INSTALLATION & OPERATION MANUAL

T350N-P
Truck Totalizer/Printer

LIQUID CONTROLS SPONSLER, INC.
FLOW MEASURING DEVICES AND CONTROLS
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LIQUID CONTROLS GROUP

CONTENTS

INTRODUCTION

A. GENERAL

The model T350N-P Totalizer/Printer displays flow directly in engineering units. The model T350N-P utilizes the latest in circuitry design and components. The circuitry is microprocessor based and performs the scaling and counting with only one main circuit board.

The totalized flow is displayed on a liquid crystal display (LCD), and is printed on standard calculator type thermal paper.

B. THEORY OF OPERATION

Model T350N-P is used in conjunction with frequency or pulse generating source such as a turbine flowmeter or other pulse flow transducers. The totalized flow display may be calibrated to indicate most any unit of volume, gals., liters, scfm., etc. Standard units are factory-calibrated for a standard flowmeter in gallons. If additional calibration is necessary, the dividing factor may be changed by adjustment of internal factoring switches located on the main circuit board.

The Model T350N-P displays total flow via an LCD display and thermal printing device. Printing of the displayed total is accomplished by pushing the PRINT switch. The printer will show a two-line message, product delivery, time and date, stating count, and finished count. There is a space provided for an authorized signature. When the printer stops, the display will zero and be ready to accept a new count. If the PRINT switch is activated during a delivery, the count will stop and the printer will print the new information.

Power Consumption – 12V Unit
Printing – 1.9 Amp
Normal – 0.5/ 0.7 Amp

INSTALLATION

Inspection
All units are completely assembled, tested and inspected at the factory prior to shipment. Upon receipt of the unit a visual inspection should be conducted to detect any damage that may have occurred during shipment.

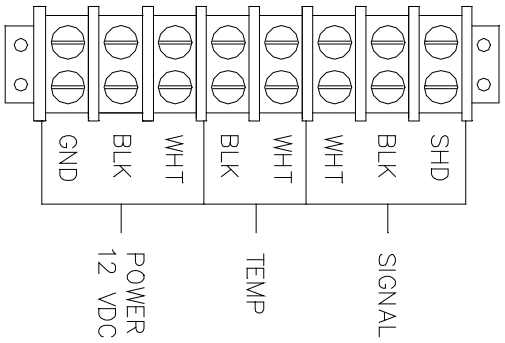
Physical
The T350N-P should be mounted as practically as possible taking into account display visibility, accessibility, etc. Ideally the T350N-P should be securely mounted using **ONLY** the supplied shock mounts on a stand positioning the unit 12-18" above the deck, clear of overhead pipes and as remote form the pump motor as possible. Adherence to these guidelines will significantly enhance the trouble free operation of the unit.

Electrical
The T350N-P is designed to operate on the 12 VDC power system of the transport and is "polarity insensitive". Both the + and – power inputs should be obtained in the pump control box. To facilitate testing without having to activate the entire pumping system + input power should be derived from the unswitched 12 V input to the pump control box. Every effort should be made to keep the T350N-P isolated as much as possible within the pump control box. In the event transport doesn't have a pump control box, as is the norm, 2 wires should be routed to the trailer power junction box located at the front of the trailer. **Do not attempt to obtain power by splicing into the light circuit located near the meter. Line drops and fluctuations may affect the operation. Additionally – do not connect a jumper from the T350N-P enclosure and the trailer chassis and do not replace the chock mounts with solid "Look a-likes" available in hardware store. They have solid mounting studs and are not isolating studs as provided by the Sponsler Company.**

Signal
The standard T350N-P signal cable is a 2 wire shielded cable with a MS3102 connector termination which is the industry standard interface for 2 pole pickup coils. The shielding is single ended and should not be altered.

Field Termination:

TBI Drawing



SWITCH & ADJUSTMENT DESCRIPTIONS

Power Switch: 3 amp DPDT, switches fused power to the logic circuits of the unit.

Print Switch: 3 amp Momentary Toggle Switch, initiates print cycle.

Sensitivity Adjustment: Single turn potentiometer establishes required input signal amplitude to initiate the count sequence.

Display Bias Adjustment: Single turn potentiometer establishes the contrast of the display.

S0- S3-Factoring Switches: 10 position (0-9) BCD rotary, inserts the desired calibration factor digitally with S0 as the LSD and S3 the MSD.

S4-Pre-scale Switch: 10 position (0-9) BCD rotary, provides the proper divider for decimal point placement in the Calibration factor. Position 1=1; 2=10; 3=100; 4=1000; 5=10000

S4-Position 9 = Self Test: Allows the totalizer's microprocessor to perform internal tests on the built- in RAM and ROM.

S5-Decimal Point Selection: 10 position (0-9) BCD rotary, position corresponds to the number of digits to the right of the decimal point.

Signal Input LED: Flashes to indicate that input signal is present (at higher frequencies the LED will appear to be constantly illuminated.)

A & B LED: Flash during 'self-test' to denote that microprocessor is testing.

VR101: Single turn potentiometer, adjusts darkness of print.

CALIBRATION

Sensitivity

The Sensitivity adjusts (R1) should be adjusted at the lowest expected flow rate. Turn R1 completely Counter-Clockwise then slowly adjust R1 Clockwise until the display increments then increase R1 slightly Clockwise again. In the nominal R1 position the arrow indicator will be in the 11 o'clock position.

Calibration Factor

The Calibration Factor is derived by taking the reciprocal of the meter's "K-Factor" (pulses per gallon or other desired engineering unit).

$$C.F. = \frac{\text{Engineering Units}}{\text{K-Factor}}$$

It is desired that zero not be dialed as the first digit on the factor switches. The CF, in most cases, will start with at least one zero. The multiplier switch on the factoring board will allow multiplying by 1, 10, 100, 1000, or 10000 to move the decimal the required digits.

S4 position	Multiplier
0	1
1	10
2	100
3	1000
4	10000

Example 1: K-Factor = 230 pulses per gallon
Engineering units desired = gallons
C.F. = 1/K = 1/230 = .00434782
Multiplier = 100; S4=2,
Factor S3=4, S2=3, S1=4, S0=8

The electronic accuracy can be verified incorporating the following formula for a timed test:

Total Displayed = Frequency X Time in seconds X C.F.

Example 2: C.F. = .004348
Time = 1 min = 60 seconds
Frequency = 500 Hz

Total = 500 X 60 X .004348

Total = 130.4 = 130

For higher resolution (reading in gallons and tenths, gallons and hundredths, etc.) multiply by 10 for tenths; by one for hundredths. The number dialed into dipswitch S5 corresponds to the number of digits to the right of the decimal point.

Example:

Flowmeter "K" Factor = 230
CF= .004348
Desired display = gallons and tenths
Multiply by = .04348
S4 = 1
Factor Switches = 4348; S3 = 4, S2 = 3, S1 = 4, S0 = 8
Decimal point = S5 = 1

Field Correction

To adjust the calibration factor to reflect the turbines actual response to the operating conditions apply the following formula:

$$\text{New Calibration Factor} = \frac{\text{Actual Total}}{\text{Meter Total}} \times \text{Calibration Factor}$$

Example #2:

Actual Total = 50
Meter Total = 52
C.F. = .004348
50/52 X .004348 = New Calibration Factor
.9615 X .004348 = .0041806
Insert 4181 into S3 – S0 respectively

In the above example .9615 denotes that the meter is operating .385% fast and multiplying the present calibration factor (.004348) by the ratio of Actual Total: Meter Total (.9615) reduces the calibration factor 3.85%.

Calibration Factor – Change of Calibration Engineering Units

Assume that rather than gallons, liters are the desired engineering unit.

Example #3:

K-Factor = 230 pulses per gallon
Liters = 3.785 per gallon

$$\frac{3.785}{230} = \text{Calibration Factor}$$

.01646 = Calibration Factor for display of liters

TOUBLE SHOOTING

PROBLEM

Unit not working (No Display Light)

A. Power Cable broken
B. Battery Low
C. Defective power switch
D. Blown fuse
E. Reversed power wires

Unit not working (Display Light On)

A. Check signal wire for breaks
B. Check sensitivity control
C. Check pickup coil
D. Check printed circuit board plugs to make sure they are mated securely.
E. Look for broken wires inside of electronic enclosure.
F. Check SWI (see draw. 1) to be sure it is in position 0-4.

Unit continues to blow fuses

A. Shorted power cable
B. Faulty electronic board
C. Power surges

Printer does not feed paper

A. Power not turned on
B. No paper installed
C. Paper not feeding into printer
D. Defective print switch

Printer feeds paper but does not print

A. Printer paper installed backwards (see drawing)
B. Wrong printer paper (Use thermal impact printer paper only!)
C. Temperature too cold for printer paper
D. Defective printer

TROUBLE SHOOTING

(INTERNAL RAM TEST (Dipswitch position #9)

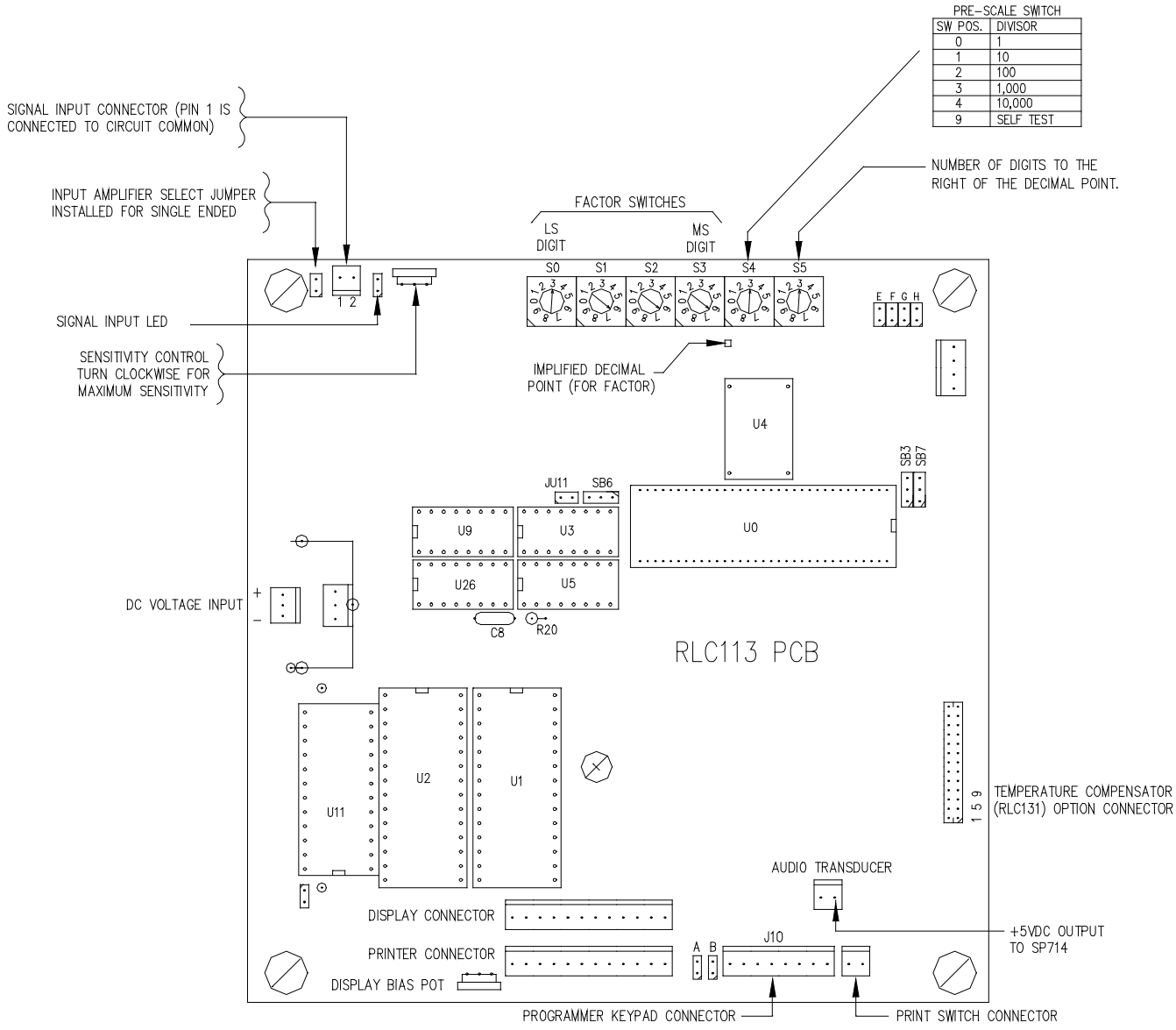
The self-test mode allows the totalizer's microprocessor to per form internal tests on the built-in RAM and ROM. The self test feature should be used only when a problem is suspected with the totalizer. To start the self-test, first set the pre-scale selector switch (S4) to position #9 (self test).

To fully test itself, the on-board computer must perform 257 different tests. As each test is completed, A & B LED's on the RLC113 PCB will flash. In order to perform the complete test the leds must flash 257 times. Upon completion of the 257 test the LCD display will print 'Eprom & RAM OK!'. Any other message indicates an error. If no message appears on the LCD display, it is possible that the display bias control is not adjusted properly. To make the display and background darker, adjust the display bias control fully counter-clockwise. Adjusting this control clockwise will make the display and background lighter.

As long as the pre-scale selector switch (S4) is in position #9, the microprocessor will continue to test itself. Leaving the switch in position #9 is a good way to isolate any transitory problems.

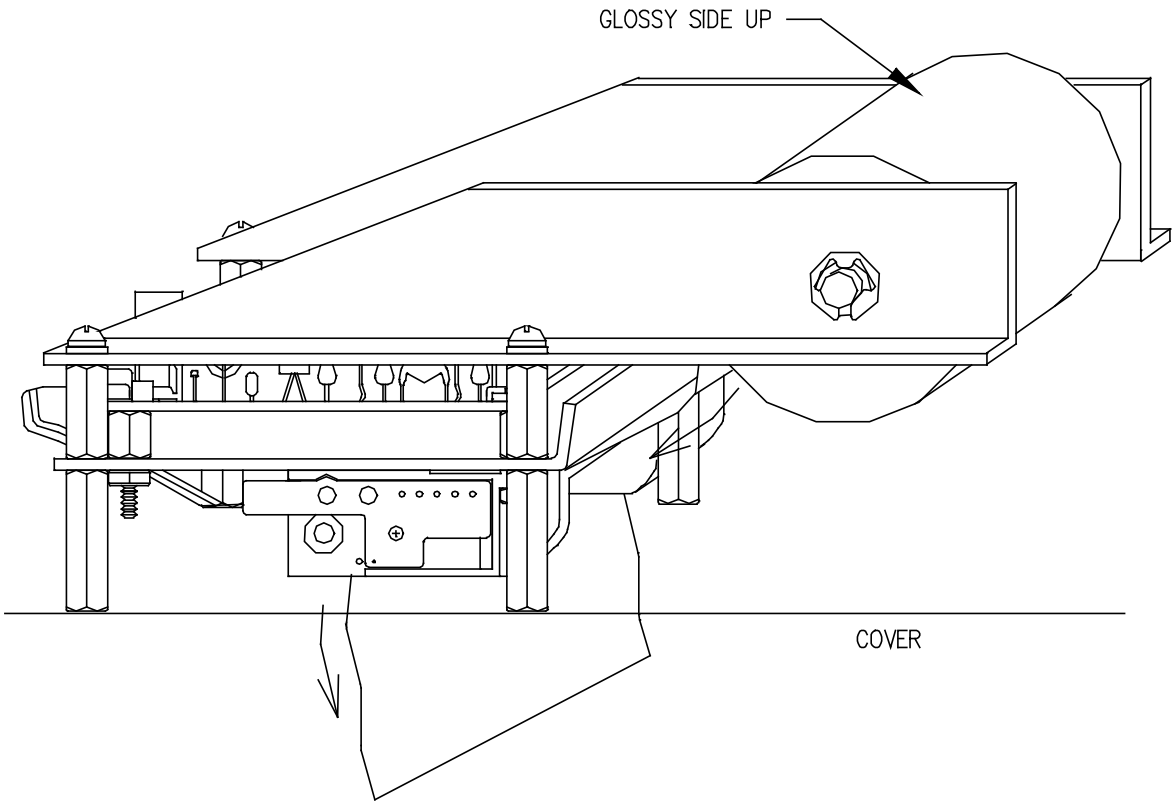
NOTE: Be sure to set the pre-scale selector switch back to the correct position for proper operation.

RLC113 PCB ILLUSTRATION

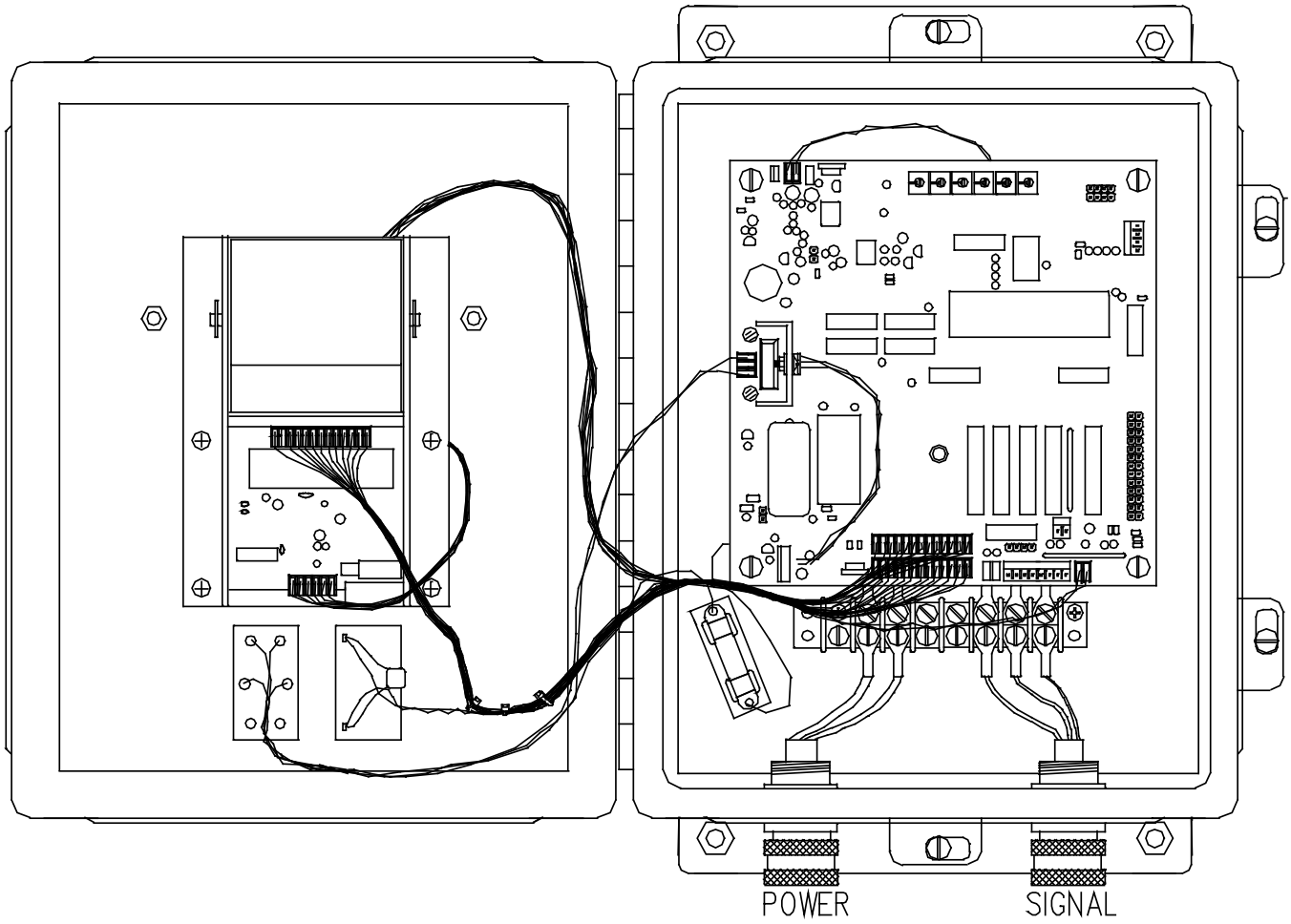


T350N—P PAPER INSTALLATION

USE THERMAL PAPER ONLY
FEED PAPER THROUGH PRINTER CARRIAGE



T350N-P 8X10X4



TEMPERATURE COMPENSATION (RLC131 option)

As product flows through the pipeline, a turbine located in the product spins and electrical pulses are generated and sent to the totalizer. The number and frequency of these pulses corresponds to the amount of product flow and the flow rate.

As the product I the pipeline heats or cools, the density and volume of the product changes. When the volume of product changes, the turbine spins faster or slower since the turbine flowmeter is a volumetric measuring device, even though the AMOUNT (measured by weight) of product is not changed. Temperature compensation operates by reading the temperature of the product and adding or subtracting pulses based on the temperature and hence the density of the product.

As long as the product flowing past the temperature sensor is within range of the product, the temperature compensation module will automatically correct for the density of the product. If the product is not within the correct temperature range, or an electrical problem exists with the temperature probe, the compensation module will not compensate for the product and will simply operate on 1 1:1 basis without compensation.

Whenever the temperature goes out of range for the selected product, the ALARM LED will illuminate. If the relay option is installed, and external relay will be energized whenever the alarm condition exists. If jumper JU2 is installed on the RLC131 compensation board the totalizer will stop accepting incoming pulses. Any pulses in storage will be outputted since these pulses were accepted while the unit was not in alarm condition.

An additional feature exists if the operator wishes to turn off temperature compensation even if the RLC131 Compensation Module is installed. To turn off temperature compensation install JU4 on the RLC131 module. When installed, no temperature compensation exists and in place of the product temperature on line 1 of the LCD is the message ‘NO TC’.

The following table summarized the various positions of the product selector switch (RLC131 PC board) and the corresponding product.

Position	Product	Low Temp	Ref Temp	Hi Temp.
0	OXYGEN	-199.977	-183.111	-140.583
1	NITROGEN	-210.370	-195.930	-155.309
2	ARGON	-188.953	-186.046	-140.583
3	CO2	-40.050	-25.166	-6.318
4	N20	-51.087	-34.679	15.384
5	CH4	-17.171	15.611	37.934
6	MAPP	-18.017	15.146	51.924
7	LPG	-40.142	15.318	50.877

PROGRAMMING TIME AND USER CONFIGURABLE MESSAGES

Programming of the clock or user definable messages is accomplished using the external 4X4 programming keyboard. This keyboard must be plugged into the unit before programming can begin.

The Ticket Printing Totalizer contains a built-in real time clock. The time and date information supplied by this clock is used to time and date stamp each ticket during printing. It is important that the time and date information is correct for proper record keeping. Setting the clock begins by pressing the SET CLOCK key. If the clock has never been set, or the battery has just been changed, the time and date information displayed by the clock on line 1 will be garbage. Pressing the CLEAR key will initialize the clock to the default time of 12:00A 01-JAN-80. Clock information can be changed by moving the cursor using the ( ) ( ) keys, to the location containing the data to be changed. Once at the proper location, press the ( ) key to increment the data. For example, if the cursor is under the month of MAR and the ( ) key is pressed, the month with change to APR. Pressing the (v) key will decrement the data at the cursor location.

When the time and date information is set correctly, press the ENTER key to store the new time and return to the setup menu.

The ticket printing totalizer has built in memory that allows the operator to store a custom message. The user definable message will be printed as the top 2 lines (by 16 characters per line) on each ticket. Each message line can be up to 16 characters long. Any information such as company name, phone number, etc. can be stored. Setting the message begins by pressing the SET MSSGE key. If the message is being set for the first time, or the battery has just been changed, the message information displayed on the LCD will be garbage. Pressing the CLEAR key will clear both message lines. Message information can be changed by moving the cursor using the ( ) for proper location, press the ( ) or (v) keys to change the data. Following is a list containing the order in which data is incremented/decremented:

!”#$%¢’()*+,-./ 0123456789:; = ? @ABCDEFGHIJKLMNOPQRSTUVXYZ (cont)
[/] _ abcdefghijklmnopqrstuvwxyz

If the first character of a message line is set to a ‘)’, then the entire message line will not be printed. In this way it is possible to skip message lines rather than having blank lines printed at the top of each ticket.

Once the message information is set correctly, press the ENTER key to store the messages and return to the setup menu.

TICKET PRINTING TOTALIZER WITH TICKET STORAGE (350S)

ENTERING ACCOUNTS

When the 3505 is first turned on, the operator is prompted to enter an account number. This account number may consist of 0 through 16 digits. To enter an account number, type in the appropriate number using the built-in keypad. Pressing ‘ ‘ will erase the last digit typed. Pressing CLEAR will clear the entire message line.

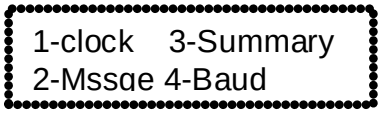
Once an account number had been entered, the operator must press the ENTER key to begin normal operation of the 3505. The account number is used as an indicator to track deliveries to specific customers. The account number will be printed on the ticket, and is also recorded and used when printing ticket summaries. If the wrong account number has been entered, the unit must be turned off, then back on so another account number can be entered.

While tickets are being printed, the number of available ticket storage locations will appear on line 1 of the LCD. After the ticket is finished printing, line 1of the LCD will return to its normal condition. If all ticket storage locations are used up (Available = 0), the unit will still continue to operate properly, however no new tickets can be stored. Ticket storage memory will be regained when tickets are erased after a ticket summary is printed.

350S ADDENDUM

PARAMETER SETUP

The parameter setup function of the 3505 allows the operator to set information necessary for proper operation of the unit. Although setup can be performed anytime by anyone, it is recommended that only those persons familiar with system operation use the setup function.
To enter the setup function, the operator must hold down the RESET key on the keypad when power to the unit is being turned on.
Whenever the setup mode is entered, the following message will be displayed.



When this message is displayed, the 3505 is in the setup mode. The setup mode allows setting the following parameters:

1) Setting the real time clock
2) Setting a custom 2 line message
3) Printing a transaction summary
4) Setting the serial interface baud rate

1) Setting the clock begins by pressing the '1' key. Pressing the CLEAR key will initialize the clock to the default time of 12:00A 01-JAN-80. Clock information can be changed by moving the cursor using the ( ) or ( )keys to the location containing the data to be changed. Once at the proper location, press the (up arrow) key (#8 button) to increment the data. For example, if the cursor is under the month of MAR and the (up arrow) key is pressed, the month will change to APR. Pressing the (down arrow) key (#2) will decrement the data at the cursor location.

When the time information is set correctly, press the ENTER key to store the new time and return to the setup menu.

2) Settings the message begins by pressing the '2' key. Pressing the CLEAR key will clear both message lines. Message information can be changed by moving the cursor using the ( ) or ( ) keys to the location containing the data to be changed. Once at the proper location, press the (up arrow) or (down arrow) keys to change the data. Following is a list containing the order I which data is incremented/ decremented:

!"#$%¢'()*+,-./ 0123456789:; = ? @ABCDEFGHIJKLMNOPQRSTUVXYZ (cont)
[/] _ abcdefghijklmnopqrstuvwxyz

If the first character of a message line is set to a ')', that entire message line will not be printed. In this way it is possible to skip message lines rather than having blank lines printed at the top of each ticket. Once the message information is set correctly, press the ENTER key to store the messages and return to the setup menu.

350S ADDENDUM

3) To print a summary of all stored tickets, press the '3' key. A ticket summary of all stored tickets will be printed. If some tickets have been lost due to battery power problems or if the unit had been put into external memory test (which destroys data stored in the ticket storage memory), then the SOME TICKETS LOST! message will be printed at the top of the summary. Summary starts by listing the date at which the ticket had been printed, then all tickets printed on that date are listed along with the time the units delivered. The number of tickets that can still be stored in memory is printed at the end of the summary.

Following is an example of a ticket summary.

****
Transaction Summary
12:34A 12-OCT-87
**********12-JUL-87*********
12:22P 1233 1222
02:20P 3456 6546
03:59P 421 213

********* 13-JUL-87 *********
01:22:P 45654 6788

Available = 116

After the ticket summary is printed, the operator is asked if the stored ticket information is to be kept or erased. The operator enters '1' to erase stored ticket information, or '0' to keep stored ticket information. If the ticket information is to be erased, the operator is prompted to enter a password. The password prevents unauthorized persons from erasing tickets. To erase tickets the correct password of 1324 must be entered.

4) Changing the band rate begins by pressing the '4' key. The current baud rate setting will be displayed on the LCD. Pressing the ( ) or ( ) keys will press the ENTER key. The valid baud rate settings are: 110, 150, 300, 600, 1200, 2400, 4800, 9600.

SERIAL INTERFACE COMMANDS

When the 350S in the setup mode, the unit will respond to several commands transmitted via the serial interface. These commands allow the unit to be externally programmed via an external computer or modem. A special feature available with 350S allows all stored tickets to be transmitted to an external computer, thereby facilitating automatic billing and recording systems. All serial interface conforms to standard ASCII, 8 data bits, 1 stop bit, no parity. The communication baud rate is programmable by the operator using setup function #4.

350S ADDENDUM

Following is a list of commands available and their corresponding functions:

(C) Whenever a CHR$(67) is received, the 350S enters the set clock mode. This mode operates exactly the same as the setting messages via the keypad, except commands are received from the serial port.

The following commands are used when setting both the clock and messages.

(sp) CHR$(32) move cursor 1 location to the right.
(H) CHR$(8) move cursor 1 location to the left.
( ) CHR$(62) increment data at cursor location.
( ) CHR$(60) decrement data at cursor location.
(C)CHR$(67) set data to space at cursor location (message only)
(R)CHR$(82) reset clock/message to default setting
(N)CHR$(78) toggle introductory message. *
(Z)CHR$(26) store clock/message as it appears and return to setup menu

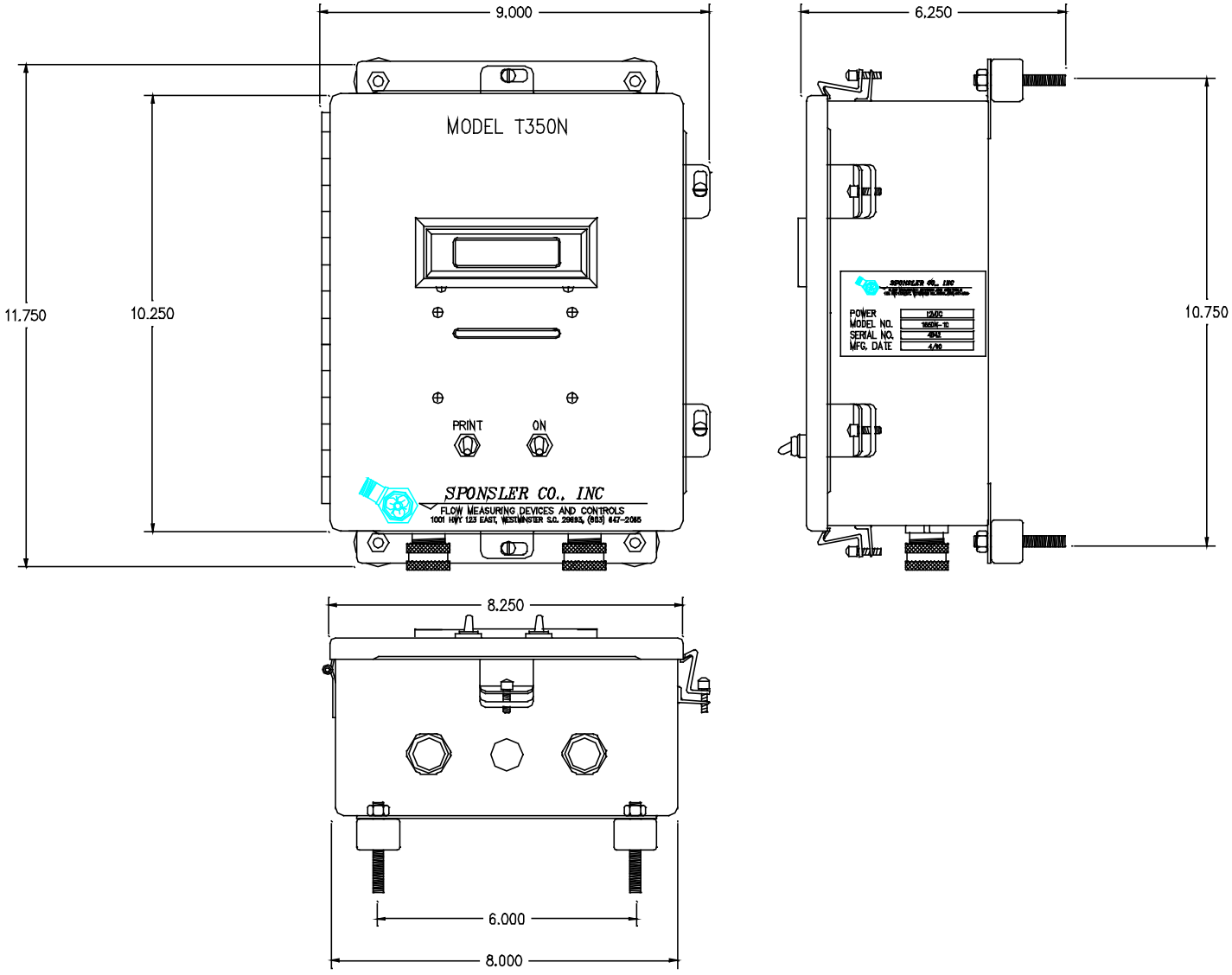
*The introductory message is printed when power is first turned on.

The following commands are available only on the 350S with ticket storage function. These commands will only function when the unit is in the setup mode.

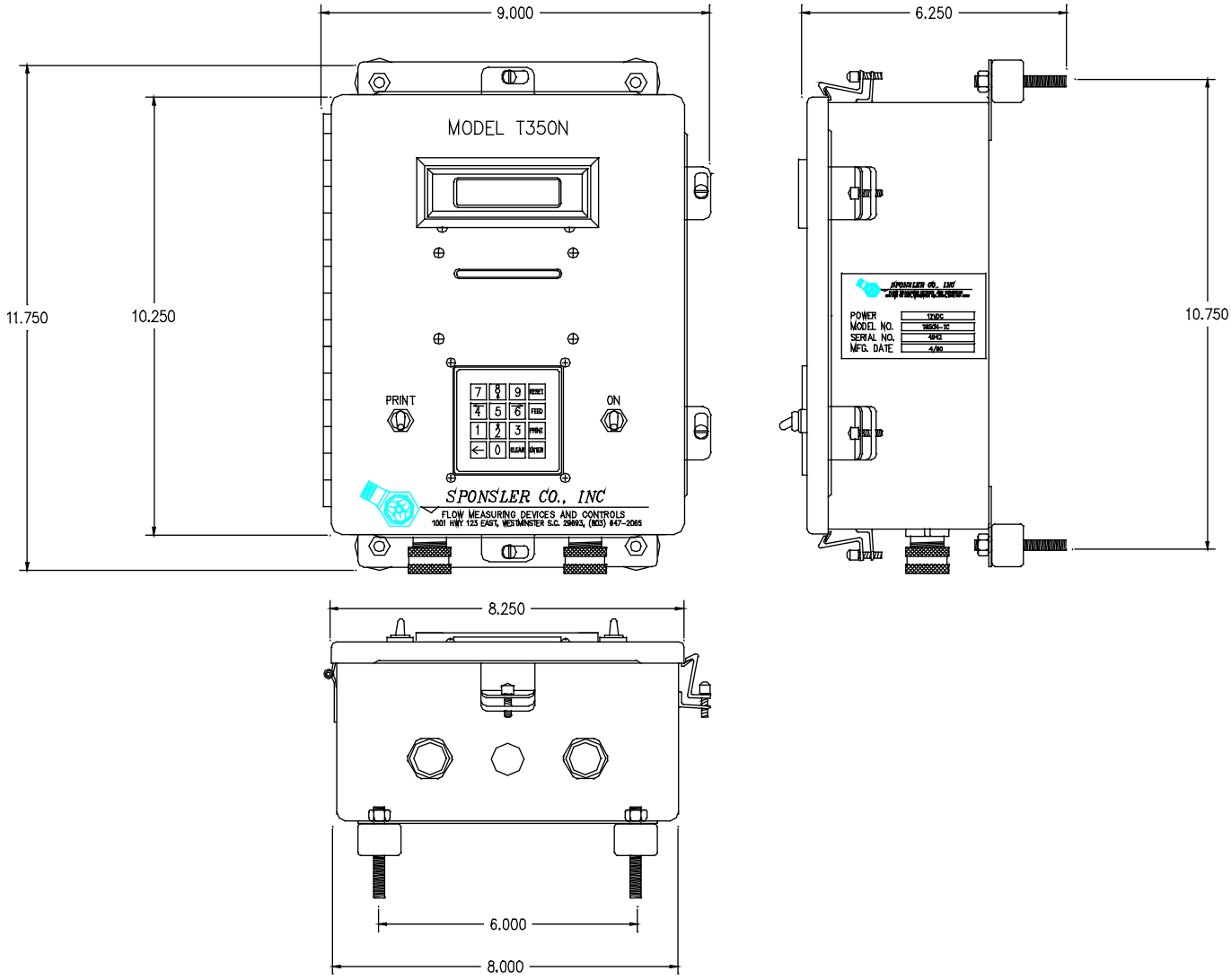
(T) Whenever a CHR$(84) is received, the 350S will begin a stored ticket dump in exactly the same format as printed on the built-in printer. The operator is still promoted on the LCD if it is desirable to erase stored tickets.

(D) Whenever a CHR$(68) is received, the 350S begins a HEX dump of all data stored in the 2048 byte ticket memory. If it is desirable to erase stored tickets after the memory dump, the letter (e) CHR$(101) should be transmitted while the memory dump is taking place. If (e) is received by the 350S, all stored tickets will be erased. NOTE: The operator is not prompted to erase tickets when using this function.

SCI---- T350N-P-01 Dimensional



SCI—T350N-P-K-01 Dimensional



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