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TLG4500-SPC Operators Manual



TLGSPC MANUAL VERSION 1.00 February 2002



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EXPLANATION OF SYMBOLS

- Alternating Current
 - Earth (ground) TERMINAL
 - On (Supply)
 - Off (Supply)
- Caution, risk of electric shock
- $\mathbf{\Lambda}$
- Caution (refer to accompanying documents)

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INTRODUCTION

You have just purchased the most advanced load monitoring system available. In addition to this system, HELM INSTRUMENT CO., INC. manufactures a complete line of load monitoring control systems for use on metal stamping, forging, compaction and assembly presses; cold forming, cold heading, injection molding and die cast machines.

Standard or custom transducers and load cells are available for in-die monitoring or transfer or progressive tooling. Easy to use software systems designed for your specific plant wide SPC programs are also available.

At HELM, quality is inherent not only in the design of our products but in the attitudes of our employees as well. We're working together to give you the best. After all, that's what our business is all about - providing innovative instrumentation to help make your manufacturing process more productive and your operation more effective.

TLG4500-SPC Operator Interface

- Computer contains touch screen LCD display, SH3A RISC 133Mhz processor, 32 Meg RAM, 2 Ethernet and 2 communication serial ports.
- Software: Windows CE 3.0 Operating System, Operator interface program containing several "screens" to control, process, display and set SCM information.

SPC CONTROL MODULE

- SPC control module processes the readings from sensors (transducers), which are press-mounted to measure force.
- The number of sensors (usually 2 or 4) correlates to the number of *channels* on the SPC.
- The SPC monitor can process a maximum of 4 channels.
- At installation, each SPC is assigned a *sequence* number (0-31). A hardware jumper setting defines the SPC sequence number. "Sequence number" in the TLG4500-SPC software, is selected in the *supervisor* screen. It must correspond to the hardware setting, for proper communication between the front panel display and the SPC control module.

SPC PURPOSE

- **Press Protection** protect press components including dies from costly damage
- **Parts Quality Control** ensure parts are being made (stamped) as specified

Variations in the mechanical press and the part making process have the costly potential of press damage, waste of material, and downtime. The SPC uses force monitoring for both press protection and parts quality control. If a large force is detected that could potentially damage the press, or if a variation in force occurs during the part making process, the SPC triggers an "alarm" and stops the press. This allows the press operator to correct potentially costly problems.

SPC FEATURES

- **MODES** THREE POSSIBLE MODES OF FUNCTIONING CONTROLLED AT THE TLG4500-SPC BY THE OPERATOR.
 - 1. **Calibrate** initial hardware installation to establish calibration numbers.
 - 2. Setup/Standby initial job setup, press protection alarms active
 - 3. Monitor Parts parts quality control alarms active
- Sample Cycle Trend Mode (also referred to as "Learn" or "Trend" cycles)
 - Occurs immediately after entering monitor-parts mode from setup mode.

- SPC "samples" for a pre-determined number of press strokes, defined as trend counts (2, 4, 8, 16 or 32) in the *Other Settings* screen of TLG4500-SPC

- After sampling is complete, SPC takes the average peak tonnage per channel (while sampling), and stores it into a *Sample value* per channel. **Sample Cycle – SPC Mode**

- Occurs immediately after entering monitor-parts mode from setup mode.

- Current Recipe values for SPC "samples" are activated and used by the TLG4500-SPC to control the process.

• When an SPC alarm is triggered, a relay stops the press from running.

PRESS PROTECTION ALARMS

• **Capacity** – Set at or below press capacity divided by number of channels. For example, a 500-ton capacity press with four channels should have each capacity channel alarm set at 125 tons or less.

PARTS QUALITY ALARMS

• **Trend** – Selectable high and low tolerance values create limits of the peak load, are based off the sample peak load value. The limits in "Trend Mode" may be a percentage (0-99) or a tonnage above and below the sample per channel. The limits in "SPC Mode" must be set in tons. These alarms are valid only in monitor-parts mode.

LOADGARD SPC Series

OTHER ALARMS

- **Parts Batch** stops press after designated number of parts has been made.
- Idle Alarm requires operator to enter downtime reason, if press stays idle for more than a designated number of minutes (1-250).

OTHER TLG4500-SPC FEATURES

- SPC Sample Collection Statistical sampling and automated part quality controls.
- JOB SETTINGS storage, retrieval and activation of up to 250 job settings.
- Alarm Reporting records, displays and prints alarm information.
- Alarm Counters records and displays alarm quantity and type data.
- **Downtime Reporting** records, displays and prints downtime information.
- Offline Signature Storage stores signatures for future analysis.
- Offline XML files writes XML transactions for Web based display.
- Offline Database Storage writes SQL database transactions.
- Line Supervisor Communication writes to an SCM Autograph for signature display and Recipe management.
- **Supervisor** lock out screens and modes (pass code protected) from operator use if necessary.

INSTALLATION GUIDELINES

TREND LOADGARD INSTALLATION



If this unit is modified in a manner not specified by the manufacturer, protection provided may be impaired. Repair or calibration of this equipment is to be done by authorized personnel only. This unit contains no serviceable parts other than those outlined in this manual. Return unit to manufacturer for repair.

For purposes of safety, this unit is to be permanently installed. Electrical lines will be housed in conduit so that wiring is not subject to mechanical stress. A means of electrical disconnect (switch or circuit breaker) shall be included in the permanent power installation. This disconnect device will be in close proximity to the equipment and within easy reach of the operator. The device will be clearly marked as the disconnect for the equipment.

For best results, mount the SPC Loadgard at eye level and within operators' reach. Use the supplied rubber shock mounts to isolate the unit from vibration. Care should be taken to insure that the instrument chassis ground Ω is the same potential as the machine ground. See Mounting Detail Illustration in Appendix A.

ENVIRONMENTAL CONDITIONS

This unit is designed for indoor use only. Operating temperature range is from 5°C up to 55°C.

STRAIN GAIN INSTALLATION AND WIRING

Specific sensor location and mounting instructions are described in the "Installing Strain Gain Transducers" manual. Refer to this manual for proper location and installation. Sensor nominal resistance values should check out in accordance with HELM drawing number T-2344-51 in Appendix A of the Transducer Manual. For proper wiring, use separate conduit or sealtite for transducer cables and avoid running these cables with any press control or high power motor circuits. Transducer cables should never be run near high voltage (220VAC, 440VAC) circuits.

STRAIN GAIN TRANSDUCER OPERATION

The basic function of the HT-400 Strain Gain is to detect the amount of the deflection imposed on the press as parts are being formed. All Strain Gain sensors are matched to within 1% and therefore can be replaced without re-calibration of the machine.

The HT-400 Strain Gain sensors are mounted to strategic high stress areas of the machine frame. Signals from these sensors are routed to the TREND Loadgard for processing. The HT-400 is capable of measuring either a tension or a compression signal.

SENSOR WIRING CONNECTIONS

The Sensor Connectors Strips are located inside the box, at the top edge of the SPC control module.

NOTE: Always route power and sensor cables through proper holes, as designated, inside the LOADGARD enclosure.

WIRING CONNECTIONS

SENSOR CONNECTIONS ON CONTROL MODULE

The module contains two 8-pin orange connectors for wiring strain gage transducers. One connector accepts up to two (2) transducers.

[WIRED IN TENSION]



Notes:

- 1. For channel 3 and 4 connections, follow diagram shown above substituting channel 4 for channel 2, and channel 3 for channel 1. Channel 3 and 4 connections are made at the upper mating connector of load module (see page 2 and 3).
- 2. Helm model HT-400 "Strain-Gain" bolt-on transducers are used for illustration. For Helm Load Cells, +Gage (Green) and -Gage (Black) wires should be reversed at the connector to yield positive output.
- 3. Transducer cables must maintain a minimum distance of 24 inches (61cm) from any power or load lines.
- 4. Use only factory-approved wire for cable extensions.

CAM/PROX WIRING CONFIGURATIONS

SYSTEM CALIBRATION

USING HELM HT-400 TRANSDUCERS

- 1. Verify a no load condition for all transducers.
- Press the CALIBRATE button on the MONITOR SCREEN to bring up the CALIBRATION SCREEN. (Note: The CALIBRATE button must be enabled by means of the SUPERVISOR SCREEN. See page 32.)
- 3. Locate SPC-4 control module inside unit (refer to page 11).
- 4. Set the Toggle Switches to middle position, Auto-Zero Off. Adjust the MANUAL ZERO BALANCE potentiometers until the corresponding channels read zero on front display.
- Move the Toggle Switches to CALIBRATE (up) position. Adjust the CHANNEL GAIN potentiometers to desired calibration number (Note: If press has not been calibrated with load cells, adjust each CAL number to 50.
- 6. Move the Toggle Switches to Auto-Zero On (down) position.
- 7. Touch icon on front display to return to MONITOR mode. Tonnage values will now be displayed when machine is cycled.

INSERT DWG E1054W01

TLG4500-SPC SCREENS

MONITOR SCREEN



The monitor screen displays the tonnages, strokes per minute, parts count, alarm status, and alarm settings. The four-channel screen contains five red meter displays. Each corner meter displays the tonnage reading corresponding to the channel, and the center meter displays the sum of the four channels.

TREND LIGHTS

All monitor screens contain a set of nine "LED display trend lights" located to the left or right of each tonnage meter. These lights give the following alarm indications corresponding to that particular channel:

Capacity Alarm: Top LED red

High Tolerance (Trend) Alarm: Top four LED's

Low Tolerance (Trend) Alarm: Bottom four LED's

The trend lights also give an indication of peak tonnage variation during the part making process. Tonnage values changing too high (or low) over (or under) the sample value, cause the LED lights to light up above (or below) the center green LED. If the peak tonnage reaches the tolerance limits, a trend alarm will be triggered. Trend lights step (from center green, green, yellow, yellow, and red) in 25% increments of the difference between the sample and the tolerance limit. The tolerance limits are the boundaries set by the operator (high and low tolerance settings in the **JOB SETTINGS** screen) as the percentage (or tons) above and below the sample value to provide part quality control.

MONITOR SETTINGS/READINGS

Each monitor screen displays the strokes per minute (SPM), and parts count. Batch is a value (set in **JOB SETTINGS** screen) that stops the press when the parts count value reaches the batch value.

The following settings are displayed adjacent to each tonnage meter:

- C: Capacity alarm value in tons.
- H: High Tolerance (Trend Alarm) setting in tons or percent.
- **S:** Sample Value "learned" during trending or set via SPC (in tons)
- V: Variance value Value varying from sample, a more exact numerical value than the trend lights. For example, when variance value equals tolerance setting, trend alarm is triggered.
- T: Target Value set in JOB SETTINGS screen for value
- L: Low Tolerance (Trend Alarm) setting in tons or percent
- **R:** Reverse Load in tons

At the top of the monitor screen, the corresponding sequence number, present job number, and present badge ID are displayed. At the bottom of the screen is a label description such as "PRESS 1" or "OUTER SLIDE" followed by the current job name. This label may be changed per sequence in the **JOB SETTINGS** screen.

ALARM ACTIVATION LABELS

Alarm Activation Labels (Trend Alarms and Idle Alarm) are displayed below the Total Meter. Enabled settings are indicated with a green label color and disabled settings are indicated with a dull yellow label color. These switches are enabled in the **JOB SETTINGS** screen per sequence.

BUTTONS

At the bottom of the monitor screen are eight buttons activated when pressed. The left seven buttons may be "locked out" in the Supervisor screen to prevent operator use. Screens may be slow to load when activated for the first time – this is a normal occurrence.

REVERSE LOAD Button – Press to display reverse loads in red meter boxes. White button indicates button on, gray button indicates button off.

RESET Button – Press button to reset any alarms, which caused the relay to trip and stop the press. If the Downtime feature is enabled on the SUPERVISOR screen, a downtime reason will be required prior to the reset.

CALIBRATE, SETUP/STANDBY, MONITOR PARTS – Press button to change mode. System will be in one of the three modes: Calibrate, Setup, Monitor Parts.

DOWNTIME HISTORY Button - Press to view DOWNTIME HISTORY Screen.

JOB SETTINGS Button – Press to view JOB SETTINGS Screen.

ALARM HISTORY Button – Press to view ALRM HISTORY Screen.

SUPERVISOR Button – Press to view Supervisor Screen

HIDDEN BUTTONS

The monitor screen contains hidden buttons behind labels and meters, which the operator may press to activate.

Center Meter Button – The center red tonnage meter, when touched, will change to the CHARTS Screen.

STATISTICAL DISPLAYS

OVERVIEW



This instrument has the built in functionality to take recorded hits and display statistical charts based on current and historical data. The display of this information depends on the mode of operation. Trend mode displays peak range charts. SPC mode has more advanced statistical charting.

CHART BUTTONS

Each chart has the same principle functions, and then some specific ones that correspond with each style of chart. Each chart has the ability to zoom in on a specific channel, to toggle between a line graph and a histogram, read and display historical points from the archive, and to print the current graph to a networked printer.

SINGLE CHANNEL SELECTION BUTTONS

In the lower-left hand corner of the screen there are the Channel Select buttons. These buttons, when clicked, will zoom in on the specified channel to see a close-up view of it. You can also touch a channel from the 4-Channel view to go directly to that channel. To return to the 4-Channel view, touch the ALL button located at the bottom of the screen.

ALL / SINGLE SELECTION

The All/Single Select is a toggle button that displays either the 4-Channel view or the Single Channel view. The caption depicts which mode the chart will use if it is activated, not the mode it is actually in currently.

LINE GRAPH/HISTOGRAM SELECT

The Line Graph/Histogram Select button will toggle the charts between a line graph and a histogram. The way that each chart will be drawn depends on what mode the instrument is currently in. See the following section for detailed information about the different ways the charts are drawn.

ARCHIVE SELECT

The Archive Select button loads up to 200,000 records of information from the Archive and displays it in the current graph. While in this mode, the information will still be stored into the archive, but the new points will not be displayed until the Archive is reloaded by leaving and re-entering the Archive.

PRINT

The Print button will print the current graph to a network printer if one is installed and setup in the Supervisor screen.

STATISTICAL DISPLAYS – TREND MODE

PEAK RANGE CHART

	Channel Two	Peak Range			cha	nnel Four	Peak Ran	ge -	
<u>518.00</u>				2 <u>530.08</u>					
307.80		Hg	Capacity	1907.68				High Capa	city
305.20				INCOME.					
702.80				782.08					
201.40				110.48					
-502.00	21 40	64 BO	100	382.00	20	4	ea.	10	1
	Channel One	Peak Range			Char	nel Three	Peak Ran	iĝe	
1 <u>518.40</u>		Hat	Capacity	2 <u>530.08</u>				High Cape	ch
<u>107 80</u>				1207.54					_
202.00				702.00					
301.40				100.40					
-602.00				612.00					-
°	ы 40	ka 10	100		20	4	L.	80	t
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~	pain + r.e.e	HR Face	â		A		
04.1		Decision Decision		Topple	dh.	forther	Print	Return	

When in TREND MODE, the instrument will display a PEAK RANGE CHART. This chart will depict the tonnages read on each channel for the last 100 hits. These points are then graphed on the chart from left to right. Then the graph will slowly scroll to the right as new points are added to the graph. When in TREND MODE, the charts have the following specific functions:

#### **TOLERANCE SELECT**

In MONITOR PARTS, the Tolerances button overlays the High and Low Tolerance values on the graph. With this option on, you can see if the tonnages are slowly moving towards one of the alarm conditions specified for the current job.

#### CAPACITIES SELECT

The Capacities button overlays the Capacity values on the graph. With this option on, all channels will scale to the highest Capacity specified by the current job.

# STATISTICAL DISPLAYS – TREND MODE

### **HISTOGRAM CHART**



Another chart provided to the user in TREND MODE is the HISTOGRAM. The Histogram will calculate the highest and lowest tonnage read for each channel and then determine a range for each bar. Each bar depicts the number of hits recorded that fall within the tonnage range listed at the bottom of the chart. Over time, the bars will adjust to the display the last 100 hits recorded, and the range will vary as the records change over time.

In the Histogram, the Tolerances and the Capacities button will toggle their respective information just as in the Peak Range Chart.

# STATISTICAL DISPLAYS - SPC MODE

#### X-BAR / SIGMA CHART

Channel Two X-Bar Chart 22.75_UCL = 15.15_Mean = 13.93_LOL = 12.71	Channel Four X.Bar Chart 29.23_UCL = 24.27_Mean = 22.82_L0L = 21.38
Parting	Market Andrew Artic
1.4 ^{ICL}	15.15 ^{1/21}
Job Xi: (Sample Ster = S)	Job X: (Sample Size = S)
Orennel Two Signe Orent	Orannel Four Signe Chart
and the second se	Concerning and States North Martin
14	*5
Chennel One X-Bar Chart	Channel Three X-Bar Chart
1423, UCL = 0.67 Mean = 0.28 LOL = -0.11	5.03 UCL = 1.24 Mean = 0.42 LOL = -0.41
m <u>musi A</u> lu	10 10 10 10 10 10 10 10 10 10 10 10 10 1
-14.99	-6 M LCL
Job X: (Sample Soc = 5)	Job X: (Sample Size = 5)
Channel One Sigma Chart 7 m UCL = 0.57 Sigma = 0.27 LCL = None	Channel Three Sigma Chart UCL = 1.21 Sigma = 0.58 UCL = None
we at A h	ungudi ilin te la
2.4	- La
Tok	TSOTO AL
$\circ$ $\cdot$ $\cdot$ $\circ$ $\cdot$ $\cdot$ $\cdot$ $\circ$ $\cdot$ $\cdot$ $\cdot$ $\cdot$ $\circ$ $\cdot$	

In SPC MODE, the instrument displays an X-Bar/Sigma Chart. The X-Bar chart calculates the Mean and Standard Deviation for each Sample point. The Means and Standard Deviations are then averaged to create the Mean of Means and the Mean of Standard Deviations.

Each Sample point is graphed against these means to generate the X-Bar and Sigma line graphs. The X-Bar and Sigma charts display only the last 100 sample points. During the course of operation, both graphs will scroll to the left to make room for any new sample points.

These charts are used to determine the accuracy of the process, and to depict when the process is out of control. By setting your Tolerance Alarms accordingly, you can predict the number of good parts the process should generate and determine what was wrong in cases when the process does not meet expectations.

SPC MODE charts have these additional functions at the bottom of the screen:

#### TOLERANCE SELECT

In MONITOR PARTS, the Tolerances button overlays the High and Low Tolerance bands to the graph. With this option on, you can see if the tonnages are slowly moving towards one of the alarm conditions specified for the current job.

#### SIGMA SELECT

The Sigma button toggles on and off the +3 and –3 Sigma lines. In addition to display the +/- 3 Sigma lines, a Normal Distribution curve is overlaid on top of the Histogram. The values for each line are calculated as follows:

+3 Sigma = (Mean of Standard Deviations) + 3 * (Mean of Standard Deviations) -3 Sigma = (Mean of Standard Deviations) - 3 * (Mean of Standard Deviations)

# STATISTICAL DISPLAYS - SPC MODE

### **HISTOGRAM CHART**



There is a Histogram chart available while in SPC MODE as well. When displaying the Histogram, the data points are the Sample points used in the X-Bar/Sigma charts.

The highest and lowest points are determined and a range is generated.

Each bar represents the number of Sample points that exist within the ranges specified at the bottom of the chart.

The Mean and the Upper and Lower Control Limits are displayed as single, vertical lines. These provide a point of reference to help correspond the Histogram back to the X-Bar/Sigma charts.

# **JOB SETTINGS SCREEN**



This screen allows the operator to store settings including alarm settings, parts, and switches for 250 job recipes. Edits are done using the Keypad. The Keypad allows the operator to enter numerical values into job number, target values, capacity values, high and low tolerance values, parts preset value, batch value, scale, idle alarm minutes, and low alarm inhibit count. Before entering values, select a particular item by touching it. Selection is indicated with a checkmark in the box next to the word or by the color of the keypad entry window. Valid entries are then be entered in the keypad and transferred to the selected item.

#### SCREEN DISPLAY

There are two categories of information on this screen, data values denoting the current process and data values for the selected job recipe. When this screen is opened the current recipe settings are loaded from the recipe file. The current instrument values are displayed to the right of the recipe values. You may: 1) Modify the recipe values and download these values to the instrument. 2) Modify these values and save to the job recipe file. 3) Modify, download, and save. It is easy to get confused – remember that edits are lost if you leave this screen and do not save them to the recipe file.

#### JOB NUMBER

Select job number (top left of screen) using one of four arrow buttons (increment or decrement -5, -1, +1, +5) below job number. Alternatively, directly select "JOB#" and enter value 1-250 in keypad. As job number is changed, all corresponding settings from job recipe database are loaded. The currently activated job recipe number is displayed at the upper right of this screen in order to distinguish it from the displayed job recipe.

#### JOB NAME

A job name is displayed (in green) and set from the box directly below the job number panel. Touch the box to display a keyboard. The job name is saved with each numbered recipe. The currently activated job name is displayed (in blue) to the right of the recipe job name.

#### MONITOR

Each instrument should be given a unique name to identify it based on location and / or function. This is done in the Monitor box (yellow text) located just below the current job name. Touching the box displays a keyboard.

# LOADGARD SPC Series

#### BADGE ID

Badge ID (yellow text), located directly beneath the monitor box, identifies the current operator and may be entered by touching the box to display a keyboard.

#### PEAK LOADS

Current peak load values appear in white at the top of each channel group. Use these for reference and to load Target Values.

#### SAMPLE LOADS

Sample load values are visible on this screen only when in SPC Mode. They appear in light yellow just below the Peak Loads. When visible, sample values may be entered directly or more commonly loaded from a capability study. After activation the sample is assumed to represent a "good" part and the instrument uses this sample and compares it and to tolerance settings to establish a "good part" range. Alarming occurs when peaks go outside this range. In Trend mode the samples are calculated by the instrument when the Monitor mode is activated.

#### TARGET

Target load values appear in green. The operator may store target loads (known good peak loads) per job for future reference, usually to compare to peak loads on initial start up of a job. Target loads may either be manually entered through the keypad, or transferred directly using the "LOAD TARGETS" button.

#### CAPACITY

Capacity alarms (enter values through keypad) are active in setup and monitor-parts modes (not calibrate) usually for press protection. The typical values entered are press capacity divided by number of channels. For example, on a 500 Ton press using four channels, capacities are set at 125 tons per channel.

#### **HIGH / LOW TOLERANCE**

Tolerance alarm settings are used to set limits for trend alarms. The values are applied to the sample (trended or SPC) to establish upper and lower alarm limits. The values can be either a percentage of the sample or the tonnage to be added or subtracted from the sample. Select and enter valid range (0-50) through keypad. These alarms are active in "monitor parts" mode only and are based off the "learned" sample value. Entering a "0" into the keypad turns the tolerance (high or low) off for that particular alarm.

#### **CURRENT PARTS**

Displays the present parts count value.

#### **ACTIVATE PARTS**

If activate parts count switch is on, the parts preset value will be set during activation. If the operator wants to keep the same parts count, yet change other settings, the activate parts count switch should be set off.

#### PARTS PRESET

This value is transferred to the parts count during activation. Usually during a job change, the operator wants to reset the parts to zero; however, this option allows the operator to set the parts count to any value (0-9999999) when activated.

#### **BATCH PRESET**

This value allows the operator to make a set amount of parts before stopping the press. When the parts count reaches the parts batch value, the parts batch alarm is triggered.

### **ADDITIONAL SETTINGS**



#### SCALE SETTINGS

Set the scale based on total press capacity divided by number of channels. For example, when using a fourchannel sensor system on a 500-ton maximum capacity press, set the scale to 125. Touch the box to activate the keypad.

#### SYSTEM DECIMAL

Use this button to set the required decimal point for data values. For a data value of 123 the setting of 1 = 123, 0.10 = 12.3, and 0.01 = 1.23. Note that TONS mode has tenths only.

#### **TONS / PERCENT**

Trend alarms are based on variation from the sample in either tons or percent. Use this button to choose the between the two. Percent is only available when the instrument is operating in Trend Mode. Note also that setting to Tons will force a 0.01 decimal setting to 0.10. This button is not visible when the instrument is in SPC Mode.

#### IDLE ALARM

Enabling idle alarm will cause the instrument's alarm relay to drop out when the press is idle for a period of time exceeding the timeout period (0 has no effect). An alarm reset is required tin order to restart the press. When used with downtime enabled, a downtime reason must be entered prior to the reset.

#### **IDLE ALARM TIMEOUT**

Enter value (1-250) for idle alarm in minutes. An idle period exceeding this value causes the alarm relay to drop out and requires an operator to reset. Touch the box to activate the keypad.

#### TREND ALARMS

Trend alarms, are valid in "monitor-parts" mode only, and are base off the "sample peak" taken during the "learn cycle" (trend mode) or determined by the capability study (SPC mode). Trend alarms provide a "parts quality" type of feature, triggering alarms if the peak tonnage goes out of range established by the sample and the high and low tolerance values.

#### **TREND COUNTS**

An instrument operating in Trend Mode will use a given number of strokes to determine the sample values. This number is determined here and can have values of 2,4,8,16 or 32.

#### LOW ALARM INHIBIT

Low trend alarms can be disabled for a given number of strokes. This is useful during startup when all stations of a die are not yet in use. Enter the number of inhibited strokes here by touching the box and then using the keypad.

### JOB SETTINGS BUTTONS



**SELECT** - Consecutively pressing this button causes all Capacity, High Tolerance, Low Tolerance, Target, or Sample (SPC) values to be selected (highlighted). This allows the operator to quickly set common values for these fields. Pressing again will clear the selections. Note that selecting parts preset or batch preset disables selected fields.

**PRINT** – Use this button to print a list of the currently displayed job recipe settings. The Printer Active feature in Supervisor must be enabled and a printer name entered in order for this feature to function.

**LOAD TARGETS -** Transfers peak load readings into target values. Operator may use the target loads for future reference on a particular job.

**LOAD CURRENT VALUES (Trend Mode only) -** Transfers current capacity and tolerance values to the recipe fields. This is useful when setting up a series of related job recipes.

**CAPABILITY (SPC Mode only)** – Opens the capability screen that allows you to collect sample data and calculate statistical information.

**ACTIVATE -** Activates all settings pertaining to the job (including "Additional Settings" screen) into the SCM (signal conditioning module).

**SAVE RECIPE** – Re-write the job recipe file with all settings from the current display.

**ADDITIONAL SETTINGS -** Toggles between the two Job Recipe displays. Note that all settings are active whether or not they are displayed.

### JOB RECIPE CAPABILITY SCREEN



This screen provides a platform for statistically sampling the forming process, calculating Sample values and determining values for Tolerance settings for the current recipe. The data can be saved to the job recipe file. An initialized Capability screen has no data and the sample / histogram display is blank. Sample size is saved with each recipe and will be displayed when this screen is opened. It will need to be entered for new job recipe records. The current value for tolerance and sample settings are displayed in the middle of the screen.

**ENTER SAMPLE SIZE** – Touching the sample size box opens a keypad to allow you to enter the sample size value. Its range is 1 to 1000. Pressing the COLLECT SAMPLES button when the size box is empty will also open the keypad.

### CAPABILITY BUTTONS

**PRINT SAMPLE DATA** – If the printer is activated on the SUPERVISOR screen this button generates a listing of the statistical information and the actual samples and sends it to the designated printer.

**SAVE TO RECIPE** – Writes the sample size, sample (mean) values and proposed tolerance settings to the job recipe file. If this button is pressed prior to collecting "sample size" settings the number of samples currently collected is substituted for the sample size and the capability study is assumed to be complete.

**CLEAR SAMPLES** – Clears any collected samples, associated statistics, the histogram display, and any proposed tolerance settings and resets the display.

**COLLECT SAMPLES** – Start recording the samples as the press cycles until the sample size is reached or the SAVE TO RECIPE button is pressed.

**DISPLAY HISTOGRAM** – Press this button at any time during and after the collection process to view a histogram of the collected data.

**DISPLAY TONNAGE** – Press this button during and after the collection process to display the samples.

**RETURN -** To "JOB SETTINGS" screen.

### JOB RECIPE CAPABILITY SCREEN - COLLECT SAMPLES



Pressing the "COLLECT SAMPLES" button starts the capability session.

Each time you cycle the press the tonnage information is recorded and displayed on this screen. It is shown as a bar representing the total tons for the stroke and the statistics for all recorded samples are updated.

Statistical calculations are based on the total forming load using the Minimum and Maximum for control limits. This allows you to "test" these limits during the sampling process in order to establish a "good part" range.



### JOB RECIPE CAPABILITY SCREEN - DELETE SAMPLES

Samples may be deleted from a statistical survey. Touch on the Tonnage Bar to be deleted and you are prompted to CONFIRM or CANCEL. The statistical calculations are refreshed to reflect the deleted sample.

# JOB RECIPE CAPABILITY SCREEN - HISTOGRAM



Selecting the HISTOGRAM button generates this display.

1. Each bar represents a quantity of strokes at the indicated tonnage. The captions below the graph are the tonnage values.

2. The MEAN is shown as a light yellow line at the center of the display.

3. Two grey lines captioned "-3" and "+3" represent minus and plus three STANDARD DEVIATIONS from the mean.

4. A graph of the NORMAL DISTRIBUTION is shown as a magenta colored dotted line.

You may toggle between the histogram and tonnage displays at any time.

### JOB RECIPE CAPABILITY SCREEN - TOLERANCES



Statistical calculations are performed using total tons of forming force. Sample and Tolerance values are initiated from the current recipe and then updated from the individual channels of tonnage during the sampling process.

The Sample values displayed in the center of the screen are the "channel means" and are re-calculated as each sample is taken.

Tolerance values may be suggested by touching the histogram display at the desired high and low points. This produces a red line indicating the position on the display. The total tons at for that point and the number of standard deviations are show in the boxes at center right. Tolerance values for the individual corners are generated and displayed at center left.

Use these features to determine a good tolerance operating range that will produce quality parts without generating nuisance alarms.

Press the SAVE TO RECIPE button to write the sample values, tolerance values, and sample size to the job recipe file.

### SUPERVISOR SCREEN



The Supervisor Screen contains special setting windows and screens, which require a passcode to view and change settings.

#### **KEYPAD AND PASSCODE**

It is important to understand the settings in the supervisor screen before changing selections. The passcode is used not as a high security feature, but to prevent unqualified personell from mistakenly changing important settings. When the operator first enters the supervisor screen, only the keypad, program version box, and Return Buttons are displayed. The supervisor selection buttons at the bottom left are displayed after a passcode is entered into the keypad.

#### **PROGRAM VERSIONS**

The top right corner box with the title "Program Versions" displays the following: Instrument Sequence Number, Instrument Model, Protocol Version, SCM Program Version, and TLG4500-SPC Program Version. The operator should have the these version numbers available if Helm service is needed.

### SUPERVISOR BUTTONS



**SYSTEM SETTINGS** - Displays the instrument or hardware system settings panel.

**NETWORK SETTINGS** - Displays the Network / Ethernet panel.

**COUNTER SETTINGS** - Displays the job and alarm counter panel.

**MODE OF OPERATION** - Displays the panel where you select between SPC and Trend modes of operation.

**SOFTWARE SETTINGS** - Opens the panel that contains all program function entries.

**LOCK BUTTONS** - Displays a panel allowing you to lock or unlock any button on the instrument display or to toggle CALIBRATE and DOWNTIME HISTORY buttons on the MONITOR screen.

### SYSTEM SETTINGS PANEL



**SEQUENCE NUMBER** - Select the instruments sequence number using the buttons below the display.

### **NETWORK SETTINGS PANEL**



**ETHERNET PORT 1** - Choose between automatic IP address assignment (via DHCP) or manual assignment. Manual assignment requires IP address and Subnet Mask. A Gateway address may be entered if needed. Touch the item to be editted and then use the keypad to enter the data. IP addresses should be keyed in using the "." Where needed.

ETHERNET PORT 2 - Same as Port 1.

### **COUNTER SETTINGS PANEL**



**RESET ACTIVE DATE** - Use this button to set this instrument's "active date and time" to the current clock. This provides a reference to instrument activation, alarm counter periods, and program updates. Pressing this button will clear all counters.

**ZERO PRESS ALARM COUNTER** - The alarm counter maintains a record of the number of alarms recorded by this instrument since activation. Pressing this button will clear this counter only.

**ZERO JOB ALARM COUNTER** - The job alarm counter maintains a record of the number of alarms recorded by this instrument since the last job activation. Note that activating the same job will reset this counter. Pressing this button will clear this counter only.

**ZERO HARDHIT ALARM COUNTER** - The hardhit alarm counter maintains a record of the number of alarms that exceed the capacity settings recorded by this instrument since activation. Pressing this button will clear this counter only.

### MODE OF OPERATION PANEL

MODE OF OPERATI	ION	PROGRAM VERSIONS SEQ: 1 MODEL: SPC SERIES PROTOCOL: 3 PROGRAM: D4P01.10 VERSION: 1.20.31F
TREND LOADGARD	UNIT OPERATES AS A TREND LOADGARD WITH NO SPC CAPABILITIES. PEAK LOADS ARE PLOTTED AS PEAK-OVER-TIME ONLY. UNIT RUNS IN SPC MODE PROVIDING CAPABILITY STUDY DURING RECIPE SETUP AND STATISTICAL SAMPLING AND DISPLAY IN PRODUCTION SETTINGS.	ENTER PASSCODE 1 2 3 4 5 6 7 8 9 CLR 0 ENT
SYSTEM NETWORK SETTINGS SETTINGS	COUNTER MODE OF SOFTWARE LOCK SETTINGS OPERATION SETTINGS BUTTONS	NOT USED RETURN

**TREND LOADGARD** – Instrument operates as a standard trend loadgard, with no SPC features. The center display opens a graphing window that shows "Peak-over-Time" only.

**SPC LOADGARD** – Instrument operates as a Trend Loadgard plus SPC features including X-Bar charts, Histogram display and Capability Analysis.

### LOCK BUTTONS PANEL



Pressing the Lock Buttons button opens the this panel. Selections are displayed with the checkmark (toggled on/off with touch).

**SCREEN BUTTONS** – Each screen in the TLG4500-SPC program is represented here and a toggle is provided for each button on a screen. Use these toggles to control access to the button's function. A checked box on this panel disables access to that button. This "lock" feature is not a security system but is intended to prevent operator error.

**MONITOR SCREEN BUTTONS** – Use this feature to toggle between the MONITOR screen buttons for "CALIBRATE" and "DOWNTIME HISTORY". Note that this setting is not saved and always defaults back to "DOWNTIME HISTORY".

### SOFTWARE SETTINGS PANEL

SOFTWARE SETTINGS		PROGRAM V	ERSIONS
MODES  DEMO MODE  DOWNTIME MODE	EXTERNAL OPTIONS SIGNATURE ACTIVE XML ACTIVE	SEQ MODEL: SP PROTOO PROGRAM: VERSION:	: 1 C SERIES COL: 3 D4P01.10 1.20.31F
EXTERNAL MODE	LINE SUPERVISOR OPTIONS	ENTER PA	SSCODE
PRINTER ACTIVE	XML ACTIVE	1 2	2 3
\\SYSTEMS22\WORK\		45	56 20
\\SCM4800\C\PRO3\EXTERNA	L\		) ENT
NETWORK PRINTER PATH			
SYSTEM NETWORK COUNTER SETTINGS SETTINGS	MODE OF SOFTWARE LOCK OPERATION SETTINGS BUTTONS	NOT USED	RETURN

Pressing the Software Settings button opens the software settings panel. Selections are displayed with the checkmark (toggled on/off with touch). Text is entered from the keyboard that appears when you touch the display box.

**DEMO MODE** – Activating this mode places the instrument in a mode of operation that may be used for feature demonstrations. Data is read from demo files and not from the SCM board. This is not a fully functioning mode and should never be used when the press is operating!

**DOWNTIME MODE** – This selection toggles DOWNTIME on or off. If activated, a downtime reason screen opens when the RESET button is pushed on the monito display. The operator must enter a downtime reason to complete the alarm reset and the reason is recorded in the Downtime History file.

**EXTERNAL MODE** – This selection is activated when you want the instrument to write data to an external storage unit such as an Internet server or FirstMate computer. A box becomes visible allowing you to enter the fully qualified path of the external disk directory. You then select the type of file to export. Be sure to add the terminating "\".

**SIGNATURE ACTIVE** – Press load signatures are written out for FirstMate display **XML ACTIVE** – Current instrument information is written out in Extensible Markup Language (XML) format for transaction processing or Webpage display.

**LINE SUPERVISOR** – Identical if operation to External Mode and used to pass data to and from a SCM Autograph acting in Line Supervisor Mode. See EXTERNAL MODE. Be sure to add the terminating "\".

SIGNATURE ACTIVE – see EXTERNAL MODE XML ACTIVE – see EXTERNAL MODE

**PRINTER ACTIVE –** Use this selection to select printing on this instrument. Activating it will cause a box to appear enabling you to enter a fully qualified path to a network printer. Be sure to add the terminating "\".

# DOWNTIME HISTORY SCREEN

DOWNTIM	E HISTOP	RY				MONITO	R PAR	TS 091
REASON	DAT	E	DOWN PAR	TS	JOB	BA	DGE	~~1
er	6/14/99 5:47	:37 AM	0	35 3	TEST		JIM	SHUE
er	6/17/99 5:39	:04 AM	0	336 3			JIM	SHUE
er	6/17/99 5:40	07 AM	0	395 3			JIM	SHUE
er	6/17/99 5:42	:00 AM	0	997 3	1		JIM	SHUE
TEST 3	6/18/99 6:40	15 AM	0	934 2			JIM	SHUE
TEST 3	6/18/99 7:37	:57 AM	0 4	056 2	FENDER		JIM	SHUE
TEST 2	6/18/99 7:38	:02 AM	0 4	061 2	FENDER		JIM	SHUE
TEST 4	6/18/99 7:38	:52 AM	0 4	106 2	FENDER		JIM	SHUE
	) 6·40·15 AM	D	OWNTIME	0	DAP	15. 03	4	D
DATE: 0/10/95	0.10.15 AM	D	Conni Line.	U	PAR	13. 93.	T	
REASON: TEST 3	3							
JOB: 2					BADGE: J	im shue		
CHART FIR		PRIOR	LAST	DEL	ETE ALL	PRINT	RETUR	IN

The Downtime History screen displays downtime records entered when resetting an alarm condition. The data contain downtime reason, event date and time, minutes of downtime, parts count, and job and operator information.

#### DOWNTIME HISTORY BUTTONS

- CHART Displays the Downtime History Pareto Chart
- **FIRST** Makes the first record the current one and display the data at the bottom of the page.
- **NEXT** Makes the next record the current one and display the data at the bottom of the page.
- **PRIOR** Makes the previous record the current one and display the data at the bottom of the page.
- **LAST** Makes the last record the current one and display the data at the bottom of the page.
- **DELETE ALL** Deletes all downtime history and reinitiates the history file.
- **PRINT** If the printer is activated on the SUPERVISOR screen this button generates a downtime history report and sends it to the designated printer.

# DOWNTIME ENTRY SCREEN



If Downtime Mode is selected in Supervisor, the Downtime Entry Screen appears when you press the Reset Alarm button in the Monitor Screen. You then may enter a downtime reason with or without resetting the instrument. Editing functions are provided to allow you to create and maintain the reason list.

#### DOWNTIME ENTRY BUTTONS

DELETE ALL REASONS - Completely remove all downtime reasons in the list.

ADD REASONS – This button opens a keyboard allowing you to enter a downtime reason.

**DELETE REASON** – Highlight a reason on the display list and then press this button to remove it from the list.

**EDIT REASON** – Highlight a reason and then press this button opening the keyboard for editing of the selected reason.

ENTER / RESET ALARM – Use this button to enter a downtime reason an reset the alarm.

**ENTER REASON ONLY** – Use this button to enter a downtime reason only without resetting the alarm relay. This is the method to use when multiple downtime events are desired during one alarm event.

# ALARM HISTORY SCREEN

ALARM HIST	ORY				MON	TOR	PARTS
DATE	DESCR	IDTION				Parts	: 30091
7/2/00 0:22:51 AM			241		80	TIVE F	ATE
7/2/99 9.23.JI AM	SETUP ALARM	ET FRONT CAPAC	1TY 241			TAVE E	
7/2/99 9:24:24 AM	SETUP ALARM - LE	FT REAR CAPACI	TY			7/3/9	99
7/2/99 9:24:25 AM	SETUP ALARM - LE	FT FRONT CAPAC	ITY		3:1	5:57	7 AM
7/2/99 9:25:35 AM	SETUP ALARM		241				
7/2/99 9:25:36 AM	SETUP ALARM - LE	FT FRONT CAPAC	ITY		# PR	ESS A	LARMS
7/2/99 9:20:40 AM	SETUP ALAKM - LE	ET FRONT CAPAU				0	
7/2/99 9:25:50 AM	SETUP ALARM		32			9	
7/2/99 9:25:51 AM	SETUP ALARM - LE	FT FRONT CAPAC			# 3	OB AL	ARMS
7/2/99 9:25:54 AM	SETUP ALARM - RI	GHT FRONT CAP	ACITY			0	
7/2/99 9:25:56 AM	SETUP ALARM - LE	FT FRONT CAPAC	TTY 00			0	
7/2/99 9:26:02 AM	SETUP ALARM		32		#1	IARD F	ITS
7/2/99 9:20:05 AM	SETUP ALARM - LE	ET REAR LOW TH	REND			~	
7/2/99 9:26:07 AM	SETUP ALARM - LE	FT FRONT CAPAC	ITY			9	
STATUS: SETUP ALA	RM - LEFT FRONT C	CAPACITY	В	ADGE	NONE		
JOB: 3	THREE		CAPACITY:	200	200	200	200
DATE: 7/2/99 9:25	5:36 AM		PEAK:	219	128	161	140
PARTS: 6431			TARGET:	0	0	0 0	)
BATCH: 0			SAMPLE:	0	0	0 0	)
FIRST N	EXT PRIOR	LAST	DELETE AL	L	PRINT	R	ETURN

The Alarm History screen displays a record for each alarm condition recorded by the instrument. The data contain event date and time, alarm description, job and operator information, parts count, batch count, capacity settings, peak loads, target loads, and sample settings.

#### **ACTIVE DATE AND COUNTERS**

This screen displays the date and time of instrument activation and the three alarm counters showing the number of alarms since the last activation. These are display fields only, use the SUPERVISOR screen to maintain or reset.

#### ALARM HISTORY BUTTONS

**FIRST** – Makes the first record the current one and display the data at the bottom of the page.

**NEXT** - Makes the next record the current one and display the data at the bottom of the page.

**PRIOR** - Makes the previous record the current one and display the data at the bottom of the page.

**LAST** – Makes the last record the current one and display the data at the bottom of the page.

**DELETE ALL** – Deletes all alarm history records and reinitiates the history file.

**PRINT** – If the printer is activated on the SUPERVISOR screen this button generates an alarm history report and sends it to the designated printer.

# **USER SPECIFICATIONS**

- 1. 90-240 VAC input power source @ 1 Amp.
- 2. Automatic Zero Balance (Auto-Zero)
- 3. Four-channel load-strain gauge input utilizes 175 ohm, 350 ohm, or 700 ohm nominal bridge resistance.
- 4. 24VDC-Cam / Prox / PLC input.
- 5. High / Low Gain Range (1 meg/140K)
- 6. 24VDC I/O 2 inputs : 10-30 VDC 2 outputs : Dry Contact
- 7. A/D Sampling Rate: 200 µsec.
- 8. Speed Range: 0-600 SPM
- 9. Recorder Output: Track signal from 0-4 volts
- 10. Optional LDT analog input. 0-10 VDC, 12 bit.
- 11.2 Ethernet ports.
- 12.1 Auxiliary RS-422/232 Communications Port.

<u>SEQUEN</u>	CE#	SWITCH SETTING
	LSB	MSB
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	LSB 1000 0100 1100 0100 1100 0110 1010 1110 0001 1001 1001 1001 1001 1000 1000 1000 1100 0010 1000 0100 1100 0010 1100 0010	MSB           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           0000           1000           1000           1000           1000           1000           1000           1000           1000
26	0101	1000
27	1101	1000
25	1001	1000
26	0101	1000
27	1101	1000
28	0011	1000
29	1011	1000
30	0111	1000
31	1111	1000
0	0000	0000

0: OFF; 1: ON