



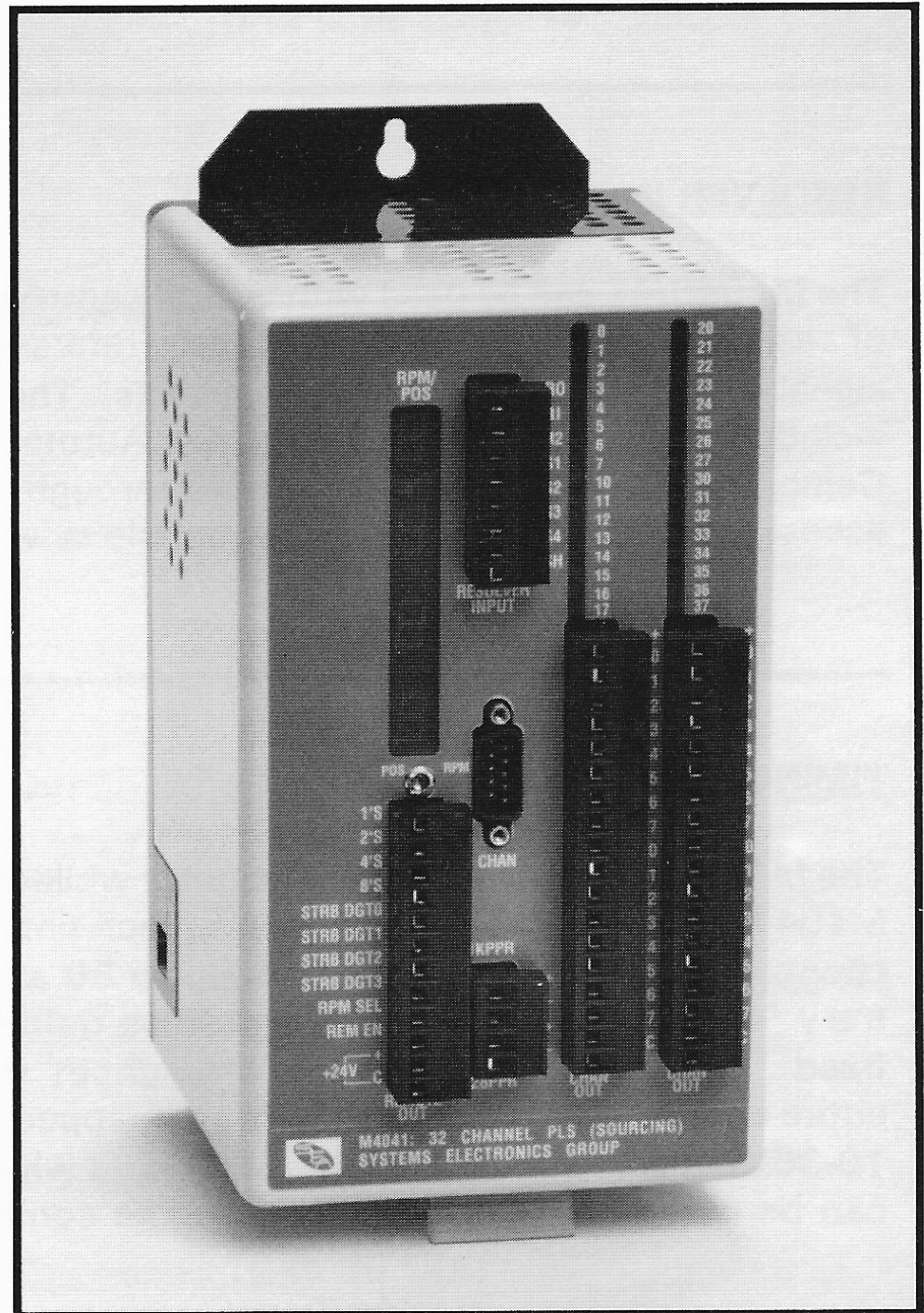
SYSTEMS M4000

INDUSTRIAL CONTROLLER

M4040/M4041 PROGRAMMABLE LIMIT SWITCH MODULES

FEATURES:

- PROGRAMMABLE LIMIT SWITCH MODULE WITH 16 (M4040) OR 32 (M4041) TIMING CHANNELS
- INTERFACES WITH MACHINE MOUNTED RESOLVER
- BUILT-IN 10-30VDC SOURCING OUTPUTS FOR EACH TIMING CHANNEL COMPLETE WITH INDIVIDUAL LED STATUS INDICATION
- PROGRAMMABLE SCALE FACTOR (2 TO 512) AND OFFSET (0 TO ONE MINUS THE SCALE FACTOR)
- MOTION OUTPUT WITH PROGRAMMABLE LOW AND HIGH SPEED THRESHOLDS
- BRAKE WEAR COMPENSATION ALGORITHM FOR CONSISTENT STOPPING OF PRESSES
- 4-DIGIT RPM / POSITION DISPLAY ALONG WITH RPM/POSITION DISPLAY OUTPUT CONNECTOR FOR REMOTE DISPLAYS OR INTERFACING TO PLCs
- DEDICATED 12VDC 128 AND 1024 PULSE PER REVOLUTION OUTPUTS
- PROGRAMMED WITH PLSdev, DOS BASED SOFTWARE PACKAGE WHICH ALLOWS BOTH ON AND OFF-LINE TIMING CHANNEL PROGRAMMING AS WELL AS PLS CONFIGURATION



- HIGH PERFORMANCE: RESOLVER TRACKING RATE OF 6,000RPM WITH A CHANNEL UPDATE UNCERTAINTY OF LESS THAN ONE MICROSECOND
- REMOVABLE FIELD WIRING CONNECTORS
- SMALL (8" X 4.5" X 5.5") PACKAGE SIZE

GENERAL DESCRIPTION:

The M4040 and M4041 PLS modules are high speed programmable limit or cam switches which accept angular position information in the form of resolver format signals and convert these to digital. The modules contain 16 (M4040) or 32 (M4041) timing channels which can be programmed "on" and "off" at user defined position set-points. Two additional outputs with a fixed

number of pulses per revolution (one at 128, the other at 1024) are available to drive digital tachometers, etc.

The scale factor of the M4040/41 is programmable from 2 to 512 divisions per revolution while the offset is programmable from 0 to one minus the scale factor. Other programmable features

GENERAL DESCRIPTION (cont'd):

include a brake wear compensation algorithm for use with presses and a motion or speed output which is activated "on" and "off" at user defined low and high speeds. Programming of the M4040/41 is implemented with PLSdev, a DOS based software package which allows the user to program the timing channels both on and off-line, set

the PLS configuration, upload and download programs to and from the PLS, etc.

High speed operation is obtained with a resolver tracking rate greater than 6,000 RPM and a timing channel output update uncertainty of less than one microsecond to a change in angular position.

RESOLVER INTERFACE:

The M4040/41 can be used with virtually any type of resolver which incorporates a rotor reference signal and two stator feedback signals. These include resolvers manufactured by C&A, Autotech, Gemco, etc. A dip switch accessible through an access hole on the left side of the module selects

the desired resolver reference voltage, either 1.45VRMS or 3.70VRMS. For Autotech and Gemco resolvers, the reference should be set at 1.45VRMS, for C&A at 3.70VRMS. For other resolvers, refer to the manufactures specifications to determine which reference should be selected.

TIMING CHANNELS:

The M4040 contains 16 timing channels while the M4041 contains 32 timing channels. Each timing channel can be programmed with up to 50 arbitrary "on-off" set-points or with a pulse train of fixed "on" and "off" divisions throughout the entire channel. All timing channels are mapped to 10-30VDC sourcing (100milliamp) outputs which can be wired to PLC inputs for machine control

timing. The status of each timing channel output is indicated with an individual LED. The timing channel outputs contain short circuit protection such that the detection of a short circuit disables the outputs, with a fault code displayed on then RPM/POSITION display. Once the short circuit condition is removed, the fault code can be reset and the outputs will resume normal operation.

RPM/POSITION DISPLAY/OUTPUT CONNECTOR:

A 4-digit RPM/POSITION display is built into the M4040/41. In addition, an RPM/POSITION output connector is also built in for remote displays or for interfacing to PLCs. Eight 24VDC sinking (true low) outputs and two 12-30VDC sourcing (true high) inputs are available on the connector. The eight outputs multiplex the data for the four digits using four wires for the digit data and four wires as the individual digit strobes. This configuration reduces the wire count required for remote displays. The two inputs are REMOTE ENABLE and RPM SELECT.

If REMOTE ENABLE is "low", RPM or POSITION is selected locally via the RPM/POSITION toggle switch on the M4040/41. If REMOTE ENABLE is "high", POSITION is displayed when RPM SELECT is a "low" and RPM is displayed when RPM SELECT is a "high". When REMOTE ENABLE is high, the strobe time of the output connector digit strobes can be user programmed from 2.5msec to 640msec. This allows the user to guarantee the digit strobe time is longer than the display strobe time or PLC scan time to which the M4040/41 is interfaced.

BRAKE WEAR COMPENSATION:

The brake wear compensation algorithm can be used in conjunction with presses which incorporate a top dead center (TDC) or back dead center (BDC) stop feature. With these presses, a timing signal is used to declutch the press for TDC or BDC stops. However, as the brake wears, the press will no longer stop at TDC but will instead overshoot. When enabled, the brake wear algorithm of the M4040/41 will automatically adjust the TDC timing signal such that the press always stops at the desired stopping location regardless of brake wear.

The brake wear algorithm is implemented in CH00 and can be enabled or disabled by the user. When disabled, CH00 functions as a standard timing

channel. When enabled, the following parameters, set by the user, are used to implement the algorithm: Desired Stop Location, Allowed Error, CH00 Timing Width, and Compensation Window.

In addition to the above parameters, the REMOTE ENABLE input is used to enable the brake wear compensation. The adjustment of CH00 is performed when the press is stopped (RPM = 0) and the REMOTE ENABLE input is high. If the REMOTE ENABLE input is low when the press is stopped, CH00 is not altered regardless of the stopping location. This allows the algorithm to be bypassed for inch and single modes as well as emergency stops.

MOTION (SPEED) OUTPUT:

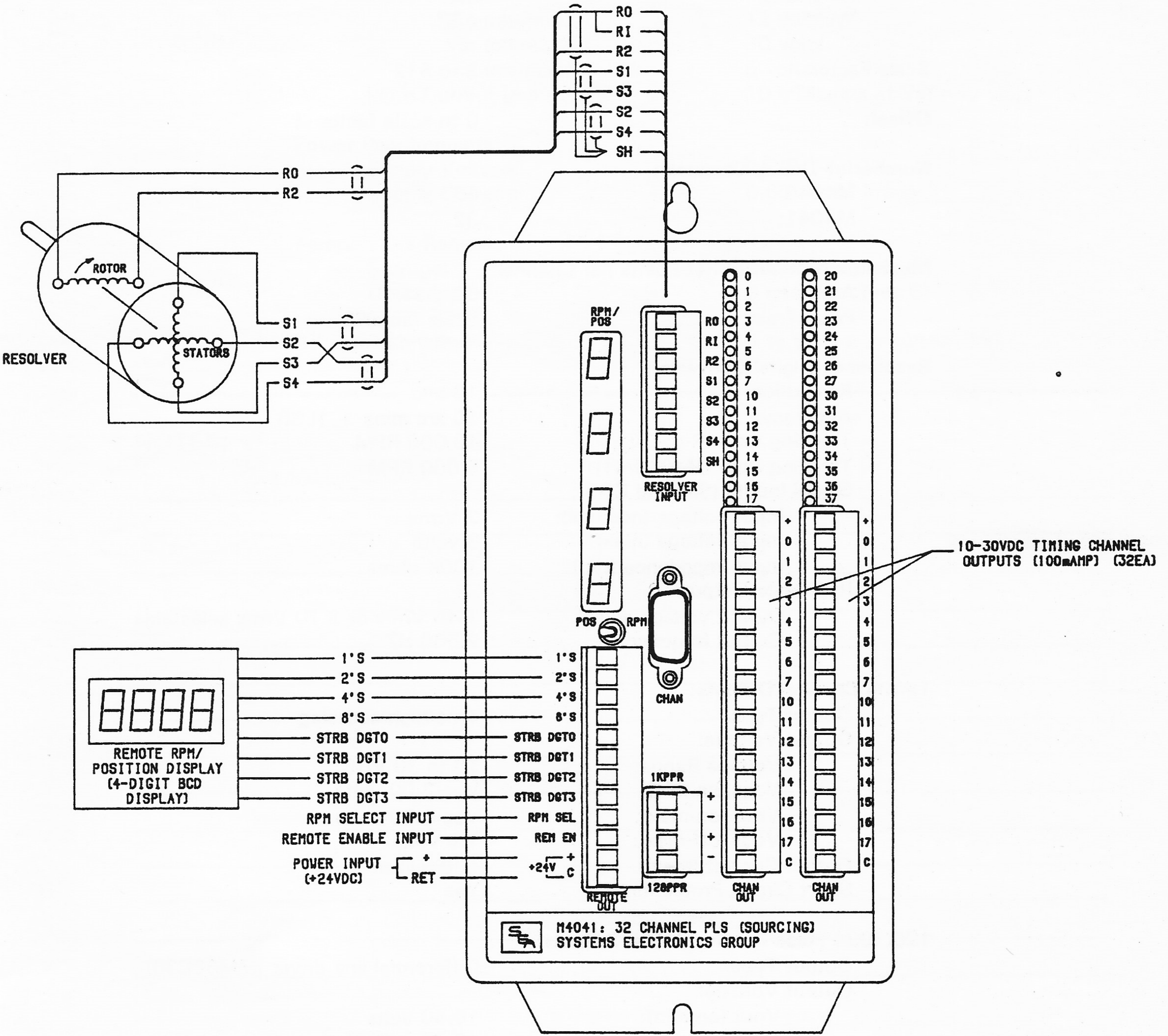
The motion output is a user enabled feature which uses the CH17 output. Two user programmable parameters are used in conjunction with the motion output: low speed threshold and high speed threshold. When enabled as a motion output, CH17 is

"on" when the speed (RPM) is between the low and high speed thresholds. When the speed is below the low speed threshold or above the high speed threshold, CH17 is "off". When disabled, CH17 functions as a standard timing channel.

PROGRAMMING:

Configuration and timing channel programming of the M4040/41 is performed with PLSdev, a DOS based programming software package which runs on any IBM PC or compatible. Connection of the PC to the M4040/41 is implemented with an RS-232 cable, no other hardware is required. PLSdev allows the user to perform the following:

- Configuration of the M4040/41 including:
 - Scale factor
 - Offset
 - Brake wear compensation enable/parameter programming
 - Motion output enable/parameter programming
- On and Off-line timing channel programming including:
 - arbitrary set-point programming
 - pulse train channel programming
 - timing channel fine tune
- Channel set-points download to M4040/41
- Channel set-points upload from M4040/41
- Configuration and Channel set-points print-outs
- M4040/41 Hardware Confidence test



M4041
32 CHANNEL PLS MODULE

SPECIFICATIONS:

Module Size:

Length: 8.0"
Height: 5.5"
Width: 4.5"

Scale Factor: 2 to 512

Offset: 0 to scale factor -1

Number of Timing Channels:

M4040: 16
M4041: 32

Maximum Number of Set-Points per Channel:

Arbitrary: 50
Pulse Train: Scale factor/2

Resolver-to-Digital Converter:

Resolution: 12 bits
Accuracy: 10 arc mins + 1LSB
Tracking Rate (R-to-D): 10,000 RPM
Tracking Rate (M4040/41): 6,000 RPM
Signal Inputs (SIN and COS):
Input voltage (nominal): 2 Vrms
Input voltage (max): 8 volts
Input impedance (typ): 100K ohms
Reference Output:
Output voltage level: 1.45 Vrms or 3.70 Vrms selectable
Output frequency: 2,500 HZ

Timing Channel Outputs:

Output Type: True high sourcing
Output Voltage:
Voltage Range: 10 to 30 VDC
Vout (on-min): Vcc-2.00 volts
Vout (on-max): Vcc-0.20 volts
Vout (off-max): 1.5 volts
Output Current (max): 100 milliamps
Short Circuit Protection: Yes

128/1024 Pulse Per Revolution Outputs:

Output Type: Differential line driver (MM88C30)
Output Voltage:
Vout (on-min): 10.50 volts
Vout (on-max): 12.75 volts
Output Current (max): 50 milliamps
Short Circuit Protection: No

RPM/POSITION Outputs:

Output Type: True Low Sinking (24VDC)
Output Voltage:
Vout (on-max): 1.50 volts
Vout (off-min): 20 volts
Output Current (max): 50 milliamps

