VARIABLE SPEED PUMPING SYSTEMS
INSTRUCTION MANUAL

Technologic® 5500 Series Pump Controller

WARNING LABEL PART #S11550 INSTALLED IN THIS LOCATION. IF MISSING IT MUST BE REPLACED.

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

DESCRIPTION

Microprocessor based dedicated pump controller for variable volume pumping systems. The control panel consists of the following components: microprocessor, operator interface with 4 line display and membrane key pad, 24 VDC power supply. Multi-pinned connecting cables for connection to bypass panels are available as options.

OPERATIONAL LIMITS

See the control panel nameplate for operating voltage, current draw, as well as information on the equipment to be connected to the control panel.

⚠ SAFETY INSTRUCTIONS

This safety alert symbol will be used in this manual and on the Technologic 5500 Safety Instruction decal to draw attention to safety related instructions. When used, the safety alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTION MAY RESULT IN A SAFETY HAZARD!**

Preface

The following manual describes the new microprocessor based Technologic 5500 Controller. This unit is in the tradition of the other members of the Technologic Control Panels as it incorporates many original, novel, and proprietary features that may only be found on B&G controllers. Some of these features require special emphasis here.

The controller is best described as a specific purpose programmable pump controller. This means that the hardware and software have been created for the control and diagnostics of pumps with consideration for their inherent characteristics. This results in an optimum pump controller without the cost of general purpose control hardware. Software is dedicated and established for the unit only after extensive testing. Changes to this software are not taken lightly and must pass rigid version control.

The controller has the unique analog input protection of other members of the control family. In the event of a short circuit condition the current limit circuitry prevents failure of the analog input components.

This new controller has standard manual bypass switches when a Bell & Gossett automatic bypass is supplied. The manual bypass switches allow the user to de-energize the programmable logic controller and take manual control of the pumping system. This is helpful during system startup to confirm pump rotation and to purge air from the system prior to switching to automatic control.

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NOTE: The information contained in this manual is intended to assist operating personnel by providing information on the characteristics of the purchased equipment.

It does not relieve the user of the responsibility to adhere to local codes and ordinances and the use of accepted practices in the installation, operation and maintenance of this equipment.

Further information pertaining to the installation, operation, and maintenance of your Technologic 5500 series pump controller can be found in the I.O.M.s for the associated equipment provided see Section 5, Maintenance, for a list of relevant manuals.

Glossary of Terms

AFD – Adjustable Frequency Drive; converts a constant power input into a variable power output for the motor; a device for controlling motor speed.

Alternation – Process of determining which pump will serve as lead pump and which pump will serve as lag pump.

Bypass – Controller bypasses the AFD, pumps stop running in variable speed mode and run at constant speed (50 Hz / 60 Hz).

Destage – To turn off a lag pump.

EOC – End Of Curve; point at which a pump is staged or destaged.

I.O.M. – Installation Operation Manual.

Lag pump – Standby pump which activates only when lead pump alone cannot efficiently provide sufficient pressure or flow rate.

Lead pump – Duty pump which runs continuously until a standby pump is required.

LED – Light emitting diode, located on OIP and controller.

OIP – Operator Interface Panel.

O.L. – Overload, device to protect a motor from overheating.

PID – Proportional Integral Derivative; 3 variables required for error control.

Process variable – Signal generated by a sensor which is set up to control the system.

Proof timer – Minimum time period before controller acknowledges an input; time period for which a signal must be stable before it is accepted by the controller as a sustained and valid signal.

RTC – Real time clock.

Stage – To start a lag pump

Section 1 - General

1.1 PURPOSE OF MANUAL

1.1.1 This manual is furnished to acquaint you with some of the practical ways to install, operate, and maintain this unit. Read it carefully before doing any work on your unit and keep it handy for future reference.

1.1.2 Equipment cannot operate well without proper care. To keep this unit at top efficiency, follow the recommended installation and servicing procedures outlined in this manual.

1.1.3 ⚠ **SAFETY INSTRUCTION**

This safely alert symbol will be used in this manual and on the unit safety instruction to draw attention to safety related instructions. When used the safety alert symbol means **ATTENTION BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN A SAFETY HAZARD.**

1.1.4 Your Technologic 5500 Series Pump Controller should have a safety instruction decal (part #S11550). If the decal is missing or illegible contact your local B&G representative for a replacement.

1.2 ADDITIONAL SAFETY REQUIREMENTS

1.2.1 Each motor must have a properly sized starter with properly sized overload block to provide overload and undervoltage protection. Ground fault protection should be sized properly. Refer to local electrical codes for sizing and selection.

1.2.2 Refer to the motor manufacturer's I.O.M. (Installation Operation Manual) for specific installation information.

1.2.3 Even when the motor is stopped, it should be considered "alive" as long as its controller is energized. Keep hands away from the output shaft until the motor has completely stopped and power is disconnected from the pump controller.

⚠ **WARNING:** Motor can start automatically. Keep hands away from output shaft until motor is completely stopped and input power is removed from the motor control panel. Lockout main power switch while working near the motor shaft. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1.2.4 The use of motor disconnect switches is acceptable. Consult the factory for proper interlocking with adjustable frequency drives, AFD's. See Section 1.9.

1.2.5 Motor control equipment and electronic controls are connected to hazardous line voltages. When servicing electronic controls, there will be exposed components at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always use accurate test meters when checking electrical components. Always work with another person in case of an emergency. Disconnect power when performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic control or rotating equipment.

⚠ **DANGER:** Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1.3 STORAGE

For long periods of storage, the unit should be covered to prevent corrosion and contamination from dirt. It should be STORED in a clean, dry location between -20 and +60ºC. The relative humidity should not exceed 85%. The unit should be checked periodically to ensure that no condensation has formed. After storage, again check that it is dry before applying power.

NOTE: EXTENDED STORAGE OF AFDs MAY REQUIRE SPECIAL ATTENTION PRIOR TO START-UP. SEE MANUFACTURER'S I.O.M. FOR DETAILS.

1.4 HANDLING

Care should be taken to prevent damage due to dropping or jolting when moving the Technologic Pump Controller. Transportation damage should be brought to the carrier's attention immediately upon receipt.

1.5 TEMPERATURE AND VENTILATION

All electrical equipment is susceptible to failure if operated in ambient temperatures outside of its rating. The OPERATING temperature range for this unit is 0 to 40°C. The relative humidity should not exceed 95% non-condensing. The unit should not be operated outside these extremes.

⚠ **WARNING:** Prevent electrical shocks. Disconnect the power supply before beginning installation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1.6 INPUT VOLTAGE

The AFD and Technologic Pump Controller can be set up to operate across a broad range of voltages. It was factory set to operate on the voltage shown on the nameplate. Check the AFD nameplate for the proper input and output voltages before wiring the AFD.

⚠ **WARNING:** Prevent electrical shocks. Disconnect the power supply before beginning installation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

The voltage tolerance is +10/-5% and phase to phase voltage must not have an imbalance greater than 5 VAC.

1.7 GROUND CONNECTIONS

A grounding terminal is provided for a dedicated ground wire connection. All provisions of the National Electrical Code and local codes must be followed.

⚠ **WARNING:** Conduit grounds are not adequate. A separate ground wire must be attached to the ground lug provided in the enclosure to avoid potential safety hazards. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1.8 POWER WIRING

Power wire types and sizes must be selected based upon conformance with the National Electrical Code and all local codes and restrictions. In addition, only copper (Cu) wire rated for 75°C (minimum) may be used for the power connections. Refer to the input current as listed on the nameplate on the enclosure door when sizing wire.

1.9 OUTPUT/MOTOR DISCONNECT

It is necessary that any device which can disconnect the motor from the output of the AFD be interlocked to the emergency shutdown circuits of the AFD. This will provide an orderly shutdown if the disconnecting device is open circuited while the AFD is in operation. Failure to provide this interlock may result in damaged components due to improper installation.

⚠ **CAUTION:** Metal filings can create electrical short circuits. Do not drill, saw, file or perform any operation on the AFD conduit entry plate while attached to the AFD. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE AND/OR MODERATE PERSONAL INJURY.**

1.10 ANALOG SIGNALS

Shielded cable (#22 AWG, Belden type 8762, Alpha #2411, or equal) should be installed for all D.C. control wiring. The shield must be terminated in the Technologic Pump Controller panel. Do not connect the shield at the other end of the cable! Insulate the shield so that no electrical connection is made at the other end of the cable. A twisted pair of #22 AWG conductors (Belden 8442, or equal) can be used in place of shielded cable. The cable length must be limited to 5,000 feet for #22 AWG wire.

1.11 FIELD CONNECTION DIAGRAMS

1.11.1 Refer to the pump Installation, Operation, and Maintenance Manual for specific details unique to the pump.

1.11.2 Refer to the flow sensor/transmitter Installation, Operation, and Maintenance manual for specific details unique to the flow sensor/transmitter.

1.11.3 The following field connection diagrams should be reviewed prior to unit installation and operation.

Drawing #	Description
Job Specific Print(s)	Wiring Diagram(s) Dimensional Drawings
Job Specific Print	Field Connection Diagram
Job Specific Print	

1.12 SENSOR AND CONTROL WIRING

⚠ **WARNING:** Prevent electrical shocks. Disconnect the power supply before beginning installation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1.12.1 The following sections are based on the installation of standard Technologic 5500 product. Because customized software and hardware is available the installing contractor should base all wiring connections on the wiring diagrams that accompany each controller. These sections are meant to complement, not replace, those wiring diagrams.

1.12.2 Differential pressure switches installed to sense the increase in pressure between the pump suction and discharge gauge taps are used to determine whether a pump is running. Each switch should be wired from the normally closed contact.

1.12.3 To monitor if an adjustable frequency drive is running it is necessary to wire from each AFD's normally open "run" or "on" contact.

1.12.4 For the Technologic 5500 Controller to start and stop each AFD it is necessary to wire to the remote start terminals in each AFD.

1.12.5 Additional wiring to each of the adjustable frequency drives may be required with certain types of controller programs. Refer to the wiring diagram for all connection points.

1.12.6 With certain bypass and control methods it is necessary to disable an adjustable frequency drive from running. This is accomplished by wiring from the Technologic 5500 terminals to each AFD's interlock terminals. Should this wiring be required, any jumpers which may be found on the AFD's interlock terminals should be removed.

1.12.7 The Technologic 5500 control family may be provided with the capability to accept many analog inputs. Typically all analog inputs must be 4-20mA and powered by the 24VDC power supply in the Technologic 5500. All shields must be grounded in the Technologic 5500 only to prevent ground loops and improper signals.

It is not necessary for all analog inputs to be used to monitor system zones. It is necessary, however, that all zone transmitters be connected consecutively starting with zone 1. Optional transmitters (i.e., other than zones) may be supplied.

1.12.8 Analog Input Sensors Powered By Others

The following steps describe the general procedure for rewiring an analog input sensor when the sensor's power source is not the Technologic 5500 controller.

⚠ **WARNING:** Prevent electrical shocks. Disconnect the power supply before beginning installation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

1) Turn off all power to the Technologic 5500 controller

2) Refer to the appropriate controller wiring diagram that was shipped with unit. Locate the analog input sensors on the wiring diagram that will be rewired. They are labeled AI X.

3) Remove the 24 VDC positive (+) wire from TB 40 for the respective analog input sensor connection. This wire needs to be removed completely or terminated if used as a jumper, to avoid any accidental contact with a negative (-) voltage source (i.e. control panel); as this could become a short circuit. Care should be taken to ensure that 24 VDC positive (+) voltage is still provided to any remaining sensors that will still be powered by the Technologic 5500 controller.

4) Remove the 24 VDC negative (-) wire from TB 41 for the respective analog input sensor connection. This wire needs to be removed completely or terminated if used as a jumper, to avoid any accidental contact with a positive (+) voltage source; as this could become a short circuit. Care should be taken to ensure that 24 VDC (-) negative voltage is still provided to any remaining sensors that will still be powered by the Technologic 5500 controller

5) Terminate the negative (-) wire of the sensor to TB 41 of the respective analog input sensor connection. Terminate the positive (+) wire of the sensor to the terminal block which is connected to the positive (+) terminal shown on the Analog input card.

NOTE: Be certain that the power supplied to other terminal blocks has not been interrupted since the wires that have been removed in the proceeding steps may have been used as jumpers.

1.12.9 Drive speed (follower) signals must be wired from the Technologic 5500 Controller to each of the adjustable frequency drives. The AFDs must be configured to accept a 0-10 VDC speed signal with the minimum speed set for 30% (0 VDC) and maximum speed set for 100% (10 VDC). All shields must be grounded in the Technologic 5500 only to prevent ground loops and improper signals.

1.12.10 Hardwire communications refers to the capability of the Technologic 5500 Controller to communicate with an energy management system. Standard communication features are listed below:

1.12.11 Remote Start/Stop

Install a switch as indicated on the wiring diagram. With the LOCAL-REMOTE-OFF switch in the REMOTE position this contact closure will provide the start signal.

1.12.12 Remote Alarm Indication

A digital output rated 8 AMPs at 115V is supplied. This output closes to indicate an alarm condition exists.

1.12.13 User Configurable I/O

The Technologic 5500 Controller comes equipped with the capability to define the operation of any unused input or output signal. Refer to Section 3.15 for detailed information on the I/O setup menus

Section 2 - Installation

2.0 **LOCATION**

2.1 Install the pumping unit appropriately for ease of inspection, maintenance and service. Observe local electrical codes concerning control panel spacing.

⚠ **DANGER:** Heavy load, may drop if not lifted properly. Do not lift the entire unit by the motor eyebolts. Lift the unit with slings placed under the unit base rails. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

2.2 **INSTALLATION OF SKID MOUNTED SYSTEMS WITH FACTORY SUPPLIED PUMPS**

This unit is built to give you years of service; install it properly and provide a suitable foundation. A base of concrete weighing 2-1/2 times the weight of the unit is recommended. (Check the shipping ticket for unit weight.) Tie the concrete pad in with the finished floor. Use foundation bolts and larger pipe sleeves to give room for final bolt location.

2.2.1 Place the unit on its concrete foundation, supporting it with steel wedges or shims totaling 1" in thickness. These wedges or shims should be put on both sides of each anchor-bolt to provide a means of leveling the base.

2.2.2 After the frame has been leveled and securely bolted to the pad, a good grade of grout should be installed beneath the base. A suggested mixture for grout is: one part Portland Cement and two or three parts plain, sharp sand mixed with water until it will pour easily. Commercial grout mixtures with suspended iron particles are available. Wet the concrete base before pouring grout. To hold wedges or shims in place, allow the grout to flow around them and beneath the entire length of the base flange.

2.2.3 Important. Do not install and operate the Bell & Gossett Technologic 5500 pump controller in a closed system unless the system is constructed with properly sized safety and control devices. Such devices include the use of properly sized and located pressure relief valves, compression tanks, pressure controls, temperature controls and flow controls as appropriate. If the system does not include these devices, consult the responsible engineer or architect before making pumps operational.

⚠ **DANGER:** The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and releases of high temperature fluids. This will be prevented by installing properly sized and located pressure relief valves and compression tanks. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PROPERTY DAMAGE AND SERIOUS PERSONAL INJURY OR DEATH.**

2.2.4 Eccentric increasers can be used in the suction lines when increasing the pipe size, with straight sides of increaser on top to eliminate air pockets. Be sure to eliminate any pipe strain on the unit. Support the suction and discharge pipes independently by use of pipe hangers near the unit. Line up the vertical and horizontal piping so that the bolt holes of the flanges match. DO NOT ATTEMPT TO SPRING THE SUCTION OR DISCHARGE LINES INTO POSITION.

2.2.5 As a rule, ordinary wire or band hangers are not adequate to maintain alignment. It is very important to provide a strong, rigid support for the suction line. A saddle hanger is recommended.

2.2.6 For critical installations, equipment for absorbing expansion and vibration should be installed in the inlet and outlet connections of the unit.

2.2.7 Before starting, all pumps and motors should be checked for proper lubrication.

2.3 PUTTING THE UNIT INTO SERVICE

2.3.1 PUMP ROTATION, 3 PHASE MOTORS ONLY

> ⚠ **CAUTION:** Seal damage may occur. Do not run pump dry. Fill and vent the pump volute prior to operation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE AND/OR MODERATE PERSONAL INJURY.**

> ⚠ **WARNING:** Rotating shafts can catch loose clothing. Do not operate the pump without all guards in place. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

With the disconnect switch engaged to the "ON" position, momentarily start and stop each motor . Observe the pump shaft rotation.

2.3.2 If a Bell and Gossett bypass panel is supplied, place the AUTO-OFF-HAND switch in HAND. In the HAND position the controller is off and the user has local control of the pumps through the DRIVE-BYPASS switches. Momentarily start the pump in the DRIVE and BYPASS mode.

2.3.3 If incorrect, turn the main disconnect off and refer to Section 4.9.

2.3.4 While the unit may be hydro tested at the factory to internal quality standards, there may be some joints that are not pressure tested. Some joints may have also been loosened to allow for draining of the system, and not retightened. Thus, some joints may be loose for due to system grainage or shocks during the shipping process.

All flanged joints are to be checked for tightness and proper torque of the flange bolts prior to filling the system with fluid. See the next section for proper setup.

> ⚠ **WARNING:** Failure to check all joints for tightness, and flange bolts for proper torque, could result in leaks and/or flooding. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

Section 3 - Setup and Features

3.1 GENERAL NOTES

3.1.1 The HELP key can be pressed at any time without disrupting system operation. The HELP key will give details on alarm conditions or if used in conjunction with any function key will give a detailed explanation of the function key application.

3.1.2 The key names are shown as CAPITAL LETTERS and the operator interface responses are shown as bold **CAPITAL LETTERS**.

3.1.3 On data input screens the ENTER key can be used to advance to the next item, the CLEAR key can be used to return to the previous item.

3.1.4 When the green LED's on the PREV. SCREEN or NEXT SCREEN keys are flashing the keys can be pressed to navigate to neighboring screens.

3.2 POWER-UP

> ⚠ **WARNING:** Electrical shock hazard. Inspect all electrical connections prior to powering the unit. Wiring connections must be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

3.2.1 Put LOCAL-REMOTE-OFF (LRO) switch in the LOCAL position. Put the optional AUTO-OFF-HAND switch in the AUTO position.

> ⚠ **WARNING:** Electrical shock hazard. Multiple power sources. The off position of the LOCAL-REMOTE-OFF switch does not disconnect all of the power sources in the technologic panel, All power sources must be disconnected prior to entering the control panel. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

3.2.2 Turn main disconnect on.

3.2.3 The operator interface will display the Technologic Pump Controller default screen.

3.2.4 The START-STOP LED will be flashing.

3.2.5 If the START-STOP LED is not illuminated as described above, press the START-STOP button once to light the LED.

3.2.6 The Auto-Manual LED should be green for auto operation. The display should also indicate **MANUAL** in the lower right hand corner. If not, press the AUTO-HAND key to enter the operation mode menu, press the SET POINT/2 key, then the ENTER key to select manual operation.

3.3 **SETUP**

3.3.1 Upon powering up the controller the display will light and show the following:

TECHNOLOGIC PUMP
CONTROLLER
MM/DD/YY   HH:MM:SS A/P
Normal   Manual

The current date and time will be displayed on the third line.

3.3.2 Press the SETUP/3 key once and the following will be displayed:

SETUP SELECTION: 0
1 = SENSORS   4 = TEST
2 = PUMPS   5 = DEFAULT
3 = SYSTEM   0 = EXIT

3.3.3 A detailed description of each setup menu item follows.

3.4 **SENSOR SETUP**

3.4.1 Press the PROCESS VARIABLE/1 key at the Setup Selection menu. Then press the ENTER key.

3.4.2 The display will show:

SENSOR NO: #

Press the numeric key(s) for the sensor you wish to set up. The sensor number is limited to the maximum number of sensors allowed, typically 16. Press the ENTER key to proceed with the set up.

3.4.3 The display will now show:

SENSOR NO #
1 - Edit 2 - Copy : #
**   0 – Exit**

Press the PROCESS VAIABLE/1 and ENTER keys to edit the sensor setup. Continue to section 3.4.4

Press the SET POINT/2 and ENTER keys to from an existing sensor 3.4.6.

3.4.4 When sensor is set up the display will show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS,
TEMP, PR SNS, DELTA T, or NONE)
SPAN= # ZERO= #
PV: (Y or N) SET POINT NO: ##
OVERRIDE: (Y or N) OK? (Y/N)

Press the YES/7 and ENTER keys to accept the values and continue to section 3.4.6.

Press the NO/0 and ENTER keys to set up each field and skip to section 3.4.7.

3.4.5 If the sensor is not set up, the display will show:

SENSOR NO ## NONE
SPAN= 0 ZERO= 0
**   OK? (Y/N)**

Press the YES/7 and ENTER keys to accept the values and continue to section 3.4.16.

3.4.6 The displays will show:

Copy to Sensor No: #
From Sensor No: #
**   OK (Y/N)**

The copy to sensor number will refer to the sensor number for which the setup is being performed.

The from sensor will be the sensor from which the information will be copied from.

To change this valve, enter the approprite number using the key pad. Then press Enter to accept the valve.

Press the YES/7 and Enter keys to accept the values and proceed to section 3.4.4

Press the NO/0 and ENTER keys to set up each field and continue to section 3.4.7.

3.4.7 If YES is selected at the sections 3.4.4 or 3.4.5; or NO is selected from 3.4.6 the following is displayed:

DO ANOTHER ? (Y/N)
Press the YES/7 and ENTER keys to set up another sensor. Return to section 3.4.2 and repeat for all remaining sensors.

Press the NO/0 and ENTER keys to return to the setup selection screen.

3.4.8 If NO is selected at section 3.4.3, the following is displayed:

NO: ## SENSOR TYPE: #
1 = DP, 2 = PR, 3 = Flow
4=KW, 5 = Temp, 6 = DT
7 = SysDP, 8 = SysKW, 0 = None

The following selections are valid.

1 = DP: Differential Pressure, the display will show units in PSID.
2 = PR Sns: Pressure, the display will show units in PSI.
3 = Flow: Capacity, the display will show units in GPM.
4 = KW Sns: Power, the display will show units in KW.
5 = Temp: Temperature, the display will show units in °F.
6 = Delta T: Differential Temperature, the display will show units in °F
7 = SysDP: System Differential Pressure, the display will show units in PSID.
0 = Non-standard transmitter, units will not be displayed.

3.4.9 Enter the numeric key for the type of sensor you are setting up. Press the ENTER key. The display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS,
TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####

3.4.10 Obtain the span of the sensor from the nameplate on the sensor. Enter the span by pressing the appropriate numeric keys followed by the ENTER key.

3.4.11 The display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = ####

Typically the variable value is zero at 4mA for many sensors. An exception would be for a temperature sensor. Enter the desired zero value by pressing the appropriate numeric keys followed by the ENTER key.

3.4.12 The display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = #####
PV: (Y or N) (Y/N)

Press the YES/7 key for all sensors that will control the system by supplying a process variable feedback signal. Typical process variable signals are supplied by <u>one</u> of the following: Pressure, Differential Pressure, Temperature, or Differential Temperature Sensors.

Press the NO/0 key for all sensors that supply optional signals. Typical optional signals are supplied by <u>any</u> of the following: System Differential Pressure, Temperature Differential Temperature, Flow, and KW Sensors.

Press the ENTER key to continue.

3.4.13 If NO is selected at the above section, skip to section 3.4.13. If YES is selected at the above section, the display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = #####
PV: Y   SET POINT NO   ##

Enter a set point number by using the numeric key pad. Enter the number zero for all sensors that do not supply the process variable. Press the ENTER key.

Make sure the setpoint number agrees with the sensor number, example sensor 5 should be configured for setpoint 5. Defining the value associated with the setpoint number is defined in Section 4.14.

3.4.14 The display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = #####
PV: Y   SET POINT NO ##
OVERRIDE: (Y or N) (Y/N)

The controller is capable of accepting sensor input either through a 4-20mA analog input or through the RS-485 communication port. The communication port must be set up properly and connected to an external building automation system. The LOCAL-REMOTE-OFF switch must be in the REMOTE position to allow the controller to receive sensor information via the RS-485 port.

Press the YES/7 key to receive sensor signals via the RS-485 port. Press the ENTER key.

Press the NO/0 key to receive the sensor signals via the analog input card. Press the ENTER key.

3.4.15 The display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = #####
PV: Y   SET POINT NO ##
OVERRIDE: (Y or N) OK? (Y/N)

Press the NO/0 and ENTER keys to correct any errors. By pressing the PREV SCREEN or NEXT SCREEN keys, correct the item in error.

Press the YES/7 and ENTER keys after confirming all variables are correct.

Skip to section 3.4.14

3.4.16 If NO was selected at section 3.4.9, the display will now show:

SENSOR NO ## (FLOW, DP, SYSDP, KW SNS, TEMP, PR SNS, or DELTA T, SYS KW)
SPAN = #####   ZERO = #####
PV: N
                              OK? (Y/N)

Press the NO/0 key then ENTER to correct any errors. After pressing the ENTER key, press the PREV SCREEN or NEXT SCREEN keys to correct the item in error.

Press the YES/7 key after confirming all variables are correct.

3.4.17 The screen will now display:

DO ANOTHER ? (Y/N)

Press the YES/7 key if additional sensors must be set up. Return to section 3.4.2 and repeat for all remaining sensors.

Press the NO/0 key to return to the setup selection screen.

Press ENTER to continue.

3.5 **PUMP SETUP**

3.5.1 Press the SET POINT/2 key at the Setup Selection menu. Then press the ENTER key.

3.5.2 The display will show:

 # PUMPS = #
P1: *   P2: *   P3: *
P4: *   P5: *   P6: *
OK ? (Y/N)

* The pump status will be displayed for each defined pump. The valid options are as follows:

N/A = pump not available as defined by setup
Rdy = pump available, not running
On = pump is running
Off = pump disabled, will not be allowed to start

⚠ **DANGER:** High voltage 3 phase power can kill. Pumps can start automatically. Disconnect and lock-out power prior to servicing pumps. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

Press the YES/7 and ENTER keys to accept pump configuration and return to setup selection screen.

Press the NO/0 and ENTER key to set up any pumps.

3.5.3 The screen will now display:

TOTAL # PUMPS = #

Press the numeric key for the total number of pumps (1 to 6 pumps). Press ENTER to continue.

3.5.4 The screen will now display:

EDIT PUMP ? (Y/N)

Press the YES/7 and ENTER keys if any of the pumps must be set up.

Press the NO/0 and ENTER keys to return to the pump status screen and return to section 3.5.2.

3.5.5 The display will show:

EDIT PUMP # #

Press the numeric key(s) for the pump you wish to set up. The pump number is limited to the maximum number of pumps. Press the ENTER key to proceed with the set up.

3.5.6 The screen will now display:

PUMP # #
ENABLE/DISABLE: #
1=ENABLE   0=DISABLE

Press the PROCESS VARIABLE/1 and ENTER keys if the pump will be enabled.

Press the NO/0 and ENTER keys if the pump will be disabled.

3.5.7 The screen will now display:

DO ANOTHER ? (Y/N)

Press the YES/7 and ENTER keys to set up another pump. Return to section 3.5.5 and repeat for all remaining pumps.

Press the NO/0 and ENTER keys to return to the pump status screen and return to section 3.5.2.

3.6 **SYSTEM SETUP**

3.6.1 Press the SETUP/3 key at the setup selection menu. Press the ENTER key.

3.6.2 The display will now show:

SELECTION: #   0 = EXIT
1 = STAGE/DESTAGE
2 = PID
3 - ALARMS

Press the NEXT SCREEN key.

The display now shows:

SELECTION: #   0 = EXIT
4 = ALTERNATION
5 = BYPASS
6 = AFD

Press the NEXT SCREEN key.

The display now shows:

SELECTION: #   0 = EXIT
7 = DATE/TIME
8 = PASSWORD
9 = I/O SETUP

Press the NEXT SCREEN key. The display now shows:

SELECTION: #   0 = EXIT
10 = COMMUNICATION
11 = SPECIAL FUNCTIONS
12 = CHANGE LANGUAGE

Press the NEXT SCREEN key. The display now shows:

SELECTION: #   0 = EXIT
13 = SAVE TO FLASH
14 = LOAD FROM FLASH
15 = SET BRITE/CNTRST

Use the appropriate numeric key to select the setup menu desired, press the ENTER key. A detailed description of each menu follows.

3.7   **STAGE/DESTAGE SETUP**

3.7.1   The first screen is displayed below:

> **SELECTION: #**
> **1 = PV STG   2 = PV DESTG**
> **3 = EOC STG   4 = EOC DEST**
> **0 = EXIT**

By pressing the appropriate numeric key and ENTER, the setup can be completed. See the following table for all Stage/Destage menu items.

When setting up the system, recording configuration values in the 'Field Value' column allows this manual to serve as a future reference.

	STAGE/DESTAGE SETUP MENU ITEMS			
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Pv Stg	**Stg Spd: ##%** The maximum speed at which the lead pump will operate prior to starting a lag pump, %.	95	0-100	
Pv Stg	**Stg Proof Timer: ### s** Proof timer prior to starting lag pump, seconds.	30	0-999	
Pv Stg	**Stab Timer: ###s** Staging stabilization time, delay prior to calculating destage value, seconds.	60	0-999	
PV Destg	**Destage: ###%** Enter the percentage of the stabilized speed at which the lag pump will stop, %.	85	0-100	
PV Destg	**Destg Pr Timer: ### s** Proof timer prior to stopping lag pump, seconds.	30	0-999	
PV Destg	**HD Spd: ### %** The lowest speed at which parallel pumps will operate prior to destaging the lag pump, %.	50	0-100	
PV Destg	**HD Pr Tm: ### s** The proof timer prior to destaging the lag pump when operating below the HD speed, seconds.	30	0-999	
EOC Stg	**Pump Max Flow: #####** The maximum flow allowable prior to starting a lag pump, GPM.	0	0-65,535	
EOC Stg	**Stg Proof Tm: ###s** Proof timer prior to end of curve staging, seconds.	30	0-999	
EOC Stg	**Flow offset: ### gpm** Flow rate of constant speed pump supplying variable speed pump, input only required on series pumping applications. The flow rate of the constant speed pump is deducted from the total system flow rate in order to provide end of curve protection for the variable speed pump.	0	0-999	
EOC Dest	**Destage Flow: ### %** Enter the percent of stabilized flow at which the lag pump is destaged, %.	45	0-100	
EOC Dest	**Destage Pr TM: ###s** Proof timer prior to destaging lag pump, seconds.	30	0-999	

3.8   PID SETUP

3.8.1   See the following table for all PID menu items.

PID MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
PID	**PID-P ###** Enter the desired proportional value.	200	0-999	
PID	**PID-I ###** Enter the desired integral value.	5	0-999	
PID	**PID-D ###** Enter the desired derivative value.	1	0-999	
PID	**Reversed ?** Enter NO for direct acting control which increases output as process variable falls below setpoint. Enter YES for reverse acting control which increases output as process variable rises above setpoint.	N	Y or N	
PID	**SP Deviation ###** Enter the value for the number of PV units at which a dead band will be created around the setpoint. The PID will be modified within the dead band per the index setting below.	0	0-999	
PID	**Index ###** Enter a value to buffer the response of the PID while operating in the dead band defined above. Index = 1 no impact Index = 999 maximum buffer.	0	0-999	

3.9   ALARM SETUP

3.9.1   See the following table for all alarm menu items.

ALARM MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Alarms	**AFD Fail Pr Tm: ###s** The proof timer prior to setting the AFD fail alarm, seconds.	20	0-999	
Alarms	**Pump Fail Pr Tm: ###s** The proof timer prior to setting the pump fail alarm, seconds.	30	0-999	
Alarms	**O.L. Fail Pr Tm: ###s** The proof timer prior to setting the O.L. fail alarm, seconds.	10	0-999	
Alarms	**Reset Tm: ###s** The time delay between pressing the RESET key and restarting the pumps in variable speed mode. Allows for pump deceleration, seconds.	10	0-999	

3.10   **ALTERNATION SETUP**

3.10.1   See the following table for all alternation menu items.

	ALTERNATION MENU ITEMS			
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Alternation	**Time Between: ###hr** Enter the time between automatic alternation cycles, hours.	0	0-999	
Alternation	**Duration: ###s** The amount of time allowed to decelerate the running pump(s) and start the new lead pumps, seconds.	20	0-999	

3.11   **BYPASS SETUP**

3.11.1   See the following table for all bypass menu items.

	BYPASS MENU ITEMS			
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Bypass	**No of AFDs Fail to go to bypass: #** Enter the number of AFDs that are required to fail prior to running the pump(s) across the line. Generally the number of drives controlled by the system.	0	0-6	
Bypass	**No of Pumps go to bypass: #** After the number of AFDs fail as per above, this item determines the maximum number of pumps allowed to start in bypass. Before setting for all available pumps confirm that the system can handle the flow.	0	0-6	

3.12   AFD SETUP

3.12.1   See the following table for all AFD menu items.

<table>
<tr><th colspan="5">AFD MENU ITEMS</th></tr>
<tr><th>Menu Item</th><th>Variable</th><th>Default</th><th>Range</th><th>Field Value</th></tr>
<tr><td>AFD</td><td>**AFD Min Spd: ###%**
Enter the percent speed at which the AFD will operate with the speed follower signal minimized.</td><td>30</td><td>0-99</td><td></td></tr>
<tr><td>AFD</td><td>**AFD Max Spd: ###%**
Enter the percent speed at which the AFD will operate with the speed follower signal maximized.</td><td>100</td><td>0-999</td><td></td></tr>
<tr><td>AFD</td><td>**Reset Tm: ###s**
Enter the time it takes the AFD to reset after detecting a self protecting fault, seconds. Refer to the AFD manufacturer's setup manual for proper set up.</td><td>0</td><td>0-999</td><td></td></tr>
<tr><td>AFD</td><td>**Reset NO.: ##**
Enter the number of resets the AFD will attempt after detecting a self protecting fault prior to determining that the AFD is in the fault condition. Refer to the AFD manufacturer's setup manual for proper set up.</td><td>0</td><td>0-10</td><td></td></tr>
<tr><td>AFD</td><td>**All PV Fail Spd = ###**
Enter the % speed for the drive(s) to operate at in the event that all zones fail.</td><td>100</td><td>0-100</td><td></td></tr>
<tr><td>AFD</td><td>**# of Pumps = #**
Enter the number of pumps that should operate at the above speed in the event that all zones fail.</td><td>1</td><td>0-6</td><td></td></tr>
</table>

3.13   **DATE/TIME SETUP**

3.13.1   See the following table for all date/time menu items.

DATE/TIME MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Date/Time	**MM** Enter the current month using both digits, example Jan. should be entered as 01.			
Date/Time	**DD** Enter the current date using both digits, example the 6th should be entered as 06.			
Date/Time	**YYYY** Enter the current year using all 4 digits.			
Date/Time	**HH** Enter the hours using the 24 hour format, example 9:00 p.m. should be entered as 21.			
Date/Time	**MM** Enter the minutes using both digits.			
Date/Time	**Display 24 Hour Format: ? (Y/N)** Enter yes to display the time in the 24 hour format. Enter no to display the time in AM/PM format.	N	Y or N	
Date/Time	**Daylite Savings Tm: ?(Y/N)** Enter yes for automatic set back during daylight savings time. Enter no to disable the automatic setback during daylight savings time.	N	Y or N	

3.14   **PASSWORD SETUP**

3.14.1   See the following table for all PASSWORD menu
items ← table missing.

PASSWORD MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Password	**ENABLE PASSWORD TO SETUP MENU: ?** Enter yes for password protection of the entire setup menu.	N	Y or N	
Password	**ENABLE PASSWORD TO SET POINT MENU: ?** Enter yes for password protection of the entire set point menu.	N	Y or N	
New Password	**ENTER NEW PASSWORD** > _ _ _ _ _ _< If either of the above are set to yes this screen prompts the user to define the password.	None	0-999999	
Verify	**VERIFY THE PASSWORD** PASSWD >_ _ _ _ _ _< After entering data in password definition screen this screen requires the user to confirm the requsted password. If the confirmed number does not agree with the first number the Enter New Password screen is repeated to allow the user to get both input screens to agree.			

3.15   I/O SETUP

3.15.1   See the following table for all I/O menu items.

> **NOTE:** The total available number of I/O to be config-
> ured is dependent on the system setup. Complete all
> previous setup screens, specifically pumps and sen-
> sors prior to completing the following.

I/O MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
DI	**Opt. DI ####** Enter the input to be configured as it appears on the digital input module. The first digit is the rack number. The second digit is the slot number. The third and fourth digits are the input numbers. For example, a digital input configured on rack 0, slot 0, input 1 would be encoded as 0001	N/A	0-9999	
DI	**Avail: ##** This screen can not be modified. It is here to advise the user of how many digital inputs can be customized	N/A	0-99	
DI	*** Code: ###** Enter the code to define the desired functionality of the input. Valid codes are defined in the Appendix C of this manual.	0	0-255	
DI	**Delay: ###s** Enter the proof timer in seconds.	0	0-999	

Menu Item	**Variable**	**Default**	**Range**	**Field Value**
DO	**Total Avail. DO = O** This screen can not be modified. It is here to advise the user of how many digital outputs can be customized	N/A	0-99	
DO	*** DO No: ####** Enter the output to be configured as it appears on the digital output module. The first digit is the rack number. The second digit is the slot number. The third and fourth digits are the input numbers. For example, a digital output configured on rack 2, slot 1, input 1 would be encoded as 2101	N/A	0-9999	
DO	*** Code: ###** Enter the code to define the desired functionality of the output. Valid codes are defined in the Appendix C of this manual.	0	0-255	

Menu Item	Variable	Default	Range	Field Value
AO	**Total Avail. AO = O** This screen can not be modified. It is here to advise the user of how many analog outputs can be customized	N/A	0-99	
AO	*** AO No: ##** Enter the output to be configured as it appears on the wiring diagram. The analog output card can be configured for 0-10VDC or 4-20mA signals. Remove the card from the rack, there are two switches below the pin connector on the back of the card. The bottom switch #1 configures the first analog output. The top switch #2 configures the second analog output. Select position "U" for 0-10VDC and position "I" for 4-20mA output signals.	N/A	0-99	
AO	*** Code: ###** Enter the code to define the desired functionality of the output. Valid codes are defined in the Appendix C of this manual.	0	0-255	
	* NOTE: If a programming error is made, ERROR is shown on the display. An error is due to reprogramming an input that is currently used by the system or inputting an undefined code number.			

3.16   **COMMUNICATION SETUP**

3.16.1   See the following table for all communication menu
         items.

COMMUNICATION MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
COM	**COMM. Setting, Select: #** Select the software protocol to drive the communications on the optional RS-485 port. 1 = Bacnet, 2 = JC N2, 3 = MODBUS, 0 = EXIT	0	1-3	
BACNET	**BACnet MS/TP** **9600, 8, 1, 1, N Slave** **MAC Address: 0** **SP Ovrd: (Y/N)** The first line confirms setup for the BACnet protocol. The second line defines the 9600 bps baud rate, 8 bit data packets, 1 stop bit, 1 start bit and no parity. The third line requires user input. Obtain the node number from the manufacturer that supplied the device that will communicate with the Technologic Controller. Select "Y" for SP Ovrd to allow the external device to override the local setpoint data.	N/A	N/A	
JCN2	**Metasys N2** **9600, 8, 1, 1, N VND** **Node: # SP Ovrd: (Y/N)** The first line confirms setup for the Johnson Controls N2 protocol. The second line defines the 9600 bps baud rate, 8 bit data packets, 1 stop bit, 1 start bit and no parity. The third line requires user input. Obtain the node number from the manufacturer that supplied the device that will communicate with the Technologic Controller. Select "Y" for SP Ovrd to allow the external device to override the local setpoint data.	N/A	N/A	
MODBUS	**Modbus** **9600, 8, 1, 1, N RTU** **Node: # SP Ovrd: (Y/N)** The first line confirms setup for Modbus protocol. The second line defines the 9600 bps baud rate, 1 stop bit, 0 start bits, and no parity. The third line requires user input. Obtain the node number from the manufacturer that supplied the device that will communicate with the Technologic Controller. Select "Y" for SP Ovrd to allow the external device to override the local setpoint data.	N/A	N/A	

3.16.2   There may have been additional protocols added to
         the communication setup menu, contact your Bell &
         Gossett representative concerning additional pro-
         tocols and setups.

3.17   SPECIAL FUNCTIONS

3.17.1   See the following table for special functions.

SPECIAL FUNCTIONS MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Special Functions	**Selection: #** Select the special function. **1 = Pump Duty/Standby** **2 = PB. Application** **0 = EXIT**	1	1-2	
Pump Duty/ Standby	**# of Duty Pump #** **# of Standby Pump #** The number of duty pumps equals the number of pumps configured in the pump setup menu. Standby pumps are those pumps that will not run unless one of the duty pumps fail.	# of pumps 0		
PB. Application	**PB. Setup #** Select the pressure booster staging scheme **1 = System Press. Alm.** **2 = NFSD** **0 = Exit**	0	0-2	
System Press. Alm.	**High Sys. Press** **High Sys. Press. #** **HSP Proof Tmr #s** The high system pressure is the pressure at which the high system pressure alarm will activate and the system will shut down. A manual reset is necessary to clear the alarm and restart the system The HSP Proof timer is the amount of time, in seconds, that the system will still run while operating above high system pressure point before shutting down.	0 0		
NFSD	**NFSD Tst Pr. Tmr #s** **Min Spd Pr. Tmr #s** **Restart PV Drop 50** **Min Run #m** The No Flow Shut Down test proof timer is the amount of time, in seconds, the controller will run the system while the PV is greater then SP. The Minimum Speed Proof Timer is the amount of time, in seconds, the system will run at minimum speed before shutting off. The Restart PV Drop is the value the PV variable needs to be less then the SP in order to restart the system. Minimum Run is the minimum amount of time, in minutes, that the system will run once it shuts down from a no flow condition and restarts.	0 30 0 10		

3.17.2   Your controller may have additional setup menus that were requested prior to delivery. Refer to the setup addendum that was shipped with the product for a definition of the unique setup items.

3.18   **CHANGE LANGUAGE**

3.18.1   See the following table for language options.

CHANGE LANGUAGE MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Change Language	**Select Language: #** Select the language. **0 = English 1 = Deutsch** **2 = Espanol 3 = Francais** English is the only available language at this time	0	0-3	

3.19   **SAVE TO FLASH**

3.19.1   See the following table for saving setup.

SAVE TO FLASH MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Save to Flash	****WARNING**** **CPU YOU BE HALTED DATA WILL BE SAVED** **PROCEED (Y/N)** Select. Saving to flash memory will save all setup information to the FPROM chip within the controller	N/A	Y or N	

3.20   **LOAD FROM FLASH**

3.20.1   See the following table for loading setup.

LOAD FROM FLASH MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Load to Flash	****WARNING**** **PRIOR SETTTINGS WILL BE LOADED FROM FPROM** **PROCEED (Y/N)** Select. Loading from flash memory will load all setup information that was saved to the FPROM chip within the controller	N/A	Y or N	

3.21   **SET BRITE/CNTRST**

3.21.1   See the following table for changing screen brightness and contrast

SET BRITE/CNTRST MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Set Brite/Cntrst	****WARNING**** **PRIOR SETTTINGS WILL BE LOADED FROM FPROM** **PROCEED (Y/N)** Select.	N/A	Y or N	

3.22 **TESTING INPUTS AND OUTPUTS**

3.22.1 At the Setup Selection menu, press the ALTER-NATION/4 and ENTER keys.

3.22.2 The display will show:

TEST SELECTION: #

1=DI	4=AO	7=DISP
2=DO	5=LED	8=COMM
3=AI	6=KEY	0=EXIT

3.22.3 Press the PROCESS VARIABLE/1 and ENTER keys to test digital inputs.

The display will now show:

DIGITAL INPUTS

SLOT 0 1	SLOT 1-4 1
1234567890	1234567890
0000000000	0000000000

The zero below each corresponding input will change to a one upon receiving a digital input.

"A" signifies the inputs at the first digital input module and "B" signifies the inputs at the second digital input module.

Press clear to exit the test.

3.22.4 At the Test Selection screen, press the SET POINT/2 and ENTER keys to test digital outputs.

The display will now show:

DO SLOT 2-x
1 2 3 4 5 6 7 8
x x x x x x x x
Enter DO# 0   (0 = EXIT)

The "x" will be replaced by the current state of the specific digital output channel. An "0" indicates that the relay is de-energized and a "1" indicates that the relay is energized which will change the state of the contacts.

Press any numeric key numbered 1-8. To change the state of the digital output press the ENTER key. To exit press "0" followed by the ENTER key.

3.22.5 At the Test Selection screen, press the SETUP/3 and ENTER keys to test analog inputs.

The display will now show:

Analog Inputs:

1: ###%	4: ###%	7: ###%
2: ###%	5: ###%	8: ###%
3: ###%	6: ###%	9: ###%

The current % of span signal will be indicated next to each input 0% = 4mA and 100% = 20mA.

Press clear to exit the test.

3.22.6 At the Test Selection screen, press the ALTER-NATION/4 and ENTER keys to test analog outputs.

The display will now show:

A01 ###%	A04 ###%
A02 ###%	A05 ###%
A03 ###%	A06 ###%

EXIT ? (Y/N)

The ### will be replaced by the actual digital output signal in %. The cursor will be flashing at the A01 value. Enter an alternate value by using the numeric keys and press ENTER to output the new value or press ENTER to move to the next channel.

This menu will only allow you to modify the output signals that are connected to the system, therfore A03 - A06 may not be modified unless the corresponding output cards are attached to the system.

3.22.7 At the Test Selection screen, press the F1/5 key to test the LED's. All of the LED's on the left key set turn on, then turn off, then flash. The entire test takes 15 seconds to complete prior to returning to the Test Selection menu. Press the CLEAR key at any time to terminate the test and return to the Test Selection menu.

3.22.8 At the Test Selection screen, press the F2/6 key to test the keypad. The display will show:

KEY TEST

PRESS A KEY FOR TESTING

Press any key except for the CLEAR key and the display will confirm that the key is working by displaying the key name. After all of the keys have been tested press the CLEAR key to return to the Test Selection menu.

3.22.9 At the Test Selection screen, press the YES/7 key to test the display. The display will scroll ASCII characters from right to left. All four lines will be tested at the same time. To exit the test press the CLEAR key and return to the Test Selection menu.

3.22.10 When the controller is setup to communicate with the building automation, press the INFO/8 key while at the test selection screen, to test the RS communication. The display will show:

Test Communication
B&G Read   #
B&G Write   #

If the controller is communicating properly, the numbers will continue increasing in value. For Modbus protocol the read and write numbers will be equal, BACnet and Johnson N2 protocol the numbers will not be equal. If the numbers are not increasing in value then the controller is not communicating properly. If it is not communicating, check the wiring at the terminal blocks and the RS communication card mounted on the controller.

3.23 **DEFAULT SETUP**

3.23.1 In the event the user would like to change all of the setup variables back to the default values the default setup menu will complete the task. The default values are defined in the tables included in Sections 3.7 to 3.18. In addition all sensor and pump setup information will be erased.

Prior to completing the default setup it is strongly recommended that all factory/field variables be recorded for future reference. Use the "Field Value" location in the tables shown in Sections 3.7 - 3.18 to record your current data. Also record your sensor and pump setup information on the wiring diagram that was included with the unit.

3.23.2   Press the F1/5 key at the Setup Selection menu. Then press the ENTER key.

3.23.3   The display will show:

WARNING
ALL SETUP DATA WILL BE OVER WRITTEN.
PROCEED: ? (Y/N)

Press the NO/0 key to exit the default setup menu and save all current factory/field variables. Press the YES/7 key to load all of the pre-defined default variables. Once the variables are loaded the controller will return to the display screen that was present prior to entering the setup menu.

3.23.4   After setting the default values proceed with completing the system setup per Sections 3.4 to 3.18.

Section 4 - Operation

4.0   TYPE OF PROGRAM

There are nine operational programs with the Technologic 5500 family of controls. Refer to the nameplate on the front of the controller to determine which program has been furnished.

No. of Program	B&G Bypass Pumps	Provided	Description
A0	1	No	One Pump/One AFD
A1	1	Yes	One Pump/One AFD
			Constant speed or variable speed operation
B3	2	Yes	Two Pumps/One AFD
			Either pump operating constant speed or variable speed.
C0	2	No	Two Pumps/Two AFDs
			Two 100% duty pumps and AFDs without staging.
D0	2	No	Two Pumps and AFDs
			Both pumps may stage and run variable speed.
D4	2	Yes	Two Pumps and AFDs
			Both pumps may stage and run variable speed or constant speed.

NOTE: Constant Speed refers to across-the-line operation.

4.0.1   Normal Scrolling Operation

Other screens may be viewed by scrolling from the Technologic Pump Controller screen shown below:

TECHNOLOGIC
PUMP CONTROLLER
MM/DD/YY HH:MM:SS
STATUS   MODE

The status portion of the display indicates the current alarm status. If **NORMAL** is displayed there are no alarms. If ***ALARM*** is displayed there are alarms that may prevent normal operation, refer to Section 4.15 for additional information.

The mode portion of the display indicates the current auto/manual mode of operation. The following table indicates all possible options:

Mode	Description	Sections for Additional Infomation
AUTO	Pump Controlled by Controller	4.1 - 4.7
MANUAL	Variable Speed Pumps Controlled by User	4.11
MAN. BPS	Constant Speed Pumps Controlled by User	4.10

4.0.2   Press the NEXT SCREEN key.

The display now shows:

PUMP STATUS
P1:(RDY or N/A)P2: (RDY or N/A) P3:(RDY or N/A)
P4:(RDY or N/A)P5: (RDY or N/A) P6:(RDY or N/A)
STATUS   MODE

Press the NEXT SCREEN key.

The display now shows:

ACTIVE VALUES
Zone: ##   Speed: ###%
Seq: #
STATUS   MODE

Press the NEXT SCREEN key.

The display now shows the following if any of the transmitters are set up:

FLOW RATE: ####   GPM
TOTAL KW: ###
SYS DP: ##   EFF: ## %
STATUS   MODE

Press the NEXT SCREEN key.

The display now returns to the Technologic Pump Controller screen.

4.1   A0 OPERATION

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	1
3.7.1	PV stage speed %	0
3.7.1	EOC pump max. flow	0
3.11.1	Number of pumps in bypass	0

4.1.1   Local Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.

Press the START/STOP key. The flashing green LED will turn solid green. After a brief delay the Pump 1 LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed.

4.1.2   Remote Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.

If a pump is not running this means the remote start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.2   **A1 OPERATION**

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	1
3.7.1	PV stage speed %	0
3.7.1	EOC pump max. flow	0
3.11.1	Number of pumps in bypass	1

4.2.1   Local Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.

Press the START/STOP key. The flashing green LED will turn solid green and the message **STARTUP-STANDBY** will be displayed. After a brief delay the

Pump 1 LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed.

4.2.2   Remote Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.

If a pump is not running this means the remote start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.4   **B3 OPERATION**

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	2
3.7.1	PV stage speed %	0
3.7.1	EOC pump max. flow	0
3.11.1	Number of pumps in bypass	1

4.4.1   Local Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

Take note of the pump sequence. Only the first pump in the sequence will run in normal operation. The second pump is a standby and will run only if the duty fails. To change which pump is the duty pump press the ALTERNATION/4 key.

Press the START/STOP key. The flashing green LED will turn solid green and the message **STARTUP-STANDBY** will be displayed. After a brief delay the duty pump LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed.

4.4.2 Remote Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

If a pump is not running this means the start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.5 **C0 OPERATION**

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	2
3.7.1	PV stage speed %	0
3.7.1	EOC pump max. flow	0
3.11.1	Number of pumps in bypass	0

4.5.1 Local Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

Take note of the pump sequence. Only the first pump in the sequence will run in normal operation. The second pump is a standby and will run only if the duty fails. To change which pump is the duty pump press the ALTERNATION/4 key.

Press the START/STOP key. The flashing green LED will turn solid green. After a brief delay the duty pump LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed.

4.5.2 Remote Automatic Operation

With the Local-Off-Remote (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

If a pump is not running this means the start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.6 **D0 OPERATION**

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	2
3.7.1	PV stage speed %	95%
3.7.1	EOC pump max. flow	max. pump flow
3.11.1	Number of pumps in bypass	0

4.6.1 Local Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

Take note of the pump sequence. The first pump in the sequence will be the lead pump. The other pump will stage on if it is needed to maintain setpoint. To change which pump is the lead pump press the ALTERNATION/4 key.

Press the START/STOP key. The flashing green LED will turn solid green and the message **STARTUP-STANDBY** will be displayed. After a brief delay the lead pump LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed. The lag pump will stage on if required.

4.6.2 Remote Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

If a pump is not running this means the start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.7 D4 OPERATION

Confirm the setup of the following items:

Section	Item	Value
3.5.3	Total # of pumps	2
3.7.1	PV stage speed %	95%
3.7.1	EOC pump max. flow	max. pump flow
3.11.1	Number of pumps in bypass	1 - 2

4.7.1 Local Automatic Operation

With the Local-Off-Remote (L-R-O) switch in the LOCAL position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

Take note of the pump sequence. The first pump in the sequence will be the lead pump. The other pump will stage on if it is needed to maintain setpoint. To change which pump is the lead pump press the ALTERNATION/4 key.

Press the START/STOP key. The flashing green LED will turn solid green and the message **STARTUP-STANDBY** will be displayed. After a brief delay the lead pump LED will turn solid green indicating that it is running variable speed. It will then try to maintain setpoint by varying pump speed. The remaining pump will stage on if required.

4.7.2 Remote Automatic Operation

With the LOCAL-REMOTE-OFF (L-R-O) switch in the REMOTE position check that the LED indicators on the Operator Interface Panel (OIP) are as follows:

LED	Condition	Meaning
Start/Stop	Flashing Green	System is stopped. No pumps running.
Pump 1 On/Off	Flashing Green	Pump1 is enabled but not on.
Pump 2 On/Off	Flashing Green	Pump2 is enabled but not on.

If a pump is not running this means the start contact (from the energy management system or other source) is not closed and the controller has not been given a start signal.

Once operating in remote it is possible to stop operation (i.e., override the remote start command) by either turning the L-R-O switch to off or by pressing the START/STOP key on the OIP. It is recommended to TURN THE L-R-O SWITCH TO OFF to stop the system if it is running in remote.

4.8 SPECIAL PROGRAMS

4.8.1. If your nameplate does not indicate one of the model numbers defined above the program was created per specific customer needs. The local and remote operation logic will be similar to that defined in the above sections. Job specific setup menus and drawings will be included with the unit. If additional information is required contact your local Bell & Gossett representative.

4.9 PUMP ROTATION

4.9.1 It will be necessary to operate all pumps in both variable speed and bypass to check for proper rotation.

4.9.2 Place the Technologic 5500 into operation as described in previous sections.

4.9.3 Run each pump in auto and then in bypass (if so equipped, see the next section) noting rotation in each.

> ⚠ **DANGER:** High voltage 3 phase power can kill. Pumps can start automatically. Disconnect and lockout power prior to servicing pumps. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

4.9.4 If both rotations (AFD and bypass) are wrong, exchange the wiring on two *motor* phases.

4.9.5 If the rotation is incorrect in the AFD mode but it is correct in the bypass mode, exchange the wiring on two of the AFD *output* phases.

4.9.6 If the rotation is correct in the AFD mode but is incorrect in the bypass mode, exchange the wiring on two of the bypass input phases.

4.9.7 **NOTE:** Changing phase at AFD input does not change output phasing.

4.10 **MANUAL BYPASS OPERATION**

4.10.1 The following programs support constant speed operation of pumps: A1, B0, B2, B3, & D4. Refer to the following steps to override the automatic operation of the unit to allow manual control of the constant speed pumps.

4.10.2 Press the START/STOP key to stop the system. The solid green LED will flash and any running pumps will stop.

4.10.3 Press the AUTO/MANUAL key and the screen will display the following:

Enter Operation Mode
#
1 = AUTO, 2 = MANUAL
3 = MANUAL BYPASS

Where the # symbol will be replaced by 1, 2, 3 depending on the current mode of operation.

Press the SETUP/3 key followed by ENTER to proceed to manual bypass operation.

The display will now show the following:

TECHNOLOGIC PUMP
CONTROLLER

DATE	**TIME**
NORMAL	**MAN. BPS**

4.10.4 If the PUMP LED is not flashing green, enable a pump to run in bypass by pressing the PUMP 1 or PUMP 2 key. The D4 program will allow operation of all pumps.

4.10.5 Press the START/STOP key to run the enabled pump(s) in bypass. The flashing green LED(s) will turn solid green after the pump(s) starts.

4.10.6 Press the START/STOP key to stop the system. The running pump(s) will stop.

4.10.7 Press the AUTO/MANUAL key and proceed with selecting the desired method of operation as described in Section 4.10.3.

4.11 **HAND MANUAL OPERATION**

4.11.1 Press the START/STOP key to stop the system. The solid green LED will flash and any running pumps will stop.

4.11.2 Press the AUTO/MANUAL key and the screen will display the following:

Enter Operation Mode
#
1 = AUTO, 2 = MANUAL
3 = MANUAL BYPASS

Where the # symbol will be replaced by 1, 2, 3 depending on the current mode of operation.

Press the Set Point/2 key followed by enter to proceed to hand manual speed control.

This display will now show the following:

MANUAL SPEED: 0%

NORMAL	**MANUAL**

4.11.3 If the PUMP LED is not flashing green, enable a pump to run in manual by pressing the PUMP 1 or PUMP 2 key. The D4 program will allow operation of all pumps.

4.11.4 Press the START/STOP key to run the enabled pump(s) in manual. After a brief time delay the pump(s) starts, and the flashing green LED(s) will turn solid green.

4.11.5 Press the F2/6 key to increase pump speed to a maximum of 100% of rated speed. Press the F4/9 key to decrease the speed to 0% where the pump will run at the minimum speed configured in the AFD, typically 18 HZ.

4.11.6 Press the START/STOP key to stop the system. The running pump(s) will stop.

4.11.7 Press the AUTO/MANUAL key and proceed with selecting the desired method of operation as described in Section 4.11.2.

4.12 **HAND BYPASS OPERATION**

4.12.1 The following programs include a Bell & Gossett bypass panel: A1, B2, B3, & D4. The bypass panel allows for switch control of the starters during system startup or failure.

4.12.2 Place the AUTO-OFF-HAND switch in HAND. The control power to the controller will be switched off, while the control power in the bypass panel will remain on.

4.12.3 Place the PUMP X (replace X by desired pump number), DRIVE - BYPASS switch in the desired position.
4.12.4   To return to Automatic control place the AUTO-OFF-HAND switch in the AUTO position.

4.12.4 To return to Automatic control place the AUTO-OFF-HAND switch in the AUTO position.

4.13 **SETPOINT MODIFICATION**

4.13.1 To modify any of the setpoints for the transmitter configured in the setup press the SETPOINT/2 key and press ENTER.

4.13.2 The following will be displayed:

SP1 = #	**SP4 = #**
SP2 = #	**SP5 = #**
SP3 = #	**SP6 = #**
OK ? (Y/N)	

The # symbol will be replaced by the current setpoint for the specific zone. To view zones 7 - 12, press the NEXT SCREEN key once. To view zones 13 - 16, press the NEXT SCREEN key twice. To return to zones 1 - 6 press the PREV. SCREEN key the required number of times depending on the current screen on the display.

4.13.3 If you agree with the current setpoint settings press the YES/7 key followed by ENTER. If you would like to modify any of the setpoints press the NO/0 key followed by ENTER at which point the setpoint in the upper left portion of the screen will begin flashing.

4.13.4 Press the numeric key to modify the setpoint and press ENTER to proceed to the next setpoint. Press ENTER to advance to next zone without modification or press CLEAR to return to the previous zone.

4.13.5 After modifying all of the zones press the ENTER key until the "?" flashes, press the YES/7 key to accept the values and return to the Technologic Pump Controller screen.

4.14 PROCESS VARIABLE MONITORING

4.14.1 To view the actual process variable signals that are being sent to the controller press the PROCESS VARIABLE/1 key.

4.14.2 The following will be displayed:

PV1 = #   SP1 = #
PV2 = #   SP2 = #
PV3 = #   SP3 = #
PV4 = #   SP4 = #

For process variables the # symbol will be replaced by the actual value. The display is updated continuously as the signal fluctuates. The units for the numbers are defined in the sensor setup menu. The source of the PV signal is also defined in the sensor setup menu.

For setpoints the # symbol will be replaced by the actual setpoint value. If the setpoint is defined by the Technologic the number remains static. If the setpoint is supplied by an external device the number will fluctuate as the SP signal fluctuates from the controlling device. The source of the SP value is defined in the communications setup menu.

4.15 ALARMS

4.15.1 When the controller detects an alarm condition, the display will flash ***ALARM*** in the lower left corner of the main screen.

4.15.2 The green LED on the HELP key will also flash during an alarm condition. Press the HELP key for additional information on the alarm(s). If there are more than one alarm the alarms will be listed in order of occurrence.

To view possible causes for alarms press the HELP key again after the alarm is displayed.

Refer to table below for an overview of the possible alarms and their respective causes.

4.15.3 Press the CLEAR key to return to the main screen. After addressing the source of the alarm press RESET to re-start the system and/or clear the alarms.

4.15.4 The controller logs alarms as they occur to aid in troubleshooting unobserved alarms. Refer to Section 5.13 for alarm logging information.

HELP SCREEN ALARM	HELP/HELP SCREEN DISPLAY	DETAILED DESCRIPTION
AFD Failure	"Check H-O-A switch, wiring , and AFD's LED"	The controller is not receiving a closed run signal from AFD number X after it has been given a start command
Battery Empty	"Check battery's voltage and its continuity"	Check for less then a 3V charge on the battery, check battery connection
High Level	"Check setting of level switch"	Check for open or closed contacts, refer to wire diagram for proper connection.
High Suction	"Check setting of the HIGH SUCTION switch"	Check for open or closed contacts, refer to wire diagram for proper connection
High System	"Check system pressure – manual RESET required"	Check the pressure setting in the setup menu.
Low Suction	"Check setting of the low suction switch"	Check for open or closed contacts, refer to wire diagram for proper connection.
Low Level	"Check setting of level switch"	Check for open or closed contacts, refer to wire diagram for proper connection.
NFSD	"System will restart automatically when flow occurs"	For variable speed, check the Reset PV Drop value and the pressure sensor connections, refer to the wire diagram. For constant speed, check the RTD connections, refer to the wire diagram.
Overload Fail	"Check amp draw, Use manual reset if it's OK"	On Systems with Bell & Gossett bypasses the controller is not receiving a digital input from the pump number X starter confirming that it has closed
Pump Fail	"Check DP switch, impeller, coupler, motor"	The controller is receiving a closed signal from the differential pressure switch for pump number X after it has been given a start command
Sensor Fail	"Check wiring, piping, polarity, continuity"	The controller is not receiving the proper 4-20mA signal from zone number X transmitter
Can IO Fail	"Check remote IO wire connection"	The controller has lost communication to the remote IO rack

Section 5 - Maintenance

5.0 **Preface:** The following is a description of the hardware, diagnostics, and corrective action to maintain a process being controlled by the Technologic 5500 Pump Controller.

NOTE: THE FOLLOWING SHOULD NOT BE INTERPRETED AS THE MAXIMUM CONFIGURATION OF THIS CONTROLLER, RATHER THIS DESCRIBES ITS APPLICATION AS A TECHNOLOGIC 5500 PUMP CONTROLLER ONLY.

5.1 **TECHNICAL OVERVIEW**

The Technologic 5500 Pump Controller is a microprocessor based dedicated pump controller unique to and exclusively manufactured by Bell & Gossett. All aspects of this unit are strictly proprietary to Bell & Gossett.

The operator interface is connected (with a serial cable) to the CPU assembly.

The CPU is mounted to a rack which allows connection to the analog and digital input/output modules.

5.2 **DIGITAL INPUTS**

The controller has provision for digital inputs with an operating voltage of 24 VDC. This signal voltage must be obtained from the 24 VDC power supply mounted to the subpanel.

It is not recommended that other power sources be used without factory approval.

Customer connections are made directly to the terminals mounted on the digital input module.

5.3 **DIGITAL OUTPUTS**

The controller has provision for relay outputs to control 120 V 50/60 HZ devices.

The relays are not removable. If defective the digital output module must be returned to the factory for repair.

All relays operate as single pole single throw. Components are provided to reduce contact arc and extend electrical life.

Customer connections are made directly to the terminals mounted on the digital output module.

5.4 **ANALOG INPUTS**

Analog inputs are provided for process variables and optional transmitters. All analog inputs operate at 4-20mA. They must be powered from 24 VDC power supply included with the controller

5.5 **MEMORY**

The logic is stored in a non-removable EEPROM chip which can only be updated from the RS-232 program port on the CPU. The user setup data is stored in non-volatile memory or fixed RAM. The fixed RAM requires power to hold the information. While the controller is powered up the CPU controller provides the power to save the user values. When the controller is powered down a 3V Lithium battery provides the power to store the user values. When the battery voltage drops below 2.5 VDC the controller will display ***ALARM***. After pressing the HELP key the display will indicate **# of # Low Battery**. You will have approximately 25 weeks to replace the battery before losing memory due to an under voltage condition during a power loss.

5.6 **CPU**

The CPU does not require any maintenance, and cannot be replaced as a field repair.

5.7 **POWER SUPPLY**

The power supply provides 24 VDC for all digital and analog signals as well as the CPU. It is specifically rated only for the controller and other loads should not be applied without factory approval.

The power supply is protected with 500 mA fuses on the primary and secondary circuits

The 24 VDC power supply includes overvoltage protection circuitry. After detecting high output voltage the power supply will trip. 0.7 to 0.8 volts DC is present at the output of the device indicating an overvoltage trip. To reset remove power from the power supply by cycling the 115 VAC control power. If the power supply does not reset it may require re-calibration. To recalibrate you will need a DC voltmeter and a screw driver. The following steps detail calibration of the power supply:

1. Turn the silver overvoltage protection (OVP) pot. (labeled R1, located just to the left side of the transformer) fully clockwise.

2. Turn the voltage adjustment pot. (labeled R9, located below the left-hand corner of the transformer) fully counter-clockwise.

3. Cycle power.

4. Turn R9 fully clockwise (you should read approximately 27 VDC at the output).

5. Slowly turn R1 counter-clockwise until the unit trip and displays approximately 0.77 VDC at the output.

6. Turn R9 fully counter-clockwise.

7. Cycle power.

8. <u>Slowly</u> turn R9 clockwise until 24 VDC is obtained at the output.

9. Cycle power and verify that 24 VDC is present at the output.

> ⚠ **DANGER:** Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

5.8 PROTECTION

5.8.1 Analog inputs - the analog inputs provided on the Technologic 5500 Pump Controller must be wired according to the wiring diagram that shipped with the unit.

5.8.2 Protection - all analog inputs are protected from high voltage, crossed wiring, etc. A sustained fault will be limited to 20mA by the current limiting circuit.

5.8.3 Digital Inputs - as long as input power is derived from the integral 24VDC power supply they are protected.

5.8.4 Digital Outputs - each output shall not exceed the ratings on the digital output module.

5.8.5 The digital outputs are fuse protected, replace with a 5x20mm SPT 5A time lag fuse only.

5.9 INSTRUMENTS AND THEIR USE

With the diagnostics described herein extensive instruments are not required. However, the instruments used should be quality units to meet the following at a minimum.

Under no circumstances shall any instrument be used to test any on board components. Especially risky is an ohmmeter with battery voltage higher than TTL logic or applied with incorrect polarity.

5.9.1 AC/DC Voltmeter -
- Input impedance shall not be less than 10 MEGOHM.
- Accuracy - AC ± 2% of Full Scale
      - DC ± 3% of Full Scale
- Rated circuit to ground voltage = 1000V.

5.9.2 OHMMETER
- Accuracy ± 2_%
- Max open circuit voltage = _ volt

5.9.3 Millimeter
- Accuracy ± 2% of Full Scale

5.9.4 Signal Generator (analyzer) - recommended

A. Beta calibrator Model 434 20mA signal analyzer.

B. Altek calibrator Model 334 4-20mA loop analyzer.

Either instrument may be purchased from a Local Process Control Distributor.

> **NOTE:** If some other instrument is used it must float above ground, preferably battery powered.

5.10 FIELD REPAIR

5.10.1 General - typical field repair should include: replacing fuses, replacing input/output modules and assuring connections are correct and secure.

> ⚠ **DANGER:** Troubleshooting live control panels exposes personnel to hazardous voltages. Electrical troubleshooting must only be done by a qualified electrician. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

5.11 PROGRAM UPDATING

To update to a new version of the program the program must be down loaded through the RS 232 port on the CPU. This can be accomplished by one of the following means:

1) Down loaded by factory authorized service technician at the job site.

2) Replacing the CPU module with one that was pre-programmed at the factory.

3) Down loading the program from the factory to the CPU via factory supplied modem.

Contact your Bell & Gossett representative for the preferred method of upgrading your software.

5.12 PROGRAM TYPE AND VERSION NUMBER

To check the program type and version number press the F3/8 key while at the Technologic Pump Controller screen.

5.12.1 The screen will now display:

Sys Info   CPU V xxx
AS V xxx   OS V xxx
Prog Type: xxxxx   #xx
Scheme Set xx

Press the CLEAR key to exit this screen.

5.12.2 The # symbol will be replaced by the actual version numbers and program type. If the factory is called for information or service on this unit this information may be requested.

5.13 DATA LOGGING

5.13.1 To view data recorded to the memory, press the F1/5 key while at the Technologic Pump – See the following table for data logging.

5.13.2 Pump – See the following table for data logging.

DATA LOGGING MENU ITEMS				
Menu Item	**Variable**	**Default**	**Range**	**Field Value**
Data Logging	**SELECTION: #** Select the log to view. **1 = ALARM LOG** **2 = PUMP LOG** **3 = DATA LOG** **0 = EXIT**	0	0-3	
	Pressing the Next Screen button displays			

Alarm Log	**DATE TIME ALARM**
	MMDD HHMM
	  " "
	  " "
	The four digit date is displayed in the MMDD format.
	The four digit time is displayed in the 24 hour HHMM format.
		N/A		

Pump Log	**View Selection #** Select the pump log to view **1 = Pump Run Time.** **2 = Pump On/Off Time** **0 = Exit**	0	0-2	
Pump Run Time	**Pump Run Time** **P1: # P2: #** **P3: # P4: #** **P5: # P6: #** The pump run time is displayed in total accumulated elapsed time in hours.	N/A		
Pump On/ Off Times	Pump On/Off **P1: # P2: #** **P3: # P4: #** **P5: # P6: #** The pump on/off times are displayed in total accumulated times the pumps are switched on and off.	N/A		
Signal Log	**View Selection #** Select the signal log to view **1 = PV** **2 = KWH** **3 = Flow** **0 = Exit**	0	0-3	

PV	**PV: # MAX: #** **MM/DD/YY 00:00:00** **NOW: # MIN: #** **MM/DD/YY 00:00:00** The process variable number is displayed along with its current, maximum, minimum values. The times and dates that the max and min values occurred are also displayed. To view other process variables press the Next Screen button	N/A		
KWH	**KiloWatt Hours** **P1: # P2: #** **P3: # P4: #** **P5: # P6: #** The pump kilowatt consumption is displayed in total accumulated hours.			
Flow	**MAX: # NOW: #** **MM/DD/YY 00:00:00** **MIN: #** **MM/DD/YY 00:00:00** The process variable number is displayed along with its current, maximum, minimum values. The times and dates that the max and min values occurred are also displayed. To view other process variables press the Next Screen button			

5.14   **MAINTENANCE (PHYSICAL)**

5.14.1   Electrical – no maintenance is required for the electrical panel except to keep the modules free of dirt and dust that might hold moisture. Cabinet door should be kept closed, and the components kept dry.

5.14.2   Mechanical – If a B&G pump was supplied it was lubricated at the factory. Future lubrication should be according to the instructions that came with the pump.

For leaky seals or gaskets and loose or damaged components, replace or repair as required.

If there is a danger of freezing, drain the pump. Inspect pump and system piping regularly.

For more instruction on the B&G pumps see the following manuals:

Manual #	Description
A91310I	Suction Diffuser Instruction Sheet
PO6451A	Series 60 Pump Installation & Operation
P95200B	Series 1550 Pump Instruction Sheet
V50960B	Triple Duty Valve with Soft Seat
None	Flow Transmitter
None	Temp/Pressure Transmitter
None	Misc. Transmitter
PO6452	Series 60 Pump Service
P70620A	Series 3510 Centrifugal Pumps
P70621B	Series 3531 Centrifugal Pump
P81547A	Series 90 In-Line Mounted Pumps
P81555B	Series 1510 Pump Kit Instructions
P81567D	Series 1531 Pump Instruction Manual
P81568B	Series 1535 Pump Instruction Sheet
P81569A	Series 1522 Pump Instruction Sheet
P81629C	Series 80 Pump Instruction Manual
P81630C	VSC & VSCS Instruction Manual
P81673E	Series 1510/Universal Pump Instruction Sheet
P81875A	Series HSC Centrifugal Pump

Appendix A

SYSTEM PIPING AND UNIT INSTALLATION – FINAL CHECK LIST

_____ 1. Is the unit base properly leveled, grouted and secured?

_____ 2. Are all lubrication points properly lubricated?

_____ 3. Are the shut-off valves to the transmitters open?

_____ 4. Is the shut-off valve to the pump suction open?

_____ 5. Is the shut-off valve on the discharge line open?

_____ 6. Is the piping properly supported so as to prevent strains on unit?

_____ 7. Is the system, including the pumps and valving, purged of debris and air?

⚠ **CAUTION:** Seal damage may occur. Do not run pumps dry. Fill and vent the pump volute prior to operation. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE AND/OR MODERATE PERSONAL INJURY.**

_____ 8. Are the pump and motor shafts properly aligned?

_____ 9. Is the pump rotation correct?

Appendix B

ELECTRICAL WIRING AND CONTROL SETTINGS – FINAL CHECK LIST

_____ 1. Does the feeder line voltage correspond to the unit voltage? Check the unit nameplate or motor terminal connection.

⚠ **WARNING:** Electrical shock hazard. Inspect all electrical connections prior to powering the unit. Wiring connections must be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

_____ 2. Are the feeder wires correctly sized for the load?

_____ 3. Are the fuses correctly sized? They must not exceed 1.75 times the full load current of the motor. Usual sizing is 1.15 to 1.5 times the full load current.

⚠ **DANGER:** High voltage 3 phase power can kill. Disconnect and lockout power prior to servicing unit. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**

⚠ **WARNING:** Conduit grounds are not adequate. A separate ground wire must be attached to the ground lug provided in the enclosure to avoid potential safety hazards. **FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.**
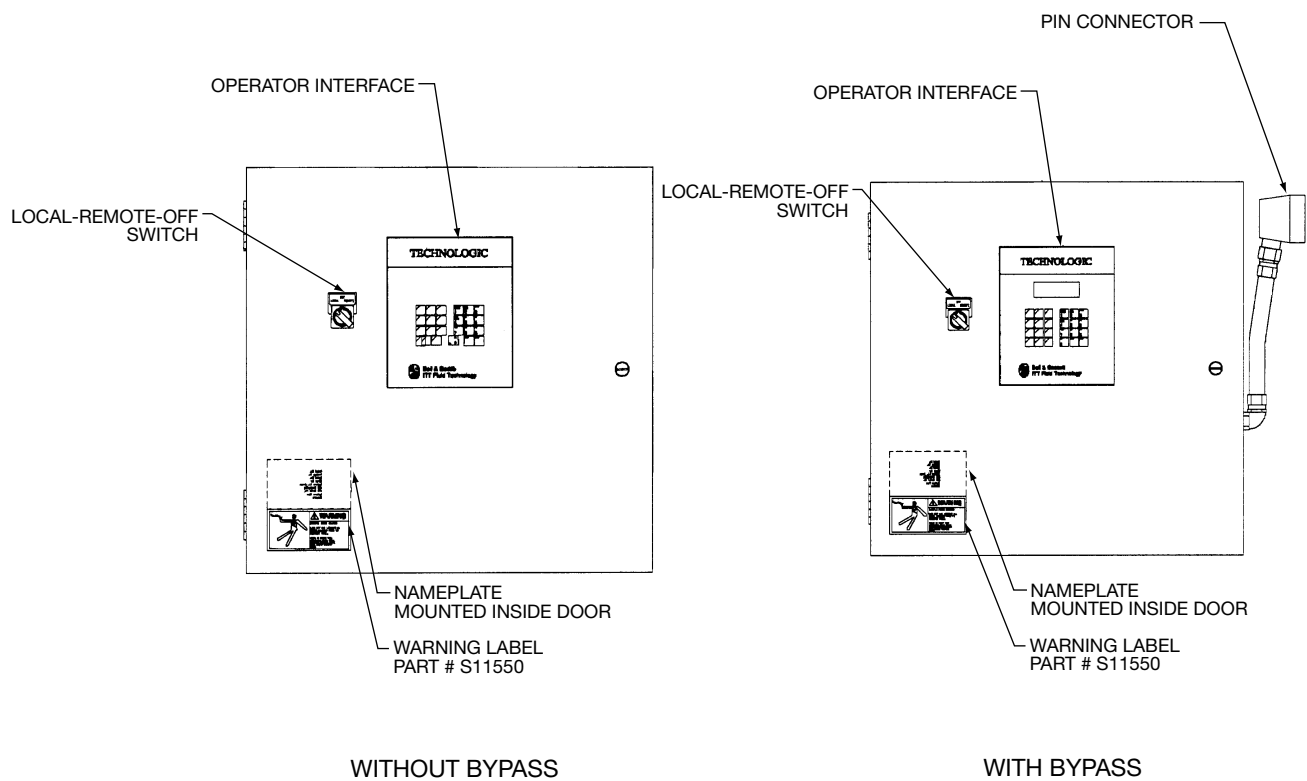
_____ 4. Is the unit properly grounded?

_____ 5. Have all the power terminals in the control panel been checked for tightness? This is imperative since stranded wires tend to "flow" and become loose after initial installation.
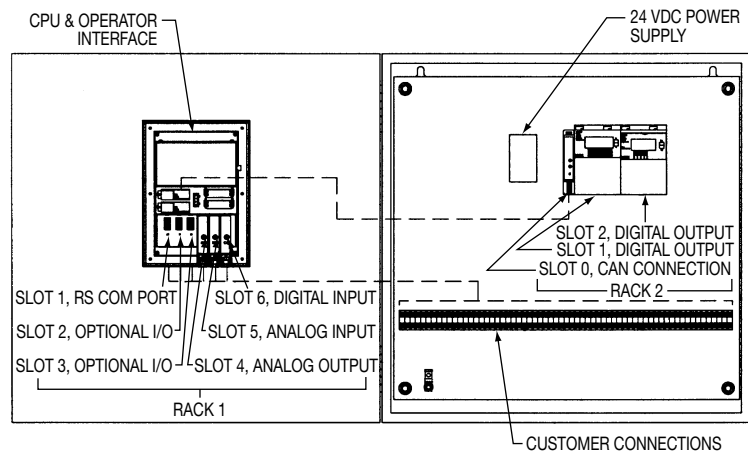
Appendix C - Valid I/O Codes

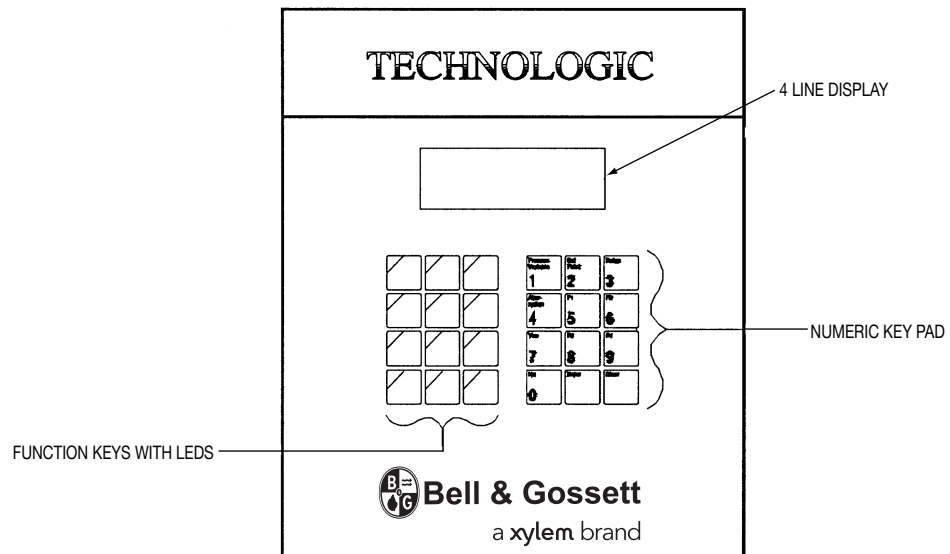| Code	Function Description	I/O Type	Range	Equate to the Signal
101	Pump 1 Status (On/Off)	DO	1/0	On/Off
102	Pump 2 Status (On/Off)	DO	1/0	On/Off
103	Pump 3 Status (On/Off)	DO	1/0	On/Off
104	Pump 4 Status (On/Off)	DO	1/0	On/Off
105	Pump 5 Status (On/Off)	DO	1/0	On/Off
106	Pump 6 Status (On/Off)	DO	1/0	On/Off
111	Pump 1 Failure	DO	1/0	On/Off
112	Pump 2 Failure	DO	1/0	On/Off
113	Pump 3 Failure	DO	1/0	On/Off
114	Pump 4 Failure	DO	1/0	On/Off
115	Pump 5 Failure	DO	1/0	On/Off
116	Pump 6 Failure	DO	1/0	On/Off
121	AFD 1 Failure	DO	1/0	On/Off
122	AFD 2 Failure	DO	1/0	On/Off
123	AFD 3 Failure	DO	1/0	On/Off
124	AFD 4 Failure	DO	1/0	On/Off
125	AFD 5 Failure	DO	1/0	On/Off
126	AFD 6 Failure	DO	1/0	On/Off
131	Pump 1 Overload Failure	DO	1/0	On/Off
132	Pump 2 Overload Failure	DO	1/0	On/Off
133	Pump 3 Overload Failure	DO	1/0	On/Off
134	Pump 4 Overload Failure	DO	1/0	On/Off
135	Pump 5 Overload Failure	DO	1/0	On/Off
136	Pump 6 Overload Failure	DO	1/0	On/Off
140	A-V Alarm Output	DO	1/0	On/Off
171	Low Suction Detected, W/ Proof Time	DI	1/0	On/Off
172	High Suction Detected, W/ Proof Time	DI	1/0	On/Off
173	High Level Alarm Detected, W/ Proof Time	DI	1/0	On/Off
174	Low Level Alarm Detected, W/ Proof Time	DI	1/0	On/Off
175	Push to Silence Switch Input	DI	1/0	On/Off
201	Speed Signal	AO	0-100	4 - 20 ma
202	Active PV	AO	0-Span	4 - 20 ma
203	System Flow Rate	AO	0-Span	4 - 20 ma
204	System KW	AO	0-Span	4 - 20 ma
205	System DP	AO	0-Span	4 - 20 ma
206	System Efficiency	AO	0-100	4 - 20 ma
211	Analog Input 1	AO	0-Span	4 - 20 ma
213	Analog Input 2	AO	0-Span	4 - 20 ma
213	Analog Input 3	AO	0-Span	4 - 20 ma
214	Analog Input 4	AO	0-Span	4 - 20 ma
215	Analog Input 5	AO	0-Span	4 - 20 ma
216	Analog Input 6	AO	0-Span	4 - 20 ma
217	Analog Input 7	AO	0-Span	4 - 20 ma
218	Analog Input 8	AO	0-Span	4 - 20 ma
219	Analog Input 9	AO	0-Span	4 - 20 ma
220	Analog Input 10	AO	0-Span	4 - 20 ma
221	Analog Input 11	AO	0-Span	4 - 20 ma
222	Analog Input 12	AO	0-Span	4 - 20 ma
223	Analog Input 13	AO	0-Span	4 - 20 ma
224	Analog Input 14	AO	0-Span	4 - 20 ma
225	Analog Input 15	AO	0-Span	4 - 20 ma
226	Analog Input 16	AO	0-Span	4 - 20 ma

Appendix – Drawings

Drawing #	Description
1.0	Technologic 5500 Pump Controller - Door
2.0	Technologic 5500 Pump Controller - Subpanel
3.0	Operator Interface and CPU

WITHOUT BYPASS

WITH BYPASS

TECHNOLOGIC 5500 PUMP CONTROLLER
(FRONT VIEW DOOR CLOSED)
DRAWING 1.0

CPU & OPERATOR INTERFACE

24 VDC POWER SUPPLY

SLOT 2, DIGITAL OUTPUT
SLOT 1, DIGITAL OUTPUT
SLOT 0, CAN CONNECTION

RACK 2

SLOT 1, RS COM PORT   SLOT 6, DIGITAL INPUT
SLOT 2, OPTIONAL I/O   SLOT 5, ANALOG INPUT
SLOT 3, OPTIONAL I/O   SLOT 4, ANALOG OUTPUT

RACK 1

CUSTOMER CONNECTIONS

(FRONT VIEW DOOR OPEN, BYPASS & NON BYPASS)
DRAWING 2.0

TECHNOLOGIC

4 LINE DISPLAY

NUMERIC KEY PAD

FUNCTION KEYS WITH LEDS

Bell & Gossett
a xylem brand

TECHNOLOGIC 5500 OPERATOR INTERFACE AND CPU
DRAWING 3.0

Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're 12,500 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

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