MSI3750CS

RF Digital Weight Indicator

a component of the CellScale® System

User Guide

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Measurement Systems International

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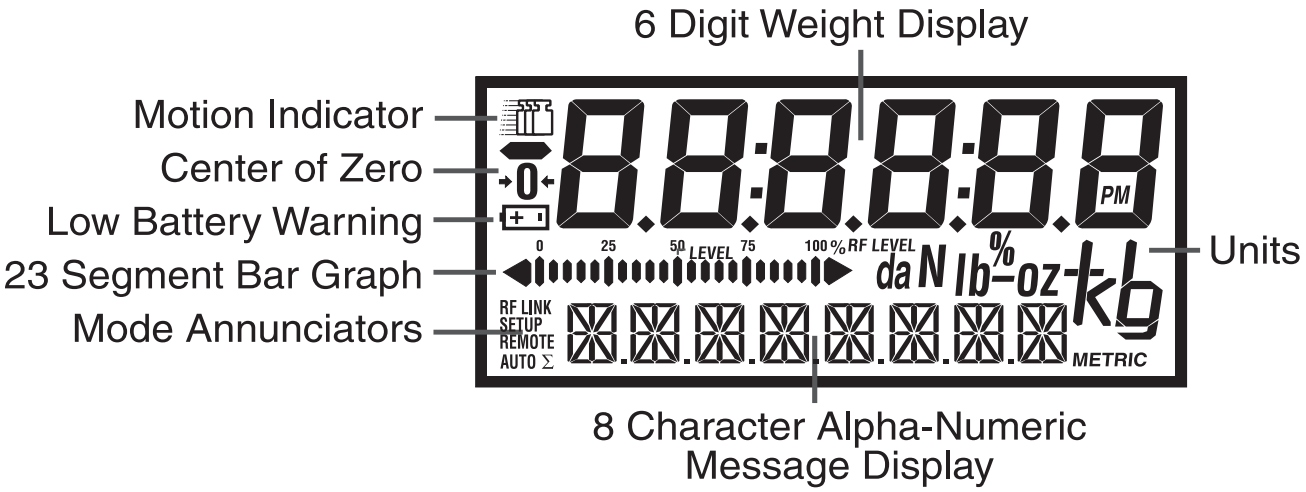
INTRODUCTION

The Measurement Systems International MSI 3750CS RF Weigh Meter is an element of MSI's CellScale® System. Combined with 1 or more CellScales, the 3750CS provides complete control over all scale and data functions. The 3750CS serves as a remote terminal for any CellScale and has no internal measurement capability. One 3750CS can read the output of many CellScales, and 1 CellScale can also provide data to many 3750CS'. The large, backlit, alphanumeric display provides precise, unambiguous indication of operating modes such as Net, Gross, or Total. The 3750CS can calibrate a CellScale remotely and provides a simple user interface to the advanced features of the CellScale. Digital calibration makes maintaining the system a snap, and the single board, marine-proof (NEMA 4) construction makes for a rugged and reliable remote indicator. The 3750CS combined with a CellScale is designed to meet or exceed the requirements of all regulatory agencies.

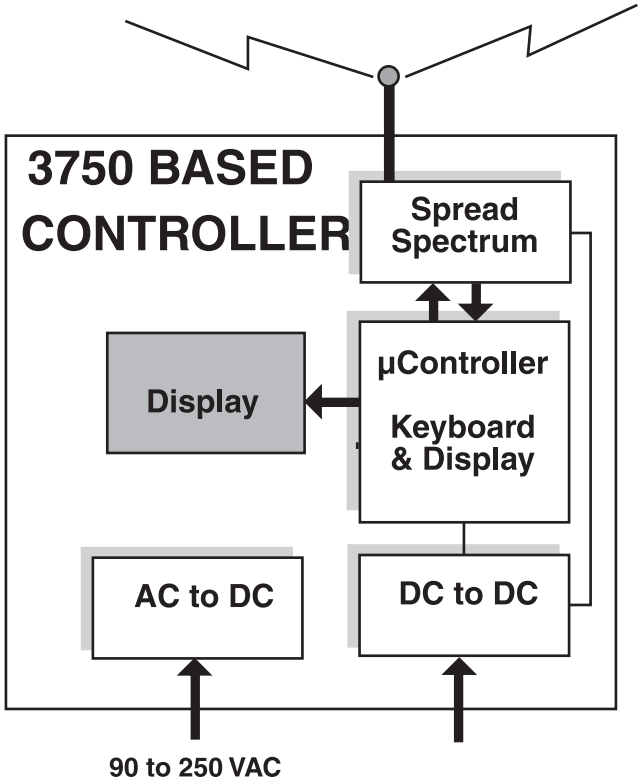
3750CS DISPLAY



3750CS FRONT PANEL

FEATURES

- Designed to meet or exceed all US and international standards.
- 6 Large, (.9") digits for clear weight readings from a distance.
- Reliable 2.4 GHz Frequency Hopping RF communications. Highly immune to interference and multi-path problems. Range in excess of 600 feet indoors and up to 5 miles line of sight with proper antennas.
- Each 3750CS can act as a terminal for any CellScale. A 3750CS can monitor multiple scales on a single CellScale, or multiple scales tied to multiple CellScales.
- Up to 32 per connected CellScale ID Codes with separate Alphanumeric Names, Tare, Mode, and Totals. ID Codes are addressed by any customer given name or number.
- Easy to read annunciation of ID Names and Menu Prompts are provided on eight .5" alphanumeric Characters.
- Full RS-232 output formatting offers exceptionally versatile data output. Weight data can be printed in any desired way, the customer can add any alpha characters and/or printer formatting commands, including formatting for Bar Code printers. The Comm Port is bidirectional allowing computer controlled operation and data reception.
- Analog bar graph provided for relative to full-scale weight indication. Also used for RF level indication.
- Display illumination uses rugged, long life, LED backlighting coupled with a transflective LCD to provide optimum display contrast under all ambient conditions from full sunlight to total darkness. Operation is light-sensing automatic or manually set.
- Versatile power input options: AC Only (90-260 VAC 45-65 Hz), 9-36 VDC Input, and 18-60 VDC. Accessory Power Supplies are available to allow 250 VDC operation as well. A UPS option is available for the vehicle power supplies.
- Easy to maintain: Full digital calibration assures reliable, repeatable measurements.
- Selectable for lb., kg, g, tons, metric tons, ounces, and per cent (some units and /or units switching may be prohibited in legal for trade units).
- Multi-mode automatic or manual weight totalizing with multiple ID registers.
- Complete Marine sealing ensures reliable operations under harsh conditions. Rugged cast aluminum package is coated to resist corrosive atmospheres. Meets all requirements of NEMA 4 and IP66.
- 32 set points standard – programmable for any in-range weight for operator alerts or process control. Optional Set Point Relay outputs are available for Set Points 1-8. Set point management is performed by the CellScale, which has 32 programmable set points. The 3750CS has independent set point reaction (relays, messages, display modes, comm port outputs, etc.).



SECTION 1 – UNIT INSTALLATION

The 3750CS is simple to setup and use. If there are no peripheral devices such as a printer or scoreboard, setup consists of installing the mounting bracket (see Appendix A), plugging in the Antenna, and applying power. To install an RS-232 cable, see the procedure in Section 8, “Comm Port Cabling”.

POWER

The 3750CS is available with three types of power inputs: 1) Universal AC power. Operates from 86 to 265 VAC 45 to 440 Hz 2) Vehicle Power. Available in two ranges, 9-36 VDC or 18-60 VDC. This power supply is transient protected and filtered for use in vehicles such as cranes, forklifts, etc..

DC Cable Color Code

Blue – Connect to Battery Negative. It is generally best to connect this directly to the battery negative terminal, or where the negative terminal is attached to the chassis.

Brown – Connect to Battery Positive. Again, a direct battery connection is usually best to avoid interference with vehicle electrical systems. The 3750CS is internally fused. If connected to a breaker or fuse panel, use 1A at 12V, .5A at 24V. Fast blow or medium blow fuses are acceptable.

White, Black, and Green – These are reserved for control functions used in specials. Usually these should be insulated and not wired anywhere. Please consult MSI for more information.

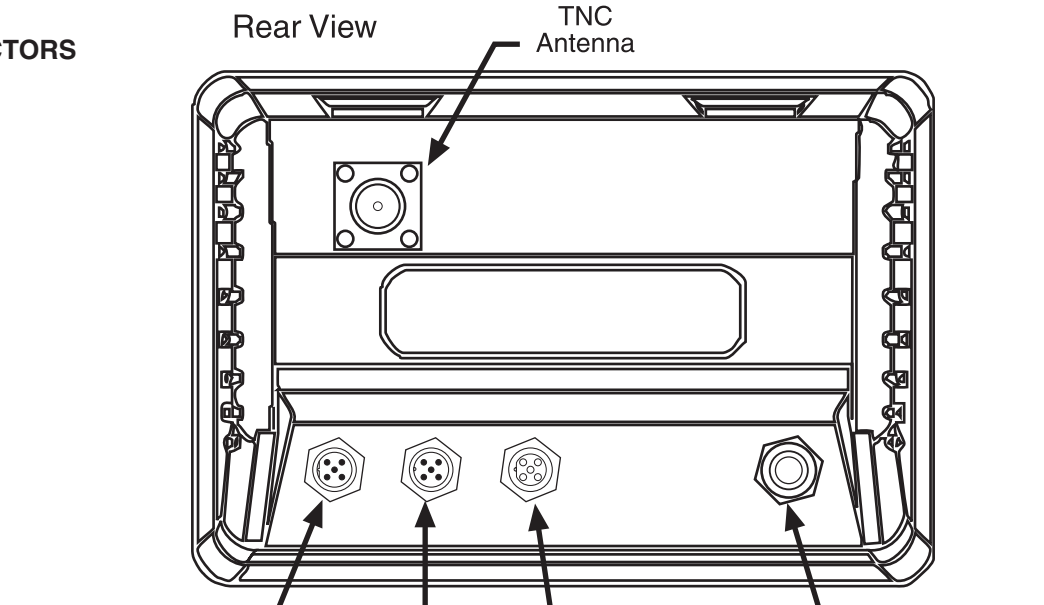
TOTALIZE SWITCH OPTION

When equipped with the totalize switch option, the user is responsible for providing a SPST (single pole, single throw) momentary switch. This can be a push-button, foot switch, momentary toggle switch, etc..

Totalize Switch Cable Wiring

This input is designed to attach to a momentary SPST switch. Totals are triggered by shorting the blue and brown wires together. Do not ground either wire. Insulate unused wires.

3750CS REAR CONNECTORS

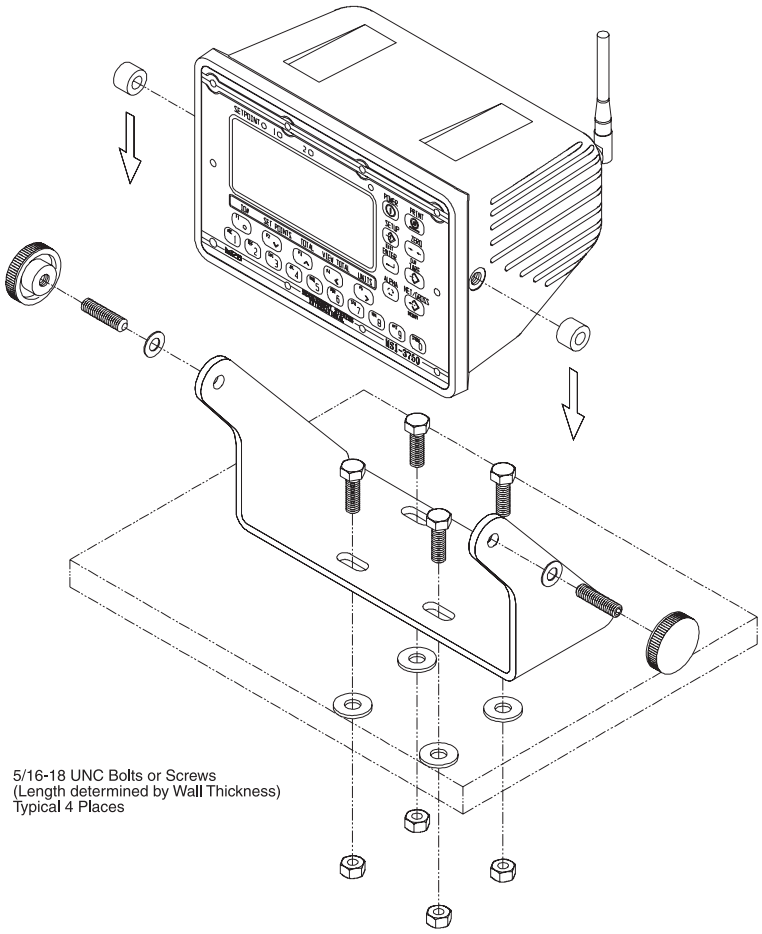


Cable Colors	
Brown	+ Power
Blue	– Ground

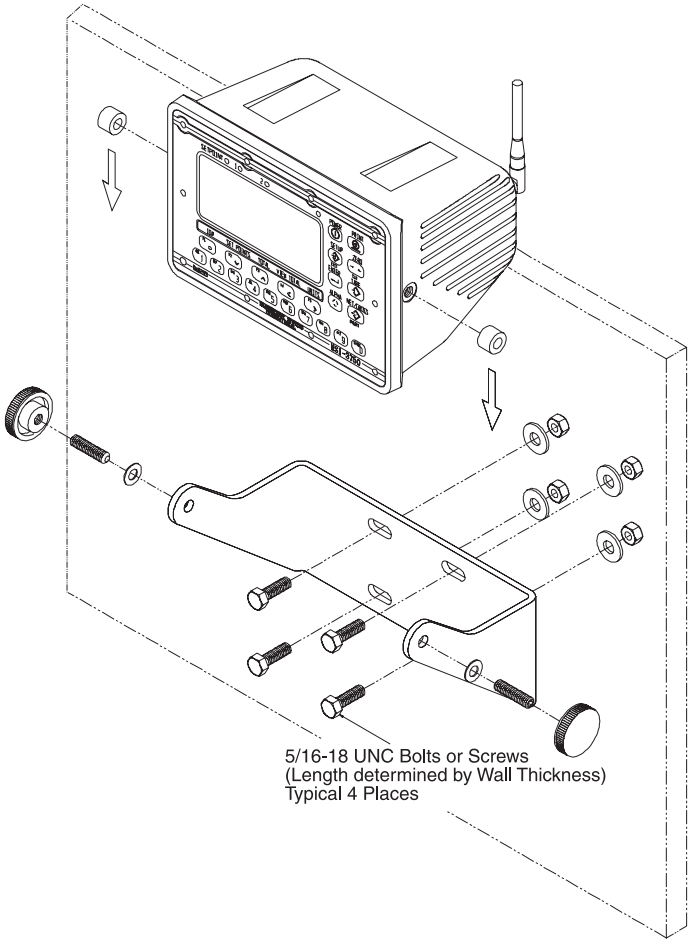
Cable Colors	
Brown	NO Switch
Blue	Switch Com

Cable Colors	
Brown	TXD
White	CTS
Blue	Gnd
Black	RXD
Grey	RTS

3750CS TABLE MOUNT



3750CS WALL MOUNT



SECTION 2 – RF SCALE COMMUNICATIONS – THE CELLSCALE SYSTEM

INTRODUCTION

The 3750CS is an element of the MSI CellScale System. The CellScale system uses frequency hopping spread-spectrum RF Modem technology transmitting in the 2.4 GHz ISM band.

RF Modems have been problematic as the RF bands are very hostile, corrupted by noise, path loss and interfering transmission from other radios. Even in a pure interference-free environment, radio performance faces serious degradation through a phenomenon known as multipath fading, a problem particularly prevalent for indoor installations. Multipath fading results when two or more reflected rays of the transmitted signal arrive at the receiving antenna with opposing phase, thereby partially or completely cancelling the desired signal. Spread spectrum reduces the vulnerability of a radio system to both interference from jammers and multipath fading by distributing the transmitted signal over a larger region of the frequency band than would otherwise be necessary to send the information. This allows the signal to be reconstructed even though part of it may be lost or corrupted in transit.

Spectrum has been set aside at 2.4 GHz in most countries for the purpose of allowing compliant spread spectrum systems to operate freely without the requirement of a site license. In the USA, there are absolutely no site licensing requirements. The CellScale system is also programmable for use in most European countries. Please contact MSI for worldwide compliance information.

FCC STATEMENT

Note: This unit has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Commensurate with EIRP limits specified in FCC Rules 15.247b, this device may not be used with antennas that exceed 36dB of gain in point-to-point applications or 16dB of gain in multi-point applications.

The Transmitter Module is licensed as FCCID: HSW-2410M.

NETWORK DESCRIPTION

The CellScale system uses frequency hopping which is produced by transmitting the data signal as usual, but varying the carrier frequency rapidly according to a pseudorandom pattern over a broad range of channels, in this case 80 discreet frequencies. These 80 frequencies are combined in different “hopping patterns” to provide 16 separate networks. With minor degradation in channel throughput, this can be doubled to 32 separate networks. The original 16 networks are numbered 00-15, the secondary networks are numbered 16-31. While it is possible to have all 32 networks commingled, some data rate degradation may occur between networks 16 channels apart (e.g. Network 00 and 16, 01 and 17, 02 and 18, etc.), although in most situations this degradation will be unnoticable.

The CellScale network uses a ‘Star’ network topology. One unit, usually the scale, is designated a ‘Master’. The Master transmits a sync pulse on a regular basis, providing synchronization of all remotes in the designated Network. Thus it forms the center of a cell. MSI provides three products capable of being the master unit: the CellScale, the CellModem, or the Trans-Weigh CS Crane Scale. Up to 254 slaves can access the master unit. The 3750CS is always a ‘Slave’. Multiple 3750CS units can coexist on one network, or can be easily switched to other networks as required.

The CellScale system uses CSMA (Carrier sense multiple access) to arbitrate between multiple remotes. CSMA is contention-based. Each remote listens to see if the channel is clear and then transmits. If the channel is not clear, the remote waits a randomly chosen period of time and then tries again.

For more on setting up CellScale networks, please refer to the CellScale manual,

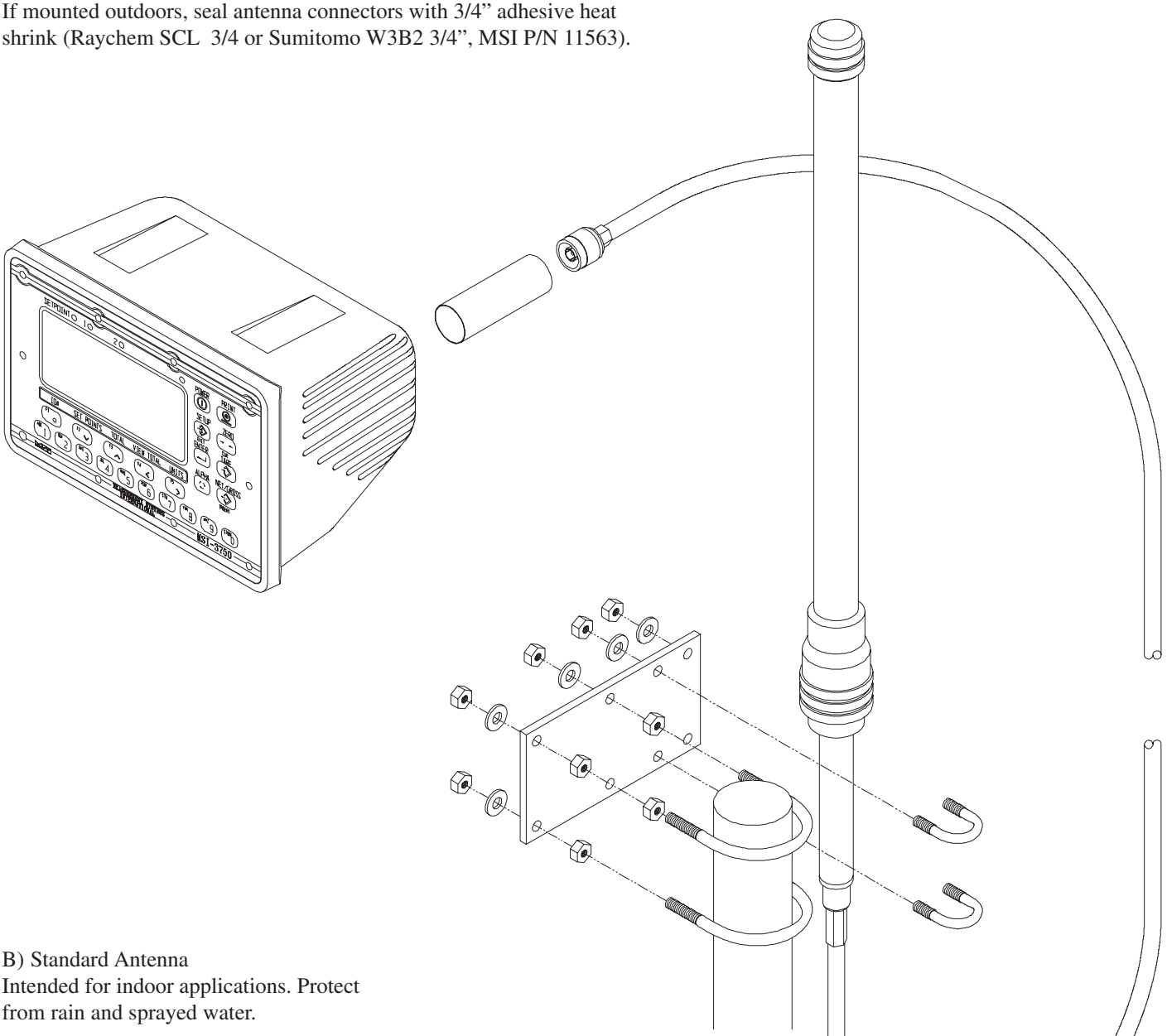
ANTENNAS

MSI offers the 3750CS with four antenna choices: 1) Standard Antenna – This is a small 1/4 wave antenna that mounts directly on the 3750CS enclosure and is suitable for most short to medium range applications. 2) Long Range Antenna – A high gain antenna that is remotely mounted from the 3750CS with a low loss coaxial cable. This omnidirectional antenna increases the range up to 4 times. The 10' cable allows placement of the antenna above the 3750CS for ease of clearing possible obstacles to data transmission. An optional reflector is available if a directional antenna is desirable. 3) Patch antenna – For applications where the standard antenna is vulnerable to physical use or outdoor applications. The Patch antenna is mildly directional which requires more care in antenna placement for long range applications. Patch Antennas are available by special order only. 4) In extreme range cases a Yagi Antenna is available by special order. Please contact MSI for details.

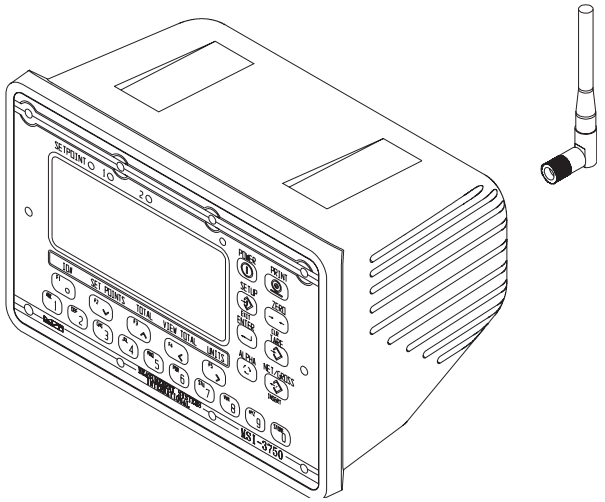
Antenna placement is critical to problem free use of your CellScale system.

1) Be sure a relatively clear transmission path exists between the 3750CS and associated CellScale master devices. The radio signals travel primarily by line of sight (LOS), and obstructions between stations will degrade the system performance. LOS is less important as distances decrease.
2) When using the long range antenna, mount the antenna on a tower or other elevated structure to ensure that you have a clear LOS transmission path. This will raise the antenna to a level sufficient to clear surrounding terrain and other obstructions. It is not necessary or desirable to provide a ground plane for the antenna.
3) Never use a directional antenna (e.g. a Yagi, or a long range antenna with a reflector) on a mobile system. However, fixed station locations can often benefit from directional antennas when the location of the other components of the RF network are always in the same general direction.
4) If using the meter mounted standard antenna, ensure that the antenna is not blocked by any metal. Transmission is good through most kinds of glass so mounting a meter next to a window should work fine. If there is no clear line of sight place to mount the 3750CS, consider switching to the long range antenna so the antenna can be remoted.
5) The standard and long range antennas are vertical plane devices. Do not mount them sideways. They should always point up. It also works to point them down, when high off the ground (such as on the underside of a large bridge crane).

A) Long Range Antenna
If mounted outdoors, seal antenna connectors with 3/4" adhesive heat shrink (Raychem SCL 3/4 or Sumitomo W3B2 3/4", MSI P/N 11563).

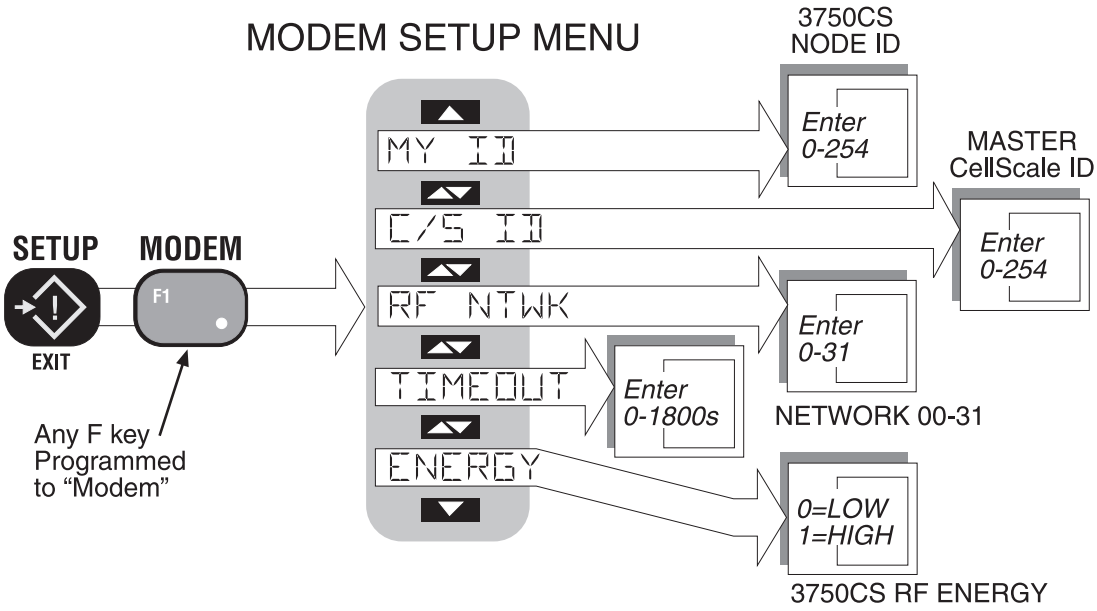


B) Standard Antenna
Intended for indoor applications. Protect from rain and sprayed water.



RF NETWORK SETUP

The 3750CS is a RF Modem connected device. The RF Modem requires setup to connect to one or more CellScales.



RF NETWORK

Sets the primary network number. Set this numbers to match the Network number of the CellScale master the 3750CS is associated with most often. Ranges from 0 to 31.

C/S ID

Sets the primary master CellScale ID number. This number must match the Source Address number of the primary master CellScale. Ranges from 0 to 254.

MY ID

Each slave unit in a given Network must have a unique ID number. Enter up to three digits to designate the 3750CS ID number. Ranges from 0 to 254.

TIMEOUT

Sets the time in seconds (0-1800) that the 3750CS will wait for data from the CellScale. The display will blank out if no data is received within this time period. Defaults to 10 seconds. Entering 0 turns off the Time-out timer. MSI recommends at least a 5 second timeout period to handle small lapses in transmissions. The system defaults to 10 seconds.

ENERGY

Sets the RF power level between 10mW (Low), and 100mW (High). In most applications power should be set to High. Reduced energy can reduce the size of the coverage/interference zone which may be desirable for multiple-network applications. Always check for adequate range coverage when using the Low setting.

The 3750CS serves as a terminal for CellScales. Its response to key presses may be delayed due to transmission times. The 3750CS will on occasion, display a "WAIT" message while transacting setups and scale controls.

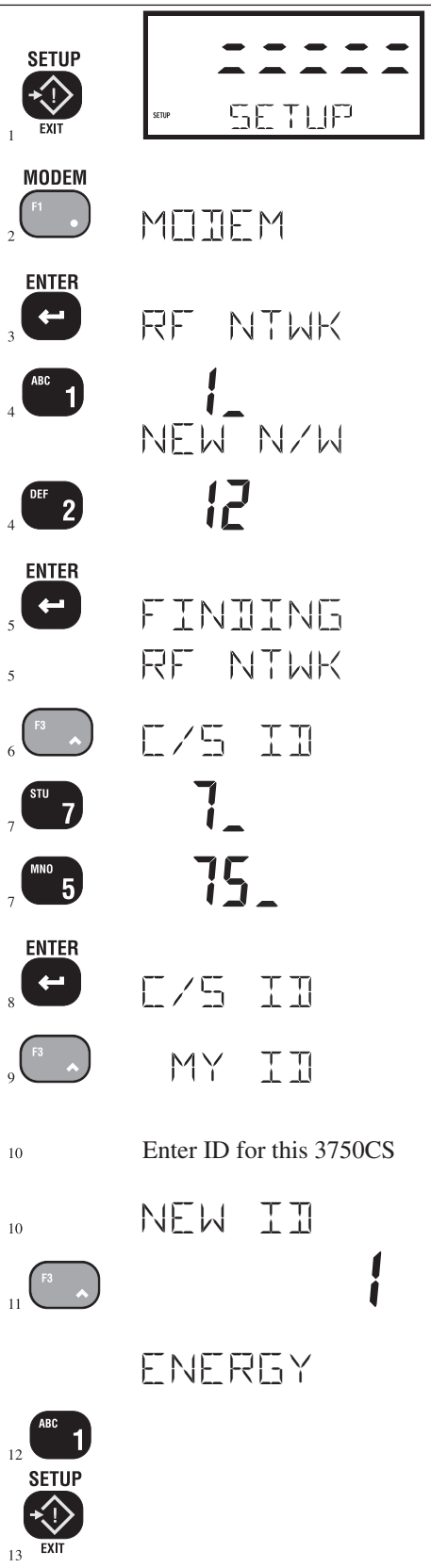
Configuring the RF Modem

Assumes F1 is configured as "MODEM", see "Setup Function Keys".

1) Push the SETUP key.
2) Push the MODEM key (usually F1). The display enters the Setup MODEM mode.
3) Push ENTER. The first menu item is RF NTWK. The numeric digits indicate the current network.
4) Change the Network number by pushing the numeric keys. As soon as you start entering numbers the screen reads "NEW N/W". Available network numbers range from 0-31.
   In this example we'll use network 12. Use the appropriate numbers for your CellScale master. It is not necessary to enter a '0' for networks below 10.

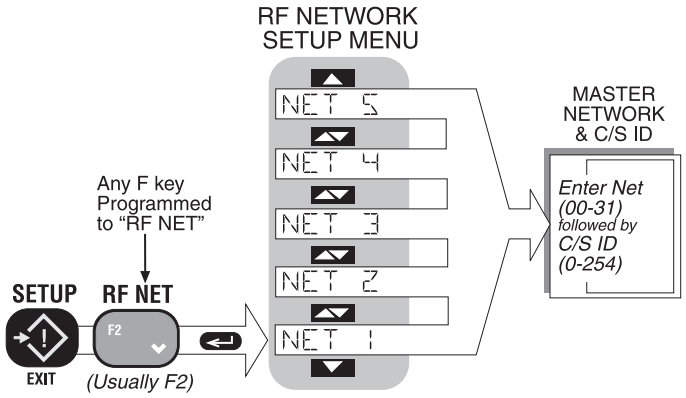
   Push the 1 key followed by the 2 key.
5) Push ENTER to set your Network choice into memory. The 3750CS tries to contact the new network while indicating "FINDING". If the master unit is on it will connect. If not, the display will flash briefly "NO NETWK".
   The "NO NETWK" or "NO TARGET" messages can be safely ignored at this time. It indicates only that the chosen network is not on or in range.
6) Push the UP key to the "C/S ID" menu.
7) Use the numeric keys to change the C/S ID number to match the SRC address programmed in the CellScale master. Available C/S ID numbers range from 0-254.
   In this example we'll use source 75. Use the appropriate numbers for your CellScale master. It is not necessary to enter leading zeros.
8) Push the ENTER key to set the C/S ID.
9) Push the UP key to the "MY ID" menu. This is the Node ID of this 3750CS slave.
10) This step is optional. My ID is important only if multiple slaves are present on the set Network. Use the Numeric keys to input a unique ID for this 3750CS, then push ENTER.
11) Push the UP key to the "ENERGY" menu. The numeric display indicates the current energy level, 1 equals High Power, 0 indicates Low power.
12) Press the 0 or 1 key as needed.

    MSI recommends using high power (1) in most installations.
13) This completes the MODEM setup. Push the EXIT key to return to normal scale operation.
14) If the 3750CS is reporting "NO TARGET" it may be necessary to send the "Talk to me" message. Do this by pushing the MODEM key (usually F1).



CONFIGURING FOR MULTIPLE NETWORKS

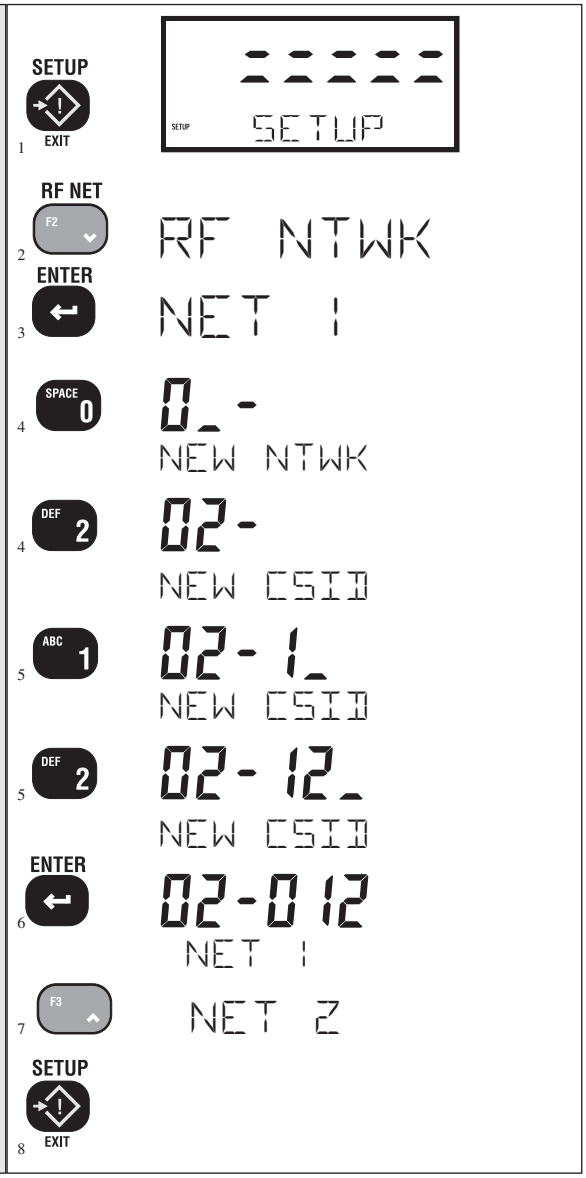
The 3750CS can access multiple CellScales by switching Networks. By programming a Function key to "RF NETWK" a double push of the key will change the network allowing the 3750CS to monitor and control different scales. Because each CellScale has both a network and a C/S ID, these must be set up with the "SETUP RF NETWORK" menu. The 3750CS can access up to 5 CellScale based Networks. It takes the 3750CS from 4 to 7 seconds to switch networks, as it has to sync with a new hopping pattern.



Set Up Multiple Networks

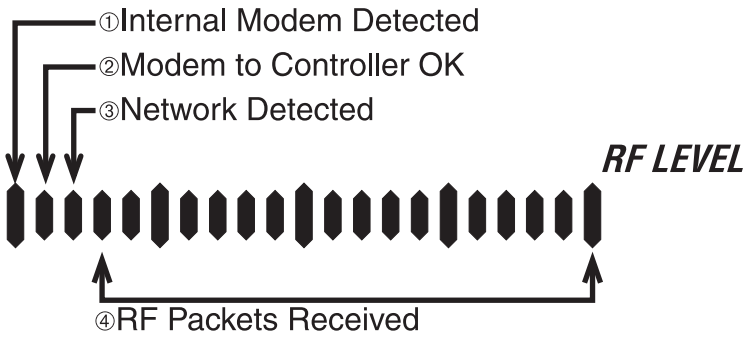
This procedure assumes F2 has been configured to the function "RF NETWK".

1) Push SETUP.
2) Push the RF NET key (usually F2). The display enters the Setup RF NETWORK mode.
3) Push ENTER. The first menu item is "NET 1". The numeric digits indicate the current network / CS ID pair.
4) Change the Network number by pushing the numeric keys. Available network numbers range from 0-31.
   In this example we'll use network 02. Use the appropriate numbers for your CellScale master. You must enter a leading '0' for networks below 10.
   Push the 0 key followed by the 2 key.
5) Use the numeric keys to change the C/S ID number to match the C/S ID of the CellScale master. Available C/S ID numbers range from 0-254.
   In this example we'll use C/S ID 12. The second half of the 5 digit entry does not need leading zeros put in.
   Push the 1 key followed by the 2 key.
6) Push the ENTER key to set the RF Network entry for NET 1.
7) Use the UP key to scroll to the next needed NET x. Repeat steps 3-5 to enter more Network addresses. Up to 5 addresses can be programmed.
   The 3750CS uses 55-555 as a place keeper for empty NET addresses.
8) Push the EXIT key after all needed RF Networks are set up.



INTERPRETING THE RF BAR GRAPH

The RF Bar Graph is a useful tool for displaying the state of communications between the 3750CS and the master CellScale. Referring to the illustration, the far left Tick (1) indicates the internal Modem is connected. The second tick (2) indicates that the Display processor has successful serial communications with the RF Modem processor. The third tick (3), when lit, indicates that a master CellScale is detected and the 3750CS has sync'd up. All additional bar segments indicate transmission and reception of usable packets. It is not necessary that the bar graph is full for communications to be successful. The bar graph will often change state while in setup menus because the 3750CS is busy and not requiring data packets sent or received.



TROUBLESHOOTING RF CONNECTION PROBLEMS

Most connection problems are caused by improperly set up RF Networks. Both the 3750CS and the master CellScale unit must have identical Network numbers. In addition, the CS ID must match on both units. If the Net-ID of the CellScale is in question, you might have to connect a terminal to the CellScale to determine its exact NET-ID. See the CellScale manual for this procedure. Verify the 3750CS settings are proper by using the "CONFIGURE RF MODEM" procedure.

3 Segments of the Bar Graph are showing, the message reads "NO NETWK"

Use the Bar Graph as described above to get some indication of RF problems. If the first 3 left most segments are on, a Master CellScale is detected. The absence of additional segments indicates that the CellScale and 3750CS are not conversing. Pushing the MODEM key (usually F1) will send a "Talk to me" message to the master CellScale. If this fails to initiate conversation, recheck your C/S ID numbers and make sure they match. Also, if there are additional 3750CS units set to the same network, they must have different Slave IDs (see "MY ID").

Another common cause of perceived problems is the "Phantom Network". This occurs when there is a conflicting Network within broadcast range. Multi-CellScale sites must be planned carefully so that there are never two master CellScales on the same Network number within range of each other. Since the CellScale can broadcast for miles with good LOS (line of sight) conditions, this consideration is very important. If you suspect your 3750CS has locked on to a distant (Phantom) network, try switching both the master CellScale and the 3750CS slave to another unused Network. MSI advises avoiding Network #0 when possible, as this is the Modem default, and therefore most likely to be found on units not properly set up.

Weight displays, but 3750CS keys don't work

This is a result of changing the C/S ID in the slave 3750CS so it no longer matches the master CellScale. The modem is still registered by the master CellScale, but control codes are not received because the master assumes the codes are intended for a different slave CellScale. Change the C/S ID in the 3750CS back to the number that matches the master CellScale.

Unit goes in and out of communication

This is usually a result of being in or near an "RF Null" zone. Because of multiple echoes of signals there is sometimes locations that are particularly problematic even for Frequency Hoppers. Usually moving the antenna location even a small distance can clear up this kind of problem. Avoid placing the antenna up against large metal walls. The antenna should be at least 4 inches away from large metal surfaces. When close to a wall, this has the effect of making the Antenna directional.

Range is Inadequate

Antenna placement is the most common cause of poor range. Check that the RF power level of the master and slave units is on “High”. Radio signals in nearby bands that have significant power can also reduce range. Longest range will always be achieved by Line-of-sight antenna placement. Any obstacle that interferes with LOS will reduce the range. Particularly bad blocking is caused by metal buildings, solid concrete walls, and anything else that has fairly high electrical conductance. Raising the antennas higher can help. Sometimes just moving the antennas sideways will find an RF “path” that will improve distance. The CellScale can sometimes take advantage of reflecting surfaces to get around obstacles. Antennas should always be place in vertical polarization, that is the shaft of the antenna should be perpendicular to the earth, not parallel. It is OK to mount the Antenna upside down. This is a good solution when an antenna is mounted on the ceiling for communication with CellScale components in the building.

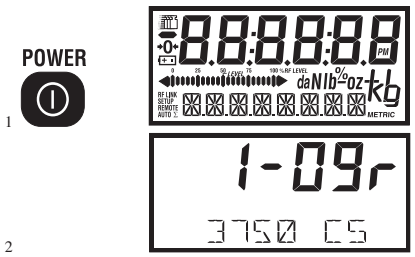
SECTION 3 – SCALE OPERATION

POWER

Turns the Weight Indicator On and Off.

To Turn On the Power

1) Push POWER. The system performs a display check: All segments and the Set Point / Total LED's illuminate for 3 seconds, then turn off for 1/2 second.
2) The LCD displays "3750 CS" and the software version number.
3) Next the RF network is contacted. If the network is functional, the display reads "WAIT" then displays the current weight. This usually takes 4-6 seconds.



If the system fails to connect in 10 seconds or less, push the MODEM key to send a "Talk-to-me" message. If this fails check RF network setups, or decrease the range between the CellScale and the 3750CS..

MULTIPLE SCALE CHANNELS

Each CellScale is capable of hosting up to 32 independent scale inputs. Since any 3750CS can communicate with any CellScale, theoretically hundreds of scales can be controlled by a single 3750CS.

Because of the complexities of multiple channel setups, the 3750CS is designed to access channels that have been previously setup in the CellScale through its terminal interface or virtual meter interface.

Channels in the CellScale are organized by A/D input channel followed by Mux sub channel value. The standard CellScale has 2 A/D inputs, but can be ordered with 4 A/D inputs with the addition of a second A/D Converter module. Each A/D channel can be further divided by the use of external multiplexers into 8 additional inputs per channel, providing a total of up to 32 independent scale inputs. The channels are designated like this:

Channel (A/D 1-4) > 1-1 < Sub channel (mux 1-8)

The channel will vary from 1-4 and the sub channel from 1-8. In addition the CellScale provides channel 5 for slave CellScales, and channel 6 for math channels which allow the user to add or subtract channels from each other or perform other math manipulations of the data. All calibration data for the 32 channels is stored in the CellScale and is independent of the 3750CS. Therefore any 3750CS can receive calibrated data from any CellScale provided the RF network is set up properly.

It should be noted that sub channels are useful even when the multiplexer option is not used. For example, channel 1-1 could be calibrated as a 1000 x 0.5 kg scale, and channel 1-2 as a 2000 x 1 kg scale, making a dual range platform (of course this assumes the platform is capable of handling 2000 kg). This will work as long as the main channel remains constant. So, in theory, 1 platform could be calibrated as 8 independent scales. This works because the CellScale does not know or care if a Multiplexer is actually present. It treats the input as a separate scale.

The 3750CS is unable to read the channels directly. It reads multiple channels by using the Scan list index. The "Scan list" is stored in the CellScale, with up to 32 channels present in the list. The first number in the scan list is called the Scan List Index number. The CellScale can have up to 32 Scan List indices. A scan list can include "Math Channels" which provide a means to add digitally the results of multiple scales. For example a scan list could look like this:

1= 1-1
2= 1-2
3= 1-3
4= 1-4
5= 6-1 *Channel 6-1 defined as (CH1-1)+(CH1-2)*
6= 6-2 *Channel 6-2 defined as (CH1-3)+(CH1-4)*
7= 6-3 *Channel 6-3 defined as (CH1-1)+(CH1-2)+(CH1-3)+(CH1-4)*

This scan list could be used with a wheel weighing system. The first 4 channels are connected through a CellScale

Multiplexer and provide individual wheel loads. Index position 5 shows front axle load, index 6 shows rear axle load, and index 7 shows total weight. The CellScale allows the user to name each channel and the name can appear on the message (lower) display of the 3750CS. When dealing with multiple channels it is recommended that you program the lower display mode to either display the scale channel number (LC NUMBR), the Scan List Index number (SC INDEX), or the channel name (LC NAME).

See the "METER SETUP" section 7 to configure the lower display mode.

For more information on Scan Lists and dealing with multiple channels, please refer to the CellScale manual.

TO ACCESS MULTIPLE CHANNELS

As mentioned above, the 3750CS will access any channels setup in the CellScale. It does this with the "SC INDEX" function. The SC INDEX steps from channel to channel as dictated by the Scan list stored in the CellScale. If the CellScale has only one scale channel defined, this procedure is not necessary. This is always the case for MSI-6260CS Crane Scales and other single load cell systems.

For systems with multiple scales attached to any given CellScale the setup procedure is:

1) Program the CellScale Scan List as required (see the CellScale Manual).
2) Program a function key for "SC INDEX" (see section 4 – FUNCTION KEYS).
3) Optional but recommended so you can readily identify which scale you are monitoring and controlling – Program the lower display mode for "LC NUMBER", "SC INDEX", or "LC NAME" (see section 7 – METER SETUP).

To Change Scale Channel

This example assumes F3 has been setup for "SC INDEX".

1) Push the SC INDEX key (F3 in this example). The message "SC INDEX" appears, and the numeric digits indicate the current SC Index # (1-32). 2) Within three seconds, push either the SC INDEX key again or the UP scroll key. The Scale Channel will index to the next channel in the list. *To go to the previous channel in the list, push the DOWN scroll key within 3 seconds of the SC INDEX key. (This won't work if you used F2 for the SC INDEX key)* 3) Either wait three seconds for normal display function to return, or you can push ENTER or EXIT to hasten return to standard scale function, now operating on a new scale channel.	1 F3 → 01 SC INDEX 2 F3 → 02 SC INDEX 3 ENTER → or wait 3 seconds.

ZERO

Sets the zero reading of the scale. Use the zero key to take out small deviations in zero when the scale is unloaded. (See "TARE SET" for zeroing (Taring) package or pallet weights)

To Zero

Push ZERO. The weight reading must be stable within ±1 division for the zero function to work. The display temporarily reads "ZEROED" and the digits display 0. The backup memory stores the zero reading, and can restore it even if power fails. Final: The numeric digits display "0" (or 0.0 or 0.00, etc.).	ZERO →0← → 0.0 lb ZEROED ZEROED

Rules for Use:

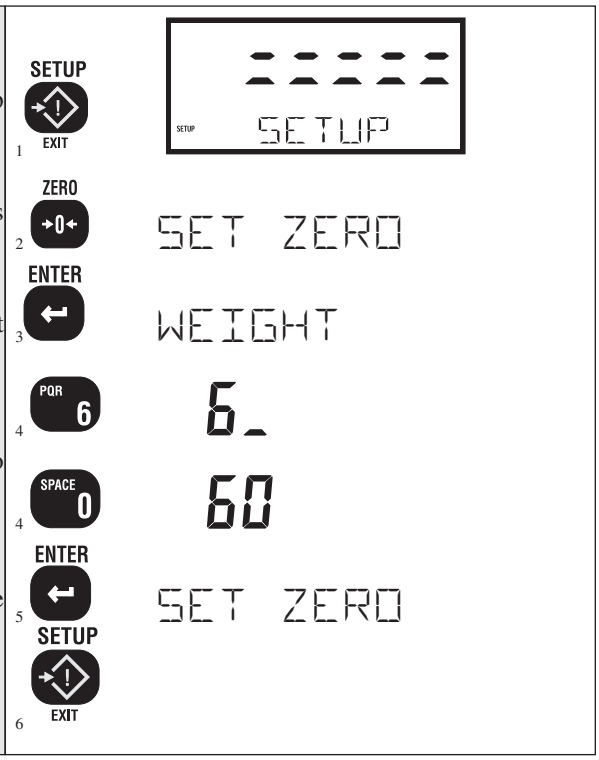
1) Works in GROSS mode or NET mode. Zeroing while in Net mode will zero the gross weight causing the display to show the negative Tare value.
2) The scale must be stable. The scale will not zero if the motion detect annunciator is on.
3) The scale will accept a zero setting over the full Range of the scale (NTEP and other Legal-for-trade models may have a limited zero range). Zero settings above 4% of full scale will subtract from the overall capacity of the scale. For example if you zero out 100 lb. on a 1000 lb. scale the overall capacity of the scale will reduce to 900 lb. plus the allowed over-range amount.

SETUP ZERO

In some applications it is desirable to have the scale return to a number other than zero. This is used in safety applications where the weight of the scale itself must be taken into account, showing all weight hanging on a crane. This feature may be disabled in Legal-for-trade units.

To Apply a Zero Offset

1) Push SETUP.
2) Push the ZERO key. The display enters the Setup ZERO mode.
3) Push ENTER. The current Zero offset value is displayed.
4) Use the numeric keys to change the zero offset as desired.
   In this example, we'll enter 60 kg as a zero offset.
5) Push ENTER to set your Zero offset value into memory.
   This is the number the scale will display after you push Zero.
6) Push the EXIT key to return to normal scale operation.



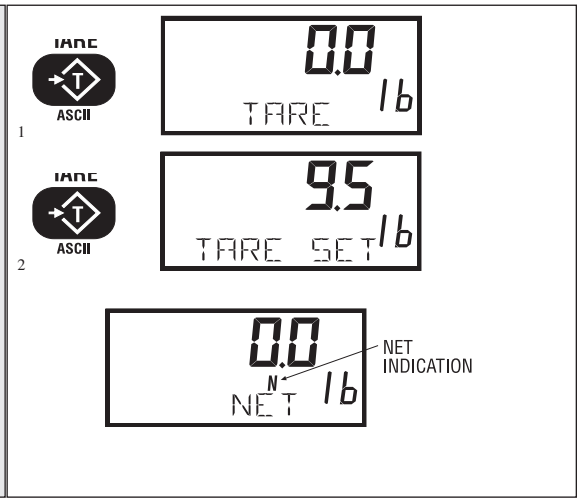
TARE

Tare is typically used to zero out a known weight such as a packing container or pallet and display the load in NET weight. A Tare value is entered in one of three ways:

1) AUTO TARE – When the TARE key is pushed twice, the current weight is zeroed and Net Weight is displayed.
2) KEYBOARD TARE – Using the numeric keys, the operator keys in the desired Tare Weight then pushes the ENTER Key.
3) TARE UP/DOWN – Using the Scroll Keys, the Tare value is changed one scale division at a time. TARE UP/DOWN is useful for increasing or decreasing the current Tare value slightly. The Keyboard Tare and Tare Up/Down modes can be disabled through the use of SETUP TARE. In the "AUTO" mode a single push of the TARE key will enact AUTO TARE.

To Auto Tare

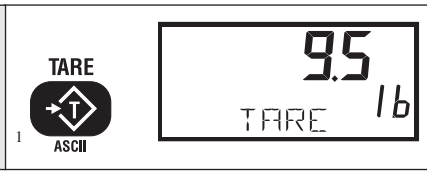
1) Push TARE. The current Tare value is displayed.
   If the TARE key is setup for "AUTO" only one push of the TARE key will be necessary.
2) Push TARE again. Assuming no motion, the display temporarily reads "TARE SET" and then converts to a "NET" display. All following readings are deviations from the set Tare value.



To Read the Tare Value

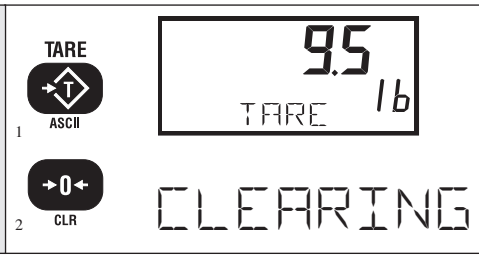
(without changing it) TARE key function must be set to "KBD/UPDN".

1) Push TARE. The message display reads "TARE" and the current Tare value appears on the numeric digits for 2 seconds. Note or Print the value as desired.



To Clear Tare and Revert to Net Mode

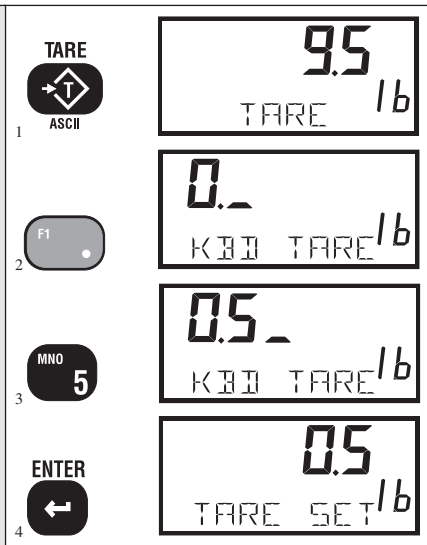
1) Push TARE followed by ` CLR (ZERO). The message display reads "CLEARING". The scale returns to the GROSS mode.
Alternate method: Remove all weight from the scale (Gross Zero) and push TARE. The message display temporarily reads "TARING". Then the scale returns to the GROSS mode.



To Keyboard Tare

(TARE key function must be set to "KBD/UPDN")

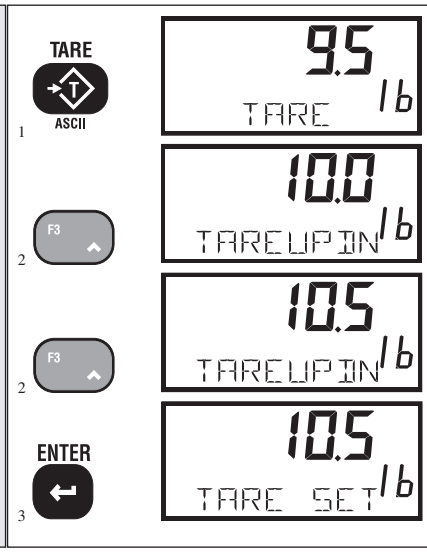
1) Push TARE. The display reads "TARE". Any current Tare value is displayed.
You have only three seconds to start step 2.
2) Using the numeric keys input the value desired. In this example we'll use 0.5 lb. as a Tare Value.
The 3750CS will automatically place a leading zero if the Tare value starts with the decimal point.
3) The Tare Value "0.5" is displayed.
4) Push ENTER to place the value in the Tare Register. The display reads "TARE SET" and displays the Tare value for 1 second. All subsequent readings have the Tare value subtracted and are displayed in "NET" weight.



To Use Tare Up/Down

(TARE key function must be set to "KBD/UPDN")

1) Push TARE. The display reads "TARE". Any current Tare value is displayed. In this example a value of 9.5 lb. was previously Tared.
2) Within 2 seconds after pushing the TARE key, use the UP or DOWN scroll keys to increment or decrement the Tare value. Each single push of the scroll keys will change the current Tare value 1 scale division. In this example, the scale increment is .5 lb.
3) The Tare Value "10.5" is displayed. Push ENTER to place the value in the Tare Register. The display reads "TARING" followed by "TARE SET" and displays the Tare value for 1 second. All subsequent readings have the Tare value subtracted and are displayed in "NET" weight.



Tare - Rules for Use:

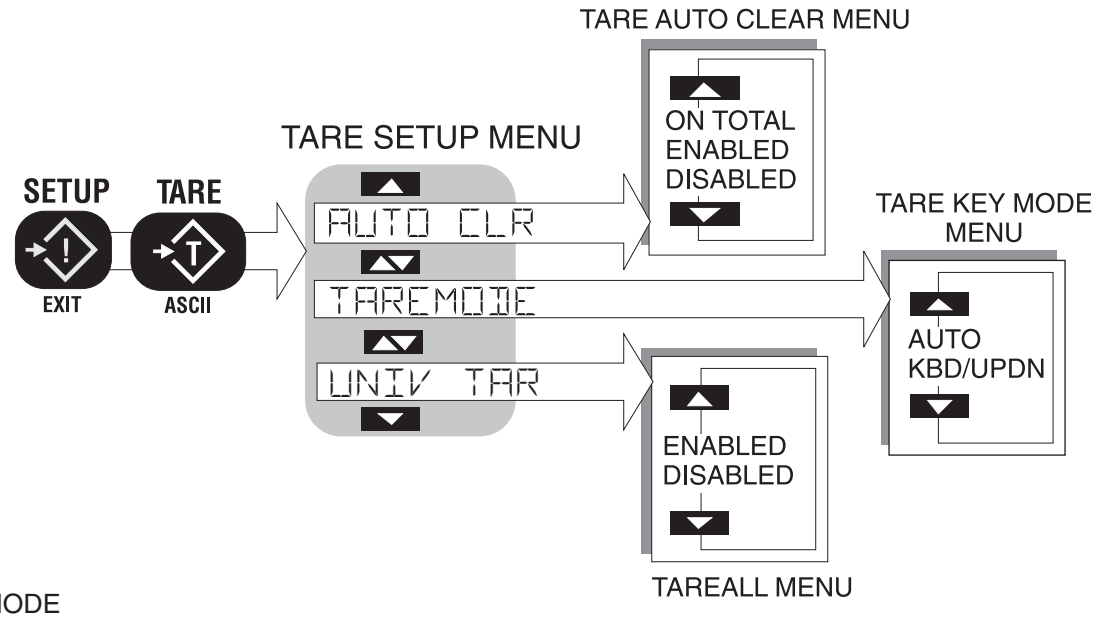
1) Only positive gross weight readings can be tared. Weight can be tared in both the NET and GROSS modes. When in the NET mode, the TARE is not cumulative, all the weight is zeroed.
2) The motion annunciator must be off. The weight reading must be stable.
3) Setting or changing the tare has no effect on the Gross zero setting.
4) Taring will reduce the apparent over range of the scale. For example, taring a 10 lb. container on a 60 lb. scale, the scale will overload at a net weight of 50 lb. (60-10) plus any additional allowed overload (usually ~4% or 9d).
5) The scale stores the Tare value in the current ID Code memory until cleared. Each available ID Code can store independent Tare values.

Multiple Tare Memories

The 3750CS is capable of storing Tare values through the use of the ID Codes. Each ID code stores an independent Tare. See Section 3 “ID Codes” for more information.

SETUP TARE

Programs the **TARE** key mode (TAREMODE), the automatic TARE Clear function (AUTO CLR), and the TAREALL function.



TAREMODE

1) AUTO – Only Auto Tare is in operation. Every time the TARE key is pushed, the current weight on the scale is tared.
2) KBD/UPDN – In this mode, pushing the TARE key will enable the numeric keypad for Keyboard Tare and the **UP/DOWN** scroll keys for TARE **UP/DOWN**. Also in this mode, pushing the TARE button a second time will enact AUTO Tare.

UNIV TAR

The Universal Tare feature allows a single Tare value to be shared by all ID Codes. With UNIV TAR enabled the individual Tares stored with each ID Code are ignored (but not erased). Disabling UNIV TAR will restore the original Tare values. UNIV TAR is intended for those applications where a common carrier or pallet is used, but multiple ID Codes are necessary for data collection.

AUTO CLR

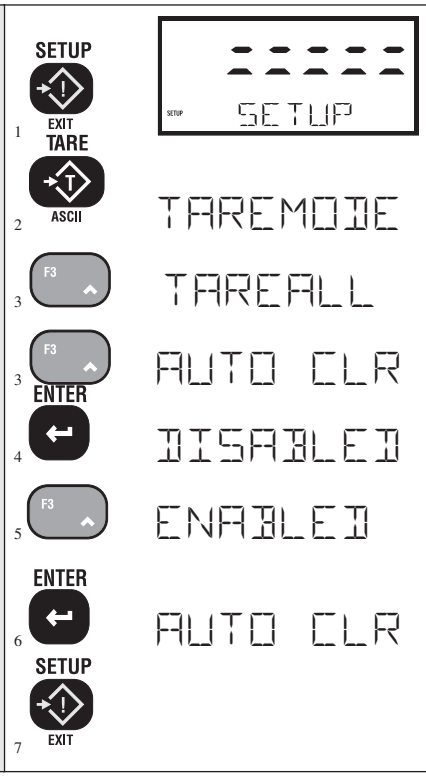
Enabling “AUTO CLR” causes the 3750CS to clear the Tare Value after each lift greater than 0 NET. The Tare Value is cleared and the display mode reverts to Gross Weight once the load is removed (the weight goes below 0 NET). The “ON TOTAL” setting clears the Tare Value after the load is totaled. The default for the “AUTO CLR” function is “DISABLED” . When disabled, the Tare Value can only be cleared manually (see “To Clear Tare and return to Gross Mode”.)

To Setup the Tare Key Mode

1) Push SETUP.
2) Push TARE. The TAREMODE submenu is shown.
3) Push ENTER. The first menu choice is the current TARE key mode. In this example, the "AUTO" mode is enabled. We'll change the mode to "KBD/UPDN".
4) Push the UP key to change the Tare Key mode to "KBD/UPDN".
5) Push ENTER. The Scale returns to the SETUP TARE menu.
6) Push EXIT to return to normal operation with the TARE key function altered.

To Enable Tare Auto Clear

1) Push SETUP.
2) Push TARE. The TAREMODE submenu is shown.
3) Push the UP scroll key to change the submenu to "AUTO CLR".
4) Push ENTER. The first selection is the current AUTO CLR mode.
5) Push the UP key to change the AUTO CLR mode to "ENABLED".
6) Push ENTER. The AUTO CLR is now enabled and the 3750CS is back in the SETUP TARE menu.
7) Push EXIT to return to normal scale operation (with the AUTO CLEAR TARE function enabled).



To Enable UNIV TAR (Universal Tare)

1) Push SETUP.

2) Push the TARE switch. The first menu choice "TAREMODE" appears.

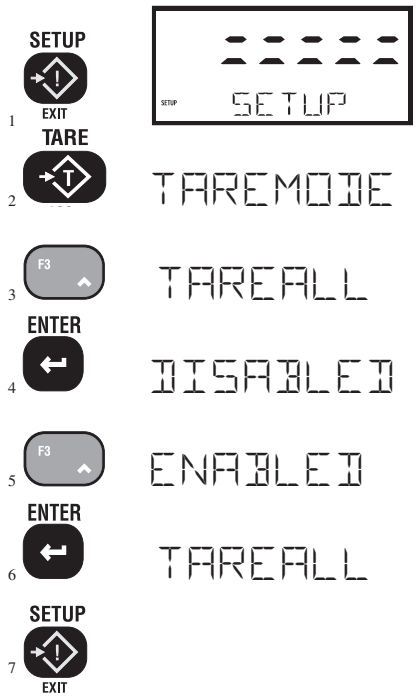
3) Push the UP scroll key to change the menu to "TAREALL".

4) Push ENTER. The first selection is the current TAREALL mode.

5) Push the UP key to change TAREALL to "ENABLED".

6) Push ENTER. TAREALL is now enabled and the 3750CS is back in the SETUP TARE menu.

7) Push EXIT to return to normal scale operation (with the TAREALL function enabled).



NET/GROSS

Switches the display between Net and Gross modes. Net Weight is defined as Gross Weight minus a Tare Weight.

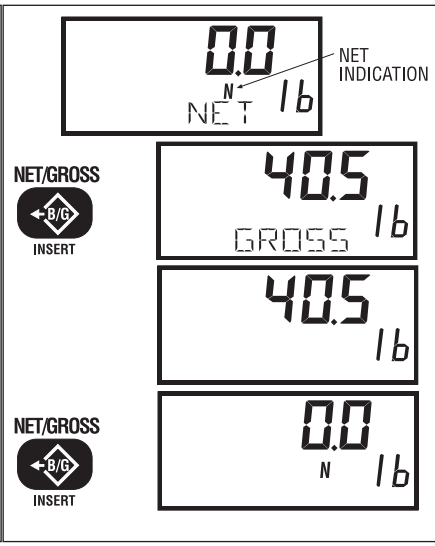
To Switch Between Net Mode and Gross Mode

Switching back to Gross mode from Net mode will not clear the Tare value. This allows the operator to use the Gross Mode temporarily without having to reestablish the Tare value. Only manually clearing the Tare or setting a new Tare will change the tare value held before switching into Gross Mode.

OIML Legal-for-trade units only: *The NET/GROSS key is temporary action only. The Gross weight is displayed for 2 seconds and then the display returns to the Net Mode. The only way to return to permanent Gross readings is to clear the Tare (see Clear Tare procedure).*

1) Starting in the NET weight mode –This example has a TARE weight equal to 40.5 lb. Push NET/GROSS. The message will briefly display "GROSS". All subsequent readings will be Gross weight until the NET/GROSS key is pushed again, or until the TARE is changed.
If working with an ID Code present the ID Name will return to the message display after the "GROSS" or "NET" message shows.

2) Pushing NET/GROSS again will revert the display to the NET mode.



UNITS

Allows easy weight units conversions. Up to 8 Units are available. See "SETUP UNITS" for details on activating the available units.

This operation requires that one of the Function Keys is setup as the UNITS key. See "FUNCTION KEYS". The example given below has F5 programmed to be "UNITS" which is the default 3750CS mode. Change the example as required if one of the other keys is programmed to be "UNITS". 3750CS using Statistics are limited to one functional unit. Statistical Units can be changed only if all the ID Code Totals are Cleared using the "CLEAR ALL TOTALS" procedure in Section 4.

To Change the UNITS

Push UNITS (Usually F5). The displayed weight will change to the next activated unit. If more than two units are activated, pushing the UNITS key will rotate through the available choices.

SETUP UNITS

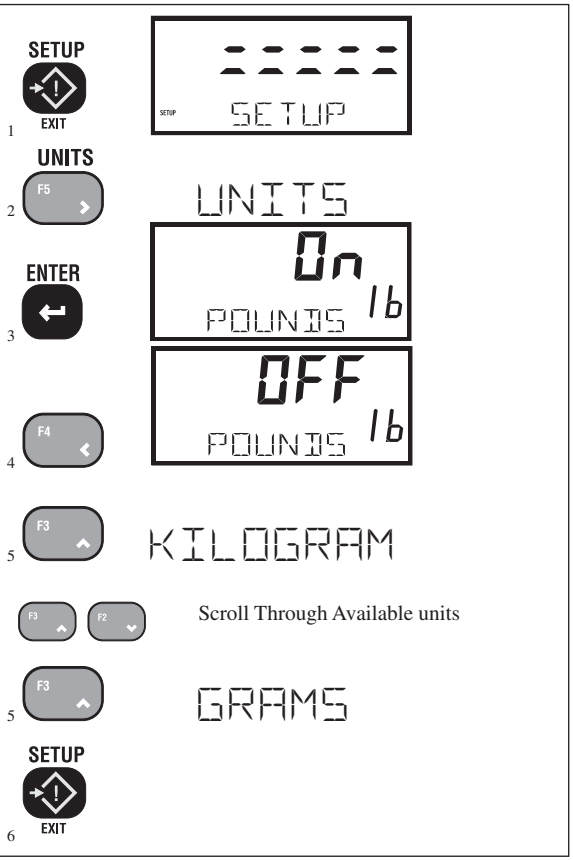
Enables the desired weight units for activation by the UNITS key. For example, if an operator only wants pounds and kilograms activated, all other units can be disabled.

This operation requires that one of the Function Keys is setup as the UNITS key.

To Enable/Disable UNITS

1) Push the SETUP key
2) Push the UNITS key (usually F5). The menu will display "UNITS"
   Tons available on capacities 2,000 lb. and over. Metric Tons available on capacities 1000 kg and over. Oz and g available on scales 250 lb and under.
3) Push ENTER. The unit POUNDS will appear.
4) The numeric display will read "On" if the displayed unit is activated or will read "OFF" if it is inactivated. Use the LEFT or RIGHT Cursor keys to change the status of the displayed unit from "On" to "Off"
5) Use the UP Scroll key to scroll through all the available UNITS and use the LEFT or RIGHT Cursor keys to enable (On) or disable (OFF) the unit as desired.

   If the user attempts to disable all units, Pounds will automatically be enabled. OIML units are limited to kg, g, and metric Tons.
6) When finished selecting units, push EXIT to return to normal scale operation.



PEAK HOLD (FUNCTION KEY OPTION)

Allows monitoring peak weight. Uses a special mode of the CellScale's A/D converter for capturing transient events.

To Capture Peak Weight Readings

1) Program a **FUNCTION** key for "PEAKHOLD" (See Section 4).
2) Turn on the Peak Hold mode by pushing the selected **FUNCTION** key. The display reads "PEAK NET" or "PK GROSS" to indicate peak hold mode is enabled. The display will only update when a greater

value than previously recorded is detected.

To Clear Peak Weight Readings

Turn off the Peak mode by pushing the **FUNCTION** key programmed as "PEAK HOLD". The 3750CS reads "PEAK OFF" and clears the peak value from memory. The display will revert to NET or GROSS mode.

Peak Hold captures data at a reading rate set up by the CellScale A/D parameters. For High Speed Peak Hold, use a faster A/D rate. See CellScale Manual.

PRINT

Sends the current displayed reading to the Comm Port, unless otherwise setup in the Print Setup menu . Any or all weight, time, date, and scale parameter functions can be printed as set in the Print Setup Mode. Refer to Section 9 for more details.

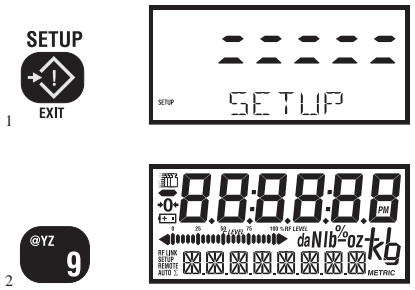
TEST

Provides a functional system test, and an on-demand display check without disturbing the current weighment. The Test function can be interrupted by pushing any key during the test.

The TEST function is also available as a FUNCTION key choice. See "FUNCTION Keys" Section 4.

Test Meter Operation

1) Push the SETUP key.
2) Push the 9 key.
a) All segments turn on for 1 second, the off for 1/2 second.
b) All digits (7 segment and 16 segment) count once from 0 to 9. All annunciators are tested including lb., kg, t. and the Total LED.
c) Battery condition is displayed next in the form: % of Battery life with a figure from 1 to 100 on the digits. The % battery life will vary depending on whether the backlight is on or off.



Final: Either the reading returns to the pre-test condition, or an error message is displayed.

ACTIVATE & DEACTIVATE CHANNELS

In systems with large channel scan lists, it is sometimes useful to be able to deactivate a channel that is not in use without losing calibration for that channel. This also improves data flow since no time is spent converting inactive channels.

1) Push the SETUP key.
2) Push the F key programmed as "SC INDEX".
3) Push Enter.
4) Use the UP/DOWN keys to scroll through all available channels. To check or change the status, push ENTER on the desired channel.
5) To change the status use the LEFT/RIGHT key. The display will toggle between "ACTIVE" and INACTIVE.
6) Repeat steps 4 and 5 for all channels.
7) Push EXIT once to return to scrolling through channels, or push EXIT twice to return to normal scale operation. All inactive channels will now be skipped.

If all channels are inactive, the 3750CS weight display will be blank.

SECTION 4 – FUNCTION KEYS

SETUP FUNCTION KEYS

The 3750CS has five FUNCTION keys that can be programmed to any of several functions. The default functions are: MODEM, RF NETWK, TOTAL, VIEW TOTAL, and UNITS. Each key can be programmed for other functions. For example, the UNITS key can be changed into a GRAND TOTAL key. Also any of the five keys can be disabled.

MSI provides Function Key Labels with every 3750CS. After the Function Keys are programmed as desired, apply the appropriate label to the embossed area above the key. MSI can supply custom labels on request. For example, if the String 1 function is to be used to input a customer number, MSI can supply a label that reads "CUSTOMER". Contact MSI to order custom Function Key labels.

Function Keys are setable to any of the following functions:

Grand Total..... Display totaled weight of all ID Codes
1KeyClrTotal ... Clears current IDs Total
2KeyClrTotal ... Clears current IDs Total, requires confirmation key
Clr Last Total .. Clears only last weighment
Grand Total..... Displays grand total of all IDs
ID Number ..... Push to change the ID code
SC Index..... Switch between selected scale channels
Modem..... Configure RF Modem
RF Network ..... Set Network parameters and switch into up to 5 RF Networks.
Peak Hold ..... Captures maximum readings
Set Points ..... Set and configure set points
Statistics..... Display stats of current ID Code
String1 ..... Displays user configured print string 1 associated with each ID.
String2..... Displays user configured print string 2 associated with each ID.
Test..... Performs LCD display test.
Total ..... Add the current weight to the total, or Auto Total On/Off
Units..... 1 button access to switching weight units.
View ∑..... Displays totaled weight of the current ID.
Disabled..... no function assigned
Clear Latch..... Used to cleared latched Set Points.

To Define the Function Keys

Note: It is possible to program a function to more than one function key. For example, to prevent anyone from turning off Auto Total, F3 could be changed to be "VIEW ∑". Therefore both F3 and F4 would show the Total weight.

1) Push SETUP. First the LCD will display the SETUP Screen

2) Push SETUP again. The first setup menu item is "KEY FCTN".
In this example we'll change the function of the UNITS key (F5) to "SETPOINT".

3) Push ENTER. You are now in the KEY FUNCTION Menu. The LCD reads "ASSGN F1".

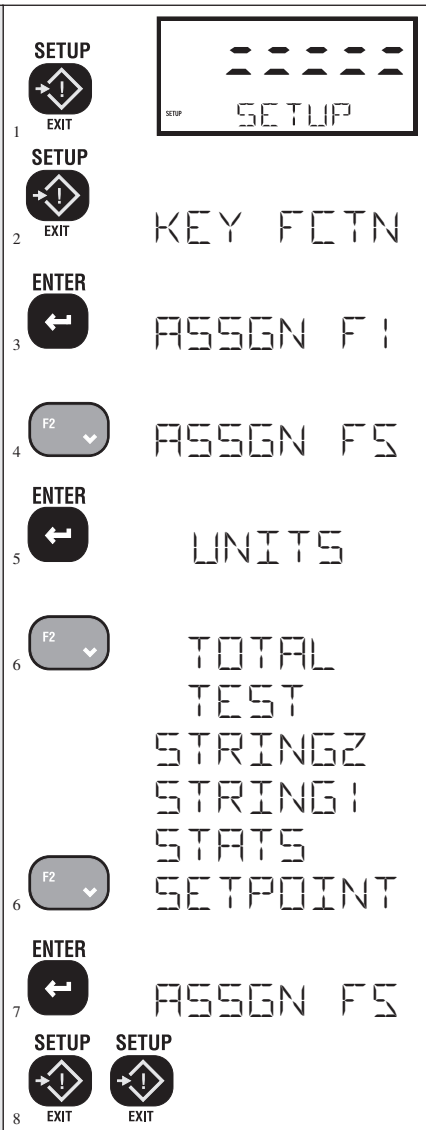
4) Push the DOWN Scroll key to change to "ASSGN F5".

5) Push ENTER. The current Function Key selection is shown.

6) Use the UP/DOWN keys to scroll through all the functions that F5 key can be set to. Stop on "SETPOINT".
If you hold down the scroll key it will start to increment automatically.

7) Push ENTER to assign the SETPOINT function to F2. The display shows the menu item "ASSGN F5".

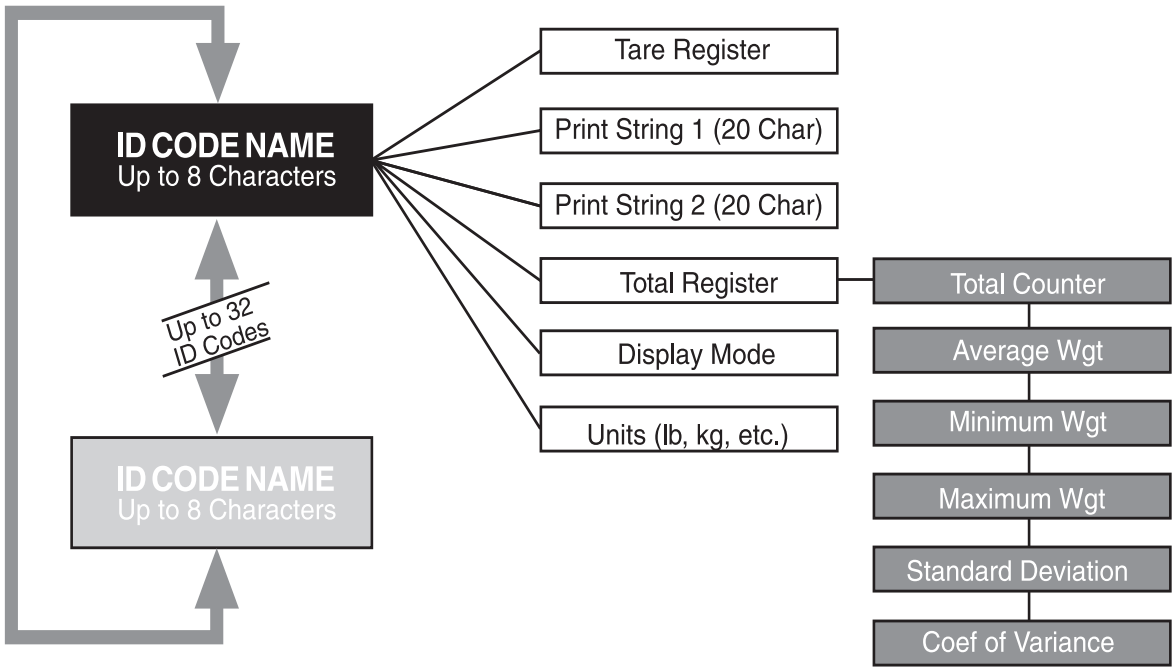
8) Push EXIT (SETUP) twice to return to normal scale operation, or assign another Function key using steps 3-6.



SECTION 5 – ID CODES

- The CellScale can store 32 ID codes. The 3750CS controls which ID Code is in use.
- Each ID Code stores a Tare Value, a Total Value, a weighment counter, display mode (Net, Gross, Peak, etc..), Unit (lb., kg, ton, etc.), and two 20 byte ID code strings. Each ID code also computes and stores statistics of Average, Min., Max., Standard Deviation, and Coefficient of Variance.
- ID Codes are created when a new name is entered by the user. The name can be all numbers, all letters, or a combination of numerals and letters. Once the name is entered by the user, the CellScale scans its memory to see if the ID Code already exists. If it does, all new totaled weighments are added to the previously totaled weighments, and any preexisting Tare value will be used for NET weight computation. If the name did not already exist, the CellScale creates a new ID Code.
- ID Codes are alphabetized when created using the standard ASCII convention.
- The 3750CS provides a way to scroll through all existing ID Codes as an alternate means of selecting an existing ID code.

ID CODE ORGANIZATION



Key Functions during ID Entry

	Used to Initiate ID Code entry. *The location of ID# can be changed with the Function Key Setup procedure.*
	Used to enter characters. If pushed twice Enter also functions as "EXIT and SAVE".
	Pushing the EXIT key will terminate the data entry and cause any changes made to be canceled. "EXIT and don't SAVE".
	The Alpha Key is used to change the data entry from Numeric to Alpha-numeric. The LCD indicates "n" for numeric entry, "U" for upper case Alpha-numeric, and "L" for lower case Alpha-numeric.
	Alpha-numeric Keys. When the Alpha key is in the "n" condition, these keys provide direct numeric digits. When the Alpha key is in the "U" condition, the keys provide the letters and number. For example, the 2 key provides "E", "F", and "2" in rotation. The 9 key provides quick access to the "@" symbol
	Clear. Will erase any character the cursor is positioned on and move the remaining characters to the left. *Pushing CLEAR followed by the LEFT Cursor key will clear the entire data line.*
	Up and Down Scroll keys (numeric mode). Used to scroll through the available character set. Using the Scroll keys can be an alternate to using the Alpha-numeric keys. They provide a convenient way to change, for example, a 1 to a 2.
	Left and Right Cursor Keys. Use to position the cursor under characters to be edited.
	Used to insert characters within a string. Position the cursor over the character you wish to insert in front of, then push the NET/GROSS key. The "highlight" character will appear on the current position. Pressing the DOWN Scroll key will delete the current character. Pressing the UP Scroll key will insert a character.
	In Alpha mode, the space key provides space and punctuation marks: ! " # $ % & ' ( ) * +, – . / : ; < = > ? [\ ] ^ _ ` *Some of the punctuation marks are hard to recognize on the 16 segment display. Use the ASCII chart and the numeric display to verify the identity of the mark.*

General Alpha-numeric Entry Procedure

1) Use the **Aa1** (ALPHA) key to switch between numeric "n", upper case "U", or lower case "L".
2) Press the desired character key. If a "B" is needed, push the **ABC0** key twice.
3) Enter the displayed character by either pushing a different key, or the **ENTER** key. If, for example, two "B"s in a row are needed, use the **ENTER** key.
4) Terminate the character string by pushing **ENTER** twice.

Some lower case characters can not be properly represented on the 16 segment displays. Lower case letters with descenders may be represented with the upper-case equivalent on the LCD. However, when the ID Code is printed or transmitted to a computer, the proper lower case character will be sent. Font Substitutions: "F" for "f", "P" for "p", "X" for "x",

USING ID CODES

To Create a New ID Code (Numeric example)

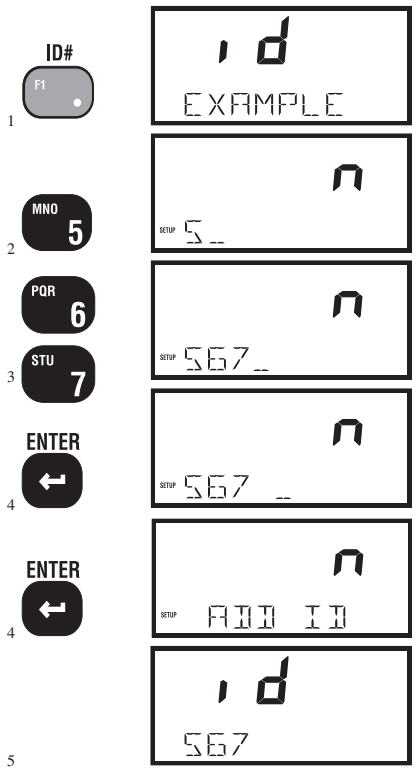
1) Push ID# (usually F1). The current ID is displayed.

2) Push the first digit of the new ID Code. In this example, the ID Code will be "567".

3) Push the second and third numbers.
Note: So far, the Enter key has not been necessary.

4) Push the ENTER key twice to terminate the ID Code entry. The 3750CS pauses while checking its memory for a match. If no match is made the display reads "ADD ID".

5) The new ID Code appears briefly on the screen. Next, the 3750CS returns to normal scale operation with the new ID Code. Any Tare value and new totals will be stored in the new ID Code.



To Create a New ID Code (Alpha example)

1) Push ID#. The current ID is displayed.

2) Push the Aa1 (ALPHA) key to enable the Alphanumeric keys. The right most numeric digit displays a "U" indicating Upper Case. In this example, the ID Code will be "TEST 1a".

3) Enter in the word "TEST". As the "S" and "T" are on the same key, this is a good illustration of how to handle this situation. Push the STU7 key twice to get the "T" to appear.

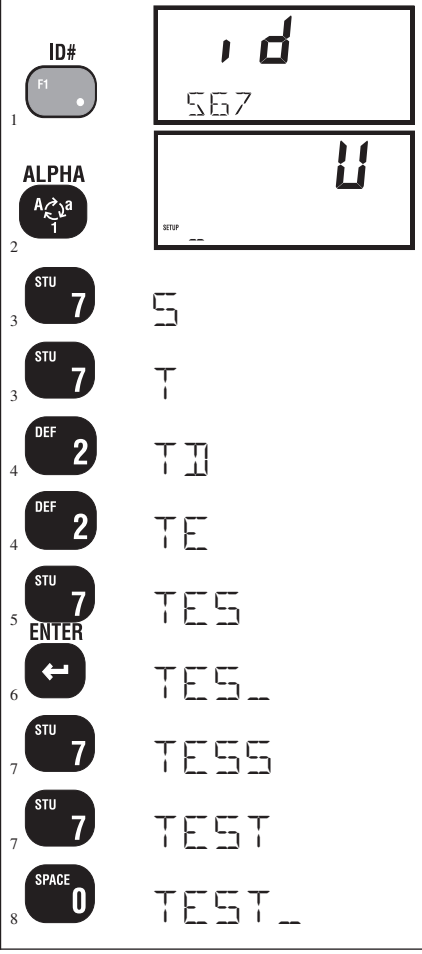
4) Push the DEF2 key twice for an "E".
So far, using the Enter key has not been necessary.

5) Push the STU7 key for an "S".

6) Now, in order to get the next "T" to appear, the ENTER key must be pushed so that the cursor will move on to the next character position.

7) Push the STU7 key twice to get the "T" to appear.

8) Push the SPACE 0 key to input a space.



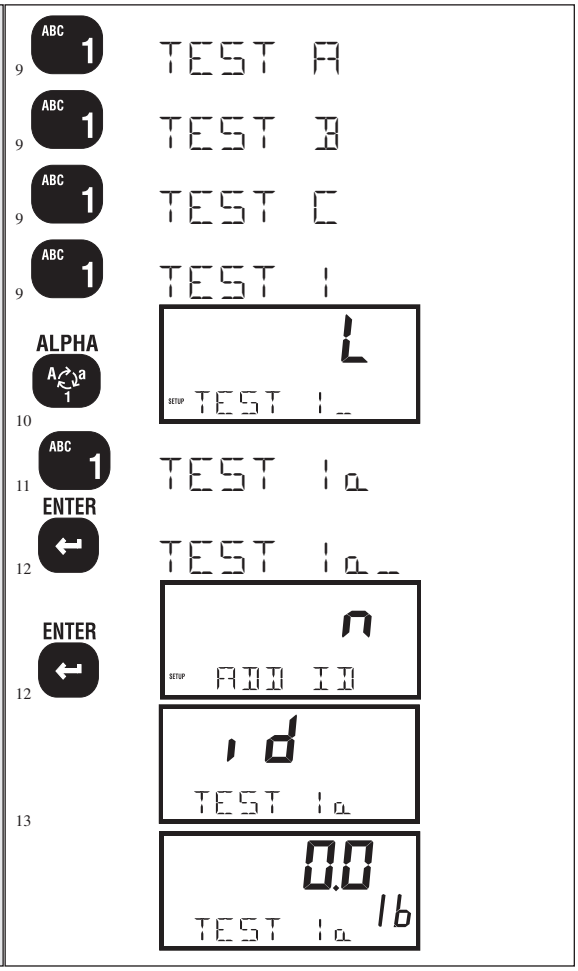
9) Push the ABC1 key four times to get a "1" to appear.
Alternately the Alpha key could be pressed to numeric mode "n" to input a 1.

10) Push the Aa1 (ALPHA) key to change to lower case letters. An "L" will indicate the change.

11) Push the ABC1 key for a lower case "a".

12) Push the ENTER key twice to terminate the ID Code entry. The 3750CS pauses while checking its memory for a match. If no match is made the display reads "ADD ID".

13) The new ID Code appears briefly on the screen. Next, the 3750CS returns to normal scale operation with the new ID Code. Any Tare value and new totals will be stored in the new ID Code.



To Access an Existing ID Code (Numeric only example)
The process of accessing an existing ID Code is identical to the process of creating a new ID Code. When the 3750CS detects an ID Code entry it always checks to see if the Code already exists.

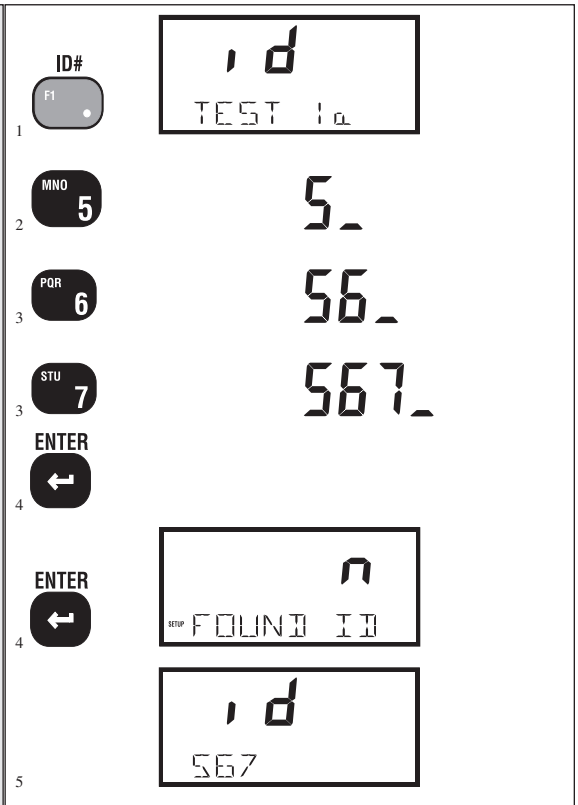
1) Push ID#. The current ID is displayed.
(This example uses F1, can be changed with the Function Key setup procedure).

2) Push the first digit of the new ID Code. In this example, we are searching for the ID Code "567" we used in the earlier example.

3) Push the second and third numbers.
So far, no Enter key has been necessary.

4) Push the ENTER key twice to terminate the ID Code entry. The 3750CS checks its memory for a match. When the match is made the message reads "FOUND ID".
If at this step, the message reads "ADD ID", then the name was not entered the same way it was created. See "Deleting an ID Code".

5) The 3750CS briefly shows the ID number and then returns to normal scale operation. Any Tare value and new totals will be stored in the ID Code "567". Total readings will be added to any existing totals previously stored on ID Code "567".



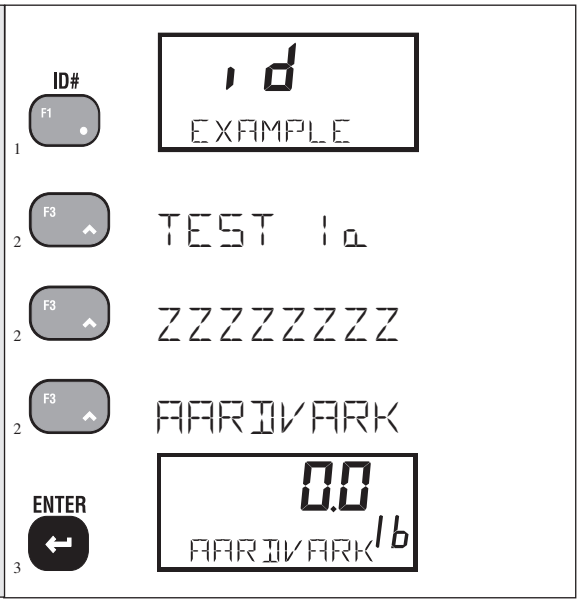
Default ID Code

The 3750CS maintains a default ID Code that functions identically to user entered ID Codes except that no name is required. Any totals taken in the default ID Code are included in the grand total. The best way to recognize that the default code is in operation is that it has no ID Code name. The default ID Code can be given a name using "SETUP ID CODES", but it will not be alphabetized, it will always be first on the list.

Note: The default ID Code is number 1, therefore using the @C command (see section 7) will always start with #2 for user entered ID Codes.

To Scroll through Existing ID Codes

1) Push ID# (Usually F1, can be changed with the Function Key setup procedure). The current ID is displayed.
2) Using the UP or DOWN Scroll key, scroll through the available ID's.
   The UP key progresses forward through the alphabet. The DOWN key back steps alphabetically. The ID# Key will also function as the UP Scroll key.
3) When the desired ID Code appears, push the ENTER key to select the ID Code. The 3750CS returns to normal scale operation with the new ID Code "AARDVARK" (for example) active. Any Tare value and new totals will be stored in the ID Code "AARDVARK".

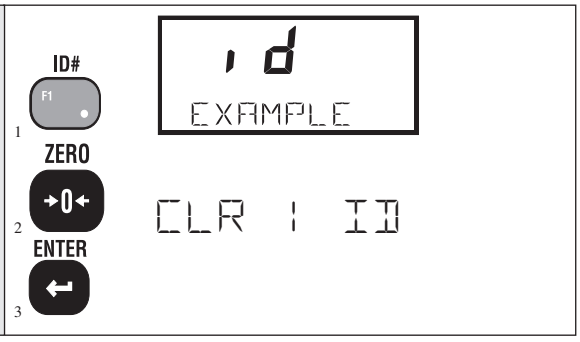


To Delete an ID Code

Note: This procedure will delete the current ID as displayed on the message line. Recall or scroll to the ID Code you wish to delete using either of the two methods detailed previously.

1) Push ID#. The current ID is displayed.
2) Push the CLR key. The message "CLR 1 ID" appears.
3) Push ENTER to delete the ID Code. The previous ID Code is deleted and the next ID Code (alphabetically) will become active.

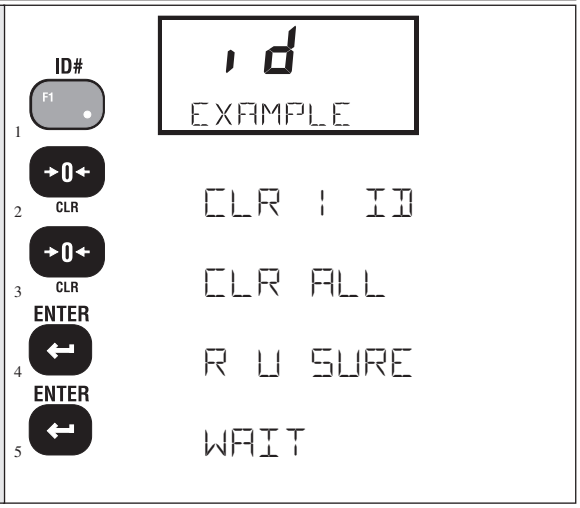
   Push EXIT instead of ENTER to cancel the ID Code delete.



To Delete all ID Codes

The following procedure deletes all existing ID Codes and any totals and statistics stored in them.

1) Push ID# (the Fkey assigned to ID#). The current ID is displayed.
2) Push the CLR key. The message "CLR 1 ID" appears.
3) Push the CLR key again. The message "CLR ALL" appears.
4) Push ENTER to delete all the ID Codes (and Total & Statistics Registers). The 3750CS double checks your intent with an "R U SURE" screen.
5) Push ENTER again to complete the Clear function. It can take a while to clear all the registers. The 3750CS indicates "WAIT" while this is occurring. Once finished deleting, the 3750CS returns to the scale mode with the default ID code activated.

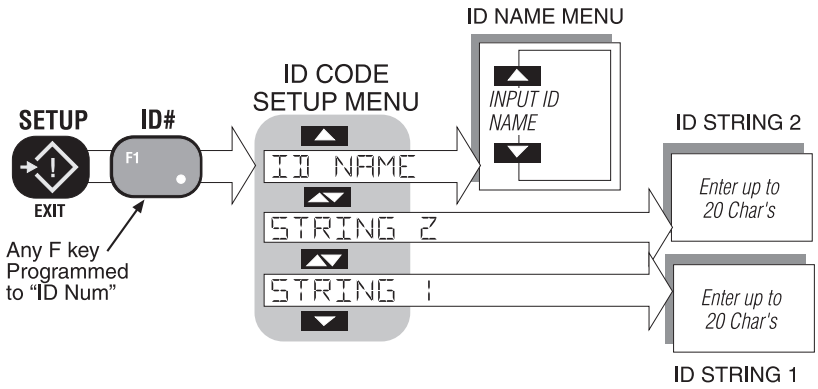


Memory Full

When the CellScales ID Code memory is full this screen appears if you try to enter a new ID Code.	

SETUP ID CODES

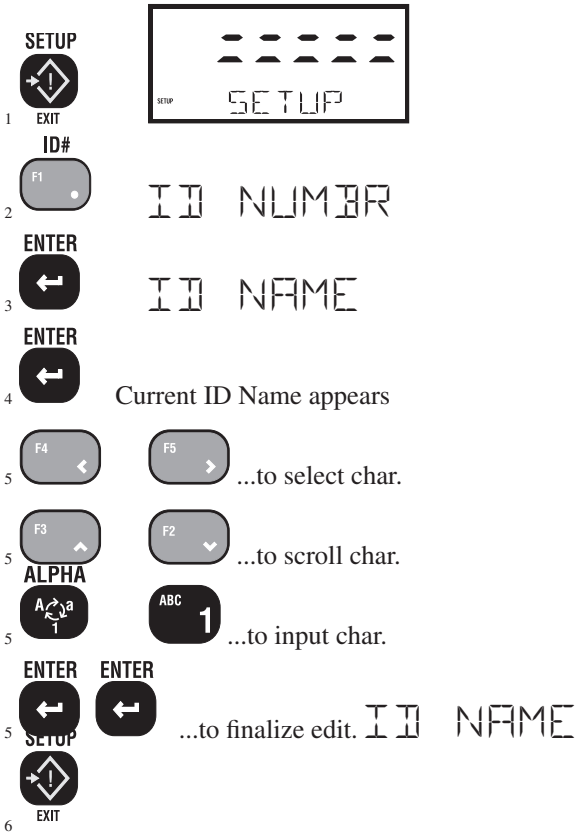
Allows Front Panel setup of ID Codes features. The 8 character ID Name can be edited, two 20 character print strings can be assigned to each ID Code, and the Numeric Display mode can be modified. In addition the display mode for the desired ID code can be changed to a PER CENT reading or the display can be turned off.



ID NAME

The name of each ID Code can be changed as desired using the scroll keys, cursor keys, and the Alpha-numeric keys. This menu item is not used for initial ID Code name entry (see ID CODES). If the name is edited, it may no longer be in alphabetical order.

To Edit the current ID Code Name

1) Push SETUP. 2) Push the ID # key (whatever Fkey ID# is assigned to). The message display reads "ID NUMBR". 3) Press ENTER. The display reads "ID NAME". 4) Push ENTER to go to the edit screen. 5) The message display will show the far left character blinking. Use the LEFT / RIGHT Cursor keys to select the character you wish to edit. Use the UP/DOWN keys or use the standard Alpha-Numeric entry procedure to change the letter(s). When finished editing, push the ENTER key twice. *See "General Alpha-Numeric Character Entry Procedure".* 6) The display reads "ID NAME". Press EXIT to return to normal weighing mode or press UP or DOWN to reach the next selection.	

ID CODE STRING 1 & STRING 2

Each ID code can be further identified with one or two ID Code Strings. A string is simply a set of alphanumeric characters that can be displayed and/or printed. The ID Code Strings differ from the ID Code Name in that they are only used in conjunction with the RS-232 option and can't be displayed on the Message display (except during the text entry process). Each string can be up to 20 characters in length. The MSI "@ codes" can also be embedded in the string which provides an extremely versatile output capability. See Section 7 – Comm Ports, for more details on programming "@ codes".

Use the ID Code Strings to set up a print string that changes with every ID code. Combined with the standard Comm Port print strings, the Code Labels can be used to design a very sophisticated bar code label with three fields that change with every ID Code – the ID Code Name, and ID String 1 and 2.

The entry procedure for ID Code Strings is identical to the Name procedure, except that you are not limited to 8 characters. After the first 8 characters are entered, the letters will scroll to the left.

The Function keys can be programmed to allow one button access to 1 or both ID Strings. This can be used for Operator ID entry, or direct access to the label printer data when the ID string is embedded in the main Comm Port output.

To Add or Edit an ID Code String

Select the ID Code you wish using the procedure "To Access an Existing ID Code" (page 41)

1) Push SETUP.

2) Push the ID # key. The message reads "ID NUMBR"

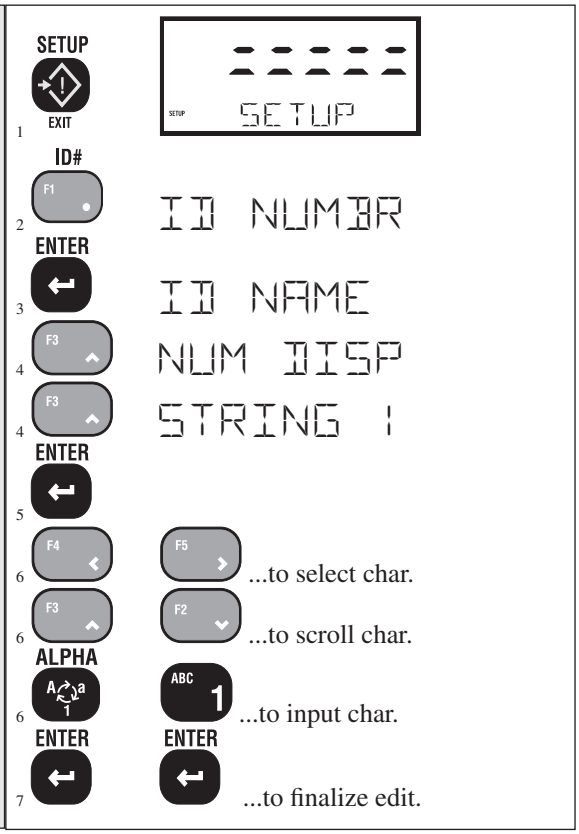
3) Push ENTER to access the menus.

4) Use the UP key to find the desired ID Code String ("STRING 1" or "STRING 2").

5) Push ENTER. The current string (if any) will be displayed.

6) The message display will show the far left character blinking. Use the LEFT / RIGHT Cursor keys to select the character you wish to edit. Use the UP/DOWN keys or use the standard Alpha-Numeric entry procedure to change the letter(s). When finished, push the ENTER key twice. (See "General Alpha-Numeric Character Entry Procedure")

The characters will scroll left or right when the string is larger than 8 characters. Use the LEFT or RIGHT cursor keys to maneuver through the string.



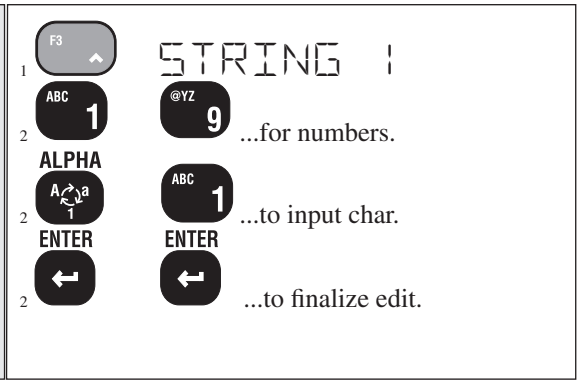
To Access the ID Code Strings with the FUNCTION keys

For this procedure to function, a FUNCTION key must be programmed for "STRING 1" and/or "STRING 2". The key(s) used for this purpose can be labeled to suit your needs (e.g. "CUSTOMER" or 'OPERATOR", etc.) See Section 4– FUNCTION KEY PROGRAMMING for details.

1) Push the FUNCTION key once to access a STRING. The current string (if previously entered) will display. F3 shown for example only. Use the key you programmed for the STRING entry.

2) The current string is displayed. Use the UP/DOWN keys to enter characters. Push ENTER when the desired character is displayed. Use the LEFT and RIGHT cursor keys to move the cursor to allow editing the String. When finished, push the ENTER key twice.

See "General Alpha-Numeric Character Entry Procedure".



SECTION 6 – TOTAL / STATISTICS

TOTAL

- The 3750CS can add independent weighments together and keep a counter of how many weighments were added (Totaled). The Weighments counter can be thought of as a box or palette counter.
- "TOTAL" always uses the displayed weight, so gross and net readings can be added into the same total.
- There are two modes of Totaling which are set in the SETUP TOTAL section. The Manual mode uses the **TOTAL** key to add the current weight to the previously totaled value. The Auto mode will automatically add the last, settled value to the total (or optionally the highest value). See "SETUP TOTAL" for instructions to enable the AUTO TOTAL modes.
- Both modes have a means to prevent the same load from totaling twice. Once totaled, the load must be removed from the scale before a new load can be added to the Total. Applied weight must be greater than the Total Threshold before it can be totaled. See "SETUP TOTAL" for instructions on how to set the Total Threshold.

To Total with the TOTAL Key
(Unit must be setup to Manual Total mode)

Place the weight to be totaled on the scale. When the weight has stabilized, push the TOTAL Key (usually F3). The current weight is added to the total register. The display gives an indication of how many weighments have been totaled. i.e. 1 TOTAL, 2 TOTAL, …x TOTAL.	

Rules for use:

1) The motion annunciator must be off, the scale must be stable unless motion is disabled in the Setup Total menu.
2) Only positive readings can be accumulated.
3) The scale adds the current reading (relative to the Net zero or Gross zero depending on mode) to the contents of the accumulate register.
4) After a weighment is totaled, the weight must go below the Total Threshold before another weight can be added to the total. This assures that a weight on the scale is only added to the total once.
5) When the total weight exceeds the display capability of 999,999 counts, or the total weighments count exceeds 9999, dashes will appear to reflect a display overflow. The larger numbers can be printed through the use of the PRINT button, or with a computer hookup.

AUTO TOTAL

SETUP Option, see "SETUP TOTAL" to enable Auto Total.

When the weight exceeds the Total Threshold the total function operates automatically.

There are 5 modes of Auto Total. Each mode is used in slightly different ways.

Mode 1, Autonorm: The displayed weight is held in a holding register and added when the weight returns below the Total Threshold. When a weight settles (no motion), the Total LED indicator will flash three times. If the weight changes to a new settled value the LED will flash again indicating that the previous settled reading has been replaced. The last settled reading is what will be used for totaling when the scale returns below the Total Threshold. The user must make sure that while removing the load the scale does not stabilize enough for a new reading or an erroneous weighment addition could occur. The last settled weight is actually added to the total when the scale returns to below the Total Threshold.

Mode 2, Autopeak: The "AUTOPEAK" total mode works the same as Autonorm, except that the highest settled reading will be used for totaling on return to zero, rather than the last settled reading.

Mode 3, Autoload: Autoload totals the applied weight as soon as the weight is stable (Motion Indicator off). Additional weight cannot be totaled until the weight drops below the Total Threshold

Mode 4, Loaddrop: The "LOADDROP" mode uses an external push button to start the total process. The operator pushes the button when the weight he wants to total is on the scale. After pushing the button, the CellScale starts a long term average of the current weight that ends when the weight is dropped. This method is designed for commodity weighing of scrap metal, or other types of materials that are loaded into rail cars,

trucks, hoppers, etc., usually with a crane.

Mode 5, Onaccept: In conjunction with target weights set up in the set points menus, the Onaccept total mode will automatically total settled readings that fall within the preselected accept weight window. See Section 8 "Set Points" for information on setting accept limits.

Auto Total Operation

1) Enable the desired Auto Total mode in the "SETUP TOTAL" menu (see "SETUP TOTAL"). Select either the "AUTONORM" or the "AUTOPEAK" mode. Exit from the setup menu.
2) Use the **TOTAL** key to disable ("TOTALOFF") or enable ("TOTAL ON") Auto Total.
3) Place the weight to be totaled on the scale. The Total LED will flash three or more times when the weight is settled. In high speed operations it is not necessary to wait for the three flashes. The total is accepted when the first flash appears.
4) Remove the weight. The screen will read "x TOTAL" where x is the number of totaled weighments.

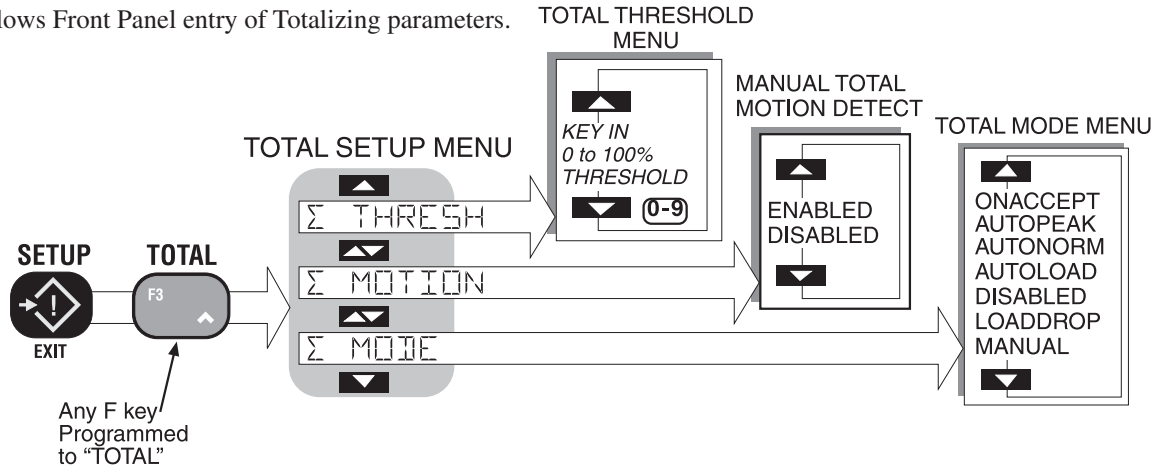
The total key is used as a Total On, Total Off, toggle key which is indicated briefly on the message display (i.e. "TOTAL ON" or "TOTAL OFF"). Auto Totaling will only occur in the TOTAL ON mode. The Auto Total On mode is indicated by an "AUTO Σ" annunciator on the LCD. This feature allows the user to turn off Auto Total for periods in which the scale needs to be used without adding to the total. Turning the Auto Total off does not erase the current total. See "To Clear the Total Value" to learn how to erase the Total.

Rules for Auto Total:

1) Cannot be in motion. An auto total acceptable reading is indicated by three or more short flashes of the Total LED.
2) Weight readings must be greater than the set Total Threshold.
3) Each reading added to total must be preceded by a return to zero (Net or Gross) or below the Total Threshold.

TOTAL MENU (SETUP TOTAL)

Allows Front Panel entry of Totalizing parameters.



Σ MODE

The Manual mode requires that the **TOTAL** key is pushed when the weight currently on the scale should be added to the previously accumulated value. See description on previous page of the 7 total modes.

Σ MOTION

Enables or disables Motion Detection for Manual Total. Has no effect on AUTOTOTAL. This menu item controls whether the scale has to be out of motion before it will total. In certain high vibration applications it is sometimes desirable to turn off the motion detect so that Totalizing can occur. This feature is disabled for legal-for-trade systems.

Σ THRESHOLD

Sets the weight value above which Totalizing is allowed. For example, setting the threshold to 10% on a 200 kg scale will set the threshold at 20 kg. Only weight above 20 kg will add to the Total. Once totaled, the weight must return below the Total Threshold to enable the next totalizing. This prevents the same weight from being totaled twice.

Another example: On a scale with a capacity of 1000 kg the user desires to Auto Total all weight that exceeds 50 kg. Since 50 kg is 5% of 1000 kg, the Total Threshold is set to 5%. The Threshold is entered in 1% increments.

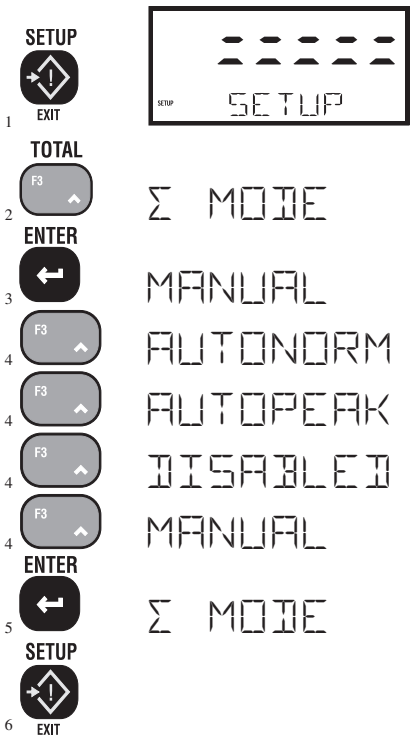
To Set the Total Mode

The following example assumes the F3 function key is programmed to "TOTAL". If the TOTAL key has been moved to a different "F" key use that key for the following procedure.

1) Push SETUP.
2) Push the TOTAL switch (usually F3).
3) Push ENTER. The first menu choice is "MANUAL" (or the last set mode). In this example, we'll enable the "AUTONORM" mode.
4) Push the UP or DOWN key to scroll through the Total Mode options.

   Shown here are all the Total Mode Options to illustrate how the menu structure works. It is not necessary to go through all options.

5) When the desired choice is displayed, push ENTER. The ENTER key should be pushed after the LCD indicates "AUTONORM".
6) Push the EXIT key to return to normal scale operation. Auto Total is now enabled. The small "AUTO Σ" annunciator will appear.



To Turn On or Off Auto Total

Turn on Auto Totaling by pushing the TOTAL key. The display will read "TOTAL ON" and the small "AUTO Σ" annunciator will appear.

Return to Auto Total operation.

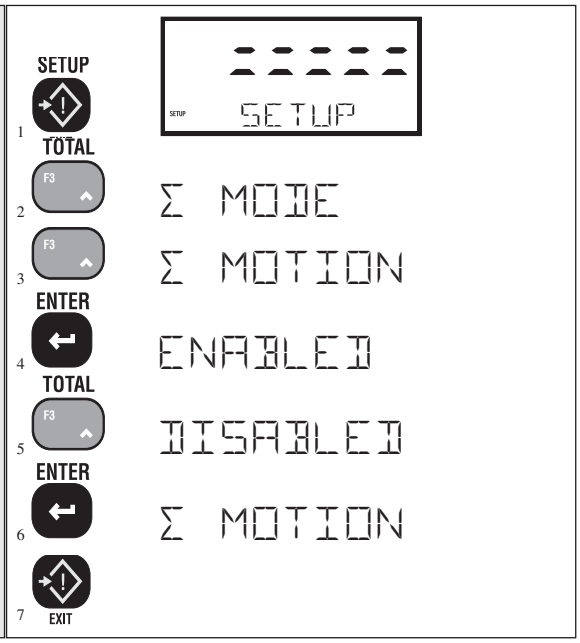
Turn off Auto Totaling by pushing the TOTAL key. The display will read "TOTALOFF" and the small "AUTO Σ" annunciator will disappear.

To Set the Total Threshold

1) Push SETUP.
2) Push the TOTAL switch (usually F3). The menu choice "Σ MODE" appears.
3) Push the DOWN key to the menu choice "Σ THRESH".
4) Push ENTER. The first menu choice is "MANUAL" (or the last set mode). In this example, we'll enable the "AUTONORM" mode.
5) Use the numeric keys to input the desired threshold in per cent. In this example we'll enter 5%.
6) Set the new Total Threshold by pushing ENTER.
7) Push the EXIT key to return to normal scale operation. Auto Total is now enabled. The small "AUTO Σ" annunciator will appear.

To Enable/Disable Total Motion Detect

1) Push SETUP.
2) Push the TOTAL switch (usually F3). The menu choice "Σ MODE" appears.
3) Push the UP key to the menu choice "Σ MOTION".
4) Push ENTER. The message display shows "ENABLED" or "DISABLED".
5) Toggle the motion condition with the UP or DOWN key.
   ENABLED means totals will not function until the weight has settled. DISABLED indicates that motion conditions are ignored.
6) Set the new Total Motion condition by pushing ENTER.
7) Push the EXIT key to return to normal scale operation.



VIEW TOTAL

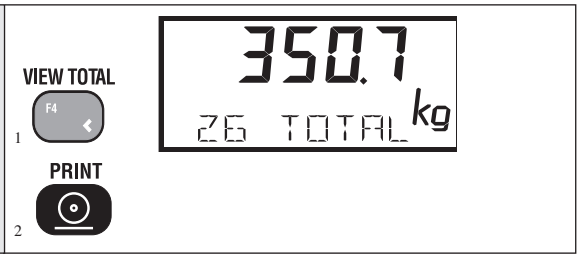
Displays the current Total value of the selected ID and allows the total(s) to be cleared.
The following examples assume the F4 function key is programmed to "VIEW TOTAL". If the VIEW TOTAL key has been moved to a different F key use that key for the following procedure.

To Display the Current ID#'s Totaled Weight

Push VIEW TOTAL (Usually F4). The numeric display shows the accumulated weight. The message display indicates the number of weighments in the Total. This screen will remain for 4 seconds.

To Print the Current ID#'s Totaled Weight

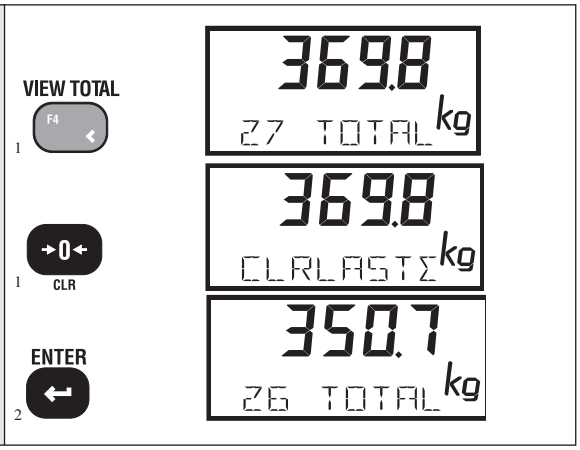
1) Push **VIEW TOTAL** (usually F4) followed quickly by the (2) PRINT key. Just the Total and number of samples of the current ID will print.



To Erase the last Totaled Weight
If the last totaled (automatic or manual) weighment was a mistake, it can be erased with the following procedure. This erases only the last weighed value.

1) Push VIEW TOTAL (Usually F4) followed immediately by CLR (ZERO).
   The display reads "CLRLASTΣ".
2) Press ENTER. The last weight totaled is subtracted and the number of weighments counter is reduced by one.

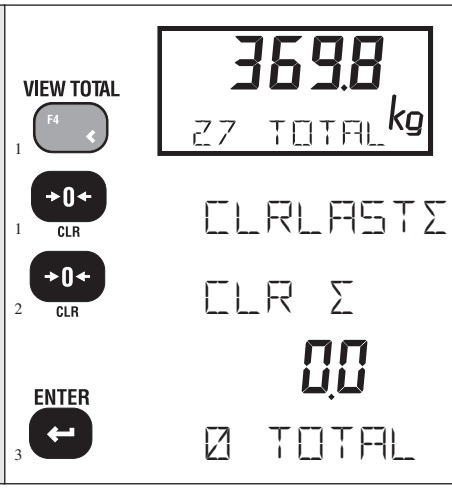
   If you change your mind, push EXIT to cancel the Clear Last Total operation.



To Clear the Total Value (Current ID Code only)

*Note: At any time during the following procedure the **EXIT** key cancels the Clear operation.*

1) Push VIEW TOTAL (Usually F4) followed immediately by CLR (ZERO). The display reads "CLR-LAST∑".
   If no weighment has been totaled since the scale was turned on or since the ID was changed, the "CLRLAST∑" screen is skipped.
2) Press CLR again. The message reads "CLR ∑".
3) Press ENTER. The Total weight and weighments counter will reset to 0.



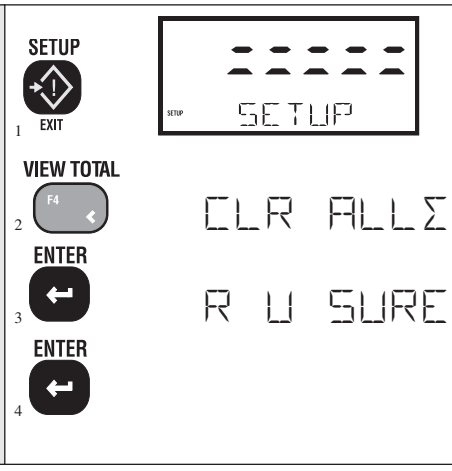
CLEAR ALL TOTALS

Allows Clearing all totals (and Statistics registers) on all ID codes at once.

This procedure deletes every totaled weighment in every ID code. Please make sure all data is recorded as necessary before proceeding.

To Clear All the Totals of all ID Codes at once.

1) Push SETUP.
2) Push the VIEW TOTAL switch (usually F4). The menu choice "CLR ALL∑" appears.
3) Push ENTER to clear all the Total and statistics registers. The 3750CS double checks with a "R U SURE" query.
4) Complete the erasure of all total registers by pushing ENTER again.



ALTERNATE CLEAR TOTAL METHODS

The 3750CS offers two alternative methods for clearing the totals. These are set up using the Function keys (see section 4). "1KEYCLR" will clear the current IDs Total without further confirmation. The "2KEYCLR" mode requires confirmation by asking "R U SURE?". Then the user must push "ENTER" to complete the clear total operation, or push any other key to cancel clearing the Total.

STATISTICS

Statistics works in conjunction with the Total function and adds MIN, MAX, Average, Standard Deviation, and Coefficient of Variance. All these computations are kept for every ID Code independently. The number of samples that statistics can be calculated for is limited only by memory requirements and will vary from a few thousand to >100000 samples. Individual samples are not stored. If needed, individual samples can be logged through either RS-232 port using the "PRINT on TOTAL" function.

A "GRAND TOTAL" function is also included with the Statistics function. The Grand Total adds all the weight in all the ID Codes and provides the following information: GRAND TOTAL, Number of Totals, and the Overall Average (GRAND TOTAL divided by Number of Totals).

Statistics are accessed in either of two ways: 1) Program a Function Key to be "STATS". Unlike the 3750 standard meter, the 3750CS is incapable of displaying the statistics registers on its LCD. Pushing an F key programmed for the "STATS" function causes an immediate printout of all the statistics to the 3750CS Comm Port. 2) The statistic registers can be accessed with a computer or terminal through an RS-232 either connected to the 3750CS or to the CellScale using host commands.

Definitions and Formulas

AVERAGE – is computed by dividing the total by the number of samples.

MIN – is a single weight register that records the minimum weighment that was added to the total.

MAX– is a single weight register that records the maximum weighment that was added to the total.

STANDARD DEVIATION – is a measure of how widely values are dispersed from the average value (the mean). The 3750CS uses the "non-biased" or "n-1" method that is based on sampling a portion of each available weighment. Standard Deviation uses the following formula where x is equal to the total, and n is equal to the number of samples:

$$\sqrt{\frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}}$$

COEFFICIENT OF VARIANCE – is a relative dispersion calculated from the sample standard deviation and the mean with the following formula:

$$\frac{100(StdDev)}{Average}\ \%$$

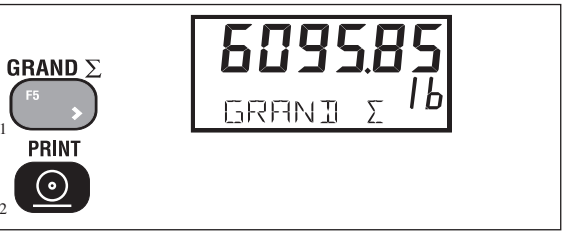
GRAND TOTAL – is computed by adding together the totals of all the ID Codes (adjusted to the default unit set in calibration if necessary).

GRAND AVERAGE – is computed by dividing the Grand Total by the number of samples of all the ID Codes.

To Print the Statistics Registers (All active IDs)
This procedure assumes a Function key is programmed to "STATS".

1) Push STATS (the F key programmed to Stats). 2) The display indicates Printing.	

To Display and Print the Grand Total (All active IDs)
This procedure assumes a Function key is programmed to "GRAND TOTAL".

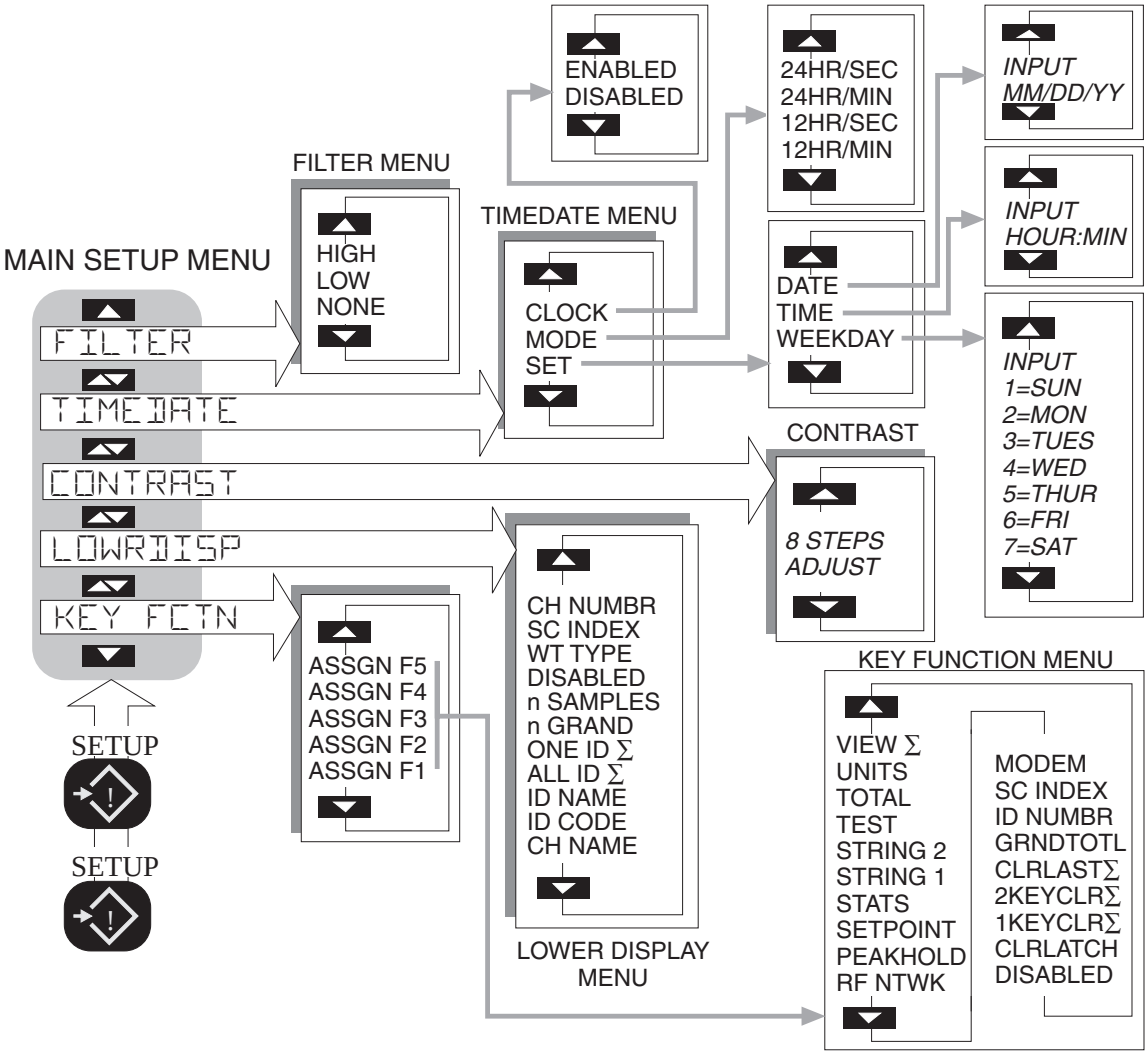
1) Push GRAND TOTAL. Displayed is the Grand Total obtained by adding the totals of all ID Codes. 2) (Optional) Push PRINT. The Grand Total and Grand # of samples will output to CommPort 1.	

SECTION 7 – 3750CS METER SETUP

MAIN SETUP MENU

Allows the user to set the A/D filter, the display contrast, the Time and Date, the Lower Display mode, and program the Function keys *(see section 4 for information on programming the function keys)*. Setup Functions are organized into Menus. You navigate through the menus using the **UP** or **DOWN** Scroll keys. You select menu items using the **ENTER** key. Pushing the **EXIT** key will step back one menu level at a time and is used to return to normal scale operation. Using the **EXIT** key at the Selection level voids any change in the active menu.

Not all the selections above are activated on every MSI 3750CS. Legal-for-trade issues and application issues require certain menu items to be under the Calibrate menu (under seal, see calibration section), and certain items to be disabled. Any or all menu items can be eliminated under software control (contact factory for details).



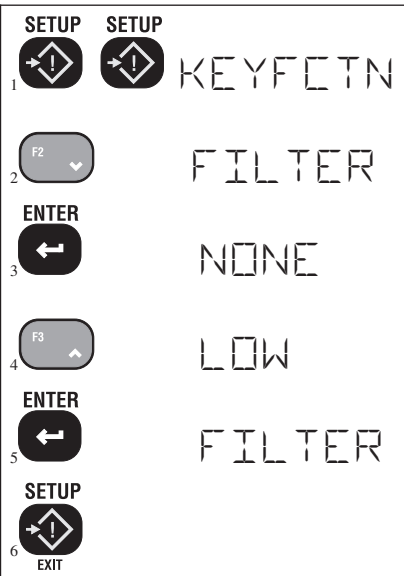
FILTER

Use the LOW setting for most scale applications. It settles fastest and is intended for general use. Use the MEDIUM setting when the scale is being used under conditions that cause light to medium swinging. Use the HIGH setting when there is a lot of scale motion or vibration. There is a time penalty to pay for using the HIGH setting. The user should wait at least 5 seconds to ensure that the final reading has settled (Motion indicator off).

Not available in some legal-for-trade systems

To Change the Filter Setting

1) Push SETUP twice. The message reads "KEY FCTN".
2) Push the DOWN scroll key to change the menu selection to "FILTER".
3) Push ENTER. The current setting for the filter is shown.
4) Select the "NONE", "LOW", or "HIGH" filter by using the UP/DOWN keys to scroll through the choices. In this example, we'll pick the LOW filter which is suitable to low to medium vibration situations.
5) Push ENTER.
6) You are back in the SETUP menu. Return to normal scale operation (LOW Filter on) by pushing EXIT (SETUP).

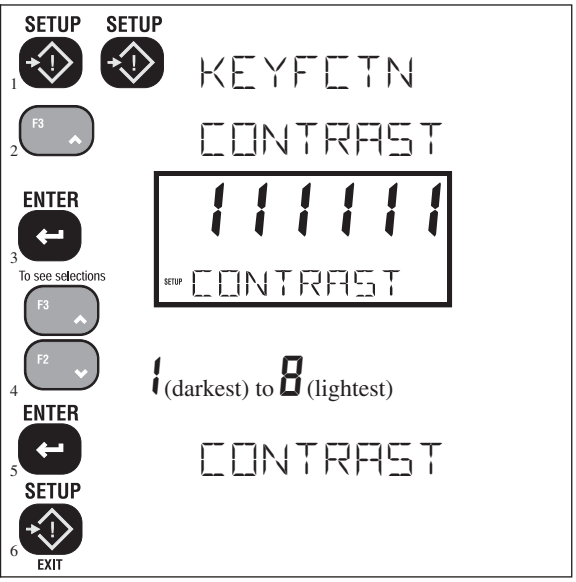


CONTRAST

Used to optimize the contrast of the LCD at various viewing angles. This is factory preset for optimal viewing. By stepping through the 8 steps the contrast can be improved for off-angle or temperature extreme applications. If the display is ghosting (off segments are visible), use a lower setting such as 1-4. If the display is too dim, use a higher setting such as 5-8.

To Adjust the LCD Contrast

1) Push SETUP twice. The message reads "KEY FCTN".
2) Push the UP scroll key until the menu selection is "CONTRAST".
3) Push ENTER. The current setting for the contrast is shown.
4) Adjust the contrast by pushing the UP or DOWN key. Observe the display from the angle it is normally used. Adjust the contrast just to the point where there is no ghosting of the unlit segments.
5) Push ENTER.
6) You are back in the SETUP menu. Return to normal scale operation by pushing EXIT (SETUP).



Lower Display Mode

The 3750CS has an eight character lower display that is customized through the use of this setup menu. There are eleven data types available for display:

1) LC NAME – This is a name assigned in the CellScale for the selected load cell channel.
2) ID CODE – Displays the current ID Code's number (see "Setup ID Codes").
3) ID NAME – Displays the current ID Code's name.
4) ALL ID ∑– Displays the grand total of all active ID Codes (see Statistics).
5) ONE ID ∑ – Displays the total of current ID Code.
6) n GRAND – Displays the number of totaled weighments of all ID Codes.
7) n SAMPLES – Displays the number of totaled weighments for the current ID Code.
8) DISABLED – The lower display is blank, except for transient messages.
9) WT TYPE – Displays "GROSS" or "NET" and other weigh mode types.
10) SC INDEX – Displays the Scale index, used in multichannel CellScale systems.
11) LC NUMBER - Displays the A/D channel and sub channel of the currently addressed CellScale.

To Setup the Lower Display Mode

1) Push SETUP twice. The message reads “KEY FCTN”.

2) Push the UP scroll key until the menu selection is “LOWRDISP”.

3) Push ENTER. The current setting for the lower display is shown.

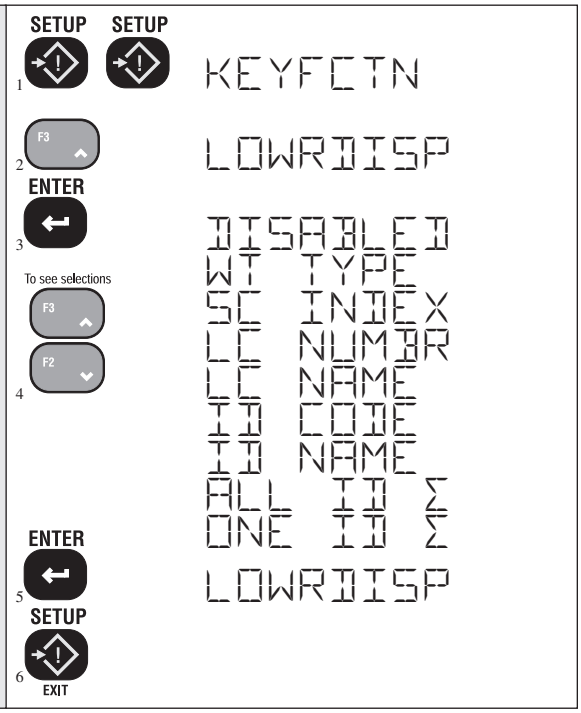
   In this example, the lower display was disabled.

4) Select the lower display mode by pushing the UP or DOWN key. Shown is the order using the UP key.

   For demonstration purposes, we’ll select “ONE ID Σ” which will display the total weight of the current ID.

5) When the desired lower display mod is shown, push ENTER.

6) You are back in the SETUP menu. Return to normal scale operation by pushing EXIT (SETUP).



REAL TIME CLOCK / CALENDAR

A clock / calendar for full time and date stamping is installed with the RS-232 option. The Clock can be set to automate weighing functions to time and date. When the scale is not being used, a digital clock display can be enabled. The Real Time Clock / Calendar is adjusted in the Setup Menu.

The Real Time Clock/Calendar is not synchronized with the CellScale. Both locations must be set independently.

To Set the Time and Date

1) Push SETUP twice. The message reads “KEY FCTN”.

2) Push the DOWN scroll key until the menu selection is “TIMEDATE”.

3) Push ENTER. The menu reads “SET”.

4) Push ENTER. The message reads “TIME”.

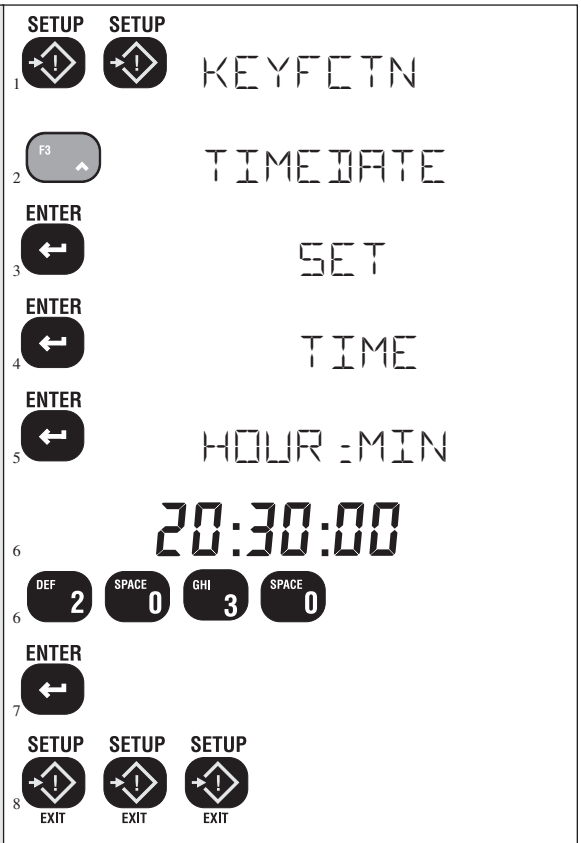
5) Push ENTER. The message reads “HOUR:MIN”. The current set time is displayed on the numeric digits.

6) Input the hours and minutes in 24 hour mode with the numeric keys. The seconds field is fixed at 00. In this example we’ll push 2, 0, 3 key 0 key to input 20:30 hours (8:30 PM).

   To Sync the 3750CS Clock with an external clock push ENTER precisely at the 00 second point. The 3750 Real Time Clock can also be sync’d to the second if set through the Comm Port by computer.

7) When the proper time is displayed, push ENTER. You are back in the Set Sub-menu.

8) Push EXIT twice to return to the TIMEDATE submenu. Push EXIT again to return to normal scale operation.



Follow a similar procedure for the Date entry. The Date is entered in the order MM DD YY. When finished setting all the Clock / Calendar parameters, push EXIT three times to return to normal scale operation.

The week day is entered with the UP/DOWN keys. Use 01 for Sunday, 02 for Monday, 03 for Tuesday, 04 for Wednesday, 05 for Thursday, 06 for Friday, and 07 for Saturday.

MODE

The MODE sets the display mode of the real-time Clock when the clock is enabled. Select "12HR/MIN" to display the time in 12 hour format with hours, minutes, and a PM indication. Select "12HR/SEC" to display the time in 12 hour format with hours, minutes, seconds, and a PM indication. Select "24HR/MIN" for 24 hour indication with hours and minutes. Select "24HR/SEC" for 24 hour indication with hours, minutes, and seconds.

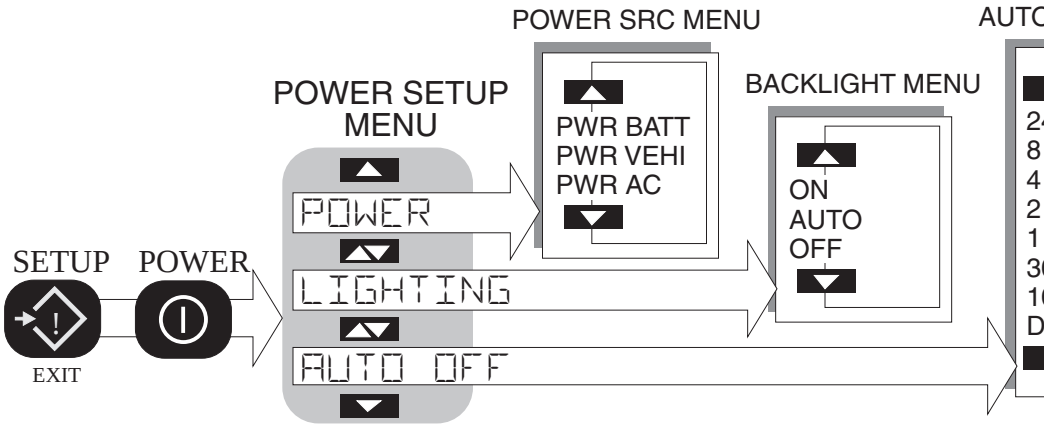
CLOCK

Select "ENABLED" to turn the scale into a clock calendar when the power is not on. The Micro-processor wakes up to update the display either every minute or every second depending on the mode selected. The processor will also check for activity on the Comm Ports to see if a Power up command is received. Therefore to achieve no worse than a 1 second turn on, set the mode to the 12HR/SEC or the 24HR/SEC selection. The mode has no effect on the power switch.

Operating the Clock from a battery powered MSI 3750CS has very little effect on battery life. The LCD and LCD drivers use only minimal power. The µP is only awake long enough to update the LCD so its average power consumption is small. Using the /MIN mode selections minimizes the µP power drain.

SETUP POWER MENU

Allows Front Panel entry of seldom set parameters involving power consumption.



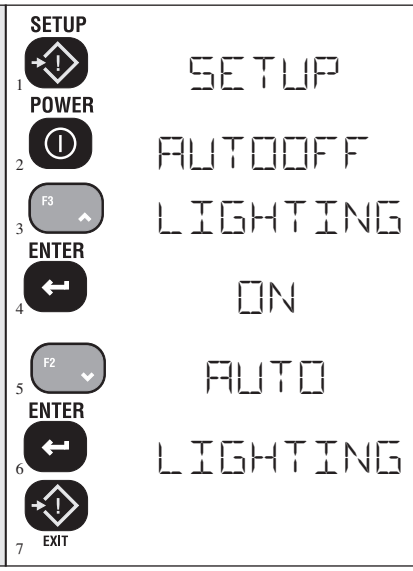
AUTO OFF

The AUTO OFF feature when enabled prolongs the battery life of the scale by turning the power off after a set time of non use. Depressing any key, or any change in the detected weight will reset the time limit . This feature defaults to the disabled mode when initially calibrated. When disabled the scale will stay on, only the power key (or Remote) will turn it off.

LIGHTING

A photocell detects ambient light and determines if the backlight should be on or off (AUTO mode). The "ON" mode turns the backlight on full time. For decreased power drain, the "OFF" mode disables the backlight.

To Turn on the Backlight

1) Push SETUP. 2) Push the POWER key. The first submenu "AUTOOFF" appears. 3) Push the UP key. The submenu reads "LIGHTING". 4) Push ENTER. The message shows the current LIGHTING setting. *In this example, we'll change the lighting from "ON" to "AUTO".* 5) Use the DOWN scroll key to change to "AUTO". 6) Push ENTER to set the LIGHTING mode and leave the submenu. 7) Push EXIT to return to normal scale operation.	

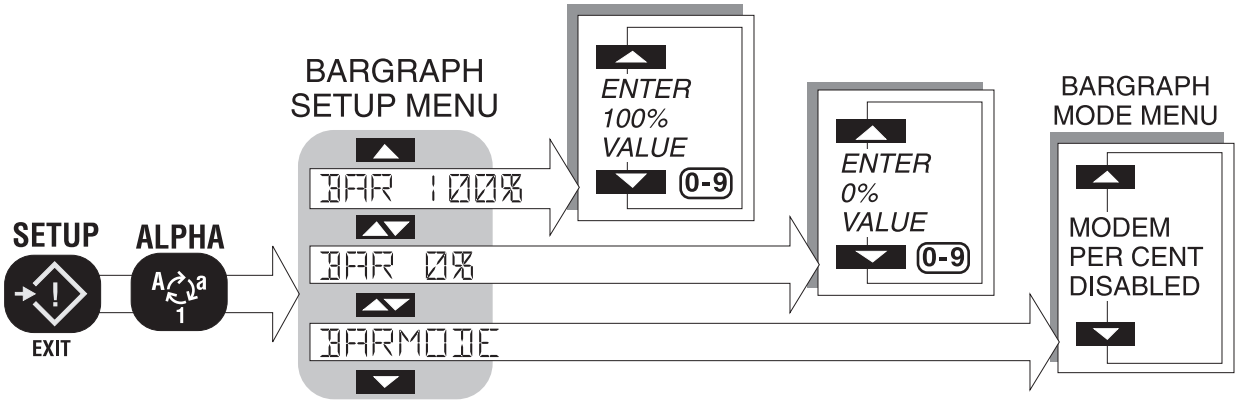
BAR GRAPH MENU

Controls the operation and calibration of the Bar graph. The Bar graph is used to monitor the RF network activity, or the bar graph can indicate relative weight. In conjunction with the "NUM DISP" setup mode, the BAR 0% and BAR 100% setting also control the numeric display PER CENT parameters. The 0% and 100% points of the bar graph can be set to any weight within the capacity of the scale. Normally a lower weight is set for the 0% value. If desired, the 0% point can be set to a higher value than the 100% point if pour down or similar applications dictate.

The BARMODE menu has three settings:

1) MODEM – Monitors the RF activity. Each segment represents successful packet transmissions. When the Bar graph starts to shorten, multiple retries of packet transmissions are failing. This will happen when the signal is blocked or nearly out of range.
2) PER CENT – The Bar graph represents a user programmed span of the weight reading. The 100% and 0% settings are programmable anywhere within the capacity of the scale.
3) DISABLED – Turns off the Bar graph.

The 3750CS defaults to the MODEM setting of the Bar graph. The following procedure shows how to set up the Bar graph for PER CENT operation.



To Set Up Bar graph Per Cent Operation

1) Push SETUP.	1 SETUP → SETUP
2) Push the ALPHA key. The Menu reads “BAR MODE”.	2 ALPHA → BAR MODE
3) Push ENTER. The menu item will be the current Bar graph Mode (defaults to “MODEM”).	3 ENTER → MODEM
4) Push the UP key until the message reads “PER CENT”. (How many times you push the UP key is dependent on the last mode set.).	4 F3 → PERCENT
5) Push ENTER.	5 ENTER → BAR MODE
6) Next, using the UP key, scroll to the “BAR 0%” menu.	6 F3 → BAR 0%
7) Push ENTER. The message display indicates “WEIGHT” and the numeric display shows the current 0% value (defaults to 0).	7 ENTER → WEIGHT
8) Using the numeric keys enter the value that you want to equal 0% on the bar graph. In this example we’ll key in 10 kg (or whatever units the scale is in) as 0%.	8 ABC 1 → 1_ 8 SPACE 0 → 10_
9) Push ENTER.	9 ENTER → BAR 0%
10) Use the UP key to scroll to the “BAR 100%” selection.	10 F3 → BAR 100%
11) Push ENTER.	11 ENTER → WEIGHT
12) Using the numeric keys enter the value that you want to equal 100% on the bar graph. In this example we’ll enter 20 kg as 100%.	12 DEF 2 → 2_ 12 SPACE 0 → 20_
13) Push ENTER ... back to the MENU level.	13 ENTER → BAR 100%
14) Push the EXIT (SETUP) key to return to normal scale operation. The Bar graph is now activated. The 0% segment is equal to 10 kg, the 100% segment is equal to 20 kg.	14 EXIT

Bargraph Resolution

The bargraph has 20 segments plus under range and over range arrows. Each segment is equal to a span of 5%. To calculate the resolution of each segment use the following formula:

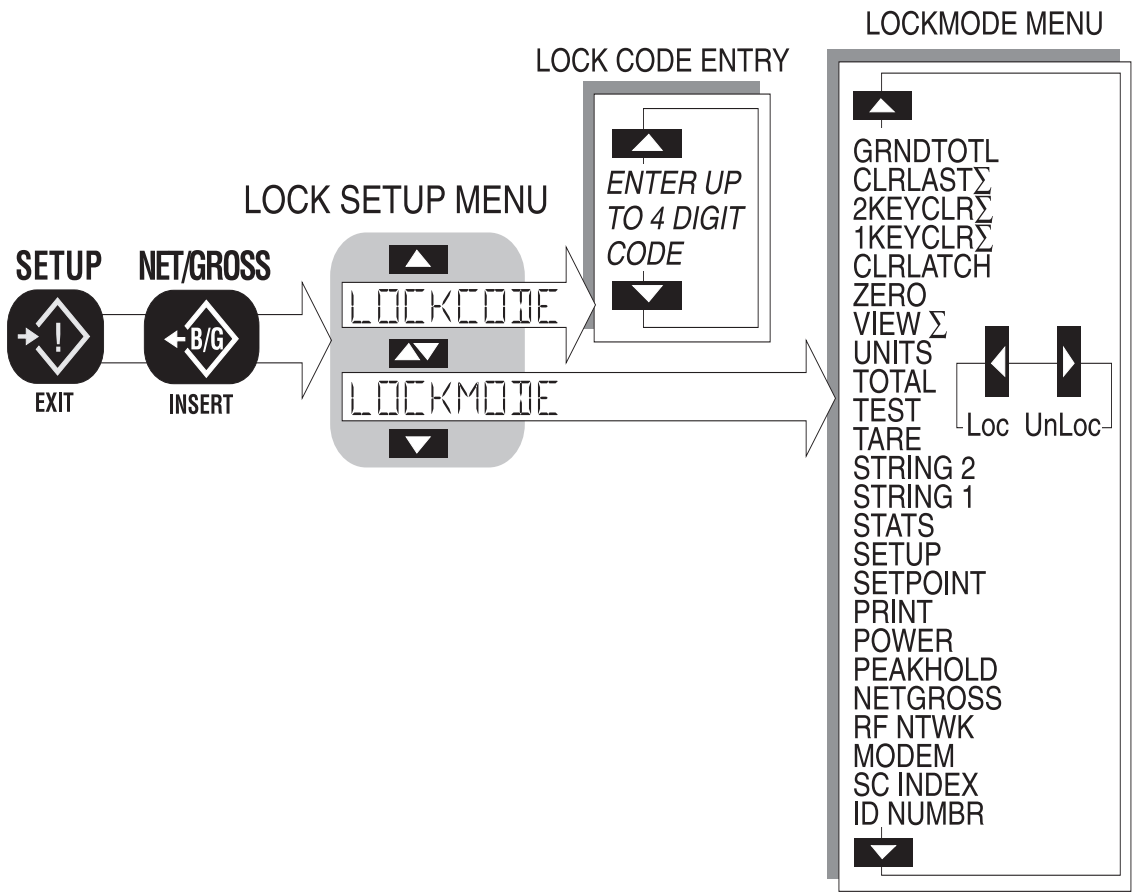
$$\frac{100\%\text{Value} - 0\%\text{ Value}}{20}$$

LOCK

The Lock function allows the user to lock various setups and or functions to prevent unauthorized changing or erasing of scale functions, features and statistical data. For added security an optional lock code (1-4 characters) can be entered. Once the MSI 3750CS is locked the message “LOCKED” will appear whenever a locked function is tried. To unlock push SETUP NET/GROSS and enter the lock code number.

The “LOCKMODE” menu determines which functions / features are locked. For example, locking the SETUP key would prevent any setup functions from being used (except of course, the LOCK function (SETUP NETGROSS).

There is no need to lock out functions that are only available on the Fx keys if no key is assigned to that function (e.g. PEAKHOLD). See "FUNCTION KEYS" for details on programming the Function Keys.



Selecting Which Features to Lock

You must set at least one item to "Loc" for the Lock Code to function.

1) Push SETUP.

2) Push the NET/GROSS key. The message display reads "LOCKCODE".

3) Push the UP key to select the menu item "LOCK-MODE".

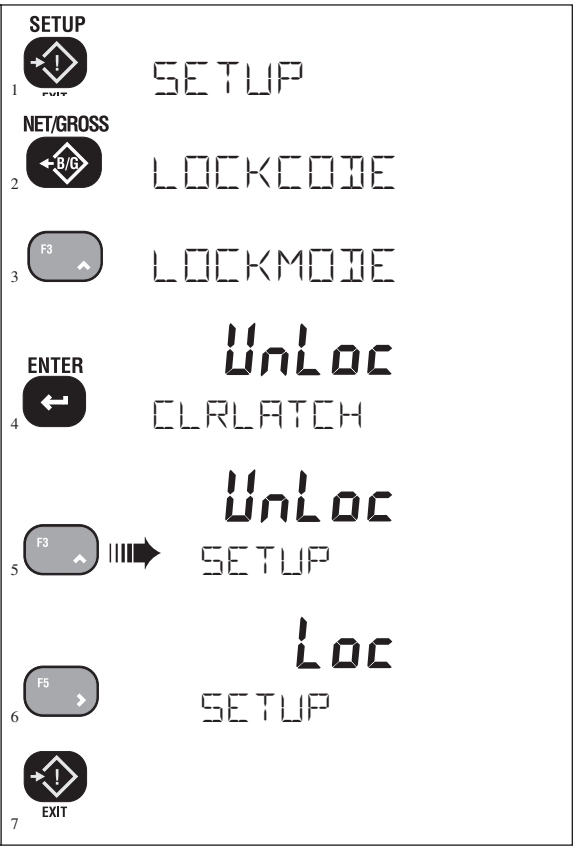
4) Push ENTER. The list of lockable items appears. The numeric display indicates if the item is locked (Loc) or unlocked (UnLoc).
The "CLRLATCH" item shown is for illustration only. The item appearing will depend on previous lock mode operations.

5) Use the UP or DOWN keys to scroll through the list. Use the LEFT or RIGHT cursor keys to toggle between locked and unlocked.
In this example we'll lock out SETUP to prevent unauthorized changing of scale parameters. Use the UP key to scroll to "SETUP".

6) Use the RIGHT cursor key to lock "SETUP".

Use the UP/DOWN keys to scroll to any other features you wish to lock or unlock. Use the LEFT / RIGHT keys to change the lock status.

7) Push EXIT (SETUP) to return to the Lock Menu, or push EXIT again to return to normal scale operation.



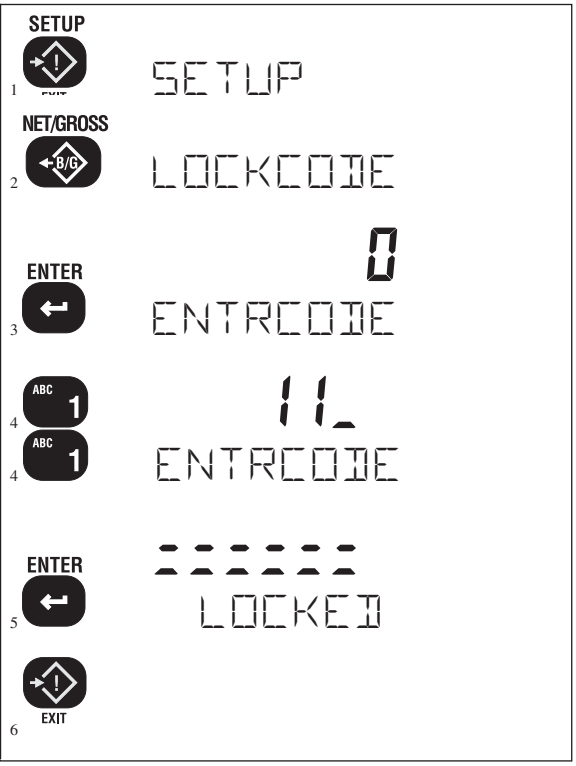
Now that you have selected all the scale features / functions you wish to lock, you must use the LOCKCODE to complete the lockup.

Do not forget your lock code. The only way to unlock a locked system without the proper lock code is to do a complete reset (RESET ALL), which will cause you to lose all setups and ID parameters.

To Lock

1) Push SETUP.
2) Push the NET/GROSS key. The message display reads “LOCKCODE”.
3) Push ENTER. The message reads “ENTRCODE”
4) Push ENTER if no security code is needed. If a custom lock code is desired, enter up to a four digit lock code with the Numeric keys.

   IMPORTANT! Make note of the code. In this example, we’ll use “11” as a lock code.
5) Push ENTER to lock the 3750. The display briefly indicates “LOCKED” then returns to the “LOCK-CODE” menu.
6) Push EXIT to return to normal scale operation. All functions selected for lock in the Lockmode menu will read “LOCKED” and won’t function.



To Unlock

Unlocking is the same process as locking. Follow the Lock procedure above to unlock. The only difference is at step 5, the message “UNLOCKED” will appear. Unlocking does not change the Lock Mode parameters, so if no changes are needed, you do not need to enter the “LOCKMODE” menu.

SECTION 8 – SET POINTS

INTRODUCTION

The CellScale system provides extensive Set Point capabilities. Up to 32 Set Points are available. The CellScale performs the A/D conversions and does limit checking for all the Set Points. The 3750CS receives Set Point information from the CellScale and responds as programmed.

All 32 Set Points are setup from either the CellScale Terminal Interface, or from a 3750CS. All Set Point value parameters are stored in the CellScale and are independent of any other device, including the 3750CS. When a Set Point is tripped (true condition), the CellScale transmits to all connected 3750CS's a message signifying which Set Point tripped.

The 3750CS Meter can fill a variety of applications in control, batching, safety and informational warnings. Set points can be used to trigger RS-232 data transmissions (see "COMM PORTS"). All 32 Set Points can put a message on the display or blink or blank the display. Set Points 1 and 2 have front panel LED indication. Add the Set Points Relay Option for relay outputs. This option includes seven 115VAC 1A relays and an 8th logic output. The Relay Option board's 8 outputs correspond to CellScale Set Points 1-8 and cannot be mapped to other Set Points (9-32).

Unique to 3750CS Parameters

The 3750CS can respond to the Set Point transmission in several ways:

1) Close a relay (Set Points 1–8 w/ option board).
2) Turn on an LED indicator (Set Points 1–2).
3) Blink the LCD weight reading (Set Points 1-32).
4) Blank the LCD weight reading (Set Points 1-32).
5) Display a message on the lower alphanumeric display (Set Points 1-32).
6) Send a message out the RS-232 port of the 3750CS (Set Points 1-32). This message can include weight parameters, time, date, and any random text the user requires (using MSI @ codes).

These actions are independent of what the CellScale does, and are independent of other 3750CS's that might be on the Network. These Set Point actions are stored only in the 3750CS and must be programmed independently in all 3750CS's used in the system.

Parameters stored in the CellScale

All parameters related to the Set Point values are stored only in the CellScale, but can be programmed from any RF connected 3750CS. These parameters include the following:

1) One or two threshold values (Value 1 and Value 2).
2) An "Operator" for each value (Oper 1 and Oper 2) which specifies whether the Set Point is Less Than, Greater Than, etc.
3) An Operator Relationship (Op Relat) which specifies an "AND" or "OR" relationship between Value 1 and Value 2.
4) A "Trigger Type" for each value (Trigtyp1 and Trigtyp2) which specifies if the Set Point responds to Gross weight, Net weight, Total weight, or number of samples in the total (nSamples). "nSamples" can also be thought of as a box counter or load counter.
5) Preact, Postact, and Deadzone – These parameters modify the value of the Set Point for process control applications. The effect of these value modifiers is detailed below.
6) Input Source – This parameter relates the Set Point to a position in the Channel List. This allows any Set Point to be assigned to any input channel or Math channel in the Cell Scale.

The Channel list must be configured in the CellScale. It cannot be programmed from the 3750CS.

7) Output Destination – The output destination list is also configured in the CellScale and is used to direct Set Point outputs at the CellScale end. See the CellScale manual for further information on this parameter.

The Output Destination list must be configured in the CellScale. It cannot be programmed from the 3750CS.

8) Latching – Any Set Point can be configured to Latch on when tripped so even when the set point is no longer true the output remains on.

9) Delay – Any Set Point can be delayed by up to 10 seconds (10000 ms). Often used to prevent spurious Set Point outputs.

10) On/Off – Any Set Point can be turned on or off independently from the rest without losing any programmed parameters.

11) All Set Points On/Off – Used to disable the operation of all 32 Set Points.

Operator Relationship, 2 Threshold Set Points

The CellScale can perform In-bounds and Out-of-bounds checking or grading by using the dual threshold feature of the Set Points. By specifying both a "Value 1" and a "Value 2" and establishing whether the values are to be "ANDed" or "ORed" the user can have complete control over the action of the Set Points.

For example, a Set Point can trip when the weight is >100kg AND <200kg which provides an in-bounds comparison. A Set Point can trip when the weight is <100kg OR >200kg which provides an out-of-bounds comparison.

The CellScale does not prevent you from entering >100kg AND >200kg which would trip when the weight was over 200kg. Just make sure your formula makes sense.

The Trigger Type parameter allows advanced capabilities such as Set Points that are conditional on weight and totals. For example set Value 1 to >1000kg with a trigger type of Gross, and set Value 2 to ≥100000kg with a trigger type of Total. Set the Operator Relationship to "OR". This will yield a Set Point that trips on each load over 1000kg, and stays tripped when the total load is ≥100000kg.

Preact, Postact, and Deadzone

To illustrate the effect of these three parameters, let's assume a set point is set for >1000kg. The value placed in Preact, Postact, or Deadzone is 20kg:

Preact – Set Point trips on >980kg (1000-20) and off at <980kg.

Postact – Set Point trips on >1020kg (1000+20) and off at <1020kg.

Deadzone – Set Point trips on at 1000kg. Turns off at 980kg.

Although the CellScale allows it, it never makes sense to program a Preact and a Postact for the same Set Point, since they would cancel each other out. However, it is sometimes desirable to combine Preact or Postact with Deadzone. This would provide hysteresis to the relay or hopper valve and prevent "chatter". To illustrate this, building on our previous example: Set point value is >1000kg, preact is 20kg, deadzone is 4kg:

Set Point trips on at 980kg, trips off at 976kg

When a Set Point is set for "less than", then Preact, Postact, and Deadzone work in the opposite direction. Let's again assume a set point is set for 1000kg, but now <1000kg. The value placed in Preact, Postact, or Deadzone is 20kg:

Preact – Set Point trips on <1020kg (1000+20) and off at >1020kg.

Postact – Set Point trips on <980kg (1000-20) and off at >980kg.

Deadzone – Set Point trips on at <1000kg. Turns off at 1020kg.

For dual value Set Points, Preact, Postact, and Deadzone apply equally to both values with the same rules illustrated above.

SET POINT SETUP MENU

To program multiple Set Points, is recommended that you use the CellScale Terminal Interface program. The terminal interface is somewhat faster than scrolling through buried menus in the 3750CS. However, there are times when a computer to plug into the CellScale is not available, or the CellScale is located inconveniently, that the 3750CS menus are useful. Also two Set Point features exist solely on the 3750CS and are independent of CellScale programming. These are local Set Point message outputs and display modes. These must be programmed locally at the 3750CS.

The Set Point Setup Menu has 22 choices. Not all menu items are needed for simple set points. The following is a brief description of the function of each Set Point menu.

ALL SET POINTS (ALL SP)

Used to disable and enable all 32 Set Points at once. This parameter is stored in the CellScale, and therefore any 3750CS can disable the Set Points for the entire Cell.

CURRENT SET POINT (CURNT SP)

This menu defines which Set Point is currently being programmed. Enter from 1 to 32.

SET POINT ON/OFF

Enables and disables the current Set Point (stored in the CellScale).

LATCHING

Enables and disables the latching feature. If Latching is enabled, once the Set Point is on, it stays on. Latching is cleared with Power Off (CellScale) or by programming a Fkey for “CLR LATCH”.

DELAY

Allows up to a 10 second delay before the Set Point triggers. Enter delay in milliseconds (1000ms = 1s). The delay is used to avoid spurious Set Point outputs. Should the value fall out of the Set Point on condition before the delay period, the Set Point will not trip.

OPERATOR RELATIONSHIP (OP RELAT)

When using two Set Point values, this menu defines the relationship between the two values. The “OR” choice will cause the Set Point to turn on when the condition for either value has been met. The “AND” choice requires that both conditions are met. The “NONE” choice prevents the second value from being used, only the condition for value 1 must be true.

OPERATOR 1, and OPERATOR 2 (OPER 1, OPER 2)

The operator establishes the compare criteria for each value. Operator 1 sets compare for Value 1 and Operator 2 sets compare for Value 2. Choices are: greater than (GRTRTHAN), greater than or equals (GT OR EQ), less than (LESSTHAN), less than or equals (LT OR EQ), and none (NONE). Selecting “none” is another way to disable the Set Point.

INPUT SOURCE (INP SRC)

The input source defines which conversion or math channel the Set Point is operating on. Enter 1 to 32 which corresponds to the Channel List programmed in the CellScale. Single scale CellScale systems will usually use only input source 1. The only way to know which scale channel is programmed to what channel list location is to have a printout of the CellScale Channel List. See the CellScale manual for more information on the Channel List.

OUTPUT DESTINATION (OUT DEST)

The output destination defines the Set Point output at the CellScale end. It has no effect on the 3750CS. Enter 1 to 32 which corresponds to the Set Point Output List programmed in the CellScale. The only way to know which each output list entry is programmed to is to have a printout of the CellScale Set Point Output List. See the CellScale manual for more information on the Output List.

TRIGGER TYPE 1 and TRIGGER TYPE 2 (TRIGTYP1 & TRIGTYP2)

The trigger type designates what kind of data the Set Point uses for its compare. There are four choices: 1) GROSS – the Set Point responds to Gross weight, regardless of being in Net weight. Use this mode for overload warnings. 2) NETGROSS – the Set Point compares to the Net weight if a Tare value is established, else it compares to the Gross weight. 3) TOTAL – the Set Point responds to Total weight of the current ID. 4) n TOTALS – the Set Point responds to the number of total weights taken. Use as a box counter, or weighments counter.

DEADZONE, PRE ACT and POST ACT

Program value modifiers. These parameters are optional. See discussion of Dead Zone, Pre act and Post act on page 70.

VALUE 1

Program Value 1 in current units. This is the main Set Point Threshold. This value shouldn’t exceed capacity unless you are programming a Math channel, Total, or n Total Set Point.

VALUE 2

Program Value 2 in current units. This is the secondary Set Point Threshold. Programming a value in Value 2 is not necessary for single threshold Set Points. This value shouldn’t exceed capacity unless you are programming a Total or n Total Set Point.

SET POINT STRING (SPSTRING)

Up to 20 characters are stored for each Set Point (1-32). These characters form the Set Point Message associated with the current Set Point. This message is stored only in the 3750CS and is not programmable from the CellScale Terminal Interface. Set Point "On" conditions transmitted from the CellScale will trigger local 3750CS message responses. The "SCREEN" and "SP OUTPUT" menus determine if and where the message is sent. The message is sent only once per Set Point Transition. That is the Set Point must go false then true again to regenerate the output message.

The 20 characters can include MSI "@ codes" that allow Set Points to include in their message such characteristics of current weight, date, time, and any additional data required. This can form the basis of a powerful maintenance tool. e.g. "Winch 1 overload 1/10/2002 23:00" which is generated with the following string: "Winch1 overload@D1@T2". Note that the printout is longer than 20 characters due to the use of "@ Codes".

Messages assigned to the LCD screen are not interpreted, therefore @ codes will display as written. Only outputting the message to the RS-232 port will interpret the @ codes as shown in the example. Also messages intended for the LCD are better written in all caps to make them easier to read on the message display. Messages intended for the RS-232 output can mix any combination of characters and "@ codes".

SCREEN

The screen menu determines the behavior of the 3750CS LCD Screen. Choices are: 1) Message – causes either the Set Point String to scroll across the lower display when the Set Point is triggered on, or the Set Point number will display. This is determined by the SP Output menu. If there are "@ Codes" embedded in the SP String, they will not be interpreted and will display as written. 2) Normal – The LCD is not affected by the Set Point. 3) Blank LCD – the weight display is blanked while the Set Point is true. 4) Blink – the weight display blinks while the Set Point is true.

SET POINT OUTPUT (SP OUTPT)

This menu directs where the SP String message goes. Choices are Comport1 On or Off, and Display On or Off.

TEST SET POINTS (TEST SP)

Lets the user override the limits checking and just turn on the Set Point. Use this for testing the effect of relay closures and the formatting of printouts. It is usually best to disable all the Set Points with the "ALL SP" menu before testing them. This prevents any interference from Set Points that may be triggered. The Test Set Points routine cannot turn off triggered Set Points.

EXAMPLE SET POINT PROGRAMMING

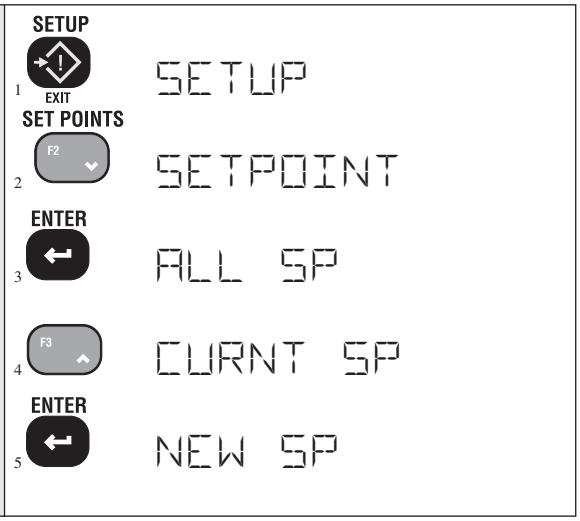
Programming 32 Set Points takes careful planning. To assist in planning 1 to 32 Set Points see Appendix E. Appendix E is a form that details all the capabilities of each of the 32 Set Points. Once planned, the entry of data, using either the CellScale Terminal Interface or the 3750CS menus, is greatly simplified.

To program a Set Point from the 3750CS the following conditions must be met:

1) The CellScale must be on.
2) The 3750CS must be in communication with the CellScale.
3) A 3750CS function key must be set up for "Set Points". *In the following examples, F2 is programmed for "SET POINTS". If you use another key, please adjust the procedure as necessary (see Section 4 "Function Keys").*

To Program a Single Threshold Set Point

1) Push SETUP.
2) Push the SET POINTS key (F2 in our example). The Menu reads "SETPOINT".
3) Push ENTER. The first menu item will be "ALL SP" which is the master Enable/Disable menu. We'll return to this later.
4) Push the UP key. The message reads "CURNT SP" and the numberic display indicates the current Set Point. For this example, we're going to program Set Point 2.
5) Push ENTER. The message reads "NEW SP".



6) Push the 2 key.

Substitute any Set Point number from 1-32.

7) Push ENTER. The message display indicates "CURNT SP" and the numeric display shows the Set Point that will be programmed (2 in this example).

8) Push the UP key until the "ON/OFF" menu appears. This menu is used to enable and disable the individual Set Point.

9) Push ENTER. The message indicates the on (ENABLED) or off (DISABLED) status of the Set Point.

10) Push the UP key to "ENABLED".

11) Push ENTER. Now the Set Point is enabled.

12) Push the UP key until the "OPER 1" menu appears

13) Push ENTER. The current Operator function appears.

14) Use the UP or DOWN key to select the desired operator.

In this example, we'll use "GT or EQ" which means Greater than or Equals.

15) Push ENTER. The operator is now stored.

16) Use the UP key to scroll to "TRIGTYP1".

17) Push ENTER. The message shows the current trigger type.

18) Use the UP key to choose the desired trigger type.

In this example we'll program the "NETGROSS" mode

19) When the trigger type selection is displayed, push ENTER.

20) Use the UP key to scroll to "VALUE 1".

21) Push ENTER. The message reads "NEW VAL1".

22) Use the numeric keys to enter a value for Value 1.

In this example we'll program 200 lb.

23) When all digits are complete, push ENTER.

A simple single threshold Set Point is now programmed. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.

All Set Points Enable/Disable

1) Push the UP or DOWN key until the "ALL SP" menu appears 2) Push ENTER. 3) Use the UP or DOWN key to toggle between "DISABLED" and "ENABLED". 4) Push ENTER. *This only enables SET POINTS that are turned ON. Individual Set Points must be enabled also.*	

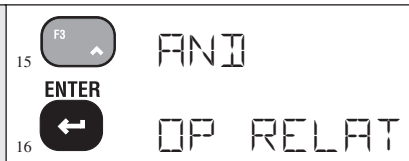
To add a second threshold for In-limits, out-of-limit, or grading applications.

This procedure is similar to the previous one except now we will program Value 2, Operator 2, Trigger Type 2, and add the Operator relationship. Since our example Set Point is set to ≥200 lb, by adding a ≤300 lb we'll have an in-bounds comparator. Skip this procedure if only one threshold is needed.

1) Push the UP or DOWN key until the "OPER 2" menu appears 2) Push ENTER. The current Operator 2 function appears. 3) Use the UP or DOWN key to scroll to the desired operator. *In this example, we'll use "LT or EQ" which means Less than or Equals.* 4) Push ENTER. 5) Use the UP key to scroll to "TRIGTYP2". 6) Push ENTER. The message shows the current trigger type. 7) Use the UP key to choose the desired trigger type. *In this example we'll program the "NETGROSS" mode* 8) When the trigger type selection is displayed, push ENTER. 9) Use the UP key to scroll to "VALUE 2". 10) Push ENTER. The message reads "NEW VAL1". 11) Use the numeric keys to enter a value for Value 1. *In this example we'll program 300 lb.* 12) When all digits are complete, push ENTER. 13) Use the UP or DOWN key to scroll to "OP RELAT". This is the menu which defines how the two thresholds relate to each other. 14) Push ENTER. The message reads the current operator relationship which defaults to "NONE".	

15) Use the UP key to scroll to “AND”. This makes the Set Point only true when both threshold conditions have been met.
Use “OR” for Set Points that trigger when either threshold condition has been met.
16) Push ENTER. The Operator Relationship is stored.

A dual threshold Set Point is now programmed. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.



To add Preact, Postact or Dead Zone to the Set Point value(s)

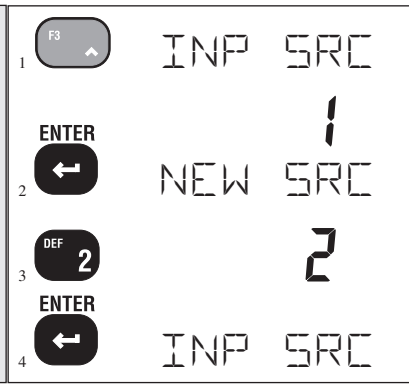
1) Use the UP key to scroll to “DEADZONE” or “PRE ACT” or “POST ACT”.
In this example we’ll add a dead zone of 5 lb.
2) Push ENTER. The current value for the parameter is displayed, and the message reads “NEW DZ” (or “NEW PRE” or “ NEW POST”).
3) Use the numeric keys to type in the value required.
4) Push ENTER to store the value.

The value modifier entry is complete. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.

To assign a Set Point to a specific CellScale Input or Math Channel
This procedure requires knowledge of the CellScale Channel List. In single channel systems the input source is always 1 which is the default. In that case this procedure can be skipped. If, however, a Set Point is assigned to a second or higher input or math channel, this procedure is necessary.
For this example, we’ll assume a two entry Channel List, and we’ll assign this Set Point to channel list entry #2.

1) Use the UP key to scroll to “INP SRC”.
2) Push ENTER. The current input source is displayed, and the message reads “NEW SRC”.
3) Use the numeric keys to type in the Channel List position number.
4) Push ENTER to store the value.

The input source entry is complete. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.



To Setup the CellScale Set Point Output
This parameter affects the CellScale only and has no effect on this or any other connected 3750CS

1) Use the UP key to scroll to “OUT DEST”.
2) Push ENTER. The current CellScale output destination is displayed, and the message reads “NEW DEST”.
3) Use the numeric keys to type in the Set Point Output List position number.
4) Push ENTER to store the value.

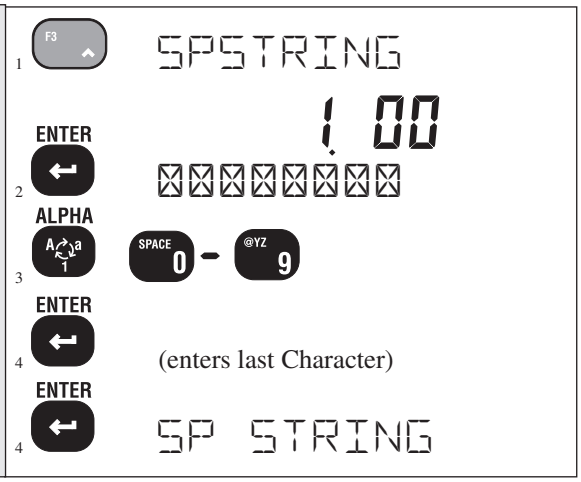
The output destination entry is complete. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.

To Program the Local 3750CS Set Point Message

Set Point messages are entered as ASCII "Strings". You can combine MSI "@ Codes" in embed weight, date, and time information in the Set Point string. See the Comm Port section following for a table of "@ Codes".

1) Use the UP key to scroll to "SPSTRING".
2) Push ENTER. The current set point message string is shown. The numeric digits indicate the character position and ASCII value in decimal notation.
3) Use the Alpha key to change from numbers to letters. Use the alpha-numeric keys to type in the message. See page 90 for details on inputting alphanumeric characters.
4) Push ENTER twice to store the string.

   The Set Point Message String is complete. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.

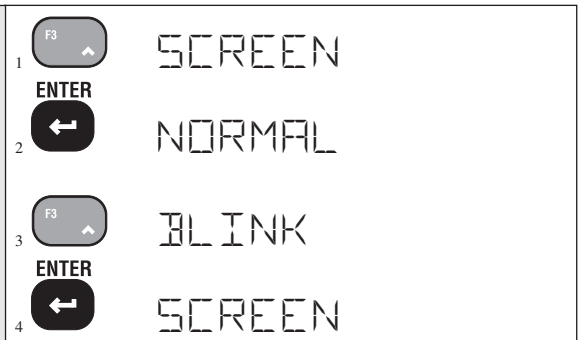


To Control the LCD Screen with a Set Point

A Set Point can cause the LCD Screen to Blink or to Blank out, or display the ASCII SP Message. In this example we'll set up the LCD to blink when the Set Point is true.

1) Use the UP key to scroll to "SCREEN".
2) Push ENTER. The current screen mode is shown. The numeric digits indicate the character position and ASCII value in decimal notation.
3) Use the UP key to scroll through the Screen mode choices: Blink, Blank, Message, and Normal.
   In this example, we'll choose "BLINK".
4) Push ENTER to store the screen mode.

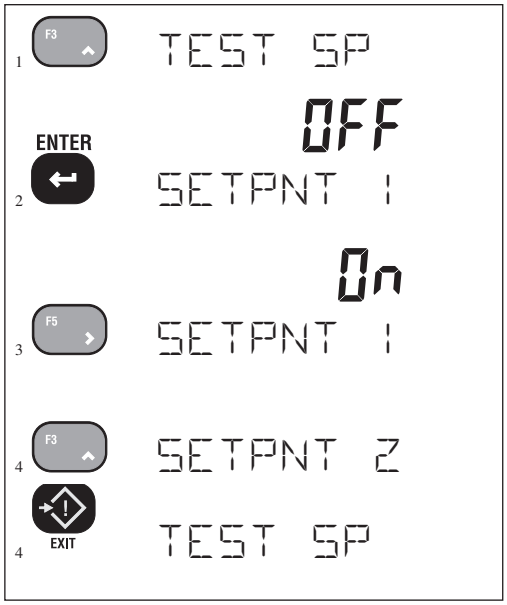
   The LCD Mode has been set. To add functionality to the Set Point, continue on to any or all of the following procedures or push the EXIT (SETUP) key to return to normal scale operation.



To Test the Set Points

This following procedure will turn on and off any device connected to the relays. Make sure that doing so will not cause a safety hazard or damage property or goods.

1) Use the UP or DOWN key to scroll to "TEST SP".
2) Push ENTER. Set Point 1 shows on the message display. The numeric display indicates OFF or ON.
3) Use the LEFT or RIGHT key to toggle between "OFF" and "ON". Observe the behaviour of relays and messages.
   LCD Screen behaviour is not testable, only relay closures , local Com Port output, and CS outputs are effected.
4) Use the UP key to scroll through all the applicable Set Points. Repeat step 3 to test Set Point Function.
5) Push EXIT (Setup) to return to the Set Points Setup menus.



RELAY OUTPUT OPTION

This option adds 7 SPDT Relays and 1 Logic Level output to the MSI 3750. The relays can be used in conjunction with alarms, motors, and other control circuitry to provide a complete automated production line, or to provide additional information to the scale operator.

Relay Function

The total of 8 set point outputs are addressable through the set point routines of the CellScale. Each set point output is fully programmable to respond to weight changes. This section is intended to cover the electro-mechanical details of hooking up and using the set point outputs. For details on programming the set points, refer to the "SET POINTS" section.

Electrical Specifications

Contacts	Form C, common pin with 1 normally open, 1 normally closed contact
Contact Rating	2A 30V DC, 0.6A 110V DC, 1A 125V AC (not rated for 240VAC!)
Max. Power	60W, 125VA
Expected Life	Mechanical: 10^8 Cycles
	Electrical: 10^5 Cycles @ 0.5A 125V AC resistive
Fuse	2A 125V rated SMD fuse (MSI P/N 10473)
Isolation	280VAC 50/60 Hz
Logic Output	1 normally high output, 1 normally low output (not isolated). Fanout:1
	TTL load, 25 CMOS loads

Relay Cabling

The Relay connections are made into terminal blocks found on the circuit board internal to the MSI-3750CS. Due to wash down requirements, use round cable that has an outside diameter of .187" to .312" (5mm to 8mm) for proper sealing with the watertight fittings. The terminal blocks are suitable for wires from 16 to 24 gauge. There are up to four watertight fittings dedicated to the Set-Point Outputs (depends on options installed). Multiple conductor cable will be necessary to access all of the relays.

Cable Installation Procedure

1) Unplug the 3750CS from the AC or DC power source.
2) Remove the 10 screws holding the front panel on.
3) Strip the outer insulation from the cable. Peel back the foil shield (if any) being careful not to nick the conductors. Cut off the foil shield and the drain wire. Strip 3/16" (5mm) from each conductor and tin the wires. It is wise to shrink a short piece of heat shrink tubing over the end of the outer jacket to further insulate the shield.
4) Loosen the watertight feedthroughs and remove the white plugs. Feed the cables through the watertight feedthroughs.
5) Insert the wires as shown in the following diagram. Push down the white lever with a small screwdriver, insert the wire, then release the lever. It might be necessary to use needle nose pliers to help insert the wires into the terminal strips. After all the pins are connected, lightly wiggle and tug on each wire to ensure that they are securely attached.
6) Tighten the watertight feedthrough around the outer insulation to ensure the water seal.
7) Replace the front panel being careful to seat the gasket evenly around the lip of the cabinet. Screw down the 10 screws in a criss-cross pattern to seat the gasket evenly.

Relay Applications

Some examples of uses for the set point relays are: Using the normally open position of a set point as a switch to turn on a light or siren when the set point is reached, using the normally closed position to cut out a motor when a set point is reached, or using the set point relays to change speeds on a motor. See figure 1 for an example hook up to a lamp. The normally open (NO) contact of a relay is used to turn devices on when a set point is reached, while the normally closed (NC) contact is used to turn a device off when the set point is reached. The common (COM) contact connects the power to the relay.

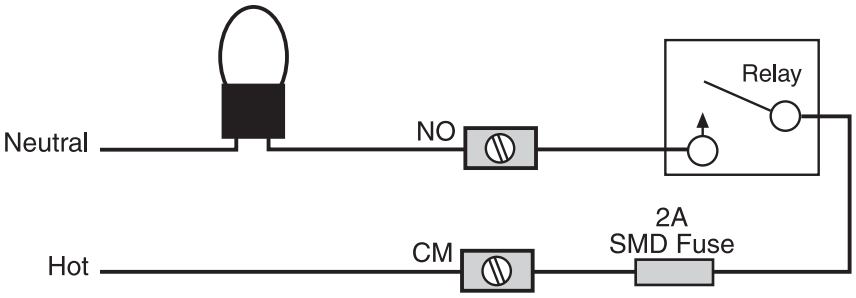


Figure 1

Set Points are often used in conjunction with automatic conveyer belts. By using the set point relays conveyor belts can be controled by weight. Using two Set Points allows speed control for dribbling or speeding up, etc. Figure 2 shows a simple arrangement where the motor is turned off when a set point is reached. Pay attention to the current and voltage ratings of the relay when using them for motor control. It may be necessary to use a boost relay externally as in figure 3.

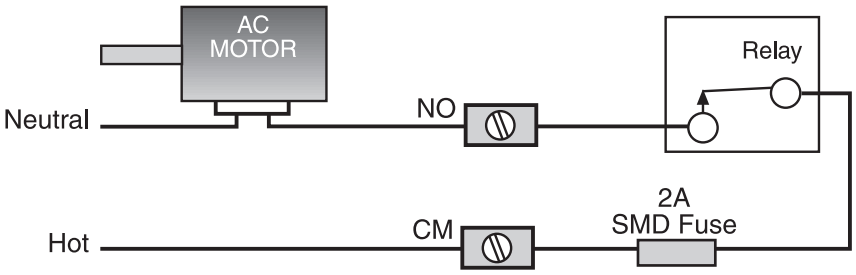


Figure 2

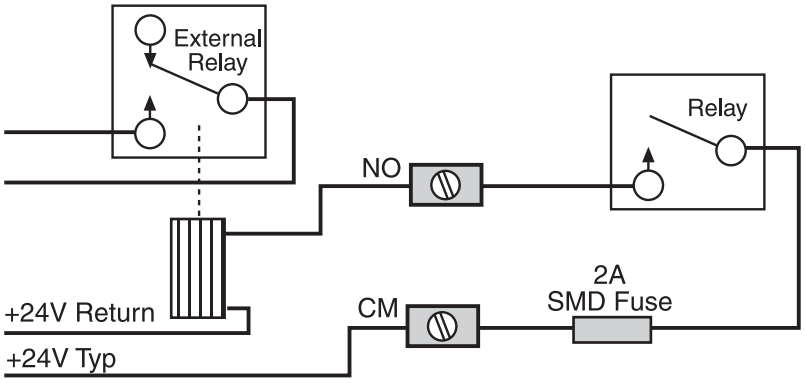


Figure 3

By combining the relay outputs of 2 or more set points, complex conditional logic functions can be achieved. In figure 4, two set point outputs are combined to control a motor when the conditions for both set points are true. In figure 5 two relays are combined to turn on a motor when either Set Point is true. One major application for combining relays is to use one for a master start/stop for all the other relays.

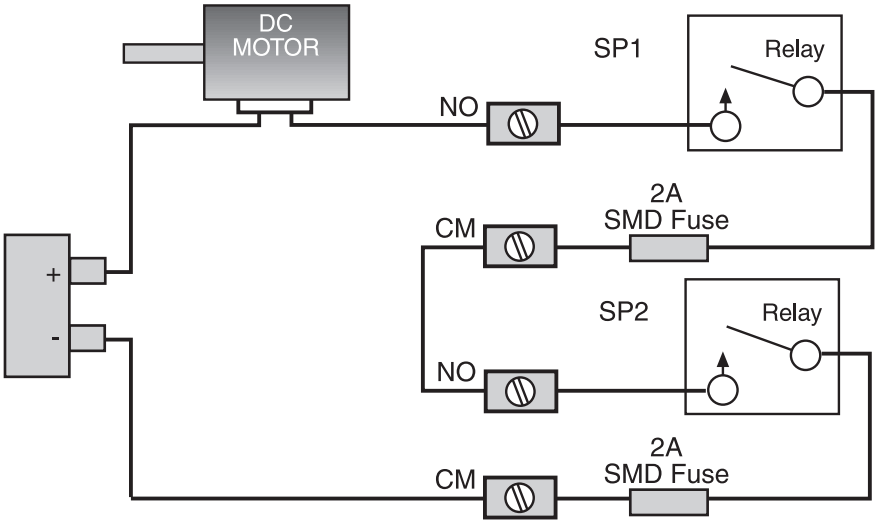


Figure 4

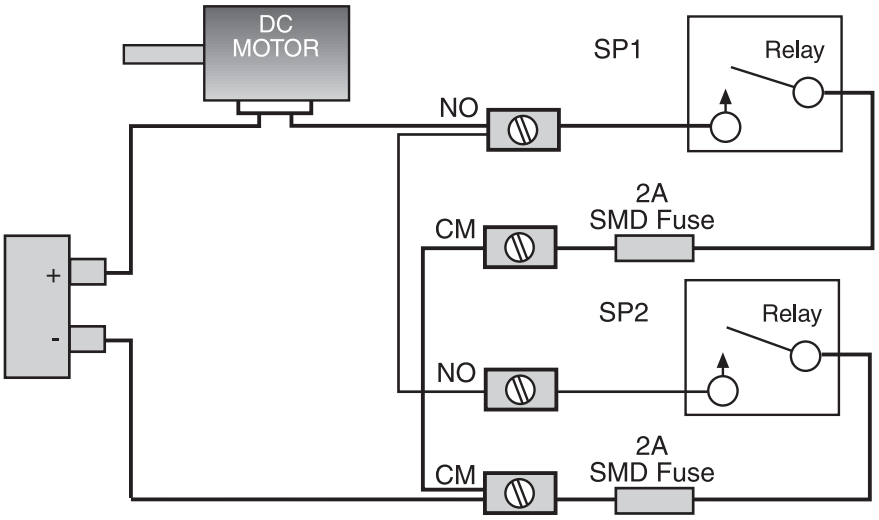


Figure 5

Programmable Logic Controllers (PLCs) are in common use for machinery control. The 3750 can interface to PLCs with the relay outputs or with the logic output on set point 8. Figure 6 shows one possible way of interfacing to a PLC. More sophisticated PLCs are able to take data directly from RS-232 and integrate the data into the control process. See the RS-232 option section for details.

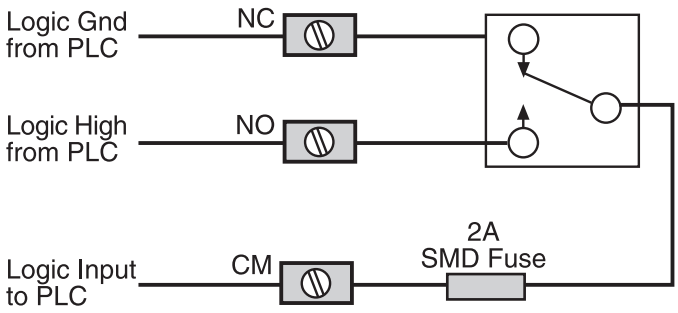


Figure 6

Logic Output (Set Point 8)

Set Point 8 is unique from Set Points 1-7. The output consists of a logic output capable of driving standard TTL loads. As the output is in reality 4000B series CMOS devices, it may be necessary to provide an external pull-up resistor in certain cases. Values of 1kΩ to 4.7kΩ usually will suffice. There are two complementary outputs as shown in Figure 7. The TTL Hi output goes high when the set point is tripped. The TTL Low output goes low

when the output is tripped. The logic output ground must be connected to provide a reference level. Output level is nominally 5V but can vary from 4.8 to 5.2V.

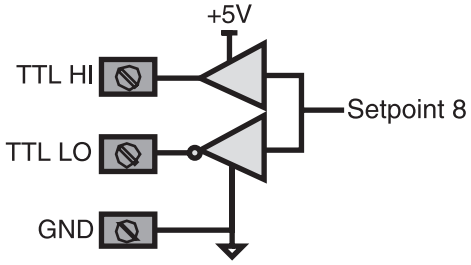


Figure 7

Besides providing a direct logic output to PLCs or other controllers, the logic output can be used to drive external relays. Figure 8 shows an example of the logic output driving an external N-channel MOSFET which can turn on a high-power relay.

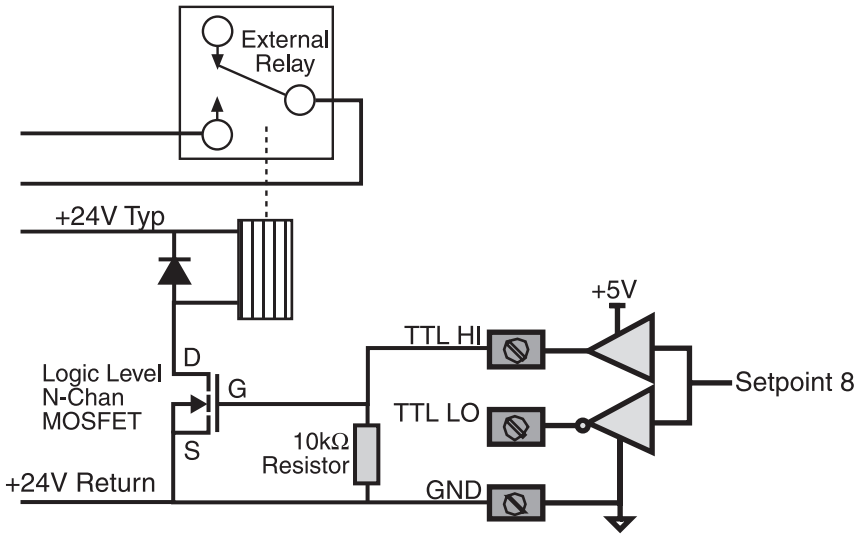


Figure 8

SECTION 9 – COMMUNICATION PORTS

INTRODUCTION

- The MSI 3750CS is equipped with a single RS-232 serial input/output and a Real Time Clock/Calendar. The Comm Port is intended for interfacing printers, data loggers, scoreboards, and computers to the 3750CS Meter. The real-time clock allows the user to time and/or date stamp any data obtained from the 3750CS.
- The data output is fully format able. The 3750CS, under menu control will print control characters for easy interfacing to any label printer. An initialize string combined with start string, product labels, user programmable data, weight data, and end strings, provides complete control over printed data.
- Many scales and weigh meters suspend weighing operation while printing and will not function until a print job is completed. The MSI 3750CS RS-232 output uses advanced DMA (direct memory access) techniques for transmitting the print strings. This prevents long print jobs from interfering with scale operation.

Comm Port Function

The RS-232 output is used in conjunction with the PRINT key to output weight and total data to a printer or can be used for bi-directional communications with a computer, allowing full computer control of scale functions. In addition there are several automatic print modes including print on Total, when there is a weight change, or when a set point is reached. Interval and continuous printing is available for data logging or interfacing Scoreboard displays.

Comm Port 2 is dedicated to RF Communications and not accessible for user programming. However, Modem parameters and diagnostic menus are available.

ELECTRICAL CONFORMANCE

The electrical characteristics of the serial input/output conform to the EIA Standard EIA-232-D (downward compatible with RS-232C). Comm Port 1 is configured as DCE. Cable connections include RXD (input), TXD (output), Ground, CTS (input), RTS (output), and Shield Ground (also known as Frame Ground). CTS/RTS handshaking is optional and the lines do not need to be connected

COMM PORT CABLING

3750CS units have a water-proof connector on the rear panel. This connector mates with MSI P/N 12023 which provide unterminated wires, or MSI P/N 501705-0001 which provides a standard 9 pin “D” connector termination.

Unterminated wire assignments are: Brown – TXD (output), Black – RXD (input), White – CTS (input), Grey – RTS (output), and Blue is Signal Ground.

DATA CONFIGURATION

The 3750CS serial port options are configured with the “COMPORT” Menus. Standard data configuration is:

Data String Buffers

A Data String is simply a collection of characters stored in memory, that are used to format the Comm Port output. Data Strings are defined by the user. The length of the formatting strings are limited to 255 characters.. However, since 3 or 4 character commands can cause an output of up to 99 characters in length, the 255 limit does not represent the maximum size of the data output. The 3750CS offers the programmer the ability to print any and all weight data, time and date stamp, and formatting controls suitable for even the most complex bar code printer.

Data Format

Each transmitted reading consists of a number of programmable character strings. Data is completely user programmable and can include formatting characters and text in addition to all weight parameters. The End-of-Line string is used for Carriage Return or other end-of-line control characters. These are easily entered through the Comm Port menu or downloaded through a computer.

OUTPUT CONTROL

The MSI 3750CS serial port functions in any of 10 modes:

1) Front Panel Print Key:
   This is a print on command mode which works when the print button on the front panel is pushed. The Print

key is active in all modes unless disabled by computer control or the Lock Function. The "MOTN DET" menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable.

2) Computer Control:
The computer can control and receive data from the MSI 3750CS through the use of simple ASCII commands. These commands can be sent through the use of a data communications terminal, or a custom computer program. The "MOTN DET" menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable.

3) Print on Total:
When the weight is totaled, one transmission of data will occur. Once transmitted, the scale must return below the Total Threshold (See Total Setup) to re-enable the transmission. Interval has no effect in this mode.

Using Print on Total with the Auto Total enabled should not be used with any weight print-out other than W5, W6, W7, or W9 (because the actual total doesn't occur until weight drops below the threshold, so the weight used for the Total would no longer be on the scale). Use "Print on Load" to print the weight used for the total.

4,5 & 6) Print on Set-Point:
Set point 1, Set point 2, or Set-point 1&2 can be configured to trigger a data print. Once transmitted, the set-point must go off then on again to transmit again. Print on a set point can also be configured to print when two set-points are true. This configuration allows printing when the weight is outside two limits or when the weight is inside two limits (windowed). The "MOTN DET" menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable.

7) Print On Change:
Every time the weight changes 1 full display count or more, one transmission of data will occur. The "MOTN DET" menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable. Interval has no effect in this mode.

8) Print on Load Change:
When the load weight exceeds the Total Threshold and motion ceases, one transmission of data will occur. Once transmitted, the scale must return below the Total Threshold to re-enable the transmission. Interval has no effect in this mode.

9) Print Continuous or on Intervals:
The Data String can be transmitted continuously for driving scoreboards. The "MOTN DET" menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable.

10)Print on CTS (Clear to Send, a RS-232 handshake line):
By toggling the CTS line from space to mark, the print string will be transmitted. If the interval is set, the string will continue to print as long as CTS is asserted.

In addition to the Control modes above, the master CellScale can also force formatted print strings out the Comm Port. See the CellScale manual for more information on Set Point messages and other types of remotely generated messaging.

There is also a special print mode used with the VIEW key. Pushing VIEW followed immediately by the PRINT key will output just the current ID Codes total and Total Count. See "@W7" for formatting information on this special output.

COMM PORT PARAMETERS

The Comm Port Parameters menu is one of the most extensive menus in the 3750CS. This menu does standard RS-232 setup and formats the data for Comm port 1 of the 3750CS. It does not affect the Comm Ports in any related CellScale. Comm Port 2 has menus for setting up the default RF Network (identical to procedures shown in Section 2), but providing a way to set up the modem without having to dedicate a function key to the task.

FORMAT

The FORMAT menu is the heart of the communications system. It controls the data output generated by the 3750CS Meter.

DATA: The "DATA" section is where all printing and formatting commands are entered. This is covered in depth in the "Printer Formatting" section.

STRTLINE: The "START LINE" string can be 0 to 4 characters long. It is intended for commonly used commands that usually precede printed lines. Typically ESC codes are used on some printers to enable or format the print string. The start of line string is usually referred to as the "SOL string". The string

defaults to empty.

END LINE: The "END-OF-LINE" string can be 0 to 4 characters long. Most commonly used for Carriage Return (CR) or Line Feed (LF), or CR/LF. The EOL string defaults to Line Feed. See "Programming the End of Line String for an example.

WAIT CHR: The "WAIT CHARACTER", if entered, will cause the print output to pause after each EOL string until the designated character is received by the port. To use the Wait Character mode, the Comm Port mode must be Duplex. Once the proper Wait Character has been received the 3750CS will output the next data string up to the next EOL string.

MODE: The MODE menu sets the communications mode for the port. Use "TALK" for outputting data to a printer that uses hardware handshaking or no handshaking. Use "DUPLEX" for printers with software handshaking (XON / XOFF, etc.) or to talk and listen to a computer. Use "LISTEN" to only receive commands from a computer. Use "OFF" to disable the port (and save power on battery units).

CONTROL: The control menu designates the condition that causes the 3750CS to output data. The Print key will always work unless specifically locked out. When the designated control is received by the scale, the print string specified in the "DATA" menu will be transmitted. If the "MOTION" parameter is enabled, the motion annunciator must be off for the scale to output data. If a valid control is received, the 3750CS will wait for the next settled (out of Motion) reading before it will output data. See descriptions of the Control Modes in the "Output Control" section above.

MOTION: When enabled the scale will only print settled data, i.e. when the motion detection annunciator is off. In legal for trade systems, the MOTN DET menu item is not editable. Use disabled when it is necessary to send data out the Comm port while the weight is in motion.

INTERVAL: Selecting "ONCE" means that after the trigger condition, a single transmission of data will occur. Selecting "ON" enables a timed transmission rate. A print interval can be entered from 0 to 28,800 seconds. Used in conjunction with the Continuous output mode, this can generate a time based data-logging system. An interval of 0 seconds means that the scale will output data at the highest rate possible (limited to 4 readings per second). Interval used with other control modes can be useful for control and monitoring purposes.

SETTINGS: The Settings menu is used to set standard Comm Port parameters. See "To Set The Baud Rate" for an example of how to use these setting menus.

BAUD RATE: Standard Baud Rates available are 300, 600, 1200, 2400, 4800, 9600, 19200, and 38400. The 3750CS defaults to 9600 Baud.

STOP BITS: Either 1 or 2 Stop Bits can be set. Stop Bits default to 1.

DATA BITS: Either 7 or 8 Data Bits can be set. If 7 bit mode is set, Data Characters above 127dec cannot be sent or received. The default is 8 bits.

PARITY: Parity mode is NONE, EVEN or ODD. The 3750CS defaults to "NONE", parity off.

HANDSHAK(e): Comm Port Handshaking is set in this menu. Use XON/XOFF for software handshaking commonly used in communicating with computers. Use CTS/RTS for hardware handshaking. Use NONE for situations where no handshaking is required or possible.

COMM PORT 2 SETUP PARAMETERS

The Comm Port 2 menus are intended for setting up, initializing, and troubleshooting the RF Modem. With the exception of the "MODEM" menu, which duplicates the functions of the MODEM function key (see Section 2 for details on setting the RF Network parameters), these menus should be left untouched by the end user.

MODEM: Identical to the MODEM function key. This submenu provides a way to setup the RF Network parameters allowing you to not have to use a function key for "MODEM".

MODE: The mode submenu has four selections: 1) WIT SLAVE – This is the default setting. Indicates the 3750CS internal modem is functioning as a slave for its configured network. 2) Off – Disables the internal modem. There is never a reason to do this except for troubleshooting purposes. 3) WIT CNFG – This connects the data from the internal modem directly to the RS-232 Comm Port. This allows a terminal program to monitor the RF traffic between the 3750CS and its master modem. This traffic is not in human readable form. 4) WIT INIT – Pushing the Enter key when in the WIT INIT selection completely initializes the Modem parameters. If you do this, you must reenter all the RF Network settings.

Improper setting of these selections can prevent the 3750CS from communicating with any CellScale.

PRINTER / OUTPUT FORMATTING

The RS-232 Option can format virtually any Printer or Serial Data Device including complex bar-code label printers through the use of the built in printer formatting. To use this versatile feature, the user must input command codes and data in a specific manner. Each command code consists of a 2 letter mnemonic. Some command codes also require a numeric suffix.

A simple example of this structure is the default print data string: @W1@E☒. The "@W" command code means to print weight. The "1" means print the current display mode. The "@E" will cause the End-of-line string to be printed. The command string must always be terminated by an ASCII 255 character We'll indicate ASCII 255s with "☒".

By combining the "@" commands with standard ASCII characters, control characters, etc., any data available from the scale, plus any additional text, can be printed in any order desired. Using formatting controls typical to modern bar-code printers is simply a matter of formatting the printer strings.

The MSI 3750CS character set includes all upper case letters, lower case letters, numbers, and most of the rest of the standard ASCII set.

General Alpha-numeric Entry Procedure

1) Use the Aa1 (ALPHA) key to switch between numeric "n", upper case "U", or lower case "L".
2) Press the desired character key. If a "B" is needed, push the ABC key twice.
3) Enter the displayed character by either pushing a different key, or the ENTER key. For example, if two "B"s in a row are needed, use the ENTER key.
4) Terminate the character string by pushing ENTER twice.

Character Set

Control characters and any other character can be printed with the following procedure.

Alternate Characters and Control Characters

1) Push the TARE key. This enables the ASCII numeric entry mode. A place holder character indicates an ASCII character not included in the MSI 3750CS character set.
2) Use the UP/DOWN keys to scroll to the decimal number of the desired ASCII character. Refer to the ASCII table in Appendix A. The left numeric digits on the LCD represent the character position. The right numeric digits represent the ASCII decimal character number. When the desired character number is displayed push ENTER.

EXAMPLE PRINTER FORMATTING

The following diagram shows a typical print string format. The end result of this example produces a printout similar to this:

PEARS
4.500 lb NET 8/15/2002

In this example we'll use control characters to both print in red and expand the characters for "PEARS". Note: control codes used in this example are unique to a specific printer (a Star Micronics DP8340) and are used for example only. The necessary string will be:

ASCII	27		14						20	27												255
String	☒	4	☒	P	E	A	R	S	☒	☒	5	@	E	@	W	3	@	D	6	@	E	☒
Notes	❶		❷						❸	❹		❺		❻			❼			❽		❾

1) The 27 is an ESC followed by a 4 which equals "Red Character Print instruction"
2) The 14 is an SO which turns on the Expanded character instruction
3) The 20 is an DC4 which turns off the Expanded character instruction
4) The 27 is an ESC followed by a 5 which turns off the Red Character Print instruction
5) @E causes the end-of-line string to be sent.
6) @W3 causes the current Net weight to be printed. If the scale was in the NET mode, @W1 would have worked as well.
7) @D6 causes the current date to be printed in MM/DD/YYYY format

8) @E causes the end-of-line string to be sent.
9) 255 is used by the 3750CS to terminate the entire print string.

PROGRAMMING THE END OF LINE STRING

The End of Line String is used to terminate print strings and is printer dependent. The default string is Line Feed (LF=ASCII 10). In this example a Carriage Return (CR=ASCII 13) will be added to the EOL String. Refer to the ASCII table in the Appendix for proper codes. Up to 4 characters can be included. You can even embed a single @ code to expand the end-of-line string.

EDITING THE PRINT STRING

To change a character

Use the LEFT(<) and RIGHT (>) Scroll keys (Alpha mode must be "n") to move around in the print string. The flashing digit indicates the edit able character. Once the desired character is flashing, use the Alpha key to change to the Alpha mode, then use the letter keys to change it. If you need to change it to a character not in the 3750CS character set, use the ASCII number entry procedure. Push ENTER twice to store the edited string.

To insert a character

Use the LEFT(<) and RIGHT (>) Scroll keys to move around in the print string. The flashing digit indicates the edit able character. Insert a new character in front of the flashing digit by pushing the NET/GROSS key. Next input the desired character. Push ENTER twice to store the edited string.

To delete a character

Position the cursor (blinking character) over the character you wish to delete. Push CLR. The remaining characters move over 1 space. Push ENTER twice to store the edited string.
Note: Pushing the EXIT key will exit out of the menu and restore the string as it was. The changes must be saved with the double ENTER key push or by pushing the POWER key.

To disable the Entire Print String

Position the cursor (blinking character) over the first character in the Print String. Push INSERT to insert a "☒" (ASCII 255) character at the beginning of the String. Push ENTER twice to store the disabled string. This procedure is more efficient than using the CLEAR key to delete the entire String, especially if the String is very long. The 3750CS ignores all characters past the first "☒" it encounters. To enable the string, position the cursor over the "☒" character and push CLEAR. This procedure can also be used to divide a long print string into smaller parts by inserting a "☒" character at discrete locations.
Memory space is always allocated for the Print Strings. There is no benefit to actually deleting characters past the first ☒.

GENERAL TEXT/CONTROL CHARACTER ENTRY

Text or control characters are simply entered into the printer data string. All ASCII characters from 0dec to 127dec can be entered with the exception of the "@" symbol which the 3750CS uses for its control characters (enter "@@" to print a single "@"). If 8 bit data transmission is enabled additional codes 128 to 255 can also be assigned. These upper numbers are often used for graphics characters on printers. "@" Commands are case sensitive, only capital letters are used.

Input Data Form

With the exception of characters following the command "@" symbol, all characters are treated as printable text or control characters. The MSI 3750CS represents characters that can't be displayed on the LCD with a "☒". Terminate the string with a dec255 character (ASCII 255). ASCll 255 characters are represented with a "☒". The "ASCII Entry Mode" is provided to input Control Characters and any other character not included in the standard 3750CS character set. Use the ASCII table (Appendix B) to determine the decimal number equal to any desired character.

SERIAL OUTPUT "@" COMMANDS

The printer formatting "@" commands and their data configurations are as follows:

@# Change to next SC Index (Channel List entry)

Use the @# command to change to the next entry in the SC Index. All subsequent commands which are channel related will be directed to the new active Channel.

@? PRINT CURRENT SC INDEX

Use the @? command to cause the output to send the SC Index number of the active analog channel.

Input Data Form:

@? to query for current list index

Output Data Form:

97 **SC INDEXxx**

where xx is the index number from 1-32.

Length: 10 Justification: left justified

@@ PRINT AN "@"

Use the @@ command to cause the output to send an "@" sign. Since this character is normally used for printer formatting, this is the only way to output the @ sign by itself.

@B PRINT BLANK SPACES

Use the @B command to cause the output to send a series of spaces. Can be used to position data on a label without having to enter multiple spaces.

Input Data Form:

@Bxx where xx is any number from 01 to 99 which equals the number of spaces desired. Note: Exactly two digits must follow the "@B" command.

Output Data Form:

"x" spaces are output limited to 99. For more spaces use two @B commands in series.

Note: For spaces fewer than 5, it is more memory efficient to enter spaces instead of the @B command.

Example - Building on the previous example, we'll center the "MSI 3750CS" on a 20 column printer:

The @B06 command printed 6 spaces followed by "MSI 3750" in red expanded characters.

@C PRINT ID CODE NUMBER

Use the @C command to cause the output to send the current product code number. The number can vary from 0 to 999 depending on the current ID# that the scale is set in. Note that the blank place holder ID# is always 1, so the lowest alpha entry will be ID#2.

Input Data Form:

@C1 to print the ID Code number plus descriptor

@C2 to print the ID Code number only

Output Data Form:

9C1 **I D C O D E # 4**

Length: 12 Justification: "ID CODE" left justified, number right justified.

9C2 **4**

Length: 3 Justification: right

@D PRINT DATE

Purpose:

Use the @D command to print the date register of the real time clock/calendar.

Input Data Form:

@D1	Full alpha date in the form DDMMMYY with the month spelled out
@D2	Print date in the form MM/DD/YY
@D3	Print date in the form DD/MM/YY (European Standard)
@D4	Print the day of the week
@D5	Full alpha date in the form DDMMMYYYY with month spelled out
@D6	Print date in the form MM/DD/YYYY
@D7	Print date in the form DD/MM/YYYY (European Standard)

Output Data Form:

@D1 **2 5 J U L 0 0**

Length: 8 Justification: left, leading day zero suppressed

@D2 **4 / 2 5 / 0 0**

Length: 8 Justification: full, leading month zero suppressed

@D3 **2 5 / 0 7 / 0 1**

Length: 8 Justification: left, leading day zero suppressed

@D4 **S A T U R D A Y**

Length: 10 Justification: left, position 10 always a space.

@D5 **2 5 J U L 2 0 0 0**

Length: 8 Justification: left, leading day zero suppressed

@D6 **4 / 2 5 / 2 0 0 0**

Length: 8 Justification: full, leading month zero suppressed

@D7 **2 5 / 0 7 / 2 0 0 1**

@E PRINT END OF LINE

Use the @E command to output the end-of-line string. The EOL string is entered in the printer Format section

Input Data Form:

@E

Output Data Form:

Sends out the EOL string. Usually a Carriage Return or Line Feed, CR/LF, ETX, etc. Can include formatting commands. See Format

@H PRINT HORIZONTAL TABS

Purpose:

Use the @H command to send a series of Tabs. Can be used to position data on a label without having to enter multiple spaces. Not all printers support tabs. Check with printer manual for proper application of tabs in printer formatting.

Input Data Form:

@Hxx where xx is any number from 01 to 99 which equals the number of tabs desired. Note: you must enter two digits following the "@H".

Output Data Form:

"x" tabs are printed (limited to 99). For more tabs use two @H commands in series.

@I OUTPUT RF MODEM ID

Use the @I command to print the RF Modem ID numbers of the connected CellScale and the internal 3750CS modem.

Input Data Form:

@I1	Print CellScale Modem ID# (0-255) of connected Master CellScale
@I2	Print Modem ID (MY ID) of this 3750CS

Output Data Form:

9I1 **CS ID #xxx**

Length: 9 Justification: right, leading zeros not suppressed

9I2 **MY ID #xxx**

Length: 9 Justification: right, leading zeros not suppressed

@L PRINT ID CODE STRINGS

Use the @L command to print one or both of the ID Code Strings. ID Code Strings will change as the ID code number is changed. ID Code Strings can include text, numbers, and control codes thereby allowing the printer format or text to change with the ID Code.

Input Data Form:

@L1	Print ID Code String 1
@L2	Print ID Code String 2

Output Data Form:

Depends on user entered Strings. Up to 20 bytes unless "@" codes are embedded, which could increase the length of data generated by this command.

***Caution**: Do not embed an "@L" command inside the ID String as this will cause an endless loop.*

@M PRINT WEIGHING MODE

Use the @M command to print either the current weighing mode or print the internal mode strings.

Input Data Form:

@M1	Print Current Display Mode
@M2	Print "GROSS"
@M3	Print "NET"
@M4	Print "TARE"
@M5	Print "TOTAL"
@M6	Print "T CNT" (Total CouNT= number of weighments totaled)
@M7	Print "TOTAL T CNT"
@M8	Print lower display Mode
@M9	Print "GROSS+" or "NET+" or "AD2TOT" depending on the last totaled weight mode.

Output Data Form:

9M1 * * * * * *

Length: 8 or 9 with DP. Justification: left ***** = Lower display

9M2 **G R O S S**

Length: 6 Justification: left

9M3 **N E T**

Length: 6 Justification: left

9M4 **T A R E**

Length: 6 Justification: left

9M5 **T O T A L**

Length: 6 Justification: left

ŋM6 **T - C N T**

Length: 6 Justification: left

ŋM7 **T O T A L , T - C N T**

Length: 12 Justification: left

ŋM8 *** * * * * * * * ***

Length: 8 or 9 if DP is present *= current lower display

ŋM9 **If Gross weight is added** **G R O S S +**

Length: 6 Justification: left

ŋM9 **If Net weight is added** **N E T +**

Length: 6 Justification: left

ŋM9 **If Register is Empty** **A D 2 T O T**

Length: 6 Justification: left, the "+" indicates that it is the weight from the last totaled register

@N PRINT ID CODE NAME

Use the @N command to print the current ID Code Name.

Input Data Form:

@N

Output Data Form:

ŋN **I D N A M E * ***

Length: 8 Justification: left (*Up to 8 Characters)

@S PRINT START OF LINE STRING

Use the @S command to output the Start of Line string. The SOL string is preprogrammed in the "COMM PORT Setup Menus".

Input Data Form:

@S Print SOL String

Output Data Form:

Sends out the SOL string, a maximum of 8 bytes.

@T PRINT TIME

Use the @T command to print the current time register from the real-time Clock.

Input Data Form:

@T1 12 hour format with HH:MM
@T2 12 hour format with HH:MM:SS
@T3 24 hour format with HH:MM
@T4 24 hour format with HH:MM:SS

Output Data Form:

ŋT1 **2 : 0 8 P M**

Length: 8 Justification: full, leading hours zero suppressed

ŋT2 **2 : 0 8 : 3 6 P M**

Length: 11 Justification: full, leading hours zero suppressed

ŋT3 **1 4 : 0 8**

Length: 5 Justification: left, leading hours zero suppressed

@T4 **1 4 : 0 8 : 3 6**

Length: 8 Justification: left, leading hours zero suppressed

@U PRINT CURRENT UNITS

Use the @U command to output the current weight units.

Input Data Form: @U

Output Data Form:

@U **L B K G O Z G**

Length: 4 Justification: left

(Units available depend on capacity and legal-for-trade setups)

@V PRINT WEIGHT (No Mode or Units)

Use the @V command to print the current weight without units or mode printed.

@V is not available on LFT configured 3750s

Input Data Form:

@V1	Displayed weight (GROSS, NET, DEV, %DEV)	
@V2	Gross weight	
@V3	Net weight	Note: will print dashes if NET mode is not enabled
@V4	Tare weight	Note: will print zeros if no TARE value has been established
@V5	Total weight	
@V6	n Totals (weighments counter)	
@V7	Total + n Totals (Combined @V5 and @V6)	
@V8	Lower Display	Note: prints the lower display as setup by the user.
@V9	Last Totaled Weight	Note: will print dashes if no weight has been totaled.

Output Data Form:

@V1 @V2 @V3 @V4 @V9

2 0 . 5 0 2

Length: 8 Justification: full, leading hours zero suppressed

@V5 **1 2 3 4 5 6 7 . 8 9**

Length: 10 Justification: right, leading zeros suppressed

@V6 **1 2 3 4**

Length: 5 Justification: right, leading zeros suppressed

@V7 **1 2 3 4 5 6 7 . 8 9 , 1 2 3 4**

Length: 16 Justification: each number field - right, leading zeros suppressed

@V8 * * * * * * * *

Length: 8 or 9 if DP is present

@W PRINT WEIGHT FULLY

Use the @W command to print the current weight with units and mode printed.

Input Data Form:

@W1	Displayed weight with units and mode	
@W2	Gross weight	
@W3	Net weight	Note: will print dashes if NET mode is not enabled
@W4	Tare weight	Note: will print zeros if no Tare value has been established
@W5	Total weight	
@W6	n Totals (weighments counter)	
@W7	Total with n Totals (combined @W5 and @W6)	
@W8	Lower Display combined with Lower Display Mode.	

@W9 Last totaled weight Note: will print dashes if no weight has been totaled.

Output Data Form:

9W1 **2 0 . 0 1 5 L B * * * * * ***

Length: 20. Justification: Weight - right, Units - left, Mode - left, ****** = Current Mode (GROSS, NET, PK GRSS, PK NET, etc.)

9W2 **2 0 . 0 1 5 L B G R O S S**

Length: 20 Justification: Weight - right, Units - left, Mode - left

9W3 **2 0 . 0 1 5 L B N E T**

Length: 20 Justification: Weight - right, Units - left, Mode - left

9W4 **2 0 . 0 1 5 L B T A R E**

Length: 20 Justification: Weight - right, Units - left, Mode - left

9W5 **1 2 2 0 . 0 1 5 L B T O T A L** Length: 22

Justification: Weight - right, Units - left, Mode - left, characters 11,16 and 22 always a space

9W6 **1 2 3 4 T – C N T**

Length: 12 Justification: Counts - right, Mode - left, characters 1, 6 and 12 always a space

9W7 **4 3 2 5 3 4 . 8 5 K G T O T A L**

1 2 3 4 T – C N T

Length: 34 Justification: Weight - right, Units - left, Mode - left, Weighments right, "T–CNT" left

9W8 *** * * * * * * * m m m m m m m m**

Length: 17 or 18 with DP in lower display. ******** = Current Lower Display mmmmmmmm = current lower display mode.

If gross weight is added

9W9 **2 0 . 0 1 5 K G G R O S S +**

If net weight is added

9W9 **2 0 . 0 1 5 K G N E T +**

If total register is empty

9W9 **- - - - - - - - K G A D 2 T O T**

Length: 20 Justification: Weight - right, Units - left, Mode - left, the "+" indicates that it is the weight from the last totaled register

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@# DATA FROM SCALE CHANNEL

Use the @# (where # = 0-31) commands in conjunction with the @Vx or @Wx commands to cause the print string to take data from any scale channel listed in the Channel List. See the CellScale manual for information on setting up a channel list. When preceded by the @0-31 command, do not use the @ sign in front of the weight command; e.g. @1W3. If the @W or @V commands are used without the @0-31 in front, the scale mode currently displayed will provide the data.

Once an @# command is sent, all subsequent scale related commands will function on the set channel, until it is changed again with @#.

Input Data Form (examples, any W or V command will work):

@1W1 Print the Weight in the last display mode of the scale channel in position 1 of the scan list.
@2V0 Print the Gross Weight of the scale channel first in the scan list.
@31W2 Print the Net Weight of the scale channel last in the scan list.

Output Data Form:

Is dictated by the suffix command, see "@W" and "@V".

Output Data Form:

Is dictated by the suffix command, see "@W" and "@V".

@? QUERY SCALE CHANNEL

Use the @? to print the active scale channel # set by the @# command.

COMPUTER OPERATION VIA HOST CODES

The MSI-3750CS can interface to computers via RS-232. All functions can be controlled remotely and all setups can be downloaded automatically. The computer can query the scale at any time to get status, weight, or accumulated totals.

General Protocol

The MSI-3750CS responds to ASCII commands that consist of a two letter mnemonic. Depending on the command, a 1 or 2 digit item selection (sub-code) may be required. Certain commands require user supplied data. Commands sent from a host computer can be chained together in any order. Commands are terminated by another command or by a semicolon (;). It is necessary to end a multiple command string with the semicolon as a terminator. Variable length numeric data must be terminated by a semicolon or by another command. Variable length alphanumeric data must be terminated by a semicolon before adding additional commands. Commands are case sensitive, only capital letters are used. The 3750CS will not accept commands if it is in any setup mode caused by pushing the SETUP key.
It is important that the final character sent to the 3750CS is a semicolon (;).

"@" Commands Under Computer Control

The "@" commands also function under computer control, however they act differently than standard computer commands. The "@" commands, when received by the 3750CS, will cause the immediate transmission of the asked for data type out the Comm port. The ";" delimiter is usually not necessary unless the "@" commands are combined with the standard computer commands. The preferred way to get data from the 3750CS is to use the "CD" command, set up a print string with all the @ codes desired, then use the "PR" command to cause a data transmission. Once the print string is set up with the desired data, only the PR command is needed.

HOST CODE COMMANDS

Auto Off	AO	1=Disabled 5= 2 hours 2= 10 min. 6= 4 hours 3= 30 min. 7= 8 hours 4= 1 hour 8= 24 hours	Once the scale is off, the compute will not be able to talk to it unless the Clock Mode is enabled
Back Light	BL	1= Automatic 2= On 3= Off	
Comm Port Data	CD	Up to 480 characters including @ Codes	Send CD followed by all '@' commands + text. Must be terminated with a semicolon (;).
Total Mode	EM	1= Disabled 5= OnAccept 2= Autoload 6= Manual 3= Autonorm 7= Loaddrop 4= Autopeak	
Filter	FL	1= Low Filter 3= High 2= Medium	
Bar Graph 100% value	GH	Enter value = to 100% in current weight units	Terminate value with any command or a semicolon.
Bar Graph 0% value	GZ	Enter value = to 0% in current weight units	Terminate value with any command or a semicolon.
Bar Graph Mode	GM	1= Disabled 3= RF Modem 2= Per Cent	
ID?	ID	Enter value = to 0% in current weight units	Terminate value with any command or a semicolon.
ID Code Display mode	IL	1= Disabled 3= Per Cent 2= Normal	
ID Name	IN	Input up to an 8 character name	End with a ; if name is less than 8 characters.
ID String	IS	1= ID String 1 2= ID String 2 add text	Example: IS1This is a test; Terminate with a ;
Keyboard Enable	KE	1= Disabled 2= Enabled	Careful–disables all front panel switches.
Keyboard Function Emulate	KF	1= Power Off 8= Clear Last Σ 2= Zero 9= Clear Σ 3= Gross 10=Clear all Σ 4= Net 11= Print 5= Tare 12= Pk Hld on 6= Total 13= Pk Hld off 7= View Total	Terminate command with other command or a ";".
Turn on the Power	O	None	Clock mode must be enable with seconds. Delay at least 200 ms before sending additional data.

Print	PR	1= *Print String*	Causes the current print format string to be printed.
Calendar Date Set	RD	Enter date in MM/DD/YYYY order	Example: RD10/05/2001; is equal to October 5th 2001
Display Clock/ Calendar	RE	1= Disabled 2= On	Turns on clock calendar when power is off and enables scale-off data reception
Time Set	RT	Enter time in HH:MM:SS order	Example: RT22:35:55 is equal to 10:35:55 PM
Day of Week Set	RW	1= Sunday 5= Thursday 2= Monday 6= Friday 3= Tuesday 7= Saturday 4= Wednesday	
Set Point Delay	ST	Input # of 0.1 seconds of delay	Example: DT150; will delay the set point by 15 seconds.
Set Point Receive Data Enable	S#	1-32 for Set Points 1 through 32	S# sets which set point receives data with the other set point commands.
Set Point Dead Zone Value	SD	Enter value in current units	Terminate weight value with a semicolon or another command.
All set points mode enable	SE	1= Disabled 2= Enabled	
Set Point Latch	SL	0= Off 1= On	
Set Point Mode	SM	1= Disabled 3= Net/Gross 2= Total 4= Gross	
Set Pt Message to Comm1	SO1	0= Off 1= On	Directs the set point messages to Comm 1.
Set Point Message to LCD	SOS	0= Off 1= On	Directs the set point messages to the LCD message display.
Set Point Display	SR	1= Normal 3= Blink LCD 2= Blank LCD 4= Message	
Set Point String	SS	Enter up to 20 characters	Terminate string with semicolon. You can embed @ commands.

Set Point Value 1	ST1	< or > followed by weight in current units.	Example: ST1>150; sets the first set point value to >150.
Set Point Value 2	ST2	< or > followed by weight in current units.	Example: ST2<200; sets the second set point to <200. With both examples as shown, a set point window has been made from 150 to 200.
Tare	TA	Input tare value in current units	Example: TA20.0; sets the tare to 20.0
Units Print Mode	UP	1= Upper Case 2= lower case	If your printer prints lower case letters select 2.
Set Units	UN	1= lb 5= oz 2= kg 6= g 3= tons (short) 7= daN 4= metric tons	

SECTION 10 – CELLSCALE CALIBRATION

CALIBRATE GENERAL INFORMATION

The following sections are intended for qualified scale technicians. The CellScale can be calibrated either directly using the Terminal Interface mode, or by using a 3750CS. See the CellScale operators guide for information on direct calibration. This section details the calibration of a CellScale using the 3750CS RF Weighmeter. Calibrating a CellScale with a 3750CS Meter requires that adequate test weights (10% of capacity, if the scale is linear), certified by the appropriate regulatory agency, are available. See the "Calibration Flowchart" for an overview of the calibration process.

Calibration constants are stored only in the CellScale. The 3750CS serves only as a controller during calibration.

Since a single CellScale is capable of hosting up to 32 independent scales, the scale to be calibrated must be selected first using the SC Index Key. To Calibrate multiple Scale Inputs, you must complete the first calibration. Then exit out of the Calibration Menus. Select the next scale with the SC Index Key. Then enable Calibration again.

For a new installation, replacing the CellScale, or setting the Capacity and/or Count-by (d):

1) Select the scale input for calibration using the SC Index Key. See "Accessing multiple scale inputs".
2) Follow the "Reset Calibration" procedure below.
3) If the unit is legal for trade, set the appropriate standard with the "LEGAL STANDARD" procedure. If the unit is to be used with metric units only set the standard to "METRIC", else use "INDUSTRY".
4) Follow the "CALIBRATION" procedure to set capacity, "d", and then calibrate.
5) Reseal the Cal' port when finished.

For recalibration of a previously calibrated CellScale:

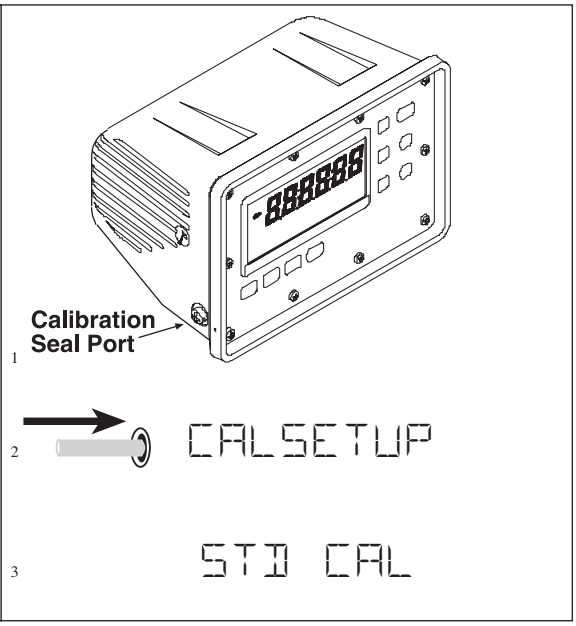
1) Select the scale input for calibration using the SC Index Key. See "Accessing multiple scale inputs".
2) First follow the "Enable Calibration" procedure below.
3) Next, follow the procedure in the "CALIBRATION" section, skipping steps 3 through 10 as instructed in the procedure.
4) Reseal the Cal port when finished.

ENABLE CALIBRATION

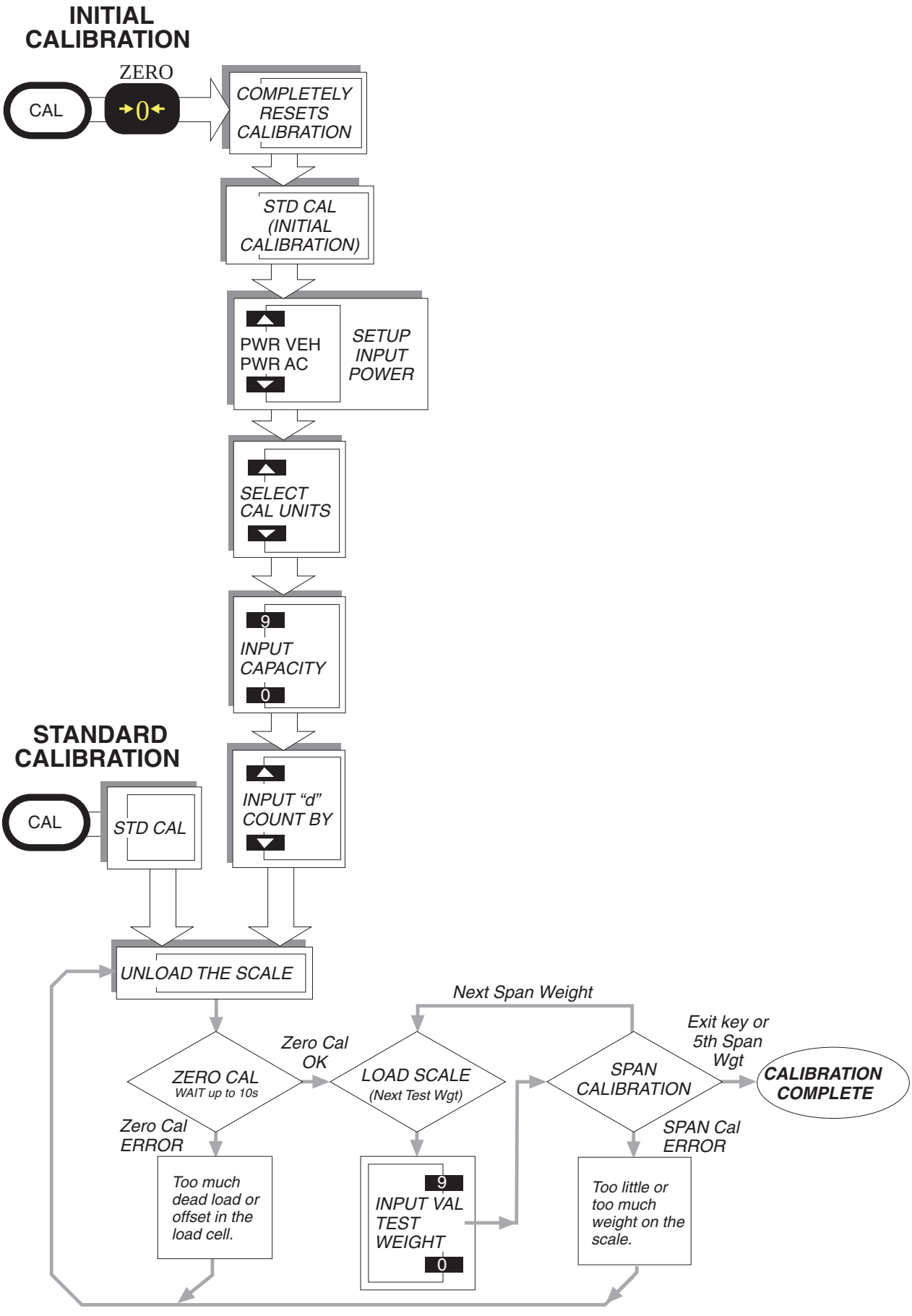
To enable the Calibration Menus

1) Expose the Calibration Seal Port by removing the seal screw on the left side of the 3750 Meter Casting with a Phillips Head Screwdriver.
2) Insert a small non-metallic screwdriver or the wooden stem of a "Q-Tip" and press the switch button in the hole. The display reads "CAL-SETUP".

   Tip: A wooden Golf Tee fits the hole perfectly.
3) After 3 seconds the Calibrate Setup Menu appears (STD CAL). Use the UP or DOWN scroll keys to locate the desired Calibrate operation as described in the following procedures.



DO NOT initiate either of the following two procedures unless you are prepared and qualified to perform a complete initialization and/or a calibration procedure. The first procedure completely clears the CellScales calibration data for the chosen scale channel. A full calibration must follow this operation. The second procedure returns all the 3750CS registers to defaults. However calibration in the CellScale is unaffected.


INITIAL CALIBRATION
ZERO
CAL
→0←
COMPLETELY RESETS CALIBRATION
STD CAL (INITIAL CALIBRATION)
PWR VEH
PWR AC
SETUP INPUT POWER
SELECT CAL UNITS
9
INPUT CAPACITY
0
STANDARD CALIBRATION
CAL
STD CAL
INPUT "d" COUNT BY
UNLOAD THE SCALE
Next Span Weight
ZERO CAL
WAIT up to 10s
Zero Cal OK
LOAD SCALE
(Next Test Wgt)
SPAN CALIBRATION
Exit key or 5th Span Wgt
CALIBRATION COMPLETE
Zero Cal ERROR
Too much dead load or offset in the load cell.
9
INPUT VAL TEST WEIGHT
0
SPAN Cal ERROR
Too little or too much weight on the scale.

RESET CALIBRATION

This procedure clears all the calibration parameters and allows a brand new capacity and resolution (count by or 'd') to be entered. This procedure should not be used for routine calibration of a previously calibrated Cell Scale system.

To Reset the Calibration Constants

This procedure will not work if the scale is already in the CAL SETUP menus. Push the EXIT key to get out of "CAL SETUP".

1) Expose the Calibration Seal Port by removing the seal screw on the left side of the 3750 Meter Casting with a Phillips Head Screwdriver. The display reads "CALSETUP"
2) Insert a small non-metallic screwdriver or the wooden stem of a "Q-Tip" and press and release the switch button in the hole, followed immediately by the ZERO key. The display reads "RESETCAL".
3) The first item in the Calibrate Setup Menu appears (STD CAL). Use the UP or DOWN scroll keys to locate the desired Calibrate operation.

RESET ALL

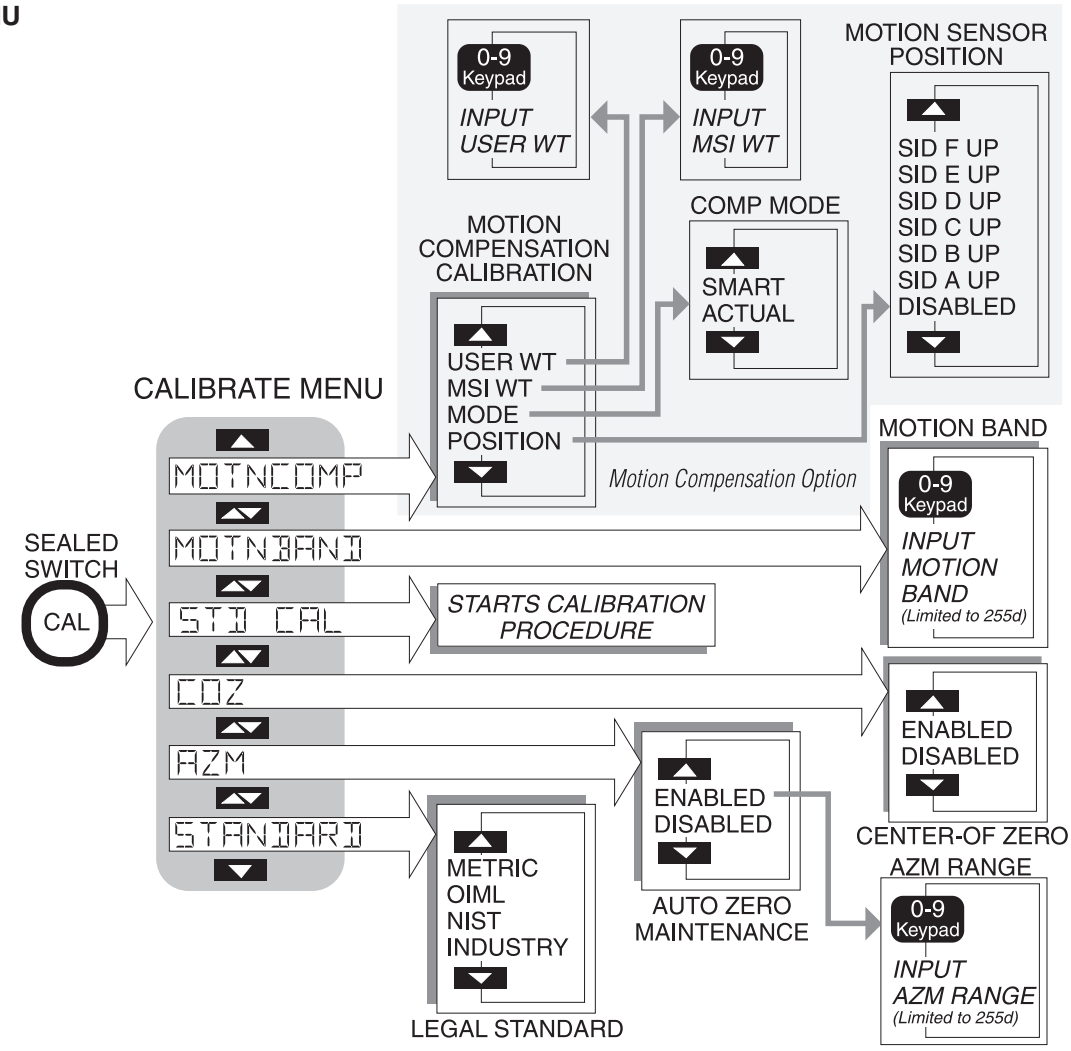
This procedure returns all registers of the 3750CS to defaults. DO NOT initiate this function unless you are prepared and qualified to perform a complete setup of the 3750CS system. This operation differs from RESETCAL in that all registers are returned to defaults. Communication will be lost until network parameters are reentered.

To Completely Reset the 3750CS

This procedure will not work if the 3750CS is already in the Cal Setup Menus. Push the EXIT key to get out of "CAL SETUP".

1) Turn off the 3750CS power. Expose the Calibration Port by removing the seal screw on the left side of the 3750CS with a Phillips Screwdriver.
2) Insert a small non-metallic screwdriver and press and hold on the switch button in the hole.
3) While holding the cal switch on, turn on the 3750CS. The display reads "RESETALL" for 2 seconds followed by "RU SURE".
4) Push ENTER to reset all registers. The display will initialize while the registers are cleared.
   If you change your mind, pushing EXIT will cancel the Reset All operation.

CALIBRATE SETUP MENU



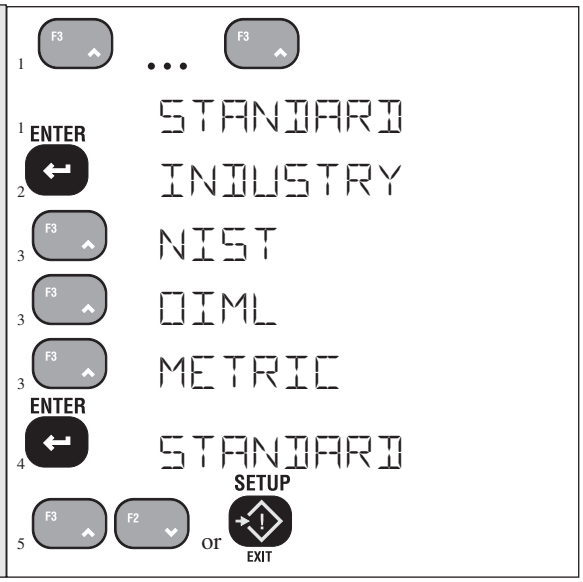
LEGAL STANDARD

The STANDARD function allows the Model 3750CS to be configured as required by various regulatory agencies. The "INDUSTRY" selection is the default. Choose "NIST" for US and Canadian Legal-for-Trade units. Choose "OIML" for European L-F-T applications. "METRIC" is the same as "INDUSTRY" except only kg and g units are enabled.

Before starting the following procedure, you must be in the Top Menu Level of Calibration. See "Enable Calibration". Contact MSI for details on the differences between the various configurations.

To Select the Legal Standard

1) Use the UP or DOWN scroll key to scroll to the "STANDARD" message.
2) Press ENTER. The current Standard is displayed.
3) Use the UP or DOWN key to scroll through the Standards options. For this example we'll pick the "METRIC" standard. This will limit the units choices to kg and g (and Metric Tons if the capacity is high enough).
4) Push ENTER to set your selection.
5) You are now back in the "CAL SETUP" menu. Use the UP/DOWN keys to scroll to the next calibration operation or push EXIT to return to normal scale operation.



TO CALIBRATE

Use this Calibration procedure for calibration of the CellScale using the 3750CS. If capacity or resolution changes are necessary (such as an initial setup of a system) first reset the Calibration with the procedure on page 111. The CellScale supports up to 10 points of span calibration, however, calibrating with the 3750CS limits the calibration to 5 span points. Zero and at least 1 span point are required for a successful calibration. The highest value test weight should be at least 20% of capacity, but 50% or more is preferable.

Before starting the following procedure, you must be in the Top Menu Level of Calibration. See "Enable Calibration".

1) Use the UP or DOWN scroll key to scroll to the "STD CAL" message.

2) Press ENTER.
If this is a recalibration, jump to step 11. If this is the initial calibration or following a Reset Cal procedure, go to step 3.

3) Use the UP or DOWN key to tell the scale what power source the 3750CS will use: "PWR AC" for 115 or 230 VAC, or "PWR VEHI" for either vehicle power adapter or for running the system from a 12V SLA Battery.

4) Push ENTER when the proper choice is displayed.
In this example the 3750CS is an AC unit.

5) Next set the default units the scale is calibrated in. Use the UP or DOWN key to scroll to the desired Calibration Unit.
In this example, we'll pick "KILOGRAM". The capacity initially programmed in the calibration units determines the overload value.

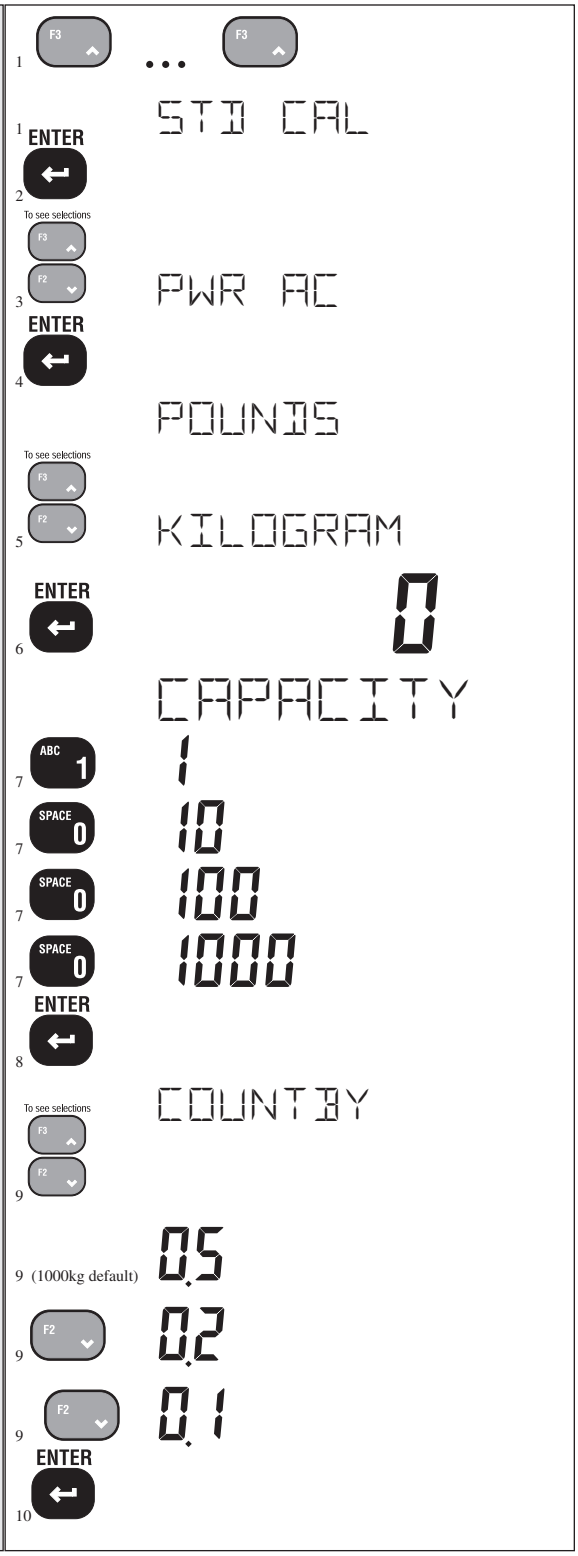
6) Press ENTER to set the Calibration Units.

7) Next set the capacity of the system in Calibration Units. The display reads "CAPACITY". Use the numeric keys to set the capacity value.
In this example we'll set the meter Capacity at 1000 kg. Capacities range up to 999,999 calibration units in any units. During capacity entry, you can back step delete any incorrect entry using the CLR (ZERO) key.

8) Push ENTER to complete the capacity value entry.

9) Next, use the UP or DOWN keys to enter the resolution in scale divisions (d). The CellScale defaults to 3000 counts or less resolution. The message display reads "COUNT BY". The numeric display indicates the calculated "d" value. Use the UP key to decrease resolution (increase the count-by). Use the DOWN key to increase resolution (decrease the count-by). Increments are in a 1-2-5 sequence.
In this example we'll change the scale divisions to 0.1 kg

10) Push ENTER when the desired scale division is displayed.



11) Zero Calibration – The message reads "Ø SCALE". Remove all weight from the scale and wait until the scale is motionless. When the load receptor is stable push ZERO or ENTER. The display reads "CAL'ING". Wait for about 5 seconds. If the detected zero weight is within acceptable limits the message "WEIGHT 1" will appear.

12) Span Calibration – The CellScale can be calibrated with any in span test weight. A minimum of 1 and a maximum of 5 weights can be used and the weight can be applied in any random order. Place the calibration weight on the load receptor.

13) Next, input your calibration weight value using the numeric keys. In this example, we show calibrating with a Test Weight certified at 500.2 kg.

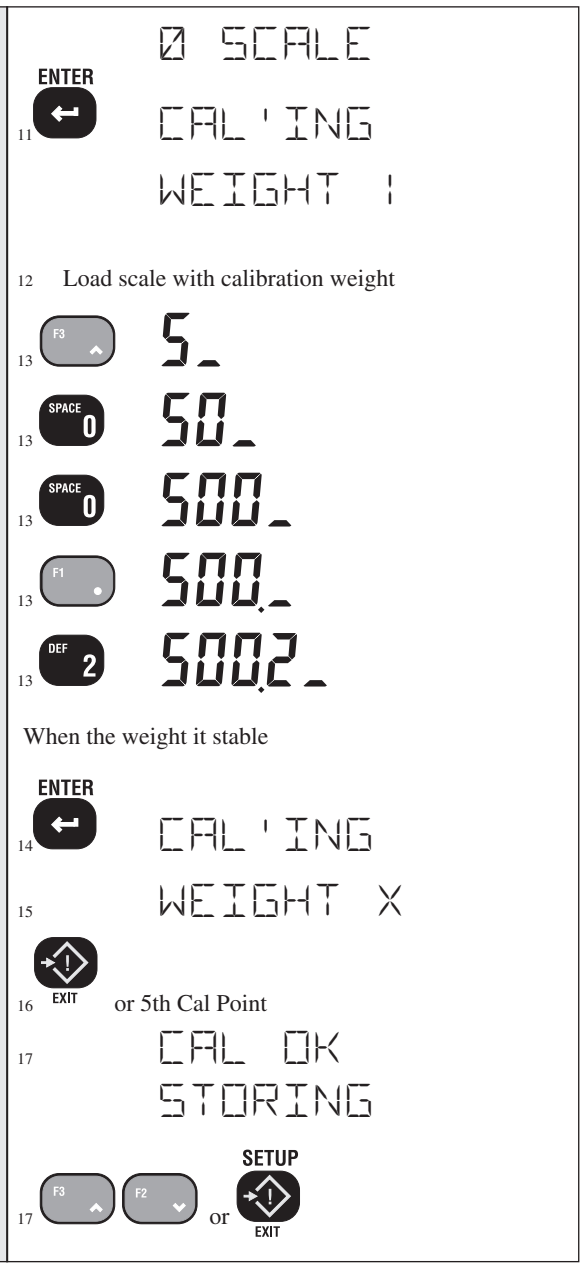
14) Once the weight value is complete and the weight on the load receptor is stable, push ENTER. The message "CAL'ING" appears.

The 3750CS checks to see if the weight data is within acceptable limits.

15) Next the message indicates "WEIGHT X" (X = 2 to 5). Repeat steps 12 through 14 for additional test weights.

16) The span calibration process is finished by either a) pushing the EXIT key after at lest 1 span point has be calibrated, or b) when the 5th span point is calibrated.

17) If the Span parameters were OK, the message will read "CAL OK" then "STORING". Calibration is complete, push EXIT to return to normal scale operation, or push UP/DOWN to choose another Calibrate Setup function. Seal the calibration port.



TO ENABLE / DISABLE AZM (AUTO ZERO MAINTENANCE)

AZM is used to adjust out variations at zero caused by debris or water on the scale, temperature drift, and any other minor variation that affects the zero setting. Typically AZM is set to 0.5d or 1d, which is adequate for most modern scale systems. The CellScale allows for a much greater AZM range (non legal-for-trade scales only) for unique applications. Use this feature cautiously as it can zero out large weight amounts unexpectedly.

An example of where a large value AZM can be advantageous is when packing produce. Typically there is some variation in the weight of the packing boxes. By setting the AZM to equal the largest variation in box weight, the error in weight caused by the box variations can be eliminated automatically. The key to making this work is that the first amount of produce placed in the box has to weigh more than the AZM range so that the produce isn't also zeroed out.

The CellScale can also adjust the time interval of AZM, but only through the Terminal Interface (refer to the CellScale manual). AZM time interval defaults to 1/second.

Do not disable AZM. The ability to disable AZM is only intended for regulatory agencies that conduct tests without AZM enabled. Disabling AZM will degrade temperature and drift performance of the CellScale. Also use caution in setting the AZM window too large. This can cause the scale to zero unexpectedly. MSI recommends keeping AZM below 5d for most applications.

To ENABLE / DISABLE AZM

1) Use the UP or DOWN scroll key to locate the menu choice “AZM”.

2) Push ENTER to access the AZM submenu.

3) Change AZM to “DISABLED” or “ENABLED” as desired using the UP or DOWN scroll key.

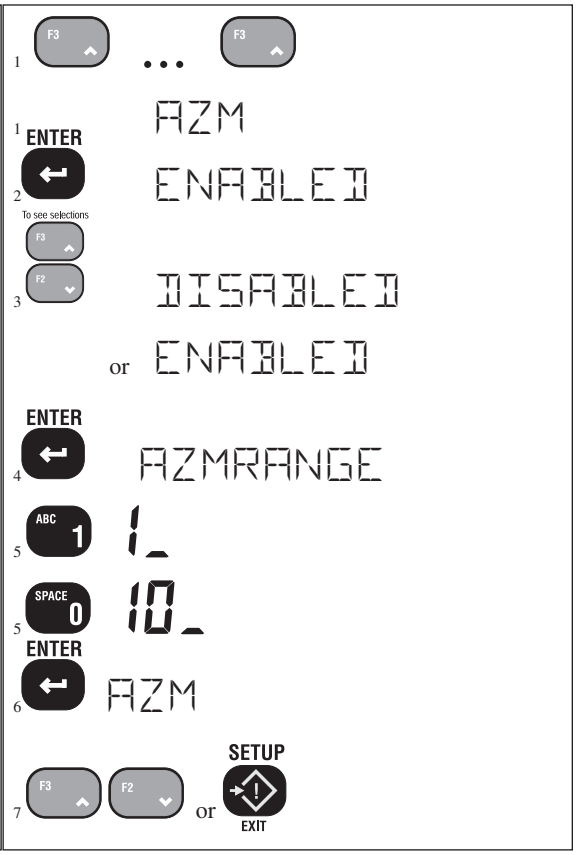
4) Push ENTER.

5) If you selected “ENABLED” in the previous step the “AZMRANGE” screen appears. Use the numeric keys to input number of scale divisions the system can zero out automatically. Use “0” for standard AZM operation. Using “0” sets the AZM window at ±0.5d. The range of AZM is limited to 255d.

   In this example, the scale is a 1000 kg x 0.1 kg. Therefore to achieve an example AZM range of 1 kg, we'll enter “10” (10 x 0.1 kg = 1 kg).

6) After keying in the desired AZM range, push ENTER.

7) Push EXIT to return to normal scale operation, or push UP or DOWN to choose another Calibrate Setup function.



MOTION BAND

The motion band determines the range of weight variation that the indicator considers to be stable weight. Since the CellScale will not zero or tare a value in motion, the motion band directly influences the accuracy of the scale system. The motion band in Legal-For-Trade systems is fixed at ≤ 0.6d and cannot be altered. In systems used for industrial applications, the motion band can be adjusted larger. Adjusting the motion band larger can help in medium accuracy applications where there is a lot of vibration or noise and it is difficult to hold the weight steady enough to tare, zero, or total. For example, setting the motion band to 5 d would allow a tare (or zero or total) to be as much as 5d off of its ideal value but it will make the indicator easier to use as you don't have to wait until the weight is completely stable.

The Motion Band ± range is limited to a maximum of 255 `d`. If you exceed this range, the 3750 will return the error message “TOO BIG”. Setting the Motion Band to 0 is equal to a range of ±0.5d.

To Adjust the Motion Band

Before starting the following procedure, you must be in the Top Menu Level of Calibration. See “Enable Calibration”.

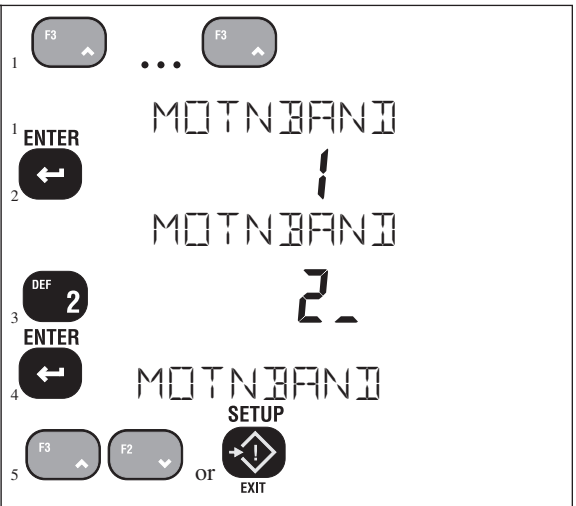
1) Use the UP or DOWN scroll key to scroll to the “MOTNBAND” message.

2) Press ENTER to access the Motion Band Submenu. The current motion band value is displayed on the numeric digits.

3) The “MOTNBAND” screen will appear. Use the numeric keys to input the weight range the system uses to detect Motion. Use “1” for standard operation. This sets the Motion Band to ±1d.
   In this example, we'll enter ±2d as the Motion Band.

4) After entering the desired motion band, push ENTER.

5) Push EXIT to return to normal scale operation, or push UP or DOWN to choose another Calibrate Setup function.



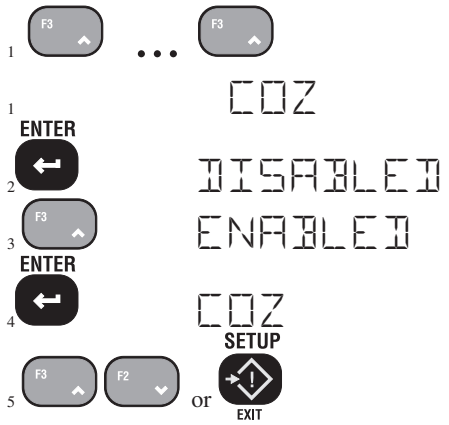
CENTER-OF-ZERO (COZ) INDICATOR

The COZ indicator turns on when the scale is within 1/4 d of the last zero setting. Some legal-for-trade jurisdictions require its use.

To Enable/Disable the COZ Indicator

Before starting the following procedure, you must be in the Top Menu Level of Calibration.

1) Use the UP or DOWN scroll key to scroll to the "COZ" message.
2) Press ENTER. The current COZ indicator status is displayed.
3) Use the UP or DOWN key to toggle between ENABLED and DISABLED options. For this example we'll "ENABLE" the COZ indicator.
4) Push ENTER to set your selection.
5) You are now back in the "CAL SETUP" menu. Use the UP/DOWN keys to scroll to the next calibration operation or push EXIT to return to normal scale operation.



SETTING UP THE MOTION COMPENSATION OPTION

The Motion Compensation Option is an advanced CellScale feature that uses an Accelerometer to measure motion and tilt angle. Successful use of the option is dependent on the setup parameters and configuration of the electronics. Refer to the Menu Map on page 94 for structure of the Motion Comp setup menus.

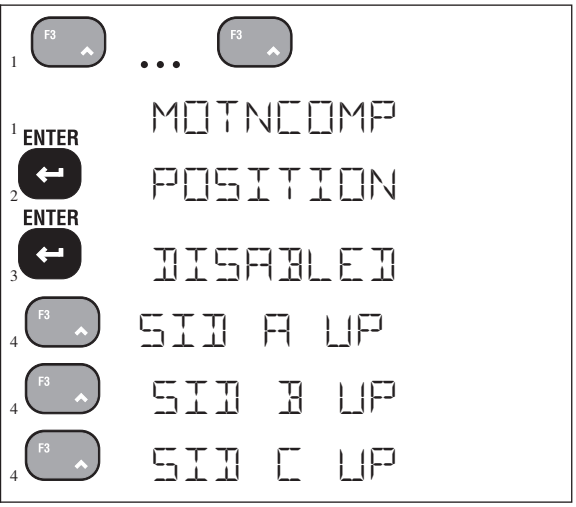
Configuration of the Compensation data depends on user input:

1) POSITION – The relative position of the Motion Comp Module must also be known. In the case of a standard Cell Scale the following diagram should be used.
2) MODE – This should usually be set to "SMART". Use of the "ACTUAL" setting requires specific knowledge of the internal workings of the CellScale A/D parameters that are only accessible through the terminal interface. Contact MSI for additional information.
3) MSI WT – The user must know the active weight (MSI WT) of the scale itself. This number is not easy to determine, and is usually provided by MSI for MSI designed load trains. For load cell systems not supplied by MSI, please contact MSI for details on determining the active weight.
   The MSI weight is found on MSI's serial number tag. It is referenced as the "COMP WEIGHT" and is usually measured in pounds. Make sure you convert this weight if the scale is calibrated in units other than pounds.
4) USER WT – The user must also know the dead load weight (USER WT) of the scale. The dead load is a weight that is normally zeroed out, but in a motion compensated system this weight must be known to a high degree of accuracy. Weighing the scale elements on another calibrated scale is one way to determine the dead load.

To Setup the Motion Compensation Option

Before starting the following procedure, you must be in the Top Menu Level of Calibration. See "Enable Calibration".

1) Use the UP or DOWN scroll key to scroll to the "MOTNCOMP" menu.
2) Press ENTER. The first submenu is "POSITION".
3) Press ENTER. The current setting for Motion Compensation position is displayed.
4) Use the UP key to scroll through the various positions available. For this example, we'll set the position to "D" (SID D UP).
   For SAI MCS Scrap loading systems use "D". For MSI DJJ three chain systems, use "A". For motion compensated TransWeigh CS systems use "D". Refer to the drawing on the previous page for CellScale orientation.



5) Push ENTER to set your position choice.

6) Use the UP key to locate the submenu “MODE”.

7) Push ENTER.

8) Select “SMART” using the UP or DOWN key.

9) Push ENTER to set the Mode.

10) Use the UP key to locate the submenu “MSI WT”.

11) Push ENTER. The current set MSI WT is displayed.

12) Using the numeric keys, input the MSI WT. For this example, we’ll input 70 kg.

Make sure that the MSI WT is in the displayed units. If not convert the MSI WT to the calibration unit as shown on the display.

13) Push ENTER to store the MSI WT.

14) Use the UP key to locate the submenu “USER WT”

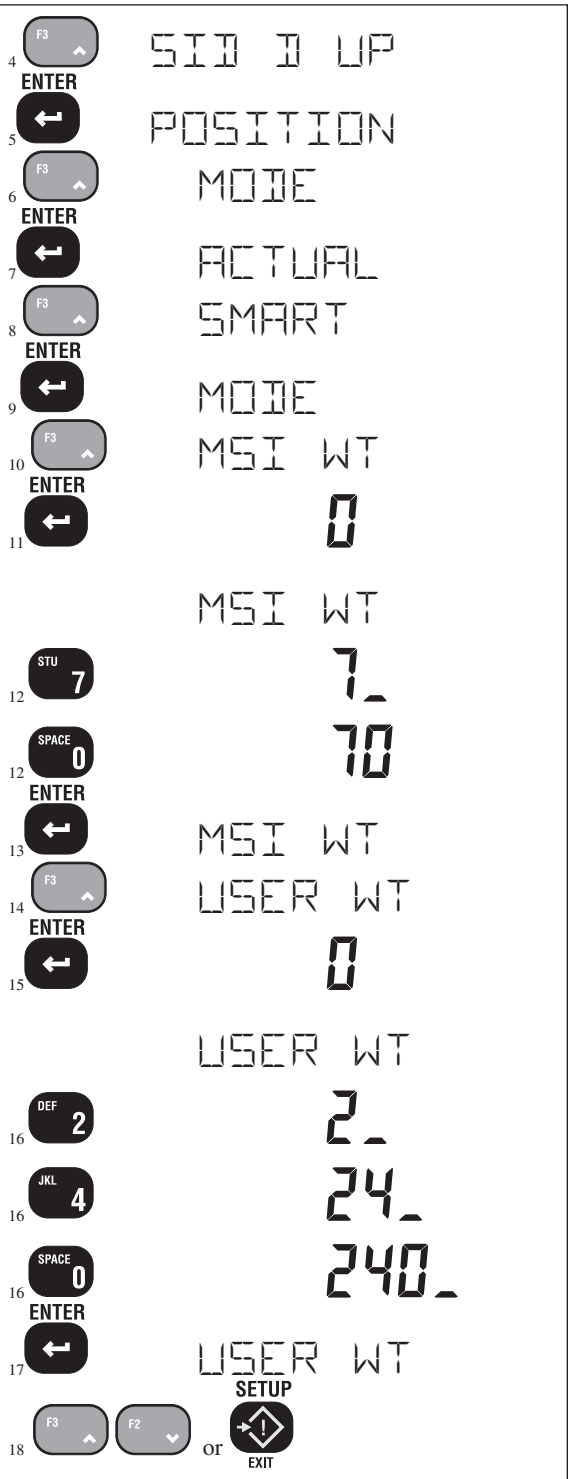
15) Push ENTER. The current user weight it displayed.

16) Using the numeric keys, input the USER WT. For this example, we’ll input 240 kg.

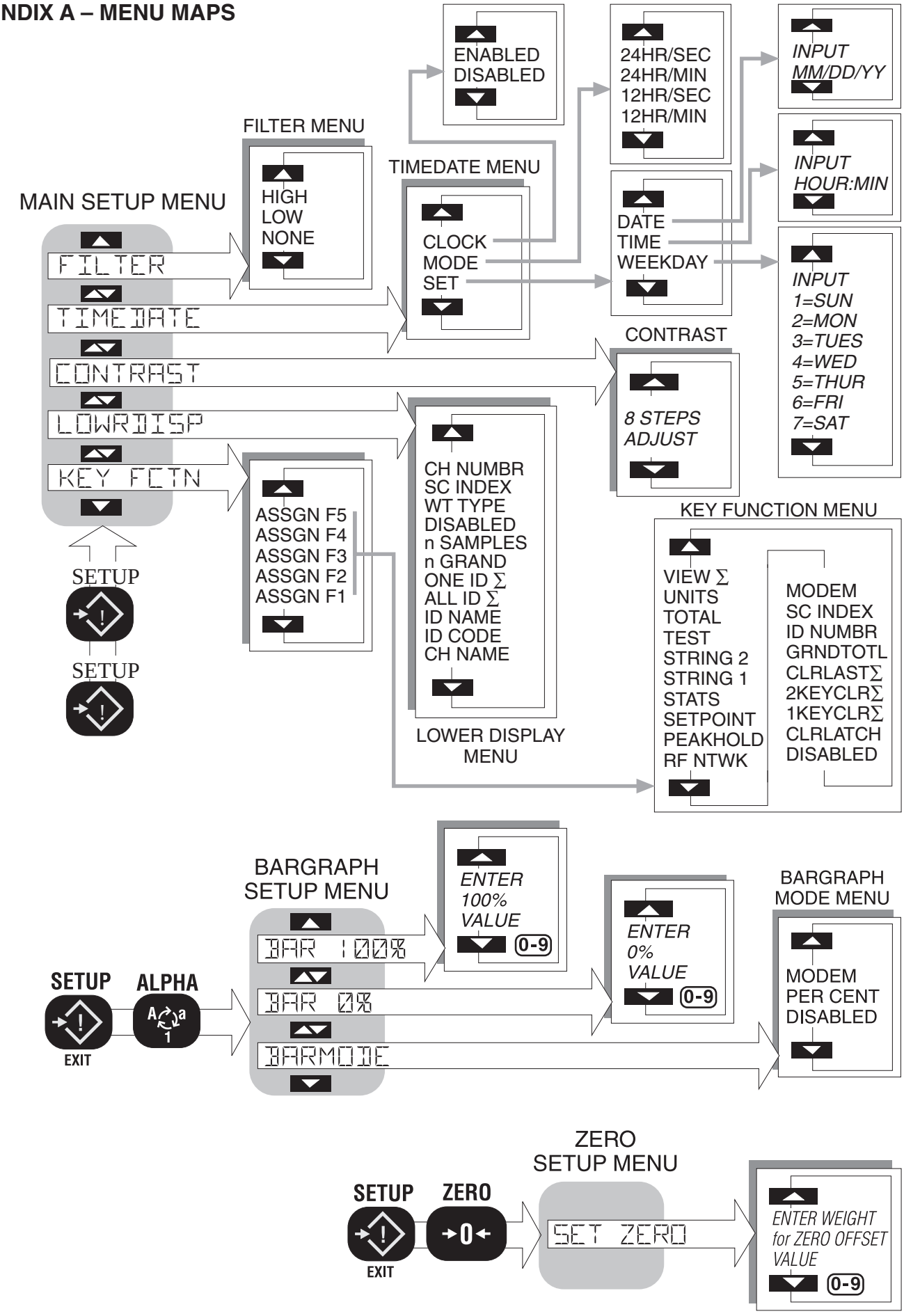
The USER WT is equivalent to the dead load of the scale. In MCS and OMS systems, the USER WT is the weight of the magnet and chains beneath the scale.

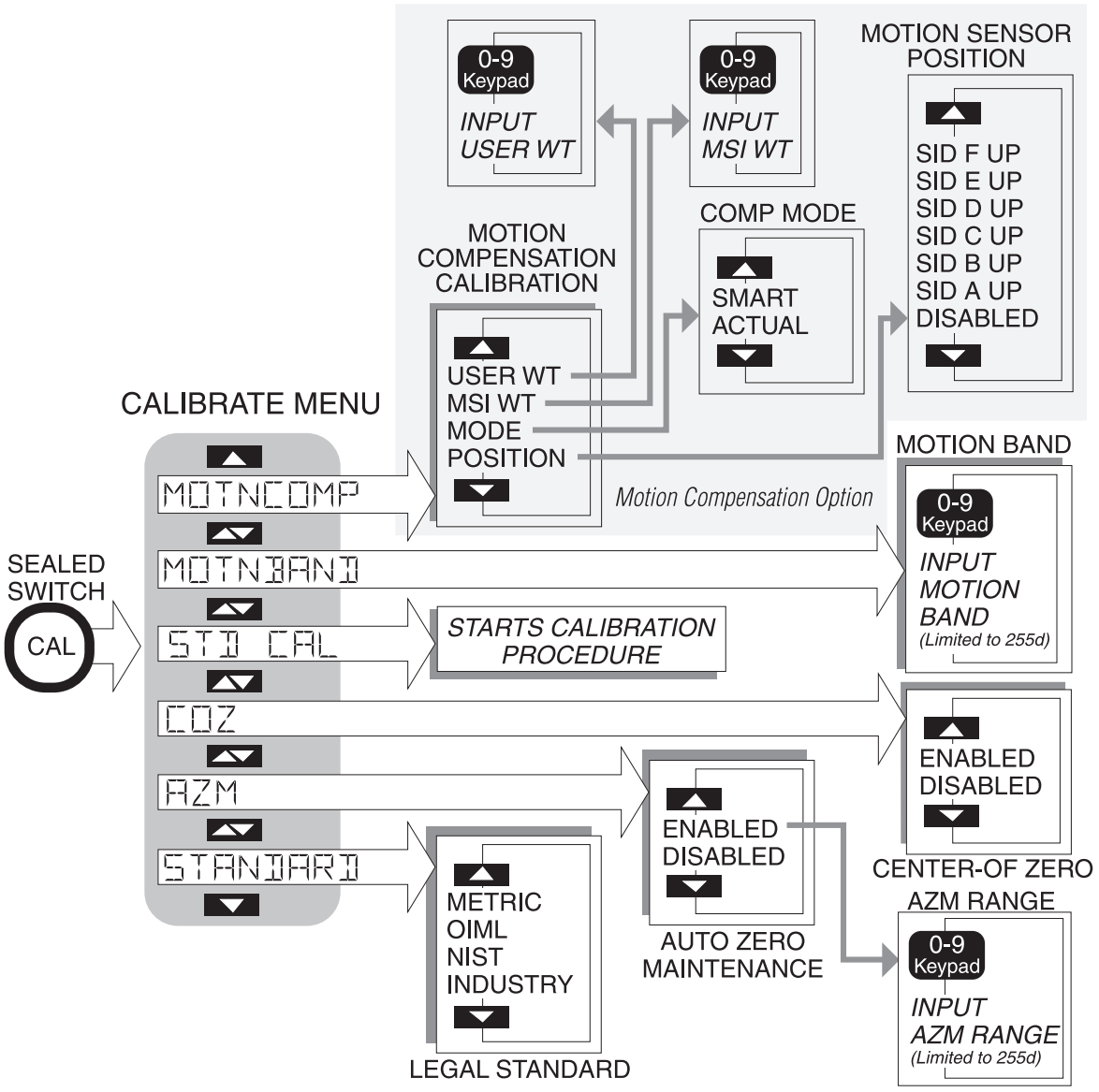
17) Push ENTER to store the USER WT.

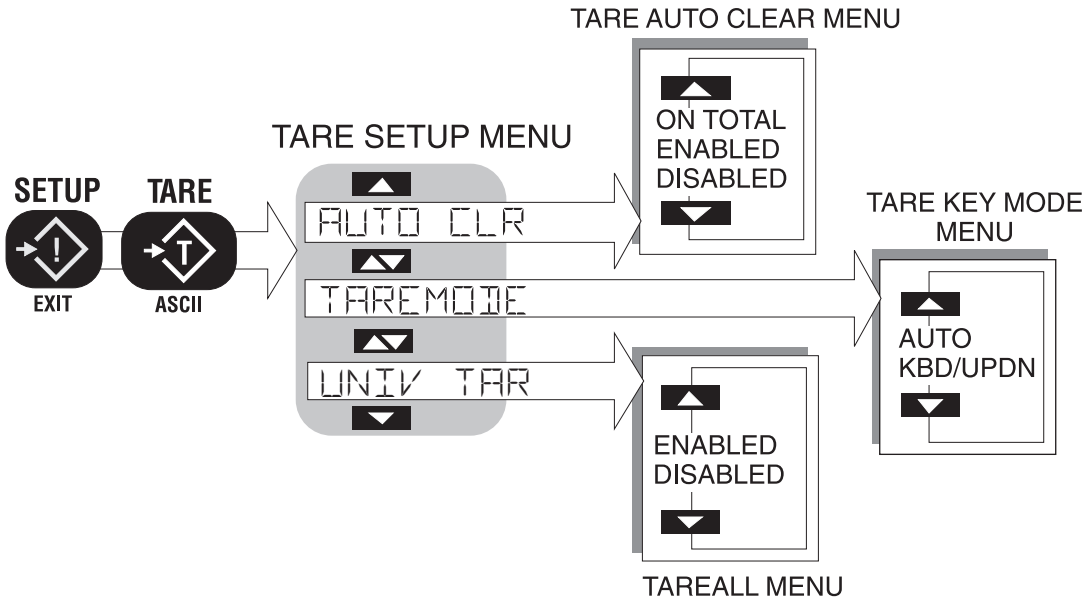
18) Push EXIT. You are now back in the “CAL SETUP” menu. Use the UP/DOWN keys to scroll to the next calibration operation or push EXIT to return to normal scale operation.

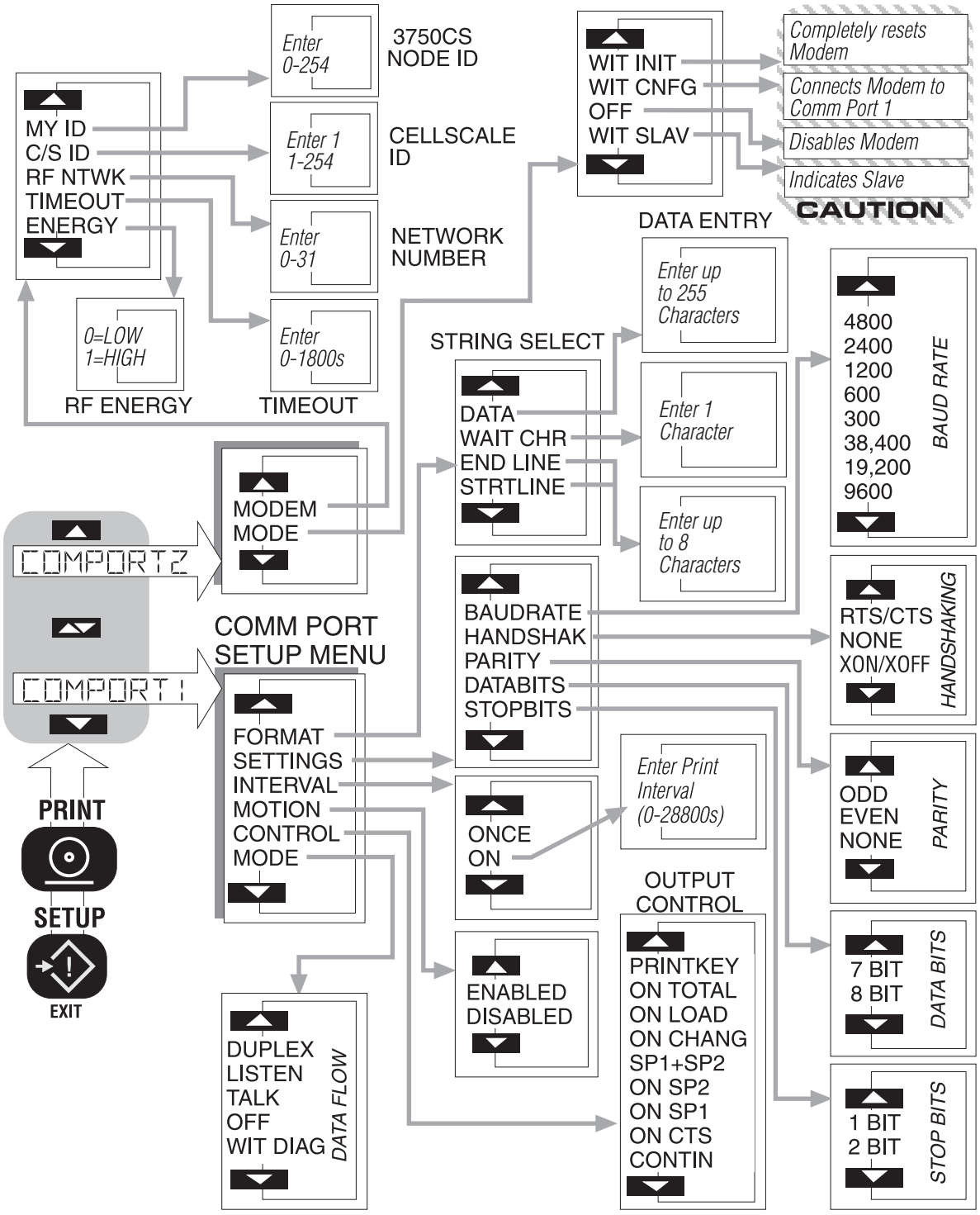


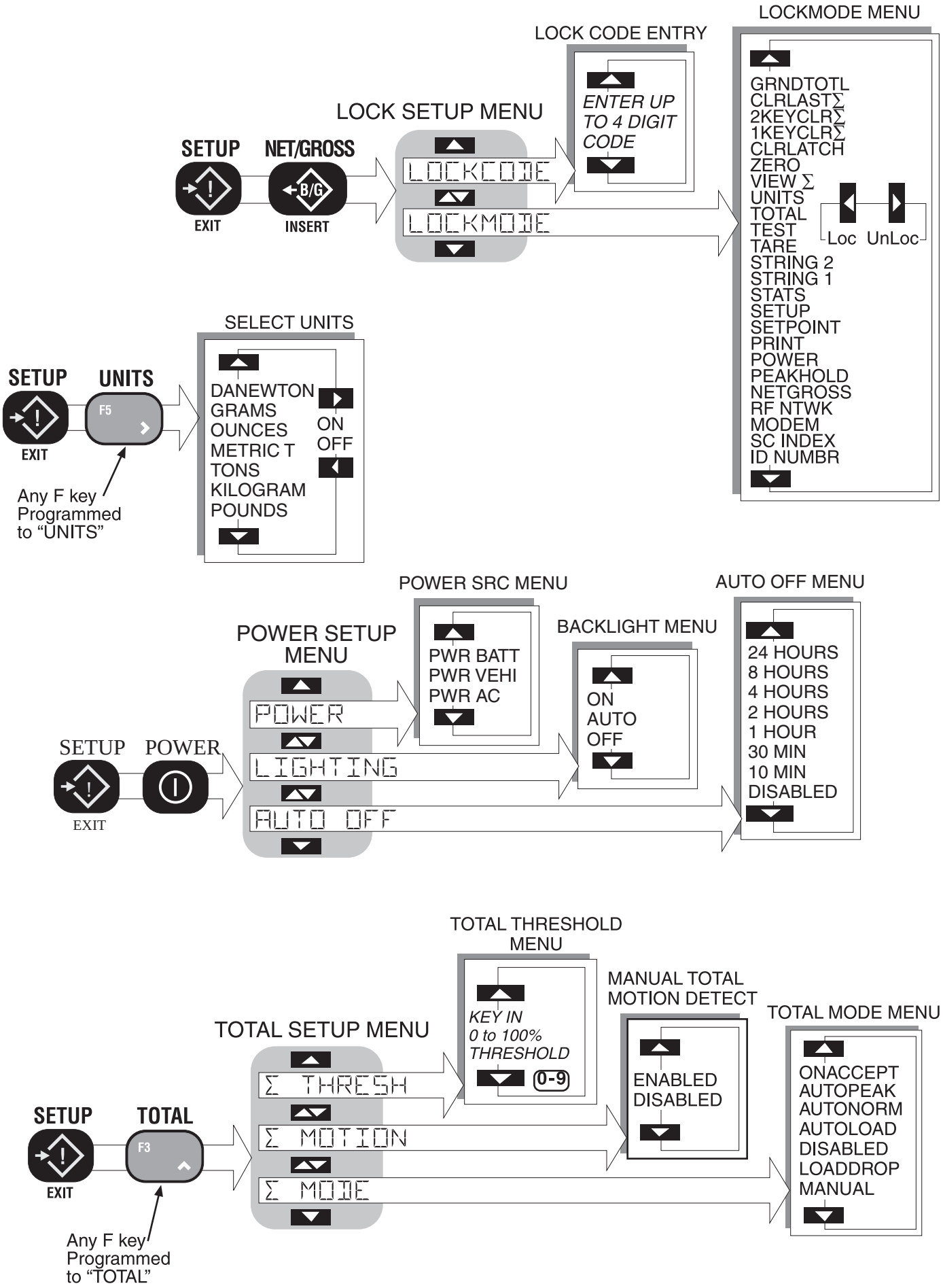
APPENDIX A – MENU MAPS



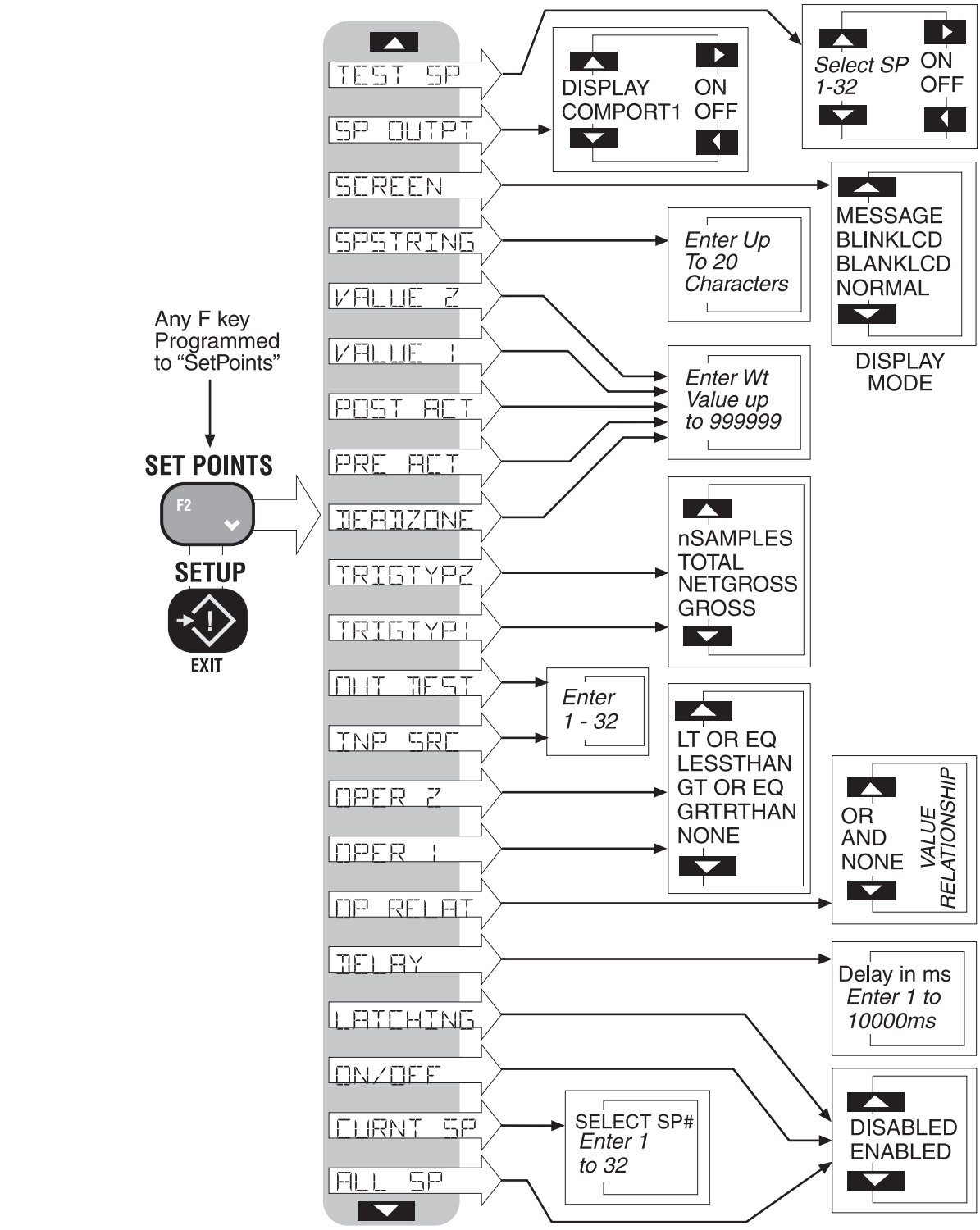

0-9 Keypad
INPUT USER WT
0-9 Keypad
INPUT MSI WT
MOTION SENSOR POSITION
SID F UP
SID E UP
SID D UP
SID C UP
SID B UP
SID A UP
DISABLED
COMP MODE
SMART ACTUAL
MOTION COMPENSATION CALIBRATION
USER WT
MSI WT
MODE
POSITION
Motion Compensation Option
CALIBRATE MENU
MOTNCOMP
MOTNBAND
STD CAL
COZ
AZM
STANDARD
SEALED SWITCH
CAL
STARTS CALIBRATION PROCEDURE
MOTION BAND
0-9 Keypad
INPUT MOTION BAND
(Limited to 255d)
ENABLED
DISABLED
CENTER-OF ZERO
ENABLED
DISABLED
AUTO ZERO MAINTENANCE
AZM RANGE
0-9 Keypad
INPUT AZM RANGE
(Limited to 255d)
METRIC
OIML
NIST
INDUSTRY
LEGAL STANDARD

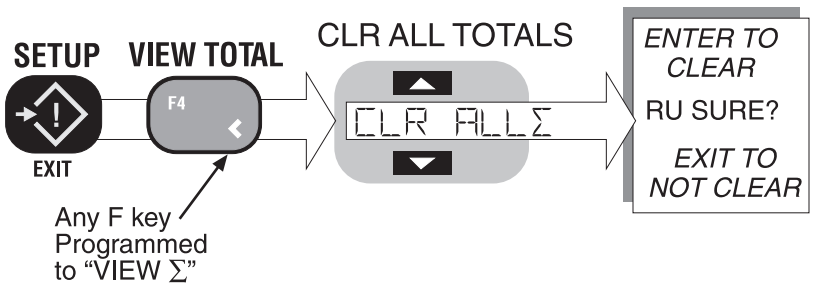

TARE AUTO CLEAR MENU
ON TOTAL
ENABLED
DISABLED
TARE SETUP MENU
SETUP
TARE
EXIT
ASCII
AUTO CLR
TAREMODE
UNIV TAR
TARE KEY MODE MENU
AUTO
KBD/UPDN
ENABLED
DISABLED
TAREALL MENU

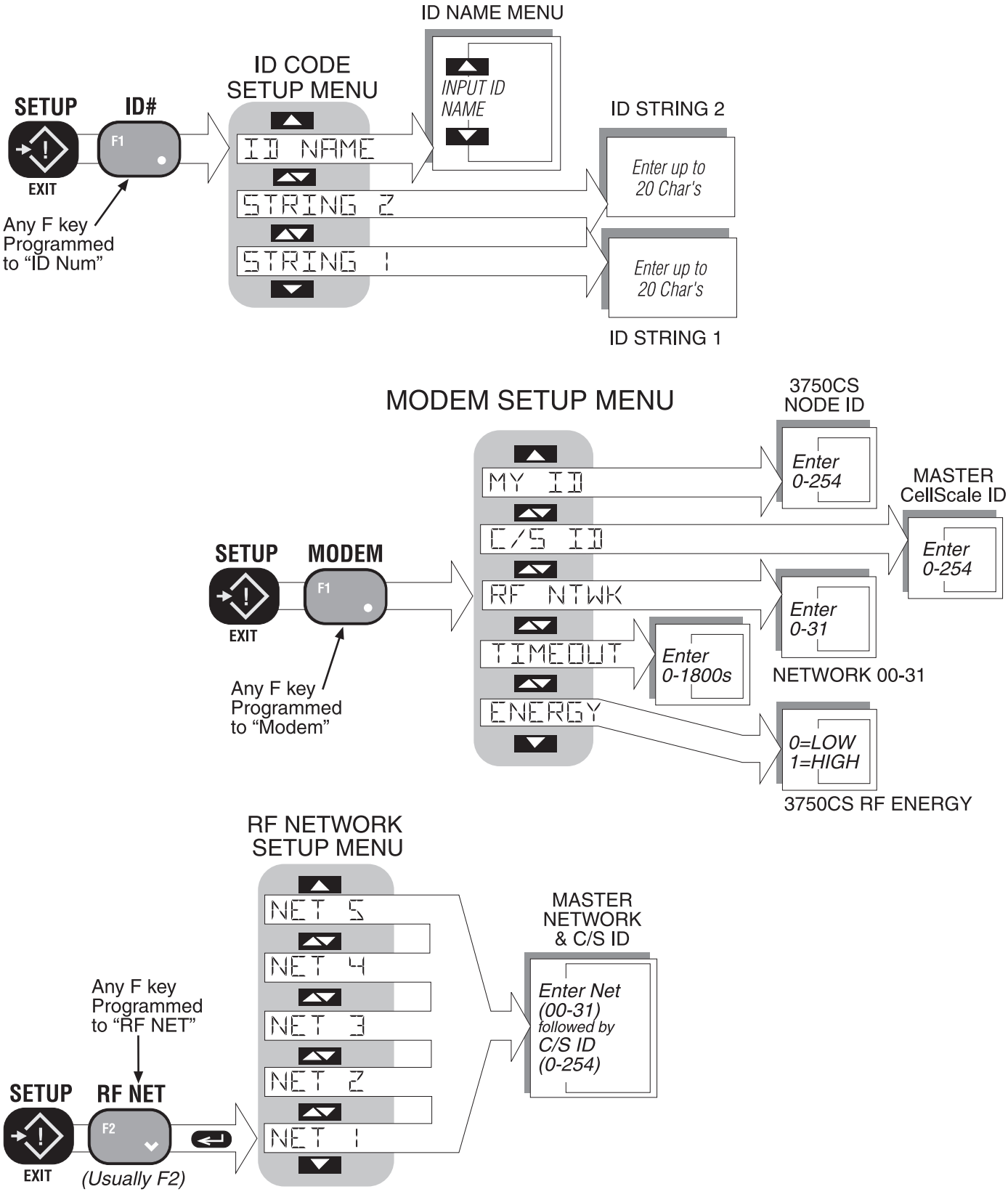

MY ID
C/S ID
RF NTWK
TIMEOUT
ENERGY
Enter 0-254
3750CS NODE ID
Enter 1 1-254
CELLSCALE ID
Enter 0-31
NETWORK NUMBER
Enter 0-1800s
TIMEOUT
0=LOW 1=HIGH
RF ENERGY
WIT INIT
WIT CNFG
OFF
WIT SLAV
Completely resets Modem
Connects Modem to Comm Port 1
Disables Modem
Indicates Slave
CAUTION
DATA ENTRY
Enter up to 255 Characters
Enter 1 Character
Enter up to 8 Characters
STRING SELECT
DATA
WAIT CHR
END LINE
STRTLINE
4800
2400
1200
600
300
38,400
19,200
9600
BAUD RATE
MODEM MODE
COMPORT2
COMPORT1
COMM PORT SETUP MENU
BAUDRATE
HANDSHAK
PARITY
DATABITS
STOPBITS
RTS/CTS
NONE
XON/XOFF
HANDSHAKING
ODD
EVEN
NONE
PARITY
7 BIT
8 BIT
DATA BITS
1 BIT
2 BIT
STOP BITS
FORMAT
SETTINGS
INTERVAL
MOTION
CONTROL
MODE
ONCE
ON
Enter Print Interval (0-28800s)
ENABLED
DISABLED
OUTPUT CONTROL
PRINTKEY
ON TOTAL
ON LOAD
ON CHANG
SP1+SP2
ON SP2
ON SP1
ON CTS
CONTIN
DUPLEX
LISTEN
TALK
OFF
WIT DIAG
DATA FLOW
PRINT
SETUP
EXIT



Software V1-15 to 1-20


Any F key
Programmed
to "SetPoints"
SET POINTS
F2
SETUP
EXIT
TEST SP
SP OUTPT
SCREEN
SPSTRING
VALUE 2
VALUE 1
POST ACT
PRE ACT
DEADZONE
TRIGTYP2
TRIGTYP1
OUT TEST
INP SRC
OPER 2
OPER 1
OP RELAT
DELAY
LATCHING
ON/OFF
CURNT SP
ALL SP
DISPLAY
COMPORT1
ON
OFF
Select SP
1-32
ON
OFF
Enter Up
To 20
Characters
MESSAGE
BLINKLCD
BLANKLCD
NORMAL
DISPLAY
MODE
Enter Wt
Value up
to 999999
nSAMPLES
TOTAL
NETGROSS
GROSS
Enter
1 - 32
LT OR EQ
LESSTHAN
GT OR EQ
GRTRTHAN
NONE
OR
AND
NONE
VALUE
RELATIONSHIP
Delay in ms
Enter 1 to
10000ms
DISABLED
ENABLED
SELECT SP#
Enter 1
to 32


SETUP
VIEW TOTAL
EXIT
F4
CLR ALL TOTALS
CLR ALLΣ
ENTER TO
CLEAR
RU SURE?
EXIT TO
NOT CLEAR
Any F key
Programmed
to "VIEW Σ"


ID NAME MENU
ID CODE SETUP MENU
SETUP
ID#
F1
EXIT
Any F key Programmed to "ID Num"
ID NAME
INPUT ID NAME
STRING 2
STRING 1
ID STRING 2
Enter up to 20 Char's
Enter up to 20 Char's
ID STRING 1
MODEM SETUP MENU
3750CS NODE ID
SETUP
MODEM
F1
EXIT
Any F key Programmed to "Modem"
MY ID
Enter 0-254
MASTER CellScale ID
C/S ID
Enter 0-254
RF NTWK
Enter 0-31
NETWORK 00-31
TIMEOUT
Enter 0-1800s
ENERGY
0=LOW 1=HIGH
3750CS RF ENERGY
RF NETWORK SETUP MENU
Any F key Programmed to "RF NET"
SETUP
RF NET
F2
EXIT
(Usually F2)
NET 5
NET 4
NET 3
NET 2
NET 1
MASTER NETWORK & C/S ID
Enter Net (00-31) followed by C/S ID (0-254)

APPENDIX B – ASCII CHART

DEC	HEX	CHAR	DEC	HEX	CHAR	DEC	HEX	CHAR	DEC	HEX	CHAR
0	00	^@ NUL	32	20	SPC	64	40	@	96	60	`
1	01	^A SOH	33	21	!	65	41	A	97	61	a
2	02	^B STX	34	22	“	66	42	B	98	62	b
3	03	^C ETX	35	23	#	67	43	C	99	63	c
4	04	^D EOT	36	24	$	68	44	D	100	64	d
5	05	^E ENQ	37	25	%	69	45	E	101	65	e
6	06	^F ACK	38	26	&	70	46	F	102	66	f
7	07	^G BEL	39	27	‘	71	47	G	103	67	g
8	08	^H BS	40	28	(	72	48	H	104	68	h
9	09	^I HT	41	29	)	73	49	I	105	69	i
10	0A	^J LF	42	2A	*	74	4A	J	106	6A	j
11	0B	^K VT	43	2B	+	75	4B	K	107	6B	k
12	0C	^K FF	44	2C	,	76	4C	L	108	6C	l
13	0D	^M CR	45	2D	-	77	4D	M	109	6D	m
14	0E	^N SO	46	2E	.	78	4E	N	110	6E	n
15	0F	^O SI	47	2F	/	79	4F	O	111	6F	o
16	10	^P DLE	48	30	0	80	50	P	112	70	p
17	11	^Q DC1	49	31	1	81	51	Q	113	71	q
18	12	^R DC2	50	32	2	82	52	R	114	72	r
19	13	^S DC3	51	33	3	83	53	S	115	73	s
20	14	^T DC4	52	34	4	84	54	T	116	74	t
21	15	^U NAK	53	35	5	85	55	U	117	75	u
22	16	^V SYN	54	36	6	86	56	V	118	76	v
23	17	^W ETB	55	37	7	87	57	W	119	77	w
24	18	^X CAN	56	38	8	88	58	X	120	78	x
25	19	^Y EM	57	39	9	89	59	Y	121	79	y
26	1A	^Z DUB	58	3A	:	90	5A	Z	122	7A	z
27	1B	^ [ESC	59	3B	;	91	5B	[	123	7B	{
28	1C	^ \ FS	60	3C	<	92	5C	\	124	7C	|
29	1D	^ [GS	61	3D	=	93	5D	]	125	7D	}
30	1E	^ ^ RS	62	3E	>	94	5E	^	126	7E	~
31	1F	^ _ US	63	3F	?	95	5F	_	127	7F	DEL

APPENDIX C – SPECIFICATIONS & SUMMARY OF FEATURES

Temperature Range
- -10° C to +40° C NTEP / OIML certified range
- -20° C to +60° C Operating (-4° F to 140° F)
- -40° C to +80° C Storage (-40° F to 176° F)

Approvals (planned or pending)
NTEP, OIML, Factory Mutual, NEMA, FCC

Radio Link
Frequency Hopping Spread Spectrum in 32 channels @ 2.4 GHz. Allows 32 networks of multiple scales. Radio functions in the ISM band, license free in the USA and Europe. 10mW (low power) or 100mW (high power) average output.

Radio Link Effective Range
Typically 500' (150 meters) indoors, standard antennas
Up to 10 miles (16 kilometers) outdoors with gain antennas

RFI/EMI Shielding
Exceeds NIST HB44 and CE Standards.

Housing
Alodined and powder coated cast aluminum. 'O' ring gasketed. NEMA 4, IP66

Connectors
Power and Comm connections are made with heavy duty waterproof industrial connectors. (Euro Style). Antenna connector is standard TNC (models manufactured in 2000 use a reversed pin SMA). Set Points internally wired with cables sealed through water-tight feedthroughs (glands).

Weight
6.2 lb. (2.8 kg)

STANDARD FEATURES

Scale Monitoring
Each 3750CS can log on to 5 different networks allowing one meter to serve for 5 separate CellScales. Easy 1 button scale changes. Each CellScale can access 32 independent Scale Channels

Calibration
Via RF, the 3750CS can calibrate any CellScale system. Sealing the system is not necessary due to password protected audit trail information. Full "Audit Trail" tracking with calibration date, parametric information, and authorization information may be printed out the 3750CS Comm Port.

Keypad
23 keys – 5 user programmable, 10 key alphanumeric, and 8 scale control keys

Push button Functions

Fixed keys:
Power: On/Off
Zero: Remove residual weight on scale
Net/Gross: Switch between Tared weight (Net) and Gross weight
Tare: Tare out empty container weight and switch to Net mode.
Print: Output user configured print strings to Comm Port
Alpha: Allows alpha character entry, upper and lower case
Enter: Store parameters or enter menus
Setup: Setup scale functions
0-9 with Alpha characters

Function Keys: 5 function keys are set able to any of the following functions:
Total: Add the current weight to the total, or Auto Total On/Off
Grand Total: Display totaled weight of all ID Codes
1KeyClear Total: Clears current IDs Total
2KeyClear Total: Clears current IDs Total, requires confirmation
Clear Last Total: Clears only last weighment
Statistics: Display stats of current ID Code
View ∑: Displays totaled weight of the current ID.
ID#: Push to change the ID code
Set Points: Set and configure set points
Units: Change weight units
Modem: Configure RF Modem
RF Network: Set Network parameters and switch into up to 5 RF Networks.
SC Index: Switch between selected scale channels
Clear Latch: Used to cleared latched Set Points.
Peak Hold: Captures maximum readings
String1 and String 2: Displays user configured print strings associated with each ID.
Test: Performs LCD display test.
Units: 1 button access to switching weight units.
Disabled: no function assigned

Programmable Features
- Automatic or Manual Tare entry
- 32 Set points with messaging capability
- Peak Hold – for capturing maximum readings
- 32 programmable ID Codes
- Each ID code has an 8 character name, two 20 character print strings, and stores independently units, tare, total with weighments counter, and full statistics (Std Dev, Min, Max, Avg, Variance).
- Automatic Power-Down, for power saving in battery applications
- Backlight On, Off or Automatic
- Lock –The user can lock any or all features to prevent tampering with setups. Protected by password.
- RS-232 Option will output on demand, on a change, regular time interval, on a set point, on Total, by computer control or continuously.
- RS-232 I/O provides full output formatting to interface with computers, printers, scoreboards and most serial devices.
- Host commands to control the 3750CS from any computer.
- Any weight unit can be turned on or off

Display
- 6 digit .9"/23 mm numeric weight LC display
- 8 digit 0.45"/11 mm alphanumeric LCD (message / units display / Total Weight display)
- 21 Segment Bar graph for process control % indications, RF Activity.
- Annunciators for measurement modes
- Sunlight visible LED indicator for Totals, Set Pts 1 and 2
- Photocell activated fiber-optic LED backlighting

Calibration Parameters
See CellScale specifications. All calibration data is stored in the CellScale, allowing any 3750CS to use any CellScale based system without recalibration.

Real Time Clock
Supports date / time stamping in US or European time and date. Backed up by a replaceable Lithium Battery (Typical life >5 years).

Data I/O
1 Comm Port, RS-232. Baud Rates: 300, 600,1200, 2400, 4800, 9600, 14.4k, 19.2k, 38.4k. CTS/RTS handshaking. User configured software handshaking.

ID
Up to 32 IDs can be stored in any connected CellScales and are identified by Alpha-numeric ID names. Each ID stores Totals, Statistics, Tare values, and two 20 byte string messages.

Totalizing & Statistics
Stored in connected CellScales, printed from the 3750CS. Internal or external connected Push button or Automatic. Total weight up to 999,999,999. Weighments counter up to 65,535. Totals and statistics are stored with each ID register. Each ID code keeps full statistics on totaled weighments. Included are Standard Deviation, Average, Minimum, Maximum, and Coefficient of Variance.

OPTIONS

Vehicle Power Supply
Transient protected Power Supply for operating the 3750CS from vehicles. Available in two ranges: 9-36Vdc and 18-60Vdc. Supplied with 13' (4m) cable.

Universal Power Supply
90-260Vac or 130-350Vdc Option. Requires Vehicle Power Supply option.

Set Point Relays
The Set Point relays provide up to 8 set point outputs for interfacing to external devices such as warning lights, process relays, or sirens. 7 SPDT (form C) 1A/115VAC relays are provided internal to the 3750CS meter for direct set-point interfacing. The

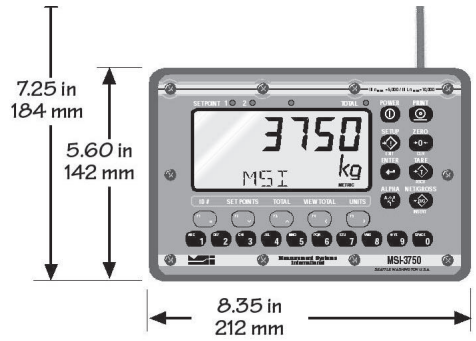
8th output is a TTL compatible Logic output. Connections are made through liquid tight feed through connectors to screw less terminal blocks.

Audible Set Points or Totalize Indicator
Coupled with the internal Set Points, an alarm can sound at any weight. Can also be used for accept or an out-of-limits indicator for blind check-weighing. Can also be configured as a totalize alert.

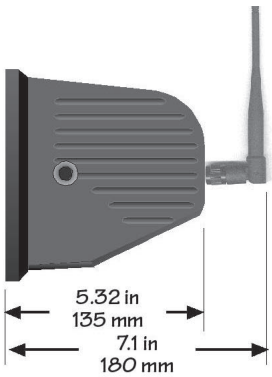
External Totalize Switch (included with Audible Totalize Indicator)
A transient protected switch input with connector for remote totalize switch. Normally open momentary switch is supplied by the end user. Supplied with 13' (4m) cable.

Long Range Antenna
A 9dBi gain antenna with a 10' (3m) low loss coaxial cable. Increases transmission range and allows for remote locating the Antenna.

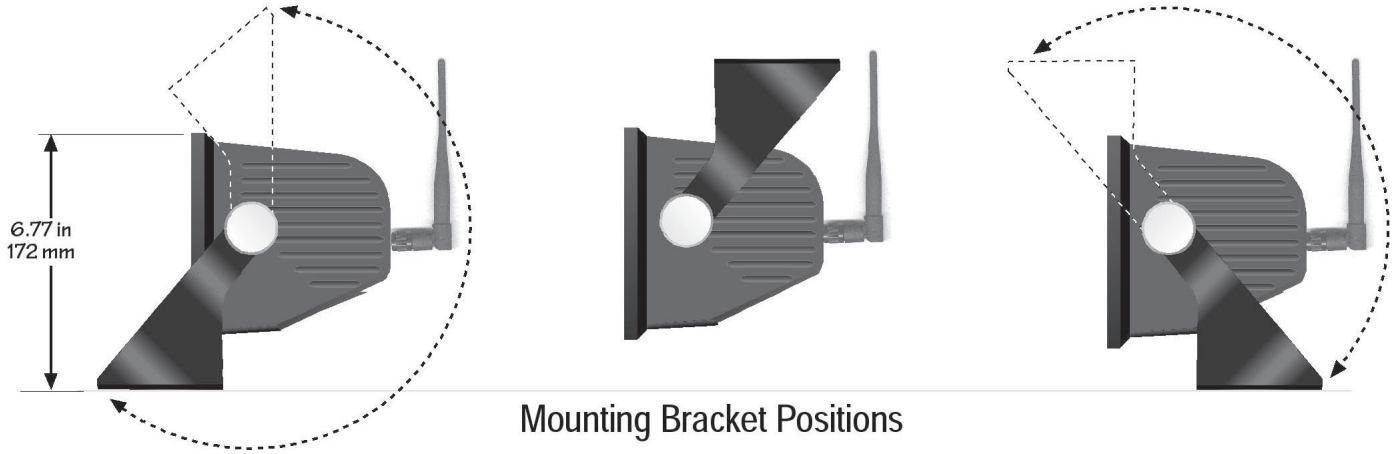
Mounting Bracket
For Wall or Bulkhead Mounting. 180° Swing



3750CS Dimensions

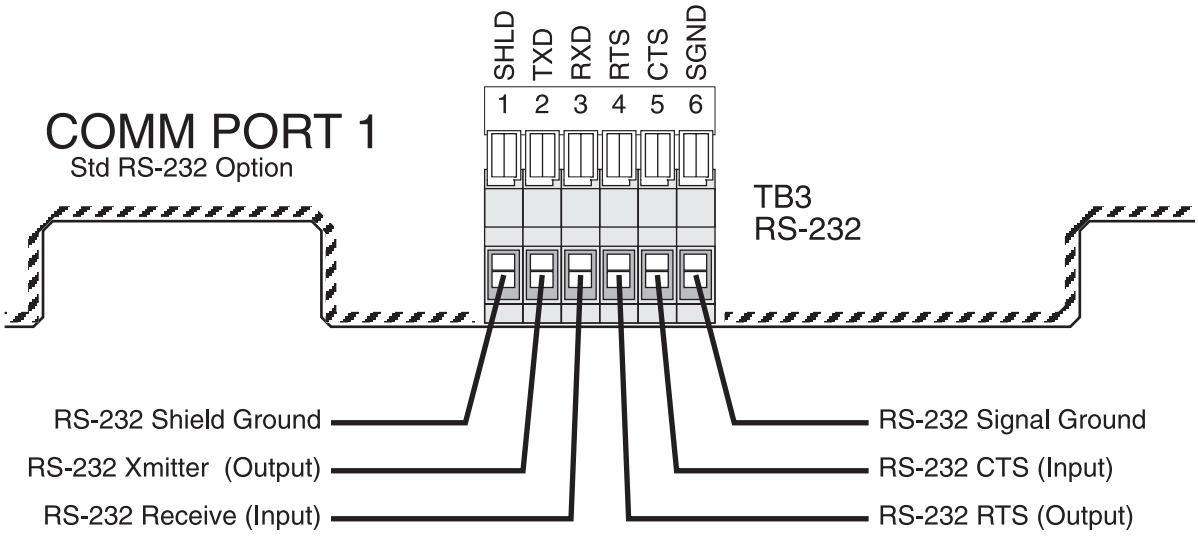


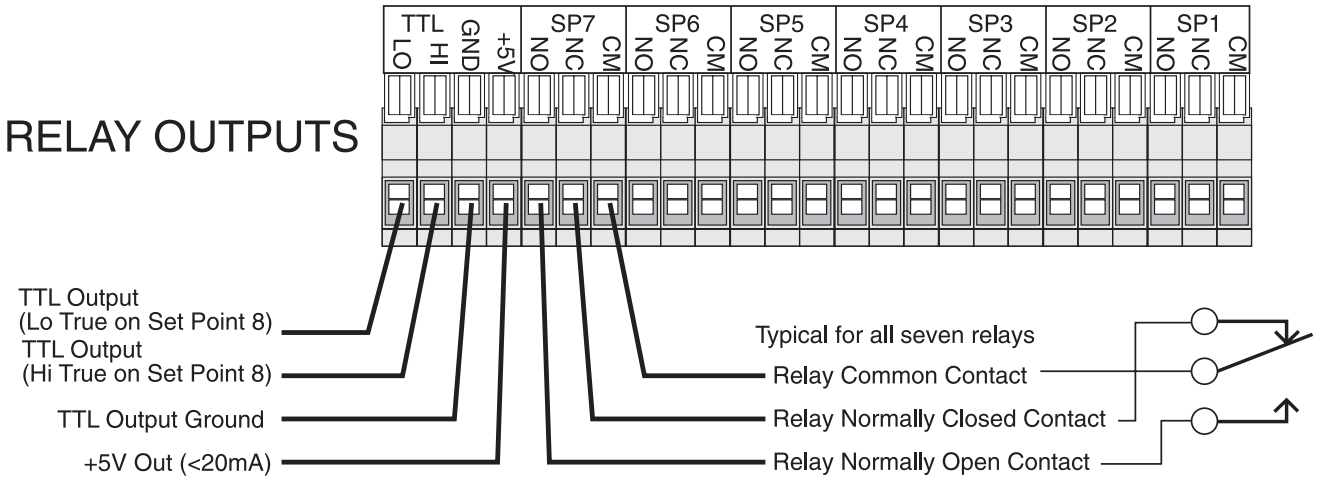
Desktop Viewing Position

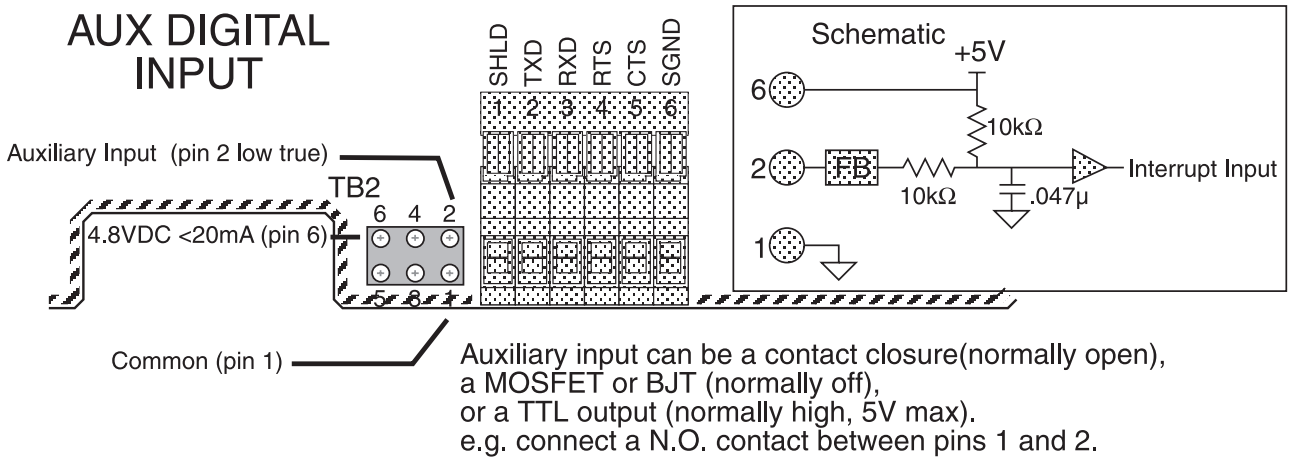


Mounting Bracket Positions

APPENDIX D – INTERNAL WIRING







Auxiliary input can be a contact closure(normally open),
a MOSFET or BJT (normally off),
or a TTL output (normally high, 5V max).
e.g. connect a N.O. contact between pins 1 and 2.

THE MSI LIMITED WARRANTY

MEASUREMENT SYSTEMS INTERNATIONAL,INC.,WARRANTS load sensing elements and meters against defects in workmanship and materials for a period of one year from date of purchase and warrants electrical cables and batteries against the same defects for a period of ninety (90)days from date of purchase.

Any device which proves defective during the warranty period will be replaced or repaired at no charge;provided that the defective device is returned to the Company freight pre-paid.

In no event shall the Company be liable for the cost of any repairs or alterations made by others except those repairs or alterations made with its specific written consent,nor shall the Company be liable for any damages or delays whether caused by defective workmanship,materials or otherwise.

The Company shall not be liable for any personal injury or property damage resulting from the handling, possession or use of the equipment by the customer.

The warranty set forth herein is exclusive and is expressly in lieu of all other warranties,express or implied, including without limitation any implied warranties of merchantability or fitness,or of any other obligations or liability on the part of the Company.

The liability of the Company under this warranty is limited solely to repairing or replacing its products during the warranty periods;and the final judgment and disposition of all claims will be made by MEASUREMENT SYSTEMS INTERNATIONAL,INC.

MADE IN THE USA

Printed in U.S.A.
PUB.269-06-01A

"We Weigh Quality First"

Measurement Systems International

14240 Interurban Avenue South STE 200
Seattle, Washington 98168-4661 U.S.A.
Ph: 206-433-0199 • Fax: 206-244-8470
Web: www.msiscales.com • Email: info@msiscales.com