# MSI3550

**DIGITAL WEIGHT INDICATOR**

# User Guide

*Quality Industrial Weighing and Force Measurement Equipment*


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## INTRODUCTION

The MSI-3550 combines proven mechanical design with advanced electronics to provide a superb feature set unmatched by any indicator in its price range. The 3550 is versatile, reliable, accurate and easy to operate.

## SPECIFICATIONS

| | |
|---|---|
| Accuracy: | Meets HB-44 Class III/IIIL (COCs pending) |
| Display: | 5 digit, 1.2 in/30 mm high manual or photocell LED brightness control. |
| Filtering: | Low, Medium or High selectable |
| Units: | Pounds or Kilograms selectable |
| Displayable Resolution: | 10,000 divisions standard (up to 100,000 available) |
| Internal Resolution: | 1,048,576 counts |
| Increments (d): | Multiples or submultiples of X1, X2, X5; down to X0.0001, up to X10,000 |
| Load Cells: | Drives up to eight 350Ω load cells |
| Sensitivity: | 0.3 microvolt per displayed digit minimum. Suitable for load cells from 0.5mV/V to 20mV/V |
| Drift: | Zero: <5PPM/ºC (with AZM)<br>Span: <15PPM/ºC |
| Capacity: | Any capacity up to 99,999,000 (99,999 x 1,000) |
| Over Capacity: | Indicates “Error Overload” when the set capacity is exceeded by 9 ‘d’ |
| Power: | 85-265 VAC surge protected (standard)<br>12-48 VDC<br>Battery power optional |
| Auto-Off Mode: | Select for 12 min., 1 hr. or off (disabled) |
| Auto-Sleep Mode: | Power reduction during non-use and power up with motion for maximum battery conservation |
| Service Counter: | Two independent 24 bit registers; Register 1 updated each time weight exceeds 25% of capacity; Register 2 updated each time weight exceeds overload; when register 1 exceeds 99,999 or register 2 exceeds 1000, display reads "LCnt" for load cell counter; Test function shows the two readings in order |
| Connectors: | Connections are made with PCB mounted terminal strips allowing easy upgrading. Cables are brought out through watertight fittings |

Enclosure: Stainless steel NEMA 4/IP 65
Mounting Bracket:
180º swing for wall or bulkhead mounting
Operating Temperature Range:
-4º to +122º F (-20º to +50º C)
RS-232 Input/Output:
Baud rates: 300, 600, 1200, 2400, 4800, 9600, and 19,200
Number Data bits: 7, 8
Parity: none, odd, even
Handshaking: none, RTS/CTS, XON/XOFF
Stop bits: 1 bit, 2 bits
Serial modes: off, talk only, listen only, full duplex
Will output when triggered: on demand (User key), on a change, continuous, CTS, setpoint 1, setpoint 2, setpoints 1&2, on load, and on total
Totalization: Up to 99,999,000 totaled with weighments counter
Print: Six selectable print strings (five pre-formatted, one custom)
Calibration: Fully digital
Warranty: One year

FUNCTION SWITCHES AND LIGHTS

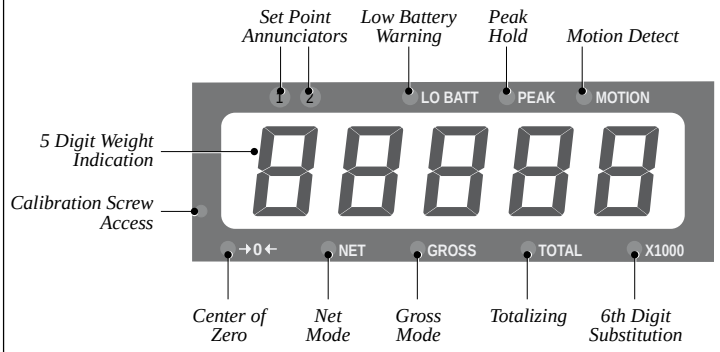
Power: Turns unit on or off
Zero: Zeros applied load up to 100% of capacity (limited range with NIST or OIML option)
Tare: Tares out applied load and displays weight in net mode. Push again to return to gross mode.
Keyboard Tare (0-9) with IR remote option.
User: User programmable multifunction pushbutton for use as Print, Test, Unit select, Net/Gross, Total (auto or manual), Peak Hold and Setpoints
Annunciators: Center of Zero, Net, Gross, Total, Peak, x1000, battery, lb/kg, motion, SP1 and SP2

## FEATURES

- NEMA IV enclosure meets or exceeds US and International Standards.
- Rugged construction throughout. Buttons are sealed and rated for over 1 million operations.
- Precise high resolution (10,000 division standard and up to 100,000 possible) 20 bit A/D conversion coupled with advanced 16 bit micro controller provides world class features and accuracy.
- Five 1.2 in/30 mm LED digits for clear weight readings from a distance.
- Easy to maintain: Full digital calibration assures reliable, repeatable measurements.

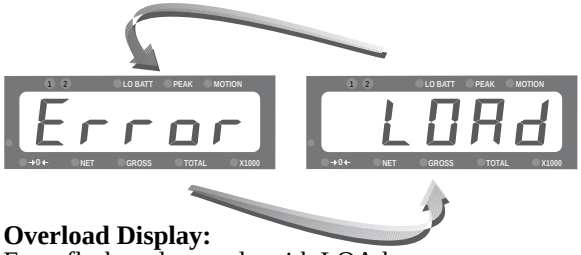
- Selectable for kgs/lbs; unless prohibited by regulations.
- Automatic or manual weight totalization for loading operations.
- Easily customized for special applications.
- PEAK Mode for stress analysis.
- Two Set Points can be set for any in-range weight for operator alerts or process control.
- Up to 130 hours of battery life utilizing Automatic Sleep Mode.
- Automatic Power Off conserves battery life by sensing no activity after 12 minutes or one hour, determined by operator, and turns Power off.
- Automatic Sleep Mode preserves battery life by dimming the LED display after one minute of no activity.
- Optional IR Remote Control provides full keyboard tare and access to all scale functions.

*The LED display provides excellent readability from full sunlight to total darkness.*




**Light Emitting Diode Display**

*In the event of an overload condition, the display will flash a warning to the operator.*




**Overload Display:**
Error flashes alternately with LOAd

## OPTIONS

Options which you may have ordered with your 3550 include:

- 6 V external rechargeable battery power for up to 130 hours operating cycle.
- Infrared remote controller with 8 meter operating range.
- Two internal 10 amp relays to trigger external warning lights, process relays or sirens.
- NTEP/OIML certification (specific approvals may be pending. Contact factory for availability)

## UNPACKING

When unpacking the indicator from the shipping container, ensure that all assembly parts are accounted for. Check for any visible damage and immediately report any damage to your shipper. It is advisable to use the original shipping container when shipping or transporting the 3550.

## LOAD CELL HOOKUP

1) Unplug the meter, or if battery powered, remove the batteries. Remove the back panel of the 3550.
2) Loosen the right side (viewed from the back) liquid tight feedthrough connector fitting with a 3/4” open wrench. Feed the load cell cable through the liquid tight connector.
3) Strip the load cell leads and attach them to the appropriate terminals. The 3550 comes standard with 4 terminal connections which are adequate for cable lengths of 50’ (15 meters) and accommodates wire sizes 24 AWG through 16 AWG. Any shield should be connected to the shield terminal. Smaller gage wire (20-24) should be tinned.
5) After pulling lightly on the wires to check for firm connection, take the slack out of the load cell cable as you close up the case.
6) Tighten the liquid tight feedthrough connector to ensure a watertight enclosure.
7) Put 2 screws in the back panel to hold it in place. Restore the power (batteries DC or AC).
8) Refer to the calibration section. If this is a first time hookup of this capacity load cell, perform the RESET CALIBRATION procedure followed by the INITIAL CALIBRATION procedure. If an identical load cell with the same capacity was replaced (or cable replaced, etc.) it should only be necessary to do a standard calibration.
9) If there were no calibration errors reported and the calibration is com-

plete, install the remaining screws loosely. When all the screws are in place tighten them down in a left, right, up, down pattern, never tightening any one screw all the way until all the screws are mostly tightened. This ensures even pressure. If you have access to a torque driver, tighten each screw to 3 to 4 inch-pounds.

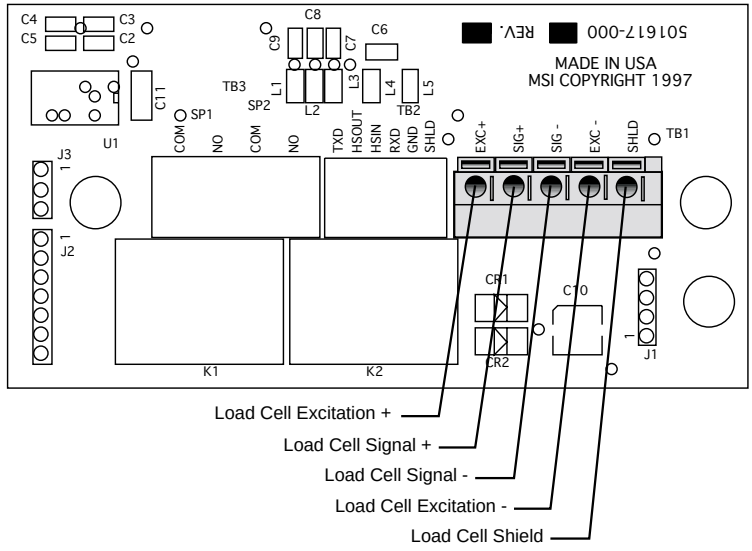



*Figure 1: Load Cell Connections*

## BATTERY (OPTION)

Your 3550 can be powered by a six volt rechargeable battery (option). The battery fits into the battery well between the mounting bracket and the indicator.

To install the battery:

1) Tilt the indicator until there is clearance to place it in the battery well between the mounting bracket and the indicator.
2) Unplug the battery connector. To disconnect, firmly grip both ends of the plastic connector, do not grip the wires to pull the connector apart.

To remove the battery:

1) Tilt the indicator until there is clearance to pull out the battery.
2) Disconnect the plastic connector from the battery.

The battery will operate for up to 130 hours (depending on LED brightness setting and number of load cells) before requiring recharging. In order to conserve battery life, the scale includes an Automatic Power Off Mode which senses operational status for no activity after 12 minutes or one hour, and turns the scale off. An additional battery saving feature is the Automatic Sleep Mode. This feature preserves battery life by dimming the display after the scale has been idle for 1 minute. Charging time for a completely discharged battery is approximately 16 hours. A spare battery is recommended to keep the 3550 in continuous operation.

Note: To obtain maximum service life from your batteries they should be stored between -4°F and 122°F (-20°C and +50°C). Stored batteries should be recharged every three months.

## BATTERY CHARGER

1) Remove the battery from the indicator.
2) Plug battery charger into an AC power receptacle of the same voltage and frequency stamped on the plug-in module.
3) Approximately 16 hours is required to recharge a fully discharged battery.

Note: To obtain maximum service life from your batteries, the manufacturer suggests recharging after each 40 hours of use. Continuous deep discharging will reduce maximum battery life cycle estimated at 2000 cycles.

# OPERATION GUIDE

MSI-3550 operation is controlled by four push buttons located below the display window.


**Caution:** Activating the push buttons with a sharp object, such as a screwdriver may cause permanent damage or broken seals.

The four push button functions are as follows:

## POWER 

**Function**

Turns the indicator on/off (toggle action).

**Use**

1) The battery pack must have enough charge to ensure accurate operation (>5.4V).
2) Ambient temperature must be greater than -30°C and less than 60°C (-22°F to 140°F).

**Action**

1) Press **POWER** and hold for one second.
2) Display check: All segment and indicator LED's are illuminated for one second.
3) Numerics display the software version number for one second.
4) During display test, all internal operations are checked and any nonconformance causes an Error message display.

**Final**

Scale reads the current weight in the last set Mode (NET, GROSS, PEAK NET, PEAK GROSS).

## ZERO 

**Function**

Sets indicator to ZERO.

**Use**

1) The load must be stable. The MSI-3550 will not ZERO if the motion detect indicator is on.
2) In Gross Mode, pushing zero will cause the display to go to zero. In Net Mode, pushing zero will cause the display to read the negative tare value.
3) The indicator will accept a ZERO setting over the full range of the scale (Legal For Trade models might have a limited ZERO range). ZERO

settings greater than 5% of capacity will subtract from the overall capacity of the scale.

**Action**

1) Press **ZERO**. The weight reading must be stable within ±1 division. If this condition is met, the digits display "0" (or "0.0" or "0.00", depending on resolution; or a negative tare value in Net Mode).
2) The ZERO setting is stored in backup memory, and the setting will be restored the next time the scale is turned on.

**Final**

GROSS indicator is illuminated and display will be "0" (or "0.0" or "0.00", depending on resolution; or a negative tare value in Net Mode).

---

## TARE

**Function**

TARE - Stores a TARE weight when in GROSS Mode and displays all subsequent readings in NET Mode; push again to return to GROSS Mode.

**Action**

TARE

1) Press **TARE**.
2) The indicator must be in GROSS Mode: The entire range of the scale can be tared in Industrial mode. In NIST mode, the tare value is limited to four digits. If it exceeds four digits, the display remains in GROSS Mode.
3) The Motion indicator must be off and the weight reading must be stable. (The weight reading must be stable within ± 1 division).
4) If the Motion condition is met, the NET indicator lights and the weight registers "0". All subsequent readings are deviations from the set TARE value.
5) Only positive weight readings can be tared.
6) Setting or changing TARE has no effect on the ZERO setting.
7) Tareing will reduce the apparent overrange of the scale. For example, if a 1000 lb container is tared and the scale capacity is 5000 lb, the scale will overload at a new weight of 4000 lb (5000 - 1000).
8) TARE value is stored in backup memory, and the value will be restored the next time the scale is turned on.

TARE OUT

1) The scale must be in NET Mode.
2) Press **TARE** to clear the value.
3) Returns to GROSS Mode.

**Final**

TARE

TARE is set, displaying NET weight. Push again and the tare weight will be cleared and the scale will revert to GROSS Mode.

## USER ▲

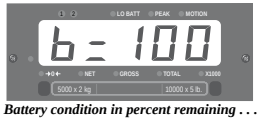
**Function**

The USER key can be programmed to any of seven functions: TEST (tESt), NET/GROSS (nEtGr), TOTAL(totAL), UNIT(kg/lb), PEAK(Phold), PRINT (Print) and OFF (oFF). See Scale Setup for instructions on programming the USER button.

**Action**

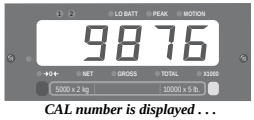
Press **USER** to initiate the preprogrammed function.

## TEST (tESt)




*Battery condition in percent remaining . . .*


*all segments & indicators are displayed for 3 seconds . . .*




*CAL number is displayed . . .*


*and all digits count once from 0 to 9.*

**Function**

Provides a functional system test and an on-demand display check without disturbing the current weighment. Also provides calibration verification in the form of a load cell CAL number.

**Action**

1) Press **USER** (USER button must be programmed as test (see Scale Setup)).
2) Battery condition is displayed in percent of battery life remaining with b = xxx figure from 0 to 100 on the digits (in 5% increments).
   Note: AC and 10-56 VDC units will display a number between 40 and 60.
3) All segments and annunciators are displayed for 3 seconds.
4) The CAL number is displayed next. To ensure that the CAL number is accurate the scale must be unloaded. Cal number shifts of up to 10 counts are insignificant.
5) All digits count once from 0 to 9. All indicators are tested.
6) Internal tests are performed to further ensure indicator integrity.

**Final**

The reading returns to the last condition, or an Error message is displayed.

## ACCESSING THE SERVICE COUNTERS

**Function**

The MSI-3550 maintains two Service Counters for safety. These Service Counters are used to judge when the load bearing elements should be inspected.

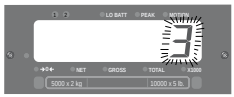
**Action**

1) To access the Service Counters, program the USER button to TEST (tESt).


*LCnt1 will be displayed for 1 second followed by . . .*


*a flashing total of "over 25%" weighments.*


*LCnt2 will be displayed for 1 second followed by . . .*




*a flashing total of "over capacity" weighments.*

2) Press **TEST** and hold until the display reads "LCnt1" (Load Counter #1). This will occur after the RCAL value has been displayed. "LCnt1" will be displayed for 1 second, followed by a flashing numeric value. This value signifies the number of weighments that exceeded 25% of capacity.
3) Press **TEST**, "LCnt2" (Load Counter #2) will be displayed for one second, followed by a flashing numeric value. This value signifies the number of weighments that surpassed capacity.
4) Press **TEST** again to complete the TEST sequence.

**Final**

TEST sequence continues.

Note: This procedure cannot be performed with the remote control. Use the front panel keys instead.

## TO RESET THE SERVICE COUNTER WARNING

1) After inspecting the scale's load train for damage, remove the indicator calibration seal screw.
2) Press the Calibration button using a blunt screwdriver.
3) Press **ZERO** to return to normal operation.

Note: This procedure does not reset the service counter, it resets the display warning only.

## TOTAL (totAL)

**Function**

For accumulation of multiple weighments. The accumulator always uses the displayed weight, so GROSS and NET readings can be added into the same TOTAL. There are two Modes of totalizing: Manual and Auto. The Manual Mode requires the TOTAL button be pressed with the weight on the scale. The weight will be added to the previously accumulated value. The Auto Mode will automatically add the last settled and stable value to the TOTAL. Both Modes require that the weight on the scale return within 1% (relative to full scale) of GROSS ZERO or NET ZERO before the next weighment can be added. This assures that a weight on the scale is only added to the total once. Applied weight must be 2% of full scale above GROSS ZERO or NET ZERO before it can be totaled.

Note: This function is not available in NIST mode.

## MANUAL TOTAL

**Function**

Allows manual weight accumulations by pressing a button.

**Use**

1) The Motion indicator must be off, the scale must be stable ±1 division. If there is considerable motion on the scale, use the Medium or High Filter setting (see Filter Setup). The indicator will accept the TOTAL button when the load is in motion, but it will not TOTAL until the Motion indicator is off.
2) Only positive readings can be accumulated.
3) After a weight is totaled, the weight on the scale must return below 1% of full scale capacity relative to GROSS ZERO or NET ZERO before another weight can be added to the TOTAL. This assures that a weight on the scale is only added to the scale once.
4) Press **USER** (USER button must be programmed as TOTAL (see Scale Setup)).
5) If the Motion indicator is on, the TOTAL indicator will begin blinking, and continue blinking, until motion stops and the Motion indicator turns off. The current weight is added to the TOTAL register and the TOTAL weight is displayed.
6) The TOTAL indicator (center right of display) will also illuminate for 4 seconds providing reinforcement that the TOTAL command was accepted.

**Final**

After totaling, normal weighing resumes.

## AUTO TOTAL

**Function**

Allows for Auto accumulate.

**Use**

1) When a weight threshold of 2% of Full Scale (FS) above NET ZERO or GROSS ZERO is exceeded, the accumulate function operates automatically.
2) When a weight that meets the minimum acceptable limit settles (no Motion), the TOTAL indicator will flash 3 times.
3) If the weight changes to a new settled value the TOTAL indicator will flash again indicating the previous settled reading has been replaced.
4) When a weight is totaled, the TOTAL indicator will flash for a steady 4 seconds, indicating the weight has been totaled and the TOTAL value will be displayed.

5) The displayed weight is added to the accumulated value in the TOTAL Register only when the weight returns to ZERO (±1% of Full Scale ).
6) The last settled reading is what will be used for totalizing when the scale returns to ZERO.


WARNING: The operator must take caution that, when removing the load, the scale does not settle (go out of Motion); or an erroneous reading could occur. The last settled weight is actually added to the TOTAL when the scale returns to less than 1% of full Scale capacity.

**Action**

1) The load cannot be in motion. An Auto TOTAL acceptable reading is indicated by 3 or more short flashes of the TOTAL indicator.
2) Weight readings must be greater than 2% of full scale, relative to NET ZERO or GROSS ZERO.
3) Each reading added to TOTAL must be preceded by a return to ZERO (NET or GROSS) ±1% of full scale. Totalization of the last settled weight is indicated by a 4 second flash of the TOTAL indicator, and a display of the current TOTAL.

**Final**

After totaling, normal weighing resumes.

## TO CLEAR THE LAST TOTALED WEIGHT

**Function**

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

**Action**

1) Press **USER**, then **ENTER (TARE)**. The display will read the revised TOTAL for 2 seconds. (This procedure assumes that you have not modified the USER function — USER is programmed as Total.)

**Final**

After displaying the update TOTAL, normal weighing resumes.

## TO CLEAR THE TOTAL VALUE

**Function**

To clear the TOTAL register in order to start a new series of totals.

**Action**

1) Press **USER**, then **CLEAR (ZERO).** (This procedure assumes that you have not modified the USER function.)

2) The display reads "0" and the TOTAL indicator will illuminate for 2 seconds.

**Final**

After clearing the TOTAL, normal weighing resumes.

## VIEWING TOTAL

**Function**

After a weight has been totaled or before the 2% threshold has been exceeded, the current TOTAL can be Viewed.

**Action**

1) Make sure there is no load on the scale. Press **USER** (USER button must be programmed as TOTAL).
2) The current TOTAL will be displayed for 3 seconds. The TOTAL indicator will illuminate.

**Final**

Normal weighing resumes.


**Caution:** If in Manual TOTAL and you push the TOTAL button to view the TOTAL value, be certain that you are not weighing more than 2% of capacity. (If you press USER to view the TOTAL and the weight is above 2% of capacity, you will add to the TOTAL, rather than view the TOTAL.)

## UNIT (lb/kg)

**Function**

To change unit between lb/kg.

**Action**

1) Press **USER** to select lb or kg mode (USER must be programmed as Unit; see USER Setup). The lb and kg indicators are located on the front panel adjacent to their relative capacity labels.

**Final**

The correct unit of measurement/weight is displayed.

***Alternate Method:*** Use the Setup UNITS Mode to change the UNITS without programming USER to UNITS.

## PEAK (Phold)

**Function**

Allows the capture of a PEAK weight. Useful for stress testing and related

operations where the maximum load measured is stored.

**Action**

1) Press **USER** (USER button must be programmed as PEAK(Phold); see USER Setup).
2) To enable PEAK(Phold), the PEAK indicator must be off. Press **USER**.
3) To disable PEAK(Phold) the PEAK indicator must be on. Press **USER**.

**Final**

1) When enabled, the PEAK(Phold) value is reset to 0 and any subsequent displayed value will correspond to the greatest positive weight detected.
2) When PEAK(Phold) is disabled the indicator will perform normally.

Note: This function is not available in NIST mode.

## NET/GROSS (nEtGr)

**Function**

Switches the display between NET and GROSS Modes while preserving the stored Tare value. NET Weight is defined as GROSS Weight minus a TARE Weight. If you push TARE to switch from Gross Mode to Net Mode, it will clear the stored Tare value.

**Use**

1) There must be a Tare weight established to switch from Gross Mode to Net Mode (see TARE).
2) NET GROSS (nEtGr) will work even when the load is in Motion.

**Action**

1) Press **USER** (USER button must be programmed as NET GROSS (nEtGr), see USER Setup).
2) No current TARE is stored (TARE =0). No action, display continues to read the Gross weight only.
3) A TARE value is stored: Toggles between NET and GROSS indicators.

**Final**

NET or GROSS indicator will illuminate.

## SCALE SETUP

**Function**

Scale Setup facilitates changes to various internal settings of the scale. Setup is initiated by holding in the USER button while turning POWER on.

**Action**

When in SETUP, the following buttons are used for selecting and changing scale settings:

ZERO functions as CLEAR/EXIT: Used to exit from a Setup menu without affecting the previous setting and for exiting Setup Mode completely. Used also to clear the current digit when entering numeric values; i.e., Set Points.

TARE functions as ENTER: Used to enter into menus and choose menu items.

USER functions as SELECT: Used to scroll through menu selections. If held down, SELECT will automatically repeat.

POWER functions as Decimal Point: Used for entering a decimal point in displayed values (i.e. Tare or Setpoint).

**Final**

Pressing **CLEAR (ZERO)** will skip all remaining parameters and return the scale to normal operation. Pressing **POWER** will also exit the Setup Mode (and turn Power off).

## QUICK USER SETUP GUIDE

Setup is initiated by holding in the USER button while turning POWER on.

Note: The RS-232 menu is not available in the USER setup when the indicator is calibrated to “nISt” or “EuroP” standards. It is automatically switched to the Calibration Setup menu (see QUICK CALIBRATION SETUP GUIDE).

| Top Menu | Selection Display | Sub-Menu | Display Definition |
|---|---|---|---|
| Func | | | Function |
| | OFF | | Off |
| | tESt | | Test |
| | totAl | | Total |
| | Unit | | Unit |
| | Phold | | Peak Hold |
| | nEtGr | | Net/Gross |
| | Print | | Print |
| A-OFF | | | Automatic Power Off |
| | OFF | | Off |
| | .2 hr | | 12 minutes |
| | 1 hour | | 1 hour |
| LEdS | | | Light Emitting Diodes |
| | Auto | | Automatic |
| | LO | | Low |
| | HI-1 | | Medium |
| | HI-2 | | High |
| Unit | | | Units |
| | Unit(kg) | | Kilograms |
| | Unit(lb) | | Pounds |
| StPt1 | | | Set Point 1 |
| | OFF | | Off |
| | GrEAt | LESS,GrEAt | Greater than |
| | LESS | followed by value | Less Than |
| StPt2 | | | Set Point 2 |
| | OFF | | Off |
| | GrEAt | LESS,GrEAt | Greater Than |
| | LESS | followed by value | Less Than |
| totAL | | | Total |
| | OFF | | Off |
| | PrESS | | Press User Button |
| | Auto | | Automatic Total |
| rS232 (IndUS and 1Unit only) | See "COMMUNICATION PORTS" Chart 5: RS-232 Menu Structure | | |

*Chart 1: User Setup Menu*

## FUNCTION (Func)

**Function**

Allows the USER button to be programmed to TEST, TOTAL, UNIT, NET/GROSS, PEAK, PRINT or OFF.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until the display reads "Func".

3) Press **ENTER (TARE)** and currently selected function will flash.
4) Press **SELECT (USER)** until desired function is displayed.
5) Press **ENTER (TARE)** to store or press **CLEAR (ZERO)** to exit without changing.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

## AUTOMATIC POWER OFF (A-OFF)

**Function**

The A-OFF feature, when enabled, prolongs the battery life of the indicator by turning POWER off when the indicator is not in use (the load is idle). Any time a button is depressed (any button), or the detected weight is in motion, the time limit is reset. Therefore, the indicator will stay on indefinitely if buttons are pressed or the weight is changing. With A-OFF disabled, the indicator will remain on; only pressing POWER will turn it off.

**Action**

To Change the A-OFF Mode:

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until the display reads "A-OFF".
3) Press **ENTER (TARE)**. You are now in the A-OFF menu.
4) Press **SELECT (USER)** to scroll through choices: OFF, .2 hours (12 minutes), or 1 hour. When the desired Mode is displayed, press **ENTER (TARE)** or press **CLEAR (ZERO)** to exit without changing.

**Final**

USER Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

## LED BRIGHTNESS (LEdS)

**Function**

Sets the LED brightness to one of three fixed settings; or to an automatic setting that adjusts brightness according to ambient light, and also adjusts to the lowest level of brightness when the scale is inactive for 1 minute (Automatic Sleep Mode). Automatic Sleep Mode is recommended to maximize battery life for battery-powered units.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until "LEdS" is displayed.

3) Press **ENTER (TARE)** and the current brightness setting will flash.
4) Press **SELECT (USER)** to change from AUTO, LO, HI-1 or HI-2 settings.
5) Press **ENTER (TARE)** to store, or press **CLEAR (ZERO)** to exit without changing.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

***Note:*** To maximize battery life, set the LED to the Automatic Sleep Mode.

## UNIT (kg/lb)

**Function**

Allows Units to alternate between kg and lb without the use of the USER button.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until "Unit" is displayed.
3) Press **ENTER (TARE)**. The display will show "Unit" while the indicator which correlates to the currently set Unit (kg or lb) will flash.
4) Press **SELECT (USER)** until the desired Unit (kg or lb) is displayed.
5) Press **ENTER (TARE)** to store, or press **CLEAR (ZERO)** to exit without changing.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

Alternate Method: Program the USER button as UNITS.

## SETPOINTS (StPt1, StPt2)

**Function**

Set Points provide warnings and indications of weighments. When the weight is above (greater than) or below (less than) a set value, the 3550 can respond by turning on the Set Point indicator light.

## SET POINT ENTRY

**Function**

To enter a Set Point.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** to choose the Set Point you wish programmed. Set Point 1 will be used for this example.
3) When the display reads "StPt1" press **ENTER (TARE)**.
4) Determine if the Set Point will activate when the weight is above ("GrEAt") or below ("LESS") the entered value. Press **SELECT (USER)** to choose the mode. For an overload alarm, for example, you would choose greater. Press **ENTER (TARE)**.
5) The current Set Point value will flash.
6) Press **SELECT (USER)** to enter the first digit of the desired Set Point weight value (value cannot exceed scale capacity). Press **ENTER (TARE)**.

Note: Press **POWER** to enter a decimal point.

7) The next significant digit flashes. Press **SELECT (USER)** to enter the next digit. Press **ENTER (TARE)** twice after the last character to complete the Set Point entry.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

## TO DISABLE A SET POINT

**Function**

To turn off a Set Point.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** to identify the Set Point you wish to disable. Set Point 1 will be used for this example.
3) When the display reads "StPt1" press **ENTER (TARE)**.
4) Press **SELECT (USER)** until the message "OFF" appears. Press **ENTER (TARE)**. This disables the Set Point and returns you to the Set Point menu.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

## TOTAL (totAL)

**Function**

Allows the TOTAL function to be set or disabled. The USER button must be programmed to TOTAL in order to view the current TOTAL value, or to use Manual TOTAL.

**Action**

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until "totAL" is displayed.
3) Press **ENTER (TARE)** and the currently selected total mode will flash.
4) Press **SELECT (USER)** until the desired TOTAL Mode — OFF, PrESS (manual), or AUTO (automatic) is displayed.
5) Press **ENTER (TARE)** to store, or press **CLEAR (ZERO)** to exit without changing.

**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

# CALIBRATION

## SYSTEM INITIALIZE


**Caution:** Do Not Initialize the scale for routine calibration. System initialize is only needed when the circuit boards are replaced. This procedure should be initiated only by the factory or any authorized service representative.

**Function**

Clears the internal Calibration settings. Usually used for board replacement, troubleshooting, or load cell replacement. This procedure does not alter factory feature settings.

**Action**

1) Turn off the scale by pressing the **POWER** key.
2) Remove the seal port on the left front panel of the scale. Press the switch button in the hole with a probe, such as a blunt tip screwdriver, and simultaneously press the **POWER** key.
3) The scale will prompt the user for confirmation by displaying “SurE?”
4) Pressing **TARE** will continue the system initialization. Pressing **ZERO** will abort the system initialization without resetting any parameters.

## CALIBRATION SETUP

**Function**

Calibration Setup is used to initiate calibration or to set seldom changed factory settings.

There are two types of calibration:

1) Initial Calibration; and
2) Standard Calibration

Calibration must be accomplished by a qualified Scale Technician trained in Certified Calibration Standards. To initiate calibration of a 3550, the Technician is required to have an accurate test weight system of adequate capacity and, in the case of a Legal For Trade 3550, the test weight system must be certified by the appropriate regulatory agency.

*Important Note:* At any point (except when entering calibration weight values), the calibration procedure can be halted by turning POWER off.

**Action**

1) Remove the seal port on the left front panel of the indicator. Insert a

probe, such as a wood golf tee, to depress the underlying button. The display will show "C-SEt" for 1 second.

2) The Calibration Setup Menu appears. Press the **SELECT (USER)** button to scroll through the various Calibration Setup menu choices.
3) Once the desired operation is displayed, press **ENTER (TARE)**.

**Final**

To return to normal operation either scroll with the **SELECT (USER)** button to exit and press **ENTER (TARE)**, or press **CLEAR (ZERO)** .

## QUICK CALIBRATION SETUP GUIDE

| Top Menu | Selection Display | Display Definition |
|---|---|---|
| CAL | | Calibration |
| F-CAL | | Fine Calibration |
| CAL-r | | Calibration with Offset Calibration Resistor |
| Filtr | | Filter |
| | LO | Low |
| | HI-1 | Medium |
| | HI-2 | High |
| StAnd | | Standards |
| | IndUS | Industry |
| | nISt | National Institute of Standards & Technology |
| | EuroP | Metric (kg only)/OIML |
| | 1 Unit | One Unit Only |
| r-Ctl | | Remote Control |
| | On | |
| | OFF | |
| AZt | | Automatic ZERO Tracking |
| | On | |
| | Off | |
| rS-232 (IndUS and EuroP only) | See "COMMUNICATION PORTS" Chart 5: RS-232 Menu Structure | |

*Chart 2: Calibration Setup Menu*

## CALIBRATION (CAL)

**Function**

Used to Calibrate the scale load cell. There are two types of calibration:

1) Initial Calibration and
2) Standard Calibration.

## INITIAL CALIBRATION

**Function**

Initial Calibration is used at the factory when Calibrating for the first time, when the circuit boards have been replaced or after the scale has gone through System Initialize.

Note: Do not use this procedure for routine Standard Calibration.

**Action**

1) Press **SELECT (USER)** until "CAL" appears then press **ENTER (TARE)**. The following steps will occur:
2) Display flashes right hand lb. indicator while displaying number of lbs. if calibrating in lbs. press **ENTER (TARE)**, or to select kgs (left hand kg indicator flashes) press **SELECT (USER)** then **ENTER (TARE)**.

Note: This step will not occur in indicators set up to measure in only one unit.

3) Display shows "CAP" for 2 seconds then flashes "0". Input the capacity using **SELECT (USER)** and **ENTER (TARE)**.
4) Display shows "d" for 2 seconds, then flashes the default Count By (division). Press **ENTER (TARE)** to accept, or press **SELECT (USER)** to pick another Count By, then press **ENTER (TARE)**.
5) Display flashes "GAin4". Press **ENTER (TARE)** to accept, or press **SELECT (USER)** to pick another gain, then press **ENTER (TARE)**. Use the table below to determine the correct gain setting for your load cell.

| Gain | Load Cell Output |
|---|---|
| 4 | less than or equal to 2.5 mV/V |
| 3 | between 2.5 and 5 mV/V |
| 2 | between 5 and 10 mV/V |
| 1 | between 10 and 20 mV/V |

Chart 3: Gain Table

6) Display flashes "UnLd". Unload the scale and press **ENTER (TARE)**. The indicator will display "CALC", for calculating.
7) Display shows "LOAd" for 2 seconds then flashes the capacity. Load the scale with a test weight that is equal to capacity weight; or if the test weight is less than capacity, enter the actual weight of the test weight by pressing **SELECT (USER)** then **ENTER (TARE)**. After the last number of the weight has been entered and the motion indicator is off press **ENTER (TARE)**. The display will show "CAL'd" if successful, or "CErr" if not successful. An unsuccessful calibration can be due to an improper gain setting, or use of a calibration weight that is too light.
8) Display flashes "UnLd". Unload the scale and press the **ENTER (TARE)** button. Afterwards "r-CAL" will be displayed until the value is determined. If successful, then the CAL-r value is displayed for 10 seconds or until any button is pressed. If unsuccessful, the display will show "r-Err" for 2 seconds.

**Final**

Display shows "StorE" to signify that the calibration parameters are being saved in backup memory. When complete the display will show "F-CAL" for the next menu item. Press **CLEAR (ZERO)** to return to normal indicator operation.

## STANDARD CALIBRATION

**Function**

Standard Calibration is used for routine annual Calibration or when the scale is not weighing accurately.

**Action**

1) To set ZERO the display flashes "UnLd". Unload the scale and press **ENTER (TARE)**. The indicator will display "CALC" (for calculating).
2) To input the Calibration weight value the display will show "LOAd" for 2 seconds then flash the capacity. Load the scale with this weight or input another weight. After the last number of the weight has been entered and the motion indicator is off, press **ENTER (TARE)**. The display will show "CAL'd" if successful, or "CErr" if not successful. An unsuccessful calibration can be due to an improper gain setting, or use of a calibration weight that is too light.
3) To set the CAL-r value the display flashes "UnLd". Unload the scale and press the **ENTER (TARE)** button. Afterwards "CAL-r" will be displayed until the value is determined. If successful, then the CAL-r value is displayed for 10 seconds or until any button is pressed. If unsuccessful, the display will show "r-Err" for 2 seconds.

Note: The failure of Cal-r is not always indicative of a problem. Cal-r will always fail when using external summing boxes or when an unusual load cell resistance is encountered. Proceed with calibration and verify that the system is functioning properly. You will not be able to follow Cal-r calibration procedures. Use Standard Calibration instead.

It may be desirable to bypass a calibration step. To do so press **CLEAR (ZERO)**. The step bypassed will retain the default or last set value. However, bypassing a calibration step may result in an incomplete or inaccurate calibration.

**Final**

Calibration is complete and the display shows "StorE" to signify that the calibration parameters are being saved in backup memory. When complete the display will show "F-CAL" for the next menu item. Press **CLEAR (ZERO)** to return to normal indicator operation.

## FINE CALIBRATION (F-CAL)

**Function**

Fine Calibration (F-CAL) is for minor adjustments to calibration and is usually not necessary. It is useful, however, in applications such as hydraulic calibration fixtures for fine adjustments.

**Action**

1) Press **SELECT (USER)** to scroll to the "F-CAL" message. Press **ENTER (TARE)**.
2) Load a test weight of (or set the hydraulic tension to) at least 25% of capacity. The weight is indicated on the numeric digits. The display will flash "LOAd" if the weight is under 25%.


**WARNING**: Fine Calibration will not function unless the load exceeds 25% of capacity.

3) Press **SELECT (USER)** to cause the displayed reading to move up slightly. Press the button **CLEAR (ZERO)** to cause the reading to move down. Each press of the **SELECT (USER)** or **CLEAR (ZERO)** button causes the calibration to shift by 1/4 displayed count. When the displayed reading is acceptable, press **ENTER (TARE)**.

**Final**

Fine Calibration is complete, press **CLEAR (ZERO)** to return to normal indicator operation, or press **SELECT (USER)** to choose another Calibration Setup function.

## CALIBRATION WITH CALIBRATION OFFSET RESISTOR (CAL-r)

Note: This procedure can only be used in systems where the rCal was in range and recorded during the previous calibration.

**Function**

Calibration with the Cal Resistor (CAL-r) is for emergency calibration only when test weights or a calibration system are not available.

**Action**

1) Press **SELECT (USER)** to scroll to the "CAL-r" message. Press **ENTER (TARE)**.
2) Display flashes "UnLd". Unload the scale and press **ENTER (TARE)**. The indicator will display "CALC" (for calculating).
3) Display shows "LOAd" for 2 seconds then flashes last set CAL-r value. Input the CAL-r value printed on the load cell Cal Sheet. After the last number has been entered, press **ENTER (TARE)**. The display will show "CAL'd".
4) Display flashes "UnLd". Unload the scale and press **ENTER (TARE)**. Afterwards CAL-r will be displayed until the value is determined. Then the CAL-r value is displayed for 10 seconds, or until any button is pressed.

**Final**

Calibration is complete and the display shows "StorE" to signify that the calibration parameters are being saved in backup memory. The calibration menu returns. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different Calibration Setup operation.

Note: When Calibration is finished, seal the Calibration Port on the front panel of the indicator.

## STANDARDS (StAnd)

**Function**

Facilitates calibration to your required standard:

| | |
|---|---|
| IndUS | Industrial |
| nISt | National Institute of Standards and Technology (NTEP setting) |
| EuroP | Metric/OIML |
| 1Unit | One Unit only (for custom scales) |

**Action**

1) Press **SELECT (USER)** until "StAnd" is displayed.
2) Press **ENTER (TARE)**and the currently selected standard will flash.
3) Press **SELECT (USER)** to choose desired standard.

4) Press **ENTER (TARE)** to store, or press **CLEAR (ZERO)** to exit without changing.

**Final**

The calibration menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different Calibration Setup operation.

## REMOTE CONTROL (r-Ctl)

**Function**

Used to enable or disable the use of a Remote Control.

**Action**

1) Press **SELECT (USER)** until "r-Ctl" is displayed.
2) Press **ENTER (TARE)** and currently selected Remote Control Mode (On/Off) will flash.
3) Press **SELECT (USER)** to choose ON or OFF.
4) Press **ENTER (TARE)** to store or press **CLEAR (ZERO)** to exit without changing.

**Final**

The Calibration menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different Calibration Setup operation.


**Caution**: Do Not enable the Remote Control if the option was not purchased with the indicator.

## AUTO ZERO TRACKING (AZT)

**Function**

To enable/disable AZt for certification testing.

**Action**

1) Press **SELECT (USER)** until "AZt" is displayed.
2) Press **ENTER (TARE)** and the currently selected AZt Mode (On/Off) will flash.
3) Press **SELECT (USER)** to choose the desired AZt Mode (On/Off).
4) Press **ENTER (TARE)** to store or press **CLEAR (ZERO)** to exit without changing.

**Final**

The Calibration menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different Calibration Setup operation.


**Caution**: Disabling Auto Zero Tracking will degrade temperature and drift performance of the 3550. Disabling the AZt is only intended for certification testing. Under no other circumstances should the indicator be used with AZt disabled.

## FILTER (Filtr)

**Function**

Allows three levels of filtering to stabilize weight readings on the display.

**Use**

1) Use LO (low setting), for most scale applications. It settles fastest and is intended for general use.
2) Use HI-1 (medium setting), when the scale is being used under conditions that cause light to medium motion.
3) Use HI-2 (high setting), when there is significant load motion. There is a time penalty when using the HI-2 setting. The operator should wait at least 5-15 seconds to ensure that the final reading has settled (motion indicator off). (Not available in some Legal For Trade scales).

**Action**

To change the Filter settings:

1) Hold in the **USER** button while turning on the power.
2) Press **SELECT (USER)** until the message reads "Filtr".
3) Press **ENTER (TARE)**. The currently selected filter will flash.
4) Press **SELECT (USER)** to scroll through LO (low), HI-1(medium) or HI-2 (high) settings. When the desired Filter setting is displayed on the message display, press **ENTER (TARE)** or press **CLEAR (ZERO)** to exit without changing the setting.

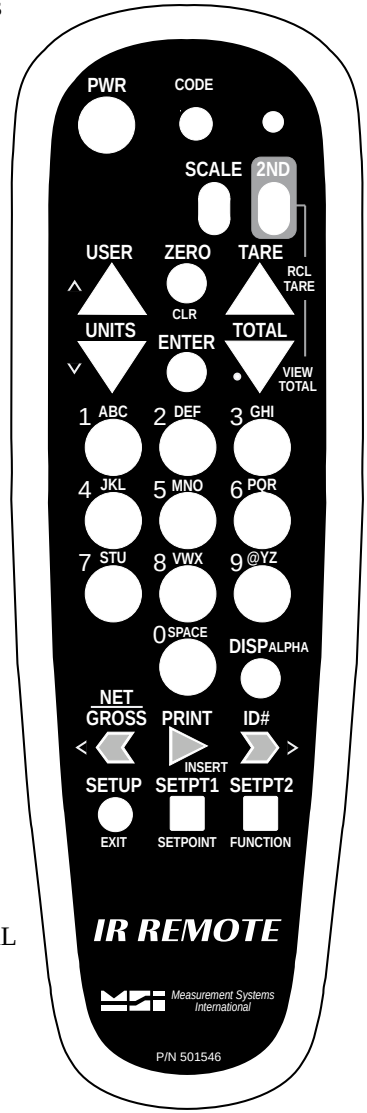
**Final**

Setup menu is displayed. Press **CLEAR (ZERO)** to return to normal operation or press **SELECT (USER)** to scroll to a different USER Setup operation.

# INFRARED REMOTE OPTION

## INTRODUCTION

The MSI IR Remote Controller option provides the user with complete remote control of all indicator operation functions. In addition, a numeric keypad allows the operator easy entry of tare values and setpoint values. Several features, which are only available on the 3550's "USER" key, are directly accessible on the IR Remote. These include "NET/GROSS", "TOTAL", "VIEW TOTAL", and "SETUP". Also, maneuvering in menus is simplified by the use of a "SETUP" key combined with "MENU UP" (USER), "MENU DOWN" (UNITS), "ENTER", and "EXIT" (SETUP) keys.




The IR Remote is available for any 3550. The necessary Infrared Sensor and supporting firmware is standard and therefore no modification of the indicator is necessary other than enabling the remote function.

**Features:**

- Reliable Infrared remote control of Power, Zero, Tare, etc.
- All indicator functions are controllable from a distance of up to 25 feet (8 meters).
- Adds easy numeric keypad entry of Tare, Set-Points, and calibration constants.
- Adds full time "NET/GROSS" key.
- Adds full time "TOTAL" and "VIEW TOTAL (Σ)" keys for easy access to the totalize functions.
- Adds full time "UNITS" key.
- Allows full time "TARE" and adds full time "RECALL TARE" keys.
- Adds full time "SETPOINT 1" and "SETPOINT 2" keys.
- Display Brightness control.
- Easy access to Setup functions.

## REMOTE CONTROLLER OPERATION

In general, the IR Remote keys function the same as the front panel switches on the indicator. The “ZERO”, “TARE”, and “USER” keys function the same as the front panel keys. The enhanced functions or any functional differences are detailed in the following sections.

The Infrared Sensor is located to the left side of the front panel. In general, the operator must aim the IR Remote unit directly at the front panel of the indicator. As distance increases, accurate aiming becomes more critical. The IR Remote will not function in direct sunlight, and will have very limited range outdoors.

## TO ENABLE REMOTE CONTROLLER

**Function**

Used to enable the Remote Controller. This procedure is performed directly on the indicator, not on the IR Remote.

**Procedure**

1) Remove the seal port on the left front panel of the 3550. Insert a probe, such as a wood golf tee, to depress the underlying button. The display will show "C-SEt" for 1 second.
2) Press **SELECT (USER)** until "r-Ctl" is displayed.
3) Press **ENTER (TARE)**. The currently selected Remote Control Mode (On/Off) will flash.
4) Press **SELECT (USER)** to choose ON.
5) Press **ENTER (TARE)** to store. The menu will change to "AZt".
6) Press **CLEAR (ZERO)** to return to normal operation.

**Final**

The IR Remote is now enabled.


**Caution**: Do Not enable the Remote Control if the option was not purchased with the indicator.

## BATTERIES

The IR Remote requires two standard ‘AAA’ cells. Battery life will depend on the frequency of use, but could last up to a year. Anytime the batteries are changed, the IR Remote Access Codes must be programmed.

## TO SET REMOTE CONTROLLER ACCESS CODES

The IR Remote contains internal access codes that must be programmed to function with the 3550. This procedure must also be followed after changing batteries:

1) Press and hold the **CODE** button until the indicator light goes on, then release the **CODE** button.
   Press and release the **2ND** button.
   Press and release the **"1"** button.
   Press and release the **"4"** button.
   Press and release the **"8"** button.
   The indicator light will go out.
2) Press and hold the **CODE** button until the indicator light goes on, then release the **CODE** button.
   Press and release the **SCALE** button.
   Press and release the **"0"** button.
   Press and release the **"0"** button.
   Press and release the **"9"** button.
   The indicator light will go out.

The IR Remote is now ready for use.


**WARNING:** If the access codes are not properly set, the IR Remote might fail to function or will function erratically. Always reset the access codes after changing batteries.

## THE INDICATOR AND 2ND KEYS

The 3550 IR Remote has two modes of operation.

1) Pressing the **SCALE** key defines the IR Remote keys to the light grey commands. For example, after pressing the **SCALE** key, the VIEW TOTAL and RECALL TARE functions are unavailable. Active: PWR, USER, ZERO, TARE, UNITS, ENTER, TOTAL, 0-9, DISP, NET/GROSS, SETUP, SETPT1, SETPT2.
2) Pressing the **2ND** key defines the IR Remote keys to the green commands. For example, after pressing the **2ND** key, the VIEW TOTAL and RECALL TARE keys are active while many other remote controller keys are inactive. Active: PWR, USER, RECALL TARE, UNITS, ENTER, RECALL TOTAL.

## POWER

**To turn on the Indicator:**

1) Aim the IR Remote at the 3550 front panel.
2) Press and hold down the **POWER** key until the 3550 turns on. Once the display lights up, release the button. This usually takes 2 to 4 seconds.

**To turn off the Indicator:**

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **POWER** key. The 3550 will turn off immediately.

See User Guide page 10 for more POWER key information.

## SETUP (USING REMOTE CONTROL)

**Function**

TO PREVENT UNINTENTIONAL CHANGING OF SETUPS, THE SETUP KEY MUST BE PUSHED TWICE. Setup functions are the same as when accessed by the 3550 front panel. The keys used for entering and maneuvering through menus are simplified with the IR Remote. For a detailed description of the Setup functions, see Scale Setup, page 17 of this manual.

*To Enable the Setup Menus*

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **SETUP** key. The first menu “Func” (User Key function) will appear.

## ZERO

See User Guide page 10.

## TARE

See User Guide page 11.

## RECALL TARE

To view the currently stored tare value, press the **2ND** button and then press the **RCL TARE** button. Don’t forget to press the **SCALE** button to reactivate the main IR Remote key functions.

## NET/GROSS

The NET/GROSS function is available on the 3550 as a USER key function. The Remote provides this function full time through the use of the NET/GROSS key. See User Guide page 17 for more detail on NET/GROSS.

## USER

The USER key is programmable to any of seven functions: TEST, NET/GROSS, TOTAL, UNIT, PEAK, PRINT and OFF. If you are making regular use of the Remote, there is no need to set the USER key to NET/GROSS, UNITS, TOTAL or PRINT, as these keys are available full time on the Remote unit. However, there is no harm in having duplicated functions on the USER key if you so desire. See “Scale Setup” for instructions on programming the USER button.

## UNITS

The UNITS function is available at power up or by programming the USER key to change between pounds and kilograms. The IR Remote provides this function full time by pressing the **UNITS** key. See User Guide page 16 for more information on UNITS.

## TOTAL

The Total function is available full time on the Remote rather than just a USER key function. See User Guide page 13 for more details.

Note: When the 3550 is set up for AUTO total, the TOTAL key has no function.

## PRINT

The Print function is available full time on the Remote rather than just a USER key function. See “Chart 5: RS-232 Menu Structure” for print-setup details.

## VIEW TOTAL (VIEW ∑)

**Function**

The VIEW ∑ key gives the user immediate access to the Total Register.

**Operation**

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **2ND** key.
3) Press the **VIEW** key. The TOTAL LED will light, and the Total weight will appear on the numeric digits for 4 seconds.
4) Don't forget to press the **SCALE** key to reactivate the main IR Remote key functions.

## CLEAR LAST TOTAL

**Function**

The user may clear the last totaled weight from the Total Register.

**Operation**

If the USER key is programmed to "Total" then:

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **USER** key.
3) Press the **TARE** key.

If the USER key is not programmed to "Total" then:

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **2ND** key.
3) Press the **TOTAL** key.
4) Immediately press the **SCALE** key.
5) Immediately press the **TARE** key.

## CLEAR ALL TOTALS

**Function**

The user may clear all totaled weights from the Total Register.

**Operation**

If the USER key is programmed to "Total" then:

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **USER** key.
3) Press the **ZERO** key.

If the USER key is not programmed to "Total" then:

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the **2ND** key.
3) Press the **TOTAL** key.
4) Immediately press the **SCALE** key.

5) Immediately press the **ZERO** key.

## KEYBOARD TARE

**Function**

A tare value can be entered using the remote numeric keypad. Once the value is entered the indicator will change into the NET mode.

**Operation**

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the numeric keys for the Tare value desired. Verify as you enter the number, that each number appears on the 3550 display.
3) Press the **TARE** key to input the number as a Tare value.

Note: If the value entered exceeds capacity the message “2 biG” appears on the display.

The TOTAL key functions as a decimal point, if needed.
To enter a Tare value less than 1, start with the **“0”** key followed by the Decimal Point. e.g. “0.5”. Use the **CLR** key to delete incorrect entries.

**Final**

1) The weigh mode changes to NET.
2) The tare value is subtracted from all readings.

## DISP KEY

**Function**

The DISPLAY key gives control of the brightness of the LED digits and annunciators. In low ambient light, it is advantageous to dim the LEDs since dimmer digits require less energy and extend battery life. Use the DISP key to adjust the display for the minimum brightness that is easily legible at the distances and light conditions you use the most.

Note: The AUTO mode for the display brightness (see “SETUP – LEDS”) will automatically dim the display when no activity is detected. Push any key on the IR remote to wake up the 3550 This activity is independent of the display key.

**Operation**

1) Aim the IR Remote at the 3550 front panel.
2) The DISP key will cycle the display brightness from lowest to highest and then back to lowest.

## SETPOINTS

**Function**

Setpoint values are entered directly from the numeric keypad.

**Operation**

For a Setpoint that responds when the weight is greater than or equal to the Setpoint Value:

1) Aim the IR Remote at the 3550 Front Panel.
2) Press the numeric keys for the Setpoint value desired. Verify as you enter the number, that each number appears on the 3550 display.
3) Press the **SETPT1** or **SETPT2** key to input the number as a Setpoint value. The message “StPt 1” or “StPt 2” appears for 2 seconds verifying the scale has stored the setpoint value in memory.

For a setpoint that responds when the weight is less than or equal to the setpoint value:

1) Aim the remote controller at the 3550 front panel.
2) Press the numeric keys for the setpoint value desired. Verify as you enter the number, that each number appears on the display.
3) Press the **SETPT1** or **SETPT2** key to input the number as a Setpoint value.
4) While the message “StPt 1” or “StPt 2” appears, immediately push the **ID** key. The display will change from “StPt 1” to “LESS” indicating that the setpoint is now set to respond when the weight is less than the value you put in.

Note: If the value entered exceeds capacity the message “2 biG” appears on the display.

The TOTAL key functions as a decimal point, if needed.
To enter a Setpoint value less than 1, start with the **“0”** key followed by the decimal point. e.g. “0.5”. Use the **CLR** key to delete incorrect entries.

## RELAY OUTPUT OPTION

This option adds two SPST relays to the MSI-3550. 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 two setpoint outputs are customized through the set point routines of the 3550. Each set point output is fully programmable to respond to weight changes. This section is intended to cover the electromechanical details of hooking up and using the set point outputs. For details on programming the set points, refer to the "SET POINTS" section.

| | |
|---|---|
| **Contacts** | Form A, with 1 normally open contact |
| **Contact Rating** | 10A 125V AC, 6A 277V AC, 5A 24V DC |
| **Max. Power** | 1,250 VA |
| **Expected Life** | Mechanical: $10^7$ Cycles<br>Electrical: $10^5$ Cycles @ 10A 125V AC |
| **Fuse** | no fuse, user is responsible for fusing circuit |

*Chart 4: Relay Output Electrical Specifications*

## RELAY CABLING

The relay connections are made into terminal blocks found on the circuit board internal to the MSI-3550 (see Figure 2). Due to washdown 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 gage. There is one watertight fitting dedicated to the setpoint outputs (an additional fitting is available if RS-232 is not in use). Multiple conductor cable will be necessary to access all of the relays.


**Caution**: Potentially fatal voltages are present within the meter! Always remove power from the meter and from your circuit before opening the cabinet and connecting or servicing the relay circuits. Ensure that the conductors to your circuit are securely fastened in the terminal block and that the cable is securely fastened in the watertight fitting. Make sure that your wiring complies with all local electrical codes.

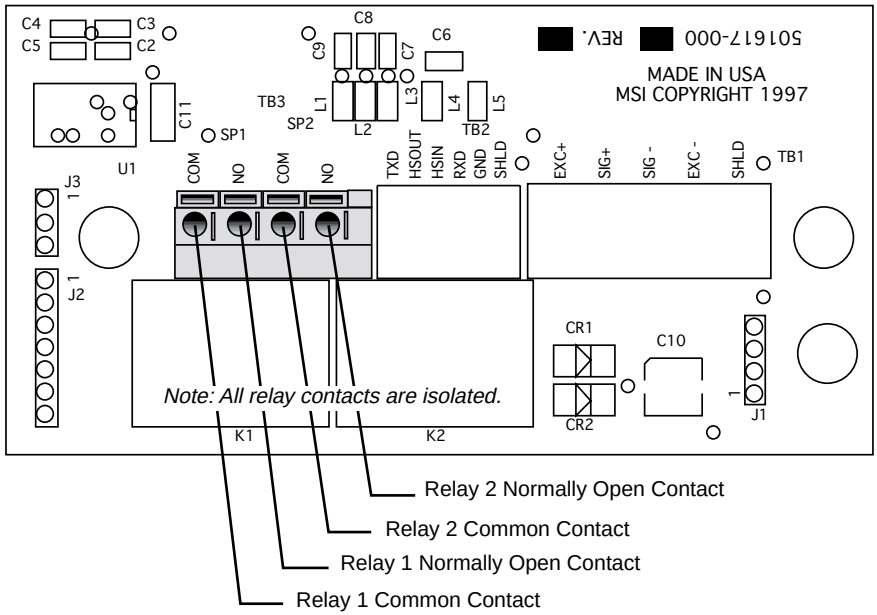



*Figure 2: Relay Connections*

Cable Installation Procedure

1) Unplug the 3550 from the AC power source.
2) Remove the screws holding the back 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 shield including the drain wire. Strip 3/16" (5mm) from each conductor. If a shield is present, it is wise to shrink a short piece of heat shrink tubing over the end of the outer jacket to insulate the shield.
4) Loosen the watertight feedthrough and remove the white plug. Feed the cable through the watertight feedthrough.
5) Insert the wires as shown in Figure 2. Push down the 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 back panel being careful to seat the gasket evenly around the lip of the cabinet. Screw down the 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 3 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 common (COM) contact connects the power to the relay.

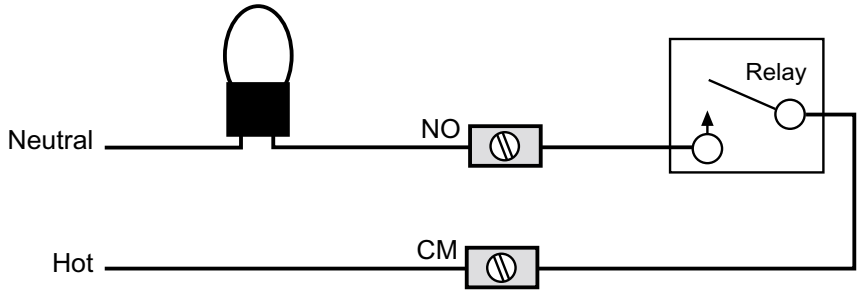



*Figure 3: Relay Hookup to a Lamp*

Set Points are often used in conjunction with automatic conveyer belts. By using the set point relays, conveyor belts can be controlled by weight. Using two Set Points allows speed control for dribbling or speeding up, etc. Figure 4 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 5. In setpoint setup, set for less.

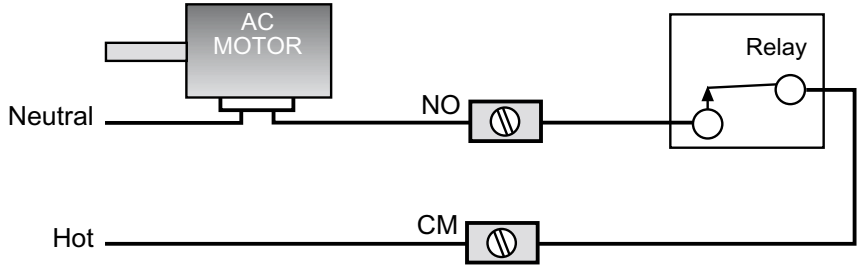



*Figure 4: Relay to Turn Off Motor*

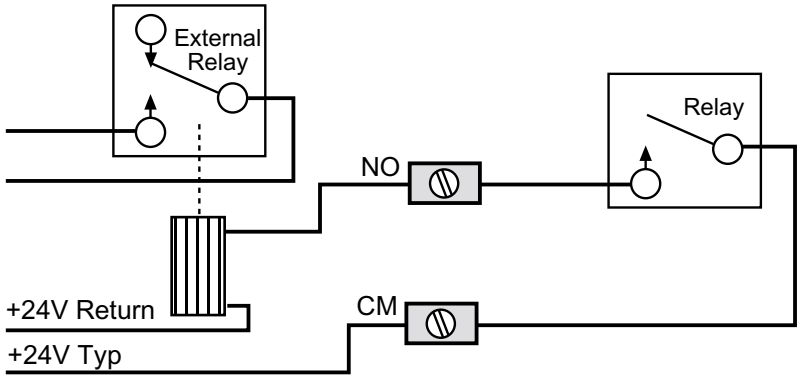



*Figure 5: External Relay Current/Voltage Boost*

By combining the relay outputs of 2 set points, you can implement in limits, out of limits, and speed controls. In Figure 6, two set point outputs are combined to cut off a motor when the weight is outside two limits. Setup SP1 (setpoint 1) for “great” and SP2 for “less”. In Figure 7 two relays are combined to turn on a motor when the weight is outside two limits. Setup SP1 for “less” and SP2 for “great”.

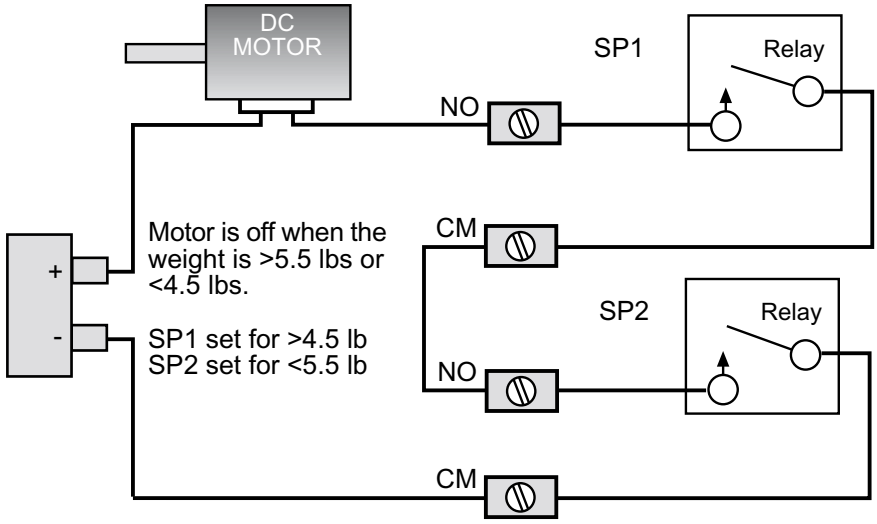



*Figure 6: Cut Off a Motor When Weight is Outside of Limits*

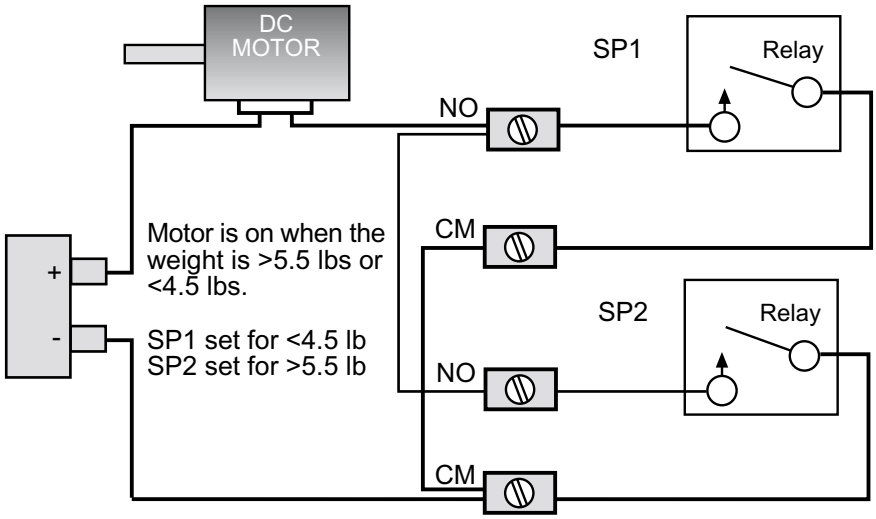



*Figure 7: Turn On a Motor When Weight is Outside of Limits*

# COMMUNICATION PORTS

- The MSI-3550 is equipped with a single RS-232 serial input/output. The Comm Port is intended for interfacing printers, data loggers, scoreboards, and computers to the 3550 Meter.
- Data output is selectable from 5 pre-formatted strings and 1 fully formattable string. The 3550, under menu control will print control characters for easy interfacing to any label printer. An initialize string combined with start string, 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-3550 RS-232 option 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 input/output is used to output weight and total data to a printer or it can be used for 2-way communications with a computer. 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.

Note: The following RS-232 Menu is entered via the User Setup Menu (when calibrated to Industrial or One Unit modes) or the Calibration Setup Menu (when calibrated to NIST or European modes).

| Menu | Sub-Menu | Display Definition | Comments |
|---|---|---|---|
| For | | Format | • To enter data strings, the left 2 digits of display show the string position you are editing. The right 2 digits show the current value of that string position in HEX.<br>• The flashing cursor shows which digit is being edited.<br>• <USER> cycles the digit 0-F.<br>• <TARE> accepts the entry.<br>• <ZERO> exits this routine.<br>• Reaching the end of this string also exits this routine.<br>• 0 0 HEX is the string terminator. |
| | dAtA | Data string 60 bytes | |
| | StLin | Start line 4 bytes | |
| | Endln | End line 4 bytes | |
| | E-Chr | Expect char 1 byte | |
| StrnG | | Print string | Selects which output format will be sent — print string 1,2,3,4,5 or the user-defined string. |
| | Str 1 | String 1 | |
| | Str 2 | String 2 | |
| | Str 3 | String 3 | |
| | Str 4 | String 4 | |
| | Str 5 | String 5 | |
| | Str U | User-defined string | |
| odE | | Printer mode | |
| | OFF | Disabled | |
| | OutPt | Output only | |
| | LIStn | Listen only | |
| | dUPL | Duplex (output and listen) | |
| Cntr | | Printer control | Selects the trigger that sends the output string. |
| | USEr | User key | |
| | Cont | Continuous | |
| | OCtS | On CTS | |
| | OnSP1 | On setpoint 1 | |
| | OnSP2 | On setpoint 2 | |
| | SP1-2 | On setpoint 1 and 2 | |
| | OnChG | On change | |
| | OnLod | On load | |
| | OnttL | On total | |
| otion | | Motion | Always on in NIST mode. |
| | OFF | Motion off | |
| | On | Motion on | |
| IntEr | | Print time interval | Allows output at a regular time interval. Activates the print interval command. Prompts user to enter a value from 0 to 28,800 seconds. |
| | OnCE | | |
| | On | | |
| SEt | | | |
| | bAud | | Baud Rate |
| | | 300 | |
| | | 600 | |
| | | 1200 | |
| | | 2400 | |
| | | 4800 | |
| | | 9600 | |
| | | 19200 | |
| | StoP | | Stop Bits |
| | | 1 bit | |
| | | 2 bit | |
| | dbitS | | Data Bits |
| | | 7 bit | |
| | | 8 bit | |
| | PAr | | Parity |
| | | nonE | |
| | | EvEn | |
| | | Odd | |
| | HAnd | | Handshaking |
| | | nonE | |
| | | C-rtS | CTS/RTS |
| | | onOFF | XON/XOFF |

*Chart 5: RS-232 Menu Structure*

## ELECTRICAL CONFORMANCE

COMM PORT 1
The electrical characteristics of the serial input/output conform to the EIA Standard EIA-232-D (downward compatible with RS-232-C). The Comm Port 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

The Comm Port RS-232 connections are made into TB3 found on the circuit board internal to the MSI 3550. Due to washdown requirements, no interface cable is supplied. Cables with an outside diameter of .187" to .300" (5mm to 7.5mm) are sealable with the watertight fitting. Preferably, cables should have twisted pair connections with an over shield. In the table below, twisted pairs are represented by A, B, and C.

| COMM PORT MODE | HAND-SHAKING | MIN # OF CONDs | W 1A | W 2A | W 1B | W 2B | W 1C | W 2C |
|---|---|---|---|---|---|---|---|---|
| **TALK only** **LISTEN only** | None | 2 + shield | TXD RXD | GND | - | - | - | - |
| **TALK only** **LISTEN only** | CTS/RTS | 4 + shield | TXD RXD | GND | HSIN | HSOUT | - | - |
| **DUPLEX** | None or SW | 4 + shield | TXD | GND | RXD | GND* | - | - |
| **DUPLEX** | CTS/RTS | 6 + shield | TXD | GND | RXD | GND* | HSIN | HSOUT |

* If your cable does not have twisted pairs, eliminate one of the ground leads.

*Chart 6: Recommended Cable Configurations*

RS-232 Cable Installation

1) Unplug the power cable. Remove the screws holding the back panel on.
2) Strip the outer insulation 1.5" (40mm) from the cable. Peel back the foil shield (if any) being careful not to nick the conductors. Cut off the foil shield leaving the drain wire intact. Strip 3/16" (5mm) from each conductor and tin the wires. Slip a 1-5/16" (33mm) piece of sleeving over the drain wire and tin the end of the drain wire. It is also wise to shrink a short piece of heat shrink tubing over the end of the outer jacket to further insulate the Shield.

3) Loosen the appropriate watertight feedthrough. Choose a front feedthrough that accommodates your wire gage. Remove the white plug. Feed the RS-232 cable through the watertight feedthrough.
4) The terminal block uses push levers. Insert the wires as shown in the following diagram. Insert a small flat bladed screwdriver in the white lever and push down to insert the wire. Use only the wires necessary for your application per Chart 6. Be sure to terminate the shield wire in position 1 (Shield Ground AKA Frame ground). In the Duplex with CTS/RTS mode where there are two signal grounds, connect both signal grounds to pin 6. After all the pins are connected, lightly wiggle and tug on each wire to ensure that they are securely attached. Reset or reposition the wires as necessary.
5) Replace the back panel being careful to seat the gasket evenly around the lip of the cabinet. Screw down the panel screws in a criss-cross pattern to seat the gasket evenly.
6) Tighten the watertight feedthrough around the outer insulation to ensure the water seal.

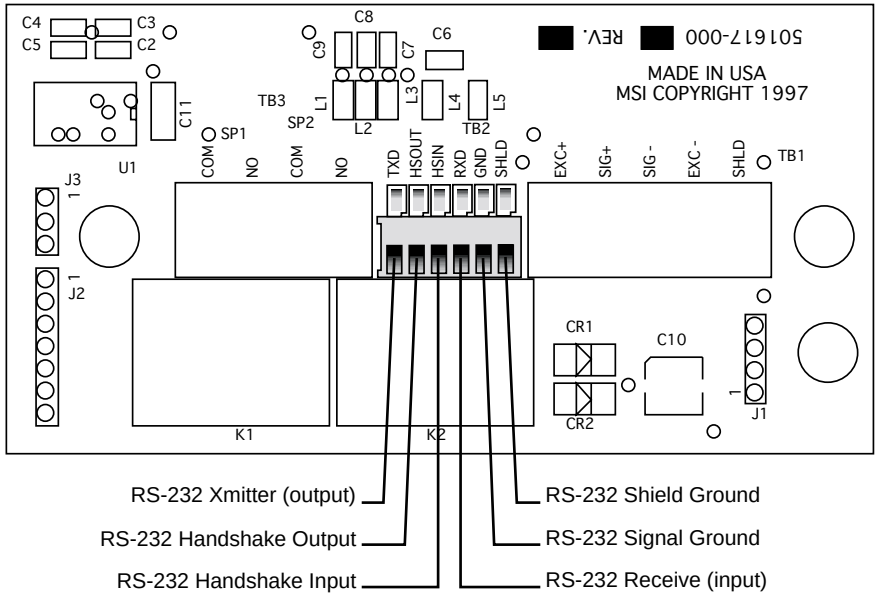



*Figure 8: RS-232 Diagram*

## DATA CONFIGURATION

The 3550 serial port options are configured with the “PRINT” Menu. Standard data configuration is:

| PARAMETER | DEFAULT | MENU CHOICES |
|---|---|---|
| **Baud Rate:** | 9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| **Data Bits:** | 8 | 7 or 8 |
| **Parity:** | None | None, Even, Odd |
| **Start Bits:** | 1 | 1 (can't be changed) |
| **Stop Bits:** | 1 | 1 or 2 |

*Chart 7: Data Configuration*

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 per the following table. However, since 3 or 4 character commands can cause an output of up to 99 characters in length, the following numbers do not represent the maximum size of the data output. The 3550 offers the programmer the ability to print any and all weight data utilizing format controls suitable for even the most complex bar code printer.

| String | Comm Port Max. Characters |
|---|---|
| Data: | 60 |
| Start Line: | 4 |
| End Line: | 4 |
| Wait Char: | 1 |

*Chart 8: Data String Buffers*

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 entered through the print menu or downloaded through a computer.

Output Control

The MSI 3550 serial port functions in any of 10 modes:

1) Front Panel User Key or IR Remote Print Key:
   This is a print on command mode which works when the USER button on the front panel is pushed (it must be set to Print). The “(m)otion” menu determines if printing is allowed or disallowed when the weight is in motion and/or not stable.
2) Computer Control:
   A computer can control and receive data from the MSI-3550 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 “(m)otion” 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.

*Note*: Using Print on Total with the Auto Total enabled should not be used with any weight printout other than W7. Use "Print on Load" to print the totaled weight.

(4,5 & 6) Print on Set-Point:
Set-point1, Set-point2, 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 "(m)otion" 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 "(m)otion" 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.

## PRINTER/OUTPUT FORMATTING

The MSI-3550 is equipped with an RS-232 input/output that can format virtually any printer or serial data device. It also allows two-way communication with personal computers.

There are six printer/output formats on the MSI-3550. Five of them are pre-formatted to provide a simple method of output. The sixth string, String U, is defined by the user and may contain up to 60 bytes of text, numbers, symbols and weighment data. However, since 3 or 4 character commands can cause an output of up to 99 characters in length, 60 bytes does not represent the maximum size of the data output. The 3550 offers the programmer the ability to print any and all weight data, and formatting controls suitable for even the most complex bar code printer.

## PRINTER/OUTPUT STRINGS 1 THROUGH 5

String 1:

Sends simple output of current weight, units and weigh mode, and places a blank line under the data.

```
 2001  LB  GROSS
```

Note: String 1 outputs the current units and weigh mode.

String 2:

Sends output of current gross weight, net weight, and tare weight with units and weigh mode, then places a blank line under the data.

```
 2001  LB  GROSS
 1501  LB  NET
  500  LB  TARE
```

Note: If net weight is not enabled, output will be dashes.
If no tare weight was input, output will be dashes.

String 3:

Sends output of current gross weight, net weight, tare weight, total weight and number of totals with units and weigh mode, then places a blank line under the data.

```
 2001  LB  GROSS
 1501  LB  NET
  500  LB  TARE
10200  LB  TOTAL
    4  T-CNT
```

Note: If net weight is not enabled, output will be dashes.
If no tare weight was input, output will be dashes.

String 4:

Sends output of current displayed weight and mode, total weight with units followed by “TOTAL”, and number of totals, then places a blank line under the data.

```
 2001  LB   GROSS
10200  LB   TOTAL
    4  T-CNT
```

String 5:

String 5 is set up for scoreboard applications. It sends a user-defined communications command to the scoreboard, and then outputs the current weight.

```
2001
```

## STRING U — THE USER-DEFINED PRINTER/OUTPUT STRING

String U allows the user to customize the output format for up to 60 bytes of information. Output may consist of letters, numbers, symbols or weighment data.

- The character set includes all upper case letters, lower case letters, numbers, and most of the rest of the standard ASCII set (see Appendix A for a complete listing).
- All scale data can be accessed.
  Output “@” commands control the output format. 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. See PRINTER CONTROL “@” COMMANDS for a complete list of data and formats.

A simple example of this structure is Print String 1, which outputs current weight, units and weigh mode, and places a blank line under the data. Its command structure is @W1@E@E . The “@W” command code means to print weight. The “1” suffix means print the current display mode. The “@E” will cause the end-of-line string to be printed. It acts like the Return key on a computer keyboard. The second “@E” sends another Return to achieve a blank line before the next data output. 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.

## PRINTER/OUTPUT STRING ENTRY AND EDITING

There are two ways to enter the commands into String U: use either the front panel keys of the 3550 or use a computer. Of the two, computer input is considerably easier. If a computer is not available, follow the procedure below for front panel entry.

### Front Panel Entry:

1) Hold down the USER key and turn on the POWER.
2) Push **USER** to scroll to “rS232”. Press **TARE** to enter.
3) Push **USER** to scroll to “StrnG”. Press **TARE** to enter.
4) Push **USER** to scroll to “Str U”. Press **TARE** to enter.
5) Push **USER** to scroll to “For”. Press Push **TARE** to enter.
6) Push **USER** to scroll to “dATA”. Press **TARE** to enter.
7) The display switches to Command Entry Mode (see illustration below). Output commands are entered one byte at a time. The left two digits of the display show the byte number you are editing. There is a space, then two digits at right show the current ASCII (HEX) code number.

   You will change one HEX digit at a time. The flashing digit is the current editable digit. To edit each digit, use **USER** to scroll up through the character set (0-9, A-F). Use **TARE** as enter. Use **ZERO** as exit.

   Note: You can only scroll up through the characters, they repeat in a loop. You cannot go to previous digits or previous bytes, you must Exit the Command Entry Mode.

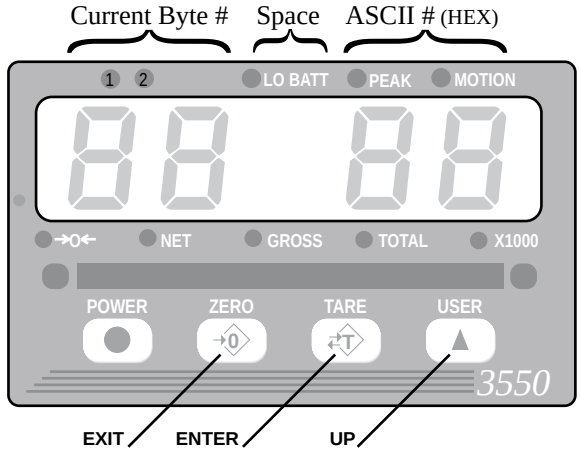



*Figure 9: Display in Command Entry Mode*

Refer to the ASCII Table Appendix. In the table, output characters are in the CHAR column. For commands, you will enter the corresponding two-character code from the HEX column. So if your screen reads 01 40, that means you are editing byte 1 and it is currently the character that corresponds to HEX 40 (@).

Example:
To output the words “SCALE 1” along with the total weight with units and total number of weighments:

1) Go to the Command Entry Mode (follow steps 1-5 above).
2) To output “SCALE 1”, you will need to enter each character separately. Byte 1 will be the letter “S”, byte 2 “C” and so on. According to the ASCII Table, the capital S (from column CHAR) corresponds to HEX code 53. Your display reads “01 xx” where xx is a HEX code. The left x flashes first to indicate that it is editable. First push **USER** to scroll up until 5 appears. Push **TARE** to enter. The right x flashes. Push **USER** to scroll up until 3 appears. Push **TARE** to enter. Push **TARE** again to go to the next byte, or push **ZERO** to exit without changes.
3) Byte 2 should be the letter “C”, or HEX code 43. Push **USER** to scroll up until the left digit is 4, then push **TARE** to enter. Change the right digit to 3 and push **TARE** to enter, push it again to go to the next byte. Follow the same procedure for “A” “L” and “E” in bytes 3, 4 and 5. Their HEX codes from the ASCII table are 41, 4C and 45.
4) To enter a space between E and 1, use HEX code 20 (SPC) for byte 6.
5) Byte 7 is the number “1”, or HEX code 31.
6) If you want the output to go to the beginning of the next line after SCALE 1, you need to enter an end-of-line string “@E”. Use HEX 40 for @ in byte 8 and HEX 45 for E in byte 9.
7) To output the total weight with units and the total number of weighments, use @W7 for byte 10, 11 and 12. To place an end-of-line string after the data, input @E for byte 13 and 14. You may wish to add another @E to place a blank line below your output.

Output:

SCALE 1
10200.00 LB  TOTAL,  4 T-CNT

The entire command string is as follows:

| BYTE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAR | S | C | A | L | E | spc | 1 | @ | E | @ | W | 7 | @ | E |
| HEX | 53 | 43 | 41 | 4C | 45 | 20 | 31 | 40 | 45 | 40 | 57 | 37 | 40 | 45 |

To clear codes:
To clear codes, type the string terminator HEX 00 (two zeros) in the byte position immediately prior to the information you wish to clear. Any coded information that follows two zeros is ignored by the processor.

**Computer Entry:**
If you use a computer to format output, you simply type “CD” followed immediately by the non-ASCII command codes (CHAR line above). The output string must end with a semicolon (;). Here is the line you type:

CDSCALE 1@E@W7@E; Note: There is a space between E and 1.

## PRINTER CONTROL “@” COMMANDS

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

@@ PRINT AN “@”
Purpose:
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
Purpose:
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 five, it is more code efficient to enter spaces instead of the @B command.

### @E PRINT End of Line (EOL)

Purpose:
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, or both, 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 x 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.

### @M PRINT WEIGHING MODE

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

Input Data Form:

| | |
|---|---|
| @M1 | Print current displayed weighing mode |
| @M2 | Print "GROSS" |

@M3 Print “NET”
@M4 Print “TARE”
@M5 Print “TOTAL”
@M6 Print “T CNT” (Total CouNT = number of weighments totalized)
@M7 Print “TOTAL T CNT”

Output Data Form:

@M 1

| * | * | * | * | * | * |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.
***** = Current Displayed mode, see @M2, @M3, @M4, @M8

@M 2

| G | R | O | S | S | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.

@M 3

| N | E | T | | | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.

@M 4

| T | A | R | E | | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.

@M 5

| T | O | T | A | L | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.

@M 6

| T | | C | N | T | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

Length: 6 Justification: left.

@M 7

| T | O | T | A | L | | T | | C | N | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Length: 12 Justification: left.

## @S PRINT STRING

Purpose:
Use the @S command to output the preprogrammed strings. See FORMAT in the PRINT SETUP menu.

Input Data Form:
@S Print SOL String

Output Data Form:
Sends out the SOL string, a maximum of 4 bytes.

## @U PRINT CURRENT UNITS

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

Input Data Form:
@U

Output Data Form:

@U

| L | B |
|---|---|
| 1 | 2 |

| K | G |
|---|---|
| 1 | 2 |

Length: 2 Justification: left

## @V PRINT WEIGHT VALUE

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

*Note*: @V is not available on LFT configured 3550s.

Input Data Form:

| | |
|---|---|
| @V1 | Displayed weight (GROSS, NET, DEV, %DEV) |
| @V2 | Gross weight |
| @V3 | Net weight<br>Note: will print dashes if NET mode is not enabled |
| @V4 | Tare weight<br>Note: will print dashes if no TARE value has been established |
| @V5 | Total weight |
| @V6 | n Totals (weighments counter) |
| @V7 | Total + n Totals (combined @V5 and @V6) |

Output Data Form:

@V1, @V2, @V3,@V4

| | | 2 | 0 | . | 5 | 0 | 2 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Length: 8 Justification: right justified.

@V5

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | . | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Length: 10 Justification: right, leading zeros suppressed.

@V6

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Length: 5 Justification: right, leading zeros suppressed.

@V7

| TOTAL VALUE | | | | | | | | | | | # OF WEIGHMENTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | . | 8 | 9 | . | | 1 | 2 | 3 | 4 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

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

## @W PRINT WEIGHT FULLY

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

Input Data Form:

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

Output Data Form:

@W1

| WEIGHT | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 0 | . | 0 | 0 | 2 | | L | B | | | | * | * | * | * | * | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

Length: 20 Justification: Weight - right justified, Units - left justified, Mode - left justified, ***** = Current Scale Display mode (GROSS, NET, PK GRSS, or PK NET) Does not include Total, Tare, or Target.

@W2

| WEIGHT | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 5 | . | 0 | 8 | | K | G | | | | G | R | O | S | S | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

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

@W3

| WEIGHT | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 5 | - | 1 | 5 | . | 5 | | L | B | O | Z | | N | E | T | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

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

@W4

| WEIGHT | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 0 | . | 5 | 0 | 2 | | L | B | | | | T | A | R | E | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

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

@W5

| TOTALED WEIGHT | | | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | 3 | 2 | 5 | 3 | 4 | . | 8 | 5 | | K | G | | | | T | O | T | A | L | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

Length: 22 Justification: Weight - right justified, Units - left justified, Mode - left justified. Character 22 always a space.

@W6

| WEIGHTMENTS | | | | | | "TOTAL COUNT" | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | T | | C | N | T | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

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

@W7

| TOTALED WEIGHT | | | | | | | | | | | UNITS | | | | | MODE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | 3 | 2 | 5 | 3 | 4 | . | 8 | 5 | | K | G | | | | T | O | T | A | L | . |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

| WEIGHTMENTS | | | | | | "TOTAL COUNT" | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | T | | C | N | T | |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |

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

## COMPUTER OPERATION

The MSI-3550 can interface to computers via the 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-3550 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. The 3550 will not accept commands if it is in any setup mode caused by pushing the **USER** key when powering on.

*Note*: It is important that the final character sent to the 3550 is a semicolon (;).

| Command | Description | Suffix (Bold text indicates default) | Comments |
|---|---|---|---|
| AO | Auto Off | **1=Off**<br>2=12 Min.<br>3=1 Hour | Once the scale is off, the computer will not be able to talk to the 3550 |
| CD | Comm Port Data | Up to 60 characters | Send CD followed by all "@" commands + text. Must be ended with a semicolon ";" |
| D | | | Display the contents of the user-defined print string |
| EM | Total Mode | **1=Disabled**<br>2=Manual<br>3=Auto | |
| FL | Filter | **1=Low Filter**<br>2=Med Filter<br>3=High Filter | |
| KE | Keyboard | 1=Disabled<br>2=Enabled | Disables all front panel switches. |
| KF | Keyboard Function Emulate | 1=Power<br>2=Zero<br>3=Gross<br>4=Net<br>5=Tare<br>6=Total<br>7=View Total<br>8=Clear Last Total<br>9=Clear All Totals<br>10=Clear All Totals<br>11=Print<br>12=Peak Hold On<br>13=Peak Hold Off | Terminate Value with any command or a ";" (semicolon).<br><br>KF01, KF02, etc. also works and eliminates the need for the semicolon following these commands |
| PK | | 1=String 1<br>2=String 2<br>3=String 3<br>4=String 4<br>5=String 5<br>6=String User | Causes the printer output to be directed by print string 1-5 or user-defined print string |
| PR | Print | 1=Print Comm Port 1 string | Causes the current print string format to be printed |

*Chart 9: Computer Control Commands*

| Command | Description | Suffix<br>(Bold text indicates default) | Comments |
|---|---|---|---|
| S# | Set Point Receive Data Enable | 1 or 2 for appropriate Set Point | S#1 and S#2 enable each setpoint. The last enabled set point receives any set point data or parameters. |
| SV | Set point Value | > or< followed by Weight in current units, or 0 to disable the setpoint | Terminate weight value with a semicolon or another command. |
| TA | Tare | Input Tare Value in displayed units | See “KF5” for Auto Tare |
| UM | Units print mode | 1=upper case<br>2=lower case | |
| UN | Set Units | 1=lb<br>2=kg | |
| US | Set User Key | 1=Disabled<br>2=Test<br>3=Total<br>4=Units<br>5=Peakhold<br>6=Net/Gross<br>7=Print | |

*Chart 9: Computer Control Commands (continued)*

## “@” 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 3550, will cause the immediate transmission of the asked for data type out the same 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 3550 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.

## TROUBLESHOOTING GUIDE

| Problem | Possible Cause | Solution |
|---|---|---|
| 1. Display is blank when POWER button is depressed | A) Discharged battery<br>B) Defective battery<br>C) Corroded battery<br>D) Defective button or electronic circuit board<br>E) Power button not properly depressed | Recharge<br>Replace<br>Clean connections<br>Requires authorized service<br><br>Press POWER firmly and hold until Power turns on. |
| 2. Display does not function properly<br>or<br>front panel buttons do not function normally<br>or<br>scale will not turn off | A) Computer lock-up<br><br>B) Faulty electronic circuit board<br>C) Faulty front button assembly | Remove and re-insert battery. If problem persists, authorized service is required<br>Requires authorized service<br><br>Requires authorized service |
| 3. Display does not respond to weight changes | A) Same as 2A, B above<br>B) Out of calibration<br>C) Faulty load cell or electronic circuit board<br>D) Load cell disconnected from printed circuit board | See 2A, B above<br>Check calibration<br>Requires authorized service<br><br>Plug in |
| 4. Display over-ranges below 100% of capacity | A) Tared out weight is added to load when overload condition is determined<br>B) Zero requires adjustment<br>C) Out of Zero range | Normal (See Operation Guide)<br><br>Recalibrate<br><br>Remove dead load and re-zero |
| 5. Display experiences excessive Zero drift between weighments | A) AZt turned off<br>B) Scale electronics do not stabilize after turning on (probably due to rapid temperature change) | Go into Cal menu and turn AZt on<br>Warm up scale for 5 minutes then re-Zero |
| 6. Display shows large number after Power-up sequence with AZt feature Off, and no applied weight | A) ZERO requires adjustment<br>B) Defective load cell or electronic circuit board | Follow Calibration Section<br>Requires authorized service |
| 7. Displayed weight shows large error | A) Scale not Zeroed before applying weight<br>B) Requires recalibration<br>C) lb/kg in wrong selection | Depress ZERO before applying weight<br><br>See Calibration<br>Set to correct selection |

| Problem | Possible Cause | Solution |
|---|---|---|
| 8. Display reading not stable | A) Filter set too low<br>B) Faulty electronic circuit board | Change filter setting<br>Requires authorized service |
| 9. Battery charger indicator does not come on when discharged battery is inserted | A) Corroded battery connections<br>B) Defective charger<br>C) Defective battery | Clean connections<br>Requires authorized service<br>Replace |
| 10. Display is "LCnt1" and/or "LCnt2" at Power on | A) Service Counter exceeded | Inspect load train; and contact factory |
| 11. Display toggles between "Error" and "A2dLo" or "A2dHi" | A) Broken wire or improper connection<br>B) Unit mis-calibrated<br>C) Load cell damaged | Check load cell wiring for connectivity<br>Re-calibrate with Initial Calibration<br>Replace load cell |
| 12. Display toggles between "Error" and "buttn" | A) A button is being depressed, or button is stuck | Release button, or contact qualified service technician |
| 13. Display toggles between "Error" and "LOAd" | A) Current weight is greater than rated capacity<br>B) Load cell damaged<br>C) Defective electronics<br>D) Broken wire or improper load cell wiring | Remove excess weight<br>Replace load cell<br>Contact qualified service technician<br>Check Load Cell connection wiring |
| 14. IR Remote does not work | A) The desired set of keys is not active<br>B) The access codes are incorrect<br>C) The 3550 is not set up to receive infrared commands<br>D) The batteries in the IR Remote controller are dead | Press 2ND or SCALE to activate the correct set of IR Remote keys. (See "THE INDICATOR AND 2ND KEYS")<br>See “TO SET REMOTE CONTROLLER ACCESS CODES”<br>See “TO ENABLE REMOTE CONTROLLER”<br>Replace 2 ‘AAA’ batteries with new. |
| 15. Some IR Remote keys do not work | A) IR Remote is in wrong mode<br>B) Remote not programmed | See “THE SCALE AND 2ND KEYS”<br>Reset remote access codes. See “TO SET REMOTE CONTROLLER ACCESS CODES” |

## SERVICE COUNTER WARNING

**Function**

*A Warning is reported at Power On if:*

Capacity of the scale has been exceeded more than 1,000 times or a weight in excess of 25% of capacity has been detected more than 100,000 times. This warning informs the operator that the scale's load train should be inspected by a qualified technician.

**Action**

If a weight in excess of 25% of capacity has been detected more than 100,000 times, then "LCnt2" (Load Counter #2) is displayed, followed by the flashing numeric value. To continue with Power On, press any button.

**Final**

Power On sequence continues.

Note: If Service Counter Warning has not been reset, it will be displayed the next time POWER is turned on, with the updated numeric values.

## APPENDIX A: ASCII TABLE

| DEC | HEX | CHAR | | DEC | HEX | CHAR | DEC | HEX | CHAR | DEC | HEX | CHAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | ^@ | NUL | 32 | 20 | SPC | 64 | 40 | @ | 96 | 60 | ‘ |
| 1 | 1 | ^A | SOH | 33 | 21 | ! | 65 | 41 | A | 97 | 61 | a |
| 2 | 2 | ^B | STX | 34 | 22 | “ | 66 | 42 | B | 98 | 62 | b |
| 3 | 3 | ^C | ETX | 35 | 23 | # | 67 | 43 | C | 99 | 63 | c |
| 4 | 4 | ^D | EOT | 36 | 24 | $ | 68 | 44 | D | 100 | 64 | d |
| 5 | 5 | ^E | ENQ | 37 | 25 | % | 69 | 45 | E | 101 | 65 | e |
| 6 | 6 | ^F | ACK | 38 | 26 | & | 70 | 46 | F | 102 | 66 | f |
| 7 | 7 | ^G | BEL | 39 | 27 | ‘ | 71 | 47 | G | 103 | 67 | g |
| 8 | 8 | ^H | BS | 40 | 28 | ( | 72 | 48 | H | 104 | 68 | h |
| 9 | 9 | ^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 | ^L | 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 | SUB | 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 |

## 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 prepaid.

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 judgement and disposition of all claims will be made by MEASUREMENT SYSTEMS INTERNATIONAL, INC.

*"We Weigh Quality First"*

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