TOTAL CONTROL SYSTEMS

"The Standard of Measurement"

TCS 3000

REGISTER

Jan 10, 2014
08:19:36 AM

System Gross
GAL   2151.4

Flowrate
GAL/min   0.0

Gross GAL

0.0

START=START DELIVERY; PRINT=PRINT TICKET

Setup & Operation Manual

Table of Contents

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.

Notice

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 7.5 amp fuse is provided to limit the 12VDC 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
Four RS 485 output, 2-wire half duplex, custom protocol; 9600 baud, 8 bit, no parity, 1 stop bit
One RS 232 output, 9600 baud; 8 bit, no parity, 1 stop bit

The USB0 and USB1 connectors are for maintenance only. To access these connectors, power to the unit is to be Disconnected or the area known to be free of ignitable gas or equivalent.

WARNINGS:

SUITABLE FOR USE IN CLASS 1, DIVISION 2, GROUPS C AND D HAZARDOUS LOCATIONS, OR UN-CLASSIFIED LOCATIONS.

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) WILL GET YOU IN TO THE SYSTEM MENU

Navigation Keyboard Functions

Start/Enter Key

Power Light

Stop/Cancel Key

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)

Alpha - Numeric and Symbol Keys   Preset Key

Print Key

Mode Key
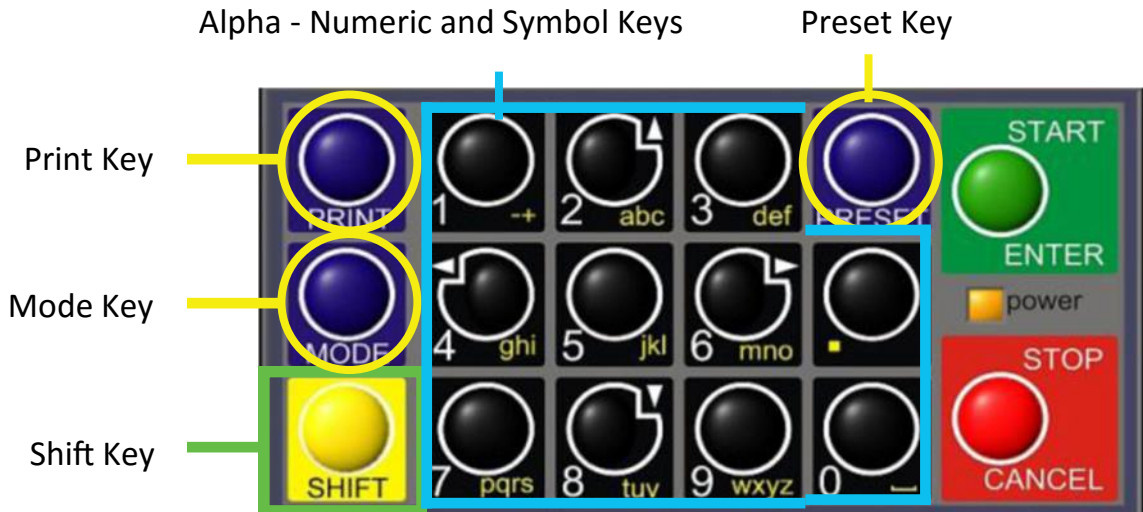
Shift Key

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
	Valve not open
	Valve(s) open
	System Settings
	Weights & Measures
AIR	Air/Vapor Exhaust

MENU (Quick Guide)

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 75 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 14 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 Page14 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.
3) After or before each Shift, the display will read Saving and Printing BEGIN or END Shift Ticket.

## Sample Begin and End Shift Tickets

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
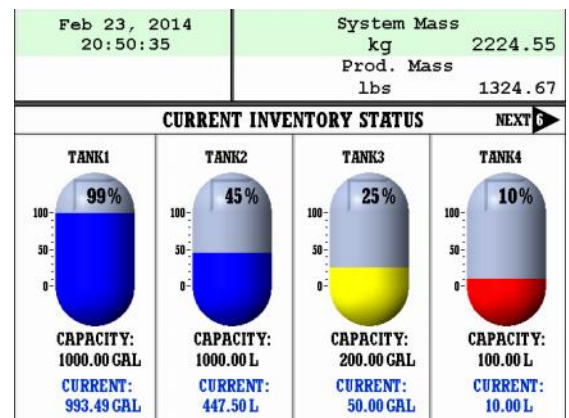
Duplicate Shift Ticket

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	View and print calibration, meter information and software
Operation Parameters	View existing voltages, temperatures and runtimes
Show Prover Status	Weights & Measures access, calibration and configuration log
Prover Ticket	Print the last calibration proving ticket
Meter Info	Meter identification
Version Info	Operating Firmware and Software
Memory Status	View stored delivery, inventory, calibration and transferred (TCS HUB) tickets
Print Error Log	Print error logs from register
Checksums	View checksums from software, firmware and operating system
System Settings	Configuration of system functions
Display Settings	Configure display screens and fields
Printer Settings	Select printer, host ,remote or none
Regional Settings	Date and Time settings
Delivery Settings	Configure delivery functions like tickets, presets, ID fields, etc.
Auxiliary Devices	Select and configure auxiliary devices and pulse output
Connectivity	Configure register and printer addresses for network data sharing
Misc. Settings	Password and Database settings
W&M Settings	Weights & Measures product setup and calibration
Products	Product settings and calibration
Accouting	Set ticket number, configure delivery tickets
Delivery Screens	Configure delivery screen fields for display
System Metrics	Unit of measure precision
Temp Probe	Temperature probe calibration
Meter Information	Register, Meter and Truck Identification
Prover Ticket	Print calibration proving ticket
Tickets Cleanup	Allows you to delete the oldest 500 printed tickets over 5000 transactions
Reset Totalizers	Reset system and product totalizers
Enable Remote Config	Remote interface configuration
Pulser Tracker	
Product Settings	Product identification for shifts and price/tax
Inventory	Create or remove tank inventories; as well as assigning products to these tanks
Product Prices	Product pricing and taxation
Activate Product	Activating onboard products within Shifts
Deactivate Product	Deactivating onboard products outside of Shifts
Product Timing	Product preset and auxiliary device timing
Auxiliary Settings	Auxiliary device configuration for a Additive Injector, Pressure Sensor, etc.
Product Lists	Listing of active, inactive and uncalibrated products
Advanced Functions	Administrative Configuration
System Shutdown	Rebooting of system
System Update	Software update

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.

5) 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.

6) 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.).

7) CHECKSUMS

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

-Software Checksum

-Firmware Checksum

- OS Checksum

```
Jun 10, 2015          System Gross
  14:24:21            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.

System Settings

1) DISPLAY SETTINGS

DEFAULT SCREEN   Select the Type of Screen you would like the TCS 3000 to default to.
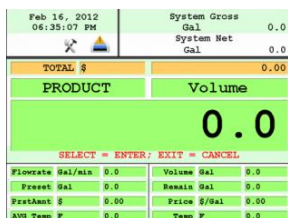
| TYPE 1 | TYPE 2 | TYPE 3 | TYPE 4 |

* TYPE 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   Net Totalizer allows you to set whether the Net Totalizer is visible on the display screen.

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

2) 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
Blaster	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 32-36 for instructions on how to daisy chain).

3) 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

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

4) 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

NOTE: Each Preset Setting requires configuration under Product Settings for S1 and S2 operation. (See page 29 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.

5) 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

Configure	Select Type:	Red Lion LD and Tekinno EagleView displays are currently the only external displays supported today
	Address:	Display Address from 1 to 99 and press ENTER
	Display Data	Choose the information to display on External Display and press ENTER

- Delivery Gross
- Delivery Net
- Delivery Volume
- Delivery Total (Currency)
- Flow Rate
- Mass

Test   This is a test sequence of numbers to exhibit on external display

AIR ELIMINATOR

The Air Eliminator is for the electronic actuation of a solenoid exhaust vent and a down stream valve, when a level sensor switches.

AE Enable/Disable Enable or disable for operation
AE Detection   Select Normally Open or Closed for level sensor detection
AE Relay   Enable or disable exhaust vent solenoid valve actuation

PULSE OUTPUT

The solid state pulse frequency transmission of a scalable pulse factor
++ May require a 1K ohm pull down resistor to bring pulse to ground (0Vdc) ++

Enable/Disable   Enable or disable operation

Configure   Sets the DEFAULT for pulse transmission output data

Delivery Total (Currency)

Gross Volume
    1 (1 pulse per unit)
    1.1 (10 pulses per unit)
    1.11 (100 pulses per unit)
    1.111 (1000 pulses per unit)

Net/Gross Auto Detect Volume
    1 (1 pulse per unit)
    1.1 (10 pulses per unit)
    1.11 (100 pulses per unit)
    1.111 (1000 pulses per unit)

Pulse Repeater repeats the incoming pulse value

Startup Reset   Enable or disable and press ENTER

RFID READER

Radio Frequency Identification (RFID) is for fixed location or fleet refueling.
++ requires the a database uploaded to the TCS 3000 register for this option to be used ++

External   External is used for remote mobile readers
ThingMagic ThingMagic is for fixed reader locations

ANALOG INPUT
Analog Input is for the 4-20 mA Boards used with the Differential Pressure & Tank Level Gauges

None   Nothing is selected.

X1 Channel   Single channel only allows you to use 1 device with the TCS 3000 (1 Differential Pressure or Level Gauge).
                    Must choose the input:
                                        - Voltage (5 Vdc Capacity)
                                        - Current

                    NOTE: The single channel analog communication bard is mounted within the TCS 3000 register. This should be ordered from the factory, but can be mounted after market.

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

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

LEVEL METERS
        Allows you to select the curve on the level meter.

Linearization Type

        External (0-100%) - Tank capacity percentage to volume level.
        Quasi Linear - Currently Not Available
        Polynomial - Currently Not Available

Calibration

        View/Edit - Allows you to enter the percentage of product in the tank.
                (% equivalent to tank volume, the more points entered the grater the accuracy)
        New Calibration - Automatically senses the tank level, READ the instructions on the TCS 3000 Screen
                before you begin.

PRESSURE SENSORS
        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

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) MISC SETTINGS

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

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   Access Key is used to lock or unlock the register keyboard 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

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 mini-USB adapter located within the Register (USB0 and USB1).

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 21.

*NOTE: ALL PRODUCTS MUST BE CALIBRATED INDIVIDUALLY *

PRODUCTS

PRODUCT TEST RUN This allows you to run the product after you've calibrated in order to verify repeatability.

Available Products	Highlight the product you are calibrating and select ENTER. START automatically begins the product test run until you press STOP to finish.

RECALIBRATE PRODUCT

Available Products	Highlight the product you want to re-calibrate and select ENTER.

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. See TABLE 2 for reference.
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

Product Name	API Table	Temp.	Coefficient Value	Range
Fuel Oil	6B	F	Specific Gravity	32-35
Gasoline	6B	F	Specific Gravity	62-65.1
Premium Gasoline	6B	F	Specific Gravity	59.1
Diesel	6B	F	Specific Gravity	32-35
Kerosene	6B	F	Specific Gravity	42
Jet A	6B	F	Specific Gravity	42.9-41.9
Jet A-1	6B	F	Specific Gravity	42.9-41.9
Av Gas	6B	F	Specific Gravity	42-44
Refined Fuels	6B	F	Specific Gravity	0 — 85

Product Name	API Table	Temp.	Coefficient Value	Range	Mean
Liquefied Propane Gas (LPG)	24	F	Specific Gravity	0.500 — 0.550	0.510
Liquefied Propane Gas (LPG)	54	C	Density KG/L	0.500—0.600	
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	790
Lubricating Oils	54B	C	Density KG/m3	850 — 905	880

Mass Density   To provide a calculated Mass value, determine the value to input Mass Density and press ENTER.

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 Starter to enter the Start Duration time in seconds, then press ENTER.

Pump Starter Advance to enter Starter Advance time in Seconds, then press ENTER.

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 2 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 0.2 seconds).
Pulser Type	Select the pulse input type (Single or Dual Channel) and press ENTER.

Pulser Type (cont.) SINGLE is a single channel pulse input (i.e. Magnetic, Turbine & Coriolis Flow Meters).
DUAL is a dual channel pulse input
QUAD is a dual channel pulse input multiplied by two.

Pulser Estimate   Manual entry of the Meter Pulse Estimate (Meter Factor). Input pulse
value and press ENTER.

**NOTE: The TCS 3000 register will not accept the entered Pulse Estimate until a
physical calibration is placed immediately after entry. See Edit Product Calibra
tion on page 20 for direct entry and acceptance.**

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
bbl	Barrel

NOTE: Selecting Product Unit does not change the Totalizer unit of measure. See
Page 24 for changing Totalizer unit of measure.

Hose Volume   Enter unit <u>volume</u> 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
21 for Enabling this function.

Maximum Pulser Error

Program the amount of reverse pulse counts the register is allowed to see before it
shuts the system down.

Additive Injector

Injection Ratio How many parts per million will be injected into the product.
(Default is 19PPM in 5 Gallons)

Injector Type

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 Additive Injector Pump

Additive Injection Ratio - Enter Parts Per Million volume.
Injector Calibration
Calibrate - Automatically Calibrates the Additive Injector
    1) Begin calibration by pressing Enter
    2) Enter volume on volumetric beaker.
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
            (PROGRAMMED IN MILLISECONDS)

B) Begin Recalibration

*NOTE: ALL PRODUCTS MUST BE CALIBRATED INDIVIDUALLY *

Select Begin Recalibration to change the Meter Calibration Value. Press ENTER
to begin calibration run. 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. Input Prover Value
and press ENTER.

When finished, a Calibration Summary screen will appear with the Gross Amount,
Net Amount, Average Temperature, Compensation Table, Pulse/Second and
Pulse/Volume (Meter Calibration Value). Press STOP to continue.

Display menu will prompt you to continue with a Test Run? or to finish the
calibration. Push SHIFT + START to begin Test Run to validate the Meter
Calibration Value. Press STOP to finish.

C) Edit Prod. Calibration

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

- Select Product to manually change Meter Calibration Value. 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.f

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

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 17 through 19, 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 19.

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. 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	########

TABLE CONTINUED ON NEXT PAGE

TCS 3000 Menu	Example Prints
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	
Inventory Name	i. e. Tank 1 Diesel
Inventory Begin	########
Inventory End	########
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. 19 PPM
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	John Q. Public
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	Delivery Volume Only (not configurable).

TYPE 1   TYPE 2   TYPE 3

DISPLAY FIELD SELECTION TABLE 1 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
Density	Density of the Product
Comp. Table	Compensation Table (6B, 54B, Etc.)

Unit Price	Unit Price
Calc. Price	Calculated Price
TAX1	Tax
TAX2	Tax
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 Ration of Additive to Product (mL)

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 meter system RTD temperature 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 TOTALISERS

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 29) 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.**

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 disable, 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.

** Can be done during a Shift **

UPDATE INVENTORY   Allows you to correct the Inventory levels by manually entering the proper inventory level.

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" Enter in the Tank Capacity and Enter 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**

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" will 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
¥	Euro

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
DKK	Danish Krone
HUF	Hungarian Forint
LVL	Latvian Lats
LTL	Lithuanian Litas
PLN	Polish Zloty
RON	Romanian Leu
SEK	Swedish Krona

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 TIMING

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

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
Not Currently Available

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 Additive Injector Pump

CORR. DP. LIMIT   Differential Pressure is calculated from the Inlet and Outlet of a filter vessel. Set the THRESHOLD value of maximum pressure the measuring system is allowed to operate. Once the Corrected Differential Pressure Limit has been met, the TCS 3000 registration Will terminate the delivery. An advisory message will be displayed on the delivery screen and the Interlock Error will print on the ticket.

PRESSURE SENSOR   Select with setting you wish to be active. Only one can be chosen. Uncorrected (Measured) Differential Pressure should be calibrated prior to use. See Filter Capacity below for calibration instructions.

None   Nothing is selected.

DP1   X1 Channel   Single channel only allows you to use 1 device with the TCS 3000 (1 Differential Pressure or Level Gauge). Must choose the input::

- Voltage (5 Vdc Capacity)
- Current

NOTE: The single channel analog communication bard is mounted within the TCS 3000 register. This should be ordered from the factory, but can be mounted after market.

DP2   X8 Channel   Eight channel allows you to use up to 8 auxiliary devices with the TCS 3000 for Level and Pressure

- Level Meters (1 - 6)
- Voltage (5 Vdc Capacity)
- Current
- Pressure (7 - 8)
- Voltage (5 Vdc Capacity)
- Current

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

FILTER CAPACITY   Enter in the Filter Vessel's certified rated flow rate capacity rating. Value is used for the Corrected Differential Pressure formula. *To read the MEASURED DIFFERENTIAL PRESSURE, enter a value of ZERO to disable the Filter Capacity. This will allow you to calibrate auxiliary differential pressure gauges externally.*

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:

$$\frac{\text{FILTER FLOW CAPACITY}}{\text{ACTUAL FLOW RATE}} \quad x \quad \text{MEASURE DIFFERENTIAL PRESSURE}$$

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.

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.).

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 Megabytes 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.

FIGURE 1

Mini USB Port

Male Mini USB to Female USB

USB Thumb Drive with communication LED
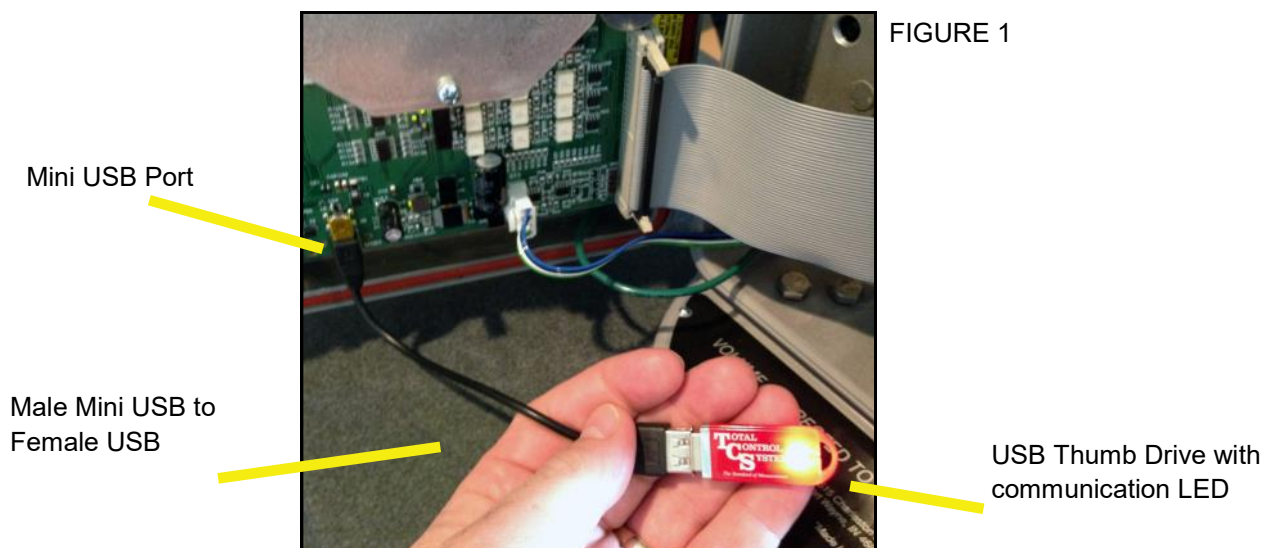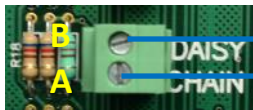
Installation Procedure—Daisy Chain

Daisy Chain:

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

To Daisy Chain the Registers use a two wire 22 gauge shielded cable. Nominate one Register to be the Host.
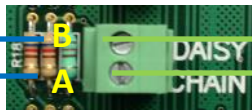
Once you've chosen which Register will be the Host the other Registers will be considered the clients. Strip a small amount of wire and run the wire from slot A and B of DAISY CHAIN on the Host Unit to slot A and B of DAISY CHAIN on the Client Unit.

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.
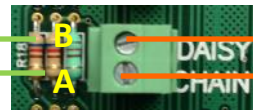

Host	Client 2	Client 3	Client 4
The Host will have 2 wires.	Client 2 will have 4 wires.	Client 3 will have 4 wires.	The Last Client will have 2 wires.
B	B	B	B
A	A	A	A

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.

Daisy Chain:

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

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.

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

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 How To

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 Madison 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

Manual Inventory How To

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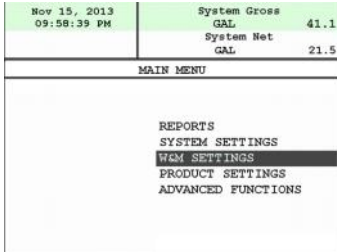
Use the arrow keys to highlight W&M SETTING.
Select START/ENTER.

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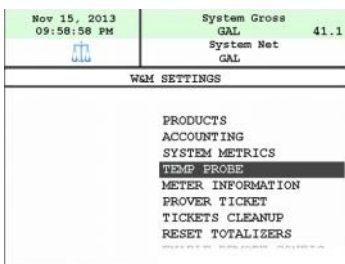
Selecting TEMP PROBE will take you to Offset Calibration
Press START/ENTER
(You are now calibrating the TCS3000 Register Temperature Probe to the Weights and Measures Temperature Probe)

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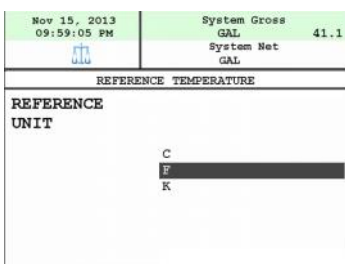

*Note: You will want to take 3 temperature readings during a run to get the average temperature.

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:
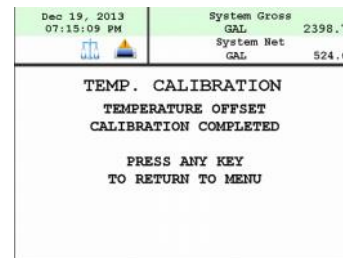
Repeat the steps if necessary.

Trouble Shooting

To comply with Weights & Measures requirements, it is necessary to start and stop each delivery with a fully packed hose. Normally, this will be the case. However, 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.

> To pack the hose at the start of a delivery:

Press the Start Button, this energizes the solenoids. Allow the pump to pack the hose.

TCS 3000 Trouble Shooting Guide

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.

Trouble Shooting Guidelines:

1) Before attempting to troubleshoot the TCS 3000 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 TCS 3000.

5) If an error occurs during a delivery, the message will appear on the Display and print on the delivery ticket. The delivery ticket will print an error message that can be useful in troubleshooting. This ticket will automatically print. Examine the prover ticket to make sure all set-up fields are accurate, e.g. pulses per unit volume, temperature coefficient, and base temperature.

6) NEVER remove a terminal block or jumper with the power on.

7) NEVER install a terminal block or jumper with the power on.

8) NEVER force a terminal block into its location.

9) NEVER exchange or reposition terminal blocks on the circuit board.

10) 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.

11) Isolate the problem before changing the circuit board.

12) Return faulty circuit boards with the proper forms, concisely completed.

There may be several probable causes for a system malfunction. Listed on the next 3 pages are several probable causes to aid in returning the system to operation as quickly as possible. The list is not all-inclusive and should only be used as a guide.

PROBLEM	PROBABLE CAUSE	SOLUTION
Unit will not power up or there is no display	Inadequate supply voltage. +12.6 to 28 VDC is required for operation	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 TCS 3000 will power-up at +11 Vdc, it is recommended that the input be at least +12.6 Vdc. 2. Check the 7.5A, in-line fuse for continuity. It is located in the accessory power line. Replace if necessary. 3. 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 +11 Vdc. 4. 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 this will indicate that the heater is warming the display to prevent any damage to the VGA display and should come-up shortly
Unit blow 7.5A Fuse	+12 VDC battery line is shorted to ground	1. For safety reasons, remove the 7.5A, 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 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 TCS 3000 terminal circuit board.

PROBLEM	PROBABLE CAUSE	SOLUTION
Power Failure appears on the delivery ticket	Power to the TCS 3000 interrupted during delivery. Static Discharge	1. Check accessory power cable for damage. Ensure that the power, common and ground wires on power connector are secure. Located on the right hand corner of the terminal board 2. Turn on all truck accessories (glow plug, headlamps, 2 way radio, heater, etc.). Engage the hose reel and monitor the DV voltage at ## using terminal ## as positive and terminal ## as ground. If the voltage drops below +10VDC, the truck electrical system may not be adequate to handle the current load for the TCS 3000. It may be necessary to upgrade the electrical system to accommodate the 3-amp TCS 3000 current requirements. 3. Verify proper grounding of the TCS 3000. Refer to the TCS 3000 Installation Manual for proper grounding procedures.
Epson printer release light flashes	Low voltage to the Epson Printer	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 Printer.
No power indicator lights to the Epson Printer	No power to the Epson printer	1. Verify that the power switch is in the ON position. This switch is located on the left-hand side of the Epson Printer. 2. 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.
"Temperature Error" appears on the TCS 3000 display	Open or shorted circuit between RTD probe and the TCS 3000	1. Check the RTD Probe and terminal block for continuity. 2. Remove terminal block Temp Probe from the circuit board. On the terminal block, measure and record the resistance between the following pins: PIN READING Red to White 100 Ω ±20? 3. If the readings are not within the above tolerances, replace the RTD probe.
Product flow does not register on TCS 3000	Pulser shaft is not turning with product flow. Pulse Failure	1. Manually spin the pulser shaft and monitor the TCS 3000 display. 2. If the TCS 3000 displays counter increments, this may indicate a mechanical problem. Contact your TCS 3000 Service Center for assistance. 3. If the TCS 3000 display counter does not increment, see Pulser Failure.
Pulser Failure, register is not reading gallons or liters	Missing pulse counts. Excessive reversals Note: Pulser faults generally occur in a high vibration environment. TCS is not responsible for pulser failures caused by excessive vibration.	1. Check the pulser output. 2. Open the TCS 3000 cover by loosening the two bolts that hold the cover closed. Using a reliable multimeter, measure the following DC voltages on terminal block is connected to the circuit board. Use terminal as ground reference. 3. TERMINAL PULSER VOLTAGE +0 VDC +5 VDC +3.74 TO 0 VDC TAHA1 WHILE SPINING +0 TO 3.74 VDC TAHB1 WHILE SPINING 4 If the following voltages are observed, check for loose pulser wiring connections. If no loose connections are found, replace the encoder. 5 Insert a ticket into the Epson printer. Begin a delivery. With product flowing through the meter, measure the following DC voltages on the terminal block. 6 TERMINAL PULSER VOLTAGE +0 VDC +5 VDC +3.74 to 0 VDC TAHA1 WHILE SPINNING +0 to 3.74 VDC TAHB1 WHILE SPINNING

PROBLEM	PROBABLE CAUSE	SOLUTION
Valve will not open	Solenoids are inactive or inoperative. Foreign debris in system	1. Insert a delivery ticket into the Epson printer and start a delivery. 2. Start a delivery and listen for the audible clicking sound from the solenoids. 3. If there is NO audible click form the solenoid, check the voltage to Pin + and 0 V of terminal block Solenoid 1. While the TCS 3000 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. 4. 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. Contact your TCS3000 Service Center. TERMINAL SOLENOID 1 for 2 VOLTAGE 9.0 VDC with plug remove VDC 2..0 VDC with solenoid connect 12.0 VDC with the solenoid energized 5. If the above voltages are correct, this may be an indication of a problem with the valve or its associated components. Contact you TCS 3000 Service Center for assistance. 6. If the above voltage are NOT correct, replace the following components with known working units until the problem is resolved: Solenoids 7. TCS 3000 Circuit Boards
Product has wrong Name	The Register was never calibrated or had the name changed in W&M Settings.	Go into prover and calibrate the product or change the Name.
Valve doesn't shut off	Valve was never set up or calibrated	Select the product and calibrated the valve for zero shutoff.
Display is reading in reverse	Channel A and B are wired backwards	Switch wiring between Channel A and B
Daisy chain communication is not working	Network Address of registers are not in proper sequence Host and Client Addresses are not in proper sequence	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 from 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.
Totalizers are incorrect	Product vs. System Totalizer Ticket is configured to show Product Totalizer instead of System Totalizer Net vs. Gross Totalizer	1. The Product Totalizer was not reset when the System Totalizer was reset to zero. 2. The ticket is configured to print the Product Totalizer instead of the System Totalizer, or visa-versa. 3. The ticket is configured to print the Net Compensated Totalizer instead of the Gross Uncompensated Totalizer, or visa-versa.
Cant begin a delivery because the screen reads "Delivery Not Completed"	Last delivery had the printer enabled, but the ticket had not printed.	The delivery ticket must be printed when the printer is communicating with the TCS 3000. To move on without the printer, either disable the printer or have the Select Printer changed to None under Printer Settings. You will be able to Re-print Tickets under the Select Function.

Start Up "Must Knows" for Setup Configuration & Calibration

1) Each Product must be thoroughly configured and calibrated in W&M Settings. There are many parameters that need to be configured to ensure your system operates properly. Failure to complete the Product Configuration may result in the TCS3000 to not function correctly.

2) 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.

3) The Calibration Screw must be threaded completely into the Calibration setting, or you will not be able to begin a shift or start a delivery.

—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.

TOTAL CONTROL SYSTEMS
TCS

"The Standard of Measurement"

2515 Charleston Place
Fort Wayne, IN 46808

Toll Free: (800) 348-4753
Phone: (260) 484-0382
Fax: (260) 484-9230
Email: sales@tcsmeters.com
Website: www.tcsmeters.com