Set-Up, Calibration and Configuration Manual

Digital-III Fueling Vehicle Control System
Fueling Pressure and Flow Rate Control

Model 64335-3

Applicable to:
The NY&NJ Port Authority
Digital Hydrant Dispenser Fueling Vehicle
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1. Objectives

The following procedure is to be utilized to set-up, calibrate and configure the refueling pressure and flow control functions of the Carter Digital III fueling control modules P/N 64335 installed on the N.Y. & N.J. Port Authority Digital Hydrant Dispenser Fueling Vehicle.

2. System Descriptions

Digital III Control System includes two Carter Digital II control systems, P/N 64235 and an OEM PLC vehicle control module. The Digital II systems provide the primary and secondary fueling pressure and flow control functions while the PLC controls the other mechanical functions of the of the vehicle. The scope of this document is limited to the setup, calibration and configuration of the fueling pressure and flow control functions.

3. Component Descriptions

The fueling pressure and flow control functions of the Digital III Control Module includes the following items:

3.1 Vehicle Mounted Equipment
   Item 1. Digital II Control Module P/N 64235 QTY: 2
   Item 2. Primary Control Valve : Hydrant Coupler P/N 64804 1
   Item 3. Secondary Control Valve : Inline Valve P/N 64504 1
   Item 4. Vehicle mounted pressure transducer P/N 64108-50 2
   Item 5. Pulser 1
       While Carter Ground Fueling does not provide the pulser, it is recommended the user selects the equivalent of a Veeder-Root 100 to 1 Pulse Generator P/N: 767181 327 along with its required mounting kit P/N: 0370020 009.
   Item 6. Control Panel Display P/N 64337 1
   Item 7. Remote Display P/N 64338 2

3.2 Test Stand Mounted Equipment
   Item 8. Test Stand Pressure Transducer P/N 64101 1

3.3 Calibration Equipment
   Item 9. Hand-Held Calibration unit P/N 64236 with cable to connect the Hand-Held unit and Control Module included 2

The item 5 Pulsar provides the flow rate information to the Digital II control system to compute the Compensated pressure at the nozzle. To accomplish this, the control system compares flow rate to sensed pressure at the item 4 vehicle mounted pressure transducer and performs a calculation to determine the maximum flow rate allowable while remaining
within the pressure range pre-determined by the user. To provide a flow rate signal to the Digital System, a pulse transmitter must be installed to and driven by the flow meter. While the Pulser is not available from Carter Ground Fueling, the use of a Veeder-Root 100 to 1 Pulse Generator P/N: 767181 327 along with its required mounting kit P/N: 0370020 009 or equivalent is recommended.

Typical installation of the vehicle mounted equipment items 1 through 7 listed above are illustrated in the figures 1 and 2. Figure 1 applies to hydrant servicer and figure 2 applies to refueler.

The item 8 test stand pressure transducer is required to be mounted on the test stand in the calibration process of the following procedure and can be removed from the test stand for safe storage after the process. See figure 3 for test stand set-up.

Both the two item 9 hand-held calibration units are required in the calibration process. One calibration unit must be connected to each control module (primary and secondary, item 1) in the calibration process although only one system can be calibrated at a time. When a particular system (primary or secondary) is being calibrated, the hand-held calibration unit must be connected to the item 6 test stand pressure transducer mounted on the test stand. See figures 4 and 5.

Image of the item 1 Control module is shown in figure 6 to facilitate clarification of the indicator lights and displays on these items. See paragraphs 3.4.

3.4 Special Features applicable to The N.Y. & N.J. Port Authority Digital Hydrant Dispenser Fueling Vehicle

3.4.1 Primary & Secondary System Selector Switch

The N.Y. & N.J. Port Authority Digital Hydrant Dispenser Fueling Vehicle is equipped with a System Selector Switch such that when placed in the Primary System position (as indicated by the illumination of the Primary indicator light on the Control Panel Display), the primary system will be controlling flow while the secondary system will act as a back-up in case the primary system fails open.

When the System Selector Switch is placed in Secondary position (as indicated by the illumination of the Secondary indicator light on the Control Panel Display), the primary system will be placed in the full open condition and the secondary system will control fuel flow at its secondary settings independently.

This switch is located in a locked box below the control panel. The purpose of this System Selector Switch is to facilitate easy checking on the function of individual system independent of each other.

While performing the set-up and calibration process of the Carter Digital III flow control system as described below, the System Selector Switch must be placed in the “Primary” position at all time without exception.

Also, after the calibration process, the System Selector Switch must be placed and remain in the “Primary” position for normal fueling operation with secondary back-up.
3.4.2 Pressure Surge Suppressor

The N.Y. & N.J. Port Authority Digital Hydrant Dispenser Fueling Vehicle is equipped with three pressure surge suppressors. Two of these suppressors are located at the front end of the vehicle behind the lift deck. The third unit is located at the rear end of the vehicle.

For Proper suppression of pressure surge created by shutting off fuel flow in 1.5±0.5 seconds at the nozzle adapter, the suppressors must be pre-charged with dry nitrogen with pressure maintained as follows:

- The two front mounted suppressors: 70 psig.
- The one rear mounted suppressor: 80 psig.

3.4.3 Pressurized Fuel accumulator

The pressure accumulator located in the mid-section of the fuel vehicle stores pressurized fuel for Hydrant Valve and Coupler actuation as the Deadman is applied. The pressurized fuel is charged into this accumulator by an electric pump drawing fuel from the recovery tank. In flow condition, the system pressure in the fueling vehicle is also capable of charging this accumulator.

Before any fuel is placed into the fuel vehicle or its recovery tank, the pressure accumulator shall be pre-charged with dry nitrogen at 40 psig.

In normal fueling operation, the pressurized fuel stored in the accumulator shall be maintained at 80 psig or above.

3.4.4 Excess Flow Control – Hydrant Coupler

The Carter Hydrant Coupler P/N 64804 installed in the N.Y. & N.J. Port Authority Digital Hydrant Dispenser Fueling Vehicle is equipped with an Excess Flow Control Device. Prior to performing the calibration process as described below, disable this excess flow control device by turning the adjustment screw clockwise until it bottoms out. Do not torque down on the screw under any circumstances.

After the calibration process, reset the Excess Flow Control device as described in paragraph 6.4 of this document.
Figure 1
Typical Digital III Pressure Control System Set-up for Hydrant Servicer Application
Figure 2
(Components shown represent to typical layout. Exact equipment geometry might differ)
Figure 3

Typical Test Stand Configuration
Figure 4: Connection among Control Module, Hand-held Calibration Unit and Test Stand Mounted Pressure Transducer

Figure 5: Hand Held Calibration unit
Figure 6: Digital II Control Module
4 Digital Control Module Operation Features

4.1 Terminology - Digital Control Module Displays

The followings describe that functions of all the displays and indicator light found on the Digital II control module P/N 64235. Refer to figure 3.

1. “FLOW RATE” display will indicate the rate of flow of the product.
2. The indicator lights to the right of the “FLOW RATE” display will illuminate to indicate the unit of measure at which the flow rate is being displayed.
3. “NOZZLE PRESSURE” will indicate the pressure at the nozzle adapter that the product is being dispensed.
4. The indicator lights to the right of the “NOZZLE PRESSURE” display will illuminate to indicate the unit of measure that pressure is being displayed.
5. “ACTIVE NOZZLE” indicator lights 1-6 will illuminate to indicate the nozzle or nozzles that are being used or that are not currently stowed.
6. The “NORMAL” (Norm) indicator light will illuminate to indicate that the power to the control module is on and that the “PRESURE OVERRIDE” switch is not applied to select the alternate refueling pressure setting.
7. The “MODIFY” indicator light will illuminate to indicate that the Hand-Held Calibration Unit is connected and is presently set to “MODIFY” mode.
8. The Solenoids A and B indicator lights will illuminate to indicate that an electric signal is being sent to the solenoids. In normal operation these lights will be flashing as the control module effects the operation of the valve to control pressure.
9. The “SYSTEM MONITOR” indicator light is normally off. If this light should come on, it would indicate a problem with the fuel filter differential pressure. (Note: The filter differential pressure function is currently not used).
10. There is a amber indicator light on the top right hand corner of the Control Module enclosure. This light will illuminate to indicate when the “DEADMAN” switch has been activated, and it will flash as required by the timer function, to indicate that a time-out condition is imminent.
Note that the display of the “Digital-II” Control Module will sometimes display some unusual looking characters. This happens because this type of (numeric) display is designed to indicate numbers instead of letters. Review the following table that includes the display characters and the letters or numbers it is intended to indicate.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>I</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>i</td>
<td>2</td>
</tr>
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<td>C</td>
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<td>G</td>
<td>S</td>
<td>7</td>
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<td>H</td>
<td>H</td>
<td>t</td>
<td>8</td>
</tr>
<tr>
<td>h</td>
<td>h</td>
<td>u</td>
<td>9</td>
</tr>
</tbody>
</table>

### 4.2 Navigating the Menu System:

In the calibration process, follow this procedure step by step to navigate through the menu which will be displayed on the LCD display panels of the control module until the calibration process is completed.

See figure 7 for details of menu display on the Control Module as the control buttons on the Hand-Held Calibration Unit are applied.

To navigate the menu tree system:

- The power to both the primary and secondary control modules must be off.
- When the power is off, both displays on the control modules will be blank, and all indicator lights will be off. Refer to Reset in section 1 for additional information.
- Connect the Cable between the Hand-Held Unit and the Control Module. This applies to both primary and secondary systems. See figure 4.
- Connect the Test Stand Pressure Transducer cable to the Hand-Held Unit for the system to be calibrated only. See figure 4.
WARNING

Connecting the cable from the Hand-Held Unit to the Control Module when the power is on can damage the Hand-Held Unit and the Control Module

- Apply power to the Control Module.
- Set the Rotary Switch on the Hand-Held Unit to the “MODIFY” position.
- Review the menu system diagram.
- Pushing the "LEFT" arrow button on the Hand-Held Unit will always return the system to the main program menu.
- Pushing the “RIGHT” arrow button will display the next branch on the menu tree.
- The “UP” and “DOWN” arrow buttons are used to change the settings. On some occasions the “DOWN” button will be used to open a sub-menu within the menu tree.
- Use the “LEFT”, “RIGHT”, “UP” and “DOWN” buttons on the Hand-Held Unit to scroll through the various functions of the Control Module as shown in figure 7
- Follow the set-up, calibration and configuration procedure as detailed in paragraph 5 to input the required parameters into the Control Module.
- Upon completion on navigating through the menu system, turn the Rotary Switch on the Hand-Held Unit to the “OPERATE” position.
- Turn the power off to the Control Module.
- Disconnect the Hand-Held Unit from the Control Module only in power off condition.
- Apply power to the control system only after the Hand-Held Units are disconnected.
- As power is applied, the Control Module will power up in the “OPERATE” mode whenever the Hand-Held Unit is not connected to it.
NOTE: To use this menu, turn off power to 64235 Control Module. Connect 64235 Hand held Calibration Unit to 64235 Control Module. Place toggle switch on 64235 Hand Held Calibration Unit to “MODIFY” position to initiate the “SETUP” process.

FIGURE 7
CALIBRATION MENU DISPLAY ON CONTROL MODULE PRIMARY SYSTEM, HYDRANT COUPLER
NOTE: To use this menu, turn off power to 64235 Control Module.
Connect 64235 Hand held Calibration Unit to 64235 Control Module.
Place toggle switch on 64235 Hand Held Calibration Unit to “MODIFY” position to initiate the “SETUP” process.

FIGURE 8
CALIBRATION MENU DISPLAY ON CONTROL MODULE
SECOND SYSTEM, INLINE VALVE
5. Pre-Calibration Preparation of Fueling Vehicle

As described in paragraph 3.4.3, a pressure accumulator located in the mid-section of the fuel vehicle stores pressurized fuel for Hydrant Valve and Coupler actuation as Deadman is applied. The pressurized fuel is charged into this accumulator by an electric pump drawing fuel from the recovery tank. Therefore, prior to initiating any calibration or setup process, introduce fuel amounts to 4 or 5 gallons into the recovery tank. The electric pump will charge up the accumulator upon power-up of the fueling vehicle.

5.1 Bleeding of Hydrant Coupling Command Hose

Connect Hand-Held Units to both the Primary and Secondary Control Module. Place both systems in the “PLSR CAL 1” sub-menu (follow steps shown in figure 7). Fully extend the Hydrant Valve command hose from its hose wheel. Apply the Deadman. As the Deadman is applied, bleed the command hose of all trapped air from both ends of the hose. This can be accomplished by cracking open the hose fitting at the hose wheel and the bleeding plug on the top of the Hydrant Coupler. In this bleeding process, shaking of the command hose might be necessary to ensure all trapped air in the hose is removed.

Upon completion of bleeding the Hydrant Coupler command hose, re-secure the hose wheel fitting and bleeding plug on the coupler.

5.2 Bleeding of Hydrant Valve Command Hose

As a continuation of the bleeding process in paragraph 5.2, keep the Deadman applied. Bleed the Hydrant Valve command hose of trapped air by cracking open the quick disconnect at the end of this command hose.

Upon completion of bleeding the Hydrant Valve Command Hose, release the Deadman but keep the two Hand-Held Calibration Units connected to the Control Modules and in the “PLSR CAL 1” sub-menu without change.

5.3 Flushing of Fueling Vehicle

Connect the Hydrant Coupler and the hydrant valve command hose to a hydrant system. Place the coupler in open position. Connect one or more nozzle hoses to the test stand and place all the connected nozzles in open position. With the Hand-Held Units still connected to both the Primary and Secondary Control Modules and both systems in the “PLSR CAL 1” sub-menu, apply the Deadman to establish flow through the fueling vehicle. Continue to flow for duration of 3 to 5 minutes till all trapped air is flushed through the fuel vehicle. This flushing process shall be performed on all hoses to ensure the all sections of the fueling vehicle are air free.

Caution

Note that prior to flushing the fuel system, the fueling vehicle is filled with air. If fuel is introduced into the fuel system at high flow rate, compression ignition of the fuel air mixture in the fueling vehicle might occur. A throttle valve upstream of the hydrant valve shall be used to slowly increase the flow rate at flow initiation.

Upon completion of bleeding and flushing, the fueling system is ready for the calibration process below.
6. Set-up, Calibration and Configuration Process

6.1 Setup

Follow the procedure as outlined in section 4 to connect the Hand-Held Unit to the Control Module to be set-up. After the cable connection, apply power to the control system. Turn the switch on the Hand-Held Unit to “MODIFY” mode.

In the set-up process as detailed in this paragraph 5.1, there will be no fuel flow when the control system is configured to modify any of the Setup sub menu settings.

In the set-up process, the nozzle in the fueling vehicle intended to be calibrated must be removed from its interlock such that the corresponding nozzle indicator light must be illuminated on the Control Module. This identifies the nozzle to be set-up. The control parameters input will only apply to this particular hose and the system (primary or secondary) subjected to the following set-up process.

A complete set-up process must be performed on every hose or hose combinations allowed by the PLC and for both primary and secondary control systems.

Follow the sequence of arrow buttons applications on the Hand-Held Unit as shown in figure 7 to enter the corresponding “SET-UP” sub-menu:

<table>
<thead>
<tr>
<th>OPENING TIME:</th>
<th>Set the menu display to indicate “OT”. The opening time is expressed as a percentage of a given time span. Use the “UP” and “DOWN” buttons to raise or lower the value displayed. A setting of 0% = 5 Seconds and 100% = 10 Seconds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings :</td>
<td>Primary System 20</td>
</tr>
<tr>
<td></td>
<td>Secondary System 20</td>
</tr>
<tr>
<td>CLOSING TIME:</td>
<td>Set the menu display to “CT”. As with the “Opening Time” setting the “Closing Time” setting is a percentage of a given time span. Press the “UP” or “DOWN” buttons to raise or lower the value displayed. A setting of 0% = 2 Seconds and 100% = 5 Seconds.</td>
</tr>
<tr>
<td>Settings :</td>
<td>Primary System 0</td>
</tr>
<tr>
<td></td>
<td>Secondary System 60</td>
</tr>
</tbody>
</table>
NOTE
The choice of flow and pressure units must be identical to all hoses and systems.

| FLOW UNITS: | Set the menu display to indicate “FLO UNIT”. This will be used to select the unit of measure for the “FLOW RATE” display. Observe the indicator lights to the right of the “Flow Rate” display. Push the “DOWN” button to scroll through the options available. After the unit of measure is selected, press the “RIGHT” button to proceed to the next step. | Settings :
 | | | Primary System | GPM |
 | | | Secondary System | GPM |

| PRESSURE UNITS: | Set the menu display to indicate “PRES UNIT”. This will be used to select the unit of measure for the pressure display. Observe the indicator lights to the “RIGHT” of the Pressure display. Push the “DOWN” button to scroll through the options available. After the unit of measure is selected, press the “RIGHT” button to proceed to the next step. | Settings :
 | | | Primary System | PSI |
 | | | Secondary System | PSI |

NOTE:
When setting the nozzle flow limit, only the nozzle or the nozzle combination allowed by PLC that is being set should be removed from its interlock. That is, only one of the nozzle indicator lights is allowed to illuminate at a time. All other nozzles must be stowed in their respective interlocks. If more than one nozzle indicator light is illuminated, both flow Rate and Nozzle Pressure displays will go blank and no modifications will be allowed until the errant nozzle is stowed.

| Nozzle Flow Limit: | Set the menu display to indicate “FL”. This will be used to set the “FLOW LIMIT” for each hose or hose combinations allowed by the PLC. Set the flow limit for each of 6 hoses. Use the “UP” and “DOWN” buttons to set the maximum flow limit for each hose that is being used, | Settings :
 | | | Primary System |
 | | | Nozzle
 | | | #1 400
 | | | #2 400
 | | | #3 750
 | | | #4 400
 | | | Secondary System |
 | | | Nozzle
 | | | #1 400
 | | | #2 400
 | | | #3 750
 | | | #4 400 |
| **SYSTEM FLOW LIMIT:** | Set the menu display to indicate “SFL”. This will be used to set the cumulative flow limit for the fueling vehicle. This flow limit will govern all other flow limits therefore shall be input once only for each of the primary and secondary system. If the system flow limit is entered repeatedly as different nozzles are set-up, the last entered value will apply to all nozzles. During fueling, the system will use the lowest of the “SYSTEM FLOW LIMIT” and the “NOZZLE FLOW LIMIT” for the particular nozzle in use. | **Settings:** |
| | | Primary System | 750 |
| | | Secondary System | 750 |

| **DEADMAN TIMER:** | Set the menu display to indicate “DT”. This will be used to turn on and set the “DEADMAN TIMER FUNCTION”. Use the “UP” and “DOWN” buttons to set the number of minutes that the system will dispense fuel, before the operator will be required to “cycle” the “DEADMAN” switch. Set the display to zero to turn off this timer function. It is recommended that the timer function be turned off if the vehicle is equipped with an overwing nozzle. | **Settings:** |
| | | Primary System | OFF |
| | | Secondary System | OFF |

| **THROTTLE CONTROL:** | The menu will only display this option if the configuration has been set to “REF.T” for refueler with throttle (See section 6). Set the menu indicator to display “THR”. Press the “UP” or “DOWN” button to set the flow rate at which the control module will activate the throttle advance on the vehicle. Press the “LEFT” button to return to the main menu. | N/A |
6.2. Calibration

Proceed to this calibration process with the Hand-Held Unit still connected to the Control Module and the switch on the Hand-Held Unit stays at the “MODIFY” mode. It is also required that the refueling equipment be set up to flow fuel through a test stand. The Test Stand Pressure Transducer must be installed on the test stand nozzle receiver and connected to the Held-held Unit for the hose and system to be calibrated.

Again, in this calibration process, the nozzle in the fueling vehicle intended to be calibrated must be removed from its interlock and connected to the flow test stand such that the corresponding nozzle indicator light must be illuminated on the Control Module.

The Pulser and Pressure Transducer Calibration are required to be performed once for each (Primary and Secondary) system and the calibration value will applies to all hose in that system.

The Nozzle Control Pressure Setting Calibration process, however, must be performed independently on every hose or hose combinations allowed by the PLC and for both primary and secondary control systems.

In the Nozzle Control Pressure Setting Calibration, only one of the two (Primary or Secondary) systems can be calibrated at one time. It is required that a Hand-Held Unit to be connected to the other system that is not subjected to calibration Process. Place this system and have it remain in the “PLSR CAL 1” sub-menu (follow steps shown in figure 7). This will put this system in full flow condition as Deadman is applied.

On the Hand-Held Unit connected to the system being calibrated, press the “RIGHT” button until “SYST CAL” is indicated on the display. Press the “DOWN” button to enter the corresponding “Calibration” sub menu. Follow steps shown in figure 7 to enter the following sub-menu:

<table>
<thead>
<tr>
<th>Pulser 1 Calibration:</th>
<th>Set the menu display to indicate “PLSR CAL 1”. For units with two meters select the nozzle connected to the meter with “Pulser #1”. Activate the “DEADMAN” switch to establish fuel flow. Using a stop watch, calculate the flow rate as indicated by the meter register. Use the “UP” and “DOWN” buttons to adjust the rate being displayed, to match actual flow rate as it was calculated.</th>
<th>Settings:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary &amp; Secondary Systems</td>
<td>Match actual flow rate per flowmeter register</td>
</tr>
<tr>
<td>Pulser 2 Calibration:</td>
<td>Most equipment will not have a second flowmeter or pulser. For those that do set the menu display to indicate “PLSR CAL 2”. Stow the nozzle that was used in the previous step and select the nozzle connected to the meter with pulser 2. Apply the deadman to establish a flow of product. Using a stop watch, calculate the flow rate as indicated by the meter register. Use the “UP” and “DOWN” buttons to adjust the rate being displayed, to match actual flow rate as it was calculated.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- 20 -
The purpose of the next two steps in this procedure is to calibrate the Vehicle Mounted Pressure Transducer and the Test Stand Pressure Transducer so that the control module can correctly interpret the signal. It will be necessary to apply a known pressure to both the Vehicle Mounted Pressure Transducer and to the Test Stand Pressure Transducer. A reference pressure gauge installed adjacent to the Test Stand pressure transducer will be required. An acceptable pressure range is 50 to 120 psi. “PT1” displayed in the Control Module applies to the Vehicle Mounted Pressure Transducer. “PT2” applies to the Test Stand Pressure Transducer which must be installed on the test stand at the time of calibration. Be sure the Test Stand Pressure Transducer is connected to the Hand-Held Unit before proceeding to the next step.

To apply a known pressure to both transducers can be accomplished as follows: With the system still in Pulser Calibration mode (ie, “PLSR CAL 1” sub menu), activate the “DEADMAN” switch and establish flow of fuel. Close the shutoff valve downstream of the re-circulation adapter. When this valve is closed, release the “DEADMAN” switch, Equal pressure will be trapped in the fueling vehicle and the test stand adapter. Wait until the trapped pressure in the flow system is stabilized. Proceed as follows:

| Pressure Transducer 1 Calibration: | Set the menu display to indicate “PT1”. Use the “UP” and “DOWN” buttons to adjust the value on the display to equal that of the reference gauge at the test adapter. | Settings:
Primary & Secondary Systems
Match actual pressure per reference gauge at test adapter |
| Pressure Transducer 2 Calibration: | Set the menu display to indicate “PT2”. Use the “UP” and “DOWN” buttons adjust the value on the display to equal that of the reference gauge at the test adapter. | Settings:
Primary & Secondary Systems
Match actual pressure per reference gauge at test adapter |
| Pressure Transducer 3 Calibration: | This is for future use. Push the “RIGHT” button to go to the next item on the menu. (NOTE: “Transducer 3” is not currently useable) | N/A |

NOTE:

While in the Pressure Transducers Calibration 1, 2 or 3 sub-menus, activating the “DEADMAN” will not initiate fuel flow. Pressure must be trapped in the flow system prior to enter these sub-menus as described above.

If a negative pressure reading is recorded in the Control Menu display, it usually indicates that the Transducer being calibrated has a faulty connection or is defective. See Trouble Shooting section 6.2.

Prior to proceed to the next step, open the shut-off valve downstream of the test stand nozzle adapter to vent the trapped pressure.
NOZZLE CONTROL PRESSURE SETTING:

This step is used to set the desired control pressure at which a nozzle will flow fuel. This procedure must be completed for each nozzle for each system. The nozzle to be subjected to calibration must be connected to the test stand for fuel flow. If the nozzle is equipped with a hose end control valve (HECV), use a block out device P/N 61656 to jam the HECV in full open position. This can be easily accomplished. The Test Stand Pressure Transducer that was calibrated in the previous step must remain connected. The display will scroll through a message that will ask you to press the “DOWN” button to begin calibration (“TO CAL PRES PUSH DN BTN”). Activate the Deadman switch and then press the “DOWN” button, waiting a few seconds for the stand to initiate and establish flow. Then slowly throttle the shutoff valve downstream of the nozzle adapter to create the nozzle back pressure at which the aircraft will be fueled. This pressure value will be indicated on the Control Module display and shall be identical to the reference pressure gage at the test stand adapter. Wait till the flow and pressure are stable at the desired fueling pressure, release the Deadman switch to input this required nozzle back pressure setting. The display will indicate “PSET” and show the pressure at which this hose will control flow during aircraft fueling. Then, rotate the switch on the Hand-Held Unit to the “OPERATE” position to lock in this pressure value.

This procedure must be done for each hose that will be controlled by this system. Upon completion of this step, replace the switch on the Hand-Held Unit to “MODIFY” mode. Push the “LEFT” button to return to “SETUP” on the main menu tree. Push the “RIGHT” button twice to get to “CONFIGURATION” menu and the “DOWN” button to enter this sub menu.

Settings:

Primary System Nozzle
#1  40
#2  40
#3  40
#4  40

Secondary System Nozzle
#1  50
#2  50
#3  50
#4  50
6.3 Configuration

All active features in the Configuration menu apply to the system and not individual hose. Therefore, the configuration program shall be entered into each system (Primary and Secondary) once only. During Configuration programming, no nozzle needs to be removed from its stowage.

Proceed to this Configuration process with the Hand-Held Unit still connected to the Control Module and the switch on the Hand-Held Unit stays at the “MODIFY” mode. On the Hand-Held Unit connected to the system being calibrated, press the “RIGHT” button twice until “SYST CONF” is indicated on the display. Press the “DOWN” button to enter the corresponding “Configuration” sub menu. Follow steps shown in figure 7 to enter the following sub-menu:

| Hose Assignment To Pulser: | This step is used to assign the available hoses to a “PULSER” if there are two pulsers in the system. This feature is for future use only and Pulser #2 is currently not supported. Factory settings already assign all hoses to Pulser #1. Proceed to next step. | N/A |
| Filter: | The filter functions of the Carter Digital Control System are not currently functional. Proceed to the next step. | N/A |
| Auxiliary Output: | Selection here will determine the operation of the “Auxiliary Output” from Terminal #36 in the Control Module. When active, this pin will provide the GROUND to complete the circuit for some external device. There will not be any voltage output from this terminal. There are two options in this sub-menu. The first choice is “D.FOL”, where “Aux. Output” will follow the operation of the Deadman switch (ie: when the Deadman switch is activated, the “Auxiliary Output” will provide a ground signal). The second choice is “D.BEP”. This General Beeper will provide a pulsing ground signal at Terminal #36 whenever the “Deadman Timer” function begins to flash at its 30-seconds to Timeout warning status. This “pulsing signal” will be active when the “Deadman Timer” function is selected, and will only provide a signal for the last thirty seconds of the timer cycle. This signal could be connected to an audible device or a light to provide an indication to the operator that the Deadman Timer must be recycled to avoid fueling operating shut down. To select one of these options set the menu display to indicate “Auxiliary Output” (A.OUT). Push the “DOWN” button to cycle through the two options. When the selection is made, push the “RIGHT” button to proceed to the next step. The load on Terminal # 36 should be limited to 28 volts DC with maximum load current of 2 amps. | N/A |
Configuration

The heading for this sub menu is also "configuration" and will be displayed as “SYST CONF”. This step will be indicated on the display as “CFG=”.

Set the menu display to “CFG=”.

Push the “UP” and “DOWN” button to select the type of equipment that the Digital Control System is part of. There are four choices. The first one is “USER” which is not currently supported and reserved for future use. The second choice is “REF” for Inline or Bypass Valve control. The third choice is “HYDR” for Hydrant Coupler control. If you have a Refueler and the Digital system is set-up to advance the throttle when the Deadman is applied, select the forth choice “REF.T”.

Settings:

<table>
<thead>
<tr>
<th></th>
<th>Primary System</th>
<th>Secondary System</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDR</td>
<td>HYDR</td>
<td></td>
</tr>
</tbody>
</table>

6.4 Re-set Excess Flow Control Device

Note that prior to the calibration process per paragraph 6.1 through 6.3, the excess flow control device in the hydrant coupler was disabled. After the calibration on the Digital III fueling control systems (both Primary and Secondary) is completed, it must be re-set as follows:

Connect Hand-Held Units to both the Primary and Secondary Control Module. Place both systems in the “PLSR CAL 1” sub-menu (follow steps shown in figure 7). Apply the Deadman to initiate flow. This will put both systems in uncontrolled full flow condition.

Adjust the shutoff valves at the test stand to establish flow at 800 gpm.

While flowing, slowly turn the adjustment screw in the Excess Flow Control Device counter-clockwise until the device is activated and the hydrant coupler closes to shut-off flow.

Caution

As the Excess Flow Control Device is activated, a stream of fuel at approximately a total volume of 3 cubic inches will shoot from the bottom of the device in a downward direction. The fueling operator must take caution to avoid being splashed by this fuel stream.

Upon completion of re-setting the Excess Flow Control Device, Turn the switch on both Hand-Held Calibration Units to “Operate” mode. Disconnect both Hand-Held Calibration Units from the Control Modules.

The Carter Digital III Fueling Control System is ready to be certified for fueling operations.
7. Trouble Shooting and Error Codes

7.1 Initial Display Message:

Whenever power is applied to the Control Module, it will momentarily display the software version, e.g. “C1.01”. If this does not occur, the system should be reset (see note below). If this does not correct the problem, contact the manufacturer of the refueling vehicle, your local Carter distributor or Carter Ground Fueling.

<table>
<thead>
<tr>
<th>Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part of the following instructions requires the control module to be reset. This may be accomplished by turning the power off to the control module and then turning it back on. On most refueling equipment, power might be turned off to the control module when the refueling equipment is returned to the road condition; that is, when all of the nozzles are stowed, the pump disengaged and the brakes released.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Reset or Power on Reset:</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is possible to restore the control module back to the factory or default setup, calibration and configuration settings. With the hand held unit connected to the control module and the rotary switch in the “Modify” position, push the “UP” and “DOWN” buttons simultaneously. This erases all previous user settings and replaces them with the original factory (default) setting. While this procedure will bring the unit back to a known baseline, it is not recommended that this unit be used to service aircraft, until the Setup, Calibration and Configuration procedures are once again performed to completion.</td>
</tr>
</tbody>
</table>

7.2 Error Codes:

The “Digital-II Control Module” includes some self diagnosing functions. When the unit encounters a problem it will display an error code. These error codes are as follows,

- **E1.1** Processor has encountered an invalid instruction OPERATIONS STOP
- **E1.2** Interruption from an unassigned or reserved area OPERATIONS STOP
- **E1.3** An unknown interrupt has occurred OPERATIONS STOP
- **E1.4** A Clock Failure has occurred OPERATIONS STOP
- **E1.5** A System Monitor Interrupt has occurred OPERATIONS STOP
- **E2.1** Zero or Negative pressure calculated OPERATIONS CONTINUE
- **E2.2** “Cv” is calculated as Less than 1.0 OPERATIONS CONTINUE
- **E2.3** Pressure is too large to be displayed OPERATIONS CONTINUE
- **E2.4** Pressure is Negative OPERATIONS CONTINUE
- **E3.1** Control Module has lost contact with Vehicle Mounted Pressure Transducer OPERATIONS STOP
- **E3.2** Control Module has lost contact with Test Stand Mounted Pressure Transducer OPERATIONS STOP
- **E3.3** Control Module has lost contact with Filter Pressure Transducer OPERATIONS STOP
- **E4.1** Control Module circuit board failure OPERATIONS STOP
- **E9.1** Power Supply Voltage to Control Module drops below 10 Volts. OPERATIONS STOP
If the Control Module displays any of the Error Codes 1.1 through 1.5, these problems can be resolved by completing a “Power-On-Reset”. This will return all of the Setup, Calibration and Configuration settings to the factory default setting. Therefore, before the unit is returned to service, the complete “Setup”, “Calibration” and “Configuration” process must be repeated. If this does not resolve the problem, contact your local Carter distributor, the OEM that assembled the fueling vehicle or Carter Ground Fueling.

It is possible that during normal operation, Error Codes 2.1 through 2.4 will appear on the display for a very short period of time. It may flash on the display or may stay on as long as two seconds before the display returns to normal operation. If this occurs, it will not affect the operation of the unit. If any of these error codes appear for 10 seconds or longer during calibration or immediately after calibration this would indicate that the calibration is invalid. It is very important that each step of the Setup, Calibration and Configuration procedure be completed. If the nozzles are equipped with an HECV, you must ensure that the Blockout device is secure and fully engaged in the HECV. The Blockout device can easily back out and allow the valve to control. If this occurs the information provided during pressure calibration would be invalid, so you would be required to repeat the Setup, Calibration and Configuration procedure.

If an Error Code between 3.1 and 3.3 is displayed, refer to section 6.2 for instructions to check the transducer and cable.

Error Code 4.1 indicates a Control Module circuit board failure, contact your local Carter distributor, the OEM or Carter Ground Fueling.

Error Code 9.1 concludes that the Supply Voltage to the Control Module has dropped below 10 Volts. Check to ensure that Terminal #1, #2 and #3 are tight and the wire is secure. With a voltmeter, check the Input Voltage at Terminal #1. If this is below 10 Volts, repair the vehicle Power Supply as required. If the voltage reading is above 10 volts, contact your local Carter distributor, the OEM or Carter Ground Fueling.

7.3 Negative Pressure Reading

If the pressure display indicates a negative pressure reading, this would indicate that the transducer has a faulty connection or is defective.

Check Terminals #11, 12 and 13 to ensure that they are tight and that the wire is secure. Inspect the cable to ensure that it has not been cut or broken. Remove the connection to the transducer and ensure that the contacts are clean and dry. To perform a continuity check on the cable the wires must be disconnected from the transducer and the control module terminal. To assure that the wires are reconnected correctly, mark the wires before disconnecting them from the terminal connector.

Visually inspect the transducer. If it is bent or dented, it is likely to be defective. If the transducer appears to be in good condition, test the output to ensure that it is functioning properly. To test operation of the Vehicle Mounted Transducer, activate the pumping system and establish a flow of fuel. Contact the positive lead from a voltage meter to Terminal #11 and the negative lead to Terminal #13 and measure the voltage. The voltage should be between 1 and 6 volts DC. If it exceeds this range, the transducer is certainly defective.
7.4 Cautions

Hoses can be used in any combination. However when performing the calibration, only one hose or one hose combination allowed by the OEM PLC can be calibrated at a time. If more than one nozzle is removed from its stowage interlock, the displays on the Control Module will be blank.

While performing calibration process on the Vehicle Mounted or Test Stand Mounted Pressure Transducers, activating the Deadman will not initiate fuel flow.

It is important to note that the presence of a negative pressure reading on the Control Module display will be the only indication that the Pressure Transducer in question is either disconnected or defective. Consequently, it is vital that the user must realize this. Do not attempt to adjust the negative pressure reading into compliance with the reference gauge reading despite that the adjustment can be performed.

When fueling with combination of hoses, the nozzle delivery pressure will be the lowest of the active hoses as set by the user. By this means, the user will decide the delivery pressure of the hose combinations.

Deadman Timer can be set for each hose individually, with a delay period of 1 to 10 minutes. When more than one hose are used simultaneously, the Control Module will use the shortest delay period programmed into individual hose from this group.