

ANILAM

**5300M/MK, 5400M/MK,
5500M CNC
Motion Setup/Testing
Utility**

Introduction 1

Accessing the MST Utility 1

Activating the MST Screen 2

MST Soft Keys 3

Clearing a Prompt Field or Message (F1) 3

Selecting an Axis..... 4

Entering a Password 4

Checking Axis Resolution (F2) 4

 Starting Reference Mark..... 5

Detecting the Index Pulse (F3)..... 6

Canceling the Active MDI or Test Command 7

Activating Manual Data Input Mode (MDI)..... 7

Balancing Motion Control Axes 7

Servo Drive Test Board 8

 Test Board Installation..... 8

 Test Points 9

 Jumpers..... 9

Balancing the DSP² Board (F6) 9

Balancing Servo Amplifier Outputs (F6) 11

Amplifier Faults 12

 Under Voltage Fault..... 14

 High Speed Electronic Circuit Breaker (HS/ECB) Fault..... 14

 Low Speed Electronic Circuit Breaker (LS/ECB) Fault 14

 Over Temp Fault..... 15

 Over Voltage Fault..... 15

 Resetting a Fault 15

 Amplifier Failure..... 15

Setting the Signal Gain (F7) 16

Tuning (F8)..... 18

Saving Final Values 20

CanTest (F9) 21

Exiting the MST Screen (F10) 22

Index..... Index-1

Introduction

This section describes how to use the ANILAM Motion Setup/Testing (MST) Utility. The MST provides commands that carry out motion-specific setup and testing in order to tune the servo system and the Proportional Integral Derivative (PID) filter parameters of a CNC.

A basic knowledge of machine operation and programming is required. Refer to the appropriate programming manual for details on how to program and operate the control.

Setup includes the following procedures:

- ❑ Servo Board Balancing
- ❑ Servo Board Signal Gain Setting (motor step response is displayed in open loop)

The CNC provides the following troubleshooting tools:

- ❑ Detection of Index Pulse
- ❑ Detection of counts between index pulses (actual resolution)
- ❑ Tuning for the optimal PID values

The following General Status information is displayed:

- ❑ Display of active CNC status codes
- ❑ Display of machine position, feedrates, RPM, dwell, and override

Accessing the MST Utility

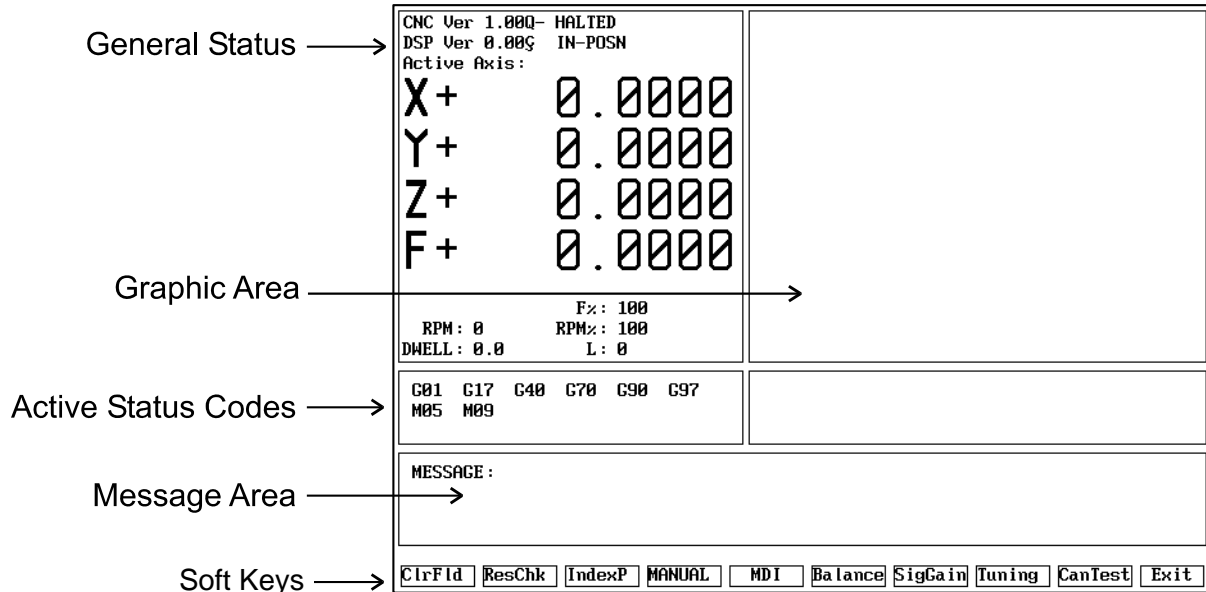
Access the Motion Setup/Testing Utility (MST) from the Software Options Screen. This screen activates automatically once the CNC has started successfully.

To activate the MST Utility:

1. Start the CNC.
2. Press **(F10)** to continue, as prompted. The Software Options screen is displayed.
3. Highlight **Motion Setup/Testing**, and press **ENTER**. The MST screen activates.

Activating the MST Screen

The axis positions displayed correspond to the current position. The Graphics Area displays step responses for the Signal Gain and Tuning functions. Refer to **Figure 1** and **Table 1**.



53MSTSCN

Figure 1, CNC Motion Setup/Testing Screen

Table 1, MST Screen Areas and Descriptions

MST Screen Area	Description
General Status	Shows Active Modes, Machine Position for each axis, RPM, Dwell, Spindle Speed and Feedrate, Active Axis, and other information regarding the status of the CNC.
Graph Area	Displays step responses for the Signal Gain and Tuning functions.
Prompt Area	Displays messages regarding information that must be entered.
Active Status Codes	Active G-codes codes.
Message Area	Displays error messages.
Soft Keys	Function keys (F1–F10) located below the CRT on the console to activate the functions, as labeled.

MST Soft Keys

NOTE: Select an active axis before you select an MST command (F1–F9).

NOTE: MST soft keys are displayed while the MST screen is active.

Access Motion Setup/Testing Utility features via the labeled soft keys located beneath the CRT on the console. Press the corresponding soft key (F1-F10) to activate the function.

Refer to **Table 2** for soft key names and functions.

Table 2, MST Soft Key Functions

Soft Key	Name	Function
F1	ClrFld	Clears prompt field in SigGain and Tuning tests.
F2	ResChk	Calculates the resolution of the active axis. Troubleshooting tool.
F3	IndexP	Detects Index Pulse and displays an indicator beside the Active Axis line of the MST screen. Troubleshooting tool.
F4	MANUAL	Cancels active MDI or test command.
F5	MDI	Activates MDI Mode.
F6	Balance	Sends out the signal needed to Balance the outputs of the system (0.0VDC). Used to balance the Motion Control Board and the Servo Amplifiers.
F7	SigGain	Enables you to set the servo board signal gain for the active axis.
F8	Tuning	Activates the Tuning Pop-Up menu, which allows the CNC to determine optimum PID values from the given parameters and save the results.
F9	CanTest	Tests and troubleshoots Can bus, inputs, and outputs.
F10	Exit	Returns the CNC to the software selection screen.
SHIFT + F4	Home	Performs a Homing Sequence on active axis.

Clearing a Prompt Field or Message (F1)

Press **ClrFld (F1)** to clear an erroneous entry. This soft key is available during the Signal Gain and Tuning tests.

Selecting an Axis

NOTE: Select an active axis before you select an MST command (F1–F9). If no axis is selected, the CNC displays an **Error** message that prompts you to do so.

Use the following keypad keys to select and activate the corresponding axes:

- | | |
|----------|--|
| X | Activates/Deactivates X-axis |
| Y | Activates/Deactivates Y-axis |
| Z | Activates/Deactivates Z-axis |
| S | Activates/Deactivates Spindle Axis (U) |

The active axis is displayed in the upper left corner of the General Status area of the MST Screen.

Entering a Password

When you enter the MST Utility and press **Balance (F6)**, **Signal Gain (F7)**, or **Tuning (F8)**, the CNC prompts for the password. Enter the appropriate password, and press **ENTER**.

The soft key activates. If the password has been entered successfully, the CNC will not prompt for the password again, you exit and re-enter the MST Utility.

Checking Axis Resolution (F2)

Refer to **Figure 2, CNC Resolution Check (ResCheck) Screen**. Press **ResChk (F2)** to calculate the actual resolution for the active axis. In the Graphics Area of the screen, the actual resolution and the resolution in the Setup are displayed for comparison. In addition the screen displays:

- The number of times the system tested for resolution (Total Cycles:)
- The number of times that the encoder lines detected do not match the number of encoder lines in the setup (Errors:). An error indicates that something is wrong, either in the setup parameters or in the hardware.
- The actual number of encoder lines found by the test (Encoder Lines:)
- The resolution and counts per revolution found. (Encoder Resolution:)

NOTE: Resolution should be four times the number of encoder lines.

Once this test is activated, you must move the axis for at least two encoder revolutions via MDI Mode, Jog Mode, or manual move. The CNC performs the calculation continuously until motion stops.

NOTE: This test is not available for axes with linear scales.

NOTE: Do not perform this test during Rapid Mode. Use it in Feed Mode only.

<p>CNC Ver 1.00Q- HALTED DSP Ver 0.00Q IN-POSN Active Axis: X+ 0.0000 Y+ 0.0000 Z+ 0.0000 F+ 0.0000</p> <p style="text-align: center;">Fz: 100 RPM: 0 RPMz: 100 DWELL: 0.0 L: 0</p> <p>G01 G17 G40 G70 G90 G97 M05 M09</p> <p>MESSAGE :</p>	<p>VALUES FROM SETUP UTILITY</p> <p>Encoder Lines: 0 Ratio: 1.0 Encoder Counts/Rev: 0 Ballscrew Counts/Rev: 0</p> <p>Total Cycles: 0 Errors: 0 Encoder Lines: 0 Encoder Resolution: 0 Cnts/Rev</p>
<p>ClrFld ResChk IndexP MANUAL MDI Balance SigGain Tuning CanTest Exit</p>	

53RESCHEK

Figure 2, CNC Resolution Check (ResCheck) Screen

Starting Reference Mark

This procedure is only necessary during setup of the system and only when the encoder is type ****EverTrack™**.

1. Select the axis you want to setup.
2. Press **F2** (Resolution Check) to display a pop-up menu with two options:
 - EverTrack Test
 - Save Current Mark

NOTE: Type must be specified as EverTrack on the Resolution – Setup screen in the Setup Utility.

****EverTrack™** EverTrack™ is a Trademark of Anilam, Inc.

3. Select **EverTrack Test**. The Setup Utility displays:
 - Encoder Resolution
 - Encoder Type
 - Starting Mark (N)The following information is displayed as the test is in progress:
 - mm between marks
 - Current Mark (N)
4. To determine the Starting Mark, move the axis to the right-most end of the EverTrack encoder (as you look at the encoder). Note that you must move the axis so that the Current Mark display, changes/transitions at least twice (about two inches). If you are within 2 inches of the right-most end of the encoder, move in the opposite direction (left) a few inches, and then move back to the right-most end of the encoder. The Current Mark display also shows the proper sign.
5. Once you have found the right-most mark, press **F2** and select **Save Current Mark** to store the Current Mark in the configuration file as the Starting Mark entry.

– or –

Write down the Current Mark (sign included) and go the Setup Utility's Starting Mark choice and enter the information.

Detecting the Index Pulse (F3)

Refer to **Figure 1, CNC Motion Setup/Testing Screen**. When you press **IndexP (F3)**, the CNC displays a flashing "I" each time it detects an Index Pulse. The flashing "I" replaces the axis name (X, Y, or Z) of the active axis. The index pulse indicator (flashing "I") for the spindle axis is displayed on the RPM field. The figure shows the axis display when the CNC has detected an index pulse in the (active) X-axis. Refer to **Figure 3, Index Pulse Indicator**.

To detect an index pulse:

1. Move the active axis to check for the presence of an index pulse.
2. On systems with rotary encoders with index pulses, the index pulse should be detected once per revolution.
3. On systems having linear scales, the index pulse should be detected where the linear scale specifies location of the index pulse.

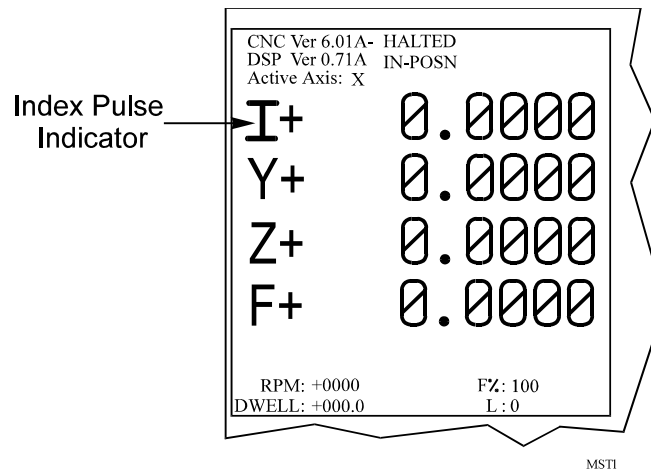


Figure 3, Index Pulse Indicator

Canceling the Active MDI or Test Command

Press **MANUAL (F4)** to cancel an active MDI or test command.

Activating Manual Data Input Mode (MDI)

Press **MDI (F5)** to activate the MDI Mode. (Refer to the programming manual for information on MDI programming.)

Balancing Motion Control Axes

To balance the outputs properly, all connections between the Motion Control Board and the servo amplifiers must be complete.

Perform all of the adjustments on one axis at a time. Make the adjustments in the following order:

1. Select an axis
2. Balance the Motion Control Board outputs
3. Balance the Servo Amplifier outputs
4. Set Servo Amplifier gain
5. Repeat for all axes

Servo Drive Test Board

Each CNC that uses ANILAM servo amplifiers (P/Ns 33000039 or 33000123) includes a Servo Drive Test Board, P/N 33000102. During machine operation, the board provides convenient access to critical signals for alignment and troubleshooting. Refer to **Figure 4**.

NOTE: The test board only works with amplifiers supplied by ANILAM.

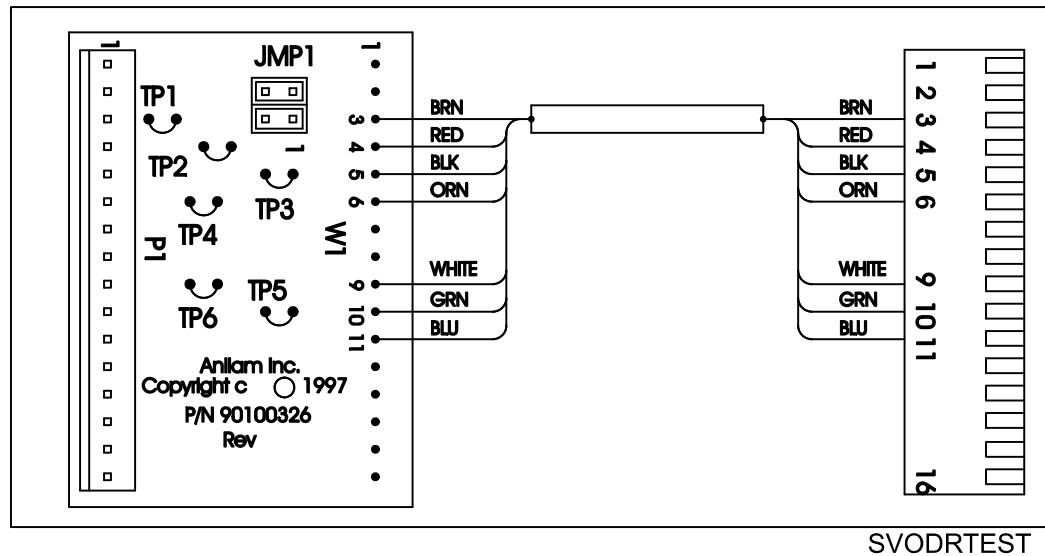


Figure 4, ANILAM Servo Drive Test Board, P/N 33000102

Test Board Installation

IMPORTANT: Press **E-STOP** to de-energize servos before installing the test board.

1. Remove the cable attached to **J1** of the Servo Drive you wish to monitor and connect it to **P1** of the test board.
2. Attach **W1** of the test board to **J1** of the servo.
3. Re-energize the servos.

Test Points

Refer to **Table 3** for a description of test points and signals.

Table 3, Servo Drive Test Board: Test Points and Jumpers

Test Point	Pin	Signal
TP1	3	Command Signal
TP2	4	Common for all servo signals and potentiometers. All readings are referenced to TP2.
TP3	5	Tachometer
TP4	6	Motor Current output monitor. The scale factor is 1V = 5A.
TP5	9	Clamp input from the SCB. When pulled to chassis ground, the servo's output is forced to 0 VDC.
TP6	10	Fault output. When the servo card is faulted, the output is pulled low. If TP6 is pulled to chassis ground, the Servo is disabled and coasts to a stop.
JMP1	11	Command Signal Common. If removed, JMP1 will open the common line at Pin 11 of J1.
JMP2	3	Common Signal. If JMP2 is removed, the Command signal will open at Pin 3 of J1.

Jumpers

While troubleshooting, you can remove jumpers to isolate the Servo Drive from the DAC outputs of the Motion Control Board during troubleshooting. If Pin 2 of JMP1 and JMP2 are shorted together, the Servo Drive's input is fixed at 0 VDC; this can be useful in troubleshooting balance problems.

Balancing the DSP² Board (F6)

On systems that use an ANILAM Servo Amplifier Board, P/N 33000039 or 33000123 (see **Figure 6 (5 LEDs)** or **Figure 7 (1 LED)**), measurements for this procedure can be made at the J1 input connector with the Servo Drive Test Board, P/N 33000102.

NOTE: If ANILAM did not provide the servo amplifiers, follow the guidelines for balancing supplied by the manufacturer.

Refer to **Figure 5, ANILAM DSP² Board Balance Pots, P/N 33000404**. Measure command voltages across TP1 and TP2 of the test board.

NOTE: These signals can also be found on Pin #3 and Pin #11 of the J1 input connector on the ANILAM Servo Amplifier Board.

All DSP² Boards are adjusted at the factory and should be within limits. Only balance the DSP² Board if it is not at 0 VDC ($\pm 0.001V$).

NOTE: On 5300MK systems, the DSP² Board is located inside the CNC console. On 5300M systems, the DSP² Board is located in the CNC chassis. Remove only the top cover of the console to access the Board. **Balance the DSP² Board with the servos off, initially.** Next, verify the DSP² Board balance with the servos on, and correct for voltage offset as required.

1. Press **Balance (F6)** to output a zero voltage signal to the axis.
2. Press **START**.
3. Refer to **Figure 5**. Make adjustments for axis outputs 0-3 on the DSP² Board at potentiometers R108-R111 respectively.
4. Adjust the potentiometer for the selected axis until the voltage across the pins is 0VDC ($\pm 0.001V$).
5. Press **MANUAL (F4)** to cancel the test.

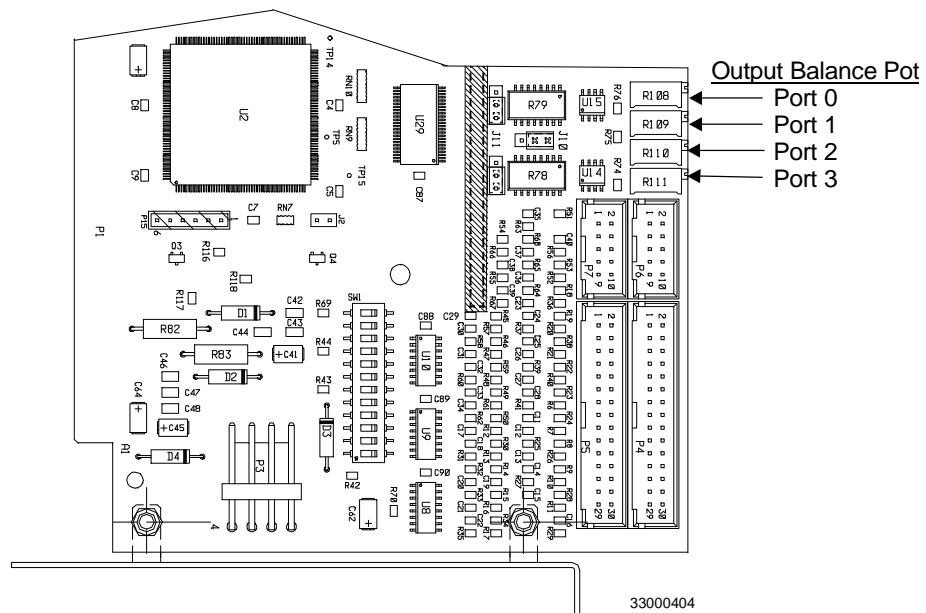


Figure 5, ANILAM DSP² Board Balance Pots, P/N 33000404

Balancing Servo Amplifier Outputs (F6)

When the command signal voltage from the DSP² Board is 0, the axis should be stationary and MST balance display should read “0000”. Alternatively, read the tachometer voltage from the motor. The tachometer should read 0 VDC (± 0.001 V). Monitor the tach voltage across TP2 and TP3 of the test board.

NOTE: These signals can also be found on Pins #5 and #11 of the J1 input connector on the ANILAM Servo Amplifier Board, P/N 33000123. Refer to **Figure 6, (5 LEDs)** or **Figure 7, ANILAM Servo Amplifier (1 LED), P/N 33000123.**

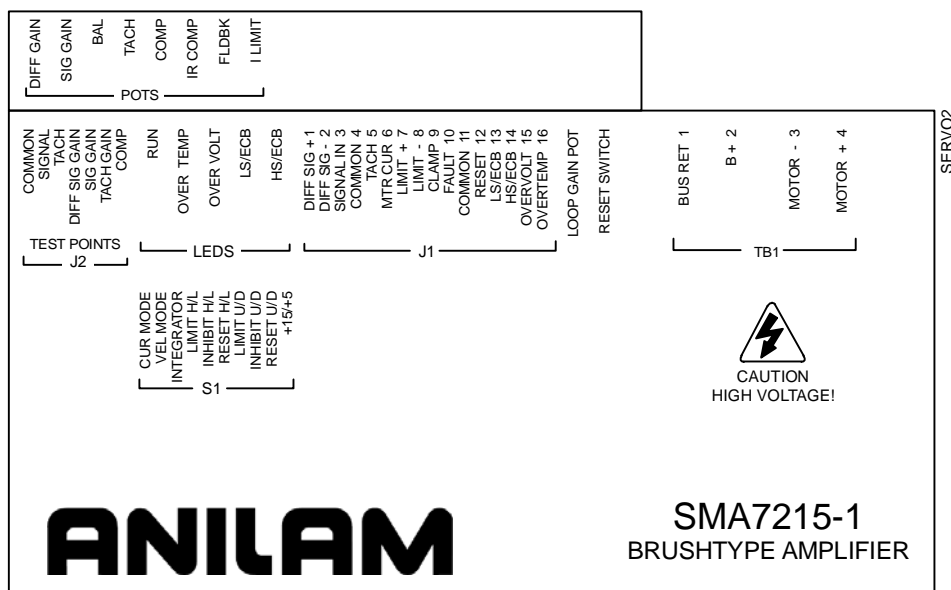


Figure 6, ANILAM Servo Amplifier (5 LEDs), P/N 33000123

NOTE: When the amplifier is shipped from the factory, the LOOP GAIN pot is fully counterclockwise (CCW). This is used to shut off uncalibrated amplifiers. When the loop gain is fully CCW, no current is delivered to the motor.

1. Apply main power and fan power.
2. Slowly turn the LOOP GAIN pot clockwise (CW). Motor should be stopped or turning slowly. If motor starts running away, remove power, reverse the tach leads, and retest. Turn the LOOP GAIN fully CW to enable.
3. Energize the servos and select an axis.
4. Refer to **Figure 8, Balance Screen**. Press **Balance (F6)** to output a zero voltage signal to the axis.
5. Press **START**.

- On the ANILAM Servo Amplifier for the axis being adjusted, adjust the balance potentiometer until the MST display is 0000, indicating that the active axis is stationary.

– or –

Adjust until tach voltage is 0 VDC (± 0.001 V), indicating that the active axis is stationary.

- Press **MANUAL (F4)** to cancel the Balance command.

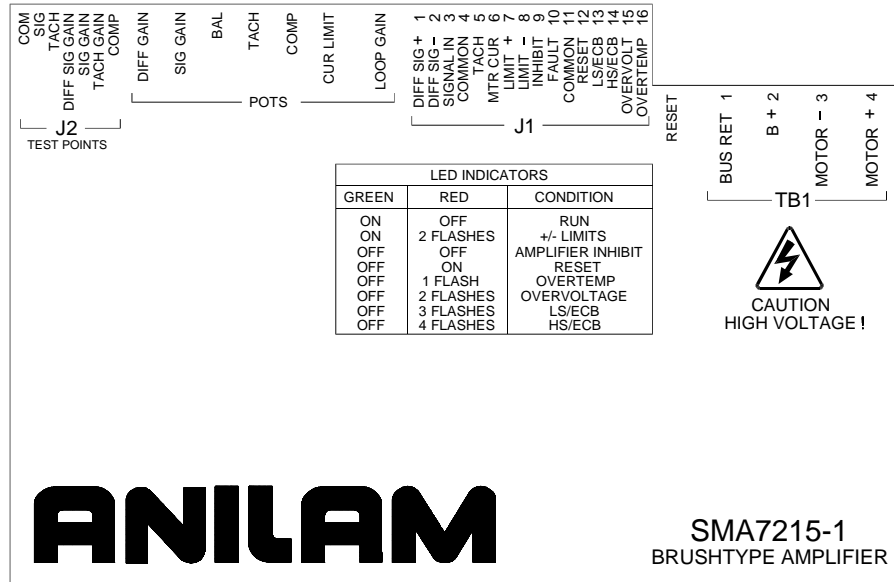


Figure 7, ANILAM Servo Amplifier (1 LED), P/N 33000123

Amplifier Faults

ANILAM amplifiers do not require any scheduled maintenance, although it is a good idea to occasionally check for dust build up or other contamination.

If an amplifier should cease to operate or one or more of the fault LEDs are lit, review the following sections for information on the fault and possible causes.

NOTE: A fault can on be caused by abnormal conditions. Locate and correct the cause of the fault before repeated recycling of power to the amplifier to prevent possible damage.

For LED fault conditions on 5 LED servo amplifiers (**Figure 6, ANILAM Servo Amplifier (5 LEDS), P/N 33000123**), see **Table 4, Table of Fault LED Conditions (5 LEDS)**.

Table 4, Table of Fault LED Conditions (5 LEDs)

Input or Fault Condition	RUN LED	HS/ECB LED	LS/ECB LED	OVER VOLT LED	OVER TEMP LED	FAULT OUTPUT
NORMAL OPERATION	ON	OFF	OFF	OFF	OFF	GROUND
LIMIT + (ON)	ON	OFF	OFF	OFF	OFF	GROUND
LIMIT - (ON)	ON	OFF	OFF	OFF	OFF	GROUND
CLAMP (ON)	OFF	OFF	OFF	OFF	OFF	GROUND
RESET (ON)	OFF	OFF	OFF	OFF	OFF	PULL-UP
EXT. FAULT	OFF	OFF	OFF	OFF	OFF	PULL-UP
UNDER VOLTAGE (+15V)	OFF	OFF	OFF	OFF	OFF	PULL-UP
HS/ECB (LATCHED)	OFF	ON	OFF	OFF	OFF	PULL-UP
LS/ECB (LATCHED)	OFF	OFF	ON	OFF	OFF	PULL-UP
OVER VOLTAGE B+ (LATCHED)	OFF	OFF	OFF	ON	OFF	PULL-UP
OVER TEMP (LATCHED)	OFF	OFF	OFF	OFF	ON	PULL-UP

For LED fault conditions 1 LED servo amplifiers, see **Figure 7, ANILAM Servo Amplifier (1 LED), P/N 33000123** or **Table 5**.

Table 5, Table of Fault LED Conditions (1 LED)

Green	Red	Condition
ON	OFF	RUN
ON	2 FLASHES	+/- LIMITS
OFF	OFF	AMPLIFIER INHIBIT
OFF	ON	RESET
OFF	1 FLASH	OVER TEMPERATURE
OFF	2 FLASHES	OVER VOLTAGE
OFF	3 FLASHES	LS/ECB
OFF	4 FLASHES	HS/ECB

Under Voltage Fault

When the +15VDC power supply is below +12VDC, a level that would cause unreliable operation:

For 5 LED amplifiers: The Run LED turns off, a Fault Output is generated, and the amplifier is inhibited.

For 1 LED amplifiers: The Green LED turns off, the Red LED is off, a Fault Output is generated, and the amplifier is inhibited.

The following is a list of possible causes:

- Main buss line voltage is too low.
- Bad power supply.

High Speed Electronic Circuit Breaker (HS/ECB) Fault

When the peak output of the amplifier exceeds 80A for 10 microseconds:

For 5 LED amplifiers: The Run LED turns off, the HS/ECB LED turns on, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

For 1 LED amplifiers: The Green LED turns off, the Red LED displays 4 flashes, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

The following is a list of possible causes:

- Shorted motor leads.
- Motor inductance too low.
- Short from the motor lead to ground.

Low Speed Electronic Circuit Breaker (LS/ECB) Fault

When the RMS output of the amplifier exceeds 13A for 5 seconds:

For 5 LED amplifiers: The Run LED turns off, the LS/ECB LED turns on, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

For 1 LED amplifiers: The Green LED turns off, the Red LED displays 3 flashes, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

The following is a list of possible causes:

- Binding or stalling of motor shaft due to excessive mechanical overload.
- Overload of amplifier output to motor.
- Large reflected load inertia.

Over Temp Fault

When the amplifier heatsink temperature has reached a level that, if exceeded, would damage the output transistors:

For 5 LED amplifiers: The Run LED turns off, the OVER TEMP LED turns on, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

For 1 LED amplifiers: The Green LED turns off, the Red LED displays 1 flash, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

The following is a list of possible causes:

- ❑ Loss of cooling, or fans are defective, or airflow is blocked.
- ❑ Excessive rise in cooling temperature due to cabinet vents being blocked or excessive hot air being ingested.
- ❑ Extended operational duty cycle due to mechanical overload of motor or defective motor.

Over Voltage Fault

When the DC Buss voltage reaches 250VDC:

For 5 LED amplifiers: The Run LED turns off, the OVER VOLTAGE LED turns on, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

For 1 LED amplifiers: The Green LED turns off, the Red LED displays 2 flashes, a Fault Output is generated, and the amplifier is inhibited.

NOTE: This is a latched condition.

The following is a list of possible causes:

- ❑ Main Buss line voltage is too high.
- ❑ Decelerating a large inertial load. When decelerating, a DC motor acts as a generator. If the inertial load is large, the generated voltage can pump up the DC-Buss. If this fault occurs, you may need a Regen Clamp. Consult ANILAM.

Resetting a Fault

The fault latch may be reset by pushing the Reset button, activating the Reset input J1–12 or by removing power and allowing the filter capacitor(s) to discharge. Note that the fault latch will not reset unless the fault has been cleared.

Amplifier Failure

If the amplifier should fail, that is, if it should cease to operate with no apparent fault, contact ANILAM.

Setting the Signal Gain (F7)

Adjust the gains of the ANILAM Servo Amplifier. Refer to **Figure 7**.

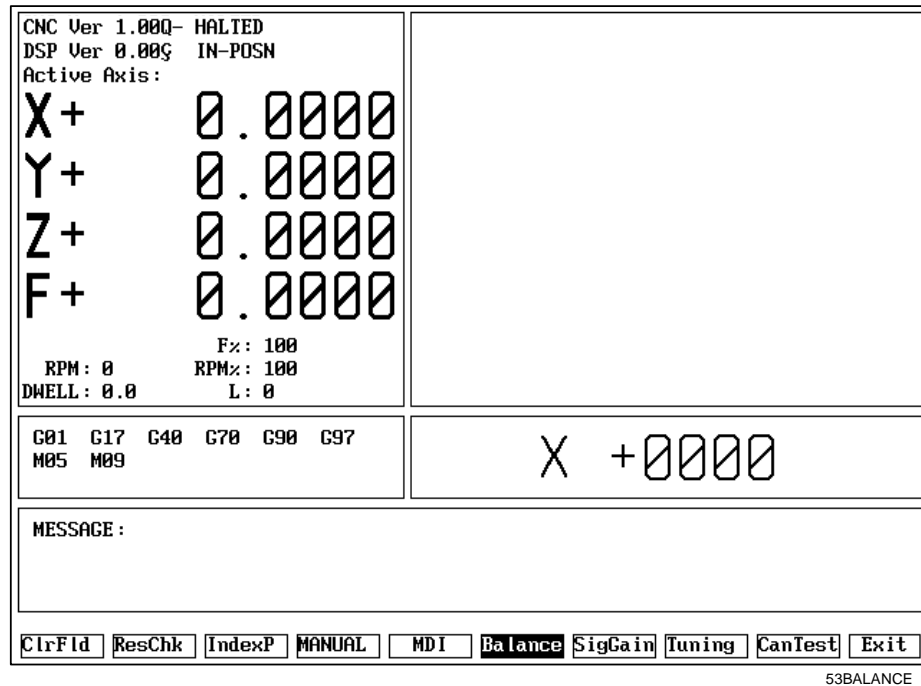


Figure 8, Balance Screen

NOTE: If ANILAM did not provide the servo amplifiers, follow the guidelines for balancing supplied by the manufacturer.

NOTE: 0.9V output is used during this procedure.

The gain is adjusted at 10% of the machine's maximum Rapid speed, using the fastest axis.

1. Energize the servos and select an axis.
2. Press **SigGain (F7)**.
3. Refer to **Figure 9, Signal Gain (SigGain) Screen**. Look at the Prompt Area of the MST screen. Enter a timed delay at the **T(sec)** entry field (two seconds is usually adequate). The graph in the graphics area plots machine motion as follows:
 - ❑ The X-axis represents elapsed time in milliseconds.
 - ❑ The Y-axis represents the speed of the machine, from 0 to constant velocity.
 - ❑ Rise time is the time required (in milliseconds) for machine movement to go from 10% to 90% of constant velocity.
 - ❑ T is the amount of time in seconds that the axis will travel in one direction before it reverses for the same amount of travel in the opposite direction. The actual distance depends on the feedrate that corresponds to 0.9V.

NOTE: Press **ClrFld (F1)** to erase the entry and enter another number.

4. Press **START**. The CNC generates an open loop step response, including rise time, in the Graph Area of the screen.
5. Adjust the signal gain pot until the displayed feedrate is at 10% of the machine's maximum Rapid speed, using the fastest axis. (The machine builder sets the maximum rapid speed in the Setup Utility.)
6. Press **MANUAL (F4)** to cancel the test.

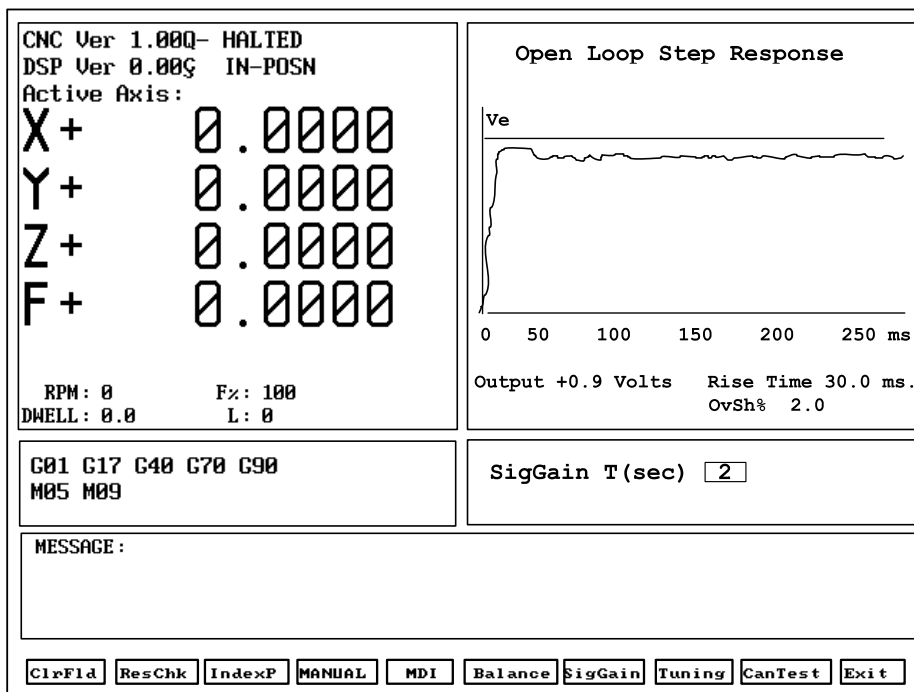


Figure 9, Signal Gain (SigGain) Screen

If the system is equipped with an ANILAM Servo Amplifier Board, all of the voltage measurements can be made with the Servo Drive Test Board.

Measure command voltage across TP1 and TP2 of the test board. These signals can also be found on Pins #3 and #11 of J1.

Measure the tachometer output across TP2 and TP3 of the test board. These signals can also be found on Pins #5 and #11 of the J1 input connector on the ANILAM Servo Amplifier Board.

Tuning (F8)

NOTE: ANILAM recommends that you set signal gain and balance the servo amplifier, as discussed in previous text, before tuning.

CAUTION: Most machines will operate correctly with the default filter parameters. Only qualified technicians who have knowledge of motion control tuning parameters should use this tool.

The Tuning function can determine optimum values within constraints you specify. The default values are usually correct for most machines. To fine-tune, enter values manually or use this test. Refer to **Figure 10, Tuning Parameters Test Results Screen**.

The Tuning Test has a setup screen that enables you to configure the extent of the test. Check the setup parameters, run the test, and then save the results. Refer to **Figure 9 and Table 4**.

Tuning Setup	
1. Tune Ki	No
2. Tune Kd	No
3. Tune All Axis	No
4. Match Axis Lag ...	No

Figure 9, Tuning Setup Menu

Table 4, Tuning Test Parameters

Parameter	Function
Tune Ki	Switches integral tuning ON or OFF. [Default: No]
Tune Kd	Switches derivative tuning ON or OFF. [Default: No]
Tune All Axis	If set, tunes all axes sequentially. [Default: No]
Match Axis Lag	If set, calculates the inch/min/mil of each axis, chooses the smallest one and matches the inch/min/mil of the other axes to the smallest by decreasing Kp. Tune All Axis must be set to use this option. [Default: No]
Hunting	If linear scales are used, you can eliminate the back-and-forth motion (hunting) produced by backlash. [Default: No]

If you have selected Kd (derivative gain), the CNC begins by measuring derivative sampling time (Ds). It measures the time between 10% and 90% of the final velocity (rise time) to determine the systems time constant, from which the Ds travel is calculated.

WARNING: If you select the Kd test, you must have at least 2.5” (63mm) of travel in the positive (+) direction.

Next, the CNC calculates Kp (proportional gain). If the current overshoot is smaller than the set one, Kp is increased by 1. If it is larger, Kp is decreased by 0.1.

If you have selected Ki (integral gain), the CNC then calculates Ki and Il (integral limit). If the lag between the commanded position and the actual position is not zero, Il is increased by 5 and this portion of the test is repeated.

The CNC calculates Kd, if selected. The CNC will attempt to decrease the overshoot until the set value (Kd overshoot) is matched. When this condition is not matched, Kd is increased by 2.

If you have chosen to test only one axis, the test is completed at this point. If you have chosen to test multiple axes, and have not selected “Lag Matching” the test will repeat the procedure on each axis in turn, until complete.

If you have chosen all axes and Lag Matching, the CNC calculates the inch/min/mil of each axis being tested and matches the inch/min/mil to the lowest value of all axes tuned.

To test:

1. Energize the servos and select an axis.
2. Press **Tuning (F8)**. A pop-up is displayed with the following choices: **Tuning Test**, **Save Results**, and **Tuning Setup**.
3. Refer to **Table 6, Tuning Test Parameters**. Check the Tuning Setup menu to determine which parameter(s) you wish to change. Select **Tuning Test**, and press **ENTER**. Choose the parameter(s) you wish to include in the test.
4. Refer to **Table 7**. Enter values for the following tuning parameters:

NOTE: Kp overshoot must be greater than Kd overshoot.

Table 7, Tuning Functions Values

Parameter	Function
Kp Overshoot %	Determines amount of overshoot the CNC will seek before ending the Kp cycle. 1% to 5% is a normal overshoot range for this test. If detected overshoot exceeds the entered OvSht%, the cycle ends. [Default: 5]
Kd Overshoot %	Sets limit for Kd overshoot. [Default: 2]
Kp min	Sets Kp to starting value during proportional tuning. [Default: 1]

5. Press **START**. The CNC begins the test.

6. Refer to **Figure 11**. After the test, the CNC plots the final step response for all axes tested, and displays them in the graphics area of the screen.
7. To save results of the test, press **Tuning (F8)** and select **Save Results**.
8. Press **MANUAL (F4)** to exit or cancel the test.

Saving Final Values

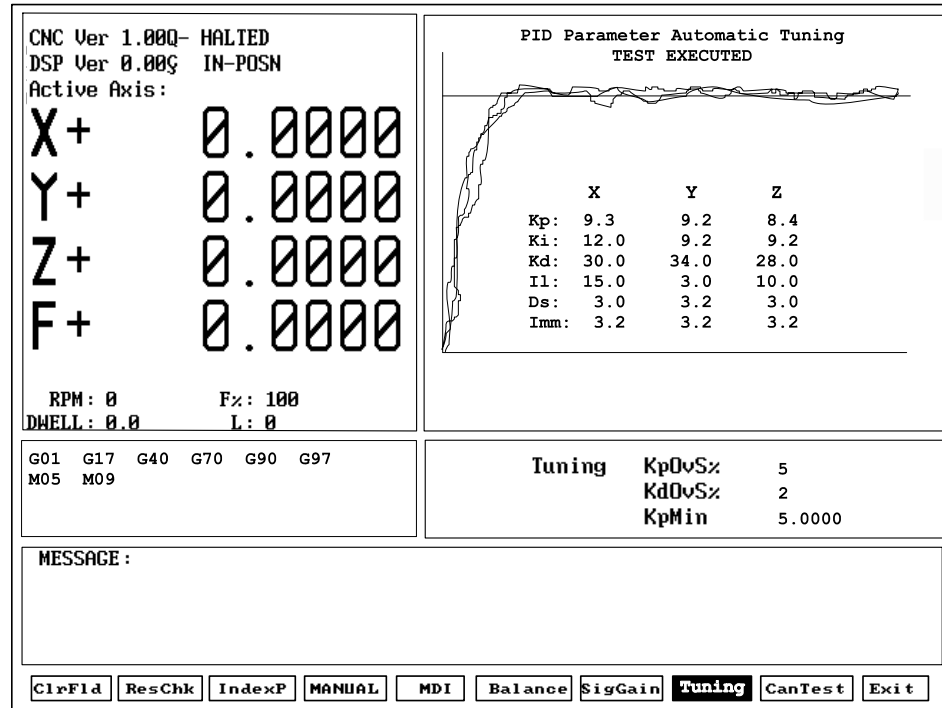


Figure 11, Tuning Parameters Test Results Screen

To save the Tuning Test values:

1. Refer to **Figure 11**. After the Tuning Test, the results are displayed in the Graphics Area of the screen. Press **TUNING (F8)** and highlight **Save Results**.
2. A pop-up is displayed with the following options: **[No Motion]**, **[Feed]**, **[Rapid]**, **[ALL Tables]**. Highlight the table to which you wish to save the final values, and press **ENTER**. This overrides the values in the Setup Utility. Normally, choose **All Tables**.
3. The CNC stores the new values in the configuration file.
4. Or, press **Cancel (F9)**.

NOTE: ANILAM recommends that you back up your configuration file before you save tuning results. This will enable the filter parameters to be recovered if necessary. Refer to *Setup Utilities* for details on backing-up and restoring setup parameters.

CanTest (F9)

Refer to **Figure 13**. Press **CanTest (F9)** to display Can Bus Test Screen in the graphic area and to troubleshoot the status of all inputs and outputs for the nodes.

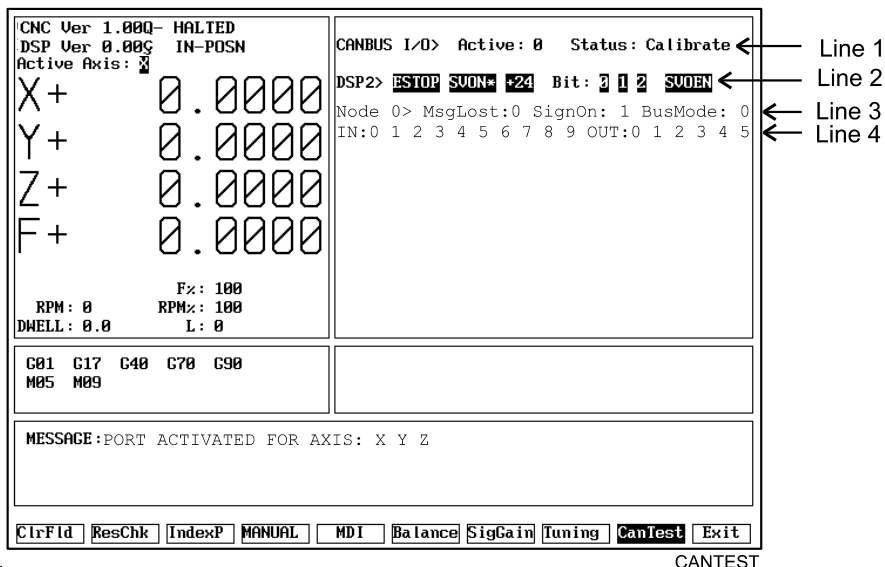


Figure 12, CAN Bus Test (CanTest) Screen

Table 8 lists the CAN bus test results displays.

Table 8, CAN Bus Test Results Displays

Display	Can Bus Status
Normal	Normal operation
Calibrate	Node found and CNC is calibrating.
Warning	CNC lost a node and is actively searching for active nodes.
Bus off	Fatal error. The bus has turned itself off due to errors.

1. Line 1 of the graph area indicates the number of active CanBus I/O nodes and their status.
2. Line 2 of the graph area indicates the basic machine I/O status.
3. Line 3 of the graph area indicates:
 - ❑ The address of the active node. Possible values are 0 to 5.
 - ❑ The number of message packets lost between the node and the controller. This should be 0.
 - ❑ The number of times the node has signed on since the control started. This should be 1 unless power was interrupted.
 - ❑ The node bus type. This is normally 0.
4. Line 4 indicates:
 - ❑ The status of the ten inputs of each node.
 - ❑ The status of the six outputs of each node.
5. Subsequent lines indicate the I/O status of any additional nodes.

Exiting the MST Screen (F10)

Press **Exit (F10)** to exit the MST Screen and return to the software selection screen in the Setup Utility.

(SHIFT+F4), Home, 3

A

accessing, MST, 1
activating
 MDI, 7
 MST screen, 2
active status codes area,
 illustration, 2
amplifier
 factory repair, 16
 failure, 15
 servo fault, resetting, 15
 servo outputs, balancing, 11
axis resolution, checking, 4
axis, selecting, 4

B

Balance (F6), 3, 9, 10, 11
Balance Screen, illustration, 16
balancing
 DSP² board, 9
 motion control axes, 7
 servo amplifier outputs, 11

C

CAN Bus Test (CanTest) screen,
 illustration, 21
CAN Bus Test
 results display, table, 21
canceling
 active MDI, 7
 test command, 7
CanTest (F9), 3, 21
checking, axis resolution, 4
clearing
 a message, 3
 a prompt field, 3
ClrFld (F1), 3
CNC Motion Setup/Testing
 screen, illustration, 2
CNC Resolution Check
 (ResCheck) screen,
 illustration, 5
CNC, troubleshooting tools,
 listed, 1
configuration file
 back up, 20
 starting mark, entry, 6

D

derivative gain, Kd, 18
derivative sampling time (Ds), 18
detecting, index pulse, 6
disclaimer, iii
Ds, derivative sampling time, 18
DSP² board
 balance pots, illustration, 10
 balancing, 9

E

entering, password, 4
EverTrack encoder, starting
 reference mark, 5
Exit (F10), 3, 22
exiting, MST screen, 22

F

F1, ClrFld, 3
F10, Exit, 3, 22
F2, ResChk, 3, 4
F3, IndexP, 3, 6
F4, MANUAL, 3, 7
F5, MDI, 3, 7
F6, Balance, 3, 9, 10
F6, Balance Servo Amplifier
 Outputs, 11
F7, SigGain, 3, 16
F8, Tuning, 3, 18
F9, CanTest, 3, 21
factory repair, servo amplifier, 16
fault conditions
 1 LED, servo amplifier, table, 13
 5 LEDs, servo amplifier, table, 12
 HS/ECB fault, description, 14
 LS/ECB fault, description, 14
 over temp fault, description, 15
 over voltage fault, description, 15
 resetting amplifier fault, description, 15
 under voltage fault, description, 14
final step responses, 20

G

general status area, illustration,
 2
graph area, illustration, 2

H

High Speed Electronic Circuit Breaker. See HS/ECB
Home (SHIFT+F4), 3
HS/ECB fault, causes listed, 14

I

Il, integral limit, 19
index pulse
 detecting, 6
 indicator, illustration, 6
IndexP (F3), 3, 6
installation, test board, 8
integral gain, Ki, 19
integral limit, Il, 19
introduction, 1

J

jumpers, description, 9

K

Kd, derivative gain, 18
Ki, integral gain, 19
Kp, proportional gain, 19

L

lag matching, description, 19
LED fault conditions
 1 LED, servo amplifier, table, 13
 5 LEDs, servo amplifier, table, 12
linear scales, index pulse, 6
LOOP GAIN pot, description, 11
Low Speed Electronic Circuit Breaker. See LS/ECB
LS/ECB fault, causes listed, 14

M

MANUAL (F4), 3, 7
Manual Data Input. See MDI
MDI
 activating, 7
 canceling, active, 7
MDI (F5), 3, 7
menus
 Tuning Setup Menu, illustration, 18
message area, illustration, 2
message, clearing, 3
motion control axes, balancing, 7
Motion Setup/Testing. See MST

MST

accessing, utility, 1
activating, screen, 2
screen areas, descriptions, 2
screen areas, illustration, 2
screen, exiting, 22
soft keys, listed, 3
utility, description, 1
utility, to activate, 1

O

over temp fault, causes listed, 15
over voltage fault, causes listed, 15

P

password, entering, 4
prompt area, illustration, 2
prompt field, clearing, 3
proportional gain, Kp, 19

R

ResChk (F2), 3, 4
resetting, amplifier fault, 15
rotary encoders, index pulse, 6

S

saving, tuning test values, 20
screens
 Balance, illustration, 16
 CAN Bus Test (CanTest), illustration, 21
 CNC Motion Setup/Testing, illustration, 2
 CNC Resolution Check (ResCheck), illustration, 5
 signal gain, illustration, 17
 Software Options, 1
 Tuning Parameters Test Results, illustration, 20
selecting, an axis, 4
servo amplifier
 1 LED, fault conditions, 13
 1 LED, illustration, 12
 5 LEDs, fault conditions, table, 12
 5 LEDs, illustration, 11
 factory repair, 16
 failure, 15
 fault, resetting, 15
 outputs, balancing, 11
servo amplifiers, 8

servo drive, test board
 description, 8
 illustration, 8
 test points and jumpers, listed, 9
setting, signal gain, 16
SigGain (F7), 3, 16
signal gain screen, illustration,
 17
signal gain, setting, 16
soft keys area, illustration, 2
soft keys, MST, listed, 3
Software Options screen, 1
starting reference mark,
 EverTrack encoder, 5

T

test board, installation, 8
test command, canceling, 7

test points, listed, 9
troubleshooting tools, CNC,
 listed, 1
tuning
 function values, table, 19
 test parameters, listed, 18
 test values, to save, 20
 to test, 19
Tuning (F8), 3, 18
Tuning Parameters Test Results
 screen, illustration, 20
Tuning Setup Menu, illustration,
 18


U


under voltage fault, causes
 listed, 14

HEIDENHAIN CORPORATION

333 East State Parkway

Schaumburg, IL 60173-5337 USA

 +1 (847) 490-1191

 +1 (847) 490-3931

E-Mail: info@heidenhain.com

www.heidenhain.com