



The Standard of Measurement

TCS 3000 REGISTER



Setup & Operation Manual Generation 1

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Receipt & Inspection

Upon receipt of register shipment, be sure to inspect the packaging and the register assembly for any damage before signing the receipt of the shipment. Notify the delivery company about possible damage and refuse receipt of the shipment.

Registers are individually boxed and are protected with static resistant packing material. Each package is identified with the register assembly part number, description, serial number. Verify the register model is the correct model, size, and configuration as ordered. Contact your distributor if there is any discrepancy or question.

Register assemblies should be handled with appropriate methods for the size and weight involved. Appropriate clothing and shoes need to be utilized. Transport the register package to the installation site with appropriate transportation methods, careful not to damage the register.

Be careful of any loose or protruding staples from the packaging, as they can be very sharp and may potentially cause injury.

If foam has been used to protect register, carefully remove top foam layer before attempting to remove register assembly from box. Foam packaging maybe formed around the register assembly making it difficult to remove. Do not lift the register assembly by wires or anything other than the metal body of the register. Do not insert objects or cables into the register unless stated. Removing register assembly from packaging without adhering these warnings may cause serious injury to you and/or the register.

Appropriate precautions should be taken regarding any personal, environmental and material compatibility with the end use system.

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Introduction

The TCS 3000 register is a fully integrated custody transfer flow computer that will control a majority of the vehicle delivery operations. The Open Software Architecture provides the option of a simple “*Pump & Print*” delivery or a custom measurement solution. The TCS 3000 features a 4.5”x 3.5” full color VGA display screen, multiple delivery screens and a flexible mounting with backlit alpha-numeric keypad for the user interface. Software features offer complete flexibility of delivery screen information and view, preset, price/tax, ticket format and password protection. Available in flexible mounting configurations of 75 or 90 degree displays for meter mounting, and a remote mounting.

As a flow computer with open software architecture, there will always be a need to add features to the register as the industry applications evolve. Therefore please be reminded to contact the factory for periodic updates.

Optional GPS, Bluetooth, Wi-Fi and Cellular capability enables the TCS 3000 to improve your product security and ease access to your delivery data to reduce your operation costs. Many additional features are available (multiple product delivery, additive injection, density/temperature correction, multiple valve & pump control, etc.) to enhance your measurement solution.

TCS 3000 - This manual will help guide you with the setup confirmation and calibration of the register. Additional information will be provided for wiring instruction and auxiliary devices to integrate into the register.

System Specifications

ELECTRICAL

| | |
|---------------------|---|
| Power: | 12 - 24Vdc A 4 amp fuse is provided to limit the power source. |
| Current: | 1.4 Amp |
| Solid State Relays: | 12 - 24 Vdc; Passive Solid State |

INTERNAL PULSER

| | |
|-------------|-----------------------|
| Pulse Ratio | 400:1 PPR; Quadrature |
| Power | 5 Vdc |
| Hertz | 0 - 5000 Hz |

EXTERNAL PULSE INPUT

| | |
|-------|-------------------------------------|
| Type | Single or Dual Channel (Quadrature) |
| Power | 5 Vdc |

ENCLOSURE

| | |
|--|---|
| Aluminum die cast with epoxy powder coat | IP 66 / NEMA 4 rated |
| UL/cUL Rating | Class 1, Division 2, Group C + D |
| Ports: | Ten 1/2” NPT UL, cUL threaded connection ports, Optional ten M20 threaded connection ports |
| Temperature Range: | -40 F to 158 F (-40 C to 70 C) |

Backlit LED Keypad
Calibration optical switch, password and mechanical seal

COMMUNICATION

Three (3) RS 485 output, 2-wire half duplex, custom protocol; 9600 baud, 8 bit, no parity, 1 stop bit
Two (2) RS 232 output, 9600 baud; 8 bit, no parity, 1 stop bit

The USB 0 and USB 1 ports are for maintenance only. To access these USB ports, power to the unit is to be disconnected or the area known to be free of ignitable gas or equivalent.

WARNINGS:

WARNING– EXPLOSION HAZARD– DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS

WARNING– EXPLOSION HAZARD– SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.

TCS 3000 Register Start Up:

Caution

Before Placing this product into service, make sure that the register has been properly calibrated and setup for the type of fluid being measured. This includes calibration factor, compensation type, compensation parameter, product type, valve settings, no flow timeout and others. Refer to the operation manual supplied with the register for instructions. Failure to properly calibrate and setup the register can result in unexpected operation, inaccurate measurements and damage to equipment or property.



SHIFT + MODE (SAME TIME) = SYSTEM MENU

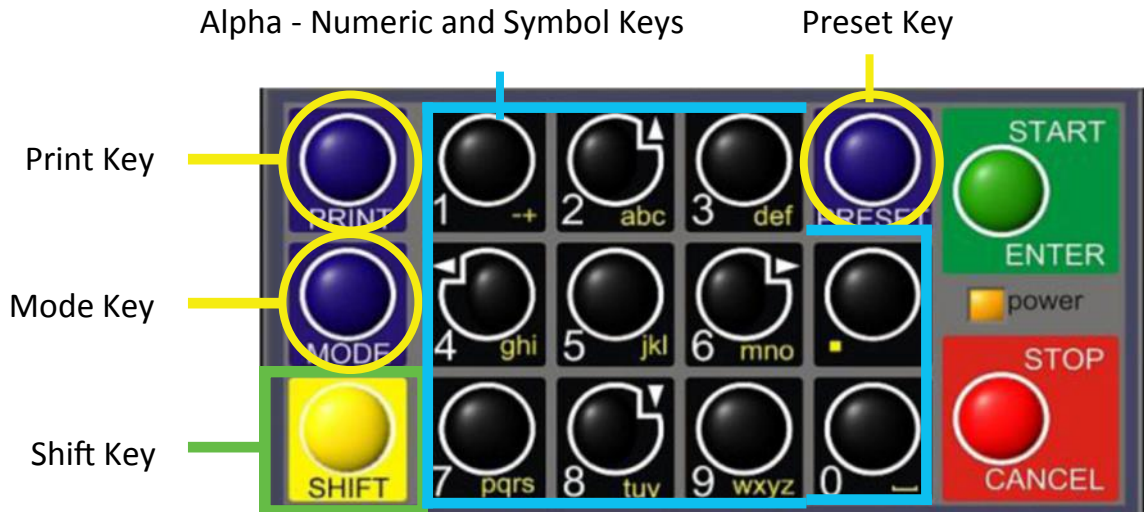
Navigation Keyboard Functions



Arrow Keys

- | | |
|-----------------|---|
| Power Light | Allows you to see that there is power to the electronic register. |
| Start/Enter Key | Allows you to enter register functions and start deliveries. |
| Stop/Cancel Key | Allows you to stop a delivery and cancel an operation. |
| Arrow Keys | Allow you to move to different fields on the Register. |

Navigation Keyboard Functions (Continued)



- Preset Key Allows you to PRESET the Price and Tax as well as Gallons into the Register.
- Alpha - Numeric Keys Allow you to enter different prices, products, etc. into the Register.
- PERIOD Hold Shift key while pressing Period key for symbols: ., %, @, &, (,), /, #, - and _.
- Mode Key MODE allows you to select different screens on the Register.
- Print Key Allows you to print. You can print the delivery with or without selecting the STOP key.
- Shift Key Allows you to select the Alpha Keys on the Alpha/Numeric Keys. Selecting Shift allows you to use anything on the Key Pad in yellow.
- Shift & Mode Allows you to get into the main Menu screen.

Display Icons

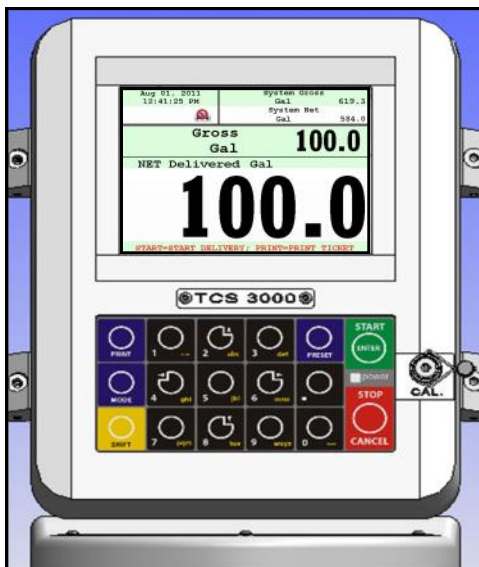
| ICON | DESCRIPTION |
|------------|----------------------------|
| | Printer with no ticket. |
| | No printer connection |
| | Printer ready with Ticket |
| | Pump Off / Valve(s) Closed |
| | Pump On / Valve(s) Open |
| | Multiple Tank Delivery |
| | System Settings |
| | Weights & Measures |
| AIR | Air/Vapor Present |
| | Density Error |
| | Water Present |

SELECT FUNCTION MENU

| | |
|---------------------------------|--|
| Start Delivery | Begins delivery transaction. |
| Show Last Delivery | Shows the last delivery on the TCS 3000 screen. |
| Begin or End Shift | Beginning Shift will take a record of Delivery information at the start through the end of the user shift. |
| View Inventory | Shows the inventory in the tank. |
| Duplicate Shift Ticket | Duplicate Shift Ticket will print a duplicate of the Begin or End Shift. |
| Re-Print Tickets | Will reprint past delivery transactions |
| Non-Printed Delivery | Prints the last transactions that have not printed. |
| Already Printed Delivery | Reprints the last #### of transactions already printed |
| Shift Tickets | Reprints the last #### of shift tickets. |
| System Menu | Setup and Configuration MENU'S for TCS 3000 |
| Reports | Calibration Log / Identification and Software Version |
| System Settings | Configuration of System Parameters, Printer and Auxiliary Devices |
| W&M Settings | Product Setup and Calibration |
| Product Settings | Product Activation, Price Settings, Device Time Settings & Auxiliary Settings |
| Advanced Functions | System Software Update |

Start Delivery

- 1) **START DELIVERY.** Press **START** to begin delivery transaction. This will reset the register causing the delivery screen to read 0.0. Start your delivery.
- 2) If a Preset or Customer ID Field is Enabled, the delivery process will begin with prompts requesting data input. See Page 12 and 13 for Preset Settings and / or for Customer ID Field to Enable/Disable.
- 3) If a Multiple Tank Delivery is Enabled, the Operating Driver must Hold the **SHIFT** key down while pressing the **START** key. When the Multiple Tank Delivery begins, a multiple tank icon will be displayed during delivery. See Page 13 for Multiple Tank Delivery to Enable/Disable.
- 4) **Finish the delivery.** Press **STOP** once to finish delivery. Or, press **STOP** once to **PAUSE** and twice to **STOP**, if Delivery Pause is enabled. If the Printer is Enabled, the ticket will be printed automatically. If the printer is not Enabled, it will be stored in memory to be retrieved at a later date.



Show Last

SHOW LAST Press START/ENTER to see the last delivery transaction

Begin Shift/End Shift

The Shift function records the Time/Date, Meter Identification and the Delivery Data from the beginning of the shift to the end of the shift. NOTE: This function is only accurate as the driver operators that utilize this feature.

- 1) BEGIN SHIFT Press and hold the SHIFT key, then press the MODE key.
- 2) END SHIFT Press and hold the SHIFT key, then press the MODE key.

After or before each Shift, the display will read Saving and Printing BEGIN or END Shift Ticket.

Sample Begin and End Shift Tickets

| | |
|---|---------------------|
| Total Controls Systems 2515 Charleston Place Fort Wayne, IN 46808 Voice (800) 348-4753 Fax (260) 484-9230 | |
| ===== | |
| BEGIN SHIFT TICKET | |
| ===== | |
| Driver | : Kelly, Bob |
| Start | : 09/29/10 20:54:10 |
| Unit | : 3 |
| First Ticket | : 5 |
| Gross Start Total | : 8.0 |
| ----- | |
| Starting Inventory : | |
| Fuel Oil | 2000.0 |
| Gasoline | 2000.0 |
| Diesel | 654.9 |
| ===== | |
| Driver Signature | |

| | |
|---|---------------------|
| Total Controls Systems 2515 Charleston Place Fort Wayne, IN 46808 Voice (800) 348-4753 Fax (260) 484-9230 | |
| ===== | |
| END SHIFT TICKET | |
| ===== | |
| Driver | : Kelly, Bob |
| Start | : 09/29/10 20:54:10 |
| End | : 09/29/10 20:54:32 |
| Unit | : 3 |
| Deliveries | : 0 |
| ----- | |
| Total Sales | : 0.00 |
| ----- | |
| Gross Start Total | : 8.0 |
| Gross End Total | : 8.0 |
| Gross Shift Del | : 0.0 |
| ----- | |
| Ending Inventory : | |
| Fuel Oil | 2000.0 |
| Gasoline | 2000.0 |
| Diesel | 654.9 |
| ===== | |
| Driver Signature | |

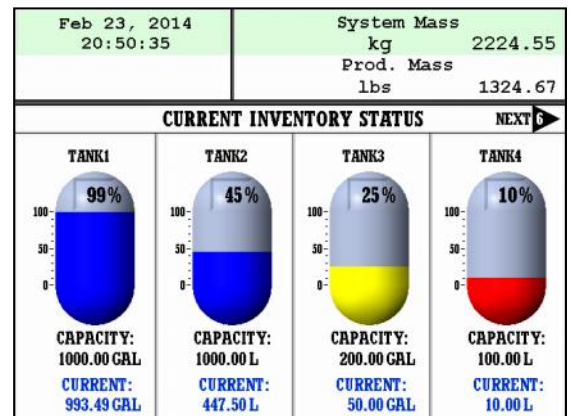
View Inventory

View Inventory allows you to select and view the inventory of product in the tank.

INVENTORY DISPLAY Displays the inventory and tank size.

SELECT INVENTORY Allows you to use the arrow keys to select the product in order to view the Inventory Details.

PRINT INVENTORY REPORT Generates a ticket of the Inventory Report



Duplicate Shift Ticket

To print a Duplicate Shift Ticket, navigate down to select the function and press ENTER.

Re-Print Tickets

To locate and reprint a past delivery ticket, navigate down to select the function and press ENTER

- | | |
|-----------------------------|---|
| 1) NON PRINTED DELIVERY | Will ask how many of the last sequential tickets (that have NOT printed) do you wish to print. Enter quantity and press ENTER. |
| 2) ALREADY PRINTED DELIVERY | Will ask how many of the last sequential tickets do you wish to re-print. Enter quantity and press ENTER. |
| 3) NON PRINTED INVENTORY | Will ask how many of the last sequential inventory tickets (that have NOT printed) you wish to print. Enter quantity and press ENTER. |
| 4) PRINTED INVENTORY | Will ask how many of the last sequential inventory tickets you wish to re-print. Enter quantity and press ENTER. |
| 5) SHIFT TICKETS | Will ask how many of the last sequential tickets do you wish to re-print. Enter quantity and press ENTER. |

System Menu (Quick Guide)

Reports

| | |
|------------------------------|--|
| Operation Parameters | View and print calibration, meter information and software |
| Show Prover Status | View existing voltages, temperatures and runtimes |
| Prover Ticket | Weights & Measures access, calibration and configuration log |
| Meter Info | Print the last calibration proving ticket |
| Version Info | Meter identification |
| Memory Status | Operating Firmware and Software |
| Print Error Log | View stored delivery, inventory, calibration and transferred (TCS HUB) tickets |
| Checksums | Print error logs from register |
| Preview Prover Ticket | View checksums from software, firmware and operating system |
| Preview Error Log | View Prover Ticket without a printer |
| Config Parameters | View error logs from register with a printer |
| Last Delivery Ticket | View system configuration parameters |
| Search Ticket | View Last Delivery ticket |
| | Search Ticket by Number or Date |

System Settings

| | |
|--------------------------|---|
| Language | Configuration of system functions |
| Display Settings | Choose the system language from English, Spanish or French |
| Printer Settings | Configure display screens and fields |
| Regional Settings | Select printer, host ,remote or none |
| Delivery Settings | Date and Time settings |
| Auxiliary Devices | Configure delivery functions like tickets, presets, ID fields, etc. |
| Connectivity | Select and configure auxiliary devices and pulse output |
| Configure Tickets | Configure register and printer addresses for network data sharing |
| Misc. Settings | Configure ticket headings and footers |
| | Password and Database settings |

W&M Settings

| | |
|-----------------------------|--|
| Products | Weights & Measures product setup and calibration |
| Accounting | Product settings and calibration |
| Delivery Screens | Set ticket number, configure delivery tickets |
| System Metrics | Configure delivery screen fields for display |
| Temp Probe | Unit of measure precision |
| Meter Information | Temperature probe calibration |
| Prover Ticket | Register, Meter and Truck Identification |
| Tickets Cleanup | Print calibration proving ticket |
| Reset Totalizers | Allows you to delete the oldest 500 printed tickets over 5000 transactions |
| Enable Remote Config | Reset system and product totalizers |
| Pulser Tracker | Remote interface configuration |
| | Track pulser outside of delivery |

Product Settings

| | |
|---------------------------|---|
| Inventory | Product identification for shifts and price/tax |
| Product Prices | Create or remove tank inventories; as well as assigning products to these tanks |
| Activate Product | Product pricing and taxation |
| Deactivate Product | Activating onboard products within Shifts |
| Product Parameters | Deactivating onboard products outside of Shifts |
| Auxiliary Settings | Product preset and auxiliary device timing |
| Product Lists | Auxiliary device configuration for a Additive Injector, Pressure Sensor, Water, Density, etc. |
| | Listing of active, inactive and uncalibrated products |

Advanced Functions

| | |
|-----------------------------|---|
| Lock The System | Administrative Configuration |
| System Shutdown | Lock the system down from use, requires remote computer for operation |
| System Update | Rebooting of system |
| Export Ticket Config | Software update |
| Restore From Backup | Copy ticket configuration for copy to other registers |
| | Restore system and product configuration to a recent backup |

Reports

1) OPERATION PARAMETERS

Selecting Operation Parameters allows you to view the live Battery and 5V Supply Voltage to internal components, as well as Display, Main Board and RTD temperatures. The Runtime is the accumulated time of the register operation from the factory.

2) SHOW PROVER STATUS

Selecting Show Prover Status allows you to view the last date and time of the last calibration.

3) PROVER TICKET

Selecting Prover Ticket allows you to print the prover information from the register.

4) METER INFO

Selecting Meter Information allows you to view the Meter Data, such as The Truck ID, Register ID, Meter Make, Meter Model, Meter Version, and the Meter Serial Number. Information must be input within the Weights & Measures menu. +++ *Required for Calibration Prover Ticket* +++

5) VERSION INFO

Selecting Version Info allows you to view the Version of Software and Firmware running on the TCS 3000.

6) MEMORY STATUS

Selecting Memory Status allows you to view the number and type of tickets printed by the TCS3000. The Transferred and Non-Transferred deliveries show whether the delivery information has been seen and transferred to third party software accounting POS programs.

7) PRINT ERROR LOG

Selecting Print Error Log allows you to log printer errors in e-ticket. To view the print errors you must have a computer interface (e.g. handheld device, HUB, etc.).

8) CHECKSUMS

Selecting Check Sums allows you to check the TCS 3000 software for errors.

- Software Checksum

- Firmware Checksum

- OS Checksum

| | |
|--|--------------------------|
| Jun 10, 2015 14:24:21 | System Gross GAL 21.8 |
| SOFTWARE CHECKSUM | |
| REFERENCE SOFTWARE CHECKSUM: 4BC82E5349011B7C9498FEB311A09792 | |
| CURRENT SOFTWARE CHECKSUM: 4BC82E5349011B7C9498FEB311A09792 | |
| PRESS "MODE" TO-RECALCULATE PRESS "CANCEL" TO EXIT | |

The Reference and Value must match.

If the values do not match, select MODE to recalculate the value.

9) PREVIEW PROVER TICKET

Selecting the Preview Prover Ticket will allow you to scroll page by page through the calibration prover ticket.

10) PREVIEW ERROR LOG

Selecting the Preview Error Log will allow you to scroll through the error log of the TCS 3000 computer.

11) CONFIG PARAMETERS

- Selecting the Preview Parameters will allow you to scroll through the system configuration parameters.
- Selecting the Print Parameters will you to print the system configuration parameters.

12) LAST DELIVERY TICKET

- Selecting Last Delivery Ticket allows you to view and scroll through the last delivery ticket produced.

13) SEARCH TICKET

- Selecting Search Ticket will allow you to view and scroll through the delivery tickets.

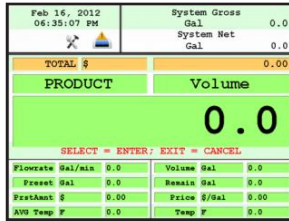
System Settings

1) LANGUAGE

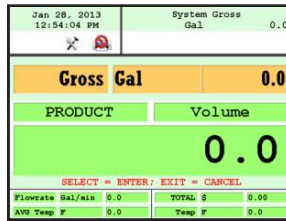
Choose the language that you want the system and product settings to be displayed.
 - ENGLISH is standard, and currently the only available language programmed.

2) DISPLAY SETTINGS

DEFAULT SCREEN Select the Type of Screen you would like the TCS 3000 to default to.



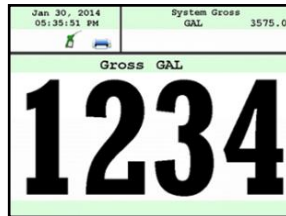
TYPE 1



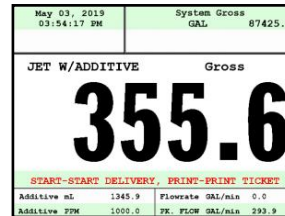
TYPE 2



TYPE 3



TYPE 4



TYPE 5

* TYPE 4 Only displays delivered volume.

CALIBRATION SCREEN

Temperature Calibration screen will show volume/mass and Temperature
 Flowrate Calibration screen will show volume/mass and Flowrate
 Empty Calibration screen will show volume/mass and nothing else

BRIGHTNESS

Brightness allows you to set the brightness of the display screen from 100 to 30 percent (brightest to dimmest) settings.

NET TOTALIZER

Always Net Totalizer is always visible
 Auto Net Totalizer is visible only when a product has Automatic Temperature Correction (ATC) enabled on a Product
 Never Net Totalizer is never visible

GROSS TOTALIZER

Gross Totalizer allows you to set whether the Gross or Volume Totalizer is visible on the display screen.

Volume Totalizer Volume Totalizer is always visible
 Mass Totalizer Mass Totalizer is always visible

3) PRINTER SETTINGS

ENABLE/DISABLE PRINTER

Enable Allows the printer to operate. Highlight Enable and select ENTER. When the printer is Enabled, a printer icon will appear in the top left portion of the screen.
 Disable Will not allow the printer to operate. Highlight Disable and select ENTER. When the printer is Disabled, the little printer will disappear in the top left portion of the screen.

SELECT PRINTER

| | |
|-------------------|---|
| None | No printer is to be used, will remove the communication for printing. |
| Remote | Client Registers must select Remote to allow you to use a printer remotely when connected to the register through a daisy chain RS485 serial communication. |
| Epson TMU 220/295 | Epson slip or roll printer driver installed |
| Citizen CMP30 | Citizen printer driver installed |
| Printek | Printek printer driver installed |
| DDP-350 | Stimare printer driver installed |
| Blaster | Blaster printer driver installed |
| Blaster_DLXI | Blaster printer driver installed |
| Blaster_CR | Blaster printer driver installed |

PRINTER HOST

Printer Host is used when you plan to daisy chain multiple TCS 3000 registers together for a single printer. Host is the primary meter and the Clients are all registers following the Host. Client registers must select the Remote printer.

| | |
|---------------------|--|
| Enable/Disable Host | To Enable or Disable the Printer Host, highlight Enable or Disable and select ENTER - Enable will allow you to use Printer Host - Disable will not allow you to use Printer Host |
|---------------------|--|

Clients Address Range Use the keypad to define the starting and ending address range of registers on the daisy chain (See pages 36-37 for instructions on how to daisy chain).

4) REGIONAL SETTINGS

DATE & TIME

| | |
|-------------|---|
| Date Format | MMMM DD, yyyy MM/dd/yyyy yy/MM/dd dd/mm/yyyy dd/mm/yy |
| Time Format | 24 Hour Clock 12 Hour Clock AM/PM |
| Set Date | Year — Format YYYY Month — Select Month Date — Select Date |
| Set Time | Format time: Hours.Minutes.Seconds (HH.MM.SS) NOTE: Hours - 24 hr. clock and a period must be used as your divider |
| Time Source | BIOS source time and date Controller source time and date |

DECIMAL SYMBOL Select a '.' period or a ',' comma and press ENTER

5) DELIVERY SETTINGS

PRESET SETTINGS

Enable Preset Utilizing the preset will request a preset amount before a delivery begins. After selection, press ENTER to complete setting.

| | |
|-----------------|--|
| Enable Preset | Enable or disable preset |
| Preset By Price | Enable or disable preset by Price |
| Gross Preset | Enable or disable preset in GROSS VOLUME |
| Net Preset | Enable or disable preset in NET CORRECTED VOLUME |
| Retain Preset | Enable or disable preset for repeat BATCH presets |
| Preset Top Off | Enable for preset batch and Pause. Press START to continue delivery. |

NOTE: Each Preset Setting requires configuration under Product Settings for S1 and S2 operation. (See page 20 for instructions on how to configure Preset valve closure).

MULTIPLE DELIVERIES

Allows for the user to fill multiple tanks on one (1) single ticket transaction. Simply press and hold the SHIFT key down while pressing the START key to begin the multiple deliveries. If preset is enabled, each tank delivery will prompt the preset amount.

CUSTOMER ID OPTIONS

The Customer ID Option will provide four (4) separate fields for the user to input prior to the delivery. The Customer Identification is normally used for Tank, Truck, Airplane Tail No., Locomotive, Driver, Customer, etc. Manual entry of data will be required through the alpha-numeric keypad. After selection, press ENTER to complete setting.

Customer ID# (1-4)

Customer ID# Text

Field programmable for identification

Request ID#

Field prompts user to enter an ID

Enforce ID#

Field requires user to enter an ID in order to operate the system

Validate ID#

Field validates the ID to ensure the ID is in the database, if invalid the system will be inoperable

DISPLAY PRECISION

The unit precision can be displayed as a whole, tenth, hundredth or thousands measurement. After selection, press ENTER to complete setting.

| | |
|-------|----------------|
| 1 | Whole Unit |
| 1.1 | Tenth Unit |
| 1.11 | Hundredth Unit |
| 1.111 | Thousands Unit |

ZERO FLOW TIMEOUT

Feature will complete a delivery transaction if the user does not press the STOP key. Enter number value in Seconds for the timeout setting and press ENTER.

NOTE: Factory setting is 180 seconds, 3 minutes after the last pulse transmission to the TCS 3000 register. This feature CANNOT be disabled. For desired extended periods, utilize a large number to have the Timeout ignored (Example: 99999).

PAUSE OPTIONS

Pause controls how pump control is used.

Allow Pause Allow Pause will Pause the pump during the delivery

Pause Pump Pause Pump will stop the pump during a Paused delivery.

6) AUXILIARY DEVICES

EXTERNAL DISPLAY

The External Display setting is for the specific manufacturers of large LED displays. This setting is for serial communication to an ancillary display that will read the same data that is displayed on the TCS 3000 register.

Enable/Disable Enable or disable and press ENTER

ANALOG INPUT

Analog Input is for the 4-20 mA expansion communication boards used with the Tank Level Gauges, Differential Pressure, Water and Density sensors.

- None Nothing is selected.
- X1 Channel Single channel only allows you to use 1 device with the TCS 3000, chosen from Level, Differential Pressure, Water or Density.
- Must choose the input:
 - Voltage (5 Vdc Capacity)
 - Current (4 - 20 mA)
- X3 Universal Three channel allows you to use 3 devices with the TCS 3000, chosen from Level, Differential Pressure, Water and Density.
- Each channel input must be designated between Voltage and Current:
 - Voltage (5 Vdc Capacity)
 - Current (4 - 20 mA)
- Reset to Default will change each channel back to Current and all values returned to zero (0).

NOTE: The X1 or X3 channel analog communication board are mounted within the TCS 3000 register.

- X8 Channel Eight channel allows you to use 8 devices with the TCS 3000 for Level, Pressure and Water.
- Level Meters (1 - 6)
 - Voltage (5 Vdc Capacity)
 - Current (4 - 20 mA)
- Pressure and Water (7 - 8)
 - Voltage (5 Vdc Capacity)
 - Current (4 - 20 mA)

NOTE: Externally mounted from the TCS 3000 register in a NEMA 4X enclosure.

LEVEL METERS

Select Level Meter - number available depends on the Analog Input board that is selected.

Measurement Unit Chose from Gal, L, UKG, daL, dL, mL, m3, cm3, bbl, floz, ft3 or in3.

Linearization Type External (0-100%) - Tank capacity percentage to volume level.
 Quasi Linear Linear capacity from the minimum to highest level with curves.
 Polynomial Nonlinear capacity to volume level.

Calibration

View/Edit - Allows you to enter the percentage of product in the tank.
(% equivalent to tank volume, the more points entered the greater the accuracy)

New Calibration Automatically senses the tank level, READ the instructions on the TCS 3000 Screen as it guides you through the calibration. Display will show tank level in percentages.

- 1) Press Start to begin with the level adjustment by adjusting the level up or down.
- 2) Press MODE to store the level and enter the volume.
- 3) Press Stop to finish each point.
- 4) Repeat as many times as necessary. No point can be less then 0.11%.
- 5) Make sure to calibrate as close to Empty (0%) and Full (100%) levels.
- 6) When finished, press Stop and then MODE to complete the tank chart.

DP, H2O & DNS (Differential Pressure, Water & Density)

Select the Sensor Type for the **X1** channel board between Differential Pressure, Water or Density); or assign the **X3** channel (DP1, DP2 and DP3) to the Sensor Type (Differential Pressure, Water or Density).

DIFFERENTIAL PRESSURE SENSOR

Allows you to program the maximum and minimum pressure of the vessel. If the pressure is too low or too high the systems will shutdown.

View/Edit 1) Minimum Pressure Input
 2) Minimum Output Current mA or Voltage Entry
 3) Maximum Pressure Input
 4) Maximum Output Current mA or Voltage Entry

NOTE: Settings will be based on whether Current (mA) or Voltage was selected under Analog Input Settings

Unit Choose the Unite of Measure: PSI, BAR, Pa, kPa, mPa, kg/cm2

WATER SENSOR

Allows you to program the maximum and minimum capacity of the Water sensor to read correctly. Water sensor settings should be have a 0 PPM at 4 mA Minimum and 50 PPM at 20mA for Maximum .

View/Edit 1) Minimum Concentration Water PPM Input
 2) Minimum Output Current mA Entry
 3) Maximum Concentration Water PPM Input
 4) Maximum Output Current mA Entry

Unit Choose the Unit of Measure: PPM

DENSITY SENSOR

Allows you to program the maximum and minimum capacity of the Density sensor for correct measurement.

View/Edit 1) Minimum Density per Unit of Measure Input
 2) Minimum Output Current mA Entry
 3) Maximum Density per Unit of Measure Input
 4) Maximum Output Current mA Entry

Unit Choose the Unit of Measure: lbs/GAL, kg/M3, kg/L, lbs/UKG, lbs/ft3, lbs/in3, lbs/floz, oz/floz

INTERLOCK

Allows you to use the Emergency Stop terminal on the 1, 3 and 8 channel communication expansion boards. Requires an external switch for actuation.

Enable/Disable Enable or disable for operation

LAMP INDICATOR

Allows you the use of External Lamps to indicate Water Sensor warnings.

Lamp Enable/Disable Enable or disable for operation. If enabled, you must reboot the register for the settings to be recognized.

Lamp Test Select from OK, Warning, Alert, Sensor Low, Sensor High, Stop Alarm, Sensor Fail and Lamp off to verify testing.

NOTE: if you have not rebooted the TCS 3000 register after Enabling operation, the Lamp Test will not operate correctly.

Lamp Address Assign the address of each Lamp Indicator.

6) CONNECTIVITY

Connectivity is used for accessory communication settings

Network Settings

Interface Bridge Interface is for handheld communication. An interface is required for this setting. You must Enable or Disable the Interface Bridge accordingly.

Address Device Address will assign the TCS 3000 the unique address within the Daisy Chain communication sequence. It is recommended to assign addresses as follows:

- Primary Host will always be number one (1)
- Client Address range will be programmed from two (2) through eight (8).

NOTE: Client Address range can reach as many as one hundred and twenty seven (127), however this will slow the processor down. Eight is recommended number of registers in the daisy chain.

Printer Settings

| | |
|----------------|--|
| Enable/Disable | Enable or Disable for operation |
| Select Printer | Select desired printer to be used with the system |
| Printer Host | Enable or Disable a printer host |
| | Clients Address Range Displays the range between Client Address range. |

7) CONFIGURE TICKET HEADERS/FOOTERS

| | |
|---------------------------|--|
| DLV Header Defaults | There are FIVE programmable fields for contact information or messages |
| DLV Footer Defaults | There are FIVE programmable fields for contact information or messages |
| Shift Tickets Headers | There are FIVE programmable fields for contact information or messages |
| Inventory Tickets Headers | There are FOUR programmable fields for contact information or messages |
| Prover Tickets Headers | There are FOUR programmable fields for contact information or messages |

8) MISC SETTINGS

L1 Password Level one (1) password protection for System and Product Settings.

Procedure to set L1 Password is as follows:

1. Highlight L1 Password and press ENTER.
2. Highlight Set Password and press ENTER.
3. Input alphanumeric password and press ENTER.
4. Confirm password entry by resubmitting password, and press ENTER.

NOTE: Alphanumeric password must be at least three (3) characters long.

L2 Password Level two (2) password protection for User ID Management

Procedure to set L2 Password is as follows:

1. Highlight L2 Password and press ENTER.
2. Highlight Set Password and press ENTER.
3. Input alphanumeric password and press ENTER.
4. Confirm password entry by resubmitting password, and press ENTER.

NOTE: Alphanumeric password must be at least three (3) characters long.

Access Key (Password) Access Key is used to lock or unlock the register keyboard when a SYSTEM INTERLOCK failure has occurred or when a Computer or Handheld device is in use.

| | |
|----------------|--|
| System Mode | System Mode is used for databases |
| Default | Used for standard register mode |
| MR1 | Used for database |
| RPA1 Mode | Used for remote programming |
| | |
| User DB Update | Used to update the database. A portable USB memory drive loaded only with a factory database file must be uploaded through the USB terminal located within the Register. |

Weights & Measures Settings

NOTE: The Calibration bolt must be removed in order to enter calibration mode. To remove the bolt, unscrew the bolt with a 3mm Hex drive. Place calibration plate and screw in a safe location where it will not be lost. Under the calibration plate you will find a screw. Using the 3mm Hex drive, loosen the calibration screw. You do not need to remove this screw all the way.

If you lose the calibration screw, you will not be able to operate the register.

DO NOT LOSE THIS CALIBRATION SCREW

BEFORE YOU CALIBRATE THE REGISTER YOU MUST ENTER A PRODUCT
To Calibrate begin in section ADD NEW on Page 24.

***NOTE: ALL PRODUCTS MUST BE CALIBRATED INDIVIDUALLY ***

PRODUCTS

RECALIBRATE PRODUCT

SELECT PRODUCT Highlight the product you want to re-calibrate and select ENTER.

NOTE: If you need to modify the settings you originally selected for the calibration of a product select MODIFY PARAMETERS, if the settings were correct and you do not need to change them select BEGIN RECALIBRATION.

A) Modify Parameters

| | |
|--------------------|---|
| Product Name | Using the keypad type in the name of the product you are calibrating. If the product listed is correct select ENTER. To change the product name press Enter and input name as desired. The menu screen will provide instructions on how to input your Alpha-Numeric keys. |
| Compensation Table | Choose the correct Volume Temperature Compensation Table and press ENTER. |
| Comp. Table Param. | Input the correct Compensation Table Parameter and press ENTER. See following tables for reference. NOTE: this list references most common products, not an exhaustive list of every volume correction. |
| NONE | No volume compensation will be corrected. |
| LINEAR_15C | Input the product specific Coefficient of Expansion to 15C |
| LINEAR_20C | Input the product specific Coefficient of Expansion to 20C |
| LINEAR_60F | Input the product specific Coefficient of Expansion to 60F See TABLE 2 for reference. |
| API TABLES | 6B, 24, 54, 54B, 54E See TABLE 3 for reference. |

TABLE 2

| Product Name | COEFFICIENT OF EXPANSION | |
|---------------------|--------------------------|--------------------|
| | Per Degree Fahrenheit | Per Degree Celsius |
| Acetone | 0.001 | 0.001416 |
| Antifreeze | 0.00036 | 0.00065 |
| Benzene | 0.0006 | 0.00108 |
| Bunker C | 0.00045 | 0.00081 |
| Corn Syrup | 0.00017 | 0.000306 |
| Ethanol | 0.0006 | 0.001072 |
| Ethylene Glycol | 0.00036 | 0.000648 |
| Isopropyl Alcohol | 0.001 | 0.001016 |
| Lubrication Oils | 0.004 | 0.0072 |
| Methanol | 0.00066 | 0.001180 |
| Methyl Ethyl Ketone | 0.00073 | 0.001314 |
| Mineral Spirits | 0.00056 | 0.001008 |
| Naptha | 0.00072 | 0.001296 |
| NH3 | 0.0013 | 0.00234 |
| Propylene Glycol | 0.0004 | 0.00072 |
| Water | 0.0002 | 0.00036 |

To compute the change in volume for a temperature change for a given liquid, use the following formula:

$$(\Delta t)(\text{Coefficient of Expansion})(100) = \% \text{ change in volume}$$

To convert from Coefficient of Expansion per Degree Fahrenheit to Celsius, multiply the value per Degree Fahrenheit by 1.8

TABLE 3

| Product Name | API Table | Temp. | Coefficient Value | Range | Standard Density (kg/m3) at 15C |
|-----------------------------|-----------|-------|-------------------|---------------|---------------------------------|
| Liquefied Propane Gas (LPG) | 24 | F | Specific Gravity | 0.500 - 0.550 | |
| Gasoline | 54B | C | Density KG/m3 | 640 - 780 | 730 |
| Diesel Oil | 54B | C | Density KG/m3 | 780 - 1074 | 840 |
| Fuel Oil | 54B | C | Density KG/m3 | 830 - 900 | 840 |
| Kerosene / Jet Fuel | 54B | C | Density KG/m3 | 780 - 840 | 800 |
| Stoddard Solvent | 54B | C | Density KG/m3 | 780 - 800 | 840 |
| Natural Gas Liquids (NGL) | 54E | C | Density KG/m3 | 352 - 687 | 468 |
| Liquefied Propane Gas (LPG) | 54 | C | Density KG/m3 | 495 - 520 | 510 |
| Fuel Oil | 6B | F | API Gravity | 32 - 35 | |
| Gasoline | 6B | F | API Gravity | 62 - 65.1 | |
| Premium Gasoline | 6B | F | API Gravity | 59.1 | |
| Diesel | 6B | F | API Gravity | 32 - 35 | |
| Kerosene | 6B | F | API Gravity | 42 | |
| Jet A/A1 | 6B | F | API Gravity | 41.9 - 42.9 | |
| Av Gas | 6B | F | API Gravity | 42 - 44 | |
| Refined Fuels | 6B | F | API Gravity | 0 - 85 | |

Mass Density

To provide a manual calculated Mass value, determine the value to input Mass Density and press ENTER. NOTE: only provide value if not using a Densitometer.

Mass = Weight per Volume

| Unit of Measure | |
|-----------------|-----------------------|
| Gram/cm3 | Gram/Cubic Centimeter |
| Gram/m3 | Gram/Cubic Meter |
| Kilogram/m3 | Kilogram/Cubic Meter |
| Milligram/m3 | Milligram/Cubic Meter |
| Pound/ft3 | Pound/Cubic Foot |
| Pound/in3 | Pound/Cubic Inch |
| Ton/yard3 | Ton/Cubic Yard |

Pump Control & Timing

Enable/Disable Pump Control and select ENTER.

- Pump is an Optional Output Control
- Enabled means that the pump control will energize a PTO or Hydraulic Drive during a truck delivery.
- Disabled means that the pump control is not active and will not energize.

Pump Speed Control 1 is a solid state voltage output signal based on a flow rate setting. Flow rate setting of zero (0) is disabled. Utilizes the Pump Starter terminal. NOTE: Pump Speed Control overwrites the Additive Pump setting.

Pump Speed Control 2 is a solid state voltage output signal based on a flow rate setting. Utilizes the Reset terminal. Flow rate setting of zero (0) is disabled.

Pump Starter to enter the Start Duration time in seconds for pump to energize while the preset valves (S1 & S2) stay closed, then press ENTER.

Pump Starter Advance is Not available at this time.

Pump Stabilization is used to enter how long you wish the Pump Starter stays powered. Enter value in Seconds and press ENTER.

Valve Type

Select whether you are using a Single or Dual Stage Valve and press ENTER.

- A SINGLE Stage valve will energize valve with Solenoid 2.
- A DUAL Stage valve will energize valve with Solenoids 1 and 2.

1101 Both S1 and S2 energize at the beginning of delivery and near the end of the delivery S1 shuts off and S2 is still operating.

1001 At the beginning of the delivery the S1 valve opens energizes while the S2 remains closed. When the preset slow flow bypass begins, the S1 valve closes and the slow flow bypass valve S2 opens until the end of the delivery.

S1 - S2 Delay

Timing of the S1 valve opening at the start of a delivery. Enter S1 time value (minimum of 3 seconds).

Maximum Flowrate

Input the maximum rated flow of flow meter and press ENTER.
NOTE: this value is critical to the Valve actuation!

S2 Flow

Timing of the S2 valve closure rate. Enter S2 time value (minimum 0.3 seconds).

Pulser Type Select the pulse input type (Single or Dual Channel) and press ENTER.
 SINGLE is a single channel pulse input.
 DUAL is a dual channel pulse input.
 Chose FORWARD or REVERSE for the direction of flow.
 QUAD is a dual channel pulse input multiplied by two.
 Chose FORWARD or REVERSE for the direction of flow.

Product Units Select TCS 3000 register units of measure and press ENTER.
 Volume: Highlight Volume Unit and press ENTER.

| | |
|-----|-------------|
| GAL | USA Gallons |
| L | Liters |
| UKG | UK Gallons |
| daL | Dekaliter |
| mL | Milliliter |
| m3 | Cubic Meter |
| bbi | Barrel |

NOTE: Selecting Product Unit does not change the Totalizer unit of measure. See Page 28 for changing Totalizer unit of measure.

Hose Volume Enter unit volume value for “packing” hose downstream of meter and press ENTER. Value will not display prior to setting and there will be no lost liquid. See Page 24 for Enabling this function.

To comply with Weights & Measures requirements, it is necessary to start and stop each delivery with a fully packed hose. There are times where the hose is not fully packed (e.g. after a preset delivery). As such, the hose must be packed and the register zeroed prior to making the next deliver.

NOTE: This procedure will not work for an empty or dry hose. If more than 1 gallon or 5 Liters of liquid is required to pack the hose, a delivery ticket must be printed.

Maximum Pulser Error Program the amount of reverse pulse counts the register is allowed to see before it shuts the system down. NOTE: Maximum value is 255.

Additive Injector

Injection Ratio How many parts per million will be injected into the product, calculated as Parts Per Million (PPM).

Injector Type NONE No Injector

EXTERNAL A constant positive signal output is provided during product delivery.
 NOTE: An external additive Injector controls injection pump rate.

INJECTOR CALIBRATION

AI Pulses/Unit (Enter Pulses per mL)

AI Pulser Type - Dual or Single

INJECTION LIMITS - Enable/Disable Injection Limit for delivery shutdown.
 Enter Minimum PPM value to end delivery
 Enter Maximum PPM value to end delivery
 Enter Additive Injection Stabilization Volume to stabilize the PPM ratio at the beginning of a delivery.

EXTERNAL Continued.

EXAMPLE: GTP Viper Injector pump will dose every 5 Gallons. Without an additive injection dose within the first 5 gallons, the minimum PPM threshold will stop the delivery).

PISTON A pulsing positive signal output is provided during product delivery.

INJECTION RATIO - Enter desired Parts Per Million volume target.

INJECTION LIMITS - Enable/Disable Injection Limit for delivery shutdown.

Enter Minimum PPM value to end delivery

Enter Maximum PPM value to end delivery

Enter Additive Injection Stabilization Volume to stabilize the PPM ratio at the beginning of a delivery.

INJECTION CALIBRATION

CALIBRATE - Automatically Calibrates the Additive Injector Pump

1) Begin calibration by pressing Enter

2) Enter volume on volumetric beaker.

NOTE: UNAVAILABLE AT THIS TIME

EDIT/VIEW PARAMETERS - Manually Calibrate the Additive Injector

AI Pulses/Unit (Enter Pulses per mL)

AI Pulser Type - Dual or Single

AI Min. Inj. Period - Time required for injection (mS)

PRESSURE An additive injection signal output for an injection pump, additive meter and controlling the injection ratio with a control valve during delivery.

INJECTION RATIO - Enter desired Parts Per Million volume target.

INJECTION LIMITS - Enable/Disable Injection Limit for delivery shutdown.

Enter Minimum PPM value to end delivery

Enter Maximum PPM value to end delivery

Enter Additive Injection Stabilization Volume to stabilize the PPM ratio at the beginning of a delivery.

EXAMPLE: A startup of a constant pressure injection pump will immediately be out of tolerance, so a injection stabilization will be required to allow the system to meet its target.

INJECTION CALIBRATION

CALIBRATE - Automatically Calibrates the Additive Injector Pump

1) Begin calibration by pressing Enter

2) Enter volume on volumetric beaker.

NOTE: UNAVAILABLE AT THIS TIME

EDIT/VIEW PARAMETERS - Manually Calibrate the Additive Injector

AI Pulses/Unit (Enter Pulses per mL)

AI Pulser Type - Dual or Single

AI Min. Inj. Period - Time required for injection (mS).

EXAMPLE: A typical minimum value of 600 mS is needed for the injection control valve to maintain consistent injection rate.

B) Begin Recalibration

***NOTE: ALL PRODUCTS MUST BE CALIBRATED INDIVIDUALLY ***

FULL CALIBRATION: Select Full Calibration to clear old calibration value(s) and establish a new calibration point for Product.

- 1) The display will prompt you to press START to begin automatic calibration of the flow meter. Press STOP when finished with a certified Weights & Measures volumetric or gravimetric proving system.
- 2) Input Prover Value and press ENTER. A Calibration Summary screen will appear with the Gross Amount, Net Amount, Average Temperature, Compensation Table, Pulse/Second and *Pulse/Volume (Meter Calibration Value)*.
- 3) Press START to Accept calibration value.
- 4) The display will ask if you would like to store this point. Enter to Store the calibration value or press Mode to run calibration over again.

NOTE: failure to Store the calibration value will lose the calibration data and require you to run the FULL CALIBRATION over again.

ADD POINT: Select Add Point to create a Multi-Point Calibration curve over the entire flow range of the flow meter. The minimum points required are two (2) and one hundred (100) is your maximum points accepted.

- 1) Select Add Point to add an addition point at a specific flow rate to linearize your calibration curve from minimum to maximum flow rates.
- 2) The display will prompt you to press START to begin automatic calibration of the flow meter. Press STOP when finished with a certified Weights & Measures volumetric or gravimetric proving system.
- 3) Input Prover Value and press ENTER. A Calibration Summary screen will appear with the Gross Amount, Net Amount, Average Temperature, Compensation Table, Pulse/Second and *Pulse/Volume (Meter Calibration Value)*.
- 4) Press START to Accept calibration value.
- 5) The display will ask if you would like to store this point. Enter to Store the calibration value or press Mode to run calibration over again.

NOTE: failure to Store the calibration value will lose the calibration data and require you to run the ADD POINT over again.

C) Edit Prod. Calibration

Allows a manual calibration modification of each flow rate point. A "WARNING" screen will then be displayed, press ENTER to continue to change Meter Calibration Value.

- Select Product to manually change Meter Calibration Value. Select Calibration Point to adjust the current Meter Calibration Value by multiplying by the equation below.
- Input value and press ENTER, which will display a "MODIFICATION" screen. Press any key to continue.
- Always double check to make sure the product calibration value was changed correctly.

$$\% \text{ ERROR} = \frac{\text{Volume on Meter Display} - \text{Volume on Prover}}{\text{Volume on Prover}} \times 100$$

Total Control Systems - Meter Pulse Value Factors

| FLOW METER | PULSE CHANNEL | TCS 3000 75/90 DEGREE MOUNT | | | | Direct Mount Pulser 100:1 | |
|------------|---------------|---|------------------|--|------------------|--|-----------------------|
| | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 REMOTE MOUNT | TCS 3000 REMOTE MOUNT |
| 682-15 | Single | 200.0 Pulses/USG | | 52.85 Pulses/LTR | | 400.0 Pulses/USG | 105.7 Pulses/LTR |
| | Dual | 400.0 Pulses/USG | | 105.7 Pulses/LTR | | 800.0 Pulses/USG | 211.4 Pulses/LTR |
| | Quadrature | 800.0 Pulses/USG | | 422.8 Pulses/LTR | | 1600.0 Pulses/USG | 422.8 Pulses/LTR |
| FLOW METER | PULSE CHANNEL | 4:1 Packing Gland (Standard) TCS 3000 75/90 DEGREE MOUNT | | | | Direct Mount Pulser 100:1 TCS 3000 REMOTE MOUNT | |
| | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 REMOTE MOUNT | TCS 3000 REMOTE MOUNT |
| 700-15 | Single | 305.9 Pulses/USG | | 80.8 Pulses/LTR | | 1223.7 Pulses/USG | 323.3 Pulses/LTR |
| | Dual | 611.6 Pulses/USG | | 161.6 Pulses/LTR | | 2446.4 Pulses/USG | 646.3 Pulses/LTR |
| | Quadrature | 1223.2 Pulses/USG | | 323.4 Pulses/LTR | | 4892.8 Pulses/USG | 1293.5 Pulses/LTR |
| FLOW METER | PULSE CHANNEL | 2:1 Packing Gland (Standard) TCS 3000 75/90 DEGREE MOUNT | | 1:1 Packing Gland TCS 3000 75/90 DEGREE MOUNT | | Direct Mount Pulser 100:1 TCS 3000 REMOTE MOUNT | |
| | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 75/90 DEGREE MOUNT | | TCS 3000 REMOTE MOUNT | TCS 3000 REMOTE MOUNT |
| 700-20/25 | Single | 277.75 Pulses/USG | 73.4 Pulses/LTR | 555.5 Pulses/USG | 146.8 Pulses/LTR | 555.5 Pulses/USG | 146.8 Pulses/LTR |
| | Dual | 555.5 Pulses/USG | 146.8 Pulses/LTR | 1111.0 Pulses/USG | 293.6 Pulses/LTR | 1111.0 Pulses/USG | 293.6 Pulses/LTR |
| | Quadrature | 1111.0 Pulses/USG | 293.6 Pulses/LTR | 2222.0 Pulses/USG | 587.2 Pulses/LTR | 2222.0 Pulses/USG | 587.2 Pulses/LTR |
| 700-30/35 | Single | 102.9 Pulses/USG | 27.2 Pulses/LTR | 205.8 Pulses/USG | 54.4 Pulses/LTR | 205.8 Pulses/USG | 54.4 Pulses/LTR |
| | Dual | 205.8 Pulses/USG | 54.4 Pulses/LTR | 411.6 Pulses/USG | 108.8 Pulses/LTR | 411.6 Pulses/USG | 108.8 Pulses/LTR |
| | Quadrature | 411.6 Pulses/USG | 108.8 Pulses/LTR | 823.2 Pulses/USG | 217.6 Pulses/LTR | 823.2 Pulses/USG | 217.6 Pulses/LTR |
| 700-40/45 | Single | 37.1 Pulses/USG | 9.8 Pulses/LTR | 74.2 Pulses/USG | 19.6 Pulses/LTR | 74.2 Pulses/USG | 19.6 Pulses/LTR |
| | Dual | 74.2 Pulses/USG | 19.6 Pulses/LTR | 148.4 Pulses/USG | 39.2 Pulses/LTR | 148.4 Pulses/USG | 39.2 Pulses/LTR |
| | Quadrature | 148.4 Pulses/USG | 39.2 Pulses/LTR | 296.8 Pulses/USG | 78.4 Pulses/LTR | 296.8 Pulses/USG | 78.4 Pulses/LTR |
| 700-60/65 | Single | 18.55 Pulses/USG | 4.9 Pulses/LTR | 37.1 Pulses/USG | 9.8 Pulses/LTR | 37.1 Pulses/USG | 9.8 Pulses/LTR |
| | Dual | 37.1 Pulses/USG | 9.8 Pulses/LTR | 74.2 Pulses/USG | 19.6 Pulses/LTR | 74.2 Pulses/USG | 19.6 Pulses/LTR |
| | Quadrature | 74.2 Pulses/USG | 19.6 Pulses/LTR | 148.4 Pulses/USG | 39.2 Pulses/LTR | 148.4 Pulses/USG | 39.2 Pulses/LTR |

D) Add New

Before you can calibrate the register, you must enter a product. Select Add New and use the keypad to enter a product (e.g. LPG, Fuel Oil, Aviation Gasoline, etc.). Once you've entered your product, press ENTER.

- All parameters for a New Product MUST be entered for the product to be accepted by the TCS 3000. Follow pages 18 through 22, under Modify Parameters to complete the Add New product setup. Once the new product parameters have been entered, you will be required to calibrate the product.

NOTE: A new product MUST be calibrated for it to be available as an Active product. Without calibration, the new product will only be seen in Product Settings LIST.

E) Remove Product

To remove an unwanted product from the TCS 3000, select and press ENTER. To confirm product removal, press MODE.

NOTE: You must first End Shift and then Deactivate the product under Product Settings.

F) Hose Charge

Enable or Disable the Hose Charge at beginning of delivery. Adjustment to the Hose Charge volume is made under the Product Hose Volume seen on page 21.

2) ACCOUNTING

Select Accounting to set the Ticket Number and Configure Tickets.

NEXT TICKET NO. Select Next Ticket No. to program the next delivery ticket number.

REQUIRE TICKET PRINT Select Require Ticket Print to require the user to print a ticket after every transaction.

CONFIGURE TICKETS

Select Ticket Type Sets the DEFAULT for the delivery ticket. If you create a new Ticket, you must choose the configured ticket as your default printed ticket. *NOTE: A MINIMUM ticket must be stored as a ticket type. Current pre-configured tickets are available to choose from the following:*

| | |
|---------|--|
| MAXIMUM | Allows the maximum amount of space on the ticket. |
| MINIMUM | Allows the minimum amount of space to be used on the ticket. |

Customize Ticket Customize Ticket allows you to customize the preconfigured information printed on the delivery ticket. Choose from the following:

| TCS 3000 Menu | Example Prints |
|----------------------|------------------------------------|
| Header 1 | Total Control Systems |
| Header 2 | TCS 3000 |
| Header 3 | Delivery Ticket |
| Header 4 | (888) 888-8888 |
| Header 5 | Programmable Field |
| Thick Separator | ----- |
| Start Time | Start Jun 04, 2012 09:42:09 AM |
| End Time | End Jun 04, 2012 09:53:42 AM |
| Truck ID | 3842 - Meter 2 |
| Ticket Number | ##### |
| Product Name | Gasoline (Product setup in Prover) |
| ProdNet Total Begin | ##### |
| ProdNet Totalizer | ##### |
| ProdGrs Total Begin | ##### |
| ProdGrs Totalizer | ##### |
| SysNet Total Begin | ##### |
| SysNet Totalizer | ##### |
| SysGrs Total. Begin | ##### |
| SysGrs Totalizer | ##### |
| Delivery Section | -- Delivery -- |
| Customer ID 1 | Programmable Field |
| Customer ID 2 | Programmable Field |
| Customer ID 3 | Programmable Field |
| Customer ID 4 | Programmable Field |
| Line | |
| Delivery Gross Begin | ##### |
| Delivery Gross End | ##### |
| Delivery Net Begin | ##### |
| Delivery Net End | ##### |
| TempComp Line | Volume Corrected to 60F (15C) |
| Tempcomp Table | Table -- i.e. Table 24 |
| Average Temp | AVG Temp. F |
| Gross Delivered | Gross Gal. Delivered |
| Net Delivered | Net Gal. Delivered |
| Line | |

CONFIGURE TICKETS CONTINUED...

| | |
|--|--------------------------|
| Inventory Name | i. e. Tank 1 Diesel |
| Inventory Begin | ##### |
| Inventory End | ##### |
| Inventory | ##### |
| Peak Corrected Differential Pressure (CDP) | i.e. 30 PSI |
| Average Corr. Diff. Pressure | i.e. 14 PSI |
| Average Flow Rate | i.e. 100 GPM |
| Peak Flow Rate | i.e. 130 GPM |
| Flow at Peak CDP | i.e. 130 GPM |
| Additive Volume | i.e. 200 mL |
| Additive Ratio | i.e. 1000 PPM |
| Peak H2O Content | i.e. 15 PPM |
| Average H2O Content | i.e. 10 PPM |
| Average Density | i.e. 6.82 lbs/GAL |
| Minimum Density | i.e. 6.76 lbs/GAL |
| Peak Density | i.e. 7.18 lbs/GAL |
| Calculated Mass | i.e. 830 lbs |
| System Mass Totalizer | ##### |
| Product Mass Totalizer | ##### |
| Unit Price | Unit Price --- i.e. 1.86 |
| Sale Amount | ##### |
| Tax 1 | Tax 1 --- i.e. Road Tax |
| Tax 2 | Tax 2 --- i.e. Sales Tax |
| Tax Amount | Tax Amount |
| Star Line | ***** |
| Amount Due | Amount Due ---- ##.## |
| Empty Line | ##### |
| Signature Line | <i>John C. Felba</i> |
| Thick Separator | ----- |
| System Line 1 | ** Duplicate Invoice ** |
| System Line 2 | *** Power Loss *** |
| Footer 1 | Programmable Field |
| Footer 2 | Programmable Field |
| Footer 3 | Programmable Field |
| Footer 4 | Programmable Field |
| Footer 5 | Programmable Field |

Add Ticket Type Create a NEW Customized Ticket, then press ENTER to name it.
Copy from an Existing Ticket, then press ENTER to name it.
NOTE: Any new ticket name must be 3 or more characters long

Remove Ticket Type Select ticket to be removed from the system and press ENTER

Header Defaults There are FIVE programmable fields for contact information or messages

Footer Defaults There are FIVE programmable fields for contact information or messages

Shift Ticket Headers There are FOUR programmable fields for contact information or messages

Inventory Tickets Header There are FOUR programmable fields for contact information or messages

3) DELIVERY SCREENS

- Configure Type 1 Using the arrow keys to move Red Cursor around the screen, highlight the field you would like to change and select ENTER. The field options are in Table 1 below.
- Configure Type 2 Using the arrow keys to move Red Cursor around the screen, highlight the field you would like to change and select ENTER. The field options are in Table 1 below.
- Configure Type 3 Using the arrow keys to move Red Cursor around the screen, highlight the field you would like to change and select ENTER. The field options are in Table 1 below.
- Type 4 Not configurable by itself. Displays the large screen field option for Configuration Type 3.
- Type 5 Using the arrow keys to move Red Cursor around the screen, highlight the field you would like to change and select ENTER. The field options are in Table 1 below.

TYPE 1

| | |
|-------------------------------|-------------------------|
| Feb 16, 2012 06:35:07 PM | System Gross Gal 0.0 |
| | System Net Gal 0.0 |
| TOTAL \$ 0.00 | |
| PRODUCT | Volume |
| 0.0 | |
| SELECT = ENTER; EXIT = CANCEL | |
| Flowrate Gal/min 0.0 | Volume Gal 0.0 |
| Preset Gal 0.0 | Remain Gal 0.0 |
| Preset Amt \$ 0.00 | Price \$/Gal 0.00 |
| AVG Temp F 0.0 | Temp F 0.0 |

TYPE 2

| | |
|-------------------------------|-------------------------|
| Jan 28, 2013 12:54:04 PM | System Gross Gal 0.0 |
| Gross Gal 0.0 | |
| PRODUCT | Volume |
| 0.0 | |
| SELECT = ENTER; EXIT = CANCEL | |
| Flowrate Gal/min 0.0 | TOTAL \$ 0.00 |
| AVG Temp F 0.0 | Temp F 0.0 |

TYPE 3

| | |
|-------------------------------|-------------------------|
| Feb 16, 2012 06:34:34 PM | System Gross Gal 0.0 |
| | System Net Gal 0.0 |
| Remain Gal 0.0 | |
| 0.0 | |
| SELECT = ENTER; EXIT = CANCEL | |

TYPE 4

| | |
|-----------------------------|----------------------------|
| Jan 30, 2014 05:35:51 PM | System Gross GAL 3575.0 |
| Gross GAL | |
| 1234 | |

TYPE 5

| | |
|--|-----------------------------|
| May 03, 2019 03:54:17 PM | System Gross GAL 87425.7 |
| JET W/ADDITIVE Gross | |
| 355.6 | |
| START-START DELIVERY, PRINT-PRINT TICKET | |
| Additive mL 1345.9 | Flowrate GAL/min 0.0 |
| Additive PPM 1000.0 | PK. FLOW GAL/min 293.9 |

DISPLAY FIELD SELECTION TABLE 4 OPTIONS:

| | |
|-----------------|---|
| Empty | No Data |
| Product Name | (LPG, Diesel, Av Gas, Etc.) |
| Delivery Gross | Non-Compensated Delivery Total |
| Delivery Net | Compensated Delivery Total |
| Delivery Volume | Amount of Delivery |
| Delivery Total | Total Price Delivered |
| Flowrate | Amount Delivered through Per Minute |
| AVG Temperature | Average Temperature of Product |
| Temperature | Temperature of Product |
| Mass | Mass of the Product (e.g. Pounds per Gallon, etc.) |
| Preset Remain | Remaining Preset (What is left of the Preset Total) |
| Preset Volume | Preset Volume Amount for Delivery |
| Preset Amount | Preset Currency Amount for Delivery |
| Comp. Table | Compensation Table (6B, 54B, Etc.) |
| Unit Price | Unit Price |
| Calc. Price | Calculated Price |
| TAX1 | Tax |
| TAX2 | Tax |

DISPLAY FIELD SELECTION TABLE 4 OPTIONS (CONTINUED):

| | |
|-----------------|--|
| CORR. DP | Corrected DP (Correction for DP Gauge) |
| Peak CDP. | Maximum Correction of the DP Gauge |
| AVG. CDP | Average Correction of the DP Gauge |
| AVG FLOW | Average Flow Rate of the Register |
| PK. FLOW | The Highest Flow Rate of the Register Recorded |
| Massrate | Mass of the Product |
| Additive Volume | How much Product was injected during the Delivery (mL) |
| Additive Ratio | The Ratio of Additive to Product (mL) |
| WATER | The Water content displayed in real-time (PPM) |
| PEAK WATER | The Highest Water value achieved during delivery |
| AVG. WATER | Average Water PPM during delivery |
| PEAK DENSITY | The Highest Density value achieved during delivery |
| MIN. DENSITY | The Lowest Density value achieved during delivery |
| AVG. DENSITY | Average Density during delivery |
| DENSITY | Density of the Product |

4) SYSTEM METRICS

PRECISION The unit precision can be displayed as a whole, tenth, hundredth or thousands measurement. After selection, press ENTER to complete setting.

- 1 Whole Unit
- 1.1 Tenth Unit
- 1.11 Hundredth Unit
- 1.111 Thousands Unit

SYSTEM TOTALIZERS This function will allow display either a Volumetric or Mass Totalizer.

Select Volume or Mass and press ENTER. Then select the Unit of Measure.

| VOLUME | |
|--------|-------------|
| GAL | USA Gallons |
| L | Liters |
| UKG | UK Gallons |
| daL | Dekaliter |
| mL | Milliliter |
| m3 | Cubic Meter |
| bbL | Barrel |

| MASS | |
|------|-----------|
| Lbs | Pounds |
| Oz | Ounces |
| t | Ton |
| Kg | Kilograms |
| g | Grams |

5) **TEMP PROBE** This function is used to change the reference temperature of the liquid meter system RTD temperature probe.

ENBL DLV. W/O PROBE Enable or Disable deliveries without the RTD temperature probe. Enable to prevent Net Volume deliveries defaulting to Gross volume if the RTD temperature probe loses communication with the register.

CALIBRATE TEMP PROBE Highlight Offset Calibration and press ENTER. Highlight Reference Temperature Unit of Measure and press ENTER.

| TEMPERATURE | |
|-------------|------------|
| C | Celsius |
| F | Fahrenheit |
| K | Kelvin |

NOTE: Must use a metrological traceable temperature probe for calibration

- 6) METER INFORMATION** Selecting Meter Information allows you to enter the information off of your meter and register. This information is required for the Report Menu on page 10, as well as the Prover Tickets from Meter Calibration.
- REGISTER # Highlight Register # and input the TCS 3000 serial number located on the unit. Press ENTER when complete.
- TRUCK ID Highlight Truck ID to input the truck or tank number. Press ENTER when complete. NOTE: if there are multiple meters daisy chained together, the Truck ID and Meter sequence number should be input here (i.e. Truck 5381 Meter 2).
- METER VERSION Highlight Meter Version and enter the manufacture. Press ENTER when complete.
- METER MAKE Highlight Meter Make and enter the meter manufacturer's name and Press ENTER when complete.
- METER MODEL Highlight Meter Model and enter the assembly model number. Press ENTER when complete.
- METER SERIAL # Highlight Meter Serial # and input the meter serial number of the unit. Press ENTER when complete.
- SYSTEM ID Highlight System ID and input the system identification. Press ENTER when complete.
- 7) PROVER TICKET** Selecting Prover Ticket allows you to Print the existing Prover Data from the TCS 3000 register. Select PRINT to print the Prover Ticket.
- 8) TICKETS CLEANUP** Enabling Tickets Cleanup will allow the system to delete the oldest 500 non-printed tickets when there are more than 5000 non-printed tickets stored.
- 9) RESET TOTALIZERS** System and Product Totalizers record the amount of all liquid that has passed through the meter by product.

*** Please Note ***

**Resetting the Totalizers will reset the TCS 3000 Totalizers to zero.
There is no way to recover totalizers once deleted.**

SYSTEM TOTALIZER

System Totalizers record the amount of all liquid that has been measured. End Shift before resetting the System Totalizer. Highlight the System Totalizer and press ENTER. A "WARNING" will appear on the screen that you are about to reset the Totalizers. Press MODE to confirm the Totalizer reset.

PRODUCT TOTALIZER

Product Totalizers record the amount of liquid for a specific product that has been measured. You must End Shift (page 8) and Deactivate Product in Product Settings (page 32) before resetting the Product Totalizer. Without doing so, the error "No Active Products" will be displayed. Highlight Product Totalizer and press ENTER.

- 10) ENABLE REMOTE CONFIG** Allows you to connect the TCS 3000 to an External Handheld device to remotely control the Calibration of the register.

- To Enable Remote Config make sure your External Handheld is connected to the TCS 3000 register with the TCS 300859 quick disconnect cable kit).
- Highlight Remote Config and select ENTER. This will enable the Remote Config setting and you will be able to calibrate your system.
- When finished calibrating, press any key to exit.

10) ENABLE REMOTE CONFIG

Allows you to connect the TCS 3000 to an External Handheld device to remotely control the Calibration of the register.

- To Enable Remote Config make sure your External Handheld is connected to the TCS 3000 register with the TCS 300859 quick disconnect cable kit).
- Highlight Remote Config and select ENTER. This will enable the Remote Config setting and you will be able to calibrate your system.
- When finished calibrating, press any key to exit.

11) PULSER TRACKER

Pulser Tracker tracks any flow between deliveries. Any time the pulser moves outside of a delivery the register captures the movement data.

++ If Pulser Tracker is disabled, any product movement without hitting start will not be recorded in the totalizer. ++

Product Settings

1) **INVENTORY** Inventory monitors how much product is in a tank.

VIEW INVENTORY Allows you to see your total inventory levels of numerous tanks on one display, See Individual inventory details, or print an Inventory Report.

INVENTORY DISPLAY Displays the current inventory status
SELECT INVENTORY Chose tank inventory to display inventory details
PRINT INVENTORY REPORT Prints the current inventory report

UPDATE INVENTORY Allows you to correct the Inventory levels by manually entering the proper inventory level. Select Inventory to update and press ENTER.

ADD TO INVENTORY Add to Inventory allows you to add to the current inventory when you are loading "X" amount of product to the tank

SET INVENTORY VALUE Set Inventory Value allows you to change the inventory level to a specific amount

FILL UP INVENTORY Filling up the inventory to 100% Tank Capacity.

QUICK RESET - Press SHIFT + PRINT

EMPTY INVENTORY Emptying the Inventory to 0%.

LEVEL METER Level Meter allows you to select the channel level meter being used.

++ Requires gauge to be calibrated, overriding the manual inventory entry ++

**** Can be done during a Shift ****

ASSIGN INVENTORY Allows you to Pair an Active Product or Products to the Inventory Tank Created to be Monitored.

****This must be done to track inventory levels****

****Can be done during a Shift****

ADD INVENTORY Creates an Inventory "Tank" to be monitored. Here you will Name your Inventory "Tank" and press Enter. Next will request your volume Unit of Measure and the Tank Capacity. Press Enter to create the Current Tank Level.

**** Must be outside of a Shift to do this step ****

REMOVE INVENTORY

Removes the Inventory Tank from being Monitored

**** Must be outside of a Shift to do this step ****

Shortcut: Pressing Shift + Print will allow you to Update, Fill, or Empty Inventory Levels Quickly during a Shift

After Adjusting the inventory you will be prompted to provide a **Bill of Lading Number****NOTE: After each calibration, you must reassign each product to its proper tank inventory.****2) PRODUCT PRICES**

Product Prices allows the price to be set for a specific product. For multiple products, pricing must also be changed. To set pricing, highlight the desired product and press ENTER. NOTE: if you have not changed the Product name, the factory default "DEMO" may be displayed.

UNIT PRICE Highlight Unit Price and press ENTER. Input the price value and press ENTER.

TAX 1 NAME Highlight Tax 1 Name and press ENTER. Input tax name and press ENTER.

TAX 1 TYPE Highlight Tax 1 Type and press ENTER. Use the navigation arrows to select Tax 1 Type and press ENTER.

TAX 1 VALUE Highlight Tax 1 Value and press ENTER. Input tax value and press ENTER.

| | |
|----------|--|
| None | No tax will be entered. |
| Percent | Tax amount value is calculated as a percent (%). |
| Per unit | Tax is calculated per unit of measure. |
| TaxTax | Tax is calculated on a tax. |

TAX 2 NAME Highlight Tax 2 Name and press ENTER. Input tax name and press ENTER.

TAX 2 TYPE Highlight Tax 2 Type and press ENTER. Use the navigation arrows to select Tax 2 Type and press ENTER.

TAX 2 VALUE Highlight Tax 2 Value and press ENTER. Input tax value and press ENTER.

| | |
|----------|--|
| None | No tax will be entered. |
| Percent | Tax amount value is calculated as a percent (%). |
| Per unit | Tax is calculated per unit of measure. |
| TaxTax | Tax is calculated on a tax. |

CURRENCY Select the Currency Symbol or Abbreviation and press ENTER

| SYMBOL | |
|--------|--------|
| \$ | Dollar |
| £ | Pound |
| ¥ | Yen |

| ABBREVIATION | |
|--------------|------------------------|
| USD | US Dollar |
| EUR | Euro |
| GBP | British Pound Sterling |
| CAD | Canadian Dollar |
| MXN | Mexican Peso |
| CLP | Chilean Peso |
| JPY | Japanese Yen |
| BGN | Bulgarian Lev |
| CHF | Swiss Franc |
| CZK | Czech Republic Koruna |

| ABBREVIATION | |
|--------------|-----------------------------|
| DKK | Danish Krone |
| HUF | Hungarian Forint |
| LVL | Latvian Lats |
| LTL | Lithuanian Litas |
| NGN | Nigerian Naira |
| PLN | Polish Zloty |
| RON | Romanian Leu |
| SEK | Swedish Krona |
| UED | United Arab Emirates Dirham |
| VND | Vietnamese Dong |

PREVIEW PRICING Preview Pricing will show the Product price and taxes.

3) ACTIVATE PRODUCT

Activate Product allows you to activate a product for a specific Shift. When liquid in your tank changes, you can change the product and calibration to match.

- To Activate a product, highlight the product and press ENTER.

4) DEACTIVATE PRODUCT

Deactivate Product allows you to deactivate an active Shift product. When liquid in your tank changes, you can also change the product.

5) PRODUCT PARAMETERS

Product Timing allows auxiliary device settings to be changed to suite the needs of the application. Currently set up for Product Density, Preset Valve, Air Eliminator Hold, Startup Volume and Hose Volume. Also allows to preview and print the product parameters. Product Timing is product specific, adjusting the actuation or closure type.

PRODUCT DENSITY Select the Product to enter the Terminal density value. This will manually calculate the value of your Mass delivery.

PRESET TIMING Preset Timing adjusts the valve closure type for preset or security valves. Highlight the Preset Timing function desired and press ENTER. This will be chosen as your default setting for the specific Product.

Full-Auto Full Automatic tune preset shutoff for Solenoid S1 (fast) and S2 (slow) flow valves. Great for presets with varying system pressures.
NOTE: Solenoid S1 (fast) flow closure is 20% of average flow rate.

Semi-Auto Semi-Automatic tuned preset shutoff for Solenoid S2 (slow) flow valve. Highlight Semi Auto and press ENTER. Input Solenoid S1 (fast) flow valve closure and press ENTER.

Next Fix Next Fix is an automatic tune shutoff, however it will allow the preset to overrun batch amount. Designed to automatically correct the shutoff on the next preset delivery. Highlight Next Fix and press ENTER. Input Solenoid S1 (fast) flow valve closure and press ENTER.

Static Static settings for the Solenoid S1 (fast) and S2 (slow) flow valves. There is no automatic correction for zero point shutoff. Highlight Static and press ENTER. Input Solenoid S1 (fast) flow valve closure and Solenoid S2 (slow) flow valve Values and press ENTER.
NOTE: for Solenoid S2 (slow) flow valve timing, run a separate preset batch with the S2 at Zero. What volume is over run and read on the screen after the shutoff should be input into the S2 (slow) valve timing.

AIR ELIMINATOR HOLD When the TCS 3000 senses air, the Solenoid S1 and S2 preset relays will de-energize for closure and energize the Auxiliary Relay open for the exhaust port to remove air from the system. Highlight Air Eliminator Hold and press Enter. The HOLD (s) is the adjustable setting for the Auxiliary Relay closure in Seconds. Input value in Seconds and press ENTER.

STARTUP VOLUME Is a soft-start mechanism at the beginning of a delivery through which the S1 fast flow valve will stay closed for scalable time (Seconds). Startup Volume will work with either the Valve Type 1101 or 1001 valve actuation.

PREVIEW PROD PARAMS Preview the product parameters by pressing ENTER, then scroll through each page to see what values are selected for each parameter.

PRINT PRODUCT PARAMS Print the product parameters by pressing ENTER if a printer is enabled. All values will be printed for each parameter for review.

6) AUXILIARY SETTINGS

Adjust the settings of the auxiliary sensors by first selecting the product the sensor is being used with.

ADDITIVE INJECTOR

Select which setting you wish to be active. Only one can be chosen.

- None No Injector
- External A constant positive signal output is provided during product delivery.
NOTE: Additive Injector controls injection pump rate.
- Piston - A pulsing positive signal output is provided during product delivery.
NOTE: TCS 3000 controls the Piston Additive Injector Pump.
- Pressure A constant positive signal output is provided to control an additive injection pump with a additive flow meter and a control valve to maintain the target PPM concentration.

PRESSURE SENSOR

Select with Sensor Address you wish to be active (dependent on which analog communication board selected in the System Settings). Only one can be chosen for the Differential Pressure Sensor. When the Sensor Address is selected, only then will the Minimum and Maximum CDP, and Max ACH. Flow Rate appear. Uncorrected (Measured) Differential Pressure should be calibrated prior to use.

MINIMUM CDP Enter the minimum corrected differential pressure (CDP) value to prevent a delivery to continue if this CDP value is not achieved. If zero (0) is entered, this function will be disabled. NOTE: used for filter and hose bursts.

MAXIMUM CDP Enter the maximum corrected differential pressure (CDP) value to prevent a delivery to continue if this CDP value is achieved. If zero (0) is entered, this function will be disabled. NOTE: used

MAX ACH. FLOWRATE Enter the maximum achievable flow rate for the delivery pumping system. Value is used for the Corrected Differential Pressure formula. *To read the MEASURED DIFFERENTIAL PRESSURE, enter a value of ZERO to disable the Max Achievable Flow Rate.*

Differential Pressure is calculated from the Inlet and Outlet of a filter vessel. A pressure differential pressure sensor is required for this setting. The Corrected Differential Pressure is generally calculated with the following formula:

$$\frac{\text{SYSTEM FLOW CAPACITY}}{\text{ACTUAL FLOW RATE}} \times \text{DIFFERENTIAL PRESSURE} = \text{CORRECTED DIFFERENTIAL PRESSURE}$$

Corrected Differential Pressure will illustrate the corrected value of the Inlet and Outlet pressure differential when Filter Vessel Systems are not being operated at maximum capacity.

WATER SENSOR

Select Water Contamination Sensor and chose the Sensor Address you wish to be active (dependent on which analog communication board selected in the System Settings). When the Sensor Address is selected, only then will the Water Limits appear.

WATER LIMITS To set the Alert, Alarm and Stop level, select Water Limits and press ENTER.

STOP LEVEL Enter the Stop Level value in parts per million (PPM) and press ENTER.

- The STOP TIME must be entered to JIG compliant. The Stop Level JIG requirement is 5 seconds, in which the Stop Level must be achieved for this value to shut the delivery off. Press ENTER to continue.

ALARM LEVEL Enter the Alarm Level value in parts per million (PPM) and press ENTER.

- The ALARM TIME must be entered to JIG compliant. The Stop Level JIG requirement is 10 seconds, in which the Stop Level must be achieved for this value to shut the delivery off. Press ENTER to continue.

ALERT LEVEL Enter the Alert Level value in parts per million (PPM) and press ENTER.

DENSITY SENSOR Select Densitometer Sensor and chose the Sensor Address you wish to be active (dependent on which analog communication board selected in the System Settings. When the Sensor Address is selected, only then will the Density Limits appear.

DENSITY LIMITS To set the Minimum and Peak Stop, Minimum and Peak Warning Limits, select Density Limits and press ENTER.

PEAK STOP LIMIT Enter the Peak Stop Limit value in the unit of measure chosen and press ENTER. The Peak Stop Limit will stop the delivery if this value is achieved. If zero (0) is entered, you will disable the Stop limit.

PEAK WARNING LIMIT Enter the Peak Warning Limit value in the unit of measure chosen and press ENTER. If zero (0) is entered, you will disable the Warning limit.

MIN STOP LIMIT Enter the Minimum Stop Limit value in the unit of measure chosen and press ENTER. The Minimum Stop Limit will stop the delivery if this value is achieved. If zero (0) is entered, you will disable the Stop Limit.

MIN WARNING LIMIT Enter the Minimum Warning Limit value in the unit of measure chosen and press ENTER. If zero (0) is entered, you will disable the Warning limit.

7) PROUCT LISTS

Displays a list of Active, Inactive and Un-Calibrated products on the TCS 3000. To view these Products, highlight the selection and press ENTER.

Advanced Functions

LOCK THE SYSTEM Enter Access Key to lock the TCS 3000 register from local use. This feature is only available for remote computers (i.e. handhelds, tablets, mobile phones, etc.).

*** Press Shift + Mode + Enter to put in your Access Key to bypass ***

SYSTEM SHUTDOWN System Shutdown Shuts the TCS3000 down. You must cut power to the TCS 3000 and reboot to turn the unit back on.

SYSTEM UPDATE System Update allows you to upgrade the TCS 3000 Software. NOTE: Update process does NOT change Weights & Measures settings or parameters.

Procedure to upload new software is as follows:

- 1) Load new software upgrade to a USB thumb drive (dongle). Specifications for the USB thumb drive should be 8 Gigabytes and formatted to FAT 32.
NOTE: The new software upgrade should be the ONLY file on the drive.
- 2) Open the TCS 3000 register. On the front cover of the register, there are 2 mini-USB connections.. Using a factory supplied USB cable, attach the thumb drive to the USB1 port closest to the inside of the register. This port is the highest on the circuit board of the two.
See Figure 1.
- 3) Plug the USB cable into the USB1 port, and then insert the USB thumb drive into the mating cable.
See Figure 1.
- 4) Under Advanced Functions, locate System Update and press ENTER.
- 5) The screen will display System Update, press MODE to continue with the update.
- 6) If the thumb drive is not recognized or there is a faulty cable, the display will respond with NO UPDATE DATA error message.
- 7) Once the file is recognized, the operating system will begin the update process. This should take approximately 3 minutes.
NOTE: Do not power down or pull USB thumb drive until the TCS3000 tells you to do so.
- 8) You may remove the USB cable and close the TCS 3000 register once the Update is Complete.

EXPORT TICKET CONFIG

Setting allows a customer to copy a configured ticket from one register and transfer it to another register without having to reprogram ticket.

Procedure to copy and transfer configured ticket:

- 1) Open the TCS 3000 register. On the front cover of the register, there are 2 mini-USB connections.. Using a factory supplied USB cable, attach the thumb drive to the USB1 port closest to the inside of the register. This port is the highest on the circuit board of the two.
See Figure 1.
- 2) Specifications for the USB thumb drive should be 8 Gigabytes and formatted to FAT 32.

NOTE: Only copy ticket to an **EMPTY** USB thumb drive.

- 3) Under Advanced Functions, navigate down to Export Ticket Config and press Enter. The current ticket configuration will be copied to the USB thumb drive (dongle). When the screen displays CONFIGURATION EXPORTED, you can remove the USB from the register and press any key to continue.
- 4) Plug the USB dongle with the copied ticket configuration into the TCS 3000 register you wish to upload the new ticket configuration.
- 5) Under Advanced Functions, locate System Update and press ENTER.
- 6) The screen will immediately say Update Found, please remove media now.
- 7) If the USB thumb drive is not recognized or there is a faulty cable, the display will respond with NO UPDATE DATA error message.
- 8) Once the file is recognized, the operating system will begin the update process. This should take approximately 45 seconds.
NOTE: Do not power down during the update process.
- 9) The ticket configuration has now been transferred over to the next register.

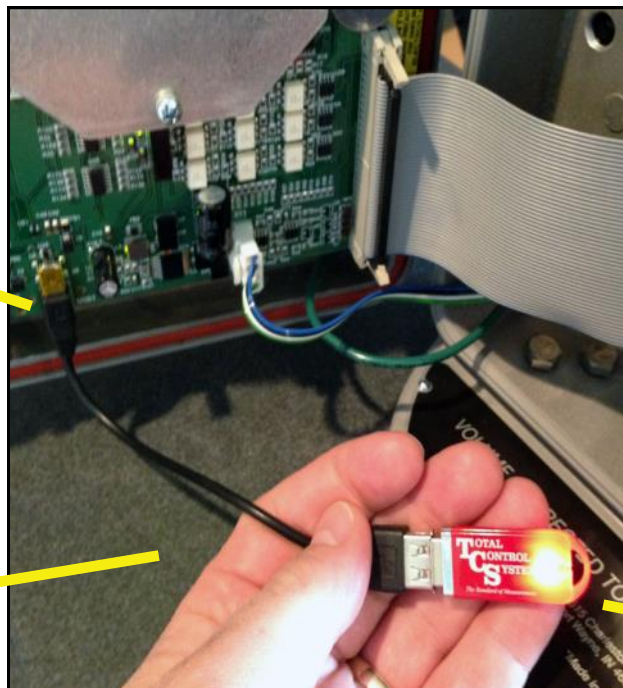


FIGURE 1

RESTORE FROM BACKUP

Feature allows you to restore the last software version before a recent update to new software. Typically only used if there was a corrupted file update.

Installation Procedure — Daisy Chain

Daisy Chain:

Daisy Chain is used for linking multiple registers together to use one printer or to link multiple registers to the data-base.



To Daisy Chain the Registers use a two wire 22 gauge shielded cable. Nominate one Register to be the Host.

Once you've chosen which Register will be the Host the other Registers will be considered the clients. Strip a small amount of wire and run the wire from slot A and B of DAISY CHAIN on the Host Unit to slot A and B of DAISY CHAIN on the Client Unit.

To tie the Client to the next Client unit on the Daisy Chain, strip a small amount of wire and run the wire from slot A and B of DAISY CHAIN to slot A and B of the next client's DAISY CHAIN.



Host

Client 2

Client 3

Client 4

The Host will have 2 wires.

Client 2 will have 4 wires.

Client 3 will have 4 wires.

The Last Client will have 2 wires.



Continue to Daisy Chain until you have tied the chain together, alternating slots on the Daisy Chain until you've reached the end of the chain. The Host and the last Client on the chain will be the only two registers on the chain to have a one wire connection.

Daisy Chain for the Printer

Connect the Printer to the Host Register. To set the Host :

Enable the Printer:

SYSTEM MENU → SYSTEM SETTINGS → PRINTER SETTINGS → ENABLE/DISABLE PRINTER → ENABLE PRINTER

Select the Printer:

PRINTER SETTINGS → SELECT PRINTER → [SELECTED PRINTER] → ENABLE

Selecting the Host Register

Select Register as Host:

PRINTER SETTINGS → DISABLE/ENABLE HOST → ENABLE

Select the Client Range:

PRINTER SETTINGS → PRINTER HOST → CLIENTS ADDRESS RANGE → CLIENTS RANGE START ADDRESS [Enter 2 and Select] →

CLIENTS RANGE END ADDRESS [Enter the number of Registers on the Chain and Select]

Please Note the Host is always # 1. The Client always starts at #2

Selecting the Client Register

***If you are not using the Daisy Chain for the Printer Please Disregard the Enabling and Selecting the Printer Steps.**

Enable the Printer:*

PRINTER SETTINGS → ENABLE/DISABLE PRINTER → ENABLE PRINTER

Select the Printer:*

PRINTER SETTINGS → SELECT PRINTER → [REMOTE] → ENABLE

SYSTEM SETTINGS → CONNECTIVITY SETTINGS → NETWORK SETTINGS → ADDRESS → DEVICE ADDRESS [Select the number of the unit you are using ex. 2 if it is the second register on the chain or 3 if it's the third register on the chain.]

To Connect to the Chain:

SYSTEM SETTINGS → CONNECTIVITY SETTINGS → NETWORK SETTINGS → INTERFACE BRIDGE [Only used when there are 2 Registers tied in the chain] → TRANSFER DATA BETWEEN RS232 <-> RS485 INTERFACES ENABLED

Continue the Selecting Client Register steps for every Client on the Chain.

Real Time Inventory How To

Manual Inventory How To

Please note, you must End Shift before you may Add or Remove Inventory

Real Time Inventory is for Automatic Tank Levels Only

Add Inventory:

While holding Shift select Mode → System Menu → Product Settings → Inventory → Add Inventory → GIVE INVENTORY NAME (Use the Keypad to assign a name, ex. Av Gas, Gasoline, Tank 1, Tank 2, etc.) → Select Unit Volume (Gallons, Liters) → ENTER CAPACITY (Tank Size) → ENTER INVENTORY (Actual Known Inventory) → Press Any Key to Continue

Assign Inventory:

Assign Inventory → Select an Active Product → Assign the Active Product to an Inventory List → Press Any Key to Continue

Please Note You can apply multiple inventories to one meter.

Update Inventory:

Update Inventory → Level Meter → Select CH# (Ex. If Product 1 is tied to CH2, then you select LVL2) →

Inventory Update Message → Press Any Key to Continue

Please Note: Use CH2-6

Also Note: Level Meter will only update when there is no movement.

To Check the Changes:

Update Inventory → Level Meter → The LVL# you selected should be highlighted.

*If you enter into this screen and None is highlighted, then the unit does not see the circuit board or the Level Gauge.

A ticket will generate if a printer is set up.

Remove Inventory:

Remove Inventory → Select Inventory → Press Mode to Confirm

Print Inventory Report:

View Inventory → Print Inventory Report

Bill of Lading:

Once you have finished in Inventory, select STOP/CANCEL →

ENTER BILL Nr. → START/ENTER

Add Inventory:

While holding Shift select Mode → System Menu → Product Settings → Inventory → Add Inventory → GIVE INVENTORY NAME (Use the Keypad to assign a name, ex. Av Gas, Gasoline, etc.) → Select Unit Volume (Gallons, Liters) → ENTER CAPACITY (Tank Size) → ENTER INVENTORY (Actual Known Inventory) → Press Any Key to Continue

Assign Inventory:

Assign Inventory → Select an Active Product → Assign the Active Product to an Inventory List → Press Any Key to Continue

Please Note You can apply multiple inventories to one meter.

Update Inventory:

Update Inventory → ADD To Inventory → ENTER AMOUNT (Amount added to tank)

Set Inventory Value → ENTER CURRENT VALUE (Current amount of product in the tank)

Fill Up Inventory → Press Any Key to Continue (Resets Inventory to full capacity)

Empty Inventory → Press Any Key to Continue (Zero's out tank amount)

Remove Inventory:

Remove Inventory → Select Inventory → Press Mode to Confirm

Print Inventory Report:

View Inventory → Print Inventory Report

Bill of Lading:

Once you have finished in Inventory, select STOP/CANCEL →

ENTER BILL Nr. → START/ENTER

Inventory Short Cut

In the Delivery Screen:

Hold down SHIFT and select PRINT (while holding Shift)

You can enter inventory through the short cut only after you've set up and assigned inventory.

Color Guide: Blue: Operating Volume

Yellow: 25% Cautionary Volume

Red: 10% Low Volume

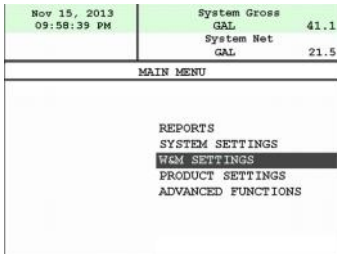
TEMPERATURE PROBE CALIBRATION HOW TO

* The following is based on product(s) you have calibrated. You must select the compensation table and the temperature unit for the product when Calibrating your product in order to Calibrate Temperature.*

Press Shift and Mode to enter the Select Function Screen.

Use the arrow keys to highlight SYSTEM MENU and Select START/ENTER.

Remove the Calibration Bolt and set in a safe location.



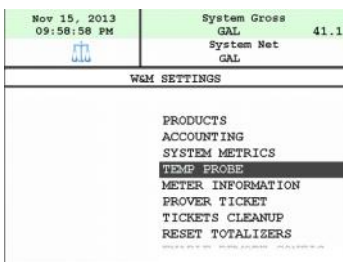
Use the arrow keys to highlight W&M SETTING. Select START/ENTER.

Use the arrow keys to highlight your product. Select START/ENTER.

Use the arrow keys to highlight PRODUCT TEST RUN. Select START/ENTER.

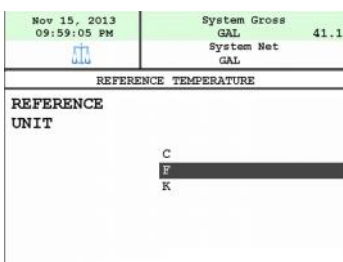
Use the arrow keys to highlight your product. Select START/ENTER.

Use the arrow keys to highlight TEMP PROBE select START/ENTER.



Selecting TEMP PROBE will take you to Offset Calibration
Press START/ENTER
(You are now calibrating the TCS3000 Register Temperature Probe to the Weights and Measures Temperature Probe)

Use the arrow keys to highlight the Reference Temperature select START/ENTER.



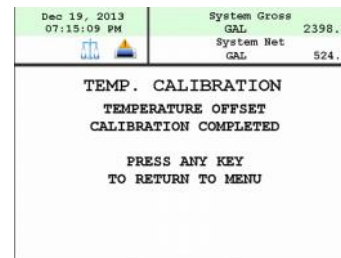
*Note: You will want to take 3 temperature readings during a run to get the average temperature.



Enter the Average Temperature Select START/ENTER

*Note: The register will display that it is calibrating and is applying the corrections. It will take a minute to calibrate the RTD Probe to the Weights & Measures Probe.

When Calibration is done the Register will display the following message:



Repeat the steps if necessary.

Trouble Shooting

The TCS3000 troubleshooting guide covers most common problem situations. Call your Total Controls Service Center for any problems that are not covered in this guide.

| NOTICE | DANGER |
|---|---|
| It may be necessary to break Weights & Measure seals to perform certain troubleshooting steps in this guide. Contact your supervisor or local Weights & Measures authorities for information before breaking any seals. | Serious Injury or Death may Result – Fire, Explosion, and Electrical Shock Hazard. Only trained and authorized personnel should perform troubleshooting. Use extreme caution when troubleshooting and taking all electrical measurements. Be sure that equipment is in a well ventilated area and that hazardous or flammable vapors are not and will not be present during testing. If equipment is located in a hazardous environment, it may be necessary to remove the equipment and perform troubleshooting in a safe area. |

- TOOLS/MATERIALS:**
- #2, #3 and #5 Metric Allen Wrenches
 - 7/16", 1/2" and 1-1/8" Wrenches
 - Digital Multimeter
 - 8G Thumb Drive (FAT 32) with TCS USB Adapter
 - Wire Stripper
 - RTV Silicone
 - Electrical Tape/Heat Shrink

Trouble Shooting Guidelines:

1. Before attempting to troubleshoot the TCS3000 system, become familiar with the operation and set-up of the specific installation.
2. Make sure all electrical connections are secure and tight.
3. Make sure all terminal blocks are firmly connected.
4. ALWAYS use a good digital multimeter. Voltage levels are critical to proper system operation. Use an accurate, reliable multimeter to test for proper voltages at the start of any service procedure. Voltage requirements are listed under each component.


NOTE: Check for proper operating voltages before changing the circuit board. If the circuit board needs to be changed, be sure to remove all power to the TCS3000.

5. NEVER remove a terminal block or jumper with the power on.
6. NEVER install a terminal block or jumper with the power on.
7. NEVER force a terminal block into its location.
8. NEVER exchange or reposition terminal blocks on the circuit board.
9. In case of a major problem such as a burned or water-damaged circuit board, evaluate possible causes before replacing it and turn the power back on.
10. Isolate the problem before changing the circuit board.
11. Return faulty circuit boards with the proper RMA forms, concisely completed.

There may be several probable causes for a system malfunction. The following list are several probable causes to aid in returning the system to operation as quickly as possible. Should you require contact with Total Control Systems factory support, please provide the following information to help manage the problem.

- REPORTS: Shift + Mode -> System Menu -> Reports
- 1) TCS 3000 Serial Number under Meter Information
 - 2) Software and Firmware under Version Information
 - 3) Print Prover Ticket before any changes are made to system settings.

BASIC DISPLAY ICON INDICATION

| ICON | INDICATION | SOLUTION |
|---|---|---|
|  | Printer is connected with paper | Printer is Enabled, connected and with paper. Awaiting delivery. |
|  | Printer is out of paper | Printer Enabled, connected, but without paper. |
|  | No printer connection | Printer has no communication with TCS Register Check cable for damage Epson printer DIP switch should be on 3 Power supply fuse is blown |
|  | Valve or Pump not open in Delivery | Valve or Pump are closed within delivery. Pump Starter delay timing can be adjusted under W&M Settings. |
|  | Active delivery | Valve or Pump Enabled |
|  | Multiple Tank Delivery | Multiple Tank Delivery is Enabled and begun by pressing Shift + Start |
|  | You're in System Settings Screen | Exit out and go to the Delivery Screen |
|  | You're in Weights & Measure Settings | Only shows when in W&M Settings. To remove, make sure the calibration screw on the register is screwed in. |
| AIR | Air is present in system or level sensor is low or high | The Air Eliminator Detection is Enabled. |
|  | Density is out of range | The Density reading is outside the limit entered values |
|  | Water is out of range | Water PPM reading is outside the limit entered values |

We will categorize Troubleshooting with **HARDWARE/SOFTWARE**, **SYSTEM**, **WEIGHTS & MEASURES** and **PRODUCT** Settings in the TCS 3000 Register. TCS HUB and Modem Settings follow register troubleshooting. The list is not all-inclusive and should only be used as a guide.

HARDWARE/SOFTWARE TROUBLESHOOTING

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|--|---|--|
| Unit will not power up or there is no display. | Inadequate supply voltage, +9 to 28VDC are required for operation. Ground short on terminals, wire harness or lug. | <ol style="list-style-type: none"> 1. With the key in the accessory position, check the battery voltage to the circuit board. Use the negative terminal as DC ground. While the TCS3000 will power-up at +9VDC, it is recommended that the input be at least +12.6VDC. 2. There is a ground short within the register or on the cable harness. Check wiring on grounds in register or chassis. Some ground shorts come from a cable jacket being worn through with a tie-down. 3. Check the 7.5A, in-line fuse for continuity. It is located in the accessory power line. Replace if necessary. 4. If the green light blinks fast it is doing what it is supposed to, but then it will go to a slow blink. If you see red, then you do not have enough power on the register. It must see a minimum of 9vdc. 5. If the red light comes on and the unit doesn't power-up. Check the voltage if the voltage is OK but the temperature is -20 F this will indicate that the heater is warming the display to prevent any damage to the VGA display and should come-up shortly. |

HARDWARE/SOFTWARE TROUBLESHOOTING (CONTINUED)

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|--|--|--|
| Unit blows 7.5A fuse. | +12VDC Battery line is shorted to ground. | <ol style="list-style-type: none"> 1. For safety reasons, remove the 4A, in-line fuse from the accessory power cable. 2. Unscrew the 3 pin power connector. Inspect for stray wire strands and visible shorts. 3. Inspect the full length of the power cable. Look for damaged insulation, which may cause shorting between the cable and ground potential (e.g. truck frame or chassis). If the power cable is damaged, it must be replaced. 4. Replace the 7.5A fuse and re-install the wires into the terminal Bd. connector. 5. If the 7.5A blows again, then replace the power cable. 6. If the 7.5A fuse blows after replacing the power cable, then replace the TCS3000 terminal circuit board. |
| Display is reading in reverse | Pulse Channel TAHA1 and TAHB1 are wired backwards | Switch Pulser wiring between Channel A and B. |
| Black display screen but power LED indicator is on. | Sufficient power to the register, however there may be a current draw from the system that will not allow the register display to power up properly. | <ol style="list-style-type: none"> 1. Cycle power of the register 2. Allow diesel chassis glow plugs to properly charge before turning over the ignition. 3. Power On Time Relay may be required for installation. 4. Contact factory for further support. |
| Time and Date reset to 10/28/13 | Low Battery Power Short on Battery | <ol style="list-style-type: none"> 1. Go to Operation Status under Reports and check internal battery voltage. If under 2.75V, battery must be replaced. 2. Check that no wires are in contact with Battery. Time and Date are reset if in contact and power is shutoff. Use electrical tape or heat shrink on bare wire to prevent from happening again. 3. If time and date reset each time you cycle power, change Time Source from Controller to BIOS in Regional Settings. |
| Display screen has multiple colored lines. | Ribbon cable is not seated properly. | <ol style="list-style-type: none"> 1. Contact factory for further support. 2. Disassemble the front cover of the register to reseal the display ribbon cable. |
| Buttons on my keyboard are not active. | Tactile button has been damaged. | <ol style="list-style-type: none"> 1. Contact factory for further support. 2. Disassemble the front cover of the register to replace keyboard. |
| System One Error | New Software not compatible with existing Firmware | <ol style="list-style-type: none"> 1. Press STOP/CANCEL to back out of a level and continue with normal operation of the register. This code detects software features that not compatible with existing firmware. 2. Some functions will not operate (Additive Injection, Differential Pressure, etc.) under old Firmware. 3. Contact factory for Firmware upgrade. |
| Register reboots in Idle or Delivery | Ground Short | <ol style="list-style-type: none"> 1. Loose ground wire causing short. Check power distribution box and TCS 3000 register for loose grounds. Find and tighten. 2. Inadequate power due to current draw from hose reel or solenoid coil. |
| Operating System (OS) Error Controller Com Error Grub Error Root Password Error | OS loading error during boot up | <ol style="list-style-type: none"> 1. OS loading errors occur during startup. Voltage spikes or current draws during OS bootup can corrupt software. 2. Contact factory for replacement. |

SYSTEM SETTINGS TROUBLESHOOTING

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|--|--|---|
| Display screen is incorrect | Default display is chosen | <ol style="list-style-type: none"> 1. If a different display screen is shown, it's possible the customer pushed Mode to flip to a different display screen than the Default screen. 2. If a different display screen is shown during a delivery, then the Default display screen must be changed. See Display Settings under System Settings for correction. |
| Display is too dim, or too bright | Display brightness was not adjusted for current environment | <ol style="list-style-type: none"> 1. The Brightness can be adjusted from 30% to 100%. 2. There is no "Sleep" mode. |
| Daisy chain communication is not working | <p>Network Address of registers are not in proper sequence</p> <p>Printer Host and Client Addresses are not in proper sequence</p> | <ol style="list-style-type: none"> 1. Check the RX and TX wiring between registers. 2. Make sure the printer is wired to the primary HOST register. 3. Check the Device Addresses of each register, with the primary HOST as 1 and Clients 2 to 8. 4. Make sure the primary HOST register has the Client Address Range set to communicate with all the TCS 3000 registers in the daisy chain. 5. Client addresses must have REMOTE PRINTER selected to be able to print delivery tickets. NOTE: Remote Printer has no effect on wireless data transfer. |
| Delivery Not Completed | Previous delivery ticket was not printed | <ol style="list-style-type: none"> 1. Press Print to print previous ticket. 2. Keep Master Switch on until delivery ticket has printed. 3. Make sure the correct printer is selected. 4. Make sure TCS 3000 address is correct for each register. 5. Check power and communication cables for proper connection or damage. 6. On initial use of Epson printer, you must cycle power on printer after #3 dip switch is turned on. 7. Printer Error light is flashing. If rebooting the printer does not eliminate the error light, printer must be replaced. 8. If printer or cable connection is damaged, you must replace. Disable printer and continue use. |
| Epson printer release light flashes. | Low voltage to the Epson printer. | <ol style="list-style-type: none"> 1. Check the battery voltage for a minimum of +12.6VDC. 2. Under extreme cold conditions, the printer may not operate. Warm up the cab of the vehicle. 3. If the release light continues to flash, replace the Epson 295 Printer. |
| No power indicator lights to the Epson printer. | No power to the Epson printer. | <ol style="list-style-type: none"> 1. Verify that the power switch is in the ON position. This switch is located on the left-hand side of the Epson 295 Printer. 2. Verify that the printer power supply fuse is not blown. 3. Check the printer power cable to ensure that it is seated properly. If the problem persists, replace the power cable followed by the Epson printer. |
| Time and Date are incorrect | Time and Date were not configured to region | <ol style="list-style-type: none"> 1. Go Regional Settings to adjust time and date, as well as format. 2. Set Time through the 24 hour clock, and be sure to use "Periods" between Hours:Minutes:Seconds 3. There is no Daylight Time Zone adjustment. 4. TCS HUB may be setup to sync with Register for time change. |
| After preset, display shows a "Pause" and will not finished transaction. | Preset Top-Up or Delivery Pause is Enabled | <ol style="list-style-type: none"> 1. Go to Preset Settings and Disable Preset Top-Up. 2. Go to Pause Options and select Allow Pause, then Disable. |

SYSTEM SETTINGS TROUBLESHOOTING (CONTINUED)

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|------------------------------------|---|---|
| The Delivery Prompts are incorrect | Customer ID options have not be configured | <ol style="list-style-type: none"> 1. Determine what questions must be asked and enter into Customer ID 1 to 4 text. 2. If question does not show, make sure the Request is enabled. 3. To make sure operator enters data into Customer ID 1 to 4, make sure Enforce is Enabled. 4. Validation only works if a Database has been loaded. Contact TCS for further support. |
| Display Precision is incorrect | Precision changed for calibration | <ol style="list-style-type: none"> 1. There are two places to change display precision: 2. W&M Settings under System Metrics 3. System Settings under Delivery Settings |
| Delivery ends during fueling | Delivery Timed Out | Under Delivery Settings, you must extend your Time Out setting from 180 or 600 seconds. |
| External Display is not reading | Red Lion or Tekkino Serial Display settings are not Enabled | <ol style="list-style-type: none"> 1. Go to Auxiliary Devices and Enable External Display. 2. Choose what is to be displayed under Configure 3. Pulse driven displays from Red Lion must be configured correct. Contact Red Lion for support. |
| I lost my passwords | Passwords are not stored locally | Contact TCS for factory support. |

WEIGHTS & MEASURES SETTINGS TROUBLESHOOTING

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|---|--|--|
| Product has wrong Name | The Register was never calibrated | Go into W&M Settings and select product to change name or add new product, then calibrate the product. |
| Metered volume not the same as Delivered Volume | Product calibration factor was not properly entered for 2 nd product. | <ol style="list-style-type: none"> 1. Under W&M Settings, read Product 1001 calibration factor and copy it to Product 1002 under Edit Product Calibration. 2. Entering calibration factors under Product Parameters will require a physical calibration operation. |
| When Product with Additive Pump is selected, I do not see or hear the Injector actuating. | <p>Additive Injector Pump is not Enabled for Product</p> <p>Injector Pump not primed or has leak</p> | <ol style="list-style-type: none"> 1. Go to Product Parameters of Product with the enabled Injector Pump, then make sure Additive Injector is on External or Piston. 2. Check that pump wiring is terminated correctly on Pump Starter and not reading 9V. If reading 0 or 12V, check the solenoid coil on the Injector Pump. 3. Look for leaking fitting on suction side of Injector Pump. 4. Prime Injector Pump |
| Ticket is not set up correctly | Ticket must be configured | <ol style="list-style-type: none"> 1. Go to Accounting and select Configure Ticket 2. Adjust Ticket configuration by adding, removing or editing each line. See ticket setup in the TCS User's Guide for more information. |
| Customer contact information is missing from ticket | Customer contact information is not setup in Header or Footer | <ol style="list-style-type: none"> 1. Go to Accounting and select Configure Ticket. 2. Header and Footer Defaults for customer contact information or messages can be entered here. |
| Delivery ticket will not print | <p>Out of paper or printer not connected</p> <p>Missing Minimum Ticket</p> | <ol style="list-style-type: none"> 1. Load paper ticket and press Print. 2. Check cable connection and termination of printer wiring for loose connection. 3. Check for worn cable throughout chassis. 4. Missing "Minimum" Ticket. Requires a copy from Existing Ticket and named Minimum. |

WEIGHTS & MEASURES SETTINGS TROUBLESHOOTING (CONTINUED)

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|---|--|--|
| Preset Valve will not open. | Solenoids are inactive or inoperative. Foreign debris in system. | <ol style="list-style-type: none"> 1. Start a delivery and listen for the audible clicking sound from the solenoids. 2. If there is an audible click from the solenoid (but still no flow), this may be an indication of a mechanical problem with the main valve or its associate components. 3. If there is NO audible click form the solenoid, check the voltage to Pin + and 0V of terminal block Solenoid 1. While the TCS3000 is still in delivery, use a reliable multimeter to measure the following DC voltages on the circuit board. Use 0 pin as a ground or frame ground. TERMINAL SOLENOID 1 for 2 VOLTAGE 9.0 VDC with plug remove VDC (NO LOAD) 2.0 VDC with solenoid connected 12.0 VDC with the solenoid energized 4. If the above voltages are correct, this may be an indication of a problem with the valve or its associated components. 5. Check for pinched 50 pin communication cable in register. 6. If the above voltage are NOT correct, replace the Solenoids and/or TCS3000 terminal board. |
| Preset Valve doesn't shut off or pulsates | Valve was never set-up and calibrated. | <ol style="list-style-type: none"> 1. Valve settings by product are not correctly setup. Check the following W&M -> Product Settings for minimum values: - S1-S2 Delay should be 2 seconds or more. - S2 Delay should be 0.2 seconds or more. - Maximum Flow Rate should be at least the maximum flow rate of flow meter. 2. Run full calibration, followed by Full Auto preset setting. Allow preset to run in its entirety. NOTE: S2 is set for 20% of preset value. 3. If preset solenoids continue to click, double the Maximum Flow Rate within Product Parameters. |
| Delivery does not begin at Zero | Hose Charge is set too high | Hose Charge under Product Parameters is set too high. Change accordingly. NOTE: Hose Charge can be disabled. |
| Maximum Pulser Error | Noise from truck is creating false pulse transmissions | <ol style="list-style-type: none"> 1. Make sure that pulser cable leads are foil wrapped with a shield drain 2. Only terminate the shield drain to the TCS 3000 register, and not the Direct Mount Pulser. 3. Change Maximum Pulser Error to maximum allowable error of 255. 4. Direct Mount Pulser has a shunt for 5V and 9-30V, check that the shunt is on 5V 5. Ferrite Coupling over pulse encoder cable. 6. Insulate the TCS 3000 register from chassis and place ground to battery. |
| Missing Pulse Channel Error | One pulse channel is missing from the Dual or Quadrature pulser setting or pulse encoder has failed. | <ol style="list-style-type: none"> 1. Check wiring of the A and B channel wiring on the TCS 3000 register for good termination. 2. Direct Mount Pulser has two LED indications for each channel. If product is flowing and one of these is not lit, then we have a bad encoder and it needs changed. 3. Direct Mount Pulser has a shunt for 5V and 9-30V, check that the shunt is on 5V |

WEIGHTS & MEASURES SETTINGS TROUBLESHOOTING (CONTINUED)

| PROBLEM | PROBABLE CAUSE | 1 SOLUTION |
|---------------------|--|---|
| 2 Temperature Error | 3 Open or shorted circuit between the RTD probe and the TCS3000. | <ol style="list-style-type: none"> 1. Check the RTD Probe and terminal block for continuity. 2. RTD Probe requires 4 wire leads. 3. Remove terminal block Temp Probe from the circuit board. On the terminal block, measure and record the resistance between the following pins: <u>PIN READING</u> Red to White 100 Ω ±20 ohms 4. If the readings are not within the above tolerances, replace the RTD probe. |

PRODUCT SETTINGS TROUBLESHOOTING

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|--|---|--|
| Inventory does not change | Active Products have not been assigned to Tank Identification. | <ol style="list-style-type: none"> 1. Go into Inventory under Product Settings and Assign Inventory. Select Active Product and then choose the Tank Identification it is to be assigned to. 2. For multiple products, you must Assign each product to one or more Tank Identification. |
| Inventory shows a negative | Manual Inventory needs to be reset Live Inventory is not Enabled | <ol style="list-style-type: none"> 1. Go into Inventory under Product Settings and update Inventory. Select Tank Identification and go to Fill Up Inventory. This will reset Inventory to 100% capacity. NOTE: Shift + Print takes you Inventory List for quick reset. 2. Go to Inventory List and then Update Inventory. Select Tank Identification and choose Level Meter. Select LVL1 for the single compartment tank. <p>NOTE: You must have the Analog Input set to X1 or X8 CHANNEL Communication and CURRENT under System Settings/Aux Devices for Live Inventory to be correct.</p> |
| Cannot find the added New Product | Product is not Active | <ol style="list-style-type: none"> 1. End Shift and go to Product Settings. 2. Select Activate Product and choose new product from list. 3. Begin Shift 4. Remove unwanted products either in W&M Settings or disable unwanted product in Product Settings. <p>NOTE: Products that have been calibrated may appear either as an Active or Inactive Product. The TCS 3000 must have at least 1 Active Product in order to Begin a Shift and Start a Delivery. Products may only be Activated or Deactivated after a Shift has Ended.</p> |
| Preset valves are cutting in and out (chatter) during delivery | Preset Timing needs to be configured | <ol style="list-style-type: none"> 1. Go to Product Timing and select Preset Timing. 2. Select Product and Preset Timing to configure preset option. 3. There are four preset timing functions for the fast flow (S1) and slow flow (S2) preset shut off. <i>Full Auto</i> – Automatically Tunes S1 and S2 Shutoff <i>Semi Auto</i> – S1 is scalable and S2 automatically shuts off. <i>Next Fix</i> – S1 & S2 automatically correct the next preset delivery. <i>Static</i> – S1 & S2 are scalable. 4. To eliminate solenoid modulation, select Static and be sure to move S1 Fast Flow preset volume to 8 gallons or more. The S2 Slow Flow preset volume is near 0.1 gallons. |

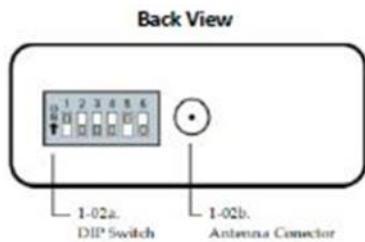
MODEM TROUBLESHOOTING

| PROBLEM | PROBABLE CAUSE | SOLUTION |
|--|--|---|
| No transactions into the HUB | Communication wire not correct Connections to modem are loose Insufficient Power | <ol style="list-style-type: none"> 1. Check wiring in the TCS 3000 to be sure RX and TX wires are terminated and seated correctly. 2. 9 pin communication cable connection is loose on the modem (radio or cell). 3. Radio Modem communication cable's RED wire is not terminated into the 12VDC power source. 4. Reset button on Radio Modem has been pressed. Contact factory for replacement. 5. Cell Modem communication cable's RED wire is terminated into the 12VDC power source and not the provided power plug. |
| I cannot determine if all transactions have been transmitted | Memory Status | Go to Memory Status under Reports to find delivery ticket status. If any number of tickets are in the Non-Transferred directory, we know there must be a communication or software failure. |

RADIO MODEM SETTINGS

DIP Switch Settings

- 1 = ON
- 2 = OFF
- 3 = OFF
- 4 = OFF
- 5 = ON
- 6 = OFF



RSSI LEDs

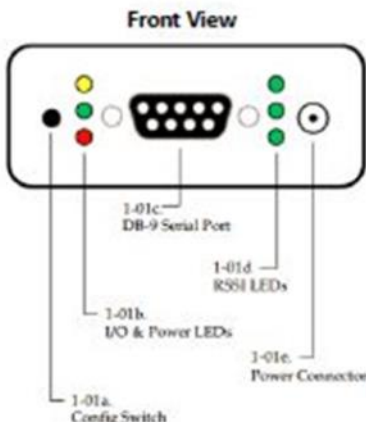
(Green LED) indicates the amount of fade margin present in an active wireless link. Fade margin is defined as the difference between the incoming signal strength and the modem's receiver sensitivity.

- 3 LEDs ON = Very Strong Signal (> 30 dB fade Margin)
- 2 LEDs ON = Strong Signal (> 20 dB Fade Margin)
- 1 LED ON = Moderate Signal (> 10 dB Fade Margin)
- 0 LED ON = Weak Signal (< 10 dB Fade Margin)

Yellow light (Top) = DATA FROM OFFICE

Green light (Middle) = DATA TO OFFICE

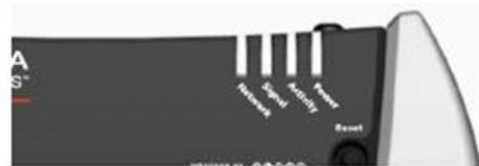
Red light (Bottom) = POWER



CELLULAR MODEM SETTINGS

LED operation is as follows:

- Off—No Activity
- Green—Full Function
- Yellow—Limited Function
- Red—Not Functional



Network:

- Green—On the network
- Flashing Green—Roaming
- Yellow—Found service, attempting to connect
- Flashing Yellow—Link Down
- Red—No data connection available

SIGNAL:

Light shows the strength of the signal and may be nearly solid (strong signal) or flashing (weaker signal). A slow flash indicates a very weak signal.

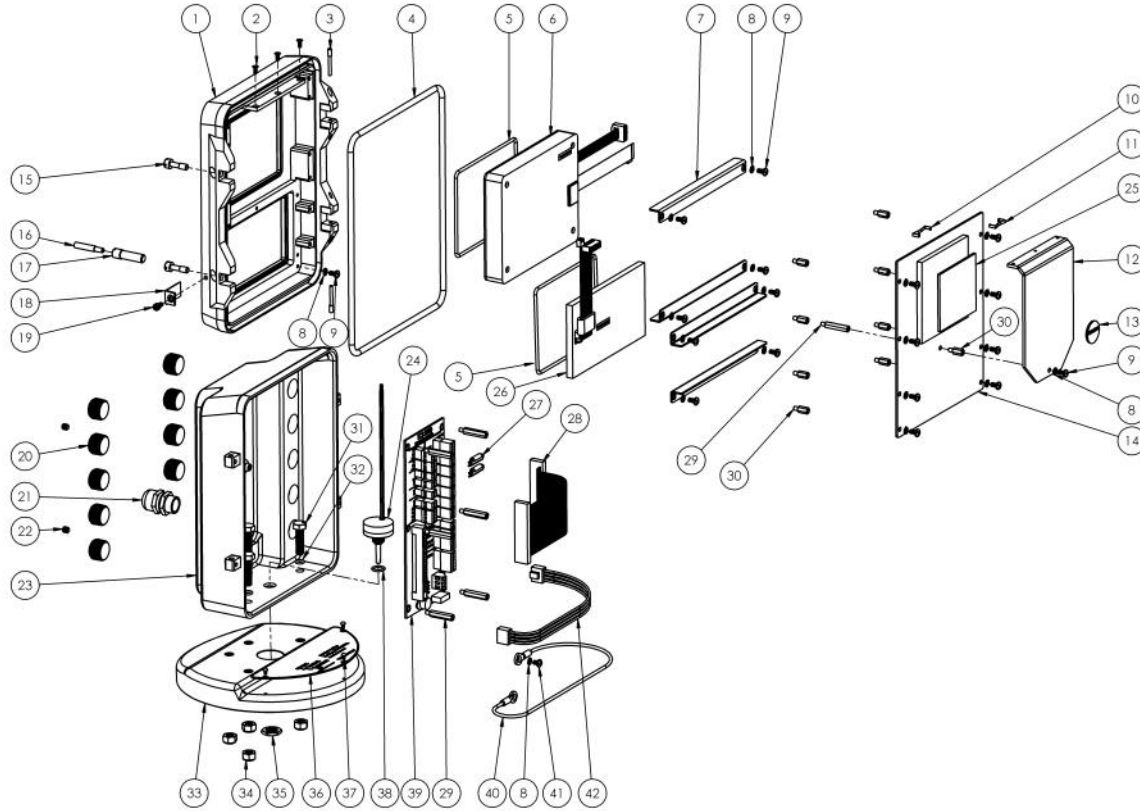
ACTIVITY:

Pulse Green on packet transmit/receive on the radio link.

POWER:

- Off—No power (above 36V or below 7.5V)
- Red—System not operational
- Green—Normal operation
- Green, Occasional Yellow—GPS Lock
- Yellow—Low power mode or system rebooting

TCS 3000 PARTS LIST



| Item | Part No. | Description | Quantity |
|------|-----------|-------------------------------|----------|
| 1 | TCS300150 | Front Cover | 1 |
| 2 | TCS300122 | Countersunk Screw | 3 |
| 3 | TCS300172 | Hinge Pin | 2 |
| 4 | TCS300174 | Gasket Cover | 1 |
| 5 | TCS300144 | Gasket Display / Keyboard | 2 |
| 6 | TCS300320 | Display w/ Screen Protector | 1 |
| 7 | TCS300131 | Compression Bar | 4 |
| 8 | TCS300138 | Washer | 18 |
| 9 | TCS300137 | Screw | 18 |
| 10 | TCS300261 | Retaining Clip | 1 |
| 11 | TCS300260 | Retaining Clip | 1 |
| 12 | TCS300120 | Radiator | 1 |
| 13 | TCS300797 | Replaceable Battery | 1 |
| 14 | TCS300110 | PC Board Assembly | 1 |
| 15 | TCS300171 | Socket Screw | 2 |
| 16 | TCS300156 | Calibration Stud | 1 |
| 17 | TCS300158 | Calibration Stud Body | 1 |
| 18 | TCS300153 | Calibration Label | 1 |
| 19 | TCS300154 | Drilled Calibration Screw | 1 |
| 20 | TCS300252 | 1/2" UL Plug | 9 |
| 21 | TCS300133 | Cord Grip; 1/2" NPT Atex | 1 |
| 22 | TCS300173 | Socket Set Screw | 2 |
| 23A | TCS300275 | 75° Rear Housing; 1/2" NPT | 1 |
| 23B | TCS300290 | 90° Rear Housing; 1/2" NPT | 1 |
| 23C | TCS300280 | Remote Rear Housing; 1/2" NPT | 1 |

| Item | Part No. | Description | Quantity |
|------|-----------|------------------------------|----------|
| 23D | TCS300175 | Remote Rear Housing; M20 | 1 |
| 23E | TCS300190 | Remote Rear Housing; M20 | 1 |
| 23F | TCS300180 | Remote Rear Housing; M20 | 1 |
| 24 | TCS300160 | Pulse Encoder | 1 |
| 25 | TCS300148 | Thermal Pad | 1 |
| 26A | TCS300230 | ENGLISH Keyboard Assembly | 1 |
| 26B | TCS300256 | French Keyboard Assembly | |
| 26C | TCS300257 | Spanish Keyboard Assembly | |
| 26D | TCS300258 | Portuguese Keyboard Assembly | |
| 27 | TCS300759 | 1K Resistor | 2 |
| 28 | TCS300176 | 50 PIN Ribbon Cable | 1 |
| 29 | TCS300124 | M4 x 27 Standoff | 7 |
| 30 | TCS300125 | M4 x 11 Standoff | 9 |
| 31 | TCS300202 | Screw | 4 |
| 32 | TCS300206 | O-ring | 4 |
| 33 | TCS300210 | 75°/90° Rear Housing Stand | 1 |
| 34 | TCS300204 | Nylon Locknut | 4 |
| 35 | TCS300162 | Pulser Nut | 1 |
| 36 | TCS300217 | Name Plate | 1 |
| 37 | TCS790095 | Drive Screw | 3 |
| 38 | TCS300166 | O-ring | 1 |
| 39 | TCS300112 | Terminal Board w/ Connector | 1 |
| 40 | TCS300181 | 6" Grounding Wire | 1 |
| 41 | TCS300151 | Screw | 1 |
| 42 | TCS300177 | Power Ribbon Cable | 1 |

—Warranty Information

WARRANTY

New 3000 electronic registers, equipment or components manufactured by Total Control Systems, a division of Murray Equipment, Inc. (TCS) with which this warranty is enclosed, are warranted by TCS to the original purchaser only for a period of TWELVE (12) months from installation or eighteen (18) months from the date of shipment, to be free, under normal use and service, from defects in material and workmanship.

Defects occurring within the stated warranty period, TCS will repair or replace, at TCS's option; provided that part or parts are returned to TCS transportation charges prepaid, and TCS's examination discloses the parts or workmanship to have been defective upon delivery to the purchaser.

EXCLUSIONS

Warranty does not cover any parts and equipment not manufactured by TCS, but these items may be covered by separate warranties of their respective manufacturers. This warranty does not extend to any equipment that has been subjected to misuse, negligence or accident or if operated in any manner other than in accordance with TCS's operating instructions and specifications.

CLAIM PROCEDURES

In order to obtain performance by TCS of its obligations under this warranty, the original purchaser must obtain a Return Goods Authorization (RGA) number from TCS's customer service department within 30 days of discovery of a purported breach of warranty, but not later than the expiration of the warranty period. Once authorization is received, return the defective meter, piece of equipment, or component covered by this warranty, with transportation charges prepaid, to TCS at the address shown below together with a written statement setting forth the nature of the defect and RGA number.

LIMITATIONS

THERE ARE NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED. TCS SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TCS will determine if all parts or meter defect falls within the warranty guidelines and will repair or replace within a reasonable time span. TCS is not responsible for any in or out bound freight. TCS's sole obligation that shall represent the buyer's sole and exclusive remedy shall be to repair or at TCS's option to replace any product or part determined to be defective. In no event shall TCS be liable for any special, direct, indirect, incident, consequential or other damages of similar nature, including without limitation, loss of profits, products, production time, or loss of expenses of any nature incurred by the buyer or any third party. TCS has not authorized on its behalf any representation or warranties to be made, nor any liability to be assumed except as expressly provided herein; there is no other express or implied warranty.

DESIGN AND EQUIPMENT CHANGES

Any changes in design or improvements added shall not create any obligation to install same on equipment previously sold or ordered.



The Standard of Measurement

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