
K SYSTEM CORPORATION INVENTORY SYSTEM

GENERAL DESCRIPTION

The K SYSTEM TANK INVENTORY CONTROL SYSTEM, #8600C Series, provides an extremely accurate method of continuously monitoring the liquid contents in storage tanks. The tanks may vary in size and shape and the liquids therein may be of any density or viscosity.

The pressure sensor, installed in each tank, produces an air pressure output proportional to the head pressure in that tank. This pressure is transmitted to a P to E transducer which converts that signal to a 0 to 10 volt DC signal. The resulting voltage is then processed by the system computer to provide accurate information on the contents in the tanks.

Product weight, volume or level for each tank is displayed on a video monitor. Units of measurement are operator selected to display the tank contents in pounds, kilograms, gallons, liters, inches or centimeters. The unused capacity of the tanks may be ascertained by pressing the "ULLAGE" pushbutton (optional). The approximate level of each tank is displayed in percent of maximum level both numerically and by use of a bar graph. This provides the user with a quick overview of product level in each tank.

Three adjustable volumetric setpoints are provided for each tank. The status of the alarms for each tank are displayed on the monitor and optional 115 VAC alarm outputs are accessed at the terminal strip located inside along the right side of the alarm cabinet attached to the main enclosure.

The product information generated by the 8600C Series INVENTORY SYSTEM may also be used for documentation purposes. The standard options include a printer to provide hard copy data on command and an RS232 output to communicate with a host computer or other peripheral equipment.

The printer option consists of a panel mounted 20 column printer which is activated by pressing the "PRINT" pushbutton. The printer will record the tank position, tank name, product name, alarm status, specific gravity and the product amount for each tank, as well as the time of actuation.

The RS232 option transmits current product quantity data upon receiving "send" signal from a peripheral device.

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OPERATION (RUN MODE)

After the product variables have been programmed, the "MODE" switch is placed in the "RUN" position and the system monitors the inventory and level status of the tanks.

A typical display for the MODEL 8600C Series is as follows:

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<u>TANK NAME</u>	<u>GALLONS</u>	<u>STATUS</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>% LEVEL</u>
TANK #1	79872	HI	1.034	PRODUCT A	92*****.
TANK #2	28764	MID	1.000	PRODUCT B	47*****.
TANK #3	630	LO	1.367	PRODUCT C	10*....
TANK #4	1978	MID	1.000	PRODUCT D	28***...
TANK #5	58	LO	1.020	PRODUCT E	2.....
TANK #6	99998	HI	1.000	PRODUCT F	100*****.
TANK #7	7296		1.000	PRODUCT G	30***...
TANK #8	10508	MID	1.000	PRODUCT H	79*****.
TANK #9	78432	HI	1.000	PRODUCT I	48*****.
TANK #10	4788		1.000	PRODUCT J	40***...
TANK #11	97332	LO	1.000	PRODUCT K	82*****.

The first line on the screen identifies the specific tank inventory system, in this case, System 8600C Series.

The time of day is displayed on the far right of the first line in hours: minutes: seconds, using a 24 hour format. The time can be reset at any time.

The first column displays the tanks being monitored, identified by tank name as specified by the customer.

The second column displays the amount of product in each tank. Note that the column heading in the example is GALLONS. The unit of measurement may be changed at any time by the operator to display in LITERS, POUNDS, KGMS, INCHES, or CMS. When the "ULLAGE" button is held in, the values in this column will reflect the unused capacity of each tank. When the "ULLAGE" button is released, the values will revert to the actual amount of product in the tank.

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The third column displays the alarm status of each tank, (HI-MID-LO). When the product amount is below the low setpoint the status display will be LO, and a 115 VAC low alarm output will be generated. When the amount is above LO and below MID, the display will be blank and no alarm output will be generated. When the middle setpoint is exceeded, MID will be displayed and the middle alarm output will come on. When the amount exceeds the high setpoint, HI will be displayed and both medium and high alarm outputs will be generated. The level setpoint values may be changed as outlined in the User Programming Section.

The fourth column displays product specific gravity. The operator sets these values to the specific gravity of the product in each tank (See USER PROGRAMMING Section). If no value has been set, the control will default to 1.000. **CAUTION:** Product name has no bearing on the calculation of content. When product name is changed be sure to check that the specific gravity has the correct value for the new product name. (See note under specific gravity in user programming section).

The last column displays level percentage. The number shown is the product level percentage of maximum level. The bar graph displays this percentage graphically.

NOTE: The following parameters may be changed in the field by authorized personnel -

TIME OF DAY
DISPLAY UNITS
LEVEL ALARM SET POINTS
SPECIFIC GRAVITIES
PRODUCT NAMES

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USER PROGRAMMING

To enter product variables, place the "MODE" selector switch in the "PROGRAM" position. The video monitor will change to display the current status of all variables. An example is as follows:

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?< ENTER DESIRED TANK NO. FOR CHANGES

<u>TANK NAME</u>	<u>NO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #A	(1)	1.034	PRODUCT A	70000	30000	1000
TANK #B	(2)	1.000	PRODUCT B	50000	25000	750
TANK #C	(3)	1.367	PRODUCT C	35000	15000	750
TANK #D	(4)	1.000	PRODUCT D	30000	15000	200
TANK #E	(5)	1.020	PRODUCT E	30000	15000	200
TANK #F	(6)	1.000	PRODUCT F	80000	70000	1500
TANK #G	(7)	1.000	PRODUCT G	10000	75000	500
TANK #H	(8)	1.000	PRODUCT H	15000	10000	500
TANK #I	(9)	1.000	PRODUCT I	75000	25000	400
TANK #J	(10)	1.000	PRODUCT J	10000	5000	300
TANK #K	(11)	1.000	PRODUCT K	99900	9800	970

This display is referred to as "**FULL PAGE**". During programming, the system will still monitor tank product amounts and if any alarm status should change, the corresponding alarm output will be actuated. To return to normal operation, turn "MODE" switch to "RUN".

To change any variable, follow the instructions on line 2 of the monitor (in bold type on the example). The tank numbers are enclosed in blinking parenthesis. Enter the number of the tank to be changed, using the keypad. The numbers entered will be displayed in the flashing parenthesis on the screen. If an error is made in the entry, press the clear or delete button to erase. If the number is correct, press the enter button to enter the number into the system.

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The following example depicts the entry of Tank #4. This display is referred to as Page 2 and isolates the selected tank information on one line. From this page the listed parameters can be changed.

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	1.000	PRODUCT D	30000	15000	200

ENTER NO. OF DATA FIELD TO BE CHANGED

- (1) = SPECIFIC GRAVITY
- (2) = PRODUCT NAME
- (3) = TIME OF DAY
- (4) = NEW TANK NUMBER
- (5) = RETURN TO FULL PAGE
- (6) = HIGH LEVEL LIMIT
- (7) = MEDIUM LEVEL LIMIT
- (8) = LOW LEVEL LIMIT
- (9) = UNITS OF MEASURE

Enter the category of change as directed by the message in bold type.

SPECIFIC GRAVITY

Upon entering a "1" to change the specific gravity, the following display will appear.

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	?	PRODUCT D	30000	15000	200

ENTER NEW SP. GR. (0.500 - 2.000) DECIMAL ASSUMED

Notice the "?" under "SP GR". Enter the new specific gravity as instructed by the last line. Immediately upon entry, the display will revert to page 2, with the new specific gravity displayed. If the number entered was less than 500 or more than 2000, the message "RANGE" will appear at center screen. If this should occur, enter a valid number through the keypad. The new value of specific gravity is now in memory and is being used to compute product amounts.

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PRODUCT NAME

The second category is PRODUCT NAME. Upon entering a "2", the following display will appear.

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	1.222	?	30000	15000	200

ENTER DESIRED PRODUCT NO. (1-13)

- (1) = PRODUCT A
- (2) = PRODUCT B
- (3) = PRODUCT C
- (4) = PRODUCT D
- (5) = PRODUCT E
- (6) = PRODUCT F
- (7) = PRODUCT G
- (8) = PRODUCT H
- (9) = PRODUCT I
- (10) = PRODUCT J
- (11) = PRODUCT K
- (13) = PRODUCT L

Note that the instruction line limits the entry to the number of product names displayed. The number of product names is not limited by the number of tanks and any number of tanks may use the same product name. In this example "13" is entered. The display will revert to page 2, with PRODUCT L in the "PRODUCT" column.

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TIME OF DAY

To change the time of day, enter "3".

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	1.222	PRODUCT L 30000	15000	200	

CHANGE TIME

ENTER HOUR (0-24) AND MINUTES

Following the instructions, enter a four digit number, the first two digits being the hour and the second two digits being the minutes (seconds are not programmable). Example: 1324 would equate to 1:23 pm.

NEW TANK NUMBER

The fourth category is NEW TANK NUMBER. This enables the operator to select a different tank to revise. Upon entering "4", the following is displayed:

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	1.222	PRODUCT L 30000	15000	200	

ENTER NEW TANK NUMBER (1 TO 11)

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RETURN TO FULL PAGE

The fifth category, Return to Full Page, returns the programming screen to the full page display if needed to view all tank parameters.

LEVEL LIMITS

The sixth, seventh and eighth categories provide for changing the activation points of the Hi-Mid-Lo screen display and/or level alarm outputs. Upon entering 6, 7, or 8 the following is displayed:

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<u>TANK NAMENO.</u>	<u>SP.GR.</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D	(4)	1.222	PRODUCT L ?	15000	200
OR					
TANK #D	(4)	1.222	PRODUCT L 30000	?	200
OR					
TANK #D	(4)	1.222	PRODUCT L 30000	15000	?

ENTER NEW LEVEL LIMIT IN GALLONS ____ GAL

Note that the level limits are in **gallons only**.

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UNITS OF MEASURE

The ninth category in Unit Selection. By changing the units the run mode display will show inventory values in selected display units.

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<u>TANK NAMENO.</u>	<u>SP GR</u>	<u>PRODUCT</u>	<u>HI LIM</u>	<u>MID LIM</u>	<u>LO LIM</u>
TANK #D (4)	1.222	PRODUCT L	30000	15000	200

ENTER DESIRED UNIT NO (1 - 6)

(1) = GALLONS
(2) = POUNDS
(3) = LILTERS

(4) = KILOGRAMS
(5) = INCHES
(6) = CENTIMETERS

Enter the number corresponding to the desired units of measurement. Upon returning to the "RUN" mode, the second column will be labled according to this selection and the values will reflect the selected units.