Angle Readout, 0–359 |
| **SAC-RD999-010** | Remote Readout/Tachometer, 0–999 |