M–Traverse

User Manual

0001-0122

Revision F

Technical Assistance

If you have comments or questions concerning the operation of the M–Traverse, a member of our Technical Support Staff will be happy to assist you. Ask for Technical Support: (763) 424-7800 or (800) 342-4411

Contrex®

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DANGER

Improper installation or improper operation of this motion control unit can cause severe injury, death or damage your system.

Integrate this motion control unit into your system with caution.

Comply with the National Electrical Code and all applicable local and national codes.

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Introduction

Introducing the M–Traverse
Examples of M–Traverse Applications

CONTREX
24.000
SET POINT
TACH
BATCH COUNT
STATUS
7
8
9
4
5
6
1
2
3
0
CLEAR
ENTER
M-TRAVERSE

INTRODUCING THE M–TRAVERSE

The M–Traverse is a highly accurate, digital, position controller. The M–Traverse's technically advanced, internally embedded, control software is specifically designed for the precise control of reciprocating lead/follower motion applications. These applications are characterized by symmetric forward and reverse follower profiles. The M–Traverse is often used for level winding, web scanning and fabric lapping, however it can be used in any operation that requires symmetrical follower profiling against a lead.

The M-Traverse allows you to enter information that is unique to your system's operation through user friendly Control Parameters. The M–Traverse uses this information to calculate and determine a variety of controls and functions and frees you from complex computations. When your system is engaged (Run), the traversing mechanism (Follower) accelerates from the “Home” position to the preset laypitch (Setpoint). Operating at the laypitch, the traverse mechanism can precisely align a product on a reel or web then decelerate the traversing mechanism to the end of the Traverse Length before beginning the end Dwell. At the “Dwell,” the M-Traverse assures that the product is properly aligned before returning in the opposite direction. The M–Traverse is remarkably precise - within one encoder line.

The M–Traverse accepts up to four preset pairs of “Setpoint” and “Traverse Length” parameters. These parameters can be engaged with a quick flip of a switch during a product change over. The M-Traverse features additional advanced control that includes; profile definition that uses engineering unit parameters, dynamic profile redefinition during a run, automatic profile generation, batch counting, unipolar/bipolar drive compatibility and dynamic system monitoring. There are seven discrete outputs for external control integration, which includes two user specified profile position outputs.

Although the M–Traverse has many advanced control capabilities, it is easy to use. The integrated keypad and display make access to the control and monitor parameters both direct and simple. A “Keypad Lockout” function allows you to restrict access to the control parameters after you have completed the setup process.

The M–Traverse features dedicated short-cut keys for quick access to the “Setpoint,” “Batch Count,” “Tach,” and “Status” parameters. In addition to the integrated user keypad and display, the M–Traverse has a RS-422 serial communications port through which you can gain computer access to all of the control and monitor parameters. Integrating the M–Traverse's applied intelligence with your system puts precise control and perfect synchronization at your fingertips, quickly, easily and cost effectively.

EXAMPLES OF M–TRAVERSE APPLICATIONS

The Level Wind is one of the M–Traverse's principle applications. The Level Wind application uses the Lay Adjusted option in the Follower mode of operation. In a Level Wind application, the M–Traverse locates the start or “Home” position and accelerates the traversing mechanism (Follower) to the preset laypitch (Setpoint). The traversing mechanism feeds a web product such as a wire, fiber optic cable or tape, onto the rotating reel (Lead) at this laypitch then decelerates the traversing mechanism to the end of the Traverse Length. At the “Dwell,” the M-Traverse assures that the web material is properly aligned on the reel before returning in the opposite direction. Figure 1-1 illustrates a typical Level Wind application.

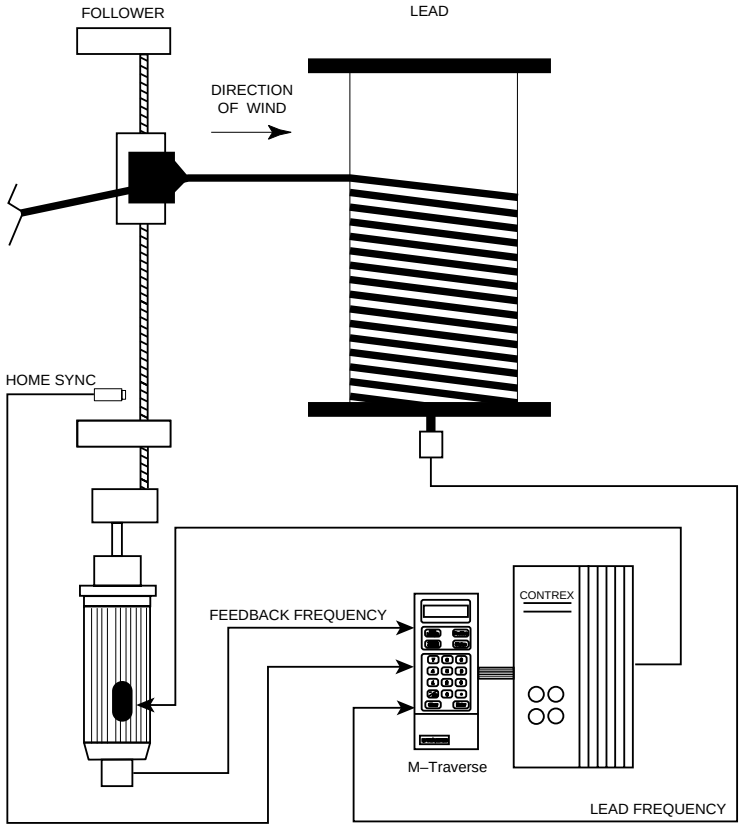


Figure 1-1 M–Traverse Level Wind Application

Web Scanning is another common M–Traverse application. The Web Scanning application frequently uses the Standard option in the Follower mode of operation, however, there are applications for which Web Scanning may use the Lay Adjusted option in the Follower mode of operation. The M–Traverse locates the start or “Home” position and accelerates the traversing mechanism (Follower) to the preset laypitch (Setpoint). The traversing mechanism applies a secondary product, such as glue or reinforcing fiber, onto the moving web. Then the M–Traverse decelerates the traversing mechanism to zero speed at the end of the “Traverse Length”. At the “Dwell” (which is usually set at zero) the traversing mechanism reverses its direction and returns with a symmetric reverse profile. Using zero or very low “Accel / Decel” and “Dwell” parameters creates a zigzag pattern. Figure 1-2 illustrates a typical Web Scanning application.

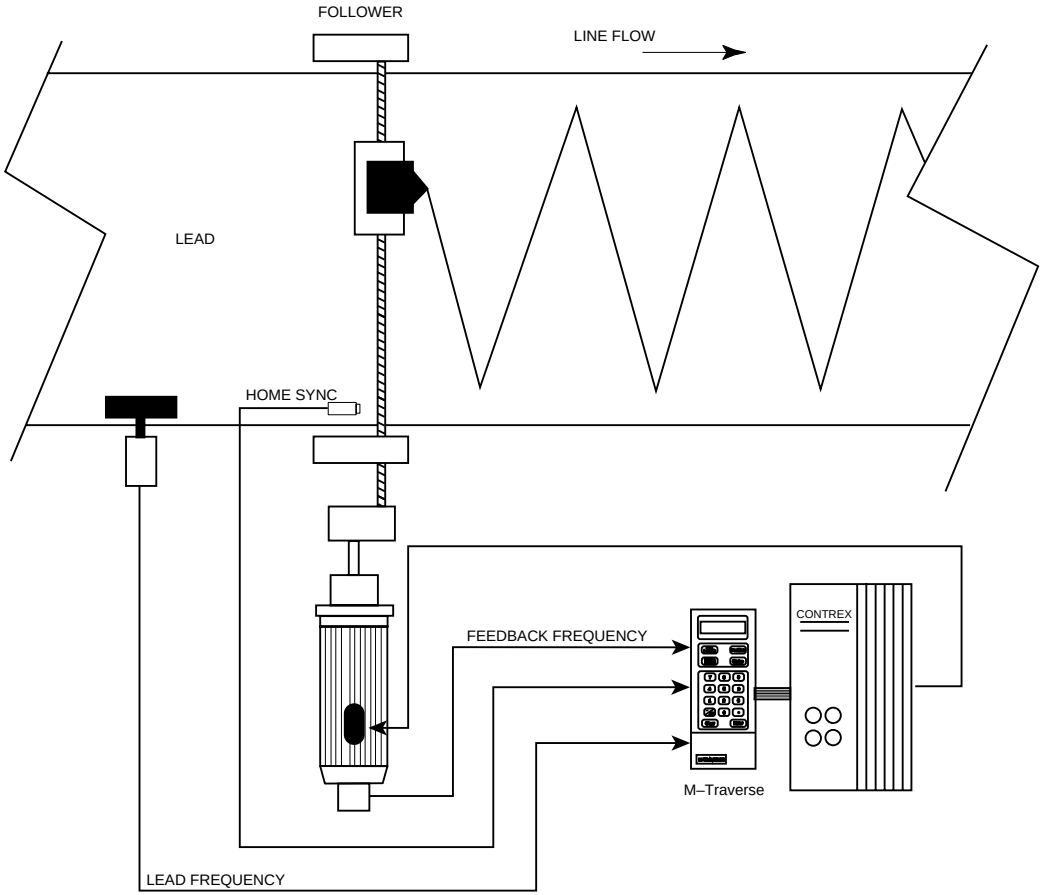


Figure 1-2 M–Traverse Web Scanning Application

—NOTES—

Installation / Setup

Configuration
Mounting
Wiring
- Inputs
- Outputs
- Serial Communications

Calibration
- Motor Drive Setup
- M-Traverse Calibration

CONFIGURATION

This section will show you how to re-configure the M-Traverse for electrical compatibility. Complete these procedures prior to installation. These procedures do not require power to complete.

The two areas that are involved in re-configuring the M-Traverse are the Isolator Voltage jumper and the Power Voltage switch. Do not re-configure the M-Traverse's Frequency Input. Use the default Quadrature position.

To re-configure the Isolator Voltage jumper and the Power Voltage switch, remove the back plate, then carefully remove the Power Board. Figure 2-1 illustrates the location of the boards.

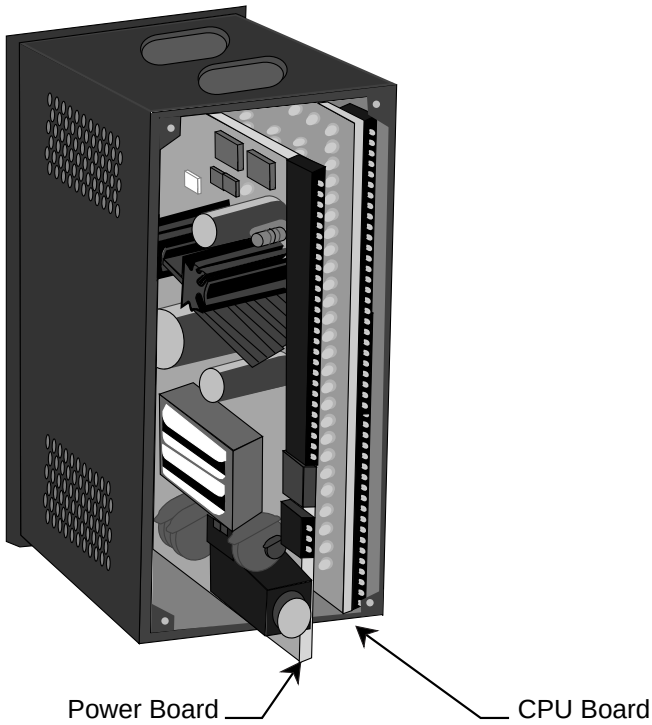


Figure 2-1 Rear View of M-Traverse

The Isolator Voltage jumper (J3) is located on the Power Board (see Figure 2-2). It configures the isolated analog output for either voltage that is ranged by an internal +15 volt reference or for voltage that is auto-ranged by the voltage level of the motor drive. The auto-range voltage position is the default configuration for the Isolator Voltage jumper.

NOTE: In most cases, the default configuration will be appropriate for your application and it will not be necessary to re-configure.

If the motor drive does not have an external voltage reference, re-configure the Isolator Voltage by moving the jumper from the default auto-range voltage position (1) to the internal +15 volt reference position (2).

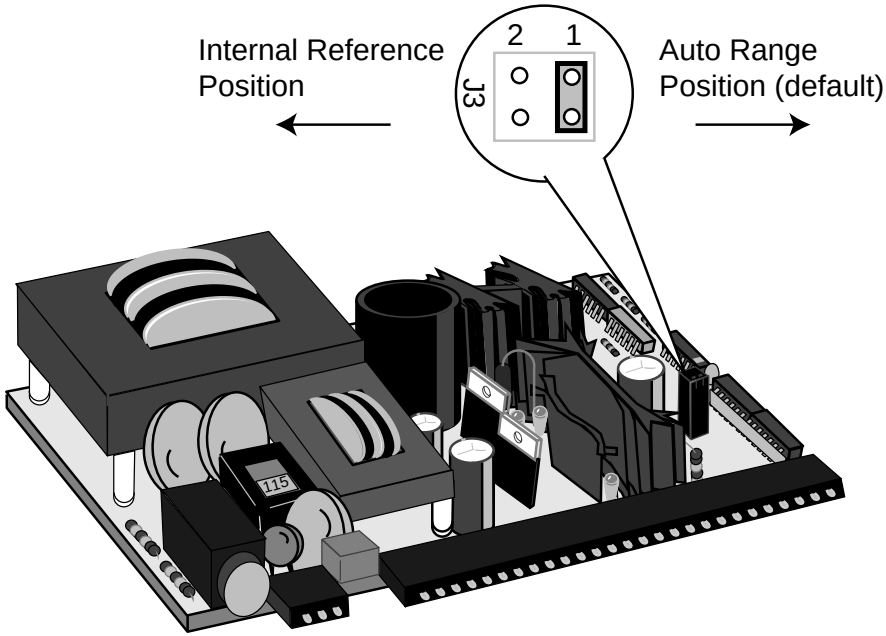


Figure 2-2 Power Board / Isolator Jumper

The Power Voltage switch (SW1) is located on the Power Board (see Figure 2-3). The default configuration for the Power Voltage switch is 115 VAC.

NOTE: In most cases, the default configuration will be appropriate for your application and it will not be necessary to re-configure.

To re-configure for 230V, move the switch from the 115V position (left) to the 230V position (right).

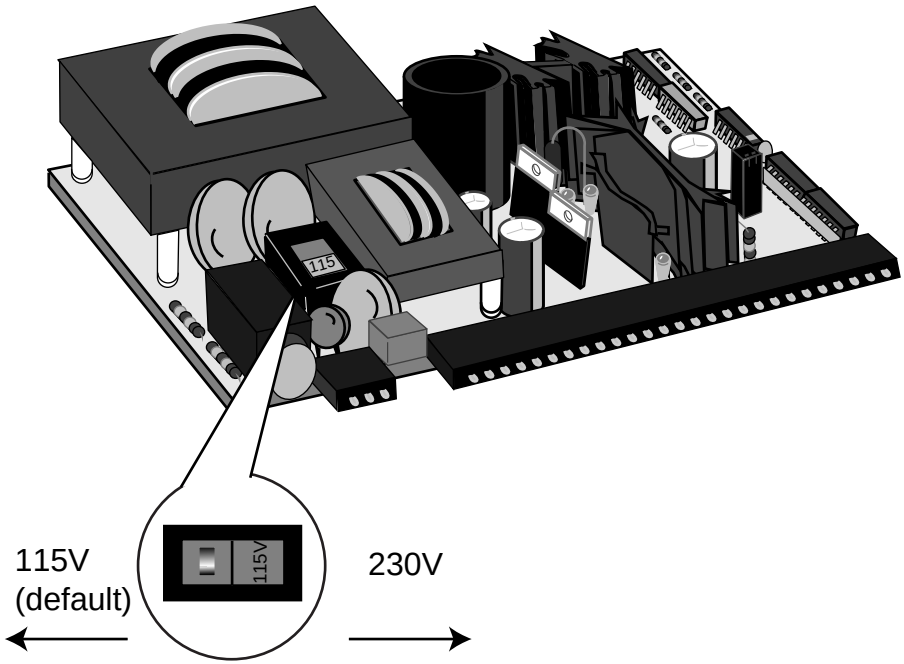


Figure 2-3 Power Board / SW1 Switch

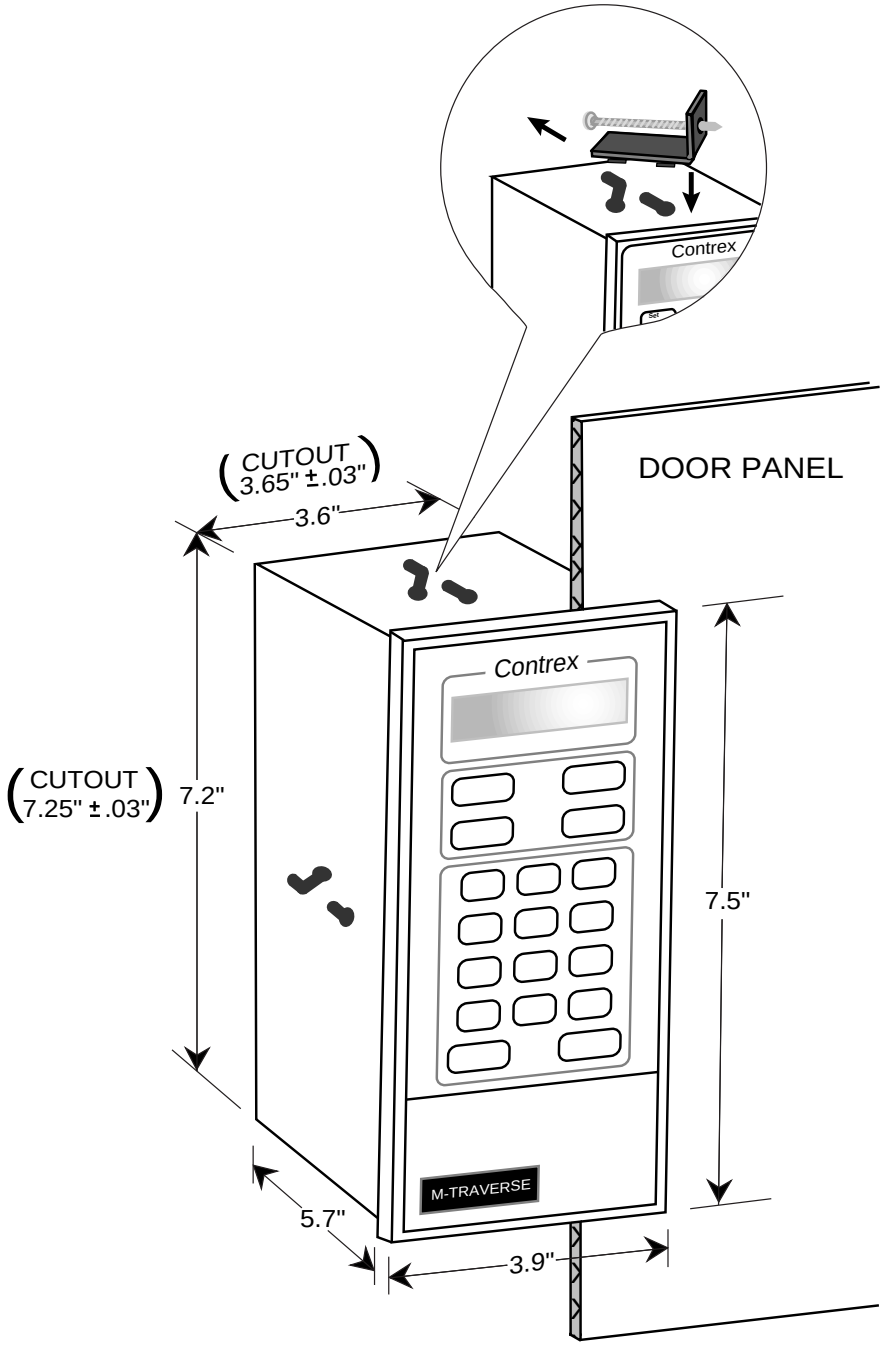


Figure 2-4 M–Traverse Mounting and Cutout Dimensions

MOUNTING

This section contains instructions for mounting the M–Traverse in the door panel of a NEMA Industrial Electrical enclosure. The M–Traverse is packaged in a compact 1/2 DIN Vertical Instrument Enclosure that mounts easily in the door of your Industrial Electrical Enclosure.

To mount the M–Traverse:

1) The NEMA Industrial Electrical Enclosure that will house the M–Traverse must conform to the following environmental conditions:

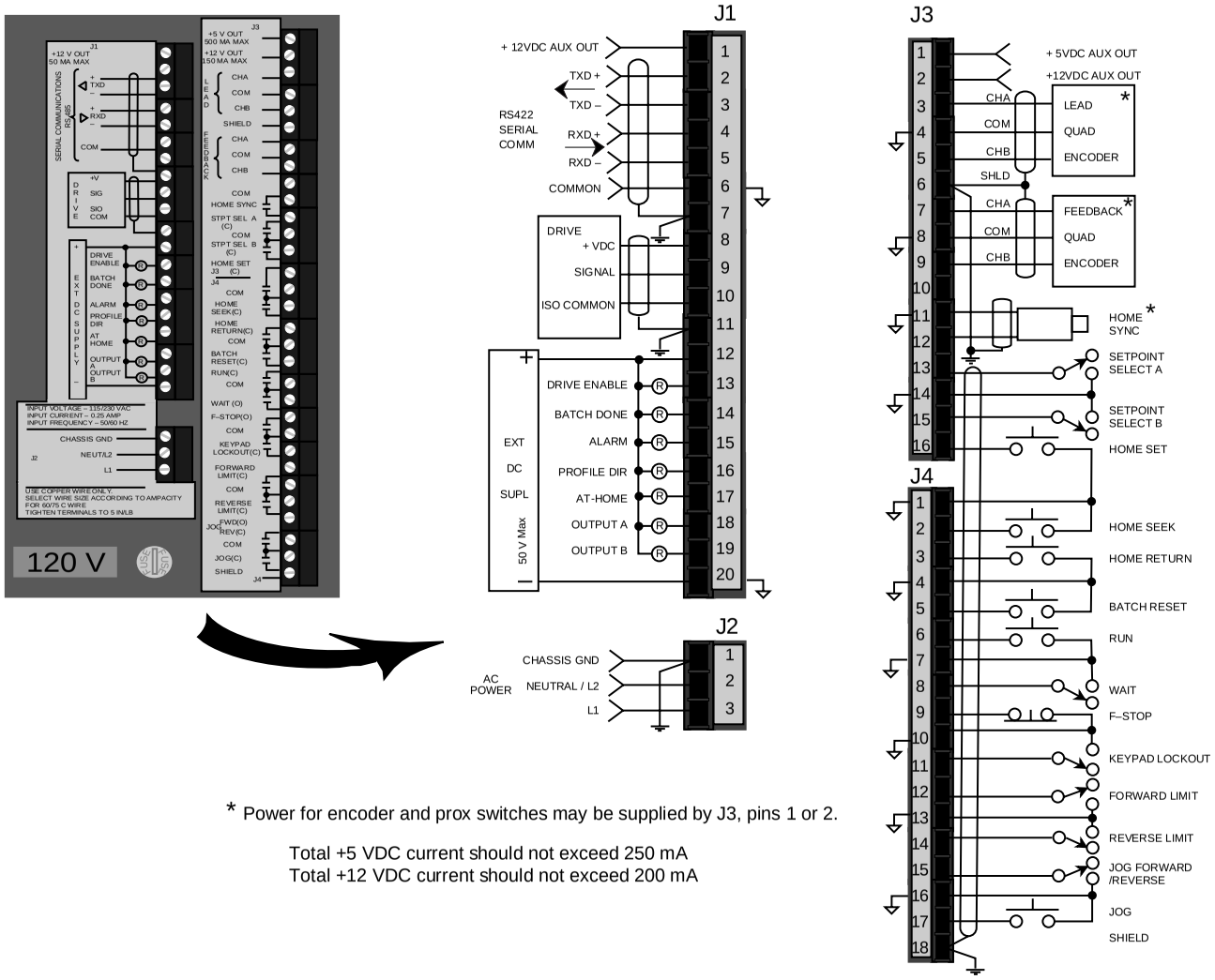
   Temperature: 0 - 55 degrees C
   (Internal NEMA enclosure temperature)

   Humidity: 0 - 90% RH non-condensing

2) The dimensions for the door panel cutout are 3.65"$\pm$ .03" X 7.25 $\pm$.03" (see figure 2-4). Allow two inches of clearance on all sides of the cutout for mounting clamp attachments, wire routing and heat convection.

3) Insert the M–Traverse through the door panel cutout until the gasket and bezel are flush with the door panel (see figure 2-4).

4) The mounting clamps can be inserted in the holes that are located either on the top and bottom or on the sides of the M–Traverse. Tighten the mounting screws until the M–Traverse is mounted securely in the NEMA Electrical Enclosure. Do not overtighten.



* Power for encoder and prox switches may be supplied by J3, pins 1 or 2.

Total +5 VDC current should not exceed 250 mA
Total +12 VDC current should not exceed 200 mA

Figure 2-5 M-Traverse General Wiring Schematic

WIRING

This section contains the input, output and serial communications wiring information for the M–Traverse. Please read this section prior to wiring the M–Traverse to ensure that you make the appropriate wiring decisions.

NOTE: The installation of this motor control must conform to area and local electrical codes. See *The National Electrical Code* (NEC,) Article 430 published by the National Fire Protection Association, or *The Canadian Electrical Code* (CEC). Use local codes as applicable.

Use a minimum wire gauge of 18 AWG.

Use shielded cable to minimize equipment malfunctions from electrical noise and terminate the shields at the receiving end only.

Keep the AC power wiring (J2) physically separated from all other wiring on the M–Traverse. Failure to do so could result in additional electrical noise and cause the M–Traverse to malfunction.

Inductive coils on relay, contactors, solenoids that are on the same AC power line or housed in the same enclosure should be suppressed with an RC network across the coil. For the best results, use resistance (r) values of 50 ohms and capacitance (c) values of 0.1 microfarads.

Install an AC line filter or isolation transformer to reduce excessive EMI noise, such as line notches or spikes, on the AC power line.

DANGER

Hazardous voltages.
Can cause severe injury, death or damage to the equipment.
The M–Traverse should only be installed by a qualified electrician.

INPUTS

NOTE: The installation of this motor control must conform to area and local electrical codes. See *The National Electrical Code* (NEC,) Article 430 published by the National Fire Protection Association, or *The Canadian Electrical Code* (CEC). Use local codes as applicable.

Input Power (J2 pins 1, 2, 3)

The M–Traverse operates on either a 115 VAC or 230 VAC (-10% + 15%, 0.25 Amps., 50/60 Hz). Use the separate 3 pin connector (J2) for the power connection.

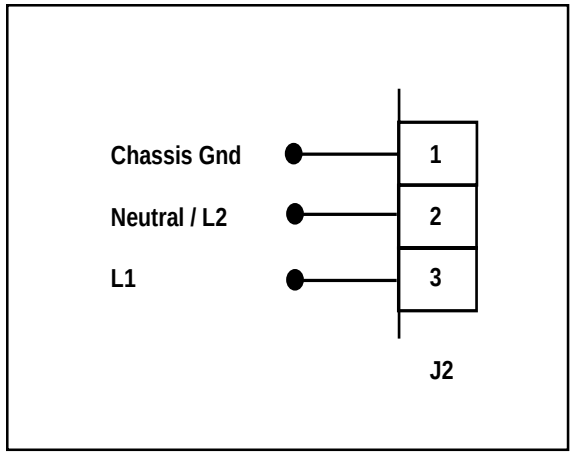


Figure 2-6 Input Power

Lead Frequency (J3 pins 3,4,5,6)

The Lead Frequency is a pulse train input that the M-Traverse uses to determine the Lead motor's speed and position. The Lead Frequency signal must be quadrature. For signal level specifications, refer to *References: Appendix A*, *M–Traverse Specifications.*

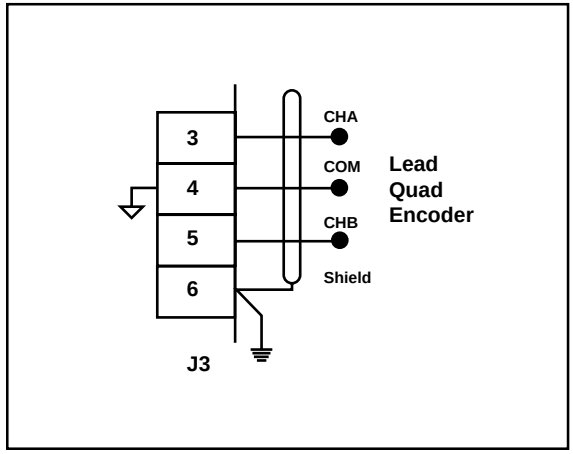


Figure 2-7 Lead Frequency

Feedback Frequency (J3 pins 6,7,8,9)

The Feedback Frequency is a pulse train input that the M-Traverse uses to determine the Follower motor's speed and position. The Feedback Frequency signal must be quadrature. For signal level specifications, refer to *References: Appendix A*, *M–Traverse Specifications.*

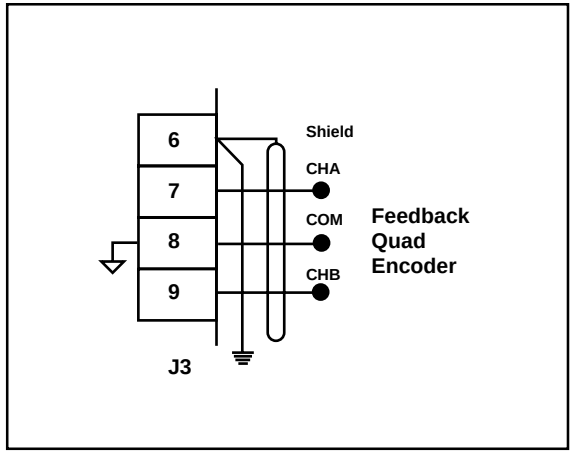


Figure 2-8 Feedback Frequency

WARNING

If the Feedback Frequency is lost,
the M-Traverse will command a !00% Speed Out
and the motor will run at 100% of the calibrated range.
This can cause severe injury, death or
it can damage your equipment.

Home Sync (J3 pins 6,11,12)

The Home Sync input identifies the location of “Home” for the Home Seek operation. This input is operated by either a proximity switch or an optical sensor switch (NPN output).

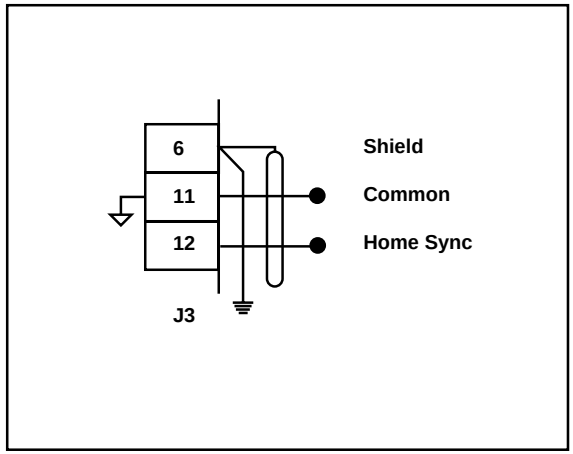


Figure 2-9 Home Sync

Setpoint Select A
(J3 pins 13,14)

The Setpoint Select A and B inputs are used in conjunction with each other to select one of four M–Traverse setpoints and traverse lengths. The chart below displays these four setpoints.

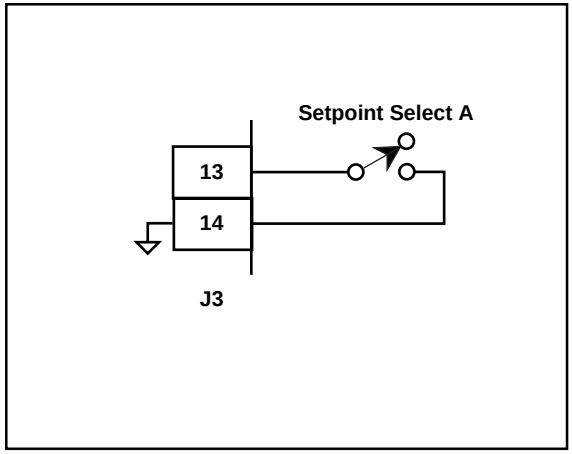


Figure 2-10 Setpoint Select A

Setpoint Select B
(J3 pins 14,15)

The Setpoint Select A and B inputs are used in conjunction with each other to select one of four M–Traverse setpoints and traverse lengths. The chart below displays these four setpoints.

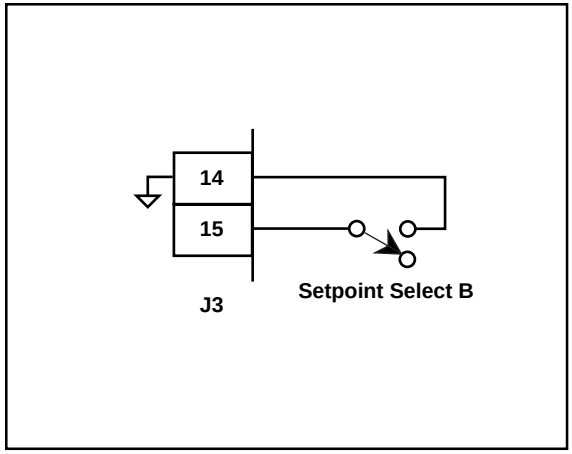


Figure 2-11 Setpoint Select B

	Setpoint Select A Open	Setpoint Select A Closed
Setpoint Select B Open	Setpoint 1 Traverse Length 1	Setpoint 2 Traverse Length 2
Setpoint Select B Closed	Setpoint 3 Traverse Length 3	Setpoint 4 Traverse Length 4

Home Set (J3 pins 14,16)

Home Set is a momentary input that is edge triggered. When Home Set is closed, it sets the current position as the new “Home” position.

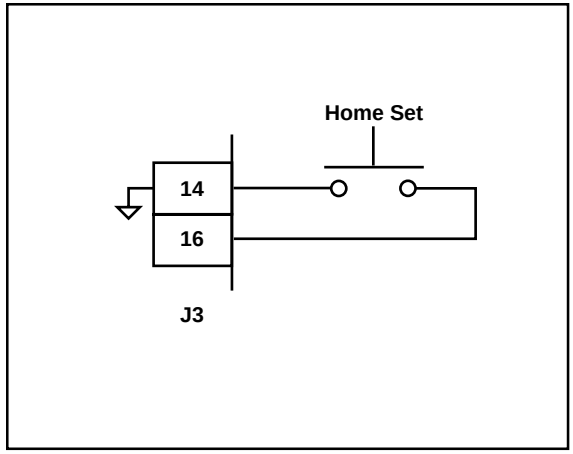


Figure 2-12 Home Set

Home Seek (J4 pins 1,2)

Home Seek is a momentary input that is edge triggered. When Home Seek is closed, the Follower makes a sustained move at Jog speed, until it reaches the “Home” sensor. As a momentary input, Home Seek is internally latched and does not need to be maintained by an operator device.

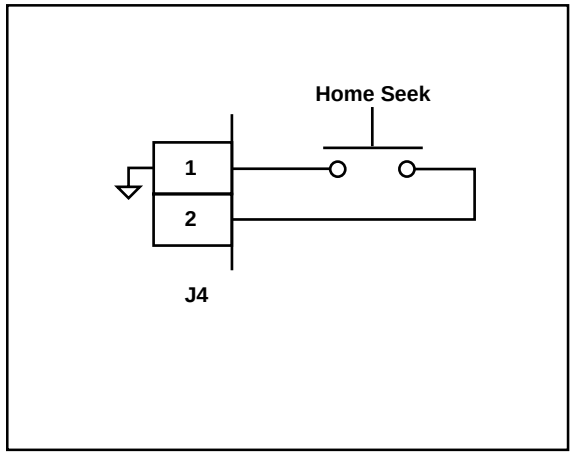


Figure 2-13 Home Seek

Home Return (J4 pins 3,4)

Home Return is a momentary input that is edge triggered. When Home Return is closed, the follower returns to the established “Home” position. As a momentary input, Home Return is internally latched and does not need to be maintained by an operator device.

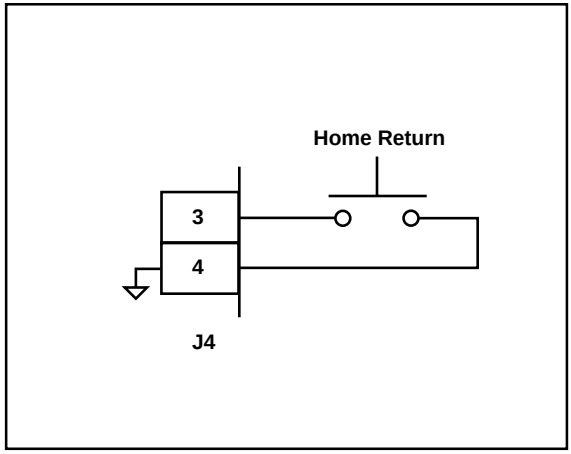


Figure 2-14 Home Return

Batch Reset (J4 pins 4,5)

In a closed position, the Batch Reset input resets the batch count to zero.

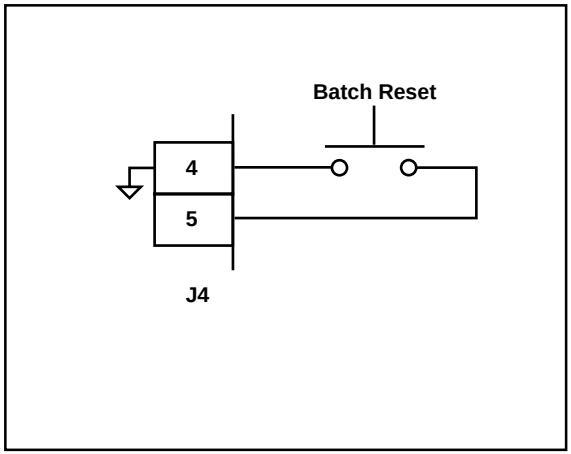


Figure 2-15 Batch Reset

Run (J4 pins 6,7)

When the Run input is momentarily closed, the M–Traverse enters Run. As a momentary input, Run is internally latched and does not need to be maintained by an operator device.

NOTE: Close the F–Stop input prior to entering Run.

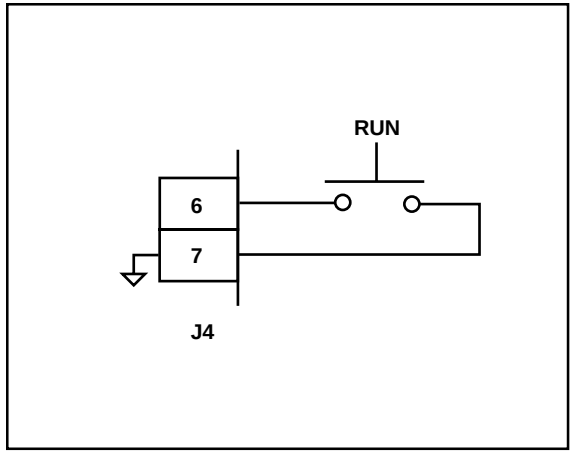


Figure 2-16 Run

Wait (J4 pins 7,8)

When the M–Traverse is in Run, it checks the Wait input before it proceeds with the next profile move in either the forward or reverse direction. If the Wait input is closed, it will pause at the end of the profile until the wait input opens.

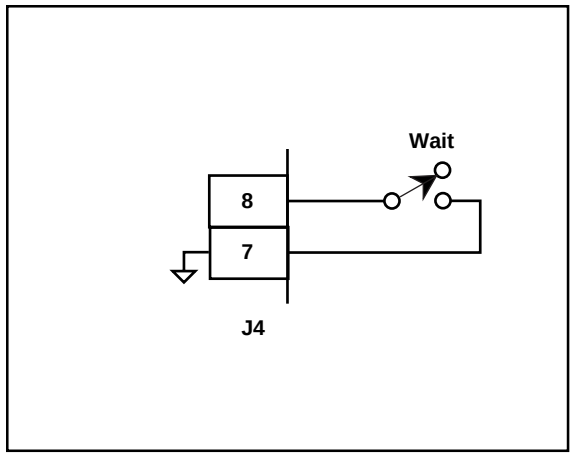


Figure 2-17 Wait

F-Stop (J4 pins 9,10)

F-Stop is a momentary input. When it is opened, the Follower stops immediately (zero RPM) and ignores the specified deceleration rate. As a momentary input, F-STOP is internally latched and does not need to be maintained by an operator device.

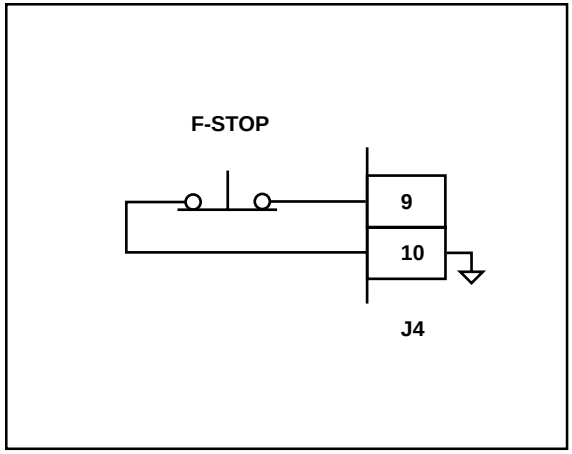


Figure 2-18 F-Stop

Keypad Lockout (J4 pins 10,11)

When the Keypad Lockout is closed, it selectively disables the front keypad so that setpoint and other control parameters can not be changed. All of the monitoring functions remain enabled.

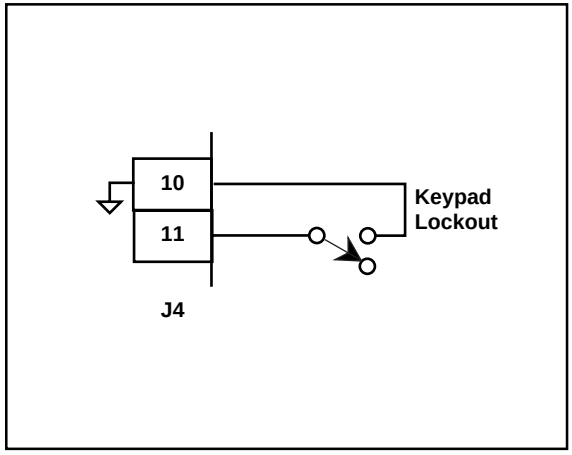


Figure 2-19 Keypad Lockout

Forward Limit (J4 pins 12,13)

When Forward Limit is closed (edge-triggered), it prevents the follower from moving forward. When the M–Traverse detects a Forward Limit, it will go to F–Stop from Forward Jog, Home Seek or Run, if CP-37 is set to “1”. If CP-37 is set to “2”, then the M-Traverse will begin a reverse profile when it detects a Forward Limit. To deactivate Forward limit, use any reverse command (e.g., Reverse Jog).

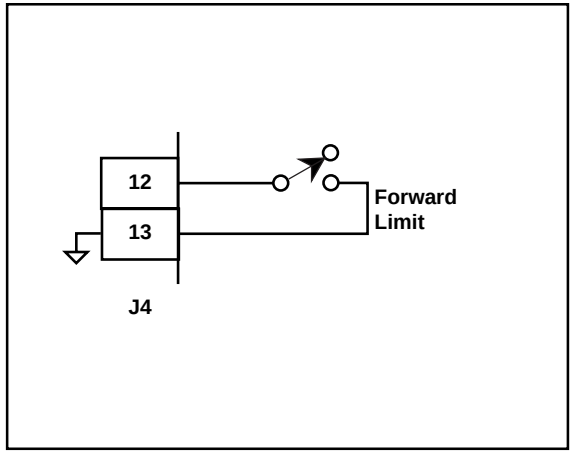


Figure 2-20 Forward Limit

Reverse Limit (J4 pins 13,14)

When Reverse Limit is closed (edge-triggered), it prevents the follower from moving in reverse. When the M–Traverse detects a Reverse Limit, it will go to F–Stop from either Run, Reverse Jog or Home Seek (any reverse move). To deactivate Reverse limit, use any forward command (e.g., Forward Jog).

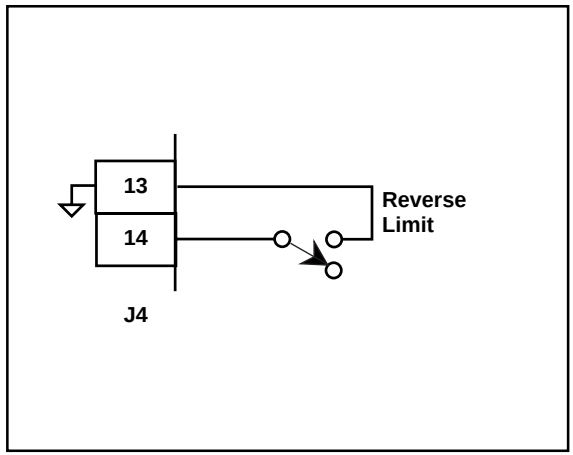


Figure 2-21 Reverse Limit

Jog Forward/Reverse (J4 pins 15,16)

The Jog Forward/Reverse input controls the direction of the Speed Command Output while it is in Jog. Jog is in the forward direction when the input is open. Jog is in the reverse direction when the input is closed.

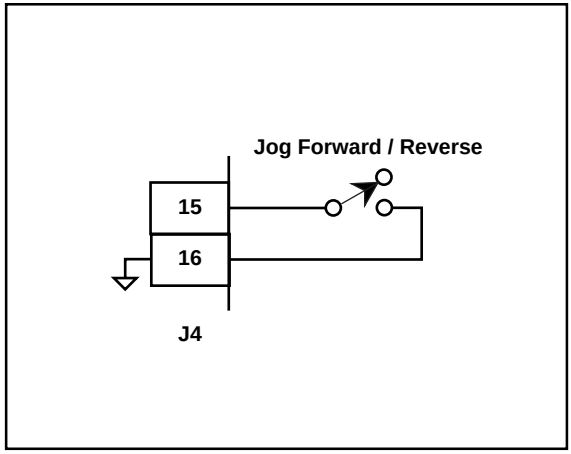


Figure 2-22 Jog Forward/Reverse

Jog (J4 pins 16, 17)

Jog is a maintained input. When the Jog input is closed, the M–Traverse sends a Speed Command Out signal to the drive at the selected jog speed. As a maintained input, Jog is only active when the operator device is closed.

NOTE: Close the F–Stop input and open the Run input, prior to entering Jog.

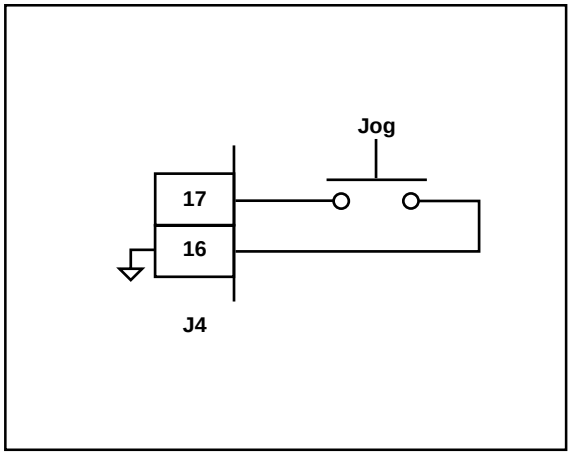


Figure 2-23 Jog

OUTPUTS

NOTE: The installation of this motor control must conform to area and local electrical codes. See *The National Electrical Code* (NEC,) Article 430 published by the National Fire Protection Association, or *The Canadian Electrical Code* (CEC). Use local codes as applicable.

Speed Command Out
(J1 pins 8, 9,10,11)

Speed Command Out is an isolated analog output signal that is sent to the motor drive to control the speed of the motor. Wire the Speed Command Out (J1 pin 9) into the Speed Signal Input of the drive. If the motor drive has a potentiometer speed control, remove the potentiometer connections, then wire the Speed Command Output to the potentiometer wiper input and wire the Voltage Reference and Isolated Common to the other two potentiometer input connections. The M–Traverse's isolated common should always be connected to the drive common.

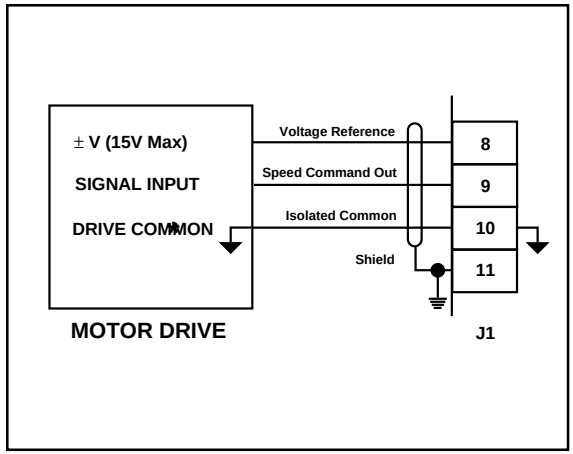


Figure 2-24 Speed Command Out

Drive Enable (J1 pin 13)

The Drive Enable output is activated (driven low) when the M–Traverse is signaling a speed command to the motor drive. The Drive Enable output is driven high (relay deactivated) after Power Up and during F–Stop. Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A*, *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Batch Done (J1 pin 14)

The Batch Done output is relay activated (driven low) when the Batch count is completed. Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A* , *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Alarm (J1 pin 15)

The Alarm output is relay activated (driven low) if the system's speed is above the speed alarm setting that has been entered in the High Speed Alarm (CP-23) parameter. Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A* , *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Profile Direction (J1 pin 16)

The Profile Direction output indicates the commanded direction of the profile. This output is relay deactivated (driven high) when the profile is commanded to move forward. This output is relay activated (driven low) when the profile is commanded to move in reverse. Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A*, *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

At-Home (J1 pin 17)

In order for this output to function, “Home” must have already been determined (using Home Set or Home Seek). Once ”Home” has been determined, this output is relay activated (driven low) when the traverse Follower Position is within the At-Home Band specified in CP-30. Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A* , *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Output A (J1 pin 18)

Output A can be set to activate at different segments of the forward and reverse profiles. The parameter values set in CP-90, CP-91 and CP-92 determine the profile segment and direction of activation, as well as the polarity (high or low). Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A* , *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Output B (J1 pin 19)

Output B can be set to activate at different segments of the forward and reverse profiles. The parameter values set in CP-93, CP-94 and CP-95 determine the profile segment and direction of activation, as well as the polarity (high or low). Refer to Figure 2-25.

NOTE: This is an open-collector relay driver. For specification details, see *References: Appendix A*, *M–Traverse Specifications*. Use an external DC power supply to power the relays. Free-wheeling diodes are incorporated internally in the M–Traverse and do not need to be added externally.

Auxiliary DC Power (J3 pins 1, 2)

The 5 volt output (J3 pin 1) is a DC regulated output that can be used to power encoders or other auxiliary equipment that is used in conjunction with the M–Traverse. The 12 volt output (J3 pin 2) is a DC regulated output that can be used to power the proximity sensors or other auxiliary equipment that is used in conjunction with the M–Traverse. Refer to Figure 2-25.

WARNING

Do not exceed the maximum current output of 250 mA for +5 VDC and 200 mA for +12 VDC.

Exceeding the maximum current output can damage the M–Traverse.

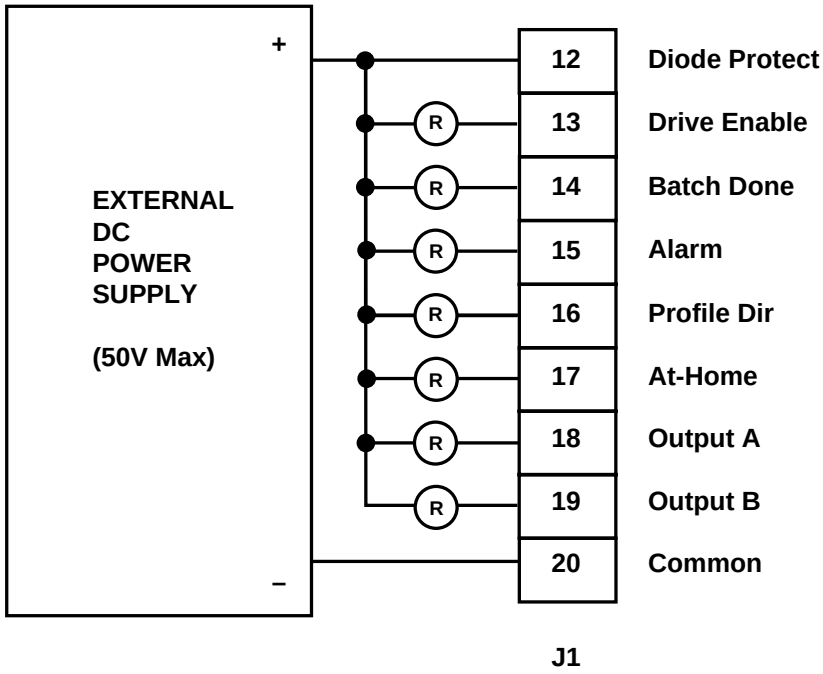


Figure 2-25 Discrete Outputs

SERIAL COMMUNICATIONS

NOTE: The installation of this motor control must conform to area and local electrical codes. See *The National Electrical Code* (NEC,) Article 430 published by the National Fire Protection Association, or *The Canadian Electrical Code* (CEC). Use local codes as applicable.

The Serial Communications interface on the M–Traverse complies with EIA Standard RS–422 for balanced line transmissions. This interface allows the host computer to perform remote computer parameter entry, status or performance monitoring, and remote control of the M–Traverse. See *Operations: Serial Communications* for information on using Serial Communications.

Figures 2-26 and 2-27 illustrate a multidrop installation of the Serial Communications link and Serial Communications connections.

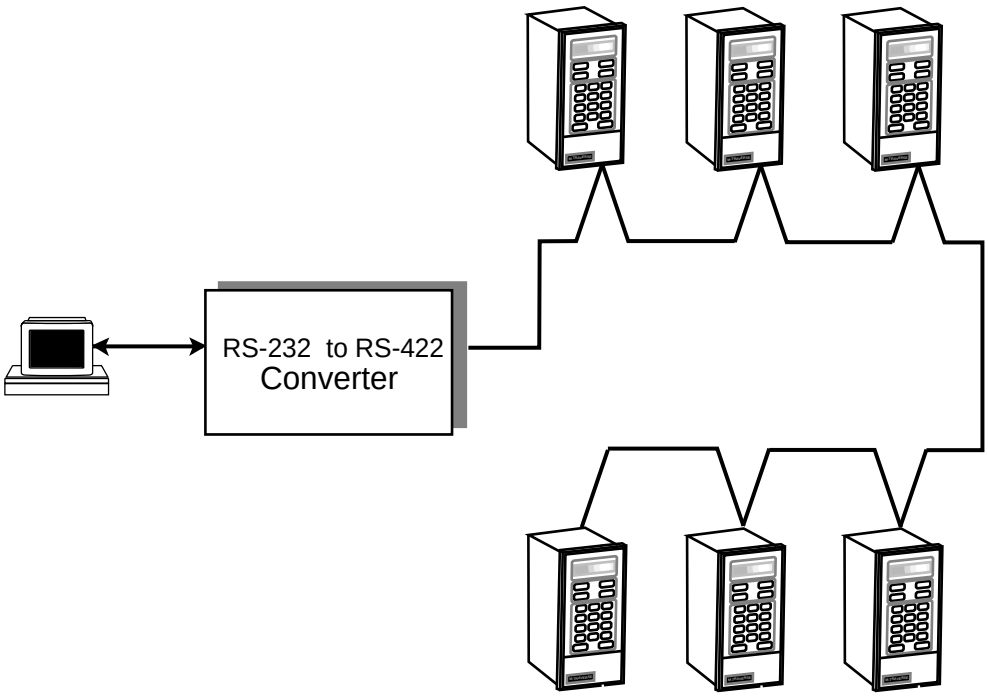
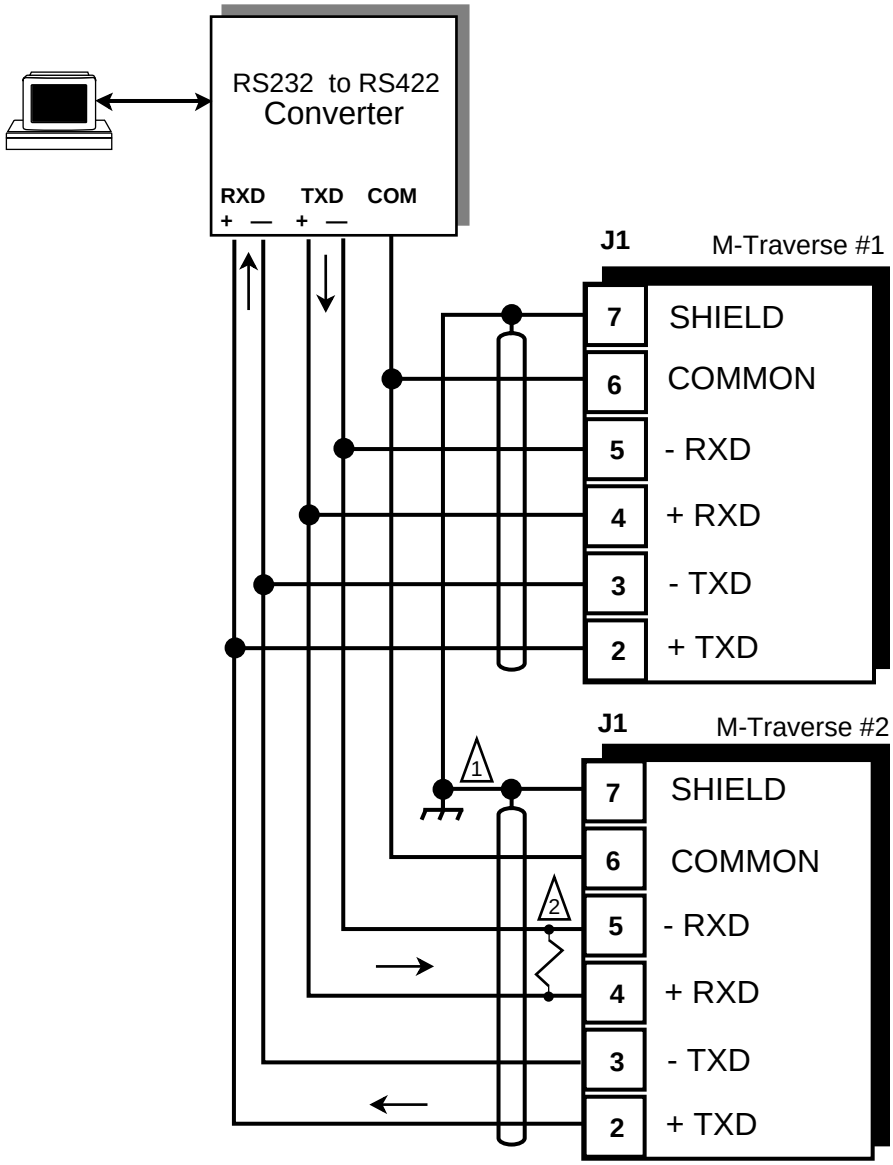


Figure 2-26 M-Traverse Multidrop Installation



1. Terminate shield only at one end of the cable.

2. If you need to terminate the communication line, then terminate it at the unit which is the furthest away from the converter. A 100 ohm, 1/2 Watt resistor will usually terminate successfully. Refer to EIA Standard RS–422, for more information.

Figure 2-27 M–Traverse Serial Communications Connections

CALIBRATION

Calibration matches the analog output of the M–Traverse with the analog input of the motor drive. Calibration is accomplished in two steps. The first step is to set up the motor drive. The second step is to calibrate the M–Traverse to the motor drive so that the speed is adjusted to the maximum operating speed. The M–Traverse must be properly installed prior to calibration. Refer to *Installation/Setup; Mounting* and *Installation/Setup; Wiring*.

DANGER

Hazardous voltages.

Can cause severe injury, death or damage to the equipment.

Make adjustments with caution.

Turn the screws fully clockwise for the maximum setting.

Turn the screws fully counterclockwise for the minimum setting.

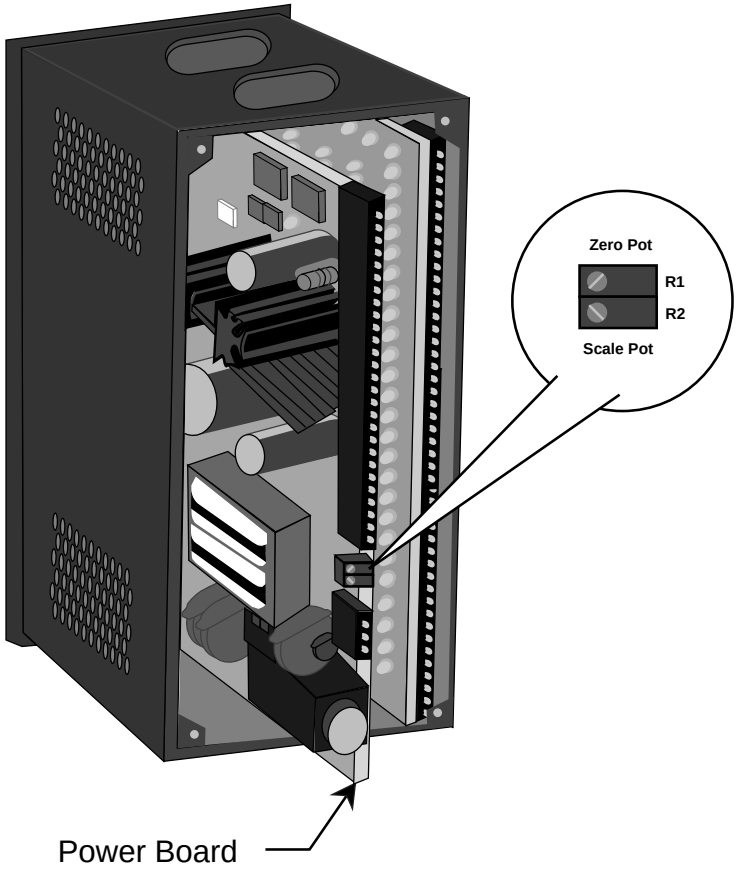


Figure 2-28 Location of M–Traverse Scale and Zero Pot

MOTOR DRIVE SET UP

1) Put the M–Traverse in “F–Stop” by opening the F–Stop input (J4 pins 9 and 10). Refer to *Installation/Setup: Wiring, F–Stop.*

2) Set the drive's Acceleration and Deceleration potentiometers to their fastest rates (minimum ramp time). The goal is to make the drive as responsive as possible, which allows the M–Traverse to control the speed changes.

3) If the drive has a Zero Speed Potentiometer, adjust it to eliminate any motor creep. If the drive does not have a zero speed pot, then adjust the zero speed pot on the M–Traverse to eliminate any motor creep. Figure 2-28 shows the location of the M–Traverse zero speed pot.

4) If the drive has an IR Compensation Potentiometer, set it at minimum.

5) Each motor drive has settings that are unique to its particular model. Adjust any remaining drive settings according to the manufacture's recommendations.

ENCODER POLARITY CHECK

1) Observe MV-41 while you rotate the lead encoder in the direction that is “forward” during normal operation. Switch the lead encoder lines on J3 pins 3 and 5 if MV-41 is negative.

2) Observe MV-42 while you rotate the Follower encoder in the direction that is “forward” during normal operation. Switch the follower encoder lines on J3 pins 7 and 9 if MV-42 is negative.

M–TRAVERSE CALIBRATION

1) Make sure that the M–Traverse is still in “F–Stop”. If it is not, put the M–Traverse in “F–Stop” by opening the F–Stop Logic input (J4 pins 9 and 10). Refer to *Installation/Setup: Wiring, F–Stop*.

2) Enter the resolution (PPRs) of the feedback sensor in the PPR Follower (CP-18) parameter by entering the following on the keypad:

   Press “Code Select”
   Enter “18”
   Press “Enter”
   Enter the Pulses Per Revolution (PPR) of the feedback sensor
   Press “Enter”

   The Tach is now scaled for feedback RPMs.

3) If the M–Traverse is using the drive voltage for reference (J1 pin 8), then set the drive's max speed potentiometer to its minimum setting. If the M–Traverse is using its internal voltage for reference (no connection to J1 pin 8) then set the drive's max speed potentiometer to its maximum setting and set the M–Traverse's scale pot to its minimum setting (fully counterclockwise). Figure 2-28 shows the location of the M–Traverse scale pot.

4) The M-Traverse is defaulted for use with bi-directional drives that use bipolar (positive and negative) voltage commands to indicate the direction. If you are using a single quadrant (direction) drive, then change CP-29 to unipolar operation, as follows:

   Press “Code Select”
   Enter “29”
   Press “Enter”
   Enter “1”
   Press “Enter”

5) Enable the M–Traverse's direct control mode by entering the following on the keypad:

   Press “Code Select”
   Enter “14”
   Press “Enter”
   Enter “2”
   Press “Enter”

6) Put the M–Traverse into RUN by shorting the F–STOP input (J4 pins 9 and 10) and the RUN input (J4 pins 6 and 7). Although the motor is now in RUN, it will have zero speed until you adjust the Direct Analog Command (CP-62).

7) Gradually set the M–Traverse's Direct Analog Command to 90% (3686) by entering the following on the keypad:

Press “Setpoint”
Enter “400”
Press “Enter”
Enter “800”
Press “Enter”

Continue to gradually increase these increments by 400 until you reach “3686”. Since there are no acceleration/deceleration ramps in Direct mode, a sudden increase to “3686” could cause damage in some systems. If the Follower is not moving in a forward direction, then rewire the drive/motor leads for forward operation.

Note: A value of –3686 will change the direction of the motor.

8) Turn either the motor drive's max speed or the M–Traverse's scale potentiometer clockwise until the drive motor's RPMs are at the maximum operating speed at which you want the system to operate. Check the speed (RPMs) by pressing the Tach” key. “Tach” should display the RPM speed that you enter in CP-19.

9) Put the Direct Analog Command back to 0% by entering the following on the keypad:

Press “Setpoint”
Enter “0”
Press “Enter”

10) Disable the M–Traverse's direct mode by entering the following on the keypad:

Press “Code Select”
Enter “14”
Press “Enter”
Enter “1”
Press “Enter”

11) Put the M–Traverse in “F–Stop” by opening the F–Stop input (J4 pins 9 and 10). Refer to *Installation/Setup: Wiring, F–Stop*.

—NOTES—

Operation

Keypad Operation

Control Parameters (CP)

- Follower Mode
- Direct Mode
- Jog
- Tuning
- Output Control

M-Traverse Operation

- Follower Mode
- Home Set
- Home Seek
- Home Return
- Direct Mode
- Jog

Monitor Variables (MV)

- Input Monitoring
- Output Monitoring
- Performance Monitoring
- Status Monitoring

Serial Communications

- Using Serial Communications
- Communications Software Design

KEYPAD OPERATION

The front panel of the M–Traverse is an easy to use keypad that gives you direct access to the Parameters (Control Parameters and Monitor Variables) by entering the Parameter Code. You can also use the keypad to change the value of a Control Parameter. The keypad has keys for Code Select, Enter and Clear. It also has numeric keys and four dedicated keys: Setpoint, Tach, Status and Batch Count. The LED display is the above the keys. Refer to figure 3-1 for the location of the keys and LED display on the keypad. Table 3-1 demonstrates basic keypad entry.

The keypad functions as follows:

Code Select	Use the “Code Select” key prior to entering a Parameter Code for either a Control Parameter (CP) or Monitor Variable (MV).
Numeric	Use the numeric keys to enter a Parameter Code for either a Control Parameter (CP) or a Monitor Variable (MV) or to enter a value for a Control Parameter. Use the “Clear” key to delete your entry. Use the “Enter” key after each entry, to enter it in the M-Traverse.
—/Alt	Use the “—/Alt” key to enter a negative value. In MVs 43, 44, 80, 81 and 84, the “—/Alt” key toggles between four lower and four higher digits because some numbers exceed the six digit display panel limit.
.	Use the decimal key for values with a decimal point.
Clear	The “Clear” key will delete the entry, if you have not used the “Enter” key.
Tach	The “Tach” key is a dedicated or shortcut key. You can access the tach Parameters directly, rather than manually entering the Parameter Code (MV-40).
Setpoint	The “Setpoint” Key is a dedicated or shortcut key. You can directly access the active setpoint in the Follower mode (either CP-01, CP-03, CP-05 or CP-07) or the active setpoint in the Direct mode (CP-62).

Batch Count Key	The “Batch Count” Key is a dedicated or shortcut key. You can directly access the Batch Count parameter (MV-89).
Status Key	The “Status” Key is a dedicated or shortcut key. You can directly access the Alarm Status parameter (MV-51).
Lower LED Display	The two-digit Parameter Code is displayed on the Lower LED Display.
Upper LED Display	The Parameter Code's value is displayed on the Upper LED display. This value can be up to six digits.
Discrete LED Display	There are five discrete LED display lights. When a specific light is “on”, it indicates the following condition:

Run ..... The M-Traverse is in Follower mode and is executing a profile.
Wait ..... The Wait input (J4 pin 8) is active.
Drive Enable .... The Drive Enable output (J1 pin 13) is active.
At-Home ..... The Follower position is within the At-Home band of the Home position.
Alarm ..... There is an active alarm condition.

Table 3-1 Basic Keypad Entry

To Enter a Parameter Code:	Press “Code Select”. Enter a Parameter Code (For a Control Parameter or Monitor Variable). Press “Enter” (within 15 seconds). The Parameter Code and its current value are displayed on the LED displays.
To Enter a Parameter Value: **(For Control Parameters only - Monitor Variables can not be changed manually)**	Follow the steps to enter a Parameter Code. Enter a new value (Use the numeric keys) . Press “Enter” (within 15 seconds).
To Use the Tach Key:	Press “Tach”. The scaled Tach - Velocity is displayed (MV-40).
To Use the Status Key:	Press “Status”. The code for the alarm status is displayed (MV-51).
To Use the Setpoint Key:	Press “Setpoint”. The value of the active setpoint is displayed, in engineering units. (CP-01, CP-03, CP-05, CP-07 or CP-62).
To Use the Batch Count Key:	Press “Batch Count” . The number of complete batch counts is displayed (MV-89).

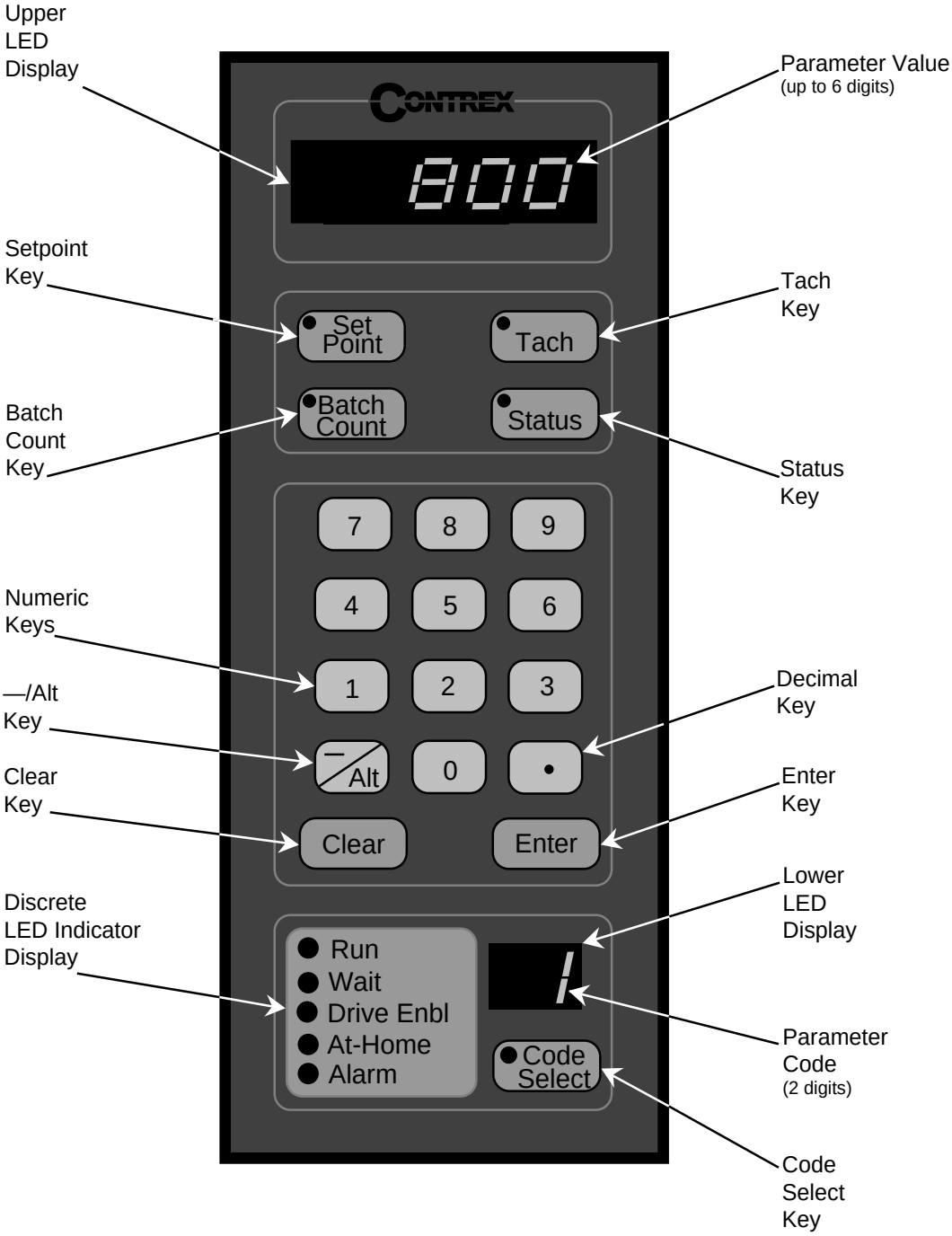
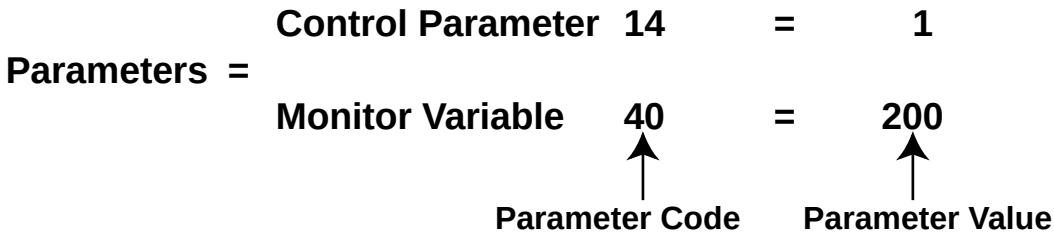


Figure 3-1 The M–Traverse Front Panel

CONTROL PARAMETERS

Parameters are divided into two classifications; Control Parameters (CP) and Monitor Variable (MV). The numbered code that represents the parameter is the Parameter Code. The operational data is the parameter's value.



This section is about Control Parameters. Monitor Variables are explained in *Operation: Monitor Parameters.*

The M–Traverse comes factory pre-loaded with a complete set of default Control Parameters values. The majority of these default settings are suitable for most applications and do not require modification.

Control Parameters allow you to enter data that is unique to your system (e.g., encoder resolution, Lead to Follower ratios) and modify the M–Traverse for your specific needs (e.g., maximum RPM, setpoints, acceleration/deceleration ramp rates) by entering a parameter value. Control Parameters can be "locked out" so that they become inaccessible from the Keypad. For details, refer to *References: Appendix C, CP-79.*

The M–Traverse is designed to execute either the Direct mode of operation or the Follower mode of operation. The values that you enter in the relevant Control Parameters determine which of the modes of operation your M–Traverse is set up for. The mode of operation that you use is determined by your systems operational requirements.

The following sections demonstrate how to enter Control Parameters for the Direct mode or the Follower mode of operation. In addition, Control Parameters for Jog, Tuning and Output Control are addressed.

FOLLOWER MODE

The M-Traverse is a multi-motor operation that is specifically designed for the precise control of reciprocating lead/follower motion control applications. Its primary mode of operation is the Follower mode. This section discusses the set up procedures for the Follower mode of operation. Refer to *Introduction: Examples of M-Traverse Applications* for an example of the Follower Mode. Refer to *Operation: M–Traverse Operation* for instructions on the operation of the Follower mode.

Caution: To avoid damage to your system, the M-Traverse must be calibrated and the motor drive set up before you enter the Follower mode. Refer to *Installation/ Setup: Calibration*.

In order to set up the M-Traverse for the Follower mode of operation, Control Parameters must be entered for the following procedures:

Control Mode Parameter
Follower Scaling Parameters
Preset Parameters
Follower Profile Parameters
Other Follower Parameters

Control Mode Parameter

The Control Mode (CP-14) parameter allows you to choose between either the Standard (1) or Lay Adjusted (3) option in the Follower mode of operation. Both options will operate your system. The calculation of the Follower profile length is the only difference between the Standard and the Lay Adjusted option. In the lay adjusted option, one lay pitch is subtracted from the profile length to adjust for the initial lay on the reel.

NOTE: You can also use Control Mode (CP-14) to choose the Direct mode of operation, which is used for calibration and trouble shooting. Refer to *Operation: Direct Mode* for information on the Direct mode.

The factory default for the Control Mode Control Parameter is found in Table 3-2. To modify the default parameter refer to Table 3-3. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-2 Default Control Mode Control Parameter

CP	Parameter Name	Parameter Value
CP-14	Control Mode	1 (Follower /Standard)

Table 3-3 Entering Control Mode Control Parameters

CP	Parameter Name	Parameter Value
CP-14	Control Mode	Enter “1” to enable the Follower Mode / Standard Enter “3” to enable the Follower Mode / Lay Adjusted

Follower Scaling Parameters

The M-Traverse allows you to use Engineering Units (e.g., feet, inches) to control and monitor your system. Follower Scaling is a convenient method for converting encoder lines to Engineering Units. Scaling Control Parameters give the M-Traverse the following information:

Engineering Units (CP-15)

In a level wind application, CP-15 is your Engineering Unit (E.U.) measurement of a laypitch. In a web scanning application, CP-15 is your E.U. measurement for a traverse length. If your application uses the M-Traverse's setpoint flexibility to change over the operation, and you have more than one measurement, then pick one arbitrarily. However, be sure to reference that same measurement consistently throughout the scaling set up. In setting up the scaling, you are simply allowing the M-Traverse to establish a conversion of encoder lines to the E.U. that you prefer to use. Place the decimal in the location of your desired resolution (to the tens, hundreds or thousands place). All of the other Control Parameters or Monitor Parameters that display in E.U.s will automatically display the correct decimal position.

Lead PPR Reel (CP-16)

In a level wind application, CP-16 is the number of Lead encoder lines that the Lead Frequency input registers as a result of one revolution of the reel. In a web scanning application, CP-16 is the number of Lead encoder lines that the Lead Frequency input registers when the Follower travels one traverse length. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers. Use the following procedure to check CP-16:

- Place the M-Traverse in F-Stop.
- Activate the Home Set input (clears the Lead position to zero).
- Place the M-Traverse in F-Stop.
- Display MV-43 (Lead Position).
- Move the Lead either one revolution of the reel (level wind) or one traverse length (web scan).
- MV-43 should have the same value as CP-16.

Follower Lines per Engineering Units (CP-17)

In a level wind application, CP-17 is the number of Follower encoder lines that the Feedback Frequency input registers as a result of the Follower laypitch that was entered in CP-15. In a web scanning application,

CP-17 is the number of Follower encoder lines that the Feedback Frequency input registers when the Follower travels one traverse length. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers. Use the following procedure to check or find CP-17 :

- Place the M-Traverse in F-Stop.
- Activate the Home Set input (clears the Follower position to zero).
- Place the M-Traverse in F-Stop.
- Display MV-44 (Follower Position).
- Jog the Follower either one laypitch (CP-15) for level wind or one traverse length(CP-15) for web scan.
- MV-44 should have the same value as CP-17.

PPR Follower (CP-18)

The PPR Follower (CP-18) parameter is the number of pulses per revolution of the feedback encoder (encoder resolution in lines).

Maximum RPM Follower (CP-19)

The Maximum RPM Follower (CP-19) parameter is the RPM of the feedback encoder shaft when the Follower is operating at maximum speed. Although this entry does not need to be exact, highly inaccurate entries will make it difficult to tune the M-Traverse for precision Follower profiling. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers.

The factory defaults for the Follower Scaling Control Parameters are found in Table 3-4. To modify the default parameters refer to Table 3-5. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-4 Default Follower Scaling Control Parameters

CP	Parameter Name	Parameter Value
CP-15	Engineering Units	0.000
CP-16	Lead PPR Reel	1000
CP-17	Follower Lines/E.U.	1000
CP-18	PPR Follower (Feedback)	60
CP-19	Max RPM Follower	2000

Table 3-5 Entering Follower Scaling Control Parameters

CP	Parameter Name	Parameter Value
CP-15	Engineering Units	In a level wind application, enter your E.U. measurement of one laypitch. In a web scanning operation, enter your E.U. measurement for one traverse length.
CP-16	Lead PPR Reel	In a level wind application, enter the number of Lead encoder lines that the Lead Frequency input registers as a result of one revolution of the reel. In a web scanning application, enter the number of Lead encoder lines that the Lead Frequency input registers as a result of one traverse length. Include calculations for all gear reductions, belt reductions and other types of reducers.
CP-17	Follower Lines/E.U.	In a level wind application, enter the number of Follower encoder lines that the Feedback Frequency input registers as a result of one Follower laypitch (reference CP-15). In a web scanning application, enter the number of Follower encoder lines that the Feedback Frequency input registers when the Follower travels one traverse length. Include calculations for all gear reductions, belt reductions and other types of reducers.
CP-18	PPR Follower (fdbk)	Enter the number of pulses per revolution of the feedback encoder (encoder resolution in lines).
CP-19	Max RPM Follower	Enter the RPM of the feedback encoder shaft when the Follower is operating at maximum speed. Include calculations for all gear reductions, belt reductions and other types of reducers.

Preset Parameters

Setpoints (CP-01, CP-03, CP-05, CP-07)

The Setpoint parameters are set up as pairs in conjunction with the Traverse Length parameters. There are four pairs of Setpoint and Traverse Length parameters. The Setpoint value is entered in Engineering Units (E.U.s) and automatically displays the decimal position that was entered in the Engineering Units (CP-15). The Setpoint parameter determines how far the Follower travels based on the Lead. The Follower travels the setpoint distance while the Lead travels the distance entered into CP-17. In the level wind application, the Setpoint parameters are the laypitch (center-to-center distance between windings on the reel). In the web scanning application, the Setpoint parameters are the traverse length. These preset parameters can be switch selected (via the Setpoint Select switches) which gives the operator the option of changing over the product up to four times.

The factory defaults for the Default Setpoint Control Parameters are found in Table 3-6. To modify the default parameters refer to Table 3-7. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-6 Default Setpoint Control Parameters

CP	Parameter Name	Parameter Value
CP-01	Setpoint 1	0.000
CP-03	Setpoint 2	0.000
CP-05	Setpoint 3	0.000
CP-07	Setpoint 4	0.000

Table 3-7 Entering Setpoint Control Parameters

CP	Parameter Name	Parameter Value
CP-01	Setpoint 1	In a level wind application, enter your E.U. measurement of one laypitch. In a web scanning operation enter your E.U. measurement for one traverse length.
CP-03	Setpoint 2	In a level wind application, enter your E.U. measurement of one laypitch. In a web scanning operation enter your E.U. measurement for one traverse length.
CP-05	Setpoint 3	In a level wind application, enter your E.U. measurement of one laypitch. In a web scanning operation enter your E.U. measurement for one traverse length.
CP-07	Setpoint 4	In a level wind application, enter your E.U. measurement of one laypitch. In a web scanning operation enter your E.U. measurement for one traverse length.

Traverse Length (CP-02, CP-04, CP-06, CP-08)

The Traverse Length parameters are set up as pairs in conjunction with the Setpoint parameters. There are four pairs of Setpoint and Traverse Length parameters. The Traverse Length value is entered in Engineering Units (E.U.s) and the decimal position that was entered in the Engineering Units (CP-15) parameter is automatically displayed. The traverse length is the distance that the Follower mechanism will travel. In level wind applications, the traverse length is generally the length of the reel. In web scanning applications, the traverse length is generally the width of the web. The traverse length measurement, corresponds to the setpoint measurement. For example, in a level wind application, you may have a reel that measures one foot, that is wrapped with two inch hose. You would enter "2" (inches) in Setpoint 1 (CP-01) and "12" (inches) in Traverse Length 1 (CP-02).

The factory defaults for the Traverse Length Control Parameters are found in Table 3-8. To modify the default parameters refer to Table 3-9. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-8 Default Traverse Length Control Parameters

CP	Parameter Name	Parameter Value
CP-02	Traverse Length 1	0.000
CP-04	Traverse Length 2	0.000
CP-06	Traverse Length 3	0.000
CP-08	Traverse Length 4	0.000

Table 3-9 Entering Traverse length Control Parameters

CP	Parameter Name	Parameter Value
CP-02	Traverse Length 1	In a level wind application, enter your reel length in E.U.s (reference Setpoint 1). In a web scanning operation, enter the width of your web, in E.U.s (reference Setpoint 1).
CP-04	Traverse Length 2	In a level wind application, enter your reel length in E.U.s (reference Setpoint 2). In a web scanning operation, enter the width of your web, in E.U.s (reference Setpoint 2).
CP-06	Traverse Length 3	In a level wind application, enter your reel length in E.U.s (reference Setpoint 3). In a web scanning operation, enter the width of your web, in E.U.s (reference Setpoint 3).
CP-08	Traverse Length 4	In a level wind application, enter your reel length in E.U.s (reference Setpoint 4). In a web scanning operation, enter the width of your web, in E.U.s (reference Setpoint 4).

The following chart demonstrates how Setpoint and Traverse Length pairs are selected by the various positions of the Setpoint Select A and Setpoint Select B discrete inputs.

	Setpoint Select A Open	Setpoint Select A Closed
Setpoint Select B Open	Setpoint 1(CP-01) Traverse Length 1(CP-02)	Setpoint 2 (CP-03) Traverse Length 2 (CP-04)
Setpoint Select B Closed	Setpoint 3 (CP-05) Traverse Length 3 (CP-06)	Setpoint 4 (CP-07) Traverse Length 4 (CP-08)

(Closed = shorted to common)

Follower Profile Parameters

In addition to being part of a setpoint pair, the traverse length acts in conjunction with the Accel/Decel Length (CP-09) parameter and the Dwell (CP-10) parameter to define the Follower Profile. The Follower Profile creates a smooth transition to dwell before reversing directions. This takes place at the reel's end in level wind applications or at the edge of the web in web scanning applications.

Accel/Decel Length (CP-09)

> The Accel/Decel Length (CP-09) parameter allows the Follower mechanism to ramp to either the constant pitch plateau or end dwell, either gradually or rapidly. This parameter is the number of encoder lines for the desired Accel/Decel Length. The lower the number, the more rapidly the Follower mechanism ramps to the constant pitch plateau or end dwell. The higher the number, the more gradually the Follower mechanism ramps to the control pitch plateau or end dwell. As a guideline, keep in mind that you do not want the accel/decel rate to exceed the load that the motor drive or mechanics can accommodate. The Accel/Decel Length parameter does not need to be an exact number, the system will perform adequately with a close estimate.

The factory default for the Accel/Decel Length Control Parameter is found in Table 3-10. To modify the default parameter refer to Table 3-11. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-10 Default Accel/Decel Length Control Parameter

CP	Parameter Name	Parameter Value
CP-09	Accel/Decel Length	0

Table 3-11 Entering Accel/Decel Length Control Parameter

CP	Parameter Name	Parameter Value
CP-09	Accel/Decel Length	Enter the number of encoder lines for the desired Accel/Decel Length.

Dwell (CP-10)

The Dwell (CP-10) parameter allows the Follower mechanism to pause at the end of the Follower profile before ramping back in the opposite direction. In level wind applications, this parameter is a portion of the encoder lines in one rotation of the reel (Lead). In web scanning applications, this parameter is a portion of the encoder lines in one traverse length. The Dwell parameter does not need to be an exact number, the system will perform adequately with a close estimate .

The factory default for the Dwell Control Parameter is found in Table 3-12. To modify the default parameter refer to Table 3-13. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-12 Default Dwell Control Parameter

CP	Parameter Name	Parameter Value
CP-10	Dwell	0

Table 3-13 Entering Dwell Control Parameter

CP	Parameter Name	Parameter Value
CP-10	Dwell	In a level wind applications, enter a portion of the encoder lines in one rotation of the reel In a web scanning applications, enter a portion of the encoder lines in one traverse length.

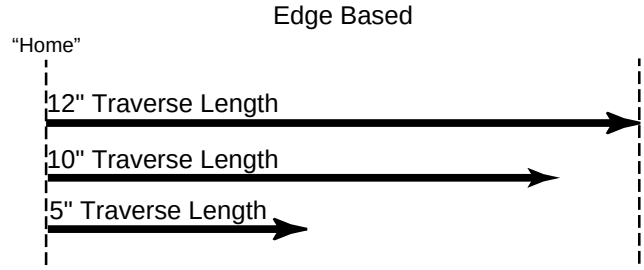
Other Follower Parameters

The orientation (edge or center) of “Home,” changes in the “Home” position and changes made on the fly, are determined by the following parameters:

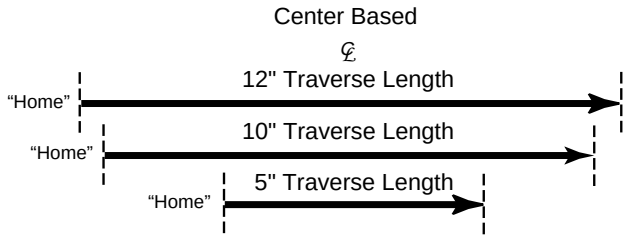
Edge/Center Based Profile (CP-24)

The traverse length is measured from “Home”. The Edge/Center Based Profile (CP-24) parameter allows you to set “Home” relative to either the edge or the center of your reel or web. The Follower mechanism moves a traverse length from that position and then returns.

To set “Home” as an edge based profile, enter “1” in CP-24. All traverse length changes occur from the edge, in the forward direction and the “Home” position does not change. The diagram below illustrates this profile. Traverse length changes can be made on the fly and the timing on these changes is a crucial factor. For the timing on edge based traverse length changes, refer to the Change Activation (CP-25) parameter.



To set “Home” as a center based profile, enter “2” in CP-24. All traverse length changes occur from the center and the “Home” position changes to compensate for traverse length changes. The diagram below illustrates this profile. Traverse length changes will occur automatically when the Follower mechanism is in the center of the web.



Change Activation (CP-25)

The Change Activation (CP-25) parameter works in conjunction with the Edge/Center Based Profile (CP-24) parameter. When CP-24 is set to “1” (edge based), then CP-25 determines when changes will occur. If CP-24 is set to “2” (center based), then CP-25 has no effect.

Change Activation (CP-25) can be set to “1”, “2” or “3”. Settings “2” and “3” have a number of variables:

If CP-25 is set to “1” then all of the changes will occur when the Follower is at “Home”.

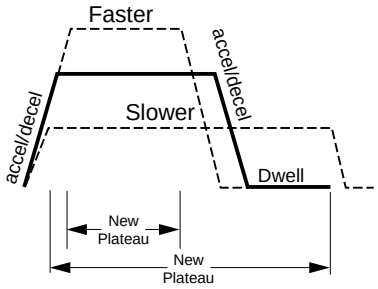
If CP-25 is set to “2” and either the Accel/Decel Length or Dwell parameters are changed, the changes will only occur at “Home”.

If CP-25 is set to “2” and the setpoint speed is changed (either faster or slower), the change will occur immediately, but only if the change occurs within the new constant pitch plateau of the profile. Otherwise setpoint speed changes occur at “Home”.

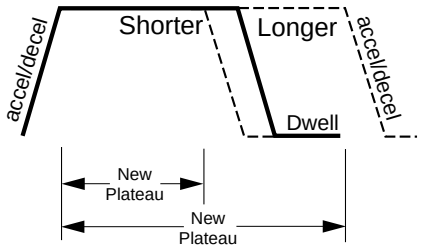
If CP-25 is set to “2” and the traverse length is changed, the change will occur immediately, but only if the longer change occurs within the old constant pitch plateau and a shorter change occurs within the new constant pitch plateau of the profile, and either change is in a forward direction. Otherwise traverse length changes occur at “Home”.

If CP-25 is set to “2” and both the traverse length and the setpoint speed are changed, then use the switches to make the changes and stay within the profile parameters listed above for setpoint speed and traverse length changes. When any of the changes are not within the specified plateaus of the profile, then the changes will occur when the Follower mechanism reaches “Home”. Refer to the diagrams below.

Setpoint Changes



Traverse Length Changes



If CP-25 is set to “3”, the change will occur at the next forward or reverse dwell position. However, if there is no dwell position, a setpoint change will occur at the start of the reverse plateau in the forward direction or at the start of the forward plateau in the reverse direction. If the setpoint is changed to a slower speed, this change will cause a spike, which will momentarily cause an abrupt jolt to the Follower mechanism. Therefore, for a smooth operation, it is best to specify a Dwell (CP-10) parameter.

At-Home Band (CP-30)

The At-Home Band (CP-30) parameter allows for a certain amount of “range” in the Home position, measured in encoder lines. Although the Home Set and Home Seek inputs place home exactly at “0”, the At-Home Band parameter allows home to be located in a band that is measured in negative and positive encoder lines on each side of the "0" mark. Enter the desired number of encoder lines in CP-30.

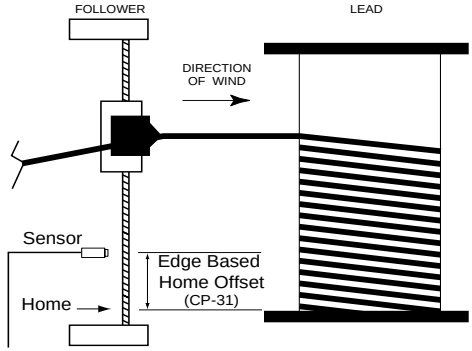
NOTE: The Follower mechanism must be positioned within the At-Home Band before “Run” is entered. The Follower position must also be within the At-Home band to activate the At-Home LED indicator (front panel) and the At-Home discrete output.

The factory defaults for the Edge/Center Based Profile, Home Offset, Change Activation and At-Home Band Control Parameters are found in Table 3-14. To modify the default parameters refer to Table 3-15. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

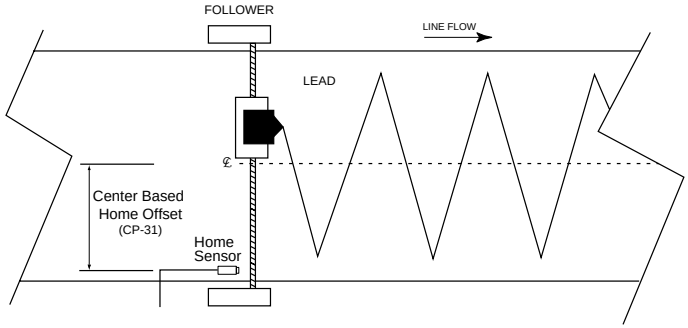
Home Offset (CP-31)

The Home Offset parameter allows you to offset the “Home” position and relocate it somewhere other than the sensor.

If CP-24 is set at “1” (edge based), measure the distance from the sensor to the desired position of “Home”. Enter that E.U. amount in CP-31.



If CP-24 is set at “2” (center based), measure the distance from the sensor to the center. Enter that E.U. amount in CP-31. The M-Traverse will make a transparent, internal calculation and position “Home” at a distance that is CP-31 minus 1/2 of the traverse length. The position of “Home” will change to correspond with any changes in the traverse length.



NOTE: Since the “Home” position calculations are dependent on the Traverse Length (CP-02, CP-04, CP-06, CP-08) parameter and the Engineering Units (CP-15) parameter, those values must have already been entered prior to entering a value in CP-31. To enter these parameters, refer to the *Operations: Control Parameters* section.

Table 3-14 Default Control Parameters for Changes

CP	Parameter Name	Parameter Value
CP-24	Edge/Center Based	1
CP-25	Change Activation	1
CP-30	At-Home Band	4
CP-31	Home Offset	0

Table 3-15 Entering Control Parameters for Changes

CP	Parameter Name	Parameter Value
CP-24	Edge/Center Based	Enter “1” for an edge based profile. Enter “2” for a center based profile.
CP-25	Change Activation	When CP-24 is set to “1” (edge based), then: Enter “1” to activate changes when the Follower is in the “Home position. Enter “2” to activate changes immediately. Enter “3” to activate changes when the Follower is in the end dwell position.
CP-30	At-Home Band	Enter the number of encoder lines that you want to allow on either side of the “0” Home Set position.
CP-31	Home Offset	If CP-24 is set at “1” (edge based), enter the distance from the sensor to the desired position of “Home”. If CP-24 is set at “2” (center based), enter the distance from the sensor to the center of the web.

The Resume Enable parameter allows you to specify the conditions under which you resume operation.

Resume Enable (CP-32)

If you interrupt the operation (F-Stop), the Resume Enable (CP-32) parameter allows you to keep track of error in both the Follower and Lead positions. It also allows you to freeze the Lead position and keep track of error in the Follower position. The M-Traverse will adjust for the error when you resume operation.

Resume is disabled by entering "1" in CP-32.
To keep track of error in both the Follower and Lead positions enter "2" in CP-32.
To freeze the Lead position and keep track of error in the Follower position, enter “3” in CP-32.

Both the Follower and the Lead information is saved at power-down. If there has been no change in the mechanical position at power-down, then the profile can be resumed at power-up.

If the mechanical position has changed and you resume operation, the Follower could make an abrupt shift to resolve the position error. This can severely injure you or damage the equipment. The specific consequences of this abrupt shift can vary, depending on your use of the equipment and your system's design. Install safety equipment that is appropriate for your application.

The factory default for the Resume Enable Control Parameter is found in Table 3-16. To modify the default parameter refer to Table 3-17. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

DANGER

When you resume operation the Follower could make an abrupt shift.

This can cause severe injury or damage equipment.

Install safety equipment that is appropriate for your application.

Table 3-16 Default Resume Enable Control Parameter

CP	Parameter Name	Parameter Value
CP-32	Resume Enable	1

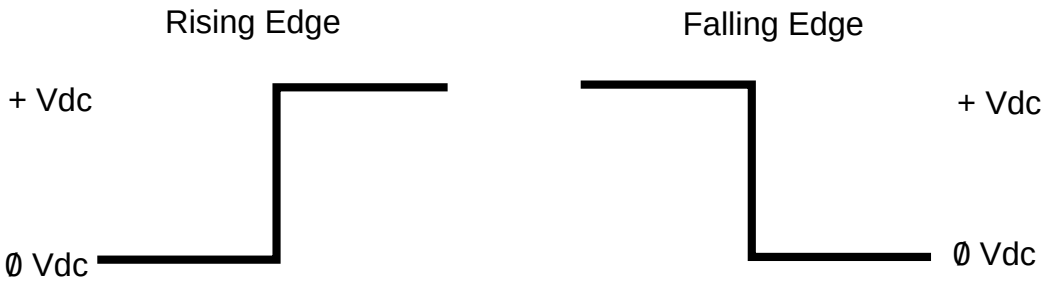
Table 3-17 Entering Resume Enable Control Parameters

CP	Parameter Name	Parameter Value
CP-32	Resume Enable	Enter "1" disable resume. Enter "2" to enable (Lead & Follower position tracking) Enter "3" to enable (Follower position tracking)

The polarity type and direction are determined by the following Control Parameters:

Home Sync Polarity (CP-35)

The Home Sync Polarity (CP-35) parameter allows you to choose between rising edge polarity (positive going signal) or falling edge polarity (negative going signal) during "Home Seek". This feature is extremely useful when you use reflective or transmissive optical sensors for the Home sensor. Enter "1" in CP-35 for a rising edge, or "2" for a falling edge. Refer to the diagram below.



Forward/Reverse Limit Polarity (CP-36)

The Forward/Reverse Polarity Limit (CP-36) parameter allows you to choose between rising edge polarity (positive going signal) or falling edge polarity (negative going signal) so that the Follower mechanism will not travel beyond the traverse length limit. This feature is extremely useful when you use reflective or transmissive optical sensors for the Home sensor. Enter "1" in CP-35 for a rising edge, or "2" for a falling edge.

The factory default for the Polarity Control Parameters are found in Table 3-18. To modify the default parameters refer to Table 3-19. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-18 Default Polarity Control Parameters

CP	Parameter Name	Parameter Value
CP-35	Home Sync Polarity	1
CP-36	Fwd/Rev Limit Polarity	2

Table 3-19 Entering Polarity Control Parameters

CP	Parameter Name	Parameter Value
CP-35	Home Sync Polarity	Enter “1” for Rising Edge Enter “2” for Falling Edge
CP-36	Fwd/Rev Limit Polarity	Enter “1” for Rising Edge Enter “2” for Falling Edge

How the Forward Limit functions is determined by the following Control Parameter:

Forward Limit Format (CP-37)

Use the Forward Limit Format (CP-37) parameter to determine how the Forward Limit will function during “Run”. If you set CP-37 to "1", then the M–Traverse will engage “F-Stop” when the Forward Limit is encountered during “Run”. However, if you want the M–Traverse to terminate the Constant Pitch Plateau, decelerate to zero speed, process the Forward End Dwell and then begin the reverse profile back to “Home” when the Forward Limit is encountered, then set CP-37 to "2".

Table 3-20 Default Polarity Control Parameters

CP	Parameter Name	Parameter Value
CP-37	Forward Limit Format	1

Table 3-21 Entering Polarity Control Parameters

CP	Parameter Name	Parameter Value
CP-37	Foward Limit Format	Enter “1” to engage ”F-Stop”. Enter “2” to terminate the Constant Pitch Plateau, decelerate to zero, process the dwell and begin the reverse profile.

DIRECT MODE

The Direct mode is used to calibrate and troubleshoot the M-Traverse. In the Direct mode of operation, you can set the level of the Speed Command Out directly from the M-Traverse to the motor drive. The Direct mode is an open-loop mode of operation. Therefore, Scaling, Accel/Decel, and closed loop compensation (PI) algorithms are bypassed in the Direct mode. The Direct mode is used in conjunction with the Run and the Stop controls.

Caution: To avoid damage to your system, the M-Traverse must be calibrated and the motor drive set up before you enter the Direct mode. Refer to *Installation/ Setup: Calibration.*

The Direct Analog Command (CP-62) parameter uses the full 12 bit resolution of the analog Speed Command Output.

A value of 4095 is a 100% forward output command.
A value of 2048 is a 50% forward output command.
0 is a zero output command.

A negative value indicates a reverse output command (e.g., - 4095 is a 100% reverse command).

To enable the Direct mode, enter "2" the Control Mode (CP-14) parameter.

The factory default Direct Mode Control Parameters are found in Table 3-20. To modify the default parameters, refer to Table 3-21. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-22 Default Direct Mode Control Parameters

CP	Parameter Name	Parameter Value
CP-62	Direct Analog Command	0
CP-14	Control Mode	1

Table 3-23 Entering Direct Mode Control Parameters

CP	Parameter Name	Parameter Value
CP-62	Direct Analog Cmd	Enter the DAC bits of the calitrated full scale Speed Command Out at which you want your system to operate.
CP-14	Control Mode	Enter “2” to enable the Direct Mode (disables both Follower Mode options).

JOG

When you activate Jog, the RPM increase at the acceleration rate that you specified in the Accel/Decel (CP-60) parameter until the Jog Setpoint (CP-61) is achieved. Jog can only be entered from F-Stop and when Jog is terminated, the Follower mechanism returns to F-Stop. Jog is used when you need brief bursts of speed to align the Follower mechanism.

The factory default Jog Control Parameters are found in Table 3-22. To modify these default parameters, refer to Table 3-23. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-24 Default Jog Control Parameters

CP	Parameter Name	Parameter Value
CP-61	Jog Setpoint	50
CP-60	Accel/Decel	5.0

Table 3-25 Entering Jog Control Parameters

CP	Parameter Name	Parameter Value
CP-61	Jog Setpoint	Enter the RPM at which you want your system to operate when it is in Jog.
CP-60	Accel/Decel	Enter the number of seconds in which you want your system to accelerate from zero RPM to the Jog Setpoint speed.

—NOTES—

TUNING

If your system is unstable, or the position error is unacceptable, tuning may stabilize your system or reduce the position error differences between the setpoint and feedback. You can achieve a stable system using conservative values in the Tuning Control parameters, however the position error may be unacceptable. On the other hand, aggressive values in the Tuning Control parameters may cause the system to become unstable. The goal is to reduce the position error to the level that you want, yet maintain the system's stability.

To achieve an acceptable level of position error, increase the Gain (CP-65) parameter until the system becomes unstable then reduce the CP-65 incrementally until the system stabilizes. In systems that require greater accuracy, it may be necessary to adjust the Integral (CP-66) parameter to reduce any remaining position error. In systems with low inertia, the position error will be reduced more quickly if you enter higher values in CP-66. An entry that is too high, however, can create instability or overshoot the setpoint before reaching the correct value. Generally, use lower entries for CP-66 on systems with a large inertia.

The M-Traverse comes factory pre-loaded with a complete set of default Tuning parameters. These default settings are suitable for most applications.

The factory defaults for the Follower Tuning Control Parameters are found in Table 3-24. To modify the default parameters refer to Table 3-25. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-26 Default Tuning Control Parameters

CP	Parameter Name	Parameter Value
CP-65	Gain	3000
CP-66	Integral	1

Table 3-27 Entering Tuning Control Parameters

CP	Parameter Name	Parameter Value
CP-65	Gain	With Integral (CP-66) set to “0” , increase the Gain parameter value until the system becomes unstable, then decrease it slightly until the system stabilizes. Larger values will increase Gain. To verify the stability of the speed changes, you can access Tach through either the Tach key or the Tach (MV-40) parameter.
CP-66	Integral	While switching between the high and low setpoints, increase the Integral's default value of “1” until the position error is reduced within an acceptable time frame. To verify the stability of the speed changes, you can access Tach through either the Tach key or the Tach (MV-40) parameter.

OUTPUT CONTROL

Output Control is influenced by the Batch Control Parameters, the Alarm Output, the At-Home output and Outputs A and B. These parameters and outputs are discussed as follows:

The **Batch Control Parameters** allow you to make a specific amount of product and then automatically stop when that amount is reached.

Batch Format (CP-26)

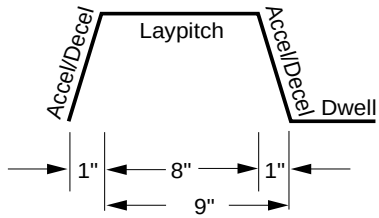
Use the Batch Format (CP-26) parameter to indicate which type of count that you want the Batch Counter to do. You can count either Follower traverses or Lead reel revolutions. Enter “1” in CP-26 to count the Follower traverses. Enter “2” in CP-26 to count Lead revolutions.

Batch Limit (CP-27)

The Batch Counter is an up-counter that is cleared to zero by the Batch Reset input. Use the Batch Done Output to shut off the system when the Batch Count has been reached. You can count either the number of Follower traverses or the number of Lead reel revolutions. If you count Follower traverses, each direction counts as one traverse. If you count Lead revolutions, each wrap of the reel (or layer), is one lead revolution. Enter the total number that you want counted in Batch Limit (CP-27).

Batch PreAct Distance (CP-28)

The Batch PreAct Distance (CP-28) parameter is used only if the Batch Format (CP-26) has been set to number “1” (Follower traverses). CP-28 allows you to set a specific distance at which to activate the Batch Done. This can be at the end dwell or any distance from dwell, up to the Accel/Decel Length at the opposite end from dwell. If you enter a number that would go beyond the Accel/Decel Length, the M-Traverse will automatically default to the Accel/Decel Length. For example, your reel is 10 inches long, with an Accel /Decel Length of 1 inch on each end, and the laypitch profile is 8 inches. CP-28 will default at 9 inches for any amount above 9 inches that you enter in CP-28, because the opposite Accel /Decel is 9 inches from the dwell. See the diagram below for a profile representation of this example:



The factory defaults for the Batch Control Parameters are found in Table 3-26. To modify the default parameters refer to Table 3-27. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-28 Default Batch Control Parameters

CP	Parameter Name	Parameter Value
CP-26	Batch Format	1
CP-27	Batch Limit	0
CP-28	Batch PreAct Distance	999999

Table 3-29 Entering Batch Control Parameters

CP		Parameter Name Parameter Value
CP-26	Batch Format	Enter “1” in CP-26 for Follower traverses. Enter “2” in CP-26 for Lead reel revolutions.
CP-27	Batch Limit	Enter the total number of Follower traverses or Lead reel revolutions that you want counted.
CP-28	Batch PreAct Dist	Enter a specific preact distance at which to activate the Batch Done (only if CP-26 is set at “1”).

The **Alarm Output** allows you to set a high speed RPM indication.

High Speed Alarm (CP-23)

Use the High Speed Alarm (CP-23) parameter to determine the RPM level that will activate the High Speed Alarm Output. When the Follower's motor RPM are at or above the value in CP-23, the High Speed Alarm Output will activate.

The factory default for the Default Alarm Control Parameter is found in Table 3-28. To modify the default parameter refer to Table 3-29. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-30 Default Alarm Control Parameter

CP	Parameter Name	Parameter Value
CP-23	High Speed Alarm	2000

Table 3-31 Entering Alarm Control Parameter

CP	Parameter Name	Parameter Value
CP-23	High Speed Alarm	Enter the RPM limit that will activate the High Speed Alarm Output.

The **At-Home Output** activates in response to the At-Home Band parameter.

At-Home Band (CP-30)

When the Follower is within the At-Home Band, the At-Home Output will be activated. The At-Home Band (CP-30) parameter allows for a certain amount of “range” in the Home position, measured in encoder lines. Although the Home Set input places home exactly at “0”, the At-Home Band (CP-30) allows home to be located in a band that is measured in negative and positive encoder lines on each side of the "0" mark. The desired number of encoder lines is entered in CP-30.

NOTE: The Follower must be within the At-Home Band before “Run” is entered. The Follower position must also be within the At-Home band to activate the front panel At-Home LED indicator and the At-Home discrete output.

The factory default for the At-Home Band Control Parameter is found in Table 3-30. To modify the default parameter refer to Table 3-31. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-32 Default At-Home Band Control Parameter

CP	Parameter Name	Parameter Value
CP-30	At-Home Band	4

Table 3-33 Entering At-Home Band Control Parameter

CP	Parameter Name	Parameter Value
CP-30	At-Home Band	Enter the number of encoder lines that you want to allow on either side of the “0” Home Set position.

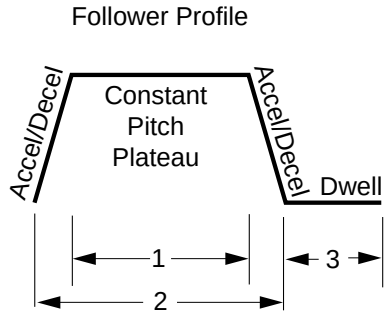
Output A activates peripheral equipment in response to the Output A parameters. This peripheral equipment can be set up to add material (e.g., adhesive or paint) during specific segments of the Follower profile.

Output A Segment (CP-90)

Use the Output A Segment (CP-90) parameter to determine what segment of the Follower profile will activate Output A.

Enter “1” in CP-90 to activate Output A during the constant pitch plateau segment of the Follower profile.
Enter “2” in CP-90 to activate Output A during the constant pitch and Accel/Decel segments of the Follower profile.
Enter “3” in CP-90 to activate Output A during the dwell segment of the Follower profile.

The diagram below illustrates the segments of the Follower profile :



Output A Direction (CP-91)

Use the Output A Direction (CP-91) parameter to specify the direction in which Output A will operate.

Enter “1” in CP-91 to activate Output A during the forward direction.
Enter “2” in CP-91 to activate Output A during the reverse direction.
Enter “3” in CP-91 to activate Output A during the forward and reverse directions.

Output A Polarity (CP-92)

Use the Output A Polarity (CP-92) parameter to specify the voltage polarity at which Output A will operate.

Enter “0” in CP-92 to activate Output A as Active Low Voltage Level.
Enter “1” in CP-92 to activate Output A as Active High Voltage Level.

The factory defaults for the Output A Control Parameters are found in Table 3-32. To modify the default parameters refer to Table 3-33. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-34 Default Control Parameters for Output A

CP	Parameter Name	Parameter Value
CP-90	Output A Segment	1
CP-91	Output A Direction	0
CP-92	Output A Polarity	0

Table 3-35 Entering Output A Control Parameters

CP	Parameter Name	Parameter Value
CP-90	Output A Segment	Enter “1” to activate Output A during the constant pitch plateau segment of the Follower profile. Enter “2” to activate Output A during the constant pitch plateau and Accel/Decel segment of the Follower profile. Enter “3” to activate Output A during the Dwell segment of the Follower profile.
CP-91	Output A Direction	Enter “1” to activate Output A during the forward direction. Enter “2” to activate Output A during the reverse direction. Enter “3” to activate Output A during the forward and reverse directions.
CP-92	Output A Polarity	Enter “0” to activate Output A as Active Low Voltage Level. Enter “1” to activate Output A as Active High Voltage Level.

Output B activates peripheral equipment in response to the Output B parameters. This peripheral equipment can be set up to add material (e.g., adhesive or paint) during specific segments of the Follower profile.

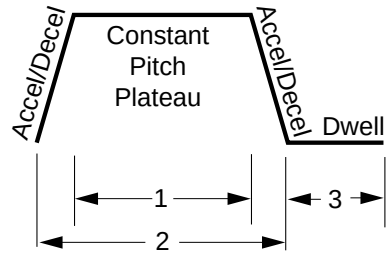
Output B Segment (CP-93)

Use the Output B Segment (CP-93) parameter to determine what segment of the Follower profile will activate Output B.

Enter “1” in CP-93 to activate Output B during the constant pitch plateau segment of the Follower profile.
Enter “2” in CP-93 to activate Output B during the constant pitch plateau and Accel/Decel segments of the Follower profile.
Enter “3” in CP-93 to activate Output B during the dwell segment of the Follower profile.

The diagram below illustrates the segments of the Follower profile :

Follower Profile



Output B Direction (CP-94)

Use the Output B Direction (CP-94) parameter to specify the direction in which Output B will operate.

Enter “1” in CP-94 to activate Output B during the forward direction.
Enter “2” in CP-94 to activate Output B during the reverse direction.
Enter “3” in CP-94 to activate Output B during the forward and reverse directions.

Output B Polarity (CP-95)

Use the Output B Polarity (CP-95) parameter to specify the voltage polarity at which Output B will operate.

Enter “0” in CP-95 to activate Output B as Active Low Voltage Level.
Enter “1” in CP-95 to activate Output B as Active High Voltage Level.

The factory defaults for the Output B Control Parameters are found in Table 3-34. To modify the default parameters refer to Table 3-35. If you are uncertain how to enter a Control Parameter, review the *Operations: Keypad* section.

Table 3-36 Default Control Parameters for Output B

CP	Parameter Name	Parameter Value
CP-93	Output B Segment	1
CP-94	Output B Direction	0
CP-95	Output B Polarity	0

Table 3-37 Entering Output B Control Parameters

CP	Parameter Name	Parameter Value
CP-93	Output B Segment	Enter “1” to activate Output B during the constant pitch plateau segment of the Follower profile. Enter “2” to activate Output B during the constant pitch plateau and Accel/Decel segment of the Follower profile. Enter “3” to activate Output B during the Dwell segment of the Follower profile.
CP-94	Output B Direction	Enter “1” to activate Output B during the forward direction. Enter “2” to activate Output B during the reverse direction. Enter “3” to activate Output B during the forward and reverse directions.
CP-95	Output B Polarity	Enter “0” to activate Output B as Active Low Voltage Level. Enter “1” to activate Output B as Active High Voltage Level.

—NOTES—

M–TRAVERSE OPERATION

The M–Traverse Operation section addresses the six modes that control the M–Traverse's operation. This section explains the function of each of these modes and how to use the modes for your specific system application. Diagrams are included to illustrate the profile sequences.

The six modes are:

Follower Mode (Standard or Lay Adjusted)
Home Set
Home Seek
Home Return
Direct Mode
Jog

FOLLOWER MODE (WEB SCANNING OR LEVEL WIND)

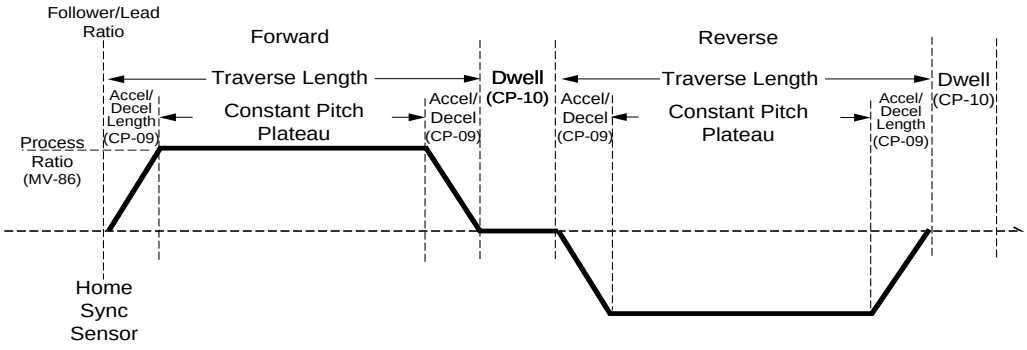
The M–Traverse is specifically designed for the precise control of reciprocating lead/follower motion control applications. Its primary mode of operation is the Follower mode. The Run input (J4, pins 6,7) activates the Follower mode when the following conditions have already been established:

- The Control Mode (CP-14) is set to the Follower mode:
  "1" for Standard.
  "3" for Lay Adjusted.
- The M–Traverse is either in F-Stop or a position hold state.
- The Follower mechanism is within the At-Home Band (CP-30).
- MV-58 displays "0", indicating that there is a valid Follower profile.

When the Follower mode has been activated, the Follower mechanism will begin to move from "Home" in a forward direction (toward the Forward Limit). As the Follower mechanism travels along the Traverse Length (CP-02, CP-04, CP-06, or CP-08), it accelerates for the specified Accel/Decel Length (CP-09) then travels the constant pitch plateau at the Process Ratio (MV-86). At the end of the constant pitch plateau, the Follower mechanism decelerates the specified Accel/Decel Length (CP-09) to Dwell (CP-10). The Follower mechanism remains at zero speed for the specified Dwell then repeats the same profile in reverse. If the Wait input (J4, pins 7, 8) is shorted to common (low) the Follower mechanism will pause at the closest end of the profile until the Wait input is open (high). The Drive Enable discrete output is active during the Follower mode.

Caution: To avoid damage to your system, the M–Traverse must be calibrated and the motor drive set up before you enter the Follower mode. Refer to *Installation/ Setup: Calibration.*

The following diagram illustrates the Follower profile:



HOME SET

Home Set is one of two ways in which you can establish “Home” (Home Seek is the other way). When the Home Set input is closed, it sets the current position of the Follower mechanism as “Home”. Home Set will establish “Home” at any arbitrary position that you choose. You can use the Jog input to position the Follower mechanism or you can position it manually.

Home Set enables the Drive Enable logic output, which allows the Follower mechanism to hold its position at “Home” despite any outside force (such as gravity). The Home Set is a momentary input that is edge triggered and is activated through the Home Set input (J3, pin 14,16).

NOTE: “Home” must be established before the Follower mode can be used. “Home” is identified by a Follower position of zero. In the Follower mode, “Home” is the position from which the profile traverses in the Forward direction.

HOME SEEK

Home Seek also establishes “Home”. Home Seek finds and sets “Home” by locating the Home Sync Sensor. When the Home Seek input is closed, the Follower mechanism makes a profiled move at jog speed, until it aligns with the Home Sync sensor, which then becomes “Home”.

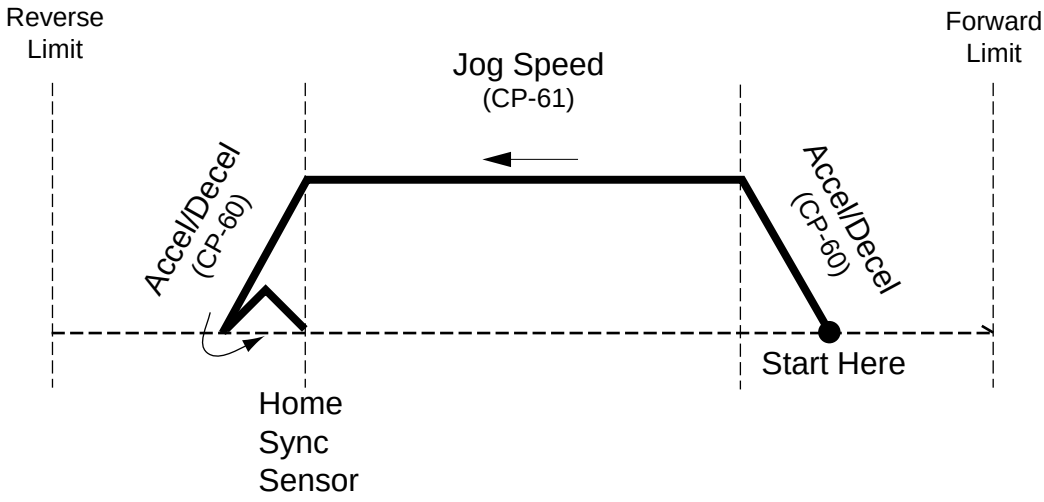
Home Seek enables the Drive Enable logic output, which allows the Follower mechanism to hold its position at “Home” despite any outside force (such as gravity). Home Seek is a momentary input that is edge triggered and is activated through the Home Seek input (J4, pin 1, 2). Home Seek is internally latched and does not need to be maintained by an operator device.

NOTE: “Home” must be established before the Follower mode can be used. “Home” is identified by a Follower position of zero. In the Follower mode, “Home” is the position from which the profile traverses in the Forward direction.

Home Seek will always begin to move the Follower mechanism in the reverse direction (towards the reverse limit). When Home Seek locates the Home Sync sensor, it ramps down at the Accel/Decel rate (CP-60) to zero. This causes the Follower mechanism to overshoot the Home Sync sensor and the M–Traverse compensates with a triangulated forward Accel/Decel move that aligns the Follower mechanism with the Home Sync sensor. There are a variety of profile possibilities, since Home Seek can find home from any position on the traverse length. The following examples will illustrate four possible Home Seek profiles.

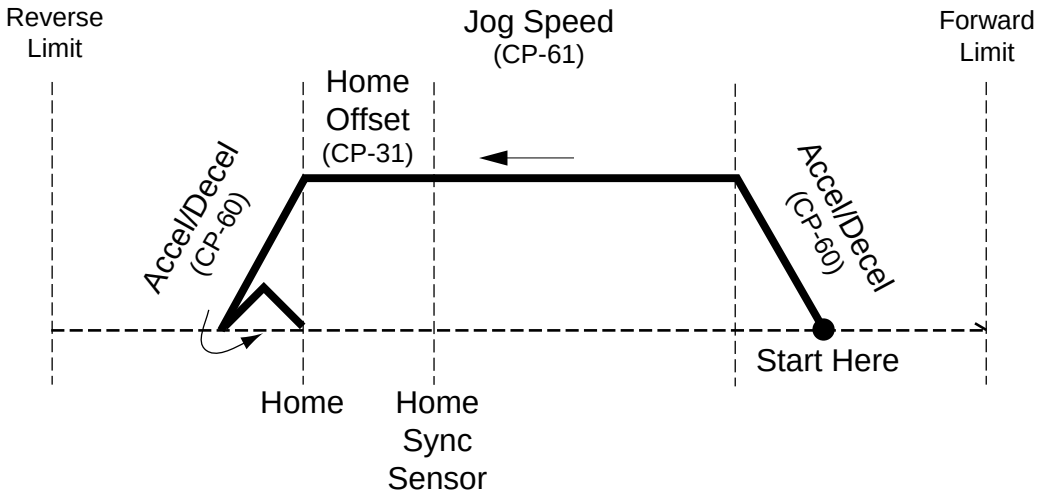
Example of an Edge Based Profile with no Home Offset.

Home Seek moves the Follower mechanism in the reverse direction (toward the reverse limit). When Home Seek locates the Home Sync sensor, it ramps down at the Accel/Decel (CP-60) rate to zero. This causes the Follower mechanism to overshoot the Home Sync sensor and the M–Traverse compensates with a forward, triangulated Accel/Decel move that aligns the Follower mechanism with the Home Sync sensor. This profile is used in both web scan and level wind applications.



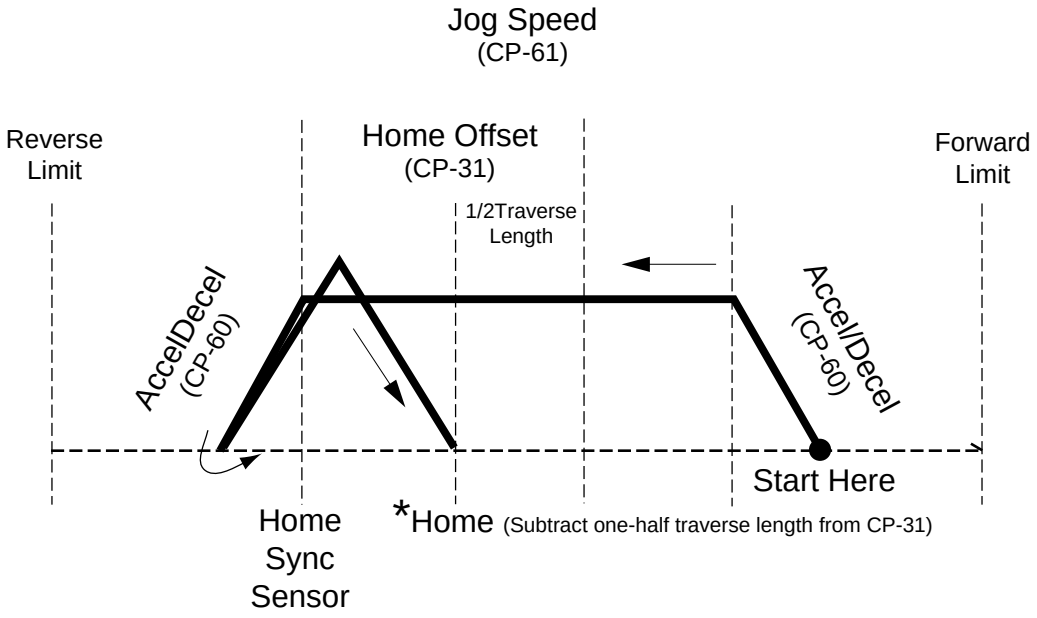
Example of an Edge Based Profile with Home Offset.

Home Seek moves the Follower mechanism in the reverse direction, bypasses the Home Sync sensor, and establishes “Home” at the Home Offset position. The Home Offset position is measured in E.U.s and is the length away from the Home Sync sensor that has been specified in the Home Offset (CP-31) parameter. When Home Seek locates the Home Offset position, it ramps down at the Accel/Decel rate (CP-60) to zero. This causes the Follower mechanism to overshoot the Home Offset position**.** The M–Traverse compensates by continuing Home Seek in a forward, triangulated Accel/ Decel move that aligns the Follower mechanism with the Home Offset and establishes “Home” . This profile is commonly used for applications that can not establish “Home” at the Home Sync sensor because of interference (e.g., the physical edge of the reel or a bracket that is in the way). This profile is used in both web scan and level wind applications.



Example of a Center Based Profile with Home Offset.

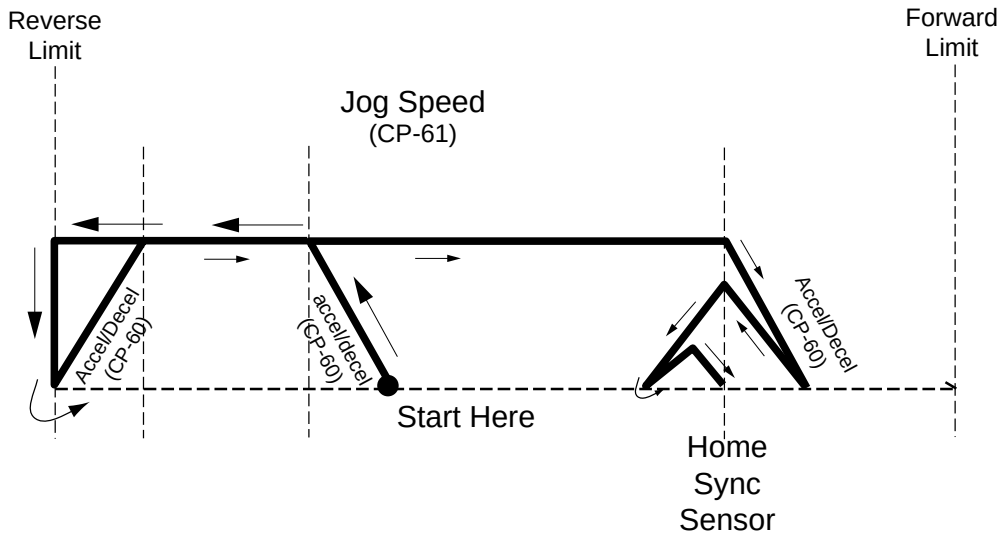
Home Seek moves the Follower mechanism in the reverse direction, detects the Home Sync sensor, then ramps down at the Accel/Decel rate (CP-60) to zero. Then the M–Traverse makes a forward, triangulated move (in the forward direction) to the "Home" position. The M–Traverse uses Home Sync as the starting point and determines the "Home" position by subtracting is one-half of the Traverse Length from Home Offset (CP-31).



Example of an Edge Based Profile with Reverse Rebound.

Home Seek moves the Follower mechanism in the reverse direction. Home Seek reaches the Reverse Limit without detecting the Home Sync sensor and immediately stops. Home Seek moves the Follower mechanism in the forward direction (toward the Forward Limit). When Home Seek locates the Home Sync sensor, it ramps down at the Accel/Decel rate (CP-60) to zero. This causes the Follower mechanism to overshoot the Home Sync sensor. The M–Traverse compensates by reactivating Home Seek in the reverse direction, then a forward, triangulated Accel/Decel move that aligns the Follower mechanism with the Home Sync senor. This profile is used in both web scan and level wind applications.

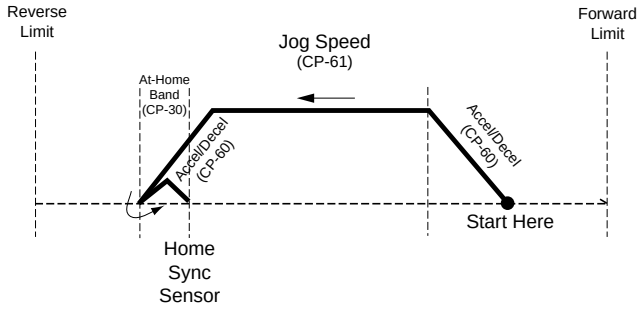
Note : If Home Seek does not detect the Home Sync sensor by the time it reaches the Forward Limit, the M–Traverse automatically shuts the system off (F-Stop).



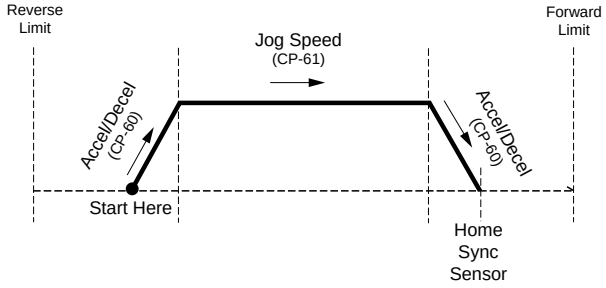
HOME RETURN

If “Home” has been established through either Home Set or Home Seek, then Home Return can return the Follower mechanism to “Home”. When the Home Return input is closed, the Follower mechanism makes a profiled move at jog speed until it aligns with “Home”.

The Follower mechanism will move toward “Home”, in either the reverse or forward direction, depending on which direction is closer to “Home”. When the Follower mechanism travels in the reverse direction to locate “Home”, it ramps down at the Accel/Decel rate (CP-60) to zero. This causes the Follower mechanism to overshoot the Home Sync sensor by a distance that is equal to the At-Home Band (CP-30). The M–Traverse compensates with a forward, triangulated Accel/Decel move that aligns the Follower mechanism with “Home”.



When the Follower mechanism travels in the forward direction to locate “Home”, it decelerates directly down to the “Home” position from a predetermined position that ramps the Follower directly to the “Home” position.



Home Return enables the Drive Enable logic output, which allows the Follower mechanism to hold its position at “Home” despite any outside force (such as gravity). The Home Return is a momentary input that is edge triggered and is activated through the Home Return input (J4, pin 3, 4). Home Seek is internally latched and does not need to be maintained by an operator device.

DIRECT MODE

The Direct mode is used to calibrate and troubleshoot the M–Traverse. In the Direct mode of operation, you can set the Speed Command Out from the M–Traverse that is connected to the motor drive, directly. The Direct mode is an open-loop mode of operation. Therefore, Scaling, Acceleration/Deceleration, and closed loop compensation (PI) software are not involved in the Direct mode.

The Direct mode is used in conjunction with the Run and F-Stop controls. The Run input (J4, pins 6,7) activates the Direct mode when the Control Mode (CP-14) parameter has been set to “2” (enable Direct mode). When the Direct mode has been activated, the analog output level goes immediately to the DAC bits specified in the Direct Analog Command (CP-62). The Direct Analog Command (CP-62) parameter uses the full 12 bit resolution of the analog Speed Command Output. A positive value indicates a forward direction and a negative value indicates a reverse direction. The F-Stop input will move the Speed Command Out to zero immediately.

The Drive Enable logic output is active during Run and deactivated during F-Stop. The Forward and Reverse Limits are also active. If the Follower mechanism encounters a Forward or Reverse Limit, it will immediately stop (F-Stop) and go to zero speed with no deceleration. The Follower mechanism can be moved away from either limit by any control mode that move the Follower mechanism in the opposite direction from the limit. All of the setpoint, Run and F-Stop changes will occur without the Accel/Decel ramps.

Caution: To avoid damage to your system, the M–Traverse must be calibrated and the motor drive set up before you enter the Direct mode. Refer to *Installation/Setup: Calibration.*

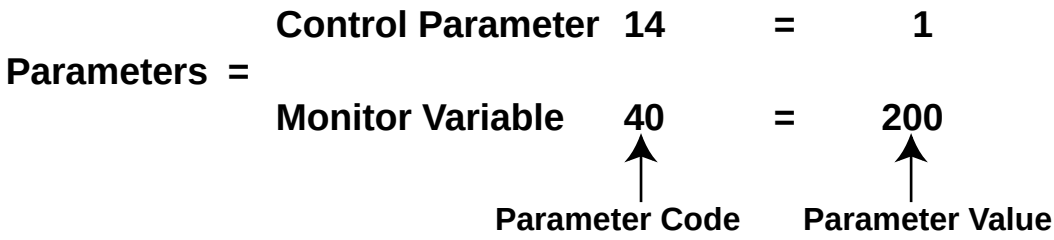
JOG

Jog is used in conjunction with Home Set to move the Follower mechanism to “Home”. Jog can also be used when you need brief bursts of speed to align the Follower mechanism. When you activate Jog, the RPMs increase at the acceleration rate that you specified in Acceleration/Deceleration (CP-60) until the Jog Setpoint (CP-61) is achieved. When Jog is terminated, the RPMs return to zero immediately, with no deceleration. The Jog direction is determined by the Jog Forward/Reverse Input (J4, pins 15,16), which controls the direction of the Speed Command Output. The Drive Enable logic output is active during the Jog mode.

Jog (J4, pins 16,17) is a maintained input. When the Jog input is closed, the M–Traverse sends a Speed Command Out signal to the drive at the selected jog speed. As a maintained input, Jog is only active when the operator device is closed.

MONITOR VARIABLES

Parameters are divided into two classifications; Control Parameters (CP) and Monitor Variable (MV). The numbered code that represents the parameter is the Parameter Code. The operational data is the parameter's value.



This section is about Monitor Variables. Control Parameters are explained in *Operation: Control Parameters.*

The M–Traverse has a number of Monitor Variables (MVs) that monitor the performance of the M–Traverse and your system, help you troubleshoot for problems, and confirm the wiring and tuning. MVs can be accessed at any time during the M–Traverse's operation, including during Run, Jog, and F–Stop.

Note: Monitor Variables are status indicators only - you can not directly affect an MV.

There are four categories of Monitor Variables:

Input Monitoring
Output Monitoring
Performance Monitoring
Status Monitoring

In the sections that follow, the Monitor Variables are listed according to these categories.

INPUT MONITORING

These MVs monitor the M–Traverse's inputs.

MV-41 LEAD FREQUENCY

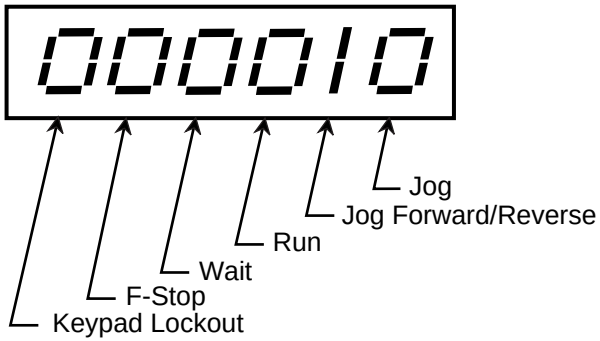
The Lead Frequency displays the frequency of the Lead Frequency Input (J3, pin 3, 4, 5) in hertz (pulses per second). MV-41 is averaged; it is the 250 millisecond frequency calculation prior to the display update.

MV-42 FEEDBACK FREQUENCY

The Feedback Frequency displays the frequency of the Feedback Frequency Input (J3, pin 7, 8, 9) in hertz (pulses per second). MV-42 is averaged; it is the 250 millisecond frequency calculation prior to the display update.

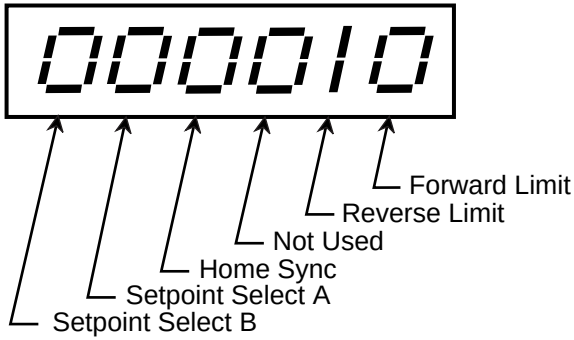
MV-53 DISCRETE INPUTS - GROUP A

The Discrete Inputs - Group A displays the status of the Jog, Jog Forward/Reverse, Run, Wait, F-Stop, and Keypad Lockout discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Jog Forward/Reverse” is the open or logic high level.



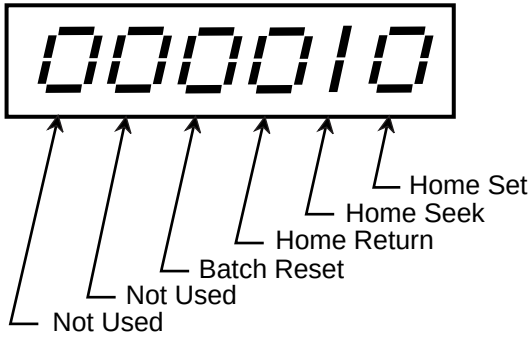
MV-54 DISCRETE INPUTS - GROUP B

The Discrete Inputs - Group B displays the status of the Forward Limit, Reverse Limit, Home Sync, Setpoint Select A and Setpoint Select B discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Reverse Limit” is the open or logic high level.



MV-55 DISCRETE INPUTS - GROUP C

The Discrete Inputs - Group C displays the status of the Home Set, Home Seek, Home Return, and Batch Reset discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Home Seek” is the open or logic high level.



OUTPUT MONITORING

These MVs monitor the M–Traverse's outputs.

MV-47 DAC OUTPUT

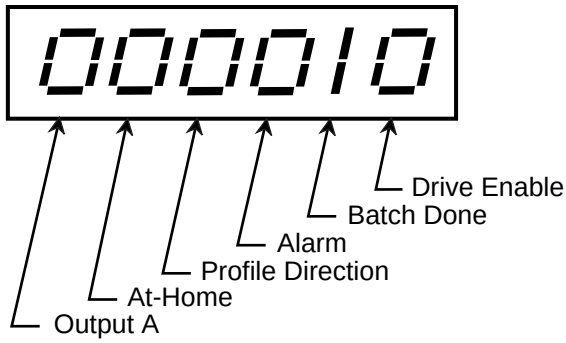
The DAC Output displays the present level of the analog speed command output to the motor drive. The DAC output displays in DAC bits. A value of 4095 indicates a 100% positive output and a value of -4095 indicates a 100% negative output.

MV-48 TRIM OUTPUT

The Trim Output is the calculated output of the compensation algorithm (gain plus integral). This value is displays in DAC bits. A value of 4095 indicates a 100% positive output and a value of -4095 indicates a 100% negative output.

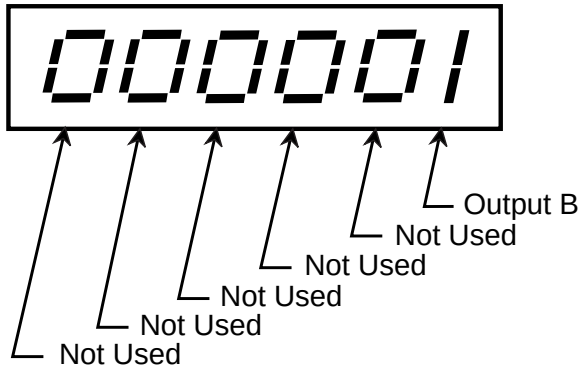
MV-56 DISCRETE OUTPUTS - GROUP A

The Discrete Output - Group A displays the status of the Drive Enable, Batch Done, Alarm, Profile Direction, At-Home and Output A discrete outputs. The number “1” indicates an inactive or de-energized (logic high) level. The number “0” indicates an active or energized (logic low) level. In the example below, “Batch Done” is the inactive or de-energized (logic high) level.



MV-57 DISCRETE OUTPUTS - GROUP B

The Discrete Outputs - Group B displays the status of the Output B discrete outputs. The number “1” indicates an inactive or de-energized (logic high) level. The number “0” indicates an active or energized (logic low) level. In the example below, “Output B” is the inactive or de-energized (logic high) level.



PERFORMANCE MONITORING

Performance Monitor Variables monitor the performance of the M–Traverse and your system. Figure 3-2 is a block diagram of the internal control structure of the M–Traverse and the Performance Monitor Variables.

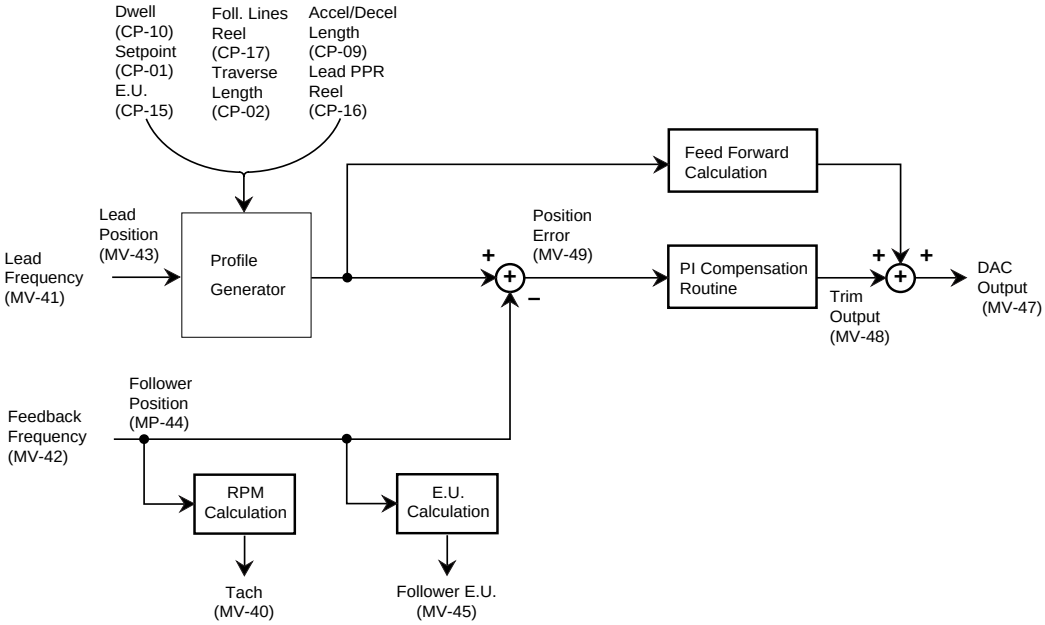


Figure 3-2 M–Traverse Internal Structure

MV-40 TACH (FEEDBACK VELOCITY)

Tach is the feedback (Follower) displayed in RPMs. The feedback is read by the M–Traverse every 250 microseconds. The readings are summed, averaged and then displayed every 250 milliseconds.

MV-43 LEAD POSITION

The Lead Position displays the distance of the Lead relative to the beginning of the profile. This value is displayed in encoder lines.

MV-44 FOLLOWER POSITION

The Follower Position displays the distance of the Follower relative to the “Home” position. This value is displayed in encoder lines.

MV-45 FOLLOWER POSITION - E.U.s

The Follower Position - E.U.s parameter converts the Follower Position (CP-44) into Engineering Units.

MV-46 PRODUCT RATE

The M–Traverse calculates the cycle time for the last completed profile (in each direction) and uses this to determine the Product Rate in profiles (layers) per minute.

MV-49 POSITION ERROR

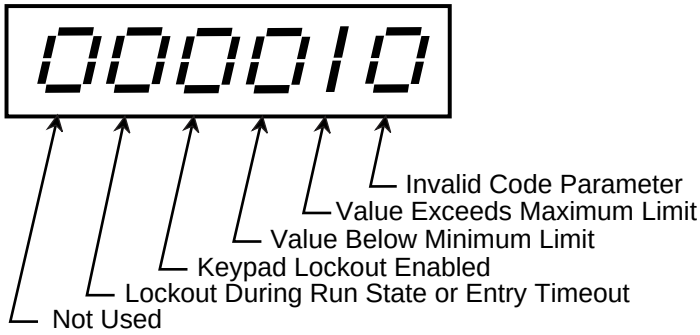
The Position Error displays the difference between the current Follower position and the commanded Follower position. It displays in Follower encoder lines. A positive value indicates that the Follower is behind the commanded position (lagging) and a negative value indicates that the Follower is ahead of the commanded position (leading).

STATUS MONITORING

These MVs monitor the status of the M–Traverse's modes of operation and operating states.

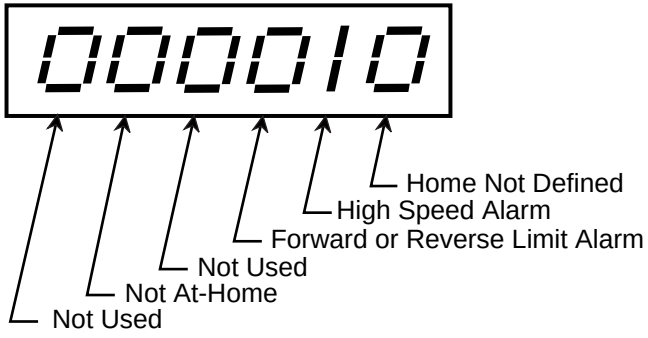
MV-50 KEYPAD ERROR

If a Control Parameter entry has been rejected, Keypad Errors will display the reason that it was rejected. The digit that displays a number “1” is the error. In the example below, “Value Exceeds Maximum Limit” is the error.



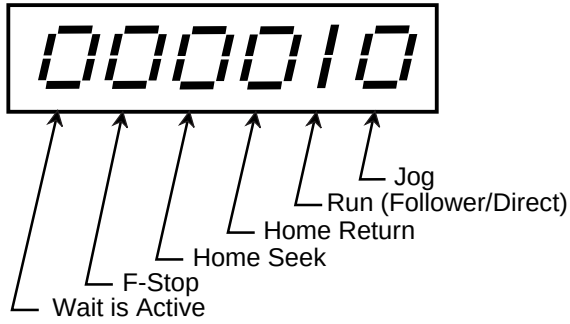
MV-51 ALARM STATUS

The digit that displays a number “1” is the active Alarm. In the example below, “High Speed Alarm ” is the active alarm.



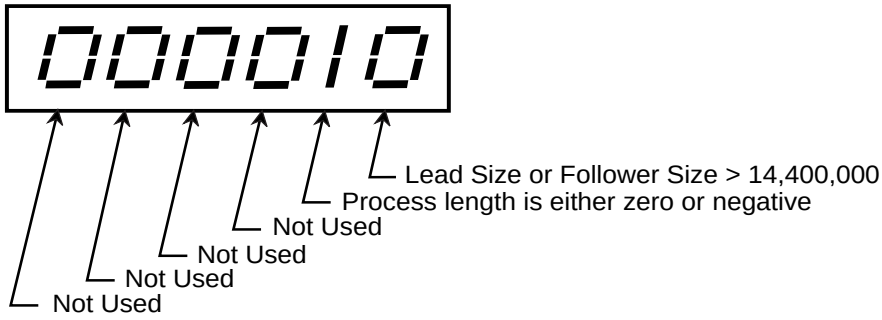
MV-52 CONTROL STATE

The digit that displays a number “1” is the active control state of the M–Traverse. In the example below, “Run” is the active control state.



MV-58 INVALID PROFILE

If a profile entry has been rejected, the Invalid Profile parameter will display the reason that it was rejected. The M–Traverse will not allow your system to enter "Run" if there is an invalid profile. The digit that displays a number “1” is the error. In the example below, “The process length is zero or negative” is the error.



MV-59 LINE NOTCH COUNTER

The Line Notch Counter parameter checks the integrity of the AC line. Notches on the line are caused by inductive loads (e.g., motors, contactors) which cause the counter to increment if the AC line is too low (soft). The Line Notch Counter displays the number of line notches that have occurred on the AC line.

MV-80 LEAD JOB SIZE

The Lead Job Size displays the total Lead encoder lines that are registered for the most recent job cycle.

MV-81 FOLLOWER JOB SIZE

The Follower Job Size displays the total Follower encoder lines registered for the forward direction of the profile.

MV-84 FOLLOWER PROFILE LENGTH

The Follower Profile Length displays the calculated number of forward encoder lines for the profile.

MV-86 PROCESS RATIO

The M–Traverse calculates and displays the commanded ratio of the Follower Frequency to the Lead Frequency. The commanded ratio is used during the constant pitch plateau segment of the profile.

MV-87 PROFILE RATIO

The M–Traverse displays the current commanded Follower to Lead ratio for the immediate operation during the in-line profile execution. MV-87 and MV-86 will be the same value during the constant pitch plateau segment of the profile.

MV-89 BATCH COUNT

The M–Traverse calculates and displays the number of completed batch counts (profile completion).

SERIAL COMMUNICATIONS

The M–Traverse can interface with a host computer through a RS422 Serial Communications Interface. This interface allows the host computer to perform remote Control Parameter entry, status or performance monitoring, and remote control of the M-Traverse. Refer to *"Using Serial Communications"* in this section.

If you are using the M-Host software, your communications network is user ready and does not require any software programming. If you are designing your own software, refer to *"Communications Software Design"* in this section. Once the software is installed, you are ready to establish a link through the Serial Communications Interface.

USING SERIAL COMMUNICATIONS

This section describes how to use the Serial Communications. Before you can apply this section, the M–Traverse must be interfaced with a host computer through a RS422 Serial Communications Interface. The host computer must have the M-Host software or its equivalent installed.

The M–Traverse comes factory pre-loaded with default Serial Communications Setup Control Parameters. These Control Parameters set up the M–Traverse to accommodate the RS422 Serial Communications Interface. Generally, the default settings are suitable for most applications and do not require modification. The factory default Serial Communications Setup Control Parameters are found in Appendix E. When communications have been established through the host computer, these default parameters can be modified, using the Serial Communications Interface.

CP-70 DEVICE ADDRESS

The M–Traverse has an access address which can be set from 1 to 32. Each individual M–Traverse on a multidrop RS422 communications link needs a unique Device Address. The address “00” will be globally accepted by all of the M–Series Controls on the communications link, however, they will not send a response message back to the host computer when this global address is used.

CP-71 BAUD RATE

There are six different baud rates (data rates) for the M–Traverse. Enter the number, for the required rate, as listed below.

1 = 300 Baud
2 = 600 Baud
3 = 1200 Baud
4 = 2400 Baud
5 = 4800 Baud
6 = 9600 Baud

CP-72 CHARACTER FORMAT

The M–Traverse uses three different character formats. Enter the number for the required format, as listed below.

1 = 8 Data Bits, No Parity, One Stop Bit
2 = 7 Data Bits, Even Parity, One Stop Bit
3 = 8 Data Bits, No Parity, Two Stop Bits

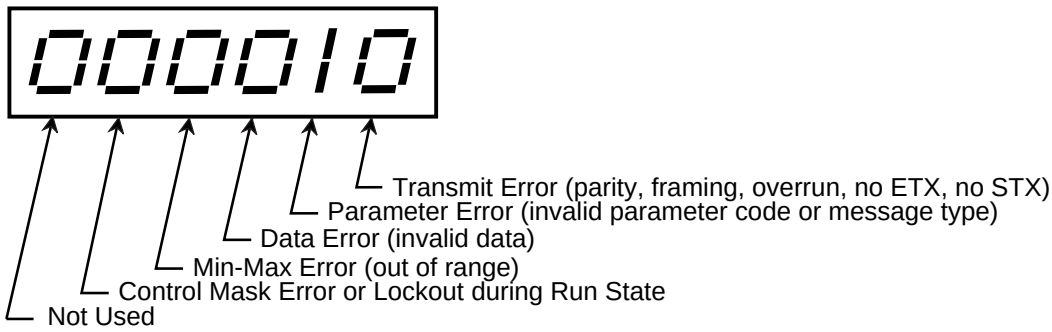
CP-73 CONTROL MASK

The Serial Communications can control some of the dicrete input functions. Enter the number for the required functions, as listed below.

0 = F–Stop only
1 = F–Stop, Run, Home Return, Home Seek, Home Set
2 = F–Stop, Batch Reset, Setpoint Select 1-4
3 = All of the Above

MV-74 COMMUNICATIONS ERROR

Serial Communications Error identifies errors in the last transmitted message that was sent to the M–Traverse by the host computer. The digit that displays a number “1” indicates the error. In the example below, “Invalid Parameter Code” is the error.



COMMUNICATIONS SOFTWARE DESIGN

The M–Traverse Serial Communications Interface uses a polling technique to establish a link with the host computer. All of the Control Parameters and Monitor Variables that are accessible through the M–Traverse's front panel keypad are also accessible through the Serial Communications Interface. The host computer sends a sixteen character record to the M–Traverse to establish the link and the M–Traverse responds with either a conformation or an error message. Once the M–Traverse responds, the host computer can send additional transmissions.

All of the M-Traverse's messages use the USA Standard Code for Information Interchange (ASCII). The host computer sends three types of messages;

Parameter Send - To change CPs.
Control Command Send - To control operating functions.
Data Inquiry - To monitor CPs and MVs.

These three message types, their character level descriptions in binary and ASCII, as well as the M–Traverse's response, are outlined in the sections that follow.

Parameter Send

Use the Parameter Send to change any of the M–Traverse's Control Parameters.

Table 3-38 Parameter Send - Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	MSG Type	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	3	0-9	0-9	0	0	0-9	0-9	0-9	0-9	0-9	0-9	0-;	ETX

The following is a description of the Parameter Send-Host Transmission Characters.

Character 1 - STX:

This is the first character in the character string. None of the other characters will be recognized without this character prefix. Always use the ASCII “STX” character to enable the M–Traverse's receive buffer.

Characters 2, 3 - Device Number:

These characters are the access address of the M–Traverse. This number identifies individual M–Traverses on a multidrop system. The M–Traverse will accept data only if this number matches the M–Traverse's address (CP-70), with the exception of a “00” address. The “00” address is universally accepted by all M–Traverses that are on the RS422 Serial Communications Interface.

Character 4 - Message Type:

This character should always be “3”.

Character 5, 6 - Parameter Number:

These characters identify the Control Parameter that you want to change (i.e., “16” = CP-16).

Characters 7 through 14 - DATA:

These characters transmit the new value for a Control Parameter that you want to change. The Data must be within the range specified in Appendix E. Characters 7 and 8 should always be "0" and are only used with the data inquiry response.

Character 15 - Data Format:

Character 15 indicates the decimal location and polarity of the data that was transmitted in characters 7 through 14.

Use the following codes to indicate decimal location and polarity:

Code	Format
0	+XXXXXX
1	+XXXXX.X
2	+XXXX.XX
3	+XXX.XXX
4	+XX.XXXX
5	+X.XXXXX
6	-XXXXXX.
7	-XXXXX.X
8	-XXXX.XX
9	-XXX.XXX
:	-XX.XXXX
;	-X.XXXXX.

Character 16 - ETX:

Always use the ASCII “ETX” character to terminate the record.

Example of Parameter Send:

A new Acceleration Time of 52.3 seconds is sent to the M–Traverse at address 4.

ASCII character string: “STX0436000005230ETX”

Note: The character string has no spaces between the characters.

Table 3-39 Parameter Send - M–Traverse Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	Error Code	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	@—	0-9	0-9	0-9	0-9	0-9	0-9	0 -9	0-9	0-9	0-9	0-;	ETX

The following is a description of the Parameter Send-M–Traverse Response Characters.

Character 1 - STX:

This is the first character in the character string.

Characters 2, 3 - Device Number:

This is the two character access address for the M–Traverse.

Character 4 - Error Code:

If there are errors in the transmission that the M–Traverse receives from the host computer, the Error Code will display them. Use Table 3-42 to convert the ASCII code to binary. Then the binary code can be decoded as follows:

Bit 7 Always “0”.
Bit 6 Always “1”.
Bit 5 Always “0”.
Bit 4 1 = Control Mask Error / Lockout during Run state.
Bit 3 1 = Minimum / Maximum Error (out of range).
Bit 2 1 = Data Error (invalid data).
Bit 1 1 = Parameter Error (invalid parameter or message type).
Bit 0 1 = Transmit Error (parity, framing, overrun, no STX or no ETX).

Note: The M–Traverse will only accept data if there are no errors. The ASCII error code “@” (Binary code “1000000”) indicates that the Host Transmission contains no errors. Also see MV-74 for the ASCII Error Code for the last Response Message.

Characters 5,6 - Parameter Number:

The Control Parameter Code is sent back to the host computer from the M–Traverse.

Characters 7 through 14 - DATA:

The Control Parameter Data is sent back to the host computer from the M–Traverse.

Character 15 - Data Format:

The Data Format is sent back to the host computer from the M–Traverse.

Character 16 - ETX:

The return message is always terminated with the ASCII “ETX” character.

Control Command Send

The Control Command Send allows the host computer to control the operating functions of the M-Traverse that are associated with the Logic inputs (F-Stop, Run, Home Return, Home Seek, Home Set, Batch Reset and Setpoint Select).

Table 3-40 Control Command Send - Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	MSG Type	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	1	0	0	0	0	0	0	0	0	0-9	0-9	0	ETX

The following is a description of the Control Command Send - Host Transmission.

Character 1 - STX:

This is the first character in the character string. None of the other characters will be recognized without this character prefix. Always use the ASCII “STX” character to enable the M–Traverse's receive buffer.

Characters 2, 3 - Device Number:

These characters are the access address of the M–Traverse. This number identifies individual M–Traverses on a multidrop system. The M–Traverse will accept data only if this number matches the M–Traverse's address (CP-70), with the exception of a “00” address. The “00” address is universally accepted by all M–Traverses that are on the RS422 Serial Communications Interface.

Character 4 - Message Type:

This character should always be “1”.

Characters 5,6 - Parameter Number:

These characters should always be “0”.

Characters 7 through 12 - DATA:

These characters should always be “0”.

Characters 13,14- DATA:

01	F-Stop
02	Not in Use
03	Run
04	Home Return
05	Home Seek
06	Home Set
07	Batch Reset
08	Setpoint Select 1
09	Setpoint Select 2
10	Setpoint Select 3
11	Setpoint Select 4
12	Not in Use
13	Not in Use
14	Not in Use
15	Not in Use

Character 15 - Data Format:

This character should always be “0”.

Character 16 - ETX:

Always use the ASCII “ETX” character to terminate the character string.

Table 3-41 Control Command Send - M–Traverse Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	Error Code	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	@—	0	0	0	0	0	0	0	0	0-9	0-9	0	ETX

The following is a description of the Control Command Send-M–Traverse Response Characters.

Character 1 - STX:

This is the first character in the character string.

Characters 2, 3 - Device Number:

This is the two character access address for the M–Traverse.

Character 4 - Error Code:

If there are errors in the transmission that the M–Traverse receives from the host computer, the Error Code will display them. Use Table 3-42 to convert the ASCII code to binary. Then, the binary code can be decoded as follows:

Bit 7 Always “0”.
Bit 6 Always “1”.
Bit 5 Always “0”.
Bit 4 1 = Control Mask Error / Lockout during Run state.
Bit 3 1 = Minimum / Maximum Error (out of range).
Bit 2 1 = Data Error (invalid data).
Bit 1 1 = Parameter Error (invalid parameter or message type).
Bit 0 1 = Transmit Error (parity, framing, overrun, no STX or no ETX).

Note: The M–Traverse will only accept data if there are no errors. The ASCII error code “@” (Binary code “1000000”) indicates that the Host Transmission contains no errors. Also see MV-74 for the ASCII Error Code for the last Response Message.

Characters 5,6 - Parameter Number:

These characters will always be “0”.

Characters 7 through 12 - DATA:

These characters will always be “0”.

Characters 13,14 - DATA:

The command function of the message that was received, is returned.

Character 15 - Data Format:

This character will always be “0”.

Character 16 - ETX:

The return message is always terminated with the ASCII “ETX” character.

Data Inquiry

Use the Data Inquiry to request the current value for Parameters (i.e., Control Parameters or Monitor Variables).

Table 3-42 Data Inquiry - Host Transmission

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	MSG Type	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	2	0-9	0-9	0	0	0	0	0	0	0	0	0	ETX

The following is a description of the Data Inquiry - Host Transmission Characters.

Character 1 - STX:

This is the first character in the character string. None of the other characters will be recognized without this character prefix. Always use the ASCII “STX” character to enable the M–Traverse's receive buffer.

Characters 2, 3 - Device Number:

These characters are the access address of the M–Traverse. This number identifies individual M–Traverses on a multidrop system. The M–Traverse will accept data only if this number matches the M–Traverse's address (CP-70), with the exception of a “00” address. The “00” address is universally accepted by all M–Traverses that are on the RS422 Serial Communications Interface.

Character 4 - Message Type:

This character should always be “2”.

Characters 5,6 - Parameter Number:

This is the Control Parameter Code (i.e., enter “16” for CP–16).

Characters 7 through 14 - DATA:

These characters should always be “0”.

Character 15 - Data Format:

This character should always be “0”.

Character 16 - ETX:

Always use the ASCII “ETX” character to terminate the character string.

Table 3-43 Data Inquiry - M–Traverse Response

Character #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DESC	STX	Dev# 10s	Dev# 1s	Error Code	Par# 10s	Par# 1s	Data 10mil	Data 1mil	Data 100th	Data 10th	Data 1th	Data 100s	Data 10s	Data 1s	Data Format	ETX
ASCII	STX	0-9	0-9	@—	0-9	0-9	0-9	0-9	0-9	0-9	0 -9	0-9	0-9	0-9	0-;	ETX

The following is a description of the Data Inquiry-M–Traverse Response Characters.

Character 1 - STX:

This is the first character in the character string.

Characters 2, 3 Device Number:

This is the two character access address for the M–Traverse.

Character 4 -Error Code:

If there are errors in the transmission that the M–Traverse receives from the host computer, the Error Code will display them. Use Table 3-42 to convert the ASCII code to binary. Then the binary code can be decoded as follows:

Bit 7 Always “0”.
Bit 6 Always “1”.
Bit 5 Always “0”.
Bit 4 1 = Control Mask Error / Lockout during Run state.
Bit 3 1 = Minimum / Maximum Error (out of range).
Bit 2 1 = Data Error (invalid data).
Bit 1 1 = Parameter Error (invalid parameter or message type).
Bit 0 1 = Transmit Error (parity, framing, overrun, no STX or no ETX).

Note: The M–Traverse will only accept data if there are no errors. The ASCII error code “@” (Binary code “1000000”) indicates that the Host Transmission contains no errors. Also see MV-74 for the ASCII Error Code for the last Response Message.

Characters 5,6 - Parameter Number:

The Control Parameter Code is sent back to the host computer from the M–Traverse.

Characters 7 through 14 - DATA:

The Control Parameter or Monitor Variable data that was requested is sent back to the host computer from the M–Traverse.

For an interpretation of the MV-50 through MV-56 data, refer to Table 3-43. For the ASCII to binary conversion, refer to Table 3-42.

Character 15 - Data Format:

Character 15 indicates the decimal location and polarity of the data that was transmitted in characters 7 through 14.

Use the following codes to indicate decimal location and polarity:

Code	Format
0	+XXXXXX
1	+XXXXX.X
2	+XXXX.XX
3	+XXX.XXX
4	+XX.XXXX
5	+X.XXXXX
6	-XXXXXX.
7	-XXXXX.X
8	-XXXX.XX
9	-XXX.XXX
:	-XX.XXXX
;	-X.XXXXX.

Character 16 - ETX:

The return message is always terminated with the ASCII “ETX” character.

Table 3-44 ASCII to Binary

ASCII	Binary Bit 7 Bit 1	ASCII	Binary Bit 7 Bit 1	ASCII	Binary Bit 7 Bit 1	ASCII	Binary Bit 7 Bit 1
NUL	0000000	SP	0100000	@	1000000	'	1100000
SOH	0000001	!	0100001	A	1000001	a	1100001
STX	0000010	"	0100010	B	1000010	b	1100010
ETX	0000011	#	0100011	C	1000011	c	1100011
EOT	0000100	$	0100100	D	1000100	d	1100100
ENQ	0000101	%	0100101	E	1000101	e	1100101
ACK	0000110	&	0100110	F	1000110	f	1100110
BEL	0000111	'	0100111	G	1000111	g	1100111
BS	0001000	(	0101000	H	1001000	h	1101000
HT	0001001	)	0101001	I	1001001	i	1101001
LF	0001010	*	0101010	J	1001010	j	1101010
VT	0001011	+	0101011	K	1001011	k	1101011
FF	0001100	,	0101100	L	1001100	l	1101100
CR	0001101	-	0101101	M	1001101	m	1101101
SO	0001110	.	0101110	N	1001110	n	1101110
SI	0001111	/	0101111	O	1001111	o	1101111
DLE	0010000	0	0110000	P	1010000	p	1110000
DC1	0010001	1	0110001	Q	1010001	q	1110001
DC2	0010010	2	0110010	R	1010010	r	1110010
DC3	0010011	3	0110011	S	1010011	s	1110011
DC4	0010100	4	0110100	T	1010100	t	1110100
NAK	0010101	5	0110101	U	1010101	u	1110101
SYN	0010110	6	0110110	V	1010110	v	1110110
ETB	0010111	7	0110111	W	1010111	w	1110111
CAN	0011000	8	0111000	X	1011000	x	1111000
EM	0011001	9	0111001	Y	1011001	y	1111001
SUB	0011010	:	0111010	Z	1011010	z	1111010
ESC	0011011	;	0111011	[	1011011	{	1111011
FS	0011100	<	0111100	\	1011100	|	1111100
GS	0011101	=	0111101	]	1011101	}	1111101
RS	0011110	>	0111110	^	1011110	~	1111110
US	0011111	?	0111111	–	1011111	DEL	1111111

Position on Binary Code String	Monitor Parameters and Corresponding Binary Numbers													
	MV-51		MV-52		MV-53		MV-54		MV-55		MV-56		MV-57	
	0	1	0	1	0	1	0	1	0	1	0	1	0	1
0	Home is Defined	Home Not Defined	Jog Inactive	Jog Active	Jog Closed	Jog Open	Forward Limit Closed	Forward Limit Open	Home Set Closed	Home Set Open	Drive Enable Active	Drive Enable Inactive	Out B Active	Out B Inactive
1	No Alarm	High Speed Alarm	Run Inactive	Run Active	Jog Forward/ Reverse Closed	Jog Forward/ Reverse Open	Reverse Limit Closed	Reverse Limit Open	Home Seek Closed	Home Seek Open	Batch Done Active	Batch Done Inactive	Not in Use	Not in Use
2	No Limit	Forward/ Reverse Limit	Home Return Inactive	Home Return Active	Run Closed	Run Open	Home Sync Closed	Home Sync Open	Home Return Closed	Home Return Open	Alarm Active	Alarm Inactive	Not in Use	Not in Use
3	Not in Use	Not in Use	Home Seek Inactive	Home Seek Active	Wait Closed	Wait Open	Not in Use	Not in Use	Batch Reset Closed	Batch Reset Open	Profile Direction Reverse	Profile Direction Forward	Not in Use	Not in Use
4	At-Home	Not At-Home	F-Stop Inactive	F-Stop Active	F-Stop Closed	F-Stop Open	Setpt Select A Closed	Setpt Select A Open	Not in Use	Not in Use	At-Home Active	At-Home Inactive	Not in Use	Not in Use
5	Not in Use	Not in Use	Wait Inactive	Wait Active	Keypad Lockout Closed	Keypad Lockout Open	Setpt Select B Closed	Setpt Select B Open	Not in Use	Not in Use	Out A Active	Out A Inactive	Not in Use	Not in Use
6	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use
7	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use	Not in Use

Table 3-45 Binary Monitor Parameters

Troubleshooting

Diagnostics
Troubleshooting
EPROM Chip Replacement

DIAGNOSTICS

This section describes how to use the diagnostic routines to verify that the M–Traverse is operating properly as well as to identify any M–Traverse problems. The diagnostic routines are run independently, with the M–Traverse temporarily disconnected from your system. Begin diagnostics with the Clear/4 test, then run tests 1-10. Use the "Status" key to increment through the tests and the "Tach" key to decrement through the tests.

If you need to verify the integrity of the M–Traverse relative to your system, refer to the *Troubleshooting: Troubleshooting* section. If any of theses tests fail or if the information in this section does not solve your problem, consult:

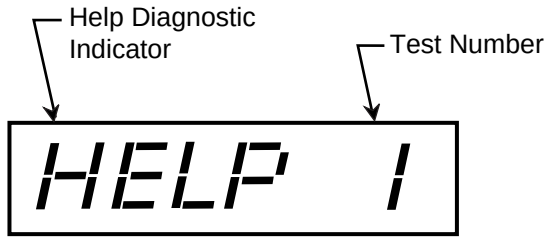
Contrex Technical Support (763) 424-7800 or (800) 342-4411

Clear/4 Test - To Begin Diagnostic Testing

To begin diagnostic testing, turn the M–Traverse off and disconnect it from your system.

Turn the power on the M–Traverse while simultaneously pressing "Clear" and "4" on the keypad.

The M–Traverse defaults to Micro Controller Register File Test #1. The "HELP" diagnostic indicator is visible on the left side of the upper LED display and the number "1" (indicating the test number) is visible on the right side of the upper LED display. If you do not see "HELP" and the number "1," you are not in diagnostics. The example below shows the "HELP" diagnostic indicator and test number "1" on the LED display.



Micro Controller Register File Test #1 - ------To Test the Micro Controller

Clear/4 automatically defaults to the Micro Controller Register File Test #1. "HELP" and the number "1" are visible in the upper LED display. If the panel covering the lower LEDs is closed, open it now.

Press "Enter" to start the test.

If Micro Controller Register File is good, then "PP" is visible in the lower LED display.

If Micro Controller Register File fails, an "EE" is visible in the lower LED display.

The test stops immediately if a failure is detected.

Press "Clear " to remove the "PP" and continue to the next test.
Press "Code Select" only if you want to exit diagnostics.

RAM Test #2 - ------To Test Random Access Memory

To enter this test, press the "Status" key to increment (or the "Tach" key to decrement) until the number "2" is visible on the right side of the upper LED display.

Press "Enter" to start the test.

If RAM is good, then "PP" is visible in the lower LED display.

If RAM fails, an "EE" is visible in the lower LED display.

The test stops immediately if a failure is detected.

Press "Clear " to remove the "PP" and continue to the next test.
Press "Code Select" only if you want to exit diagnostics.

EPROM Test #3 - ------To Test Programmable Read Only Memory

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “3” is visible on the right side of the upper LED display.

Press “Enter” to start the test.

If EPROM is good, then “PP” is visible in the lower LED display.

If EPROM fails, an “EE” is visible in the lower LED display.

Press “Clear ” to remove the “PP” and continue to the next test.
Press “Code Select” only if you want to exit diagnostics.

Display Test #4- To Test Upper and Lower LED Display Panel Segments

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “4” is visible on the right side of the upper LED display.

Press “Enter” to start the test.

NOTE: The M–Traverse will quickly run through all of the display variations. Watch each of the display variations carefully for missing segments. For example, a nine with missing segments could look like a seven. The M–Traverse will display the following:

Upper LED Display	Lower LED Display
0.0.0.0.0.0.	0.0.
1.1. 1.1.1.1.	1.1
2.2.2.2.2.2.	2.2.
3.3.3.3.3.3.	3.3.
4.4.4.4.4.4.	4.4.
5.5.5.5.5.5.	5.5.
6.6.6.6.6.6.	6.6.
7.7.7.7.7.7.	7.7.
8.8.8.8.8.8.	8.8.
9.9.9.9.9.9.	9.9.
–.–.–.–.–.–.	–.–.
E.E.E.E.E.E.	E.E.
H.H.H.H.H.H.	H.H.
L.L.L.L.L.L.	L.L.
P.P.P.P.P.P.	P.P.

. . . . .	. .
0.0.0.0.0.0.	0.0.
1.1.1.1.1.1.	1.1.
2.2.2.2.2.2.	2.2.
3.3.3.3.3.3.	3.3.
4.4.4.4.4.4.	4.4.
5.5.5.5.5.5.	5.5.
6.6.6.6.6.6.	6.6.
7.7.7.7.7.7.	7.7.
8.8.8.8.8.8.	8.8
9.9.9.9.9.9.	9.9.
A.A.A.A.A.A.	A.A.
b.b.b.b.b.b.	b.b.
C.C.C.C.C.C.	C.C.
d.d.d.d.d.d.	d.d.
E.E.E.E.E.E.	E.E.
F.F.F.F.F.F.	F.F.

The lower LED display is blank and the upper LED display defaults back to “Help” and the number “4” after the M–Traverse has completed the display variations.

The M–Traverse automatically exits the test - go to the next test. Press “Code Select” only if you want to exit diagnostics.

Annunciator Test #5- To Test the Discrete LED Indicator Display

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “5” is visible on the right side of the upper LED display.

Press “Enter” to start the test.

If they are functioning properly, the discrete LED indicator displays will illuminate in this order:

Code Select
Status
Tach
Setpoint
Batch Count
Run
Control Enable
Lead Sync
At-Home
Alarm

The M–Traverse automatically exits the test - go to the next test. Press “Code Select” only if you want to exit diagnostics.

Keypad Test #6 - To Test the Keypad

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “6” is visible on the right side of the upper LED display.

Press “Enter” to start the test.

The lower LED display remains blank until you press the keypad keys.

Press each of the keypad keys and verify against the following list:

Press	Display
.	.
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
SETPOINT	10
TACH	11
BATCH COUNT	12
STATUS	13
ENTER	14
CODE SELECT	15
* CLEAR	No display

* If “Clear” is functioning, pressing “Clear” will take you out of the Keypad test and you may go to the next test.

If “Clear” is not functioning, it will not take you out of the test and the number of the prior key (15) will remain on the lower LED display.

Press Clear”, then “Code Select” only if you want to exit diagnostics.

Input Test #7 - To Test the Discrete Inputs

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “7” is visible on the right side of the upper LED display.

Press “Enter” to start the test.

The lower LED display will remain blank unless an input has been shorted to common. If an input has been shorted, it's number will display. For example, if the number four appears in the display, then F–Stop has been shorted. To test an input, short that input and open all of the other inputs.

Input Closure	Display
NOT USED (J3-10)	10
HOME SYNC (J3-12)	11
SETPOINT SELECT A (J3-13)	12
SETPOINT SELECT B (J3-15)	13
HOME SET (J3-16)	14
HOME SEEK (J4-2)	15
HOME RETURN (J4-3)	16
BATCH RESET (J4-5)	17
RUN (J4-6)	02
WAIT (J4-8)	03
F-STOP (J4-9)	04
KEYLOCK (J4-11)	05
FWD LIMIT (J4-12)	06
REV LIMIT (J4-14)	07
JOG FWD/REV (J4-15)	01
JOG (J4-17)	00

Press “Clear” to exit the test.
Press “Code Select” only if you want to exit diagnostics.

Output Test #8 - To Test the Discrete Outputs

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “8” is visible on the right side of the upper LED display.

Only the “Help” diagnostic indicator and the number “8” will be visible on the upper LED display during this test. To run this test, connect the outputs to a pull up resistor and either a meter or LED, or connect the outputs to a relay and either lights or sound.

Press “Enter” to start the test.

Press keys 1 - 7 to activate the outputs.

Press	To Activate
1	Drive Enable
2	Batch Done
3	Alarm
4	Profile Dir.
5	At-Home
6	Output A
7	Output B

Press “Clear” to exit the test.
Press “Code Select” only if you want to exit diagnostics.

Speed Command Out Test #9- To Test the Speed Command Out

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number “9” is visible on the right side of the upper LED display.

Use an oscilloscope to view Speed Command Analog Output (J1 Pin 9). The output should ramp from +10 volts to –10 volts, then back to +10 volts.

Press “Enter” to start the test.

Press “Clear” to exit the test.
Press “Code Select” only if you want to exit diagnostics.

Serial Input Test #10- To Test the Serial Input

To enter this test, press the “Status” key to increment (or the “Tach” key to decrement) until the number 10” is visible on the right side of the upper LED display.

Jumper J1 Pin 4 to J1 Pin 2
Jumper J1 Pin 5 to J1 Pin 3

Press “Enter” to start the test.

If the Serial Input is good, then “PP” is visible in the lower LED display.

If the Serial Input fails, one or all of the following will display briefly in the lower LED display:

Failure	Lower LED Display
300 baud failure	03
2400 baud failure	24
9600 baud failure	96

If any failures have occurred, an “EE” will display briefly in the lower LED display when the test has been completed.

The M–Traverse automatically exits the test.
Press “Code Select” only if you want to exit diagnostics.

In addition to the diagnostic tests 1-10 that you can perform, the M–Traverse automatically performs two power up diagnostic routines during every power up.

RAM TEST - Random Access Memory

The M–Traverse performs a pattern read/write test on RAM.

If RAM fails, error code “-----5” appears in the upper LED display.
The test will stop if a failure is detected.
Press “Clear ” to continue the test.

IF the RAM is good, the M–Traverse will begin the PROM test.

PROM TEST - Programmable Read Only Memory

The M–Traverse performs a checksum comparison on the PROM.

If the test fails, error code “-----3” appears in the upper LED display.
The test stops if a failure is detected.
Press “Clear”.

If PROM is good, exit is automatic. The M–Traverse will begin the initialization routines and normal operation.

In addition to the diagnostic and power up tests, M–Traverse has automatic indicators that alert you when there is a power line failure or EMI noise.

Power Failure

If the AC power line voltage drops below the level that is specified for the M-Traverse, then "- - - - - 1" will appear in the upper LED display. Check the power line for AC voltage integrity. Use MV-59 to monitor line notching.

CPU Watchdog Failure

If a CPU watchdog failure occurs, then "- - - - - 2" will appear in the upper LED display. This failure is generally the result of EMI or high frequency noise on the power or the signal lines. To prevent these failures:

- Ground the chassis and AC power properly.
- Only one end of the shield wire in a shielded cable should be attached to earth ground.
- Install a power line filter on the AC line if you suspect there may be AC line noise.
- Isolate the internal signal common (J3 Pin 4) and chassis ground (J2 Pin 1).
- Install ARC suppressors on any relay and contactors that are in close proximity to the M-Traverse.
- Keep all signal wires isolated from AC power wires.

Because "- - - - - 2" indicates that the CPU has malfunctioned, it is important to restore the M-Traverse default memory locations. Run the Clear 7 Power Up procedure and the M-Traverse will restore the factory default settings and it will also perform the power up routine. To run the Clear 7 Power Up procedure:

- Record the Control Parameters that are unique to your system.
- Turn the power to the M-Traverse off.
- Turn the power to the M–Traverse on, while simultaneously pressing "Clear" and "7" on the keypad.
- The M-Traverse restores the factory default settings and then performs the power up routine.
- Reenter the Control Parameters that are unique to your system.

TROUBLESHOOTING

This section contains four troubleshooting flowcharts to help you resolve four possible system operating problems. The four scenarios that are addressed by the flowcharts are:

Motor Does Not Stop
Motor Does Not Run
Motor Runs at Wrong Speed
Motor Runs Unstable

If you need to verify the integrity of the M–Traverse independently, refer to the *Troubleshooting: Diagnostics* section. If the information in this section does not solve your problem, consult:

Contrex Technical Support (763) 424-8700 or (800) 342-4411

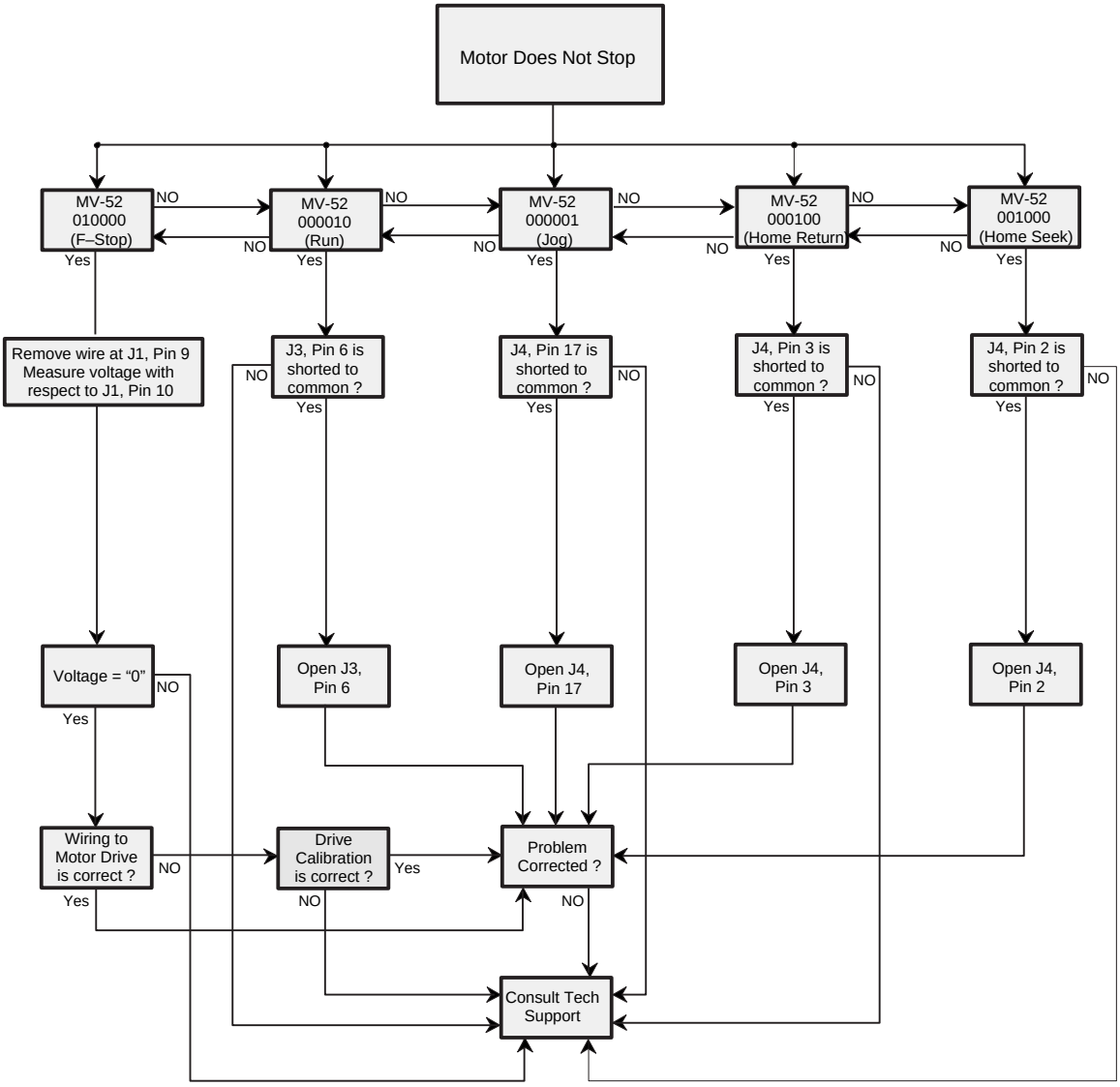


Figure 4-1 Motor Does Not Stop Flowchart

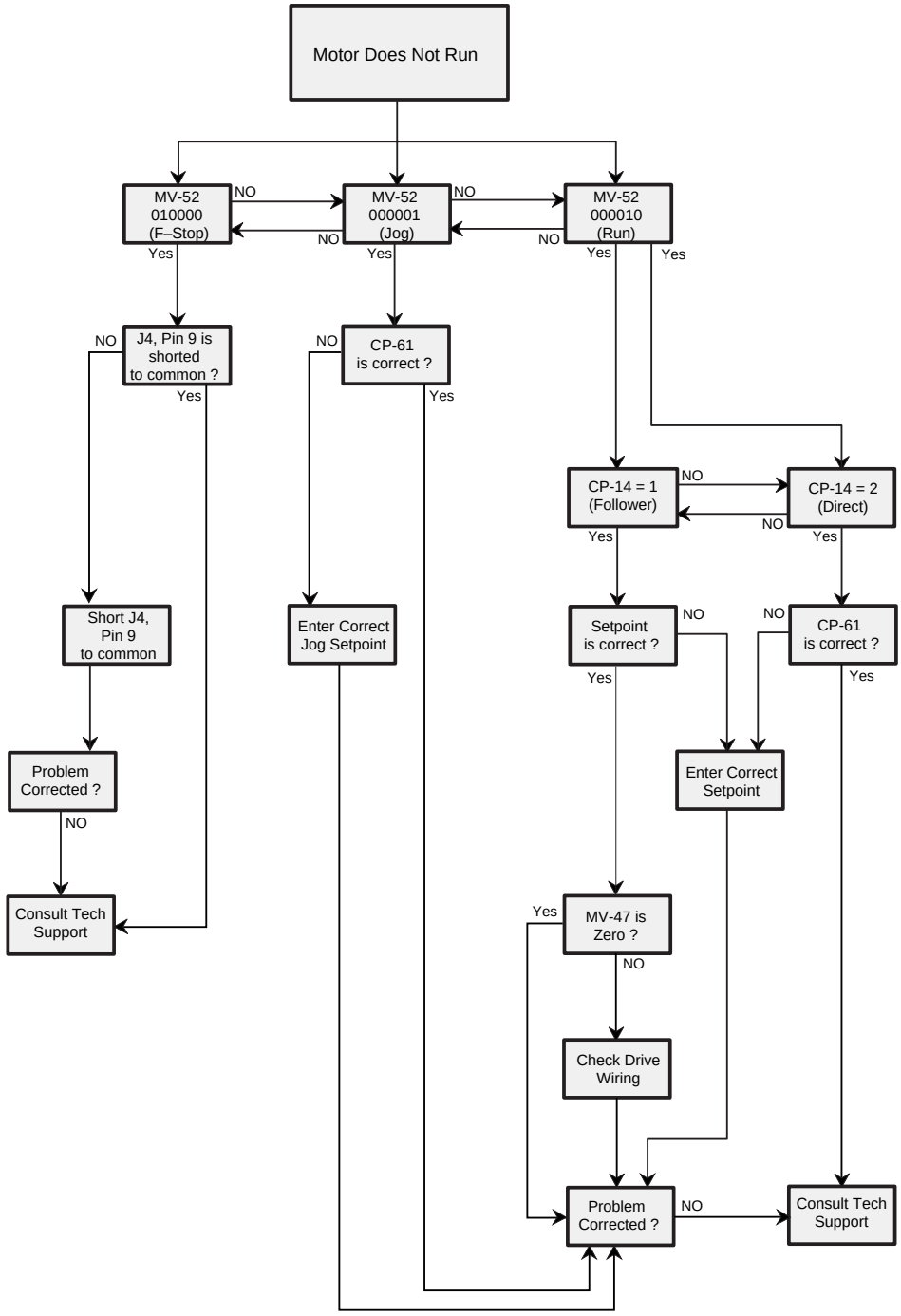


Figure 4-2 Motor Does Not Run Flowchart

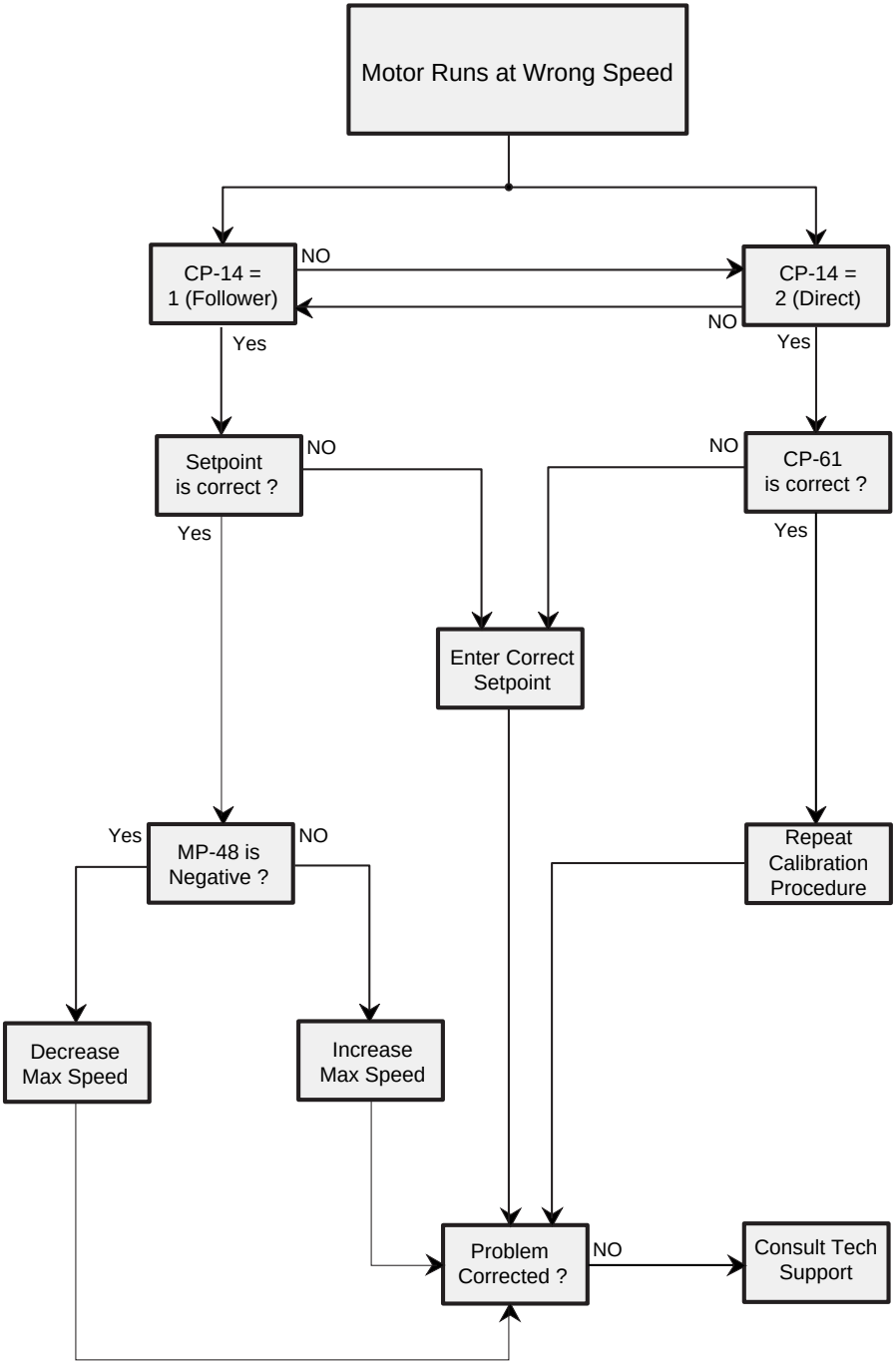


Figure 4-3 Motor Runs at Wrong Speed Flowchart

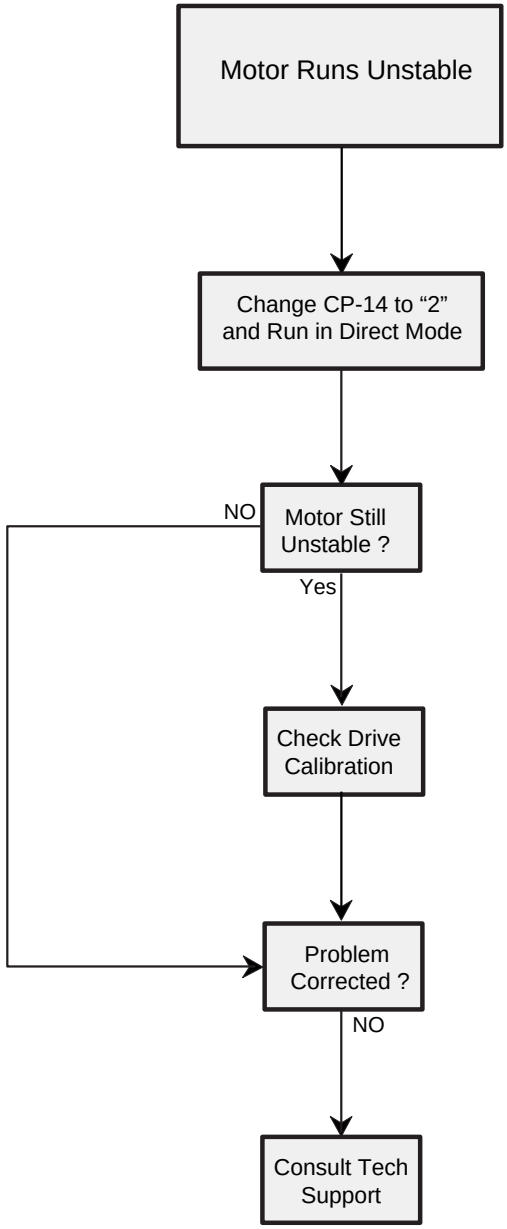


Figure 4-4 Motor Runs Unstable Flowchart

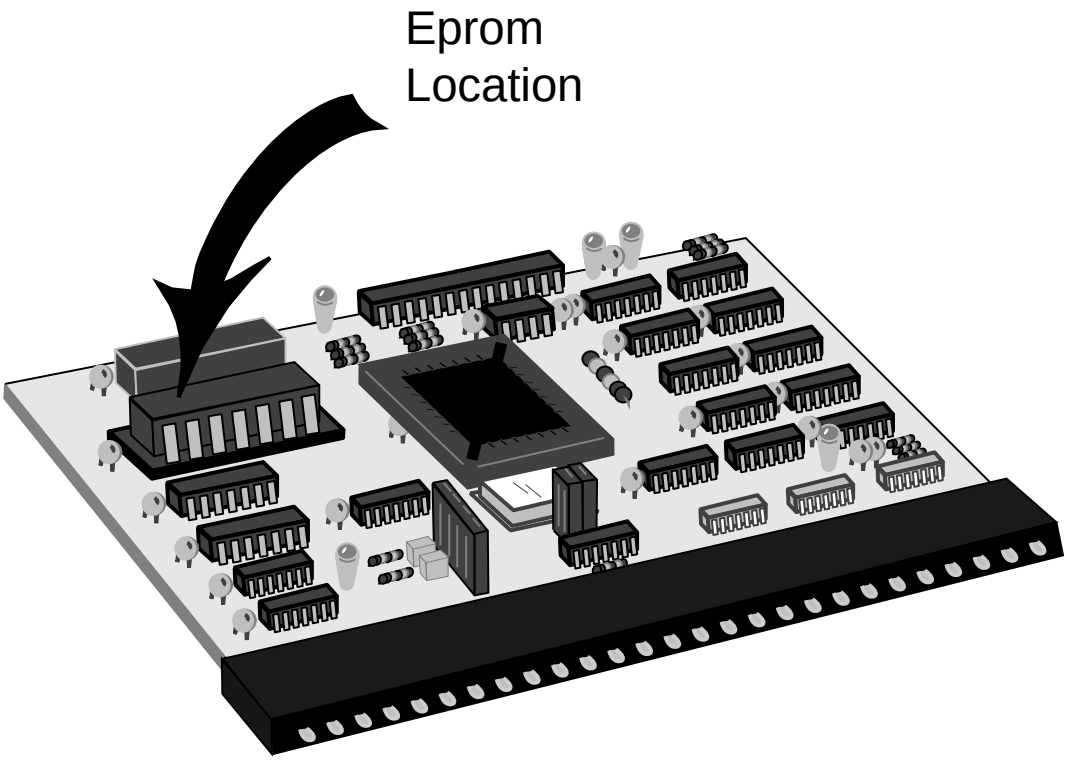


Figure 4-5 EPROM Location

EPROM CHIP REPLACEMENT

The EPROM (Erasable Programmable Read Only Memory) chip is the software for the M–Traverse. See Figure 4-5 for the EPROM's location on the CPU Board.

To replace the EPROM chip:

- Make a record of your current Control Parameter values; the replacement chip contains default values that will replace your current values when you perform the Clear/7 step.
- Turn off the power to the M–Traverse.
- **Ground yourself - Static electricity can damage the CPU board and the EPROM chip.**
- Remove the back panel.
- Pull out the CPU board.
- Locate the EPROM chip and note the orientation of the Pin 1 Indicator.
- Carefully pry the EPROM that is being replaced from the socket.
- Carefully install the replacement EPROM in the socket, using the Pin 1 Indicator for correct placement. Be careful not to bend the EPROM pins.

  NOTE: Incorrect placement can damage the EPROM.
- Replace the CPU board.
- Replace the back panel.
- Press “Clear” and “7” and apply power to the M–Traverse simultaneously.
- The M–Traverse restores the factory default settings and automatically performs the Power Up diagnostic routines.
- Reenter your Code Parameters values.

—NOTES—

References

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Appendix A - M–Traverse Specifications
Appendix B - Formulas
Appendix C - Parameter Summary - Numeric Quick Reference
Appendix D - Control Parameter Reference
Appendix E - Monitor Variable Reference
Appendix F - Fax Cover Sheet
Appendix G - Wiring Diagram Examples
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GLOSSARY

Acceleration/Deceleration	See Appendix C; CP-60.
Accel/Decel Length	See Appendix C; CP-09.
Alarm - High Speed	See Appendix C; CP-23.
Alarm Status	See Appendix C; MV-51.
At-Home Band	See Appendix C; CP-30.
Batch Count	See Appendix C; MV-89.
Batch Format	See Appendix C; CP-26.
Batch Limit	See Appendix C; CP-27.
Batch Preact Distance	See Appendix C; CP-28.
Baud Rate	See Appendix C; CP-71.
Calibration	Calibration matches the analog output of the M-Traverse with the analog input of the motor drive.
Change Activation	See Appendix C; CP-25.
Character Format	See Appendix C; CP-72.
Closed loop	A system that is controlled by manipulating the output based on error (setpoint - feedback).
Closed Loop Compensation (PI) Software	A mathematical term for a control algorithm that resolves the control error (feedback - setpoint) to zero. Output = $Kp \times Error + K_I \int Error\ dt$ PI represents “Proportional and Integral”.
Code Select Key	This is the key that is used prior to entering a Parameter Code (either a Control Parameter or a Monitor Variable).
Control Command Send	The Control Command Send allows the host computer to control the operating functions of the M-Traverse that are associated with the Discrete inputs (F-Stop, Run, Home

	Return, Home Seek, Home Set, Batch Reset, and Setpoint Select).
Control Mask	See Appendix C; CP-73.
Control Mode	See Appendix C; CP-14.
Control Parameters	Control Parameters allow you to enter data that is unique to your system (e.g., encoder resolution, Lead to Follower ratios) and modify the M–Traverse for your specific needs (e.g., maximum RPMs, setpoints, acceleration/deceleration ramp rates). There are Control Parameters for Direct mode, the Follower mode, Jog, Tuning, and Output Control. The M–Traverse comes factory pre-loaded with a complete set of default Control Parameters.
Control State	See Appendix C; MV-52.
Communications Error	See Appendix C; MV-74.
DAC Output	See Appendix C; MV-47.
Data Inquiry	Use the Data Inquiry to request the current value for Parameters (i.e., Control Parameters or Monitor Variables) in serial communications.
Dedicated Keys	The “Setpoint ” , “Tach” , “Batch Count” and “Status” keys are shortcut keys that access the active Setpoint , Tach, Batch Count and Status variables directly, rather than manually entering the Code Parameter.
Device Address	See Appendix C; CP-70.
Digital Motor Controller	A precision motor controller that uses digital compensation technology.
Direct Analog Command	See Appendix C; CP-62.
Direct Mode	In the Direct mode of operation, the analog output from the M-Traverse that is connected to the motor drive can be set directly. Direct mode is an open-loop mode of operation. Scaling, Acceleration/Deceleration, and Closed Loop Compensation (PI) software are not involved in the Direct mode. The Direct mode is used in conjunction with the Run and F-Stop controls

Discrete Inputs	Setpoint Select A Setpoint Select B Home Set Home Seek Home Return Batch Reset Run	Wait F-Stop Keypad Lockout Forward Limit Reverse Limit Jog Forward/Reverse Jog

Discrete Inputs - Group A	See Appendix C; MV-53.
Discrete Inputs - Group B	See Appendix C; MV-54.
Discrete Inputs - Group C	See Appendix C; MV-55.
Discrete Outputs - Group A	See Appendix C; MV-56.
Discrete Outputs - Group B	See Appendix C; MV-57.
Dwell	See Appendix C; CP-10.
Edge/Center Based Profile	See Appendix C; CP-24.
Engineering Units (E.U.)	Engineering units are the units of measure that you select for your setpoint scaling (e.g., inches, feet or centimeters).
EPROM Chip	The EPROM (Erasable Programmable Read Only Memory) chip is the software for the M–Traverse.
F–Stop	The F–Stop discrete input brings the M–Traverse's speed command (analog output) to an immediate Zero. F–Stop has priority over the other operating states.
Feedback Frequency	See Appendix C; MV-42.
Follower Engineering Units	See Appendix C; MV-45.
Follower Job Size	See Appendix C; MV-81.
Follower Lines Per E.U.	See Appendix C; CP-17.
Follower Mode	A complex multi-drive system. This is the M-Traverse's primary mode of operation. The M–Traverse compares the profile ratio or percentage of the Follower sensor shaft feedback and Lead sensor shaft to calculate any position error. When the M–Traverse finds speed error, the control algorithm adjusts the motor drive's Speed Command analog output and reduces the error to zero.

Follower Position	See Appendix C; MV-44.
Follower Profile Length	See Appendix C; MV-84.
Fwd/Rev Limit Polarity	See Appendix C; CP-36.
Gain	See Appendix C; CP-65.
Hardwired	Inputs that are wire shorted rather than using push buttons or switches.
Home Offset	See Appendix C; CP-31.
Home Sync Polarity	See Appendix C; CP-35.
Input Monitoring	Lead Frequency (MV-41) Feedback Frequency (MV-42) Discrete inputs, Group A (MV-53) Discrete Inputs, Group B (MV-54) Discrete Inputs, Group C (MV-55)
Inputs	Input Power (J2 pins 1, 2,3) Lead Frequency (J3 pins 3, 4, 5) Feedback Frequency (J3 pins 7, 8, 9) Home Sync (J3 pins 11, 12) Setpoint Select A (J3 pins 13, 14) Setpoint Select B (J3 pins 14, 15) Home Set (J4 pins 14, 16) Home Seek (J4 pins 1, 2) Home Return (J4 pins 3, 4) Batch Reset (J4 pins 4, 5) Run (J4 pins 6, 7) Wait (J4 pins 7, 8) F-Stop (J4 pins 9, 10) Keypad Lockout (J4 pins 10, 11) Forward Limit (J4 pins 12, 13) Reverse Limit (J4 pins 13, 14) Jog Forward/Reverse (J4 pins 15, 16) Jog (J4 pins 16, 17)
Integral	See Appendix C; CP-66.
Invalid Profile	See Appendix C; MV-58.
Jog	Jog is used in conjunction with Home Set and Home Seek

	to move the Follower mechanism to “Home”. Jog can also be used when you need brief bursts of speed to align the Follower mechanism. When you activate Jog, the RPMs increase at the acceleration rate that you specified in Acceleration/Deceleration (CP-60) until the Jog Setpoint (CP-61) is achieved. When Jog is terminated, the RPMs return to zero immediately. The Jog direction is determined by the Jog Forward/Reverse Input (J4, pins 15,16), which controls the direction of the Speed Command Output. The Drive Enable discrete output is active during the Jog mode.
Jog Setpoint	See Appendix C; CP-61.
Keypad Error	See Appendix C; MV-50.
Lead Frequency	See Appendix C; MV-41.
Lead Job Size	See Appendix C; MV-80.
Lead Position	See Appendix C; MV-43.
Lead PPR Reel	See Appendix C; CP-16.
LED Display	The two digit Parameter Code is displayed in the lower LED Display. The Parameter Code's value is displayed in the upper LED display. This value can be up to six digits.
Line Notch Counter	See Appendix C; MV-59.
Max RPM Follower	See Appendix C; CP-19.
Mode of Operation	The method used to operate your system, for example Direct mode or Follower mode.
Monitor Variables	Monitor Variables (MVs) monitor the performance of the M–Traverse and the system which the M–Traverse is controlling. Monitor Variables also confirm the wiring, the tuning and assist with troubleshooting. MVs can be accessed at any time during the M–Traverse's operation, including during Run, Jog and F–Stop. There are four categories of Monitor Variables: Input Monitoring, Output Monitoring, Performance Monitoring and Status Monitoring.
Numeric Keys	Use the numeric keys to enter a Parameter Code for either

	a Control Parameter (CP) or a Monitor Variable (MV) OR to enter a value for a Control Parameter. Use the “Enter” key after each entry. Use the “Clear” key to delete your entry.
Open Loop	A system that is controlled only by inputs without feedback.
Operating State	The systems status, such as Run, F–Stop, or Jog, within a mode of operation.
Output Monitoring	DAC Output (MV-47) Trim Output (MV-48) Discrete Outputs - Group A (MV-56) Discrete Outputs - Group B (MV-57)
Output A Direction	See Appendix C; CP-91.
Output A Polarity	See Appendix C; CP-92.
Output A Segment	See Appendix C; CP-90.
Output B Direction	See Appendix C; CP-94.
Output B Polarity	See Appendix C; CP-95.
Output B Segment	See Appendix C; CP-93.
Outputs	Speed Command Out (J1 pins 8, 9, 10, 11) Drive Enable (J1 pin 13) Batch Done (J1 pin 14) Alarm (J1 pin 15) Profile Direction (J1 pin 16) At-Home (J1 pin 17) Output A (J1 pin 18) Output B (J1 pin 19) Auxiliary DC Power (J3 pin 1, 2)
Parameters	Parameters are divided into two classifications; Control Parameters (CP) and Monitor Variables (MV).
Parameter Code	The numbered code that represents a Parameter.
Parameter Send	Use the Parameter Send to change any of the M–Traverse's Control Parameters in Serial Communications.
Parameter Value	Default parameter values are pre-loaded in the factory,

	however, you can modify Control Parameter values with operational data that is unique to your system.
Performance Monitoring	Tach Lead Position Follower Position Follower Engineering Units Product Rate Position Error
Position Error	See Appendix C; MV-49.
PPR Follower	See Appendix C; CP-18.
Process Ratio	See Appendix C; MV-86.
Product Rate	See Appendix C; MV-46.
Profile Ratio	See Appendix C; MV-87.
Tach	See Appendix C; MV-40.
Traverse Length 1,2,3,4	See Appendix C; CP-02, 04, 06, 08.
Tuning	Tuning stabilizes speed error differences between the setpoint and feedback.
Ring Kits	Ring Kits are flange motor mounted sensors that measure the pulses per revolution (PPR) of the motor shaft.
Resume Enable	See Appendix C; CP-32.
RPM Feedback	The operating speed of the Follower.
RPM Lead	The operating speed of the Lead.
Run	The Run discrete input initiates the follower profiling function. Run can be activated when the M–Traverse is in F–Stop, however Run cannot be activated when the M–Traverse is in Jog, Home Seek or Home Return.
Scaling	Scaling Control Parameters supply the M–Traverse with the information that it needs to calculate the ratio of Follower Lines to Lead Lines, using Engineering Units.
Serial Communications	The M–Traverse can interface with a host computer

	through a RS422 Serial Communications Interface. This interface allows the host computer to perform remote computer parameter entry, status or performance monitoring, and remote control of the M–Traverse.
Setpoints 1, 2, 3, 4	See Appendix C; CP-01, 03, 05, 07.
Status Monitoring	Keypad Error (MV-50) Alarm Status (MV-51) Control State (MV-52) Invalid Profile (MV-58) Line Notch Counter (MV-59) Lead Job Size (MV-80) Follower Job Size (MV-81) Follower Profile Length (MV-84) Process Ratio (MV-86) Profile Ratio (MV-87) Batch Count (MV-89)
Trim Output	See Appendix C; MV-48.
Unipolar/Bipolar	See Appendix C; CP-29.

APPENDIX A: M–TRAVERSE SPECIFICATIONS

Job Space	536,000,000 Encoder Lines Maximum
Accuracy:	± 1 Encoder Line Resolution
Response:	1 millisecond control loop update
Tuning:	Separately adjustable Gain and Integral parameters for stability and response
Scaling Formats:	Direct - Direct set of Speed Command Out (analog) Follower - Ratio Setpoint calculation
Setpoints:	Six Total: (4) Engineering Units (1) Jog (1) Direct
Frequency Inputs:	Feedback and Lead Quadrature Encoder Format Open-Collector Driver Compatible (NPN) Internal 2.7 kOhm to +5 VDC on M–Traverse 120 kHz maximum frequency
Preset Select:	External switch selection of four preset engineering unit setpoints
Discrete Inputs:	Vin, MAX ≤ 24.0 VDC Vin, LOW ≤ 0.7 Volts minimum Vin, HIGH ≥ 4.3 Volts maximum Home Sync Setpoint Select A Setpoint Select B Home Set Home Seek Home Return Batch Reset Run Wait F-Stop Keypad Lockout

	Forward Limit Reverse Limit Jog Forward/Reverse Jog
Discrete Outputs:	Open-Collector Driver (50 VDC max, 200 mA continuous, 800 mA continuous total) Drive Enable Batch Done Alarm Profile Direction At-Home Output A Output B
Speed Command:	±5 to ± 15 VDC, Unipolar or Bipolar, isolated output Auto-range to drive reference level 12 bits resolution
+ 5 VDC Supply:	500 mA, max at 0-25 degrees C ambient 250 mA, max at 25-50 degrees C ambient
Serial Interface:	RS422 300 to 9600 Baud Full parameter access and control
Power Requirements:	115 /230 - 10% +15% VAC 50/60 Hz 0.25 Amp
Operating Temperature:	0 to 55 degrees C
Humidity:	0 to 90% non-condensing
Physical Dimensions:	1/2 DIN, NEMA 12 panel mount 7.5 inches height 3.9 inches width 6.0 inches depth
Weight	5 pounds, 6 ounces

APPENDIX B: FORMULAS

Use the following formulas to calculate Tach (MV-40)
and E.U. setpointing (MV-84, MV-86).

M-TRAVERSE FORMULAS Tach and Engineering	
Feedback (MV-40) Velocity (RPMs)	$\frac{\text{Feedback Frequency (MV-42)} \times 60}{\text{PPR Follower (CP-18)}}$
Process (MV-86) Ratio	$\frac{\text{Setpoint (CP-01)}}{\text{E.U. (CP-15)}} \times \frac{\text{Follower Lines/ E.U. (CP-17)}}{\text{Lead PPR Reel (CP-16)}}$
Follower (MV-84) Profile Length (encoder lines)	$\text{Traverse Length (CP-02)} \times \frac{\text{Follower Lines/E.U. (CP-17)}}{\text{E.U. (CP-15)}}$

APPENDIX C: PARAMETER SUMMARY - NUMERIC QUICK REFERENCE

CP-01 SETPOINT 1

The Setpoint parameters are set up as pairs in conjunction with the Traverse Length parameters. There are four pairs of Setpoint and Traverse Length parameters. The Setpoint value is entered in Engineering Units (E.U.s) and automatically displays the decimal position that was entered in the Engineering Units (CP-15). The Setpoint parameter determines how far the Follower travels based on the Lead. The Follower travels the setpoint distance while the Lead travels the distance entered into CP-16. In the level wind application, the Setpoint parameters are the laypitch (center-to-center distance between windings on the reel). In the web scanning application, the Setpoint parameters are the traverse length. These preset parameters can be set up as a switch (via the Setpoint Select switches) which gives the operator the option of changing over the product up to four times.

CP-02 TRAVERSE LENGTH 1

The Traverse Length parameters are set up as pairs in conjunction with the Setpoint parameters. There are four pairs of Setpoint and Traverse Length parameters. The Traverse Length value is entered in Engineering Units (E.U.s) and the decimal position that was entered in the Engineering Units (CP-15) parameter is automatically displayed. The traverse length is the distance that the Follower mechanism will travel. In level wind applications, the traverse length is generally the length of the reel. In web scanning applications, the traverse length is generally the width of the web. The traverse length measurement corresponds to the setpoint measurement. For example, in a level wind application, you may have a reel that measures one foot, that is wrapped with two inch hose. You would enter "2" (inches) in Setpoint 1 (CP-01) and "12" (inches) in Traverse Length 1 (CP-02).

CP-03 SETPOINT 2

The Setpoint parameters are set up as pairs in conjunction with the Traverse Length parameters. There are four pairs of Setpoint and Traverse Length parameters. The Setpoint value is entered in Engineering Units (E.U.s) and automatically displays the decimal position that was entered in the Engineering Units (CP-15). The Setpoint parameter determines how far the Follower travels based on the Lead. The Follower travels the setpoint distance while the Lead travels the distance entered into CP-16. In the level wind application, the Setpoint parameters are the laypitch (center-to-center distance between windings on the reel). In the web scanning application, the Setpoint parameters are the traverse length. These preset parameters can be set up as a switch (via the Setpoint Select switches) which gives the operator the option of changing over the product up to four times.

CP-04 TRAVERSE LENGTH 2

The Traverse Length parameters are set up as pairs in conjunction with the Setpoint parameters. There are four pairs of Setpoint and Traverse Length parameters. The Traverse Length value is entered in Engineering Units (E.U.s) and the decimal position that was entered in the Engineering Units (CP-15) parameter is automatically displayed. The traverse length is the distance that the Follower mechanism will travel. In level wind applications, the traverse length is generally the length of the reel. In web scanning applications, the traverse length is generally the width of the web. The traverse length measurement corresponds to the setpoint measurement. For example, in a level wind application, you may have a reel that measures one foot, that is wrapped with two inch hose. You would enter "2" (inches) in Setpoint 2 (CP-03) and "12" (inches) in Traverse Length 2 (CP-04).

CP-05 SETPOINT 3

The Setpoint parameters are set up as pairs in conjunction with the Traverse Length parameters. There are four pairs of Setpoint and Traverse Length parameters. The Setpoint value is entered in Engineering Units (E.U.s) and automatically displays the decimal position that was entered in the Engineering Units (CP-15). The Setpoint parameter determines how far the Follower travels based on the Lead. The Follower travels the setpoint distance while the Lead travels the distance entered into CP-16. In the level wind application, the Setpoint parameters are the laypitch (center-to-center distance between windings on the reel). In the web scanning application, the Setpoint parameters are the traverse length. These preset parameters can be set up as a switch (via the Setpoint Select switches) which gives the operator the option of changing over the product up to four times.

CP-06 TRAVERSE LENGTH 3

The Traverse Length parameters are set up as pairs in conjunction with the Setpoint parameters. There are four pairs of Setpoint and Traverse Length parameters. The Traverse Length value is entered in Engineering Units (E.U.s) and the decimal position that was entered in the Engineering Units (CP-15) parameter is automatically displayed. The traverse length is the distance that the Follower mechanism will travel. In level wind applications, the traverse length is generally the length of the reel. In web scanning applications, the traverse length is generally the width of the web. The traverse length measurement corresponds to the setpoint measurement. For example, in a level wind application, you may have a reel that measures one foot, that is wrapped with two inch hose. You would enter "2" (inches) in Setpoint 3 (CP-05) and "12" (inches) in Traverse Length 3 (CP-06).

CP-07 SETPOINT 4

The Setpoint parameters are set up as pairs in conjunction with the Traverse Length parameters. There are four pairs of Setpoint and Traverse Length parameters. The Setpoint value is entered in Engineering Units (E.U.s) and automatically displays the decimal position that was entered in the Engineering Units (CP-15). The Setpoint parameter determines how far the Follower travels

based on the Lead. The Follower travels the setpoint distance while the Lead travels the distance entered into CP-16. In the level wind application, the Setpoint parameters are the laypitch (center-to-center distance between windings on the reel). In the web scanning application, the Setpoint parameters are the traverse length. These preset parameters can be set up as a switch (via the Setpoint Select switches) which gives the operator the option of changing over the product up to four times.

CP-08 TRAVERSE LENGTH 4

The Traverse Length (CP-08) parameters are set up as pairs in conjunction with the Setpoint parameters. There are four pairs of Setpoint and Traverse Length parameters. The Traverse Length value is entered in Engineering Units (E.U.s) and the decimal position that was entered in the Engineering Units (CP-15) parameter is automatically displayed. The traverse length is the distance that the Follower mechanism will travel. In level wind applications, the traverse length is generally the length of the reel. In web scanning applications, the traverse length is generally the width of the web. The traverse length measurement corresponds to the setpoint measurement. For example, in a level wind application, you may have a reel that measures one foot, that is wrapped with two inch hose. You would enter "2" (inches) in Setpoint 4 (CP-07) and "12" (inches) in Traverse Length 4 (CP-08).

CP-09 ACCEL/DECEL LENGTH

The Accel/Decel Length (CP-09) parameter allows the Follower mechanism to ramp to either the constant pitch plateau or end dwell, either gradually or rapidly. In level wind applications, this parameter is a portion of the encoder lines in one rotation of the reel (Lead). In web scanning applications, this parameter is a portion of the encoder lines in one traverse length. The lower the number, the more rapidly the Follower mechanism ramps to the constant pitch plateau or end dwell. The higher the number, the more gradually the Follower mechanism ramps to the constant pitch plateau or end dwell. As a guideline, keep in mind that you do not want the accel/decel rate to exceed the load that the motor drive or mechanics can accommodate. The Accel/Decel Length Parameter does not need to be an exact number, the system will perform adequately with a close estimate.

CP-10 DWELL

The Dwell (CP-10) parameter allows the Follower mechanism to pause at the end of the Follower profile before ramping back in the opposite direction. In level wind applications, this parameter is a portion of the encoder lines in one rotation of the reel (Lead). In web scanning applications, this parameter is a portion of the encoder lines in one traverse length. The Dwell Parameter does not need to be an exact number, the system will perform adequately with a close estimate .

CP-14 CONTROL MODE

The Control Mode (CP-14) parameter allows you to choose between either the Standard or the Lay Adjusted options in the Follower mode of operation. You can also use Control Mode (CP-14) to choose the Direct mode of operation. The Direct mode is used for calibration and troubleshooting. The Follower mode of operation is used to operate your system in either the Standard option or the Lay Adjusted option. The calculation of the Follower profile length is the only difference between the Standard and the Lay Adjusted options. In the Level Wind application that uses the Lay Adjusted option, one lay pitch is subtracted from the profile length to adjust for the initial lay on the reel.

Enter “1” for the Follower Mode / Standard.
Enter “2” for the Direct Mode.
Enter “3” for the Follower Mode / Lay Adjusted.

CP-15 ENGINEERING UNITS

In a level wind application, CP-15 is your Engineering Unit (E.U.) measurement of a laypitch. In a web scanning application, CP-15 is your E.U. measurement for a traverse length. If your application uses the M-Traverse's setpoint flexibility to change over the operation, and you have more than one measurement, then pick one arbitrarily. However, be sure to reference that same measurement consistently throughout the scaling set up. In setting up the scaling, you are simply allowing the M-Traverse to establish a conversion of encoder lines to the E.U. that you prefer to use. Place the decimal in the location of your desired resolution (to the tens, hundreds or thousands place). All of the other Control Parameters or Monitor Parameters that display in E.U.s will automatically display the correct decimal position.

CP-16 LEAD PPR REEL

In a level wind application, CP-16 is the number of Lead encoder lines that the Lead Frequency input registers as a result of one revolution of the reel. In a web scanning application, CP-16 is the number of Lead encoder lines that the Lead Frequency input registers when the Follower travels one traverse length. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers.

NOTE: CP-16 can not be changed during “Run”.

Use the following procedure to check CP-16:

- Place the M-Traverse in F-Stop.
- Activate the Home Set input (clears the Lead position to zero).
- Place the M-Traverse in F-Stop.
- Display MV-43 (Lead Position).
- Move the Lead either one revolution of the reel (level wind) or one traverse length (web scan).
- MV-43 should have the same value as CP-16.

CP-17 FOLLOWER LINES PER ENGINEERING UNITS

In a level wind application, CP-17 is the number of Follower encoder lines that the Feedback Frequency input registers as a result of the Follower laypitch that was entered in CP-15. In a web scanning application, CP-17 is the number of Follower encoder lines that the Feedback Frequency input registers when the Follower travels one traverse length. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers.

NOTE: CP-17 can not be changed during “Run”.

Use the following procedure to check or find CP-17:

- Place the M-Traverse in F-Stop.
- Activate the Home Set input (clears the Follower position to zero).
- Place the M-Traverse in F-Stop.
- Display MV-44 (Follower Position).
- Jog the Follower either one laypitch (CP-15) for level wind
  or one traverse length(CP-15) for web scan.
- MV-44 should have same value as CP-17.

CP-18 PPR FOLLOWER

The PPR Follower (CP-18) parameter is the number of pulses per revolution of the feedback encoder (encoder resolution in lines).

NOTE: CP-18 can not be changed during “Run”.

CP-19 MAXIMUM RPM FOLLOWER

The Maximum RPM Follower (CP-19) parameter is the RPMs of the feedback encoder shaft when the Follower is operating at maximum speed. Although this entry does not need to be exact, highly inaccurate entries will make it difficult to tune the M-Traverse for precision Follower profiling. When you calculate this variable, be sure to consider all gear reductions, belt reductions and other types of reducers.

NOTE: CP-19 can not be changed during “Run”.

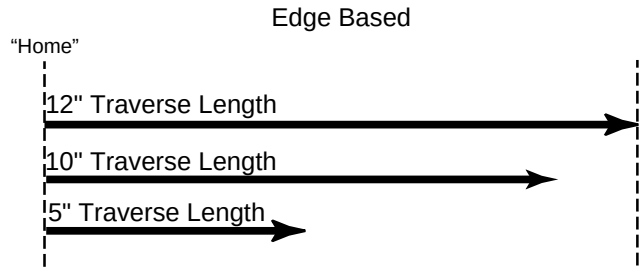
CP-23 HIGH SPEED ALARM

Use the High Speed Alarm (CP-23) parameter to determine the RPM level that will activate the High Speed Alarm Output. When the Follower's motor RPMs are at or above the value in CP-23, the High Speed Alarm Output will activate.

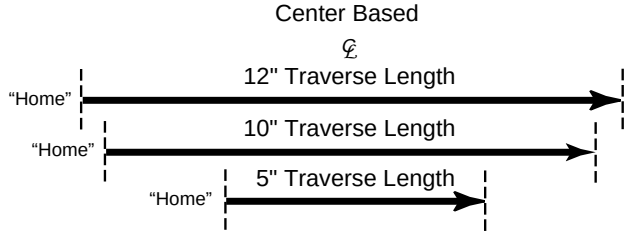
CP-24 EDGE/CENTER BASED PROFILE

The traverse length is measured from “Home”. The Edge/Center Based Profile (CP-24) parameter allows you to set “Home” relative to either the edge or the center of your reel or web. The Follower mechanism moves a traverse length from that position and then returns.

To set “Home” as an edge based profile, enter “1” in CP-24. All traverse length changes occur from the edge, in the forward direction and the “Home” position does not change. The diagram below illustrates this profile. Traverse length changes can be made on the fly and the timing on these changes is a crucial factor. For the timing on edge based traverse length changes, refer to the Change Activation (CP-25) parameter.



To set “Home” as a center based profile, enter “2” in CP-24. All traverse length changes occur from the center and the “Home” position changes to compensate for traverse length changes. The diagram below illustrates this profile. Traverse length changes will occur automatically when the Follower mechanism is in the center of the web.



CP-25 CHANGE ACTIVATION

The Change Activation (CP-25) parameter works in conjunction with the Edge/Center Based Profile (CP-24) parameter. When CP-24 is set to “1” (edge based), then CP-25 determines when changes will occur. If CP-24 is set to “2” (center based), then CP-25 has no effect.

Change Activation (CP-25) can be set to “1”, “2” or “3”. Settings “2” and “3” have a number of variables:

If CP-25 is set to “1” then all of the changes will occur when the Follower is at “Home”.

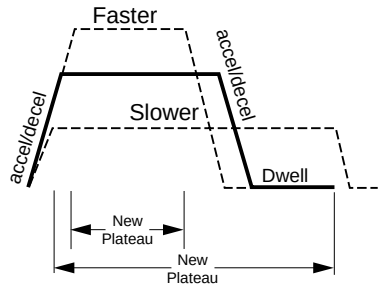
If CP-25 is set to “2” and either the Accel/Decel Length or Dwell parameters are changed, the changes will only occur at “Home”.

If CP-25 is set to “2” and the setpoint speed is changed (either faster or slower), the change will occur immediately, but only if the change occurs within the new constant pitch plateau of the profile. Otherwise setpoint speed changes occur at “Home”.

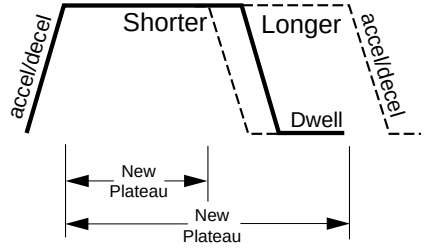
If CP-25 is set to “2” and the traverse length is changed, the change will occur immediately, but only if the longer change occurs within the old constant pitch plateau and a shorter change occurs within the new constant pitch plateau of the profile, and either change is in a forward direction. Otherwise traverse length changes occur at “Home”.

If CP-25 is set to “2” and both the traverse length and the setpoint speed are changed, then use the switches to make the changes and stay within the profile parameters listed above for setpoint speed and traverse length changes. When any of the changes are not within the specified plateaus of the profile, then the changes will occur when the Follower mechanism reaches “Home”. Refer to the diagrams below.

Setpoint Changes



Traverse Length Changes



If CP-25 is set to “3”, the change will occur at the next forward or reverse dwell position. However, if there is no dwell position, a setpoint change will occur at the start of the reverse plateau in the forward direction or at the start of the forward plateau in the reverse direction. If the setpoint is changed to a slower speed, this change will cause a spike, which will momentarily cause an abrupt jolt to the Follower mechanism. Therefore, for a smooth operation, is best to specify a Dwell (CP-10) parameter.

CP-26 BATCH FORMAT

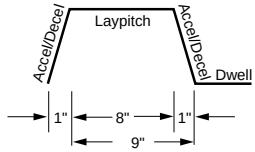
Use the Batch Format (CP-26) parameter to indicate which type of count that you want the Batch Counter to do. You can count either Follower traverses or Lead reel revolutions. Enter “1” in CP-26 to count the Follower traverses. Enter “2” in CP-26 to count Lead revolutions.

CP-27 BATCH LIMIT

The Batch Counter is an up-counter that is cleared to zero by the Batch Reset input. Use the Batch Done Output to shut off the system when the Batch Count has been reached. You can count either the number of Follower traverses or the number of Lead reel revolutions. If you count Follower traverses, each direction counts as one traverse. If you count Lead revolutions, each wrap of the reel (or layer), is one lead revolution. Enter the total number that you want counted in Batch Limit (CP-27).

CP-28 BATCH PREACT DISTANCE

The Batch PreAct Distance (CP-28) parameter is used only if the Batch Format (CP-26) has been set to number "1" (Follower traverses). CP-28 allows you to set a specific distance at which to activate the Batch Done. This can be at the end dwell or any distance from dwell, up to the Accel/Decel Length at the opposite end from dwell. If you enter a number that would go beyond the Accel/Decel Length, the M-Traverse will automatically default to the Accel/Decel Length. For example, your reel is 10 inches long, with an Accel /Decel Length of 1 inch on each end, and the laypitch profile is 8 inches. CP-28 will default at 9 inches for any amount above 9 inches that you enter in CP-28, because the opposite Accel /Decel is 9 inches from the dwell. See the diagram below for a profile representation of this example:



CP-29 UNIPOLAR/BIPOLAR

The M-Traverse can interface with either single quadrant (direction) drives or with bi-directional drives that use bipolar voltage commands (positive and negative) to indicate the direction. Enter "1" for Unipolar operation or "2" for Bipolar operation.

NOTE: CP-29 can not be changed during "Run".

CP-30 AT-HOME BAND

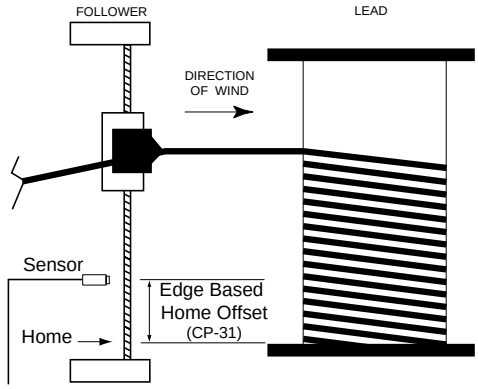
The At-Home Band (CP-30) parameter allows for a certain amount of "range" in the Home position, measured in encoder lines. Although the Home Set and Home Seek inputs place home exactly at "0", the At-Home Band parameter allows home to be located in a band that is measured in negative and positive encoder lines on each side of the "0" mark. Enter the desired number of encoder lines in CP-30.

NOTE: The Follower mechanism must be positioned within the At-Home Band before "Run" is entered. The Follower position must also be within the At-Home band to activate the At-Home LED indicator (front panel) and the At-Home discrete output.

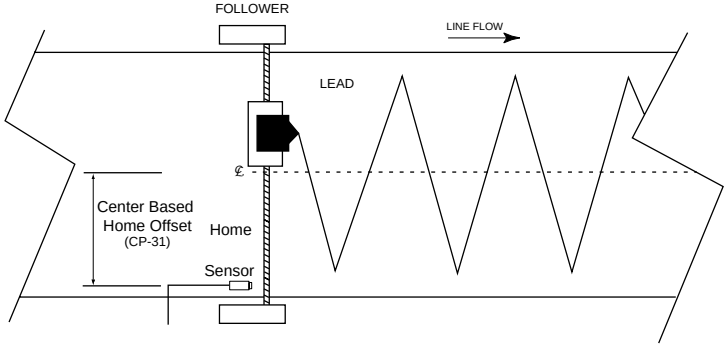
CP-31 HOME OFFSET

The Home Offset (CP-31) parameter allows you to offset the “Home” position and relocate it somewhere other than the sensor.

If CP-24 is set at “1” (edge based), measure the distance from the sensor to the desired position of “Home”. Enter that E.U. amount in CP-31.



If CP-24 is set at “2” (center based), measure the distance from the sensor to the center. Enter that E.U. amount in CP-31. The M-Traverse will make a transparent, internal calculation and position “Home” at a distance that is CP-31 minus 1/2 of the traverse length. The position of “Home” will change to correspond with any changes in the traverse length.



NOTE: Since the “Home” position calculations are dependent on the Traverse Length parameter (CP-02, CP-14, CP-06, CP-08) and the Engineering Units parameter (CP-15), those values must have already been entered prior to entering a value in CP-31).

CP-32 RESUME ENABLE

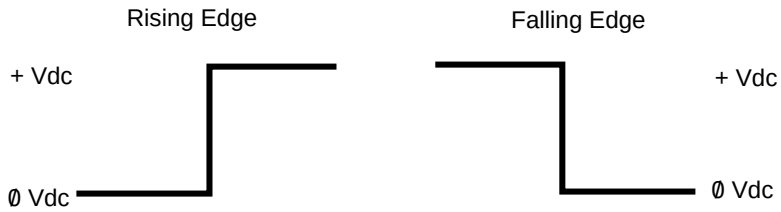
If you interrupt the operation (F-Stop), the Resume Enable parameter allows you to keep track of error in both the Follower and Lead positions. It also allows you to freeze the Lead position and keep track of error in the Follower position. The M-Traverse will adjust for the error when you resume operation.

Resume is disabled by entering "1" in CP-32.
To keep track of error in both the Follower and Lead positions enter "2" in CP-32.
To freeze the Lead position and keep track of error in the Follower position, enter “3” in CP-32.

When you resume operation, the Follower could make an abrupt shift back to its former position, which can severely injure you or damage equipment. The specific consequences can vary, depending on your use of the equipment and your system's design. Install safety equipment that is appropriate for your application.

CP-35 HOME SYNC POLARITY

The Home Sync Polarity (CP-35) parameter allows you to choose between rising edge polarity (positive going signal) or falling edge polarity (negative going signal) during "Home Seek". This feature is extremely useful when you use reflective or transmissive optical sensors for the Home sensor. Enter "1" in CP-35 for a rising edge, or "2" for a falling edge. Refer to the diagram below.



CP-36 FORWARD/REVERSE LIMIT POLARITY

The Forward/Reverse Polarity Limit (CP-36) parameter allows you to choose between rising edge polarity (positive going signal) or falling edge polarity (negative going signal) so that the Follower mechanism will not travel beyond the traverse length limit. This feature is extremely useful when you use reflective or transmissive optical sensors for the Home sensor. Enter "1" in CP-35 for a rising edge, or "2" for a falling edge.

CP-37 FORWARD LIMIT FORMAT

Use the Forward Limit Format (CP-37) parameter to determine how the Forward Limit will function during “Run”. If you set CP-37 to "1", then the M–Traverse will engage “F-Stop” when the Forward Limit is encountered during “Run”. However, if you want the M–Traverse to terminate the Constant Pitch Plateau, decelerate to zero speed, process the Forward End Dwell and then begin the reverse profile back to home when the Forward Limit is encountered, then set CP-37 to "2".

MV-40 TACH (FEEDBACK VELOCITY)

Tach is the feedback (Follower) displayed in RPMs. The feedback is read by the M-Traverse every 250 microseconds. The readings are summed, averaged and then displayed every 250 milliseconds.

MV-41 LEAD FREQUENCY

The Lead Frequency displays the frequency of the Lead Frequency Input (J3, pin 3, 4, 5) in hertz (pulses per second). MV-41 is averaged; it is the 250 millisecond frequency calculation prior to the display update.

MV-42 FEEDBACK FREQUENCY

The Feedback Frequency displays the frequency of the Feedback Frequency Input (J3, pin 7, 8, 9) in hertz (pulses per second). MV-42 is averaged; it is the 250 millisecond frequency calculation prior to the display update.

MV-43 LEAD POSITION

The Lead Position displays the distance of the Lead relative to the beginning of the profile. This value is displayed in encoder lines.

MV-44 FOLLOWER POSITION

The Follower Position displays the distance of the Follower relative to the “Home” position. This value is displayed in encoder lines.

MV-45 FOLLOWER POSITION - E.U.s

The Follower Position - E.U.s parameter converts the Follower Position (CP-44) into Engineering Units.

MV-46 PRODUCT RATE

The M-Traverse calculates the cycle time for the last completed profile (in each direction) and uses this to determine the Product Rate in profiles (layers) per minute.

MV-47 DAC OUTPUT

The DAC Output displays the present level of the analog speed command output to the motor drive. The DAC output displays in DAC bits. A value of 4095 indicates a 100% positive output and a value of -4095 indicates a 100% negative output.

MV-48 TRIM OUTPUT

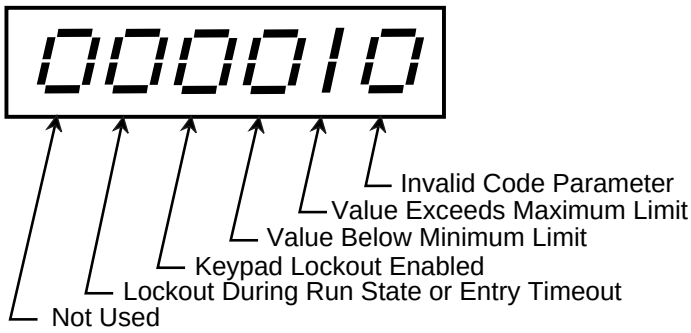
The Trim Output is the calculated output of the compensation algorithm (gain plus integral). This value is displays in DAC bits. A value of 4095 indicates a 100% positive output and a value of -4095 indicates a 100% negative output.

MV-49 POSITION ERROR

The Position Error displays the difference between the current Follower position and the commanded Follower position. It displays in Follower encoder lines. A positive value indicates that the Follower is behind the commanded position (lagging) and a negative value indicates that the Follower is ahead of the commanded position (leading)

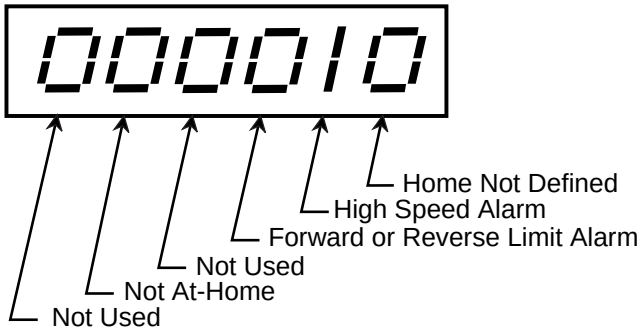
MV-50 KEYPAD ERROR

If a Control Parameter entry has been rejected, Keypad Errors will display the reason that it was rejected. The digit that displays a number “1” is the error. In the example below, “Value Exceeds Maximum Limit” is the error.



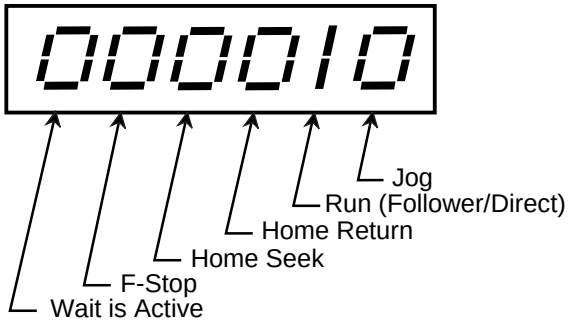
MV-51 ALARM STATUS

The digit that displays a number “1” is the active Alarm. In the example below, “High Speed Alarm ” is the active alarm.



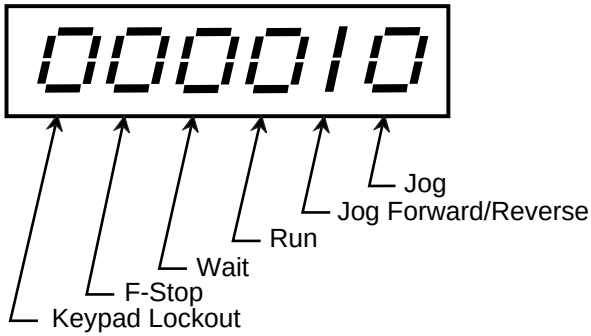
MV-52 CONTROL STATE

The digit that displays a number “1” is the active control state of the M-Traverse. In the example below, “Run” is the active control state.



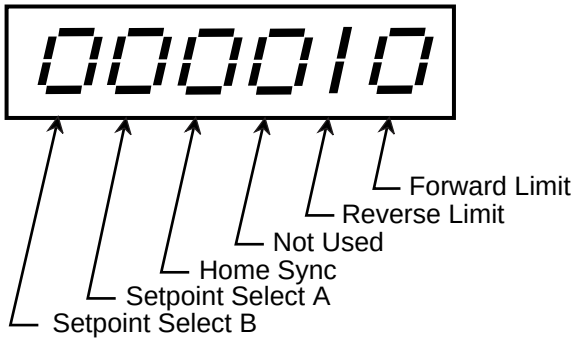
MV-53 DISCRETE INPUTS - GROUP A

The Discrete Inputs - Group A displays the status of the Jog, Jog Forward/Reverse, Run, Wait, F-Stop, and Keypad Lockout discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Jog Forward/Reverse” is the open or logic high level.



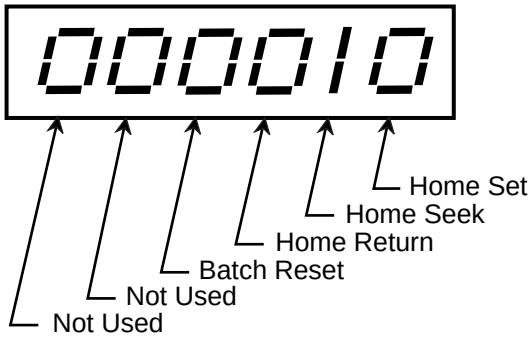
MV-54 DISCRETE INPUTS - GROUP B

The Discrete Inputs - Group B displays the status of the Forward Limit, Reverse limit, Home Sync, Setpoint Select A and Setpoint Select B discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Reverse Limit” is the open or logic high level.



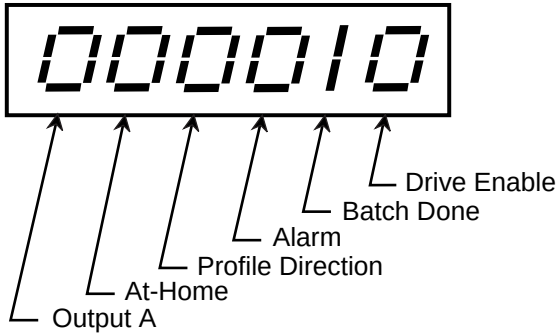
MV-55 DISCRETE INPUTS - GROUP C

The Discrete Inputs - Group C displays the status of the Home Set, Home Seek, Home Return, and Batch Reset discrete inputs. The number “1” indicates an open, or logic high level. The number “0” indicates a closed, or logic low level (shorted to common). In the example below, “Home Seek” is the open or logic high level.



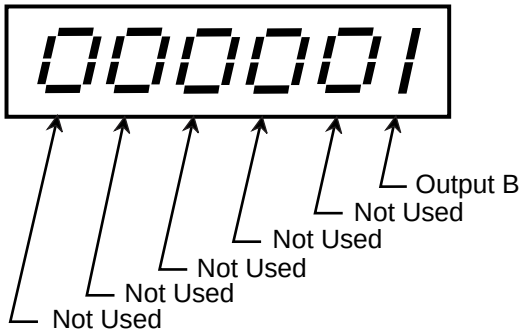
MV-56 DISCRETE OUTPUTS - GROUP A

The Discrete Outputs - Group A displays the status of the Drive Enable, Batch Done, Alarm, Profile Direction, At-Home and Output A discrete outputs. The number “1” indicates an inactive or de-energized (logic high) level. The number “0” indicates an active or energized (logic low) level. In the example below, “Batch Done” is the inactive or de-energized (logic high) level.



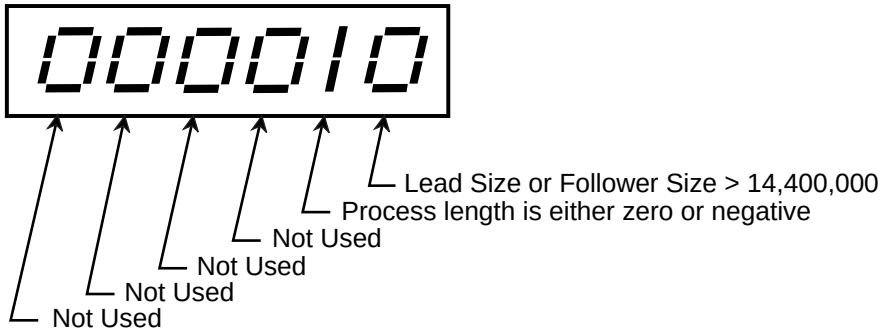
MV-57 DISCRETE OUTPUTS - GROUP B

The Discrete Outputs - Group B displays the status of the Output B discrete outputs. The number “1” indicates an inactive or de-energized (logic high) level. The number “0” indicates an active or energized (logic low) level. In the example below, “Output B” is the inactive or de-energized (logic high) level.



MV-58 INVALID PROFILE

If a profile entry has been rejected, the Invalid Profile parameter will display the reason that it was rejected. The M-Traverse will not allow your system to enter "Run" if there is an invalid profile. The digit that displays a number “1” is the error. In the example below, “The process length is zero or negative” is the error.



MV-59 LINE NOTCH COUNTER

The Line Notch Counter parameter checks the integrity of the AC line. Notches on the line are caused by inductive loads (e.g., motors, contactors) which cause the counter to increment if the AC line is too low (soft). The Line Notch Counter displays the number of line notches that have occurred on the AC line.

CP-60 ACCEL/DECEL

Accel/Decel (CP-60) is the number of seconds in which you want your system to accelerate from zero RPMs to the Jog Setpoint speed.

NOTE: CP-60 can not be changed during “Run”.

CP-61 JOG SETPOINT

Jog Setpoint (CP-61) is the RPM at which you want your system to operate when it is in Jog. When you activate Jog, the RPMs increase at the acceleration rate that you specified in Accel/Decel (CP-60) until the Jog Setpoint (CP-61) is achieved. Jog can only be entered from F-Stop and when Jog is terminated, the Follower mechanism returns to F-Stop. Jog is used when you need brief bursts of speed to align the Follower mechanism. The Jog Setpoint (CP-61) is also used in the Home Seek and Home Return modes.

CP-62 DIRECT ANALOG COMMAND

The Direct Analog Command (CP-62) parameter uses the full 12 bit resolution of the analog Speed Command Output.

A value of 4095 is a 100% forward output command.
A value of 2048 is a 50% forward output command.
0 is a zero output command.

A negative value indicates a reverse output command (e.g., - 4095 is a 100% reverse command).

CP-65 GAIN

With Integral (CP-66) set to “0” , increase the Gain (CP-65) parameter value until the system becomes unstable, then decrease it slightly until the system stabilizes. Larger values will increase Gain. To verify the stability of the speed changes, you can access Tach through either the Tach key or the Tach (MV-40) parameter.

CP-66 INTEGRAL

In systems that require greater accuracy, it may be necessary to adjust the Integral (CP-66) parameter value to reduce any remaining position error. In systems with low inertia, the position error will be reduced more quickly if you enter higher values in CP-66. An entry that is too high, however, can create instability or overshoot the setpoint before reaching the correct value. Generally, use lower entries for CP-66 on systems with a large inertia. While switching between the high and low setpoints, increase the Integral's default value of “1” until the position error is reduced within an acceptable time frame. To verify the stability of the speed changes, you can access Tach through either the Tach key or the Tach (MV-40) parameter.

CP-70 DEVICE ADDRESS

The M–Traverse has an access address which can be set from 1 to 32. Each individual M–Traverse on a multidrop RS422 communications link needs a unique Device Address. The address “00” will be globally accepted by all of the M–Series Controls on the communications link, however, they will not send a response message back to the host computer when this global address is used.

CP-71 BAUD RATE

There are six different baud rates (data rates) for the M–Traverse. Enter the number, for the required rate, as listed below.

1 = 300 Baud
2 = 600 Baud
3 = 1200 Baud
4 = 2400 Baud
5 = 4800 Baud
6 = 9600 Baud

CP-72 CHARACTER FORMAT

The M–Traverse uses three different character formats. Enter the number for the required format, as listed below.

1 = 8 Data Bits, No Parity, One Stop Bit
2 = 7 Data Bits, Even Parity, One Stop Bit
3 = 8 Data Bits, No Parity, Two Stop Bits

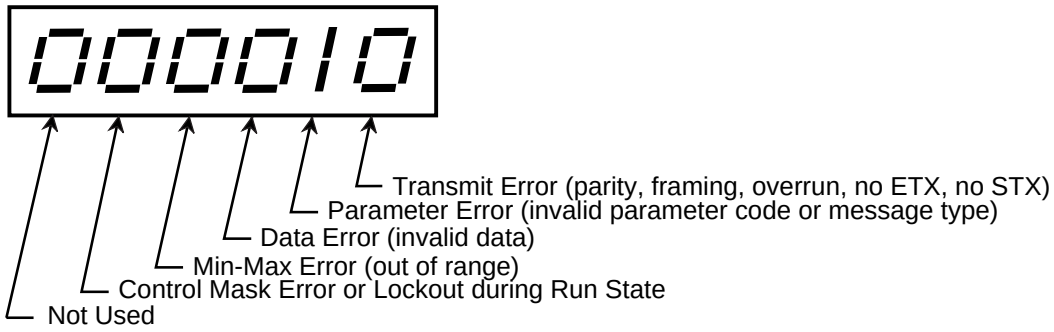
CP-73 CONTROL MASK

The Serial Communications can control some of the discrete input functions. Enter the number for the required functions, as listed below.

0 = F–Stop only
1 = F–Stop, Run, Home Return, Home Seek, Home Set
2 = F–Stop, Batch Reset, Setpoint Select 1-4
3 = All of the Above

MV-74 COMMUNICATIONS ERROR

Serial Communications Error identifies errors in the last transmitted message that was sent to the M–Traverse by the host computer. The digit that displays a number “1” indicates the error. In the example below, “Invalid Parameter Code” is the error.



CP-79 KEYPAD LOCKOUT MASK

Keypad Lockout Mask is active when the Keypad Lockout input (J4, pins 10,11) is closed. The value that you enter in CP-79 determines which CPs are locked out and inaccessible to the operator. Enter the number for the required format, as listed below.

1 = All CPs are locked out (Global lockout).
2 = All CPs except 01-08 (Setpoints and Traverse Lengths) are locked out.

MV-80 LEAD JOB SIZE

The Lead Job Size displays the total Lead encoder lines that are registered for the most recent job cycle.

MV-81 FOLLOWER JOB SIZE

The Follower Job Size displays the total Follower encoder lines registered for the forward direction of the profile.

MV-84 FOLLOWER PROFILE LENGTH

The Follower Profile Length displays the calculated number of forward encoder lines for the profile.

MV-86 PROCESS RATIO

The M-Traverse calculates and displays the commanded ratio of the Follower Frequency to the Lead Frequency. The commanded ratio is used during the constant pitch plateau segment of the profile.

MV-87 PROFILE RATIO

The M-Traverse displays the current commanded Follower to Lead ratio for the immediate operation during the in-line profile execution. MV-87 and MV-86 will be the same value during the constant pitch plateau segment of the profile.

MV-89 BATCH COUNT

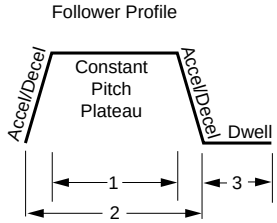
The M-Traverse calculates and displays the number of completed batch counts (profile completion).

CP-90 OUTPUT A SEGMENT

Use the Output A Segment (CP-90) parameter to determine what segment of the Follower profile will activate Output A.

Enter “1” in CP-90 to activate Output A during the constant pitch plateau segment of the Follower profile.
Enter “2” in CP-90 to activate Output A during the constant pitch plateau and Accel/Decel segments of the Follower profile.
Enter “3” in CP-90 to activate Output A during the dwell segment of the Follower profile.

The diagram below illustrates the segments of the Follower profile :



CP-91 OUTPUT A DIRECTION

Use the Output A Direction (CP-91) parameter to specify the direction in which Output A will operate.

Enter “1” in CP-91 to activate Output A during the forward direction.
Enter “2” in CP-91 to activate Output A during the reverse direction.
Enter “3” in CP-91 to activate Output A during the forward and reverse directions.

CP-92 OUTPUT A POLARITY

Use the Output A Polarity (CP-92) parameter to specify the voltage polarity at which Output A will operate.

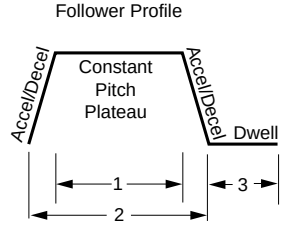
Enter “0” in CP-92 to activate Output A as Active Low Voltage Level.
Enter “1” in CP-92 to activate Output A as Active High Voltage Level.

CP-93 OUTPUT B SEGMENT

Use the Output B Segment (CP-93) parameter to determine what segment of the Follower profile will activate Output B.

Enter “1” in CP-93 to activate Output B during the constant plateau segment of the Follower profile.
Enter “2” in CP-93 to activate Output B during the constant plateau and Accel/Decel segments of the Follower profile.
Enter “3” in CP-93 to activate Output B during the dwell segment of the Follower profile.

The diagram below illustrates the segments of the Follower profile:



CP-94 OUTPUT B DIRECTION

Use the Output B Direction (CP-94) parameter to specify the direction in which Output B will operate.

Enter “1” in CP-94 to activate Output B during the forward direction.
Enter “2” in CP-94 to activate Output B during the reverse direction.
Enter “3” in CP-94 to activate Output B during the forward and reverse directions.

CP-95 OUTPUT B POLARITY

Use the Output B Polarity (CP-95) parameter to specify the voltage polarity at which Output B will operate.

Enter “0” in CP-95 to activate Output B as Active Low Voltage Level.
Enter “1” in CP-95 to activate Output B as Active High Voltage Level.

MV-99 SOFTWARE CODE REVISION

MV-99 displays the code revision number of the M–Traverse's software (EPROM).

MV-00 SOFTWARE PART NUMBER

MV-00 displays the last four digits of the eight digit part number for the M–Traverse's software (EPROM). The first four digits are assumed to be “1000”.

APPENDIX D: CONTROL PARAMETER REFERENCE

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-01	Setpoint 1	000.000	999999	0.000		E.U.
CP-02	Traverse Length 1	000.000	999999	0.000		E.U.
CP-03	Setpoint 2	000.000	999999	0.000		E.U.
CP-04	Traverse Length 2	000.000	999999	0.000		E.U.
CP-05	Setpoint 3	000.000	999999	0.000		E.U.
CP-06	Traverse Length 3	000.000	999999	0.000		E.U.
CP-07	Setpoint 4	000.000	999999	0.000		E.U.
CP-08	Traverse Length 4	000.000	999999	0.000		E.U.
CP-09	Accel/Decel Length	0	65535	0		Lead Lines
CP-10	Dwell	0	65535	0		Lead Lines
CP-14	Control Mode	1	3	1		Coded
CP-15	Engineering Units	000.000	999999	0.000		E.U.
CP-16	Lead PPR Reel	0	999999	1000		Lead Lines
CP-17	Foll Lines per EU.	0	999999	1000		Lines/EU
CP-18	PPR-Follower	60	6000	60		PPR
CP-19	Max RPM - Follower	100	30000	2000		RPM
CP-23	High Speed Alarm	0	30000	2000		RPM
CP-24	Edge/Ctr Based Profile	1	2	1		Coded
CP-25	Change Activation	1	3	1		Coded
CP-26	Batch Format	1	2	1		Coded
CP-27	Batch Limit	0	9999	0		Counts
CP-28	Batch Preact Distance	000.000	999999	999999		E.U.
CP-29	Unipolar/Bipolar	1	2	2		Coded
CP-30	At-Home Band	1	60000	4		Foll Lines
CP-31	Home Offset	-99999	999999	0		E.U.
CP-32	Resume Enable	1	3	1		Coded
CP-35	Home Sync Polarity	1	2	1		Coded
CP-36	Fwd/Rev Limit Polarity	1	2	2		Coded
CP-37	Forward Limit Format	1	2	1		Coded
CP-60	Accel/Decel	0.1	600.0	5.0		Seconds

(continued)

APPENDIX D: CONTINUED

CODE	DESCRIPTION	MIN	MAX	DEFAULT	USER RECORD	UNITS
CP-61	Jog Setpoint	0	30000	50		RPM
CP-62	Direct Analog Command	-4095	4095	0		DAC Bits
CP-65	Gain	0	30000	3000		N/A
CP-66	Integral	0	30000	1		N/A
CP-70	Device Address	1	32	1		N/A
CP-71	Baud Rate	1	6	6		Coded
CP-72	Character Format	1	3	2		Coded
CP-73	Control Mask	0	3	0		Coded
CP-79	Keypad Lockout Mask	1	2	1		Coded
CP-90	Output A Segment	1	3	1		Coded
CP-91	Output A Direction	1	3	1		Coded
CP-92	Output A Polarity	0	1	0		Coded
CP-93	Output B Segment	1	3	1		Coded
CP-94	Output B Direction	1	3	1		Coded
CP-95	Output B Polarity	0	1	0		Coded

APPENDIX E: MONITOR VARIABLE REFERENCE

CODE	DESCRIPTION	MIN	MAX	UNITS
MV-40	Tach-Velocity	-3600	3600	RPM
MV-41	Lead Frequency	-99999	120000	Hz
MV-42	Feedback Frequency	-99999	120000	Hz
MV-43	Lead Position	-99999999	536000000	Lines
MV-44	Follower Position	-99999999	536000000	Lines
MV-45	Follower Position E.U.	-99999	999999	E.U.
MV-46	Product Rate	0.0	9999.9	Cycles/Min
MV-47	DAC Output	-4095	4095	DAC Bits
MV-48	Trim Output	-4095	4095	DAC Bits
MV-49	Position Error	-99999999	536000000	Lines
MV-50	Keypad Errors	0	011111	Coded
MV-51	Alarm Status	0	010111	Coded
MV-52	Control State	1	110000	Coded
MV-53	Discrete Inputs-Group A	0	111111	Coded
MV-54	Discrete Inputs-Group B	0	111011	Coded
MV-55	Discrete Inputs-Group C	0	001111	Coded
MV-56	Discrete Outputs-Group A	0	111111	Coded
MV-57	Discrete Outputs-Group B	0	000001	Coded
MV-58	Invalid Profile	0	000011	Coded
MV-59	Line Notch Counter	0	999999	Coded
MV-74	Com Errors	0	11111	Coded
MV-80	Lead Job Size	0	536000000	Lines
MV-81	Foll Job Size	0	536000000	Lines
MV-84	Foll Profile Length	0	536000000	Lines
MV-86	Process Ratio	0.0000	10.0000	Ratio
MV-87	Profile Ratio	0.0000	10.0000	Ratio
MV-89	Batch Count	0	9999	Counts
MV-99	Software Code Revision	—	—	—
MV-00	Software Part Number	—	—	—

APPENDIX F: FAX COVER SHEET

Date: _____

Atten: Contrex Technical Support

From:
Name _____ Ext_____

Company _____Telephone #_____Fax # _____

We have _____ M-Traverses that are used for: _____

_____

_____

Serial Communication Hookup: _____Yes _____No

Brief Description of the Problem: _____

_____

_____

_____

_____

_____

_____

Contrex Fax # = (763) 424-8734

We are transmitting _____ pages, including:

- a copy of this Cover Sheet,
- a copy of Appendix D with the User Record completed,
- a sketch of the system that the M-Traverse is integrated with.

APPENDIX G: WIRING DIAGRAM EXAMPLES

WARNING

This diagram is for conceptual purposes only!
Use safety equipment.
Make wiring connections carefully.
Incorrect use of equipment or connections can cause injury or death.

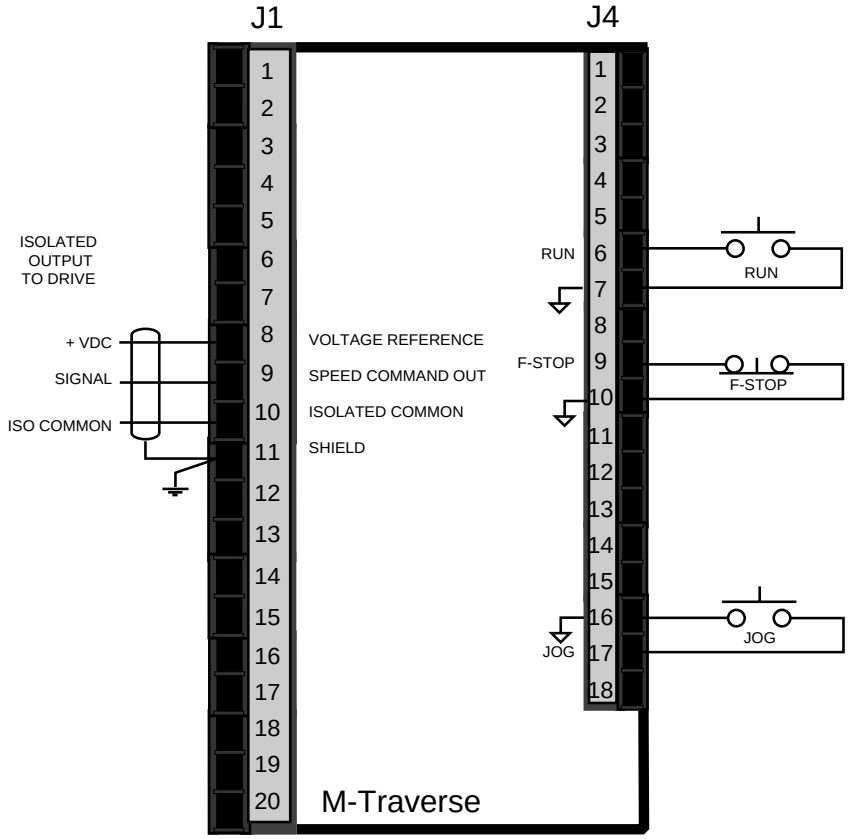


Figure G-1 M–Traverse Wiring Connections without Relays

WARNING

This diagram is for conceptual purposes only!
Use safety equipment.
Make wiring connections carefully.
Incorrect use of equipment or connections can cause injury or death.

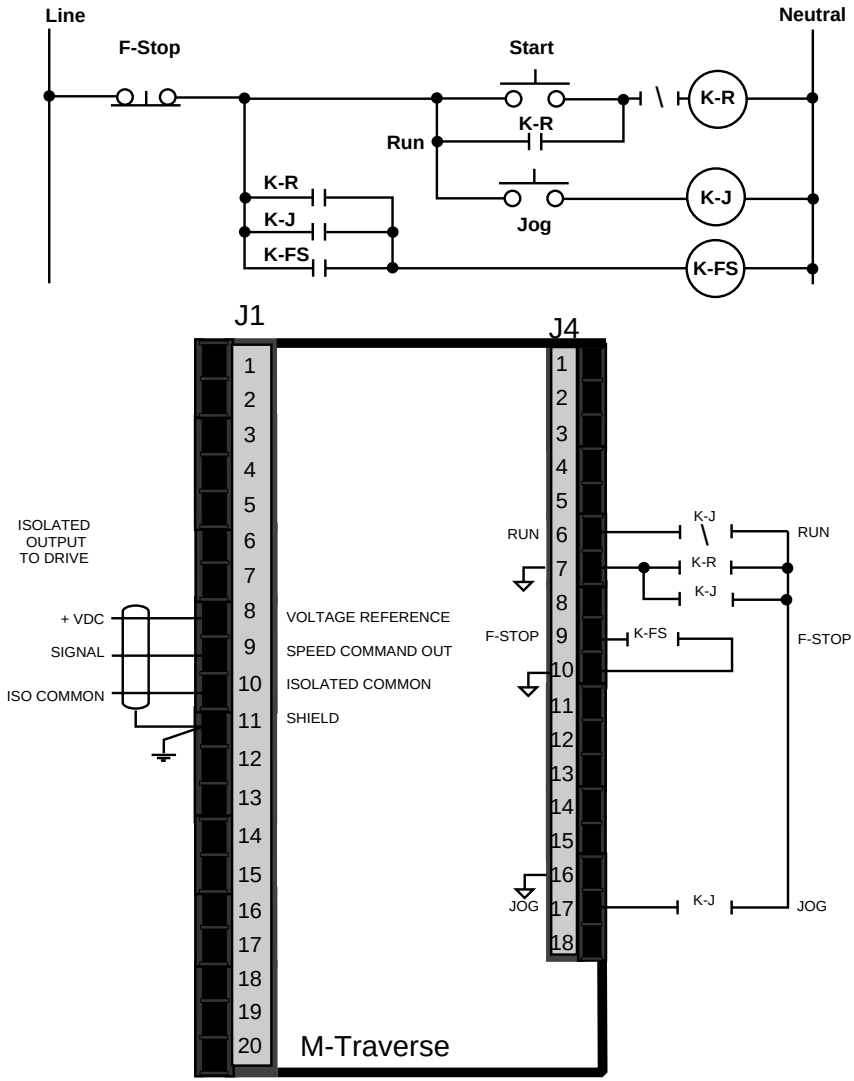


Figure G-2 Relay Run/Stop Wiring Connections

WARNING

This diagram is for conceptual purposes only!
Use safety equipment.
Make wiring connections carefully.
Incorrect use of equipment or connections can cause injury or death.

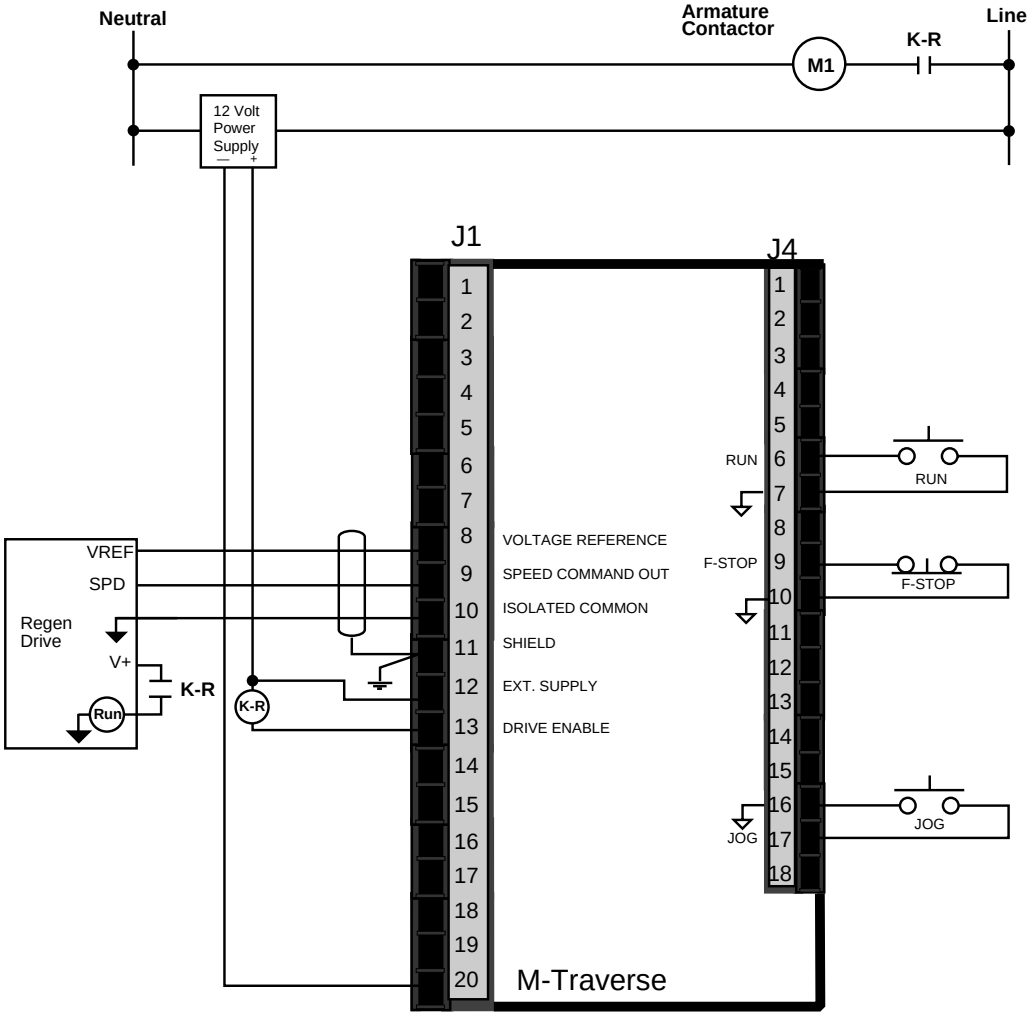
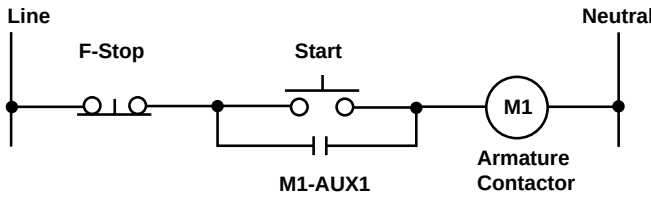


Figure G-3 Run/Stop for Regen with Armature Contactor

WARNING

This diagram is for conceptual purposes only!
Use safety equipment.
Make wiring connections carefully.
Incorrect use of equipment or connections can cause injury or death.



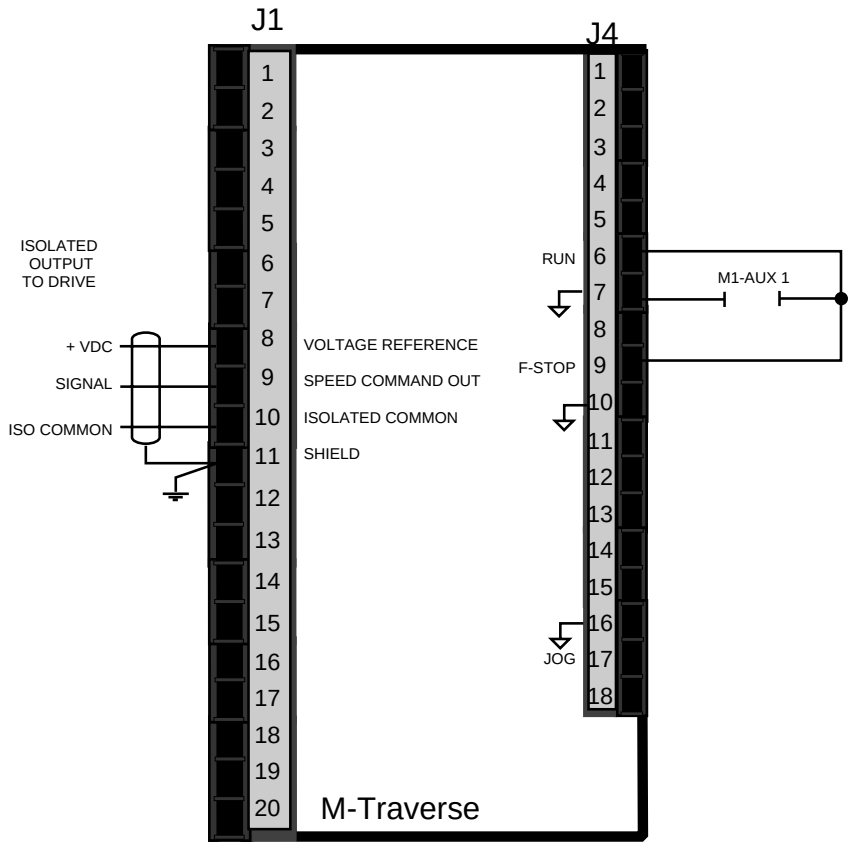


Figure G-4 Run/Stop for Non-Regen with Armature Contactor

APPENDIX H: REVISION LOG

Manual Revision	ECO Number	Revision Date	Corresponding * Software Rev.	Pages Changed
A	—	7/96	1000-7671 Rev. 1.00	New Manual Release, xerox edition
B	6396	9/96	1000-7671 Rev. 1.20	Pages ii, 5-34, 5-35, 5-38, Index. Added Rev. Log/Appendix H, page 44
C	6439	4/97	1000-7671 Rev. 1.60	Pages i, ii, v, vi, 3-28 through 3-80, 5-24, 5-36, 5-37, 5-44, Index.
D	6464	11/97	1000-7671 Rev. 1.70	Pages i, iii, 1-4, 1-5, 2-17, 2-29, 2-31, 3-9, 3-24, 3-29, 3-43, 3-44, 5-6, 5-17, 5-18, 5-21, 5-30, 5-36, 5-44, Index.
E	6539	3/99	1000-7671 Rev. 1.80	Pages cover, 2-30, 2-31, 5-11, 5-13, 5-36, 5-38, 5-44.
F	6587	9/00		Added new area code (763).

* Software revisions may not mandate manual changes. If your software revision is more recent than what is reflected here, use the the most current revision of the manual.

SERVICE POLICY

Contrex, Inc., recognizes that with each sale of its product there are certain product obligations. This document defines the limits of such obligations and provides guidelines for the performance of related services.

Applicability

This Service Policy shall apply to all product sales of Contrex, Inc. However, it may be modified by mutual consent. Thus, whenever an accepted proposal contains wording inconsistent with this policy, the proposal will prevail with respect to specific sale or series of sales involved. Applicability of this policy is also somewhat limited in cases where products are sold to an OEM for resale to user. See paragraph below entitled *OEM Service.*

Service Personnel

Contrex, Inc., has a staff whose primary responsibility is service - both factory service and field (on-site) service. Personnel of this department are usually available for service on a 24 hour notice. To facilitate quicker handling of service requests, either written or by phone, such requests should be directed to the Contrex, Inc., Technical Services Department.

Service Charges

Contrex, Inc., reserves the right to charge for all services performed at the customers request with the exception of factory service performed under warranty. All on-site service is charged at flat-rate per diem rates plus expenses. Any Contrex, Inc., product developing defects as defined in the warranty during its effective period will be repaired or replaced without charge, providing it is shipped, prepaid, to Contrex, Inc., 8900 Zachary Lane North, Maple Grove, Minnesota 55369.

Spare Parts

Contrex, Inc., will usually have an adequate inventory of spare parts and circuit boards for all standard products. However, purchasers are encouraged to maintain a nominal supply of spare parts to insure immediate on-site accessibility.

Instruction Manuals

Instructions for installation, maintenance and troubleshooting are included in manuals that are provided with the equipment. Repairs may be performed in the field by competent customer personnel; but in order to not invalidate the warranty they must be made in strict accordance with published instructions, and ONLY AFTER obtaining approval of the Technical Service Department (such repairs are usually limited to the replacement of circuit boards and major subassemblies, not the repair of these items).

OEM Service

In many instances Contrex, Inc., products are sold to the original equipment manufactures or integrators for inclusion in larger systems. In such cases the obligations of Contrex, Inc., extend only to that original purchaser. It is the latter's responsibility to handle any service required by his customer, the end user. Such problems can usually be solved by field replacement of complete units. OEM's are encouraged to buy and maintain a supply of “loaners” for this purpose. Contrex, Inc., will provide factory overhaul service at nominal charges to support that OEM. Users of Contrex, Inc., products that were acquired as components of larger systems may buy service or spare parts directly from Contrex, Inc., at standard prices, but they must appeal through the OEM for warranty service.

If Contrex, Inc., encounters trouble in the field which appears to be the result of fault or inadequacy of the system, Contrex, Inc., reserves the right to recover service charges from the party that authorized the service activity.

WARRANTY

Contrex, Inc., guarantees this device against defects in workmanship and materials for a period of one (1) year from the date of purchase. Any parts or components that fail during the warranty period will be replaced or repaired without charge. This guarantee is void if the device has been damaged by improper installation or operation, tampering, careless handling or accident.

When a device fails to function in accordance with standards set forth in the instruction manual, the purchaser should contact an authorized representative of Contrex, Inc., 8900 Zachary Lane North, Maple Grove, Minnesota 55369. Whether repairs will take place in the field or at the factory will be solely the prerogative of Contrex, Inc.

If inspection reveals defects that are caused by faulty materials or workmanship, Contrex, Inc., reserves the right to either replace the device or rebuild the device using new or refurbished warranted parts and components. In either instance, the device that is returned to the purchaser meets full factory standards for new device performance. If there is less than 90 days remaining on the warranty period at the time of the repair, the warranty will extend to 90 days after the repair.

Parts and services outside the scope of this warranty will be available at Contrex, Inc., current market price.

Contrex's liability for a device or it's use, whether in warranty or not, shall not in any instance exceed the cost of correcting the defects of the device. Contrex, Inc., assumes no responsibility for damage to property or injuries to persons from improper use of this device.

No express warranties and no implied warranties whether of merchantability or otherwise (except as to title), other than those set forth above , which are expressly made in lieu of all other warranties, shall apply to any devise sold by Contrex, Inc.

Contrex, Inc., reserves the right to change or improve its devices without imposing any obligation upon Contrex, Inc., to make changes or improvements in previously manufactured devices.

This warranty statement is a summary of Contrex, Inc's policy. Further limits of liability are contained in the Contrex, Inc's purchase order acknowledgments and invoices.

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