
K1600 MANUAL
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I. SYSTEM OVERVIEW

INTRODUCTION

The K SYSTEMS K1600 Tank Inventory system is a micro-processor based inventory control system designed for high accuracy measurements of liquid contents of up to 16 storage tanks. The inventory and alarm status of each tank can be viewed on a large 4x20 LCD display. Tank inventory is continuously run in the background even while the operator has control of the system through the LCD display and the front panel key pad.

The K1600 can be configured to accept up to 16 pneumatic or 4-20 milliamp input signals from the sensors in the tank. This signal is converted from analog to digital (ATOD) counts which, in conjunction with the entered specific gravity and programmed tank profile tables, are utilized in determining the correct inventory value. The K1600 can manually or automatically compensate for zero shift of input signals directly from the display without

having to adjust at the sensors.

Alarm setpoints, Product names and Specific gravities, Transmitter zero values and Time/date can easily be changed by authorized personell through use of multi-level access codes and the functionally labeled keypad on the front panel.

Inventory for individual or multiple tanks can be viewed on the display by pressing the RUN/PAGE button. Once on the desired display page additional tanks can be viewed by pressing the up/down arrow keys. In addition inventory can be read in POUNDS or GALLONS (LITERS or KILOGRAMS) by selecting the UNITS button.

Optional field programmable alarm outputs, an RS232 communication port, and Printout capability allow accurate inventory information to be brought out to a host of peripheral devices for reporting and control.

Although the K1600 Tank Inventory System is micro-processor based, it is functionally driven and requires little knowledge and understanding of computers. All functional displays and operations can be accessed from either the single or multiple tank display screen by selecting the button which corresponds to the desired operation.

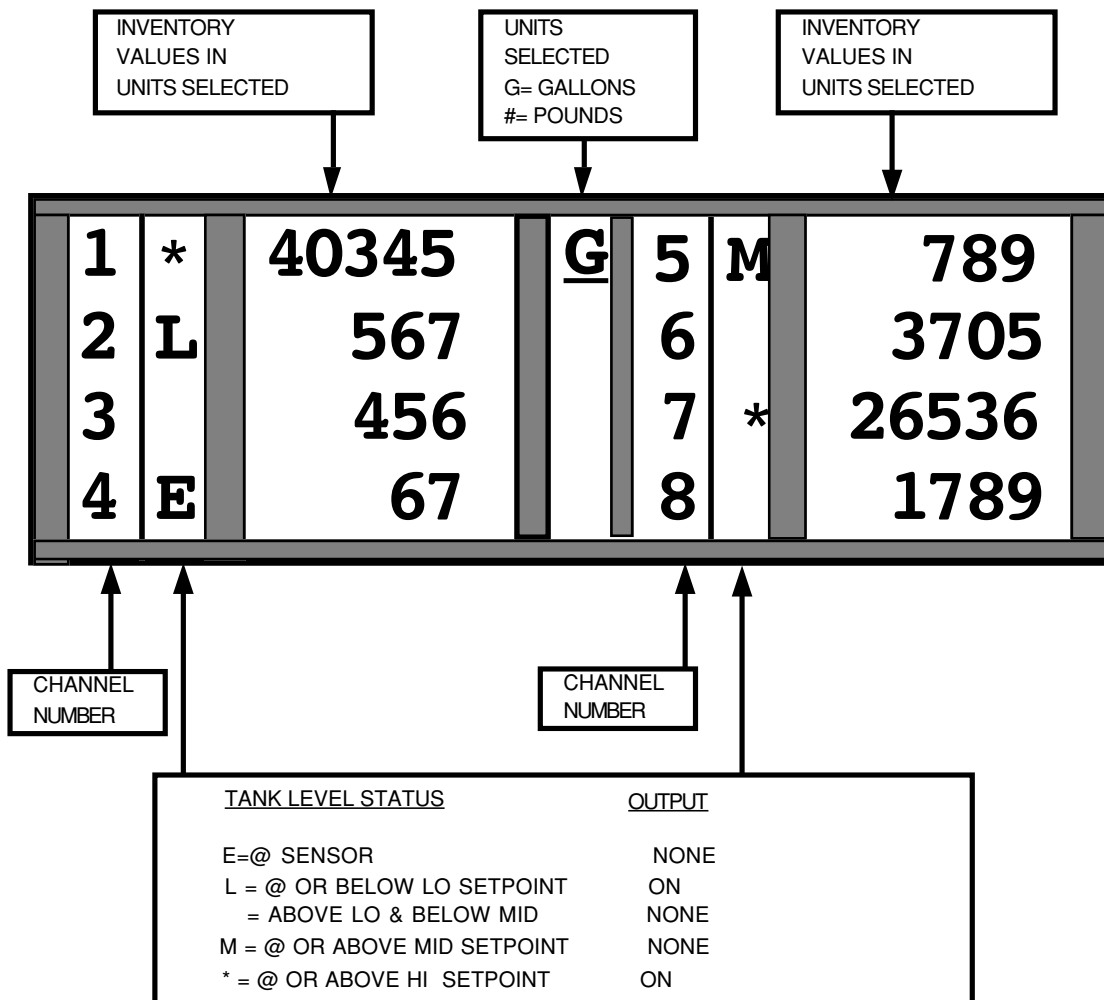
FUNCTION PUSHBUTTONS

- RUN PAGE** - toggles between the multi-tank and the single tank readout. Depressing this button from any other sub-level viewing or programming screen will return to the active inventory screen last viewed.
- PROG** - turns on/off the system programming feature allowing for alterations of tank, product and sensor parameters when required.
- UNIT** - toggles between pre-programmed units of measure (pounds and gallons or liters and kilograms)
- ALARM** - changes screen to view alarm setpoint values in gallons. The multi-tank screen will indicate all the HI- level values indicated by an asterisk (*) and by pressing the up and down keys to the left of the readout the screen will change to view MID (M) and LO (L) level values. The single tank screen will display the HIGH - MID - LO for the tank selected. Press RUN/PAGE to return to normal inventory display.
- PROD** - changes screen to view product names for all tanks from the multi-tank screen. Product names are normally displayed on the single tank screen.
- TIME ZERO** - changes Multi-tank screen to view the zero offset values in ATOD counts of the transmitter output for all tanks. From the single tank screen the bottom line will display the ATOD values of the offset as well as the current output.
- PRINT** - accesses optional line printer.
- ALARM ACK** - acknowledges an alarm condition and silences optional audible alarm
- ENTER** - records the existing entry in a data field in memory and either moves to the next programmable data field on the page or moves to the next screen and terminates the programming mode.
- DELETE** - erases an entry in an active field during programming

MULTIPLE TANK DISPLAY

The K1600 Multi-tank display is a two page display where tanks are arranged in 2 columns per page as defined by channel numbers 1-4, 5-8, 9-12, 13-16. Page 1 shows the inventory levels of channels 1 through 8 (tanks 1-8) and Page 2 displays channels 9 - 16 (tanks 9-16). Each tank has a status mark which becomes active when an alarm condition exists (see TANK LEVEL STATUS below). While all tank inventories are continuously updated, the operator can easily toggle from Page 1 to Page 2 by using the scroll keys. The <PAGE> key can be used to toggle from the Multi-tank display to the Individual tank display where more complete tank information can be viewed.

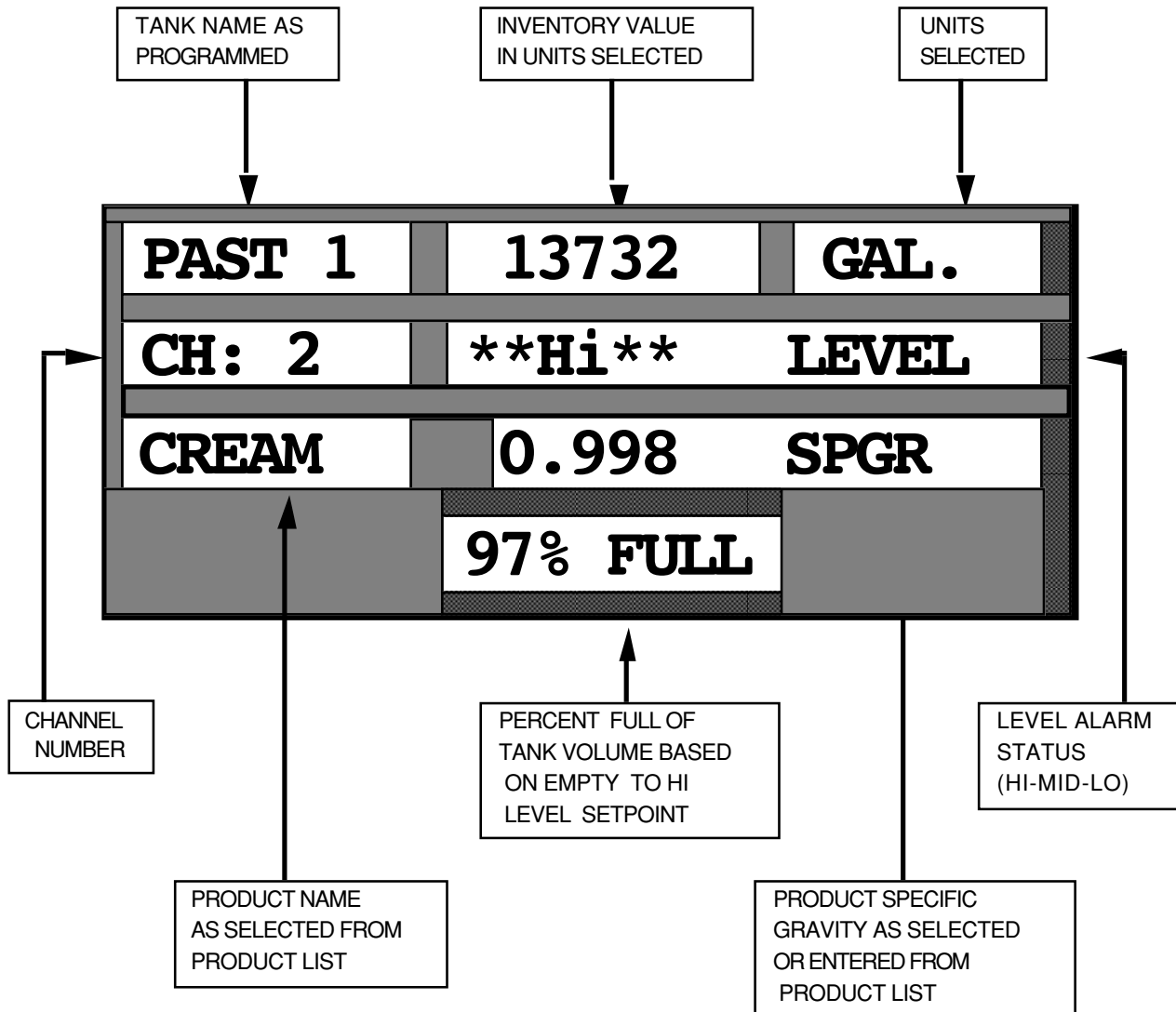
MULTIPLE TANK DISPLAY



SINGLE TANK DISPLAY

This display lists inventory on a tank by tank basis. The operator may view all individual tank information by using the scroll keys to increment or decrement the channel number. Again, the <PAGE> key can be used to toggle between the multiple and individual tank screens.

SINGLE TANK DISPLAY



II. DESCRIPTIONS

CHANNEL NUMBER

During the initial set-up of the system each tank is linked in software to an input channel number as defined by hardware on the analog input board (See System Set-up and Installation). The channel number also defines the Multi-tank display location of a tank and is used throughout the system to identify a particular tank's data shown on display screens where actual tank names cannot be written. Channel numbers are displayed on the Multi-tank displays prior to the particular information requested. On the Single tank displays the channel number is usually preceded by the characters "CH" as in CH:12. There are 16 available channels, one for each tank. The actual number of channels used and displayed is typically determined by the number of tanks on the system. When in the appropriate mode, channel number can be incremented or decremented using the scroll keys.

TANK NAMES

Tank names or designations which define a particular tank appear in the upper left-hand corner of the single tank display and consist of up to six characters. Names such as RT 1, PT 6, or TANK 3 help the operator identify a tank. Tank Names are supplied by the customer and are entered into the system prior to shipment as part of the initial factory set-up. These names are stored in E-prom memory and will not be lost during a power outage. Tank names cannot be altered in the field through use of the keyboard entry system.

UNITS

The K1600 will readout in English or metric units as either Pounds and Gallons or Liters and Kilograms. Units define the units of measure in which the inventory value is shown and appears on the Single tank screen in the upper right-hand corner following the actual inventory value displayed. On the Multi-tank screen units are indicated in the center of the display on the 1st line. Pressing the <UNITS> button toggles the display and inventory values between the units of measure programmed.

PRODUCT NAMES

Product names on the Single tank screen appear on the 3rd row , left-hand side of the display. These names identify the product selected by the operator for the tank shown. Up to 18 product names consisting of a maximum of six characters are supplied by the customer and are pre-programmed at the factory during initial set-up prior to shipment. Similar to Tank Names, Product Names are stored in E-Prom memory and will not be lost during a power outage nor can they be altered through the keyboard entry system. On the Multi-tank screen product names can be viewed by pressing the <PROD> button on the front panel. The product names will be preceded by the appropriate channel number.

(See Viewing Data - Multi-Tank)

SPECIFIC GRAVITY

Product specific gravity is indicated on the Single tank screen only on the 3rd row directly to the right of the product name. Specific gravity refers to the weight of the product in the tank which directly effects the head pressure being measured. The specific gravity of the product displayed has a direct effect on the accuracy of the inventory value and as such care should be taken to insure that the proper "SPGR" is shown. Even though the product name is correct, incorrect SPGR can adversely effect the inventory value indicated. The correct specific gravity for a product is entered and linked to the product name during operator programming so thereafter, a product name selected from the Product list simultaneously selects the correct specific gravity. (See User Programming- Product Name)

PERCENT FULL

Line 4 of the Single tank display indicates how full the tank is in percentage of volume.

GENERAL ALARM STATUS LINE

When an alarm is encountered during normal operation or in the programming mode, line 1 or 4 of any display is replaced by the general alarm status line. This will alert the operator of an alarm condition in a tank. The operator will be cued to silence the audible alarm (optional) and acknowledge, <ACK>, the alarm. After acknowledgement is complete, normal operation will resume. Multiple alarms will be processed on a first in - first out basis.

LEVEL ALARM STATUS

There are three level setpoints per tank (HI - MID - LO) which are programmed by the user. When the level in the tank reaches a setpoint line 1 or 4 on the screen is replaced by the General Alarm Status Line. After all alarms have been acknowledged the display returns to its normal appearance. However, the level status indicator is now activated for the alarms acknowledged. Level alarm status indication appears on both the Single and the Multi-tank screen in various forms. The Multi-tank screen displays an asterisks (*) for high level, the letter "M" for mid level and the letter "L" for low level. These characters appear immediately following the channel number. If there is no indication in the level status column for a particular tank then the actual product level in the tank is between the lo level and the mid level setpoint.

The letter "E" appearing in the level status column indicates that the product level is at or below the level sensor in the tank.

The Single tank screen displays the tank level status on the 2nd line after the channel number and preceding the word "LEVEL". When the tank product level is at or above the Hi-level setpoint the characters "HI" appear. Similarly when the product level is at or above the Mid-level setpoint and below the Hi-level setpoint the characters "Md" appear. The characters "OK" are displayed when the product level is between the lo-level and the mid-level setpoints. "LO" appears when the level is at or below the lo-level setpoint. When the product level is at or below the tank sensor the characters "EMPTY" appear on the screen.

(CAUTION: Even though the screen reads "empty" product may remain in the tank below the level sensor)

ANALOG TO DIGITAL COUNTS

The K1600 uses a 12-Bit **Analog to Digital** converter which normally converts a 4-20 Ma current input signal to 0-4096 digital counts. The K1600 utilizes a "LIVE" zero and condensed span adjustment so that a 4.00 milliamp input produces 50 AtoD counts and a 20 milliamp input produces 4050 counts. The system micro-processor then utilizes these digital counts in determining the product level in the tank. The current **ATOD** count for each tank can be viewed individually from the Single tank screen by pressing the <TIME/ZERO> button. These values can be used as a reference to view and/or adjust the transmitter zero offset when a tank is empty.

TRANSMITTER ZERO OFFSET - MANUAL/ AUTO ZERO FUNCTION

The K1600 is designed to accommodate tank transmitters with either a direct 4-20 ma output or a pneumatic pressure output transduced with the KIO Pneumatic Interface to a 4-20 milliamp signal.

The K1600 utilizes a "live" zero to provide an easy means of adjusting the inventory display for transmitter zero shift both above and below 4.00 ma. The transmitter **Zero Offset** represents the **Analog to Digital** count conversion by the AtoD input card which corresponds to the transmitter output when the product level in a tank falls below the transmitter. Typically the zero setting for a transmitter equals 4.00 ma with a corresponding Zero Offset AtoD value of approximately 50 counts. The Zero Offset value for a particular tank can be viewed by pressing the **<TIME/ZERO>** button when in the Single-tank display mode and verified by comparing it to the actual AtoD count currently being converted from the level sensor when the tank is empty. Both ATOD values should be identical. If they are not, corrections can be programmed directly to the zero offset at the K1600 without physically adjusting the tank sensor. This is referred to as the **Manual Zero Function**.

Shifts in P/I transmitter zeros with pneumatic sensors, when used in conjunction with the KIO-12 or KIO-16 pneumatic input enclosure, are automatically monitored and compensated for by the K1600 on a preprogrammed time interval and therefore cannot be manually programmed. This is referred to as the **Auto-Zero Function**.

III. VIEWING DATA

The K1600 INVENTORY SYSTEM will display tank inventory and information in either a Multi-tank or Single-tank mode. In the single tank mode much of the pertinent information for a tank can be viewed all at once. Due to obvious space constraints the Multi-tank mode will display much less information for each tank. However, when required all data can easily be viewed by the touch of a button.

Parameters which can be viewed and changed from either display mode are:

- UNITS OF MEASURE
- PRODUCT NAMES AND SPECIFIC GRAVITIES
- ALARM LEVEL SETPOINTS
- TRANSMITTER ZERO OFFSET VALUES
- TIME AND DATE

TO VIEW
DISPLAYS

PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN

UNITS

N/A

UNITS OF MEASURE ARE ALWAYS DISPLAYED

1	WHEY	G	5	SKIM
2	MILK		6	OIL
3	WATER		7	SUCRSE
4	CREAM		8	JUICE

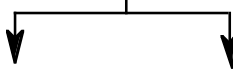
UNITS OF MEASURE ARE ALWAYS DISPLAYED

TANK 1	42730	GAL.
CH: 1	**HI**	LEVEL
CREAM	0.998	SPGR
97% FULL		

PRODUCT
IN TANKS

PROD

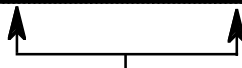
CHANNEL NUMBER



1	WHEY	5	SKIM
2	MILK	6	OIL
3	WATER	7	SUCRSE
4	CREAM	8	JUICE

PRODUCT NAME AND SPECIFIC GRAVITY ALWAYS DISPLAYED

TANK 1	42730	GAL.
CH: 1	**HI**	LEVEL
CREAM	0.998	SPGR
97% FULL		



PRODUCT NAME

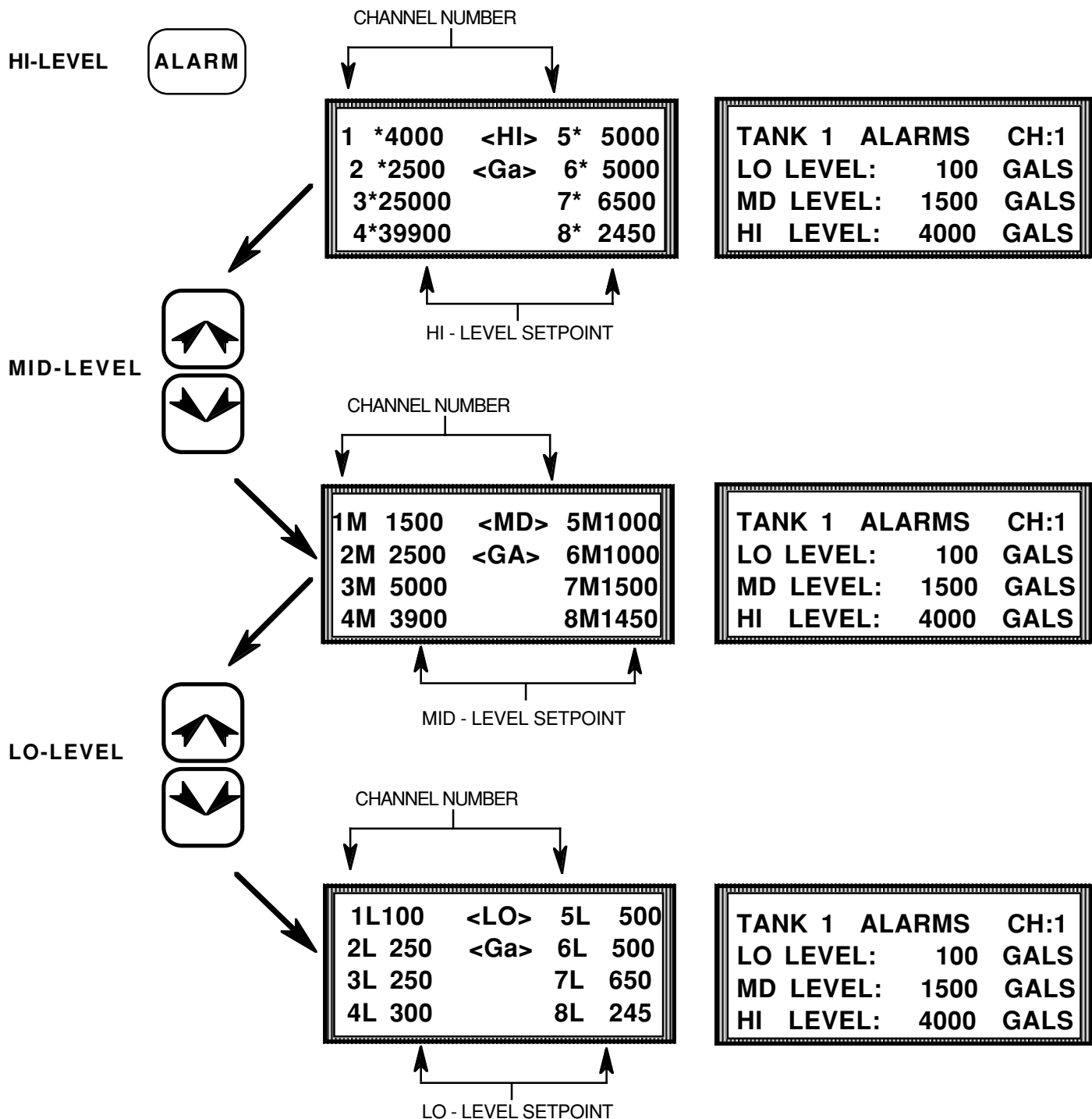
VIEWING DATA

ALARMS SETPOINTS

TO VIEW PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN DISPLAYS



VIEWING DATA

TO VIEW

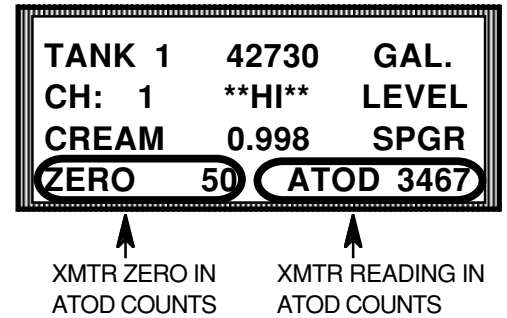
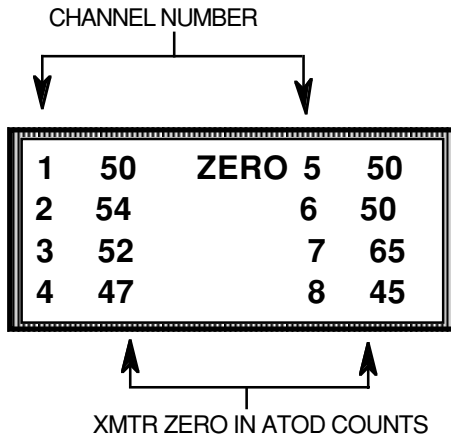
PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN DISPLAYS

ZERO
OFFSET
VALUES

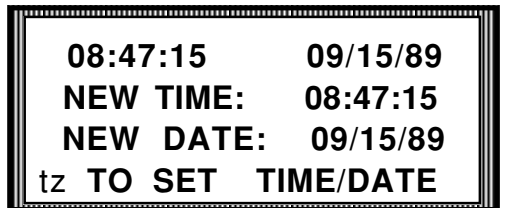
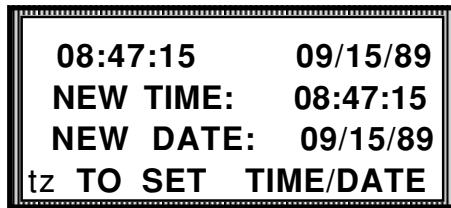
TIME
ZERO



TIME
DATE

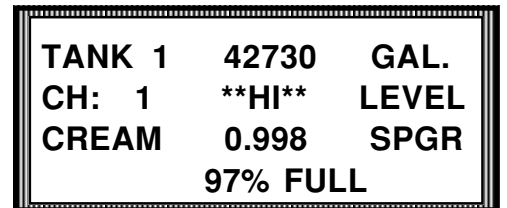
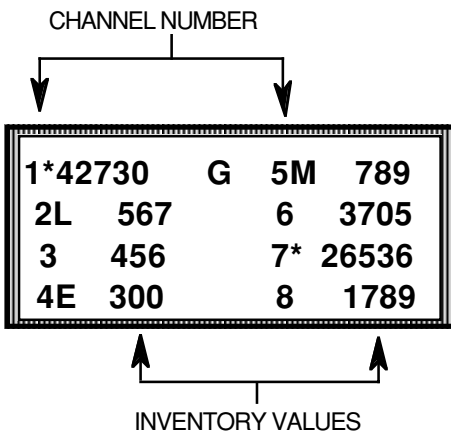
TIME
ZERO

TIME
ZERO



INVENTORY
SCREENS

RUN
PAGE



IV. PROGRAMMING AND CHANGING DATA

Changing tank parameters can be performed from either the Single-tank or the Multi-tank screen by activating the programming function when viewing the appropriate parameter screen.

Programming is initiated by pressing the <PROG> key which activates the numerical keypad on the front panel. A flashing cursor appears on the screen and the system is now in the programming mode awaiting input from the keypad. The program mode can be terminated by either:

- A. Pressing the <PROG> button again which terminates programming at the point where the programming function was entered and no changes to the entry are made
- B. Pressing the <RUN/PAGE> button which terminates the programming mode, no changes to the field are made and returns the system to the inventory screen last viewed
- C. Pressing the <ENTER> button which records the new entry in the data field and either moves to the next programmable data field on the page or moves to the next screen and terminates the programming mode.

ACCESS CODES

The system recognizes three codes that allow access to restricted programming areas. These three unique codes are programmed through the system and correspond to three levels of clearance: Low, High, and Master. The Master access code is reserved for areas in the system which are used to initially set up the system parameters and is not normally accessible to plant personell while High and Low access codes allow Operator entrance to select areas.

As previously stated all display pages may be viewed and all viewing functions can be executed without any access code requirement. In these cases operation of the function begins immediately upon selection of a particular function command.

However, programming requires that a valid access code be entered before execution of the desired procedure can be permitted. When access codes are required the access code prompt will be displayed. If a valid code with equal or higher clearance than that required by the selected procedure is not entered at this point, the system will deny access to that procedure.

Access codes must be entered during the program phase, when prompted, in order to modify tank or product parameters. Appropriate code levels required to change parameters are listed below (a higher code level than required is acceptable).

ACCESS LEVELS REQUIRED TO CHANGE PARAMETERS


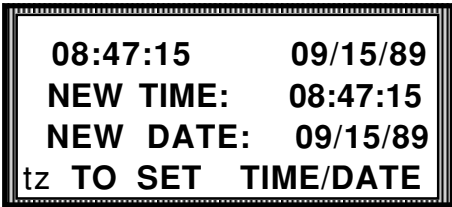
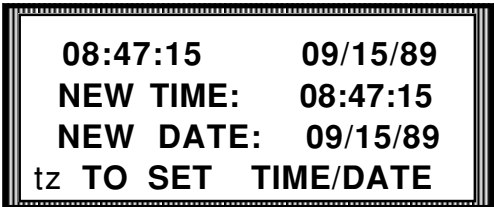
<u>LOW</u>	<u>HIGH</u>	<u>MASTER</u>
TIME AND DATE	ALARM SETPOINTS	RESERVED
PRODUCT NAMES	XMTR ZERO OFFSETS	
SPECIFIC GRAVITIES	UNIT OF MEASURE SETTING	

TIME AND DATE

TO PROGRAM PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN DISPLAYS

TIME			
DATE			

Press the **<TIME/ZERO>** button twice from either the Multi-tank or Single tank display. Then press the **<PROG>** button to activate the programming feature. The screen displays access code:

<ENTER ACCESS CODE>
XXXX

Enter the low level access code. If a mistake is made the following screen will be displayed and the sequence will have to be restarted from the beginning.

****** ERROR !!****
YOUR ACCESS LEVEL IS
NOT HIGH ENOUGH FOR
SELECTED FUNCTION!**

When the proper code is entered the date/time screen will reappear with a flashing cursor. The system is now ready to program the new date and time.

**08:47:15 09/15/89
NEW TIME:
NEW DATE: 09/15/89
tz TO SET TIME/DATE**

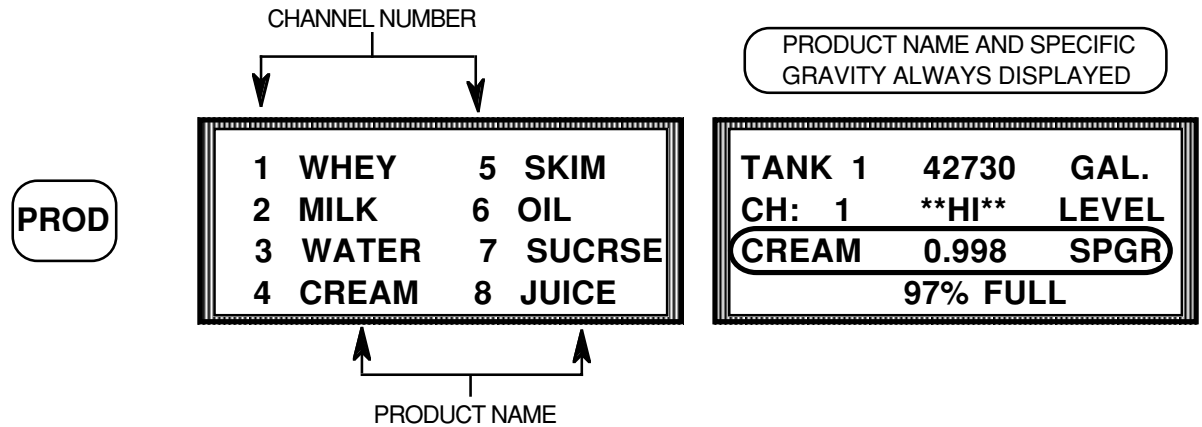
1. Enter the correct time in 24 hour format - hr/min/sec - or press the enter button until the flashing cursor appears over the number to be changed. The cursor will move to the next field when **<ENTER>** is pressed.
2. When the desired time and date appear turn off the programming feature by pressing the **<PROG>** button again.
3. Press the **<TIME/ZERO>** button to enter the changes into the system. The top line will now display the new time and date.
4. Press the **<RUN/PAGE>** button to return to the inventory screen.

PRODUCT NAMES AND SPECIFIC GRAVITY

TO PROGRAM PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN DISPLAYS



To change product names and / or specific gravities press the **<PROD>** pushbutton from the Multi-tank display and the above display will appear (the product name and specific gravity always appears on the single tank display). Press the **<PROG>** pushbutton to alert the system that the programming function is desired and activate the keypad.

On the Multi-tank display a flashing number appears at the bottom center of the display which signifies the tank channel number from the list above for which, if entered, the product will be changed. If a different tank product is to be changed other than that which is indicated by the flashing number, select the desired channel number from the keypad and press **<ENTER>**.

The Single tank screen displays the product name and specific gravity as part of the normal readout. If the product name to be changed is for a tank other than what is currently being displayed, use the **<UP-DOWN scroll arrows>** on the left of the display to move to the desired tank. When the proper tank is displayed press the **<PROD>** button.

The following screen will appear when the **<PROD>** button from the single tank display or the **<ENTER>** button from the Multi-tank display is pressed:

Programming cont.

```
TANK 1    WATER=1.000
CHANGE PROD = <PROG>
EXIT = <RUN/PAGE>
```

Press the **<RUN/PAGE>** button to return to the inventory display or press the **<PROG>** button to continue programming. When the **<PROG>** button is pressed the access code screen is displayed and the proper access code must be entered for the system to allow further programming.

```
<ENTER ACCESS CODE>
XXXX
```

ENTER THE LOW LEVEL ACCESS CODE. IF A MISTAKE IS MADE THE FOLLOWING SCREEN WILL BE DISPLAYED AND THE SEQUENCE WILL HAVE TO BE RESTARTED FROM THE BEGINNING.

```
**** ERROR !!****
YOUR ACCESS LEVEL IS
NOT HIGH ENOUGH FOR
SELECTED FUNCTION!
```

When the proper access code is entered the **PRODUCT LIST** screen will be displayed. The first line indicates the tank designated for alteration, the Product name currently in that tank and the specific gravity of the current product. Lines 2 - 4 lists the alternative product choices programmed into the system.

```
TANK 1    WATER=1.000
1 WATER      4 PRDT 4
2 PRDT 2     5 PRDT 5
3 PRDT 3     6 PRCT 6
```

There are 18 product choices listed 1-6, 7-12, and 13-18. Use the **<DOWN>** scroll button to find the page on which the desired new product number is found. Press **<PROG>** to activate the programming feature.

Programming cont.

After pressing **<PROG>** to active the programming feature, a flashing number appears at the bottom center of the screen.

```
TANK 1   WATER=1.000
1 WATER           4 PRDT 4
2 PRDT 2         5 PRDT 5
3 PRDT 3   1 6 PRCT 6
```

Select the new product number and press **<ENTER>**.

```
TANK 1   WATER=1.000
1 WATER           4 PRDT 4
2 PRDT 2         5 PRDT 5
3 PRDT 3   5 6 PRCT 6
```

The following screen appears after **ENTERING** the product number:

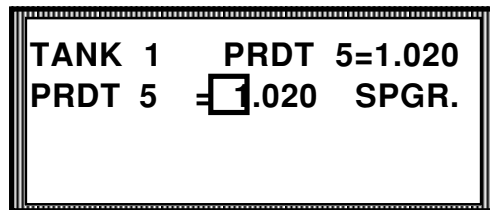
```
TANK 1   WATER=1.000
PRDT 5 = 1.020 SPGR.
<PROG> TO CHNG PROD
SPGR,   <ENTER> IF OK
```

The new product name and specific gravity appear on line 2 below the old information. If the specific gravity shown for the new product is correct, press **<ENTER>** and the screen will change to the inventory screen with the new product and gravity entered into the system and product programming is complete.

If, however, the specific gravity for the new product needs to be altered then go to the next step.

Programming cont.

When the specific gravity for the new product needs to be altered press the **<PROG>** button and the following will appear:

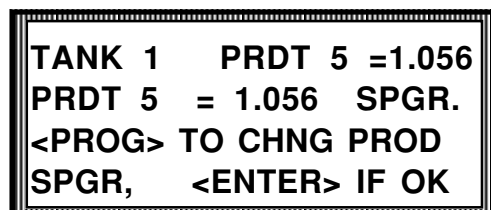


TANK 1 PRDT 5=1.020
PRDT 5 = 1.020 SPGR.

The tank name appears on the first line along with the new product and its specific gravity. The second line shows the product name and a flashing cursor appears over the first number of the gravity signifying that this will be the first number of the new gravity. Select the new gravity by pressing the appropriate numbers on the keypad. A valid entry must fall between .500 and 2.000. (The decimal point is assumed and does not have to be entered). The **<DELETE>** key erases the entry.

When the desired number appears on the display with the flashing cursor over the first number press the **<PROG>** button again to disengage the programming feature and the display reverts back to the previous screen with, however, the new product and specific gravity in place.

EXAMPLE: 1056 <PROG>



TANK 1 PRDT 5 =1.056
PRDT 5 = 1.056 SPGR.
<PROG> TO CHNG PROD
SPGR, <ENTER> IF OK

Now press **<ENTER>** if the product and gravity are correct and the screen will return to the inventory screen utilizing the new product name and specific gravity.

Programming cont.

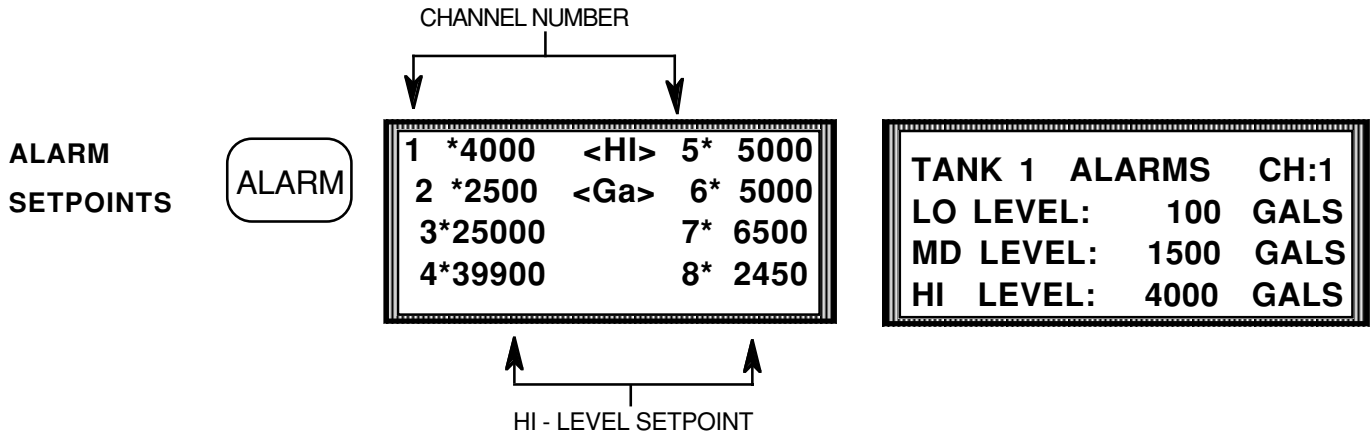
ALARM SETPOINTS

NOTE: All alarm level setpoints are to be entered in GALLON values.

TO PROGRAM PRESS

MULTI-TANK SCREEN DISPLAYS

SINGLE-TANK SCREEN DISPLAYS

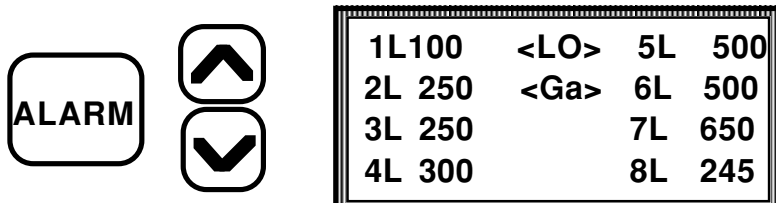


To program the alarm setpoints first display the current alarm points by pressing the **<ALARM>** button from either the Multi-tank or the single tank screen.

From the Multi-tank Display first find the HI, MID or LOW level screen which displays the level value for the tank channel number to be changed by pressing the **<ALARM>** button and the **<UP-DOWN SCROLL>** buttons. Then press the **<PROG>** button, the **<channel number>** for the alarm to be changed, and then the **<ENTER>** button. The Single tank level alarm screen will then be displayed.

For example, if the LOW level setpoint is to be changed on tank channel number# 5 to 250 gallons then:

1. Press the **< ALARM>** button from the Multi-tank inventory display
2. Press the **<UP-DOWN SCROLL>** buttons until the screen displays the low level value for tank channel #5
3. Press **<PROG>** and a flashing cursor appears at the middle of the bottom line.
4. Press the **<5>** on the keypad and the **<ENTER>** button.



Programming cont.

PRESS <PROG> AND A FLASHING CURSOR APPEARS

1L100	<LO>	5L	500
2L 250	<Ga>	6L	500
3L 250		7L	650
4L 300	2	8L	245

PRESS <5> then <ENTER> and the Single tank alarm level screen appears

SINGLE TANK LEVEL ALARM SCREEN

TANK 5	ALARMS	CH:5
LO LEVEL:	500	GALS
MD LEVEL:	1500	GALS
HI LEVEL:	4000	GALS

Press <PROG> to inform the system that programming is desired and the access code screen will appear.

<ENTER ACCESS CODE> XXXX

ENTER THE HIGH LEVEL ACCESS CODE. IF A MISTAKE IS MADE THE FOLLOWING SCREEN WILL BE DISPLAYED AND THE SEQUENCE WILL HAVE TO BE RESTARTED FROM THE BEGINNING.

**** ERROR !!**** YOUR ACCESS LEVEL IS NOT HIGH ENOUGH FOR SELECTED FUNCTION!
--

Programming cont.

When the proper access code is entered the Single tank Alarm level screen will reappear with a flashing cursor over the first number that can be changed.

TANK 5 ALARMS	CH:5
LO LEVEL: <input type="text"/> 500	GALS
MD LEVEL: 1500	GALS
HI LEVEL: 4000	GALS

If the cursor is over the level value to be changed then enter the proper value through the keypad and press **<ENTER>**. A valid entry is between 0 and 99,999 gallons. When **<ENTER>** is pressed the cursor moves to the next programmable data field. If the cursor is not over the desired value press **<ENTER>** or the **<UP-DOWN SCROLL>** buttons to move the cursor. The **<DELETE>** button will erase an entry.

To change the low value to 250 gallons press **<2> <5> <0> <ENTER>**.

TANK 5 ALARMS	CH:5
LO LEVEL: 250	GALS
MD LEVEL: <input type="text"/> 1500	GALS
HI LEVEL: 4000	GALS

If all the values shown are correct then press the **<RUN/PAGE>** button to return to the inventory display.

As previously indicated all level setpoints are programmed in gallons regardless of the normal inventory display units. In addition, when the alarm values are entered, if the current volume in the tank meets the alarm condition the **GENERAL ALARM STATUS LINE** will appear and the alarm will have to be silenced and acknowledged. In doing so, the programming function is automatically turned off and the **<PROG>** button will have to be pressed and access codes re-entered.

Programming cont.

TRANSMITTER ZERO OFFSETS

TRANSMITTER ZERO OFFSET - MANUAL/ AUTO ZERO FUNCTION

The K1600 is designed to accommodate tank transmitters with either a direct 4-20 ma output or pneumatic pressure output converted to a 4-20 milliamp signal. The 4-20 milliamp signal is converted to digital counts by the **Analog to Digital** converter board in the K1600. The K1600 utilizes a "live" zero which provides an easy means of compensating the inventory display for transmitter zero shift, both above and below 4.00 ma. When a 4.00 ma signal from the transmitter is applied to the input termination board, the current **AtoD** count for a particular channel should read about 50 counts.

Transmitter outputs can shift for a variety of reasons, most notably due temperature fluctuations. If not adjusted or compensated for, transmitter shift will cause errors (either high or low) in inventory readings.

The Transmitter Zero Offset represents the **Analog to Digital** count which corresponds to the transmitter output (presumably 4.00 ma) when the product level in a tank falls below the transmitter. The Zero Offset value for a particular tank can be viewed by pressing the **<TIME/ZERO>** button when in the single tank display mode and verified by comparing it to the actual **AtoD** count currently being converted from the level sensor when the tank is empty . The value on the left (Offset value) should match the current AtoD value on the right. If they do not, corrections can be made directly to the Zero Offset at the K1600 without physically adjusting the tank sensor. This **AtoD** number represents the zero setting of the transmitter and will be used in determining the net AtoD value required for calculating inventory. Typically, a transmitter output of 4.00 milliamps should read approximately 50 AtoD counts.

Shifts in P/I transmitter zeros with pneumatic sensors, when used in conjunction with the KIO-12 or KIO-16 pneumatic input enclosure, are automatically monitored and compensated for by the K1600 on a preprogrammed time interval and therefore cannot be manually programmed.

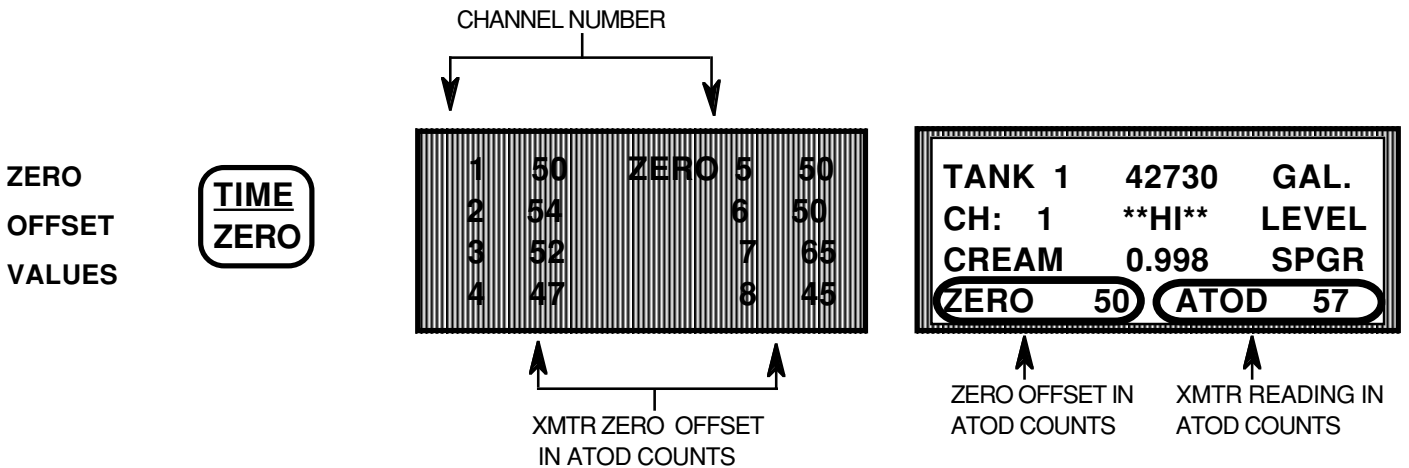
Programming cont.

Example: The tank on Channel #5 is empty and the zero offset reads 50 but the transmitter reads 57 AtoD counts. This means that the zero of the transmitter has shifted upward from approx. 4.00 ma to approx. 4.028 ma.

TO PROGRAM PRESS

MULTI-TANK SCREEN DISPLAYS

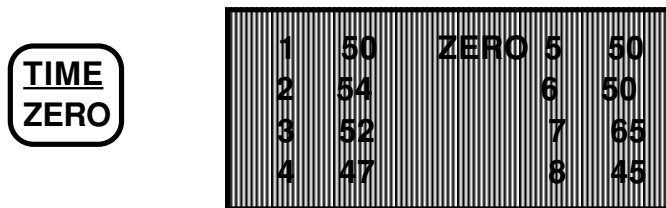
SINGLE-TANK SCREEN DISPLAYS



To program the transmitter zero offset, first display the current offset by pressing the **<TIME/ZERO>** button from either the Multi-tank or the single tank screen.

From the Multi-tank Display locate the zero value for the tank channel number to be changed. Then press the **<PROG>** button, the **<channel number>** for the offset to be changed, and then the **<ENTER>** button. The Single tank zero offset screen will then be displayed.

1. Press the **<TIME/ZERO>** button from the Multi-tank inventory display
2. Press **<PROG>** and a flashing cursor appears at the middle of the bottom line.
3. Press the **<5>** on the keypad and the **<ENTER>** button.



Programming cont.

PRESS <PROG> and a flashing cursor appears

1	50	ZERO	5	50
2	54		6	50
3	52		7	65
4	47	2	8	45

PRESS <5> then <ENTER> and the Single tank alarm level screen appears.

SINGLE TANK ZERO OFFSET SCREEN

TANK 5	30	GAL.
CH: 1	**LO**	LEVEL
CREAM	0.998	SPGR
ZERO	50	ATOD 57

↑ XMTR ZERO IN ATOD COUNTS ↑ CURRENT XMTR OUTPUT IN ATOD COUNTS

PRESS <PROG> to inform the system that programming is desired and the access code screen will appear.

<ENTER ACCESS CODE>
XXXX

ENTER THE HIGH LEVEL ACCESS CODE. IF A MISTAKE IS MADE THE FOLLOWING SCREEN WILL BE DISPLAYED AND THE SEQUENCE WILL HAVE TO BE RESTARTED FROM THE BEGINNING.

**** ERROR !!****
YOUR ACCESS LEVEL IS
NOT HIGH ENOUGH FOR
SELECTED FUNCTION!

Programming cont.

When the proper access code is entered the Single tank Zero Offset screen will reappear with a flashing cursor over the zero offset currently being stored in memory and ready to program.

NOTE: If the Auto Zero Function is activated a screen will appear indicating that the Zero Offsets cannot be changed manually.

TANK 5	30	GAL.
CH: 1	**LO**	LEVEL
CREAM	0.998	SPGR
ZERO <input type="checkbox"/>	50	ATOD 57

Enter the current transmitter AtoD value through the keypad and press <ENTER>. When <ENTER> is pressed the new value becomes the Zero Offset which is stored in memory. The <DELETE> button will erase an entry.

To change the Zero Offset value to 57 AtoD counts press <5> <7> <ENTER>.

TANK 5	30	GAL.
CH: 1	**LO**	LEVEL
CREAM	0.998	SPGR
ZERO	57	ATOD 57

The new Transmitter Zero Offset Value will now be utilized in determining the correct inventory value without having to physically re-zero the transmitter.

NOTE: If the current AtoD reading of the transmitter output deviates greatly in either direction from the stored Zero Offset value when the tank is empty and temperature stabilized then the tank transmitter should be physically re-calibrated prior to resetting the Zero Offset value. Reprogramming of the Transmitter Zero Offset should be performed on transmitters which have been powered for at least one hour.

Programming cont.

UNITS OF MEASURE SETTING

The K1600 is designed to readout in units of either English or Metric. Unless otherwise specified the K1600 will be shipped to read in Pounds and Gallons of product.

TO PROGRAM PRESS

MULTI-TANK SCREEN DISPLAYS

**DISPLAY
UNITS**

PROG

UNIT

PROGRAM DISPLAY UNITS
(PRESS 1 OR 2)
1- POUNDS OR GALLONS
2- LITERS OR KILOS

From the Multi-tank Display only press the <PROG> button then the <UNIT> button and the following display appears:

PROGRAM DISPLAY UNITS
(PRESS 1 OR 2)
1- POUNDS OR GALLONS
2- LITERS OR KILOS

Press either 1 or 2 to change the display units to either pounds or gallons OR liters or kilos. The Access Code Screen appears and the proper code must be entered.

<ENTER ACCESS CODE>
XXXX

ENTER THE HIGH LEVEL ACCESS CODE. IF A MISTAKE IS MADE THE FOLLOWING SCREEN WILL BE DISPLAYED AND THE SEQUENCE WILL HAVE TO BE RESTARTED FROM THE BEGINNING.

Programming cont.

****** ERROR !!****
YOUR ACCESS LEVEL IS
NOT HIGH ENOUGH FOR
SELECTED FUNCTION!**

When the proper access code is entered the Program Units screen will reappear momentarily and the system will return to the Multi-tank inventory display with the new units of measure being displayed. To change from one unit to another now just press the <UNITS> button.

NOTE: When the RS232 communication port is being utilized do not change units of measure unless the host computer is properly advised as this also changes the inventory values being transmitted to the newly selected unit of measure.

V. INSTALLATION AND START UP

INSTALLATION of INVENTORY CABINETS

1. Mount Main K1600 enclosure in safe location away from steam, vibration, and where wide temperature changes may occur. IF RS232 communications are to be utilized consideration should be given to the distance between the K1600 and the Host computer.
2. Install the KIO-12 or KIO-16 PNEUMATIC INPUT ENCLOSURE if required as shown on PHYSICAL LAYOUT Data Sheet# DS-112590PLPN12 or #DS-011091PLPN16.
3. Any conduit or plumbing brought into the enclosure should comply with Nema-4 standards. Do not enter the enclosure from the top if possible. Top entry may tend to leak and water damage will void warranty.
4. When providing openings in the cabinet, extreme care should be taken to cover all components as metal shavings can cause shorts in the system.
5. A clean 120VAC power source should be provided from a dedicated circuit breaker. This breaker must be on at all times and no other equipment may be powered from it. A power conditioning unit may be required to reduce incoming line noise depending on individual plant conditions.
6. Keep electrical connection clean and dress all wiring. Route electrical wiring away from all enclosure equipment (along bottom or side of enclosure).
7. Do not use enclosure for any outside wiring or other electrical equipment. Do not use enclosure as a pull box.
8. Enclosure doors should be secured at all times. This is to prevent outside contamination and to stabilize internal temperature.

Installation and Start up cont.

9. Connect incoming 120VAC power to AC input terminals (TB1) as shown on PHYSICAL LAYOUT Data Sheets #DS-120590PLMA , #DS-112590PLPN12, #DS-011091PLPN16.

120 VAC L - TERMINAL #1 (H)
120 VAC N - TERMINAL #2 (N)
GROUND G - TERMINAL #3 (G)

INSTALLATION OF 4-20MA TRANSMITTERS

If supplied by K SYSTEMS CORP. , see enclosed Manufacturer's manual or Data Sheet on installation of tank transmitters.

INSTALLATION OF 4-20MA SIGNAL LINES

1. To connect incoming 4-20 MA sensor signal lines see the following Data Sheets:
Incoming signal lines must be connected in the positions as outlined on the Data Sheets.
Unpowered transmitters can use the 24VDC on-board power supply of the K1600.

Direct 4-20 ma signal wires - K1600 PHYSICAL LAYOUT
Data Sheet #DS-120590PLMA

- TRANSMITTER INPUT &
COMMUNICATION DATA
Data Sheet #DS-010291TMAD

2. Signal lines from the tank transmitters are to be installed to the input terminals as shown on the Data Sheet and in the order as they appear on the Multi-tank Inventory screen. The input channels are positioned on the terminal strip in blocks of 4 terminals from the bottom to top #1-16. Terminal Block #1 is stacked underneath TERMINAL Block #2 and alternate similarly for 3-16. Odd numbered Blocks are under the even numbered blocks. Removeable plug in terminals are provided to facilitate wire installation. The first tank displayed in the CHannel #1 position on the Multi-tank screen (upper left) is associated with Terminal Block #1 and so on.

Installation and Start up cont.

INSTALLATION OF PNEUMATIC TANK SENSORS AND CONTROLS

If supplied by K SYSTEMS CORP. , see enclosed Manufacturer's manual or Data Sheet on installation of tank transmitters.

INSTALLATION OF PNEUMATIC TANK SENSOR SIGNAL LINES

1. To connect incoming Pneumatic Sensor Air Lines see the following Data Sheets: .
Incoming signal lines must be connected in the positions as outlined on the Data Sheets.

Pneumatic Sensor tubing - KIO-12 PNEUMATIC INPUT ENCLOSURE LAYOUT
Data Sheet #DS-112590PNI12

- KIO-16 PNEUMATIC INPUT ENCLOSURE LAYOUT
Data Sheet #DS-010991PNI16

2. Signal air lines from the tank sensor controls are to be installed to the solenoid associated to P/I transducers as labeled or in the order as shown on the Data Sheet and Multi-tank Inventory screen. The transducers are positioned in the rack from left to right 1-12. The first tank displayed in Channel #1 on the Multi-tank screen (upper left) is associated with P/I rack Position #1 (far left).
3. Do not pressurize enclosure. Only transmitter air lines should be brought into the enclosure and they must be connected to P/I converter or capped. No other air device should be installed in enclosure.
4. Pneumatic air leaks will produce incorrect inventory values. Check for leaks with air line not connected to P/E rack as **overpressure can damage the P/I transducers.**

Installation and Start up cont.

INSTALLATION OF OPTIONAL LEVEL ALARMS OUTPUTS

The alarm output board allows for 24-120Vac relays that are currently programmed for HI and LO level alarm outputs on Channels 1-12. See DATA SHEET #DS-112890AO- K1600 ALARM OUTPUTS for installation of external wiring.

INSTALLATION OF OPTIONAL RS232 COMMUNICATION

An RS232 communication port is provided for downloading inventory information to a host computer on demand. For Cable connections, Software protocol and transmission information refer to Data Sheet #DS-010191SC REV 1 - K1600 SERIAL COMMUNICATION BOARD and Data Sheet #DS-010291TMAD - TRANSMITTER INPUT & COMMUNICATION DATA.

INSTALLATION OF OPTIONAL ALARM HORN

Mount horn in desired location per the mounting instructions provided with the horn. connect horn wiring according to Data Sheet #DS-100591OH and DS-022792AH

OPERATION AND START UP

Before introducing power to the inventory system, check to see that all connections are tight and made to the correct terminal. Turn the power switch on the power supply board to the "ON" position and the system should power up and momentarily display the K Systems Initialization Screen and then display the Multi-tank Inventory screen. If this does not occur turn off the System, check the incoming power connections and restart again.

The K1600 is now running and will show inventory values based on the tank and information provided prior to shipment. **If an alarm condition is present the GENERAL ALARM STATUS LINE will appear and the alarm condition will have to be acknowledged by pressing the <ACK> pushbutton. Several alarms may have to be acknowledged.** The inventory values shown after all alarms have been acknowledged should reflect the "RESERVE" values assuming the tanks are empty. The "RESERVE" values represent the amount of product in the tank below the sensor that obviously cannot be sensed by the tank transmitters and will be the lowest value displayed by the system. As Product is being introduced into the tank the display will not register until the "RESERVE" value is exceeded.

Installation and Start up cont.

Check Product names and Specific Gravities for each tank to see that what is displayed truly reflects the tank contents. If not refer to Programming and Changing Data -Product Names & Specific Gravities.

INSTALLATION AND START UP SUMMARY

1. Review Entire manual before Installation & Operation
2. Install cabinets per appropriate Data Sheets
3. Connect clean 120VAC power to power board terminals
4. Connect transmitter signal wires or tubing per appropriate Data Sheet
5. Connect Alarm Output wiring if required
6. Connect RS232 communication cable if required
7. Mount and connect optional remote alarm horn if required
8. Turn on system
9. **Silence Alarm horn and acknowledge any active alarms.**
10. Check transmitter Zero Offset Values for each tank input and set if required
11. Check Product Names and Specific Gravities and change if required