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MSC-1000™

MICROSTEP CONTROLLER

Operation / Installation Manual

Manual Part Number: S8M5008
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1.0 GENERAL DESCRIPTION

1.0 FUNCTIONAL DESCRIPTION

The MSC-1000 is a microprocessor based stepper motor controller which provides a 1/2, 1/4 or 1/10 micro stepping output to operate most stepper drive motors requiring 1.0 - 7.2 amps/phase current. The controller is designed to be used with the CWT torch positioning slides and the WSC-1000 weld sequence controller. It can also be used as a stand-alone positioning controller. The MSC has an RS-232 port, which can be configured to allow off-line programming and control of the stepper motor. The MSC can be configured to use the Local Area Network (LAN) port which allows the WSC-1000 weld sequence control to program and control the CWT torch positioning slide assemblies.

The MSC-1000 provides a constant current Sine/Cosine output to operate two phase stepper motors. The output phase current can be user programmed from 1.0 - 7.2 amps. The MSC provides 3 modes of operation. The MSC can be configured for 1/2, 1/4 or 1/10 step micro stepping. In the 1/2 step mode the each step is subdivided into 2 micro steps. When using a 200step/rev motor the MSC will provide 400 steps/rev with a maximum speed of 900 rpm. In the 1/4 step mode the each step is subdivided into 4 micro steps. When using a 200 step/rev motor the MSC will provide 800 steps/rev with a maximum speed of 450 rpm. In the 1/10 step mode each step of the motor is subdivided into 10 micro steps. When using a 200step/revolution motor the MSC will provide a 2000 step/rev output at a maximum speed of 180 rpm. In the 1/10 micro stepping mode the MSC provides two user selectable motor current profiles. The first is a conventional Sine/Cosine current which provides the maximum motor torque profile. The second is a modified parabolic Sine/Cosine current out/put which provides best motor positioning.

1.2 SPECIFICATIONS

General Specification:

Dimension:	4.0"h x 8.5"w x 11"l (102mm x 165mm x 280mm)
Mounting Dimension:	7.50" w x 8.50" l 4 ea 10-32 blind hole nutserts
Weight:	12 lbs (5.44 kgms)
Power Input:	120 ±10% vac 50/60 hz @ 5.0 amps
Operating Temp:	-10° f to +140°f (-23°c to +60°c)

Control Specification:

Motor Output Current:	1.0 - 7.2 amps peak each phase
Motor Output Voltage:	1.5 - 10.0 volts peak each phase
Current Profile:	Sine/Cosine or Parabolic Sine/Cosine
Limit Switch Inputs:	CW and CCW 5.0 vdc active low inputs. with internal 4.7K ohm pull up resister.
Brake Soleniod Output:	24 vdc @ 0.5 amp for 0.5 seconds then 2.0 khz PWM modulated for 12 vdc hold-in voltage @ 0.5 amps.
Step resolution:	10 steps/step, 4 steps/step or 2 steps/step user selectable

Velocity:	10 - 6000 steps/sec.
Acceleration:	10 - 1000 steps/sec ²
Index Step Count:	1 - 65535 steps
Index Scale Factor:	1-255 steps/step scale factor.
Communications:	RS-232-C 9 pin serial port. 2 WSC-LAN BNC serial ports.

2.0 INSTALLATION

2.1 LOCATION

The MSC-1000 controller should be located near the stepper drive motor it is controlling. The maximum motor drive cable length is 75 ft. Mount the MSC-1000 controller in a location that allows easy access to the front and rear panel. Figure 2-1 shows the mounting pattern for the control enclosure.

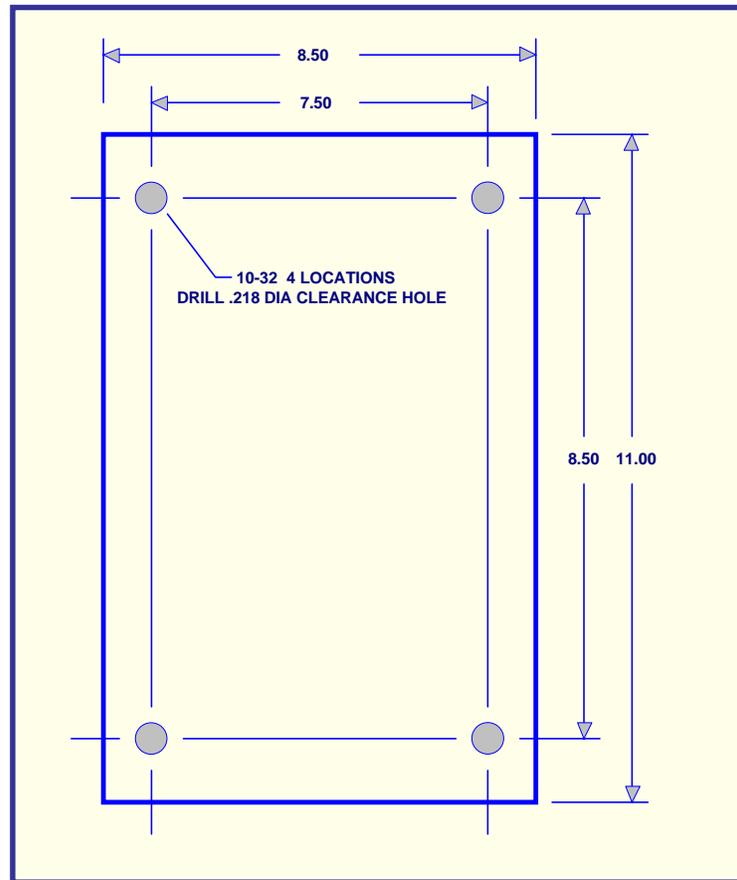


FIG 2-1: Enclosure mounting dimensions

2.2 MULTIPLE ENCLOSURE INSTALLATIONS

If multiple enclosures are installed the enclosures can be stacked. To stack multiple units, remove the six screws from the sides of the enclosure. Remove the cover. Remove the four plastic hole plugs in the cover. Mount the cover to the bottom of the second enclosure using four 10-32 x 3/8 pan head screws. Reinstall the cover and second enclosure assembly to the original configuration.

2.3 CABLES

Connect a suitable source of 115 vac power to the power input connector using a power cable assembly (CWT P/N S3W5043). Refer to Appendix A for power cable connection information for the power cable assembly. Connect the stepper motor drive cable (CWT P/N S3W5034) to the motor connector on the rear panel. The maximum motor cable length is 75 ft. Refer to Appendix A for motor control cable connection information. If the unit is being used with a WSC-1000 controller connect the LAN cable (CWT P/N S3W5049) from the WSC to one of the BNC LAN connectors on the rear panel. The two BNC connectors are identical and can be used as a junction point to daisy chain multiple LAN cables. Refer to appendix A for LAN cable connection information. If the controller is being used with an external Host computer, connect the RS-232 cable (CWT P/N S3W5050) to the RS-232 connector on the rear panel. Connect the other end of the cable to the Host RS-232 serial port connector.

2.4 CONTROLLER SETUP

If the WSC-1000 is being used with a CWT slide or stepper motor no modification of the control parameters are required. If the controller is being used with a different stepper motor, the user must set the controller output current before activating the servo drive power. The factory default motor current is 6.5 amps.

Warning: Operating the MSC with excessive motor current levels will result in permanent damage to the stepper motor. Verify the proper operating current for the stepper motor before operating the MSC controller.

To set the servo power output from a RS-232 Host controller, perform the following steps:

- Step 1. Turn the MSC power switch "ON".
- Step 2. From the host terminal type the following command:
`A=#.#(cr) (Ctrl)S`

Where: #.# is the motor current as specified for the motor.

To set the motor current from the WSC-1000 controller, connect the Host computer to the WSC-1000 terminal port and perform the following steps:

- Step 1. Turn the MSC and WSC power switches "ON".
- Step 2. From the Host terminal type the following commands:
`L#=l(cr)`
`L#=A#.#(cr)`
`L#=#S(cr)`
`L#=E(cr)`
`L#=H(cr)`
Where: # is the LAN axis drive number (1, 2, 3 or 4)
#.# is the motor current as specified for the motor.
- Step 3. Turn the power switch on the WSC to the "OFF" position.
- Step 4. Turn the WSC power switch to the "ON" position.

2.5 LIMIT SWITCH INPUTS

The MSC-1000 provides two limit switch inputs which are used to prevent over driving the mechanical slide assembly and to establish a home position. Upon power up the MSC will drive to the CCW limit switch and initialize the step indexes position counter to 0. The CWT torch slide assemblies provide two Hall effect limit switches for CW and CCW. When using other slide assemblies it is recommended that limit switches should be installed. The limit switch inputs are 5.0 vdc TTL input and are active low. The MSC provides a 4.7K ohm pull up to an internal 5 vdc source for each limit switch input. A +5 vdc source is also provided to power a HALL-EFFECT sensor limit switch. The following is an example of interfacing to the MSC limit switch inputs:

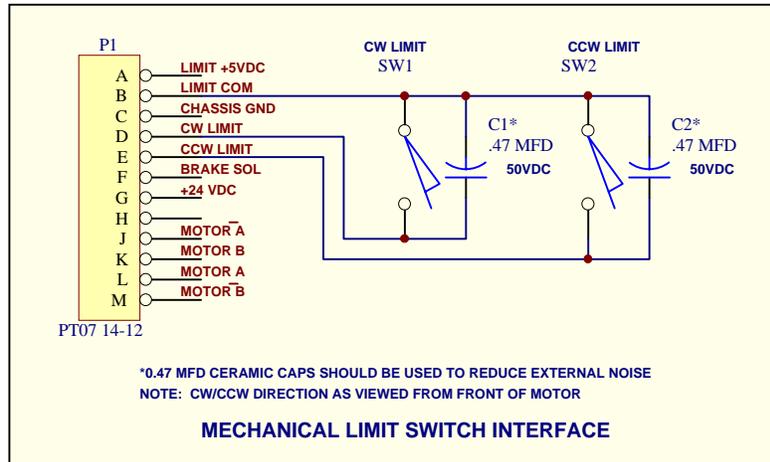


FIG 2-2: Limit switch interface

The MSC-1000 provides a power down brake output which can be used to operate a electro-mechanical motor brake. This output will be active any time power is applied to the motor windings. The output provides a 24 vdc signal rated at 0.5 amps. The output will be set at 24 vdc for 0.5 seconds to allow full power pull-in then the output will be PWM modulated at 2.0 khz to provide a 12 vdc output for reduced power brake hold-in. This reduces the power dissipation in the brake assemble. The CWT vertical slide assembly uses a ELECTROID P/N 16MFSB-15-0-24V brake assembly. The following is an example of interfacing a electro-mechanical brake to the MSC controller:

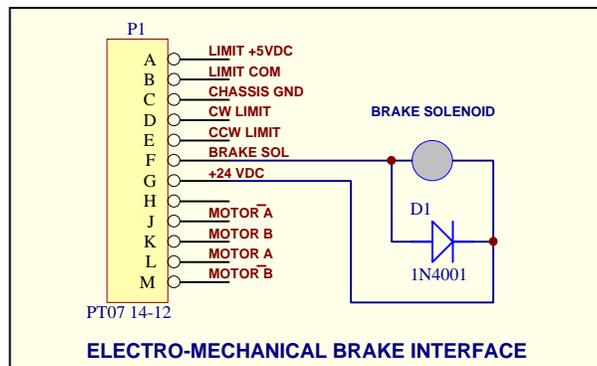


FIG 2-3: Motor Brake interface

2.7 STEPPER MOTOR INTERFACE

The MSC-1000 is designed to use any 2-phase stepper motor with a current rating of 1.0 - 7.2 amps. The following is an example of how to interface a 2 phase stepper motor to the MSC controller:

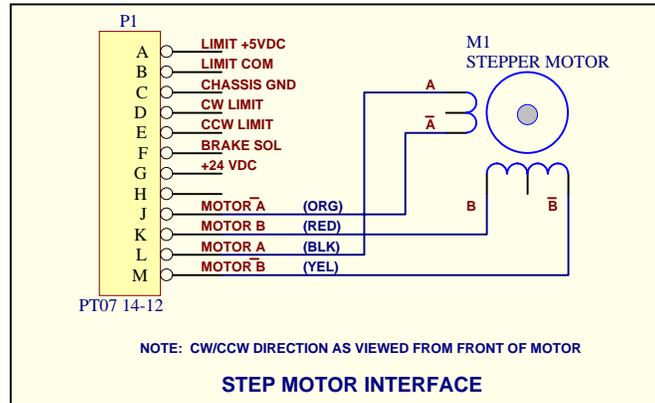


FIG 2-4: Stepper motor interface

2.8 CONTROL PARAMETERS

If the WSC-1000 is being used with a CWT slide or stepper motor no modification of the control parameters are required. If the controller is being used with a different stepper motor, or mechanical slide assembly the user must set the controller step mode output before activating the servo drive power. The factory default operating mode is 1/10 step/step.

Warning: Changing the operational mode while the drive is operating may cause erratic operation. Disable the drive power before changing step modes.

To set the step operational mode from a RS-232 Host controller, perform the following steps:

- Step 1. Turn the MSC power switch "ON".
- Step 2. From the host terminal type the following command:
 $O=\#(cr)$
 $(Ctrl)S$

Where: # is the desired operational mode for the drive.

To set the step operational mode from the WSC-1000 controller, connect the Host computer to the WSC-1000 terminal port and perform the following steps:

- Step 1. Turn the MSC and WSC power switches "ON".
- Step 2. From the Host terminal type the following commands:
 $L\#=I(cr)$
 $L\#=O\#(cr)$
 $L\#=E(cr)$
 $L\#=H(cr)$
 $L\#=T(cr)$

L#=#S(cr)

Where: # is the LAN axis drive number (1, 2, 3 or 4)

is the motor current as specified for the motor.

Step 3 Turn the power switch on the WSC to the "OFF" position.

Step 4 Turn the WSC power switch to the "ON" position.

3.0 MSC-1000 LAN/OFF-LINE SERIAL TERMINAL PROTOCOL

3.1 COMMUNICATION SELECTION

The MSC-1000 is designed for use with Computer Weld Technology's WSC-1000 or MWC-1000 controller using serial LAN communication or it can be configured for use through a standard RS-232-C serial port. Only one mode of communications can be enabled at a time. The MSC-1000 is configured at the factory for LAN communication with a specific axis drive. A label is placed on the back panel of the MSC-1000 that indicates the current factory setting by AXIS DRIVE NUMBER. The Mode of communications is determined by the setting of S1 Dip switch and the JP6 - 7 jumpers located on the Drive CPU P.C. Board



S1 (ALL SWITCHES IN CLOSED POSITION)

JP6

JP7

FIG 3-1 – S1 Switch and Jumper Locations

*Note: When setting the **Dip Switches of S1** the following applies:
If the Switch is pressed towards the **NUMBER** side of S1 the Switch is in the **CLOSED** position.*

To enable **RS-232 Serial Port Communication** with the MSC-1000, use the following procedures:

- Step 1. Remove power to the MSC-1000
- Step 2. Remove the cover to the MSC-1000
- Step 3. Locate S1, JP6 and JP7 on the P.C.B. of the MSC-1000 (see Figure 3-1)
- Step 4. Set all the S1 Dip switches to the **CLOSED** position. The Switches are in the **CLOSED** position when they are set to the **NUMBER** side of S1.

(see Figure 3-1)

- Step 5. Move both of the Jumpers on JP6 and JP7 from pin 1-2 to pin 3-4.
- Step 6. Replace the cover on the MSC-1000.
- Step 7. Connect an RS-232 cable to the RS-232 connector on the rear of the MSC-1000 and to the computer terminal.
- Step 8. Apply power to the MSC-1000.

The MSC-1000 is ready to accept commands from the computer terminal via the RS-232 cable. **See Section 3.3 through 3.10 for RS-232 communications programming and a list and description of commands.**

3.2 LAN COMMUNICATIONS

To enable **LAN communications** routines, install jumpers on JP6 and JP7 pins 1, 2. The S1 DIP switches must be set to the LAN address (or Axis) for the desired motor control functions. The usable LAN address range is 1 - 4. Example: If Axis 2 is the desired motor for control, set S1 Dip Switch 2 to the **OPEN** position. A switch is in the **OPEN** position when it is set to the **OPEN** side of S1. Switch 1, 3 and 4 should remain in the **CLOSED** position. See figure 3-2.

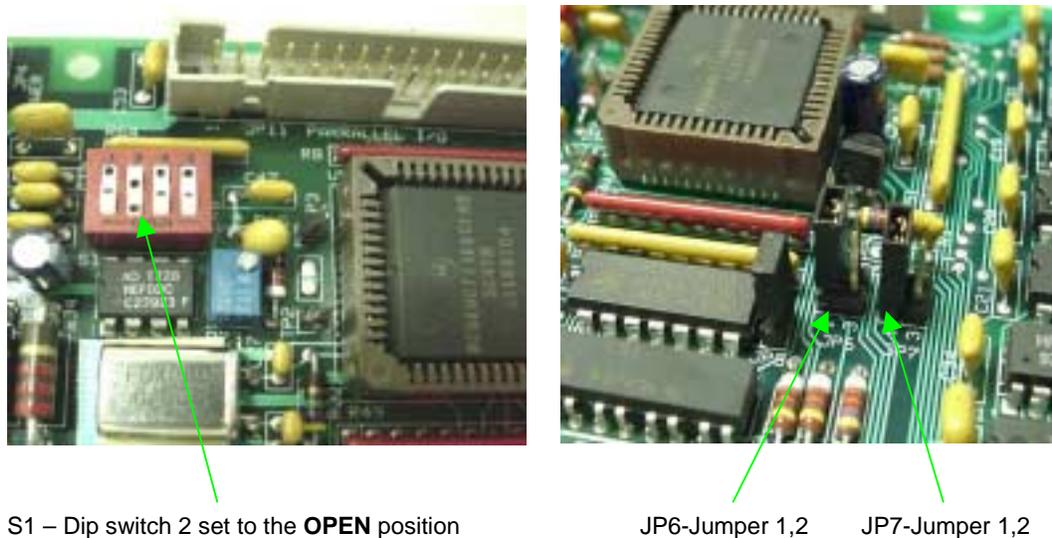


FIG 3-2 - LAN Axis 2 Switch and jumper settings

LAN ID	SW1	SW2	SW3	SW4	WSC-1000 CONTROL FUNCTION
1 (AXIS 1)	OPEN	CLOSED	CLOSED	CLOSED	Horizontal AXIS 1 (Default Setting)
2 (AXIS 2)	CLOSED	OPEN	CLOSED	CLOSED	Vertical AXIS 2 (Default Setting)
3 (AXIS 3)	CLOSED	CLOSED	OPEN	CLOSED	PLC Addressable AXIS 3
4 (AXIS 4)	CLOSED	CLOSED	CLOSED	OPEN	PLC Addressable AXIS 4

The MSC-1000 is ready to accept commands through the **LAN**. **See Section 3.11 through 3.12 for LAN communications programming and a list and description of commands.**

3.3 RS-232 COMMUNICATIONS OFF LINE PROTOCOL

The RS-232 communications port is used to off-line program the MSC-1000 sequence and drive parameters when not configured for LAN operations. It is also used to configure the operating parameters for the MSC. The Protocol is a simple ASCII command string that allows the user to upload or down load the various parameters. The serial port is configured for the following data format:

Baud Rate: 9600, Full Duplex
Word Length: 8 Data Bits, One Stop and no parity
Flow Control: None
Translation: CR to CR/LF

3.4 RS-232 COMMAND STRINGS

The Protocol consists of a command string and optional data bytes. The command string is an Alpha character followed by an optional "=" followed by optional data and terminated with a ASCII "cr" (0dh). The "=" will indicate that data is being sent to the selected parameter by the host controller. If the host is up loading data to the MSC, the data will be placed after the "=" character and must be an ASCII string terminated with an ASCII "cr" (0dh). The following is an example of sending a new drive motor speed to the MSC-1000:

V=1000(cr) Sent from Host

The host can request status information from the MSC by sending the following command:

D(cr) Sent from Host

The MSC will send the following status report to the Host:

```
*** MSC-1000 System Status Report ****
Maximum Position (inch) = #.####
Current Position (inch) = #.####
Step velocity (inch/sec) = #.####
PWM output current (amp)= #.#
COSINE PWM Duty Cycle (%) = ##
SINE PWM Duty Cycle (%) = ##
PWM Power Supply (vdc) = ##.#
12vdc Power supply (vdc)= ##.#
Acceleration (inch/sec/sec) = #.####
```

FIG 3-3 - MSC Status screen where # is the current value for the parameter

3.5 HELP SCREENS

The MSC can display a help screen, on the host terminal, which list the available terminal commands. To display the help screen type the following command from the host terminal:

?(cr) Sent from Host to MSC

The following screen will be displayed:

MSC-1000 COMMAND SUMMARY: Press letter, value (# indicates required value) and CR. To cancel command press CTRL C.	
KEY	FUNCTION
M#	Move slide position # steps. NOTE: One step equal 0.001 inch
V#	Stepper motor velocity in # steps/second (10-6000 steps/sec).
W#	Width of oscillation in # steps (2 step - (Max Width/2)).
R#	Shift oscillation pattern Right # steps (1 step - 9999 step).
L#	Shift oscillation pattern Left # steps (1 step - 9999 step).
Q	Quit auto sequence routine.
G	Run stored auto execute routines.
A#.#	Set PWM output current to #.# amps (1.0 amp - 7.0 amp).
S#=#	Program auto sequence command (0-49). Press S#=# then press M#### to Save. Press S#=0 to clear a sequence command (Example: S1=M1000).
Z	Clear all auto sequence values.
H	Find end limits and set slide to center position (X=1 to disable)
I	Inhibit PWM output drive and activate brake.
E	Enable PWM output drive and release brake.
D	Display current MSC-1000 status.
C	Set slide to Center Position.
^S	Save stored Auto Execute sequence data in EEPROM.
^L	Load stored Auto Execute sequence data from EEPROM.
U=#	Load Acceleration constant in (10 - 2000 in/sec/sec).

FIG 3-4 - MSC Terminal Help screen

3.7 SEQUENCE ROUTINES

The MSC has the ability to store up to 50 auto sequence routines. The sequences are stored in nonvolatile memory and can be used to execute move, velocity, and delay commands. To program the auto sequence routines, the following command format is used:

$$S\{number\}=\{Command\}\{value\}(cr)$$

Where: *number*=Sequence number to program
Command = M(move), D(delay), V(velocity)
value = numerical value for the selected command

The MSC will begin execution of the auto sequence routine when a *G(cr)* terminal command is sent. It will start with S1 and execute all programmed sequence numbers until a null command is detected (S#=0) or the end of the sequences are reached. The MSC will then reset to the start of the sequences and repeat the stored sequences. To end the auto execute routine, the host must send a *Q(cr)*.

3.8 SAVING SEQUENCES

To save the programmed sequence in the MSC the host must send a *(Ctrl)S* command. The MSC will respond with the following terminal messages:

- Step 1. Clearing EEPROM Memory and Saving Sequence Data.
 Step 2. Sequence Data Saved and Verified in EEPROM.

WARNING: *Parameters loaded from the host are not automatically saved to the EEPROM. When power is removed all data not saved to the EEPROM will be lost. After loading and testing auto sequence routines or changing control setup parameters, save new configurations to EEPROM using the (Ctrl)S command.*

The auto execute sequences stored in EEPROM will be loaded into the MSC RAM during the power up routines. The following is an example of an auto sequence routine that will move the slide to a 3.000 inch position, delay for 0.1 seconds, set the velocity to 5.000 inch/sec, move the slide to a 1.000 inch position, delay for .05 seconds, then set the velocity to 2.500 inch/sec.

```
S1=M3000
S2=D10
S3=V5000
S4=M1000
S5=D5
S6=V2500
```

3.9 RS-232 SERIAL COMMANDS

The following is a summary of the RS-232 serial Commands supported by the MSC-1000:

- M=** Move to position specified by value.
- A=** Set output current to value specified.
- V=** Set velocity to value specified.
- R=** Jog slide center position CW by specified value.
- L=** Jog slide center position CCW by specified value.
- U=** Set axis drive acceleration constant to value specified.
- +=** Index slide in the CW direction to position specified by the value.
- =** Index slide in the CCW direction to position specified by the value.
- X=** Disable home limit switch search routine (X=1 Disabled, X=0 Enable)
- H** Reset drive and move to Home position. If a value is provide the MSC will set the Home search speed to the specified value.
Example:
H(cr) - Send the MSC slide assembly to the Home position.
H1500(cr) - Set the MSC slide home search routine to 1500 steps/sec.
- E** Enable axis drive power output.
- I** Inhibit axis drive output power.
- S** Set auto sequence parameter S1 - S50 to specify move, velocity or delay parameter.
Example:
S1=V1000, set sequence 1 to set motor velocity equal to 1000 steps/sec.
- G** Start axis drive auto sequence routine.
- Q** Quit axis drive auto sequence routine.
- Z** Clear all axis drive sequence parameters.
- T** If a value is entered with this command the value will be used as the maximum width. If the command does not have a value the MSC will calculate the maximum position based on external limit switch inputs.
Example:
T(cr) - Find slide width using CCW and CW limit inputs.
H6500(cr) - Set the MSC slide max position to 6500 steps.
- D** Display MSC status and auto sequence routines on terminal.

- ? Display MSC command summary on terminal.
- O= Sets operational mode for stepper drive:
- O=0 Sets 1/10 steps/step mode with Set Sine/Cosine motor current profile to optimize motor torque (Default Mode).
 - O=1 Sets 1/10 steps/step mode with Set Sine/Cosine motor current profile to optimize motor position.
 - O=2 Set 1/4 steps/step mode with torque compensated Sine/Cosine motor current profile.
 - O=3 Sets 1/2 steps/step mode with torque compensated Sine/Cosine motor current profile.
 - O=4 Disable Inverted motion control commands
 - O=5 Enable Inverted motion control.
 - O=6 Enable Home limit search mode.
 - O=7 Disable Home limit search mode.
 - O=8 Enable PWM brake drive control.
 - O=9 Disable PWM brake drive control and apply full brake power.
- F= Sets scale factor (steps/distance) for position control. The default value is set to 1. The following equation can be used to determine the scale value for a given application:
- $$F = (\text{steps/rev}) / (\text{distance/rev})$$
- Example: Slide uses a 0.25 Pitch ball screw drive and the MSC is set for 1/10 step or 2000steps/rev. $F = (2000) / (0.25)$*
- F=8(cr)**

3.10 CONTROL FUNCTION KEYS

In addition to the terminal commands the MSC-1000 supports several special control key functions. These functions are used to save the programmed data in the EEPROM and to clear any pending terminal commands. The following commands are generated by pressing the CTRL" and specified letter key at the same time. When sending any of the following control codes, the MSC-1000 will respond with a ASCII "CR". The following is a summary of the special control character functions supported by the MSC-1000:

Control Codes	Command Function
^S	Save current drive configuration to drive EEPROM and use as default.
^L	Load default drive EEPROM data.
^Q	Terminate current drive move command and return position.

3.11 LAN COMMUNICATIONS PROTOCOL

If the MSC-1000 is configured for LAN communications, then the following commands may be used to configure the controller using the WSC-1000 or MWC-1000 terminal port and a P.C. based communications program. See the Operator Manual for the WSC-1000 or the MWC-1000 for LAN Communications Protocol procedures. To send MSC drive commands, use the L#= WSC terminal command where # is the AXIS drive LAN ID number. The string following the "=" will be sent to the selected axis drive.

*Example: To change the Travel speed for AXIS 1 type:
L1=V1000 (cr) Set travel speed to 1000 steps.*

3.12 LAN DRIVE COMMANDS

The following is a summary of the MSC-1000 LAN drive commands:

^S Save current drive configuration to EEPROM and use as default.

To send the **Save Command** to the MSC-1000 through the LAN, type the following terminal command:

*Example: L#=**^S** <enter>*

Where (#) = the AXIS number of the MSC-1000 that you want to save data to the EEPROM. To get the (^) symbol hold the shift key down and press the number 6 on the key board.

^L Load default EEPROM data.

M= Move to position specified by value.

A= Set output motor current to value specified.

V= Set velocity to value specified.

R= Jog drive position forward by specified value.

L= Jog drive position reverse by specified value.

U= Set axis drive acceleration constant to value specified.

+= Drive motor in the forward direction at speed specified by the value.

-= Drive motor in the reverse direction at speed specified by the value.

h= Disable home limit switch search routine (h=1 Disabled, h=0 Enable)

H Reset drive and move to Home position. If a value is provided the MSC will set the Home search speed to the specified value.

*Example: H(cr) - Send the MSC slide assembly to the Home position.
H1500(cr) - Set the MSC slide home search routine to 1500 steps/sec.*

I Inhibit axis drive output power.

S Set auto sequence parameter S1 - S50 to specify move, velocity or delay parameter.

Example: S1=V1000, set sequence 1 to set motor speed equal to 1000 steps/sec.

T If a value is provide with this command the value will be used as the maximum width. If the command does not have a value the MSC will calculate the maximum position based on external limit switch inputs.

*Example: T(cr) - Find slide width using CCW and CW limit inputs.
H6500(cr) - Set the MSC slide max position to 6500 steps.*

G Start axis drive auto PLC sequence routine.

Q Quit axis drive auto PLC sequence routine.

Z Clear all axis drive PLC sequence parameters.

E Enable axis drive power output.

O= Sets operational mode for stepper drive:

O=0 Sets 1/10 steps/step mode with Set Sine/Cosine motor current profile to optimize motor torque (Default Mode).

- O=1** Sets 1/10 steps/step mode with Set Sine/Cosine motor current profile to optimize motor position.
- O=2** Set 1/4 steps/step mode with torque compensated Sine/Cosine motor current profile.
- O=3** Sets 1/2 steps/step mode with torque compensated Sine/Cosine motor current profile.
- O=4** Normal mode operating mode.
- O=5** Inverted motion operating mode.
- O=6** Enable home search routine.
- O=7** Disable home search routine.
- O=8** Enable PWM Brake drive control.
- O=9** Disable PWM Brake Drive and use full Power.

F= Sets scale factor (steps/distance) for position control. The default value is set to 1. The following equation can be used to determine the scale value for a given application:

$$F=(\text{Steps/rev})/(\text{Distance/Rev})$$

Example: Slide uses a 0.25 Pitch ball screw drive and the MSC is set for 1/10 step or 2000steps/rev. $F=(2000)/(0,25)$

4.0 TROUBLESHOOTING PROCEDURES

In a normal operating condition, the operator should observe the following indications on the front of the MSC-1000:

1. The Power On switch should illuminate.
2. The Serial Data LED should illuminate green.
3. The LAN LED should illuminate green or flash very quickly from red to green if the system is connected to the LAN (if not connected to the LAN the LED will be OFF).
4. The Servo Power LED should be red.

If any of the above LED's are off or a color other than listed above it could indicate a possible problem with the MSC-1000.

SYMPTOM	DIAGNOSIS
No Power	<ol style="list-style-type: none"> 1. Verify AC power source. 2. Check AC Power Cord cannon plug and verify that the locking collar is locked into position. 3. Disconnect power plug from power source. Remove and check 5 AMP fuse. Replace if defective. If fuse blows after replacement contact CWT service representative.
None of the LED's light up	<ol style="list-style-type: none"> 1. Remove power from the MSC-1000. 2. Remove the cover from the MSC-1000. 3. Check and make sure the wires to the LED's are not loose. 4. Check the connector located at JP9 on the MSC-1000 P.C. board and make sure it is properly seated. 5. Check the fuse for the power supply located on the divider wall of the MSC-1000. 6. Replace the cover and apply power to the MSC-1000. 7. If LED's do not light up, contact CWT service representative.
Serial Data LED remains Red	<ol style="list-style-type: none"> 1. Serial Data LED remains RED: 2. Verify that power has been applied to the WSC-1000 or the MWC-1000. 3. Check for proper installation of the LAN cable. 4. If more that one MSC-1000 is connected to the LAN (Daisy

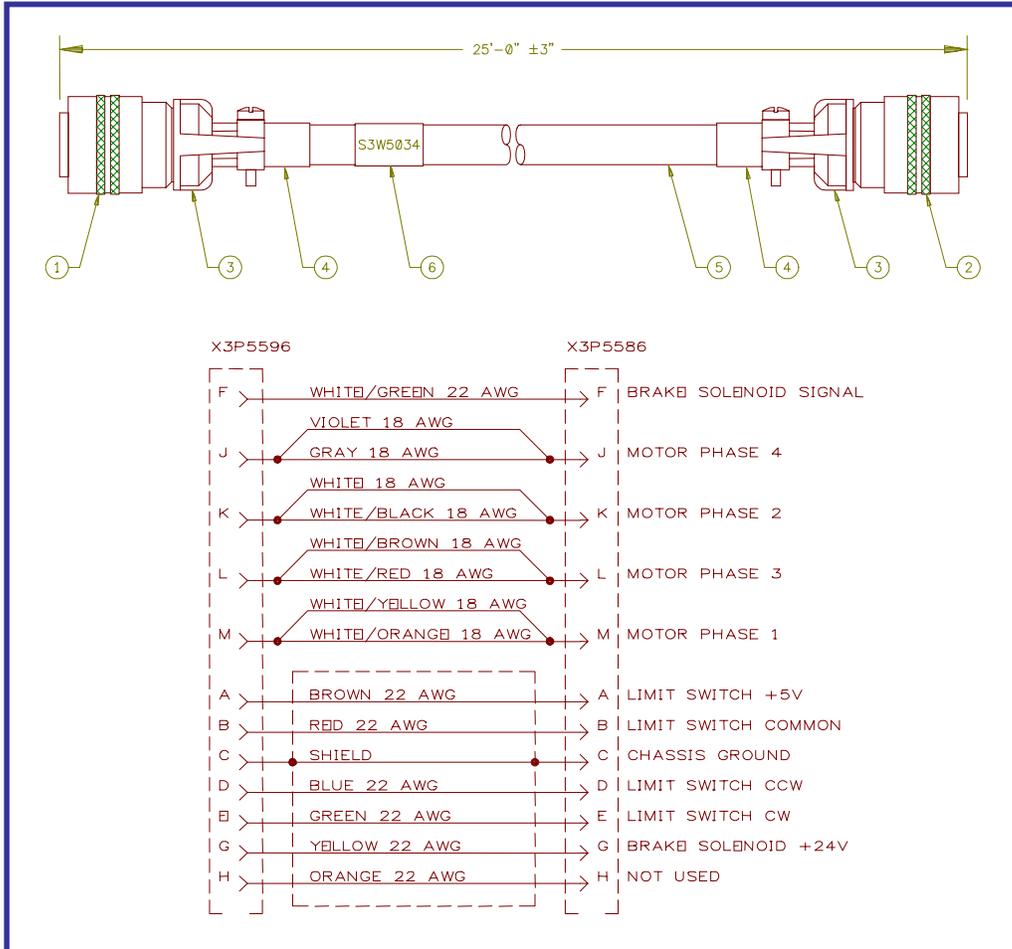
<p>Serial Data LED remains Red (CONT)</p>	<p>Chain) disconnect one at a time and check the Serial Data LED. If it turns Green while disconnecting the LAN cables, replace that LAN cable. If the Problem still exist, contact a CWT service representative.</p> <ol style="list-style-type: none"> 5. Check LAN cable for damage. 6. Contact CWT service representative.
<p>Serial Data LED is Orange or Yellow</p>	<ol style="list-style-type: none"> 1. Remove power to the MSC-1000 and remove top cover. 2. Locate S-1 on the MSC-1000 P.C. board. (see FIG 3-1) 3. Set the S1 DIP switch corresponding to the LAN device number to the OPEN position. Place the other three DIP switches in the CLOSED position. Ensure that two AXIS Devices have not been selected for use. Only one AXIS device (DIP SWITCH OPEN) can be selected per MSC-1000. Verify that JP6 and JP7 have a jumper installed across pins 1 and 2. (See Section 3, Para 3-2 of this manual for details) 4. Contact CWT service representative.
<p>No LAN LED or LAN LED RED</p>	<ol style="list-style-type: none"> 1. Verify that the WSC-1000 or MWC-1000 have power applied. 2. Check for installation of LAN cable. 3. Check LAN cable for damage(replace if damaged) 4. Contact CWT service representative
<p>No Servo Power LED</p>	<ol style="list-style-type: none"> 1. Verify that the WSC-1000 or the MWC-1000 have power applied and the LAN cable is connected. 2. Remove power to the MSC-1000 and remove top cover. 3. Locate S-1 on the MSC-1000 P.C. board. (see FIG 3-1) 4. Set the S1 DIP switch corresponding to the LAN device number to the OPEN position. Place the other three DIP switches in the CLOSED position. Ensure that two AXIS Devices have not been selected for use. Only one AXIS device (DIP SWITCH OPEN) can be selected per MSC-1000. Verify that JP6 and JP7 have a jumper installed across pins 1 and 2. (See Section 3, Para 3-2 for details) If problem still exist go to next step. 5. If using a WSC-1000 go to the front panel and perform the following: <p style="margin-left: 40px;">If the problem is with the MSC-1000 for the Horizontal Slide (AXIS 1), press the ALTER key. Press the FWD/NEXT key until the WEAVE PARAMETERS Screen is displayed. Press the ENTER/YES key. Press the FWD/NEXT key until the OSC POWER? Screen is displayed. If the screen displays a YES, go to the next step</p>

<p>No Servo Power LED (CONT)</p>	<p>6 of these instructions. If the screen displays a NO, press the ENTER/YES key until a YES is displayed on the screen. The SERVO POWER light should come on and the slide will move to the HOME position. If the screen will not display a YES, go to step 6 of these instructions.</p> <p>If the problem is with the MSC-1000 for the Vertical Slide (AXIS 2), press the ALTER key. Press the FWD/NEXT key until the TORCH PARAMETERS Screen is displayed. Press the ENTER/YES key. Press the FWD/NEXT key until the TORCH POWER? Screen is displayed. If the screen displays a YES, go to the next step 6 of these instructions. If the screen displays a NO, press the ENTER/YES key until a YES is displayed on the screen. The SERVO POWER light should come on and the slide will move to the HOME position. If the screen will not display a YES, go to step 6 of these instructions.</p> <p>If the problem is with any other AXIS (3 or 4) go to step 6 of these instructions.</p> <p>6. Connect a computer terminal to the WSC-1000 or MWC-1000 through the RS-232 port. Using a Terminal program type the following commands:</p> <p>CAUTION: Some of these commands will cause the slides to move. Ensure they are free to travel to prevent damage to equipment or harm to the operator.</p> <p>Type: S1=13,1 (enter) M0=0 (enter) M0? (enter) the PLC will respond with a 1</p> <p>L#=E (enter) (where # is the Axis Number) (example: If the Vertical slide is AXIS 2 you would type L2=E (enter)</p> <p>The command E stands for Enable the drive. The Servo Power LED should be illuminated. If not type:</p> <p>L#=I (enter) and then type L#=E. If the Servo Power LED did not illuminate, send the following command:</p> <p>L#=H (enter) The slide should move to the home position. If the slide does not move contact a CWT service representative for further instructions.</p> <p>If the LED illuminates and the slide moves to the Home Position then the MSC-1000 is working properly. Power cycle the WSC-1000 or the MWC-1000 off and back on.</p> <p>If the Servo Power LED does not illuminate during power up, contact a CWT service representative.</p>
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No Servo Power LED (CONT)	<p>Note: The descriptions of all the LAN commands that can be sent to the MSC-1000 are located in Section 3, para 3.11 of this manual.</p> <p>7. If none of the above procedures corrects the problem, contact a CWT service representative for assistance.</p>
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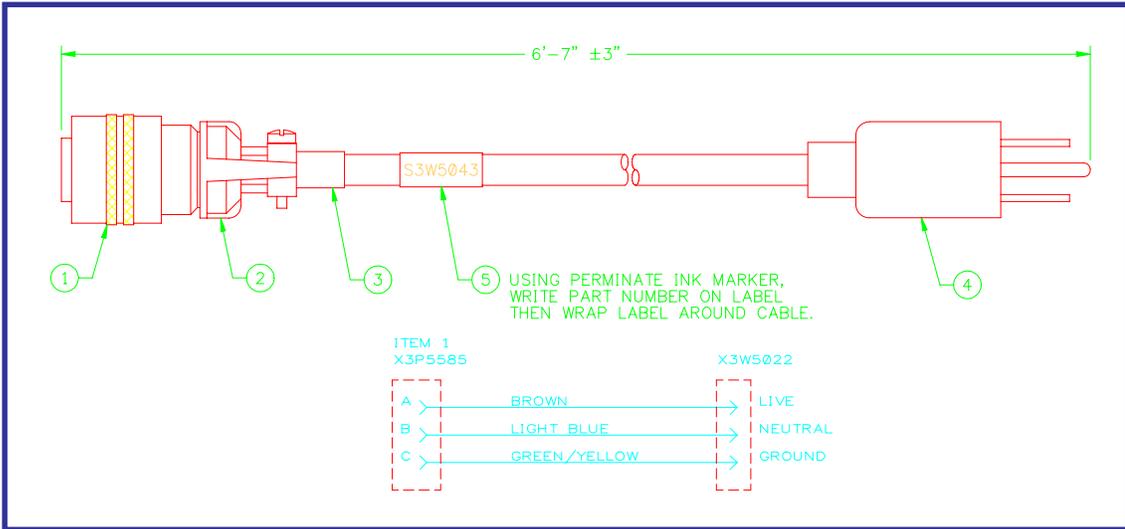
APPENDIX A SYSTEM CABLES

A-1 MICROSTEP DRIVE CABLE P/N: S3W5034



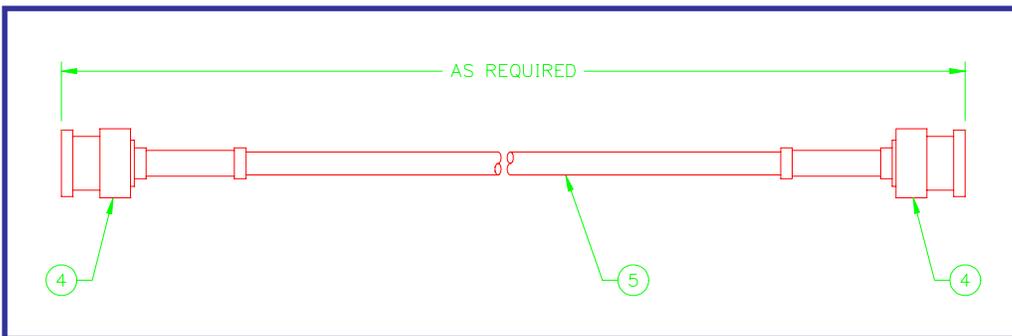
ITEM	QTY	PART NO	DESCRIPTION
1	1	X3P5596	Connector, Plug 12 Circuit
2	1	X3P5586	Connector, Plug 12 Circuit
3	1	X3P5589	Clamp, Cable
4	2	X3P5505	Boot, Cable Clamp
5	25'	X3W0077	Cable, Series 1000
6	1	X3Z5089	Tag, Identification

A-2 POWER CABLE P/N: S3W5043



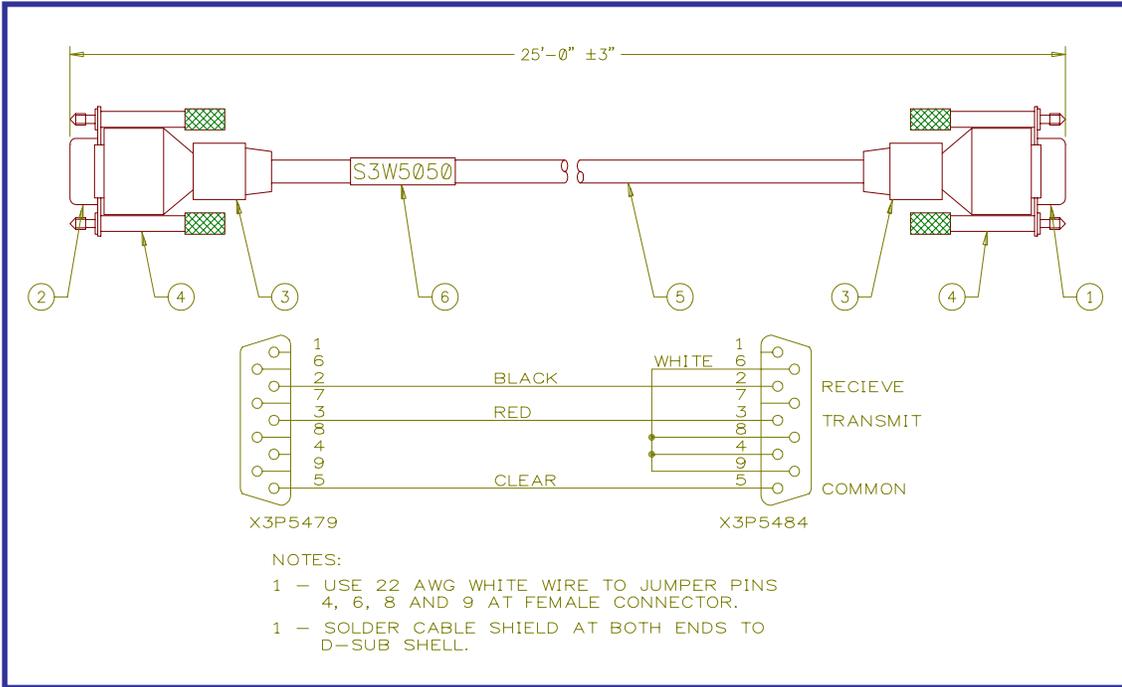
ITEM	QTY	PART NO	DESCRIPTION
1	1	X3P5585	Connector, Plug 3 Circuit
2	1	X3P5126	Clamp, Cable
3	1	X3P5519	Boot, Cable Clamp
4	1	X3W5022	Cable, Power
5	1	X3Z5089	Tag, Identification

A-3 LAN CABLE P/N: S3W5049



ITEM	QTY	PART NO	DESCRIPTION
1	2	X3P5619	Connector, BNC
2	A/R	X3W5076	Cable, Coaxial

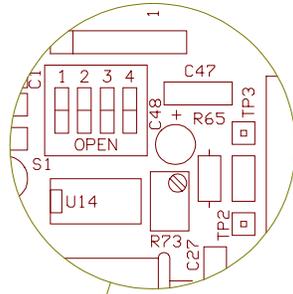
A-4 TERM CABLE P/N: S3W5050



ITEM	QTY	PART NO	DESCRIPTION
1	1	X3P5484	Connector, D-sub 9 Circuit
2	1	X3P5479	Connector, D-sub 9 Circuit
3	2	X3Z5081	Shell, D-sub
4	2	X3Z5084	Kit, Thumb Screw D-sub
5	25'	X3W5025	Cable, 3 Conductor 22 AWG Shielded
6	1	X3Z5089	Tag, Identification
7	0.2'		Wire, 22 AWG White Teflon Coated

APPENDIX B CALIBRATION

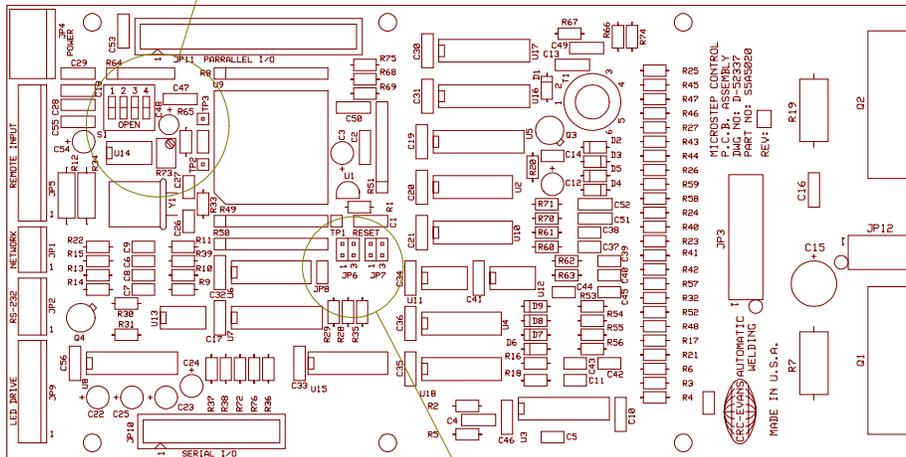
B-1 CONTROL BOARD CALIBRATION AND JUMPERS



Using voltage meter, attach negative lead to testpoint "TP3" and positive lead to "TP2".

Adjust pot "R73" to calibrate to 5.12 volts.

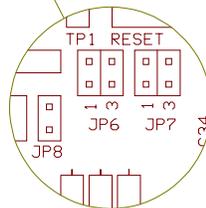
Microstep Control Board



Emergency stop jumper settings:

- * JP6 installed - enabled
- * JP6 removed - disabled

When disabling, install jumper only on one pin of JP6.

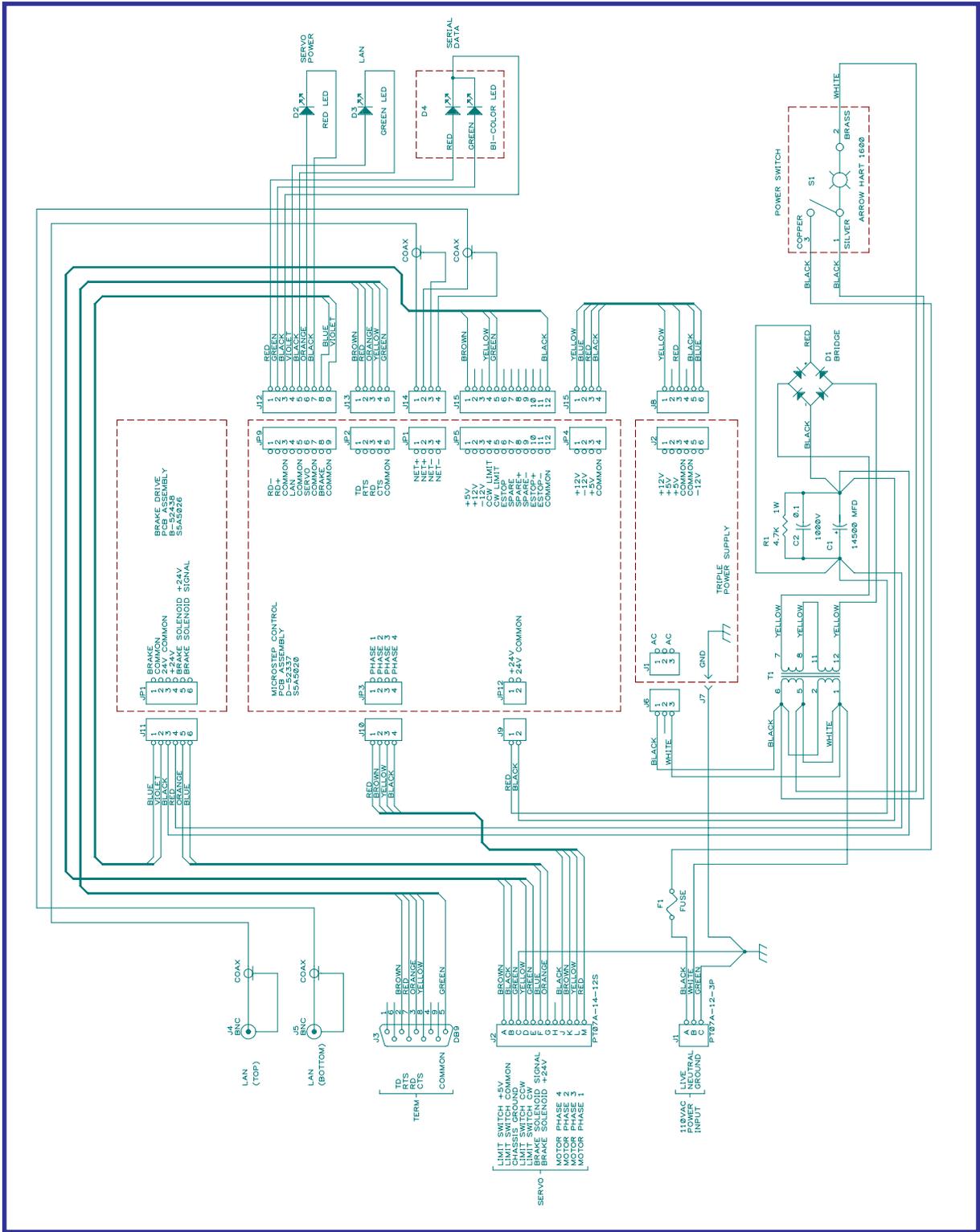


Communication jumpers:

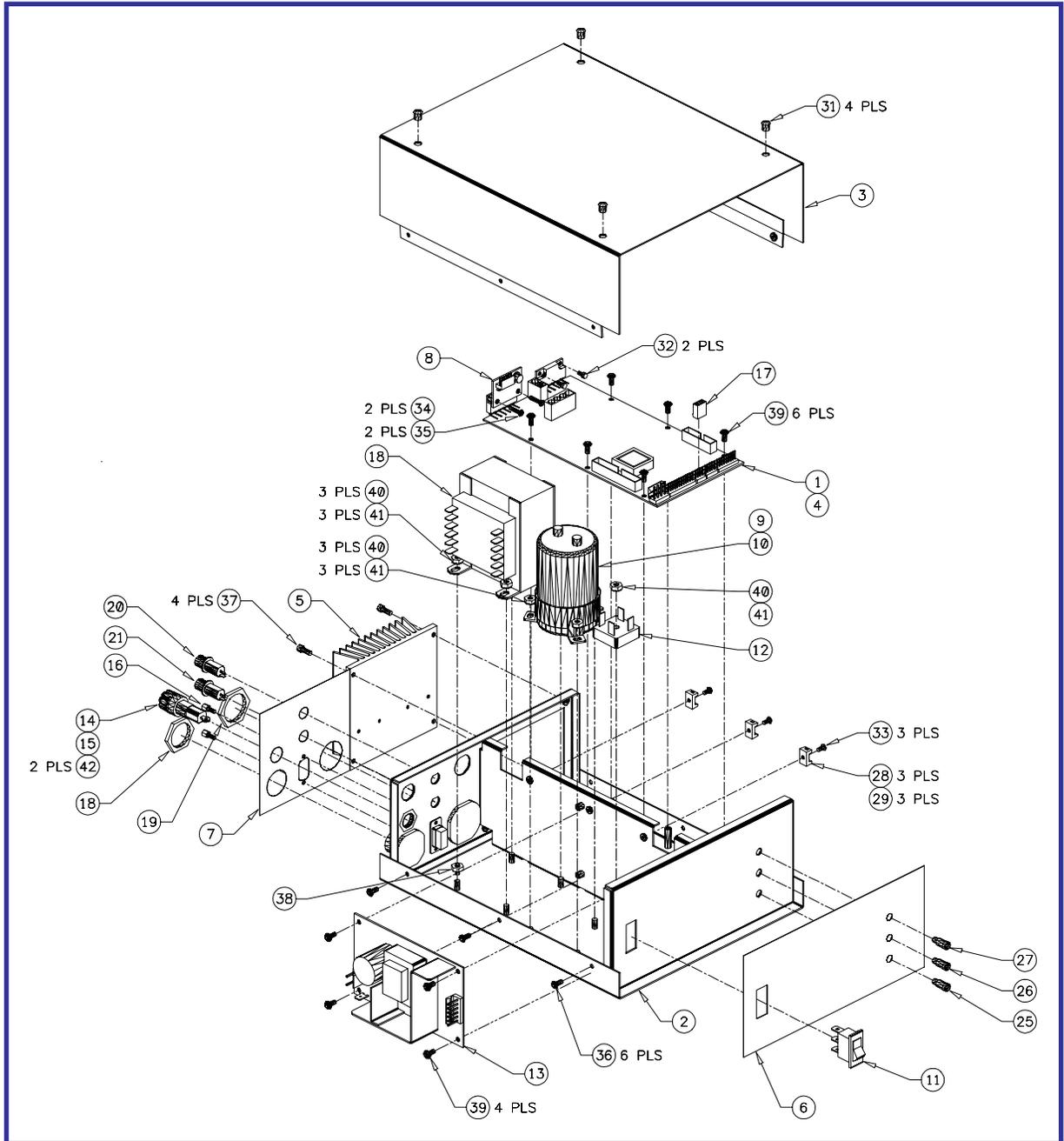
- RS-232 settings
- * JP6 pins 1 & 2
 - * JP7 pins 1 & 2
 - * JP8 pins 1&2

- LAN settings
- * JP6 pins 3 & 4
 - * JP7 pins 3 & 4

B-2 CONTROL SCHEMATIC DIAGRAM



B-3 ENCLOSURE DRAWING AND PARTS LIST



ITEM	QTY	PART NO	DESCRIPTION
1	1	S5A5020	Microstep Control P.C.B. Assembly
2	1	S3E5034	Enclosure
3	1	S3E5035	Cover
4	1	S5I5010	Eprom
5	1	S2M5050	Heatsink
6	1	S3E5036	Front Overlay
7	1	S3E5037	Rear Overlay
8	1	S5A5026	Brake Drive P.C.B. Assembly
9	1	X5C5136	14500 Mfd. Electrolytic Capacitor
10	1	X5Z0007	Capacitor Holder
11	1	X3S5078	Rocker Switch
12	1	X5D0044	Bridge Rectifier
13	1	X3T5065	Power Supply
14	1	X3C0003	Fuse Holder
15	1	X3C5021	5 Amp 3AG Fuse
16	1	X3Z5027	Screwlock Kit
17	1	X3P5003	4 Circuit Connector Housing
18	1	S3W5061	110VAC Power Wiring Harness
19	1	S3W5063	Servo Wiring Harness
20	1	S3W5064	Top Lan Cable
21	1	S3W5065	Bottom Lan Cable
22	1	S3W5066	Cap/Resistor Harness
23	1	S3W5067	Cap- Cable
24	1	S3W5068	Cap+ Cable
25	1	S3W5069	Bi-Color LED Cable
26	1	S3W5070	Green LED Cable
27	1	S3W5071	Red LED Cable
28	3	X6Z5022	Cable Tie Mount
29	3		Cable Tie
30	A/R		Thermal Compound
31	4	X6Z5071	Hole Plug
32	2		#4-40 x 3/16" Lg. Socket Hd. Cap Screw
33	3		#4-40 x 1/4" Lg. Socket Button Hd. Screw
34	2		#4-40 x 1/2" Lg. Socket Button Hd. Screw
35	2		#4 Internal Lock Washer
36	6		#6-32 x 1/4" Lg. Socket Button Hd. Screw
37	4		#6-32 x 3/8" Lg. Socket Hd. Cap Screw
38	1		#6-32 Hex Nut
39	10		#6-32 x 3/8" Lg. Pan Hd. Screw w/Washer
40	8		#8-32 Hex Nut
41	8		#8 Internal Lock Washer
42	2		1/4" Dia. x 1/2" Lg. Heat Shrink Tubing