YORK®	*MILLENNIUM*™ CONTROL CENTER YIA Single Stage For Absorption Chillers	
SERVICE MANUAL	Supersedes: 155.16-M3 (694)	Form 155.16-M3 (397)

PART NUMBER 371-01288-102
FOR
SINGLE-STAGE ABSORPTION UNIT

MODELS YIA-ST-1A1 THRU YIA-ST-14F3
AND
YIA-HW-1A1 THRU YIA-HW-14F3

28342A

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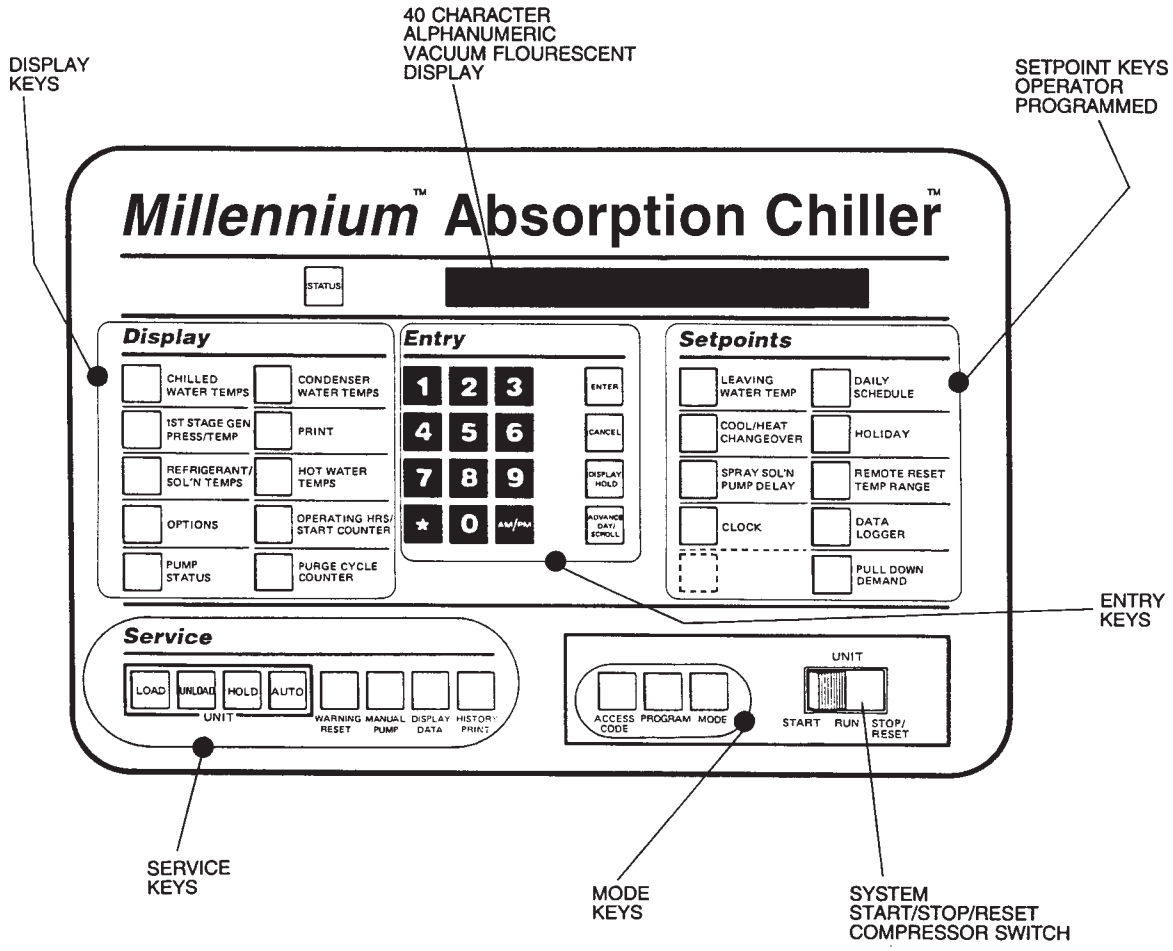


FIG. 1 – MILLENNIUM CONTROL CONTROL CENTER KEYPAD

INTRODUCTION

This instruction provides a detailed description of the operation of each of the printed circuit boards and major components in the Control Center. The proper voltage level or signal for any operating condition are provided for all input and output connections of all the circuit boards. Special programming procedures, system commissioning checklist and troubleshooting procedures are also provided.

Several levels of supporting documentation are required to be used with this document. The Control Center "Operation" manual, Form 155.16-O3 provides Control Center and unit operation and display message details. "Field Control Modifications Diagram", Form 155.16-PA3 provides details of remote start/stop inputs,cycling inputs, status outputs and remote setpoint interfacing. "Wiring Diagram", Form 155.16-W1, provides the point to point connections of all printed circuit boards and other components within the Control Center.

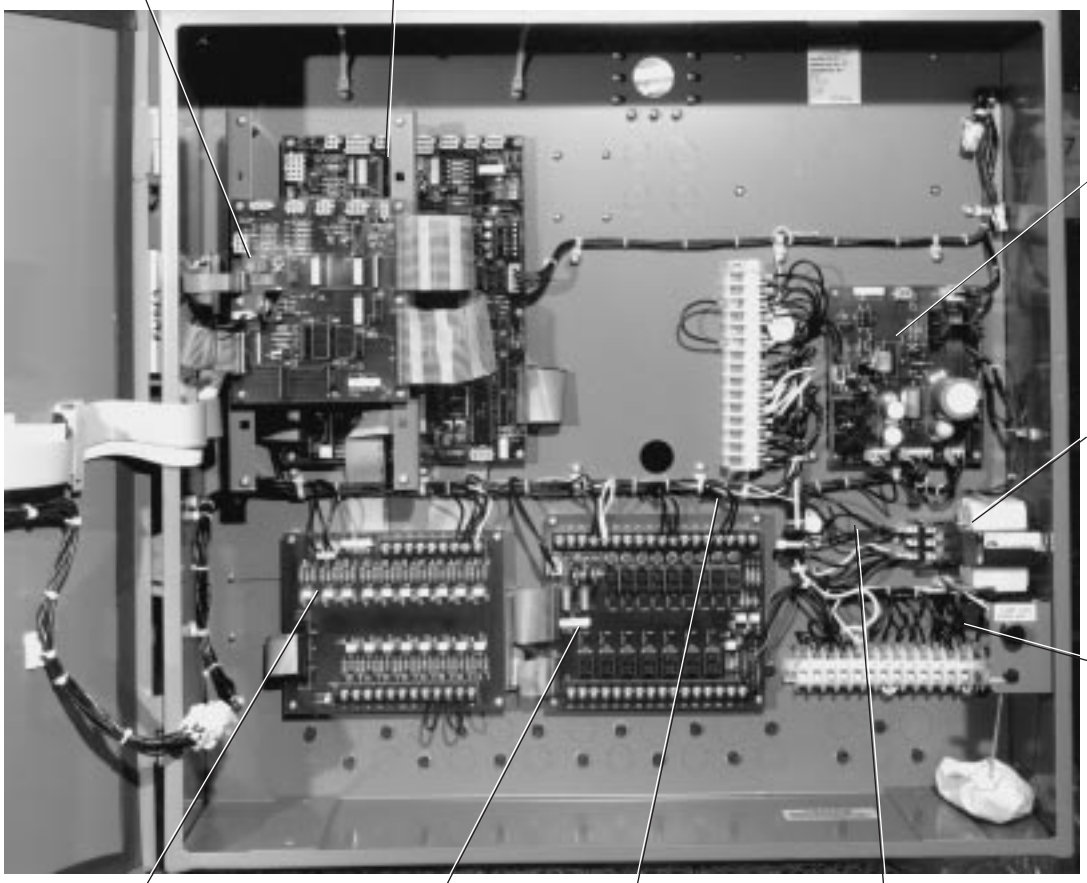


FIG. 2 – MILLENNIUM CONTROL CENTER – DOOR OPEN

SYSTEM ARCHITECTURE

(Refer to Fig. 3)

The Control Center is a microprocessor based control system. The microprocessor, EPROM memory, RAM memory and supporting logic are located on the Micro Board. The operating program is stored in the EPROM. These logic circuits operate on +5VDC that is supplied from a +5VDC regulator that is located on the Micro Board. All system inputs and outputs pass through this board. However, since these circuits operate on +5VDC, the 115VAC inputs from external devices must be converted to +5VDC before entering the Micro Board. This function is provided by the Digital Input Board.

The Digital Input Board contains opto-couplers that convert the 115VAC digital inputs to +5VDC from pump starter overloads, remote cycling devices, high temperature/pressure safety devices and other system controls. The 115VAC voltage is isolated from the +5VDC by the opto-couplers. The output of this board is connected directly to the Micro Board. Under program control, the Micro Board responds to these inputs and starts or stops the unit or initiates other appropriate action.

The Micro Board also controls system solenoids and pumps. Since these devices are operated from 115VAC, the +5VDC Micro Board circuits must be isolated. This function is provided by the Relay Board. This board contains +12VDC relays that are controlled by the Micro Board. The contacts of each relay apply 115VAC to the system solenoids and pump starters. Also included on this board are triacs that are used to control the steam valve on steam units. Additional digital input capability is provided on the relay board by opto-couplers that perform the same function as those on the digital input board.

System pressures are sensed by transducers. The output of the transducers is a DC voltage that is analogous to a given pressure. This voltage is input to the Micro Board. System temperatures are sensed by thermistors. The output of the thermistors is a DC voltage that is analogous to a given temperature. This voltage is input to the Micro Board. The Micro Board interprets these pressure and temperature values and controls the unit accordingly.

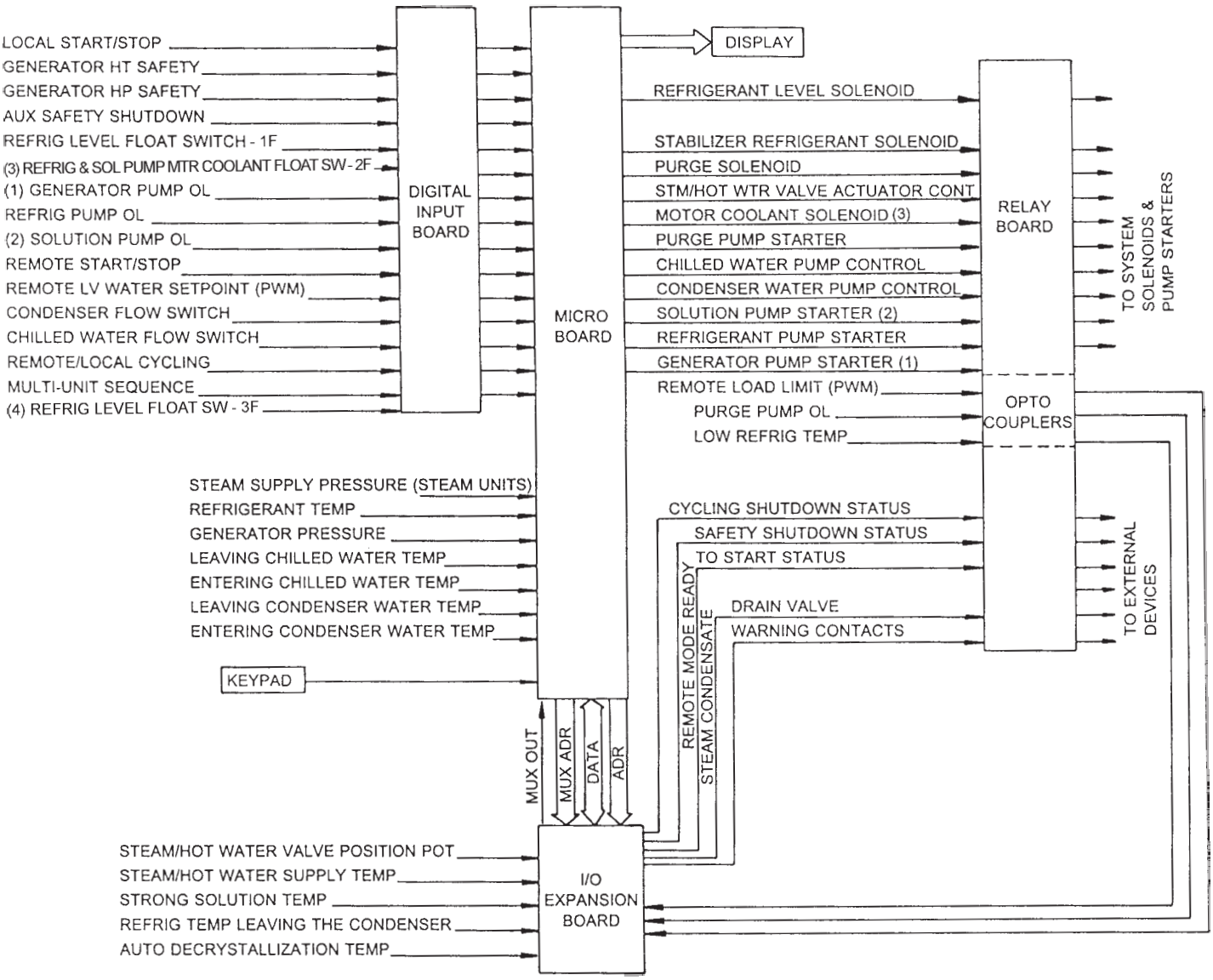
The primary system temperature and pressure protection is provided by external electro-mechanical cutout switches that are mounted at various places on the unit. These devices are connected to the Control Center in a way that shuts down the unit by providing a positive break of the start signal to the steam or hot water shutoff valve when the safety threshold is exceeded. Simultaneously, an indication is provided to the Micro Board in the form of a digital input. Analog inputs to the Micro Board from thermistor and transducers provide backup safety shutdown functions.

The I/O Expansion Board allows additional digital inputs and outputs and analog inputs to be connected to the Micro Board. The analog inputs are multiplexed into the Micro Board and the digital inputs and outputs are applied directly to the Micro Board data bus.

System pressures, temperatures and setpoints are displayed on the 40 character vacuum fluorescent display that is mounted on the Control Center door.

A touch sensitive keypad, mounted on the Control Center door, is used to enter the system setpoints, perform certain manual control operations and display system parameters.

A power supply board supplies all of the regulated and unregulated DC supply voltage to all of the Control Center printed circuit boards.



(1) 50 HZ YIA10E3 - YIA14F3 WITH FRANKLIN PUMPS

(2) ABSORBER PUMP ON 50 HZ YIA10E3 - YIA14F3 WITH FRANKLIN PUMPS

(3) UNITS EQUIPPED WITH FRANKLIN PUMPS ONLY

(4) UNITS EQUIPPED WITH BUFFALO PUMPS ONLY

FIG. 3 – MILLENNIUM CONTROL CENTER – STEAM & HOT WATER APPLICATIONS

DIGITAL INPUT BOARD

The Digital Input Board converts 115VAC input signals to +5VDC logic level signals for use by the Micro Board. The board contains 17 identical level converter circuits. When the input to any circuit is 115VAC, the output of that circuit is +5VDC (logic high). When the input is 0VAC, the output is 0VDC. (Refer to Figs. 4 thru 7.)

INPUTS

J2-1 – Generator high temperature safety cutout switch (HT1). 0VAC when switch is not tripped. 115VAC when switch is tripped. It is calibrated to trip at 330°F. The switch must be manually reset after the temperature decreases to 329°F.

J2-2 – Keypad start/run/stop-reset switch **STOP** input. 115VAC when switch is in the **STOP** position. Otherwise, 0VAC.

J2-3 – Keypad start/run/stop-reset switch **START** input. 115VAC when switch is in the **START** position. Otherwise, 0VAC.

TB1-10 – Refrigerant level float switch (1F). 115VAC when level is sufficient (float switch closed). Otherwise, 0VAC. When open, the dilution cycle is interrupted.

TB1-11 – Units equipped with Franklin pumps - Refrigerant and solution pump motor coolant level float switch (2F). 115VAC when level is sufficient (float switch closed). Otherwise, 0VAC. When open, initiates safety shutdown.

Units equipped with Buffalo pumps - Refrigerant level float switch (3F). 115VAC when refrigerant level is above float switch causing switch to close. Otherwise, 0VAC when refrigerant level is below float switch causing switch to open. When both 1F and 3F open, and after the refrigerant pump shutdown delay setpoint timer has elapsed, the refrigerant pump is turned off.

TB1-18 – Generator pump overload contacts (50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps only). 0VAC when generator pump motor protector (4OL) or motor thermal switch (MTH4) has tripped (opened) indicating an overload condition. Otherwise, 115VAC. Motor protector 4OL must be manually reset. Thermal switch MTH4 automatically resets.

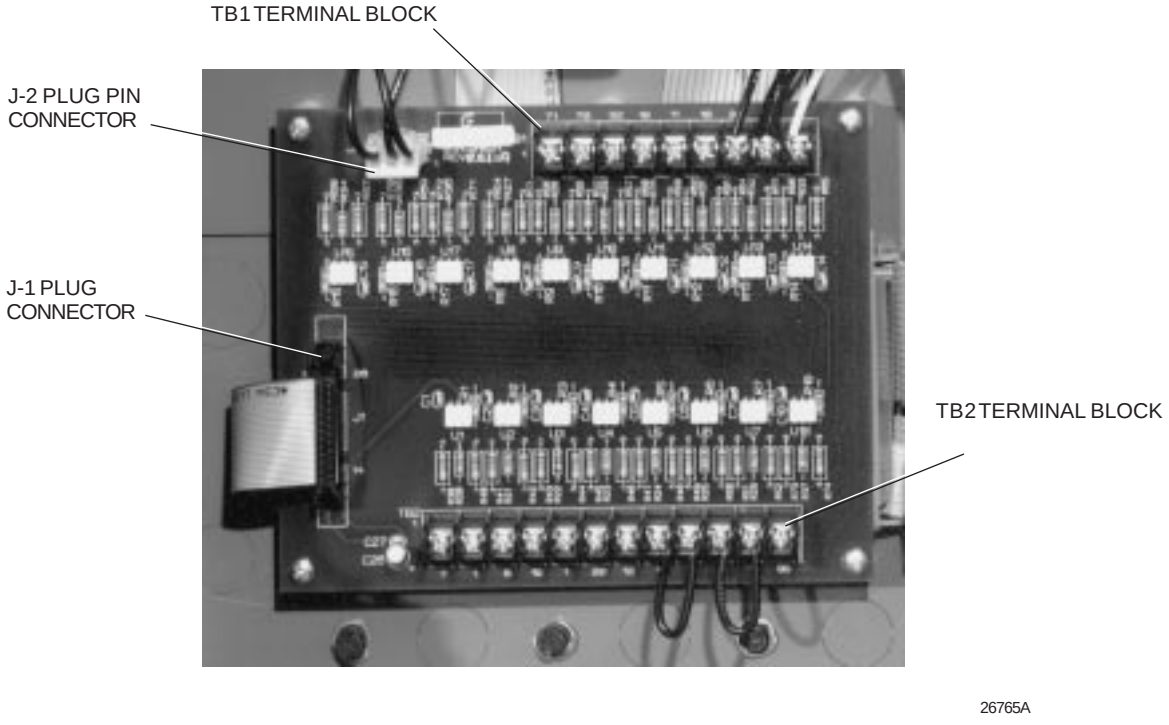


FIG. 4 – DIGITAL INPUT BOARD

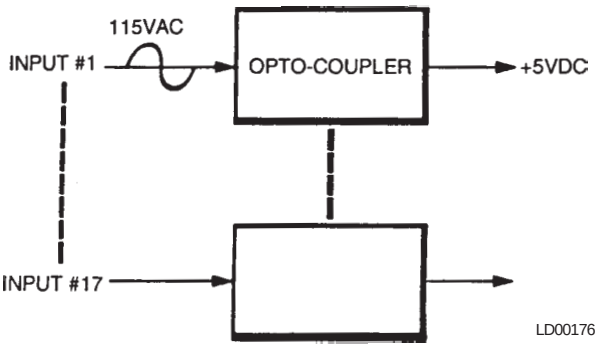


FIG. 5 – DIGITAL INPUT BOARD – SIMPLIFIED BLOCK DIAGRAM

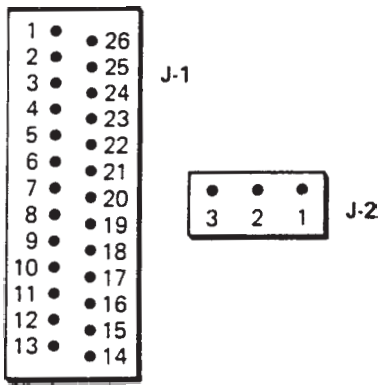


FIG. 7 – DIGITAL INPUT BOARD – PIN IDENTIFICATION

TB1-31 – Auxiliary safety shutdown input. Application of 115VAC (momentary or maintained) to this input initiates a safety shutdown. 0VAC allows the unit to restart, after the Millennium Control Center has been reset. This is a general purpose safety shutdown input for customer use. Refer to Fig. 8.

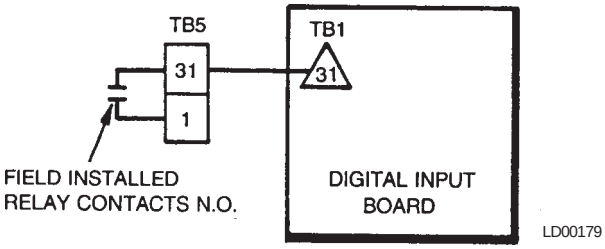


FIG. 8 – AUXILIARY SAFETY SHUTDOWN INPUT TYPICAL APPLICATION

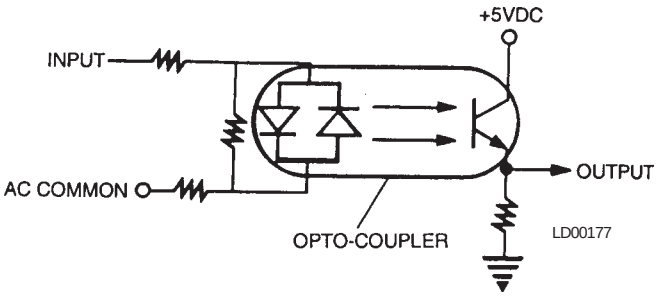


FIG. 6 – DETAILED SCHEMATIC REPRESENTATION DIGITAL INPUT BOARD

TB1-32 – Generator high pressure safety cutout switch (HP1). 0VAC when switch is not tripped. 115VAC when switch is tripped. It is calibrated to trip at 13.73 PSIA. It will automatically reset at 0.77 PSIA.

TB1-70 – Refrigerant pump starter overload contacts. 0VAC when refrigerant pump motor protector (2OL) or motor thermal switch (MTH2) has tripped (opened) indicating an overload condition. Otherwise, 115VAC. Motor protector 2OL must be manually reset. Thermal switch MTH2 automatically resets.

TB1-71 – Solution pump* starter overload contacts. 0VAC when solution pump motor protector (1OL) or motor thermal switch (MTH1) has tripped (opened) indicating an overload condition. Otherwise, 115VAC.

*Absorber pump on 50Hz Models YIA10E3 thru YIA14F3 with Franklin Pumps

TB2-7 – Remote start input. 115VAC causes unit to start if in **REMOTE** mode and **UNIT** switch is in **RUN** position. Input is designed to accept 115VAC from external field supplied contacts to start unit. Refer to Fig. 9.

TB2-1 – Connected to 115VAC on digital input board.

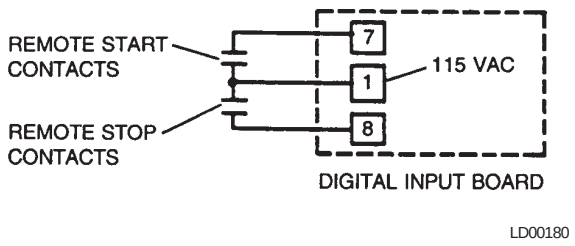


FIG. 9 – REMOTE START AND STOP UNITS

TB2-8 – Remote stop input. 115VAC causes unit to stop if in **REMOTE** mode and **UNIT** switch is in **RUN** position. Input is designed to accept 115VAC from external field supplied contacts to stop unit. This signal must be maintained signal, not momentary. (Refer to Fig. 9.)

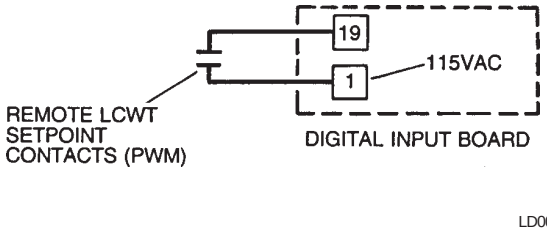


FIG. 10 – REMOTE LEAVING WATER TEMP SETPOINT INPUTS (PWM)

TB2-19 – Remote leaving water temp setpoint pulse width modulation (PWM) input from external energy management system or optional card file in Millennium Control Center. A 1-11 second application of 115VAC in **REMOTE** mode resets the leaving water temp setpoint as follows: A 1 second application of 115VAC corresponds to the keypad programmed value (BASE). An 11 second application of 115VAC corresponds to the maximum allowed reset value, 10°F or 20°F as programmed. (Refer to Field Control Modifications diagram, Form 155.17-PA1 and "Remote Reset Temp Range" section of this book for details of this feature.) Refer to Fig. 10.

TB2-1 – Connected to 115VAC on digital input board. Source voltage for condenser water flow switch.

TB2-20 – Condenser water flow switch or interlock. 115VAC when flow switch is closed. 0VAC when flow switch is open.

TB2-12 – Chilled water flow switch. 0VAC when flow switch is closed. 115VAC when flow switch is open.

TB2-13 – Remote or local cycling device. 115VAC allows unit to run as long as keypad **UNIT** switch is in **RUN** position and there are no other cycling or safety shutdowns. 0VAC causes unit to shutdown. If no cycling device connected, input must be jumpered as shown. (Refer to Fig. 11.)

TB2-1 – Connected to 115VAC on digital input board. Source voltage for remote/local cycling input and multi-unit sequence input. (Refer to Fig. 11.)

TB2-9 – Multi-unit sequence unit device. 115VAC allows unit to run as long as keypad **UNIT** switch is in **RUN** position and there are no other cycling or safety shutdowns. 0VAC causes unit to shutdown. If no cycling device is connected, input must be jumpered as shown. (Refer to Fig. 11.)

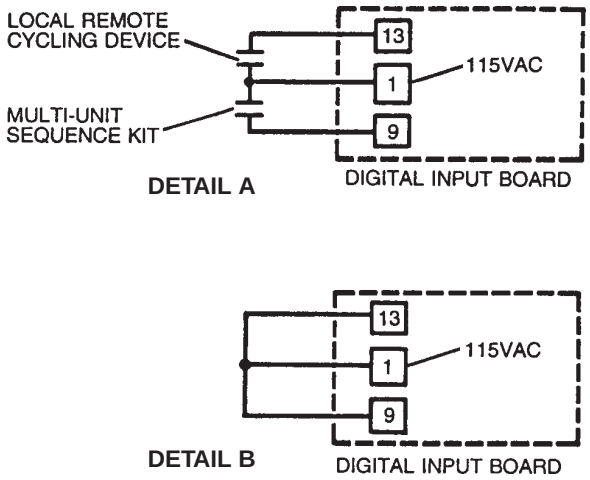


FIG. 11 – LOCAL REMOTE CYCLE DEVICE AND MULTI-UNIT SEQUENCE KIT INPUTS

OUTPUTS

If the input is 115VAC, the output is +5VDC. If the input is 0VAC, the output is 0VDC.

J1-1 – Generator pump overload (50Hz, Model YIA10E3 thru YIA14F3 with Franklin pumps).
J1-2 – Generator high pressure.
J1-3 – Refrigerant pump overload.
J1-4 – Solution pump overload.
J1-5 – Not used.
J1-6 – Not used.
J1-7 – Generator high temperature.
J1-8 – Local Stop.
J1-9 – Local Start.
J1-10 – Not used.
J1-11 – Not used.
J1-12 – Not used.
J1-13 – 5VDC return (GND).
J1-14 – +5VDC regulated.
J1-15 – Remote Start.
J1-16 – Remote Stop.
J1-17 – Remote leaving water temp setpoint (PWM)
J1-18 – Condenser water flow switch.
J1-19 – Chilled water flow switch.
J1-20 – Remote/local cycling device.
J1-21 – Multi-unit sequence device.
J1-22 – Not used.
J1-23 – Not used.
J1-24 – Auxiliary safety shutdown.
J1-25 – Refrigerant level float switch - 1F.
J1-26 – Refrigerant and solution pump motor coolant level float switch. (Franklin pumps) - 2F. Refrigerant level, float switch (Buffalo pumps) - 3F.

RELAY OUTPUT BOARD

The Relay Output Board allows the Micro Board to be interfaced to 115VAC output signals. Ten board-mounted relays are driven directly by the Micro Board. The remaining six relays are indirectly driven by the Micro Board via the I/O Expansion Board. One side of each relay coil is connected to +12VDC regulated supply. The other side of each coil is driven by a relay driver on the Micro Board or I/O Expansion Board. The input is driven to logic low (<1VDC) condition to energize the relay. The contacts of each relay are interfaced to various 115VAC solenoids and pump starters. The relay board also contains two triacs that are used to control the steam/hot water valve actuator. The Micro Board controls these triacs with triac drivers that are located on the Micro Board. The relay board also contains three opto-couplers (identical to those used on the Digital Input Board) that provide expanded digital input capability. These opto-couplers convert 115VAC input signals to +5VDC logic level signals that are applied to the I/O Expansion Board where they are input to Micro Board. (Refer to Figs. 12 & 13.)

INPUTS

The relay inputs are driven to a logic low (<1VDC) condition to energize the relay (close the contacts). The inputs are allowed to go to +12VDC to de-energize the relay (open the contacts). When an opto-coupler input is 115VAC, the output is +5VDC. When the opto-coupler input is 0VAC, the output is 0VDC.

J3-1 – Cycling shutdown status contacts.
J3-2 – Safety shutdown status contacts.
J3-3 – Remote mode ready to start status contacts
J3-4 – Not used.
J3-5 – Warning contacts.
J3-7 – 5VDC return (GND).
J3-8 – +5VDC regulated.
J3-11 – Steam condensate drain valve (Steam units only).
J3-12 – 12VDC return (GND).
J3-13 – 12VDC return (GND).
J1-1 – Motor coolant solenoid (units equipped with Franklin pumps only).

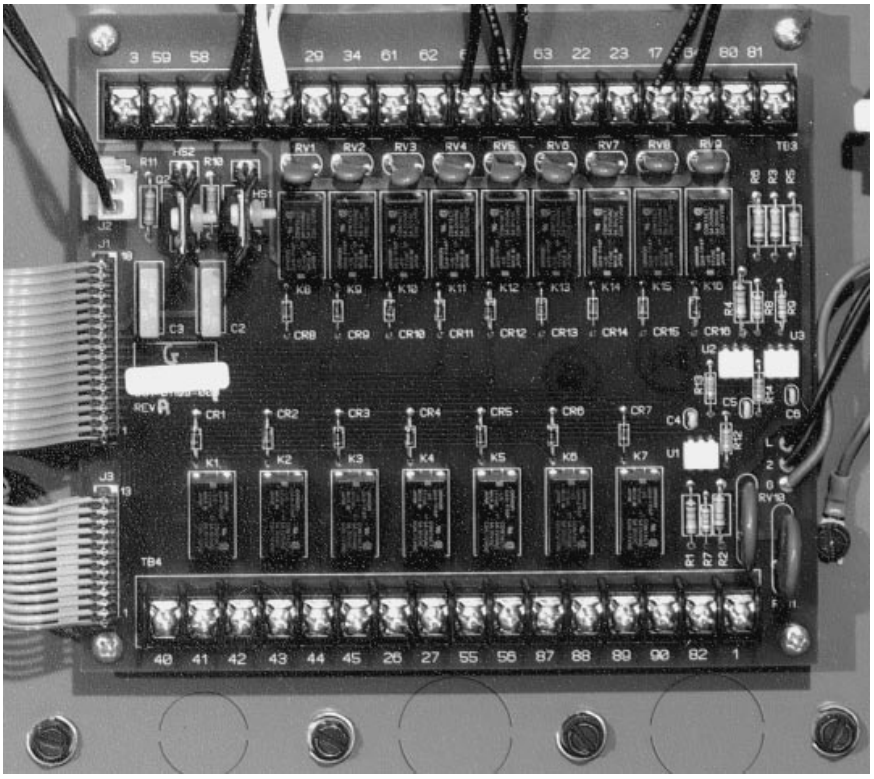


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FIG. 12 – RELAY BOARD

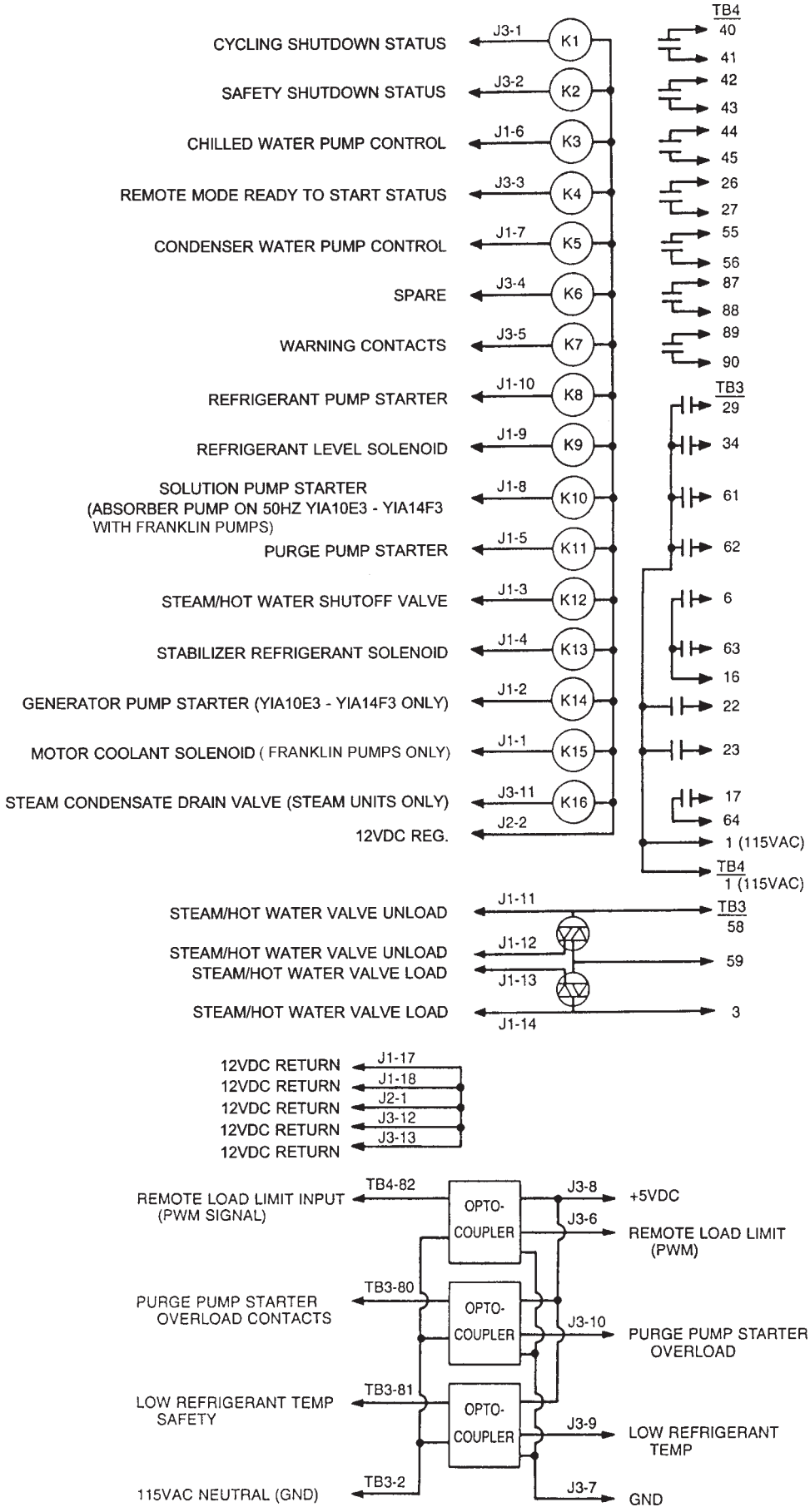

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FIG. 13 – RELAY BOARD

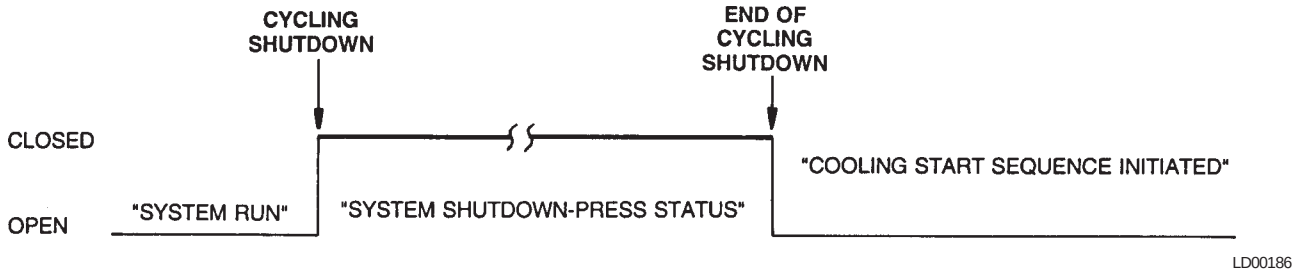
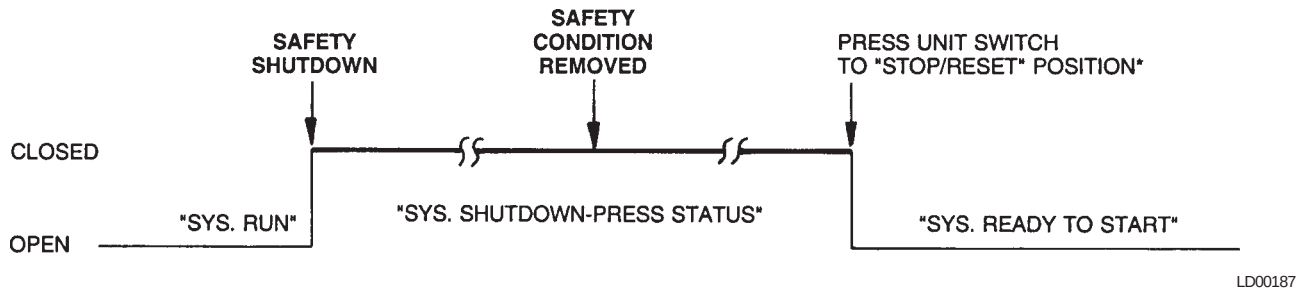
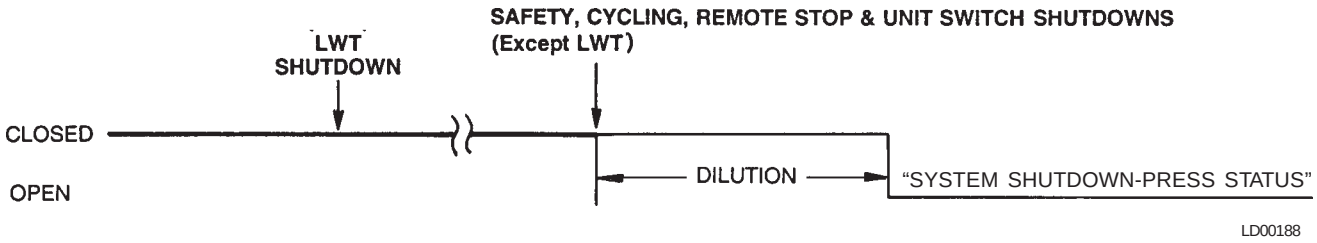


FIG. 14 – CYCLING SHUTDOWN STATUS CONTACTS – RELAY BOARD TB4-40/41

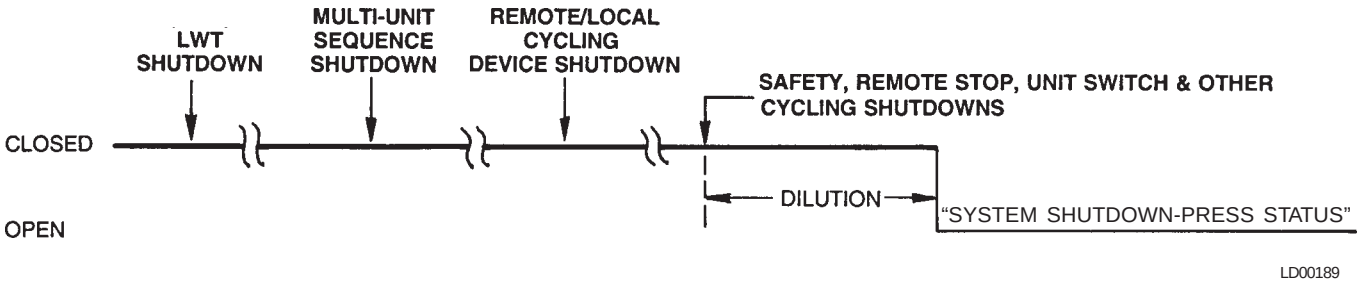


* Some Safety Shutdowns require pressing the **WARNING RESET** key in **SERVICE** mode. Refer to "Operation" manual, Form 155.16-O3 for details.

FIG. 15 – SAFETY SHUTDOWN STATUS CONTACTS – RELAY BOARD TB4-42/43



MICRO BOARD PROGRAM JUMPER J54 INSTALLED



MICRO BOARD PROGRAM JUMPER J54 REMOVED

FIG. 16 – CHILLED WATER PUMP CONTROL CONTACTS – RELAY BOARD TB4-44/45

J1-2 – Generator pump starter (50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps only).
J1-3 – Steam/Hot water shutoff valve.
J1-4 – Stabilizer refrigerant solenoid.
J1-5 – Purge pump starter.
J1-6 – Chilled water pump control.
J1-7 – Condenser water pump control.
J1-8 – Solution pump starter (Absorber pump on 50Hz YIA10E3 thru YIA14F3 with Franklin pumps).
J1-9 – Refrigerant level solenoid
J1-10 – Refrigerant pump starter.
J1-11 – Steam/Hot water valve unload (Note 1).
J1-12 – Steam/Hot water valve unload (Note 1).
J1-13 – Steam/Hot water valve load (Note 2).
J1-14 – Steam/Hot water valve load (Note 2).
J1-15 – Not used.
J1-16 – Not used.
J1-17 – 12VDC return (GND).
J1-18 – 12VDC return (GND).

NOTES:

1. 0VAC as measured from J1-11 to J1-12 when Micro Board is commanding steam valve to unload. Approximately 115VAC (20-30VAC Modutrol motors) when holding or loading.
2. 0VAC as measured from J1-13 to J1-14 when Micro Board is commanding steam valve to load. Approximately 115VAC (20-30VAC Modutrol motors) when holding or unloading.

J2-1 – 12VDC return (GND).
J2-2 – +12VDC regulated.

TB3-2 – 115VAC neutral (GND).

TB3-80 – Purge pump starter overload. 0VAC when purge pump starter overload (3OL) has tripped. Otherwise, 115VAC.

TB3-81 – Low refrigerant temp safety. 115VAC when low refrigerant temp safety (LRT) has tripped. Otherwise, 0VAC.

TB4-82 – Remote load limit PWM input - 115VAC for 1-11 seconds while the PWM input is present. Otherwise, 0VAC. (Refer to "Field Control Modifications Diagram", Form 155.16-PA3 and "Remote Setpoints" section of this book for details of this feature.

OUTPUTS

TB4-40/41 – Cycling shutdown status contacts. Dry closure N.O. contacts (rated for 115VAC, 2 amps) available for remote status indications. Contacts close whenever chiller is shut down on a **CYCLING** shutdown. A cycling shutdown is that which does not require a manual reset at the Control Center to restart the unit. (Refer to "Operations" manual, Form 155.16-O3 for list of cycling shutdowns.) The contacts remain closed as long as the shutdown condition exists. The contacts open and the unit automatically restarts when the condition that caused the shutdown clears. (Refer to Fig. 14.)

TB4-42/43 – Safety shutdown status contacts. Dry closure N.O. contacts (rated for 115VAC, 2 amps) available for remote status indications. Contacts close whenever unit shuts down on a **SAFETY** shutdown. A safety shutdown requires a manual reset at the Control Center to restart the unit. (Refer to "Operations" manual, Form 155.16-O3 for list of safety shutdowns.) The contacts remain closed as long as the safety shutdown condition exists. The contacts will open when the safety condition clears and the **UNIT** switch is pressed to the **STOP/RESET** position. Some safety shutdowns require pressing the **WARNING RESET** key (in **SERVICE** mode), instead of the **STOP/RESET** key to **RESET** position (refer to "Operation" manual, Form 155.16-O3 for these exceptions). (Refer to Fig. 15.)

TB4-44/45 – Chilled water pump control contacts. Dry closure N.O. contacts (rated for 115VAC, 2 amps) that can be used to automatically start and stop the chilled water pump. An anti-chatter circuit on the Micro Board prevents the output from energizing the pump at a rate greater than once every 10 seconds. A program jumper (CHW Pump-J54), located on the Micro Board determines the operation of these contacts as follows: (Refer to Fig. 16.)

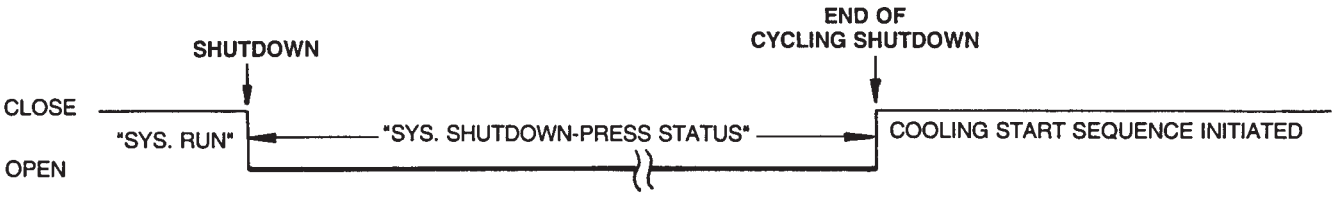
JUMPER INSTALLED – The contacts are closed during start sequence, unit run, dilution cycle and following **LWT** shutdowns.

JUMPER REMOVED – The contacts are closed during start sequence, unit run, dilution cycle, and following **LWT, Multi-unit**, and **Remote/Local Cycling** shutdowns.

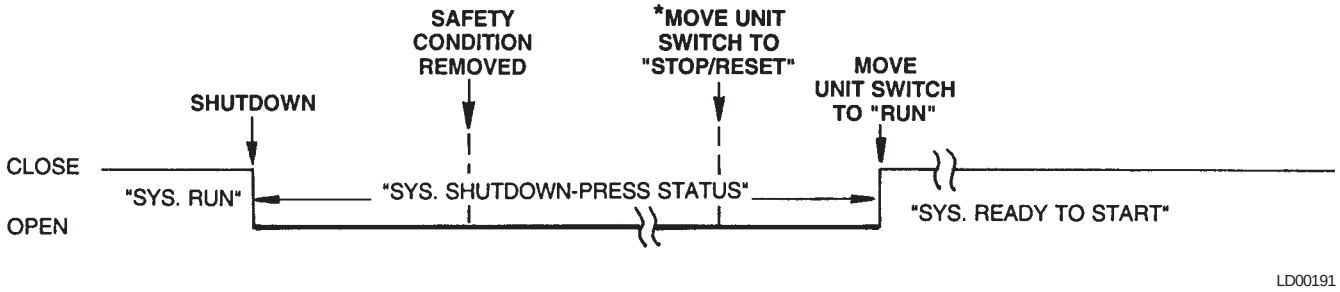
TB4-26/27 – Remote mode ready to start status contacts. Dry closure N.O. contacts (115VAC, 2 amps) available for remote status indications. The contacts will be closed if the **UNIT** switch is in the **RUN** position, all safety and cycling shutdowns are satisfied and the 30 minute anti-recycle timer has elapsed. This indicates that the unit will start when a remote start signal is received. The contacts will be open under all other conditions, indicating the unit will not start. (Refer to Fig. 17.)

TB4-55/56 – Condenser water pump control contacts. Dry closure N.O. contacts (115VAC, 2 amps), that can be used to start and stop the condenser water pump. (Refer to Fig. 18.)

CYCLING SHUTDOWN



SAFETY SHUTDOWN



*Some Safety Shutdowns require pressing the **WARNING RESET** key in **SERVICE** mode. Refer to Operation manual, Form 155.16-O3 for details.

FIG. 17 – REMOTE MODE READY TO START STATUS CONTACTS – RELAY BOARD TB4-26/27

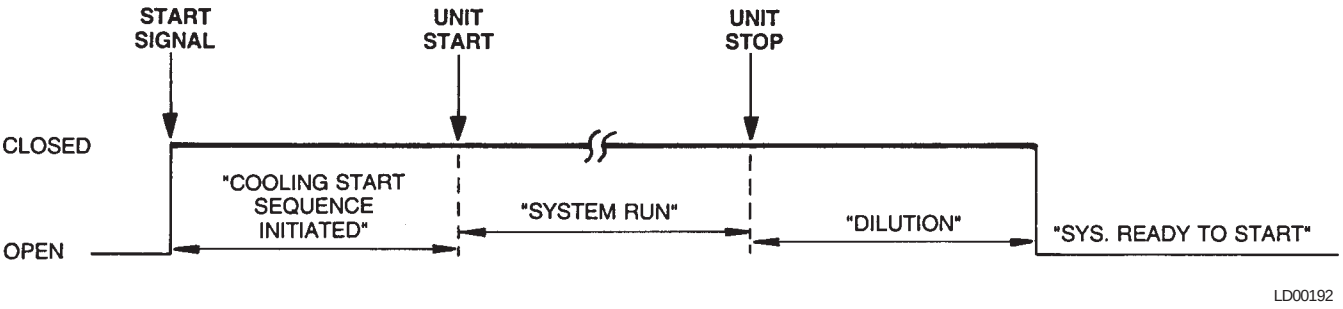


FIG. 18 – CONDENSER WATER PUMP CONTROL CONTACTS – RELAY BOARD TB4-55/56

TB4-87/88 – Not used.

TB4-89/90 – Warning contacts. Dry closure N.O. contacts (115VAC, 2 amps), that are used to activate an external customer supplied audible alarm when the warning condition occurs. The contacts close when the warning message is displayed. The contacts remain closed until the **WARNING RESET** key is pressed (in any mode). If the condition that caused the warning reaches the reset threshold, the contacts will automatically open when entering **SYSTEM RUN** upon starting the unit. These contacts operate while the unit is running or not running. Refer to "Operation" manual, Form 155.16-O3 for list of **WARNING CONDITIONS**.

TB3-29 – Refrigerant pump starter. 115VAC when Micro Board is commanding the refrigerant pump to run. Otherwise, 0VAC.

TB3-34 – Refrigerant level solenoid. 115VAC when Micro Board is commanding the solenoid valve to energize (open). Otherwise, 0VAC.

TB3-61 – Solution pump starter (Absorber pump on 50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps). 115VAC when micro panel is commanding the pump to run. Otherwise, 0VAC.

TB3-62 – Purge pump starter and purge solenoid. 115VAC when Micro Board is commanding purge pump to run. Otherwise, 0VAC.

TB3-6 – Steam/Hot water shutoff valve. 115VAC when Micro Board is commanding the steam or hot water shutoff valve to open. Otherwise, 0VAC.

TB3-63 – Stabilizer refrigerant solenoid. 115VAC when Micro Board is commanding valve to open. Otherwise, 0VAC.

TB3-22 – Generator pump starter (50Hz YIA10E3 thru YIA14F3 with Franklin pumps only). 115VAC when Micro Board is commanding the generator pump to run. Otherwise, 0VAC.

TB3-23 – Motor current solenoid. 115VAC when Micro Board is commanding the solenoid valve to open. Otherwise, 0VAC. (Units with Franklin pumps only).

TB3-17 – Steam condensate drain solenoid. 115VAC when Micro Board is commanding the valve to open. Otherwise, 0VAC (steam units only).

TB3-58 – Steam/Hot water valve unload (close). **MODUTROL ACTUATOR** – Less than 10VAC as measured to TB3-59 when Micro Board is commanding valve to close. Otherwise, 20-30VAC. **ALL OTHER ACTUATORS** – Less than 20VAC as measured to TB3-59 when Micro Board is commanding steam valve to close. Otherwise, 115VAC.

TB3-3 – Steam/Hot water valve load (open). **MODUTROL ACTUATOR** – Less than 10VAC as measured to TB3-59 when Micro Board is commanding valve to open. Otherwise, 20-30VAC. **ALL OTHER ACTUATORS** – Less than 20VAC as measured to TB3-59 when Micro Board is commanding valve to open. Otherwise, 115VAC.

TB3-59 – Steam/Hot water valve common or power source. **MODUTROL ACTUATOR** – Actuator open/close common. **ALL OTHER ACTUATORS** – 115VAC source voltage for actuator.

J3-6 – 1-11 second Pulse Width Modulated (PWM) signal. +5VDC for 1-11 seconds each time the PWM input is received. Otherwise, 0VDC.

J3-10 – Purge pump starter overload. 0VDC when purge pump starter overload has tripped. Otherwise, +5VDC.

J3-9 – Low refrigerant temperature safety. +5VDC when low refrigerant temp safety has tripped. Otherwise, 0VDC.

POWER SUPPLY BOARD

POWER SUPPLY BOARD (Ref. Figs. 19 & 20)

This board provides the necessary operating voltages for all the PC boards in the Millennium Control Center. A step-down transformer (1T) (external to the power supply board) provides 24VAC to a bridge rectifier. The unregulated output (≈30VDC) is applied to the I/O expansion board. This board has its own on-board 12VDC regulator.

Two switching regulators supply +12VDC and +10VDC to the Relay Output Board and Micro Board respectively. The 10VDC output is further regulated to +5VDC for use by the vacuum fluorescent display.

Finally, a voltage regulator supplies +24VDC to the optional card file for use by the remote LCWT setpoint card.

A **Display Reset Circuit** outputs a reset signal to the vacuum fluorescent display during low voltage situations. This prevents "latch-up" conditions in the display, whenever the +5VDC regulated output (J2-4) to the display is equal-to or less-than 4.7VDC, the $\overline{\text{RESET}}$ output (J6-2) transitions from +5VDC to a logic low condition (less-than 1VDC). This causes the display to blank for the duration of the condition.

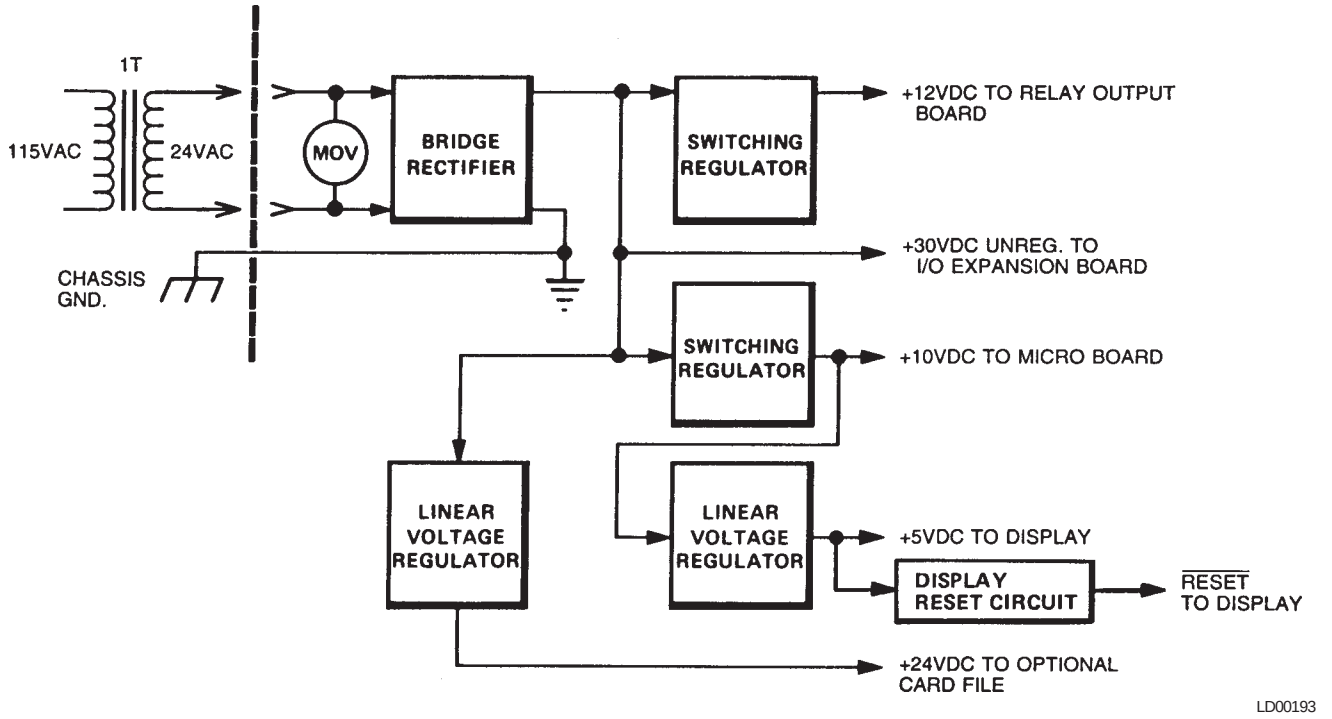
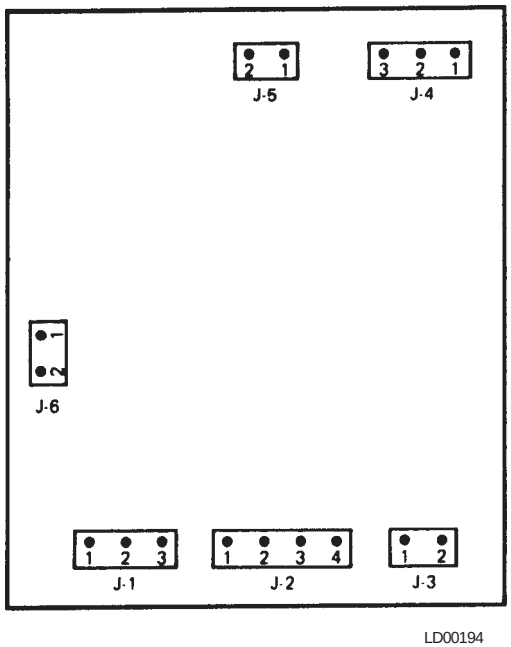


FIG. 19 – POWER SUPPLY BOARD BLOCK DIAGRAM



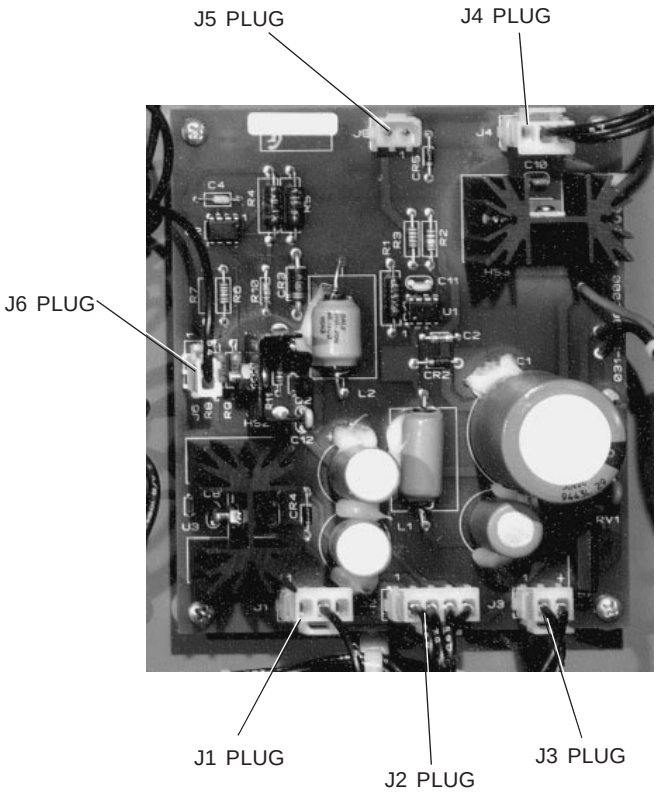


FIG. 20 – POWER SUPPLY BOARD

MICRO BOARD

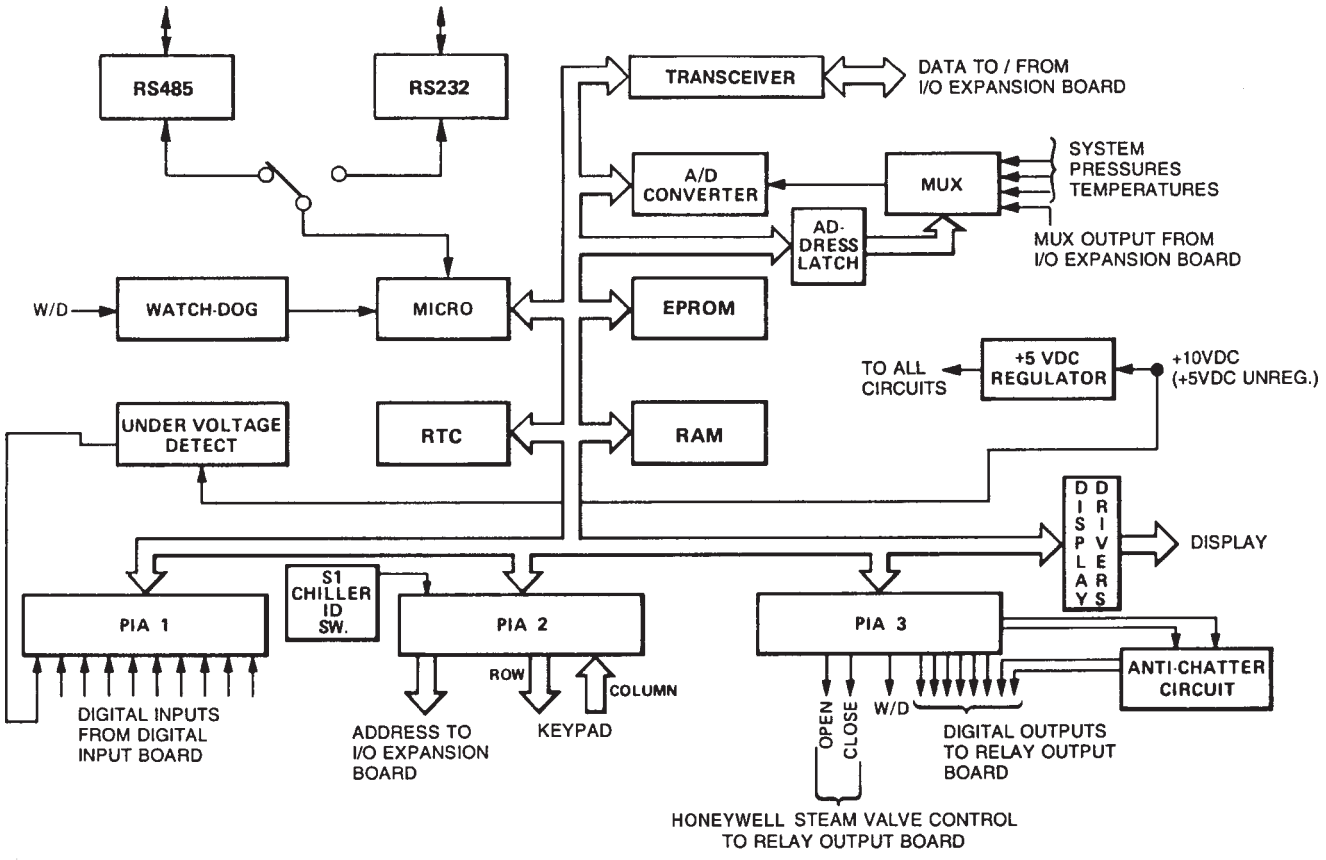
(Refer to Figs. 21 thru 25)

The Micro Board contains a microprocessor. An external **RAM** is provided for scratchpad memory and the operating program is stored in an external **EPROM**. Operator entered system setpoints are stored in battery-backed RAM available in the real-time clock (RTC). The RTC also stores and updates the time-of-day, day-of-week, and calendar date.

System analog parameters (Pressures, Temperatures, Motor Current) are input to the multiplexer (MUX). Under program control, these parameters are transmitted serially to the analog to digital converter where they are converted to digital words. The Micro Board compares these values to stored safety thresholds (EPROM) and initiates a chiller shutdown if thresholds are exceeded. These parameters are stored for: a.) subsequent viewing on the display if requested by the operator thru keypad operation; b.) data transmission thru RS-232 or RS-485 serial ports. The Micro Board also uses these parameters for system control.

An undervoltage detection circuit monitors the +5VDC unregulated (approximately 10VDC) input from the power supply board. This voltage is compared to a reference voltage. When the input voltage decreases to the reference voltage threshold, the undervoltage detector output transition is read by the Micro Board via the PIA No. 1 and the Micro Board initiates a chiller shutdown. If the **AUTO-R** (J50) program jumper on the Micro Board is installed (Auto-Restart After Power Failure) and the keypad **UNIT** switch is in the **RUN** position, the Micro Board will initiate a chiller start (START SEQUENCE INITIATED is displayed) when power is restored. If the **AUTO-R** (J50) program jumper is removed (Manual Restart After Power Failure), SYSTEM SHUTDOWN-PRESS STATUS is displayed when power is restored. MON 10:00 AM – POWER FAILURE is displayed when the operator presses the keypad **STATUS** key. The Micro Board will prevent a chiller restart until the operator moves the **COMPRESSOR** switch to the **STOP-RESET** position and then to the **START** position.

A watchdog circuit ensures that the complete program is executed every program cycle. This prevents the program from looping endlessly in a subroutine with the result that critical chiller parameters could be overlooked.



LD00195

FIG. 21 – MICRO BOARD BLOCK DIAGRAM

J54 • • **CHW PMP**

IN = Causes chilled water pump contacts (Relay Board TB 4-44/45) to open at completion of the dilution cycle following all unit shutdowns except Low Water Temp (LWT) shutdowns. On LWT shutdowns, the contacts remain closed after the dilution has been completed. Pressing the **UNIT** switch to the **STOP-RESET** position while the unit is shut down on LWT, causes the contacts to open following the completion of the dilution cycle.

OUT = Causes chilled water pump contacts to open at completion of the dilution cycle following all shutdowns except Low Water Temp, Multi-Unit, and Remote/Local cycling shutdowns. On these shutdowns, the contacts remain closed after the dilution has been completed. Pressing the **UNIT** switch to the **STOP-RESET** position while the unit is shut down on any of these shutdowns causes the contacts to open following the completion of the dilution cycle.

JP1 **NON TM/SC (Direct-Fired/Steam)**

IN = Configures the Micro Board for steam application.

OUT = Configures the Micro Board for hot water application.

J53 • • **SENS –** Not Used.

J52 • • **ENGL**

IN = System pressures and temperatures are displayed in PSIA and °F.

OUT = System pressures and temperatures are displayed in KPa (Kilo Pascals) and °C.

JP2 **R11 (Pump Type)**

EPROM Version A.02F.02 and later

IN = selects Buffalo pump operation. Must be in this position when the unit is equipped with Buffalo pumps. When in this position, program jumper JP3 has no effect on operation.

OUT = Selects Franklin pump operation. Must be in this position when unit is equipped with Franklin pumps.

J51 • •

IN = *CAUTION – Jumper should only be in when required for factory testing or field servicing. When installed, although the low refrigerant temperature override, high entering condenser water temperature override, and generator high temp, high pressure override, and strong solution temp override messages are displayed, the unit can actually be loaded beyond the override thresholds using the* ***LOAD*** *keypad key in* ***SERVICE*** *mode.*

OUT= The above override functions inhibit or control loading at the respective thresholds.

J50 • • **AUTO R**

IN = Enables auto-restart after power failure feature.

OUT = Enables manual-restart after power failure feature.

JP3 **WATER (50Hz applications)**

EPROM Version A.02F.02 and later - if JP2 is in (units equipped with Buffalo pumps), the position of this jumper has no effect on unit operation. When the unit is equipped with Buffalo pumps, there is no Generator pump.

IN = Configures Micro Board for all units except 50Hz Models YIA10E3 thru YIA14F3.

OUT= Configures Micro Board for 50Hz Model YIA10E3 thru YIA14F3 employing an absorber and generator pump.

J55 • • (DIS / ENA) **TEST –** In the **DISABLE** position, the software diagnostic is disabled. This is the normal position for operating the unit.

• • (DIS / ENA) **TEST –** In the **ENABLE** position, the software diagnostic is enabled. Refer to Testing Section of this book before putting the jumper in this position.

J56 (MODEM / EMS)

RS232 – In the **MODEM** position, a local printer can be connected to the RS-232 serial port (TB-8). Refer to Form 155.16-NO1.2 for details of the local printer option.

RS232 – In the **EMS** position, the YORK FAX-4500 Energy Management System (EMS) can be connected to the RS485 serial port (Micro Board TB-7). The remote PWM load limit and the remote PWM leaving water temp setpoint and start/stop inputs to the digital input board cannot be used with the jumper in this position. Refer to Form 450.11-O1 for details of the FAX-4500.

JP4 **CSTDN –** Not Used.

JP5 **CURR UNBAL (Steam/Hot Water Supply Temp)**

EPROM Version A.02F.01 and later

IN = Standard Temperature Units

	Steam	Hot Water
Warning Cut-Out	285.0 °F	250.0 °F
Warning Reset	284.0 °F	249.5 °F
Safety Cut-Out	290.0 °F	255.0 °F
Safety Reset	289.0 °F	254.0 °F

OUT = High Temperature Units

	Steam	Hot Water
Warning Cut-Out	337.0 °F	266.0 °F
Warning Reset	336.0 °F	265.5 °F
Safety Cut-Out	340.0 °F	270.0 °F
Safety Reset	339.0 °F	269.0 °F

JP6 **PRERUN –** Not Used.

JP7 **–** Not Used.

J57 **CLOCK**

(CLKON / CLKOFF)

In the **CLOCKON** position, the RTC clock (day, time, date) is permitted to run. This is the normal operating position. To turn on clock, move jumper to this position while AC power is applied to the Millennium Control Center. Then proceed to program clock setpoint per operating instructions, Form 155.16-O3. Clock will start when keypad **ENTER** key is pressed after clock setpoint is programmed. Placing the jumper in the **CLKON** position also resets the 7-day purge counter and purge pump operating hours to zero.

In the **CLOCKOFF** position, the RTC clock does not run. This position is used for long-term storage, shipping and winter shutdowns when AC power is removed from the Millennium Control Center. This extends the life of the RTC battery. To turn clock off, move jumper to this position while AC power is applied to the Millennium Control Center.

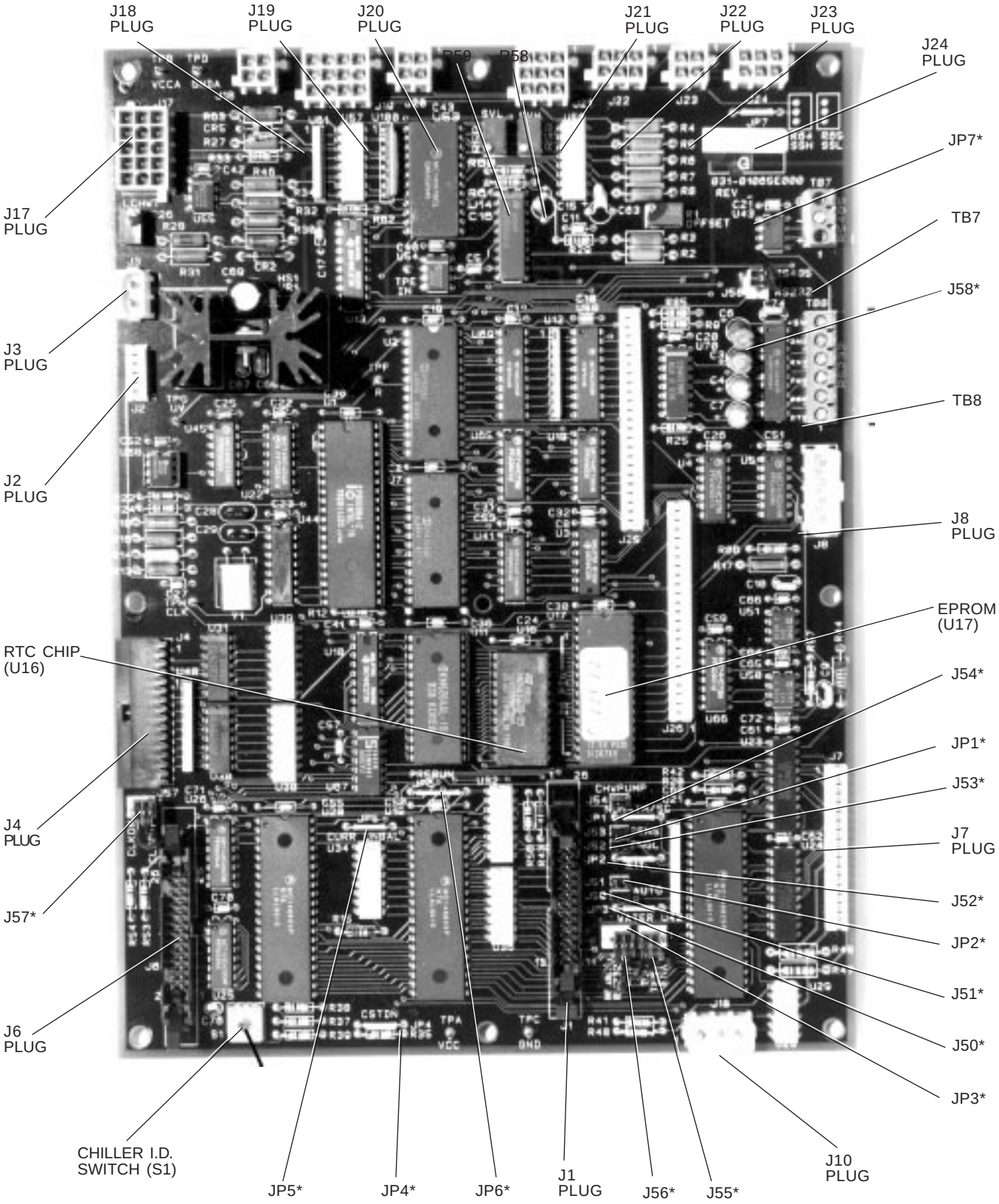
J58 **SERIAL PORT SELECT –** The position of this jumper determines which serial port (RS232 or RS485) can be used.

(RS-485 / RS-232)

In this position, the RS232 port (TB8) is enabled. Place in this position when a local printer is connected to TB8. If this position is selected, program jumper J56 must be in **MODEM** position.

In this position, the RS485 port (TB7) is enabled. Place in this position when the "YORK FAX-4500" Energy Management System is connected to TB7. If this position is selected, program jumper J56 must be in **EMS** position.

FIG. 22 – MICRO BOARD PROGRAM JUMPERS (MICRO BOARD 031-01065-001)



*PROGRAM JUMPER

25608A

FIG. 23 – MICRO BOARD AND PIN IDENTIFICATION

Each program cycle (≈100MS) the Micro Board outputs a pulse to the watchdog circuit via the parallel interface adapter (PIA). This pulse starts a 2 second timer in the watchdog circuit. If another pulse is not received by the watchdog circuit before 2 seconds have elapsed, the watchdog circuit will output a reset pulse to the Micro Board. The Micro Board shuts down the chiller, reinitializes the program and displays MON 10:00 AM – PROGRAM INITIATED RESET . The Micro Board will automatically restart the chiller.

Serial data interfacing to external equipment is provided through an RS-232 port (TB8) **or** an RS-485 port (TB7). Both ports cannot be connected to external devices at the same time. The position of program jumper J58 determines which port is enabled.

The RS-232 port can be connected to a local printer (Refer to Form 155.16-NO1.2.) Program jumper J56 must be in the **MODEM** position when this port is used.

The RS-485 port can be connected to the "YORK FAX-4500" facility automation system. Program jumper J56 must be in the **EMS** position when this port is used.

The Real-Time Clock (RTC) circuit stores and updates the time-of-day, day-of-week and calendar date. Anytime the chiller shuts down on a safety or cycling shutdown, the "Day" and "Time" of shutdown is displayed along with the cause of shutdown. This "Time" information is also used to determine correct chiller start and stop times when the programmable internal time clock is used to automatically start and stop the chiller. The RTC chip contains a non-replaceable battery. This battery powers the RTC RAM in the event of an AC power failure. All of the keypad programmable setpoints are stored in the RTC RAM. Therefore, the setpoints will be saved during a power failure. The life of this battery is 5-10 yrs. During each program cycle, the Micro Board monitors the condition of the battery. If a low battery condition is detected, REPLACE RTC. U16 – REPROGRAM SETPOINTS is displayed on the keypad display. If this message appears, the RTC Chip (U16) must be replaced. Refer to instructions in "Operating" manual, Form 155.16-O3. This RTC chip (YORK Part Number 031-00955-000) is available from the YORK Parts Distribution Centers. To conserve battery life over winter shutdowns, J57 Program Jumper must be positioned to the **CLOCK OFF** position. Refer to Fig. 22 for procedure. Also, the service technician must turn-on the clock during chiller commissioning.

The Parallel Interface Adapters (PIA) allow the Micro Board to interface to digital inputs, or outputs. Each PIA formats the digital inputs, or outputs into 8 bit words. PIA No. 1 receives the digital (On/Off) inputs from the digital input board. These are 115VAC system inputs that have been converted to +5VDC/–0VDC digital inputs by the digital input board. In each program cycle, the digital inputs are read by the Micro Board. The Micro Board, under program control, acts accordingly on the digital inputs. For example, if the High Pressure (HP) input transitions from 0VDC to +5VDC, the Micro Board initiates a chiller shutdown and displays the appropriate message.

PIA No. 2 sends a 3-bit address to the I/O Expansion Board. This address is applied to a multiplexer. It outputs analog data to the multiplexer on the Micro Board. The data and associated addresses are as follows:

ADDRESS	DATA
000	Steam/Hot water valve position
001	Steam/Hot water supply temp
010	Strong solution temp
011	Refrigerant temp leaving the condenser
100	Auto decrystallization temp
101	Not used.
110	Not used.
111	Not used.

Each program cycle (approx. 100MS), the Micro Board applies all of these addresses (in sequence) to the I/O Expansion Board. As each address is received, the respective analog value is transferred to the Micro Board. At the Micro Board, the data is further multiplexed to the analog-to-digital converter where it is converted to a digital value. Each value is stored for: a.) subsequent viewing on the display if requested by the operator thru keypad operation; b.) data transmission thru RS-232 or RS-485 serial ports; and c.) unit control thru program operation.

PIA No. 2 also interfaces to the front panel keypad to determine which key the operator is pressing (Refer to Fig. 25.) The keypad is a two-layer matrix of conductors arranged in a configuration of rows and columns. When a key is pressed, the conductor in that column makes contact with the conductor in that row. There are 6 PIA outputs to the keypad rows. The rows are designated 4, 8, 10, 20, 40, 80. There are 8 PIA inputs from the keypad columns. The columns are designated 1, 2, 4, 8, 10, 20, 40, 80. At regular intervals, the Micro Board reads the keypad keys by sequentially driving the PIA outputs to the rows to logic low (<1VDC) and reading the resultant voltage at the column input to the PIA. For example, when row 8 is driven to logic low, if no keys are accessed in that row, all column inputs to the PIA will be +5VDC. However, if any key is pressed in row 8, the appropriate column input to the PIA would be at logic low (<1VDC) potential.

PIA No. 3 drives the steam/hot water valve actuator via

triacs that are located on the relay board. The actual leaving chilled water temperature (as detected by the leaving chilled water thermistor, RT1) is constantly compared to the **Leaving Chilled Water Setpoint.** The actuator is modulated in a pulsing action to achieve and maintain the setpoint. The **Open** triac is turned on to cause the actuator to open. The **Close** triac is turned on to cause actuator to close. Refer to "Steam/Hot Water Valve Control" section for details of valve control.

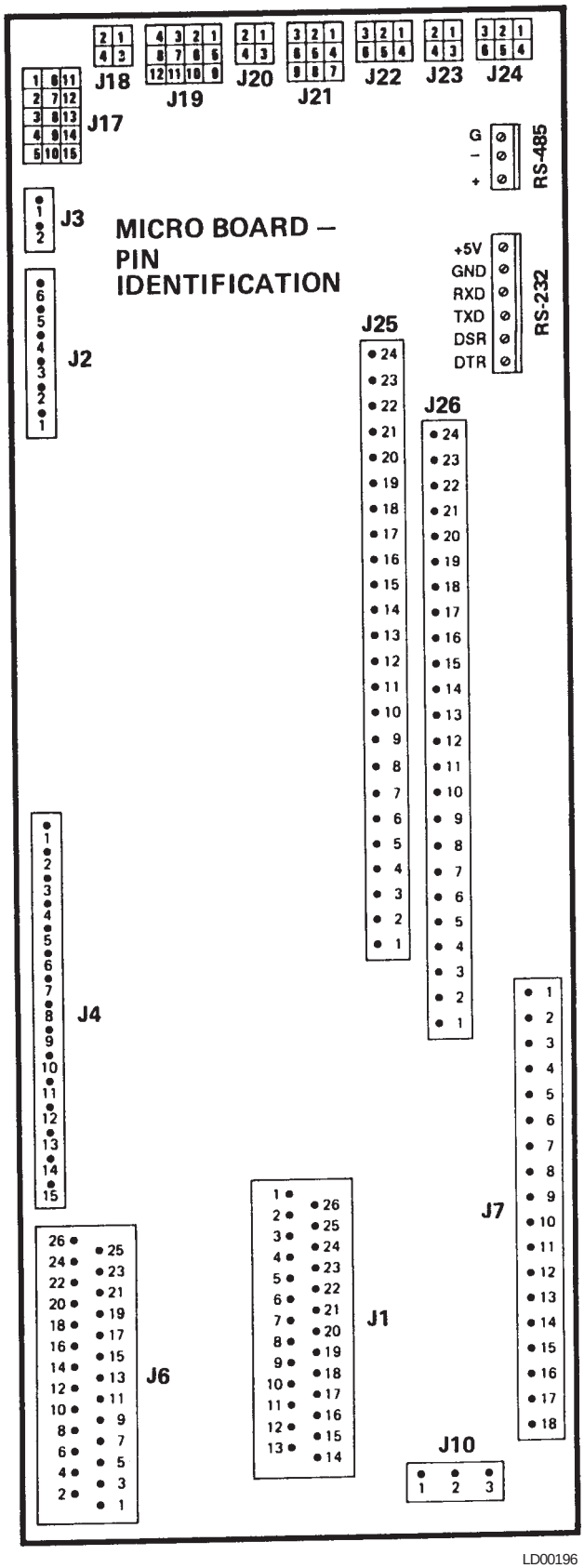
PIA No. 3 also interfaces to the **Relay Board** (J1) to control **DC** relays that allow the Micro Board logic level circuits to interface to 115VAC system solenoids and relays. On the relay board, one side of all the relays is tied to +12VDC. The other side of each relay is connected to the Micro Board via ribbon cable. Under program control, the micro energizes each of the relays by driving the appropriate PIA output to "Logic Low" (GND) potential. It de-energizes a relay by shutting off the PIA, allowing the output to go to +12VDC. To prevent relay chatter, anti-chatter circuits are employed for outputs J7-3 (steam/hot water shutoff valve) and J7-5 (purge pump starter). These circuits prevent the outputs from energizing at a rate greater than once every 15 seconds for J7-3 and once every 30 seconds for J7-5.

A chiller identification switch (S1) is provided for use when "YORK FAX-4500" energy management system or local system status printer is connected to the Micro Board serial data ports. The chiller ID switch can be used to assign an identification number (0 thru 7) to each chiller. If a local system status printer is applied, this number is printed at the top of each printout. Refer to YORK Form 155.16-NO1.2 for details of printer applications. This ID is useful in multiple chiller installations to identify individual printouts from different chillers.

Since the Micro Boards are universal in application, program jumpers are provided to configure for different applications. Refer to Fig. 22 for explanation of each program jumper.

Additional digital inputs to the Micro Board are provided from the **I/O Expansion Board.** These inputs are: Remote Load Limit PWM, Purge Pump Starter Overload, and Low Refrigerant Temperature Safety Device. These 115VAC inputs are first applied to opto-couplers on the **Relay Board**, where the 115VAC is converted to +5VDC. These logic level outputs are then applied to the I/O Expansion Board where they are applied to a latch circuit that holds the data until read by the micro. The micro reads this data by applying control signals **OPTRD** and **OPTSEL** and address "100". The data is then transferred to the Micro Board address/data bus via a transceiver.

Additional digital outputs are output to the **Relay Board** via the **I/O Expansion Board**. These are: Cycling



NOTE: USE AMP REMOVAL TOOL 724668-2 WHEN REMOVING PINS FORM J17-J24

FIG. 24 – MICRO BOARD PLUG PIN IDENTIFICATION

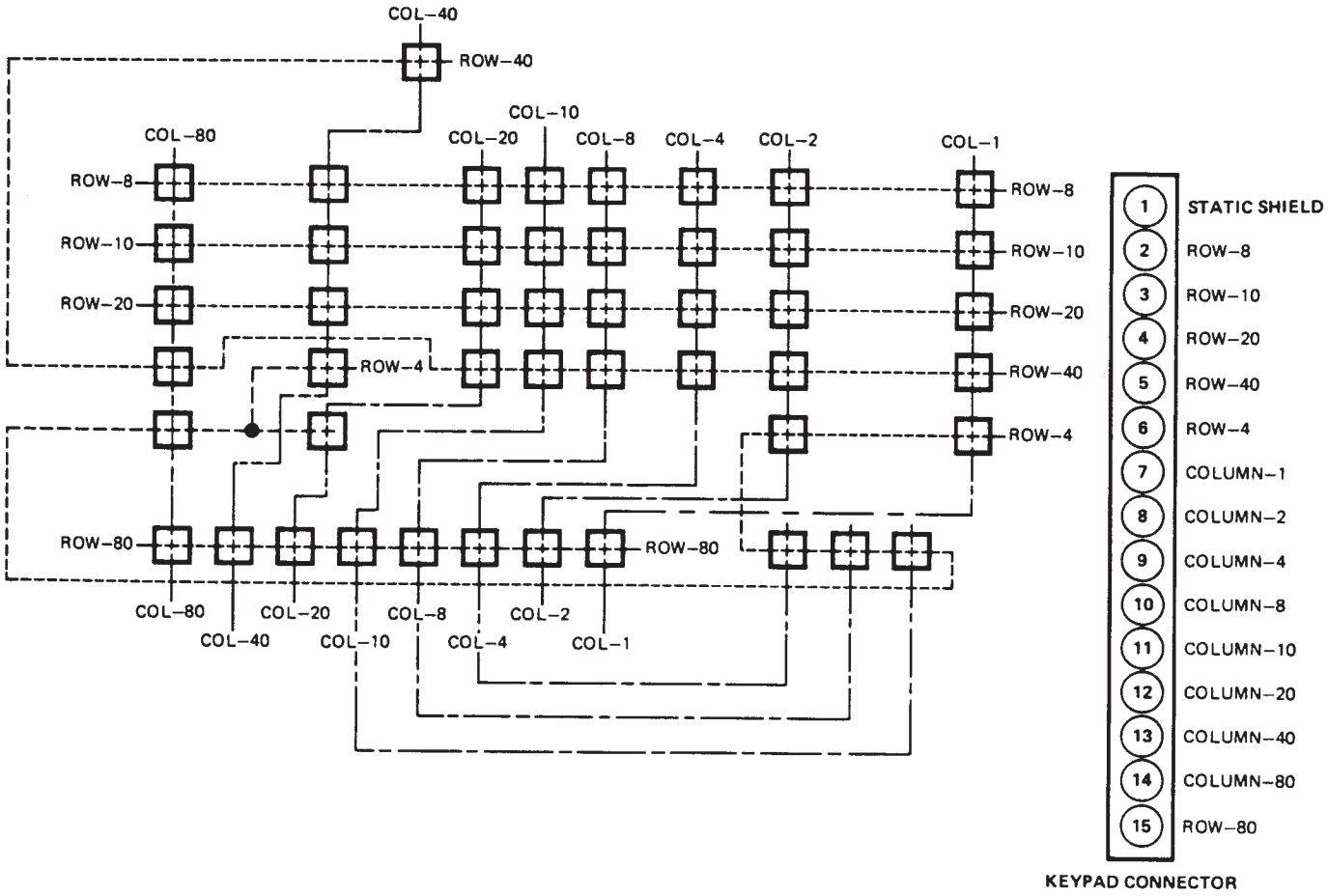


FIG. 25 – KEYPAD CONNECTION MATRIX

Shutdown Status Contacts, Safety Shutdown Status Contacts, Remote Mode Ready to Start Status Contacts, and Warning Contacts. The digital outputs are applied from the address/data bus to a latch circuit on the I/O Expansion Board via the transceiver. The data is latched into this circuit by control signal **OPTWR** and **OPTSEL** and address "011". The latch circuit drives +12VDC relays on the Relay Board. It energizes a relay by driving the output to "Logic Low" potential. Otherwise the output is +12VDC.

MICRO BOARD INPUTS AND OUTPUTS

J1-1 – Generator pump starter overload contacts input (50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps only). 0VDC when generator pump motor protector (4OL) or motor thermal switch (MTH) has tripped (opened) indicating an overload condition. Otherwise, +5VDC.

J1-2 – First-stage generator high pressure safety cutout switch input. +5VDC when safety device(s) are tripped. Otherwise, 0VDC.

J1-3 – Refrigerant pump starter overload contacts input. 0VDC when refrigerant pump motor protector (2OL) or motor thermal switch (MTH2) has tripped (opened) indicating an overload condition. Otherwise, +5VDC.

J1-4 – Solution pump (Absorber pump on 50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps) starter overload contacts input. 0VDC when pump motor protector (1OL) or motor thermal switch (MTH1) has tripped (opened) indicating an overload condition. Otherwise, +5VDC.

J1-5 – Not used.

J1-6 – Not used.

J1-7 – Generator high temp safety cutout switch input. +5VDC when switch is tripped. Otherwise, 0VDC.

J1-8 – Keypad **START/RUN/STOP-RESET** switch **Stop** input. +5VDC when switch is in the Stop position. Otherwise, 0VDC.

J1-9 – Keypad **START/RUN/STOP-RESET** switch **Start** input. +5VDC when switch is in the Start position. Otherwise, 0VDC.

J1-10 – Not used.
J1-11 – Not used.

J1-12 – Not used.

J1-13 – +5VDC return (GND) output.

J1-14 – +5VDC output.

J-15 – Remote start input. Momentary or maintained +5VDC causes unit to start if in **REMOTE** mode and **UNIT** switch is in **RUN** position. Otherwise, 0VDC.

J1-16 – Remote stop input. Momentary or maintained +5VDC causes unit to stop if in **REMOTE** mode and **UNIT** switch is in **RUN** position. Otherwise, 0VDC.

J1-17 – Remote leaving water temp setpoint pulse width modulation (PWM) input. +5VDC for 1-11 seconds when PWM input is present. Otherwise, 0VDC. Signal is only accepted every 60 seconds. Any PWM input applied at a rate greater than 1 signal/60 seconds will be ignored. Refer to "Remote Setpoint" section and Form 155.16-PA3 for details.

J1-18 – Condenser water flow switch input. +5VDC when flow switch is closed. Otherwise, 0VDC.

J1-19 – Chilled water flow switch input. 0VDC when flow switch is closed. Otherwise, +5VDC.

J1-20 – Remote/local cycling device input. +5VDC allows unit to run as long as **UNIT** switch is in **RUN** position and there are no other safety or cycling shutdowns. 0VDC causes unit to shutdown.

J1-21 – Multi-unit sequence input. +5VDC allows unit to run as long as **UNIT** switch is in **RUN** position and there are no other safety or cycling shutdowns. 0VDC causes unit to shutdown.

J1-22 – Not used.

J1-23 – Not used.

J1-24 – Auxiliary safety shutdown input. Momentary or maintained application of +5VDC causes unit to shutdown. Otherwise, 0VDC.

J1-25 – Refrigerant level float switch (1F) input. +5VDC when float switch is closed indicating sufficient level. Otherwise, 0VDC.

J1-26 – Units equipped with Franklin pumps – Refrigerant and solution pump motor coolant level float switch (2F). +5VDC when float switch is closed indicating sufficient refrigerant level. Otherwise, 0VDC. Units equipped with Buffalo pumps – Refrigerant level float switch (3F). +5VDC when refrigerant level is above the float switch causing float switch to close. Otherwise, 0VDC when refrigerant level is below float switch causing switch to open.

J2

J2-1 – 2^2 address bit to multiplexer on I/O Expansion Board. +5VDC in the active (Logic 1) state. Otherwise, 0VDC.

J2-2 – 2^1 address bit to multiplexer on I/O Expansion Board. +5VDC in the active (Logic 1) state. Otherwise, 0VDC.

J2-3 – 2^0 address bit to multiplexer on I/O Expansion Board. +5VDC in the active (Logic 1) state. Otherwise, 0VDC.

J2-4 – +5VDC output to I/O Expansion Board.

J2-5 – GND output to I/O Expansion Board.

J2-6 – Multiplexed 0-5VDC input from I/O Expansion Board as follows:

CHANNEL	ADDRESS	DATA
0	000	Steam/Hot water valve position. Refer to I/O Expansion Board J6-2.
1	001	Steam/Hot water water supply temp. Refer to Table 7.
2	010	Strong solution temp. Refer to Table 7.
3	011	Refrigerant temp leaving the condenser. Refer to Table 5.
4	100	Auto decrystallization temp. Refer to Table 6.
5	101	Not used.
6	110	Not used.
7	111	Not used.

J3

J3-1 – +5VDC return (GND) from power supply board.

J3-2 – +5VDC unregulated (10VDC) from power supply board.

J4

J4-1 – +5VDC return.

J4-2 – Keypad output, row-8. This line is driven to GND when Micro Board is scanning row-8. Otherwise, +5VDC.

J4-3 – Keypad output, row-10. This line is driven to GND when Micro Board is scanning row-10. Otherwise, +5VDC.

J4-4 – Keypad output, row-20. This line is driven to GND when Micro Board is scanning row-20. Otherwise, +5VDC.

J4-5 – Keypad output, row-40. This line is driven to GND when Micro Board is scanning row-40. Otherwise, +5VDC.

J4-6 – Keypad output, row-4. This line is driven to GND when Micro Board is scanning row-4. Otherwise, +5VDC.

J4-7 – Keypad input, column-1, Logic Low when a key in column 01 is pressed. Otherwise, +5VDC.

J4-8 – Keypad input, column-2, Logic Low when a key in column 2 is pressed. Otherwise, +5VDC.

J4-9 – Keypad input, column-4, Logic Low when a key in column 4 is pressed. Otherwise, +5VDC.

J4-10 – Keypad input, column-8, Logic Low when a key in column 8 is pressed. Otherwise, +5VDC.

J4-11 – Keypad input, column-10, Logic Low when a key in column 10 is pressed. Otherwise, +5VDC.

J4-12 – Keypad input, column-20, Logic Low when a key in column 20 is pressed. Otherwise, +5VDC.

J4-13 – Keypad input, column-40, Logic Low when a key in column 40 is pressed. Otherwise, +5VDC.

J4-14 – Keypad input, column-80, Logic Low when a key in column 8 is pressed. Otherwise, +5VDC.

J4-15 – Keypad output, row-80. This line is driven to GND when Micro Board is scanning row-80. Otherwise, +5VDC.

J6

J6-1 – "T0" output. Control bit that is used to initiate the display self-test. Bit is GND for greater than 3 sec to initiate test. Otherwise, +5VDC.

J6-3 – $\overline{CS}$ (Chip Select) output. Control bit that is 0VDC to enable vacuum fluorescent display module to accept a character. Otherwise, +5VDC.

J6-5 – +5VDC.

J6-7 – "A" output. Not used.

J6-9 – $\overline{WR}$ (Write) output. Control bit that is 0VDC to write a character into the vacuum fluorescent display module. Otherwise, +5VDC.

J6-11 – 2^0 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-13 – 2^1 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-15 – 2^2 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-17 – 2^3 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-19 – 2^4 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-21 – 2^5 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-23 – 2^6 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J6-25 – 2^7 bit output. ASCII that is +5VDC in the active state. Otherwise, 0VDC.

J7

J7-1 – Motor coolant solenoid valve output (Franklin pump only). Logic Low (<1VDC) when micro is commanding the solenoid valve to energize (open). Otherwise, +12VDC.

J7-2 – Generator pump motor starter output. Logic Low (<1VDC) when micro is commanding the pump to run. Otherwise, +12VDC. Applicable to 50Hz Models YIA10E3 thru YIA14F3 with Franklin pumps.

J7-3 – Steam/Hot water shutoff valve. Logic Low (<1VDC) when micro is commanding the shutoff valve to open. Otherwise, +12VDC.

J7-4 – Stabilizer refrigerant solenoid valve. Logic Low (<1VDC) when the micro is commanding the solenoid to energize (open). Otherwise, +12VDC.

J7-5 – Purge pump starter output. Logic Low (<1VDC) when micro is commanding the purge pump to run. Otherwise, +12VDC.

J7-6 – Chilled water pump control output. Logic Low (<1VDC) when micro is commanding the chilled water pump to run. Otherwise, +12VDC.

J7-7 – Condenser water pump control output. Logic Low (<1VDC) when micro is commanding the condenser water pump to run. Otherwise, +12VDC.

J7-8 – Solution pump (Absorber pump on 50HzYIA10E3 thru YIA14F3 with Franklin pumps.) Starter output. Logic Low (<1VDC) when micro is commanding the pump to run. Otherwise, +12VDC.

J7-9 – Refrigerant level solenoid valve output. Logic Low (<1VDC) when micro is commanding the valve to open. Otherwise, +12VDC.

J7-10 – Refrigerant pump starter output. Logic Low (<1VDC) when micro is commanding the pump to run. Otherwise, +12VDC.

J7-11/12 – Steam/Hot water valve actuator close output. **MODUTROL ACTUATOR –** Less than 5VAC (as measured from J7-11 to J7-12) when micro is commanding the valve to close. Otherwise, 20-30VAC. **ALL OTHER ACTUATORS –** Less than 5VAC (as measured from J7-11 to J7-12) when micro is commanding valve to close. Otherwise, 115VAC.

J7-13/14 – Steam/Hot water valve actuator open output. **MODUTROL ACTUATOR –** Less than 5VAC (as measured from J7-11 to J7-12) when micro is commanding the valve to close. Otherwise, 20-30VAC. **ALL OTHER ACTUATORS –** Less than 5VAC (as measured from J7-11 to J7-12) when micro is commanding valve to close. Otherwise, 115VAC.

J7-15 – Not used.

J7-16 – Not used.

J7-17 – +12VDC return (GND).

J7-18 – +12VDC return (GND).

J8 – Not used.

J10 – Not used.

TB7 – RS-485 serial port. Used for YORK FAX-4500 Energy Management System.

TB7-1 – RS-485 serial port balanced (+) I/O line. >+0.2VDC with respect to (–) line (TB7-2) is a logic 1 (mark). Greater than –0.2VDC is a logic 0 (space). Baud rate is determined by application.

TB7-2 – RS-485 serial port balanced (–) I/O line. See TB7-1.

TB7-3 – RS-485 serial port ground.

TB8 – RS-232 serial port. Used for: System Status Printer (Refer to Form 155.16-NO1.2.)

TB8-1 – DTR (Data Terminal Ready). Control signal to remote device. Logic High (+5 to +25VDC) when micro is ready to transmit to or receive data from remote device. Otherwise, Logic Low (–5 to –25VDC).

TB8-2 – DSR (Data Set Ready). Control signal from remote device. Logic High (+5 to +25VDC) when remote device is ready to send data to or receive data from the Micro Board. Otherwise, Logic Low (–5 to –25VDC).

TB8-3 – TXD (Transmit Data). Serial data to remote device. Logic 1 = –5 to –25VDC. Logic 0 = +5 to +25VDC. Baud rate is determined by the application.

TB8-4 – RXD (Receive Data). Serial data from remote device. Logic 1 = –5 to –25VDC. Logic 0 = +5 to +25VDC. Baud rate is determined by the application.

TB8-5 – Ground output to remote device.

TB8-6 – +5VDC output to remote device.

J17-1 – +5VDC return (GND).

J17-2 – Not used.

J17-6 – +5VDC output.

J17-11 – Not used.

J17-3 – +5VDC return (GND).

J17-4 – Not used.

J17-8 – +5VDC output.

J17-13 – Not used.

J17-5 – Not used.

J17-9 – Not used.

J17-10 – Not used.

J17-15 – Not used.

J18-1 – Not used.
J18-2 – Not used.

J18-3 – Not used.

J18-4 – Not used.

J19-1 – +5VDC return (GND).

J19-2 – Not used.

J19-5 – +5VDC output.

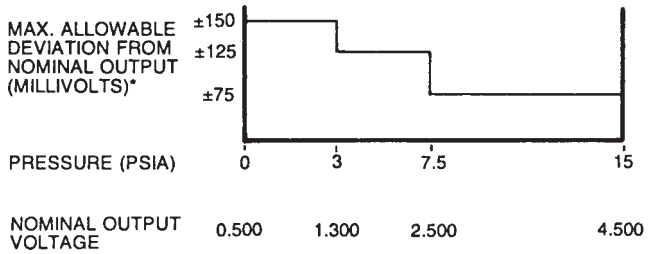


FIG. 26 – GENERATOR TRANSDUCER
YORK PART NO. 025-29907-001

J19-9 – Generator transducer (PT1) input. +0.5 - 4.5VDC transducer output corresponds to 0 - 15PSIA pressure input. To calculate the transducer output voltage vs. a given input pressure. Use the following formula. (Refer to Fig. 26.)

TO SOLVE FOR V:

$$V = \frac{P + 1.875}{3.75}$$

WHERE: V = Volts DC
P = Pressure in PSIA

TO SOLVE FOR P:

$$P = (3.75 \times V) - 1.875$$

J19-4 – Not used.

J19-7 – +5VDC output.

J19-8 – +5VDC return (GND).

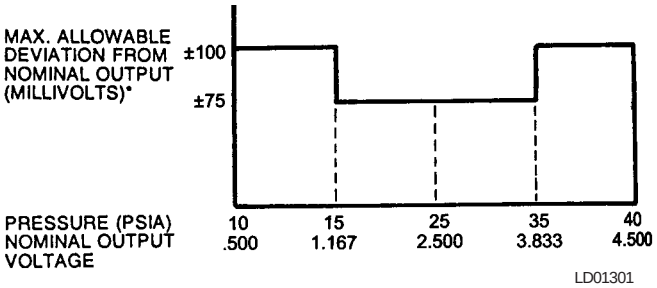


FIG. 27 – STEAM SUPPLY PRESS. TRANSDUCER
YORK PART NO. 025-29148-001

J19-12 – Steam supply pressure transducer (PT2) input. .5 - 4.5VDC transducer output corresponds to 10.0 - 40 PSIA transducer input. To calculate the transducer output voltage vs. a given input pressure, use the following formula: (Refer to Fig. 27.)

TO SOLVE FOR V:

$$V = (.1333 \times P) - .8333$$

WHERE: P = Pressure in PSIA
V = Volts DC

TO SOLVE FOR P:

$$P = (7.5 \times V) + 6.25$$

J19-3 – Not used.
J19-6 – +5VDC output.

J19-10 – Leaving chilled water temperature thermistor (RT1) input. 0 - 5VDC. (Refer to Table 1.)

J20-1 – Not used.

J20-2 – Not used.

J20-3 – Not used.

J20-4 – Not used.

J21-1 – Not used.

J21-2 – Not used.

J21-4 – +5VDC output.

J21-7 – Entering chilled water temperature thermistor (RT6) input. 0 - 5VDC. (Refer to Table 2.)

J21-3 – Not used.

J21-5 – +5VDC output.

J21-8 – Refrigerant temperature thermistor (RT9) input. 0 - 5 VDC. (Refer to Table 3.)

J21-6 – Not used.

J21-9 – Not used.

J22-1 – Not used.

J22-4 – +5VDC output.

J22-5 – Entering condenser water temperature thermistor (RT4) input. 0 - 5VDC. (Refer to Table 4.)

J22-3 – Not used.

J22-2 – +5VDC output.

J22-6 – Leaving condenser water temperature thermistor (RT4) input. 0 - 5VDC. (Refer to Table 4.)

J23-1 – Not used.

J23-2 – Not used.

J23-3 – Not used.

J23-4 – Not used.

J24-1 – Not used.

J24-2 – Not used.

J24-3 – Not used.

J24-4 – Not used.

J24-5 – Not used.

J24-6 – Not used.

J25-1 – Address bit **A9** output. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J25-2 – Address bit **A10** output. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J25-3 – Address bit **A11** output. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J25-4 – Not used.

J25-5 – Not used.

J25-6 – Not used.

J25-7 – Not used.

J25-8 – $\overline{\text{OPTSEL}}$ (Option Select) output. 0VDC in the active state (Logic 0), when the micro is reading data from or writing data to the I/O Expansion Board. Otherwise, +5VDC.

J25-9 – Not used.

J25-10 – $\overline{\text{DEN}}$ (Data Enable) output. 0VDC in the active state (Logic 0), when the micro is reading data from or writing data to the I/O Expansion Board. Otherwise, +5VDC.

J25-11 – +5VDC output.

J25-12 – Not used.

J25-13 – Data bit **D7** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-14 – Data bit **D6** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-15 – Data bit **D5** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-16 – Data bit **D4** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-17 – Data bit **D3** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-18 – Data bit **D2** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-19 – Data bit **D1** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-20 – Data bit **D0** input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J25-21 – +5VDC output.

J25-22 – "$\overline{\text{OPTION}}$" control signal input. 0VDC in the active state (Logic 0) to enable the transceiver on the Micro Board to accept or transmit data to the I/O Expansion Board. Otherwise, +5VDC.

J25-23 – +5VDC output.

J25-24 – Not used.

J26-1 – Not used.

J26-2 – Not used.

J26-3 – Not used.

J26-4 – Not used.

J26-5 – Not used.

J26-6 – Not used.

J26-7 – Not used.

J26-8 – Not used.

J26-9 – Not used.

J26-10 – Not used.

J26-11 – Ground output.

J26-12 – "$\overline{\text{OPTWR}}$" (Option Write) control signal output. 0VDC when micro is writing data to the I/O Expansion Board. Otherwise, +5VDC.

J26-13 – Ground output.

J26-14 – Not used.

J26-15 – Ground output.

J26-16 – Not used.

J26-17 – Ground output.

J26-18 – Not used.

J26-19 – Ground output.

J26-20 – Not used.

J26-21 – Ground output.

J26-22 – "$\overline{\text{RESET}}$" control signal output. 0VDC in the active state when the micro resets the output latch on the I/O Expansion Board. Otherwise, +5VDC.

J26-23 – Ground output.

J26-24 – "$\overline{\text{OPTRD}}$" (Option Read) control signal output. 0VDC when micro is reading data from the I/O Expansion Board. Otherwise, +5VDC.

TABLE 1 – LEAVING CHILLED WATER TEMPERATURE

temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin
9.90	1.4280	15.13	1.5957	20.17	1.7634	25.08	1.9311
10.00	1.4310	15.22	1.5987	20.26	1.7664	25.17	1.9341
10.09	1.4341	15.32	1.6018	20.35	1.7695	25.26	1.9372
10.19	1.4371	15.41	1.6048	20.44	1.7725	25.35	1.9402
10.29	1.4402	15.50	1.6079	20.53	1.7756	25.43	1.9433
10.39	1.4432	15.60	1.6109	20.62	1.7786	25.52	1.9463
10.48	1.4463	15.69	1.6140	20.71	1.7817	25.61	1.9494
10.58	1.4493	15.78	1.6170	20.80	1.7847	25.70	1.9524
10.68	1.4523	15.87	1.6201	20.89	1.7878	25.79	1.9555
10.77	1.4554	15.97	1.6231	20.98	1.7908	25.87	1.9585
10.87	1.4584	16.06	1.6262	21.07	1.7939	25.96	1.9616
10.97	1.4615	16.15	1.6292	21.16	1.7969	26.05	1.9646
11.06	1.4645	16.24	1.6322	21.25	1.8000	26.14	1.9677
11.16	1.4676	16.34	1.6353	21.34	1.8030	26.23	1.9707
11.25	1.4706	16.43	1.6383	21.43	1.8060	26.31	1.9738
11.35	1.4737	16.52	1.6414	21.52	1.8091	26.40	1.9768
11.45	1.4767	16.61	1.6444	21.61	1.8121	26.49	1.9798
11.54	1.4798	16.70	1.6475	21.70	1.8152	26.58	1.9829
11.64	1.4828	16.80	1.6505	21.79	1.8182	26.67	1.9859
11.73	1.4859	16.89	1.6536	21.88	1.8213	26.76	1.9890
11.83	1.4889	16.98	1.6566	21.97	1.8243	26.84	1.9920
11.93	1.4920	17.07	1.6597	22.06	1.8274	26.93	1.9951
12.02	1.4950	17.16	1.6627	22.15	1.8304	27.02	1.9981
12.12	1.4981	17.26	1.6658	22.24	1.8335	27.11	2.0012
12.21	1.5011	17.35	1.6688	22.33	1.8365	27.20	2.0042
12.31	1.5042	17.44	1.6719	22.42	1.8396	27.28	2.0073
12.40	1.5072	17.53	1.6749	22.51	1.8426	27.37	2.0103
12.50	1.5103	17.63	1.6780	22.60	1.8457	27.46	2.0134
12.59	1.5133	17.72	1.6810	22.69	1.8487	27.55	2.0164
12.69	1.5164	17.81	1.6841	22.78	1.8518	27.64	2.0195
12.78	1.5194	17.90	1.6871	22.87	1.8548	27.73	2.0225
12.88	1.5225	17.99	1.6902	22.96	1.8579	27.81	2.0256
12.97	1.5255	18.08	1.6932	23.04	1.8609	27.90	2.0286
13.07	1.5286	18.17	1.6963	23.13	1.8640	27.99	2.0317
13.16	1.5316	18.26	1.6993	23.22	1.8670	28.08	2.0347
13.26	1.5347	18.35	1.7024	23.31	1.8701	28.17	2.0378
13.35	1.5377	18.44	1.7054	23.40	1.8731	28.25	2.0408
13.45	1.5408	18.54	1.7085	23.49	1.8762	28.34	2.0439
13.54	1.5438	18.63	1.7115	23.58	1.8792	28.43	2.0469
13.64	1.5469	18.72	1.7146	23.67	1.8823	28.52	2.0500
13.73	1.5499	18.81	1.7176	23.75	1.8853	28.61	2.0530
13.83	1.5530	18.90	1.7207	23.84	1.8884	28.69	2.0561
13.92	1.5560	18.99	1.7237	23.93	1.8914	28.78	2.0591
14.01	1.5591	19.08	1.7268	24.02	1.8945	28.87	2.0622
14.11	1.5621	19.17	1.7298	24.11	1.8975	28.96	2.0652
14.20	1.5652	19.26	1.7329	24.20	1.9006	29.04	2.0683
14.29	1.5682	19.36	1.7359	24.29	1.9036	29.13	2.0713
14.39	1.5713	19.45	1.7390	24.37	1.9067	29.22	2.0744
14.48	1.5743	19.54	1.7420	24.46	1.9097	29.31	2.0774
14.57	1.5774	19.63	1.7451	24.55	1.9128	29.39	2.0805
14.67	1.5804	19.72	1.7481	24.64	1.9158	29.48	2.0835
14.76	1.5835	19.81	1.7512	24.73	1.9189	29.57	2.0866
14.85	1.5865	19.90	1.7542	24.82	1.9219	29.66	2.0896
14.95	1.5896	19.99	1.7573	24.91	1.9250	29.75	2.0927
15.04	1.5926	20.08	1.7603	24.99	1.9280	29.83	2.0957

TABLE 1 – LEAVING CHILLED WATER TEMPERATURE (Cont'd.)

temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin
29.92	2.0988	34.73	2.2665	39.57	2.4342	44.46	2.6019	49.48	2.7696
30.01	2.1018	34.82	2.2695	39.66	2.4372	44.55	2.6049	49.57	2.7726
30.10	2.1049	34.91	2.2726	39.74	2.4403	44.64	2.6080	49.66	2.7757
30.18	2.1079	34.99	2.2756	39.83	2.4433	44.73	2.6110	49.75	2.7787
30.27	2.1110	35.08	2.2787	39.92	2.4464	44.82	2.6141	49.84	2.7818
30.36	2.1140	35.17	2.2817	40.01	2.4494	44.91	2.6171	49.94	2.7848
30.45	2.1171	35.26	2.2848	40.10	2.4525	45.00	2.6202	50.03	2.7879
30.53	2.1201	35.34	2.2878	40.19	2.4555	45.09	2.6232	50.12	2.7909
30.62	2.1232	35.43	2.2909	40.27	2.4586	45.18	2.6263	50.22	2.7940
30.71	2.1262	35.52	2.2939	40.36	2.4616	45.27	2.6293	50.31	2.7970
30.79	2.1293	35.61	2.2970	40.45	2.4647	45.36	2.6324	50.40	2.8001
30.88	2.1323	35.70	2.3000	40.54	2.4677	45.36	2.6354	50.50	2.8031
30.97	2.1354	35.78	2.3031	40.63	2.4708	45.55	2.6385	50.59	2.8062
31.06	2.1384	35.87	2.3061	40.71	2.4738	45.64	2.6415	50.68	2.8092
31.14	2.1415	35.96	2.3092	40.80	2.4769	45.73	2.6446	50.78	2.8123
31.23	2.1445	36.05	2.3122	40.89	2.4799	45.82	2.6476	50.87	2.8153
31.32	2.1476	36.13	2.3153	40.98	2.4830	45.91	2.6507	50.96	2.8184
31.41	2.1506	36.22	2.3183	41.07	2.4860	46.00	2.6537	51.06	2.8214
31.49	2.1536	36.31	2.3214	41.16	2.4891	46.09	2.6568	51.15	2.8245
31.58	2.1567	36.40	2.3244	41.24	2.4921	46.18	2.6598	51.24	2.8275
31.67	2.1597	36.48	2.3274	41.33	2.4952	46.27	2.6629	51.34	2.8306
31.76	2.1628	36.57	2.3305	41.42	2.4982	46.36	2.6659	51.43	2.8336
31.84	2.1658	36.66	2.3335	41.51	2.5012	46.45	2.6690	51.52	2.8367
31.93	2.1689	36.75	2.3366	41.60	2.5043	46.55	2.6720	51.62	2.8397
32.02	2.1719	36.83	2.3396	41.69	2.5073	46.64	2.6751	51.71	2.8428
32.10	2.1750	36.92	2.3427	41.78	2.5104	46.73	2.6781	51.80	2.8458
32.19	2.1780	37.01	2.3457	41.87	2.5134	46.82	2.6811	51.90	2.8489
32.28	2.1811	37.10	2.3488	41.96	2.5165	46.91	2.6842	51.99	2.8519
32.37	2.1841	37.18	2.3518	42.05	2.5195	47.00	2.6872	52.09	2.8549
32.45	2.1872	37.27	2.3549	42.14	2.5226	47.09	2.6903	52.18	2.8580
32.54	2.1902	37.36	2.3579	42.23	2.5256	47.18	2.6933	52.28	2.8610
32.63	2.1933	37.45	2.3610	42.31	2.5287	47.27	2.6964	52.37	2.8641
32.72	2.1963	37.54	2.3640	42.40	2.5317	47.36	2.6994	52.46	2.8671
32.81	2.1994	37.62	2.3671	42.49	2.5348	47.45	2.7025	52.56	2.8702
32.89	2.2024	37.71	2.3701	42.58	2.5378	47.55	2.7055	52.65	2.8732
32.98	2.2055	37.80	2.3732	42.67	2.5409	47.64	2.7086	52.75	2.8763
33.07	2.2085	37.89	2.3762	42.76	2.5439	47.73	2.7116	52.84	2.8793
33.16	2.2116	37.98	2.3793	42.85	2.5470	47.82	2.7147	52.94	2.8824
33.24	2.2146	38.07	2.3823	42.94	2.5500	47.91	2.7177	53.03	2.8854
33.33	2.2177	38.15	2.3854	43.03	2.5531	48.00	2.7208	53.13	2.8885
33.42	2.2207	38.24	2.3884	43.12	2.5561	48.09	2.7238	53.22	2.8915
33.51	2.2238	38.33	2.3915	43.21	2.5592	48.18	2.7269	53.32	2.8946
33.59	2.2268	38.42	2.3945	43.30	2.5622	48.27	2.7299	53.41	2.8976
33.68	2.2299	38.51	2.3976	43.39	2.5653	48.37	2.7330	53.51	2.9007
33.77	2.2329	38.60	2.4006	43.48	2.5683	48.46	2.7360	53.60	2.9037
33.86	2.2360	38.69	2.4037	43.57	2.5714	48.55	2.7391	53.70	2.9068
33.94	2.2390	38.77	2.4067	43.65	2.5744	48.64	2.7421	53.79	2.9098
34.03	2.2421	38.86	2.4098	43.74	2.5775	48.74	2.7452	53.89	2.9129
34.12	2.2451	38.95	2.4128	43.83	2.5805	48.83	2.7482	53.98	2.9159
34.21	2.2482	39.04	2.4159	43.92	2.5836	48.92	2.7513	54.08	2.9190
34.29	2.2512	39.13	2.4189	44.01	2.5866	49.01	2.7543	54.17	2.9220
34.38	2.2543	39.22	2.4220	44.10	2.5897	49.11	2.7574	54.27	2.9251
34.47	2.2573	39.30	2.4250	44.19	2.5927	49.20	2.7604	54.36	2.9281
34.56	2.2604	39.39	2.4281	44.28	2.5958	49.29	2.7635	54.46	2.9312
34.64	2.2634	39.48	2.4311	44.37	2.5988	49.38	2.7665	54.55	2.9342

TABLE 1 – LEAVING CHILLED WATER TEMPERATURE (Cont'd.)

temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin
54.65	2.9373	60.05	3.1050	65.75	3.2727	71.83	3.4404	78.42	3.6081
54.74	2.9403	60.15	3.1080	65.85	3.2757	71.95	3.4434	78.55	3.6111
54.84	2.9434	60.25	3.1111	65.96	3.2788	72.06	3.4465	78.67	3.6142
54.93	2.9464	60.36	3.1141	66.06	3.2818	72.18	3.4495	78.80	3.6172
55.03	2.9495	60.46	3.1172	66.17	3.2849	72.29	3.4526	78.93	3.6203
55.12	2.9525	60.56	3.1202	66.28	3.2879	72.41	3.4556	79.05	3.6233
55.22	2.9556	60.66	3.1233	66.39	3.2910	72.52	3.4587	79.18	3.6264
55.32	2.9586	60.76	3.1263	66.49	3.2940	72.64	3.4617	79.31	3.6294
55.41	2.9617	60.86	3.1294	66.60	3.2971	72.75	3.4648	79.44	3.6325
55.51	2.9647	60.96	3.1324	66.71	3.3001	72.87	3.4678	79.57	3.6355
55.61	2.9678	61.06	3.1355	66.82	3.3032	72.98	3.4709	79.69	3.6386
55.70	2.9708	61.17	3.1385	66.93	3.3062	73.10	3.4739	79.82	3.6416
55.80	2.9739	61.27	3.1416	67.03	3.3093	73.21	3.4770	79.95	3.6447
55.90	2.9769	61.37	3.1446	67.14	3.3123	73.33	3.4800	80.08	3.6477
56.00	2.9800	61.47	3.1477	67.25	3.3154	73.44	3.4831	80.20	3.6508
56.09	2.9830	61.57	3.1507	67.36	3.3184	73.56	3.4861	80.33	3.6538
56.19	2.9861	61.67	3.1538	67.47	3.3215	73.68	3.4892	80.46	3.6569
56.29	2.9891	61.78	3.1568	67.58	3.3245	73.80	3.4922	80.59	3.6599
56.39	2.9922	61.88	3.1599	67.68	3.3276	73.92	3.4953	80.72	3.6630
56.48	2.9952	61.98	3.1629	67.79	3.3306	74.04	3.4983	80.85	3.6660
56.58	2.9983	62.08	3.1660	67.90	3.3337	74.16	3.5014	80.98	3.6691
56.68	3.0013	62.18	3.1690	68.01	3.3367	74.28	3.5044	81.11	3.6721
56.78	3.0044	62.28	3.1721	68.12	3.3398	74.40	3.0575	81.24	3.6752
56.87	3.0074	62.39	3.1751	68.23	3.3428	74.52	3.5105	81.37	3.6782
56.97	3.0105	62.49	3.1782	68.34	3.3459	74.64	3.5136	81.50	3.6813
57.07	3.0135	62.59	3.1812	68.45	3.3489	74.75	3.5166	81.63	3.6843
57.17	3.0166	62.69	3.1843	68.56	3.3520	74.87	3.5197	81.76	3.6874
57.26	3.0196	62.80	3.1873	68.67	3.3520	74.99	3.5227	81.89	3.6904
57.36	3.0227	62.90	3.1904	68.78	3.3581	75.11	3.5258	82.02	3.6935
57.46	3.0257	63.01	3.1934	68.90	3.3611	75.23	3.5288	82.15	3.6965
57.56	3.0287	63.11	3.1965	69.01	3.3642	75.35	3.5319	82.28	3.6996
57.66	3.0318	63.22	3.1995	69.12	3.3672	75.47	3.5349	82.41	3.7026
57.76	3.0348	63.32	3.2025	69.23	3.3703	75.60	3.5380		
57.86	3.0379	63.43	3.2056	69.34	3.3733	75.72	3.5410		
57.96	3.0409	63.53	3.2086	69.45	3.3763	75.84	3.5441		
58.06	3.0440	63.63	3.2117	69.56	3.3794	75.96	3.5471		
58.15	3.0470	63.74	3.2147	69.67	3.3824	76.08	3.5501		
58.25	3.0501	63.84	3.2178	69.78	3.3855	76.20	3.5532		
58.35	3.0531	63.95	3.2208	69.89	3.3885	76.32	3.5562		
58.45	3.0562	64.05	3.2239	70.01	3.3916	76.44	3.5593		
58.55	3.0592	64.16	3.2269	70.12	3.3946	76.57	3.5623		
58.65	3.0623	64.26	3.2300	70.24	3.3977	76.69	3.5654		
58.75	3.0653	64.37	3.2330	70.35	3.4007	76.81	3.5684		
58.85	3.0684	64.47	3.2361	70.46	3.4038	76.93	3.5715		
58.95	3.0714	64.58	3.2391	70.58	3.4068	77.05	3.5745		
59.05	3.0745	64.68	3.2422	70.69	3.4099	77.18	3.5776		
59.15	3.0775	64.79	3.2452	70.80	3.4129	77.30	3.5806		
59.25	3.0806	64.90	3.2483	70.92	3.4160	77.43	3.5837		
59.35	3.0836	65.00	3.2513	71.03	3.4190	77.55	3.5867		
59.45	3.0867	65.11	3..2544	71.15	3.4221	77.68	3.5898		
59.55	3.0897	65.21	3.2574	71.26	3.4251	77.80	3.5928		
59.65	3.0928	65.32	3.2605	71.37	3.4282	77.93	3.5959		
59.75	3.0958	65.43	3.2635	71.49	3.4312	78.05	3.5989		
59.85	3.0989	65.53	3.2666	71.60	3.4343	78.17	3.6020		
59.95	3.1019	65.64	3.2696	71.72	3.4373	78.30	3.6050		

TABLE 2 – ENTERING CHILLED WATER TEMPERATURE

temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin
15.01	1.5918	23.03	1.8604	30.78	2.1289	38.51	2.3975
15.16	1.5967	23.17	1.8652	30.92	2.1338	38.65	2.4023
15.31	1.6016	23.31	1.8701	31.06	2.1387	38.79	2.4072
15.46	1.6064	23.45	1.8750	31.20	2.1436	38.93	2.4121
15.61	1.6113	23.60	1.8799	31.34	2.1484	39.07	2.4170
15.76	1.6162	23.74	1.8848	31.48	2.1533	39.21	2.4219
15.91	1.6211	23.88	1.8896	31.62	2.1582	39.35	2.4268
16.05	1.6260	24.02	1.8945	31.76	2.1631	39.50	2.4316
16.20	1.6309	24.16	1.8994	31.90	2.1680	39.64	2.4365
16.35	1.6357	24.31	1.9043	32.04	2.1729	39.78	2.4414
16.50	1.6406	24.45	1.9092	32.18	2.1777	39.92	2.4463
16.64	1.6455	24.59	1.9141	32.32	2.1826	40.06	2.4512
16.79	1.6504	24.73	1.9189	32.46	2.1875	40.20	2.4561
16.94	1.6553	24.87	1.9238	32.60	2.1924	40.34	2.4609
17.09	1.6602	25.01	1.9287	32.74	2.1973	40.48	2.4658
17.23	1.6650	25.16	1.9336	32.88	2.2021	40.62	2.4707
17.38	1.6699	25.30	1.9385	33.02	2.2070	40.76	2.4756
17.53	1.6748	25.44	1.9434	33.16	2.2119	40.91	2.4805
17.68	1.6797	25.58	1.9482	33.30	2.2168	41.05	2.4854
17.82	1.6846	25.72	1.9531	33.44	2.2217	41.19	2.4902
17.97	1.6895	25.86	1.9580	33.59	2.2266	41.33	2.4951
18.11	1.6943	26.00	1.9629	33.73	2.2314	41.48	2.5000
18.26	1.6992	26.14	1.9678	33.87	2.2363	41.62	2.5049
18.41	1.7041	26.28	1.9727	34.01	2.2412	41.76	2.5098
18.55	1.7090	26.42	1.9775	34.15	2.2461	41.90	2.5146
18.70	1.7139	26.56	1.9824	34.29	2.2510	42.05	2.5195
18.84	1.7188	26.71	1.9873	34.43	2.2559	42.19	2.5244
18.99	1.7236	26.85	1.9922	34.57	2.2607	42.33	2.5293
19.13	1.7285	26.99	1.9971	34.71	2.2656	42.48	2.5342
19.28	1.7334	27.13	2.0020	34.85	2.2705	42.62	2.5391
19.43	1.7383	27.27	2.0068	34.99	2.2754	42.76	2.5439
19.57	1.7432	27.41	2.0117	35.13	2.2803	42.90	2.5488
19.71	1.7480	27.55	2.0166	35.27	2.2852	43.05	2.5537
19.86	1.7529	27.70	2.0215	35.41	2.2900	43.19	2.5586
20.00	1.7578	27.84	2.0264	35.55	2.2949	43.33	2.5635
20.15	1.7627	27.98	2.0313	35.69	2.2998	43.48	2.5684
20.29	1.7676	28.12	2.0361	35.83	2.3047	43.62	2.5732
20.44	1.7725	28.26	2.0410	35.97	2.3096	43.76	2.5781
20.58	1.7773	28.40	2.0459	36.11	2.3145	43.91	2.5830
20.73	1.7822	28.54	2.5058	36.25	2.3193	44.05	2.5879
20.87	1.7871	28.68	2.0557	36.39	2.3242	44.19	2.5928
21.01	1.7920	28.82	2.0605	36.53	2.3291	44.34	2.5977
21.16	1.7969	28.96	2.0654	36.67	2.3340	44.48	2.6025
21.30	1.8018	29.10	2.0703	36.81	2.3389	44.62	2.6074
21.45	1.8066	29.24	2.0752	36.95	2.3438	44.77	2.6123
21.59	1.8115	29.38	2.0801	37.09	2.3486	44.91	2.6172
21.73	1.8164	29.52	2.0850	37.23	2.3535	45.06	2.6221
21.88	1.8213	29.66	2.0898	37.37	2.3584	45.20	2.6270
22.02	1.8262	29.80	2.0947	37.51	2.3633	45.35	2.6318
22.17	1.8311	29.94	2.0996	37.66	2.3682	45.49	2.6367
22.31	1.8359	30.08	2.1045	37.80	2.3730	45.64	2.6416
22.45	1.8408	30.22	2.1094	37.94	2.3779	45.79	2.6465
22.60	1.8457	30.36	2.1143	38.08	2.3828	45.93	2.6514
22.74	1.8506	30.50	2.1191	38.22	2.3877	46.08	2.6563
22.88	1.8555	30.64	2.1240	38.36	2.3926	46.22	2.6611

TABLE 2 – ENTERING CHILLED WATER TEMPERATURE (Cont'd.)

temp(°F)	Vin
46.37	2.6660
46.51	2.6709
46.66	2.6758
46.80	2.6807
46.95	2.6855
47.09	2.6904
47.24	2.6953
47.39	2.7002
47.53	2.7051
47.68	2.7100
47.82	2.7148
47.97	2.7197
48.11	2.7246
48.26	2.7295
48.41	2.7344
48.56	2.7393
48.70	2.7441
48.85	2.7490
49.00	2.7539
49.15	2.7588
49.30	2.7637
49.44	2.7686
49.59	2.7734
49.74	2.7783
49.89	2.7832
50.04	2.7881
50.19	2.7930
50.34	2.7979
50.48	2.8027
50.63	2.8076
50.78	2.8125
50.93	2.8174
51.08	2.8223
51.23	2.8271
51.38	2.8320
51.53	2.8369
51.68	2.8418
51.83	2.8467
51.98	2.8516
52.13	2.8564
52.28	2.8613
52.44	2.8662
52.59	2.8711
52.74	2.8760
52.89	2.8809
53.04	2.8857
53.19	2.8906
53.34	2.8955
53.50	2.9004
53.65	2.9053
53.80	2.9102
53.95	2.9150
54.11	2.9199
54.26	2.9248
54.41	2.9297

temp(°F)	Vin
54.56	2.9346
54.72	2.9395
54.87	2.9443
55.02	2.9492
55.17	2.9541
55.33	2.9590
55.48	2.9639
55.64	2.9688
55.79	2.9736
55.95	2.9785
56.11	2.9834
56.26	2.9983
56.42	2.9932
56.57	2.9980
56.73	3.0029
56.89	3.0078
57.04	3.0127
57.20	3.0176
57.36	3.0225
57.51	3.0273
57.67	3.0322
57.83	3.0371
57.99	3.0420
58.15	3.0469
58.31	3.0518
58.47	3.0566
58.62	3.0615
58.78	3.0664
58.94	3.0713
59.10	3.0762
59.26	3.0811
59.42	3.0859
59.59	3.0908
59.75	3.0957
59.91	3.1006
60.07	3.1055
60.23	3.1104
60.39	3.1152
60.55	3.1201
60.72	3.1250
60.88	3.1299
61.04	3.1348
61.20	3.1396
61.37	3.1445
61.53	3.1494
61.69	3.1543
61.85	3.1592
62.02	3.1641
62.18	3.1689
62.34	3.1738
62.51	3.1787
62.67	3.1836
62.84	3.1885
63.01	3.1934
63.17	3.1982

temp(°F)	Vin
63.34	3.2031
63.51	3.2080
63.68	3.2129
63.84	3.2178
64.01	3.2227
64.18	3.2275
64.34	3.2324
64.51	3.2373
64.68	3.2422
64.85	3.2471
65.02	3.2520
65.19	3.2568
65.36	3.2617
65.53	3.2666
65.70	3.2715
65.87	3.2764
66.04	3.2813
66.21	3.2861
66.39	3.2910
66.56	3.2959
66.73	3.3008
66.91	3.3057
67.08	3.3105
67.25	3.3154
67.43	3.3203
67.60	3.3252
67.77	3.3301
67.95	3.3350
68.12	3.3398
68.30	3.3447
68.48	3.3496
68.66	3.3545
68.83	3.3594
69.01	3.3643
69.19	3.3691
69.36	3.3740
69.54	3.3789
69.72	3.3838
69.90	3.3887
70.08	3.3936
70.26	3.3984
70.45	3.4033
70.63	3.4082
70.81	3.4131
70.99	3.4180
71.17	3.4229
71.36	3.4277
71.54	3.4326
71.72	3.4375
71.91	3.4424
72.09	3.4473
72.28	3.4521
72.46	3.4570
72.64	3.4619
72.83	3.4668

temp(°F)	Vin
73.01	3.4717
73.20	3.4766
73.38	3.4814
73.57	3.4863
73.76	3.4912
73.95	3.4961
74.14	3.5010
74.33	3.5059
74.53	3.5107
74.72	3.5156
74.91	3.5205
75.10	3.5254
75.29	3.5303
75.48	3.5352
75.68	3.5400
75.87	3.5449
76.07	3.5498
76.26	3.5547
76.46	3.5596
76.65	3.5645
76.84	3.5693
77.04	3.5742
77.24	3.5791
77.44	3.5840
77.64	3.5889
77.84	3.5938
78.04	3.5986
78.24	3.6035
78.44	3.6084
78.64	3.6133
78.84	3.6182
79.04	3.6230
79.25	3.6279
79.45	3.6328
79.66	3.6377
79.86	3.6426
80.07	3.6475
80.27	3.6523
80.48	3.6572
80.68	3.6621
80.89	3.6670
81.10	3.6719
81.31	3.6768
81.52	3.6816
81.72	3.6865
81.93	3.6914
82.14	3.6963
82.35	3.7012
82.56	3.7061

TABLE 3 – REFRIGERANT TEMPERATURE

temp(°F)	Vin
0.02	1.3818
2.45	1.4600
4.82	1.5381
7.14	1.6162
9.43	1.6943
11.68	1.7725
13.91	1.8506
16.11	1.9267
18.30	2.0068
20.48	2.0850
22.66	2.1631
24.83	2.2412
27.00	2.3193
29.18	2.3975
31.37	2.4756
33.58	2.5537
35.81	2.6318
38.06	2.7100
40.34	2.7881
42.66	2.8662
45.01	2.9443
47.42	3.0225
49.88	3.1006
52.40	3.1787
54.98	3.2568
57.65	3.3350
60.42	3.4131
63.27	3.4912
66.23	3.5693
69.34	3.6475
72.59	3.7256
76.02	3.8037
79.64	3.8818
83.48	3.9600
87.61	4.0381
92.05	4.1162
96.89	4.1943
102.22	4.2725
108.14	4.3506
114.81	4.4287
122.54	4.5068
131.66	4.5850
142.84	4.6631

TABLE 4 – ENTERING AND LEAVING CONDENSER WATER

temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin	temp(°F)	Vin
40.12	1.8408	48.39	2.1094	56.61	2.3779	64.98	2.6465
40.27	1.8457	48.54	2.1143	56.76	2.3828	65.14	2.6514
40.42	1.8506	48.69	2.1191	56.91	2.3877	65.29	2.6563
40.58	1.8555	48.84	2.1240	57.06	2.3926	65.45	2.6611
40.73	1.8604	48.99	2.1289	57.21	2.3975	65.60	2.6660
40.88	1.8652	49.14	2.1338	57.36	2.4023	65.76	2.6709
41.03	1.8701	49.29	2.1387	57.51	2.4072	65.91	2.6758
41.18	1.8750	49.44	2.1436	57.66	2.4121	66.07	2.6807
41.33	1.8799	49.59	2.1484	57.81	2.4170	66.22	2.6855
41.48	1.8848	49.74	2.1533	57.97	2.4219	66.38	2.6904
41.64	1.8896	49.89	2.1582	58.12	2.4268	66.54	2.6953
41.79	1.8945	50.03	2.1631	58.27	2.4316	66.69	2.7002
41.94	1.8994	50.18	2.1680	58.42	2.4365	66.85	2.7051
42.09	1.9043	50.33	2.1729	58.57	2.4414	67.00	2.7100
42.24	1.9092	50.48	2.1777	58.72	2.4463	67.16	2.7148
42.39	1.9141	50.63	2.1826	58.87	2.4512	67.32	2.7197
42.54	1.9189	50.78	2.1875	59.02	2.4561	67.47	2.7246
42.70	1.9238	50.93	2.1924	59.17	2.4609	67.63	2.7295
42.85	1.9287	51.08	2.1973	59.33	2.4658	67.78	2.7344
43.00	1.9336	51.23	2.2021	59.48	2.4707	67.94	2.7393
43.15	1.9385	51.38	2.2070	59.63	2.4756	68.10	2.7441
43.30	1.9434	51.53	2.2119	59.78	2.4805	68.26	2.7490
43.45	1.9482	51.68	2.1268	59.93	2.4854	68.41	2.7539
43.60	1.9531	51.83	2.2217	60.09	2.4902	68.57	2.7588
43.75	1.9580	51.97	2.2266	60.24	2.4951	68.73	2.7637
43.90	1.9629	52.12	2.2314	60.39	2.5000	68.89	2.7686
44.05	1.9678	52.27	2.2363	60.54	2.5049	69.05	2.7734
44.20	1.9727	52.42	2.2412	60.69	2.5098	69.21	2.7783
44.35	1.9775	52.57	2.2461	60.85	2.5146	69.36	2.7832
44.50	1.9824	52.72	2.2510	61.00	2.5195	69.52	2.7881
44.65	1.9873	52.87	2.2559	61.15	2.5244	69.68	2.7930
44.80	1.9922	53.02	2.2607	61.30	2.5293	69.84	2.7979
44.95	1.9971	53.17	2.2656	61.45	2.5342	70.00	2.8027
45.10	2.0020	53.32	2.2705	61.61	2.5391	70.16	2.8076
45.25	2.0068	53.47	2.2754	61.76	2.5439	70.32	2.8125
45.40	2.0117	53.62	2.2803	61.91	2.5488	70.48	2.8174
45.55	2.0166	53.77	2.2852	62.06	2.5537	70.64	2.8223
45.70	2.0215	53.92	2.2900	62.21	2.5586	70.80	2.8271
45.85	2.0264	54.07	2.2949	62.36	2.5635	70.96	2.8320
46.00	2.0313	54.21	2.2998	62.52	2.5684	71.12	2.8369
46.15	2.0361	54.36	2.3047	62.67	2.5732	71.28	2.8418
46.30	2.0410	54.51	2.3096	62.82	2.5781	71.44	2.8467
46.45	2.0459	54.66	2.3145	62.98	2.5830	71.61	2.8516
46.60	2.0508	54.81	2.3193	63.13	2.5879	71.77	2.8564
46.75	2.0557	54.96	2.3242	63.29	2.5928	71.93	2.8613
46.90	2.0605	55.11	2.3291	63.44	2.5977	72.09	2.8662
47.05	2.0654	55.26	2.3340	63.59	2.6025	72.25	2.8711
47.20	2.0703	55.41	2.3389	63.75	2.6074	72.41	2.8760
47.35	2.0752	55.56	2.3438	63.90	2.6123	72.57	2.8809
47.50	2.0801	55.71	2.3486	64.06	2.6172	72.73	2.8857
47.65	2.0850	55.86	2.3535	64.21	2.6221	72.89	2.8906
47.79	2.0898	56.01	2.3584	64.36	2.6270	73.05	2.8955
47.94	2.0947	56.16	2.3633	64.52	2.6318	73.22	2.9004
48.09	2.0996	56.31	2.3682	64.67	2.6367	73.38	2.9053
48.24	2.1045	56.46	2.3730	64.83	2.6416	73.54	2.9102

TABLE 4 – ENTERING AND LEAVING CONDENSER WATER (Cont'd.)

temp(°F)	Vin
73.71	2.9150
73.87	2.9199
74.04	2.9248
74.20	2.9297
74.37	2.9346
74.53	2.9395
74.70	2.9443
74.86	2.9492
75.03	2.9541
75.19	2.9590
75.36	2.9639
75.52	2.9688
75.69	2.9736
75.85	2.9785
76.02	2.9834
76.19	2.9883
76.35	2.9932
76.52	2.9980
76.69	3.0029
76.85	3.0078
77.02	3.0127
77.19	3.0176
77.36	3.0225
77.53	3.0273
77.70	3.0322
77.86	3.0371
78.03	3.0420
78.20	3.0469
78.37	3.0518
78.54	3.0566
78.71	3.0615
78.88	3.0664
79.05	3.0713
79.22	3.0713
79.40	3.0811
79.57	3.0859
79.74	3.0908
79.91	3.0957
80.08	3.1006
80.26	3.1055
80.43	3.1104
80.60	3.1152
80.77	3.1201
80.95	3.1250
81.12	3.1299
81.29	3.1348
81.47	3.1396
81.64	3.1445
81.81	3.1494
81.99	3.1543
82.16	3.1592
82.33	3.1641
82.51	3.1689
82.69	3.1738
82.86	3.1787
83.04	3.1836
83.22	3.1885
83.39	3.1934
83.57	3.1982
83.75	3.2031
83.93	3.2080
84.10	3.2129
84.28	3.2178
84.46	3.2227
84.65	3.2275
84.83	3.2324
85.01	3.2373
85.19	3.2422
85.37	3.2471
85.55	3.2520
85.73	3.2568
85.92	3.2617
86.10	3.2666
86.28	3.2715
86.47	3.2764
86.65	3.2813
86.84	3.2861
87.02	3.2910
87.21	3.2959
87.39	3.3008
87.58	3.3057
87.76	3.3105
87.95	3.3154
88.13	3.3203
88.32	3.3252
88.51	3.3301
88.70	3.3350
88.88	3.3398
89.07	3.3447
89.26	3.3496
89.44	3.3545
89.63	3.3594
89.82	3.3643
90.01	3.3691
90.20	3.3740
90.39	3.3789
90.59	3.3838
90.78	3.3887
90.97	3.3936
91.16	3.3984
91.35	3.4033
91.54	3.4082
91.74	3.4131
91.93	3.4180
92.13	3.4229
92.32	3.4277
92.52	3.4326
92.72	3.4375
92.91	3.4424
93.11	3.4473
93.31	3.4521
93.51	3.4570
93.70	3.4619
93.90	3.4668
94.10	3.4717
94.30	3.4766
94.50	3.4814
94.70	3.4863
94.90	3.4912
95.11	3.4961
95.31	3.5010
95.52	3.5059
95.72	3.5107
95.93	3.5156
96.13	3.5205
96.34	3.5254
96.54	3.5303
96.75	3.5352
96.96	3.5400
97.17	3.5449
97.38	3.5498
97.59	3.5547
97.80	3.5596
98.01	3.5645
98.22	3.5693
98.43	3.5742
98.64	3.5791
98.86	3.5840
99.07	3.5889
99.29	3.5938
99.50	3.5986
99.71	3.6035
99.93	3.6084
100.14	3.6133
100.36	3.6182
100.58	3.6230
100.79	3.6279
101.01	3.6328
101.23	3.6377
101.45	3.6426
101.67	3.6475
101.89	3.6523
102.11	3.6572
102.33	3.6621
102.55	3.6670
102.78	3.6719
103.00	3.6768
103.22	3.6816
103.45	3.6865
103.67	3.6914
103.89	3.6963
104.12	3.7012
104.35	3.7061
104.58	3.7109
104.81	3.7158
105.04	3.7207
105.27	3.7256
105.50	3.7305
105.73	3.7354
105.96	3.7402
106.20	3.7451
106.44	3.7500
106.67	3.7549
106.91	3.7598
107.14	3.7646
107.38	3.7695
107.62	3.7744
107.86	3.7793
108.11	3.7842
108.35	3.7891
108.59	3.7939
108.84	3.7988
109.08	3.8037
109.32	3.8086
109.57	3.8135
109.82	3.8184
110.06	3.8232
110.31	3.8281
110.56	3.8330
110.81	3.8379
111.05	3.8428
111.31	3.8477
111.56	3.8525
111.82	3.8574
112.08	3.8623
112.34	3.8672
112.59	3.8721
112.85	3.8770
113.11	3.8818
113.37	3.8867
113.63	3.8916
113.88	3.8965
114.14	3.9014

TABLE 5 – REFRIGERANT TEMP LEAVING THE CONDENSER

temp(°F)	Vin
8.14	0.5127
18.05	0.6689
26.43	0.8252
33.82	0.9814
40.53	1.1377
46.75	1.2939
52.62	1.4502
58.24	1.6064
63.68	1.7627
69.00	1.9189
74.25	2.0752
79.49	2.2314
84.74	2.3877
90.05	2.5439
95.47	2.7002
101.07	2.8564
106.84	3.0127
112.90	3.1689
119.30	3.3252
126.13	3.4814
133.54	3.6377
141.69	3.7939

TABLE 6 – AUTO-DECRYSTALLIZATION TEMPERATURE

temp(°F)	Vin
98.10	1.2842
105.06	1.4404
111.74	1.5967
118.21	1.7529
124.54	1.9092
130.82	2.0654
137.08	2.2217
143.39	2.3779
149.77	2.5342
156.32	2.6904
163.03	2.8467
170.01	3.0029
177.36	3.1592
185.14	3.3154
193.50	3.4717
202.59	3.6279
212.61	3.7842
223.88	3.9404

TABLE 7 – STEAM OR HOT WATER SUPPLY TEMP & STRONG SOLUTION TEMP

temp(°F)	Vin
90.24	0.2930
110.58	0.4492
126.12	0.6055
139.04	0.7617
150.36	0.9180
160.60	1.0742
170.08	1.2305
179.08	1.3867
187.58	1.5430
195.87	1.6992
203.98	1.8555
212.00	2.0117
220.00	2.1680
228.04	2.3242
236.16	2.4805
244.49	2.6367
253.12	2.7930
262.11	2.9492
271.48	3.1055
281.37	3.2617
291.98	3.4180
303.47	3.5742
316.18	3.7305
330.40	3.8867
346.73	4.0430

DISPLAY

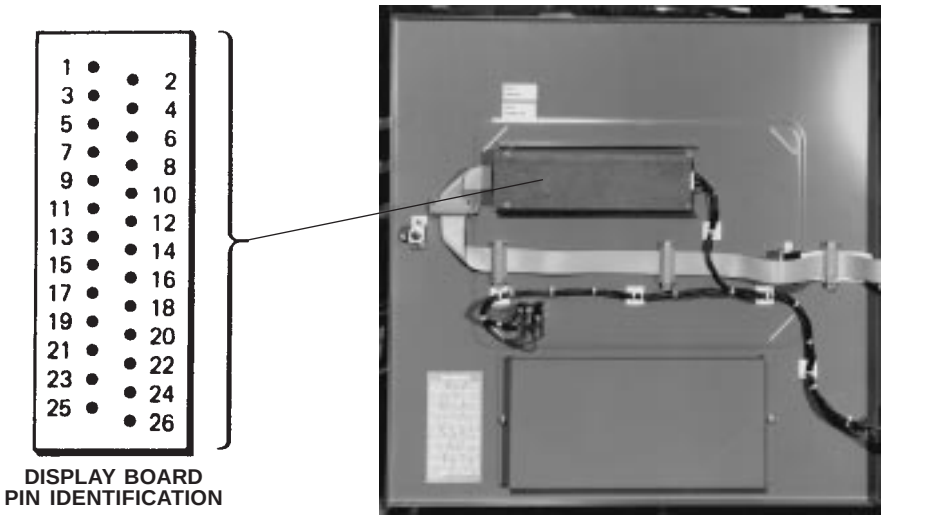


FIG. 28 – CONTROL CENTER DISPLAY BOARD

DISPLAY (Refer to Fig. 28 & 29)

The Control Center Display P/N 031-00775-001 (Babcock VF-140-02 or IEE 33383-01) is a 40 character vacuum fluorescent dot matrix display. It receives a parallel 8-bit ASCII alphanumeric word from the Micro Board. Each 8-bit word represents a character.

When the Micro Board writes to the display, it provides the 8-bit word along with a **WR** pulse and the **DP** (chip select pulse). The Least Significant Bit (LSB) of the address bus, A∅ , must also be driven low to allow the display to accept data from the Micro Board.

In addition to the alphanumeric data that is written to the display, command codes are also written to the display. These codes control the position of the cursor.

When the Micro Board writes a command code to the display, it provides the code along with a **WR** and **DP** pulse. Also, the LSB of the address bus must be driven high to allow the display to accept a command code.

Each character is displayed on a 5 x 7 phosphor dot matrix (Fig. 29). A character generator interprets the ASCII word and illuminates the appropriate dots in the matrix to form the alphanumeric character.

The power supply board (031-01080) contains a reset circuit that resets the display during low voltage latch-ups. Whenever the +5VDC regulated supply voltage to the display decreases to 4.7VDC, the power supply drives the $\overline{\text{RESET}}$ input (J1-6) from +5VDC to a Logic Low condition (less than 1VDC). This causes the display to blank for the duration of the condition.

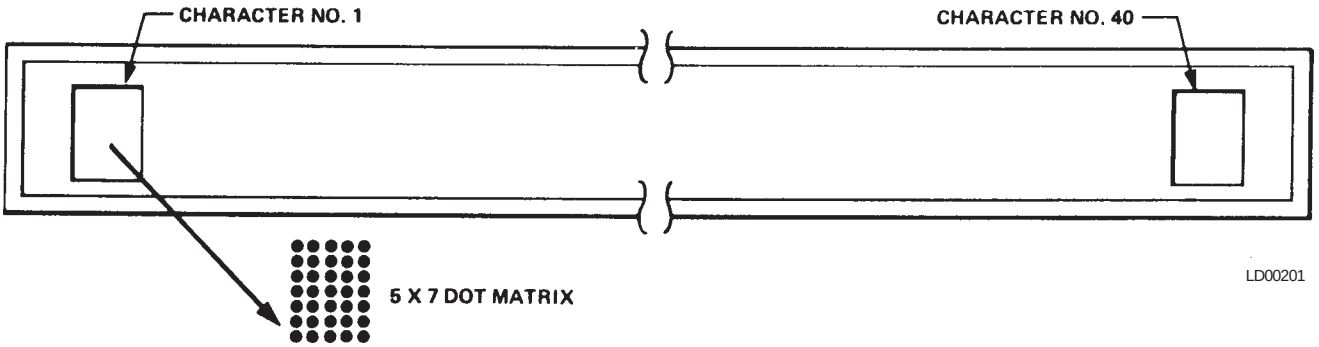


FIG. 29 – VACUUM FLUORESCENT DISPLAY

I/O EXPANSION BOARD

(Refer to Figs. 30 & 32)

Most of the components used in the **Millennium Control Center** are common to other applications of the Control Center. Specifically, Centrifugal and Screw Chillers. However, the absorption application requires a greater number of analog and digital inputs and outputs. The **I/O Expansion Board** allows additional analog inputs to be multiplexed into the **Micro Board** thru an onboard multiplexer. It also allows additional digital input and output capability by providing direct access to the Micro Board data bus.

External analog inputs are connected to the multiplexer (MUX). Each program cycle, the micro accesses all these values by applying 3-bit addresses to the MUX. As each address is received, the appropriate analog input is sent to the Micro Board. The analog inputs and addresses are as follows:

ADDRESS	DATA
000	Steam/Hot water valve position potentiometer. Refer to I/O Expansion Board inputs and outputs, Section J6-2 for data values.
001	Steam/Hot water supply temperature. (Refer to Table 7.)
010	Solution Dilution Temperature. (Refer to Table 7.)
011	Refrigerant temperature leaving the condenser. (Refer to Table 5.)
100	Auto decrystallization temperature. (Refer to Table 6.)
101	Not used.
110	Not used.
111	Not used.

The micro controls relays that are located on the **Relay Board** via the output latch circuit. When the output latch circuit output is Logic 0 (<1VDC), the respective relay is energized. When the output is Logic 1 (+12 VDC), the respective relay is de-energized. The micro controls the output latch circuit by applying address 011 and control signal "$\overline{\text{OPTSEL}}$" (Option Select) to the decoder. "$\overline{\text{OPTSEL}}$" enables the decoder. The decoder decodes this address and outputs "$\overline{\text{OUTREG}}$" (Output Register). Simultaneously, the micro applies control signal "$\overline{\text{OPTWR}}$" (Option Write). When the output latch circuit receives these two control signals, the data that is on the Micro Board data bus is then loaded into the latch circuit. A Logic 0 causes the relay to energize; Logic 1 causes the relay to de-energize. The latch circuit will hold this state until again changed by the micro. To prevent relay chatter, the micro applies control signal "$\overline{\text{RESET}}$" during low voltage conditions and power-up and power-down transitions. While the reset signal is applied, the output latch circuit cannot change state. The relays that are controlled are as follows:

1. Warning status relay K7.
2. Steam condensate drain valve relay K16. (Steam units only).
3. **REMOTE** mode ready to start status relay K4.
4. Safety shutdown status relay K2.
5. Cycling shutdown status relay K1.

Digital input signals are applied to the **Input Latch** circuit. These +5VDC or 0VDC logic level inputs have been converted from 115VAC/0VAC levels by opto-couplers on the **Relay Board**. Other digital inputs are **Program Jumpers** that can be used to complement the program jumpers that are located on the Micro Board. The micro reads these inputs by applying address 100 and control signal "$\overline{\text{OPTSEL}}$" simultaneously to the decoder. "$\overline{\text{OPTSEL}}$" enables the decoder. The decoder outputs "$\overline{\text{INREG}}$" and the micro simultaneously applies "$\overline{\text{OPTRD}}$" (Option Read) to the input latch circuit. This causes the digital inputs to be transferred to the Micro Board. The digital inputs are as follows:

1. Purge pump overload.
2. Low refrigerant temperature safety device.
3. Remote load limit pulse width modulation (PWM) input.
4. Program Jumper JP1 – Refer to Fig. 32.
5. Program Jumper JP2 – Refer to Fig. 32.
6. Program Jumper P14 – Refer to Fig. 32.
7. Program Jumper P13 – Refer to Fig. 32.
8. Program Jumper P12 – Refer to Fig. 32.

Whenever the micro transfers data to or from the Micro Board data bus as per above, it applies control signal "$\overline{\text{DEN}}$" (Data Enable) along with "$\overline{\text{OPTSEL}}$". These two signals are combined on the I/O Expansion Board to produce control signal "$\overline{\text{OPTION}}$". "$\overline{\text{OPTION}}$" is applied to the Micro Board where it enables the transceiver and allows the data to be transferred to or from the data bus.

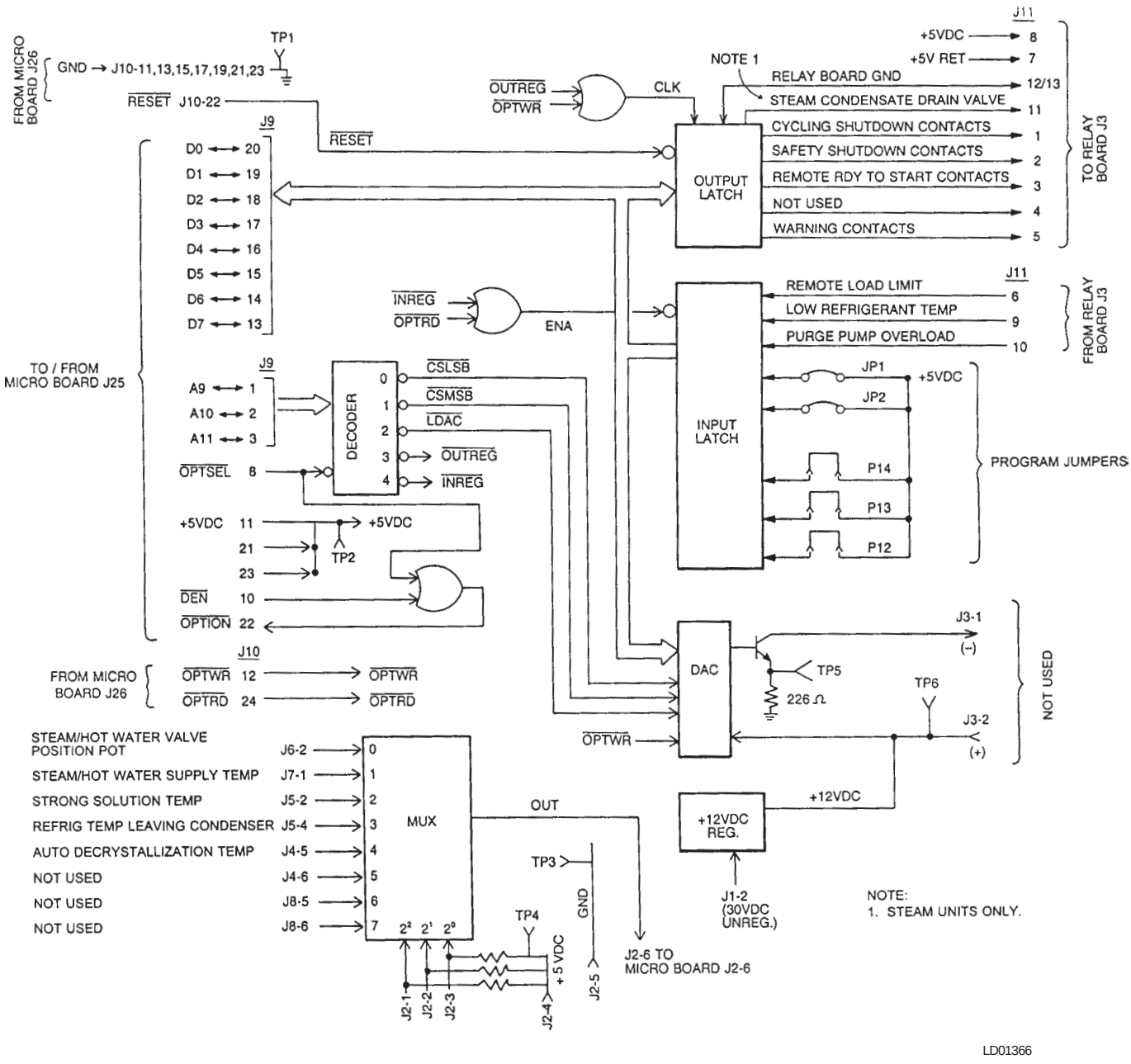


FIG. 30 – I/O EXPANSION BOARD BLOCK DIAGRAM

I/O EXPANSION BOARD INPUTS AND OUTPUTS

J1-1 – Not used.

J1-2 – 30VDC unregulated input.

J2-1 – Multiplexer address bit 2^2 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J2-2 – Multiplexer address bit 2^1 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J2-3 – Multiplexer address bit 2^0 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J2-4 – +5VDC regulated input.

J2-5 – Ground input.

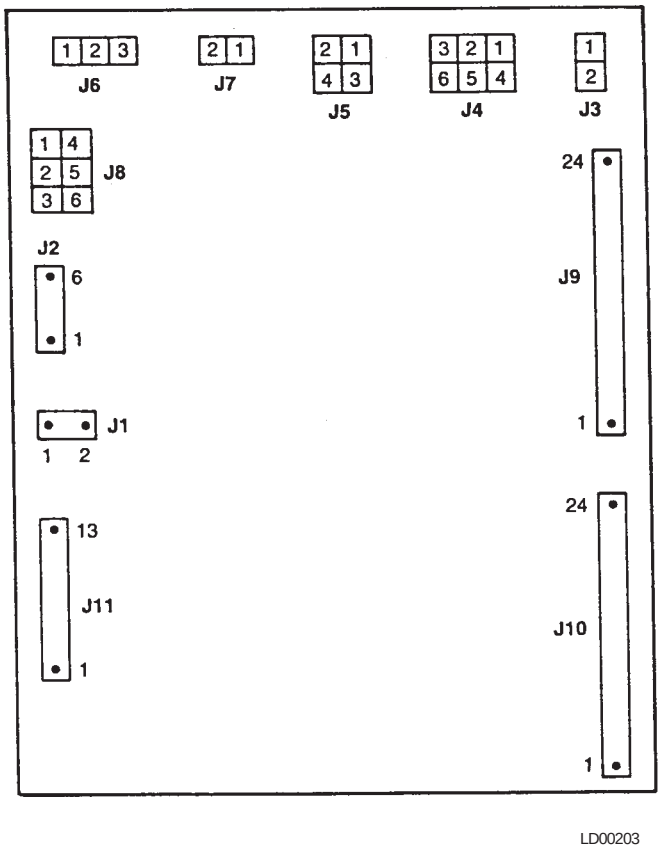


FIG. 31 – I/O EXPANSION BOARD PIN IDENTIFICATION

J12 ⊡ **ENGLISH/GERMAN**

IN = All messages are displayed and printed in English language.

OUT = All messages are displayed and printed in German language.

J13 ⊡ **–** Not used.

J14 ⊡ **–** Not used.

JP1 ⌒ **STEAM/HOT WATER VALVE TYPE –** The position of this jumper determines the valve control routine that will be used. Butterfly valves require different load/unload pulse durations and intervals between pulses than other valve types. Refer to "Steam/Hot Water Valve control" Section for details of the valve control routines.

IN = Butterfly Type (steam applications); as listed in Table 8.

OUT = Cage Type (steam applications); Globe Type 3-way (hot water applications) as listed in Table 9.

JP2 ⌒ Not Used.

FIG. 32 – I/O EXPANSION BOARD PROGRAM JUMPERS

J2-6 – Multiplexed 0-5VDC output as follows:

CHANNEL	ADDRESS	DATA
0	000	Steam/Hot water valve position potentiometer. Refer to I/O Expansion Board J6-2.
1	001	Steam/Hot water supply temp. (Refer to Table 7.)
2	010	Strong solution temp. (Refer to Table 7.)
3	011	Refrigerant temp leaving condenser. (Refer to Table 5.)
4	100	Auto decrystallization temp. (Refer to Table 6.)
5	101	Not used.
6	110	Not used.
7	111	Not used.

J3-2 – Not used.

J3-1 – Not used.

J4-1 – Not used.

J4-2 – +5VDC output.

J4-3 – Not used.

J4-4 – +5VDC output.

J4-5 – Auto decrystallization temp thermistor (RT2) input. (Refer to Table 6.)

J4-6 – Not used.

J5-1 – +5VDC output.

J5-2 – Strong solution temperature thermistor (RT3) input. (Refer to Table 7.)

J5-3 – +5VDC output.

J5-4 – Refrigerant temp leaving the condenser thermistor (RT9). (Refer to Table 5.)

J6-1 – +5VDC output.

J6-2 – Steam/Hot water valve position potentiometer input. 0.440VDC to 0.587VDC (0.5VDC nominal) at 0% (closed) position. 4.374VDC to 4.619VDC (4.5VDC nominal) at 100% (fully open) position. Actual value is a result of the "Auto Calibration" procedure. (Refer to

TABLE 8 – BUTTERFLY VALVES

YORK PART NO.	VALVE	APPLICATION	ACTUATOR
022-09134-000	Fisher B21A or A41 (4 in.)	Steam	Jordan 1710-34
022-09135-000	Fisher B21A or A41 (6 in.)	Steam	Jordan 1710-34
022-09136-00	Fisher B21A or A41 (8 in.)	Steam	Jordan 1710-34
022-09536-000 (Note 1)	Samson 200mm; 50:1 Linear	Steam	Samson
022-09537-000 (Note 1)	Samson 250mm; 50:1 Linear	Steam	Samson
022-09538-000 (Note 1)	Samson 300mm; 50:1 Linear	Steam	Samson

Note:

1. EPROM Version A.02F.01 and later.

"Steam/Hot Water Valve Calibration" section.) Positions between 0% and 100% can be calculated as follows:

$$\% \text{ Loading} = \frac{V - V_{LO}}{V_{HI} - V_{LO}} \times 100$$

V = Voltage @ J6-2 @ any position between 0% to 100%

V_{LO} = Voltage @ J6-2 @ 0%

V_{HI} = Voltage @ J6-2 @ 100%

J6-3 – Ground (–v) output (steam units only).

J7-1 – Steam/Hot water supply thermistor (RT7) input. (Refer to Table 7.)

J7-2 – +5VDC output.

J8 – Not used.

J9-1 – Address bit A9 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J9-2 – Address bit A10 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J9-3 – Address bit A11 input. +5VDC in the active state (Logic 1). Otherwise, 0VDC.

J9-4 – Not used.

J9-5 – Not used.

J9-6 – Not used.

J9-7 – Not used.

J9-8 – "$\overline{\text{OPTSEL}}$" (Option Select) control signal input. 0VDC in the active state (Logic 0) when the micro is writing data to or reading data from the I/O Expansion Board. Otherwise, +5VDC.

J9-9 – Not used.

J9-10 – "$\overline{\text{DEN}}$" (Data Enable) control signal input. 0VDC in the active state (Logic 0) when the micro is writing data to or reading data from the I/O Expansion Board. Otherwise, +5VDC.

J9-11 – +5VDC input.

J9-12 – Not used.

J9-13 – Data bit D7 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-14 – Data bit D6 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-15 – Data bit D5 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-16 – Data bit D4 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-17 – Data bit D3 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-18 – Data bit D2 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-19 – Data bit D1 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-20 – Data bit D0 input and output. +5VDC is Logic 1. 0VDC is Logic 0.

J9-21 – +5VDC input.

J9-22 – "$\overline{\text{OPTION}}$" control bit output. 0VDC in the active state (Logic 0) to enable the transceiver on the Micro Board to receive or transmit data from/to the I/O Expansion Board. Otherwise, +5VDC.

J9-23 – +5VDC input.

J9-24 – Not used.

J10-1 – Not used.

J10-2 – Not used.

J10-3 – Not used.

J10-4 – Not used.

J10-5 – Not used.

J10-6 – Not used.

J10-7 – Not used.

J10-8 – Not used.

J10-9 – Not used.

J10-10 – Not used.

J10-11 – Ground input.

J10-12 – "$\overline{\text{OPTWR}}$" (Option Write) control bit input. 0VDC in the active state (Logic 0) when the micro is writing data to the I/O Expansion Board. Otherwise, +5VDC.

J10-13 – Ground input.

J10-14 – Not used.

J10-15 – Ground input.

J10-16 – Not used.

J10-17 – Ground input.

J10-18 – Not used.

J10-19 – Ground input.

J10-20 – Not used.

J10-21 – Ground input.

J10-22 – "$\overline{\text{RESET}}$" control bit input. 0VDC (Logic 0) when the micro detects a low voltage condition on the +5VDC power supply. Otherwise, +5VDC.

J10-23 – Ground input.

J10-24 – "$\overline{\text{OPTRD}}$" (Option Read) control bit input. 0VDC in the active state (Logic 0) when the micro is reading data from the I/O Expansion board. Otherwise, +5VDC.

J11-1 – Cycling shutdown status contacts output. <1VDC when micro is commanding the cycling shutdown status relay (K1) on the relay board to energize (close). Otherwise, +12VDC.

J11-2 – Safety shutdown status contacts output. <1VDC when micro is commanding the safety shutdown status relay (K2) on the relay board to energize (close). Otherwise, +12VDC.

J11-3 – Remote mode ready to start status contacts output. <1VDC when the micro is commanding the remote mode ready to start relay (K4) on the relay board to energize (close). Otherwise, +12VDC.

J11-4 – Not used.

J11-5 – Warning contacts output. <1VDC when the micro is commanding the warning relay (K7) on the relay board to energize (close). Otherwise, +12VDC.

J11-6 – Remote steam limit pulse width modulation (PWM) input. +5VDC for 1-11 seconds each time the PWM input is applied. Otherwise, 0VDC. (Refer to "Remote Setpoints" Section and Form 155.16-PA3.)

J11-7 – +5VDC return (ground) output.

J11-8 – +5VDC output.

J11-9 – Low refrigerant temp safety device input. +5VDC when low refrigerant temp safety device (LRT) has tripped. Otherwise, 0VDC.

J11-10 – Purge pump starter overload input. 0VDC when the purge pump overload (3OL) has tripped. Otherwise, +5VDC.

J11-11 – Steam condensate drain valve solenoid output. <1VDC when micro is commanding relay K16 on relay board to energize (close) to cause valve to open. Otherwise, 12VDC.

J11-12 – +12VDC return (ground).

J11-13 – +12VDC return (ground).

TABLE 9 – CAGE TYPE VALVES & GLOBE TYPE 3-WAY VALVES

YORK PART NO.	VALVE	TYPE	APPLICATION	ACTUATOR
022-09130-000	Honeywell 8108 (3 in.)	Cage	Steam	Honeywell Modutrol M6284A
022-09131-000	Honeywell 8109 (4 in.)	Cage	Steam	Honeywell Modutrol M6284A
022-09132-000	Honeywell 810A (5 in.)	Cage	Steam	Honeywell Modutrol M6284A
022-09133-000	Honeywell 810B (6 in.)	Cage	Steam	Honeywell Modutrol M6284A
022-09518-000 (Note 1)	Samson (40 mm), 50:1	Cage	Steam	Samson
022-09519-000 (Note 1)	Samson (50 mm), 50:1	Cage	Steam	Samson
022-09520-000 (Note 1)	Samson (65 mm), 30:1	Cage	Steam	Samson
022-09521-000 (Note 1)	Samson (80 mm), 30:1	Cage	Steam	Samson
022-09522-000 (Note 1)	Samson (100 mm), 30:1	Cage	Steam	Samson
022-09523-000 (Note 1)	Samson (125 mm), 30:1	Cage	Steam	Samson
022-09524-000 (Note 1)	Samson (150 mm), 30:1	Cage	Steam	Samson
022-09525-000 (Note 1)	Samson (200 mm), 30:1	Cage	Steam	Samson
022-09526-000 (Note 1)	Samson (250 mm), 30:1	Cage	Steam	Samson
022-09550-000 (Note 2)	Leslie (2-1/2 in.)	Cage	Steam	Leslie
022-09551-000 (Note 2)	Leslie (3 in.)	Cage	Steam	Leslie
022-09552-000 (Note 2)	Leslie (4 in.)	Cage	Steam	Leslie
022-09553-000 (Note 2)	Leslie (6 in.)	Cage	Steam	Leslie
022-09155-000	Honeywell 1603 (1 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09156-000	Honeywell 1603 (1 in.), 250 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09157-000	Honeywell 1604 (1-1/4 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09158-000	Honeywell 1604 (1-1/4 in.), 250 PSIG	Globe 3-way	Hot Water	Honeywell M940B

TABLE 9 – CAGE TYPE VALVES & GLOBE TYPE 3-WAY VALVES (Cont'd.)

YORK PART NO.	VALVE	TYPE	APPLICATION	ACTUATOR
022-09159-000	Honeywell 1605 (1-1/2 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09160-000	Honeywell 1605 (1-1/2 in.), 300 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09161-000	Honeywell 1606 (2 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09162-000	Honeywell 1606 (2 in.), 300 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09163-000	Honeywell 1607 (2-1/2 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09164-000	Honeywell 1607 (2-1/2 in.), 300 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09165-000	Honeywell 1608 (3 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09166-000	Honeywell 1608 (3 in.), 300 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09167-000	Honeywell 1609 (4 in.), 125 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09168-000	Honeywell 1609 (4 in.), 300 PSIG	Globe 3-way	Hot Water	Honeywell M940B
022-09169-000	Honeywell 190B (6 in.), 125 PSIG	Globe 3-way	Hot Water	Beck 14-105
022-09170-000	Honeywell 190B (6 in.), 300 PSIG	Globe 3-way	Hot Water	Beck 14-105
022-09171-000	Honeywell 190C (8 in.), 125 PSIG	Globe 3-way	Hot Water	Beck 14-105
022-09173-000	Honeywell 190C (8 in.), 250 PSIG	Globe 3-way	Hot Water	Beck 14-105
022-09527-000 (Note 1)	Samson (40 mm) 50:1 Linear	3-way Diverting	Hot Water	Samson
022-09528-000 (Note 1)	Samson (50 mm) 50:1 Linear	3-way Diverting	Hot Water	Samson
022-09529-000 (Note 1)	Samson (65 mm) 30:1 Linear	3-way Diverting	Hot Water	Samson
022-09530-000 (Note 1)	Samson (80 mm) 30:1 Linear	3-way Diverting	Hot Water	Samson
022-09531-000 (Note 1)	Samson (100 mm) 30:1 Linear	3-way Diverting	Hot Water	Samson
022-09532-000 (Note 1)	Samson (125 mm) 30:1 Linear	3-way Diverting	Hot Water	Samson
022-09533-000 (Note 1)	Samson (150 mm) 30:1 Linear	3-way Diverting	Hot Water	Samson
022-09534-000 (Note 1)	Samson (160 mm) 50:1 Linear	3-way Diverting	Hot Water	Samson
022-09535-000 (Note 1)	Samson (200 mm) 50:1 Linear	3-way Diverting	Hot Water	Samson

Notes:

1. EPROM Version A.02F.0.1 and later.
2. EPROM Version A.02F.0.2 and later.

REMOTE SETPOINTS

The following setpoints will be accepted from remote devices when the Control Center is in **REMOTE** mode:

LOAD LIMIT – The Control Center will accept Remote Load Limit setpoints via the following inputs. The value that is input can be viewed by pressing the **DISPLAY DATA** key. One of the scrolled messages is REMOTE LOAD LIMIT = XXX% .

RS-485 Serial Port – If the YORK FAX-4500 Energy Management System is connected to the RS-485 Serial Port (Micro Board TB7), and Micro Board program jumpers J58 and J56 are in the "RS-485" and "EMS" positions respectively, serial data commands from the FAX-4500 can reset this setpoint over a range of 100% to (10-20% as programmed) steam/hot water valve position. (See Note 1.)

-OR-

Pulse Width Modulation – On those units that do not have the YORK FAX-4500 Energy Management System connected to the RS-485 serial port, a 1-11 second PWM signal can be input to the relay board TB4-82. This signal resets the setpoint over a range of 100% to (10-20% as programmed) steam/hot water valve position. This input can be directly from an external energy management system. Refer to YORK Form 155.16-PA3 for details of this feature. (See Note 1.)

-OR-

4-20mA or **0-10VDC** or **Contact Closure** – On those units that do not have the YORK FAX-4500 EMS connected to the RS-485 serial port, the Control Center can be equipped with the optional **Remote Setpoint** board (Option Card) part number 031-00814-000. This board can receive a 4-20mA or 0-10VDC signal or contact closure from an external energy management system to reset the setpoint over a range of 100% to (10-20% as programmed) steam/hot water valve position. It converts the 4-20mA or 0-10VDC signal to a 1-11 second pulse width modulation (PWM) signal that is then input to the **Relay Board** PWM input TB4-82. The contact closure input is converted to a 0-10VDC level that is determined by the setting of a field adjustable potentiometer located on the **Remote Setpoint Board**. When the contacts are open, the level is 0VDC. When the contacts are closed, the level is determined by the setting of the potentiometer. This 0-10VDC level is converted to a 1-11 second PWM signal that is then applied to the **Relay Board** PWM input TB4-82. Refer to Page 47 of this book and Form 155.16-PA3 for details of this feature. Refer to Note 1.

LEAVING WATER TEMP – The Control Center will accept **LEAVING CHILLED WATER TEMP** setpoints via the following inputs. The value that is input can be viewed in **REMOTE** mode by pressing the keypad **LEAVING WATER TEMP** setpoint key. LVG CHILLED WATER SETPOINT = XX°F is displayed.

This setpoint can be reset over a range of 10°F or 20°F (Remote Reset Temp Range) above the **LEAVING CHILLED WATER TEMP** setpoint (BASE) that has been locally entered at the keypad by the unit operator. The **REMOTE RESET TEMP RANGE** (10°F or 20°F) setpoint is also entered at the keypad by the unit operator.

RS-485 Serial Port – If the YORK FAX-4500 Energy Management System is connected to the RS-485 serial port (Micro Board TB7), and Micro Board program jumpers J58 and J56 are in the "RS-485" and "EMS" positions respectively, serial data commands from the FAX-4500 EMS can reset this setpoint.

-OR-

Pulse Width Modulation – On those units that do not have the YORK FAX-4500 Energy Management System connected to the RS-485 serial port, a 1-11 second PWM signal can be applied to the **Digital Input Board** PWM input TB2-19 to reset this setpoint. This input can be directly from an external energy management system. Refer to YORK Form 155.16-PA3 for details of this feature.

-OR-

4-20mA or **0-10VDC** or **Contact Closure –** On those units that do not have the YORK FAX-4500 Energy Management System connected to the RS-485 serial port, the Control Center can be equipped with the optional **Remote Setpoint** board (Option Card) part number 031-00814-000. This board can receive a 4-20mA or 0-10VDC signal or contact closure from an external energy management system to reset this setpoint. It converts the 4-20mA or 0-10VDC signal to a 1-11 second pulse modulation (PWM) signal that is then input to the **Digital Input Board** PWM input TB2-19. The contact closure input is converted to a 0-10VDC level that is determined by the setting of a field adjustable potentiometer located on the **Remote Setpoint Board**. When the contacts are open, the level is 0VDC. When the contacts are closed, the level is determined by the setting of the potentiometer. This 0-10VDC level is converted to a 1-11 second PWM signal that is then applied to the **Digital Input Board** PWM input TB2-19. Refer to Page 47 of this book and YORK Form 155.16-PA3 for details of this feature.

If it is desired to use the 4-20mA, 0-10VDC or contact closure inputs to reset the **LEAVING WATER TEMP** or **LOAD LIMIT** setpoint, a Card File (part number 031-00827-000) and 1 ea. Remote Setpoint Boards (part number 031-00814-000) are required. The card file mounts in the upper right corner inside the Control Center. The remote reset board slides into the card file. However, if it is desired to use these inputs to reset both the **LEAVING WATER TEMP** setpoint and **LOAD LIMIT** setpoint, 2 ea. remote setpoint boards are required; one for **LEAVING WATER TEMP** and one for **LOAD LIMIT**. Both boards are then inserted into a single card file. Page 47 of this book and YORK Form 155.16-PA3 provide details of this installation and the operation of these boards.

NOTE:

1. During unit operation, the steam/hot water valve is modulated between (10% - 20% as programmed) to 100% steam/hot water valve position. The actual valve position is returned to the Control Center via a position potentiometer mounted inside the valve actuator. The minimum allowable valve position is programmable from 10% to 20%. During operation, the unit will be inhibited from unloading to less than this position. At unit shutdown, the valve is returned to the 0% (fully closed) position. This value is programmed by the YORK factory, but can be changed by a qualified field service engineer if required by local operating conditions. Refer to "Special Setpoints and Programming Procedures" section of this book.

REMOTE SETPOINT BOARD (Refer to Fig. 33)

The Remote Setpoint Board (part number 031-00814-000) allows the Control Center to accept a 4-20mA, 0-10VDC or contact closure input from an Energy Management System (EMS). This board slides into a Card File (part number 031-00827-000) that is field mounted in the upper right corner of the Control Center. Both the card file and the remote setpoint board(s) are customer options.

This board can be used to reset either the **LEAVING WATER TEMP** setpoint or the **LOAD LIMIT** setpoint. If it is desired to reset both of these setpoints, then two cards are required. Otherwise, only one is required.

The Energy Management System (supplied by others) applies a 4-20mA, 0-10VDC or a dry contact closure to the **Remote Setpoint Board**. The board converts the 4-20mA or 0-10VDC input to a 1-11 second PWM signal. The contact closure input is converted to a 0-10VDC level, the value of which is determined by the setting of a field adjustable potentiometer located on the Remote Setpoint Board. When the contacts are open, the level is 0VDC. When the contacts are closed, the level (0-10VDC) is determined by the setting of the potentiometer. This 0-10VDC level is converted to a 1-11 second PWM signal. The PWM signal is then applied to TB4-82 of the **Relay Board** (load limit) or TB2-19 of the **Digital Input Board** (leaving water temp). Refer to Fig. 34.

The board creates the PWM signal by closing its board mounted dry contacts for 1-11 seconds every 80 seconds. One side of these contacts are connected to 115 VAC supplied by the Digital Input Board (leaving water temp) or Relay Board (load limit). The other side of these contacts is connected to the Digital Input Board TB2-19 (leaving water temp) or Relay Board TB4-82 (load limit). The contacts will close for 1-11 seconds, applying 115VAC for 1-11 seconds to these boards. This 115VAC PWM signal is converted to +5 VDC PWM signal by opto-couplers on the Digital Input Board and Relay Board. (Refer to Fig. 34.) The +5 VDC PWM pulse output of the Digital Input Board is applied to the Micro Board where it is converted to a digital word and stored for viewing using the keypad **LEAVING WATER TEMP** setpoint key and used to control the Leaving Chilled Water Temp. The +5VDC PWM output of the Relay Board is applied to the I/O Expansion Board where it is read by the Micro Board. The Micro Board converts the PWM pulse to a digital word and stores it for viewing via the **DISPLAY DATA** keypad key and uses it to limit the loading of the steam/hot water valve.

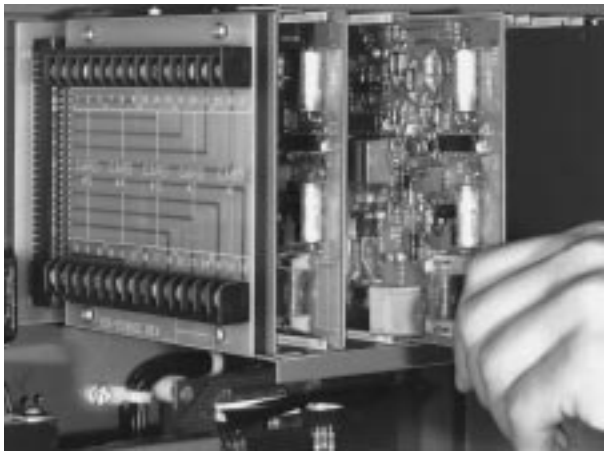
The board contains five 2-pin connectors (JU1 thru JU5) that are used to configure the board for the desired input signal type. The two 2-pin jumper plugs are provided with each board. These jumper plugs should be installed on the 2-pin connectors as follows:

INPUT	INSTALL JUMPERS ON:
4-20mA	JU5 & JU3
0-10VDC	JU4 & JU2
Contact Closure	JU1 & JU4

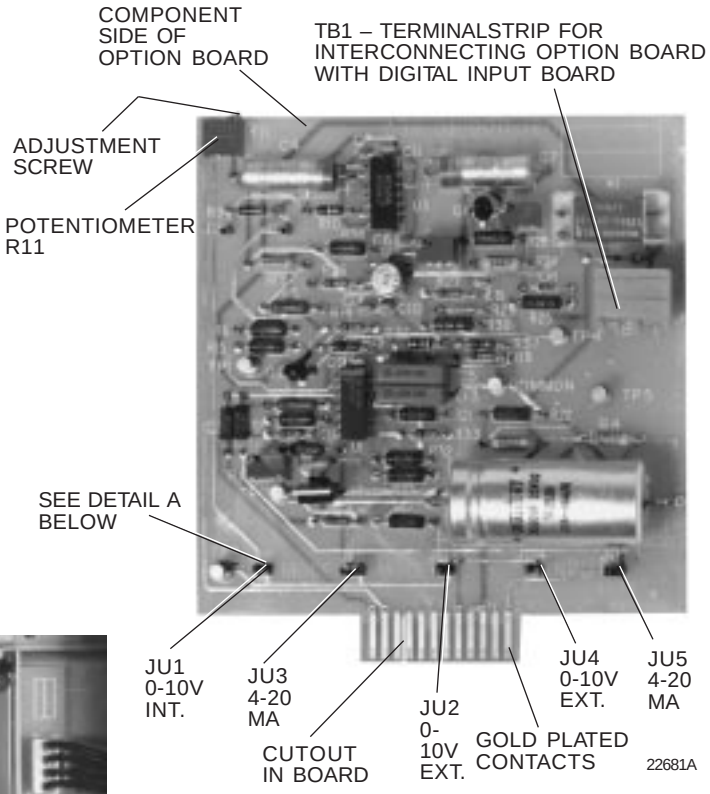
The **0-10VDC** input is applied to the board at J1-12 and passes through JU4 and JU2 to amplifier No. 1 where it is conditioned for input to the Analog-to PWM converter. This level can be monitored at TP3. The 80 second interval timer assures a PWM pulse is only output at a rate of 1 pulse every 80 seconds. The Micro Board ignores pulses received at a rate greater than 60 second intervals. The PWM output drives normally open relay (K1) which is normally de-energized. When the PWM pulse is output, relay (K1) is energized (closed) for a period of 1-11 seconds.

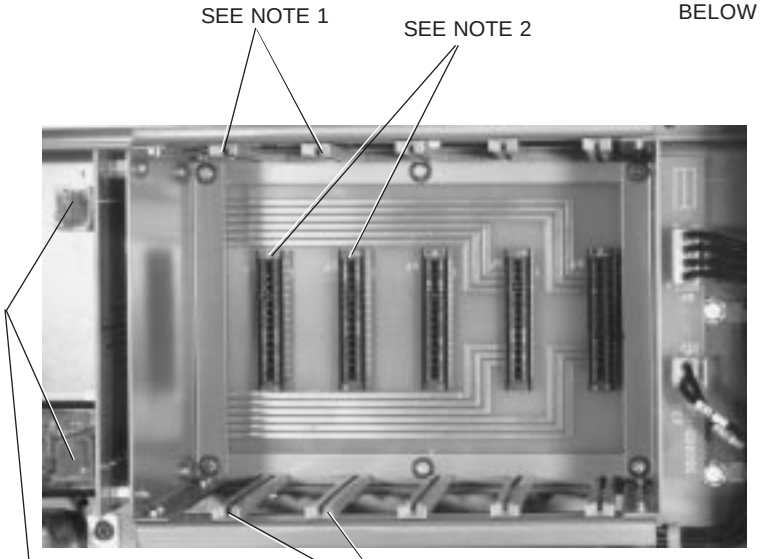
The **4-20mA** input is applied to the board at J1-12 and passes thru JU5 to the "Current to Voltage Converter" where the 4-20mA signal is converted to a 0-10VDC signal. This signal passes thru JU3 and then continues on the same path as the 0-10VDC signal discussed above.

REMOTE SETPOINT BOARD



22647A





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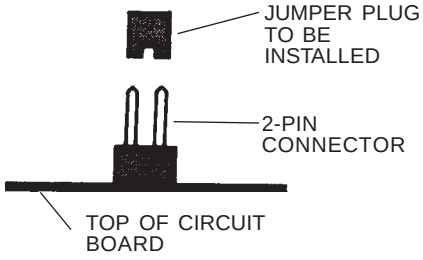
DETAIL A – TYPICAL OF JU1-JU5



NOTES:

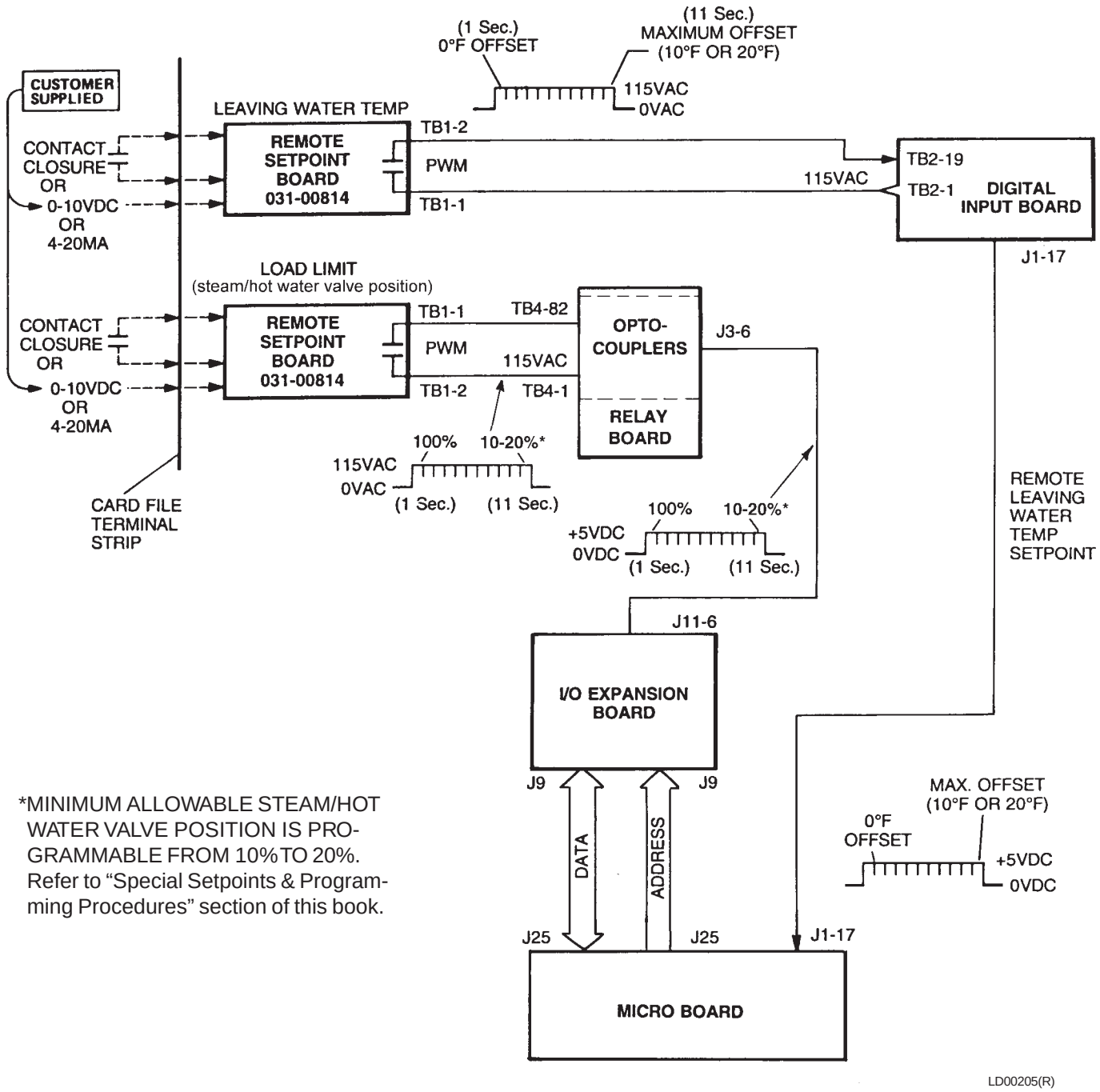
1. Card edge guides used to slide option board into card file.
2. Option board to be installed into either connector J2 or connector J3 on the inside of the card file.

FIG. 33 – CARD FILE AND BOARDS

LD00204(R)

The **Contact Closure** input is applied at J1-1 and J1-2. When the contacts are open, 0VDC is applied to JU1. When the contacts are closed, a voltage (0-10VDC) corresponding to the setting of potentiometer R11 is applied to JU1. This signal passes thru JU1 and continues on the same path as the 0-10VDC signal discussed above.

Refer to YORK Form 155.16-PA3 for installation and application information on the Remote Setpoint Boards. Refer to the “Inputs & Outputs” section following for input signal vs. PWM output tables.



*MINIMUM ALLOWABLE STEAM/HOT WATER VALVE POSITION IS PROGRAMMABLE FROM 10% TO 20%. Refer to "Special Setpoints & Programming Procedures" section of this book.

FIG. 34 – REMOTE SETPOINT BOARD INTERFACE BLOCK DIAGRAM

REMOTE SETPOINT BOARD INPUTS AND OUTPUTS

Regardless of which setpoint the Remote Setpoint Board (part number 031-00814-000) is used to reset, the operation of the board is the same. If it is used to reset **Leaving Water Temp**, it is installed in card file slot J3. If it is used to reset **Load Limit**, it is installed in card file slot J2. Refer to YORK Form 155.16-PA3 for installation and application details.

4-20mA INPUT	PWM OUTPUT (SECONDS)
4mA	1.0
5mA	1.6
6mA	2.3
7mA	2.9
8mA	3.5
9mA	4.1
10mA	4.8
11mA	5.4
12mA	6.0
13mA	6.6
14mA	7.3
15mA	7.9
16mA	8.5
17mA	9.1
18mA	9.8
19mA	10.4
20mA	11.0

0-10VDC INPUT	PWM OUTPUT (SECONDS)
0VDC	1.0
1VDC	2.0
2VDC	3.0
3VDC	4.0
4VDC	5.0
5VDC	6.0
6VDC	7.0
7VDC	8.0
8VDC	9.0
9VDC	10.0
10VDC	11.0

CONTACT CLOSURE INPUT	PWM OUTPUT (SECONDS)
Contacts Open	1.0
Contacts Closed	1-11 seconds as determined by the setting of potentiometer R11 on Remote Reset Board. The setting of the pot establishes a 0-10VDC input to the Analog-to-PWM converter. This 0-10VDC input is then interpreted the same as the 0-10VDC input above.

Refer to YORK Form 155.16-PA3 to calculate the actual setpoint change that results from a given 4-20mA, 0-10VDC or contact closure input. Also, refer to this form for the external connections to the card file.

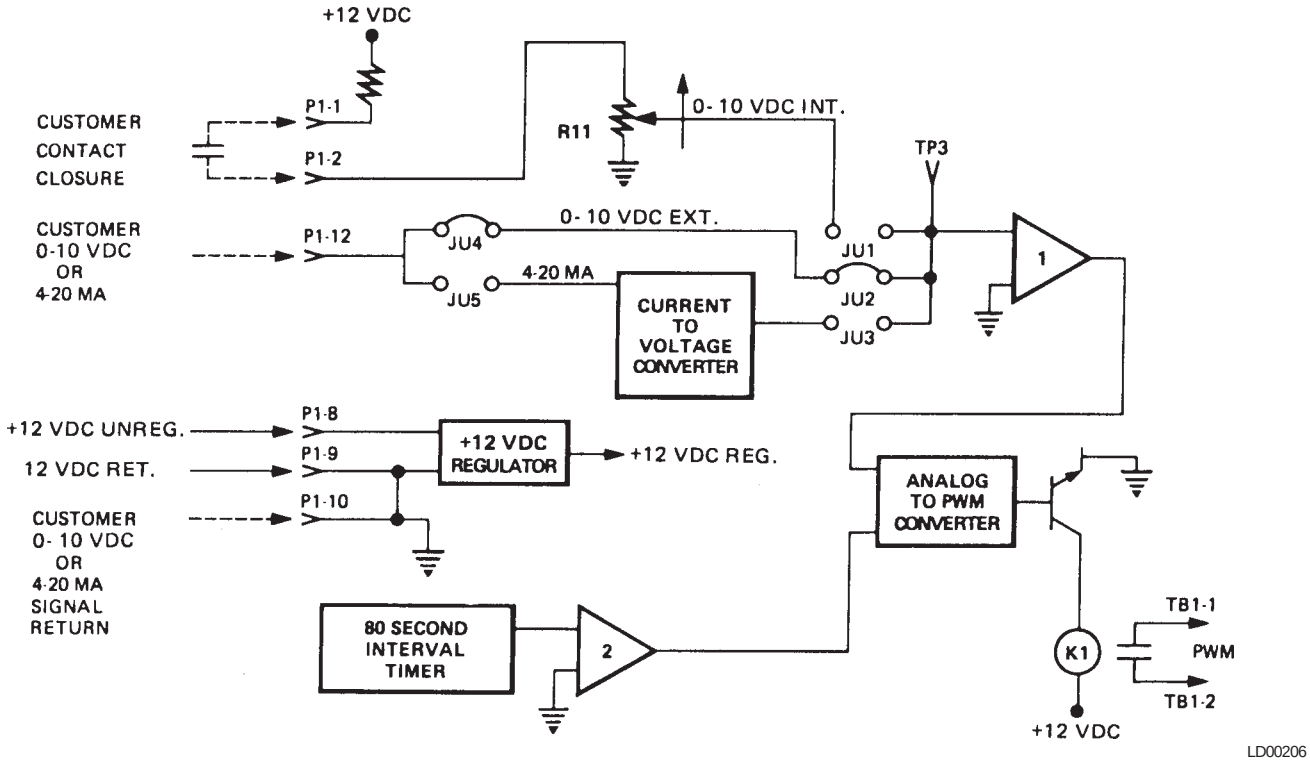


FIG. 35 – REMOTE SETPOINT BOARD SIMPLIFIED BLOCK DIAGRAM PART NO. 00814-000

SPECIAL SETPOINTS & PROGRAMMING PROCEDURES

The following special setpoints and programming procedures are for factory or field service technician use only. The correct setpoint values are established and entered at the YORK factory, prior to shipment. However, local operating conditions or service requirements might demand these values to be changed from the nominal (typical) values entered by the factory. Setpoints other than operating hours, start counter, cycle counters and auto purge enable/disable should be changed only after factory consultation. As outlined in the System Commissioning Checklist, the service technician must verify the nominal values have been entered by the YORK factory.

The following is a description of each setpoint followed by a detailed change procedure for each. A special access code is required.

To view the setpoint values that have been entered, use the procedure below to gain access to **PROGRAM** mode, then refer to specific procedure for each setpoint. Follow that procedure but do not enter new values or press the **ENTER** key.

To change any of the setpoint values, follow the procedure below to gain access to **PROGRAM** mode. Then refer to the specific procedure for the desired setpoint.

1. Press **ACCESS CODE** key.
2. ENTER VALID ACCESS CODE is displayed.
3. Using **Entry** keys enter **1 3 8 0.**
4. As each digit is entered, the characters **Y O R K** are displayed. NOTE: If digits other than **1 3 8 0** are entered, **Y O R K** is still displayed.
5. Press **ENTER** key.
   NOTE: If digits other than **1 3 8 0** were entered in Step No. 4, INVALID ACCESS CODE is displayed when the **ENTER** key is pressed. If this occurs, enter the correct access code (1380) and proceed.
6. ACCESS TO PROGRAM KEY AUTHORIZED is displayed.
   NOTE: Unless terminated by pressing the **ACCESS CODE** key again, the operator will have access to the **PROGRAM** key for 10 minutes. When 10 minutes have elapsed, access to **PROGRAM** key will be automatically disabled and the operator must return to Step No. 1 to gain access.
7. Press **PROGRAM** key.
8. PROGRAM MODE, SELECT SETPOINT is displayed.
9. Select and perform desired procedure from the following:

MAXIMUM ALLOWED ENTERING CONDENSER WATER TEMP – The maximum allowed entering condenser water temperature is determined by the design of the unit. The various models have different limitations.

When the entering condenser water temperature exceeds the programmed value for 10 continuous minutes after a 30 minute bypass at start, the loading is limited to 60% steam/hot water valve position and WARNING - ENT COND WATER TEMP HIGH LIMIT is displayed. The value is programmable from 75°F to 125°F. The default value is 86°F. Use procedure below to change value.

To enter the **MAXIMUM ALLOWED ENTERING CONDENSER WATER TEMPERATURE**:

1. Press and release the **CONDENSER WATER TEMPS** key. The following program prompt message is displayed:
   MAX ALLOWED CONDENSER WATER TEMP = XX.X°F
2. Using the **Entry** keys, enter the desired value (75-125°F). If the **CANCEL** key is pressed, the default value 86.0°F appears.
3. Press the **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.
4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

AUTO/MANUAL SOLENOID CONTROL – When automatic solenoid control is selected, the refrigerant level solenoid is under automatic program control. When manual operation is selected, this solenoid can be energized and de-energized using the **DISPLAY DATA** key.

To select **AUTO** or **MANUAL** solenoid control, the unit must be in **SERVICE** mode. Then use the procedure at the beginning of this section to gain access to **PROGRAM** mode and proceed as follows:

1. Press keypad **MANUAL PUMP** key.
   SOLENOID CONTROL: __ (0=MANUAL, 1=AUTO) is displayed.

2. Using **Entry** keys, press 0 for manual operation; 1 for automatic operation.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

To energize and de-energize refrigerant level solenoid, the unit must be in **SERVICE** mode. Then use the procedure at the beginning of this section to gain access to **PROGRAM** mode and proceed as follows:

1. Press keypad **DISPLAY DATA** key.
   REF LEVEL SOLENOID VALVE: 0 (0=OFF, 1=ON) is displayed.

2. Using **Entry** keys, press 0 to de-energize; 1 to energize the solenoid.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

STEAM/HOT WATER VALVE CONTROL – When cage or globe (3-way) type valves are used (I/O Expansion Board program jumper JP1 removed), there are two programmable values that affect the control of the valve: "RATE LIMIT" and "MAXIMUM ALLOWED UNLOAD PULSE". "RATE LIMIT" is programmable from 0.5°F to 2.0°F in 0.1°F increments (EPROM Version A.01F.01 and later allow range of 0.3°F to 5.0°F). "MAXIMUM ALLOWED UNLOAD PULSE" is progrmmable from 6 to 12 seconds in 1 second increments. The value entered as "RATE LIMIT" determines the response to leaving chilled water temperature rate of change. The value entered as "UNLOAD PULSE" will be the maximum allowed unload pulse duration in seconds. When butterfly type valves are used (I/O Expansion Board program jumper JP1 installed), there is only one programmable value that affects valve control: "RATE LIMIT" as described above. Refer to "Steam/Hot Water Valve Control" section for details of valve control routines. Units equipped with EPROM Version A.02F.01 and later have an additional programmable value "VALVE PULSE INTERVAL" that applies to all valves. The value programmed determines the duration of the LONG SAMPLE PERIOD/OUTPUT INTERVAL and is programmable over the range of 1 to 10 minutes. To program these variables, proceed as follows:

CAGE & GLOBE (3-WAY) TYPE:

1. Press keypad **CHILLED WATER TEMPS** key.
   RATE LIMIT = X.X: UNLOAD PULSE = XX is displayed.

2. Using **Entry** keys, enter the desired rate limit value. The cursor will move under the first changeable digit of the "UNLOAD VALUE". then enter the desired "UNLOAD PULSE" value. Use leading zeroes where necessary (i.e. **06**). If the **CANCEL** key is pressed, default values of **1.0** (rate limit) and **6** (unload pulse) are displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

BUTTERFLY TYPE:

1. Press **CHILLED WATER TEMPS** key.
   RATE LIMIT = X.X is displayed.

2. Using **Entry** keys, enter the desired "RATE LIMIT" value. If the **CANCEL** key is pressed, the default value **1.0** is displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

ALL VALVES (EPROM Version A.02F.01 and later)**:**

1. Press **SUPPLY STEAM PRESS/TEMP** key.
   VALVE PULSE INTERVAL = XX MINUTES is displayed.

2. Using **Entry** keys, enter the desired value of 1 to 10 minutes. Use leading zeroes where necessary (i.e. **02**). If the **CANCEL** key is pressed, the default value **01** (Butterfly type) or **4** (Cage/Globe type) is displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed.

STEAM/HOT WATER VALVE PART NUMBER (EPROM Version A.02F.01 and later only) – When performing LOW ENTERING CONDENSER WATER TEMP load limiting (SYSTEM RUN – LOW ECDWT LIMIT IN EFFECT is displayed), the maximum allowed steam/hot water valve position (%) is determined by the actual entering condenser water temperature and the valve profile. The valve profile includes the size, flow characteristics and linearity. These parameters for each valve are stored in memory and accessed based on valve part number. Therefore, the part number of the valve that is installed on the unit must be entered using the following procedure and TABLES 8 and 9 of this book:

1. Press **PUMP STATUS** key.
   STM/HOT WTR VALVE PART #: XXX-XXXXX-XXX
   is displayed.

2. Using Entry keys, enter part number of steam or hot water valve that is applied to the unit. Refer to Tables 8 and 9.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

SOLUTION TEMP OVERRIDE OF LOW ENTERING CONDENSER WATER TEMPERATURE LOAD LIMIT (EPROM Version A.02F.02 and later) – If the strong solution temperature is below the programmed LOW ECDWT OVERRIDE setpoint (165.0 to 185.0°F), the low entering condenser water temp load inhibit is not performed.
To enter the LOW ECDWT SOLUTION TEMP OVERRIDE setpoint value:

1. Press **REFRIGERANT/SOLUTIONTEMPS** key. Use **ADVANCE DAY/SCROLL** key if necessary to display:
   LOW ECDWT SOLUTION TEMP OVERRIDE=XXX.X F

2. Using **Entry** keys, enter desired value from 165.0 to 185.0°F. If the **CANCEL** key is pressd, DEFAULT value 175.0 is displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

MAXIMUM UNLOAD LIMIT – Some units operating under light loads become unstable in operation. The low generator heat caused by the small steam/hot water valve opening, prevents sufficient refrigerant supply to the absorber for stable operation. Other local operating conditions at light load can also cause unstable operation. Therefore, the minimum allowed steam/hot water valve position during unit run can be programmed from 10% to 20%. The typical (default) value is 10%. However, the field service technician can adjust this value as necessary.

During unit run, the steam/hot water valve will be modulated as necessary between (10-20% as programmed) and 100% valve position. The unit will be prevented from unloading to less than the programmed steam/hot water valve position. However, at unit shutdown, the steam/hot water valve will be driven to the fully closed (0%) position.

To enter the **MAXIMUM UNLOAD LIMIT**, proceed as follows:

1. Press and release the **UNLOAD** key.
   MAXIMUM UNLOAD LIMIT = XX% is displayed.

2. Using the Entry keys, enter the desired value (10%-20%). If the **CANCEL** key is pressed, the default value 10% appears.

3. Press **ENTER** key.
   PROGRAM MODE SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

MAXIMUM ALLOWED LOADING – Site conditions and various unit conditions that routinely occur during unit commissioning sometimes make it desirable to limit the loading ability of the unit. For instance, non-condensibles sometimes take a few days to be completely removed. During the purging process, the loading of the unit should be limited due to the possibility of high generator pressure nuisance trips. If necessary, the maximum loading may be limited between 50% and 100% steam/hot water valve position as desired until the situation allows the design heat input to be established.

During operation, the steam/hot water valve position will be limited to the programmed value. When the steam/hot water valve position reaches this value, SYSTEM RUN-MAXIMUM COOLING is displayed.

To enter **MAXIMUM ALLOWED LOADING**:

1. Press and release the **LOAD** key. The following prompt message is displayed:
   MAX ALLOWED LOADING = XXX%

2. Using the **Entry** keys, enter the desired value (50-100%). Use leading zeroes where necessary (i.e. **075**%). If the **CANCEL** key is pressed, the default value **100**% appears.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

7-DAY PURGE CYCLE COUNTER – Anytime the EPROM (IC U17 on Micro Board) or the real time clock (RTC) chip (IC U16 on Micro Board) is replaced, an erroneous number could appear in the 7-day purge cycle counter. If this happens, the counter can be reset to zero as follows:

- With AC power applied to Control Center, remove Micro Board program jumper (J57) from "CLKON" position and replace it to the "CLKON" position.

-OR-

- With AC power applied to Control Center, remove Micro Board program jumper (J57) from "CKLOFF" position and place it on the "CLKON" position.

OPERATING HOURS, START COUNTER AND TOTAL (LIFETIME) PURGE COUNTER – These values should not be arbitrarily changed or reset. However, since these values are stored in the Micro Board RTC chip (IC U16 on Micro Board), replacing either the Micro Board or RTC chip will cause these values to be lost. Therefore, the service technician should note these values prior to replacing either of these components. After the new component is installed, these values should be entered using the procedure below. There is also a procedure to reset the values to zero.

To enter **OPERATING HOURS, START COUNT** and **TOTAL (LIFETIME) PURGE COUNT** values:

1. Press **OPERATING HRS./START COUNTER** display key.
   OPER. HOURS = _ _ _ _ _; START COUNTER = _ _ _ _ _
   is displayed.

2. Using the **Entry** keys, enter the desired values for operating hours and start counter. Use leading zeroes where necessary (i.e., **00417**). The cursor will move left to right as digits are entered.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. If it is not desired to enter **TOTAL PURGE** count values, press **ACCESS CODE** key to exit.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily and the display then returns to the normal foreground message. Otherwise, proceed to step 5.

5. Press **PURGE CYCLE COUNT** display key.
   LIFETIME PURGE COUNTS = _ _ _ _ _ is displayed.

6. Using the **Entry** keys, enter the desired values for lifetime purge counter. Use leading zeroes where necessary (i.e. **00156**). The cursor will move left to right as digits are entered.

7. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

8. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

To reset **OPERATING HOURS, START COUNTER** and **TOTAL (LIFETIME) PURGE COUNTER** to zero: *(NOTE: This procedure resets ALL of these values to zero simultaneously. It is not possible to reset them individually.)*

1. Press the **OPERATING HRS./START COUNTER** or **PURGE CYCLE COUNTER** display keys.
   OPER. HOURS = _ _ _ _ _; START COUNTER = _ _ _ _ _
   or LIFETIME PURGE COUNTS = _ _ _ _ _ is displayed respectively.

2. Using the **Entry** keys, enter zeroes for all changeable digits.

3. Press the **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press the **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

LEAVING CHILLED WATER TEMPERATURE MINIMUM ALLOWED SETPOINT – The overall programmable range of Leaving Chilled Water Temperature (LCWT) setpoints is 40-77°F. However, each unit is

designed with a specific minimum allowed LCWT setpoint. This setpoint is programmed into the Control Center at the factory. The setpoint must never be set lower than this value. To prevent customer personnel from setting it lower than the allowed value, factory personnel use the special access code (1380) to program the LCWT setpoint. This value becomes the lowest allowed setpoint. If someone tries to enter a lower value using the general access code (9675), the program will reject it and display OUT OF RANGE - TRY AGAIN . If the Micro Board or "RTC" chip (IC U16) is replaced, this value must be programmed by the field serviceman using the procedure below.

To illustrate the above: If a particular unit is designed to produce a LCWT of 43.5°F, factory personnel would program the LCWT setpoint to 43.5°F using the special access code (1380). The allowable range of LCWT setpoints for this unit then becomes 43.5-77°F.

To enter the **LEAVING CHILLED WATER TEMP MINIMUM ALLOWED SETPOINT** value:

1. Press **LEAVING WATER TEMP** setpoint key.
   LVG CHILLED WATER SETP = XX.X°F (DESIGN) is displayed.

2. Using the **Entry** keys, enter the desired value (40-77°F). If the **CANCEL** key is pressed, default value 44.0°F is displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

REFRIGERANT FLOAT SWITCH SHUTDOWN TIMER (EPROM Version A.02F.02 and later that are equipped with Buffalo pumps; Micro Board program jumper JP2 in) – This setpoint is a timer that determines the amount of time the unit is allowed to operate without the REFRIGERANT PUMP running when the unit is equipped with Buffalo pumps. It is programmable from 20 to 60 minutes. The DEFAULT is 30 minutes. The timer is started when the unit enters "SYSTEM RUN" at unit start and when 3F (refrigerant level float switch) opens during unit run, turning off the refrigerant pump. If the refrigerant pump is not started before the timer elapses, a safety shutdown is performed and "DAY-TIME-REFRIGERANT PUMP FLOAT SWITCH FAILURE" is displayed.

To enter the REFRIGERANT FLOAT SWITCH SHUTDOWN SETPOINT value:

1. Press **REFRIGERANT/SOL'N TEMPS** key. Use **ADVANCE DAY/SCROLL** key, if necessary, to scroll thru messages until
   REFRIGERANT FLOAT SWITCH SHUTDOWN = XX MIN
   is displayed.

2. Using Entry keys, enter desired value (20 to 60). If **CANCEL** key is pressed, DEFAULT value "30" is displayed. Use leading zeroes where necessary (i.e. **03**).

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

REFRIGERANT PUMP SHUTDOWN DELAY SETPOINT (EPROM Version A.02F.02 and later that are equipped with Buffalo pump; Micro Board program jumper JP2 in) – This setpoint determines the time delay between detection of insufficient refrigerant level and the control center intitiating a shutdown of the Buffalo refrigerant pump. It is programmable from 1 to 45 seconds. The DEFAULT and nominal value is 30 seconds. When the refrigerant level has decreased below the level that allows refrigerant level float switch 3F to open, and it remains open continuously for the duration of the timer, the refrigerant pump will be shutdown after this programmed time delay has elapsed. This setpoint is used in conjunction with the REFRIGERANT PUMP STARTUP DELAY setpoint below to limit pump cycling.

To enter the REFRIGERANT PUMP SHUTDOWN DELAY SETPOINT value:

1. Press **REFRIGERANT/SOL'N TEMPS** key. Use **ADVANCE DAY/SCROLL** key to scroll thru messages until REF PUMP SHUTDOWN DELAY (3F) = XX SEC
   is displayed.

2. Using **Entry** keys, enter desired value (1 to 45 seconds). If the **CANCEL** key is pressed, default value "30" is displayed. Use leading zeroes where necessary (i.e. **02**).

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

REFRIGERANT PUMP STARTUP DELAY SETPOINT (EPROM Version A.02F.02 and later that are equipped with Buffalo pumps; Micro Board program jumper JP2

in) – This setpoint determines the time delay between detection of sufficient refrigerant level and the control center intitiating a start of the Buffalo refrigerant pump. It is programmable from 1 to 900 seconds. The DEFAULT and nominal value is 480 seconds. When the refrigerant level has increased to a level that allows refrigerant level float switch 1F to close, and it remains closed continuously for the duration of this timer, the refrigerant pump will be started after this programmed time delay has elapsed. This setpoint is used in conjunction with the REFRIGERANT PUMP SHUTDOWN DELAY setpoint above to limit pump cycling. This setpoint timer is disabled at the instant of unit shutdown. This is to allow the refrigerant pump to start at the beginning of the dilution cycle.

To enter the REFRIGERANT PUMP STARTUP DELAY SETPOINT value:

1. Press **REFRIGERANT/SOL'N TEMPS** key. Use **ADVANCE DAY/SCROLL** key to scroll thru messages until
   REF PUMP STARTUP DELAY (1F) = XXX SEC is displayed.

2. Using **Entry** keys, enter desired value (1 to 900 seconds). If the **CANCEL** key is pressed, default value "480" is displayed. Use leading zeroes where necessary (i.e. **050**).

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

MOTOR COOLANT SOLENOID VALVE (applicable only to units equipped with Franklin pumps (program jumper JP2 removed) and EPROM Version A.02F.02 or later) – The motor coolant solenoid valve (1SOL) is normally energized (opened) when the strong solution temperature is >160°F and de-energized (closed) when it is <150°F. Units operating at lower heat source temperature require a lower temperature threshold for energizing (opening) the motor coolant solenoid valve (1SOL). To accomodate these units, the "open" threshold is programmable from 127°F to 160°F. The default is 160°F. The "close" threshold is fixed at (programmed open threshold minus 10°F). **THE DEFAULT VALUE SHOULD BE USED UNLESS DIRECTED OTHERWISE BY THE YORK FACTORY!!!** To enter the strong solution temperature at which the motor coolant solenoid valve will be energized, proceed as follows:

1. Press **SUPPLY HOT WATER TEMPS** key.
   MOTOR COOLANT SOLENOID OPEN = XXX F is displayed.

2. Using **Entry** keys, enter desired value (127 to 160). If the **CANCEL** key is pressed, default value "160" is displayed.

3. Press **ENTER** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

4. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM KEY DISABLED is displayed momentarily. The display then returns to the normal foreground message.

WARNING MESSAGE OVERRIDE PROCEDURE

If Micro Board program jumper (J51) is **IN**, and the Control Center is in **SERVICE** mode, the **LOAD** key can be used to manually load the unit beyond certain override thresholds. For example, in normal operation the load signal is driven down to 30%, regardless of load requirement, when generator pressure reaches 10.0 PSIA. This feature allows the **LOAD** key to manually drive the load signal up to any desired value greater than 30% even though the pressure is ≥10.0 PSIA. This feature should only be used at the YORK factory during testing. The following is a list of the functions that can be overriden with this feature: (Refer to "Display Messages" section of Form 155.16-O3 for details of each message.)

- WARNING – Low Refrigerant Temperature
- WARNING – Gen Shell High Pressure
- WARNING – Strong Solution Temp Override
- WARNING – Ent Cond Water Temp High Limit

STEAM/HOT WATER VALVE POTENTIOMETER CALIBRATION

The steam/hot water valve actuator contains a position feedback potentiometer. The various models of actuators use different potentiometer values. These are listed in Wiring Diagram, Form 155.16-W1. The potentiometer indicates the position (0-100%) of the valve to the Micro Board. To assure the pot indicates 100% when the valve is fully open, and 0% when fully closed, calibration is necessary. The calibration procedure, once initiated, is automatic. It must be performed anytime the steam valve, steam valve pot, Micro Board or Micro Board "Real-Time Clock" (RTC) IC U16 is replaced. The calibrated values are stored in the "RTC" chip.

The automatic calibration is initiated by the service technician. Once initiated, the MicroComputer Control Center automatically drives the valve to the fully loaded (open) position. When the valve stops moving for a period of approximately 30 seconds, that position is marked as the 100% position. The valve is then driven to the fully unloaded (closed) position. When it stops moving for a period of approximately 30 seconds, that position is marked as the 0% position. If the feedback voltage to the I/O Expansion Board J6-2 from the pot was 4.007VDC to 4.643VDC (4.496VDC nominal) at the 100% point, it is considered a valid (pass) 100% calibration. Otherwise, it is considered an invalid (fail) 100% calibration. If the feedback voltage was 0.415VDC to 0.879VDC (0.488VDC nominal) at the 0% point, it is considered a valid (pass) 0% calibration. Otherwise, it is considered an invalid (fail) 0% calibration. A fail indication for either the 0% or 100% point requires troubleshooting to locate the cause of the problem.

To perform the calibration, gain access to **PROGRAM** mode using the procedure below. Then proceed with the calibration procedure. Steam applications require Micro Board program jumper JP1 be installed. Hot water applications require JP1 be removed.

1. Press **ACCESS CODE** key.
   ENTER VALID ACCESS CODE _ _ _ _ is displayed.

2. Using **Entry** keys, enter **1 3 8 0**. As each digit is entered, the characters **Y O R K** are displayed. NOTE: If digits other than 1 3 8 0 are entered, **Y O R K** is still displayed.

3. Press **ENTER** key. If digits other than 1 3 8 0 were entered in step 2, INVALID ACCESS CODE is displayed when the **ENTER** key is pressed. If this occurs, enter the correct access (1380) code and proceed.

4. ACCESS TO PROGRAM KEY AUTHORIZED is displayed. NOTE: Unless terminated by pressing the **ACCESS CODE** key again, the operator will have access to **PROGRAM** mode for 10 minutes. When 10 minutes have elapsed, access to **PROGRAM** mode will be automatically disabled and the operator must return to Step No. 1 to gain access.

5. Press **PROGRAM** key.
   PROGRAM MODE, SELECT SETPOINT is displayed.

CALIBRATION PROCEDURE:

1. Press **UNIT** switch to **STOP/RESET** position.

2. Press **AUTO** service key.
   AUTO-CAL STEAM VALVE POT – LOAD X.XXXV
   (if Micro Board program jumper JP1 is removed, AUTO-CAL HW VALVE – LOAD X.XXXV) is displayed. The valve is driven to the fully open (loaded) position while this is displayed. As the valve is loading, the voltage feedback from the valve pot is displayed. It will increment as the valve opens. When the valve stops moving for approximately 30 seconds, the voltage value at that time is logged as the 100% point and it is immediately driven to the closed (unloaded) position.
   AUTO-CAL STEAM VALVE POT – UNLOAD X.XXXV
   (If Micro Board program jumper JP1 is removed, AUTO-CAL HW VALVE – UNLOAD X.XXXV) is displayed. The voltage feedback from the pot will decrement as the valve unloads. When the valve stops moving for approximately 30 seconds, the voltage value is logged as the 0% point.

3. The pass/fail message is now displayed. Refer to above description of pass/fail criteria. If the auto-calibration was successful at both the 0% (lo) and 100% (hi) points, PASS LO = X.XXXV, PASS HI = X.XXXV is displayed. The voltage value displayed is that which has been logged as the fully closed and open points (i.e. the voltage feedback from the pot when the valve was at its fully closed and open position positions). If either the lo or hi points are not within the allowed voltage range, "FAIL" is substituted for "PASS".

4. If either "PASS" or "FAIL" is displayed, press the **ENTER** key. PROGRAM MODE, SELECT SETPOINT is displayed. If "PASS" is displayed for both lo and hi, the calibration is complete. However, if "FAIL" is displayed for either one, the calibration is not successful and the service technician must trouble-shoot the problem.

5. Press **ACCESS CODE** key.
   ACCESS TO PROGRAM MODE DISABLED is displayed.

STEAM/HOT WATER VALVE CONTROL

GENERAL

During **UNIT RUN**, the steam/hot water valve is modulated under program control to control the Leaving Chilled Water Temperature (LCWT) to the **LEAVING CHILLED WATER TEMPERATURE** setpoint. It is modulated between (10-20% as programmed) to 100% steam/hot water valve position. The valve is prevented from decreasing to less than the programmed value (10-20%) during unit run. This minimum allowed unload point (10-20%) is programmed using the procedure in "Special Setpoints and Programming Procedures" section. At unit shutdown, the valve is driven to the fully closed (0%) position. The fully open position is 100%. The fully closed an fully open points are established when the "Steam/Hot Water Valve Potentiometer Calibration" procedure is performed.

There are two categories of valves that are used:

A. – Butterfly Type as listed in Table 8.
B. – Cage Type and 3-Way Globe Type as listed in Table 9.

Each of these categories require a different valve control routine. Program jumper "JP1" on the I/O Expansion Board must be placed in the appropriate position to enable the proper routine; "IN" for category "A" valves, "OUT" for category "B" valves. Since category "B" valves respond more slowly than category "A" valves, the maximum allowed **LOAD** and **UNLOAD** pulses and the interval between these outputs (sample period) are different as shown in Table 10.

To accelerate LCWT pulldown at start, each time the unit goes into **SYSTEM RUN** or is placed in **AUTO** mode in **SERVICE** mode, the "SHORT SAMPLE PERIOD/OUTPUT INTERVAL" is used. It is used until the LCWT is less than or equal to 5°F above the LCWT setpoint or until the steam/hot water valve position is greater than 80%; then the "LONG SAMPLE PERIOD/OUTPUT INTERVAL" is used. Units equipped with EPROM Version A.02F.01 and later have an additional programmable variable called "VALVE PULSE INTERVAL". This allows the LONG SAMPLE PERIOD/OUTPUT INTERVAL for both category "A" and "B" to be programmed over a range of 1 to 10 minutes. Refer below for details of VALVE PULSE INTERVAL setpoint.

The program monitors:

1. – The error between the LCWT and the LCWT setpoint
2. – The rate of change of the LCWT within each sample period.

It responds with an output that contains a proportion component and rate component accordingly as follows: at the end of each sample period, the output is a **LOAD**, **UNLOAD**, or **HOLD** response as appropriate until the LCWT reaches setpoint. The **LOAD** and **UNLOAD** responses are in the form of **LOAD** and **UNLOAD** pulses from the MicroComputer Control Center to the steam/hot water valve actuator. The duration of these pulses and whether the output is a **LOAD** or **UNLOAD** pulse is determined by the magniture of error between the LCWT and the LCWT setpoint; whether the error is above or below the LCWT and the LCWT setpoint; and the amount (rate) and direction of change of the LCWT within the sample period. If the LCWT falls to 2°F below setpoint, the unit shuts down and displays DAY-TIME-LOW WATER TEMP-AUTOSTART .

The rate component of the output is applied in response to the LCWT's rate and direction of change (toward or away from setpoint). The amount of rate response is determined by the relationship of the rate change (amount of change in the sample period) to the programmed "RATE LIMIT" value. The closer the rate of change value is to the "RATE LIMIT" value, the greater the rate component in the output. The actual "RATE LIMIT" value programmed is a function of conditions at the jobsite; such as length of chilled water loop, number of chillers, multiple chiller configuration (Series or Parallel), primary/secondary chilled water loop, etc. For example, short chilled water loops generally cause the LCWT rate of change to be greater. The greater the rate of change, the greater the tendency to overshoot or undershoot the setpoint, causing large excursions in the LCWT. At unit commissioning, the service technician must evaluate the local conditions and refine the "RATE LIMIT" setpoint as required. Refer to below for details of "RATE LIMIT" setpoint.

TABLE 10 – MAXIMUM OUTPUTS

VALVE CATEGORY	MAX LOAD PULSE DURATION (SECONDS)	MAX UNLOAD PULSE DURATION (SECONDS)	SHORT SAMPLE PERIOD/OUTPUT INTERVAL (MINUTES)	LONG SAMPLE PERIOD/OUTPUT INTERVAL (MINUTES)
A	2	2	1	1-10 as programmed*
B	6	6-12 as programmed	1	1-10 as programmed*

*EPROM Version A.02F.00 – Category "A" fixed at 1 minute, category "B" fixed at 4 minutes.

When the unit is equipped with a category "B" valve (I/O Expansion Board jumper JP1 out), another programmable variable is "MAXIMUM ALLOWED UNLOAD(CLOSE) PULSE". This is required because units in some installations could have a tendency to undershoot the LCWT setpoint and shutdown on "LOW WATER TEMP". The conditions that can cause this are the same as those that cause a rapid rate of change in the LCWT. These conditions require a longer duration **UNLOAD** pulse when the LCWT is below or near the setpoint. Typical applications require the maximum allowed **LOAD** and **UNLOAD** pulses to be the same (6 seconds). However, if the longer duration **UNLOAD** pulses are needed, the service technician can select an appropriate value. Refer to below for details.

RATE LIMIT

"RATE LIMIT" is a field programmable variable that determines the Control Center's sensitivity/response to the rate of change of Leaving Chilled Water Temperature (LCWT). The "RATE OF CHANGE" is defined as the amount of change in the Leaving Chilled Water Temperature in each sample period. The LCWT's rate of change is calculated over each sample period of unit operating time. At the end of each sample period. the rate of change is compared to the "RATE LIMIT" value. The closer the rate of change value is to the "RATE LIMIT", the greater the rate component will be in the Output Pulse. In other words, the greater the effect rate of change will have on the duration and polarity (**LOAD** or **UNLOAD**) of the Output Pulse. This means that rate sensitivity increases as programmed "RATE LIMIT" value is decreased.

To illustrate, the "RATE LIMIT" is programmable from 0.5°F to 2.0°F (0.3°F to 5.0°F in EPROM Version A.02F.01 and later) in 0.1°F increments. The default value is 1.0°F. The smaller the number programmed, the greater the sensitivity to rate of change. If 2.0 is programmed, and the LCWT increases 1.0°F in the sample period, there would be minimal rate response. However, if 0.5 was programmed under the same conditions, there would be maximum rate response because the LCWT change (1.0°F) exceeded the programmed threshold (0.5°F). In most installations, 1.0 will be the optimum value for "RATE LIMIT". Programming a value less than 1.0 will tend to cause excessive valve movement.

In detecting the rate of change, the Control Center anticipates where the LCWT is going and responds accordingly to prevent overshoot and undershoot. For example, if the LCWT is <5°F above setpoint and decreasing, a Close Pulse would be applied at the end of the sample period, even though the LCWT is above setpoint.

MAXIMUM ALLOWED UNLOAD PULSE (Applicable to those valves listed as category "B" only; Cage Type and 3-way Globe Type) I/O Expansion Board program jumper JP1 must be removed.

The maximum allowed duration of the **CLOSE** pulse is programmable from 6 to 12 seconds in 1 second increments. The default value is 6. Since the maximum **OPEN** pulse is 6 seconds, programming this value to "**6**" would make the **LOAD** and **UNLOAD** response the same. However, if this value is programmed to "**9**", for example, the maximum allowed **CLOSE** pulse would be longer than the maximum allowed **OPEN** pulse. This provides the unit with an "UNLOAD BIAS". This bias, generally, causes the unit to unload faster than it loads.

VALVE PULSE INTERVAL (EPROM Version A.02F.01 and later)

VALVE PULSE INTERVAL is a field programmable variable that allows the LONG SAMPLE PERIOD/ OUTPUT INTERVAL to be programmed over a range of 1 to 10 minutes in 1 minute increments. The default values (1 minute - Butterfly; 4 minute - Cage/Globe) will provide proper operation in most applications. However, applications with extremely long or short chilled water loops, large load changes in a short period of time or other special requirements, could require a longer or shorter interval.

Each time the unit is started, after the SHORT SAMPLE PERIOD/OUTPUT INTERVAL is no longer in effect (Leaving Chilled Water Temp is within 5°F of setpoint or the steam/hot water valve position is >80%), the LONG SAMPLE PERIOD/OUTPUT INTERVAL is then in effect until the unit shuts down. At the end of each interval a load, unload, or hold output is applied, as required, to the steam/hot water valve.

PROGRAMMING

To program the above "RATE LIMIT", "MAX ALLOWED UNLOAD PULSE" (category "B" valves only) and "VALVE PULSE INTERVAL" (EPROM Version A.02F.01 and later) setpoints, proceed under "Special Setpoints and Programming Procedures" section.

TESTING

SOFTWARE DIAGNOSTICS

The diagnostic software consists of six tests. These tests are Ram test, A/D test, display test, keyboard test, digital input test, and digital output test. The diagnostic software is stored in the same memory as the operating program. To enable the diagnostic, enter **SERVICE** mode and place Micro Board program jumper J55 in the **ENABLE** position. To disable the diagnostic, leave **SERVICE** mode and place J55 jumper plug in the **DISABLE** position. After the diagnostic is enabled, all further service technician interaction is done on the front panel keypad. When the diagnostic is enabled, the service technician is presented with a menu from which he can choose the test to be performed. The menu and six tests are described as follows:

CAUTION!!!: BEFORE PERFORMING ANY OF THE FOLLOWING TESTS, BE CERTAIN THE MANUAL STEAM OR HOT WATER STOP VALVE IS CLOSED, PREVENTING ANY HEAT FROM ENTERING THE GENERATOR. ALSO, PRESS THE MANUAL TRIP BUTTON ON ALL PUMP OVERLOADS MOUNTED IN THE POWER PANEL. This prevents the system pumps from being turned on during these tests. At completion of these tests, open the stop valve and reset all overloads.

MENU

Upon entering the diagnostic software, the technician will observe a menu from which one of the six tests may be chosen. Press **"9"** key to view all five tests. The tests may be chosen by selecting the numeric key listed with the test. The keys and tests are as follows:

0 – Ram test	3 – Keyboard test
1 – A/D test	4 – Digital input test
2 – Display test	5 – Digital output test

The numeric keys are located under **Entry** on the front of the Control Center.

RAM TEST

This test will check all ram locations in the system. The ram consists of two areas:

EXT – External Ram
RTC – Ram Internal to the Real-Time Clock IC

After the test is completed, the display will show the two areas with either a pass or fail. A failed condition would indicate that the Micro Board should be replaced.

Press the **"*"** key after the test is over to return to the main menu.

A/D TEST

This test will allow the technician to select any of the analog input channels and display the voltage on that channel on the display. The display will show the voltage found on that channel in volts (0-5.000V). Upon entering this test, the technician will be asked to push one of the display function keys to select a group of analog channels; from here an individual channel may be selected. The analog channels associated with the display keys are as follows:

CHILLED LIQUID TEMPS
ECWT – Entering Chilled Water Temp
LCWT – Leaving Chilled Water Temp

(The analog voltage displayed for LCWT is that which is measured at IC U53 pin #7, not Micro Board input J19-10)

SUPPLY STEAM PRESS/TEMP (Steam Units)
Steam Temperature
Steam Pressure

REFRIGERANT/SOL'N TEMPS
REF – Refrigerant temp
SOL – Solution temp

OPTIONS
COND REF – Refrigerant Temp Leaving the Condenser
ADC – Automatic Decrystallization Temp

CONDENSER WATER TEMPS
ECNWT – Entering Condenser Water Temp
LCNWT – Leaving Condenser Water Temp

PRINT
GENERATOR PRESSURE

SUPPLY HOT WATER TEMP (Hot Water Units)
HW TEMP – Supply Hot Water Temp

OPERATING HOURS/START COUNTER
STEAM LOADING – Steam Valve Position Feedback (Steam Units)
HW LOADING – Hot Water Valve Position Feedback (Hot Water Units)

After tests are completed, press "*****" key to return to main menu.

DISPLAY TEST

This test will make sure the display is functioning. Upon entering this test, the technician will be instructed to press a key to start the test. Once the test has started, the technician will see various characters, numbers and symbols scroll past on the display. After the test has started, any key can be pressed to return to the main menu.

KEYPAD TEST

This test allows the service technician to make sure that all the keys on the keypad are functioning. Upon entering this test, the technician will be instructed to press any of the keys. When each key is pressed, a description of that key is displayed on the display. To exit this test and return to the main menu, press the "*" key.

DIGITAL INPUT TEST

This test will display the state of each digital input. A mnemonic for each of the inputs will be displayed with its associated state (1 if high; 0 if low). The inputs are:

STOP – Unit Switch Stop Input
STRT – Unit Switch Start Input
AUX – Auxiliary Safety Shutdown
GENTEMP – Generator High Temp Safety Switch
GENPRESS – Generator High Pressure Safety Switch
SOLN-OL – Solution Pump Overload 1OL & Motor Thermal Switch MTH1 in series (All units except 50HZ Models YIA10E3 thru YIA14F3.)
ABS-OL – Absorber Pump Overload 1OL & Motor Thermal Switch MTH1 in series. (50HZ Models YIA10E3 thru YIA14F3 only.)
REFR-OL – Refrigerant Pump Overload 2OL & Motor Thermal Switch MTH2 in series
PURG-OL – Purge Pump Overload 3OL & Motor Thermal Switch MTH3 in series
LOWREF – Low Refrigerant Temperature Safety Switch
CWFLOW – Chilled Water Flow Switch
CONDFLOW – Condenser Water Flow Switch
REFFLT – Refrigerant Level Float Switch
MTR CLNT – Refrigerant and Solution Pump Motor Collant Float Switch
REMCYC – Remote/Local Cycling
MULCYC – Multi Unit Sequence
REM START – Remote Start
REM STOP – Remote Stop
REM PWM TEMP – Remote Pulse Width Modulation Leaving Chilled Water Temp Setpoint Reset Input
REM PWM LOAD – Remote Pulse Width Modulation Load Limit Setpoint Reset Input
GEN-OL – Generator Pump Overload 4OL & Motor Thermal Switch MTH4 in series. (50HZ Models YIA10E3 thru YIA14F3 only.)
J50 – Micro Board Program Jumper – Auto-Restart After Power Failure – IN-0; OUT-1
J51 – Micro Board Program Jumper – Warning Condition Override – IN-0; OUT-1
J52 – Micro Board Program Jumper – English/Metric – IN-0; OUT-1
J53 – Micro Board Program Jumper – Sensitivity – IN-0; OUT-1
J54 – Micro Board Program Jumper – Chilled Water Pump – IN-0; OUT-1
J55 – Micro Board Program Jumper – Test (Diagnostic) – DISABLE-0; ENABLE-1
J56 – Micro Board Program Jumper – RS-232 Modem/ EMS – MODEM-0; EMS-1
J57 – Micro Board Program Jumper – Clock – CLKON-0; CLKOFF-1
JP1 – Micro Board Program Jumper – Steam/Hot Water – IN-0; OUT-1
JP3 – Micro Board Program Jumper – 60Hz/50Hz – IN-0; OUT-1
JP1(EX) – I/O Expansion Board Program Jumper – Steam/Hot Water Valve Type – IN-0; OUT-1
JP12(EX) – I/O Expansion Board Program Jumper – English/German – IN-0; OUT-1

After tests are complete, press "*" key to return to main menu.

DIGITAL OUTPUT TEST

This routine allows the technician to monitor and change the state of the digital outputs. The technician will see an output listed, along with its present state (1 = high; 0 = low). At this time the output state can be changed by pressing the **"1"** key to make it high or **"0"** key to make it low. The outputs are:

SOLUTION PUMP – Solution Pump Starter (All units except 50HZ Models YIA10E3 thru YIA14F3.)
ABSORBER PUMP – Absorber Pump Starter. (50HZ Models YIA10E3 thru YIA14F3 only.)
CHILLED WATER PUMP – Chilled Water Pump Starter
COND WATER PUMP – Condenser Water Pump Starter
REFRIGERANT PUMP – Refrigerant Pump Starter
REFRIG LVL SOL – Refrigerant Level Solenoid
REFRIG STAB SOL – Refrigerant Stabilizer Solenoid
MOTOR COOLANT SOL – Motor Coolant Solenoid
PURGE PUMP – Purge Pump Starter
STEAM/HOT WATER VALVE OPEN – Steam or Hot Water Valve Load Command
STEAM/HOT WATER VALVE CLOSE – Steam or Hot Water Valve Unload Command
*EMS – Energy Management System "Remote Mode Ready To Start" Status Contacts
*CYCLING SD – Cycling Shutdown Status Contacts
*SAFETY SD – Safety Shutdown Status Contacts

*ALARM WARN RELAY – Warning Message Alarm Contacts
*STEAM DRAIN VALVE – Steam Condensate Drain Solenoid
STEAM/HW SHUTOFF – Steam or Hot Water Shutoff Valve
GENERATOR PUMP – Generator Pump Starter. (50HZ Models YIA10E3 thru YIA14F3)

*These outputs go thru the I/O Expansion Board which has inverted outputs. Therefore, the logic is inverted; "0" to de-energize, "1" to energize.

After tests are complete, press "*" key to return to main menu.

SYSTEM COMMISSIONING CHECKLIST

1. Verify configuration of Micro Board program jumpers. ***CAUTION: PROGRAM JUMPER J51 MUST BE REMOVED!!*** Refer to Fig. 22, Page 18.

2. Start Real-Time Clock. Fig. 22, Page 18.

3. Verify configuration of I/O Expansion Board program jumpers. Refer to Fig. 32, Page 41.

4. Program System Setpoints. Refer to Operation Manual, Form 155.16-O3.

5. Program "Maximum Allowed Entering Condenser Water Temp" setpoint. Refer to "Special Setpoints and Programming Procedures" section. The setpoint should be programmed 1°F above the design entering condenser water temperature that is listed on the sales order.

6. Program the "Maximum Allowed Unload Limit" setpoint. Refer to "Special Setpoints and Programming Procedures" section. The setpoint should be programmed to **10%** unless factory instructions or local operating conditions require otherwise.

7. Program the "Maximum Allowed Loading" setpoint. Refer to "Special Setpoints and Programming Procedures" section. The setpoint should be programmed to **100%** unless factory instructions or local operating conditions require otherwise.

8. Program the "Leaving Chilled Water Temp Minimum Allowed" setpoint. Refer to "Special Setpoints and Programming Procedures" section. The setpoint should be programmed to the design value listed on the sales order.

9. Select "Automatic" Refrigerant Level Solenoid Control. Refer to "Special Setpoints and Programming Procedures" section.

10. Perform "Steam/Hot Water Valve Calibration Procedure" after the valve and actuator have been field wired.

11. After unit has been started and is operating under typical conditions, evaluate steam/hot water valve control of leaving chilled water temperature. Excessive overshoot/undershoot of LCWT setpoint or excessive steam/hot water valve movement, can be reduced by adjustment of the setpoints for steam/hot water valve control. Refer to "Special Setpoints and Programming Procedures" section for programming instructions. Complete description of steam/hot water valve control is in "Steam/Hot Water Valve Control" section.

12. Program the steam/hot water valve part number (units equipped with EPROM Version A.02F.01 and later). Refer to "Special Setpoints and Programming Procedures" section.

13. Program the following Buffalo pump setpoints: (units equipped with Buffalo pumps and EPROM Version A.02F.02 and later). Refer to "Special Setpoints and Programming Procedures" section.

    • "Refrigerant Float Switch Shutdown Timer Setpoint"
    • "Refrigerant Pump Shutdown Delay Setpoint"
    • "Refrigerant Pump Startup Delay Setpoint"

14. Program the "Low Entering Condenser Water Temp Solution Temp Override" setpoint (units equipped with EPROM Version A.02F.02 and later).

TROUBLESHOOTING

(Refer to Figs. 36 thru 43)

The failures or problems that could be encountered in the Millennium Control Center can be placed in the following major categories:

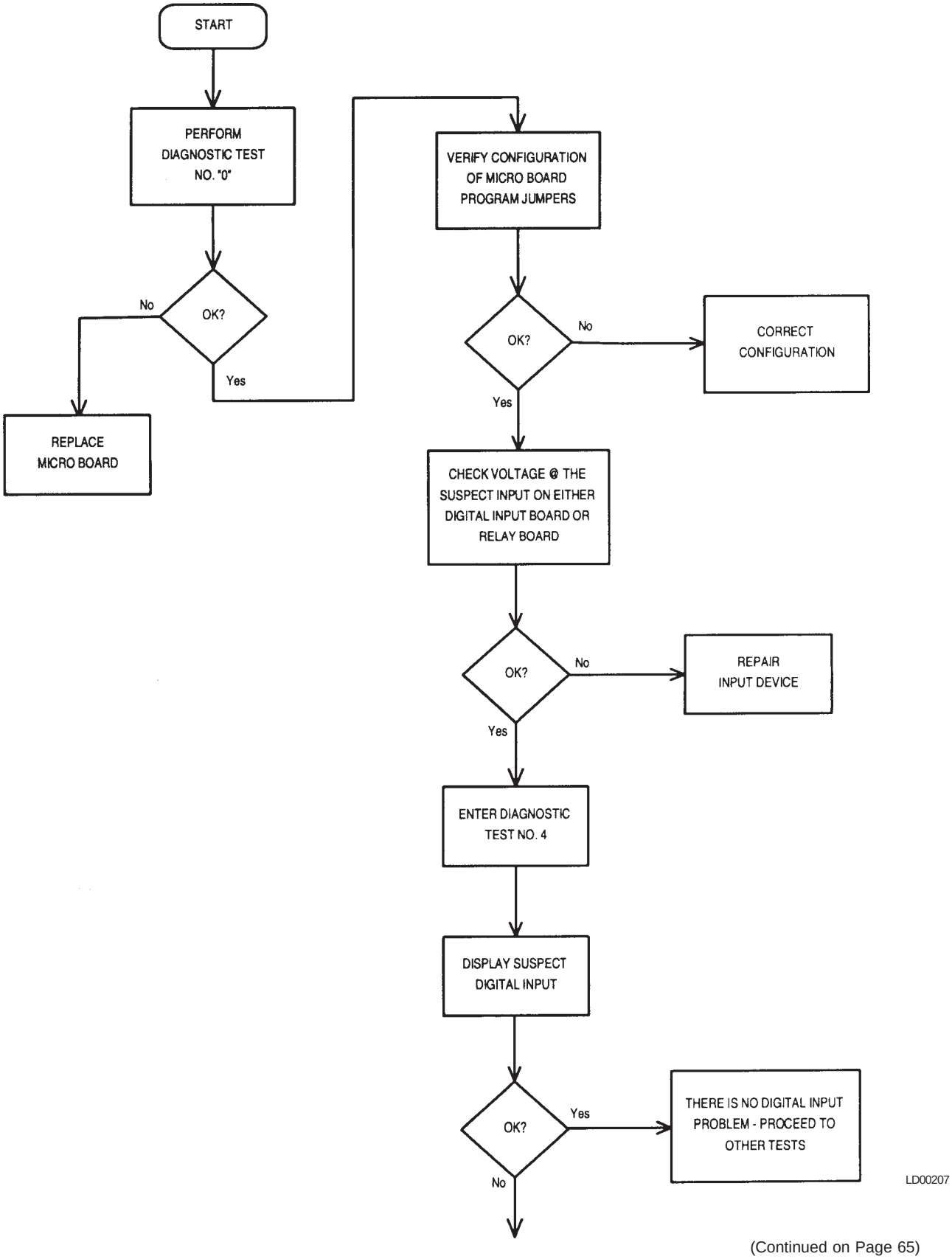
- Digital Inputs
- Relay Outputs
- Transducers and Thermistors
- Keypad Display
- Keypad Keys
- Leaving Water Temp Remote Setpoint Interface
- Load Limit Remote Setpoint Interface
- EMI Noise

Each category requires a specific procedure to resolve the problem. The symptom determines which procedure should be selected. These procedures direct the technician along the path that leads to the resolution of the problem.

The technician should understand the overall operation and the function and operation of each major component and printed circuit board in the Millennium Control Center. Also required is a knowledge of the expected voltage level at the input or output of a printed circuit board for any operating condition. Finally, the technician should understand the system interface and be able to utilize unit wiring diagrams to follow signal flow through the system. Several levels of documentation are required for this understanding. The unit Wiring Diagram (Form 155.16-W1) is the top level document. It provides the overall wiring configuration. The Service manual (Form 155.16-M3) provides the details of the operation of each printed circuit board and the expected voltage level at the input or output of each board for any operating condition. Also, block diagrams provide signal flow and simplified representations of board circuitry. The "Operation" manual (Form 155.16-O3) provides the details of the messages that are displayed on the keypad display.

When the unit shuts down on a safety or cycling shutdown, or is being prevented from starting for any reason, a message is displayed on the keypad alphanumeric display. This message states the reason for shutdown or the reason the unit is being prevented from starting. Before beginning the troubleshooting process, the technician should refer to "Operation" manual, Form 155.16-O3 for a detailed description of this message.

TROUBLESHOOTING PROCEDURES
DIGITAL INPUTS



(Continued on Page 65)

FIG. 36

(Continued from Page 64)

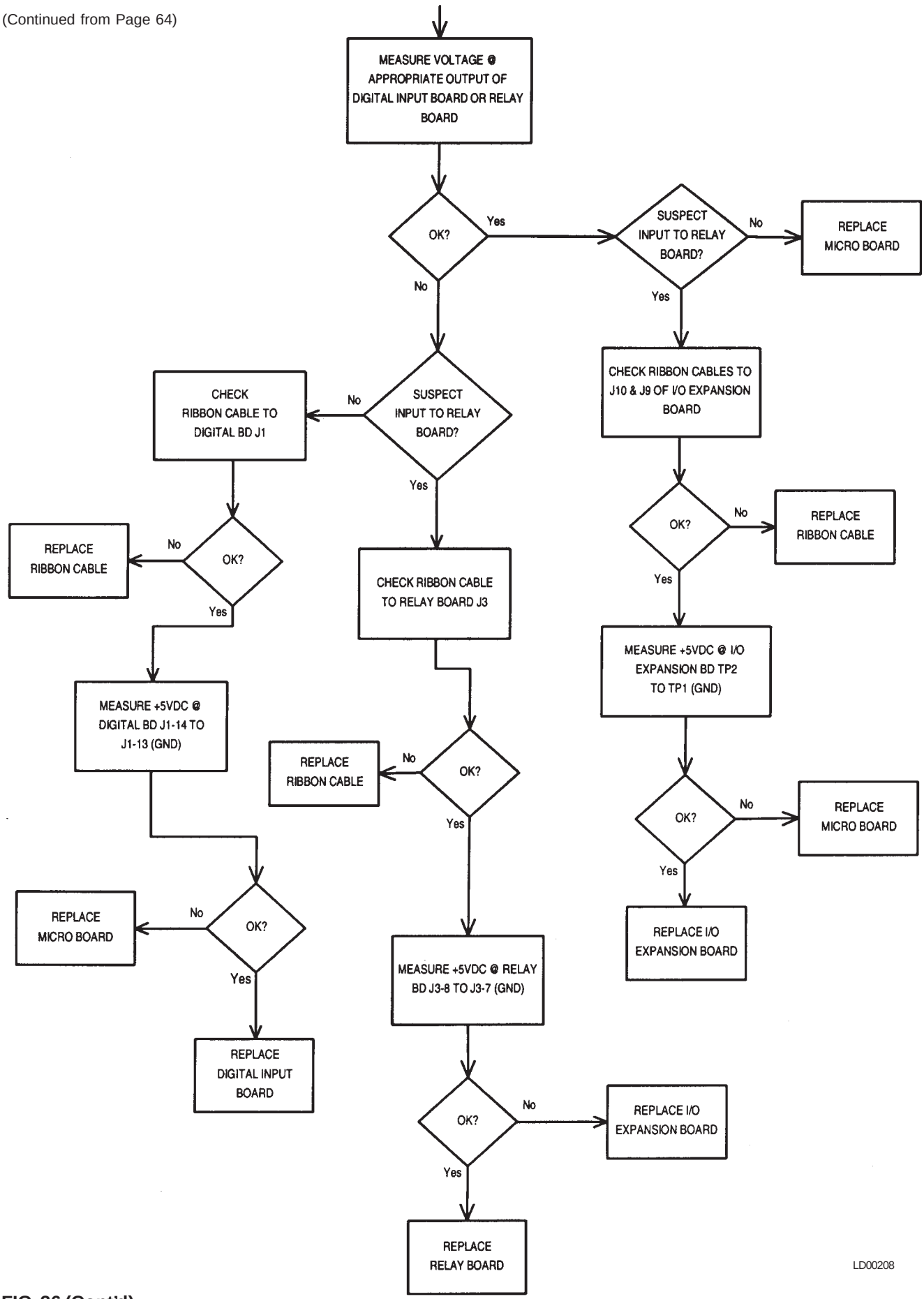


FIG. 36 (Cont'd)

RELAY OUTPUTS

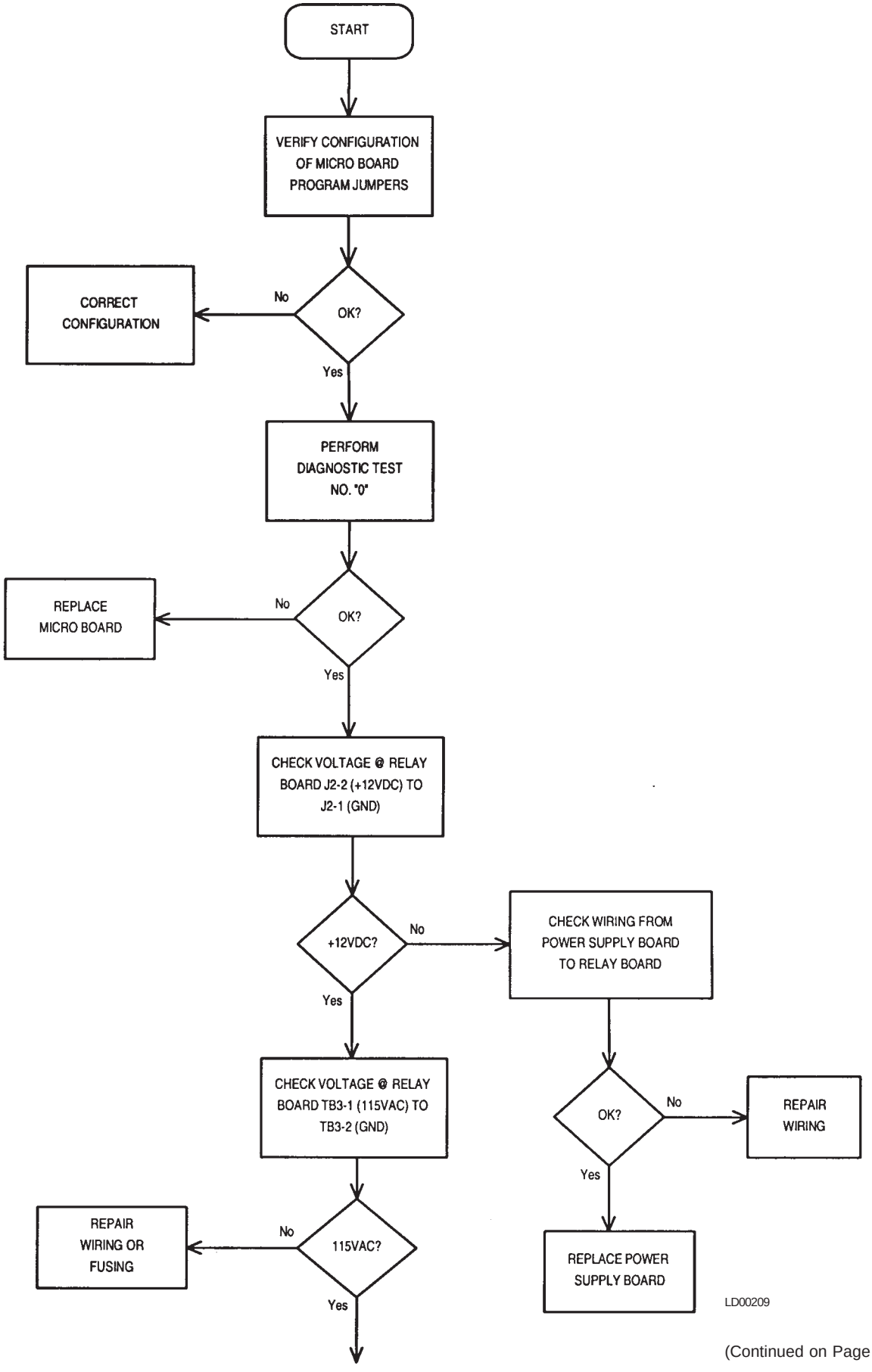


FIG. 37

(Continued on Page 67)

(Continued from Page 66)

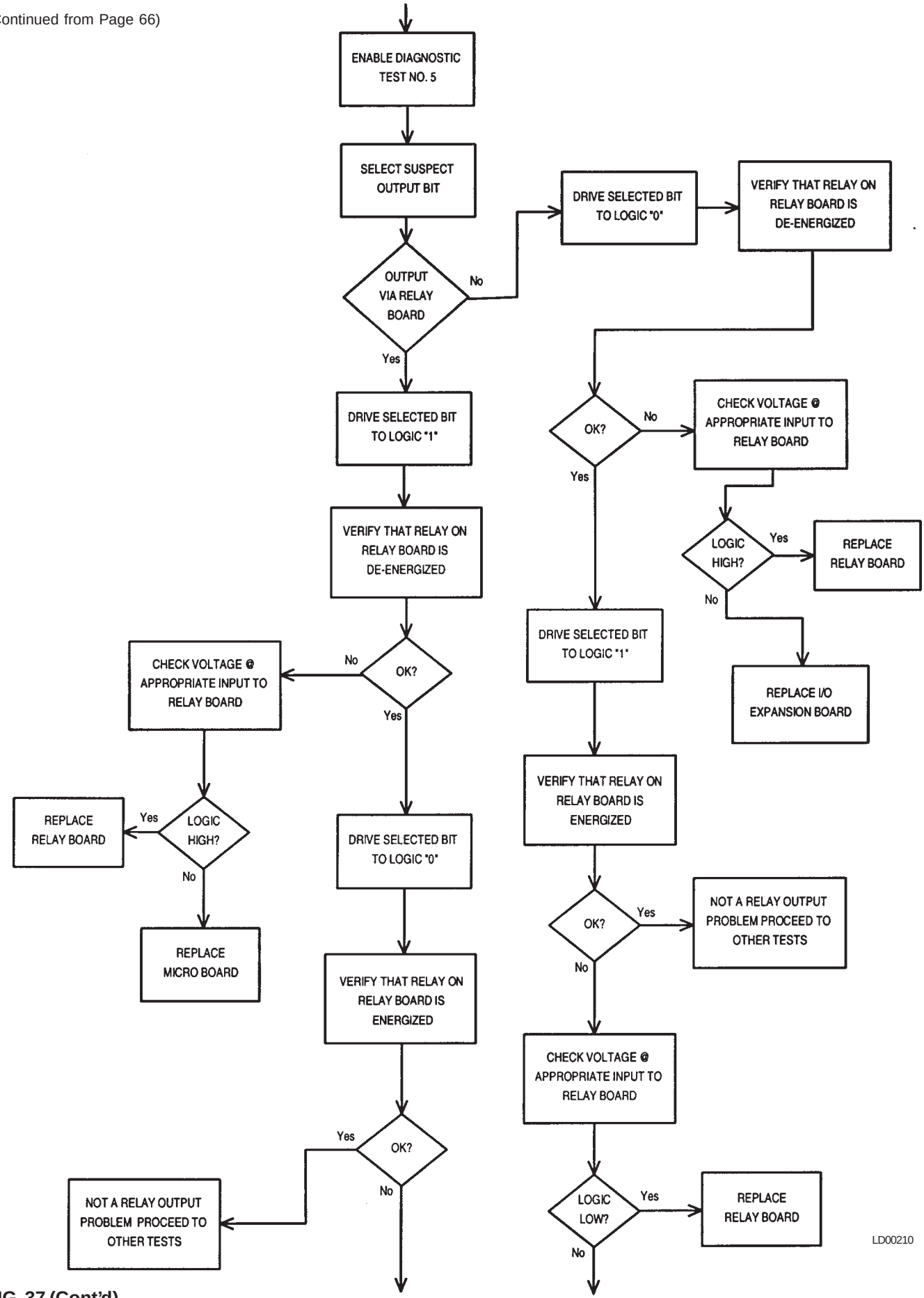


FIG. 37 (Cont'd)

(Continued on Page 67)

(Continued from Page 67)

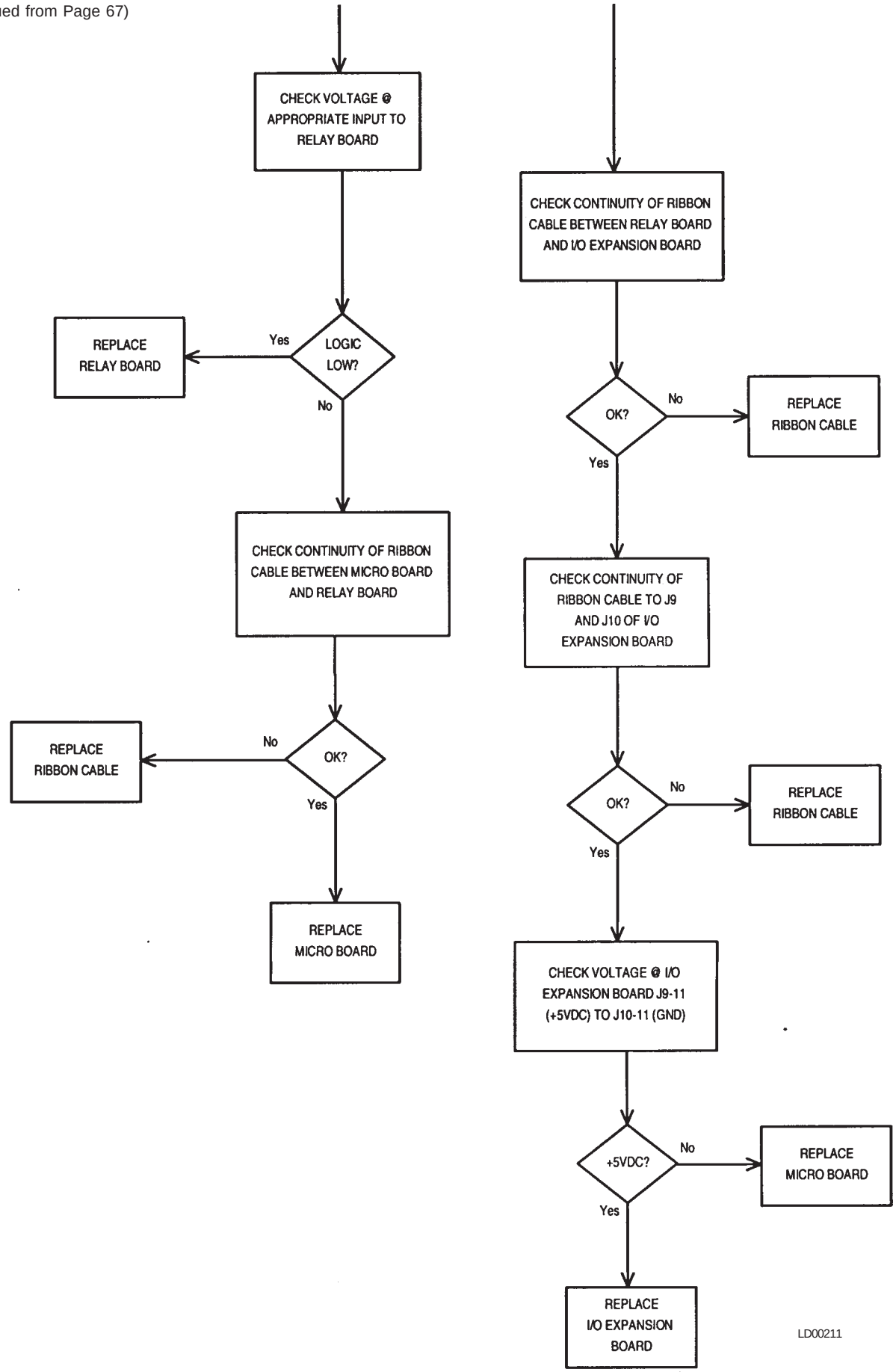
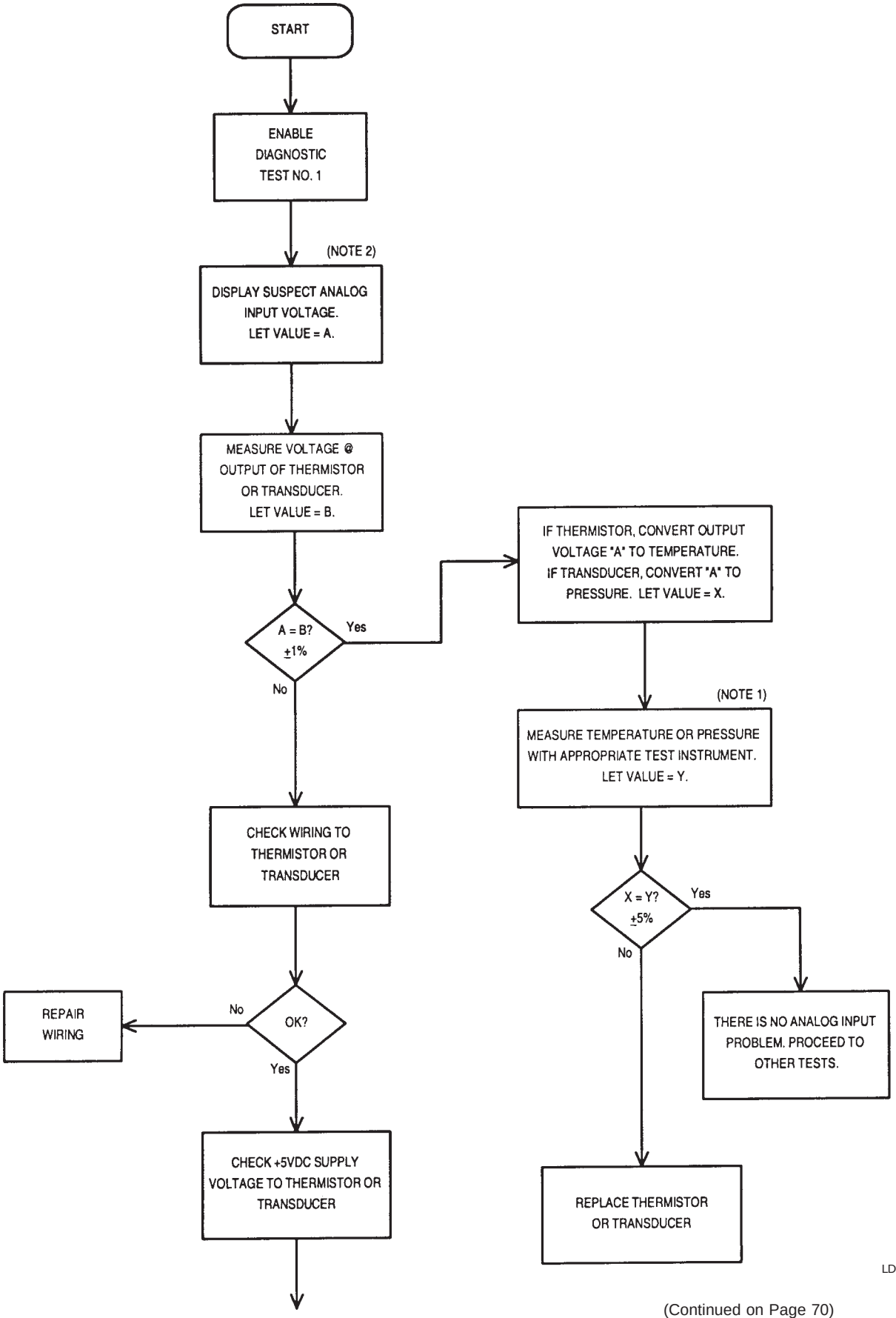


FIG. 37 (Cont'd)

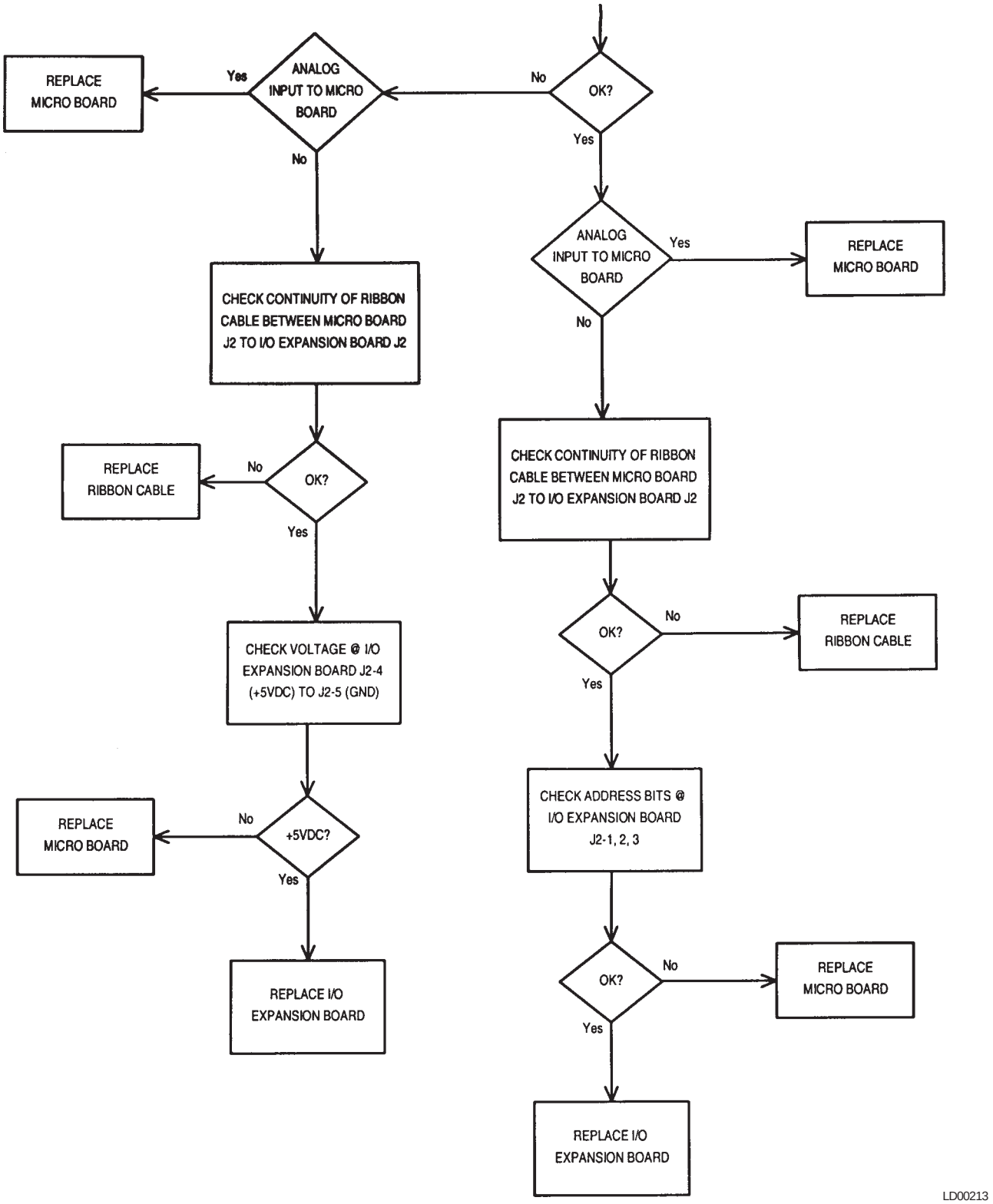
TRANSDUCERS AND THERMISTORS



(Continued on Page 70)

FIG. 38

(Continued from Page 69)

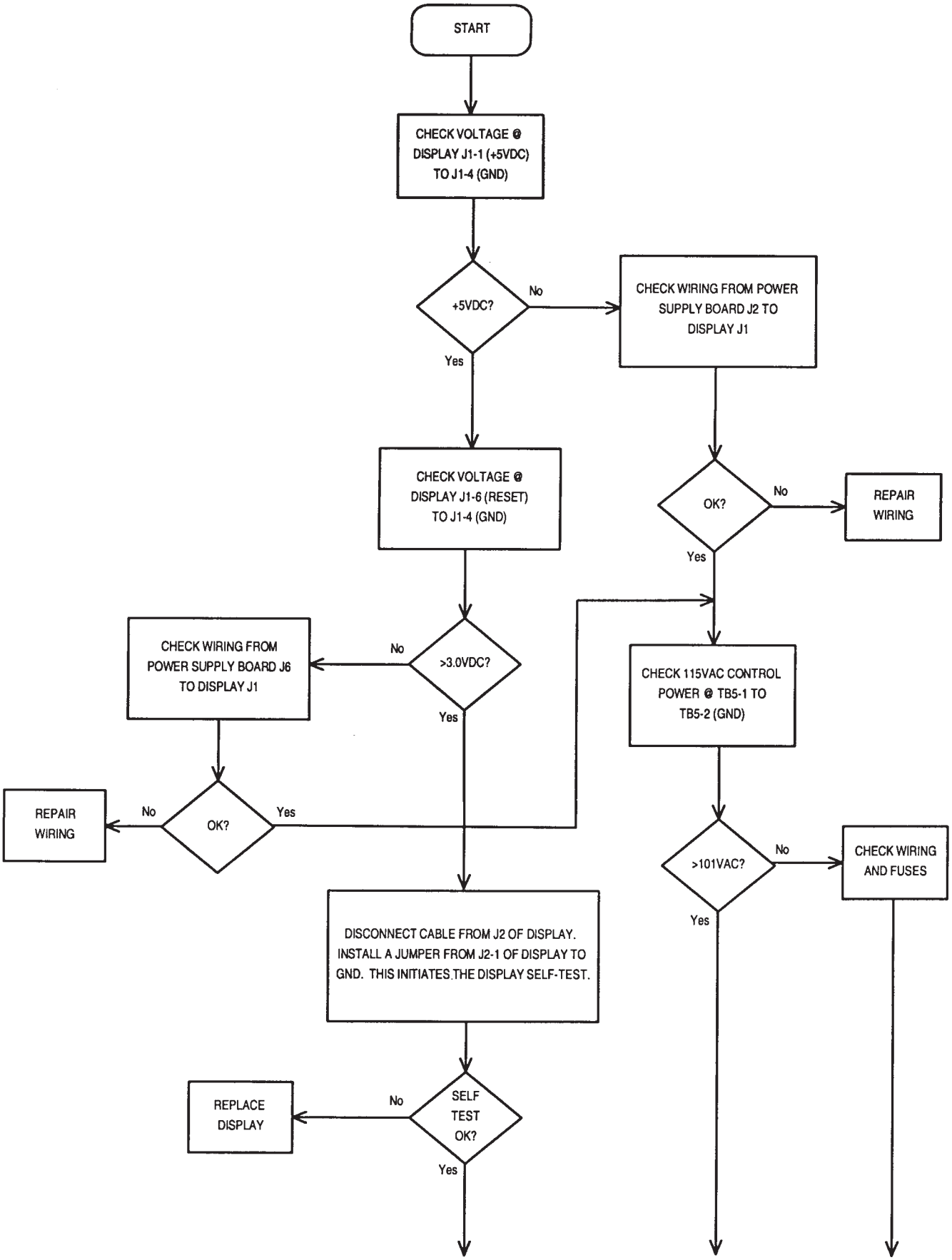


NOTES:

1. Test instrumentation is listed in YORK Form 155.16-NM1 Millennium Absorption Operation and Maintenance.
2. When “Leaving Chilled Water Temp” is selected, the analog voltage displayed is that which is measured at Micro Board IC U53 Pin #7, not Micro Board J19-10.

FIG. 38 (Cont’d)

KEYPAD DISPLAY



(Continued on Page 72)

FIG. 39

LD00214

(Continued from Page 71)

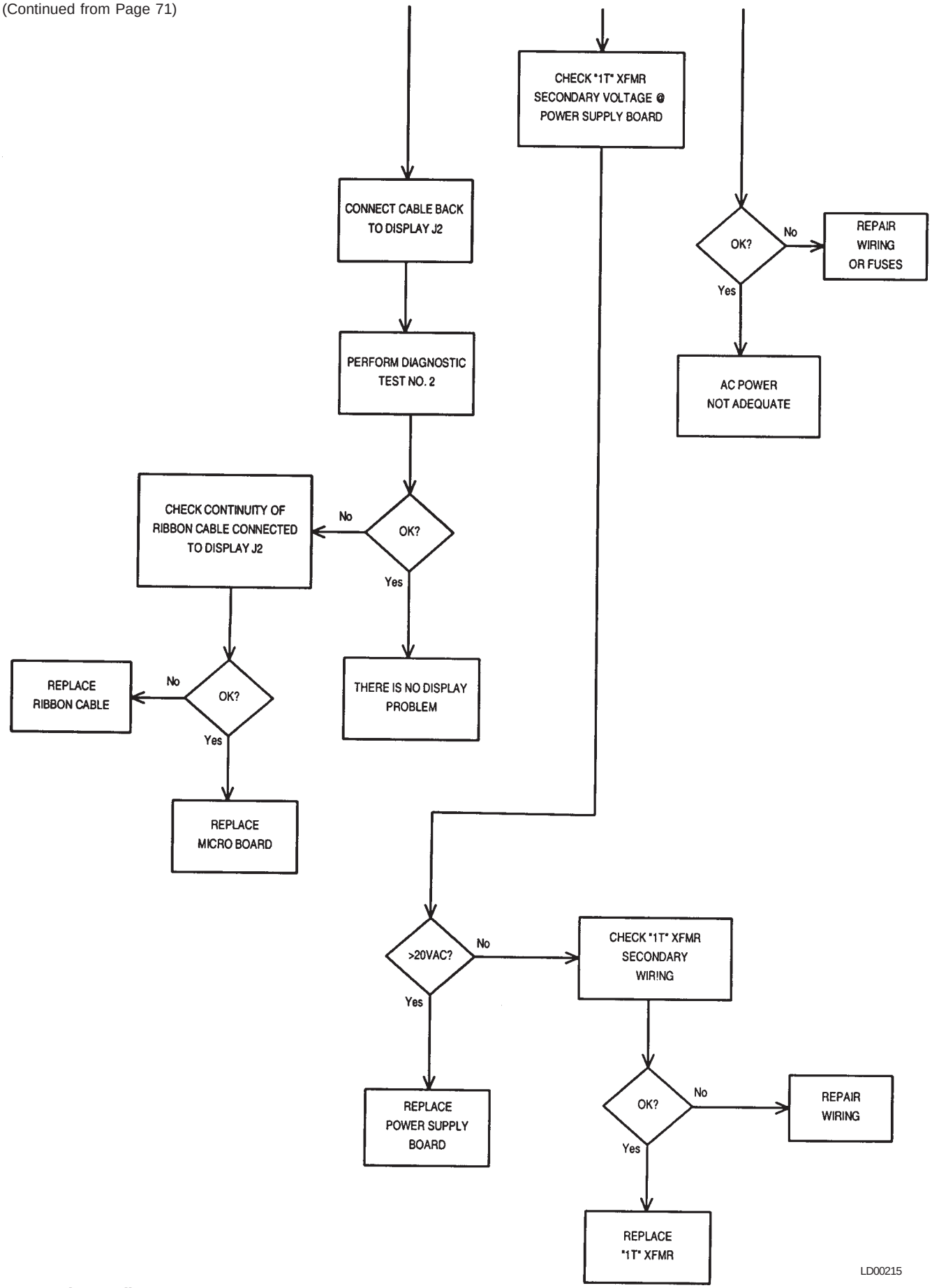


FIG. 39 (Cont'd)

KEYPAD KEYS

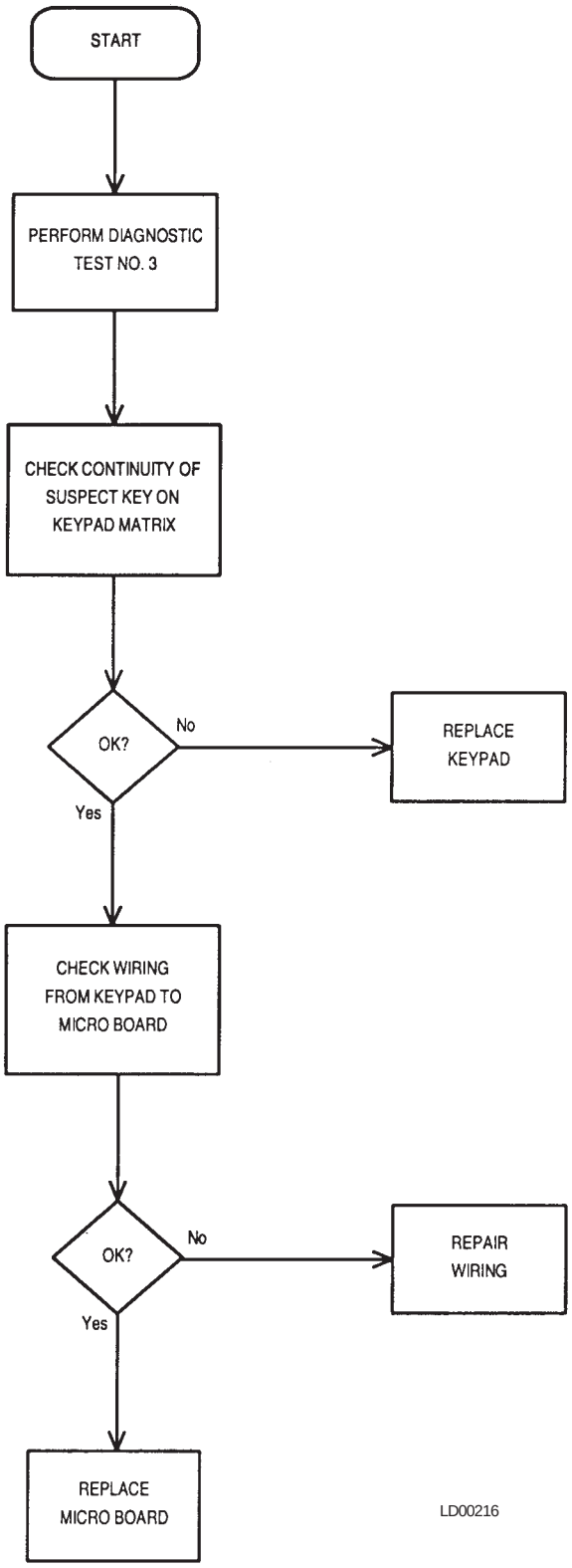


FIG. 40

LEAVING WATER TEMP. REMOTE SETPOINT INTERFACE (0-10VDC, 4-20MA, CONTACT CLOSURE PWM)

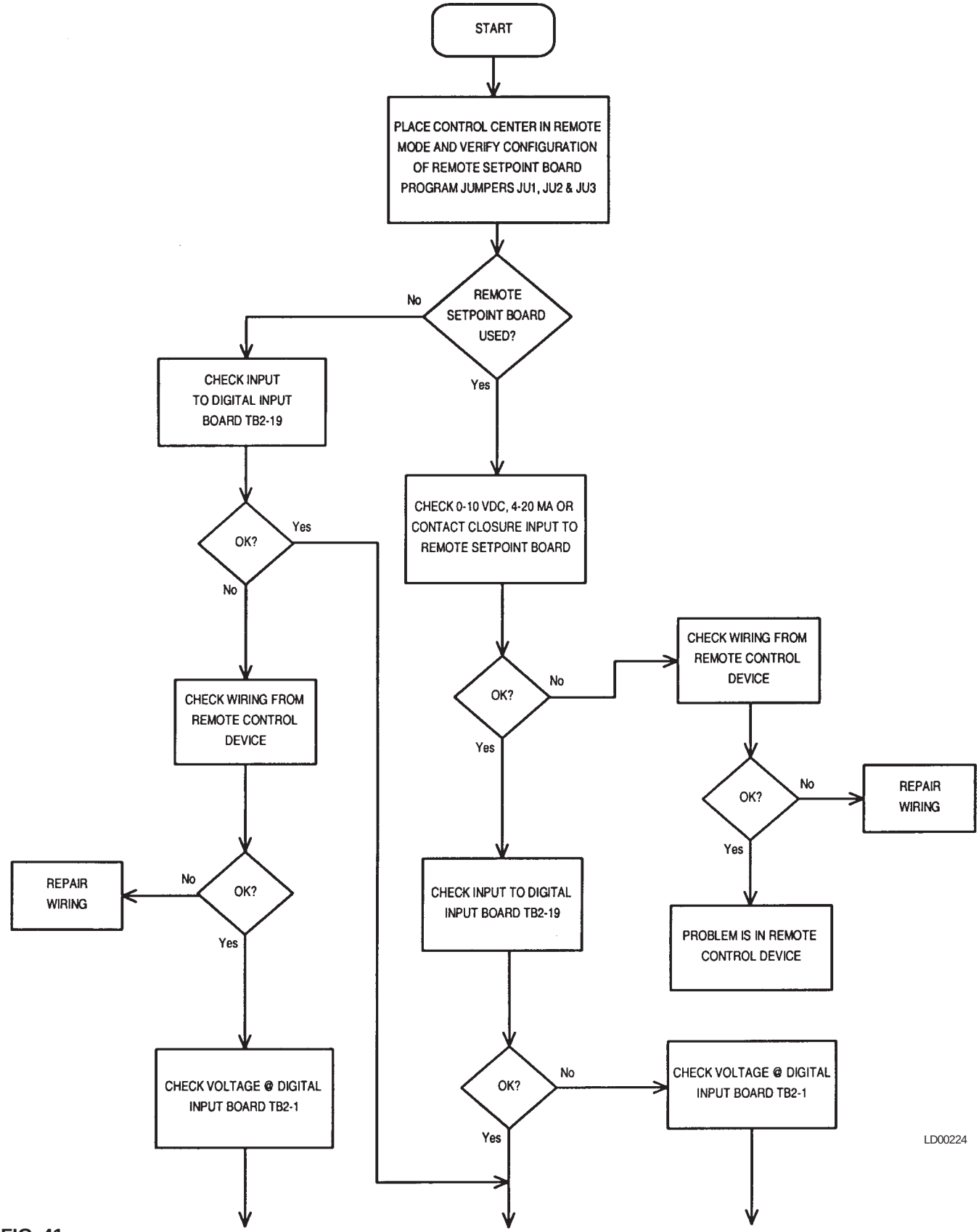


FIG. 41

(Continued on Page 75)

(Continued from Page 74)

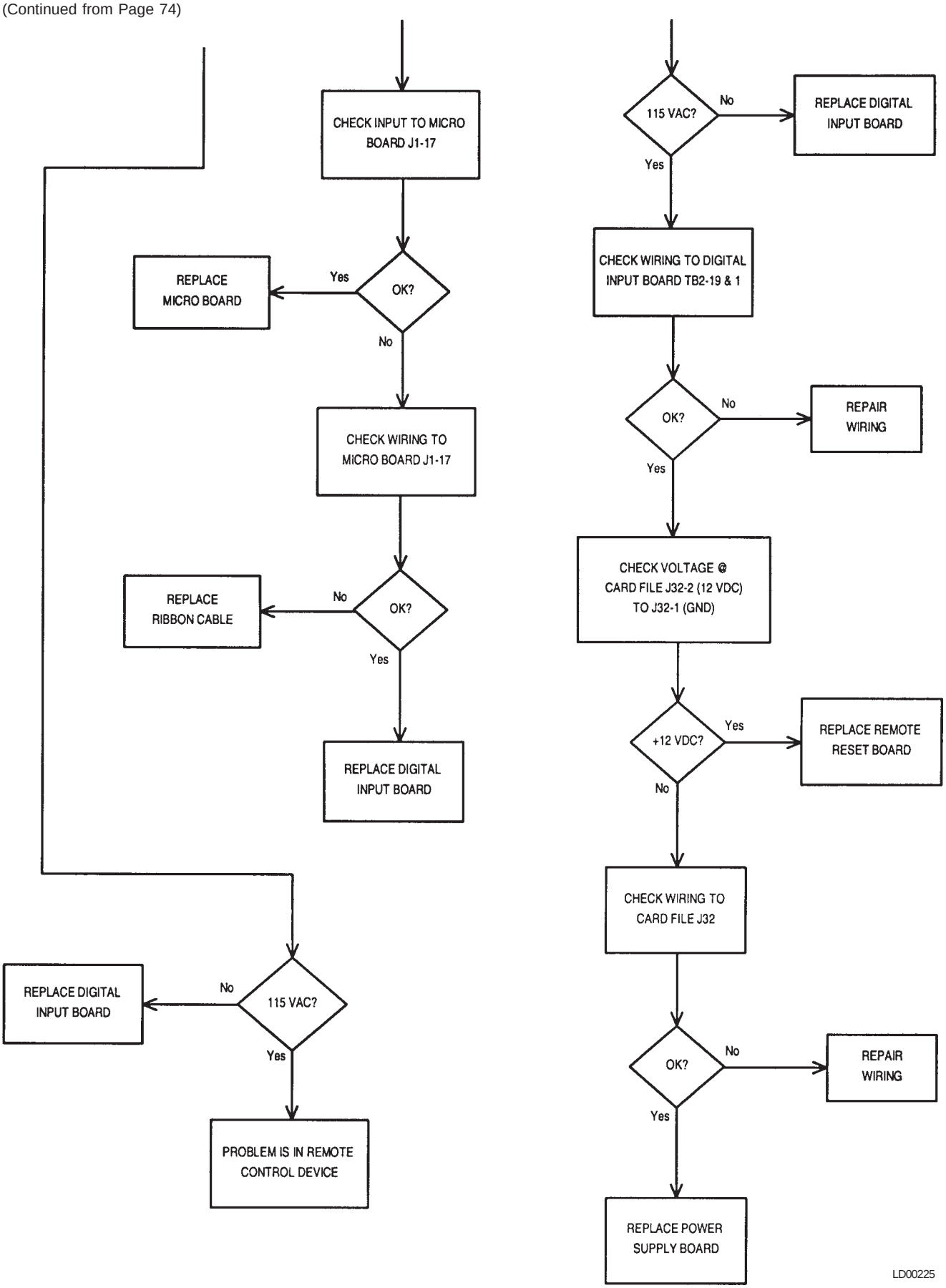
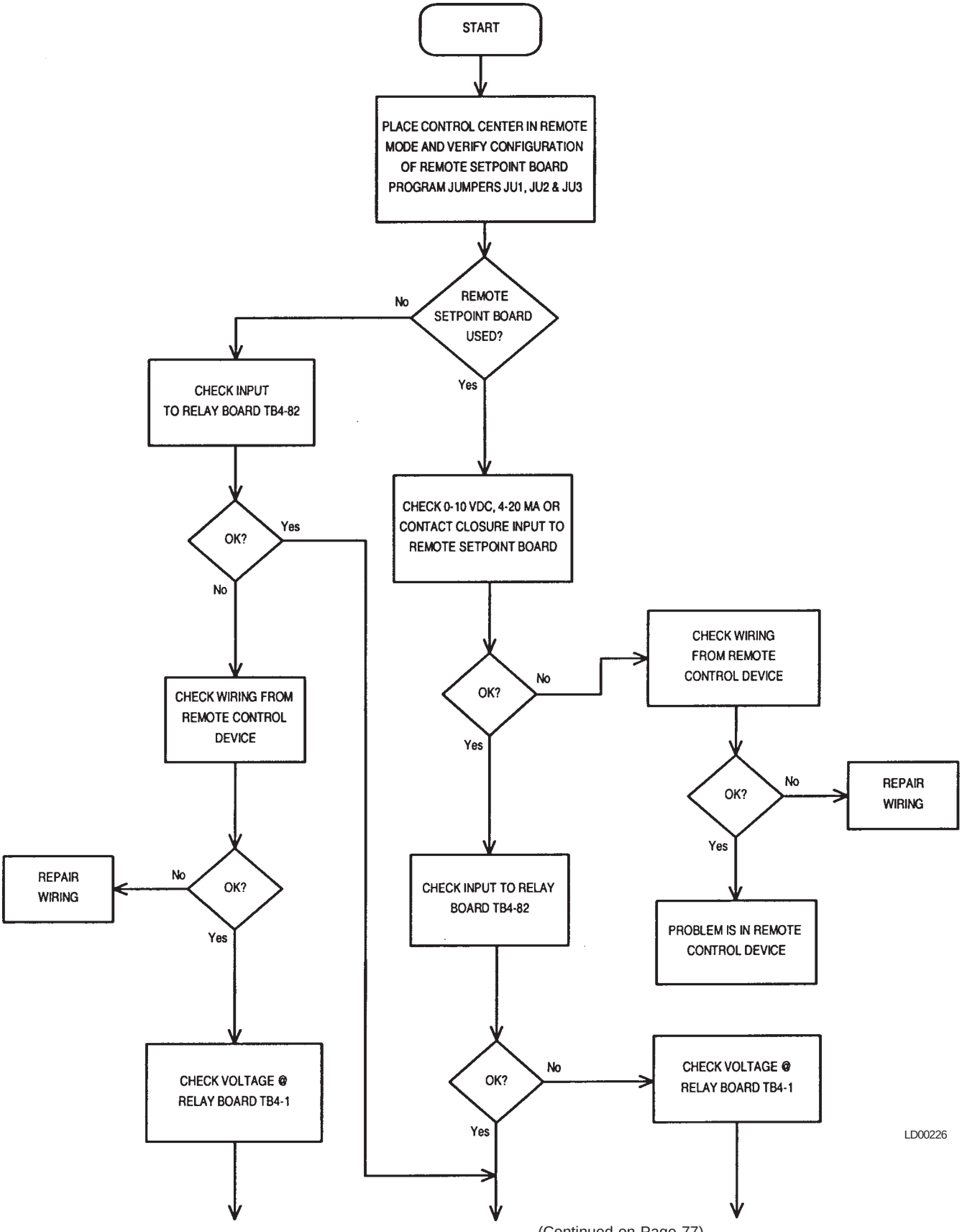


FIG. 41 (Cont'd)

LOAD LIMIT REMOTE SETPOINT INTERFACE (0-10VDC, 4-20MA, CONTACT CLOSURE PWM)



(Continued on Page 77)

FIG. 42

(Continued from Page 76)

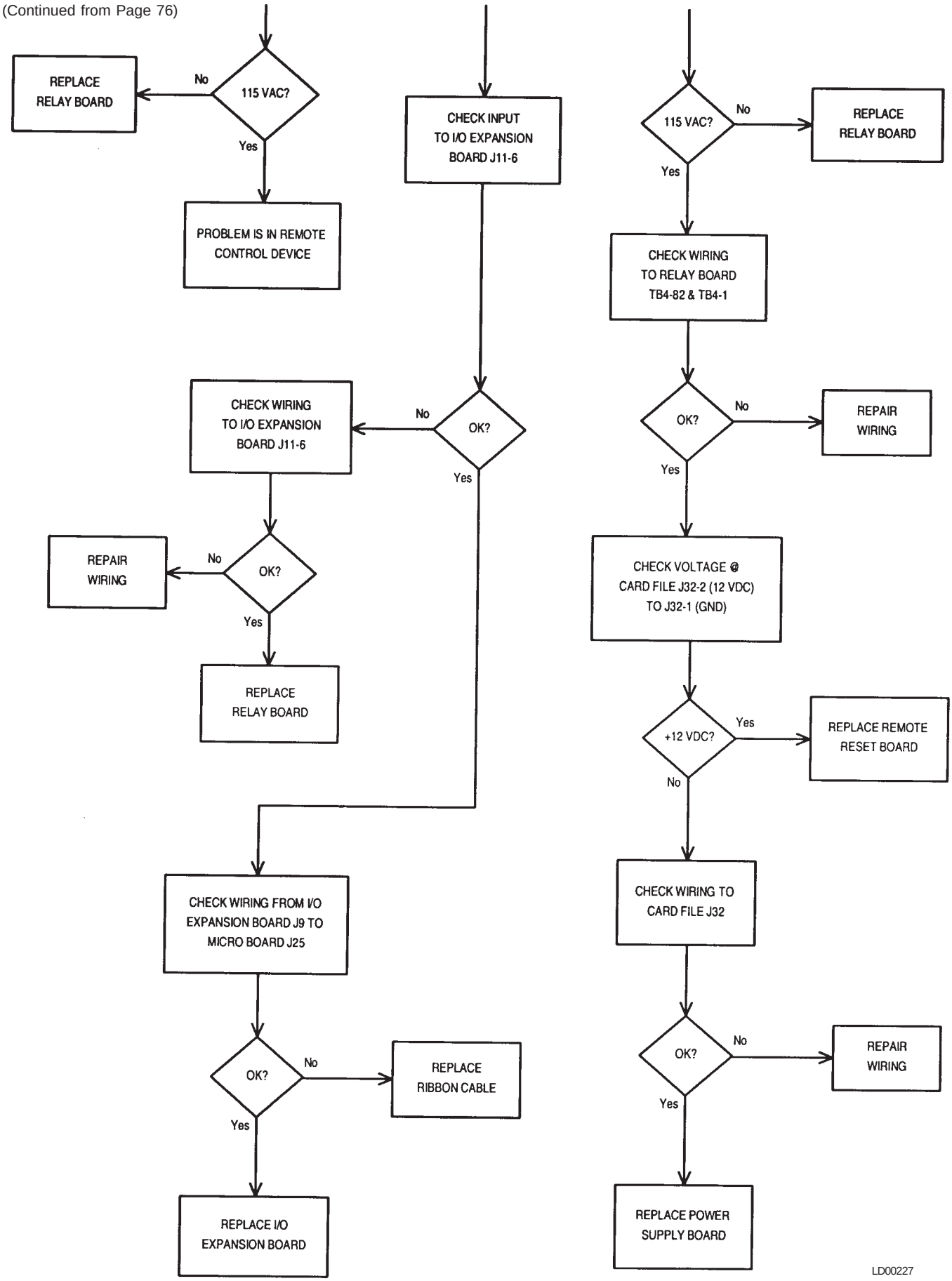


FIG. 42 (Cont'd)

EMI NOISE

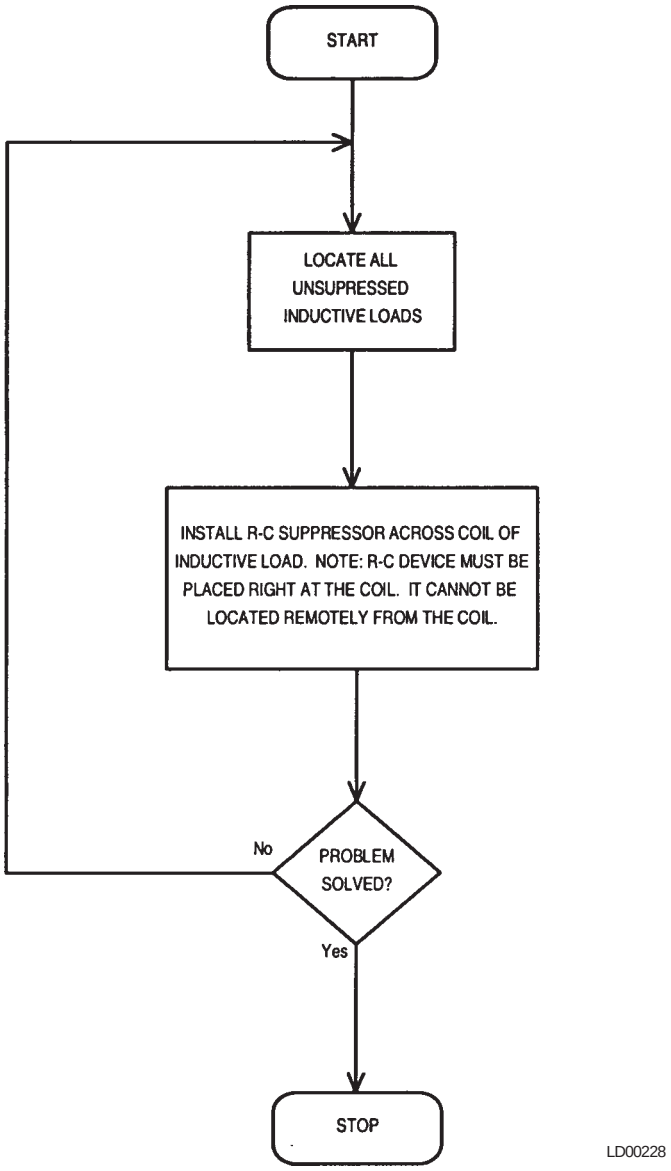


FIG. 43

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