SERVICE

# Wayne® 2400 Management Control System

Wayne DRESSER

# Wayne® 2400
# Management Control System
# Service Manual

October 1990 Part No. 917454 Rev. C

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## 1. INTRODUCTION

This manual describes the service of the Wayne® 2400 Management Control System (MCS). This system can be ordered in various configurations. These different configurations will operate with different types of dispensers. The basic troubleshooting methods, and service theory, is the same for all of these configurations. Any information which is specific to a particular configuration is shown as specific in the text.

Any service problems which cannot be solved should be referred to Wayne Product Support or to the regional service manager.

| | |
|---|---|
| Wayne Product Support<br>Austin, TX | 1-800-289-2963<br>24 hours/7 days |
| Northeastern Regional<br>Service Manager<br>Salisbury, MD | 410-546-6849<br>8:30AM-5:00 PM E.S.T. |
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## 1.1. OVERVIEW OF THE CONTROL SYSTEM

There are two major types of 2400 MCS, they are Data Link (also called DL) and MV/DE (also called pulsing). These two types of control systems were designed to control different types of dispensers. The DL system will control Wayne dispensers with model numbers beginning with DL or V; pulsing systems control mechanical and Wayne electronic pulsing dispensers. (Electronic pulsing dispensers have no DL or V in their model number.)

The 2400 MCS is a modular design incorporating three (3) or more cabinets, depending on the application, and a remote console. These cabinets are intended to be wall mounted and are generally placed in an out of the way location. The cabinets which are used in the 2400 MCS are as follows:

- Site Controller (also called the Electronic Central; used in both DL and pulsing systems)
- Data Distribution Cabinet (two may be required; used only in DL systems)
- Pulser Interface Cabinet (used only in pulsing systems; more than one may be required)
- Relay Cabinet (not used in MV systems; more than one may be required)

### 1.1.1. Site Controller

The Site Controller is the heart of the 2400 MCS. It contains all of the logic boards and the power supply which control the system. In a basic 2400 MCS there are two logic boards; these are the pump control Central Processing Unit (CPU) and the Companion Board. Both of these will be discussed in more detail in later sections of this manual.

In addition to the logic boards installed in a “basic” system the 2400 is capable of handling a variety of optional boards. These boards can be used to interface the 2400 system to an auxiliary controller; such as the NCR 2950 or 2157, the Suntronics point of sale, and the Koppens Micromax, or to inventory devices such as tank inventory gauges or telecommunications systems.

### 1.1.2. Data Distribution Cabinet

One Data Distribution Cabinet (DDC) is capable of handling communications with up to sixteen fueling points; if there are more than sixteen fueling points in a given station there should be two DDC’s with the system. Inside the DDC is the Data Distribution Board; it is connected to the Site Controller (SC) by two pair of data wires. Each of these pairs represents one channel, or loop, of communication to the dispenser computers. The connections to the dispenser computers are then made at the Distribution Board. On the Distribution Board there is one switch for each pair of dispenser communication wires. These switches are used to bypass the communication to any dispenser computer.

### 1.1.2. **Data Distribution Cabinet,** continued

The dispenser communication in the 2400 MCS is set up in a serial loop. That is, the positive communication wire to the first computer is attached to the 2400 MCS, its negative wire is attached to the positive wire of the second computer. This continues until the last computer is reached; its negative communication wire is then connected back to the system completing the serial loop (see Figure 1-1). Each dispenser computer is assigned an individual fueling point number so that it may be identified by the Site Controller.

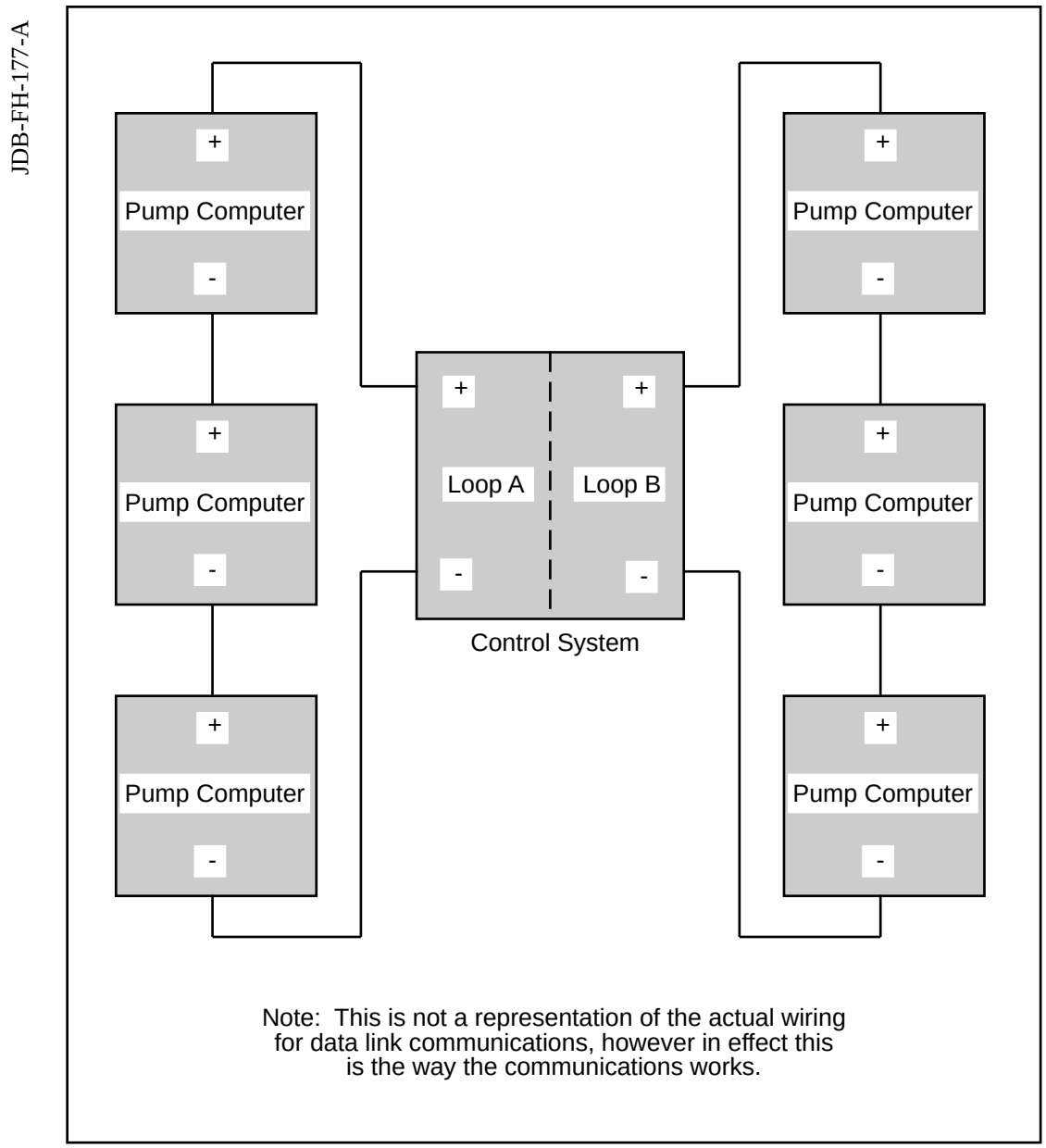



**FIGURE 1-1. DATA LINK COMMUNICATIONS BLOCK DIAGRAM**

### 1.1.3. Pulser Interface Cabinet

The Pulser Interface Cabinet (PIC) is used in systems which control mechanical, or electronic pulsing pumps and dispensers. These systems can be identified by the presence of LMV, LDE, MV, or DE in the model number located on the outside of the Site Controller.

In newer versions of these systems the PIC houses only two boards. These are called Four Pump Control Boards, as the name implies each of these boards is used to control four fueling points. There is one switch for each fueling point on the Four Pump Control Board. This switch has three positions; AUTO, OFF, and MANUAL. In the AUTO position the fueling point is under console control, in the MANUAL position the fueling point will act as a full service dispenser, and in the OFF position the fueling point will not operate at all.

In older versions of these systems the setting of the switches and the operation is the same. There are, however, additional boards in the PIC. In addition to the two Four Pump Control Boards there will be one Pulser Interface Board for each fueling point, either one or two field connection boards, and one or two terminal boards.

### 1.1.4. Relay Cabinet

The relay cabinet contains relays which are used to control the remote submersible pumps. In addition, there are terminal strips used to connect the relay select lines from the dispensers and the power in and out for the submersible pump motors. Depending on the application more than one relay cabinet may be required. **Specifically, two dispensers cannot be connected to the same relay if their control powers are not on the same electrical phase**. In order to assure that this condition is met Wayne recommends that all dispensers which are connected to the same submersible pump relay be connected to the same circuit breaker.

### 1.1.5. Console

The remote console used by the 2400 MCS contains a keyboard and display. There is very little memory resident in the console itself. All of the stored memory in the system is located in the Site Controller.

## 2. ELECTRONIC/ELECTRICAL PARTS

There are various electronic components in the 2400 MCS. The type and number of these components may vary depending on the particular application. The following section will describe each of these components in some detail.

### 2.1. SITE CONTROLLER (see Figure 2-1)

The Site Controller is the heart of the system. The cabinet will contain some or all of the following:

- system power supply
- pump control CPU
- Companion Board
- Motherboard
- optional battery backup module
- Peripheral Interface Board (PIB)
- TLS-250 interface board (used to connect the 2400 to a Veeder-Root TLS-250 tank inventory gauge)

#### 2.1.1. System Power Supply

The system power supply converts the input AC line voltage to regulated DC voltages. These voltages are as follows:

- +5 VDC operates all of the electronic central logic boards, except -12 VDC which is used for data modem transmission (telecommunications).

- +12 VDC is used for all data transmission to the console and the data distribution cabinet, powers the data distribution cabinet, and is available on each of the option board connectors.

- -12 VDC is used for peripheral communications which use RS-232-C protocol. This -12 VDC is used to generate a binary mark in systems with RS-232-C interfaces.

- +24 VDC is used for AC monitor which is used by the main CPU to determine brownout or overvoltage conditions.

- +28 to +40 VDC is used as a measure of VCAP, which is used as primary DC supply voltage.

Each DC output is fuse protected against shorts and overloads. The fuses, the voltage regulators which they control, and the fuse size are listed in Table 2-1. The voltage which will be measured on each fuse should be +24 to +40 VDC from the fuse to a chassis ground.

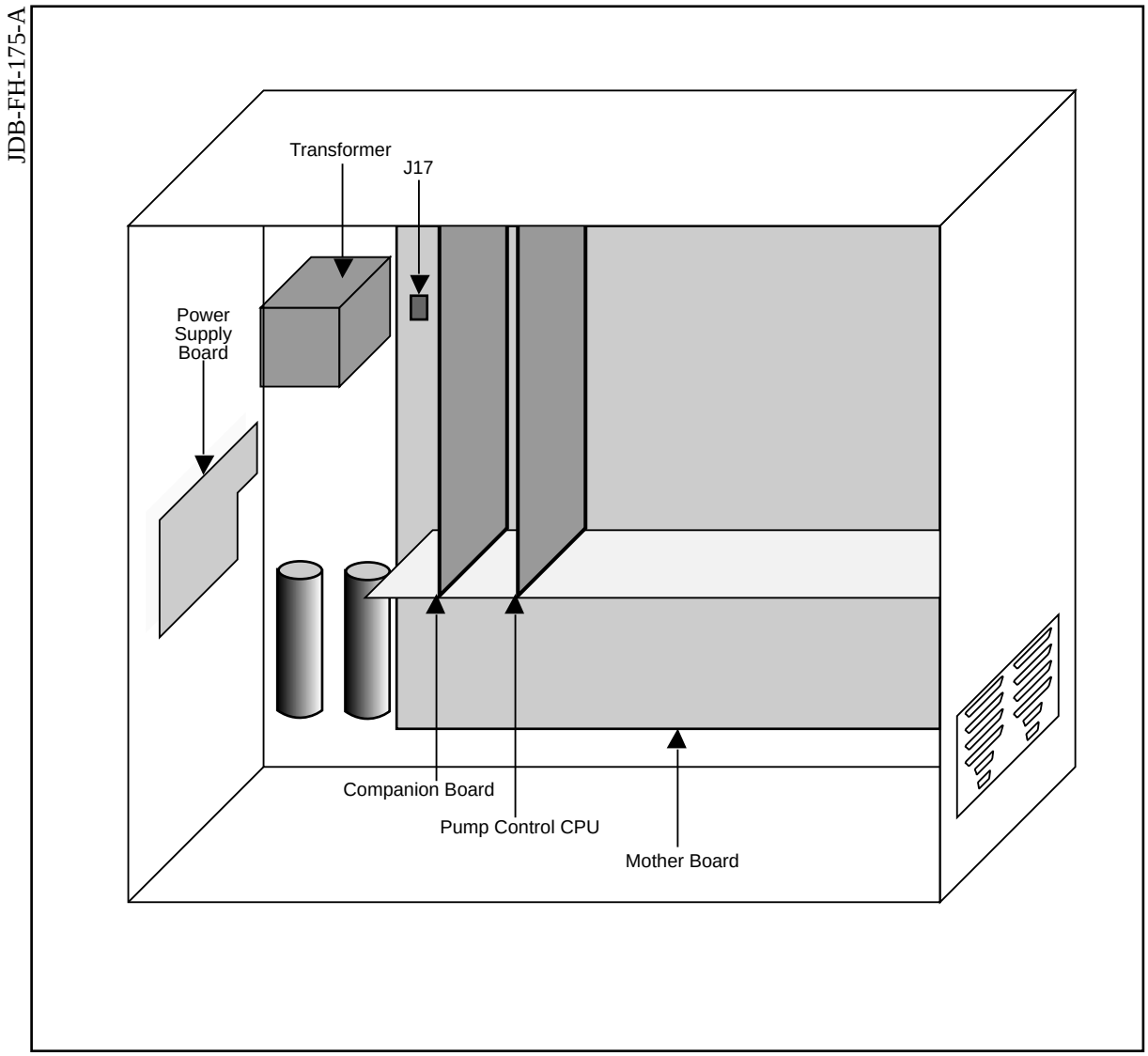



**FIGURE 2-1. SITE CONTROLLER**

### 2.1.1. **System Power Supply,** continued

| TABLE 2-1. POWER SUPPLY FUSE DESCRIPTIONS | | |
|---|---|---|
| **FUSE** | **REGULATOR** | **FUSE SIZE** |
| F1 | +12 and - 12 VDC | 8 AMPS |
| F2 | +24 VDC | 2 AMPS |
| F3 | +5 VDC | 5 AMPS |

Voltage on the main filter capacitor is constantly being monitored to insure that an adequate supply of power is available to the system. If this voltage should fall below specified limits, the normal power down sequence is initiated. This design provides "brown-out" protection against loss of memory or transaction data.

The voltage measurements for the DC power supply on J17 connector are listed in Table 2-2, below:

| TABLE 2-2. VOLTAGE MEASUREMENTS | | |
|---|---|---|
| **PIN NUMBER** | **SIGNAL** | **VOLTAGE** |
| 1 | VB2 | +12 VDC (only with optional battery) |
| 3 & 11 | Data Loop, PIC & RPS Power | +11.8 to 13.2 VDC |
| 4 | V.B. On (only with optional battery) | OV (Normal) , +5V (Optional Battery) |
| 5 | AC Monitor | +21-24 VDC |
| 6 & 9 | SC Power | +4.8 to +5.2 VDC |
| 7 | V Cap | +28 to +40 VDC |
| 13 | Option Boards | -10 to -13.2 VDC |
| 14 | GND | 0 VDC |
| 15 | GND | 0 VDC |

See Figure 2-1 for the location of the J17 connector, and Figure 2-2 for the location of each pin within the connector.

### 2.1.2. **Pump Control CPU**

The pump control CPU is a microprocessor controlled computer which contains the programming and all of the stored memory for the entire system. It controls all activities and communications for the 2400 system.

EPROM's on the main CPU contain the basic operating system. By changing these EPROM's the CPU can be configured for different applications. For instance the CPU board can be changed from a DL to an MV system by changing the EPROM's.

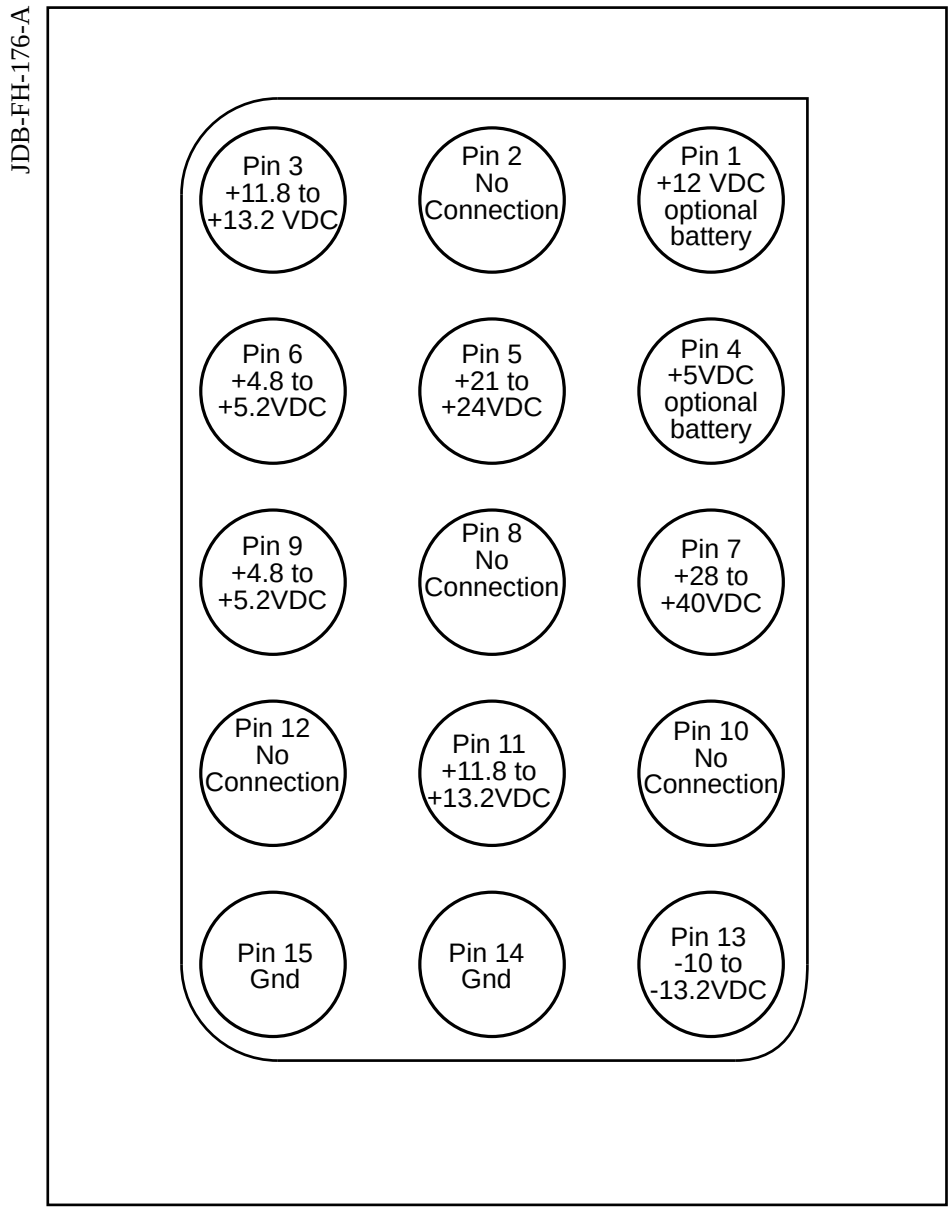



**FIGURE 2-2. J17 CONNECTOR WIRE SIDE**

### 2.1.2. **Pump Control CPU,** continued

RAM chips on the main CPU store all the end-user programming and the management information. This is all the programming data that is input at start-up as well as the totals information which is accumulated as the station is operated. This memory is retained during power failure by a replaceable battery located on the main CPU board.

### 2.1.3. Companion Board Data Link Systems

The Companion Board acts as an input/output board for the main CPU. Circuitry on the Companion Board interfaces the main CPU with each console and Data Distribution Cabinet. The DC power for the two consoles is supplied using power transistors on the Companion Board and each output is protected by replaceable fuses. Each of these fuses has an LED physically near it; these are fuse blown indicators. That is to say that if either of these fuses opens the LED next to it will light. The exception to this is the LED next to the F3 fuse; it will light when the system is in an ALL STOP condition and go out when that condition is cleared. The fuses and their usages are shown in Table 2-3 below.

**TABLE 2-3. FUSE DEFINITIONS DATA LINK STYLE COMPANION BOARDS**

| FUSE | DEFINITION | AMPERAGE RATING |
|---|---|---|
| F1 | Supplies power for console 2 | 1 amp |
| F2 | Supplies power for console 1 | 1 amp |
| F3 | (Not currently used) | 1/8 amp |

Two pairs of wires connect the Electronic Central to the Data Distribution Cabinet. Each of these pairs represents a separate communication channel to the dispenser computer. These two channels are separated on the Companion Board, as well as the CPU. Each channel has the capability of handling up to 12 computer assemblies in a series loop. The connections for each dispenser are made in the Data Distribution Cabinet.

### 2.1.4. Companion Board MV and DE Systems

The Companion Board in MV and DE systems is slightly different than that in DL systems. It still provides the communications to and the power for the console(s); the difference is in the communications to the dispensers.

In MV and DE systems there is no communications directly from the dispenser to the Site Controller. Instead the dispenser communicates to its Four Pump Control Board and the Four Pump Control Board in turn communicates with the Site Controller. The Companion Board provides a separate four wire communication channel for each of the Four Pump Control Boards. One of these pairs is used for transmitting and the other for receiving communications.

### 2.1.4. **Companion Board MV and DE Systems,** continued

In addition to these four wires the Companion Board also provides the power to each of the Four Pump Control Boards. This is 12 VDC and is fused on the Companion Board. This brings the total number of fuses on the MV or DE Companion Board to eight, two for the consoles and one for each possible Four Pump Control Board. Located next to each fuse is a red LED these LED's are fuse blown indicators; when one is ON the fuse next to it is blown. The fuses and their uses are listed in Table 2-4.

**TABLE 2-4. FUSE DEFINITION MV AND DE COMPANION BOARD**

| FUSE | AMPERAGE RATING | DEFINITION |
|---|---|---|
| F1 | 1 amp | Fuses the +9 to 40 VDC to console number 2. |
| F2 | 1 amp | Fuses the +9 to 40 VDC to console number 1. |
| F3 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 1 through 4. |
| F4 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 5 through 8. |
| F5 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 9 through 12. |
| F6 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 13 through 16. |
| F7 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 17 through 20. |
| F8 | 1 amp | Fuses the +12 VDC to the four pump control board for fueling points 21 through 24. |

### 2.1.5. **Remote Price Setting Board DE and LDE Systems Only**

The Remote Price Setting (RPS) board is used in DE and LDE systems to send prices automatically to electronic pulsing dispensers. In applications without the RPS board the prices must be manually set at the dispenser if the prices in the control system are changed.

The RPS board operates four parallel communications channels accessed from terminals on the motherboard. It sends information in a constant stream of communication to the dispensers. That is, it does not wait for an operation to occur at the console before transmitting prices to dispensers. This makes it easy to determine if the RPS board is transmitting.

### 2.1.5. **Remote Price Setting Board DE and LDE Systems Only**, continued

Simply place the leads of a meter (analog) across the transmitting terminals (terminals 13 and 14, or 15 and 16 on the motherboard in the SC). Check the terminals that the "trouble" dispensers are attached to; if the RPS board is working the communications will be seen as a fluctuating DC voltage (approximately +5 VDC). If there is a constant 0 VDC or a constant +5 VDC the RPS board is defective.

### 2.1.6. Motherboard

The Motherboard has edge connectors to accept the main CPU, companion boards, and all option boards. This board has no electronic components, but provides terminal strip connections for up to two consoles, two data distribution cabinets, three pulser interface cabinets, and optional peripheral devices (i.e., tank inventory gauges, data, modem, etc.).

### 2.1.7. Optional Battery Module

An optional battery module provides up to 16 minutes of console operation to allow the operator to retrieve all transactions and memory information in the event of a power failure. This battery is charged whenever power is on, and may be activated by the pump start key (old models) or a pushbutton on the back of the console. The STOP key will turn the console off, or after 5 minutes, power will be turned off automatically to save the battery. It may then be restarted using the above procedure.

**Note: All systems are equipped with a battery which retains memory during a power loss. This battery is located on the main CPU board.**

### 2.1.8. Peripheral Interface Board

The Peripheral Interface Board (PIB) allows controllers other than the Wayne 2400 console to control the 2400 MCS. It provides two RS-232 channels located on edge connectors on the outer side of the PIB (as it is mounted in the Site Controller), and one OCIA channel which is accessed from a terminal strip located on the motherboard.

### 2.1.9. TLS-250 Interface Board

The TLS-250 interface board allows the 2400 MCS to read data from Veeder-Root's tank level sensing system. The interface is an RS-232 channel which is accessed from a terminal strip located on the motherboard. When this interface is installed the 2400 console will then display the levels in each tank as well as illuminating a warning lamp when there is an excessive amount of water in a given tank. (The water warning lamp will only operate if the TLS-250 is equipped with a water sensor.)

## 2.2. DATA DISTRIBUTION CABINET (DL SYSTEMS ONLY)

The Data Distribution Cabinet (DDC) houses the data distribution board. This board contains terminal strips providing connections for dispenser communication circuits. Terminal strips are provided to connect up to eight pairs of data wires per data link channel with a maximum of 12 computers per data link channel allowed for each system.

### 2.2.1. Data Distribution Board

While the data distribution board is physically one board it is electrically divided into two halves vertically down the center of the board. Each of these halves operates a separate data loop for communication to the dispenser computers and is connected to the Site Controller by a separate pair of data wires. The two red LED's located on this board serve as continuity indicators. If there is a complete loop from the Site Controller to each of the dispenser computers and back to the Site Controller the LED for that loop will illuminate. If the LED is out this is an indication that there is an open circuit in the loop. The switches located on the distribution board are provided to allow the communication wiring to a given dispenser to be bypassed.

## 2.3. PULSER INTERFACE CABINET (PULSING SYSTEMS ONLY)

The Pulser Interface Cabinet (PIC) is used in LMV, LDE, MV, and DE systems only it takes the place of the data distribution cabinet. Its purpose is to interface the power required to operate pulsing dispensers with the Site Controller.

The PIC can house two different styles of boards depending on the age of the system in question. The cabinets used in LMV and LDE systems (the newer version) will house far fewer boards than the cabinets used in MV and DE systems (the older version).

The MV and DE systems will contain the following boards:

- four pump control board
- pulser interface boards
- field connection board
- terminal board

In the newer LMV and LDE systems the functions of all of these boards have been incorporated into the four pump control board. For this reason only the four pump control board will be installed in the PIC used in LMV and LDE systems.

### 2.3.1. Four Pump Control Board MV and DE Systems

The Four Pump Control Board is a microprocessor controlled computer. Its main purpose is as a communications link between the pump control CPU and the dispensers. It receives instructions from the pump control CPU and interprets these instructions to control the pulser interface boards which in turn control the dispensers. It also receives return information from the dispensers (mechanical money pulsers in mechanical pumps, and money and volume pulse returns from electronic pulsing computers), through the pulser interface boards, and transfers that information to the pump control CPU.

### 2.3.2. Pulser Interface Board MV and DE Systems Only

The Pulser Interface Board contains triacs (or solid state relays in very old systems) which switch the AC authorize signal on to the dispensers. There are also triacs (or relays) which control the neutral lines to the solenoid valves in the dispensers. In addition to this, the pulser interface board also contains circuitry which converts the return pulses from the dispensers into voltages which can be counted by the Four Pump Control Board.

In addition to this, the switch which converts the fueling point from manual to auto or off is located on the pulser interface board. This switch, in the manual position, simply provides a constant AC voltage to the authorize terminal and a constant AC neutral to the valve wires.

### 2.3.3. Field Wiring Board MV and DE Systems Only

The field wiring board is used mainly to make the wiring connections to the dispensers. It does however perform three functions.

First, there is a relay located on the field wiring board. The purpose of this relay is to shut off all power to the dispensers when the STOP key is pressed on the console. All of the power to the dispensers is routed through this relay before it reaches any other boards. When the stop key is pressed the relay coil is deenergized (there is an LED located next to the relay labeled DS1; when it is on the relay is energized; when it is off the relay is deenergized), dropping out all available power to the dispensers. (The dispenser lights power can be included in this relay.) Occasionally if one of these relays is not energized, stopping and restarting the system will pull the relay in allowing the associated dispensers to operate.

### 2.3.3. **Field Wiring Board MV and DE Systems Only,** continued

Second, there is circuitry to isolate the relay select lines from the dispensers. In this system there is a return line from the dispensers labeled IN USE; this is an AC return line which informs the system that the dispenser is being used. This in use voltage is routed through a diode and then to the PRODUCT SELECT terminal which is used to turn on the correct submersible pump relay. If this diode were not installed and the IN USE wire was connected to the relay all fueling points dispensing like products would show in use when any one of them was on.

Third, the field wiring board houses fuses which protect the AUTHORIZE and dispenser light circuitry. There is one fuse for each fueling point which controls the authorize voltage for that fueling point, these are the 3 amp fuses. The 5 amp fuse operates the dispenser lights for all fueling points which are attached to the field wiring board.

### 2.3.4. Terminal Board MV and DE Systems Only

The terminal board is used to make all wiring connections from the Site Controller and the PIC. It contains traces and terminal blocks which allow connections to be made to the four pump control board.

Located on the terminal board is a fuse which protects the 12 VDC to the four pump control board. Also on the terminal board is an LED located near the fuse. This LED comes on to show that the 12 VDC is being input to the interface cabinet.

### 2.3.5. Four Pump Control Board LMV and LDE Systems

The Four Pump Control Board used in LMV and LDE systems (the newer style pulsing system) incorporates all of the functions listed in the preceding paragraphs onto one board. There are only two functions that are not performed by the LMV and LDE systems. First, there is no stop relay in newer pulsing systems, therefore, there is no way to remove all of the power from the dispenser using the 2400 console. Second, there is no product select circuitry provided. The “in use” wires are isolated from one another in the relay cabinet.

## 2.4. RELAY CABINET

There are two styles of relay cabinets available with the 2400 control system. One of these is used with data link systems and the other is used with DE and LDE systems. (MV and LMV systems are not supplied with relay cabinets.) Both types contain the following components.

Inside the relay cabinet there are either four or six relays depending on how the system was ordered. Also inside the relay cabinet are the associated terminal strips to be used in making the electrical connections to and from the relays. By using the appropriate terminal strip the relay cabinet receives AC signals (relay select) from each of the dispensers and switches the AC voltage to the appropriate submersible pump.

## 2.4. RELAY CABINET, continued

In DE and LDE systems there is an additional board in the relay cabinet. This board is used to isolate the "in use" wires from each dispenser so that there will be no false "in use" signals. On this board there are two banks of terminal strips totaling 24 terminals each. Between these two banks are 24 sets of diodes and resistors. Each "in use" wire is attached to a terminal on the input bank of terminals, physically at the bottom of the board. At the output bank, physically at the top of the board, all fueling points dispensing like products are jumpered together before running one wire to a relay select terminal.

## 2.5. CONSOLE

The console is a remote keyboard and display which allows operators to input and access data from the control system and dispensers (i.e., shift totals, dispenser sales, etc.).

The console attaches to the Site Controller through an eight (8) conductor cable and connector. Two pairs of wires are used for full duplex data transmission. (Note: There is one twisted pair of wires for receiving data and one twisted pair for sending data.) One wire for the optional battery start circuit, two wires for the +9-40 VDC power, and the remaining wire is for earth grounding of the console.

The console consists of three major electronic components:

- keyboard
- display board
- switching regulator board (power supply)

### 2.5.1. Keyboard

The keyboard is the heart of the console. It uses a microprocessor to monitor the numeric and special function keys (i.e., authorize, pump stop, etc.), and controls the display board and the pump status indicator lamps. In addition, it receives and transmits information from the Site Controller. An annunciator provides audible indication of various functions as determined by programming.

An optional circuit may be included on the keyboard to interface peripherals, such as an Electronic Cash Register or a Receipt/Totals Printer. This circuit consists of a Console Option Interface chip. This chip may take one of two forms. First, earlier chips were a piggy-back affair with an EPROM installed in the top of another chip called an emulator. Second, the current production chip is a single ROM chip. Each of these types includes two fourteen pin chips. These chips only need be installed if two conditions are satisfied.

**2.5.1. Keyboard,** continued

If there is a Wayne® 1000 Electronic Cash Register (ECR) installed **and** there are two sockets on the keyboard marked U13 and U14 to accept these smaller chips. If there is no register **or** there are no sockets these chips may be discarded. If these two chips are installed they act as communications buffers to ensure that sale information sent to a ECR is not transmitted until the register is ready to accept it.

Circuitry is provided to add a pushbutton to the back of the console when the optional battery backup is installed.

The display drive circuitry for the status indicator lamps (these are the three rows of LED's on the keyboard) is located on the keyboard. The keyboard also generates all of the information which is transmitted to the display board. Two flat ribbon cables connect the keyboard and the display board.

**2.5.2. Console Display Board**

The display board provides visual readings of sales and programming information. It utilizes red LED's for all digits and function indicators. The information which is displayed is generated by the keyboard, however, all of the decoders and drivers for the LED's are located on the display. A light sensor automatically adjusts the intensity of the digits to optimize their visibility during changing lighting conditions (day/night).

**2.5.3. Switching Regulator** (see Table 2-5)

A switching regulator assembly connects to the keyboard through a 4-pin plug. This board regulates the 9-40 VDC from the Site Controller down to the 5 VDC for the keyboard logic and for the display and LED drive. A 2 AMP fuse on this board protects the console from over voltage or shorts.

**TABLE 2-5. SWITCHING REGULATOR VOLTAGE MEASUREMENT**

| CONNECTOR AND PIN NUMBER | VOLTAGE DESCRIPTION | VOLTAGE MEASUREMENT |
|---|---|---|
| J1-1 (Orn) to J1-2 (Whi) | Power In | +9 to +40 VDC |
| J2-1 (Red) to J2-2 (Whi) | +5 Reg. | +4.8 to +5.2 VDC |
| J2-3 (Yel) to J2-4(Whi) | Differential Voltage reading | 0.7 to 0.9 VDC higher than J2-1 |

## 3. TROUBLESHOOTING CONTROL SYSTEM PROBLEMS

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| System totally inoperative, keyboard dead and display blank. | 1. No AC input voltage. | Check for AC at terminals 1 and 2 in the electrical box at the side of the Site Controller. If not present reset circuit breaker or correct station wiring. |
| | 2. Defective EMI filter. | Check the output from the EMI filter; it should be the same as the AC control power. The filter islocated on the left hand wall of the Site Controller. The voltage can be checked at the two pin connector on the load side of the filter. Replace if necessary. |
| | 3. Defective power supply assembly. | The terminals on the large capacit ors in the Site Controller should read +22 to + 40 VDC. If not replace power supply assembly. |
| | 4. Defective power supply board. | Check the fuses on the power supply board; they should read +22 to +40 VDC to a chassis ground. Check voltages on the J17 connec-tor. If any of these voltages are out of tolerance replace the power\ supply board. |
| | 5. Blown fuse on the Companion Board. | Check the F1 and/or F2 fuses on the Companion Board. Replace as necessary. |
| | 6. Defective Companion Board. | Check for +9 to +40 VDC on TB1 terminals 1 and 2 (for console 1) and terminals 8 and 9 (for console 2). If not present replace Companion Board. If the voltage is still not present replace the motherboard. |

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| System totally inoperative, keyboard dead and display blank, continued | 7. Defective console cable. | Check for +9 to +40 VDC input to console at the J1 connector. This is the in line connector containing the orange and white wire. |
| | 8. Blown fuse on the switching regulator board. | Check the fuse, replace as needed. |
| | 9. Defective switching regulator board. | Check for +5 VDC on J2 connector from pin 1 (red wire) to pin 2 (white wire). If not present, disconnect the keyboard and check again. If still not present, replace the switching regulator board. If the voltage is correct with the keyboard disconnected replace keyboard. |
| | 10. Shorted switch on keyboard. | Replace keyboard. |
| System totally inoperative (console ticks). | The console has lost communications with the Site Controller. | |
| | 1. Defective extension cable. | If there is an extension cable installed eliminate it by carrying the console to the Site Controller and plugging it directly in. |
| | 2. Defective power supply. | Check all voltages on the J17 connector. Replace the power supply if any voltages are out of tolerance. |
| | 3. Defective switching regulator board. | Check all voltages replace the switching regulator board if necessary. |

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| System totally inoperative (console ticks), continued | 4. Defective console display. | Disconnect ribbon cables to display replace console display if the ticking stops. It is necessary to disconnect the console from the Site Controller before disconnecting the ribbon cables. |
| | 5. Defective keyboard. | Replace the keyboard. |
| | 6. Defective cable to console, either inside the Site Controller or attached to the console. | Ohm out all wires in cables. Replace if necessary. |
| | 7. Poor connection at edge connectors on CPU and/or Companion Board. | Clean edge connector using contact cleaner or alcohol. |
| | 8. Defective Companion Board. | Replace the Companion |
| | 9. Defective CPU board. | Replace the CPU board |
| | 10.Defective motherboard. | Move the console cable to the console two position. To do this move all wiring on the TB1 terminal strip from terminals 1 through 7 to 8 through 14. (Terminal 1 goes to 8, 2 goes to 9 etc.) If the problem is corrected replace the motherboard. In LMV and LDE systems, simply move the 9 way plug. |
| System not maintaining programmed data. | 1. Defective battery on the CPU board. | Measure voltage on battery terminals. Voltage should be 3.55 VDC or more if not, replace battery. |
| | 2. Manager restrictions not set correctly. | Check mode 61 to determine if station personnel have changed programming. Check/change mode 99 accordingly. |
| | 3. Defective CPU board. | Replace. |

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Erratic or intermittent sole display operation. | 1. Defective switching regulator board. | If the voltage reading on J2 con-pin 3 is not 0.7 to 0.9 VDC higher than J2 pin 1, replace the switching regulator board. |
| | 2. Defective display board. | Use mode 90-01 to test the display. If some or all digits or function indicators on the display board do not light, replace the display board. |
| | 3. Defective keyboard. | If during the mode 90-01 test some of the status indicators board on the keyboard do not light, replace the keyboard. |
| Erratic or intermittent Keyboard operation. | 1. Defective keyboard. | Replace the keyboard. |
| No access to console during power outage. Assuming that there is an optional battery backup module installed. | 1. Defective battery. | Check J17 pin 1 to pin 14 for 12 VDC. Replace battery if not present. |
| | 2. Defective switch. The switch which enables the battery backup is located on the back of the console. | Check J17 pin 4 to 14, It should read +5 VDC with the button pressed. If it is not present, replace switch. |

## 4. TROUBLESHOOTING DISPENSER COMMUNICATION PROBLEMS DL SYSTEMS

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| One dispenser will not operate under console control. | 1. No communications to the dispenser. | Make sure AUTO/BYPASS switch is in the AUTO position.<br><br>Check fueling point in dispenser in question. Reset if necessary.<br><br>Problem with dispenser. Reference the service manual for the dispenser in question. |
| | 2. Incorrect programming. | Check the programming for the dispenser in question. Reference the 2400 operation and programming manual for the system in question for specifics. |
| Some or all dispensers will not operate under console control. | **See Below** | |
| **LED's on in Data Distribution Cabinet** | | |
| | 1. Pump not in data loop. | Check for dispenser power.<br><br>Make sure AUTO/BYPASS switch in the distribution cabinet is in the AUTO position. |
| | 2. Dispenser computer has lost its fueling point. | Reset fueling point in dispenser computer. |
| | 3. Incorrect programming. | Check the programming for the dispenser in question. Reference the 2400 program ming manual for the system in question for specifics. |
| | 4. Incorrect wiring. | Check data wires from DDC to dispenser computer. |
| | 5. Defective dispenser computer. | Replace. |

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Some or all dispensers will not operate under console control, continued | **See Below** | |
| **LED's out in Data Distribution Cabinet** | | |
| | 1. Defective power supply board. | Check for +12 VDC on terminal 3 and 12 of J17. If not present, replace power supply board. |
| | 2. Defective Companion Board. | Check current on data loop in Site Controller. TB2 terminals 3 and 4 and/or 7 and 8 should read 32 to 36 mA. If not, replace Companion Board. |
| | 3. Defective/Incorrect wiring Site Controller to distribution cabinet. | Ohm out wires from Site Controller to distribution cabinet. Check for correct polarity as well as continuity. |
| | 4. Open wire in data loop. | Put one AUTO/BYPASS switch into BYPASS at a time. If LED comes on check wires attached to suspect switch. |
| | 5. Defective distribution board. | Put all switches into the BYPASS position. Remove wires from the Site Controller. On TB5 and/or TB6 check for ohms; if an open circuit is found replace board. |

## 5. TROUBLESHOOTING DISPENSER COMMUNICATIONS PROBLEMS PULSING SYSTEMS

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Dispenser(s) will authorize on the console but will not reset. | 1. AUTO, OFF, MANUAL switch in the OFF position. | Reset switch to the AUTO position. |
| | 2. Stop relay is not . energized (This does not apply to LMV or LDE systems.) | Check the LED next to the stop relay in the center of the field wiring board. If it is not ON press the STOP button on the console and then re-start the system. If this does not clear up the problem replace the relay.If the problem still persists replace the Four Pump Control Board. |
| | 3. Blown authorize fuse. | There is a 3 amp fuse which controls the authorize voltage to each dispenser. These are marked either F1, 2, 3, or 4 depending on the position. Check the fuse and replace if necessary. |
| | 4. Defective Four Pump Control Board. (Pulser Interface Board in MV or DE systems.) | Check the authorize terminal. It should read the same as the control power voltage; if not replace the board. |
| | 5. Incorrect wiring or dispenser problem. | If the authorize voltage is present in the Interface Cabinet check station wiring and/or dispenser. |

## 5. TROUBLESHOOTING DISPENSER COMMUNICATIONS PROBLEMS PULSING SYSTEMS

| FAILURE INDICATION | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Dispenser(s) will not authorize. | 1. Incorrect programming. | Refer to the programming manual for the system in question. Specifically check modes 00 through 09 and 33. |
| | 2. No 12 VDC to the Four Pump Control Board. | Check the fuse on the Com panion Board. Replace if necessary.<br><br>Check the 12 VDC fuse in the Interface Cabinet. Replace if necessary.<br><br>Check all wiring from the Site Controller to the Interface Cabinet. |
| | 3. Short or open in the communication wiring from Interface theSite Controller to the Cabinet. | Check the four communication wires to the Four Pump Control Board in question. |
| | 4. Defective Companion Board. | Replace the Companion Board. |
| | 5. Defective Four Pump Control Board. | Replace the Four Pump Control Board. |
| | 6. Defective pump control CPU board. | Replace the pump control CPU. |
| Prices not being transferred to dispensers. (DE and LDE systems with remote price setting only.) | 1. Defective Remote Price Setting Board. | Replace the Remote Price Setting Board. |
| | 2. Incorrect wiring to the. dispenser. | Check all wiring. |
| | 3. Defective pump computer(s). | Replace the pump computer. |

## 6. COMPONENT REPLACEMENT

**Caution: Before replacing any components, power should be removed from the system. Additionally, totals should be read and recorded in case of memory alteration.**

**Before replacing any components, servicing personnel must wear a static guard wrist strap (Dresser part number 916962 or equivalent) securely attached to an earth grounding point in order to prevent damage to electronic components due to static electricity.**

### 6.1. ELECTRONIC CENTRAL

#### 6.1.1. Boards Installed in the Card Cage

1. Turn OFF the control power circuit breaker.
2. Lift white tabs on the PCB and slide out of the card guide.
3. To install a replacement board, insure the board is in the upper and lower guides, then slide the board into the card cage. Apply pressure to the white tabs until the board snaps into the sockets.
4. Turn the control power back ON and test for proper operation.

When replacing the CPU record all totals before and after changing the board. Give these totals to the station dealer for his records.

#### 6.1.2. Power Supply PCB

1. Turn OFF the control power circuit breaker.
2. Unplug the 15-way plug from the motherboard.
3. Unplug the 11-way connector on the power supply PCB.
4. Remove (4) phillips head screws on the outside of the electronic central cabinet below the power access box. (These screws must be replaced or heat sink will not work effectively causing damage to the new board).
5. Remove (2) phillips head screws holding the board to standoffs on the power supply frame.
6. Lean board toward the transformer and lift out of the card guide, insuring that the heat sink will clear the power supply frame.
7. To install a replacement board, follow the reverse procedure.
8. Turn the control power back ON and test for proper operation.

### 6.1.3. Power Supply Assembly

1. Shut OFF the control power at the circuit breaker.

2. Disconnect the two wire connector from the EMI filter, and the J17 connector from the motherboard.

3. Remove the two screws on the outside of the Site Controller which secure the power supply frame to the Site Controller side wall, and the four screws which attach the power supply board heat sink to the Site Controller.

4. Remove the four screws inside the Site Controller which secure the power supply frame to the Site Controller back wall.

5. Remove the power supply assembly.

6. Turn the control power back ON and test for proper operation.

### 6.1.4. Battery Back-up Module (Optional)

1. Unplug the battery 2-way connector.

2. Disconnect the 5-way connector from the power supply PCB.

3. Remove the single hold down screw.

4. Tilt the module back to release the locking tabs, then lift straight out.

5. To replace; reverse the procedure.

6. Test for proper operation.

## 6.2. DATA DISTRIBUTION CABINET

### 6.2.1. Data Distribution Board

1. Mark and remove all data wires from the dispensers and electronic central.

2. Remove the data distribution PCB by removing the 4 corner screws.

3. Install a new PCB by using the reverse procedure and test for proper operation.

## 6.3. PULSER INTERFACE CABINET

### 6.3.1. Four Pump Control Board (LMV and LDE Systems)

1. Shut OFF the control power to the Site Controller.

2. Remove the cover from the inside of the pulser Interface Cabinet by removing the four screws, one at each corner, from the cover.

3. Disconnect the five removable wiring blocks from the Four Pump Control Board.

4. Disconnect the AC wires from the four terminal block in the center of the Four Pump Control Board.

5. Remove the Four Pump Control Board from the cabinet by removing the four screws one from each corner of the board.

6. Install the new board using the reverse procedure.

7. Turn the control power back ON and test for proper operation.

### 6.3.2. Four Pump Control Board (MV and DE Systems)

1. Shut OFF the control power to the Site Controller.

2. Remove the cover from the inside of the Pulser Interface Cabinet by removing the four screws, one at each corner, from the cover.

3. Remove all of the Pulser Interface Boards by pulling them out of their sockets.

4. Disconnect the relay control wiring harness from the center of the field wiring board. Note the direction of the connector so that the new one may be installed in the correct position.

5. The Four Pump Control Board is located along the edge of the pulser Interface Cabinet. Remove it by pulling it straight out.

6. Install the new board by using the reverse procedure. Make sure that the relay control harness is connected correctly.

7. Turn the control power back ON and test for proper operation.

### 6.3.3. Pulser Interface Board (MV and DE Systems)

1. Shut OFF the control power to the Site Controller.

2. Remove the cover from the inside of the pulser Interface Cabinet by removing the four screws, one at each corner, from the cover.

3. Remove the Pulser Interface Board (the one with the switch on it) by pulling it straight out toward you.

4. Install the new Pulser Interface Board using the reverse procedure.

5. Turn the control power back ON and test for proper operation.

### 6.3.4. Field Wiring Board (MV and DE Systems)

1. Shut OFF the control power to the Site Controller.

2. Remove the cover from the inside of the Pulser Interface Cabinet by removing the four screws, one at each corner, from the cover.

3. Remove the Pulser Interface Boards.

4. Label and disconnect all wires from the field wiring board.

5. Remove the six screws which secure the field wiring board to its bracket, and remove the board.

6. Install the new board using the reverse procedure.

7. Turn the control power back ON and test for proper operation.

### 6.3.5. Terminal Board

1. Shut OFF the control power to the Site Controller.

2. Remove the cover from the inside of the Pulser Interface Cabinet by removing the four screws, one at each corner, from the cover.

3. Remove the Four Pump Control Board and the field wiring board.

4. Remove the bracket which the field wiring board was attached to by removing the four phillips head screws which secure it to the back wall of the Interface Cabinet.

### 6.3.5. **Terminal Board,** continued

5. Remove the bracket and the terminal board as a unit.

6. Remove the four screws which secure the terminal board to the bracket.

7. Install the new board using the reverse procedure.

8. Turn the control power back ON and test for proper operation.

## 6.4. CONSOLE

**The console must be disconnected from the Site Controller or the control power shut OFF at the circuit breaker before replacing any components in the console.**

**Power may be turned ON and dispensers operated in manual with the console removed from the system.**

### 6.4.1. Keyboard Assembly

1. Remove the black face plate from the top of the console.

2. Turn the console upside down and remove the bottom by removing the four screws located one at each corner of the console.

3. Disconnect the power 4-way connector (J-5) and the data 9-way connector (J-1) from the keyboard.

4. Gently disconnect the two ribbon cables from the display board.

5. Disconnect the 2-way connector to the keyswitch. When connecting the keyswitch to the new keyboard make sure that it is connected to the pair of wires which are soldered closest to the center of the keyboard.

6. Disconnect the 2-way connector from the battery backup enable switch if the system is equipped with one. When connecting this switch to the new keyboard make sure that it is connected to the pair of wires which are soldered furthest from the center of the keyboard.

7. Remove the two screws holding the strain relief bracket which holds the option interface cable.

8. Remove the two 1/4 inch hex standoffs at the front of the console. These attach two metal rails, which support the keyboard, to the console housing.

**6.4.1. Keyboard Assembly,** continued

9. Remove the two phillips head screws which secure the opposite end of these rails to the display.

10. Lift the keyboard from the console.

11. Remove the four phillips head screws which secure the rails to the keyboard.

12. Install the rails onto the new keyboard.

13. Install the new keyboard using the reverse procedure.

14 Test for proper operation.

**6.4.2. Switching Regulator Assembly**

1. Remove the black face plate from the top of the console.

2. Turn the console upside down and remove the bottom by removing the four screws which are located one on each corner.

3. Disconnect the input power 2-way connector from the console cable and the 4-way power connector from the keyboard.

4. Remove the two screws which hold the strain relief bracket to the case and lay the cable off to one side.

5. Remove the two hex stand offs holding the regulator bracket.

6. Lift the entire assembly from the console.

7. Replace the switching regulator using the reverse procedure.

8. Test for proper operation.

### 6.4.3. Display Board

1. Remove the Switching Regulator Assembly using procedures elsewhere in this manual.

2. Disconnect the two ribbon cables from the display board.

3. Remove the two screws holding the display assembly and lift the entire assembly (board plus display) from the console.

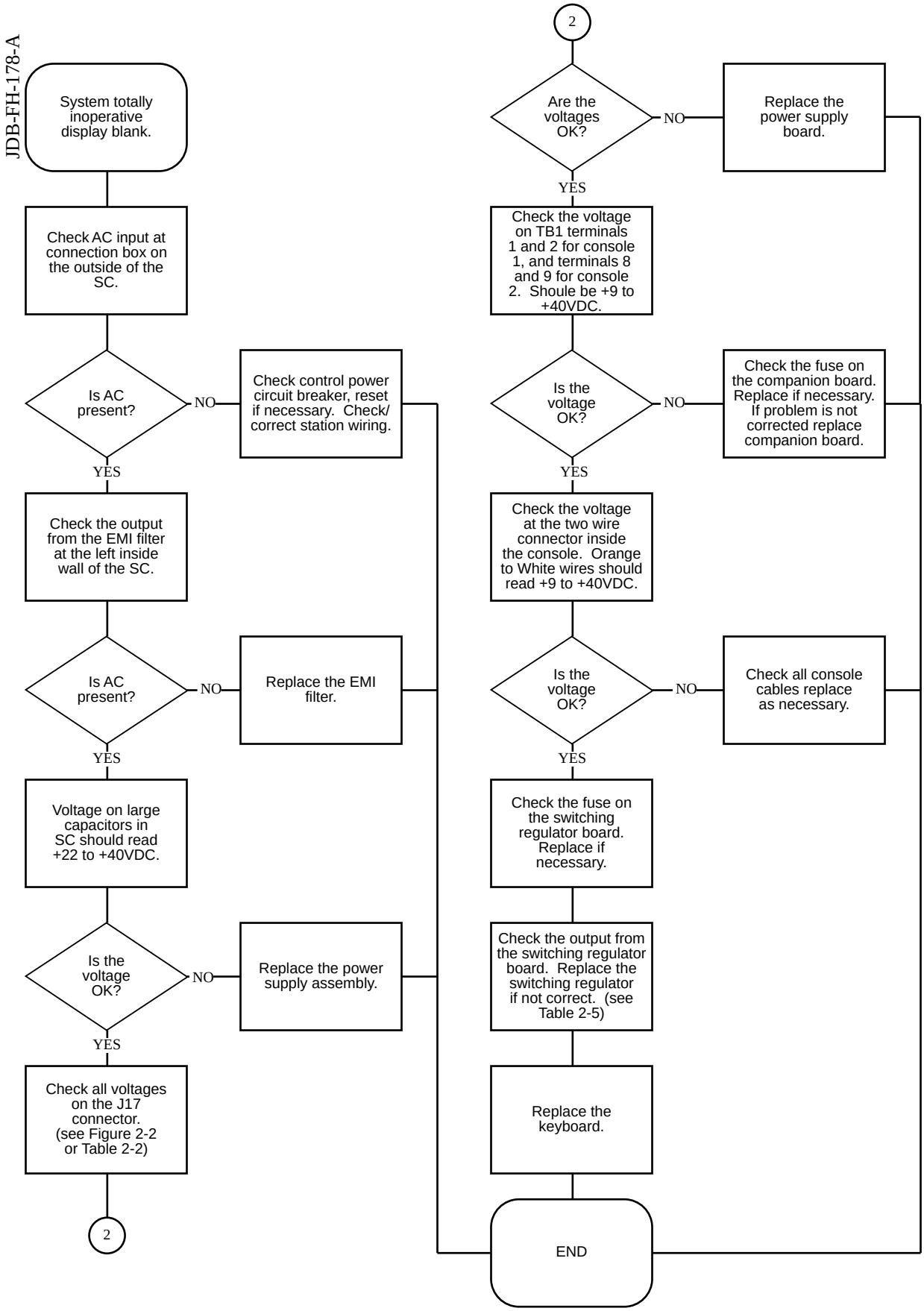
4. Remove the display board from the bezel assembly by removing the four screws.

5. Assemble the new display to the bezel and reinstall the assembly using the reverse procedure. When connecting the two ribbon cables, be careful not to bend the pins in the connector. **Do not force the connector.**

6. Test for proper operation.

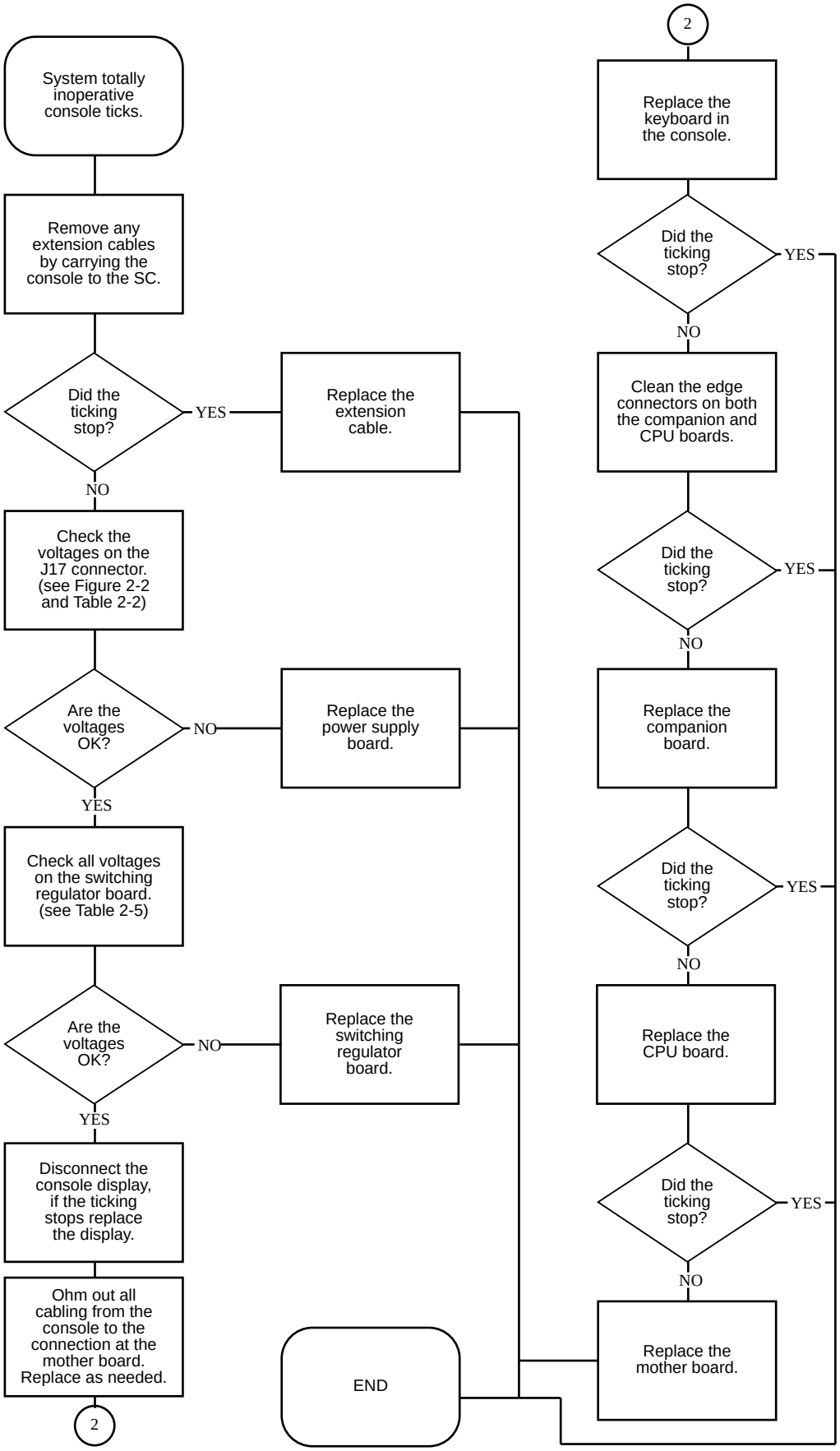
## APPENDIX A

## TROUBLESHOOTING FLOWCHARTS: 2400 SYSTEM PROBLEMS

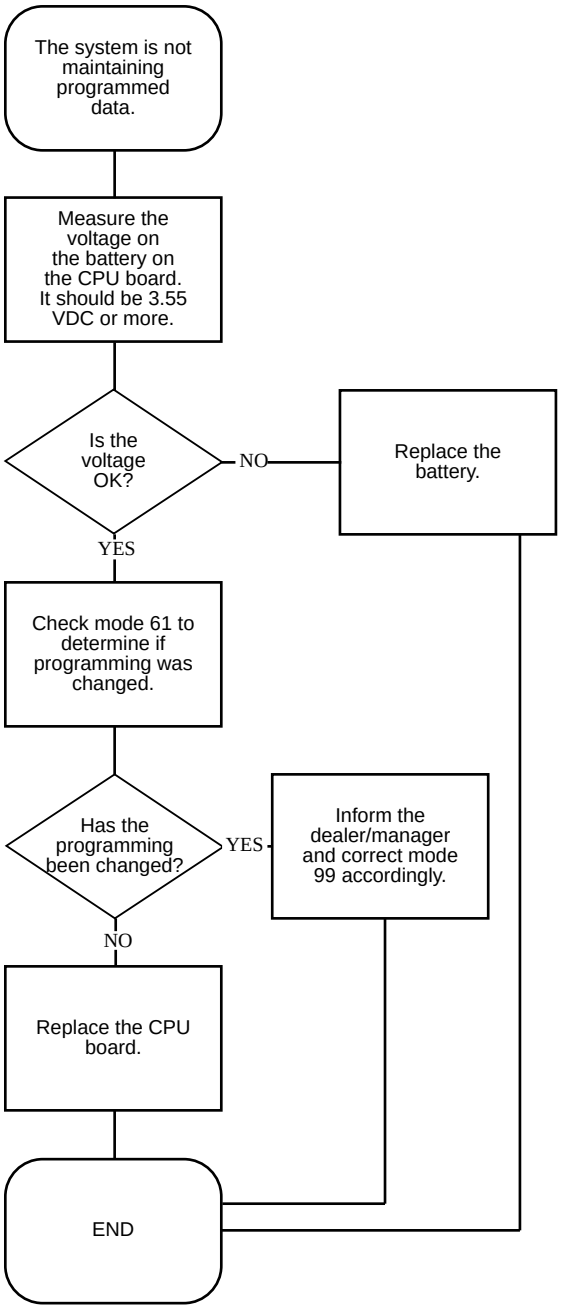



**FLOWCHART A-1. SYSTEM TOTALLY INOPERATIVE--DISPLAY BLANK**

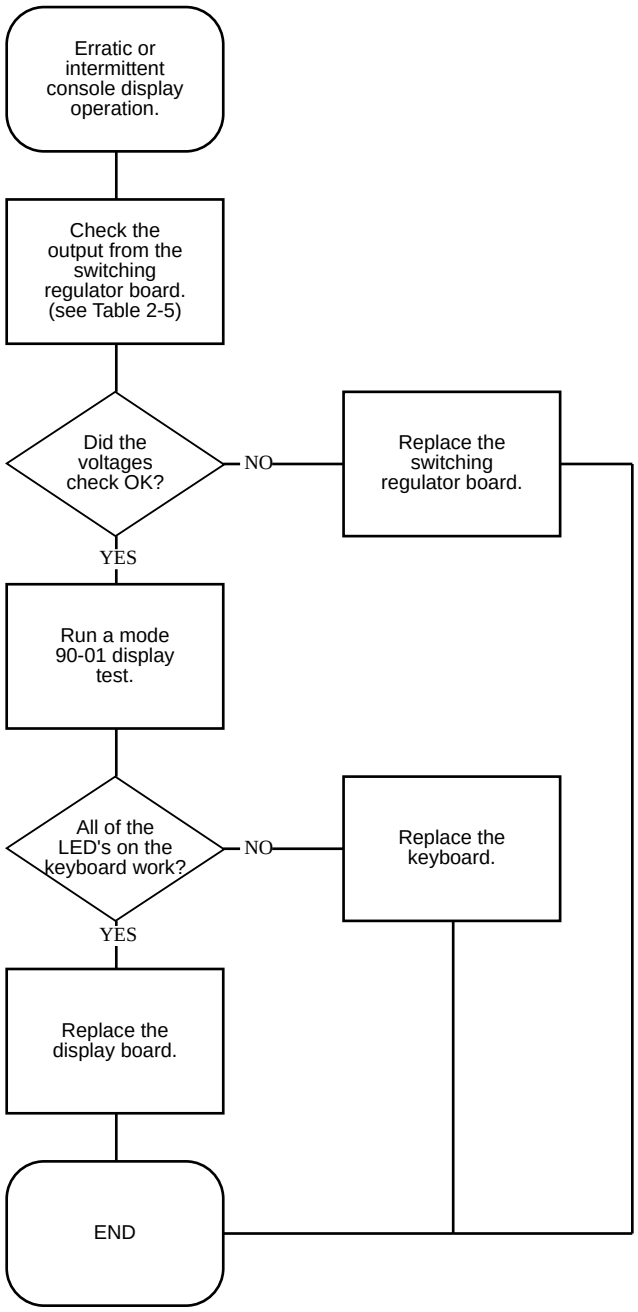
JDB-FH-179-A




**FLOWCHART A-2. SYSTEM TOTALLY INOPERATIVER--CONSOLE TICKS**



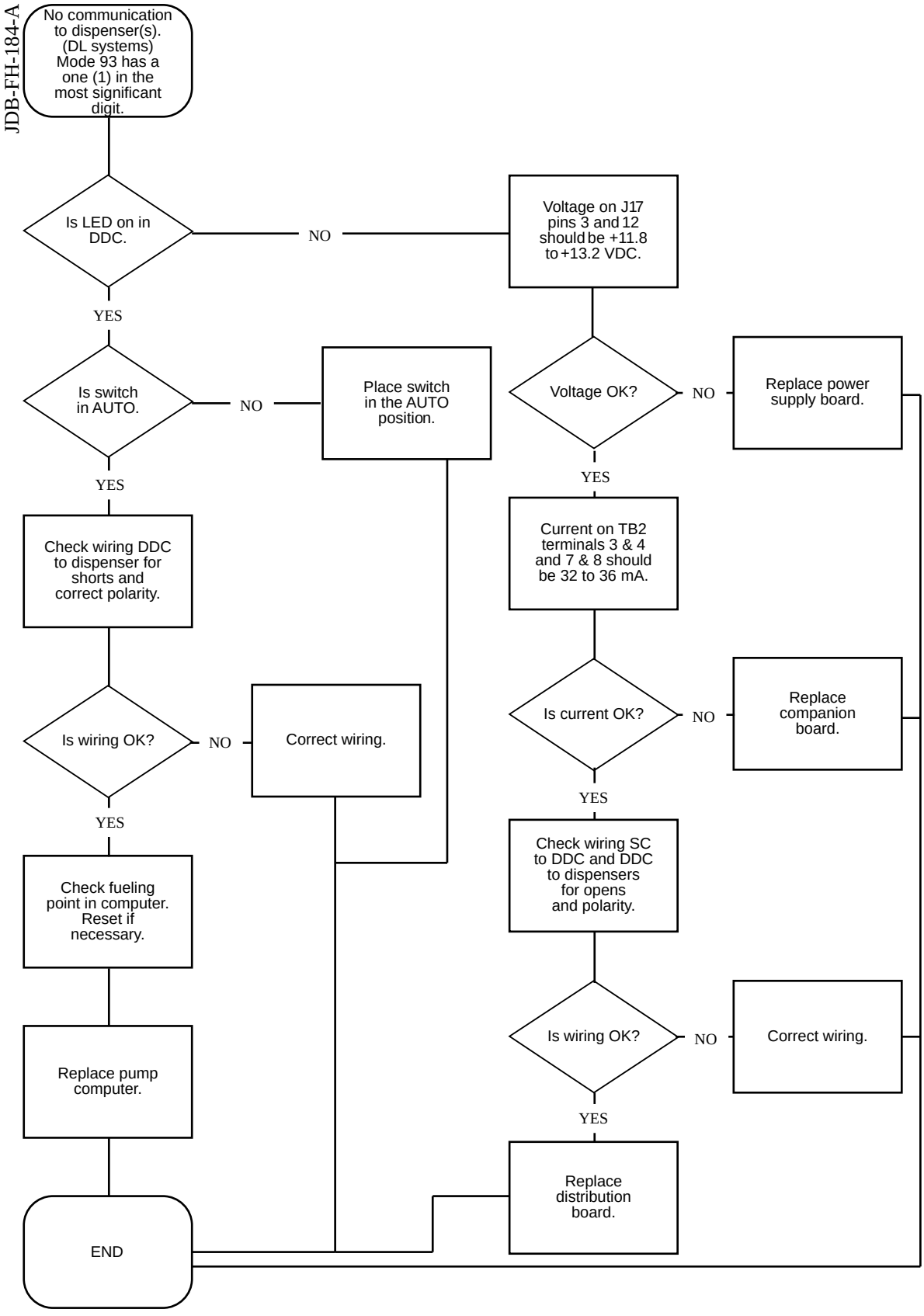

**FLOWCHART A-3. SYSTEM NOT MAINTAINING PROGRAMMED DATA**



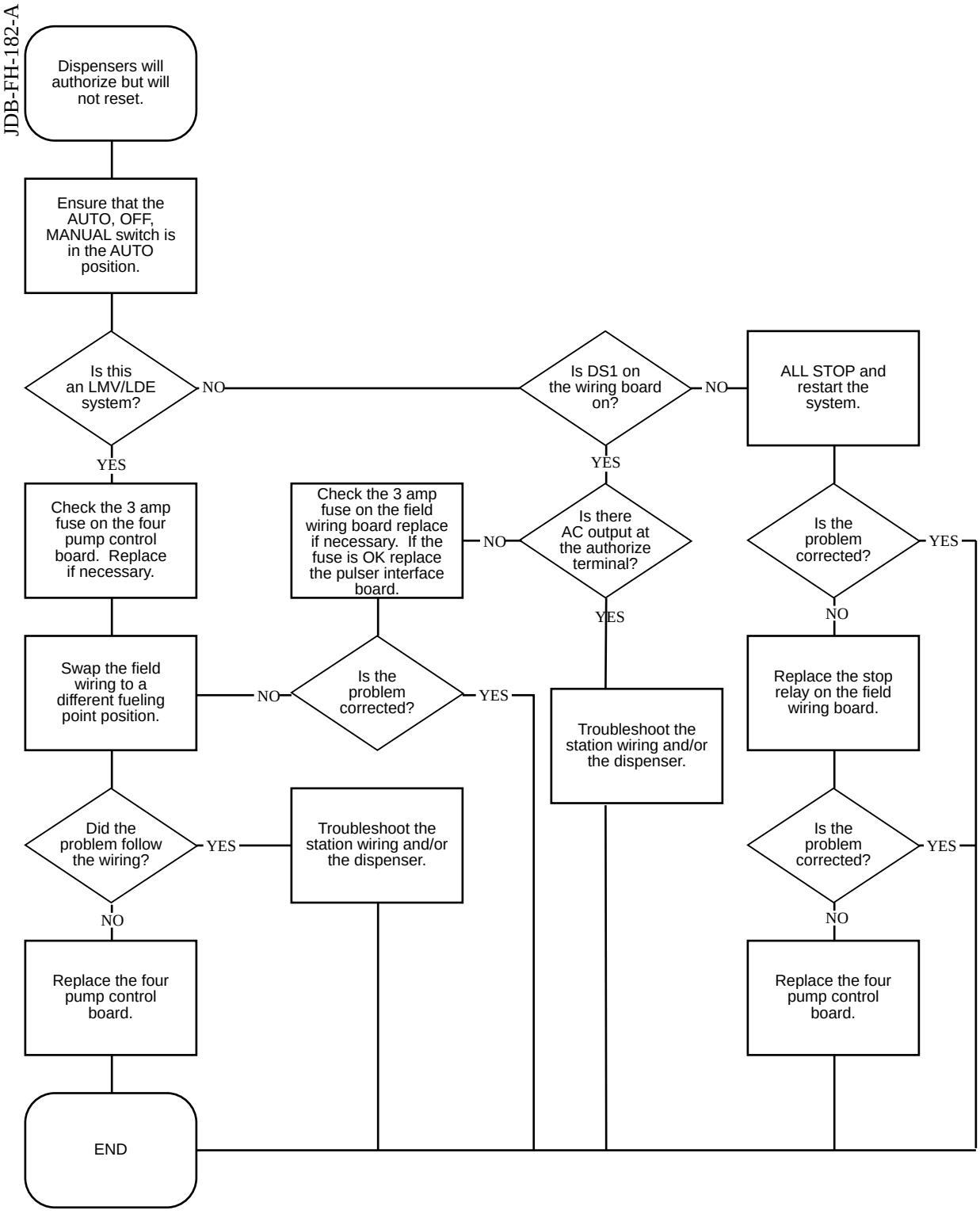

**FLOWCHART A-4. ERRATIC OR INTERMITTENT DISPLAY OPERATION**

## APPENDIX B

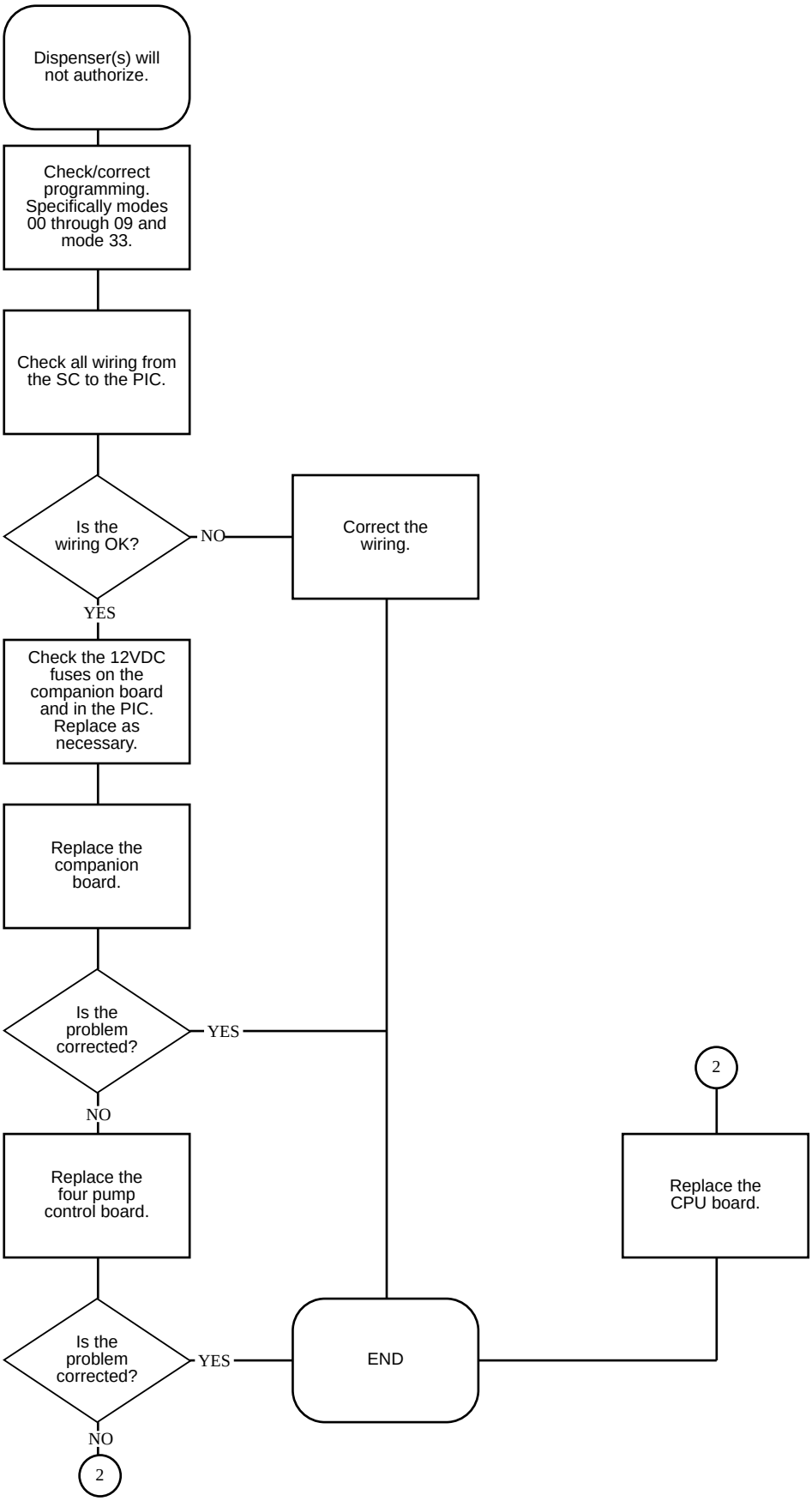
### TROUBLESHOOTING FLOWCHARTS: DISPENSER COMMUNICATIONS PROBLEMS




**FLOWCHART B-1. NO COMMUNICATIONS TO DISPENSER(S) DATA LINK SYSTEMS**




**FLOWCHART B-2. DISPENSERS WILL AUTHORIZE BUT NOT RESET LMV/LDE, MV/DE SYSTEMS**



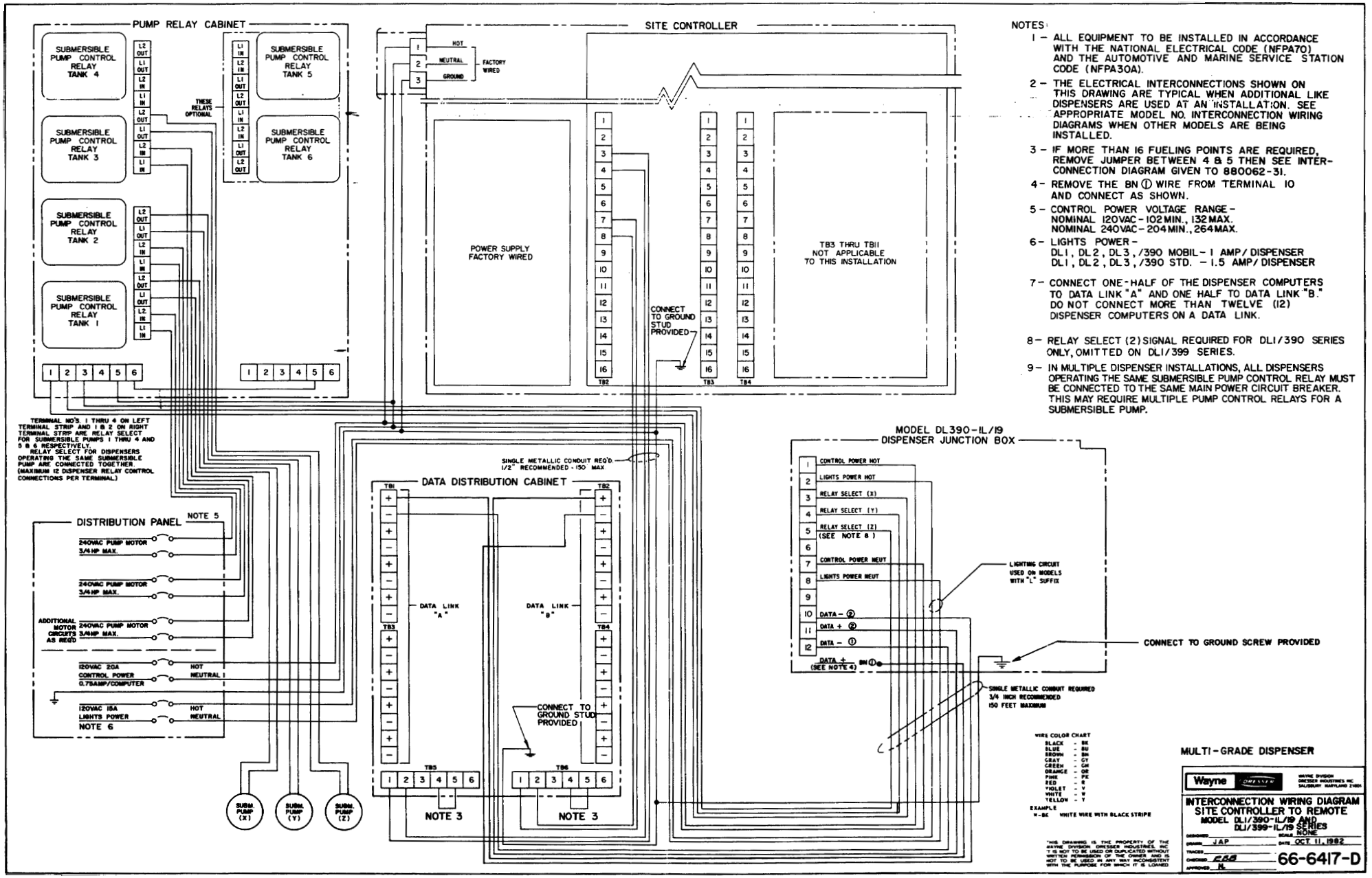

**FLOWCHART B-3. DISPENSER(S) WILL NOT AUTHORIZE LMV/LDE, MV/DE SYSTEMS**

## APPENDIX C

INTERCONNECTION WIRING DIAGRAM

The interconnection wiring diagrams shown in this section are for example only. Refer to the installation manual for the equipment in question for complete sets of wiring diagrams.

# INSERT 11X17 DRAWINGS HERE




NOTES:

1 – ALL EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA70) AND THE AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA30A).

2 – THE ELECTRICAL INTERCONNECTIONS SHOWN ON THIS DRAWING ARE TYPICAL WHEN ADDITIONAL LIKE DISPENSERS ARE USED AT AN INSTALLATION. SEE APPROPRIATE MODEL NO. INTERCONNECTION WIRING DIAGRAMS WHEN OTHER MODELS ARE BEING INSTALLED.

3 – IF MORE THAN 16 FUELING POINTS ARE REQUIRED, REMOVE JUMPER BETWEEN 4 & 5 THEN SEE INTERCONNECTION DIAGRAM GIVEN TO 880062-31.

4 – REMOVE THE BN ① WIRE FROM TERMINAL 10 AND CONNECT AS SHOWN.

5 – CONTROL POWER VOLTAGE RANGE – NOMINAL 120VAC – 102 MIN., 132 MAX. NOMINAL 240VAC – 204 MIN., 264 MAX.

6 – LIGHTS POWER – DL1, DL2, DL3, /390 MOBIL – 1 AMP/DISPENSER DL1, DL2, DL3, /390 STD. – 1.5 AMP/DISPENSER

7 – CONNECT ONE-HALF OF THE DISPENSER COMPUTERS TO DATA LINK "A" AND ONE HALF TO DATA LINK "B." DO NOT CONNECT MORE THAN TWELVE (12) DISPENSER COMPUTERS ON A DATA LINK.

8 – RELAY SELECT (2) SIGNAL REQUIRED FOR DLI/390 SERIES ONLY, OMITTED ON DLI/399 SERIES.

9 – IN MULTIPLE DISPENSER INSTALLATIONS, ALL DISPENSERS OPERATING THE SAME SUBMERSIBLE PUMP CONTROL RELAY MUST BE CONNECTED TO THE SAME MAIN POWER CIRCUIT BREAKER. THIS MAY REQUIRE MULTIPLE PUMP CONTROL RELAYS FOR A SUBMERSIBLE PUMP.

WIRE COLOR CHART

| | |
|---|---|
| BLACK | BK |
| BLUE | BU |
| BROWN | BN |
| GRAY | GY |
| GREEN | GN |
| ORANGE | OR |
| PINK | PK |
| RED | R |
| VIOLET | V |
| WHITE | W |
| YELLOW | Y |

EXAMPLE
W-BK WHITE WIRE WITH BLACK STRIPE

MULTI-GRADE DISPENSER



Wayne DRESSER

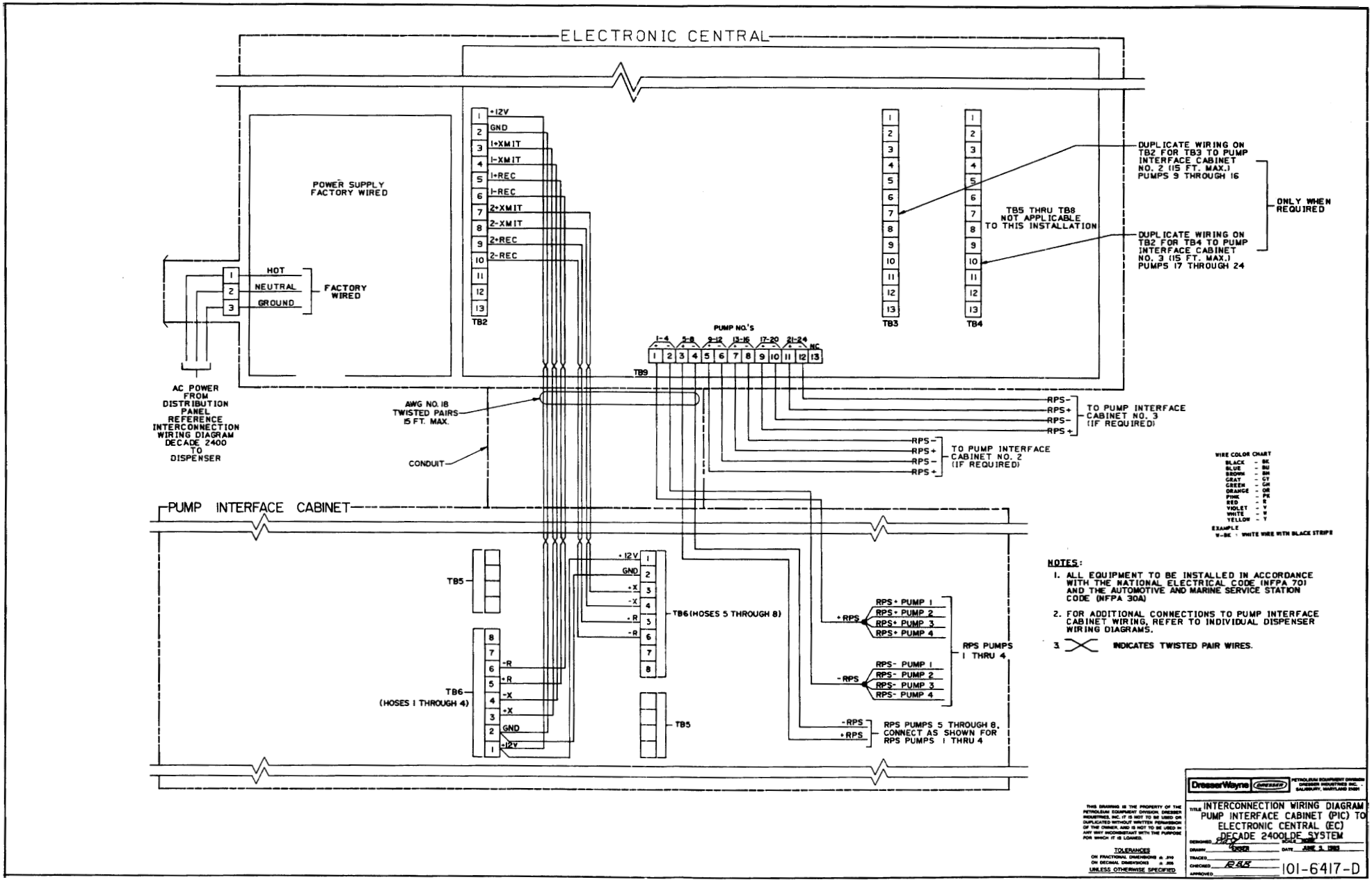
WAYNE DIVISION DRESSER INDUSTRIES INC SALISBURY MARYLAND 21801

INTERCONNECTION WIRING DIAGRAM SITE CONTROLLER TO REMOTE MODEL DLI/390-IL/19 AND DLI/399-IL/19 SERIES

DESIGNED
DRAWN JAP
TRACED
CHECKED EAB
APPROVED M.

SCALE NONE
DATE OCT. 11, 1982

66-6417-D




WIRE COLOR CHART

| | |
|---|---|
| BLACK | - BK |
| BLUE | - BU |
| BROWN | - BR |
| GRAY | - GY |
| GREEN | - GN |
| ORANGE | - OR |
| PINK | - PK |
| RED | - R |
| VIOLET | - V |
| WHITE | - W |
| YELLOW | - Y |

EXAMPLE
W-BK : WHITE WIRE WITH BLACK STRIPE

**NOTES:**

1. ALL EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70) AND THE AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA 30A)
2. FOR ADDITIONAL CONNECTIONS TO PUMP INTERFACE CABINET WIRING, REFER TO INDIVIDUAL DISPENSER WIRING DIAGRAMS.
3. INDICATES TWISTED PAIR WIRES.

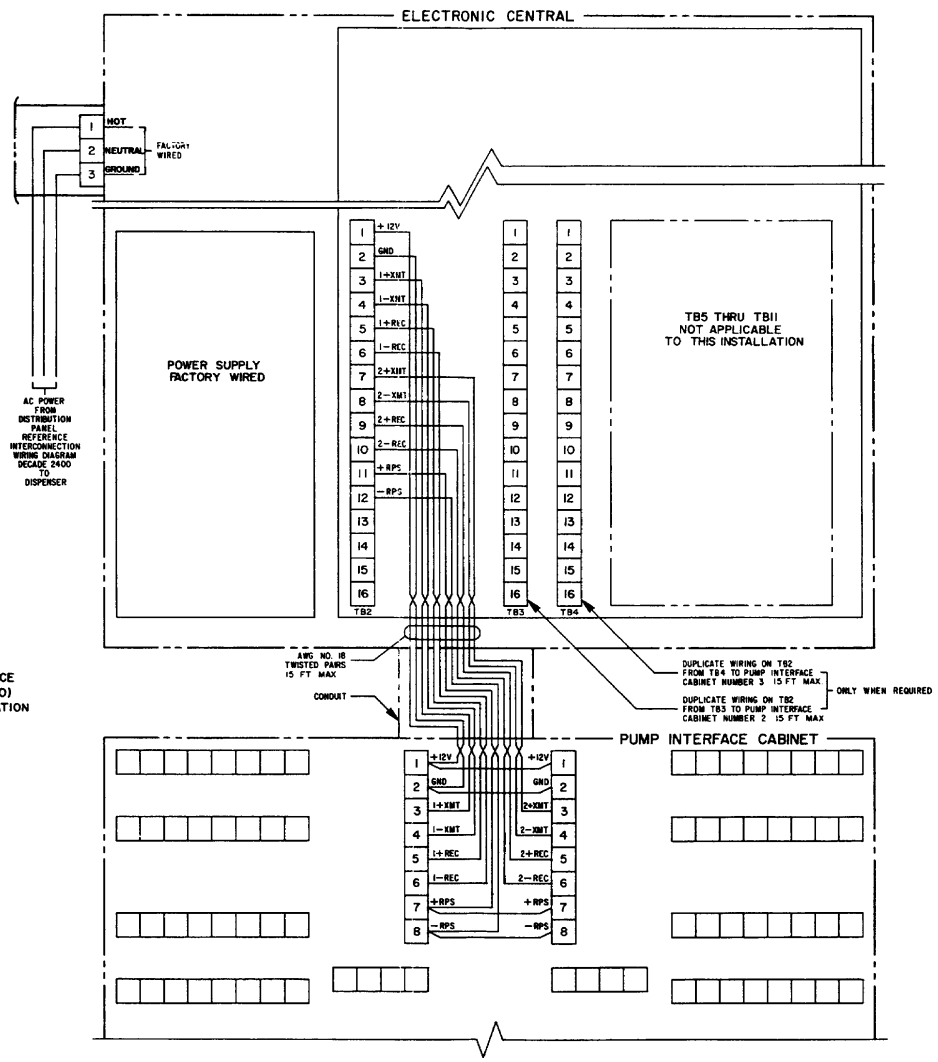


TOLERANCES
ON FRACTIONAL DIMENSIONS ± .010
ON DECIMAL DIMENSIONS ± .005
UNLESS OTHERWISE SPECIFIED

DresserWayne — PETROLEUM EQUIPMENT DIVISION, DRESSER INDUSTRIES INC., SALISBURY, MARYLAND 21801

TITLE: INTERCONNECTION WIRING DIAGRAM PUMP INTERFACE CABINET (PIC) TO ELECTRONIC CENTRAL (EC) DECADE 2400LDE SYSTEM

| | | |
|---|---|---|
| DESIGNED | | SCALE NONE |
| DRAWN | OWNER | DATE JUNE 3, 1983 |
| TRACED | | |
| CHECKED | RAS | |
| APPROVED | | 101-6417-D |




WIRE COLOR CHART

| | |
|---|---|
| BLACK | – BK |
| BLUE | – BU |
| BROWN | – BN |
| GRAY | – GY |
| GREEN | – GN |
| ORANGE | – OR |
| PINK | – PK |
| RED | – R |
| VIOLET | – V |
| WHITE | – W |
| YELLOW | – Y |

EXAMPLE:
W – BK = WHITE WIRE WITH BLACK STRIPE

NOTE:
ALL EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70) AND THE AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA 30A).



TOLERANCES
ON FRACTIONAL DIMENSIONS ± .010
ON DECIMAL DIMENSIONS ± .005
UNLESS OTHERWISE SPECIFIED

Dresser Wayne (DRESSER)
PETROLEUM EQUIPMENT DIVISION DRESSER INDUSTRIES INC. SALISBURY, MARYLAND 21801

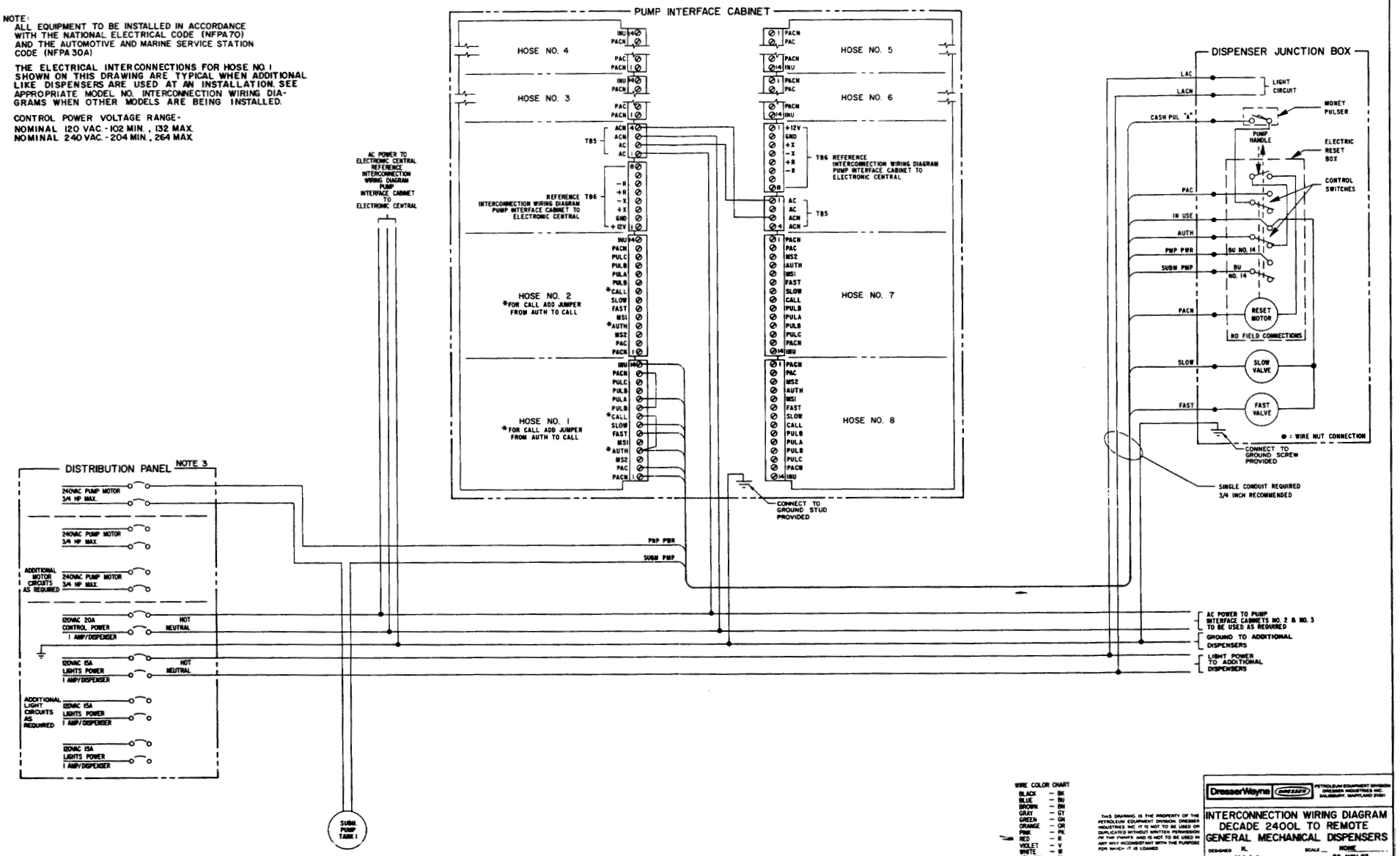
# INTERCONNECTION WIRING DIAGRAM PUMP INTERFACE CABINET TO ELECTRONIC CENTRAL – DECADE 2400 CONTROL SYSTEM

DESIGNED H.
DRAWN Val Art
TRACED
CHECKED RAB
APPROVED
SCALE NONE
DATE 9 JUN 81

3-6417-D

NOTE:

1. ALL EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70) AND THE AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA 30A)
2. THE ELECTRICAL INTERCONNECTIONS FOR HOSE NO. 1 SHOWN ON THIS DRAWING ARE TYPICAL WHEN ADDITIONAL LIKE DISPENSERS ARE USED AT AN INSTALLATION. SEE APPROPRIATE MODEL NO. INTERCONNECTION WIRING DIAGRAMS WHEN OTHER MODELS ARE BEING INSTALLED.
3. CONTROL POWER VOLTAGE RANGE-
   NOMINAL 120 VAC - 102 MIN., 132 MAX.
   NOMINAL 240 VAC - 204 MIN., 264 MAX.




WIRE COLOR CHART

| | |
|---|---|
| BLACK | BK |
| BLUE | BU |
| BROWN | BN |
| GRAY | GY |
| GREEN | GN |
| ORANGE | OR |
| PINK | PK |
| RED | R |
| VIOLET | V |
| WHITE | W |
| YELLOW | Y |

EXAMPLE
W - BK = WHITE WIRE WITH BLACK STRIPE



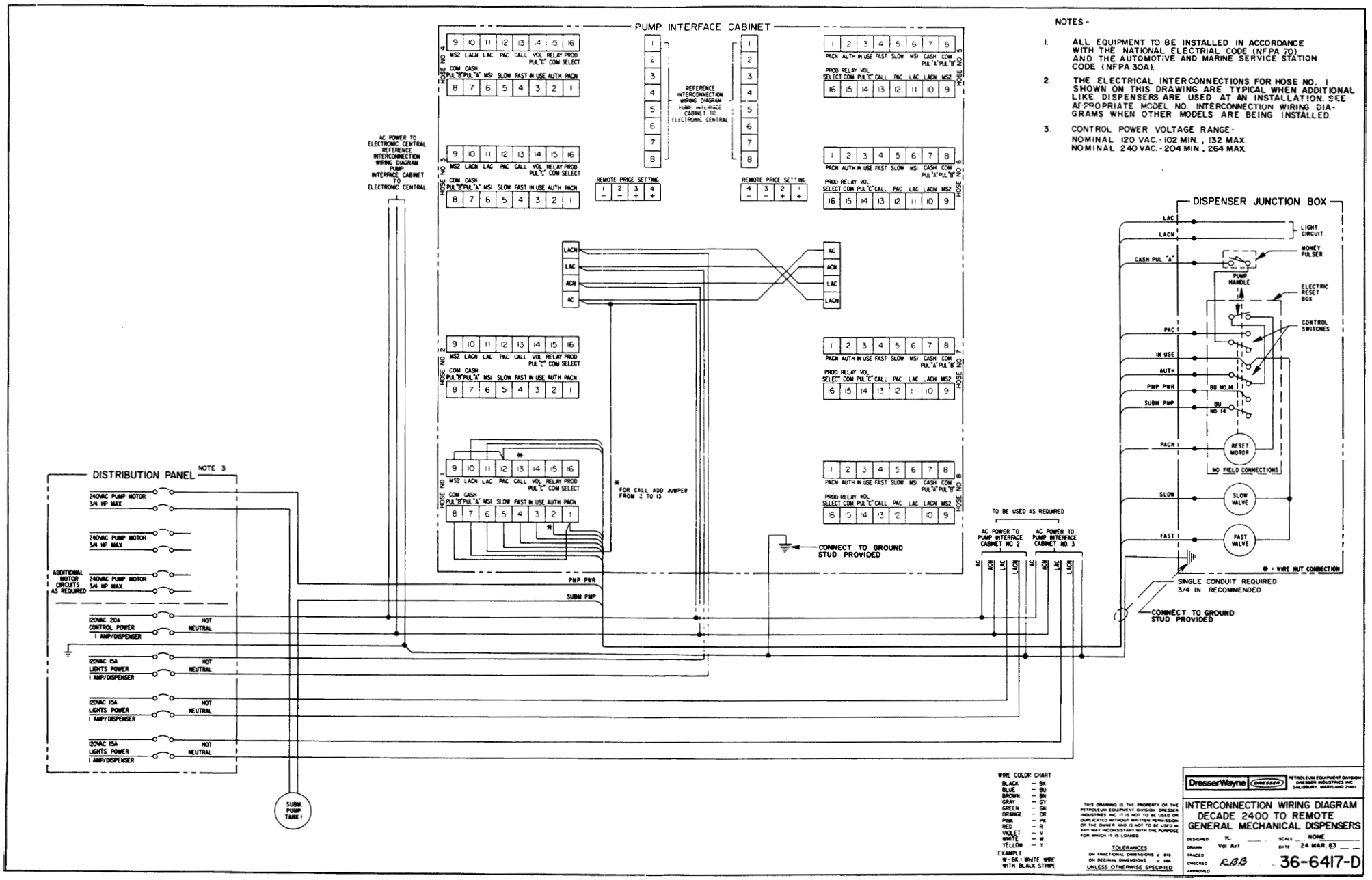
TOLERANCES
ON FRACTIONAL DIMENSIONS ± 1/32
ON DECIMAL DIMENSIONS ± .005
UNLESS OTHERWISE SPECIFIED

Dresser Wayne | Ambassador
PETROLEUM EQUIPMENT DIVISION DRESSER INDUSTRIES INC. SALISBURY, MARYLAND 21801

# INTERCONNECTION WIRING DIAGRAM DECADE 2400L TO REMOTE GENERAL MECHANICAL DISPENSERS

| | | | |
|---|---|---|---|
| DESIGNED | K. | SCALE | NONE |
| DRAWN | Val Art | DATE | 28 NOV 83 |
| TRACED | | | |
| CHECKED | RBB | | |
| APPROVED | | | |

95-6417-D




NOTES -

1. ALL EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIAL CODE (NFPA 70) AND THE AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA 30A).
2. THE ELECTRICAL INTERCONNECTIONS FOR HOSE NO. 1 SHOWN ON THIS DRAWING ARE TYPICAL WHEN ADDITIONAL LIKE DISPENSERS ARE USED AT AN INSTALLATION. SEE APPROPRIATE MODEL NO. INTERCONNECTION WIRING DIAGRAMS WHEN OTHER MODELS ARE BEING INSTALLED.
3. CONTROL POWER VOLTAGE RANGE -
   NOMINAL 120 VAC - 102 MIN., 132 MAX
   NOMINAL 240 VAC - 204 MIN., 264 MAX

WIRE COLOR CHART

| | |
|---|---|
| BLACK | BK |
| BLUE | BU |
| BROWN | BN |
| GRAY | GY |
| GREEN | GN |
| ORANGE | OR |
| PINK | PK |
| RED | R |
| VIOLET | V |
| WHITE | W |
| YELLOW | Y |

EXAMPLE
W - BK = WHITE WIRE WITH BLACK STRIPE



TOLERANCES
ON FRACTIONAL DIMENSIONS ± .010
ON DECIMAL DIMENSIONS ± .005
UNLESS OTHERWISE SPECIFIED

DresserWayne DRESSER
PETROLEUM EQUIPMENT DIVISION DRESSER INDUSTRIES INC. SALISBURY, MARYLAND 21801

# INTERCONNECTION WIRING DIAGRAM DECADE 2400 TO REMOTE GENERAL MECHANICAL DISPENSERS

| | | | |
|---|---|---|---|
| DESIGNED | M. | SCALE | NONE |
| DRAWN | Val Art | DATE | 24 MAR. 83 |
| TRACED | | | |
| CHECKED | R.B.B. | | 36-6417-D |
| APPROVED | | | |

**INDEX**

# WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Seller warrants that new products and parts of its own design and manufacture when shipped, will be of good quality and will be free from defects in material and workmanship and will conform to applicable specifications. Work, when performed by Seller, will meet applicable work requirements. No warranty is made with respect to used or rebuilt equipment and with respect to products not manufactured by Seller, Seller's only obligation shall be to assign to Buyer, at the time of sale, whatever warranty Seller has received from the manufacturer. Items such as but not limited to lamps, electric motors, hoses, nozzles, hose swivels and safety impact valves are included in the category referred to in the previous sentence. Seller's recommendations with respect to the operation of Seller's equipment are advisory only and are not warranted. All claims under this warranty must be made in writing immediately upon discovery and, in any event, within twenty-four (24) months from date of start-up, if a product is involved, or from completion of the applicable work, if work is involved, or thirty (30) months from date of invoice (whichever shall occur first). (Provided however, that with respect to the Wayne Plus system, 2400 system, DL series dispensers, and card readers, all claims must be made in writing within twelve (12) months from date of start-up. With respect to receipts/totals printers, and any other printers or printing mechanisms, all claims must be made in writing within ninety (90) days from date of start-up. Wayne Vista dispenser external metal panels will be free from defects due to rust and/or corrosion for a period of forty-eight (48) months from date of dispenser start-up.) Defective and nonconforming items must be held for Seller's inspection and returned to the original f.o.b. point upon request. Seller's warranty on service parts, whether new or reconditioned, is ninety (90) days from the date of installation, or twelve (12) months from date of invoice, whichever first occurs. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESSED, IMPLIED AND STATUTORY, INCLUDING WITHOUT LIMITATIONS, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS.

Upon Buyer's submission of a claim as provided above and its substantiation, Seller shall, at its option either (I) repair or replace its product or work at the original f.o.b. point or location of purchase products and/or parts or (II) refund an equitable portion of the purchase price.

THE FOREGOING IS SELLER'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY AND, EXCEPT FOR GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, THE FOREGOING IS BUYER'S EXCLUSIVE REMEDY AGAINST SELLER FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES. BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE CAUSE OF ACTION ACCRUES OR IT SHALL BE BARRED.

"NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense."

Wayne Division, Dresser Industries Inc., P.O. Box 1859, Salisbury, MD 21802-1859,(410) 546-6600
Part No.917454 Rev. C  200/10/90