

INSTALLATION AND START UP

INSTALLATION of INVENTORY CABINET

1. Mount ID-1 enclosure in safe location away from steam, vibration, and where wide temperature changes may occur.
2. 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.
3. When providing openings in the cabinet, extreme care should be taken to cover all components as metal shavings can cause shorts in the system.
4. 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.
5. Keep electrical connections clean and dress all wiring. Route electrical wiring away from all enclosure equipment (along bottom or side of enclosure).
6. Do not use enclosure for any outside wiring or other electrical equipment. Do not use enclosure as a pull box.
7. Enclosure doors should be secured at all times. This is to prevent outside contamination and to stabilize internal temperature.
8. Install 1/4 X 1/4 Tube Bulkhead Fitting in cabinet (preferably in bottom). Connect 1/4" Polyflo tube between bulkhead fitting and the fitting in the P/I mounting rack. **NOTE: Air leaks will cause inaccurate inventory readings.**
9. Connect incoming 120VAC power to AC input terminals as shown on Drawing# C0087-4.
 - 120 VAC L - TERMINAL #17 (H)
 - 120 VAC N - TERMINAL #18(N)
 - GROUND G - TERMINAL Gnd (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 LINEARIZED 4-20MA OUTPUT LINES

A linearized 4-20 mA signal will be transmitted from the terminals as shown on Print C0087-4. See the FACTORY CONFIGURATION data sheet enclosed for the indicator value range of the output.

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. Signal air lines from the tank sensor controls are to be installed to the Bulkhead Fitting previously installed in the cabinet
2. 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.
3. 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.**

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 on and the system should power up and display an Inventory number. If this does not occur turn off the System, check the incoming power connections and restart again.

The ID-1 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 ALARM STATUS light will appear and the alarm audible will sound and will have to be acknowledged by pressing the <Silence> pushbutton.** The inventory values shown should read "0" assuming the tank is empty. As Product is being introduced into the tank the display will not register until the level sensor is covered.

Check OFFSET

Set the zero offsets of each transmitter on the ID-1 per the instructions in "**OFFSET**".

If the values shown for Zero is different than what is listed in the Factory Configuration sheet, check the transmitter output to make sure that it is 4.00 ma and refer to **Configuration Menu Items Section V. Offsets.**

If pneumatic tank sensors and controls are used in conjunction with the ID-1 the tube should be disconnected during this process.

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 Specific Gravity and change if required

OPERATING INSTRUCTIONS

ALARM [A] AND [B] KEYS

The ID-1 features (2) form C relay outputs rated at 5 amps (non-inductive loads). The alarm relays activate when the ID-1 displayed value exceeds the alarm set point. To avoid relay "chattering" at the alarm trip point use the relay hysteresis feature of the ID-1. (RLY HYS in the CONFIGURATION MENU)

TO CHANGE THE "A" AND "B" ALARM VALUES:

- 1) Unlock the unit
- 2) Press the "ALARM" [A] OR "ALARM" [B] key. The unit will momentarily display "ALARM A or B" and then will begin to flash the current alarm set point.
- 3) Press the [CLR] key, enter the new value and press [ENT] or press the [ENT] key to leave this value unchanged and return to the inventory display.

SPECIFIC GRAVITY [C] KEY

If the specific gravity of the product being inventoried changes, it will be necessary to change the "GRAVITY" setting of the ID-1. The tank table should have been developed in gallons of water. If the tank contains a product other than water, the " SPECIFIC GRAVITY" of that product will need to be entered into the ID-1 for it to display accurate inventory . If the inventory display is in mass (pounds) the scaling factor must also be changed when a specific gravity change is made. (see SCALING in configuration menu)

TO CHANGE THE " SPECIFIC GRAVITY" VALUE:

- 1) Press the "SP.GR." [C] key. The unit will momentarily display "GRAVITY" and then will begin to flash the current specific gravity.
- 2) Press [CLR], enter a new "GRAVITY", and press [ENT] or press [ENT] to keep the "GRAVITY" the same and return to the inventory display.

Note: the decimal point can be entered by pressing the "PROG" [D] key during a data entry mode.

PROGRAM "D" KEY

The "PROG" [D] key is used to enter the ID-1'S CONFIGURATION MENU.

CONFIGURATION MENU ITEMS

I. DEV TYP

A. WINDOW

The "WINDOW" parameter of the ID-1 allows the user to set the display update time from 1 to 12 seconds. the normal "WINDOW" setting would be 1 second, however, tanks with agitators or other equipment running may require a higher setting in order to produce a more stable inventory reading.

TO CHANGE THE "WINDOW" VALUE:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the [ENT] key and the unit will display "WINDOWxx" where "xx" represents the current value.
- 4) Press [CLR], enter a new code, and press [ENT] or press [ENT] to keep the value the same and proceed to the "WEIGHT" parameter.

B. WEIGHT

The "WEIGHT" parameter of the ID-1 allows the user to set the percentage of the current inventory display which is to be added to and averaged with each new reading. The normal "WEIGHT" setting would be 10. , however, some system configurations may require a higher setting in order to have a stable inventory display. The "WEIGHT" value setting can be from 00 to 99. A higher setting will produce the most stable display, however, will cause the ID-1 to react slowly to changes in actual tank inventory.

TO CHANGE THE "WEIGHT" VALUE:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the [ENT] key and the unit will display "WINDOWxx" press [ENT] again and the unit will display "WEIGHTxx" where "xx" represents the current value.
- 4) Press [CLR], enter a new value, and press [ENT] or press [ENT] to keep the code the same and proceed to the "SCALING" parameter.

C. SCALING

The "SCALING" parameter of the ID-1 allows the user to program an inventory display "SCALING" factor. The "SCALING" factor can be set to any value from .00000001 to 999999999. The "SCALING" factor is used to convert the inventory value returned from the look up table, normally in gallons, to other units of volume or mass. The normal "SCALING" factor for an inventory display in gallons would be 1. To display inventory in pounds for a tank that contains product which weighs 8.345 pounds per gallon set the "SCALING" factor to 8.345. If the inventory display is in mass (pounds) the specific gravity must also be changed when a scaling factor change is made. (see SPECIFIC GRAVITY section)

TO CHANGE THE "SCALING" VALUE:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the [ENT] key (3) times and the ID-1 will display "SCALING" momentarily and then the current value.
- 4) Press [CLR], enter a new value, and press [ENT] or press [ENT] to keep the code the same and proceed to the "DEC LOC." parameter.

D. DEC LOC.

The "DEC LOC" parameter of the ID-1 is used to set the decimal point location for the inventory display.

TO CHANGE THE "DEC LOC" SETTING:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the [ENT] key (4) times to and the ID-1 will display "DEC LOC." momentarily and then the current decimal location.
- 4) Press the [1] key for no decimal, the [2] key for 1 decimal place, and the [3] key for 2 decimal places.
- 5) Press the [ENT] key with the correct decimal position displayed to enter the setting and exit the CONFIGURATION MENU.

II. LOCKOUT

The ID-1 is equipped with two security lock levels to prevent programming changes to the unit by unauthorized personnel.

The "LOCK ON" levels are:

"PR LCK": no changes can be made to Alarm A, Alarm B, Specific Gravity, or the system configuration.

"PR UNLK": changes can be made to Alarm A, Alarm B, and Specific Gravity, but not to the system configuration.

LOCK OFF: changes can be made to Alarm A, Alarm B, Specific Gravity, and to the system configuration. In this mode the unit is unlocked and all programming data can be changed.

To unlock the unit enter the (4) digit security code while the unit is displaying inventory. The unit will respond with a "LOCK OFF" message. To lock the unit enter the (4) digit security code while the unit is displaying inventory. The unit will respond with a "LOCK ON" message. the ID-1 security code is set at the factory to "1000". The security code should be changed and recorded in a safe place when the unit is installed.

TO CHANGE THE SECURITY "CODE":

- 1) Unlock the unit
- 2) Press the "PROG" [D] key - the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] key again - The unit will display "LOCKOUT"
- 4) Press the [ENT] key - The unit will display "CODE" momentarily and then begin to flash the current security code
- 5) Press the [CLR], enter a new code, and press [ENT] or press [ENT] to keep the code the same and proceed to the "PR LCK/PR UNLK" lock level selection.

TO CHANGE THE "LOCK ON" LEVEL:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] key again. the unit now displays "LOCKOUT"
- 4) PRESS THE [ENT] key (2) times and the unit will display the current lock level "PR LCK" or "PR UNLK".
- 5) To toggle between "PR LCK" and "PR UNLK" Press the "PROG" [D] key
- 6) Press the [ENT] key with the desired lock level displayed to store your entry and exit the CONFIGURATION MENU.
- 7) To lock the unit enter the (4) digit security code while on the inventory display.

III. OUTCARD

The "OUTCARD" function of the unit allows for the configuration of the optional serial and parallel outputs. In the multi-drop serial mode up to 16 ID-1s can be linked together with each ID-1 being assigned a "UNIT" number from 0 to 15. The "BAUD" rate and "PARITY" type are also user definable.

TO CHANGE THE "UNIT" NUMBER:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (2) more times. the unit will now display "OUTCARD"
- 4) Press the [ENT] key and the unit will display the current "UNIT" number
- 5) Press [CLR], enter a new number, and press [ENT] or press [ENT] to keep the number the same and proceed to the "SER" / "PL" selection.

TO SELECT THE SERIAL OR PARALLEL MODE:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (2) more times. the unit will now display "OUTCARD"
- 4) Press the [ENT] key (2) more times and the unit will display "PL_SER" or "PL SER_". The "_" bar after the currently specified mode.
- 5) To select a new setting press the "ALARM" [B] key for "PL" (parallel) or press the "PROG" [D] key for "SER" (serial).
- 6) Press the [ENT] key with the desired selection displayed to store your entry and move to "BAUDRATE" configuration if the serial mode was selected or exit the CONFIGURATION MENU if the parallel mode was selected.

TO CHANGE THE "BAUD" RATE:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (2) more times. the unit will now display "OUTCARD"
- 4) Press the [ENT] key (3) times and the unit will display "BAUDRATE" momentarily and then the current baud rate.
- 5) To select a new setting press the "PROG" [D] key until the desired baud rate is displayed.
- 6) Press the [ENT] key with the desired baud rate displayed to store your entry and move to "PARITY" configuration.

TO CHANGE THE "PARITY" SETTING:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (2) more times. the unit will now display "OUTCARD"
- 4) Press the [ENT] key (4) times and the unit will display "PARITY" momentarily and then the current parity setting.
- 5) To select a new setting press the "PROG" [D] key until the desired parity type is displayed.
- 6) Press the [ENT] key with the desired setting displayed to store your entry and exit the CONFIGURATION MENU.

IV. ALG OUT

The optional linearized analog output card can be configured from this area. Typical uses for this option would include connection to a PLC, computer, or remote indicator all of which would receive a linearized 4-20 mA signal. In the SET LOW section enter the ID-1 displayed amount that 4.00 mA is to equal. In the SET HIGH section enter the displayed amount to represent 20 mA. The normal low and high values are 0 and the tanks full scale inventory amount, however other values can be selected depending on the application.

TO CHANGE "ALG OUT" LOW AND HIGH VALUES:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (3) times until "ALG OUT" is displayed
- 4) Press the [ENT] key, "SET LOW" will be displayed momentarily and then the current low value will begin to flash.
- 5) Press the [CLR] key and enter the new value or press the [ENT] key to leave this value unchanged and proceed to "SET HIGH".
- 6) "SET HIGH" will be displayed for a moment and then the current high value will begin to flash.
- 7) Press the [CLR] key and enter the new value or press the [ENT] key to leave this value unchanged and exit the CONFIGURATION MENU.

V. OFFSET

The ID-1 has a calibrated input range of 3.80 to 19.80 mA. The normal level sensor output is 4.00 to 20.00 mA. The ID-1 was designed with a "live zero" to provide an easy means of adjusting the inventory display for any level transmitter zero shift both above and below 4.00 mA. With a 4.00 mA signal applied the ID-1 during "TEST" should display about 156. This will be the "OFFSET" value to be entered in to the ID-1. The "OFFSET" should be checked only with an empty tank and a transmitter that has been powered for at least 1 hour.

TO TEST THE OFFSET:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) Press the "PROG" [D] (4) more times. The unit will now display "OFFSET"
- 4) Press the [ENT] key and the unit will display the current mode "TEST" or "RUN"
- 5) To toggle between "TEST" and "RUN" press the "PROG" [D] key. Select "TEST" and press [ENT] twice to exit the CONFIGURATION MENU and view the sensor offset "T xxx" number.

TO PROGRAM THE OFFSET:

- 1) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 2) Press the "PROG" [D] (4) more times. The unit will now display "OFFSET"
- 3) Press the [ENT] key and the unit will display the current mode "TEST"
- 4) To toggle between "TEST" and "RUN" press the "PROG" [D] key. Select "RUN".
- 5) Press the [ENT] key, "VALUE" will be displayed momentarily and then the current "OFFSET" value will begin to flash.
- 6) Press [CLR] , enter the offset number, and press [ENT] or press [ENT] to keep the number the same and exit the CONFIGURATION MENU.

VI. 16 POINT TANK LINEARIZATION TABLE

The 16 point tank linearization table is used to scale the ID-1 display to the tank and liquid level transmitter. Some tanks installations will require only (2) point tables where others will make use of all (16) points.

If a tank is a vertical cylinder with a flat bottom and the level sensor is mounted on the flat bottom facing up then the level sensor output is directly proportional to the level in the tank. If this same tank were to be laid horizontal with the sensor mounted facing up then the sensor output would not be linear (proportional to the level).

The two examples of tank types given do not consider many other questions concerning tank configuration and sensor mounting. It is not always possible to mount the sensor on the bottom of a tank. Horizontal tanks are normally pitched, tanks can bulge when full, many tanks have dished or cone bottoms.

With the use of the tank linearization table these tank variables can be accommodated. The tank table can be created by using simple geometry if detailed tank dimensions are available. However the most accurate method of creating the table is with a "wet calibration". The "wet calibration" is done by setting the ID-1 to the calibrate mode, adding measured amounts of water, and noting the ID-1 reading at the end of each water addition. This data can now be used to create a very accurate tank linearization table.

VII. REL HYS

The "REL HYS" (relay hysteresis) setting are used to keep the ID-1 relay outputs from "chattering" as the inventory amount passes through the alarm setpoints. The "REL HYS" values are expressed in the same units as the inventory display and represent the relay reset (turn-off) point below the "A" or "B" alarm activate (turn-on) settings.
TO CHANGE "REL HYS" A AND B VALUES:

- 1) Unlock the unit
- 2) Press the "PROG" [D] key and the unit will display "PROG" momentarily and then "DEV TYPE"
- 3) PRESS THE "PROG" [D] key (6) times until "REL HYS" is displayed
- 4) Press the [ENT] key, "A VALUE" will be displayed for a moment and then the current "A" relay hysteresis value will begin to flash.
- 5) Press the [CLR] key and enter the new value or press the [ENT] key to leave this value unchanged and proceed to the "B" relay hysteresis value.
- 6) "B VALUE" will be displayed for a moment and then the current B relay hysteresis value will begin to flash.
- 7) Press the [CLR] key and enter the new value or press the [ENT] key to leave this value unchanged and exit the CONFIGURATION MENU.

16 POINT TANK LINEARIZATION TABLE

The model ID-1 tank inventory system has a 16 point linearization tank look up table which can be programmed in the field and or changed in the field. Quite often only two points are required if the tank is vertical, its bottom and top are flat and the tank has straight walls. If this is the case, it can be set into the system by utilizing only points 01 and 02 of the 16 point system. To do this, enter the program mode and after "Dev Typ" appears, push button D five times until the display reads "16 point", then push "ENT" two times until the display shows "point 00" press 1 and the display becomes "Point 01" press "ENT", then "F" and some number is displayed. The number probably will be 0. "F" stands for frequency and when the tank is empty it should read 0 (ie; a frequency of 0 = 4 mA). So if "F" is not 0, clear the number and press "ENT". The unit now displays "K" and some number. "K" stands for constant and is the number which divides the frequency by the quantity of the product in the tank at that point. When the tank is empty and only two points are utilized "K" at point 01 is always the same as its value at point 02, when the tank is full. A decimal point is needed when entering the value of "K" into the 16 point table. Pressing button "D" enters a decimal point when desired.

To linearize a tank that requires more than 2 points of linearization, such as a horizontal, spherical or dished bottom tank it is necessary to develop a tank linearization table. The best way to develop this table is to use a highly accurate flow meter to fill the tank with water, noting the quantity of water in the tank at various readings of the sensor the ID-1 tank inventory system is able to express sensor output in frequency quite easily. The frequency should be 0 when the tank is empty and 10,000 when the tank is full. This rarely happens since an output from the sensor of 20 mA gives a frequency reading of 10,000 and most sensors read less than 20 mA when the tank is full. That is not important as long as you have the right frequency for the amount of product in the tank.

To express sensor output in frequency it is necessary to go with the program phase of the system by entering the proper security code and pushing button "D", after "Dev Typ" is displayed on the unit press button "D" five more times until "16 point" is displayed. Press "ENT" once and "Run" will be displayed. Pressing button "D" will change the display to "Test," leave "Test" on the display and press "ENT" two more times and the display will show "P" followed by some number. That number is the frequency for 0-10,000 corresponding to 4 to 20 mA. This is also the frequency that should be entered into the tank linearization tables. As you add gallons of water into the tank, take readings of gallons vs. frequency as often as deemed necessary, until the tank is full. These readings will be the tank table to be entered into the 16 tank inventory linearization table. Edit the table so that when frequency vs. gallons changes fast the readings are close together and when frequency vs. gallons change at a steady rate the readings can be further apart.

Care must be taken for developing constant "K" for "Point 01" it should be taken as soon as the sensor is completely under water. "K" for "point 01" should never be 0. K for all the other points should be as calculated from the formula $K=F/Q$.

After frequency readings have been taken for various quantities of water in the tank, return the program to "16 Point" to change the system from test to run. This is done by pressing button "D" when test is displayed, push "ENT" two more times to display inventory.

Enter the 16 tank table into the system in the same way that the two tank table was entered except for "K" of tank 01.

If the master meter method of proving the values of sensor output vs. tank capacity is not used and the tank manufacturers calculated tank values are used then the following applies for a 16 or less point tank table. The last point of the tank table (usually point 16, but it can be less) is the point where the tank is full. Q at this point can be determined from the tank manufacturers calculations. F is a straight line function from empty tank ($F=0$) to the maximum calibration of the sensor in the tank (ie the point where the sensor has a 20 mA output). F at this point is 10,000. If the sensor was calibrated, as an example for 10 PSI (276.8" of water) and the maximum height of the water level will be 207.6" of water (which is 3/4 of 276.8"), F for point 16 will be 7500 and Q will be whatever the tank manufacturer says the capacity is at 207.6 say 700 gallons so for point 16 "F" would be 7500 and Q would be 700 gallons. Therefore K would be $7500/700$ or 10.714. The rest of the points except zero can be calculated the same way. Use the tank manufacturers volume at any one height as Q and then calculate "F" as a proportion of the amount the sensor was calibrated. If the tank manufacturers calculated capacity at 125" is 400 gallons, then "F" will be $125/276.8$ times 10,000 or 4515.9. Q is 400 so "K" will be 11.29 using the formula $K=F/Q$, "F" and "K" for all the other points (except 01) can be determined the same way. "F" at point 01 will be 0 and "K" will be 1/5 of "K" at point 02 if point 01 and point 02 are close together.