Your GSE distributor is:

GSE Scale Systems

650 Series Programmable Process Controllers

User's Guide

GSE scale systems
A United Dominion Company

PART NUMBER: 39-10-31468

650 Series
Programmable Process Controllers

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GSE SCALE SYSTEMS PUBLISHING GROUP
The User's Guide to the 650 Series Programmable Process Controllers

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The 650 series instruments come standard with a number of features which makes it the most versatile and powerful system in its price class. From the rugged load cells to the sophisticated electronics, every effort was made in design and manufacture to provide you with the most accurate and highest quality instrumentation.

Your GSE distributor will have done most of the work in setting up your system to suit your application. This user's guide is intended to be a reference tool for explaining the basic functions of day to day operations. Any questions concerning the programming setup or servicing of this product should be addressed to your GSE distributor. For those who would like more information on installation and program setup, a complete Technical Reference Manual is available through your GSE distributor at a nominal cost.

If you have any questions or need assistance after first reading this manual, please contact a GSE customer service representative at the following number.

Your GSE distributor is:

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Warning!

Any deviation from the original part design will void the equipment warranty. This includes the cutting or replacement of the power cable. Contact your GSE distributor before attempting any modifications.

Warning!

Make sure the 650 series instrument is completely disconnected from the power source before working on it.

Any operation which involves going inside the enclosure should be performed by qualified service personnel only! Hazardous voltage is accessible within the enclosure.

AVERTISSEMENT!

Assurez-vous que le cordon d'alimentation secteur du contrôleur de type 650 soit toujours débranché avant d'effectuer un travail sur l'appareil.

Tout travail nécessitant l´ouverture de l'appareil devra être effectué par du personnel qualifié après s'être assuré d'avoir débranché l'alimentation secteur afin d'éviter tout contact avec une charge électrique dangereuse provenant de l'intérieur de l'instrument.

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to the description of parameter P206 for more information.

tx abort This occurs if the **[CLR]** key is pressed when the tx on hold error message is shown or if P206 is set for abort and the transmit buffer becomes full.

tx con'd This will appear briefly when the handshake is re-asserted after the tx on hold message occurs.

9.9 Trouble-Shooting

DATA TRANSMISSION: If a data transmission of any weight-related numeric data such as Gross, Net or Tare, is sent as dashes, an overload or underload (negative overload) condition was in effect. Remove the cause of the overload (or underload) and repeat the transmission. Check also the setup of parameters **P204** and **P206**.

DISPLAYED WEIGHT: If an overload or underload occurs due to an electrical overstress (EOS) normally due to lightning or ESD discharge, then press the **[CLR]** key. The message "wait 1" will appear for about 1 second. The A/D converter will then be reset and the system should again be functional. If not, power down for a few seconds. If the indicator still does not work properly after power-up, check the load cell or platform wiring. If okay, permanent damage may have occurred, most likely to the instrument amplifier.

9.10 Service

There are no user-serviceable items in the GSE 650 series! Service must be performed by qualified service technicians only! Attempts to service this instrument by unqualified personnel may void the warranty!

Chapter 1 Introduction

1.1 About This Manual

This User's Manual contains basic operating information on the 650 series controllers. A 650 Series Technical Reference Manual is also available with all operating instructions, available options, installation information, and technical information on system setups (ie. macro Programming). This manual is available through your GSE distributor.

The layout of the manual divides basic features of the 650 series instruments into a chapter to allow for a brief but informative explanation.

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Figure 1-1. Model 650

Figure 1-2. Model 653 with

Figure 1-3. Model 654

Figure 1-4. Model 655

9.8 Communications Error Messages

prtyXerror This indicates that the parity of a received character did not match the parity specified in the Setup Mode, parameter P202. This could also result if the baud rate (P200) or the number of data bits (P201) are incorrect.

ovrnXerror This indicates an over-run error where an additional character was received while the receive buffer of the 650 was full, and thus the extra received character will be lost.

frmgXerror This indicates that the stop bit of a received character did not occur when it was expected. This could be the result of an incorrect baud rate (P200), incorrect number of data bits (P201), or incorrect parity setting (P202).

portX error This indicates that the 650 did not check its receive data register in time, thus missing a character. If this error should occur, please notify your GSE distributor or the factory. To prevent the problem, try reducing the baud rate (P200).

tx on hold This will occur if a data transmission is held up for two seconds of more due to a de-asserted handshake. Refer

for a parameter which is not field changeable, such as the serial numbers or the audit trail counter results in this message.

- - Cksumerror Upon each power-up, the indicator tests the integrity of its EPROM. If the result is not correct this message is displayed and the Indicator is not usable. Verify that the EPROM (U13) is installed properly (no bent pins).

9.7 Miscellaneous Messages

EntryError This error message is the most commonly used. The primary causes are entering a value preceding a key (such as **[ZERO]**) which is not allowed, entering alpha data for a numeric selection, or entering a fractional value for an entry which only accepts whole numbers. This may occur while in the Setup Mode or one of the operational modes.

WhichTx#? This message will appear when the instrument is setup with more than one custom transmit with parameter P991 set for "Prmpt" (Prompt) and the **[PRINT]** key is pressed. The "WhichTx#?" message is asking for a custom transmit number to be entered. Keyin the custom transmit desired and then press **[ENTER]**. I.E. **[2] [ENTER]**, for custom transmit number 2.

written permission of GSE. This also includes both the software used for computer simulation of GSE hardware and its firmware. Setup files that have not been developed by GSE are neither the property nor the responsibility of GSE. It is highly recommended that all setup files for the model 650 to be backed on disk in ASCII text form.

GSE Scale Systems offers technically-advanced, precision weighing instruments for high-quality weighing systems. Among these instruments are programmable process controllers. All GSE controllers have innovative features that contribute to workplace efficiency and productivity.

Within its 650 Series of products, GSE offers the following programmable process controllers:

- Model 650, shown in Figure 1-1;
- Model 651, which is identical to the Model 650 except for the display;
- Model 653, shown in Figure 1-2;
- Model 654, shown in Figure 1-3;
- Model 655, shown in Figure 1-4;
- Model 657, shown in Figure 1-5;

The Model 651 has a four-line-by-20-character alphanumeric display in place of the standard display.

The Model 655 incorporates the standard VFD display and the 4-line x 20-character prompting display.

Panel-mount versions of the Model 650 and Model 651 exclude the back panel and tilt stand for special wall-cavity mounting.

A variety of options that enhance the 650 Series controllers are available. The number of options that can be used (and, therefore, the maximum capabilities) varies among the five models.

When integrated with a load cell, the 650 Series controllers form a

complete *weigh system.* Load cells and scale platforms manufactured by GSE and other companies can be used in these systems. The 650 Series controllers convert the output signals from the load cell or scale platform into a digital form that is displayed on the controller display.

GSE 650 Series controllers can be customized for every type of weighing application imaginable. Programmable software enables the transmission of output data from the controller to a computer or printer by way of an RS-232 port.

Accurate and durable, GSE 650 Series controllers are built to provide years of quality weighing service even in the most demanding industrial environments.

Figure 1-5. Model 657

34 RES> 25K!	The current combination of capacity **P110** and increment **P111** result in a resolution greater than 25,000 graduations. This is simply a warning in case this was not intended.
35 RES>100K!	The current combination of capacity **P110** and increment **P111** result in a resolution greater than 100,000 graduations. This is not allowed and as soon as any key is pressed the instrument will jump back into the setup mode to parameter **P110** to verify the settings.
36 RES< 100!	The current combination of capacity **P110** and increment **P111** result in a resolution less than 100 graduations. This is simply a warning in case this was not intended.
37 RES< 1 !!	The current combination of capacity **P110** and increment **P111** result in a resolution less than 1 graduation (i.e. the increment is greater than capacity). This is not allowed and as soon as any key is pressed the instrument will jump back into the Setup Mode to parameter **P110** to verify the settings.

9.6 General Error Messages

99 Can't Set!	An attempt to enter a value

the capacity, **P110**, and for the calibration weight. If all appears correct, refer to the use of the information parameter **P61100**, and determine the output (in mv / volt) of the connected load cell.

31 F.S.<.1mVv The entered calibration weight, together with the currently applied signal, indicates that the full scale signal will be less than the allowed minimum of the indicator. Verify the proper entries for the capacity, **P110**, and for the calibration weight. If all appears correct, refer to the use of the information parameter, **P61100** and determine the output (in mv / volt) of the connected load cell.

32 ADD MORE! The applied weight during calibration was less than 0.1% of capacity. More weight than this is required. Refer to **P61100** if this is incorrect.

33 ReCALReq'd The just completed calibration is insufficient to guarantee accurate results due to either the cal weight being less than 5% of capacity or this was the first calibration of this platform to this indicator and therefore the coarse gain was adjusted by the indicator.

1.2 Controller Descriptions

Most apparently, the 650 Series controllers differ in appearance. Table 1-1 provides dimensions for the five models.

Table 1-1. 650 Series Controller Dimensions

Model	Width	Height	Depth
650	11 in* (279 mm)*	9 in* (228 mm)	3.7 in* (94 mm)
651	11 in* (279 mm)*	9 in* (228 mm)	3.7 in* (94 mm)
653	16 in (406.4 mm)	22.5 in** (571.5 mm)**	9.28 in (235.7 mm)
654	24 in (609.6 mm)	32.5 in** (825.5 mm)**	9.28 in (235.7 mm)
655	11.07 in* (281.20 mm)	12.16 in* (308.9 mm)	4.70 in* (119.4 mm)
657	16.60 in* (421.6 mm)	12.10 in* (307.3 mm)	4.93 in* (125.2 mm)

mm =millimeter; in = inch
*Includes mounting stand.
**Includes mounting flange.

GSE Controller Models 650, 651 and 655 have a stainless steel

enclosure for washdown environments. They come with a tilting stand for so they can be positioned on a tabletop mounted to a wall. The panel-mount version can be mounted in a wall cavity or user-provided enclosure. As many as two optional 16-position I/O boards can be installed on either the standard or panel-mount Model 650 and Model 651.

Model 653 and Model 654 have full metal enclosures. Each is equipped with one 16-position I/O board. The Model 654 accepts an optional 16-position I/O board, as well, expanding input and output to 128 channels (Contact GSE). Optional prompting displays and alphanumeric keypads can also be added to either the Model 653 or Model 654.

The standard keypad on the Model 650 and Model 651 differs slightly from the standard keypad for the Model 653 and Model 654.

1.3 Common Weighing Applications

Typical weighing applications for GSE 650 Series controllers include:

- Small parts weighing
- Large parts weighing
- Parts counting
- Vehicular truck loading (Truck in / Truck Out)
- Tank weighing
- Process industry weighing
- Inventory control
- Order picking
- Floor and hopper scales control
- Conveyor weigh systems control
- Batching (mixing)

1.4 Features

The 650 Series controllers have the following standard features:

- Easy-to-read vacuum fluorescent display with 0.75-in high

25 DefltSetup Upon power-up the indicator has not found the proper codes. Therefore all parameters have been reset to factory default values.

26 Bad Setup The stored data has a checksum error. Check all parameters or re-load setup.

27 RE-BOOT! The indicator cannot use the EEPROM for data storage, so it is attempting to power-up again to cure the problem.

28 NoRAMAVAIL The current setup requires more RAM than is currently installed. Either contact your dealer or the manufacturer.

29 PIN error This message will appear on power-up or setup if the E^2 is corrupted in the PIN section. Check E^2 for problems. The access code is defaulted to the manufacturer (GSE) access code. Also check Error 11.

9.5 Calibration Error Messages

30 F.S.>MAX! The entered calibration weight, together with the currently applied signal, indicates that the full scale signal will be greater than the allowed maximum of the indicator. Verify that correct entries have been made for

9.4 Hardware Problem Error Messages

17 A/D BAD! The processor has detected a problem with the A/D chip. Contact your GSE distributor.

18 BufSzMax! The accumulative total buffer size for both the TX and RX buffers of all four COMM ports on the 650 is 4096 bytes. If entries to the "buffer size" parameters (P207-P208) exceed this total, this error message will be displayed.

19 x06\x44\x61ta&Stop Certain combinations of protocol are not available. The protocol combination selections are in P201, P202 and P203. This error occurs if an illegal protocol combination is selected. Refer to chapter 8 Communications in the technical reference manual for more information.

20 Deflt A/D This message appears for 1 second. It will be displayed if the A/D calibration data gets corrupted. Refer to the technical reference manual or contact your GSE distributor.

21 WriteNVErr Error reading data from the EEPROM. Possible U16 and U17 problem.

22 ReadNVErr Error writing data to the EEPROM. Possible U16 and U17 problem.

23 CheckNVPar Supplementary error message for above errors.

24 NVParFull! The setup being attempted requires more EEPROM than is currently installed.

(19-mm high) digits **(except Model 651)**

- Sealed elastomer keypad for superior protection against chemicals and harsh environments
- Capability to power as many as twelve 350-ohm load cells for demanding applications, such as floor, truck, tank, and hopper scales
- Alternating Current (AC) power operation
- Front Panel calibration and linearization execution
- Full scale response time from 0.06 to 8 seconds
- Selectable weighing units: pounds (lb), kilograms (kg), ounces (oz), grams (g), and so on
- Programmable RS-232 communications software
- Programmable event timing
- As many as 256 programmable setpoint events
- Eight programmable I/O ports (as many as eight remote key activations)
- Storage and recall of VAR and specified data
- 999 user-defined variables: Strings, Floats, Unsigned Integers and Integers
- Remote Display support capability
- Expandable memory for increased data storage
- As many as eight external relay module boards with as many as 16 modules per board (128 modules possible)
- Battery-backed Time and Date Clock

- Weighing increments of 1, 2, or 5 units, from .00001 to 500

Other features include:

- Stainless Steel Enclosure for washdown environments **(Models 650, 651, 655 and 657)**
- Versatile swivel stand for table or wall mounting **(Models 650, 651, 655 and 657)**
- Four-line by 20-character alphanumeric display **(Model 651 and 655)**

1.5 Available Options

Numerous hardware and software options that maximize the capabilities and functions of the standard 650 Series controllers are available. These options can be installed by your GSE distributor when you order your controller, or they can be added later. All options must be installed by your GSE distributor or a qualified technician. Please do *not* return the controller to GSE for installation of options.

Options are listed below in alphabetic order. Consult your GSE products distributor for installation instructions.

16-Position I/O Board Option:
Board increases I/O capability to as many as 128 I/O circuits **(except Model 653)**.

8-Position I/O Board Option:
Board installs inside the instrument (Model 657 only).

4-Position I/O Board Option:
Boards (2 max) install inside instrument (Model 655 only)

Alpha Keypad Option:
Enables entry of alphabetic and ASCII characters.

Cable Options:
Scanner/Keyboard Adapter Cable

208 taking into consideration the 4% overload.

9.3 Setup Mode Error Messages

10 Entry>Max!	An entry was made which had more characters than allowed.
11 WRONGCODE!	The incorrect access code was entered, thus preventing changes. In order to access the Setup Mode, either the proper code must be entered or the **[ENTER]** key must be pressed alone (to view selections without making changes).
12 No Mods!	The Setup Mode is being accessed, but changes are prevented.
13 OutOfRange	An entry made for a selection was beyond the range of valid choices.
14 Must Keyin	The choice for the current parameter must be keyed in.
15 Size>3999!	The size of one of the Custom Transmit setup has exceeded the limit.
16 CHECK JUMPR	A programming operation was attempted when the program jumper is installed. Installation of this jumper will prohibit any programming changes.

03 Over-Load! Input signal is greater than positive full scale. Use same check as for underload.

04 # > Dsply Number to be displayed will not fit within 6 digits. This will not normally occur for the Gross, Net or Tare Weights but may result while displaying the accumulated totals if the amount exceeds 999,999. Either clear the totals or settle for only being able to transmit the totals.

05 Zero> Max.! An attempt was made to zero out more than allowed per **P118** selection. Use the **[TARE]** key for subtracting off container weights or if large dead-load is always to be present, apply this dead-load during the New Zero? prompt during calibration to permanently eliminate the offset.

06 Tare>F.S.! Tare entry was greater than full scale. Most likely the entered tare value was incorrect.

07 Tare < 0 ! Negative tare attempted, but not allowed per **P162**. For auto-tares, the GROSS Weight must be greater than zero unless **P162** is changed to allow negative tares.

08 CheckConn. This message is displayed if the signal into the A/D is +/- 2 times the Full Scale signal. This is effectively taken into consideration when the information sent to the micro processor from the A/D is +/- twice the allowable F.S. reading.

ie. P110 F.S. = 100

Error message will be displayed at +/-

Computer Cable
Printer (Eltron) Cable
RS-232 dot matrix printer cable

Database Memory Options:
Adds capability for creating database records, consisting of fields, for data storage and retrieval; battery-backed SRAM increases internal storage to 256K, 512K, 1M, or 2M

Multi-Scale Capabilities Option:
Enables the use of as many as *three additional* scale platforms per controller.

Network Module:
Addressable RS-485 network card.

Panel Mount Version (Models 650 and 650 only)
Provides Model 650 standard electronics, keypad, and display without the enclosure, tilt stand, and back panel for installation in user-defined wall cavity or enclosure.

Peripherals Options:
Alphanumeric Keyboard (ASCII)

Prompting Vacuum Fluorescent Display Option:
An illuminating, four-line-by-20-character dot matrix display for the additional display of prompting and status information.

Setup Parameter Memory Expansion Option:
8K memory chip can replace each of the two standard 2K memory chips, increasing internal E2 memory from the standard 4K to 16K maximum.

Severe Transient Voltage Suppression Option:
Protects the controller from power line transient damage.

Analog Output Option:
Up to 8 Analog Output cards can be added for analog output signals of each scale value or any other independent variable.

Splash Guard Option:
A clear flexible vinyl cover for use in harsh environments. It

will keep the indicator well protected and looking like new.

Dura-Shield Option:
A clear weatherable film lexan. Adheres over keypad and display. Recommend when high-pressure washdown, petroleum distillates or harsh cleaning agents are present.

Technical Reference Manual:
A comprehensive manual for the advanced operation setups. Includes many examples in each chapter, including macro, database, communications and setpoint setups. Recommended for anyone developing custom systems.

Simulation Software Package:
This software package is a tool used by programmers to simulate actual application setups without the actual system hardware. This package is used along with the Technical Reference Manual by your local GSE distributor to provide you with custom setups matched to your specific application needs.

Technical Training Classes on all GSE instrumentation are offered by GSE, Inc. Contact your GSE distributor for more information.

1.6 Display

Except for the Models 651 and 657, all 650 Series controllers have a two-section vacuum fluorescent standard display. On the left side of the display is a large, six-digit numeric area, and to the right is a smaller, two-line-by-five-character dot matrix area. See Figure 1-7. The large digit area displays numeric data, such as Gross Weight, Net Weight or Tare Weight.

The dot matrix area has several purposes:

- The first two characters on the upper line show the weighing units of the displayed data.
- The last three characters on the upper line show a CENTER ZERO (-->O<--) condition, at times.
- The lower line of the dot matrix area specifies the type of data, such as Gross, Net, Tare, etc.

If the time/date must be added to the custom transmit, add parameter "**11**" to the custom transmit table. The custom transmits are located starting at parameter P989. The first custom table includes the manufacturer defaulted custom transmit shown in chapter 6, Print Operations. The 650 has 249 other custom transmit tables for a total of 250 custom printouts each with the possibility of having 3999 characters. The combination cannot exceed amount of E^2 installed.

Chapter 9 Troubleshooting

This section of the User's Manual provides information on error messages, trouble-shooting and servicing the 650 series instruments. Some information included in this section refers to parameters that are not discussed in this manual. They are provided as a quick reference to problems and solutions. Additional error messages and advanced explanations of each error are in the technical reference manual. Please refer to the technical reference manual or consult your GSE distributor for additional information.

9.1 Error Messages (overview)

The following is a summary of all of the error messages within the 650. They are listed below in numerical order. The leading two digits will appear on the numerical portion of the display, and the message will appear on the two lines of dot matrix display. Following each message is a summation of possible causes and probable remedy.

9.2 Operational Mode Error Messages

02 UnderLoad! Input signal less than negative full scale. If this is due to excessive loading, reduce the load. Otherwise check the load cell connections. If a 4 wire load cell cable is being used, check that the sense jumpers are in place. Verify that the capacity selection **P110** is correct. Use the information parameters, especially **P61100** to check the setup and input signal.

While in the Weigh Mode, the time and date can be displayed simultaneously in the dot matrix and main displays. Press **[11] [SELECT]** (This can also be accomplished by adding parameter "**11**" in as one of the selectable modes in the P300 parameters). Contact your local GSE Distributor for more information. The date is then displayed on the large numeric display in the format "MO.DA. YR" (or DA.MO.YR for international style) and the time is displayed on the dot matrix display in the format "HH:MM:SS". The time may be displayed in a 24 or 12 hour format with an "am" or "pm" displayed as appropriate, depending on the setup of time-date.

8.3 Entering New Time and Date

Access to changing the time and date easily from the keypad can be set at P502. Make sure parameter P502 is set for "**Enbld**". This will select the operation to prompt the operator to enter a new **date** and **time**. Press **[11] [SELECT]** to access the mode to enter the time and date. The new date is entered by keying in "MO.DA.YR" (or "DA. MO.YR" if international format was selected) followed by the **[ENTER]** key. Month, day and year entries must be separated by decimal points. Leading zeroes need not be entered. For example, if you enter "4.1.96" and press **[ENTER]** the date is set to 04/01/96. If the date is entered improperly, the prompt "try m.d.y" (or "try d.m.y" for international format) is displayed. The word "**Date**" will then be displayed. Press **[ENTER]** if the date is correct and move to the "**Time**" setting mode.

The new time is entered by keying in "HH.MM.SS" in a 24 hour format! Hours and minutes entries must be separated by a decimal point. Seconds entry is optional, and if omitted, they are set to zero. To specify seconds, it also must be separated from minutes by a decimal point. Leading zeroes need not be entered. For example, if you enter "8.9.45" and press **[ENTER]**, the time will be set to 08:09:45; if you enter "15.02" and press **[ENTER]** the time is set to 15:02:00. If time is entered improperly, the prompt "try h.m.s" is displayed. The word "**Time**" will then be displayed. Press **[ENTER]** if the time is correct.

8.4 Adding Time and Date to the Custom Transmit

The dot matrix area also displays specific messages during controller operation and setup.

On the Models 651 and 657, a four-line-by-20-character alphanumeric display is substituted for the two-section vacuum fluorescent display. See Figure 1-6.

1.7 Keypad

The standard keypad for the Models 650, 651, 655 and 657 controllers is shown in Figure 1-8 and for the Model 653 and Model 654 in Figure 1-9.

NOTE:

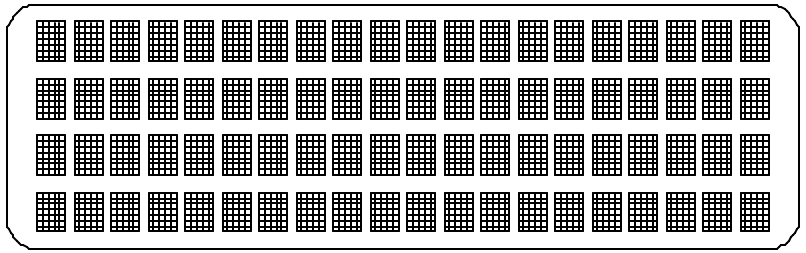

Figure 1-6. Models 651 and 657 Display

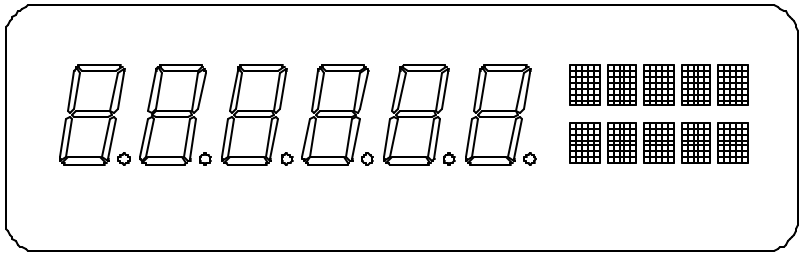

Figure 1-7. Models 650, 653 and 654 Display

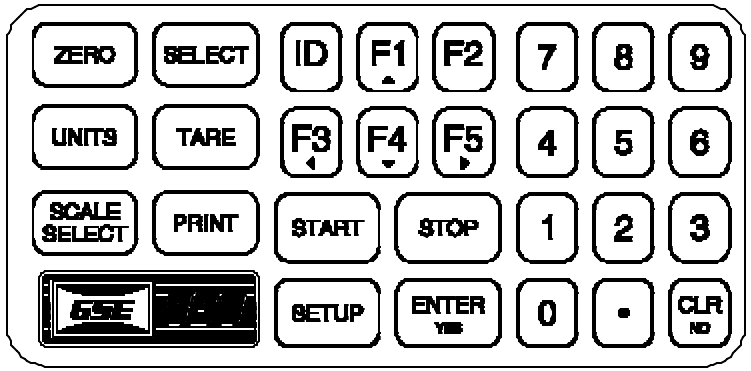

Figure 1-8. Standard Keypad for the Model 650, 651 and 657 Controllers

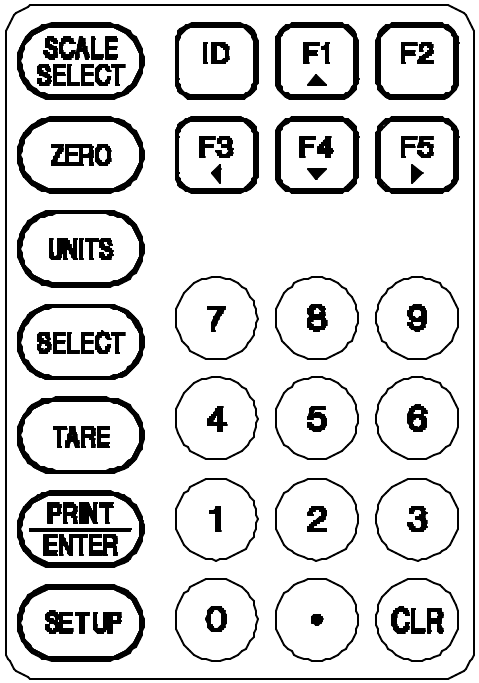

Figure 1-9. Standard Keypad for the Model 653 and 654 Controllers

entry length exceeds the setup size, the error message "Entry >> Max!" is displayed briefly. The extra characters which surpass the setup size are automatically eliminated and the remaining entry is then displayed. Press **[ENTER]** to store the remaining entry.

7.3 To Store a Variable Entry

After completing your entry, press **[ENTER]** to store it as the new variable.

Chapter 8
Time and Date (Clock Feature)

8.1 Introduction

The 650 series includes a Time/Date feature which is battery backed. This means that when the feature is used, the time and date does not need to be entered every time the instrument is powered up. The Time/Date feature permits printouts with time and day of the week and the date in many possible formats. Consult with your local GSE distributor or the 650 Series Technical Reference Manual for more information on Time/Date configurations.

NOTE: In the following discussion, HH is a 2 digit representation for hours, MM is minutes, SS is seconds, MO is month, DA is day and YR is year. When the 650 is powered up, the time and date clock is set to Jan 1, 1970, 00:00:00 am (the UNIX computer standard).

A new Time and Date value can be keyed in by accessing the time-date setup parameters starting at Parameters P500 thru P504 (refer to the 650 Series Technical Reference Manual or contact your local GSE distributor). The Date is displayed in the large numeric display in the format "MO.DA.YR" (or DA.MO.YR if set for the international style). The Time is displayed in the dot matrix display in the format "HH.MM.SS".

8.2 Viewing Time and Date

Variables may also be accessed by pressing **[80] [.] [X] [SELECT]** where "X" is the number of the variable. If you try to select an ID that is not available, the 650 will display "Invld Instn" (invalid instance).

In either case you may press **[SELECT]** at any time to exit the variable viewing mode.

7.2 To Enter a Variable Value

If the variable value will be entirely numeric simply access the variable, key in the numbers on the numeric keypad and press **[ENTER]**. The entry you make here will overwrite any previously entered information. Once an entry is started, an arrow symbol will appear in the upper line of the dot matrix display. The entered digits will then appear on the second line and will scroll across the lower then the upper line. You may enter up to the maximum number of digits programmed in the Setup Mode. The maximum number of characters is 63. Once an entry has been started, the **[F3↴]** key acts as a BACKSPACE key. If **[F3↴]** is pressed with only one character on the display, the entry mode would be canceled and the previous display would appear.

The **[CLR]** key may be pressed at any point during entry, prior to pressing the **[ENTER]** key, to clear the entered characters. Pressing **[CLR]** after first accessing the variable will clear the existing value. To replace the existing contents, simply enter new information as described previously.

If **[F5↴]** is pressed after the string type variable is accessed, the current variable data is copied into the entry buffer and the last character of the existing variable entry would be shown in the last (bottom right) position on the display. This lets you add characters to the end of an existing entry or modify the last characters by using the backspace function.

Alphabetic and other characters may be entered at any point by pressing the **[F1▲]** key while in the variable entry mode. An "A" will appear in the display. At this point the **[F1▲]** and **[F4↴]** keys are used to scroll up and down through the entire standard ASCII character set. The **[F3↴]** key can be used to backspace, shifting all the previously entered data down toward the lower right corner, with the last character being lost. Pressing **[F5↴]** would shift the entire previous entry toward the left thus making room for a new character. This new character would be an "A". If the

The Model 650, 651 and 655 controllers have the following keys that are not found on the Model 653 and Model 654 controllers:

- **[CLR (No)]**
- **[ENTER (Yes)]**
- **[PRINT]**
- **[START]**
- **[STOP]**

The Model 653 and Model 654 controllers have the following keys that are not found on the Model 650 controller:

- **[PRINT/ENTER]**
- **[CLR]**

The rest of the keys are identical in label and function.

ZERO Press **[ZERO]** to zero the current quantity/weight reading. When the meter is at Center Zero the international center-of-zero indication will appear on the upper line of the dot matrix display. This indication is a right and left arrow pointing to a circle. If a Custom Unit's **name** is greater than 2 characters, the Center Zero indication is not displayed. If in the quantity mode pressing **[ZERO]** will set the current mode to a gross zero quantity. If in the weigh mode, pressing **[ZERO]** sets the current mode to Gross Weight.

UNITS Pressing the **[UNITS]** key in the quantity has no effect. Pressing **[UNITS]** from the weigh mode will toggle the displayed units through the available selections. Converted units are automatically rounded to the appropriate increment. If the "lb/oz" units selection is used, the first digits of the numeric display will read the value for pounds, the last digits will read ounces, and since the upper line of the dot matrix display is used to show the units, there is no center zero indication. As with other units designations, the characters showing units will blank out when motion is present.

SELECT Pressing **[SELECT]** will toggle you through the

Net Weight, Tare Weight and Gross Weight, Acc. Net Wt., Acc. Gross Wt. or other enabled operating modes. Refer to the Mode Selection parameters, **P300 - P309**. Contact your GSE distributor for more information.

TARE Pressing **[TARE]** by itself will perform an auto-tare. A Net Zero is then displayed. You can enter a known Tare Weight into the 650 by keying in the number and pressing **[TARE]**. In either case, the indicator will be placed in the Net Mode, unless you are in the Tare Mode. Auto-Tare and / or Keyboard Tare may be disabled in the Setup Mode (P802). For more information contact your GSE distributor.

ENTER/YES Press **[ENTER]** key following certain numeric entries. Doubles as a **[YES]** key for conditional branching operations within macro routines.

PRINT Press to send data to a printer, computer or other device.

ID This key has multiple functions, entering ID's, macro menu selection, database access and specific macro access. The exact function of this key depends on the selectable internal setup (P806).

[F1▲] The **[F1▲]** key doubles as a direct access key to invoke macro 1 or an **Up** arrow key. While having accessed any mode or parameter which requires a character entry, the **[F1▲]** key will scroll through a set of ASCII characters. As entries are keyed into the entry buffer, the **[ENTER]** key will complete the entry.

[F2] The **[F2]** key has direct access to invoke macro 2.

[F3↰] The **[F3↰]** key doubles as a direct access key to invoke macro 3 or a **Left** arrow key. While

Chapter 7
Variable or String Operations

The 650 series has 999 variables which may be defined as strings, floats, integers or unsigned integers. These variables may be used to store such things as part numbers and descriptions, bin locations or any other alphanumeric item that will be used during operation. The 650 is manufacturer defaulted with no variables pre-programmed. If a variable is defined as a string type the maximum ID size can be set to 63 characters. Entering information into a variable is explained in the following sections.

7.1 To View the Contents of a Variable

To access a variable while in the Weigh Mode, press **[X] [ID]** where "X" is the number of the variable. The five segments of the lower portion dot matrix display will read "V#001". This is the name of variable number 1 (This name can be custom named to your application). The upper line of the dot matrix display will show the first five characters of a string contents. If the variable was defined as a float, integer or unsigned integer type the value will be shown on the main display.

Although all transmissions are usually initiated by pressing the **[PRINT]** key, exceptions in the setup will allow for remote key printing and continuous printing. The continuous print will transmit the custom programmed information each time the display is updated. This feature is particularly useful with a remote display or an interface with a computer that is monitoring a process.

If the receiving device (printer, display or computer) goes off line, is powered down or for any other reason cannot receive the data being sent, the message "Tx On Hold" will appear for a few seconds. Press **[CLR]** to abort the transmission. If this situation happens while using the continuous print feature, the transmission is suspended, but can be resumed by pressing the **[PRINT]** key.

The 650 series is manufacturer defaulted to transmit the custom transmit (previously shown) out COM Port 1, On Request (PRINT key), Motion Inhibited. These selections are made at parameters P980 thru P998.

Connecting a printer or computer cable to the 650 requires entering the enclosure. These connections should be made by a certified technician. Entering the 650 enclosure may void the warranty. Contact your GSE distributor or refer to the technical reference manual if this defaulted configuration does not meet the application requirements. The full programmability of the 650 series as defined in its technical reference manual makes it easy to meet virtually all serial RS232-C communications requirements.

Additional internal connections other than COMM 1 include serial bi-directional COMM Ports 2, 3 and 4. Note that COMM Port 4 is manufacturer configured as a serial TTL bi-directional port. Also note that COMM 4 can be field configured as a serial RS232-C bi-directional port. Refer to the 650 Technical Reference Manual for more information.

CAUTION!

Any operation which involves going inside the enclosure should be performed by qualified service personnel only! Hazardous voltage is accessible within the enclosure.

having accessed any mode or parameter which requires a character entry, the **[F3↴]** key will backup to the previous character. As entries are keyed into the entry buffer, the **[ENTER]** key will complete the entry.

[F4↴] The **[F4↴]** key doubles as a direct access key to invoke macro 4 or a **Down** arrow key. While having accessed any mode or parameter which requires a character entry, the **[F4↴]** key or Down Arrow will scroll through the character set in reverse. As entries are keyed into the entry buffer, the **[ENTER]** key will complete the entry.

[F5↴] The **[F5↴]** key doubles as a direct access key to invoke macro 5 or a **Right** arrow key. While having accessed any mode or parameter which requires a character entry, The **[F5↴]** key or Right Arrow when pressed will move over to the next character. As entries are keyed into the entry buffer, the **[ENTER]** key will complete the entry.

When in the weigh or quantity modes, the unit is ready to accept a structured ASCII file for custom setups. The custom setup is received through one of the units bi-directional communications ports on an internal connector of the 650 identified as (J5).

START The **[START]** key will invoke macro 6.

STOP The **[STOP]** key will invoke macro 7.

SETUP The **[SETUP]** key will invoke macro 8.

0 thru 9 & . Press these keys to enter 0 thru 9. Press the decimal point key to establish a decimal point.

CLR Press this key to clear a numeric entry mistake prior to entering it into memory.

SCALE SELECT Pressing **[SCALE SELECT]** will toggle through all the enabled scale inputs.

1.8 Alpha Keypad (Standard on Model 657)

The TTL alpha keypad is a standard feature on the model 657. This keypad is an option for any 650 series instrument. It interfaces easily on COM 4 set for TTL interface. The models 653 and 654 have been designed to accommodate this keypad in their enclosure.

1.8.1 Keying In All Caps Data

To key in alphabetic information in an *all caps* format, simply press the desired alphabetic keys. View the display.

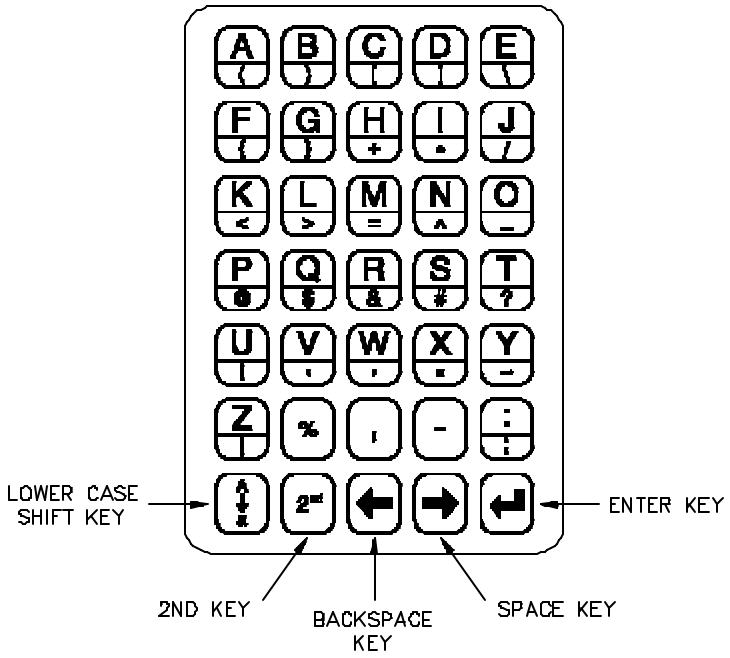

Figure 1-10. Alpha-numeric Keypad for Model 657

Chapter 6
Printing Operations

6.1 Performing a Print Operation

Pressing the **[PRINT]** key will transmit the information in the custom transmit. The 650 series has 250 custom transmits. The custom transmit refers to a table that can be customized to your application. The 650 series is configured with a manufacturer default transmission shown below. If this is not the desired transmission format, contact your GSE distributor for custom modifications to the transmit format or refer to the *650 Series Technical Reference Manual*.

```
9876.54 lbs Gross Wt.
  12.34 lbs Tare Wt.
9864.20 lbs Net Wt.
```

Table 5-1. Accumulation Mode Numbers

Mode Number	Description
3	Gross Total (GrTOT)
6	Net Total (GrTOT)
9	*Accumulation Counter (# Accum)*
31	Quantity Total (QtTOT)

1.8.2 Keying In Lower Case Data

To enter alphabetic information in a *lower case* format, hold in the lower case shift key in the bottom left corner of the Alpha Keypad along with the desired alphabetic keys. See Figure 1-10. View the display.

1.8.3 Confirming Data Entry

When the data you have keyed in appears on the display to your satisfaction, press the ENTER key (↵) located in the lower right corner of the Alpha Keypad. (See Figure 1-10.) This action transmits the *Enter* command (%e) to the Process Controller.

1.8.4 Keying In ASCII Characters

To enter non-alphabetic ASCII characters, press the "2nd" key (on the bottom row of keys) along with the desired character, which appears in the lower, gray-shaded portion of the Alpha Keypad keys. See Figure 1-10.

1.8.5 Keying In a Percent Sign

To key in a percent sign (%), press the "%" key. (See Figure 1-10.) This action transmits two percent sign signals to the Process Controller, but creates just one percent sign on the display.

Example: Key in "**2 % Q**" to insert the command to send custom transmit #2.

1.8.6 Initiating a Command

To initiate a command, press the "2nd" key along with the percent sign (%) key. (See Figure 1-10.) This action transmits one "%" character to the Process Controller, enabling the next character you press to represent a command.

Example: Key in "**2**[**2nd**]**% Q**" to send custom transmit #2 manually. (You press 2, then holding in the "2nd" key, you press

%, and then you press Q).

1.8.7 Backspacing

To backspace, press the left arrow (←) key. See Figure 1-10.

1.8.8 Spacing

To create a space in the text, press the right arrow (→) key. See Figure 1-10.

1.9 Operating Modes (Brief Explanation)

The 650 series controllers, provide five modes of operation available to you: The Weighing mode, Counting mode, Calibration mode, Accumulation mode and the Setup mode. The three operational modes are described elsewhere in this manual.

The setup mode provides you access to the many groups of Parameter registers physically resident within the unit. By entering data in the Parameter registers, you can customize your weighing operation to remember the different programming information for your particular weighing application. Contact your local GSE distributor for further information on this feature.

1.10 Specifications

Performance

- Full Scale — Selectable
- Resolution — 100,000 displayed (+/-500,000 internal)
- Display Update — Selectable 0.05-20 seconds
- A/D Conversion — 60 Hz
- Non-Linearity — 0.005% of full scale (input dependent)
- Zero Track — 0.05-20.0 displayed divisions
- Zero Range — Selectable from 0.01-100% of full scale
- Calibration — Selectable, 5 multi-point calibration for linearization

The Accumulation Registers may be reset to a new number. This would permit you to enter a total from the previous day or shift to continue the accumulation, or to reset the number to "0". Simply access the accumulation mode by keying in the single or two digit mode number from table 5-1 and pressing **[SELECT]**. If the mode is one of the pre-programmed selectable modes simply toggle to the corresponding mode using the **[SELECT]** key only. Keyin the desired reset value and press **[ENTER]**. You will then be prompted to confirm the accumulation modification by a display of **MOD AC?** for 1 second followed by **ENTER =MOD**. Press **[ENTER]** to confirm the change or any other key to abort the modification of the accumulation total.

The **[CLR]** key may be used to reset both the net and gross totals to zero. The prompt **CLEAR ACS?** will appear briefly followed by **ENTER =CLR!** Press **[ENTER]** to complete the clearing or press any other key to abort the clear operation.

5.4 Preventing Double Accumulations

A setup parameter (P122) can help to prevent accidental double accumulations. This parameter lets you choose a percent of capacity that the gross weight must fall below before a second accumulation can take place.

If an accumulate is attempted without first removing the last accumulated weight, the message **CLEAR WGHT!** is displayed briefly and the operation is aborted.

After an accumulation occurs, these values are frozen at their new accumulate total values until the Gross Weight again falls below the value set by parameter P122. Parameter P122 has several selections of percentages of full scale value. The weight must fall below this percentage of full scale before another accumulation is allowed. At that time, these values again resume their active state. This feature prevents double accumulations. A "CLEAR WGHT" prompt appears to warn of such situations.

5.3 Initializing Accumulation Totals

Table 4-1. Counting Mode Parameter Numbers

Mode Number	Description
30	Quantity
31	Quantity Total
34	Piece Weight
35	Piece Weight x 1000
36	Percentage Accuracy Achieved
37	Last Sampled Amount

- Division Size .00001 through 500
- Warranty 1 year

Electrical

- Power Input 90-250 VAC, 50/60 Hz
- Fuse 0.5 amp Slow-Blow

Load Cell Input

- Connections 4 lead or 6 lead with sense, jumper selectable
- Power Twelve 350-ohm cells
- Signal Range 0.1 to 20 mV/V at full scale
- Excitation 10 VDC or VAC, short circuit protected
- Current 290 mA maximum

Communications

- RS-232 4 bi-directional serial ports
- Output Up to 250 independent Custom Transmit tables for labels, reports, transmitting control characters, etc.
- Transmit OutputContinuous transmit, on request, motion inhibited, or once per weighment
- Baud Rate Selectable, 150-19,200 bits/sec, 38,400 between 650 Series controllers
- Protocol Selectable

Display

- Size Vacuum fluorescent, 0.75-inch digits display weight
- Increments 1,2, 5, 10, 20, 50, 100, 500
- Decimal Point Selectable
- Bi-Polar Up to 99,999
- Polarity "-" sign to left of most significant active digit
- Status Indicator 10-character dot matrix prompting display

Weight and Construction

- 650/651, 6 lb/3 kg, Stainless Steel, NEMA 4 Type
- 653, 44 lb/20 kg, Mild Steel, NEMA 12 Type (Stainless Steel Available)

- 654, 82 lb/37 kg, Mild Steel, NEMA 12 Type (Stainless Steel Available)
- 657, 16 lb/7 kg, Stainless Steel, NEMA 4 Type (Mild Steel Available)

For additional information about the 650 Series controllers, refer to the *650 Series Programmable Process Controllers Technical Reference Manual,* GSE part number **39-10-31884**.

Chapter 2
Installation Instructions

This section of the user's manual outlines the basic installation of the 650 series instruments. Please take the time to review these important guidelines and step-by-step procedures.

2.1 Positioning the Instrument

2.1.1 Table-Top Use

The Model 650, 651, 655 and 657 instruments have been designed with a swivel bracket which lets you tilt the instrument face to any desired angle. When the instrument is placed on a table, the non-slip rubber feet prevent scratching and slipping across the surface when keys are pressed.

2.1.2 Panel Mount Use

The 650 and 651 are available in a panel mount version. The panel cutout dimensions are L=9.25 x W=8.25. The unit is fully washdown

Accumulation Operations

5.1 Accumulation Operations

The 650 series offers three main memory registers into which weighing data may be accumulated. The three registers are the Gross Total, Net Total and the Quantity Total. There are a few specific parameter selections built around the way in which accumulations operate. These selections are made in the Setup Mode. This chapter will explain how to do an accumulation after the selections have been configured in the setup mode. Contact your local GSE distributor for more information on the accumulation parameter P122.

5.2 Performing Accumulations

First, enter the desired "accumulation mode" either by pressing the **[SELECT]** key until one of the Accumulation Modes appears on the display or keyin one of the accumulation parameters directly shown in table 5-1 followed by the **[SELECT]** key. Once in an accumulation mode, press **[.] [ENTER]** to add the displayed value to the accumulated total. Accumulate operations are motion delayed. If motion is occurring when an accumulation is requested, the Mot'n Delay prompt is displayed until motion ceases. If motion does not stop, press **[CLR]** to abort the accumulation. There are six Accumulation Modes with corresponding Mode Numbers as shown in table 5-1. The order of appearance of these modes can be assigned when setting up parameters **P300 - P309**. An accumulation mode can be added to the default selectable modes. The factory default selectable modes are Gross, Net, Tare, Quantity and Average Piece Weight. The Quantity and Average Piece Weight will appear after a sample routine is performed. Contact your local GSE distributor if it is desired to add another mode of operation to the standard default modes.

When an Accumulation is made, both the Gross and Net totals are affected.

of the current piece weight is shown on the display, above the "Qty" indication, whenever the weight is not in motion. For example, after performing a sample operation the 650 might show " 10. 98.3% Qty". If this parameter is selected as "off" then the top line of the alpha numeric display will only be used to indicate motion.

P185 PreSm
Pre-Sample: This parameter permits 5 choices; none, scale 1, scale 2, scale 3 and scale 4. If the parameter is set to a particular scale number, if the operator presses the **[ENTER]** key while in the quantity mode, the 650 will switch to Scale 1, 2, 3 or 4. If "none" has been selected, the 650 will remain on the presently selected scale.

P186 AftSm
After Sample: This parameter permits 5 choices; none, scale 1, scale 2, scale 3 and scale 4. If the parameter is set to a particular scale number, after a sample is completed, the 650 will switch to Scale 1, 2, 3 or 4. If "none" has been selected, the 650 will remain on the presently selected scale.

P187 SmpFl
Set the controller response time in terms of seconds for sample operations.

P188 AcEnf
Enforces accuracy during the sample operation.

4.6 Counting Mode Listing

The **[SELECT]** key will advance the 650's mode to the next mode as programmed in the setup mode P300 - P309. Alternatively, keying a mode number then pressing **[SELECT]** will change the 650's current mode to be the mode whose number was keyed in. The following six modes are Model 650 counting related. Refer to table 4-1. Any one of these parameter numbers listed may be added to a custom transmit printout.

Chapter 5

once installed. The panel mount version functions identical to the table top version. The only difference between the two package types is the mechanical aspects of the enclosure and the positioning of the main board and display. Refer to figures 2-1 and 2-2. Refer to the 650 Series Technical Reference Manual for further panel mount version installation procedures and available options.

2.1.3 Permanent Mounting

IMPORTANT!

The 650 series instruments do not include an on/off switch and therefore must be installed near a power outlet socket which is easily accessible, in keeping with UL/CSA approval requirements.

INFORMATION IMPORTANT!

Prendre note que les contrôleurs de serie 650 ne sont pas munis d'interrupteurs "Marche / Arrêt". Par conséquent, il devront être installés près d'une source d'alimentation secteur accessible pour demeurer sous les exigences des normes UL/CSA.

Refer to the following line drawings is this chapter for mounting hole dimensions.

2.1.4 Environment Suitability

The 650 series instruments are supplied in a sealed enclosure and may be used in a washdown environment. Care must be taken to insure that the AC power socket outlet is properly protected!

The keypad is made of silicon rubber. It may be cleaned periodically with a soft damp non-abrasive cloth.

The display window is made from a polycarbonate material which may scratch due to aggressive cleaning. Care must be taken to avoid such damage. For models 650/651, GSE offers a Splash Guard transparent vinyl cover for added protection. Contact your local GSE distributor for more information.

Chapter 3
Calibration Mode

3.1 Calibration Mode

The 650 series can be calibrated several ways. The following method described is a quick calibration procedure and assumes that the necessary parameters are selected before the actual calibration is performed. (ie. full scale value, graduation size, etc.) These parameters will normally be set up by your local GSE distributor.

NOTE:

The 650 series instruments are assembled in a sealed enclosure and may be used in a washdown environment. Care must be taken to insure that the AC power socket outlet is properly protected! Connections from the load cell to the single channel input require gaining access to J1 inside the sealed enclosure. Calibrating the unit requires entering the setup mode and selecting the calibration parameters specific to your application needs. Your local GSE distributor is available for this operation. Physically gaining access to the unit may void the warranty.

Additional Connections:

Peripherals and options can be interfaced to the 650 series instruments by means of connections internal the enclosure. Additional scale inputs can be added to the system which require gaining access to the inside of the unit. Refer to the technical reference manual or contact your local GSE distributor. Gaining access to the inside of the unit may void the warranty.

the value entered here will affect the maximum number of pieces which may be added and still allow the enhancement to take place.

P180 ASmpl
Auto Sample Accept: This parameter affects the sampling process. If set for "off", the **[ENTER]** key must be pressed after the sample is placed on the platform. However, when **P180** is set to "on", the 650 will automatically accept the applied weight as the requested sample size. The criteria for weight acceptance is that motion occur and the weight is not at a center of zero condition.

P181 AEnhn
Auto-Enhance: Setting this parameter to "off" prevents the auto-enhance feature from operating. The "on"selection allows the 650 to auto-enhance the piece weight whenever the necessary criteria are met.

182 SmpSz
Default Sample Size: This parameter specifies the sample amount which the operator is prompted to add after the **[ENTER]** key is pressed while in the *quantity* mode. Any whole number between 1 and 9999 may be entered here. 10 is the factory default.

P183 %Accy
Required Piece Weight Accuracy for Sample Acceptance: The value entered here specifies minimum piece weight accuracy which must be achieved in order for a sample to be accepted. If an applied sample weight is insufficient to achieve the accuracy specified, the operator will be prompted to add a specific number of parts in order to achieve that accuracy. The choices available are no minimum accuracy required (displayed as "none") or 90.0% to 99.96%, in 0.04% increments. Key in the desired percentage then **[ENTER]**. Entries will be rounded down to the next lower available accuracy increment. Enter [0] for no accuracy requirement. This results in a minimum sample weight of slightly greater than the zero-track aperture, P112. Press **[ENTER]** to cycle through the available choices starting at the previously selected choice.

P184 AcDsp
Accuracy Displayed: With this parameter set for "on", the accuracy

scale **1**, **2, 3** or **4** when the **[ENTER]** key is pressed while in the quantity mode. The selection of "**none**" is also available and if selected the 650 will remain on the presently selected scale. The Pre-scale select would generally be used to select a smaller sampling scale to establish an average piece weight. During operation, the operator will press the **[ENTER]** key and the 650 will automatically select the predetermined sample scale. The 650 will prompt the operator with "**add XX parts**". The "**XX**" is a GSE factory default of 10 parts. The operator places the specified number of pieces on the sample scale and again presses **[ENTER]**. The average piece weight having been established, the 650 automatically selects the appropriate "bulk" scale for higher capacity counting.

Parameter P186 can be set to select scale **1**, **2, 3** or **4** automatically after the sample routine. The selection of "**none**" is also available and if selected the 650 will remain on the presently selected scale. The Aft-scale select would generally be used to select the larger scale on the 650 after the sample routine. An even larger floor bulk scale for counting the remaining parts can also be selected. During operation, after the sample routine is completed the Aft-scale will be selected and placed in the quantity mode. Establish a tare value in the standard fashion on the "Aft" scale if necessary.

4.5 Other 650 Series Features

The following parameters may have been enabled by your GSE distributor depending on your specific application.

P124 ErFac

Accuracy Error Factor: This parameter should normally be set to 1. However this is intended to allow authorized GSE distributors to adjust the 650 accuracy calculations to compensate for less than ideal environment conditions. Conditions such as air currents, widely varying temperature conditions, poor load cell performance, and significant vibrations due to heavy machinery operating nearby or poor support conditions can increase the sampling error of the 650. For example, entering a value of 2 would double the size of the sample required to achieve a given accuracy. The entered value may be between 0.1 and 20. Numbers less than one will increase the calculated accuracy of the 650. Since the 650's decision as to when it can and cannot enhance is based upon the it's calculated accuracy,

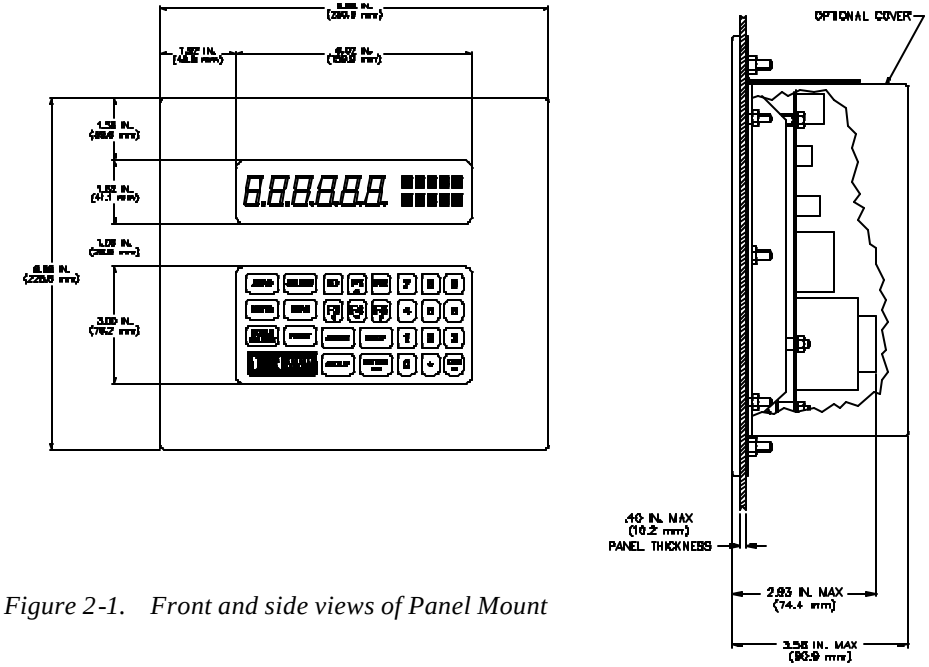

Figure 2-1. Front and side views of Panel Mount

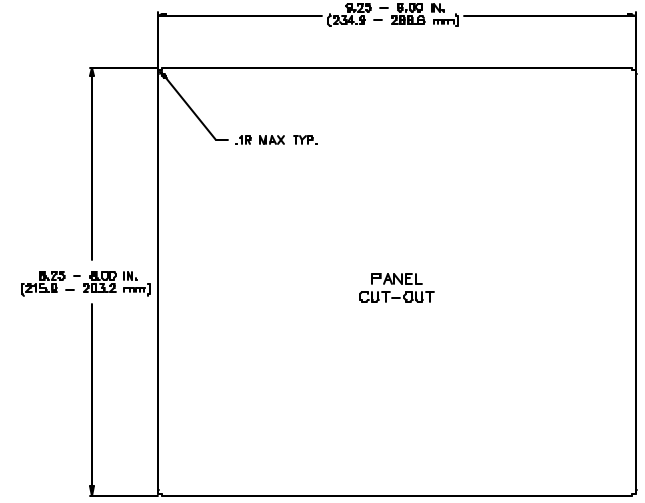

Figure 2-2. Panel Mount version cutout dimensions

3.2 Quick Calibration

The 650 series is calibrated as described below.

NOTE: A certified weight is required to perform a calibration. Serious inaccuracies could result from using non-certified standards for calibration.

1. From the Weigh Mode press:

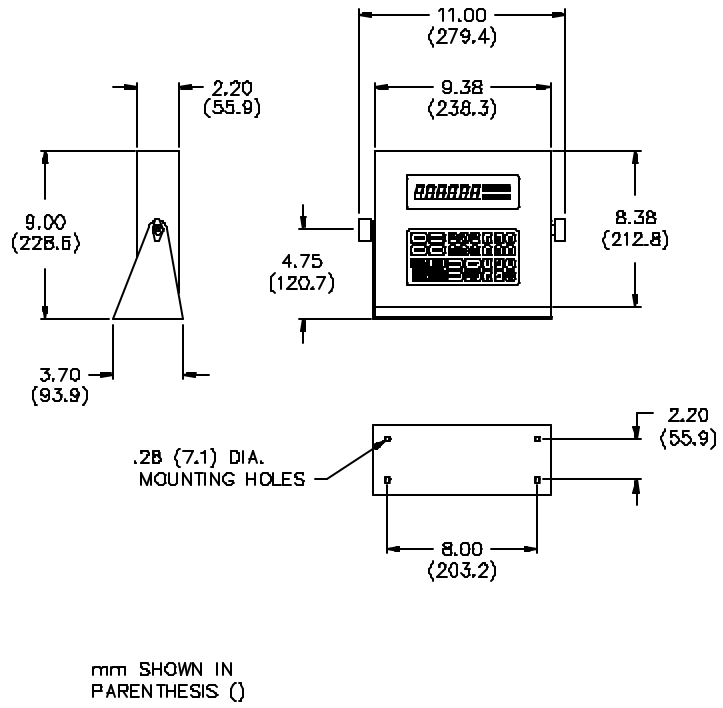

Figure 2-3. Model 650 and 651 Dimensions

Access the quantity mode.

Place an empty container on the platform. (optional).

Press **[ENTER]**. The 650 tares the instrument to a zero net weight. The display shows the current net weight and the prompt: "Add 10" (the actual number is programmable via setup parameter P182).

Place the specified number of parts on the scale.

Press **[ENTER]**. The 650 then calculates the piece weight of the sample parts and momentarily displays the maximum number of parts which may be added for a piece weight enhancement to occur. The minimum achieved accuracy is then displayed.

If a greater accuracy is desired, add additional parts but not more than the maximum enhanceable quantity.

As soon as motion ceases, the 650 will recalculate the piece weight and then briefly display the new maximum number of pieces which can be added and still accurately enhance the piece weight.

Repeat as many times as necessary to achieve the desired accuracy.

4.3 Known Container Weight

Place the full container of parts on the weigh platform.

At any point in the counting process, the known weight of a container can be keyed in followed by the **[TARE]** key in order to cancel the affect of the container. Make certain that the weighing units of your entry are consistent with the current unit selection (lb, kg, etc.)

4.4 Automatic Scale Select

(Where more than one weighing platform is present)

The 650 has the capability of automatically selecting a predetermined scale before and after the a sample routine. One or more multi-scale option cards must be installed for this feature to work. Parameters P185 and P186 allow for selecting the Pre-scale and Aft-scale. In other words, parameter P185 can be set to select

the message **Code 32 ADD MORE!** is displayed briefly. This will most often occur when the **[ENTER]** key is pressed without adding any parts. If the parts were in fact placed on the scale, either the parts are too light to count on that capacity platform or a much larger quantity of parts must be hand counted in order to perform the sample.

4.1.3 Negative Sampling to Determine a Piece Weight

In order to perform a negative sample routine, access the quantity mode, place a full or partially full container of parts on the scale and press **[ENTER]**.

The 650 will then perform an auto-tare resulting in a zero net weight. The display will then prompt you to **Add xx** where the "xx" is the sample quantity of parts (sample size) set by parameter P182. In this case, the prompt **Add xx** actually means **Take** parts from the container. Proceed to remove the requested number of parts, then press the **[ENTER]** key. If the sample's total weight was sufficient, the piece weight will be calculated and the sample quantity will be displayed (-10 parts). Otherwise, you may be prompted to **Take** additional parts. The exact prompts will depend on whether the auto-enhance and/or minimum accuracy assurance features have been enabled.

If the weight of the sample removed was un-detectable or barely detectable then the message **Code 32 ADD MORE!** is displayed briefly. This indicates that more weight must be removed adding to the overall sample weight. This will most often occur when the **[ENTER]** key is pressed without taking out any parts. If the parts were in fact taken from the scale, either the parts are too light to count on that capacity platform or a much larger quantity of parts must be hand counted out in order to perform the sample.

4.2 Pieceweight Enhancement

Note: The presence of this feature depends on the internal setup of your 650. It is intended for the accurate counting of **extremely** light parts.

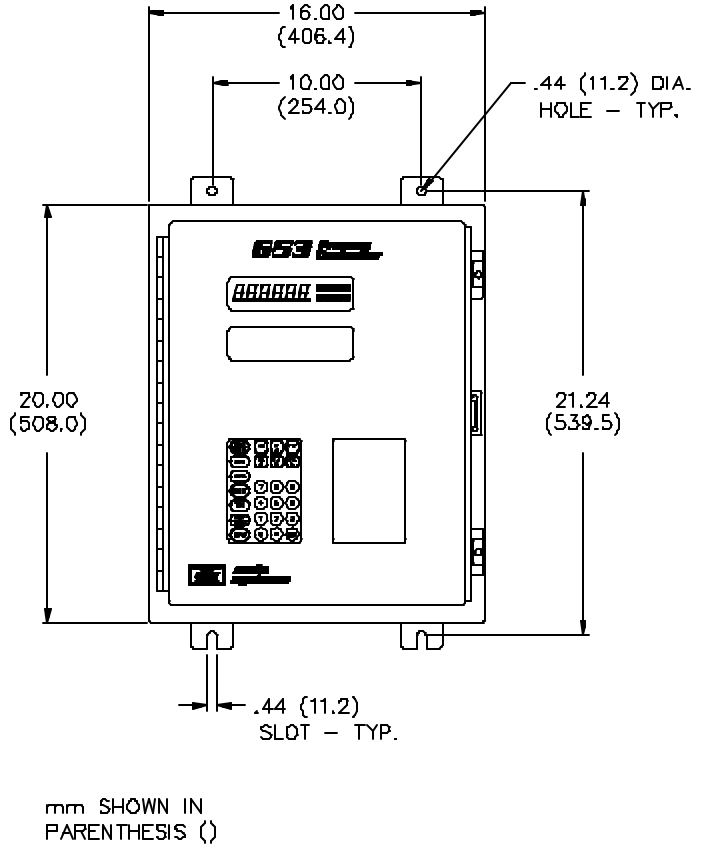

Figure 2-4. Model 653 Dimensions

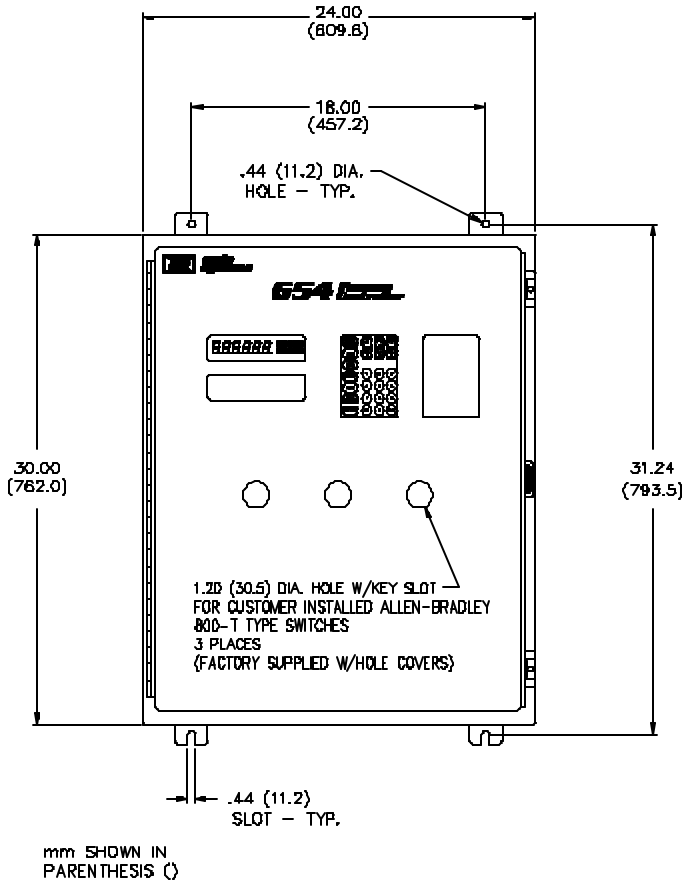

Figure 2-5. Model 654 Dimensions

entry when the current mode is GROSS or GrTot, the stored tare weight is assumed to be from a previous weighment and is cleared out. Otherwise, any previous tare is assumed to be for the container in use, so the tare is retained and the current net weight is used to calculate the piece weight based on the entered sample size. This allows for the situation where the tare weight of the container, if any, remains consistent with what has been established. Here, you can add the parts and then key in the number of parts.

NOTE:
The first method is recommended to avoid the possibility that inappropriate tare weights may affect the piece weight calculation.

NOTE:
When the Quantity mode is accessed and the residing piece weight value is "0.00", the prompt "**Must Sampl**" will be displayed. Press the **[ENTER]** key to proceed with the sampling to determine a piece weight (refer to section 4.1.2) or key in a piece weight value at P34.

4.1.2 Sampling to Determine a Piece Weight

Although the sampling process may be performed in a number of ways, the recommended method is to first *access* the quantity mode, then place an empty box or empty container on the scale platform, and press **[ENTER]**.

The 650 will then perform an auto-tare resulting in a zero net weight. The display will then prompt you to **Add xx**, where the "xx" is the sample quantity of parts (sample size) set by parameter P182—the manufacturer default setting is 10 pieces. Add the requested number of parts to the scale and press the **[ENTER]** key.

If the sample's total weight was sufficient, the piece weight will be calculated and the sample quantity will be displayed. Otherwise, you may be prompted to **add** additional parts. The exact prompts will depend on whether the auto-enhance and/or minimum accuracy assurance features have been enabled. The minimum amount of weight required for the sample routine to meet the selected accuracy requirements for the specified scale capacity is considered.

If the weight of the sample is un-detectable or barely detectable then

Chapter 4
Counting Operations

4.1 About The Counting Mode

The front panel keys on the 650 series take on different functions depending on which mode is selected. This chapter will define the front panel key operation for the Counting mode. In order for the 650 to count parts, a sampling operation has to be performed to establish the actual weight of one of the pieces to be counted.

4.1.1 Counting mode (Key Operation)

To activate the counting operation, the indicator must be in the *Quantity mode*. To access the Quantity mode, you must place parameter 30 in the selectable modes of instrument operation. Simply press the **[SELECT]** key to step through all enabled modes of instrument operation, including the Quantity mode. (Refer to Chapter 24 of the *650 Series Technical Reference Manual*.) You can also access the Quantity mode directly when you press **[30] [SELECT]**.

Once you are in the Quantity mode, if you press the **[ENTER]** key alone (without first making a numeric entry), the indicator will perform an auto-tare, establishing a net zero as a starting point. The current net weight and the prompt "**Add XX**" will be displayed. ("XX" is the default value set at parameter **P182**.)

If you add the specified number of parts—the default sample size set at **P182—**press the **[ENTER]** key to confirm the sample. If the number of parts you add is different from the default sample size set at **P182**, first key in the *actual* number, then press the **[ENTER]** key. The subsequent results depend on the selections made for the auto-enhance and minimum accuracy selections. Refer to section 4.6 for more information.

If you make a numeric entry before you press the **[ENTER]** key, the indicator will ***not*** perform an auto-tare. The entry is assumed to be the number of parts already on the scale platform. If you make the

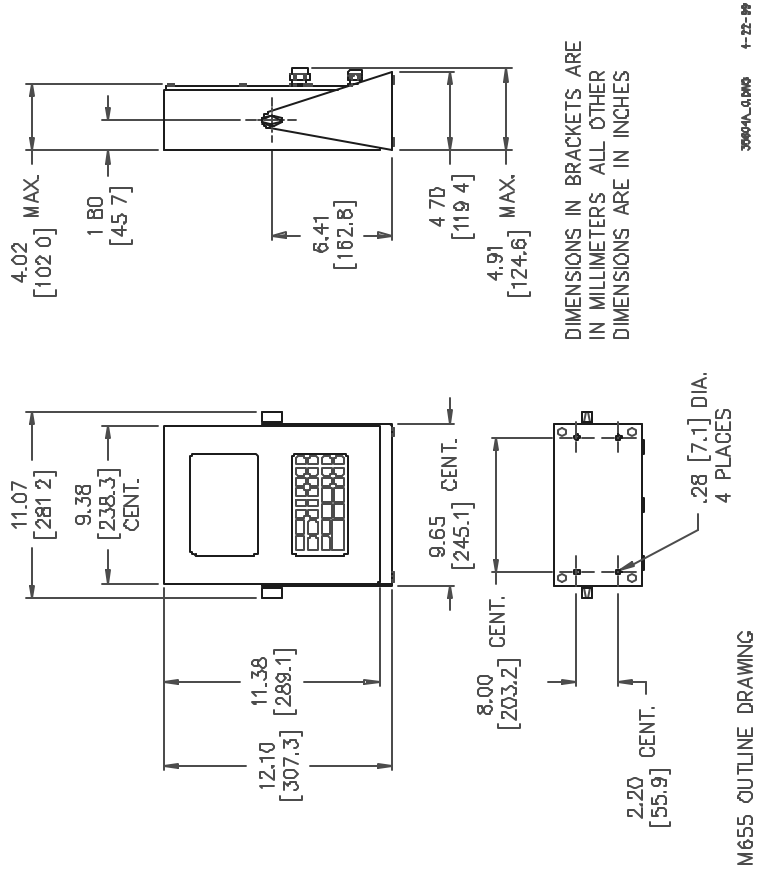

Figure 2-6. Model 655 Dimensions

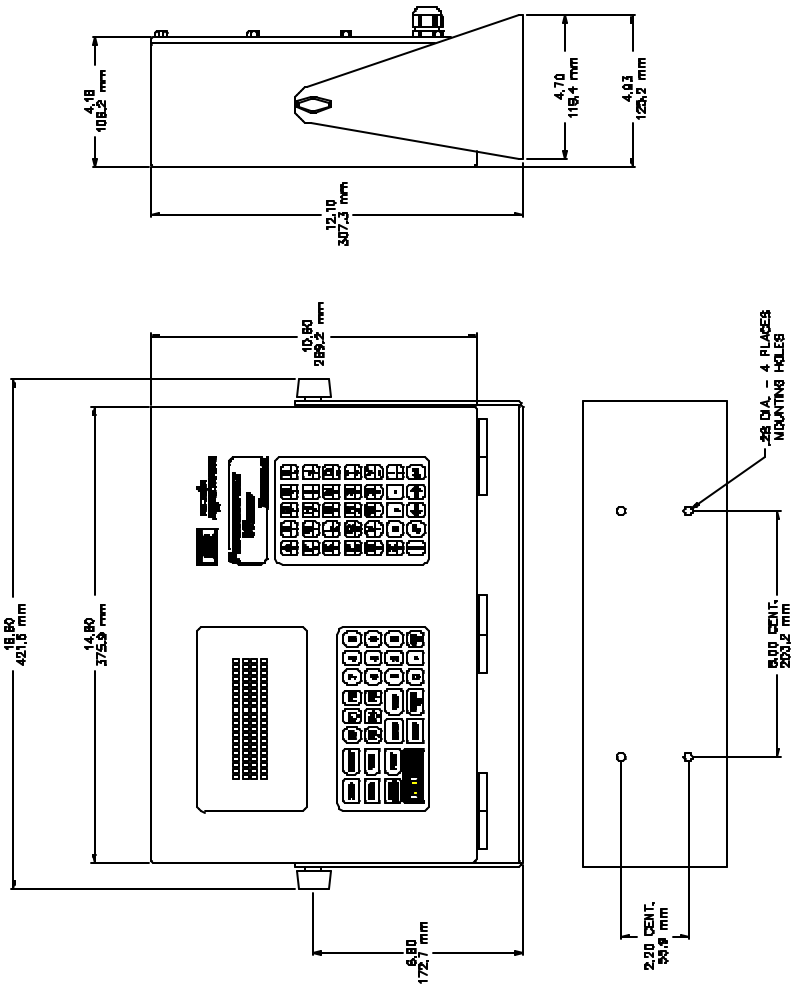

Figure 2-7. Model 657 Dimensions

prompt as described above and override the re-calibration requirement. GSE recommends that you perform a re-calibration in order to avoid any serious inaccuracy.

A variation of the calibration process is the linearization procedure. Linearization is useful in improving the absolute accuracy of large-capacity systems, which often exhibit poor linearity. This feature is documented in the *650 Series Technical Reference Manual*.

When reset, these parameters are adjusted to the lowest possible values. Contact GSE regarding *Information Parameters* for a more detailed explanation on the gain factors.

Normally, a Cal Reset is performed if the amplifier is locked in at an extremely high gain factor and will not allow a new calibration to be performed.

If an overload or underload condition exists while the controller is in the Calibration Mode, press **[CLR]** to perform a Cal Reset. This has the same effect as pressing **[ENTER]** at the Cal Reset prompt.

Once the Cal Reset is performed, the controller returns to the "**New Zero?**" prompt. Press **[SELECT]** to toggle to the desired calibration routine.

Following a Cal Reset, a re-calibration should be performed before exiting the calibration or setup modes. The reset will not be saved unless a re-calibration is performed and changes are saved.

3.3 Save Calibration

The indicator will perform the calibration, display the value of the calibration weight, and display the prompt, **CAL OK?** At this point, you can check the accuracy of the calibration by weight without leaving the Calibration mode.

A. If the calibration was accurate, press **[ENTER]**.

The indicator will prompt you to save the new calibration plus any other changes you made. Press **[ENTER]** to save, and **[ENTER]** to exit.

B. If the calibration is not accurate, press **[CLR]**.

The indicator will return to the **New Zero?** prompt.

NOTE:
If the calibration weight is less than 5% of capacity or if there is a large change in the calibration, the indicator will prompt, **ReCal Req'd** Press **[ENTER]** and you will be returned to the beginning of the calibration selections, or press **[CLR]** to obtain the **CAL OK?**

[100] [SELECT] [5 4 3 2 1] [ID] [ENTER]

The 650 will briefly prompt you with the following:

QUICK CAL!

If multiple scales are enabled, the 650 will prompt you with the following.

Keyin Scl #

2. Keyin the scale number being calibrated and press **[ENTER]**.

NOTE: Pressing the **[CLR]** key at any point in the calibration routine will back you up one step.

- Press the **[SELECT]** key to toggle through the available selections. and **[ENTER]** when the desired selection is displayed.
- Press **[ENTER]** to view a desired selection.

3. The selections are as follows, starting with "**New Zero?**".

a) "**New Zero?**"	Refer to section 3.2.1
b) "**Last Zero?**"	Refer to section 3.2.2
c) "**Temp Zero?**"	Refer to section 3.2.3
d) "**Only Zero?**"	Refer to section 3.2.4
e) "**Cal Reset**"	Refer to section 3.2.5

3.2.1 "New Zero?"

"New Zero?" is the selection for establishing the first or a new calibration.

If you select **New Zero?**, the controller displays the dead load (which might not be in precise units) that is present on the scale. The

controller assumes a "NO LOAD" condition.

You are prompted to remove any extraneous load. Remove the load, and press **[ENTER]**.

As soon as you press **[ENTER]**, a new zero is established. This is reflected on the main display with the prompt **"Adj'g Zero"** followed by the prompt **"Keyin CalWt."**

At this point, the controller is waiting for you to enter the actual calibration value . Here, you place the calibration weight on the platform, key in the weight value, and press **[ENTER]**.

NOTE:
*If you key in a cal weight and press **[ENTER]** without adding any weight since the last calibration weight, the controller will prompt you to add CalWT. Add the weight and press **[ENTER]**.*

Entering Numeric Values:

Where appropriate, you can use the numeric keypad to enter numeric values. If you make an error entering data, press **[CLR]** before you press **[ENTER]**.

The controller will perform the calibration, display the value of the calibration weight, and prompt **CAL OK?** At this point, you can check the accuracy of the calibration by weight without leaving the Calibration Mode.

- If the calibration was accurate, press **[ENTER]**.

  The controller will prompt you to save the new calibration plus any other changes you have made. Press **[ENTER]** to save, and **[ENTER]** to exit.

- If the calibration is not accurate, press **[CLR]**.

  The controller will return to the **New Zero?** prompt.

NOTE:
If the calibration weight was less than 5% of capacity, or if

high, the controller displays an overload message. In such a situation, you press **[CLR]**. The controller will reduce the current instrument gain and return you to step 2 so you can re-start the calibration.

The system will perform the calibration, display the value of the calibration weight, and prompt **CAL OK?** Here, you can check the accuracy of the calibration by weight without leaving the Calibration Mode.

- If the calibration was accurate, press **[ENTER]**.
  The controller will prompt you to save the new calibration plus any other changes that were made. Press **[ENTER]** to save, and **[ENTER]** to exit.

- If the calibration is not accurate, press **[CLR]**.
  The controller will return to the **New Zero?** prompt.
  Proceed as described in step 3 of this section.

NOTE:
*If the calibration weight was less than 5% of capacity, or if there was a large change in the calibration, the controller prompts **ReCal Req'd**.*

*Press **[ENTER]** and return to step 3 of the procedure in Section 3.2, or press **[CLR]** to obtain the **CAL OK?** prompt and override the re-calibration requirement.*

GSE recommends that you perform a re-calibration in order to avoid any serious inaccuracy.

3.2.5 "Cal Reset"

"Cal Reset" adjusts the zero and gain factors of the amplifier on the A/D. The parameters being adjusted include:

- P61104 Coarse Zero
- P61105 Fine Zero
- P61106 Coarse Gain
- P61107 Fine Gain

Zero?" prompt.

The calibration units message and "Adj Zero!" displays for one second, followed by the "Cal OK?" prompt.

Selecting "Only Zero?" can be useful in tank weighing applications where the re-zero parameter **(P118)** is set very low in order to prevent inadvertent re-zeroing. A build-up of sludge can be zeroed out in this manner.

For example, with the connected scale platform cleared of any extra weight, you can perform the following procedure.

1. Access the calibration mode:

   - Using a *remote keyboard*, press: **[SELECT] 5 4 3 2 1 [ID] [ENTER]**

2. Press **[SELECT]** to toggle to the "Only Zero?" routine.
3. At the "Only Zero?" prompt, press **[ENTER]**.

   The displayed value zeroes out.

   "Adj Zero!" is displayed briefly, followed by "CAL OK?"
4. Press **[ENTER]** to accept the newly established zero, or **[CLR]** to re-do the calibration.

5. Follow the prompts to save all changes, and exit.

   The calibration zero of the controller is now set to establish the gross zero for the scale platform at the current input signal from the platform.

NOTE:
If the keyed in weight exceeds Full Scale by +4% or falls below 0.1% of Full Scale, an error message is displayed.

*If you forgot to add the calibration weight before you press **[ENTER]**, the controller prompts you to do so. Place the calibration weight on the scale, and press **[ENTER]**.*

If an overload exists or the previously set instrument gain is too

*there was a large change in the calibration, the controller prompts **ReCal Req'd**.*

*Press **[ENTER]** and return to step 3 of the procedure in Section 3.2, or press **[CLR]** to obtain the **CAL OK?** prompt as described above and override the re-calibration requirement.*

GSE recommends that you perform a re-calibration to avoid any serious inaccuracy.

3.2.2 "Last Zero?"

The "Last Zero?" selection is used to recalibrate the already applied cal weight.

"Last Zero?" allows you to re-calibrate the controller without removing the applied weight if, during a calibration check, the calibration is found to be out of tolerance. This is especially beneficial for large capacity applications, such as tank weighing on remote platforms.

At the "Last Zero?" prompt, press **[ENTER]**.

A scenario where you might select "Last Zero?" follows.

1. A scale is to be checked for compliance with local weights and measures regulation.

2. The controller is zeroed by pressing the **[ZERO]** key.

3. The necessary load is applied to verify accuracy.

4. The weight indication is found to be out of tolerance.

5. The calibration mode is accessed, using the Quick Cal or normal method, while the calibration weight is still applied!

6. At the "Last Zero?" prompt, the **[ENTER]** key is pressed.

7. The controller briefly displays the message: "Using Last0"and then "Units = xx" indicating the proper units for the keying in of the calibration weight. The controller uses the zero

established by the last use of the **[ZERO]** key in the Weigh Mode as the new calibration zero.

8. At the prompt "Keyin CalWt" the operator keys in the currently applied weight, such as **5 0 0 0 0 [ENTER]**. The controller adjusts the calibration parameters to bring the system into calibration.

9. After the prompt "Cal OK?," the weight can be removed and re-applied, if necessary, to assure the inspector that the calibration has been adjusted properly.

10. The inspector is satisfied with the calibration, so **[ENTER]** is pressed to save the calibration.

11. At the prompts "Save Mods?" and "Enter = Save" are displayed, **[ENTER]** is pressed to save the new calibration factors.

12. At the "Enter = Exit" prompt, **[ENTER]** is pressed again and the controller returns to the weigh mode.

3.2.3 "Temp Zero?"

"Temp Zero?" is used to recalibrate without establishing a new zero.

In some applications you might want to perform a calibration without removing the currently applied load. This is particularly useful in tank weighing applications where it is both time-consuming and costly to drain the tank being weighed.

During the calibration procedure, at the "Temp Zero?" prompt you press **[ENTER]**.

This action causes the controller to zero the displayed weight temporarily so additional weight can be added to assure system calibration. The zero determined during the previous calibration is not affected.

For example, where you have a tank containing an unknown amount of material (such as on a remote scale) you would perform the following procedure.

1. Access the calibration mode:

   - Using a *remote keyboard* , press: **[SELECT] 5 4 3 2 1 [ID] [ENTER]**.

2. Use the **[SELECT]** key to toggle to "Temp Zero?"

3. At the "Temp Zero?" prompt, press **[ENTER]**.

   The displayed value should zero out.

4. Apply the calibration weight to the tank.

5. Key in the value of the calibration weight: for example, **1 0 0 0 [ENTER]**.
   The numeric display should show the entered value.

6. Remove the calibration weight from the tank.

   The display should return to zero.

   - *If the display reads as specified*, at the "Cal OK?" prompt press **[ENTER]**.

   - *To repeat the calibration process*, press **[CLR],** and then repeat steps 2 through 5.

7. Save the newly determined calibration weight: At the "Enter = Save" prompt, press **[ENTER]**

8. To return to the weighing mode, at the "ENTER = EXIT" prompt, press **[ENTER]**.

   The controller will return to the Weigh Mode.

3.2.4 "Only Zero?"

"Only Zero?" is used for calibration re-zeroing.

If you only want to re-establish the calibration zero of the controller without affecting the established gain, you press **[ENTER]** at the "Only