Autotech Controls

M1050-M10 PLS

Instruction & Operation Manual

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MAN-M1050-M10
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M1050-M10 PLS

Instruction Manual

Introduction

Autotech's PLS and Mini-PLS families have continually set the standard for speed, precision, reliability, and product features in the Programmable Limit Switch market place. While retaining the features and high standards of other Autotech products, the M1050-M10 is a 16 turn PLS, designed for linear applications with total machine travel between 40.96 and 640 inches. The M1050-M10 takes its position input from a single turn resolver. The M1050-M10 PLS outputs are referenced to the ModZ input. This ModZ input has to be active for any of the PLS outputs to be enabled. A programmable machine offset is available to compensate for the distance between the ModZ sensor and the activated devices.

The M1050-M10 combines 8/16 power outputs, fault detection and indication, 60/30 user defined PLS programs and simple and easy-to-learn programming in one compact unit with a NEMA 12 front panel. In addition, each PLS program supports 128/256 set point pairs, programmable in increments of 0.01 inch. Included also are a fault output that indicates on the display the source of the fault for fast, easy troubleshooting, and a motion indicator that energizes when the resolver speed is between the motion limits.

Powerful, Easy-to-Learn, Man-Machine Interface

Autotech's human factors engineering has made it possible to program all PLS functions with only five front-panel keys and a smart front-panel display.

With these five self-explanatory programming keys, programming the M1050-M10 is extremely simple — no long, complex key sequences to remember.

Display of Parameters For Easy Understanding

In the normal operating mode, the large 0.56" numerical display indicate machine position or the resolver RPM. When programming PLS set points, the display shows the selected channel number and the selected On or Off set point. In all modes, bright easy-to-read bar graph displays show the true output status of all eight PLS outputs, as well as the fault relay status and the motion output status.

Patented "↑" and "↓" Keys for Fine Tuning in Motion

Most programmed values can be adjusted with the machine running, making fine tuning of job parameters easy. Two fully isolated supervisory inputs prevent accidental or unauthorized program changes.

Multiple Program Storage and Duplication Makes Job Changeover Easy

The M1050-M10 PLS can store 30/60 independent, user-defined PLS programs for different machine setups. Duplication of one program to another is provided. Also duplication of one channel's set points to another channel is provided.

Fully Isolated Inputs and Outputs

All M1050-M10 inputs and outputs are fully isolated from user power sources to provide outstanding electrical noise immunity in harsh industrial environments.

Built-in Fault Detector

The Fault Output is normally energized when the M1050-M10 PLS is operating normally and the resolver wiring is intact. If an internal M1050-M10 fault is detected, or the power fails, or one or more of the resolver wires is broken or disconnected, the Fault output will de-energize. Under fault conditions all PLS outputs and the motion output will de--energize.

Built-in Tachometer

The built-in tachometer is accurate to 1 RPM and are updated over 68 times per second to provide fast, accurate indication and detection of rotary motion.

Motion Detector

The motion detector is programmed to energize a power relay output when the resolver's RPM is between the motion low and high limits. The motion detector output status is indicated on the front panel.

Two User Definable Configurations

The M1050-M10 is easily configured to either 60 total programs with channels 1–8 as PLS outputs, or 30 total programs with channels 1–16 as PLS outputs.

Specifications

Power Requirements:
105–135 VAC, 50/60 Hz., 20W or
220–260 VAC, 50/60Hz., 20W (option)
Operating Temperature:
–10 to +130°F (–23 to +55°C)

PROGRAMMING

Number of PLS Programs:
Selectable: 60 programs 8 channel outputs
or 30 programs 16 channel outputs
PLS Setpoints:
256 per PLS program for 60 total programs
512 per PLS program for 30 total programs
Scale Factor:
Programmable from 2.56 inches to 40.00 inches per resolver revolution. Maximum machine travel = 16 x scale factor. Scale factor is common to all PLS programs.
Offset:
Programmable from 0 to 16 x Scale Factor Value, common to all PLS programs
NO-Motion Detector:
Low RPM Limit programmable from 0 to 999 RPM.
Both are common to all PLS programs.

RESOLVER INTERFACE

Position Transducer:
Resolver, Autotech Series RL100, E6R, E7R, E8R, RL101 or equivalent
Cable Length between Resolver and M1051:
2500 feet max, shielded
Resolver Cable:
Autotech CBL-10T22-XXXX
Maximum Resolver Shaft Speed: 3600 RPM
Resolver Decoder: Ratiometric

CONTROL INPUTS

Electrical specifications: (All Inputs)
Optical Isolation: 1500 V
Input impedance:1800 Ohms
Logic levels
True: 1 to 28 VDC sourcing; FALSE: 0 to 0.8 VDC
Program Enable (PE):
When True, enables programming.
Output Enable (OE):
When True, PLS Channel outputs enabled (both Fault and Motion always enabled)
Fault Check Enable (FCE):
When True, disables PLS and Motion Detector Outputs whenever Resolver Broken Wire Fault or M1051 internal fault occurs.
Supervisory (SUP):
True: All programming modes enabled
False: Only default, program number change, and set point modes enabled
Modified Zero (ModZ):
On False to True transition the resolver position is captured and used to zero the position for that cycle.
All ON:
True: All output channels are energized
False: Outputs are normal PLS control
Total Program Number Change (PGM):
True: Enable changing the total number of programs' configuration

OUTPUTS

Unregulated Voltage Out (VO):
Current Limited, unregulated 12VDC for use with M1051 inputs ONLY. ***Not*** for external sensor power.
Fault Output:
Detects resolver broken wire and M1051 internal faults)
EM relay (Form C) output; 10 Amp resistive max @ 120 VAC;
Without Fault: Relay remains energized
With Fault: Relay de-energized (fail safe)
Motion Output:
EM relay (Form C) output; 10 Amp resistive max @ 120 VAC; Relay de-energized when the resolver RPM does not reach the low limit during the low timer limit (engage time)
PLS Outputs:
1--8 Normal PLS in 60 total program configuration
1--16 Normal PLS in 30 total program configuration
Number of PLS Setpoints:
60 Total Program Configuration: 32 per Channel, 256 total per program.
30 Total Program Configuration: 32 per Channel, 512 total per program.

Types of Outputs:
A. Electromechanical SPDT Relay
10 Amp resistive continuous @ 120 VAC
B. Solid-State Relay
1. AC output: 120 VAC @ 3 A; ON time: <3 ms after zero cross; OFF time: At zero cross; Leakage: 2.1 mA @ 120 VAC
2. DC output: Up to 60 VDC @ 3 A; ON time: 5 µs; OFF time: 35 µs; Leakage: 0.2 9 mA @ 15 VDC
3. DC output: Up to 200 VDC @ 1 A; ON time: 15 µs OFF time: 100 µs; Leakage: < 0.0 1mA @ 30 VDC

How to Order

1. M1050-M10 PLS

SAC- M1050-M10	Basic unit, 16 PLS outputs (*without* relays); 1 motion and 1 fault output (*with* electromechanical relays).

2. Relay Output Chassis

***ASY-RLYCH-08RL**	Chassis for 8 EM-relay outputs with motion detector output and built-in power supply.
***ASY-RLYCH-08SS**	Above chassis for 8 solid-state relay outputs.

Note:
For 220 VAC unit, change the "Y" to "2" and
For 240 VAC unit, change "Y" to "4".

3. Power Output Relays

Select the number and type of relays required.

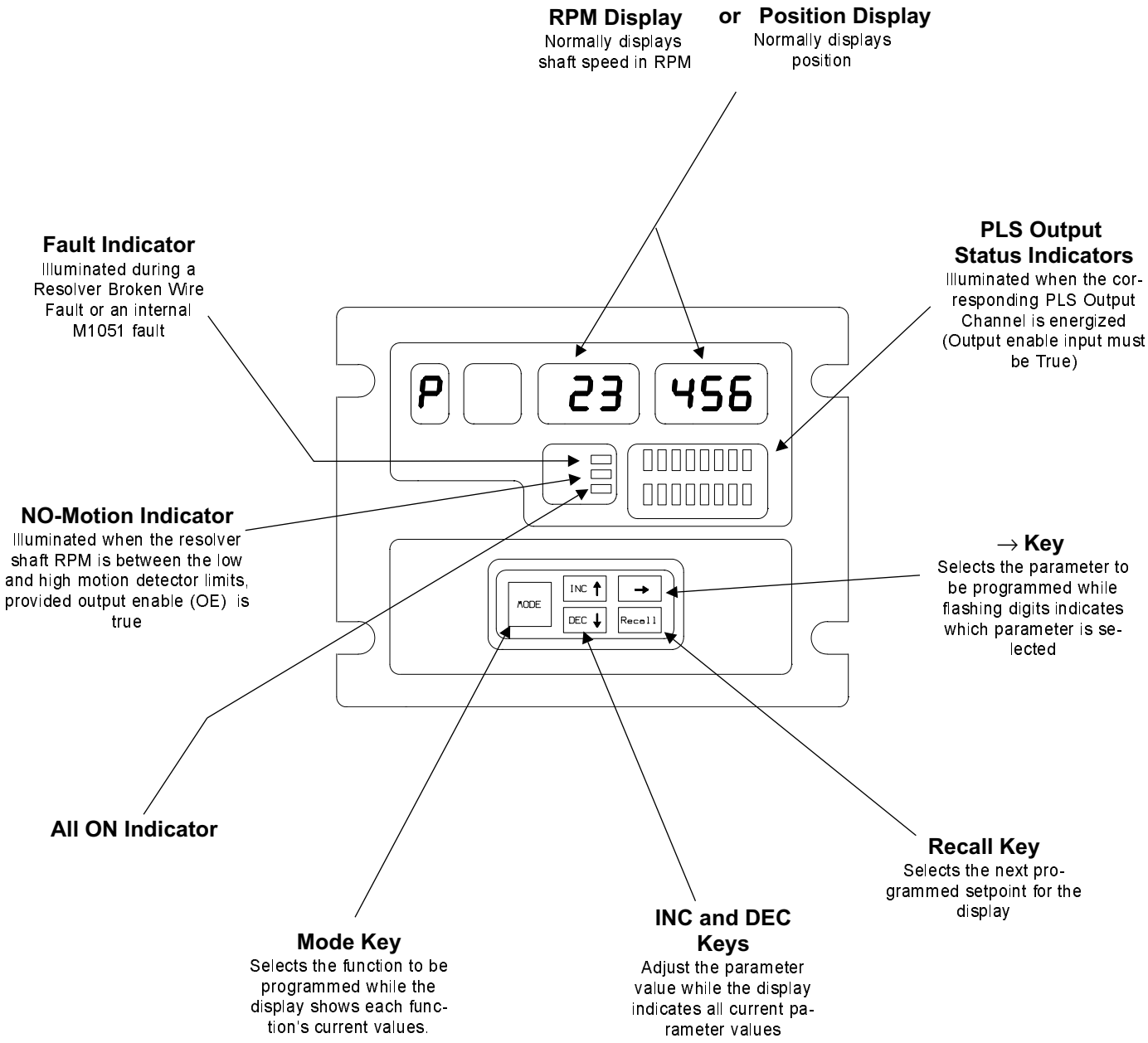
KSD-012DC-10A	EM relay, SPDT, 120VAC @ 10 Amps resistive
KSS-120AC-3AMP	Solid state relay, 120VAC @ 3Amps
KSS-60VDC-3AMP	Solid state relay, 60VDC @ 3 Amps
KSS-200DC-1AMP	Solid state relay, 200VDC @ 1 Amp

4. Position Transducers

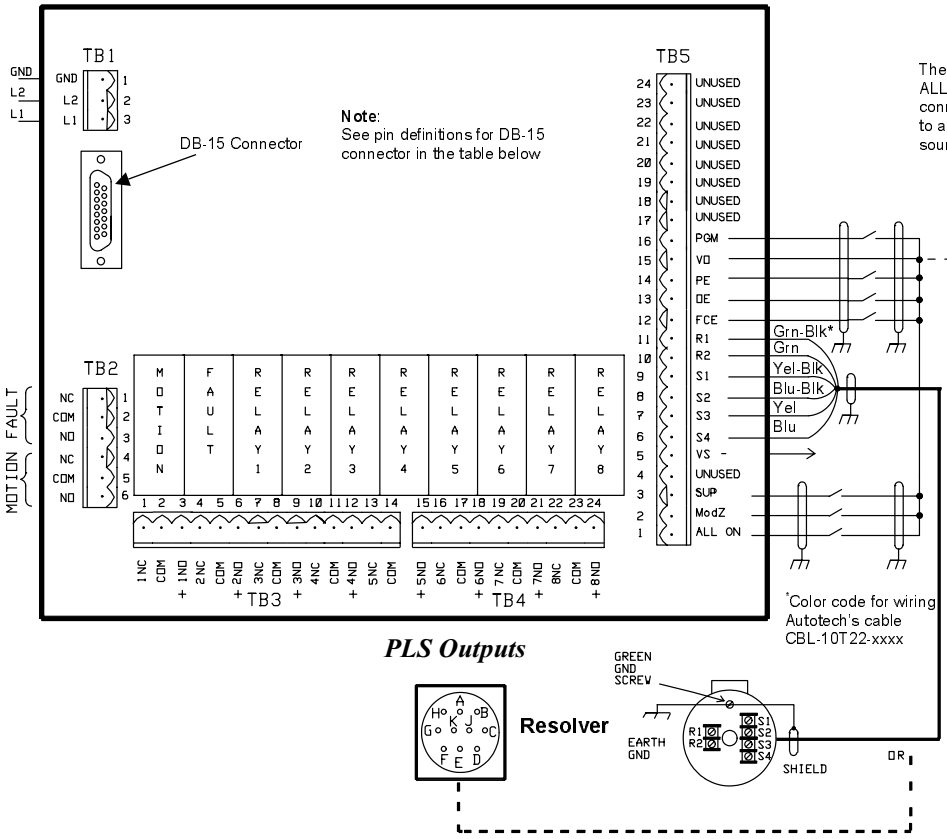
The M1050-M10 requires a single turn resolver as an input device, such as Autotech's RL100, E6R, E7R or E8R series of resolvers. Please see rotary position transducer manual for How to Order information on these transducers and appropriate accessories.

Installation and Operation

M1050-M10 Front Panel



M1050-M10 Rear View, Terminals and Wiring



Resolver Wiring CBL-10T22-xxxx Cable

Wire Color	*Resolver Terminal*	*Conn. Pin*
Green-Black	R1	F
Green Twisted pair	R2	E
Yellow-Black	S1	D
Yellow Twisted pair	S3	C
Blue-Black	S2	B
Blue Twisted pair	S4	A
Shield	Grn Gnd	G

Logic I/O	*Function/Description*
ALL ON	All channel outputs are ON when input is true
PGM	Total Program Number Change: True enables switching the total number of programs from 30 to 60 or 60 to 30
SUP	Supervisory Input: True - All programming modes available
ModZ	Modified zero input: False to True transition, PLS is rezeroed
VO	Unregulated, Current Limited 12VDC output (For use with M1051 inputs only)
PE	Program Enable Input: True enables programming
OE	Output Enable Input: True enables PLS channel outputs
FCE	Fault Check Enable
R1-R2,S1-S4	Resolver input
VS-	Common terminal for Customers 11–28 VDC source
NC	Normally Closed (Not connected for solid state relays)
NO	Normally Open (Positive side for solid state relays)
COMMA	Common

Pin Definitions for DB-15 Connector on Cam Modules (Cable: CBL-15S22-DAxxx)

Pin #	Cable Color	Function
1	Black	NC
2	White	Vs– (SigRef or COMMA)
3	Red	Vs+ (50VDC max for P&N; 5VDC max for T)
4	Green	NC
5	Orange	Channel 15
6	Blue	Channel 13
7	White/Black	Channel 11
8	Red/Black	Channel 9
9	Green/Black	Vs–
10	Orange/Black	Vs+
11	Blue/Black	NC
12	Black/White	Channel 16
13	Red/White	Channel 14
14	Green/White	Channel 12
15	Blue/White	Channel 10

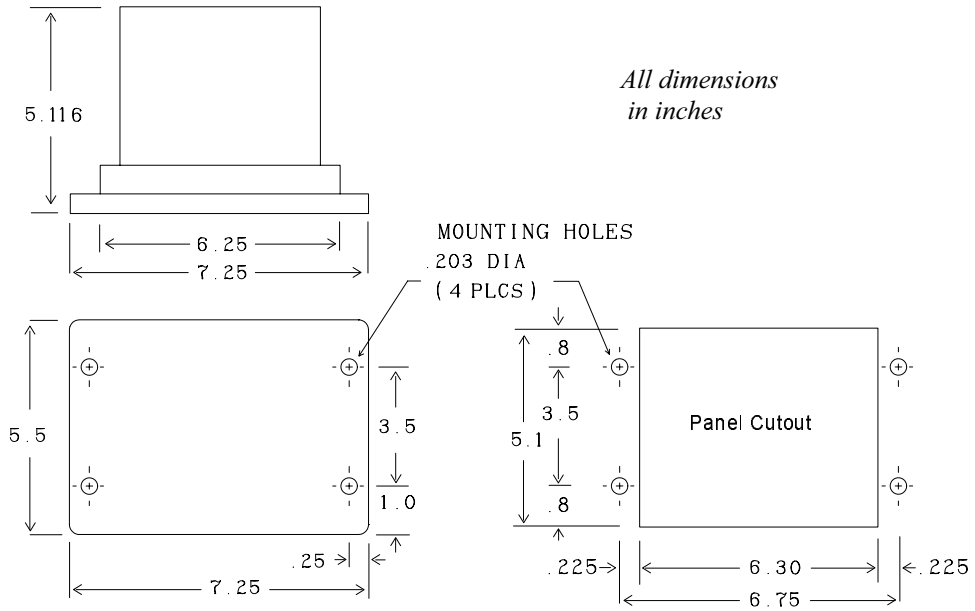
NC : Not Connected;
White/Black : White wire with Black stripes

Notes:

- Output wiring to other electronic devices such as programmable controllers must use uninterrupted runs of shielded cable with the shield connected to earth ground at both ends.
- No special tools are required to wire the M1050-M10 PLS.
- Only NO output is available with solid state relays. For solid state relays, the NO terminal must be at a higher voltage than COMMA terminal.
- Use Autotech's overall foil shielded cables for wiring resolver. Following table gives wire colors of cable CBL-10T22-xxxxx used to wire resolver.
- To change the resolver ascending count direction, reverse the S1 and S3 connections.

Mounting

The M1051 PLS mounts in a 6.30" x 5.1" panel cutout and requires four mounting holes as shown in the Panel Cutout drawing below. The M1051 will fit in a 6 inches deep panel. Slide the M1051 through the panel opening with gasket and tighten the four #8 mounting screws. Attach the pre-wired removable terminal blocks to complete the installation.



Symbols Used in Programming

Channel Number	Symbol Displayed	Channel Number	Symbol Displayed
1	1	9	9
2	2	10	A
3	3	11	b
4	4	12	C
5	5	13	d
6	6	14	E
7	7	15	F
8	8	16	H

Programming the M1050-M10 16 Channel PLS

The following is an overview of the programming modes on the M1050-M10 PLS. The different modes are accessed by repeatedly pressing the Mode Key until the desired mode is displayed. A more detailed description of the programming modes follow in the next section. Also, see the programming flow chart on the next page.

With the supervisory input (Sup) False, the following three modes can be accessed. If the program enable input (PE) is True, changes to the programming are made possible. PE input false, allows only viewing of parameters.

- **Default Display**
  Either position or tachometer can be displayed. "INC" or "DEC" keys toggle between the two.
- **Program Number Selection**
  The program number is changed by direct program selection.
- **Set Point Programming**
  Programming of On or Off set points is possible.

If the supervisory input (sup) is True, the following modes are available. Program enable (PE) True allow changes to parameters. Program enable (PE) False allows only viewing of parameters.

- Default Display Position or Tach
- Scale Factor Calibration
- Scale Factor (2.56 to 40.00 inches per rev)
  Maximum machine travel =16 X scale factor
- Offset (0 to 16 X scale factor)
- Motion Limits
  High RPM limit (low RPM limit to 999)
  Low RPM limit (0 to high RPM limit)
- Program Number Selection
  (1 to 30 or 1 to 60)
- Channel Duplication
- Program Duplication
- PLS Set Points (0 to 16 X scale factor)

The M1050-M10 will automatically return to the default display mode if left without any key presses for more than one minute.

Program

There are either 60 or 30 setups that may be programmed into M1050-M10. These setups are identified by a program number 1 to 60 or 1 to 30. The current program number may be changed in the program number mode. A description on how to change the total number of programs is found in the default mode selection.

The following parameters are independent of program number:

- Scale Factor
- Offset
- Motion Limits

The set points may have different values from program to program.

Channel

Channels 1 to 8 are available for programming when the M1050-M10 is configured for 60 total programs, and channels 1 to 16 for 30 total programs.

Each channel is associated with an independent output, each of which contains its own setpoint program to turn the output ON or OFF at different machine positions.

Key Functions

The programming key sequences are fairly general for all modes. The keys function as follows:

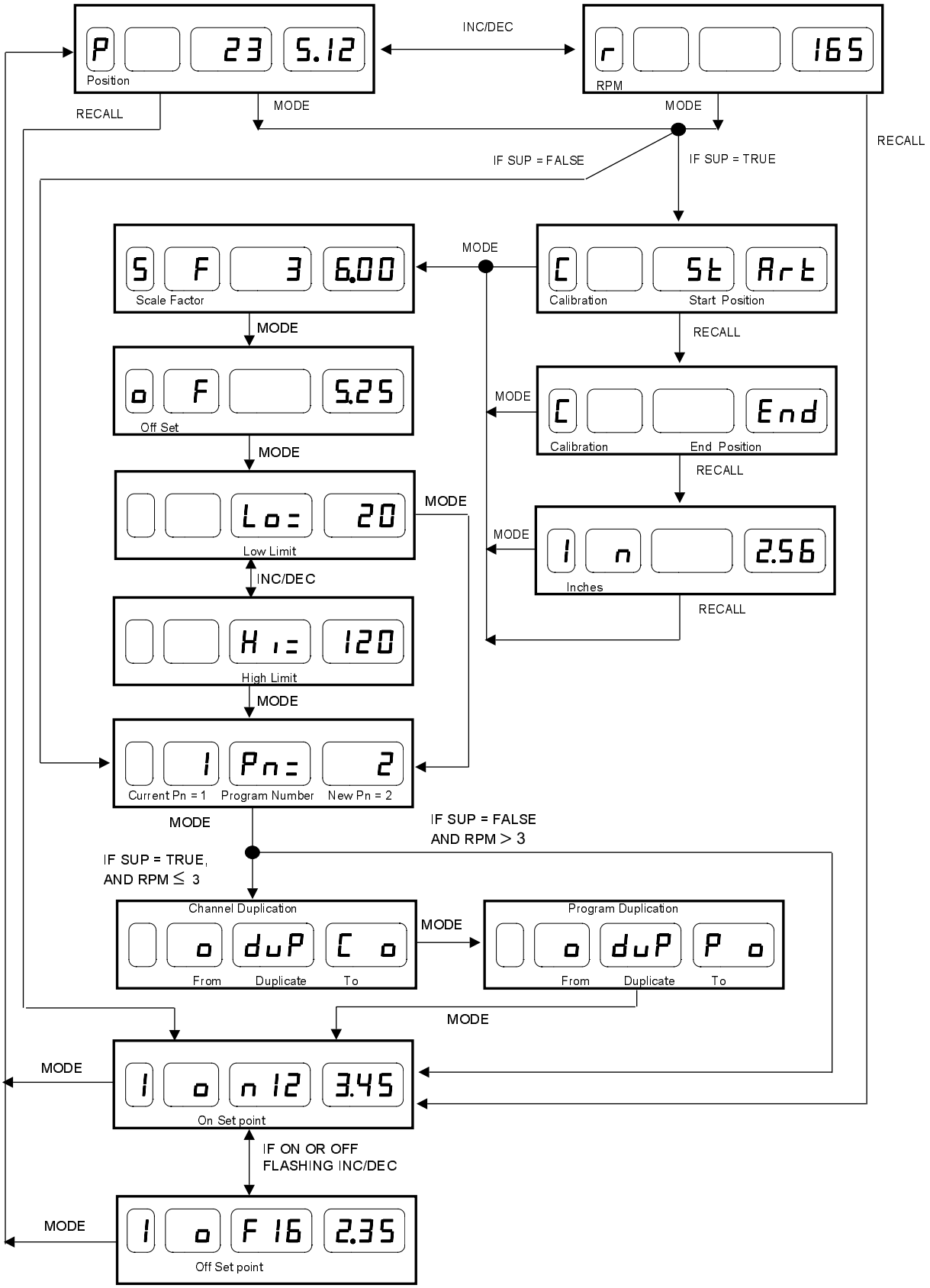
Mode Key:
Press to sequence through the different programming modes. Pressing Mode key while in Scale Factor, Offset, Motion Limit, and Set Point modes, will save programming changes to the nonvolatile memory.

INC\DEC Keys:
Blinking digits in a window indicate that that window's contents may be changed; numbers will be incremented or decremented, non-numerical selections will change to other selections.

Right Arrow Key:
The right arrow key will change the displayed value to be edited. Editing may occur in the window with the blinking digits.

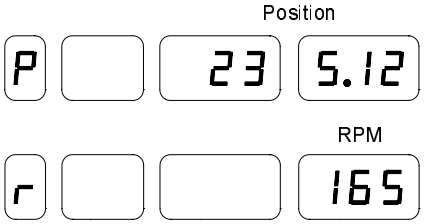
Recall Key:
When in the default display, pressing the Recall key will jump to the setpoint mode. Pressing the Recall key, while in Scale Factor Calibration, Program Number Selection and Program Duplication modes will save programming changes to nonvolatile memory. The Recall key is used to recall setpoints in the setpoint mode.

Programming Flow Chart



1. Default Display

PE input must be True for programming.
There are two default displays. One displays the resolver position and the other displays the resolver speed (RPM). Pressing the "INC" or "DEC" keys toggles between the two displays.

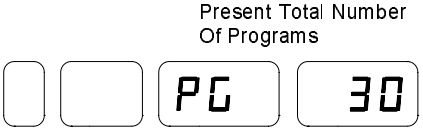


In the event of a resolver fault, the message "CABLE" will be displayed instead of position or RPM

The base position for the M1050-M10 is composed of the absolute resolver position plus the machine offset value.

Changing the Total Number of Programs

PGM must be True for changing total number of programs
The total number of PLS programs can be changed while in the default display. Pressing the " →" and "INC" keys simultaneously will display the following.



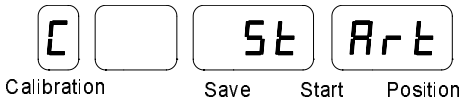
Pressing the "INC" or "DEC" keys will toggle the display between 30 and 60 programs. Pressing the "Recall" key will change the total number of PLS programs and save this selection to nonvolatile memory. All of the current programmed setpoint values will be lost. Pressing the "Mode" key will exit this display without changing the total number of programs.

2. Scale Factor Calibration

Pressing the Mode key during the calibration sequence will abort the procedure, then scale factor will be displayed and can be manually changed.

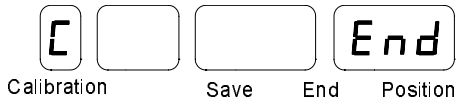
PE input and SUP input must be True for the calibration mode to appear.

Start Position



The M1050-M10 PLS is able to self calibrate the scale factor. When in the start display, the machine is moved to a start position. When "Recall" is pressed, the start position is saved. The following is then displayed.

End Position



When in the end position display, the machine is moved to an end position. When "Recall" key is pressed, the end position is saved. The following is then displayed.

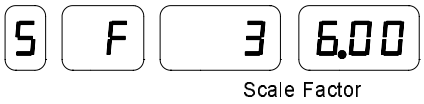
Distance in Inches

The distance between the start and end positions is measured and then entered by pressing the "INC" and "DEC" keys. When "Recall" key is pressed, scale factor is calibrated and then displayed.

Limitations:
Resolver shaft has to turn at least 24° between the start and end positions, for the calibration to be successful.

3. Scale Factor

PE input and SUP input must be True and RPM ≤ 3 for programming.



The scale factor is in inches per one resolver resolution. The scale factor can be manually changed in this display using "INC" and "DEC" keys.
Maximum Value = 40.00 Inches
Minimum Value = 2.56 Inches
The maximum machine travel is 16 resolver turns
(16 x Scale Factor).

4. Offset

PE input and SUP input must be True for programming.

Offset

Offset is the physical machine distance between the ModZ sensor (photo-eye) and the actuated device (glue gun).

5. Program Number Selection

PE input must be True and RPM ≤ 3 for programming.

Current Pn = 2 New Pn = 7

Program number selection is allowed only, if the following conditions are met.

- The resolver shaft is not turning (RPM < 4)
- The program enable is ON

When the "Recall" key is pressed, the M1050-M10 program is changed. The new PN will appear in the current PN window. Pressing "Mode" key will proceed to the next programming mode and will not change the program number.

6. Duplication of Channels

PE input and SUP input must be True and RPM ≤ 3 for this mode to appear.

Duplicate From Program Duplicate To Program

Channel set points can be duplicated from one channel to another, within the current program number. The channel number to duplicate from and to, are displayed. The "INC" and "DEC" keys toggles between the from and to channel numbers. Pressing the "Recall" key will duplicate the from channel set points into the to channel set points. The current to channel set points are lost, they are replaced `by the duplicated values. The duplication is complete when a null "0" appears in the to window. Pressing "Mode" key will proceed to the next programming mode and will not duplicate any channel set points. See the table on page 6 for the symbols displayed and their corresponding channel numbers.

7. Duplication of Program

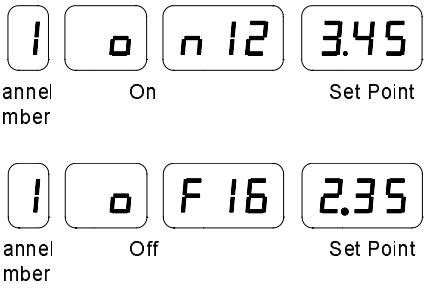
PE input and SUP input must be True and RPM ® 3 for this mode to appear.

Duplicate From Program Duplicate To Program

The program numbers to duplicate from and to, are displayed. The "INC" and "DEC" keys toggles between the from and to program numbers. Pressing the "Recall" key will duplicate the from program parameters into the to program parameters. The current to program parameters are lost, they are replaced by the duplicated values. The duplication is complete when a null "0" appear in the to window. Pressing "Mode" key will proceed to the next programming mode and will not duplicate any programs. See the table on page 6 for the symbols displayed and their corresponding channel numbers.

8. Setpoint Programming

PE Input must be True for programming



Channel Number On Set Point

Channel Number Off Set Point

Position-On/Position-Off setpoints are programmed in this mode. In 60 program operation channels, 1 to 8 are programmable. In 30 program operation channels, 1 to 16 are programmable. See the table on page 6 for the symbol displayed and its corresponding channel number.

Position-On/Position-Off

When the shaft is in the forward direction (CCW), Position-On/Position-Off setpoints are defined as follows.

- Position-On = Position at which the output will turn on
- Position-Off = Position at which the output will turn off

These positions are programmed by using the right arrow key to select the number to edit, then incrementing or decrementing the number. Pressing right arrow key moves you from channel number to On/Off select to set point value. Pressing the "Recall" key will reveal any additional setpoints in the selected channel and will provide the "Null Set Point" symbol [ ][0], so that additional setpoints may be added to that channel.

Each Channel is limited to 32 set points (16 dwells)

Channel outputs turn off when the resolver shaft turns backward (CW).

M1050-M10 Troubleshooting Guide

Symptoms	Possible causes
Unable to program unit parameters (Scale Factor, Offset, etc.)	• Is the Program Enable Input (PE) false? (i.e., the voltage level at the input is less than 11V) • Is the machine moving? — programming of several parameters (Scale Factor, Program Number) is disabled if the resolver is turning faster than 3 RPM. • If unable to program setpoints, the PLS channel may already have 32 setpoints.
Program memory is changing by itself.	• Has the program number been changed to a different number? • Have proper grounding and shielding practices been applied? • Is the Program Enable input TRUE? (while this will not cause the program to change itself — keeping it FALSE when not actually programming the unit — ensures that the memory cannot be programmed.)
Position and RPM readings are incorrect.	• Is the resolver correctly wired? Follow the steps below for a quick check. 1. Turn power off to M1050-M10 unit 2. With main terminal block removed from unit, measure with ohm meter the followings: A. Term. 5 to Term. 6 (R1 to R2) = about 30 ohms B. Term. 1 to Term. 3 (S1 to S3) = about 55 ohms C. Term. 2 to Term. 4 (S2 to S4) = about 55 ohms • Is the resolver cable properly grounded and shielded?
Mechanical Zero drifts.	• Is the mechanical Resolver linkage loose? • Has the offset value been changed?
If all fails	• Call AVG Technical Support @ 1-800-TEC-ENGR (832-3647)

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Autotech Controls warrant their products to be free from defects in materials or workmanship for a period of one year from the date of shipment, provided the products have been installed and used under proper conditions. The defective products must be returned to the factory freight prepaid and must be accompanied by a Return Material Authorization (RMA) number. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

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Autotech Controls' products are carefully engineered and rigorously tested to provide many years of reliable operation. However any solid-state device may fail or malfunction sometime.The user must ensure that his system design has built-in redundancies if Autotech Controls' product is being used in applications where a failure or malfunction of the unit may directly threaten life or cause human injury. The system should be so designed that a single failure or malfunction does not create an unsafe condition. Regularly scheduled inspections, at least once a week, should be made to verify that the redundant circuits are fully functional. All faults should be immediately corrected by repair or replacement of the faulty unit. In addition, the user may have to comply with OSHA, ANSI, state or local standards of safety. The user of Autotech Controls' products assumes all risks of such use and indemnifies Autotech Controls against any damages.

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