

# THAYER SCALE

PROCESS MEASUREMENT & CONTROL EQUIPMENT

## SERIES 5200 Weigh Feeder Controller and Integrator

- **POWERFUL**
- **PRECISE MEASUREMENT**
- **OPERATOR FRIENDLY**
- **EASY TO USE**
- **ROBUST STATE-OF-THE-ART ELECTRONICS**
- **SYSTEM INTEGRATION**
- **PROCESS COMMUNICATIONS**



# THAYER SCALE SERIES 5200 WEIGH FEEDER CONTROLLER & INTEGRATOR

## The SERIES 5200, Thayer Scale's new generation of operator interface for control and monitoring of any process weighing and flow control equipment.

- For use with any Strain Gauge or LVDT type load cells.
- Powerful internal 24 bit (1 part in 16,777,216) load resolution produces unparalleled system accuracy.
- Minimal customer wiring. The Scale Unit (SU-5200) mounted at the feeder gathers, load, speed and temperature; and communicates this information to the central processor (CPU) through a 2-wire RS-485 connection.

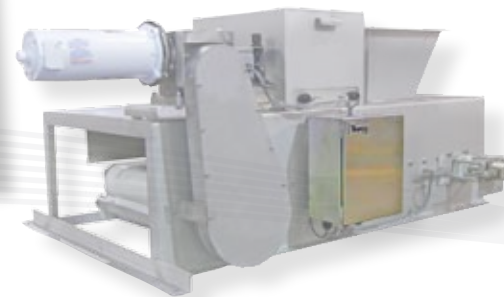
### SCALE UNIT (SU-5200)

This is the heart of the control system. It is responsible for continuously monitoring the major sensor signals of the process weighing equipment and digitally communicating their status back to the CPU for further processing. The Scale Unit consists of a motherboard that accepts several optional plug-in boards. These boards allow it to be easily applied to a variety of process weighing or flow equipment with sensors; LVDT and Strain Gauge Weight sensors, temperature sensors, two Channel Industrial Encoders, three Wire NPN Open Collector Proximity Switches or Piezoelectric Accelerometer speed sensors; and Analog or Digital flow rate sensors. The motherboard is also equipped with digital Input/Output terminals that can monitor and/or control specific weighing equipment signals such as; Automated Calibration Devices, Belt Tracking Limit Switches and other similar devices. It is located within ten feet (three meters) of the load sensor (if applicable). The factory mounts the unit to the equipment's frame and pre-wires any of the critical sensors that are an integral part of this framework.

The Scale unit typically receives its power from the main instruments dedicated DC power supply and digitally transmits its information back to the instrument via an RS-485 communication link. Both of these cables are typically contained in a single dedicated conduit run.



*The SCALE UNIT digitizes vital load & speed signals at the weighing device to provide noise immunity and defeat analog line loss over long wiring distances.*



### SERIES 5200 CPU

The CPU is the brain of the control system. It is responsible for monitoring, displaying and/or controlling the variables of the process weighing or flow equipment. At the foundation of this instrument is the CPU or Embedded PC (EPC). This executes the proprietary application specific software based on real time operating system firmware. Both the software and firmware are stored in a nonvolatile memory format compact FLASH card). Sub-components of the instrument include: power supply that convert incoming AC power to the required DC supply for this unit as well as that required by the SU-5200 and OI-5200. Interface cards that handle the RS-485 communications between the SU-5200 and OI-5200 and Input/Output cards for the fixed and programmable inputs and outputs that are available.

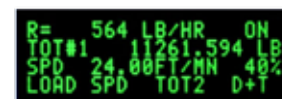
### OPERATOR INTERFACE

This is the human interface of the control system. It is responsible for providing the operator with a means of easily interfacing with the process weighing or flow equipment. It includes 24 graphic keypad controls, a 4 x 20 vacuum fluorescent display and audio beeper that combined provide visual as well as the tactile aid needed to program, operate, maintain, diagnose, and troubleshoot the entire control system.

Each application can contain up to three operator interfaces. One unit is typically mounted in the door of the instrumentation (CPU) and the others (if applicable) are shipped loose for remote mounting. Remote mounted units are available in industrial rated enclosures or as open chassis and are supplied if additional operator interfaces are required. Each unit, regardless of its location in the system, receives its information to and from the instrument controls via a communications link. A minimum of one operator interface unit is required for system operation.



*The OPERATOR INTERFACE provides plain language prompts which guides the operator through all aspects of data entry, operation, calibration and diagnostics.*



### SOFTWARE

The Embedded PC (EPC) executes proprietary software based on real time operating system firmware. Both the software and firmware are stored in a nonvolatile memory format (compact FLASH card). The EPC directly boots from this FLASH card each time the instrument power is cycled. This makes it easily reconfigurable to manage a variety of open and closed loop software applications such as:

- Weigh-Belt Integrator Software-Noncommercial Version, open loop.
- Weigh-Belt Integrator Software-Commercial (Security) Version, open loop.
- Weigh-Belt Controller Software-PI Controller, closed loop.
- Loss-In-Weight Controller Software-PI Controller, closed loop.
- Loss-In-Weight Batch Controller Software-Batch out, open or closed loop.
- Rate Controller Software-PI Controller, closed loop.

At the initial boot up the EPC retrieves all vital information regarding the application software it is to execute from the FLASH card. This software must then be programmed and set-up for the actual piece of process equipment it will manage. During this process all of the application specific information is stored on the FLASH card so all successive boots require no further action to be taken other than the normal operational commands.

*SOFTWARE resides on removable Flash media for easy software upgrade and maintenance (no EPROMS)*



### OPERATOR INTERFACE (OI)

- 4 x 20 Vacuum Florescent Display.
- Key presses are both tactile audible.
- Numeric Keys for numeric entries.
- Single Menu Key for:
- Normal MENU FUNCTIONS
- Kernel Menu Functions.
- Exception Menu Functions.
- Diagnostic Menu to view information about:
  - Software Revisions.
  - Raw Data.
  - Alarm & Calibration Histories.
- Calibration key for normal calibration function with simple YES and NO response keys.
- Acknowledge and Silence keys for alarms and shutdown.
- Minimal customer wiring:
- Single supply required from the CPU or local 24-48 VDC supply.

### CENTRAL PROCESSOR UNIT (CPU)

- Enclosure: 350 mm High X 300 mm Wide X 200 mm Deep.
- Standard: NEMA 4 (IP 65), Mild Steel, Enclosure Mounting
- Optional: NEMA 4X (IP65), 304 or 316 Stainless Steel Mounting
- Communications:
  - Isolated RS-485, 4,000 wire feet max, to SU.
  - Isolated RS-485, 4,000 wire feet max, to OI.
- Power requirements: 100 to 240 VAC @ 50-60 Hz, 350 watts.
- Communications:
  - FieldBus communication: Devicenet, Profibus, Ethernet IP/Modbus TCP
  - Serial Communications: RS-232/422/485 Allen Bradley DF1 and Modbus RTU.
  - Parallel Port for printing totalizer & amount delivered since last print.

### SCALE UNIT (SU)

- Enclosure: 300 mm High X 250 mm Wide X 150 mm Deep
- Standard: NEMA 4 (IP 65), Mild Steel, Enclosure
- Optional: NEMA 4X (IP65), 304 or 316 Stainless Steel
- Power Requirements: +24 to +48 VDC ±5%, 10 watts.
- Area Classification: Consult Factory.
- Encoder & Accelerometer plug-in speed boards.
- LVDT & Strain Gauge plug-in load boards.
- 24 bit A/D resolution with an effective resolution of 1 part in 1,048,576.
- No hardware programming required.

### Environmental:

- Operating Temperature: -10° to +60°C.
- Operating Humidity: 10 to 90%, non-condensing.
- Storage Temperature: -20 to +85°C.
- Storage Humidity: 5 to 95%, Non-condensing.
- Vibration Continuous:
  - 10 ≤ f < 57 0.375 mm amplitude
  - 57 ≤ f < 150 0.5g constant acceleration
- Vibration Occasional:
  - 10 ≤ f < 57 0.375 mm amplitude
  - 57 ≤ f < 150 0.5g constant acceleration
- Shocks: 15g, 11 ms half-sine in three axis.
- Altitude: Up to 2,000 M operational. 3,000 M storage (70 kPa).



### SYSTEM INTEGRATION/COMMUNICATIONS

Thayer Scale provides a wide variety of interface options, including standard bi-directional analog and serial communications such as:

- Serial DF1 Allen Bradley Interface.
- Serial RTU Modbus Interface.
- Fieldbus DeviceNet Interface.
- Fieldbus Profibus Interface.
- Ethernet/IP - Modbus/TCP Interface

*CONNECT TO YOUR PROCESS WEIGHING EQUIPMENT communication kits provide seamless integration to host supervisory control systems.*



### THAYER Series 5200 I/O List

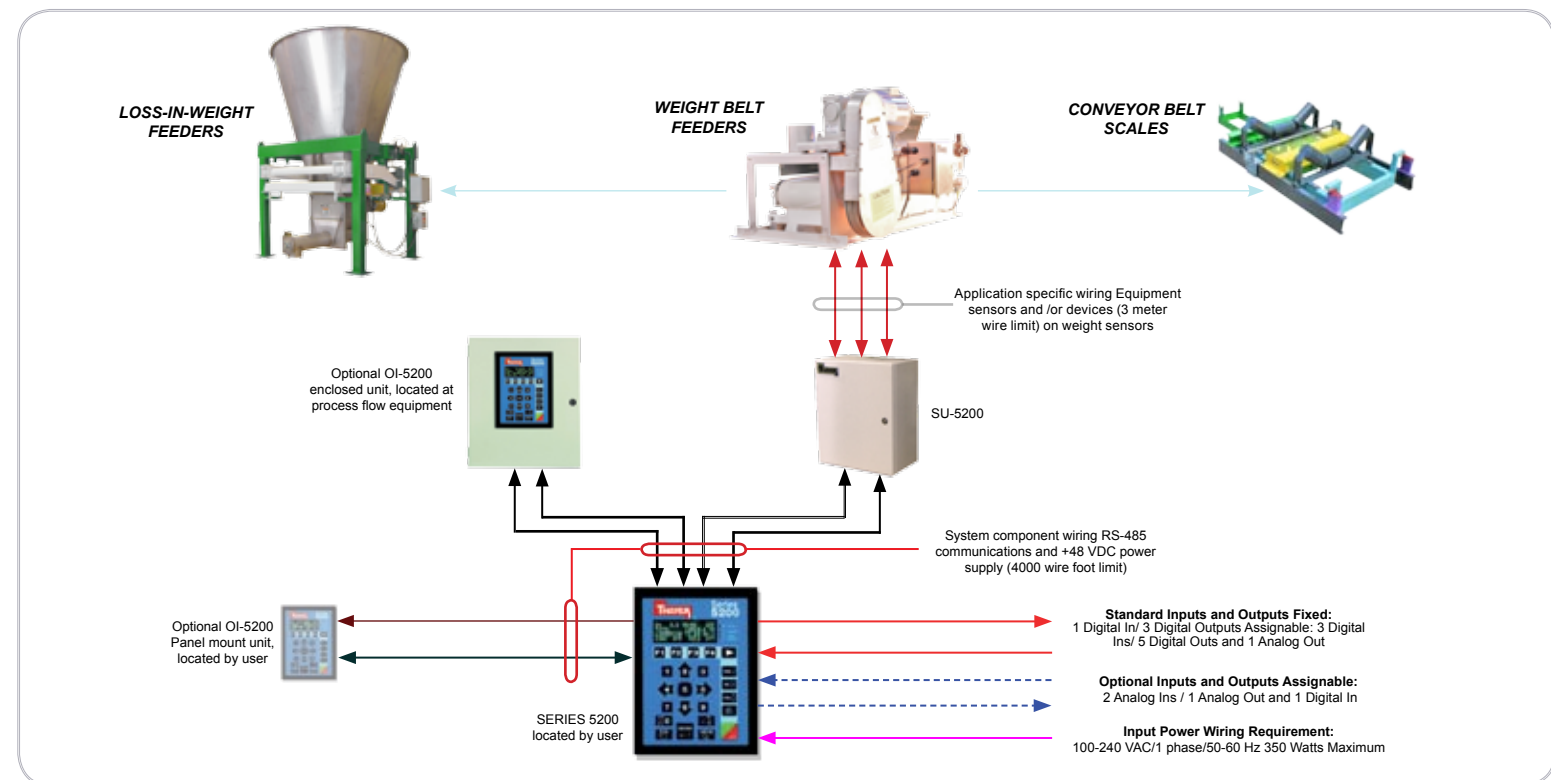
	5200 Integrator	5200 Secure Integrator	5200 Belt Controller	5200 LWF Controller	5200 LIW BATCH
<b>Digital Input<sup>3</sup></b>	Not used (2,3,4)	Not used (3,4)	Not used (2,3,4)	Not used (2,3,4)	Not used (2,3,4)
	OI Lock	OI Lock	OI Lock	OI Lock	OI Lock
	Alarm/Shutdown Ack	Alarm/Shutdown Ack (3)	Alarm/Shutdown Ack (3)	Alarm/Shutdown Ack (3)	Alarm/Shutdown Ack (3)
	Silence Audible Alarm	Silence Audible Alarm (4)	Silence Audible Alarm (4)	Silence Audible Alarm	Silence Audible Alarm
	Initiate Auto. Calibration	<b>Security Release (2) Fixed</b>	Initiate Auto. Calibration	EAFI	Start/Stop (2)
	Reset All Totalizers		Reset All Totalizers (2)	Reset All Totalizers (2)	Reset All Totalizers
	Initiate Auto. Zero Calibration	Initiate Auto. Zero Calibration	Initiate Auto. Zero Calibration	Manual Fill (4)	Manual Fill (4)
	Takeaway Conveyor Running		Takeaway Conveyor Running	Takeaway Conveyor Running	
	Reset Totalizer #1		Reset Totalizer #1	Reset Totalizer #1	Reset Batch Counter
	Reset Totalizer #2		Reset Totalizer #2	Reset Totalizer #2	Reset Batch Totalizer
	Reset Output SLC Buffer		Reset Output SLC Buffer		
	Reset Takeaway Buffer		Reset Takeaway Buffer	Reset Takeaway Buffer	Reset Master Totalizer
	Reset Takeaway Totalizer		Reset Takeaway Totalizer	Reset Takeaway Totalizer	
	Reset Preset Counter		Reset Preset Counter	Reset Preset Counter	Reset Preset Counter
			Remote Run	Remote Run	Remote Run
			Input SLC Running	Input SLC Running	
			Auto/Manual Control	Auto/Manual Control	
				Reset Input SLC Buffer	
			Purge		
			Vol/Grav		
<b>Digital Output<sup>4,5</sup></b>	Not used (1,2,3)	Not used (1,2,3)	Not used (1,2,3)	Not used (1,2,3)	Not used (1,2,3)
	Drive Fault	Drive Fault	Drive Fault	Drive Fault	Drive Fault
	Audible Alarm	Audible Alarm (2)	Audible Alarm	Audible Alarm	Audible Alarm
	Audible Shutdown	Audible Shutdown	Audible Shutdown	Audible Shutdown	Audible Shutdown
	Common Alarm	Common Alarm (1)	Common Alarm	Common Alarm	Common Alarm (2)
	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown
	<b>Factory Default Values (4)</b>	<b>Factory Default Values (4)</b>	<b>Factory Default Values (4)</b>	<b>Factory Default Values (4)</b>	Factory Default Values
	Tachometer >0	Tachometer>0	Tachometer>0	Tachometer>0	Tachometer>0
	Weigh Mode	Weigh Mode	RunMode (3)	Run Mode	Batch Running (4)
	Alarm - Low Load	Alarm - Low Load	Alarm - Low Load	Alarm - Low Load	Alarm - Low Supply
	Alarm - High Load	Alarm - High Load	Alarm - High Load	Alarm - High Load	
	Alarm - Low Speed	Alarm - Low Speed	Alarm - Low Speed	Alarm - Excessive Fill Time	
	Alarm - High Speed	Alarm - High Speed	Alarm - High Speed	Alarm - SOR Time	Alarm - SOR Time
	Alarm - Low Rate	Alarm - Low Rate	Alarm - Low Rate	Alarm - Low Rate	
	Alarm - High Rate	Alarm - High Rate	Alarm - High Rate	Alarm - High Rate	Batch Done
			Alarm-High Drive Output	Alarm-High Drive Output	
			Input SLC Running	Input SLC Running	
	Belt Mistracking	Belt Mistracking	Belt Mistracking		Batch Running
	Calibration Done/Error	Calibration Done/Error	Calibration Done/Error	TakeAway Fault	
	Calibration Running	Calibration Running	Calibration Running	Takeaway Running	Agitator Running
	Auto Zero	Auto Zero	Auto Zero	Agitator Running	Fill Output
	Auto Calibration	Auto Calibration	Auto Calibration	Fill Output (1)	Deviation Alarm
					Overfill
	Limber Moved	Limber Moved	Limber Moved		Busy
			Deviation Alarm	Deviation Alarm	
				Overfill (3)	
				Busy	
	Preset Counter Alarm	Preset Counter Alarm	Preset Counter Alarm	In Purge	
	Preset #1 Done	Preset #1 Done	Preset #1 Done	In ML1	
	Preset #2 Done	Preset #2 Done	Preset #2 Done	In ML2	
Preset Counter Done	Preset Counter Done	Preset Counter Done	In SOR		
Preset Counter Running	Preset Counter Running	Preset Counter Running			
		Remote Setpoint	Remote Setpoint		
		Sampling Control Status			
		Sampling Hold Status			

**BOLD** Selections are Factory Defaults, Followed by the particular I/O in parentheses.

	5200 Integrator	5200 Secure Integrator	5200 Belt Controller	5200 LWF Controller	5200 LIW BATCH
<b>Analog Input<sup>1</sup></b>	Not used (1,2,F1)	Not used (1,2,F1)	Not used (1,2,F1)	Not used (1,2,F1)	Not used (1,2,F1)
	Takeaway Conveyor Speed	Takeaway Conveyor Speed	Takeaway Conveyor Speed	Takeaway Conveyor Speed	
			Setpoint	Setpoint	
			Ratio Setpoint: Master Demand	Ratio Setpoint: Master Demand	
			Ratio Setpoint Ratio Demand	Ratio Setpoint Ratio Demand	
			Input SLC Belt Speed	Input SLC Belt Speed	
<b>Analog Output<sup>2</sup></b>	Not Used	Not Used	Not Used	Not Used	Not Used
	<b>Scale Loading (2)</b>	<b>Scale Loading (2)</b>	Scale Loading	<b>Scale Loading (FO)</b>	Scale Loading (2, FO)
	<b>Feed Rate (1, FO)</b>	<b>Feed Rate (1, FO)</b>	<b>Feed Rate 1, FO)</b>	<b>Feed Rate, (1)</b>	Feed Rate
	Belt Speed	Belt Speed	Belt Speed	Speed	
	Takeaway Conveyor Speed	Takeaway Conveyor Speed	Takeaway Conveyor Speed	Takeaway Conveyor Speed	
			<b>Drive Output (2)</b>	<b>Drive Output (2)</b>	Drive Output (2)
			Input SLC Belt Speed	Input SLC Belt Speed	
			Ratio Setpoint: Master Demand	Ratio Setpoint: Master Demand	
			Ratio Setpoint: Ratio Demand	Ratio Setpoint: Ratio Demand	
			Setpoint	Setpoint	

**BOLD** Selections are Factory Defaults, Followed by the particular I/O in parentheses.

Analog Input:	A1 1, 2:	0-24 mA range (factory configured for 4-20 mA representing 0-100%), 600 Ω impedance.
	FI 1	24 VDC, 0-25 KHZ, user programmable range.
Analog Output:	AO 1,2:	0-24 mA range (factory configured for 4-20 mA representing 0-100%), 750 Ω impedance.
	FO 1:	24 VDC, 0-25 KHZ, user programmable range.
Digital Input:	DI 1-4:	Contact closure, 10 mA minimum
Digital Output:	DO 1, 2:	Form A, Solid State Relay, 240 VAC/VDC, 100 mA maximum.
	DO 3, 4:	Form C, 120 VAC @ 0.5A, VDC @ 1.0 A.



# General Description Functions of Displays and Controls of the Series 5200 Operator Interface

**1 Vacuum Fluorescent Display** - A four line by twenty character vacuum fluorescent display. It displays all information available from the system to the operator.

**2 Function Keys (F1-F4)** - The function keys are used to select operations indicated by the four labels on the bottom line of the display. If more than four labels are available, the MORE key (12) can be pressed to rotate to the next group.

**3 Numeric Keys (0-9, ".")** - These keys are used to enter numeric data. The decimal point is entered at the desired position. It cannot be the first character. Always precede a decimal point with a zero for numbers less than one.

**4 The numbers 2, 4, 6 and 8 are shaped like arrows and serve as multiple purpose keys as follows:**

- When in Menu mode they are used as navigation keys. The Left/Right arrow keys are used to scroll from category to category (side to side) and the Up/Down arrow keys are used to scroll from line to line (up and down) of each category. In the programming mode, when the entries calls for a non-numeric item, the Up/Down arrow keys are used to scroll through a list of available menu entry selections.

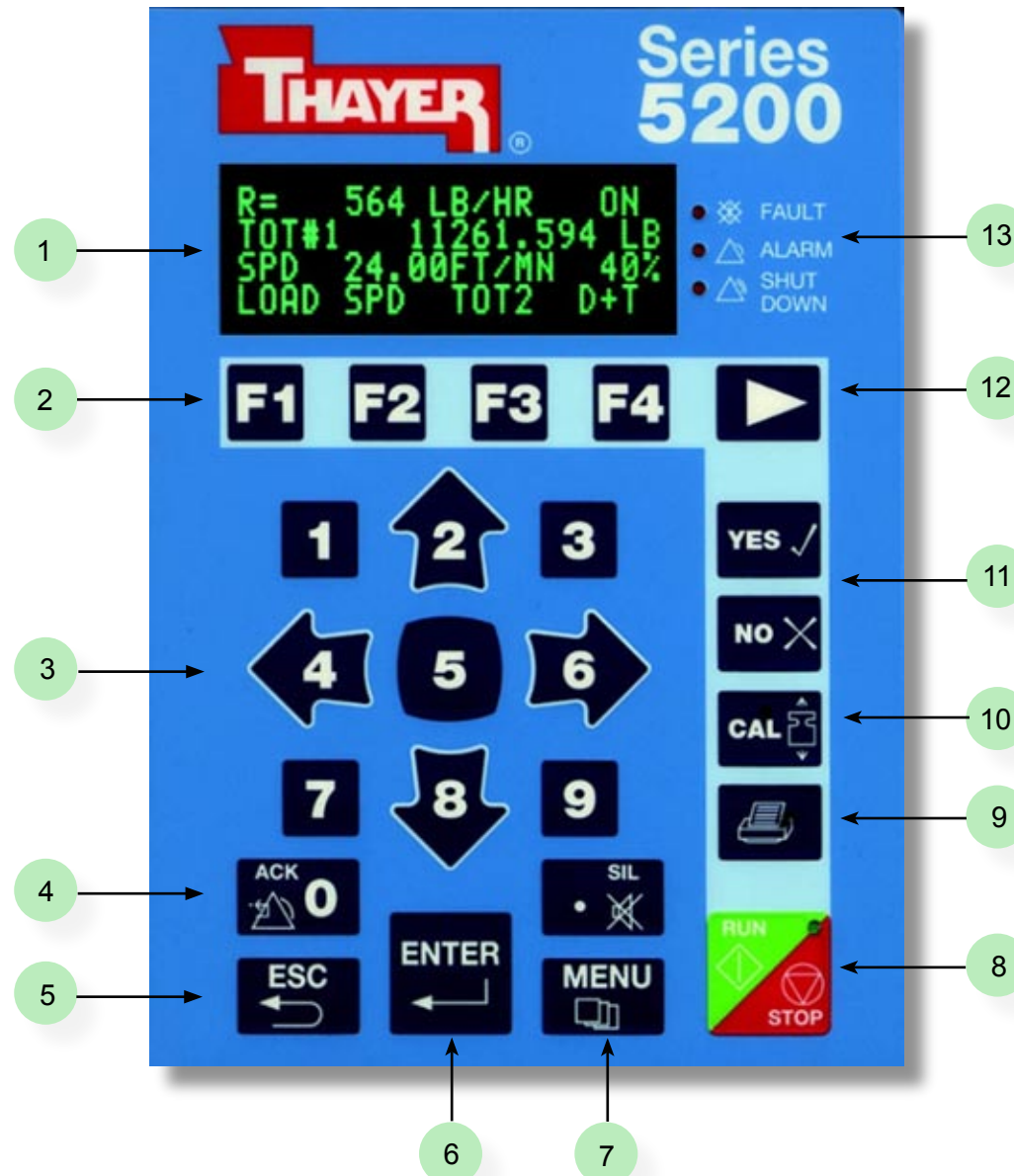
- When in Run-time mode and Controller Application software is installed they are used as process adjustment keys. The Left/Right arrow keys are used in the Manual mode of operation to ramp the controllers Output up and down. The Up/Down arrow keys are used in the Automatic mode of operation to ramp the controllers Setpoint up and down. 4 ACK, SIL (0, ".") Keys - During run time operations the zero key doubles as the acknowledge key and the decimal point key functions as the silence key as follows:

- The **SIL** key is used to silence any programmed audible outputs. This key will disable any user programmed audible outputs that are currently active. Pressing this key a second time will not re-enable the outputs. However, pressing the ACK key twice will sound the audible outputs again. If the instrument has gone into the shutdown mode, it must be acknowledged by pressing the ACK key before normal operations are allowed to resume.

- The **ACK** key is used to acknowledge an alarm or shutdown condition and acts as a toggle switch. During an alarm condition pressing this key will stop the reporting of the alarm on the third line of the display and disable any programmed outputs activated by the condition. Both audible and non-audible alarms are deactivated. Pressing this key a second time will bring the alarm message back onto the display and re-enable all programmed outputs associated with that alarm. The alarm indicator on the operator interface (the middle red LED to the right of the display) will remain lit as long as the alarm condition remains. It cannot be turned off by the acknowledge key.

**5 ESC Key** - This key is used to cancel entry of data, to abort special functions and to exit the menu structure. During menu operations pressing escape (ESC) clears any incorrectly entered data already entered allowing new data to be entered. Pressing the key a second time prior to entering data after opening a field will close the open field and restore the previous data. The menu area is exited by pressing the ESC key when no data field is open. Escape is also used to abort some procedures that have been evoked.

**6 ENTER Key** - This key is used to open a programming data field. After data has been keyed in the ENTER key must be pressed again to store the data and close the field.



## DISPLAY MODES

- **RUN-TIME** Run-time is the normal operating display. The information displayed includes a broad range of system data such as rate, totals, mode, and various status conditions. During operation the information presented on the third line of the display may be alternated with information regarding specific events such as alarm conditions.

- **SUPPLEMENTAL** Supplemental displays are extensions of run-time displays. They provide detailed information on specific system variables and operations. These displays are typically called up by a technician performing diagnostic procedures or advanced system configurations.

- **MENU** Menu displays allow the programmer or operator to scroll through and modify application setup parameters, activate support routines, present diagnostic information and configure the instrument for operation. Various password levels can optionally be employed to prevent changes by unauthorized personnel.

- **PROCEDURAL** Procedural displays appear as logical steps within a procedure, such as calibration or count belt pulses. Procedural displays give information about the step logic being performed. These displays also prompt the operator for confirmation before continuing with specific procedures.

**13 FAULT, ALARM, SHUTDOWN LED'S** - These three red LED'S are used to display instrument status and will illuminate if the following set of conditions are met.

**FAULT** No illumination indicates that the Instrument is communicating properly with the OI-5200 and SU-5200. Steady Red indicates that the OI-5200 has lost its communications with the Instrument.

Flashing Red indicates that the SU-5200 has lost its communications with the Instrument.

**ALARM** Steady Red indicates that a programmed alarm parameter has exceeded its preprogrammed limit.

**SHUTDOWN** Steady Red indicates that a programmed shutdown parameter has exceeded its preprogrammed limit and the system has entered a shutdown condition.

**12 MORE Key** - This key is used to show the next group of function keys (if available), on the bottom line of the display.

**11 YES/NO Key** - These keys are used to answer questions asked during programming, procedural set-ups and calibration procedures.

**10 CAL Key** - This key instructs the program to initiate a Normal Calibration run for all weighing applications.

**9 PRINT Key** - This key instructs the program to send predefined data consisting of header information, current totalizer value, totals delivered, and current date and time to the printer port.

**8 RUN/STOP Key** - This is an Application software dependent Key. Function of this key is solely dependent on the application type and menu parameter set-up. Reference must be made to the individual Application Manuals for detailed information regarding the setup and operation of this key. Embedded within this key outline is a green LED. It illuminates when the system is in the Weigh or Run mode.

**7 MENU Key** - This key is valid only while the run-time screen is being displayed. When pressed the bottom line of the display will offer a selection of menus. Select the desired menu by pressing the corresponding function key (2) or the MORE key (12) to see other menus if available. While inside the menu structure pressing the MENU key will move the cursor back to the first item in the first category. Use the escape key (5) to exit a menu.

## PRODUCTS & MARKETS SERVED

Thayer Scale supplies the world with process measurement & control equipment with emphasis on solids flow weighing and metering. Our products include: Loss-In-Weight Feeder, Weigh Belt Feeders, Conveyor Belt Scales, Measurement & Control Instrumentation and Bin & Hopper Material Flow Aids. The markets we serve include: Forest Products, Plastics, Food, Chemicals and Cement to name a few.

## MAJOR PRODUCTS & TECHNOLOGIES

- Patented "FMSS" Force Measurement Suspension System Cable Scales
- Patented Loss-In-Weight "Differential™" Screw Feeder
- Patented "Nodal-Membrane" Vibratory Tray Feeders.
- Patented "Spiralator™" Hopper Agitator
- Patented "Rocking Flexure" Belt Scales
- Patented "PF" Volumetric Screw Feeder
- Patented "Bridge Breaker™" Bin & Hopper Dischargers.
- Low Feed Rate "Miniature" Weigh Belt & Loss-In-Weight Feeder.
- "NAR" NTEP Approved commercial grade Conveyor Belt Scales (approved for legal trade).
- "SI" Insertion Weigh Belt Feeder and Scale.
- "MFLI" Mass Flow Liquid Injection System.
- High Capacity, Heavy Industry Weigh Belts.
- Modular, Singular or Multi Feeder Continuous or Batch Control Systems.

## SUPPORT SERVICES

### TEST FACILITIES:

Thayer Scale operates three fully equipped dry particle test centers in a dedicated wing of our Massachusetts facility. A full time staff performs product application and performance testing with user supplied materials. These facilities are designed to duplicate as closely as possible industrial processing conditions.

### SERVICE:

Thayer Scale has a well trained professional service department with an outstanding record of longevity, experience and achievement. Thayer's technicians are available for start-up support, inspection, diagnosis and repair service, routine maintenance and material testing services.

### TRAINING:

Thayer Scale offers formal training either here at the factory in Pembroke, MA or at the customer's plant. Each training class is tailored to the specific instrumentation and mechanical equipment used in their facility.



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## THAYER SCALE-HYER INDUSTRIES, INC.

91 Schoosett St., Pembroke, MA 02359  
Ph: 781-826-8101 Fax: 781-826-7944  
e-Mail: Sales@ThayerScale.com  
WEB: www.ThayerScale.com