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River Corridor
Closure Contract

Operation and Maintenance Manual

Phase II Testing – Bioremediation Design for Deep Zone Petroleum Contamination (UPR-100-N-17) at the 100-N Area

January 2014

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For Review

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

Attached to: 1223390

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APPROVAL PAGE

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The approval signatures on this page indicate that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

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Draft A

River Corridor Closure Contract

Operation and Maintenance Manual

Phase II Testing – Bioremediation Design for Deep Zone Petroleum Contamination (UPR-100-N-17) at the 100-N Area

January 2014

Authors:

For Review

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Office of Assistant Manager for River Corridor

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1.0 BIOREMEDIATION SYSTEM DESCRIPTION

The Bioremediation System (BRS) system was designed in response to a historical diesel spill in the 100-N Area. The BRS is a bioventing system with the primary goal of encouraging biodegradation of contaminants in the unsaturated soils. A photographic log of the system components can be found in Appendix F. The BRS equipment is housed within a CONEX container and can operate 24 hours per day continuously unless the blower(s) is set to the OFF mode or an alarm condition exists (see the following sections). As-built drawings for the system are provided in Appendix A. A periodic maintenance plan for the system is provided in Section 8.0.

1.1 BRS BLOWERS

The BRS is designed to operate as a four-blower system for injecting ambient air into up to four wells screened in the vadose zone (only three blowers were installed in 2012, but the BRS Control Panel and power distribution panels can accommodate four). The operator can use the BRS Control Panel touchscreen to do the following:

1. Change the blower operation modes (AUTO, OFF, HAND)
2. Change the BRS setpoints
3. Change the current date and time
4. Read the current blower mode, date, time, blower pressures, CONEX temperature, or alarm condition.

The system currently contains pressure transmitters for each of the three blowers (system is wired to accommodate four pressure transmitters) and a single temperature transmitter for monitoring the temperature inside the CONEX. A remote telemetry and alarm messaging unit (a Sensaphone® 2000) is installed to monitor the BRS transmitters (pressures and temperature) and send alarm messages to the operators, as programmed. Alarms are shown on a red exterior strobe light, a universal red flashing light on the front of the BRS Control Panel, and a flashing alarm message for the respective blowers on the touchscreen. The BRS Control Panel has one universal reset button to clear the active alarms.

® Sensaphone is a registered trademark of Phonetics Incorporated.

2.0 BRS CONTROL PANEL

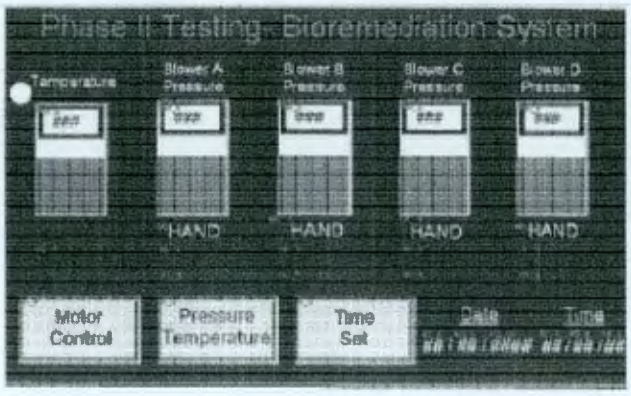
2.1 DESCRIPTION AND OPERATION

The BRS Control Panel controls all of the blowers and receives and logs all telemetry from the system sensors. The operator uses the BRS system via the interface touchscreen on the front of the BRS Control Panel. The Operator Interface Touchscreen was programmed to allow the operator to control the BRS at the BRS Control Panel through the following screens:

[Main] Screen - The following information is displayed on the Main Screen (see Figure 1):

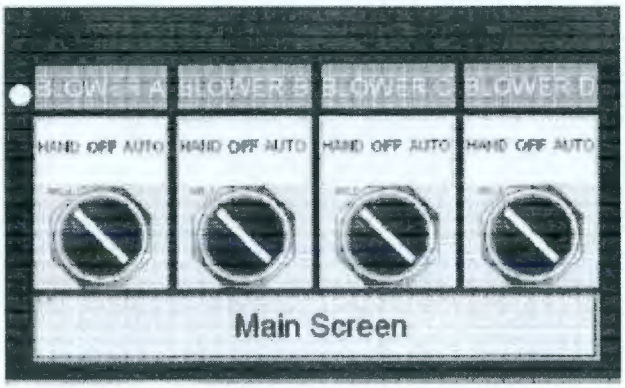
1. The title (Phase II Testing - Bioremediation System)
2. Time and Date
3. Blower labels (B-A to B-D) and current Mode or Alarm Condition(s)
4. Pressures from pressure transducers (PS-1A to PS-1C) in inches water column (WC) (the fourth blower would require a pressure transducer PS-1D)
5. BRS CONEX interior temperature (degrees Fahrenheit [°F])
6. List of other screens to toggle to from the Main Screen (via touch "buttons")

Figure 1. [Main] Screen Menu.



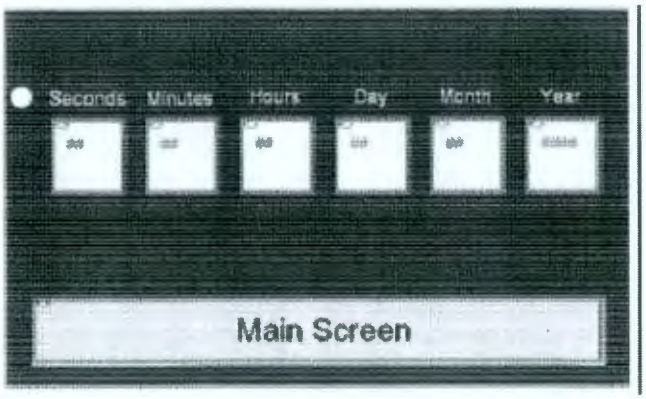
[Motor Control] Screen - The control panel display shows a list of the blowers and buttons for setting the respective blowers (B-A to B-D) to "AUTO," "OFF," or "HAND" (see Figure 2). Tapping the "switch" graphic toggles the mode for each respective blower from "HAND" to "OFF" to "AUTO." A button to return to the Main Screen is also included.

Figure 2. [Motor Control] Screen.



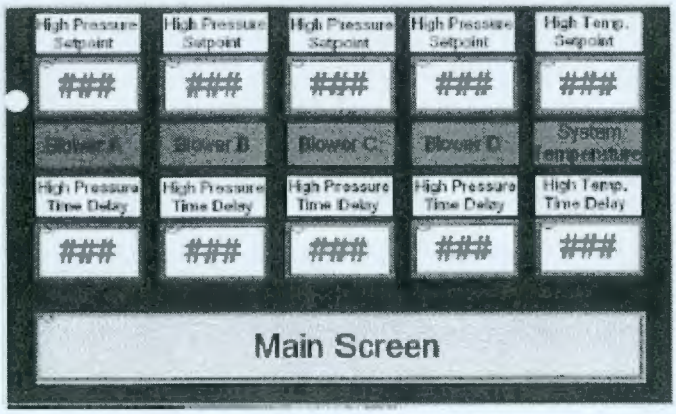
[Time Set] Screen - The operator can change the time and date from this screen (see Figure 3). A button to return to the Main Screen is also included.

Figure 3. [Time Set] Screen.



[Pressure Temperature] Setpoint Screen - The different setpoints for alarm conditions are shown and can be set on this screen (see Figure 4). Each blower has a High Pressure Setpoint and a High Pressure Time Delay. The system also has a High Temperature Setpoint and a High Temperature Time Delay. (See Section 4.1.1 for setpoint explanations and Section 9.0 for recommended setpoints.) A button to return to the Main Screen is included.

Figure 4. [Pressure Temperature] Setpoint Screen.



The BRS Control Panel also has one red universal alarm light that is labeled "Alarm Condition" (mounted above the universal reset button) and one red universal reset pushbutton located beneath the universal alarm light and labeled "Alarm Main Reset". If any Alarm condition exists, this light will activate and blink until the "Alarm Main Reset" button is pressed and the alarm condition is cleared. The reset button will reset the system after an alarm condition triggers an alarm and if the alarm condition no longer exists. Please refer to the attached documentation in Appendix C for further details of the BRS Control Panel.

2.1.1 Maintenance

No routine maintenance is expected for the BRS Control Panel (see Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule). If issues arise associated with the BRS Control Panel, a certified electrical worker should inspect the BRS Control Panel and perform the necessary repairs or equipment replacement. Due to the potential for extreme temperatures at the site, some electrical equipment may wear out faster than expected despite installation of an exhaust fan.

3.0 POWER SUPPLY

3.1 DESCRIPTION AND OPERATION

The BRS is supplied electrical service from a local overhead power drop. The local service consists of 100A at 480VAC, 3-phase, and 60Hz. Power is provided to the BRS CONEX via an exterior rated SOO cord with plug connections on both ends that connect to the receptacles on the BRS CONEX and panel on the adjacent power pole. Electrical power is distributed from the main power receptacle through two panels (PNL-1 and PNL-2). PNL-1 is the primary panel for 480VAC electrical distribution for all blowers and control power. PNL-2 is the secondary panel for 120VAC electrical distribution.

The 120VAC power distribution includes two 20A circuits for convenience outlets (115A, 20A, ground fault circuit interrupter [GFCI] duplex outlet), one 20A circuit for the exterior floodlights, one 15A circuit for T-stat controlled ventilation fan, and one 15A circuit for internal lighting.

3.1.1 Maintenance

No routine maintenance is expected for the power supply system. (See Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule.) Operators should visually inspect the exterior SOO power cord and connection points for damage, but should not touch any of this equipment unless certified for electrical work and using power safety equipment. Any damage, loss of power, or issue with the electrical supply system should be noted and the property project manager notified so that certified electricians can conduct the necessary repair work.

4.0 REGENERATIVE BLOWERS

4.1 DESCRIPTION AND OPERATION

The BRS Control Panel was designed and fabricated to operate four blowers. Three blowers were installed prior to delivery with the fourth blower being optional if future need arises. The three installed regenerative blowers are all AMETEK® Rotron Model DR808AY72MX (7.5HP, 208-230/480VAC, 3PH, 60Hz, TEFC motor). Corresponding blower performance curves and relevant service information are provided in Appendix B. The blowers are all controlled via the BRS Control Panel with standard motor starters (see Figure 2). None of the blowers are operated with a variable frequency drive. The blowers all operate in accordance with the following modes:

AUTO Mode - Each of the blowers should primarily operate in AUTO mode. The respective blower mode designation label shows "AUTO" unless an alarm condition exists, and then the respective designation and lights will activate.

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OFF Mode - When the OFF mode is selected; the respective blower is de-energized and shut off. The respective blower mode designation label will show "OFF" unless an alarm condition is present (red light blink) for that sub-system and has not been cleared. The blower B-D (FUTURE BLOWER) will always show as "OFF" until installed. Changing the blower B-D mode to AUTO or HAND will have no effect on the system because this motor has not been installed.

HAND Mode - The respective blower will be energized and run even if alarm conditions exist, unless the equipment is inoperable (thermal overload, broken, etc.). The respective blower mode designation will show "HAND" (and if an alarm exists then see the responses detailed below).

ALARM Mode - If any one of the blowers is in an alarm mode, the blower mode designation will comply with the specified alarm labels until the alarm is cleared in accordance with the specifications.

The blowers should always be run in AUTO mode unless testing is being performed and the control logic needs to be bypassed by running in HAND mode. The blower should only be run in HAND mode for short periods (a few minutes). HAND mode bypasses the blowers' control logic and protection features (high pressure shutoff) and can potentially damage the blower if run for an extended time.

4.1.1 Monitoring Gauges and Alarm Conditions

The BRS Control Panel controls the blowers and response to the alarm conditions listed below in the manner detailed. Refer to Section 9.0 for the recommended set points for these levels.

System sensors will monitor parameters and direct telemetry to the Control Panel. When levels exceed the acceptable ranges, the following "Alarm" Conditions will exist and the blowers will respond accordingly:

1. **High Pressure Level** - Each of the blowers has an associated pressure transmitter (PS-1A to PS-1C) (see Figure [0100N-DD-E0295]). When any or all of these pressure transmitters exceed the High Pressure Setpoint for a consecutive period greater than the High Pressure Time Delay (fixed 60-second interval), then the respective blower(s) will shut down and the system goes into alarm mode and the appropriate alarm signals are activated (Sensaphone calls, exterior red strobe, BRS Control Panel universal red alarm light, the respective touchscreen blower mode designation[s] blink "HIGH PRESSURE"). The blower(s) will not go back on-line until the alarm condition is cleared and the BRS Control Panel universal reset button is pressed. The respective BRS blower will shut down only if the blower is in the "AUTO" mode. A high-pressure alarm condition in any of the blowers will not shut down any of the other blowers, if there are no other alarm conditions. Additionally, each blower is equipped with a mechanical pressure gauge to serve as a backup to the pressure transducer. Mechanical gauges can be used to verify BRS Control Panel readings during maintenance visits.

2. **Thermal Overload** - If any of the thermal overloads are tripped on any of the system motors, the respective blower mode designation on the touchscreen will blink "THERMAL," the BRS Control Panel red universal alarm light will activate and blink, the red strobe light will blink, and the respective blower will go off-line. The blower(s) will not go back on-line until the alarm condition is cleared and the BRS Control Panel universal reset button

is pressed. The respective BRS blower will shut down only if the blower is in the "AUTO" mode. A thermal overload condition in any of the blowers will not shut down any of the other blowers if there are no other alarm conditions.

3. **High Temperature Level** - If the Temperature Transmitter inside the BRS CONEX exceeds the High Temperature Setpoint for a consecutive period greater than the High Temperature Time Delay Setpoint, then all of the BRS blowers will shut down and the appropriate alarm signals will activate (Sensaphone calls, exterior red strobe, BRS Control Panel universal red alarm light, touchscreen blower mode designations all blink "HIGH TEMP") for a **period** set by the High Temperature Time Delay (1 to 999 minutes). Once the High Temperature Time Delay has expired, and if the interior temperature has dropped below the High Temperature Setpoint, then the alarm condition will automatically clear and the blowers will reactivate in cascade function (only if the blowers were in Auto or Hand mode prior to high temperature shutdown) and the High Temperature Time Delay reset. If the High Temperature Time Delay has expired, and if the interior temperature is still above the High Temperature Setpoint, then the High Temperature Time Delay will reset and the blowers will stay off-line until the High Temperature Time Delay expires and the interior temperature is below the High Temperature Setpoint. The High Temperature Time Delay will keep resetting until the interior temperature is below the High Temperature Setpoint when the High Temperature Time Delay expires.

4.1.2 Flow Control Equipment

Control over air flow from the blowers is accomplished using the 4-inch brass gate valves located just downstream of the blower effluent. Control of the air flow to each individual line is done using the 4-inch gate valves on the main manifold. The backpressure on each blower is measured by the respective pressure transducer and is shown on the control panel touchscreen. Decreasing the air flow from the blower by partially closing the gate valve also increases the backpressure on the blower. The blower can operate over a wide range of air flows and backpressures, but should not be operated with the gate valve closed. Operation with the gate valve closed would cause excessive backpressure and damage the motor. If a thermal overload occurs, the motor thermal switch should trip and shut down the motor, thus protecting the motor. The motor will need to cool down and be reset before commencing further operation. The Control Panel will register this condition and activate an alarm. This can be cleared by pressing the universal reset button on the front of the Control Panel. Refer to Section 9.0 for expected flow ranges for each well.

4.1.3 Maintenance

All of the blowers were manufactured to operate continuously. The blower motor life is reduced by frequent intermittent operation and extreme weather conditions (heat and cold). The BRS CONEX is vented and has a thermostatically controlled fan to help reduce a buildup of heat in the BRS CONEX during periods of hotter weather. The following maintenance tasks should be conducted on a regular interval (see Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule):

1. The operation of the CONEX box fan should be checked during hot weather to ensure that it is working properly. Adjusting the thermostat to a low temperature to check that the fan activates is a good method of quickly checking its operation.

2. Each of the blower inlet filters should be checked to ensure they are not clogged with dust and particles. If build-up is apparent, clean the filter, or replace it if cleaning is not effective.

3. If the system does not require all of the blowers running continuously, then the "Off" blower should be rotated between the operational blowers to ensure that they all operate equally and are not left off to seize up.

4. The pressure levels on each of the blowers should be monitored closely. Valve adjustments to balance the flows and reduce pressures should be made when they exceed 55 to 60 inches of water column (WC). Average backpressures should be around 50 inches of WC or lower. Each well line should be balanced to give approximately equal amounts of air to each line with the gate valves located just below the flow gauges for each line.

4.1.3.1 Air Filters. The only routine maintenance recommended by the blower manufacturer is the replacement of inlet air filters. (See Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule.) As air filters become dirty or clogged, blower performance will decrease and backpressure will increase. A backpressure greater than 60 inches WC may indicate the need for filter maintenance. Filters should be inspected regularly. If build-up is apparent, clean the filter or—if cleaning is not effective—replace it. In addition, AMEC recommends that filters are cleaned/replaced during the late spring sampling event in preparation for the more extreme operating conditions that accompany the hot summer.

4.1.3.2 Well Maintenance. No routine maintenance is expected for the wells. During sampling events, operators should visually inspect the well casings and covers for damage. If any damage is discovered, repairs should be conducted by a licensed well installer. Refer to Appendix D for a sample of a routine field maintenance sheet for inspecting and noting equipment conditions and recording maintenance issues.

5.0 PRESSURE SENSORS

5.1 DESCRIPTION AND OPERATION

The BRS includes both mechanical and transducer-type pressure sensors. Each blower has a pressure transducer and mechanical pressure gauge installed just downstream of the blower effluent port (see Appendix A, drawing 0100N-DD-E0295). The pressure transducers are all Dwyer model 673-3C (0-5 psi range, 4-20mA signal, 9-30VDC power) conduit-style transducers. The operator can view the real-time pressure transducer telemetry on the BRS Control Panel Operator Interface Touchscreen Main Screen (see Figure 1). The operator can vary the flow and backpressure by adjusting the system gate valves and observing the change in pressure on the control panel and flow on the manifold flow meters. The mechanical pressure gauges provide a visual backup to the transducers.

5.1.1 Maintenance

No maintenance is required for the pressure transducers or gauges. The transducers and gauges are meant to provide backup to each other and to indicate when either a gauge or transducer has failed. In the event that a gauge or transducer fails, the operator should replace

the faulty unit with a new one of the same type and model. AMEC has provided two spare pressure transducers in the back (end with double swing doors) of the BRS CONEX amongst the spare hoses (for additional well connection). The pressure transducers and gauges provide information about the status of the system. Please refer to Section 4.1.1 concerning the maintenance issues concerning elevated operating pressures.

6.0 SENSAPHONE 2000 TELEMETRY / ALARM UNIT

6.1 DESCRIPTION AND OPERATION

The BRS system includes a Sensaphone 2000 monitoring/alarm/datalogging unit that was installed inside the panel and used for remote monitoring/logging and alarm auto-dialing. All Sensaphone 2000 software, information, and programs are included with the BRS Control Panel book. All Sensaphone local terminals were wired to field terminals to allow easy change of signal wiring to the unit. The Sensaphone 2000 unit monitors the following system parameters/sensors:

1. **Blower B-A Pressure** - Differential pressure (velocity pressure) for B-A on the pressure side (XXX.X in. WC with a range of 0 to 138.5 in. WC) using pressure transmitter PS-1A.

2. **Blower B-B Pressure** - Differential pressure (velocity pressure) for B-B on the pressure side (XXX.X in. WC with a range of 0 to 138.5 in. WC) using pressure transmitter PS-1B.

3. **Blower B-C Pressure** - Differential pressure (velocity pressure) for B-C on the pressure side (XXX.X in. WC with a range of 0 to 138.5 in. WC) using pressure transmitter PS-1C.

4. **Blower B-D Pressure** - FUTURE Differential pressure (velocity pressure) for B-D on the pressure side (XXX.X in. WC with a range of 0 to 138.5 in. WC) using pressure transmitter PS-1D.

5. **Blower B-A On/Off** - The BRS monitors if B-A is ON (AUTO or HAND Modes) or OFF (OFF Mode) and reports it in an ON or OFF condition on the Sensaphone 2000.

6. **Blower B-B On/Off** - The BRS monitors if B-B is ON (AUTO or HAND Modes) or OFF (OFF Mode) and reports it in an ON or OFF condition on the Sensaphone 2000.

7. **Blower B-C On/Off** - The BRS monitors if B-C is ON (AUTO or HAND Modes) or OFF (OFF Mode) and reports it in an ON or OFF condition on the Sensaphone 2000.

8. **BRS CONEX Temp** - Monitors the temperature of BRS CONEX using the Sensaphone temperature sensor and reports it in °F (XXX.X deg. F) across the manufacturer's temperature range.

The Sensaphone 2000 unit communicates with remote users via the cellular device, which is also installed with the BRS Control Panel (connected to BRS Control Panel in a separate panel).

6.1.1 Maintenance

The Sensaphone 2000 unit does not require any maintenance other than monitoring and replacing the NiCad rechargeable batteries every 2 years (see Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule). The status of the battery is shown on the "Inputs" window when the unit is being monitored remotely. The Sensaphone 2000 unit must be opened to replace the battery. A certified electrical worker must be the one to do this since the Sensaphone 2000 unit is inside the BRS Control Panel and electrical issues are present. If any other issues arise associated with the Sensaphone 2000 unit, the operator should have both the Sensaphone 2000 unit and the cellular unit checked by a certified electrical worker familiar with this type of equipment.

7.0 MANIFOLD, VALVES, AND PIPING

7.1 DESCRIPTION AND OPERATION

The BRS contains galvanized steel, brass, polyvinyl chloride (PVC) piping/hose, fittings, and valves. These components were assembled to provide the piping and manifold controls needed to direct the air injection work from the respective blowers to the selected wells. Gate valves are provided on the effluent of each blower before the main line and at the manifold where individual lines direct air to each well. The gate valves can be used to accomplish the following:

1. Balance air flow to the individual wells using the valves on the manifold,
2. Close off flow to a well(s),
3. Close off an air line to a blower if it is shutdown (so air does not blow back through it), and
4. Induce backpressure to test the pressure transducers and gauges.

WARNING: The galvanized steel lines from each active blower and main line can get hot after extended operation and especially during hot weather. The operator should not touch these lines without proper thermal protection (e.g., leather gloves).

7.1.1 Maintenance

The BRS piping, valves, and fittings should not require significant maintenance. (See Section 8.0 for Periodic Inspection/Maintenance Plan and Schedule.) If a fitting or valve fails, the part should be replaced by a field technician with experience working with this type of equipment. Care should be taken when working around the piping/hose to not damage it. The PVC components and fittings that are on the exterior of the BRS CONEX will eventually degrade under ultraviolet (UV) sunlight after a couple years and become brittle. Schedule 80 PVC components were used since they last significantly longer in sunlight than Schedule 40 PVC components. If the system is operated for a period greater than 2 years, the operator should conduct monthly inspections of the PVC parts (especially the hose) and determine when the respective parts should be replaced. The operator should inspect all of the interior and exterior fittings and connections on a monthly basis to see if any have become loose. If any fittings, threaded connections, pipe clamps, or Fernco flexible couplers are found to be loose, an experienced field technician should tighten and secure these items to the proper position.

8.0 PERIODIC INSPECTION/MAINTENANCE PLAN AND SCHEDULE

The BRS will require routine inspection and maintenance in order to continue operating properly. Table 1 groups the maintenance activities with the recommended schedule.

Table 1. Recommended Schedule for Maintenance Activities.

Description	Monthly	Quarterly	Annually
Inspection of Pipe Fittings / Couplers / Power Cable / etc. (Interior and Exterior)	X		
Inspection/Replacement of Blower Filters	X		
Monitoring/Adjustments of System Pressures [a]	X		
Monitoring / Switching Blowers [b]	X		
Inspection of Wells		X	
Inspection of CONEX Box Outlets, Lights, Fan, Alarms [c]		X	
Replacement of Sensaphone 2000 Batteries			X

[a] Adjustments of system due to pressure readings will be conducted on an as-needed basis.

[b] Monitoring the blowers for mechanical defects (unusual noise or thermal trips) and switching the blowers should be done monthly. Switching the blowers will only be done when one or more operational blower is shut down to reduce pressure and wear on the system.

[c] All of the exterior and interior lights should be inspected quarterly and replaced as necessary. A full inspection and test of the alarm conditions should be conducted during an annual inspection by a qualified technician or engineer. Any deficiencies identified during this test should be immediately reconciled or repaired and the system brought back online. The CONEX fan should be checked monthly by turning down the temperature control below the ambient to ensure that the fan comes on and functions properly. Once project fan response has been confirmed the thermostatic control should be reset to 90°F.

9.0 RECOMMENDED BRS SETPOINTS AND NORMAL RANGES

Based upon the monitoring of the system and experience with the pilot BRS and similar types of systems, AMEC is recommending that the following setpoints be used and monitored:

1. High Pressure – The normal operation of the blowers should be between about 50 and 60 inches WC. AMEC recommends that all functioning pressure transducers have the setpoint be set between **55 and 60 inches WC** depending on observed backpressure.

2. High Pressure Time Delay – The High Pressure Time Delay setpoint is set to relieve the system from pressure sensor bounce from incorrectly shutting off the system. A high pressure level must be above the High Pressure level for a continuous period longer than the High Pressure Time Delay in order to activate this alarm. It is recommended that this time delay be for a period of **1 to 5 minutes**.

3. High Temperature – The High Temperature sensor reads the ambient temperature in the CONEX box and initiates an alarm and system shutdown when the setpoint is exceeded for a continuous period greater than the High Temperature Time Delay period (see no. 4 below). This setpoint should be between **110° and 125°F** depending upon the time of year. During the winter a lower setpoint can be used since incoming air will typically be much cooler than the summer months.

4. High Temperature Time Delay – The High Temperature Time Delay also relieves temperature sensor bounce by requiring the temperature exceedance to be for a continuous period of over **5 to 10 minutes**. This will keep the equipment from overheating the box during any season. The CONEX box fan should come on long before this time and assist in lowering the temperature below the High Temperature level.

5. CONEX Box Fan Thermostat – In order to reduce the ambient temperature in the CONEX box, the CONEX box fan is controlled by an automatic thermostat with a temperature dial. AMEC recommends setting this dial to a temperature of approximately **90°F**.

6. Flow Meter Ranges – Each line has an independent mechanical flow meter located just above each of the respective valves for each line. Based upon prior testing and system operations, it is expected that typical flow ranges for each well should be between about **200 and 250 cubic feet per minute (cfm)**. The operator should attempt to balance flows between lines while maximizing the total flow rate (combined total from individual lines).

10.0 LIMITATIONS

This manual was prepared exclusively for Washington Closure Hanford (WCH) and Terranear by AMEC Environment & Infrastructure, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on (1) information available at the time of preparation, (2) data supplied by outside sources, and (3) the assumptions, conditions, and qualifications set forth in this report. This operations and maintenance manual is intended to be used by WCH for the Phase II Testing – Bioremediation System operation only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

APPENDIX A

AS-BUILT PLANS

DRAWING NO.	REV. NO.
0100N-DD-G0078	1

VICINITY MAP

U.S. DEPARTMENT OF ENERGY

DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

DOE CONTRACT NO.
DE-AC06-05RL-14655

HANFORD SITE

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA

AS-BUILT

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PORTLAND, OR

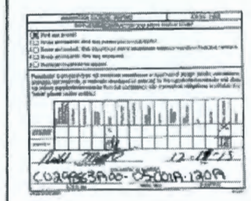
100-N DRAWING INDEX				TECHNICAL SPECIFICATION INDEX	
DRAWING #	DRAWING TITLE	DRAWING #	DRAWING TITLE	SPECIFICATION #	SPECIFICATION TITLE
GENERAL		ELECTRICAL			
0100N-DD-G0078	DRAWING & TECHNICAL SPECIFICATION INDEX	0100N-DD-E0295	ELECTRICAL LAYOUT AND ONE-LINE DIAGRAM	0100N-SP-G0017 △1	PHASE II TESTING BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION AT 100-N AREA
0100N-DD-G0079	GENERAL ABBREVIATIONS AND SYMBOLS LIST	INSTRUMENTATION			
CIVIL		0100N-DD-J0055	PROCESS AND INSTRUMENTATION DIAGRAMS		
0100N-DD-C0734	INJECTION WELL DETAILS				
0100N-DD-C0735	INJECTION WELL HEAD ASSEMBLY DETAILS				
0100N-DD-C0736	EQUIPMENT LAYOUT FOR AIR INJECTION				
0100N-DD-C0737	SYSTEM LOCATION PLAN				

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
H-1-96995 SHT01	100N	0000

NOTES

1. SUBCONTRACTOR IS RESPONSIBLE FOR VERIFICATION AND PROTECTION, BUT NOT REMOVAL, OF ALL ABOVE AND BELOW GRADE INTERFERENCES INCLUDING WELLS, BENCHMARKS, EXISTING UTILITIES, AND ENERGIZED SYSTEMS.
2. FOLLOWING INSTALLATION OF THE BIOREMEDIATION SYSTEM, SUBCONTRACTOR SHALL PREPARE AS-BUILT DRAWINGS BY REVISIONS REV. 0 "ISSUED FOR CONSTRUCTION" TO REV. 1 "AS-BUILT". THESE AS-BUILT DRAWINGS SHALL BE SUBMITTED FOR SUBCONTRACT REQUIRED CLOSE-OUT ACTIVITIES.



RECEIVED
DEC 19 2013
WCH - DOCUMENT CONTROL

EXPIRES June 2014

DOCUMENT CONTROL akb 12/23/13

REV	DATE	DESCRIPTION	DRAWN BY	CHK'D	CHK'D	CHK'D	CHK'D	CHK'D
△								
△								
△								
△1	12/16/13	AS-BUILT	PM	[illegible]	[illegible]	DS	MA	[illegible]
△0	6/28/12	ISSUED FOR CONSTRUCTION	PM	PS	PS	KH	MA	PS

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

TERRANEAR PMC, LLC.
RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA
DRAWING & TECHNICAL SPECIFICATION INDEX

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	IND00078_R1.DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-G0078	1

DRAWING NO.	REV. NO.
0100N-DD-G0079	1

GENERAL ABBREVIATIONS

AC	ASBESTOS CEMENT
ACM	ASBESTOS CONTAINING MATERIAL
AOC	AREA OF CONTAMINATION
AWG	AMERICAN WIRE GAGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BOC	BOTTOM OF CONCRETE
BOE	BOTTOM OF EXCAVATION
CI	CAST IRON
CONC	CONCRETE
℄	CENTER LINE
cm	CENTIMETER
CSA	CONTAMINATED SOIL AREA
CTA	CONTAINER TRANSFER AREA
DEMOL	DEMOLISHED
DIA	DIAMETER
DN	DIAMETER NOMINAL
DP	DEEP
DR	DRAIN
DWG	DRAWING
E	EASTING
EL	ELEVATION
EQ	EQUAL
ERDF	ENVIRONMENTAL RESTORATION DISPOSAL FACILITY
ft^3	CUBIC FEET
FDN	FOUNDATION
FR	FRENCH
FT	FEET
FW	FILTERED WATER
GND	GROUND
GPa	GIGAPASCAL
GPR	GROUND PENETRATING RADAR
GPS	GLOBAL POSITIONING SYSTEM
HDPE	HIGH DENSITY POLYETHYLENE
HGIS	HANFORD GEOGRAPHICAL INFORMATION SYSTEM
HORZ	HORIZONTAL
HPT	HIGH POINT
HRA	HIGH RADIATION AREA
ID	INSIDE DIAMETER
INV	INVERT
JB	JUNCTION BOX
km	KILOMETER
kV	KILOVOLT
kW	KILOWATT
L	LENGTH
LF	LINEAR FEET
LG	LONG
LM	LINEAR METER
LOC	LOCATION
M	METER
m^3	CUBIC METER
mm	MILLIMETER
MAX	MAXIMUM
MI	MILES
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MOBILE OFFICE
MON	MONITORING
N	NORTHING
NEC	NATIONAL ELECTRICAL CODE
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
PE	PIPE ENCASEMENT
R	RADIUS
RDR	RADIOACTIVE DRAIN
REF	REFERENCE
S	SEWER
SCH	SCHEDULE
SST	STAINLESS STEEL
STL	STEEL
THK	THICK
TOC	TOP OF CONCRETE
TYP	TYPICAL
V	VERTICAL
VP	VITRIFIED CLAY PIPE
W	WATER
WIDS	WASTE INFORMATION DATA SYSTEM
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
XFMR	TRANSFORMER

GENERAL SECTION/DETAIL CUTS

DETAIL NUMBER
1
0100N-DD-C0001
DRAWING NUMBER WHERE SHOWN OR TAKEN

DETAIL NUMBER
1
—
TAKEN AND SHOWN ON SAME DRAWING

SECTION DESIGNATION — SECTION ARROW
A
0100N-DD-C0002
DRAWING NUMBER WHERE SHOWN OR TAKEN

SECTION DESIGNATION — SECTION ARROW
A
—
TAKEN AND SHOWN ON SAME DRAWING

WATER, EFFLUENT, SEWER LINES

- EFFLUENT PIPING TO BE REMOVED
- EXPORT WATER
- INACTIVE SERVICE WATER
- FIRE PROTECTION WATER
- EXISTING MANHOLE LOCATIONS

GENERAL SYMBOLS

N 151753.29 / E 574089.53 — WASHINGTON STATE PLANE COORDINATES

- PROPOSED AIR MONITOR STATION
- PERMANENT MARKER
- EXISTING WASTE SITE/UNPLANNED RELEASE
- ACTIVE FIRE HYDRANT
- MONUMENT LOCATION
- MONITORING WELL
- EXISTING PAVED ROAD
- EXISTING UNIMPROVED ROAD
- EXISTING RAILROAD TRACKS
- EXISTING FENCE

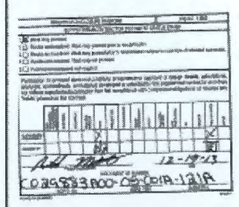
ELECTRICAL/TELEPHONE UTILITIES

- A — EXISTING ELECTRICAL LINE (230 kV)
- C — EXISTING ELECTRICAL LINE (13.8 kV)
- F — EXISTING ELECTRICAL LINE (480 V)
- H — EXISTING ELECTRICAL LINE (120/240 V)
- J — EXISTING ELECTRICAL LINE (120/208 V)
- DIRECT BURIED CABLE
- T — TELEPHONE LINE
- UTILITY POLE
- LIGHT POLE
- POLE MOUNTED TRANSFORMER

MONUMENT DESIGNATION	WASHINGTON STATE PLANE COORDINATES (METERS)	MONUMENT DESCRIPTION SEE NOTE 1
HSWB-041	N 150168.449 E 571820.323	STATION MARK EL 144.579 HORIZONTAL DATUM: NAD83(91) VERTICAL DATUM: NAVD88
HSWB-068	N 149280.359 E 571596.529	STATION MARK EL 141.664 HORIZONTAL DATUM: NAD83(91) VERTICAL DATUM: NAVD88
S324	N 148641.070 E 571961.243	STATION MARK EL 143.235 HORIZONTAL DATUM: NAD83(91) VERTICAL DATUM: NAVD88

NOTES

1. SURVEY MONUMENT INFORMATION SHOWN ON THIS DRAWING WAS DERIVED FROM A SURVEY PERFORMED PREVIOUSLY IN THE 100-N AREA.
2. WHERE NOT EXPLICITLY INDICATED, ALL MEASUREMENTS AND COORDINATES ARE SHOWN IN METRIC UNITS.
3. COORDINATES AND ELEVATIONS PROVIDED WERE DERIVED FROM HANFORD SITE RECORDS. ACTUAL LOCATIONS AND DIMENSIONS SHALL BE FIELD VERIFIED BY THE SUB-CONTRACTOR. AS-BUILT CONSTRUCTION MAY VARY FROM NEAT-LINES SHOWN ON DRAWINGS.
4. THIS IS A STANDARD ABBREVIATIONS AND SYMBOLS LIST. THEREFORE, NOT ALL OF THE INFORMATION SHOWN ON THIS SHEET MAY BE USED ON THIS PROJECT.



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EXPIRES June 2014

DOCUMENT CONTROL OKB 12/23/13

REV	DATE	DESCRIPTION	DRAWN BY	DESIGN CHK	CADD CHK	CHECKED CHK	ENGR APPR	PROJ APPR
1	12/19/13	AS-BUILT	PM			DS		
0	6/28/13	ISSUED FOR CONSTRUCTION	PM	PS	PS	RH	N/A	PS

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

TERRANEAR PMC, LLC.
RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA
GENERAL ABBREVIATIONS AND SYMBOLS LIST

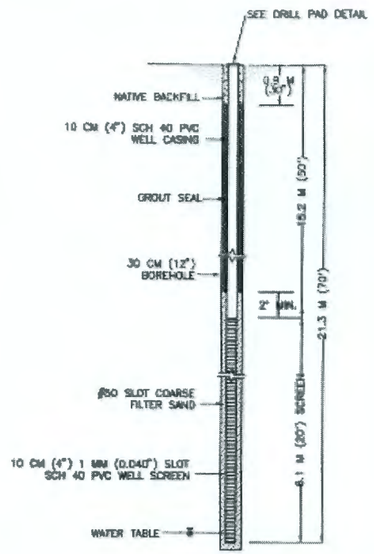
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	INDG0079_R1.DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-G0079	1

RECORD INFORMATION

RECORD NO.	PLOT NO.	INDEX NO.
H-1-96996 SHT01	100N	0000

DRAWING NO.	REV. NO.
0100N-DD-C0734	1



DEEP AIR INJECTION
WELL INSTALLATION (SEE NOTE 2)
199-N-167 (DIW-1),
199-N-172 (DMP-4)

NOT DRAWN TO SCALE

NOTES

1. FITTINGS AT WELLS SHALL BE THREADED TO ALLOW MODIFICATIONS AS NEEDED.

2. THE WELL CONSTRUCTION INFORMATION IS PROVIDED FOR INFORMATION PURPOSES ONLY. WELLS WILL BE CONSTRUCTED BY OTHERS PRIOR TO INSTALLATION OF BIOVENTING SYSTEM COMPONENTS.

3. THREADED PVC SHALL BE PROVIDED AS PART OF WELL CONSTRUCTION FOR SUBCONTRACTOR USE IN ABOVE-WELL ATTACHMENT OF BIOVENTING PIPING.

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DEC 18 2013
WCH - DOCUMENT CONTROL

DOCUMENT CONTROL OKb 12/23/13

REV.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJ ENGR	DISC ENGR	CONST ENGR	CONST MGR
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0	9/28/12	ISSUED FOR CONSTRUCTION	PM	PS	PS	KH	N/A	PS

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

TERRANEAR PMC, LLC.
RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA
INJECTION WELL DETAILS

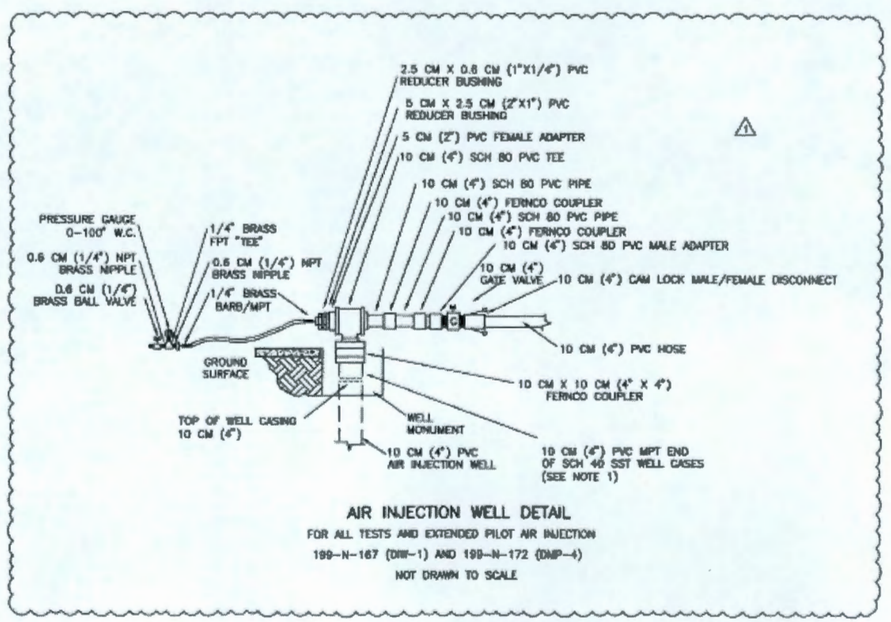
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14855	DE-AC06-05RL-14855	N0C0734_R1.DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-C0734	1

RECORD INFORMATION

RECORD NO.	INDEX NO.	INDEX NO.
H-1-96998 SHT01	100N	0500

DRAWING NO.	REV. NO.
0100N-DD-C0735	1



AIR INJECTION WELL DETAIL

FOR ALL TESTS AND EXTENDED PILOT AIR INJECTION

199-N-167 (DIW-1) AND 199-N-172 (DMP-4)

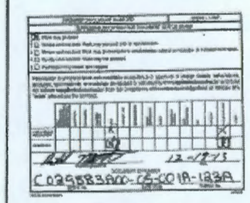
NOT DRAWN TO SCALE

WELL CASING SIZE

WELL	CASING
199-N-167 (DIW-1)	10 cm (4")
199-N-172 (DMP-4)	10 cm (4")

NOTES

1. FITTINGS AT WELLS SHALL BE THREADED, UNLESS OTHERWISE SHOWN, TO ALLOW MODIFICATIONS, AS NEEDED.



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DEC 19 2013
WCH - DOCUMENT CONTROL

EXPIRES JULY 2014

DOCUMENT CONTROL AKb 12/23/13

REV	DATE	DESCRIPTION	DRAWN BY	CHKD BY	CHKD BY	DES. MANAGER	DES. MANAGER	PROJ. MANAGER
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0	6/26/12	ISSUED FOR CONSTRUCTION	PM	PS	PE	RH	R/A	PS

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON

TERRANEAR PMC, LLC. RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA INJECTION WELL HEAD ASSEMBLY DETAILS

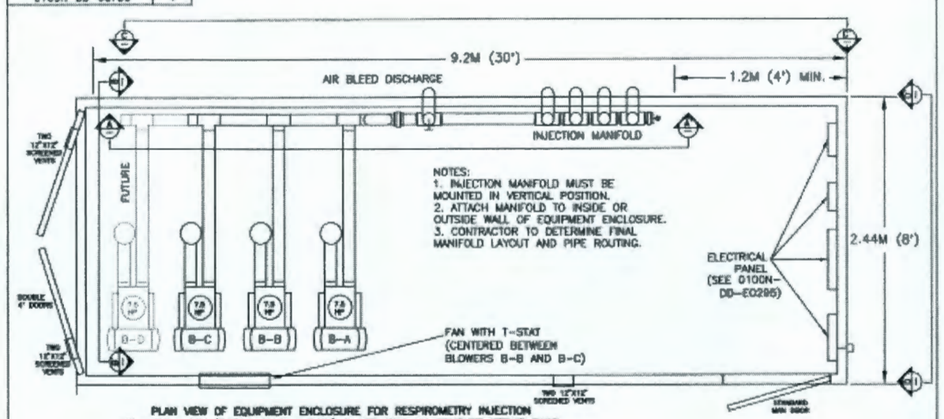
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	INDC0735_R1.DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-C0735	1

RECORD INFORMATION

RECORD NO	BLDG NO.	INDEX NO
H-1-96999 SHT01	100N	0500

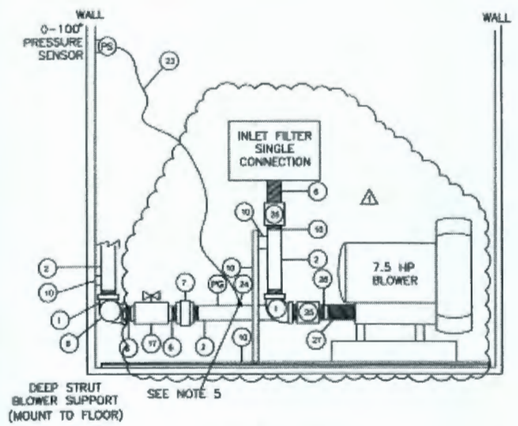
DRAWING NO.	REV. NO.
0100N-DD-C0736	1



PLAN VIEW OF EQUIPMENT ENCLOSURE FOR RESPIROMETRY INJECTION
8' x 30' x 8'H (2.3M x 9.1M x 2.3M) CONEX BOX ON CRUSHED STONE BASE
NOT DRAWN TO SCALE

ABBREVIATIONS

CPVC	CHLORINATED POLYVINYL CHLORIDE
GI	GALVANIZED IRON
GS	GALVANIZED STEEL
PVC	POLYVINYL CHLORIDE



B TYPICAL SECTION – BLOWER CONNECTIONS
NOT DRAWN TO SCALE

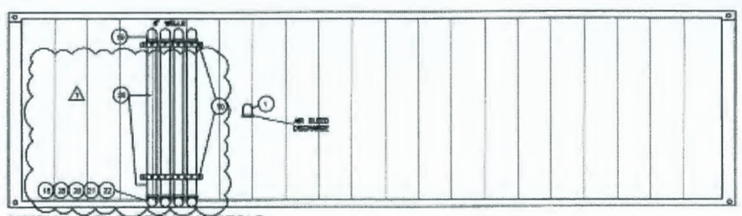
NOTES

1. SEE DRAWING 0100N-DD-J0055 FOR LOCATION OF GAUGES.
2. CONTRACTOR SHALL INSTALL ADDITIONAL PIPE SUPPORTS AS NEEDED.
3. ALL PLANNED AND ADDITIONAL BLOWERS SHALL BE 7.5 HP FOR CONNECTION TO 480V THREE-PHASE POWER SOURCE.
4. ALL BLOWERS B-A TO B-C (AND FUTURE B-D) ARE SPECIFIED AS AMETEK ROTRON MODEL DRB08AY72MX (7.5HP, 208-230/460 VAC, 3 PH 60Hz TEFC MOTOR)
5. PRESSURE GAUGES (PG-201 TO PG-205) SHALL BE INSTALLED DIRECTLY INTO THE PRESSURE LINE (FROM EACH BLOWER) WITH TAP/DIE SET.

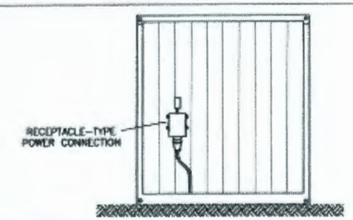
PARTS LEGEND

SECTION A/B/C

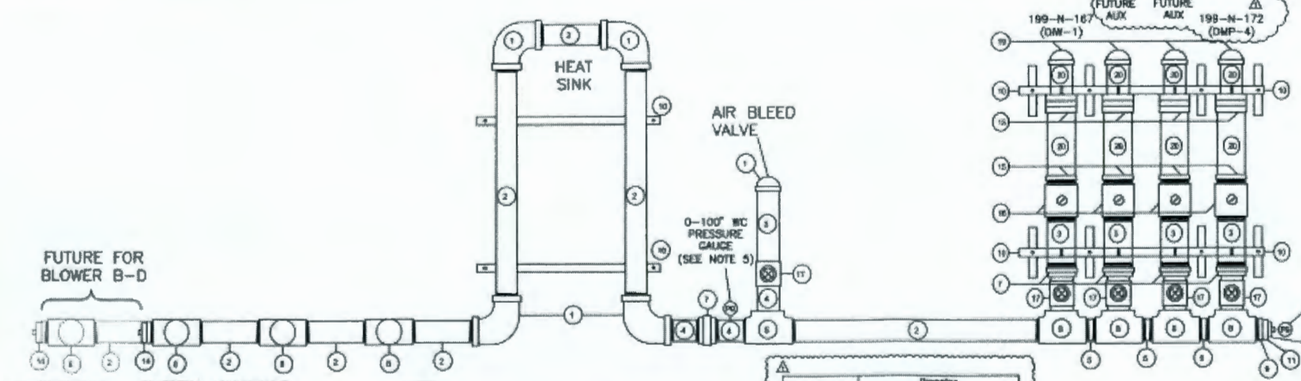
1 - 4" GS 90 ELBOW (FPT ENDS)
2 - 4" GS PIPE (MPT ENDS - CUT TO LENGTH)
3 - 4" X 12" GS NIPPLE
4 - 4" X 6" GS NIPPLE
5 - 4" X 3" GS NIPPLE
6 - 4" GS CLOSE NIPPLE
7 - 4" GS UNION
8 - 4" GS TEE (ALL FPT ENDS)
9 - 4" X 2" GS REDUCER BUSHING
10 - ZINC-PLATED STEEL STRUT AND PIPE CLAMPS
11 - 2" X 1" GS REDUCER BUSHING
12 - 1" X ½" GS REDUCER BUSHING
13 - 4" X 4" FLEXIBLE COUPLER (FERNCO)
14 - 4" GS MPT PLUG
15 - 4" SCH. 80 PVC MALE ADAPTER
16 - 4" ROTRON FLOW METER (FM40C450Q)
17 - 4" BRASS GATE VALVE
18 - 4" SCH. 80 PVC FEMALE ADAPTER
19 - 4" SCH. 80 PVC 90 ELBOW
20 - 4" SCH. 80 PVC PIPE
21 - 4" SS MPT X FEMALE CAMLOCK
22 - 4" SS MALE CAM PLUG
23 - 5/16" POLY TUBING
24 - BRASS ¼" MPT X ¼" BARB
25 - 4" GS COUPLER
26 - 4" X 3" REDUCER BUSHING
27 - 3" CLOSE NIPPLE
28 - 4" SCH. 80 PVC 45° △



C EXTERIOR SECTION OF SYSTEM MANIFOLD
NOT DRAWN TO SCALE



D SECTION – POWER CONNECTION
NOT DRAWN TO SCALE



A SECTION – SYSTEM MANIFOLD
NOT DRAWN TO SCALE

NOTES:
1. ATTACH INJECTION MANIFOLD TO WALL OF SHED USING STRUT CHANNEL AND CLAMPS. SECURE STRUT CHANNEL TO WALL USING GALVANIZED BOLTS AND NUTS.

Well ID	Screening		
	Well Size (inches)	Flow (cfm)	Flow Meter
199-N-167 (DIW-1)	4	250	4"
199-N-172 (DMP-4)	4	250	4"
AUX	4	250	4"
AUX	4	250	4"

RECEIVED
DEC 19 2013
WCH - DOCUMENT CONTROL

DOCUMENT CONTROL 12/25/13

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
H-1-97000 SHT01	100N	0110

12-19-13
CONTRACT NO. DE-AC06-05RL-14655

EXPIRES June 2014

△							
△							
△							
△	12/19/2013	AS-BUILT	PM			DS	
△	8/28/12	ISSUED FOR CONSTRUCTION	PM	PS	PS	RN	R/A	PS
SYM	DATE	DESCRIPTION	DRAWN BY	CHKD BY	ENGR/SCIENTIST	CHKD ENGR	DES ENGR	ENGR GROUP

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON

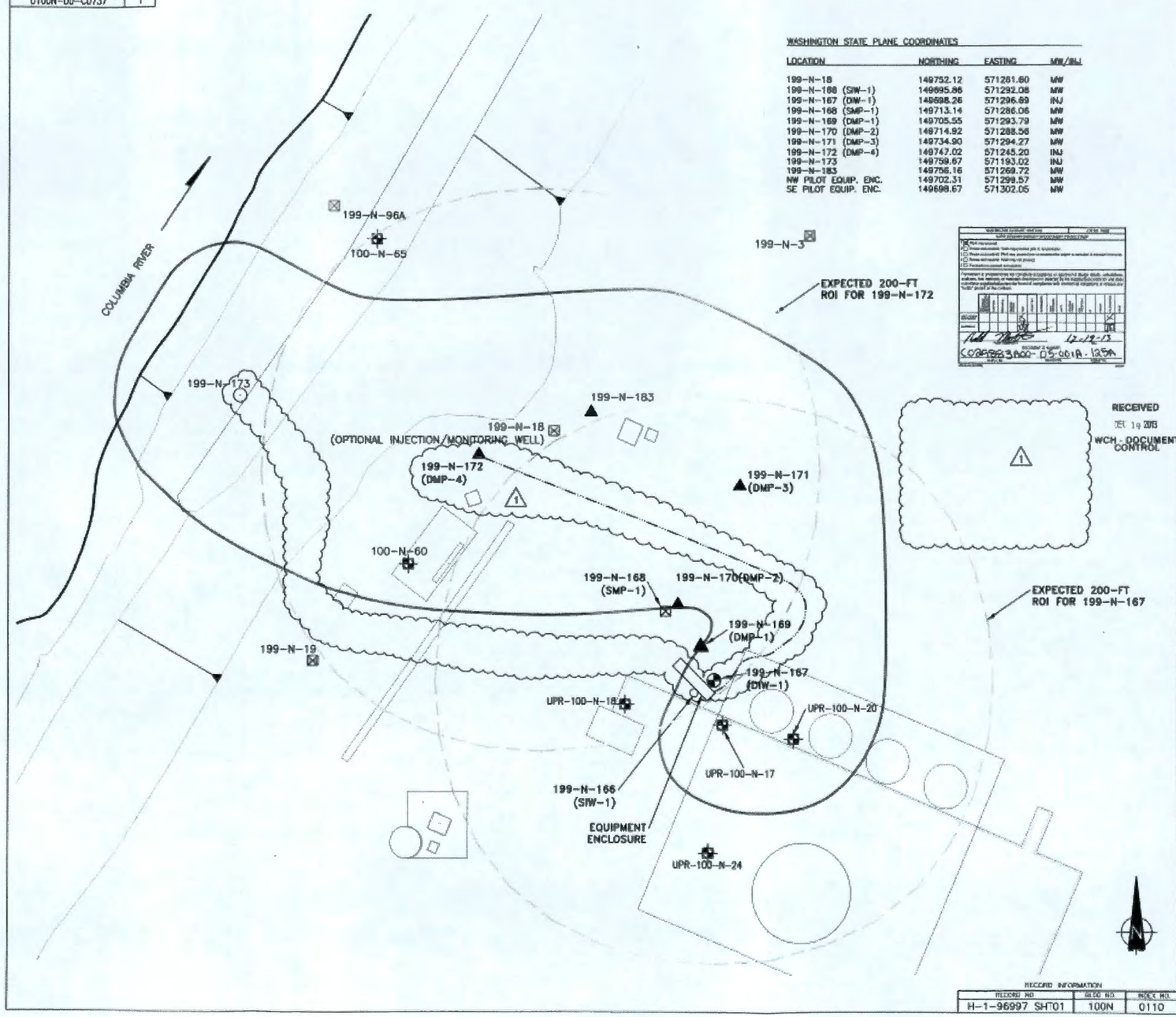
TERRANEAR PMC, LLC. RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA EQUIPMENT LAYOUT FOR AIR INJECTION

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	INDC0736_R1.DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-C0736	1

DRAWING NO.	REV. NO.
0100N-DD-C0737	1



WASHINGTON STATE PLANE COORDINATES

LOCATION	NORTHING	EASTING	MW/INJ
199-N-18	149752.12	571261.60	MW
199-N-166 (SIW-1)	149695.86	571292.08	MW
199-N-167 (DIW-1)	149695.26	571296.69	INJ
199-N-168 (SMP-1)	149713.14	571286.06	MW
199-N-169 (DMP-1)	149705.55	571293.79	MW
199-N-170 (DMP-2)	149714.92	571288.56	MW
199-N-171 (DMP-3)	149734.90	571294.27	MW
199-N-172 (DMP-4)	149747.02	571245.20	INJ
199-N-173	149759.67	571193.02	INJ
199-N-183	149756.16	571269.72	MW
NW PILOT EQUIP. ENC.	149702.31	571299.57	MW
SE PILOT EQUIP. ENC.	149698.67	571302.05	MW

NOTES

1. WELL LOCATIONS SHOWN ARE FOR DESIGN LAYOUT PURPOSES ONLY. FINAL LOCATION WILL BE DETERMINED BY CONTRACTOR IN THE FIELD (e.g., USING GEOPHYSICAL INVESTIGATIONS OF BURIED INTERFERENCES).

2. ALIGNMENT OF ABOVE GROUND HOSE AND PIPING CONNECTIONS FOR SYSTEM TO BE DETERMINED IN THE FIELD.

3. TOPOGRAPHY SHOWN IS FOR INFORMATIONAL PURPOSES ONLY. ACTUAL TOPOGRAPHY MAY VARY DUE TO ONGOING REMEDIATION OF NEARBY ABOVE- AND BELOW-GRADE FACILITIES.

EXPIRES June 30th

EXPLANATION

- DIW-1 ⊕ EXISTING DEEP INJECTION WELL
- DMP-1 ▲ DEEP MONITORING POINT
- ○ SHALLOW MONITORING WELL CONVERTED TO SHALLOW INJECTION WELL
- ⊕ PROPOSED DEEP INJECTION WELL LOCATION
- ⊕ PROPOSED OPTIONAL DEEP INJECTION WELL LOCATION
- PROPOSED DEEP MONITORING POINT
- EXISTING MONITORING WELLS
- EXISTING MONITORING WELLS TO BE USED FOR MONITORING VAPOR
- WASTE SITE
- APPROXIMATE LOCATION OF 500 mg/L (SPRING 2010) TPH-DIESEL IN GROUNDWATER CONTOUR
- ABOVEGROUND HOSE
- ROI AROUND WELLS

0 10 20 30 40 METERS
SCALE 1":10 METERS

DOCUMENT CONTROL OKb 12/23/13

REV	DATE	DESCRIPTION	DRAWN BY	REVIEW	CHECK	REVIEW	ENGR.	CHIEF ENGR.
1	11/12/13	AS-BUILT	PM	[illegible]	[illegible]	DS	N/A	[illegible]
0	6/28/12	ISSUED FOR CONSTRUCTION	PM	PS	PS	KM	N/A	PM

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON

TERRANEAR PMC, LLC. RICHLAND, WA

PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA SYSTEM LOCATION PLAN

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	INDC03733_R1DWG

TASK	DRAWING NO.	REV. NO.
100N	0100N-DD-C0737	1

RECORD INFORMATION

RECORD NO.	AREA NO.	INDEX NO.
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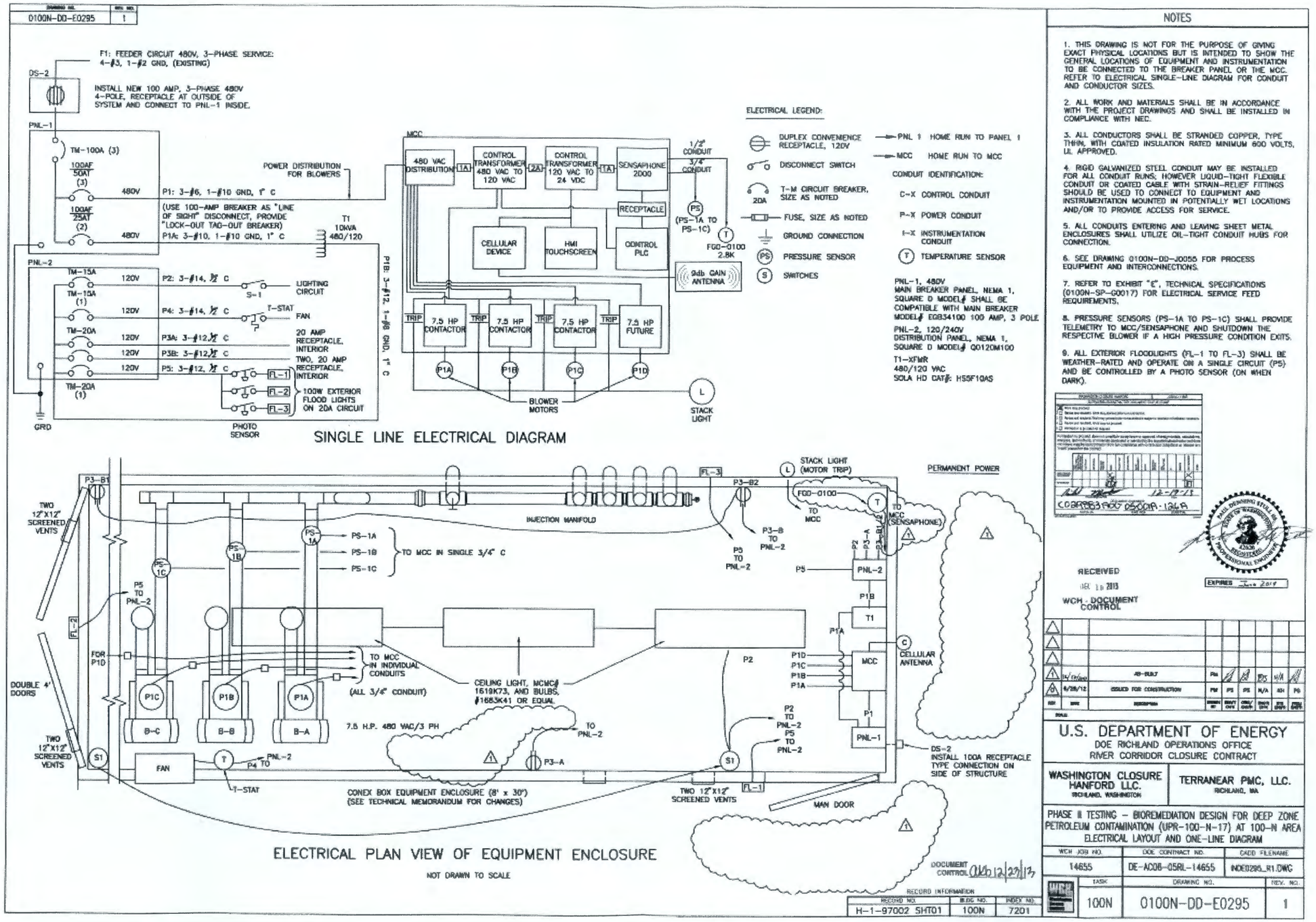
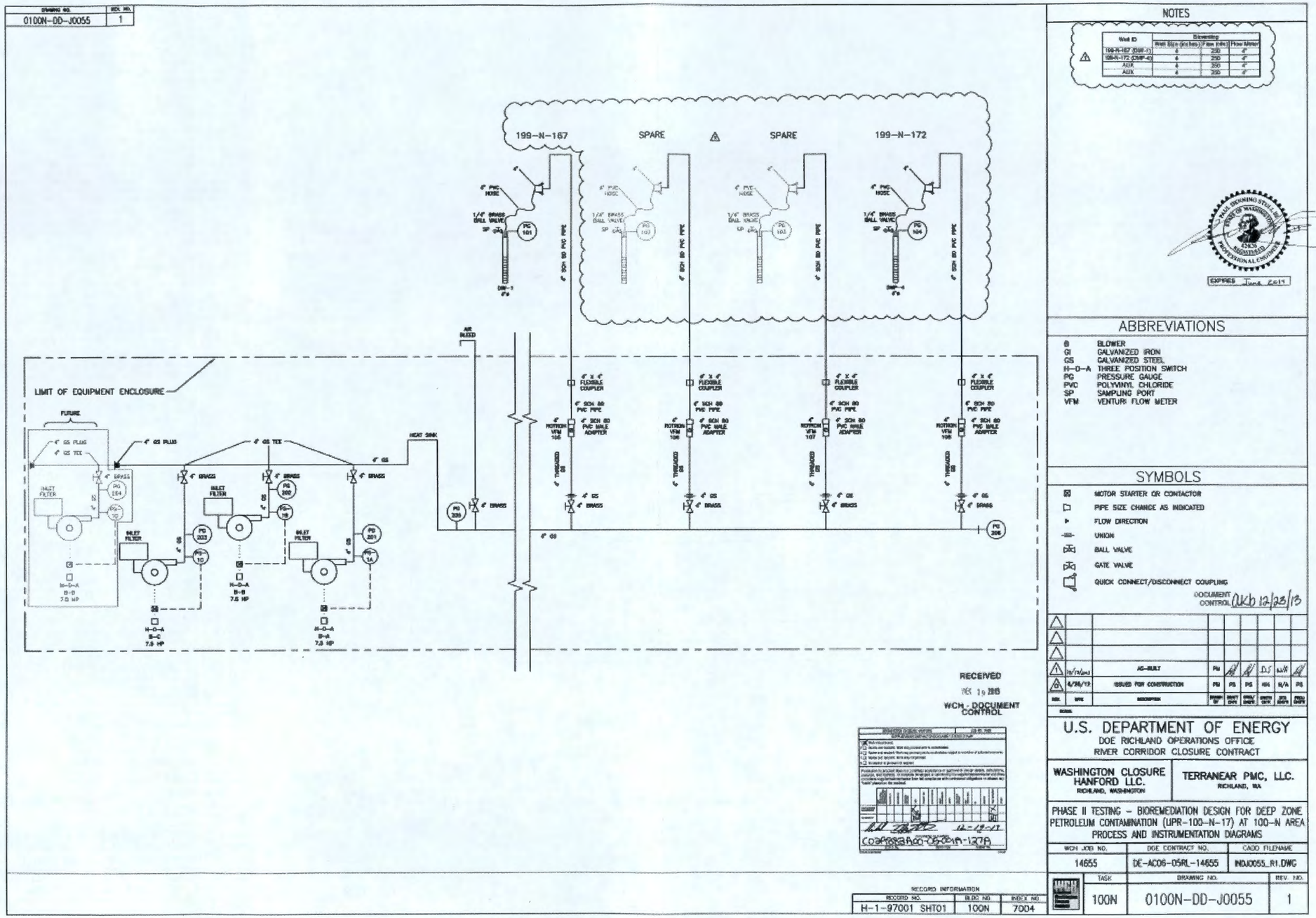

0100N-DD-E0295
1
F1: FEEDER CIRCUIT 480V, 3-PHASE SERVICE: 4-#3, 1-#2 GND, (EXISTING)
DS-2
INSTALL NEW 100 AMP, 3-PHASE 480V 4-POLE, RECEPTACLE AT OUTSIDE OF SYSTEM AND CONNECT TO PNL-1 INSIDE.
PNL-1
TM-100A (3)
100AF 50AT (3)
100AF 25AT (2)
480V
P1: 3-#6, 1-#10 GND, 1" C
(USE 100-AMP BREAKER AS "LINE OF SIGHT" DISCONNECT, PROVIDE "LOCK-OUT TAG-OUT BREAKER)
P1A: 3-#10, 1-#10 GND, 1" C
POWER DISTRIBUTION FOR BLOWERS
T1 10kVA 480/120
PNL-2
TM-15A
120V
P2: 3-#14, 3/4" C
LIGHTING CIRCUIT
P4: 3-#14, 3/4" C
T-STAT
FAN
TM-20A
P3A: 3-#12, 3/4" C
20 AMP RECEPTACLE, INTERIOR
P3B: 3-#12, 3/4" C
P5: 3-#12, 3/4" C
TWO, 20 AMP RECEPTACLE, INTERIOR
FL-1
FL-2
FL-3
100W EXTERIOR FLOOD LIGHTS ON 20A CIRCUIT
P1B: 3-#12, 1-#8 GND, 1" C
GRD
PHOTO SENSOR
MCC
480 VAC DISTRIBUTION
CONTROL TRANSFORMER 480 VAC TO 120 VAC
CONTROL TRANSFORMER 120 VAC TO 24 VDC
SENSAPHONE 2000
RECEPTACLE
CELLULAR DEVICE
HMI TOUCHSCREEN
CONTROL PLC
1/2" CONDUIT
3/4" CONDUIT
PS (PS-1A TO PS-1C)
FGD-0100 2.8K
9db GAIN ANTENNA
TRIP
7.5 HP CONTACTOR
7.5 HP FUTURE
P1A
P1B
P1C
P1D
BLOWER MOTORS
STACK LIGHT
ELECTRICAL LEGEND:
DUPLEX CONVENIENCE RECEPTACLE, 120V
DISCONNECT SWITCH
T-M CIRCUIT BREAKER, SIZE AS NOTED
FUSE, SIZE AS NOTED
GROUND CONNECTION
PRESSURE SENSOR
SWITCHES
PNL 1 HOME RUN TO PANEL 1
MCC HOME RUN TO MCC
CONDUIT IDENTIFICATION:
C-X CONTROL CONDUIT
P-X POWER CONDUIT
I-X INSTRUMENTATION CONDUIT
TEMPERATURE SENSOR
PNL-1, 480V MAIN BREAKER PANEL, NEMA 1, SQUARE D MODEL# SHALL BE COMPATIBLE WITH MAIN BREAKER MODEL# EGB34100 100 AMP, 3 POLE
PNL-2, 120/240V DISTRIBUTION PANEL, NEMA 1, SQUARE D MODEL# QO120M100
T1-XFMR 480/120 VAC SOLA HD CAT#: HS5F10AS
SINGLE LINE ELECTRICAL DIAGRAM
TWO 12"X12" SCREENED VENTS
P3-B1
P3-B2
INJECTION MANIFOLD
STACK LIGHT (MOTOR TRIP)
PERMANENT POWER
FGD-0100
TO MCC
TO MCC (SENSAPHONE)
PS-1A
PS-1B
PS-1C
TO MCC IN SINGLE 3/4" C
P5 TO PNL-2
P3-B TO PNL-2
P2
P3-A
P3-B
P5
PNL-2
P1B
T1
P1A
MCC
CELLULAR ANTENNA
P1D
P1C
P1B
P1A
P1
PNL-1
DS-2 INSTALL 100A RECEPTACLE TYPE CONNECTION ON SIDE OF STRUCTURE
FOR P1D
TO MCC IN INDIVIDUAL CONDUITS
(ALL 3/4" CONDUIT)
CEILING LIGHT, MCMC# 1619K73, AND BULBS, #1683K41 OR EQUAL
DOUBLE 4' DOORS
B-C
B-B
B-A
7.5 H.P. 480 VAC/3 PH
TO PNL-2
P3-A
TWO 12"X12" SCREENED VENTS
FAN
PNL-2
P4 TO
T-STAT
CONEX BOX EQUIPMENT ENCLOSURE (8' x 30') (SEE TECHNICAL MEMORANDUM FOR CHANGES)
TWO 12"X12" SCREENED VENTS
MAN DOOR
ELECTRICAL PLAN VIEW OF EQUIPMENT ENCLOSURE
NOT DRAWN TO SCALE
DOCUMENT CONTROL
RECORD INFORMATION
H-1-97002 SHT01
100N
7201
NOTES
1. THIS DRAWING IS NOT FOR THE PURPOSE OF GIVING EXACT PHYSICAL LOCATIONS BUT IS INTENDED TO SHOW THE GENERAL LOCATIONS OF EQUIPMENT AND INSTRUMENTATION TO BE CONNECTED TO THE BREAKER PANEL OR THE MCC. REFER TO ELECTRICAL SINGLE-LINE DIAGRAM FOR CONDUIT AND CONDUCTOR SIZES.
2. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE PROJECT DRAWINGS AND SHALL BE INSTALLED IN COMPLIANCE WITH NEC.
3. ALL CONDUCTORS SHALL BE STRANDED COPPER, TYPE THHN, WITH COATED INSULATION RATED MINIMUM 600 VOLTS, UL APPROVED.
4. RIGID GALVANIZED STEEL CONDUIT MAY BE INSTALLED FOR ALL CONDUIT RUNS, HOWEVER LIQUID-TIGHT FLEXIBLE CONDUIT OR COATED CABLE WITH STRAIN-RELIEF FITTINGS SHOULD BE USED TO CONNECT TO EQUIPMENT AND INSTRUMENTATION MOUNTED IN POTENTIALLY WET LOCATIONS AND/OR TO PROVIDE ACCESS FOR SERVICE.
5. ALL CONDUITS ENTERING AND LEAVING SHEET METAL ENCLOSURES SHALL UTILIZE OIL-TIGHT CONDUIT HUBS FOR CONNECTION.
6. SEE DRAWING 0100N-DD-J0055 FOR PROCESS EQUIPMENT AND INTERCONNECTIONS.
7. REFER TO EXHIBIT "E", TECHNICAL SPECIFICATIONS (0100N-SP-G0017) FOR ELECTRICAL SERVICE FEED REQUIREMENTS.
8. PRESSURE SENSORS (PS-1A TO PS-1C) SHALL PROVIDE TELEMETRY TO MCC/SENSAPHONE AND SHUTDOWN THE RESPECTIVE BLOWER IF A HIGH PRESSURE CONDITION EXITS.
9. ALL EXTERIOR FLOODLIGHTS (FL-1 TO FL-3) SHALL BE WEATHER-RATED AND OPERATE ON A SINGLE CIRCUIT (P5) AND BE CONTROLLED BY A PHOTO SENSOR (ON WHEN DARK).
RECEIVED
WCH - DOCUMENT CONTROL
EXPIRES
U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT
WASHINGTON CLOSURE HANFORD LLC
RICHLAND, WASHINGTON
TERRANEAR PMC, LLC.
RICHLAND, WA
PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA
ELECTRICAL LAYOUT AND ONE-LINE DIAGRAM
WCH JOB NO. 14655
DOE CONTRACT NO. DE-AC06-05RL-14655
CADD FILENAME INDE0295_R1.DWG
TASK 100N
DRAWING NO. 0100N-DD-E0295
REV. NO. 1


DRAWING NO.
REV. NO.
0100N-DD-J0055
1
199-N-167
SPARE
SPARE
199-N-172
LIMIT OF EQUIPMENT ENCLOSURE
FUTURE
HEAT SINK
AIR BLEED
INLET FILTER
NOTES
ABBREVIATIONS
B BLOWER
GI GALVANIZED IRON
GS GALVANIZED STEEL
H-O-A THREE POSITION SWITCH
PG PRESSURE GAUGE
PVC POLYVINYL CHLORIDE
SP SAMPLING PORT
VFM VENTURI FLOW METER
SYMBOLS
MOTOR STARTER OR CONTACTOR
PIPE SIZE CHANGE AS INDICATED
FLOW DIRECTION
UNION
BALL VALVE
GATE VALVE
QUICK CONNECT/DISCONNECT COUPLING
DOCUMENT CONTROL
AS-BUILT
ISSUED FOR CONSTRUCTION
RECEIVED
WCH - DOCUMENT CONTROL
U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT
WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON
TERRANEAR PMC, LLC.
RICHLAND, WA
PHASE II TESTING – BIOREMEDIATION DESIGN FOR DEEP ZONE PETROLEUM CONTAMINATION (UPR-100-N-17) AT 100-N AREA
PROCESS AND INSTRUMENTATION DIAGRAMS
WCH JOB NO.
DOE CONTRACT NO.
CADD FILENAME
14655
DE-AC06-05RL-14655
INDJ0055_R1.DWG
TASK
DRAWING NO.
REV. NO.
100N
0100N-DD-J0055
1
RECORD INFORMATION
RECORD NO.
BLDG NO.
INDEX NO.
H-1-97001 SHT01
100N
7004

APPENDIX B

COMPONENT INFORMATION

Industrial / Chemical Processing Blowers

DR 808 & CP 808

ROTRON®

5.0 / 7.5 HP Regenerative Blower

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- CE compliant - Declaration of Conformity on file
- Maximum flow: 375 SCFM
- Maximum pressure: 120 IWG
- Maximum vacuum: 95 IWG
- Standard motor: 7.5 HP, TEFC
- Cast aluminum blower housing, impeller & cover; cast iron flanges (threaded)
- UL & CSA approved motor with permanently sealed ball bearings
- Inlet & outlet internal muffling
- Quiet operation within OSHA standards

MOTOR OPTIONS

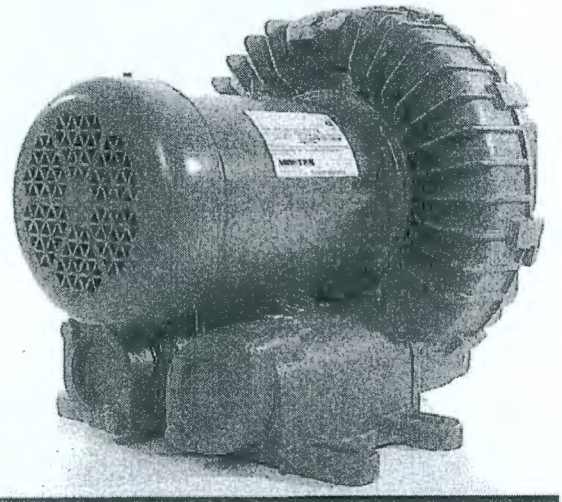
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

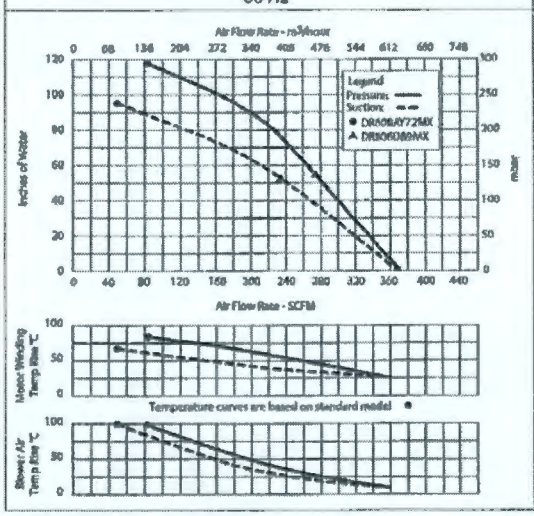
ACCESSORIES

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

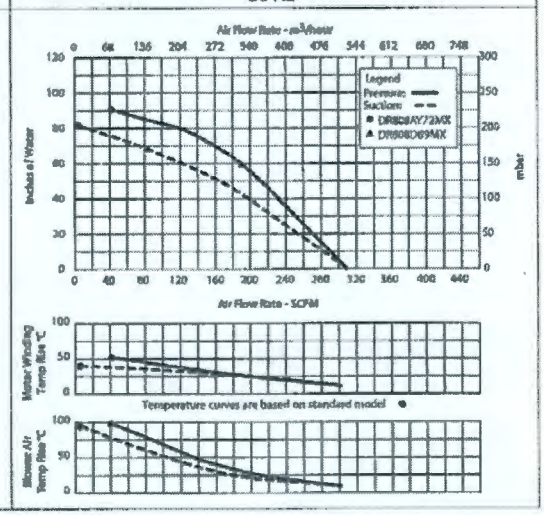


Blower Performance at Standard Conditions

60 Hz



50 Hz



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C 40

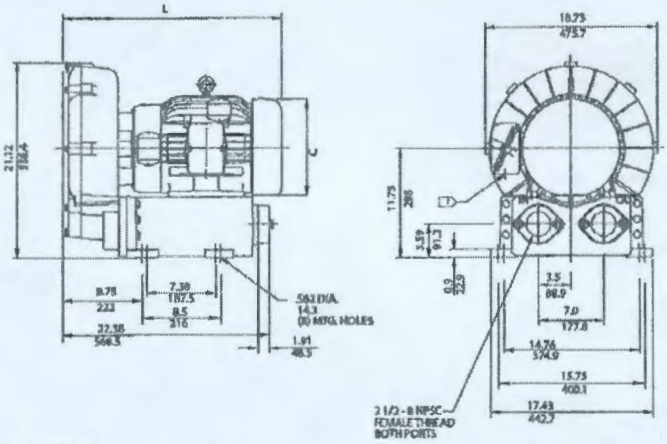
AMETEK
TECHNICAL & INDUSTRIAL PRODUCTS

Industrial / Chemical Processing Blowers

DR 808 & CP 808

ROTRON®

5.0 / 7.5 HP Regenerative Blower



IN
MM

NOTES
1 TERMINAL BOX CONNECTOR HOLE 1.06 (26.9) DIA.
2 DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3 CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

MODEL	L (IN/MM)
DR808AY72MX	22.23/564.6
DR808D69MX	19.31/490.5

		Part/ Model Number				
		DR808AY72MX	DR808AY56MX	DR808D69MX	CP808FG72MXLR	HiE808AY72MX
Specification	Units	081222	081224	081225	081233	081228
Motor Enclosure - Shaft Mtl.	-	TEFC-CS	TEFC-CS	TEFC-CS	Chem TEFC-SS	TEFC-CS
Horsepower	-	7.5	7.5	5.0	7.5	7.5
Voltage	AC	230/460	575	230/460	230/460	230/460
Phase - Frequency	-	Three-60 hz	Three-60 hz	Three-60 hz	Three-60 hz	Three-60 hz
Insulation Class	-	F	F	F	F	F
NEMA Rated Motor Amps	Amps (A)	17.8/8.9	7.2	17.3-15.6/7.8	17.8/8.9	17.8/8.9
Service Factor	-	1.15	1.15	1.15	1.15	1.15
Max. Blower Amps	Amps (A)	28/14	10.8	14/7	28/14	28/14
Locked Rotor Amps	Amps (A)	120/60	60	152/76	120/60	120/60
NEMA Starter Size	-	1/1	1	1/0	1/1	1/1
Shipping Weight	Lbs	285	242	195	285	301
	Kg	129.3	109.8	88.5	129.3	136.5

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz.** Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz.** All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

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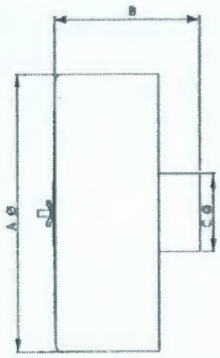
AMETEK
TECHNICAL & INDUSTRIAL PRODUCTS

Accessories

Filtration - Inlet Filter (Single Connection)

ROTRON®

Inlet Filters protect the blower and the air distribution system from dust, and other airborne particles and contaminants. Normally used in pressure systems.



SPECIFICATIONS:

HOUSING – Steel
MEDIA – Polyester
EFFICIENCY – 97-98% (8 to 10 micron particle size)
FILTER ELEMENT – Replaceable (see filter elements)
NOTE "Z" MEDIA (1 to 3 micron particle size) available

		Part/Model Number								
Specification	Units	477411	516466	515122	515123	515124	515125	515146	515151	516511
Filter Element	-	A	B	C, D	E	E	F	G	H	H
Ref Blower Model	-	271078	515132	515132	515133	515134	515134	515134	515135	516515
Outlet Connection	-	2.00 SO	1.00 NPT	1.50 NPT	2.00 NPT	2.00 NPT	2.50 NPT	3.00 NPT	4.00 NPT	6.00 NPT
Dimension A	Inches	4.56	6.00	6.00	7.75	10.00	10.00	10.00	10.00	16.00
	mm	115.8	152.4	152.4	196.9	254	254	254	254	406.4
Dimension B	Inches	6.12	6.50	6.50	7.25	12.25	12.50	13.00	14.00	15.00
	mm	155.4	165.1	165.1	184.2	311.2	317.5	330.2	355.6	381
Dimension C	Inches	2.00	1.00	1.5	2.00	2.00	2.50	3.00	4.00	6.00
	mm	50.8	25.4	38.1	50.8	50.8	63.5	76.2	101.6	152.4
Z Media Filter PN	-		517865	517866	517867	517868	517869	517870	517871	517872

Blower Model Reference Key	
A = SPIRAL	E = DR/EN/CP 656, 6, 633, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 757, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 833, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1233, 14, S15, P15 (Inlet Only)

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G 1

AMETEK
TECHNICAL & INDUSTRIAL PRODUCTS

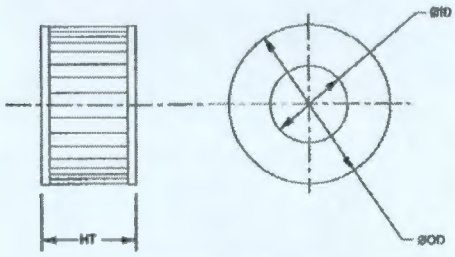
Accessories

Filtration - Filter Element

ROTRON®

All ROTRON Air Filters and Filter/ Silencers have replaceable filter elements. The filter media is polyester designed for high efficiency over a wide spectrum of industrial applications. See filter element cross reference table. Filter elements supplied with foam pre-filter.

Standard Replacement Filter Element Cross Reference Table					
Filter	Element	Filter	Element	Filter	Element
271200 477411 515122	271078 271078 515132	515158 515254 515255	515134 516434 516435	516489 516491 516493	515132 515133 515134
515123 515124 515125	515133 515134 515134	515256 516461 516463	516435 516434 515135	516495 516497 516499	515134 515134 515135
515145 515151 515157	515134 515135 515133	516465 516466 516487	515135 515132 515132	516511 516513 517611	516515 516515 516515



For DR Blower Models

		Part/Model Number						
Specification	Units	515132	515133	515134	515135	516434	516435	516515
Z Media Filter PN	-	517873	517874	517875	517876	517893	517894	517877
Dimension ID	Inches	3.00	3.63	3.5	4.75	2.56	3.50	8.00
	mm	76.2	92.2	88.9	120.7	65	88.9	203.2
Dimension OD	Inches	4.38	5.88	5.88	7.88	5.00	5.88	11.75
	mm	111.3	149.4	149.4	200.2	127	149.4	298.5
Area	Sq/Ft	4.75	4.75	9.50	9.63	4.75	8.75	9.63
	Sq/M	0	0	1	1	0	1	1
Dimension HT	Inches	1.5	2.3	4.5	8.3	2.0	4.5	19.0
	mm	38.1	58.4	114.3	210.8	50.8	114.3	482.6

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AMETEK
TECHNICAL & INDUSTRIAL PRODUCTS

Accessories

Measurement - Air Flow Meter

ROTRON®

FEATURES

- Direct reading in SCFM
- Low pressure drop (2-4" typical) across the flow meter
- Non-clogging, low impedance air stream
- Light weight aluminum
- No moving parts
- Large easy-to-read dial
- Accurate within 2% at standard conditions
- Good repeatability
- Available in 2", 3" and 4" sizes
- Factory configured for quick installation
- .048" Allen key supplied for gauge adjustment

OPTIONS

- Corrosion-resistant version with Chem-Tough™ or in stainless steel
- FDA-approved Food Tough™ surface conversion

BENEFITS

- OPTIMIZE SYSTEM EFFICIENCY
  Measuring the correct air flow can assist you in fine-tuning to your system's optimal efficiency.
- BALANCE MULTI-PIPING SYSTEMS
  When evaluating CFM from more than one pipe, different run lengths or end system impedance can cause one pipe to handle more CFM than the other. With an accurate CFM reading, piping can be balanced by bleeding air in/out or by creating an extra impedance.
- DETECT CHANNELING OR PLUGGING
  For systems in which channeling or plugging can occur, a change in the CFM measured can help indicate the unseen changes in your system.

		Part/Model Number					
		FM20C030Q	FM20C045Q	FM20C065Q	FM20C125Q	FM20C175Q	FM20C225Q
Specification	Units	550599	550600	550601	550602	550603	550604
Flow Rate	CFM	2	2	2	2	2	2
	m3/hr	3.4	3.4	3.4	3.4	3.4	3.4
Threads B	-	6-30	9-45	13-65	25-125	35-175	45-225
Dimension C	Inches	7.18	7.18	7.18	7.18	7.18	7.18
	mm	182.4	182.4	182.4	182.4	182.4	182.4
Dimension D	Inches	7.0	7.0	7.0	5.8	5.8	5.8
	mm	177.8	177.8	177.8	147.3	147.3	147.3
Dimension E	Inches	2.0	2.0	2.0	2.0	2.0	2.0
	mm	50.8	50.8	50.8	50.8	50.8	50.8
Dimension F	Inches	3.75	3.75	3.75	3.75	3.75	3.75
	mm	95.3	95.3	95.3	95.3	95.3	95.3

		Part/Model Number					
		FM30C250Q	FM30C350Q	FM30C475Q	FM40C450Q	FM40C600Q	FM40C850Q
Specification	Units	550605	550606	550607	550608	550609	550610
Flow Rate	CFM	2	2	2	2	2	2
	m3/hr	3.4	3.4	3.4	3.4	3.4	3.4
Threads B	-	50-250	70-350	95-475	90-450	120-600	170-850
Dimension C	Inches	7.18	7.18	7.18	7.18	7.18	7.18
	mm	182.4	182.4	182.4	182.4	182.4	182.4
Dimension D	Inches	7.0	7.0	7.0	5.8	5.8	5.8
	mm	177.8	177.8	177.8	147.3	147.3	147.3
Dimension E	Inches	2.0	2.0	2.0	2.0	2.0	2.0
	mm	50.8	50.8	50.8	50.8	50.8	50.8
Dimension F	Inches	3.75	3.75	3.75	3.75	3.75	3.75
	mm	95.3	95.3	95.3	95.3	95.3	95.3

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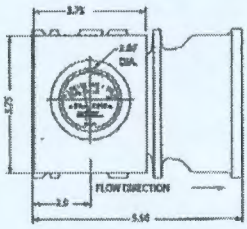
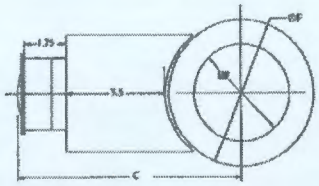
AMETEK
TECHNICAL & INDUSTRIAL PRODUCTS

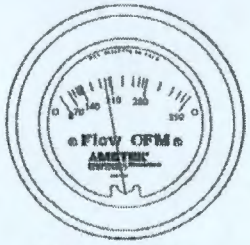
Accessories
Measurement - Air Flow Meter

ROTRON®

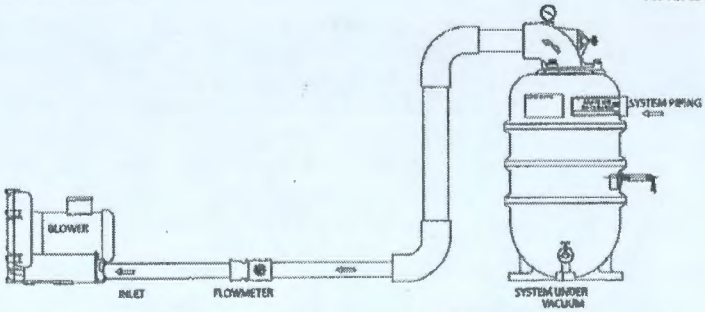
TYPICAL FLOW METER ARRANGEMENT







TYPICAL GAUGE FACE



HIGH TEMPERATURE/PRESSURE CORRECTION

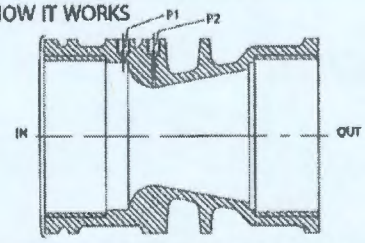
$$SCFM_2 = \frac{SCFM_1}{\sqrt{\left(\frac{14.7}{Pf_2}\right) \times \left(\frac{530}{Tf_2 + 460}\right)}}$$

Pf_2 = Absolute Pressure in PSIA

Tf_2 = Temperature in °F

- Use on inlet to limit need to correct for high pressure or elevated outlet temperature
- Standard model limits = 140°F and 30 PSIG

HOW IT WORKS



ROTRON'S flow meter is a venturi style design. After air enters the inlet, the pressure is measured in the P1 tap. The second tap, P2, measures the pressure at the throat. The differential between P1 and P2 registers across a special calibrated CFM gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

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AMETEK®
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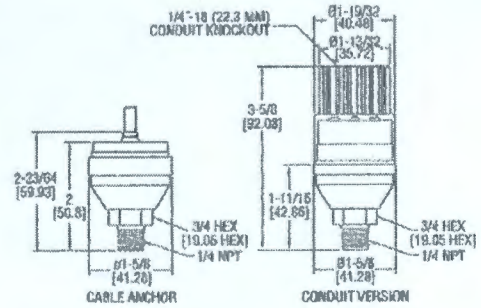
Bulletin A-30-673

Series 673 Pressure Transmitter

Specifications - Installation and Operating Instructions

Conduit Version



The low cost Series 673 Pressure Transmitter is a fixed range transmitter designed for harsh environments and suitable for high shock and vibration applications. Constructed of stainless steel, the Series 673 provides a 4-20 mA output signal with 0.25% accuracy. Use the Series 673 in industrial OEM equipment, hydraulic systems, HVAC equipment, industrial engines and compressor controls.

INSTALLATION

Electrical Connections

The Series 673 Pressure Transmitter is a true 2-wire, 4-20 mA current output device and delivers rated current into any external load of 0-800 ohms. The transmitter has a two wire cable where red is positive and black is negative. Connect shield to system or earth ground.

The 4-20 mA current output units are designed to have current flow in one direction only - please observe polarity. We suggest that the electrical cable shield be connected to the system's loop circuit ground to improve electrical noise rejection.

Media Compatibility

These transmitters are designed to be used with any gas or liquid compatible with 17-4 PH stainless steel.

Pressure Fitting

Typically, standard pipe fittings and procedures should be used. However, for pressure ranges in excess of 500 psig, we suggest the use of a sealant. Excessive torquing of metal fittings may cause a slight zero shift. The use of plastic fittings typically results in no noticeable zero shift. Torquing does not appreciably affect linearity or sensitivity.

MAINTENANCE

Upon final installation of the Series 673 Pressure Transmitter, no routine maintenance is required. A periodic check of system calibration is recommended. The Series 673 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

SPECIFICATIONS

Service: Compatible, non-combustible liquid, gas, or vapor.
Wetted Materials: 17-4 PH stainless steel.
Accuracy: RSS* (at constant temperature) ±0.25%.
Non-Linearity: (BFSL) ±0.22% FS;
Hysteresis: 0.10% FS;
Non-Repeatability: 0.05% FS.
Temperature Limits: -40 to 185°F (-40 to 85°C).
Pressure Limits: 2 X full scale range.
Compensated Temperature Range: -40 to 176°F (-40 to 80°C).
Thermal Effects: Zero Shift: ±2.0% FS/100°F (±1.8% FS/50°C); Span Shift: ±1.5% FS/100°F (±1.3% FS/50°C); Warm-up Shift: ±0.1% FS total.
Stability: 0.5% FS/year.
Response Time: 5 milliseconds.
Supply Voltage: 9-30 VDC.
Output: 4-20 mA**, 2-wire.
Zero and Span Adjustment: Fixed.
Loop Resistance: 0 to 800Ω.
Shock: 200 g.
Vibration: 20 g.
Electrical Connections: 2 ft (61 cm) multi-conductor cable.
Conduit Models: 1/4"-18 (22.3 mm) knockout.
Enclosure: Stainless steel and Valox.
Weight: 2.3 oz (65 g).
Agency Approvals: CE.

*RSS of non-linearity, non-repeatability and hysteresis
**Zero output factory set to within ±0.16 mA.
**Span (full scale) output factory set to within ±0.16 mA.

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Sensaphone 2000

Summary | Accessories | Sensors | Specifications | Downloads

Quick View

Built-In: Power Failure

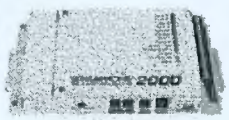
Inputs: 8 - Select Temperature, Dry Contact, 4-20mA or 0-5V analog, Pulse Count, Run Time Accumulator

Outputs: 1

Notifications: 32 numbers - Select custom voice, fax, numeric pager, cell phone text message, email, or modem

Part Numbers: Sensaphone 2000 w/ International Power Supply *FGD-2000-INT*

Sensaphone 2000 with Nema-4X Enclosure *FGD-2000-E*



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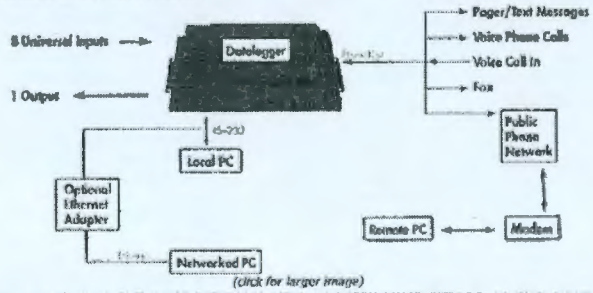
Sensaphone 2000 Functional Diagram



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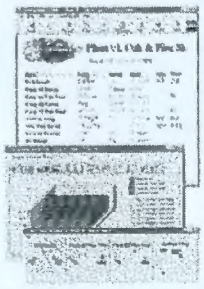
Sensaphone 2000
(For data logging, Includes FREE Microsoft Windows compatible software)



The Sensaphone Model 2000 is an eight channel system with some very unique and powerful features. The eight inputs are universal and can accept either dry contact sensors, thermistors, 4-20mA transducers, and even pulse count devices. Instead of a local keypad for programming and status, the 2000 includes free Windows-compatible software for your PC for easy point-and-click access. One of the main reasons that the 2000 is so popular with our customers is its data logging capabilities. It can store 32,000 time stamped records internally that can be retrieved either locally or remotely. The stored data can then be analyzed and graphed for a detailed view of the trends at your site.

When you have multiple remote sites that you need to monitor, the Sensaphone 2000 makes it easy. If you dedicate a PC that is running the 2000 software, you can use the PC to automatically retrieve and maintain the monitoring status and history information for all of the remote sites. You can program a polling schedule for the PC to follow when collecting data so that all of the data from the remote sites is always available from that single PC. You can even have the PC create web pages from the retrieved data so you can view status and history from a web page anywhere in the world. In addition to all of the data and software features in the Model 2000, it also has enhanced notification capabilities. The 2000 is sophisticated enough to allow notification scheduling so you can have alarms call you at the office during the day, at your house at night, and to your cell phone on the weekends.

In addition to making custom voice phone calls, the Model 2000 can send text messages to an alphanumeric pager or cell phone, and can even send messages directly to a fax machine. A total of 32 people can be notified by the Sensaphone 2000 in case of an alarm.

Rockwell Automation LISTEN. THINK. SOLVE.

Programmable Logic Controllers
MicroLogix 1100 System

Controller

The MicroLogix 1100 combines all the features you demand in a compact controller, with EtherNet/IP messaging, online editing, a built-in LCD screen on every controller and a powerful combination of I/O. For applications that utilize a 12 V power source, the new DC/O controller has been added to the MicroLogix 1100 line. In addition, all MicroLogix 1100 controllers have recently been enhanced to offer increased power, speed and expanded communication capabilities.

MicroLogix Series B controllers offer the following:

- **Key Features and Benefits**
  - **Built-in 10/100 Mbps EtherNet/IP port for peer-to-peer messaging** — offers users high speed connectivity between controllers, with the ability to access, monitor and program from anywhere an Ethernet connection is available
  - **Online editing functionality** — modifications can be made to a program while it is running, making fine tuning of an operating control system possible, including PID loops. Not only does this reduce development time, but it aids in troubleshooting
  - **Embedded Web server** — allows a user to custom configure data from the controller to be displayed as a web page
  - **Isolated RS-232/RS-485 combo port** — provides a host of different point-to-point and network protocols
  - **Embedded LCD screen** — allows user to monitor data within the controller, optionally modify that data, and interact with the control program. Displays status of embedded digital I/O and controller functions, and acts as a pair of digital trim pots to allow a user to tweak and tune a program
- **Additional Features**
  - One 40kHz embedded high-speed counter (on controllers with dc inputs)
  - Two 40kHz high-speed PTO/PWM (on controllers with dc outputs)
  - Two embedded analog inputs (0 - 10 dc, 10 bit resolution)
  - A simple operator interface for messages and bit/integer input
  - 4K words user program memory and 4K words user data memory
  - Up to 128K bytes for data logging and 64K bytes for recipe
  - Email support
  - CIP generic messaging support

For small applications, the embedded I/O in this controller may represent all of the control required. There are 10 digital inputs, 6 digital outputs, and 2 analog inputs on every controller, with the ability to add digital, analog, RTD, and thermocouple modules to customize the controller for your application. On the versions of the controller with dc inputs, there is a high speed counter, and on the dc output version, two PTO/PWM (pulse train outputs and pulse width modulated) outputs, enabling the controller to support simple motion capabilities.

The MicroLogix 1100 also supports expansion I/O. Up to four of the 1762-I/O modules (also used by the MicroLogix 1200 controller) may be added to the embedded I/O, providing application flexibility and support of up to 80 digital I/O.

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Rockwell Automation LISTEN. THINK. SOLVE.

1762 MicroLogix Expansion I/O

Expansion I/O Modules

MicroLogix 1100 controller with four expansion I/O modules

The 1762 MicroLogix expansion I/O modules are compatible with MicroLogix 1100, MicroLogix 1200, and MicroLogix 1400 controllers. If your application requires more I/O than the built-in I/O provided by the controller, add expansion I/O modules.

Install the expansion I/O modules to the right of the controller, either on a panel with two mounting screws or on a DIN rail. You can use digital and analog I/O modules in many combinations, up to the maximum supported by the controller. The current loading capacity of the controller's built-in power supply may limit the actual number of I/O modules that can be connected to the controller.

Features

- Integrated high-performance I/O bus
- Software keying to prevent incorrect positioning within the system
- Finger-safe terminal blocks for I/O wiring
- Label to record I/O terminal designations
- Network support includes EtherNet/IP, DeviceNet, and DH-485 (local only)
- Digital, analog, and specialty I/O modules available

Maximum 1762 Expansion I/O Modules per Controller

Controller	Number I/O Modules, Max.
MicroLogix 1100	4
MicroLogix 1200	6
MicroLogix 1400	7

Environmentals and Certifications

Environmental Specifications

	1762 MicroLogix Expansion I/O Modules
Operating Temperature	-20...65 °C (-4...149 °F) (on selected modules)
Operating Humidity	5...95% noncondensing
Operating Altitude, Max.	2,000 m (6,561 ft)
Vibration, Operating	10...500 Hz, 5 g, 0.015 in peak-to-peak
Vibration, Relay Operation	2 g
Shock, Operating	30 g panel mounted, 20 g DIN-rail mounted
Shock, Relay Operation	7.5 g panel mounted, 5 g DIN rail mounted
Shock, Nonoperating	40 g panel mounted, 30 g DIN rail mounted
Dimensions (HxWxD), Approx.	90 x 40 x 87mm (3.543 x 1.575 x 3.425 in.)*
Radiated and Conducted Emissions	EN50081-2 Class A
ESD Immunity (IEC 1000-4-2)	4 kV contact, 8 kV air, 4 kV indirect

Radiated RF Immunity (IEC 1000-4-3)	10V/m, 80...1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
EFT/B Immunity (IEC 1000-4-4)	2 kV, 5 kHz
Surge Transient Immunity (IEC 1000-4-5)	2 kV common mode, 1 kV differential mode
Conducted RF Immunity (IEC 1000-4-6)	10V, 0.15...80 MHz‡

* Height including mounting tabs is 110 mm (4.33 in.).
‡ Conducted immunity frequency range may be 150 kHz...30 MHz if the radiated immunity frequency range is 30 MHz...1000 MHz.

Certifications

Certifications: C-UL certified (under CSA C22.2 No. 142), UL 508 Listed, CE compliant for all applicable directives.
Hazardous Environment Class: Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL1604, C-UL under CSA C22.2 No. 213).

When product is marked. See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Digital I/O Modules

Digital Output Modules

Cat. No.	Outputs	Voltage Category	Operating Voltage Range	Continuous Current per Output, Max.	Continuous Current per Module, Max.	Off-State Leakage Current, Max.	Bus Current Load, Max.
1762-OA8	8 (4 points/group)	100...240V AC	85...265V AC at 47...63 Hz	0.25 A at 55 °C (131°F) 0.5 A at 30 °C (86 °F)	2.0 A (1.0 A per common) at 55 °C (131 °F) 4.0 A (2.0 A per common) at 30 °C (86 °F)	2 mA at 132V AC 2.5 mA at 265V AC	115 mA at 5V DC (0.575 W)
1762-OB8	8	24V DC source	20...26.4V DC	0.5 A at 55 °C (131°F) 1.0 A at 30 °C (86 °F)	4.0 A at 55 °C (131°F) 8.0 A at 30 °C (86 °F)	1.0 mA	115 mA at 5V DC (0.575 W)
1762-OB16	16	24V DC source	20...26.4V DC	0.5 A at 55 °C (131°F) 1.0 A at 30 °C (86 °F)	4.0 A at 55 °C (131°F) 8.0 A at 30 °C (86 °F)	1 mA	175 mA at 5V DC (0.88 W)
1762-OW8	8 (4 points/group)	AC/DC N.O. contact	5...265V AC 5...125V DC	2.5 A*	16.0 A (8.0 A per common)	0 mA	80 mA at 5V DC (0.40 W) 90 mA at 24V DC (2.16 W)
1762-OW16	16 (8 points/group)	AC/DC N.O. contact	5...265V AC 5...125V DC	2.5 A*	16.0 A (8.0 A per common)	0 mA	140 mA at 5V DC (0.7 W)‡ 180 mA at 24V DC (4.32 W)‡
1762-OX6I	6 N.C., N.O.	AC/DC Type C Relay	5...265V AC 5...125V DC	7.0 A*	30.0 A (7.0 A per common*)	0 mA	110 mA at 5V DC (0.55 W) 110 mA at 24V DC (2.64 W)
1762-OV32T	32 (16 points/group)	24V DC sink	10.2...26.4V DC	0.5 A at 60 °C (140 °F)	4.0 A (2.0 A per common) at 60 °C (140 °F)	0.1 mA at 26.4V DC	175 mA at 5V DC
1762-OB32T	32 (16 points/group)	24V DC source	10.2...26.4V DC	0.5 A at 60 °C (140 °F)	4.0 A (2.0 A per common) at 60 °C (140 °F)	0.1 mA at 26.4V DC	175 mA at 5V DC

* See MicroLogix Programmable Controllers Family Selection Guide, publication 1761-SG001, for complete information on relay contact ratings.

Digital Input Modules

Cat. No.	Inputs	Voltage Category	Operating Voltage Range	On-State Current, Max.	Impedance, Nom.	Signal Delay, Max.	Off-State Voltage and Current, Max.	Bus Current Draw, Max.
1762-IA8	8	100/120V AC	79...132V AC at 47...63 Hz	16 mA at 132V AC, 63 Hz	12 kΩ at 50 Hz 10 KΩ at 60 Hz	On/Off: 20 ms	20V AC 2.5 mA	50 mA at 5V DC (0.25 W)
1762-IQ8	8				3 kΩ			

		24V DC sink/source	10...26.4V DC at 55 °C (131 °F) 10...30V DC at 30 °C (86 °F)	12 mA at 30V DC		On/Off: 8 ms	5V DC 1.5 mA	50 mA at 5V DC (0.25 W)
1762-IQ16	16 (8 points/group)	24V DC sink/source	10...26.4V DC 10...30V DC* ‡	12 mA at 30V DC	3 kΩ	On/Off: 8 ms	5V DC 1.5 mA	70 mA at 5V DC (0.35 W)‡
1762-IQ32T	32 (8 points/group)	24V DC sink/source	10...26.4V DC 10...30V DC§	6.5 mA at 30.0V DC	4.7 kΩ	On/Off: 8.0 ms	5V DC 1 mA	170 mA at 5V DC

* See MicroLogix 1762-IQ16 DC Input Module Installation Instructions, publication 1762-IN010, for derating chart.
§ See MicroLogix 1762-IQ32T DC Input Module Installation Instructions, publication 1762-IN019, for derating chart.
‡ Only applicable for series B.

Digital Combination Modules

Cat. No.	Inputs/Outputs	Voltage Category	Operating Voltage Range	On-State Current, Max.	Continuous Current per Output, Max.	Off-State Voltage and Current, Max.	Off-State Leakage Current, Max.	Impedance, Nom.	Signal Delay, Max.	Bus Current, Max.
1762-IQ8OW6	8 inputs	24V DC sink/source	10...26.4V DC at 65 °C 10...30V DC at 30 °C	10 mA at 5V DC	—	5V DC 1.5 mA	—	3 kΩ	On/Off: 8 ms	110 mA at 5V DC (0.25 W) 80 mA at 24V DC
	6 outputs	AC/DC N.O. contact	5...265V AC 5...125V DC	—	2.5 A (8.0 A per module, max.)	—	0 mA	—	—	110 mA at 5V DC (0.40 W) 80 mA at 24V DC (2.16 W)

Analog I/O Modules

Cat. No.	Inputs/Outputs	Analog Ranges	Bus Current Draw, Max.	Overall Accuracy*	Resolution Across Full Range	Typical Update Period
1762-IF4	4 differential inputs (bipolar)	Voltage: ±10V Current: 4...20 mA	40 mA at 5V DC 50 mA at 24V DC	±0.32% full scale at -20...65° C (-4...149° F)‡ ±0.24% full scale at 25° C (77° F)	15 bits (bipolar)‡	130, 250, 290, 450, 540 ms (selectable)
1762-OF4	4 single-ended outputs (unipolar)‡	Voltage: 0...10V Current: 4...20 mA	40 mA at 5V DC 165 mA at 24V DC	±1.17% full scale at -20...65° C (-4...149° F)‡ ±0.5% full scale at 25° C (77° F)	12 bits (unipolar)	2.5 ms
1762-IF2OF2	2 differential inputs (unipolar) 2 single-ended outputs (unipolar)	Voltage: 0...10V Current: 4...20 mA	40 mA at 5V DC 105 mA at 24V DC	±0.55% full scale at -20...65° C (-4...149° F)‡ ±0.3% full scale at 25° C (77° F)	12 bits (unipolar)	2.5 ms (inputs) 4.5 ms (outputs)

* Includes offset, gain, non-linearity, and repeatability error terms.
‡ Only applicable for series B.

Specialty I/O Modules

Cat. No.	Inputs/Outputs	Accepted Inputs	Bus Current Load, Max.	Accuracy at 25 °C (77 °F)*	Resolution Across Full Range	Channel Update Time (Typical)
1762-IR4	4 input channels	• RTDs: Platinum (385 and 3916), Copper (426), Nickel (672 and 618), Nickel-Iron (518) • Resistance Ranges: 0...3000 Ω	40 mA at 5V DC 50 mA at 24V DC	*With autocalibration enabled* • RTD inputs: ±0.2...±0.6 °C (±0.36...±1.08 °F), depending on RTD type • Resistance inputs: ±0.5...±1.5 Ω depending on resistance value	Input filter and configuration dependent‡	6...303 ms per enabled channel, depending on filter selection
1762-IT4	4 input channels plus a CJC sensor	• Thermocouple Types: J, K, T, E, R, S, B, N, C	40 mA at 5V DC	±1.3 °C (±2.34 °F)	15 bits plus sign	

http://www.ab.com/en/epub/catalogs/12762/2181376/2416247/25463/2164029/print.html 12/26/2012

• Millivolt Input Ranges: ±50 mV and +100 mV	50 mA at 24V DC	7...303 ms per enabled channel +CJC update time

• Includes offset, gain, non linearity, and repeatability error terms.
♦ Refer to the MicroLogix 1200 RTD/Resistance Input Module User Manual, publication: 1762-UM003, for more information
A CJC update time is equal to the largest enabled channel's update time.

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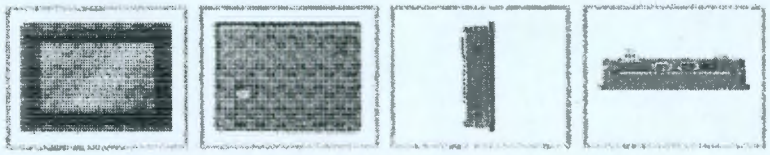
7" Graphic HMI HMI5070TH

7 inch Graphic HMI (Ethernet) with High-Res Color TFT Display and Analog Touchscreen.



Click On Image to Enlarge

7" Touchscreen HMI with a Widescreen Display and Ethernet Port

Maple Systems' 7 inch Widescreen HMI is a high-resolution touchscreen Human Machine Interface with 35 percent more viewing area than a standard 5.6 inch HMI. The outer dimensions of this operator interface terminal are the same as a standard 5.6 inch unit, so the panel cut-out is the same. With an 800 x 480 pixel high-brightness high-contrast TFT display, this graphic HMI has a 400 MHz processor, and is loaded with 128 MB of Flash memory and 64 MB of DRAM. Connectivity includes an Ethernet port, as well as USB and Serial ports.

The two inch depth of this OIT (coupled with the fanless design) allows for mounting in tight spacing conditions. Also, this touch screen unit can be programmed in either portrait or landscape mode so that you can orient it either horizontally or vertically. Additionally this unit has a VNC server which allows for remote communication to the HMI with a computer, cell phone or other device with a VNC client app. The HMI5070TH can be configured with easy-to-use EZware software -- which gives you the ability to create your application the way you want it.

PHOENIX CONTACT

Home | Products | Measurement and control technology | Isolating amplifiers, 6 mm

Product list Temperature transducers | Thermocouple measuring transducer - MINI MCR-SL-TC-UI - 2864448

Thermocouple measuring transducer - MINI MCR-SL-TC-UI - 2864448

The figure shows version MINI MCR -SL-TC-UI-NC

MCR temperature transducer for thermocouples, can be configured via DIP switches, with screw connection, order configuration

This product has to be configured.

Configuration | **Overview** | Technical data | Accessories | FAQs | Approvals | Downloads

Product description

The 6.2 mm wide MINI MCR-SL-PT100-UI-200... is a configurable 3-way isolated temperature measuring transducer. It is suitable for the connection of thermocouples type J and K in acc. with IEC 60584-1.
On the output side, the analog standard signals 0...20 mA, 4...20 mA, 0...10 V, 0...5 V, 1...5 V, 10...0 V, 20...0 mA or 20...4 mA are available, electrically isolated.
The DIP switches are accessible on the side of the housing and allow the following parameters to be configured:
- Sensor type
- Temperature range to be measured
- Cold junction compensation on/off
- Output signal as well
- Fault evaluation type

Power (19.2 V DC to 30 V DC) can be supplied through connection terminal blocks on the modules or in conjunction with the DIN rail connector.

Product Features

- Power supply possible via the foot element (T-connector)
- For J and K thermocouples according to IEC 60584
- Error indication via diagnostic LED and analog signal
- Internal cold junction compensation

- Highly-compact temperature transducer for electrical isolation, conversion, amplification, and filtering of thermocouple signals to create standard signals
- Temperature measuring range of -150°C to +1350°C
- Input and output signals can be configured via DIP switches
- 3-way isolation

Key commercial data

Packing unit	1 PCE
Catalog page	Page 364 (IF-2011)
GTIN	4017918974862
Custom tariff number	85437090
Country of origin	Germany (GERMANY)

Phoenix Contact Inc.

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Middletown, PA 17057

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E-mail

Your local sales contact

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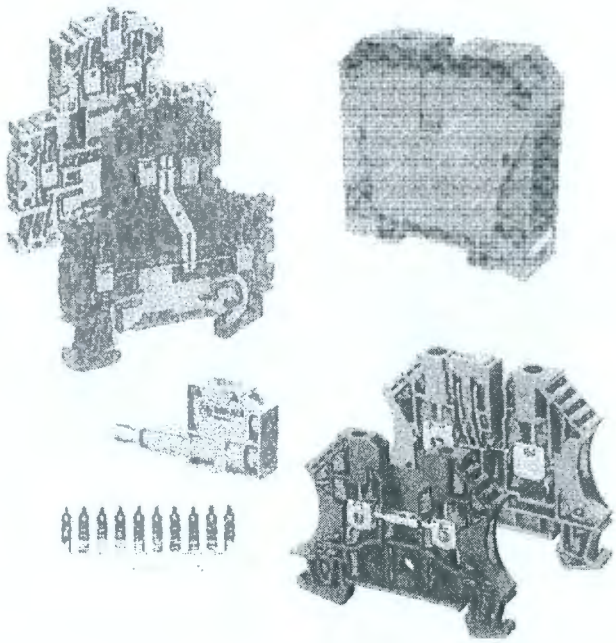
LISTEN THINK SOLVE

BULLETIN 1492
IEC Terminal Block Line Extension



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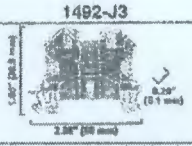
Rockwell Automation

Bulletin 1492

Screw Connection Terminal Blocks

Standard Feed Through Blocks

	1492-J3				1492-J4			
Dimensions are not intended to be used for manufacturing purposes. Note: Height dimension is measured from top of rail to top of terminal block.								
Specifications	Feed-through terminal block				Feed-through terminal block			
Certifications		CSA	IEC	ATEX		CSA	IEC	ATEX
Voltage Rating	600V AC/DC		800V AC/DC	550V AC/DC	600V AC/DC		800V AC/DC	650V AC/DC
Maximum Current	25 A	20 A	24 A	21 A	35 A	25 A	32 A	28 A
Wire Range (Rated Cross Section)	#22...12 AWG	#26...12 AWG	2.5 mm²	2.5 mm² (#20...14 AWG)	#22...10 AWG	#26...10 AWG	4 mm²	4 mm² (#20...12 AWG)
Wire Strip Length	0.39 in. (10 mm)				0.39 in. (10 mm)			
Recommended Tightening Torque	4.5...7.1 lb•in. (0.5...0.8 N•m)				9.0 lb•in. (1.0 N•m)			
Density	59 pcs/ft (196 pcs/m)				49 pcs/ft (163 pcs/m)			
Housing Temperature Range	-58...+248 °F (-50...+120 °C)				-58...+248 °F (-50...+120 °C)			
Short-Circuit Current Rating	See Page 8							
Terminal Blocks	Cat. No.			Pkg Qty.	Cat. No.			Pkg Qty.
Color: Grey	1492-J3			100	1492-J4			100
Red	1492-J3-RE			100	1492-J4-RE			100
Blue	1492-J3-B			100	1492-J4-B			100
Black	1492-J3-BL			100	1492-J4-BL			100
Green	1492-J3-G			100	1492-J4-G			100
Yellow	1492-J3-Y			100	1492-J4-Y			100
Orange	1492-J3-OR			100	1492-J4-OR			100
Brown	1492-J3-BR			100	1492-J4-BR			100
White	1492-J3-W			100	1492-J4-W			100
Violet	1492-J3-V			100	1492-J4-V			100
Mounting Rails: 1 m Symmetrical DIN (Steel)	199-DR1			10	199-DR1			10
1 m Symmetrical DIN (Aluminum)	1492-DR5			10	1492-DR5			10
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6			2	1492-DR6			2
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7			2	1492-DR7			2
End Barriers Grey	1492-EBJ3			50	1492-EBJ3			50
Blue	1492-EBJ3-B			50	1492-EBJ3-B			50
Yellow	1492-EBJ3-Y			50	1492-EBJ3-Y			50
End Anchors and Retainers: Screwless End Retainer	1492-ERJ35			20	1492-ERJ35			20
DIN Rail — Normal Duty	1492-EAJ35			100	1492-EAJ35			100
DIN Rail — Heavy Duty	1492-EAHJ35			50	1492-EAHJ35			50
Jumpers:* Screw Center Jumper — 10-pole	1492-CJJ5-10			20	1492-CJJ5-10			20
Screw Center Jumper — 4-pole	1492-CJJ5-4			50	1492-CJJ5-4			50
Screw Center Jumper — 3-pole	1492-CJJ5-3			50	1492-CJJ5-3			50
Screw Center Jumper — 2-pole	1492-CJJ5-2			50	1492-CJJ5-2			50
Plug-in Center Jumper — 50-Pole	1492-CJLJ5-50			10	1492-CJLJ5-41 (41-pole)			10
Plug-in Center Jumper — 10-Pole	1492-CJLJ5-10			20	1492-CJLJ5-10			20
Plug-in Center Jumper — 9-Pole	1492-CJLJ5-9			20	—			—
Plug-in Center Jumper — 8-Pole	1492-CJLJ5-8			20	—			—
Plug-in Center Jumper — 7-Pole	1492-CJLJ5-7			20	—			—
Plug-in Center Jumper — 6-Pole	1492-CJLJ5-6			20	—			—
Plug-in Center Jumper — 5-Pole	1492-CJLJ5-5			20	—			—
Plug-in Center Jumper — 4-Pole	1492-CJLJ5-4			60	1492-CJLJ5-4			60
Plug-in Center Jumper — 3-Pole	1492-CJLJ5-3			60	1492-CJLJ5-3			60
Plug-in Center Jumper — 2-Pole	1492-CJLJ5-2			60	1492-CJLJ5-2			60
Insulated Side Jumper — 24-Pole	1492-SJ5B-24			50	—			—
Insulated Side Jumper — 10-Pole	1492-SJ5B-10			50	—			—
Screw Type Jumper Notching Tool	1492-T1			1	1492-T1			1
Other Accessories: Partition Plate	1492-EBJ10			20	1492-EBJ10			20
Test Plug Socket	1492-TPS23			20	1492-TPS23L			50
Test Plug	1492-TP23			20	1492-TP23			20
Test Plug (Stackable)	1492-TPJ5			25	1492-TPJ5			25
Electrical Warning Plate	1492-EWPJ5			25	1492-EWPJ5			25
Marking Systems: Snap-In Marker Cards	1492-MR5X12 (120/card)			5	1492-MR6X12 (120/card)			5
	1492-M6X8 (200/card)			5	1492-M6X8 (200/card)			5

* Use of center jumpers may affect spacings, requiring derating of terminal blocks. See page 12-78 for details.

Allen-Bradley

Visit our website: www.ab.com/catalogs
Preferred availability cat. nos. are printed in bold

3

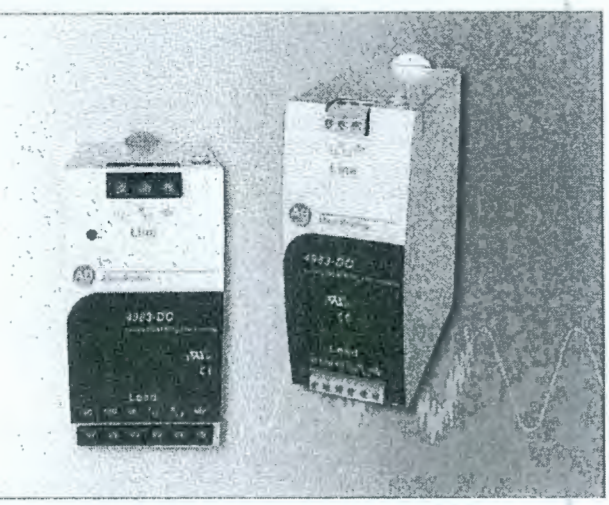
BULLETIN 4983-DC

DIN Rail Surge & Filter Protective Device

Bulletin 4983-DC is the combination of a filter and surge protective device. The 4983-DC product meets both UL 1449 and UL 1283. This product allows you to get transient and noise protection in one small package.

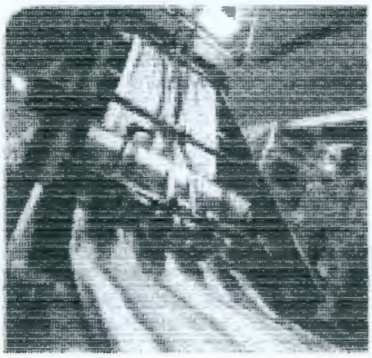
4983-DC Features

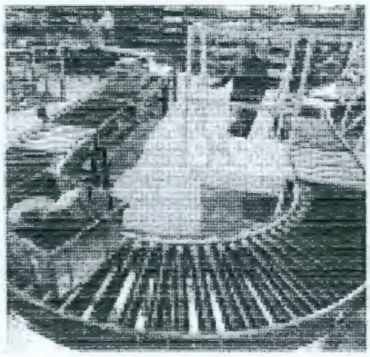
- UL 1449 Third Edition, UL 1283, CE
- Small combination (filter and SPD) package size
- Features Islatrol® filter technology
- All mode transient protection with exceptional L to N value of 25 kA
- LED power indication
- Form C contact for remote status indication
- DIN rail

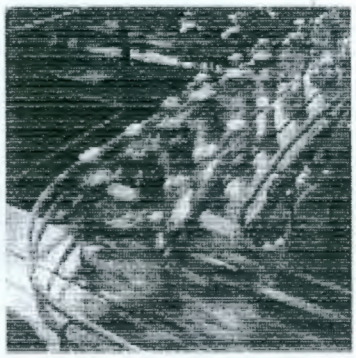


Bulletin 4983-DC Selection

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
120	L/G, L/N, N/G	47…63 Hz	150V AC	10 kA	25 kA	10 kA	3 kA	600V	400V	600V	--	3	4983-DC120-03
											--	5	4983-DC120-05
											--	10	4983-DC120-10
											--	20	4983-DC120-20
240	L/G, L/N, N/G	47…63 Hz	320V AC	10 kA	25 kA	10 kA	3 kA	1200V	--	--	800V	3	4983-DC240-03
									--	--		5	4983-DC240-05
									--	--		10	4983-DC240-10
									--	--		20	4983-DC240-20

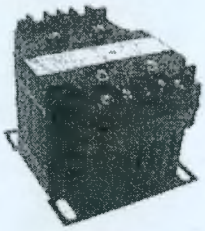






Hammond Power Solutions Inc.

Machine Tool Industrial Control Transformers



The HPS Imperator™ series of machine tool rated industrial control transformers are specifcally designed to meet high inrush industrial applications where electromagnetic components such as relays, solenoids and magnetic motor starters are used.

With **11 standard voltage groups**, a VA range from **50VA to 5000VA** and available with **standard secondary and optional primary fuse kits**, the HPS Imperator™ series provides the perfect solution for any application.

The HPS Imperator's unique terminal block design (patent pending) allows for the quick and easy installation of standard secondary or optional primary13/32" x 1 1/2" midget/type CC fuse clips on every unit. This is the simplest and most inexpensive fusing installation provided on any industrial control transformer in the market today.

Key features:

- 600V class, machine tool rated industrial control transformers
- 11 standard multi primary and secondary voltage groups available[1]
- 50/60 Hertz (60Hz on PH***AJ & PH***AR)
- VA range from up to 50 to 5000[1]
- Standard SEMS washers - supplied on all units up to and including 1500VA[2]
- UL listed
- CE Mark standard onall molded units up to and including 1500VA
- RoHS compliant
- LIFETIME Warranty (Limited)

For more information, click one of the links below:

- HPS Imperator Brochure (ENCCON Control Brochure)
- HPS Imperator Catalog Information (HTP-08 Catalog Sec. 1)
- HPS Imperator Wiring Instructions (PHWD1-2 Wiring Instructions)
- HPS Imperator Wiring Instructions - French (PHWD1-2 Wiring Instructions)
- HPS Imperator Typical Specification (SPS 19, Rev 01)

[1] special voltage and VA sizes available upon request

[2] excluding PH750PH, PH1000PG, PH750MLI, PH1000MLI

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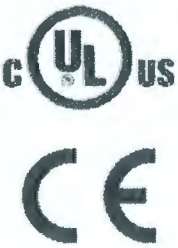
SECTION 1 HPS INDERATOR™

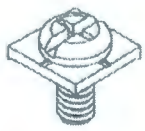
SECTION 1

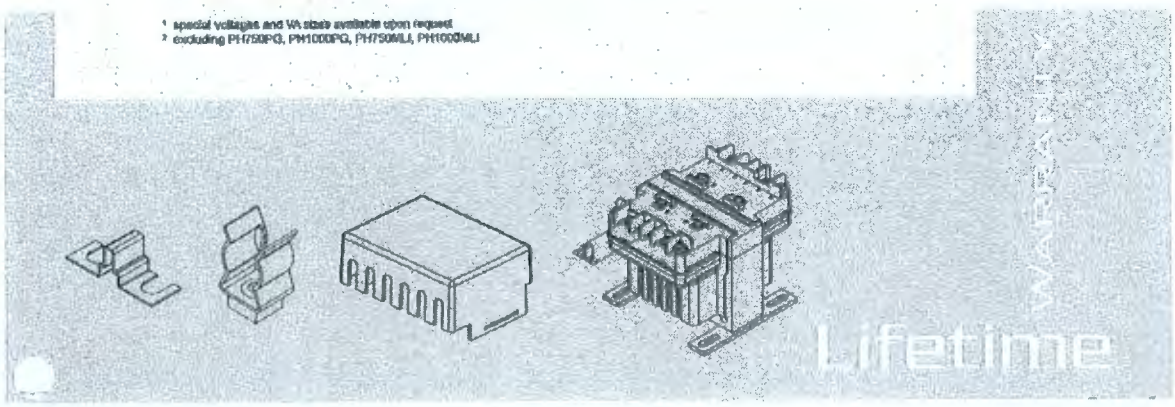
FEATURES & BENEFITS

- 600V class, machine tool rated industrial control transformers
- 11 standard multi primary and secondary voltage groups available[1]
- 50/60 Hertz (60Hz on PH***AJ & PH***AR)
- VA range from 50 to 5000[1]
- Superior insulation system
  - 50-150VA, temperature rise 55°C, insulation class 105°C
  - 250-1500VA, temperature rise 80°C, insulation class 130°C
  - 2000-5000VA, temperature rise 115°C, insulation class 180°C
- Constructed with high quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils (up to and including 1500VA) encased in a custom injection molded cover, protects coils and terminations from moisture, dirt and other industrial airborne contaminants.
- Mounting Feet: made of heavy steel and welded or bolted to the core, these mounting feet provide superior strength in a compact design.
- Termination: combination slot/Philips #6 screw, complete with SEMS washer (suitable for 18 AWG to 14 AWG solid or 14 AWG stranded wire)
- Standard SEMS washers - supplied on all units up to and including 1500VA[2]
- Standard secondary fuse kits -utilizing 13/32" x 1 1/2" midget/type CC fuse clips (supplied with all standard units up to and including 1500VA)
- Optional primary fuse kits available utilizing 13/32" x 1 1/2" midget/type CC fuse clips (available on all standard units up to and including 1500VA)
- Optional finger safe terminal covers available on all units up to and including 1500VA
- UL Listed (approved for U.S. and Canada)
- CE Mark standard on all molded units up to and including 1500VA (excluding PH***AJ & PH***AR)
- LIFETIME Warranty (Limited)
- RoHS Compliant

[1] special voltages and VA sizes available upon request
[2] excluding PH750PG, PH1000PG, PH750MLI, PH1000MLI







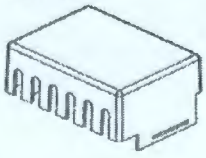
Features & Benefits Continued

Terminal connection numbers molded into the terminal block and correspond to the nameplate and wiring diagrams which makes connecting the HPS Imperator quick and simple.

Standard secondary and optional primary fuse kits utilizing 13/32" x 1 1/2" midget/type CC fuse clips provide an economical solution to your fusing requirements (fuses not available).

Innovative terminal block design (patent pending) provides for easy hook-up and installation of fuse clips.

Optional removable finger safe terminal covers available on all units up to and including 1500VA.



Made of heavy steel and welded or bolted to the core, these mounting feet provide superior strength in a compact design.

Custom injection molded coil cover with its unique "fin shaped" design combines superior cooling properties with a clean, bold look.

SECTION 1 HPS IMPERATOR

SECTION 1

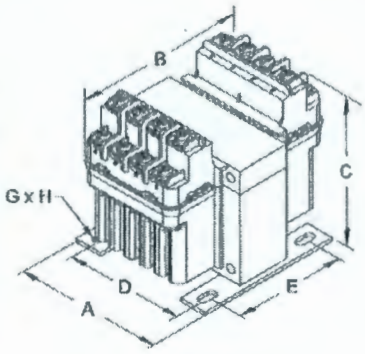


FIGURE A

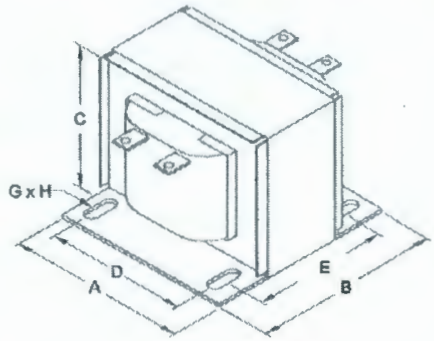


FIGURE C

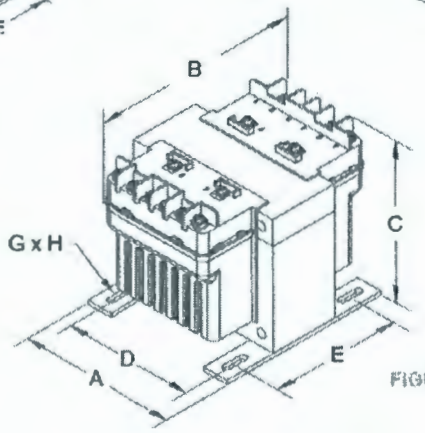


FIGURE B

Group C

Primary Voltage: 240 x 480 | 230 x 460 | 220 x 440
Secondary Voltage: 120 x 240 | 115 x 230 | 110 x 220

c UL us CE **50/60 Hertz**

VA Rating	Catalog Number	Mtg. Fig.	Output Amps	Overall Dimensions			Mounting Centers		Mounting Slot	Height with Finger Guard	Depth with Finger Guard	Approx. Ship Weight Lbs.	Optional Primary Fuse Kit P/N
				A	B	C	D	E	G X H				
50	PH50MQMJ	A	0.42/0.21	3.00	4.38	3.19	2.50	2.25	0.22 x 0.44	4.00	5.82	3.50	PFK1
75	PH75MQMJ	A	0.63/0.31	3.25	3.88	3.56	2.63	2.50	0.22 x 0.44	4.37	5.32	3.54	PFK1
100	PH100MQMJ	A	0.83/0.42	3.25	4.19	3.63	2.63	2.63	0.22 x 0.44	4.44	5.63	4.50	PFK1
150	PH150MQMJ	B	1.25/0.63	4.00	4.94	3.81	3.38	2.75	0.22 x 0.75	4.50	6.44	5.70	PFK2
250	PH250MQMJ	B	2.08/1.04	4.50	5.44	3.81	3.75	3.13	0.22 x 0.75	4.50	6.94	7.50	PFK2
350	PH350MQMJ	B	2.92/1.46	4.50	5.19	4.44	3.75	3.75	0.22 x 0.75	4.94	6.69	10.1	PFK3
500	PH500MQMJ	B	4.17/2.08	4.75	5.94	4.31	4.06	3.81	0.31 x 0.94	4.81	7.44	14.2	PFK3
750	PH750MQMJ	B	6.25/3.13	5.13	6.69	4.31	4.38	4.31	0.31 x 0.81	4.81	8.19	16.6	PFK3
1000	PH1000MQMJ	B	8.33/4.17	5.25	6.81	4.94	4.50	4.44	0.31 x 0.81	5.56	8.31	23.6	PFK3
1500	PH1500MQMJ	B	12.5/6.25	5.25	8.19	4.94	4.50	6.06	0.38 x 1.00	5.56	9.69	32.0	PFK3
2000	PH2000MQMJ	C	16.7/8.33	6.38	7.50	5.50	4.38/5.31	6.00	0.31 x 1.13	N/A	N/A	45.4	N/A
3000	PH3000MQMJ	C	25.0/12.5	7.50	10.00	6.25	4.50/6.00	7.00	0.38 x 1.00	N/A	N/A	76.7	N/A
5000	PH5000MQMJ	C	41.7/20.8	9.00	11.00	7.63	5.25/7.00	7.00	0.44 x 1.00	N/A	N/A	121.2	N/A

All dimensions in inches

Secondary fuse clips, fuse clip mounting screws and primary and secondary voltage linkjumpers supplied standard with transformers up to and including 1500VA. Refer to page 54 for wiring schematic drawing. Special voltages and VA sizes available upon request.
Units over 1500VA are UL approved and CSA certified, but do not carry the CE mark.
*** Available with FACTORY INSTALLED Primary and Secondary Fuse Kits up to 1500VA. To order,add the suffix "-FK" to the above part number. Refer to page 49 for details. ***

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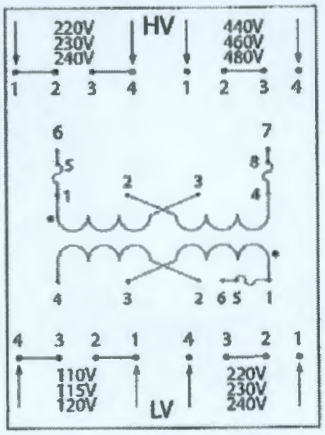
SECTION 1 HPS IMPERATOR

HPS IMPERATOR Series - Wiring Schematic Drawings continued

Group C

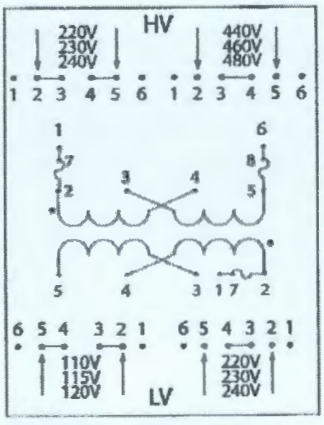
SECTION 1



PH*MQMJ Schematic for 50, 75 and 100VA Units**

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240 230 220	1-2, 3-4	1, 4	Unfused
480 460 440	2-3	1, 4	Unfused
240 230 220	1-2, 3-4	6, 7	1-5, 4-8
480 460 440	2-3	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	3-4, 1-2	1, 4	Unfused
240 230 220	2-3	1, 4	Unfused
120 115 110	3-4, 1-2	4, 6	1-5
240 230 220	2-3	4, 6	1-5



PH*MQMJ Schematic for 150VA to 1500VA Units**

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240 230 220	2-3, 4-5	2, 5	Unfused
480 460 440	3-4	2, 5	Unfused
240 230 220	2-3, 4-5	1, 6	2-7, 5-8
480 460 440	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	4-5, 2-3	2, 5	Unfused
240 230 220	3-4	2, 5	Unfused
120 115 110	4-5, 2-3	1, 5	2-7
240 230 220	3-4	1, 5	2-7

Rockwell Automation

Bulletin 194E, 16...100 A

Electrical Ratings

Performance Data				16 A	25 A	32 A	40 A	63 A	80 A	100 A	Aux. Contacts
IEC Applications											
Rated operational voltage (U_e): IEC			[V]	690	690	690	690	690	690	690	690
Rated operational voltage (U_e): UL, CSA			[V]	600	600	600	600	600	600	600	600
Rated isolation voltage (U_i): IEC/UL, CSA			[V]	690/600	690/600	690/600	690/600	690/600	690/600	690/600	690/600
Rated impulse voltage (U_{imp}): UL, CSA			[kV]	8	8	8	8	8	8	8	8
Test voltage, (U_i) 1 minute			[kV]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Lost power per pole			[W]	0.58	1.0	1.5	1.6	2.4	3.6	5.5	0.4
Rated frequency			[Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Conventional free air thermal current I_{th}			[A]	25	40	50	63	75	100	100	12
Conventional enclosed thermal current I_{the}			[A]	20	32	40	50	63	80	100	10
Rated current I_e			[A]	16	25	32	40	63	80	100	10
AC-1	Non-inductive or only slightly inductive loads										
AC-21A	Switching of resistive loads with slight overload										
Rated power P_e											
AC-21A	Occasional switching of AC motors and other highly inductive loads (criterion for selecting main switches)	230V	[kW]	5.5	7.5	7.5	15	18.5	22	30	--
		400V	[kW]	7.5	11	15	22	30	37	55	--
		690V	[kW]	7.5	11	15	18.5	22	37	45	--
AC-3	Squirrel-cage motors; starting and stopping of running motors	230V	[kW]	4	5.5	7.5	11	15	18.5	22	--
		400V	[kW]	5.5	7.5	11	15	18.5	30	37	--
		690V	[kW]	5.5	7.5	11	15	18.5	30	22	--
Short circuit current (co-ordination type 2) Rated conditional short-circuit current (Maximum fuse rating of circuit (type gG))		400/415V	[kA]	30	30	15	20	15	30	25	--
			[A]	20	25	35	50	63	80	100	--
Rated short time current I_{cw} (1 s)			[A]	800	950	900	1300	1300	2500	2500	--
Rated breaking capacity AC23A (cos φ 0.45)		230V	[A]	156	204	296	484	484	780	780	--
		400V	[A]	120	256	256	404	504	800	800	--
		690V	[A]	70	136	136	196	194	376	376	
DC switching capacity	1 pole										
Rated current I_e		24/48V	[A]	20	25	32	40	63	80	100	--
		110V	[A]	5	5	6	8	10	16	20	
		220V	[A]	1	1	1	1.5	1.5	3	3	
		440V	[A]	0.5	0.5	0.5	0.6	0.6	0.7	0.7	
DC-21A For resistive loads, T < 1 ms, U_e max = 660V	2 poles in series	96V	[A]	20	25	32	40	63	80	100	
		110V	[A]	20	23	25	37	50	70	80	
		220V	[A]	5	5	6	8	10	16	20	
		440V	[A]	1	1	1	1.5	1.5	3	3	
		600V	[A]	0.6	0.6	0.6	0.8	0.8	1	1	
	3 poles in series	110V	[A]	20	25	32	40	63	80	100	--
		220V	[A]	13	13	15	20	25	50	63	
		440V	[A]	2.2	2.2	2.2	3.6	3.6	6.5	6.5	
		600V	[A]	1.5	1.5	1.5	2	2	3	3	
Rated power P_e	3 poles in series										--
DC-23A, DC-3, DC-5		90V	[kW]	1	1.3	1.5	2.9	4.1	5.1	7.2	
	For inductive loads, T ≥ 15 ms	110V	[kW]	1	1.1	1.3	2.2	3.3	5.5	7	

220V	[kW]	0.8	0.9	1.1	1.7	2	3.5	4.4
440V	[kW]	0.6	0.6	0.6	0.9	0.9	1.1	1.1
600V	[kW]	0.4	0.4	0.4	0.5	0.5	0.9	0.9

a See standards compliance listed on Standards Compliance.

Electrical Ratings, Continued

Performance Data			16 A	25 A	32 A	40 A	63 A	80 A	100 A	Aux. Contacts
UL/CSA Applications										
Continuous current		[A]	16	25	32	40	63	80	100	–
Heavy Pilot Duty		[A/C]	A600	A600	A600	–	–	–	–	A600
Standard Duty		[D/C]	–	–	–	–	–	–	–	Q600
Motor rating 60 Hz	120V, 1P	[FLA]	16	16	16	24	34	56	80	–
Single-phase (2 poles)		[Hp]	1	1	1	2	3	5	7.5	
	240V, 1P	[FLA]	12	12	17	17	28	50	68	
		[Hp]	2	2	3	3	5	10	15	
	480V, 1P	[FLA]	8.5	8.5	14	21	26	34	48	
		[Hp]	3	3	5	7.5	10	15	30	
	600V, 1P	[FLA]	11.2	11.2	11.2	16	20	27	44	
		[Hp]	5	5	5	7.5	10	15	25	
Three-phase	120V, 3P	[FLA]	13.6	13.6	19.2	30.4	40	56	84	–
		[Hp]	2	2	3	5	7.5	10	15	
	240V, 3P	[FLA]	9.4	15.2	23	28	42	66	80	
		[Hp]	3	5	7.5	10	15	25	30	
	480V, 3P	[FLA]	11	14	21	27	34	52	65	
		[Hp]	7.5	10	15	20	25	40	50	
	600V, 3P	[FLA]	11	11	17	22	27	52	52	
		[Hp]	10	10	15	20	25	50	50	

Mechanical Data

Performance Data			16 A	25…32 A	40…63 A	80…100 A	Aux. Contacts
Protection class according to IEC 529							
Motor rating 60 Hz							
handles			IP66	IP66	IP66	IP66	IP66
switch bodies			IP20	IP20	IP20	IP20	IP20
Mechanical life		[million operations]	0.2	0.2	0.2	0.2	0.2
Max wire gauges							
Terminal size per IEC 947-1			A4	A6	A7	A9	2xA2
rigid wire	1/2 conductor	[AWG] [mm²]	(1)16…10/(2)16…12 (1)1…10/(2)1…4	(1)14…8/(2)14…10 (1)1.5…16/(2)1.5…6	(1)12…4/(2)12…8 (1)2.5…25/(2)2.5…16	(1)10…1/(2)10…4 (1)4…50/(2)4…25	18…14 0.75…2.5
fine strands	1/2 conductor	[AWG] [mm²]	(1)16…8/(2)16…12 (1)1.5…6/(2)1.5…4	(1)14…8/(2)14…10 (1)1.5…10/(2)1…6	(1)12…4/(2)12…8 (1)2.5…16/(2)2.5…10	(1)10…1/(2)10…6 (1)4…25/(2)4…16	18…14 0.5…2.5
Tightening torque		[N·m]/[lb·in]	1.4/12.2	1.4/12.2	2.8/24.5	5.6/50	1/8.8

Environmental Data

Storage -40…+80 °C (-40…+176 °F)

Operation -25…+60 °C (-13…+140 °F)

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MIRA
A CERUS INDUSTRIAL PRODUCT

MRC(D)-9b~150a
MTK-32,63,95,150

INSTRUCTION SHEET

CERUS INDUSTRIAL
www.cerusind.com

MRC(D) Series Contactors
MTK Series Thermal Overload Relays

Thank you for purchasing CERUS products. Ourcontactors and overloads are designed and manufatured for the toughest industrial applications and are backed by five years limited warranty. To ensure the best performance from your CERUS products, please review this manual before product installation and use.

Product Listings/Ratings

KEMA

Standards: IEC60947, UL508, VDE0660, EN60947, BS5424, KS3947
Certification: CE, UL/CSA, KS, ISO14001, ISO9001

Warning

1) Before installation or inspection of contactors, overloads turn off disconnect and verify power has been removed.
2) Do not modify device unless authorized, in writing, by CERUS and change complies with NEC regulations.
3) Be sure to tighten terminal screws to specified torque. Loose terminal connection may result in fire.
4) Do not operate contactor with cover removed, an open arc-extinguishing chamber may result in electric shock and severe burns.
5) In the event of an overload trip, inspect system and remove the cause of the overload condition before re-applying power.
6) Installation, maintenance, and inspection should be performed by qualified personnel.
7) When disposing, treat products as industrial waste.

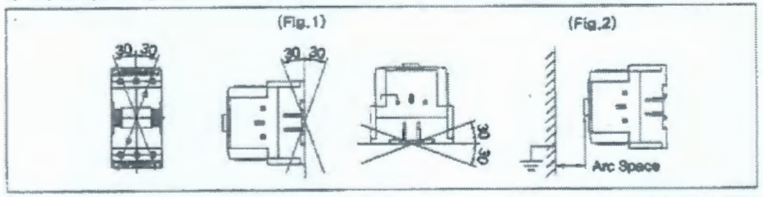
Check point before Installation

Please verify that the product ratings are correct for intended application.

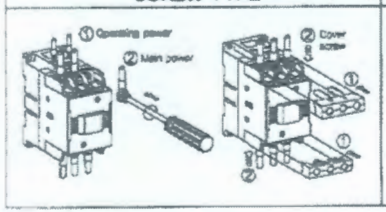
Installation Instruction

1) Install in environment free from excessive vibration and humidity.
2) Product may be installed in either a vertical or horizontal position. Up to 30° deviation is allowed. Consult Fig.1 for details.
3) Keep arc space (Fig.2) of 10 mm free of any objects for all contactor installations. (with the safety cover)

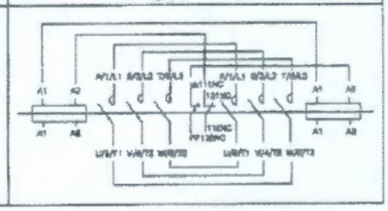
(Fig.1) (Fig.2)



SCREW TYPE



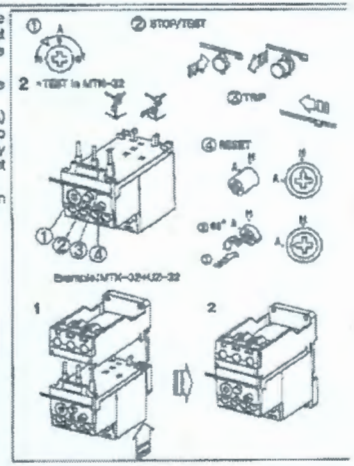
R-TYPE Wiring Diagram



Thermal Overload Relay

1) Turn the current setting dial arrow to the appropriate amperage setting. For service factor other than 1.00, increase the current setting by the service factor percentage. MTK relays may be set up to 20% higher than maximum motor rating.
2) Please rotate the current adjustment dial within the amp range scale.
3) Select either manual overload reset (H) or automatic reset (A) by depressing and rotating green button, so the arrow points to the desired mode. In manual mode reset the trip condition by pressing green button. Note: relay will only reset after sufficient cooling time has elapsed.
4) Test the overload by pulling the red button. Press the red button to open the N/C contacts (95-96)

	STOP	TEST/TRIP	RESET
NC 95-96			
NO 97-98			



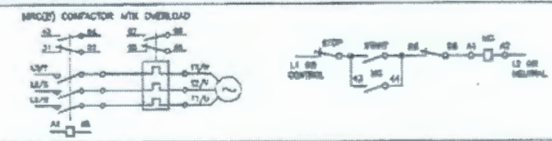
Reversing Contactors

1) When using contactors in a reversing operation use either the mechanical interlock MR-02 or if using an electrical interlock, we recommend use of a time delay relay to avoid a possible short circuit.
2) When using an electrical interlock, the residual charge in the motor windings must be dissipated before transitioning to avoid a line side short.
3) In case of using in reversible mode which may cause arc-short by change, use the delay or dead interval of up to operational on reversing must be taken into account.

Wire Size and Tightening Torque

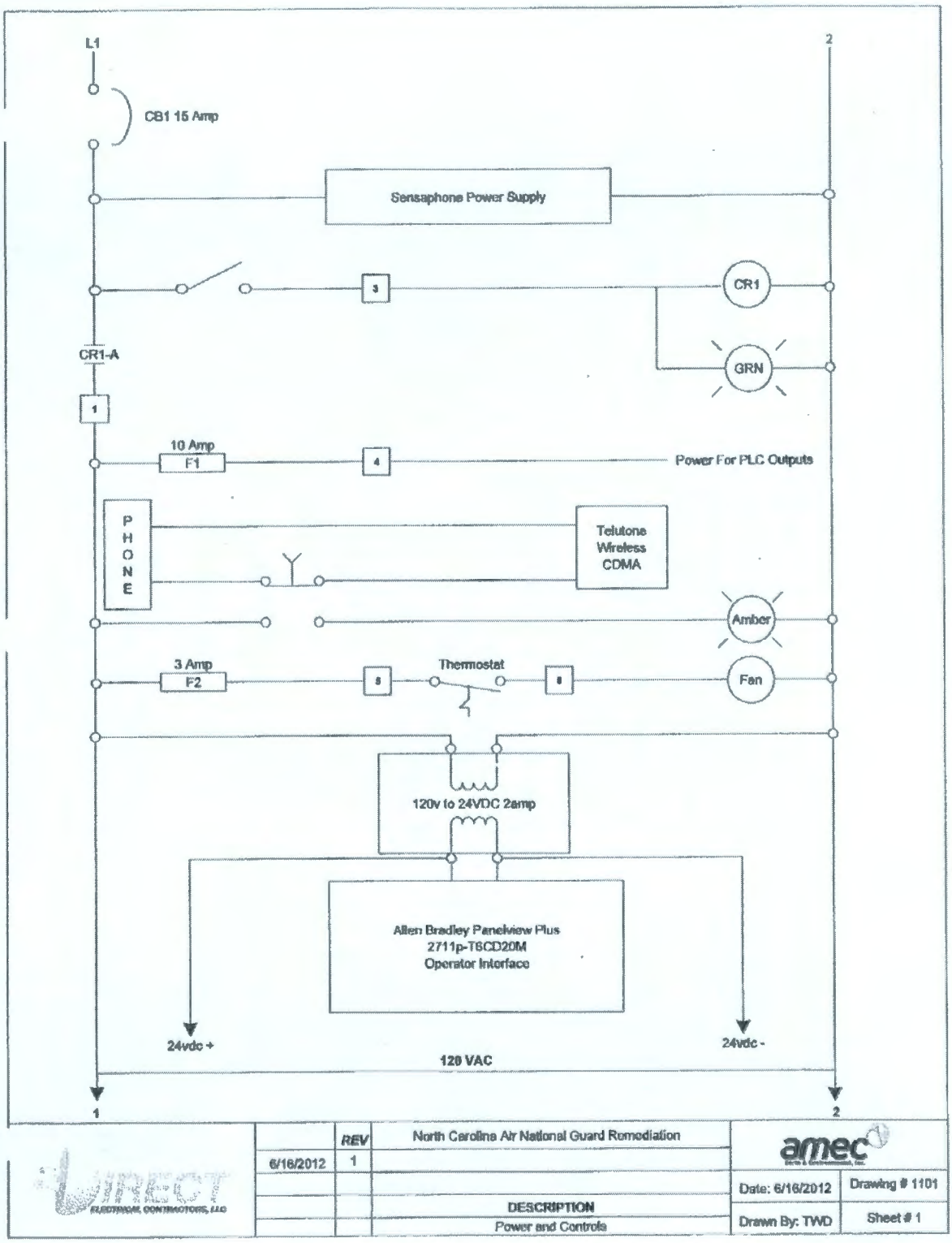
FRAME \ WIRE TYPE		[mf/AWG]						[m/Max]	TORQUE [Nm/lb-in]
MRC(D)-92AF		1~6/10~10		1~6/10~10		1~6/10~10	0.75~6/10~10	9.5	2.25/20
MRC(D)-40AF		1~6/10~10		1~6/10~10		1~6/10~10	0.75~4/10~10	12.5	2.25~4/20~35
MRC(D)-65AF		0.75~65/10~2	0.75~65/10~4	0.75~65/10~2	0.75~65/10~4	0.75~65/10~4	0.75~10/10~6	—	4/35
		—		—		—		34	
MRC(D)-100AF		2.5~70/12~1_0	2.5~65/12~1_0	2.5~70/12~2_0	2.5~65/12~1_0	2.5~70/12~2_0	2.5~35/12~2	—	5.1/45
		—		—		—		17	
MRC(D)-150AF		2.5~70/12~2_0	2.5~65/12~1_0	35~65/5~4_0	35~65/5~4_0	35~65/5~4_0	35~65/5~4_0	—	6.1/55
		—		—		—		34.5	
COIL TER		0.5~0.5/20~14		0.75~0.5/10~12				7.8	1.75/15

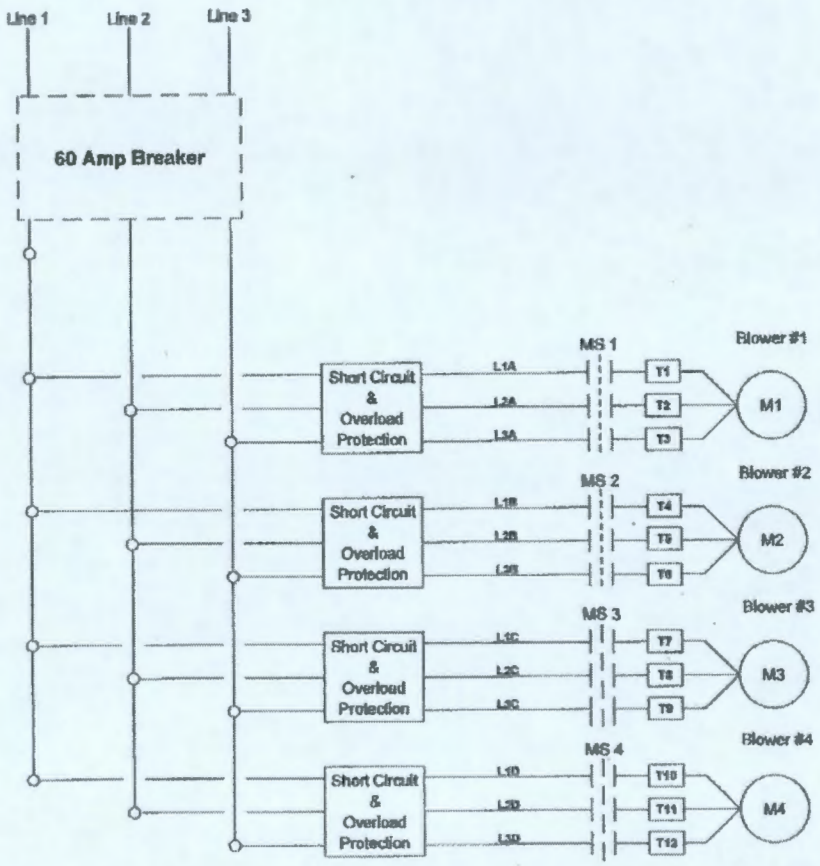
Wiring Schematic



APPENDIX C

BRS CONTROL PANEL DOCUMENTS


L1
2
CB1 15 Amp
Sensaphone Power Supply
3
CR1
GRN
CR1-A
1
10 Amp
F1
4
Power For PLC Outputs
PHONE
Telutone
Wireless
CDMA
Amber
3 Amp
F2
5
Thermostat
6
Fan
120v to 24VDC 2amp
Allen Bradley Paneliew Plus
2711p-T6CD20M
Operator Interface
24vdc +
24vdc -
120 VAC
1
2
REV
North Carolina Air National Guard Remediation
6/16/2012
1
DESCRIPTION
Power and Controls
amec
Date: 6/16/2012
Drawing # 1101
Drawn By: TWD
Sheet # 1

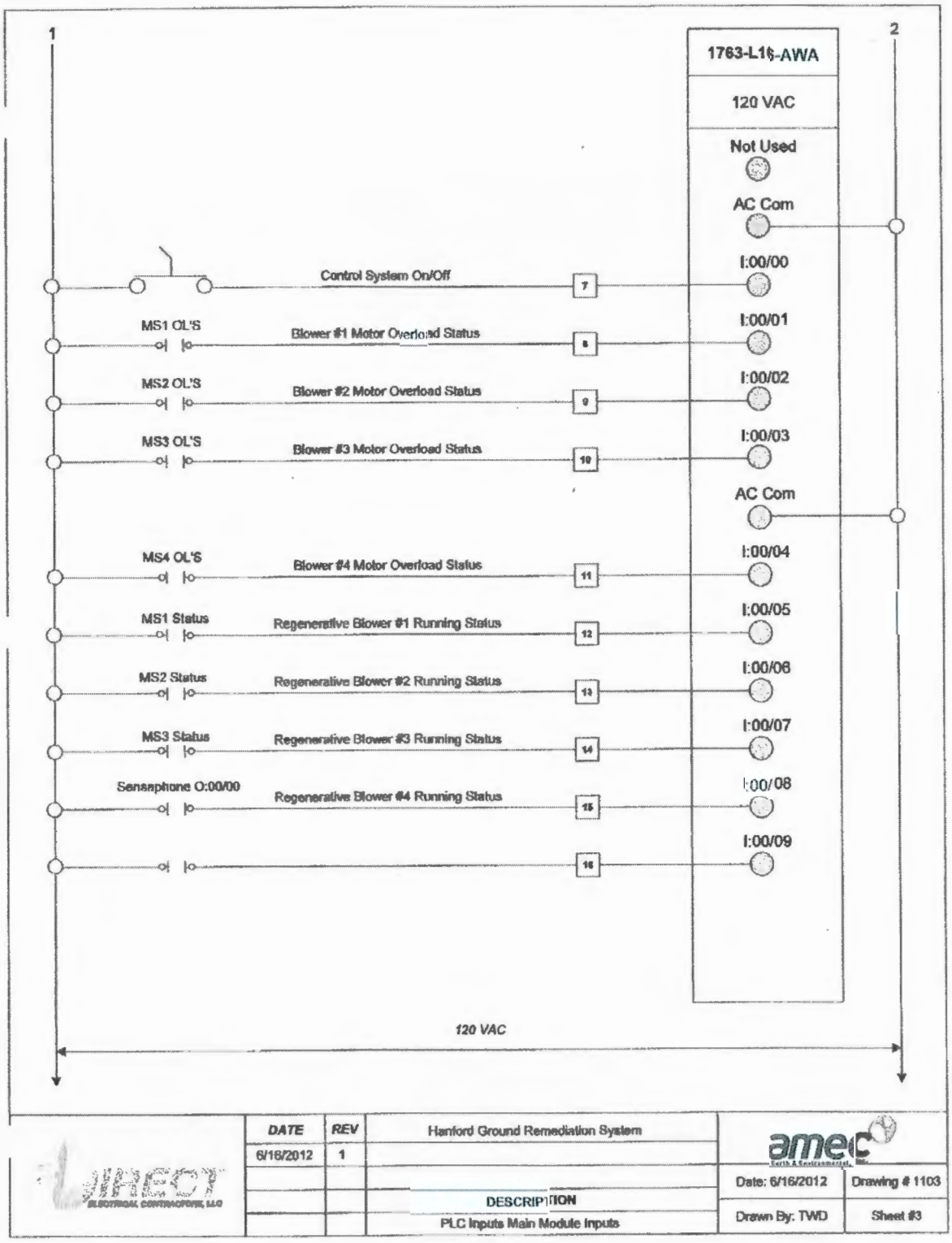


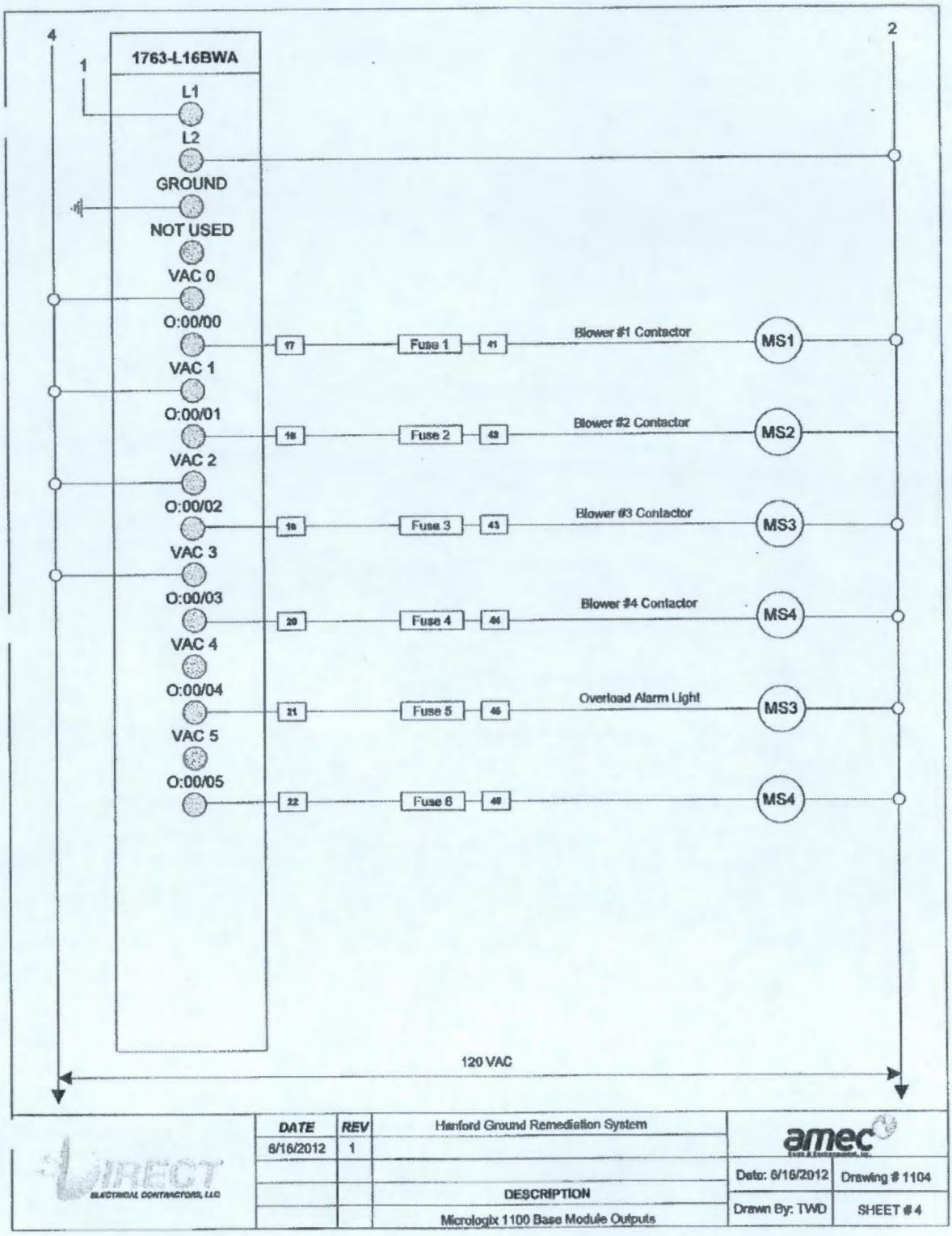
DATE	REV	Hanford Ground Remediation System
6/16/2012	1	
		DESCRIPTION
		Motors and Motor Starter Diagram

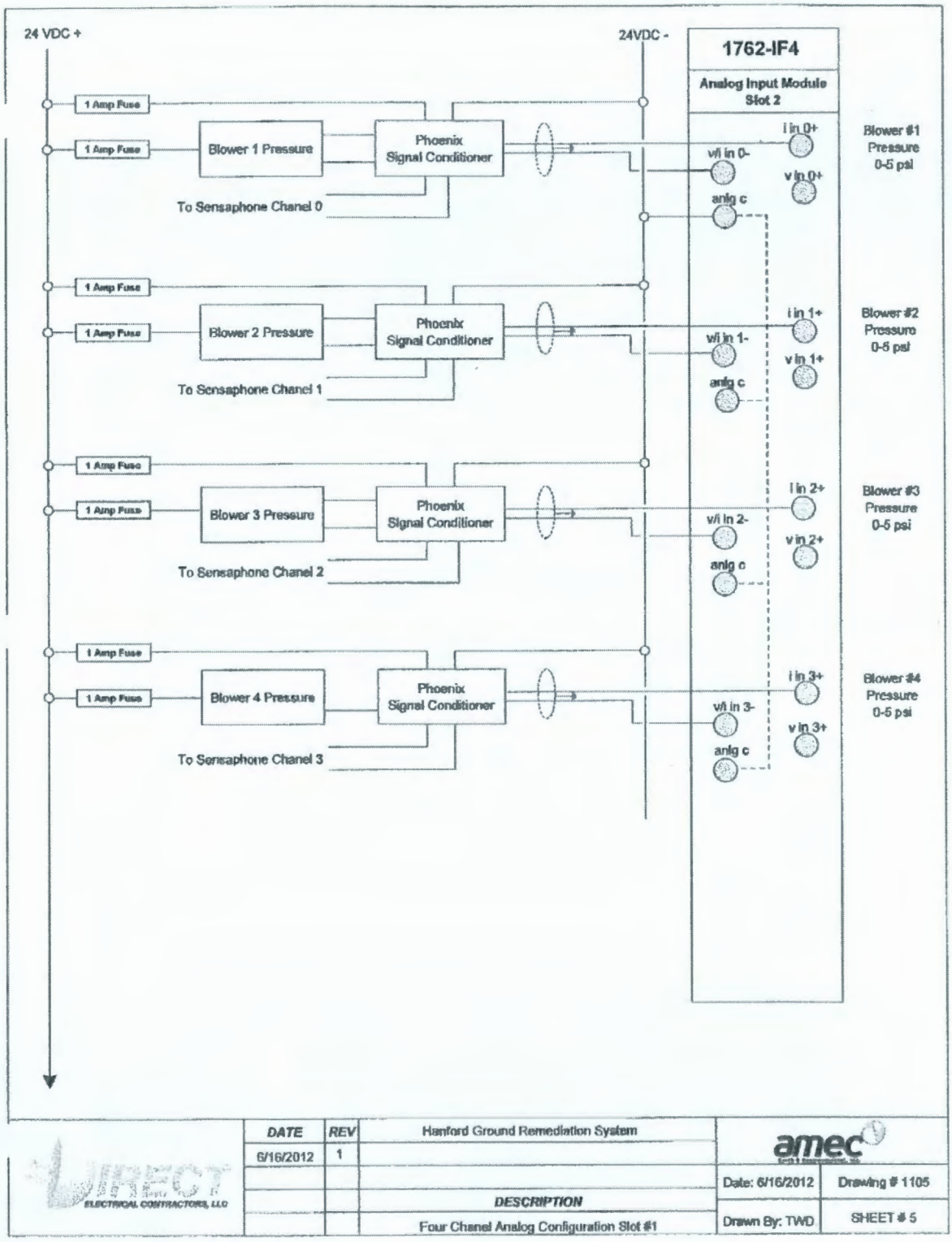
DIRECT ELECTRICAL CONTRACTORS, LLC

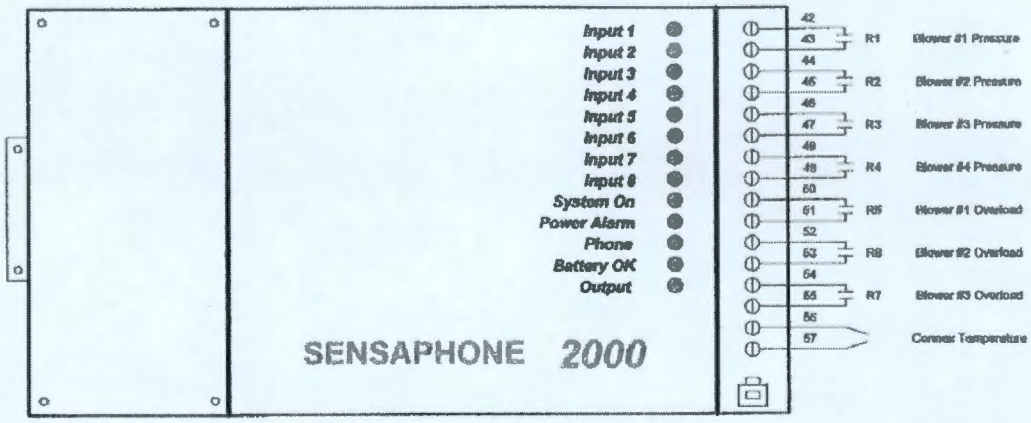
amec

DATE: 6/16/12	Drawing # 1102
Drawn By: TWD	Sheet # 2

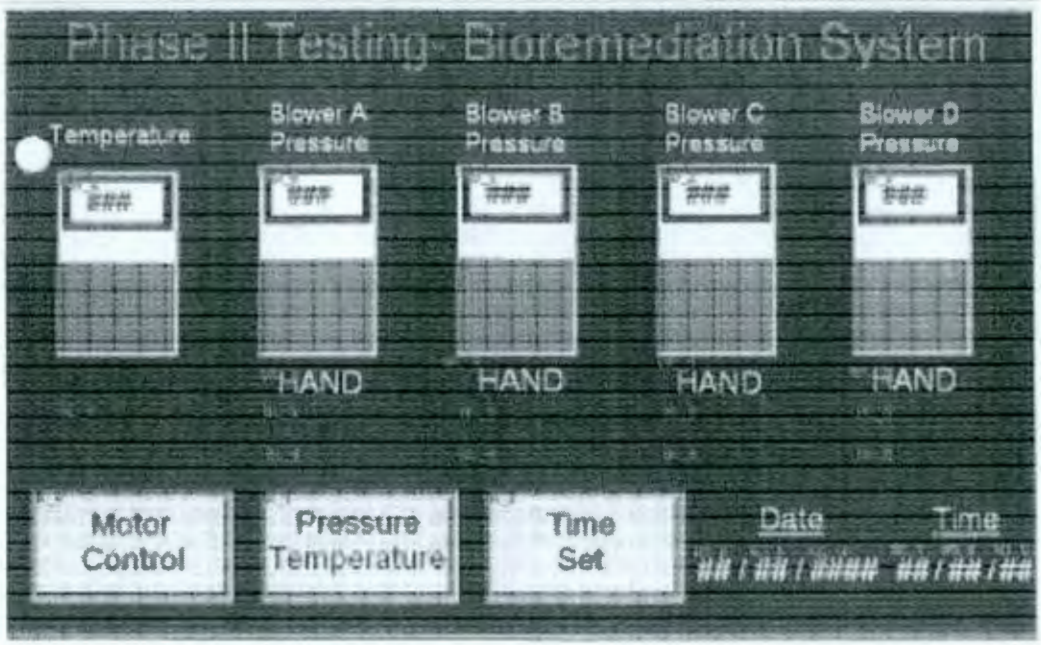

1
2
1763-L16-AWA
120 VAC
Not Used
AC Com
I:00/00
Control System On/Off
7
MS1 OL'S
Blower #1 Motor Overload Status
8
I:00/01
MS2 OL'S
Blower #2 Motor Overload Status
9
I:00/02
MS3 OL'S
Blower #3 Motor Overload Status
10
I:00/03
AC Com
MS4 OL'S
Blower #4 Motor Overload Status
11
I:00/04
MS1 Status
Regenerative Blower #1 Running Status
12
I:00/05
MS2 Status
Regenerative Blower #2 Running Status
13
I:00/06
MS3 Status
Regenerative Blower #3 Running Status
14
I:00/07
Sensaphone O:00/00
Regenerative Blower #4 Running Status
15
I:00/08
16
I:00/09
120 VAC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
PLC Inputs Main Module Inputs
Date: 6/16/2012
Drawing # 1103
Drawn By: TWD
Sheet #3


1763-L16BWA
L1
L2
GROUND
NOT USED
VAC 0
O:00/00
VAC 1
O:00/01
VAC 2
O:00/02
VAC 3
O:00/03
VAC 4
O:00/04
VAC 5
O:00/05
Fuse 1
Fuse 2
Fuse 3
Fuse 4
Fuse 5
Fuse 6
Blower #1 Contactor
Blower #2 Contactor
Blower #3 Contactor
Blower #4 Contactor
Overload Alarm Light
MS1
MS2
MS3
MS4
120 VAC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
Micrologix 1100 Base Module Outputs
Date: 6/16/2012
Drawing # 1104
Drawn By: TWD
SHEET # 4


24 VDC +
24VDC -
1762-IF4
Analog Input Module
Slot 2
1 Amp Fuse
Blower 1 Pressure
Phoenix
Signal Conditioner
To Sensaphone Chanel 0
i in 0+
vi in 0-
v in 0+
anig c
Blower #1
Pressure
0-5 psi
Blower 2 Pressure
To Sensaphone Chanel 1
i in 1+
vi in 1-
v in 1+
Blower #2
Pressure
0-5 psi
Blower 3 Pressure
To Sensaphone Chanel 2
i in 2+
vi in 2-
v in 2+
Blower #3
Pressure
0-5 psi
Blower 4 Pressure
To Sensaphone Chanel 3
i in 3+
vi in 3-
v in 3+
Blower #4
Pressure
0-5 psi
DIRECT
ELECTRICAL CONTRACTORS, LLC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
Four Chanel Analog Configuration Slot #1
amec
Date: 6/16/2012
Drawing # 1105
Drawn By: TWD
SHEET # 5



	Date:	REV	Hanford Ground Remediation System	amec	
DIRECT ELECTRICAL CONTRACTORS LLC	6/18/2012	1			
			Description:	Date: 6/18/2012	Drawing # 1106
			Scada & Wireless Telemetry	Drawn By: TWD	SHEET 6

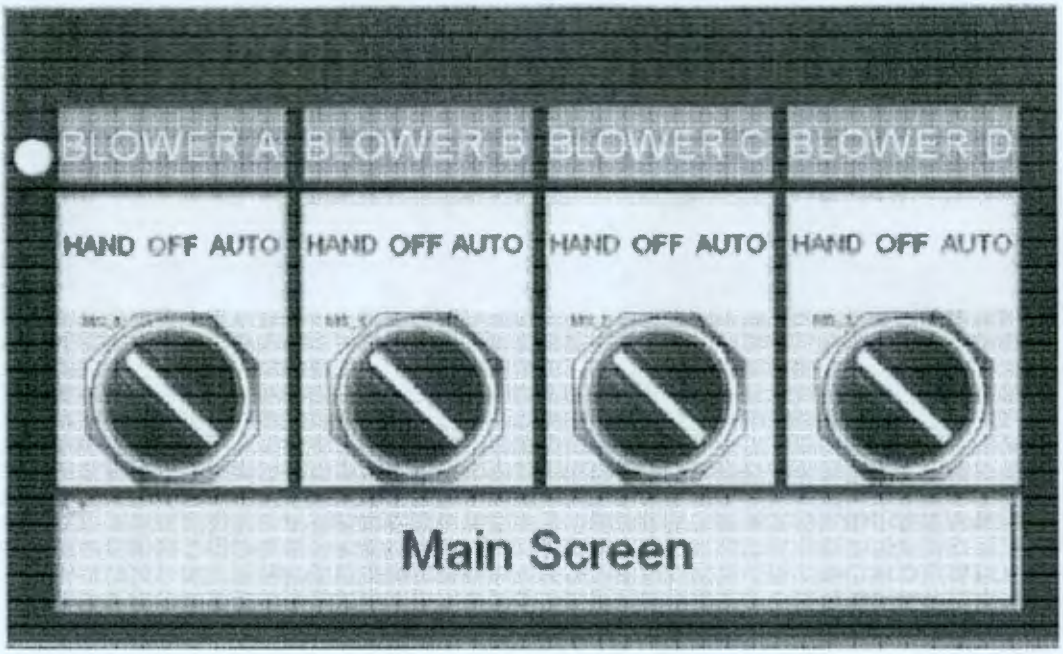


[Main] Screen

The [Main] Screen is used to display the following:

- The title (Phase II Testing - Bioremediation System)
- Time and Date
- Blower labels (B-A to B-D) and current Mode or Alarm Condition(s)
- Pressures from pressure transducers (PS-1A to PS-1C) in inches water column (WC) (the fourth blower would require a pressure transducer PS-1D)
- BRS CONEX Interior Temperature (degrees Fahrenheit [°F])
- List of other screens to toggle to from Main Screen (via touch "buttons")

This screen is for **display only**. From this screen, the operator can toggle to the [Motor Control], [Time Set] and [Pressure Temperature] screens.



Blower [Motor Control] Screen

This screen is used to control all of the blower motors. Each motor (A through D) is controlled by a three-position touch button. Buttons are as follows:

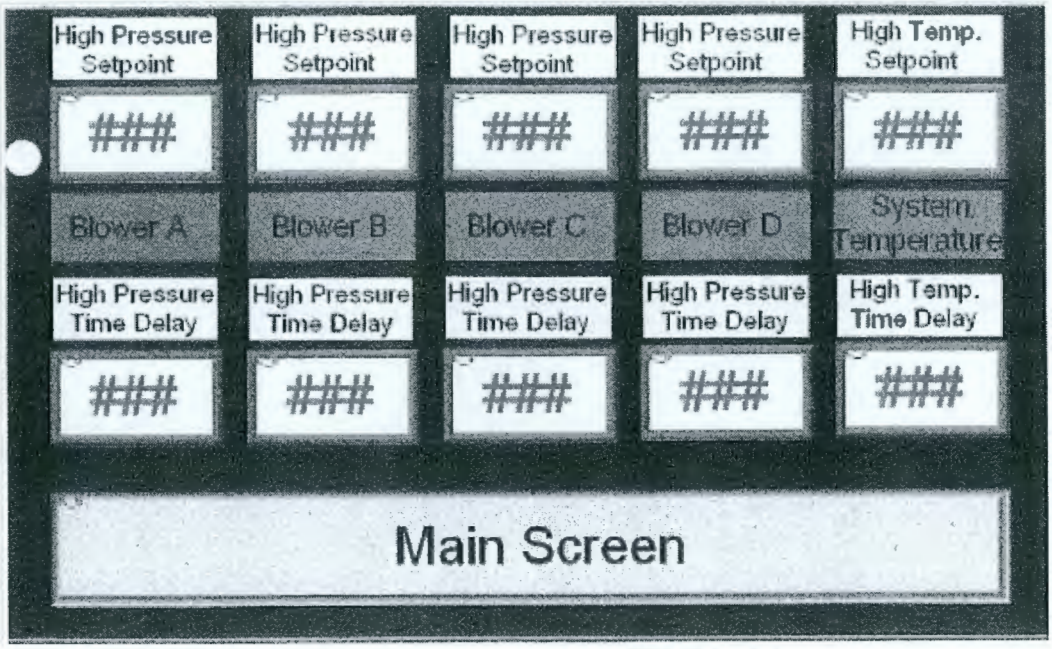
HAND—used for maintenance and for when the operator wants to override all control functions

OFF—deactivates a motor.

AUTO—used to control a motor with all of the control setpoint functions. These functions include:

- CONEX temperature
- Blower pressure
- Motor controller trip

From this screen the operator may only toggle to the [Main] Screen.



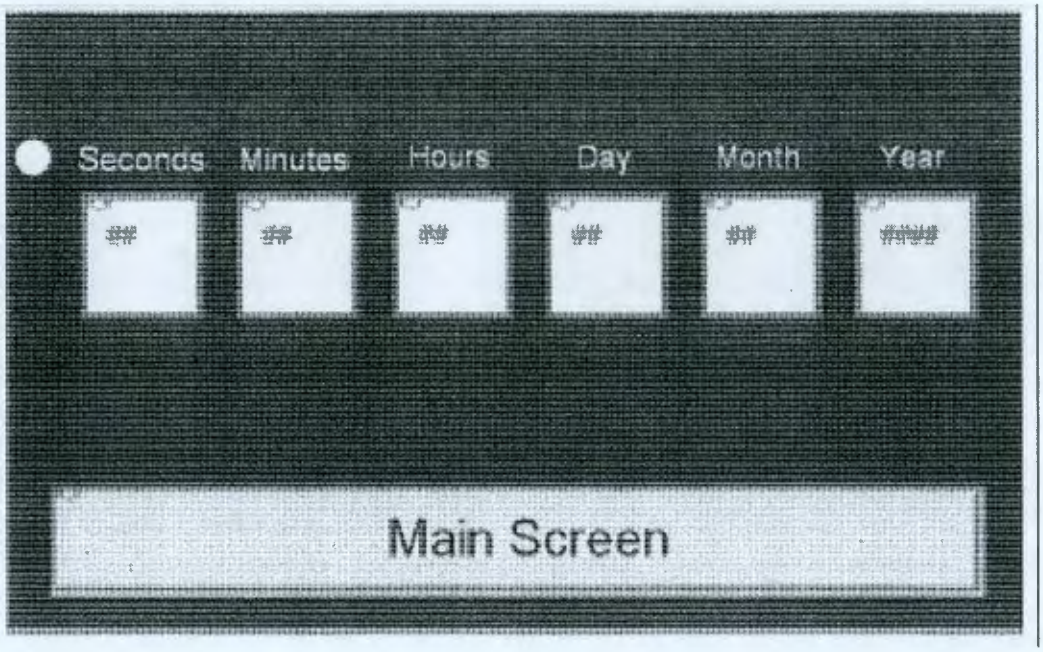
[Pressure Temperature] Setpoint Screen

This screen is used to change the High Pressure Setpoint and the High Temperature Setpoint.

This screen is also used to change the length of the time delay that is allowed above the Pressure and Temperature Setpoint for each blower motor before an Alarm Condition.

A finger-touch to the number [###] button will produce a pop-up numeric display that the operator can then use to enter the desired time delay, pressure or temperature. This action, followed by pressing the enter button [ENT], will change the controller and the screen will reflect the chosen inputs.

From this screen the operator may only toggle to the [Main] Screen.



[Time Set] Screen

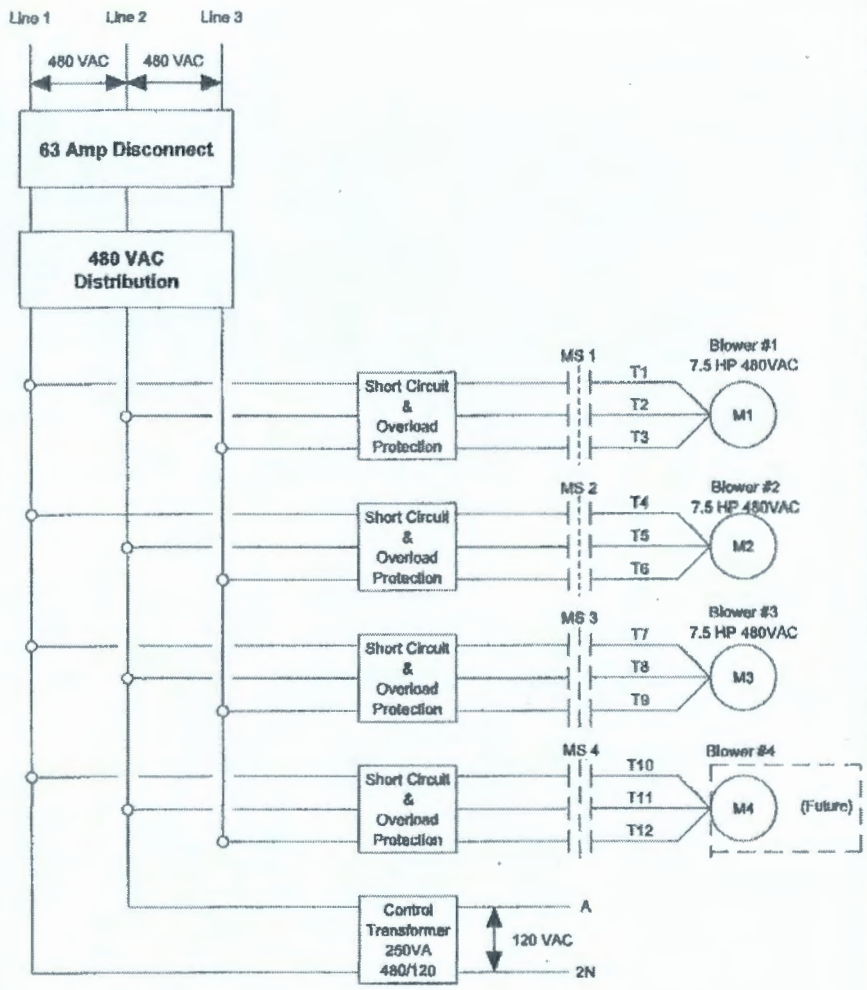
This screen is used to change the real-time clock displayed on the [Main] Screen.

The labels Seconds, Minutes, Hours, Day, Month and Year are displayed. Below each label is a corresponding square button ([##]).

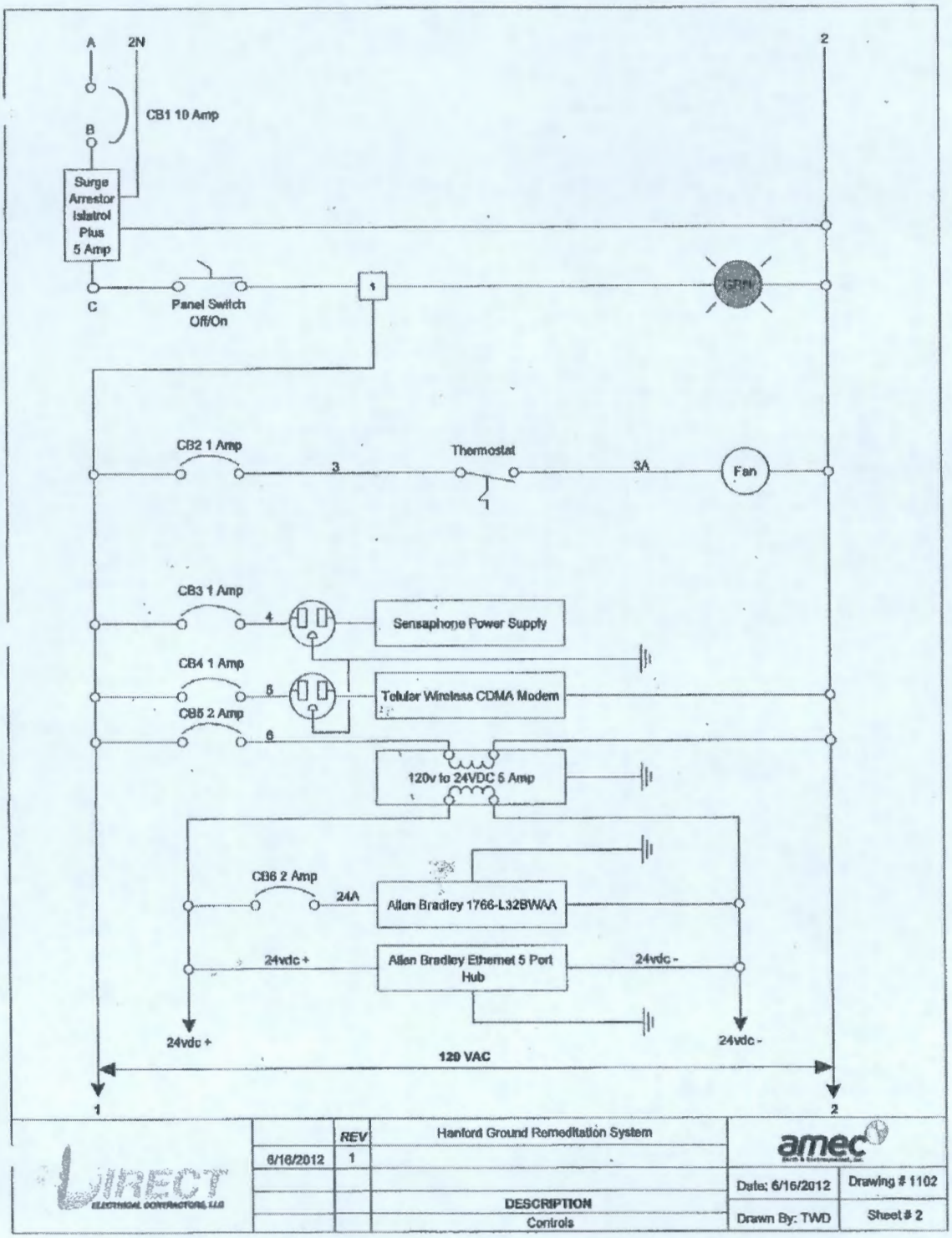
In order to change the clock, the operator much finger-touch the square button associated with the correct label he/she would like to change. This action with generate a pop-up numeric display.

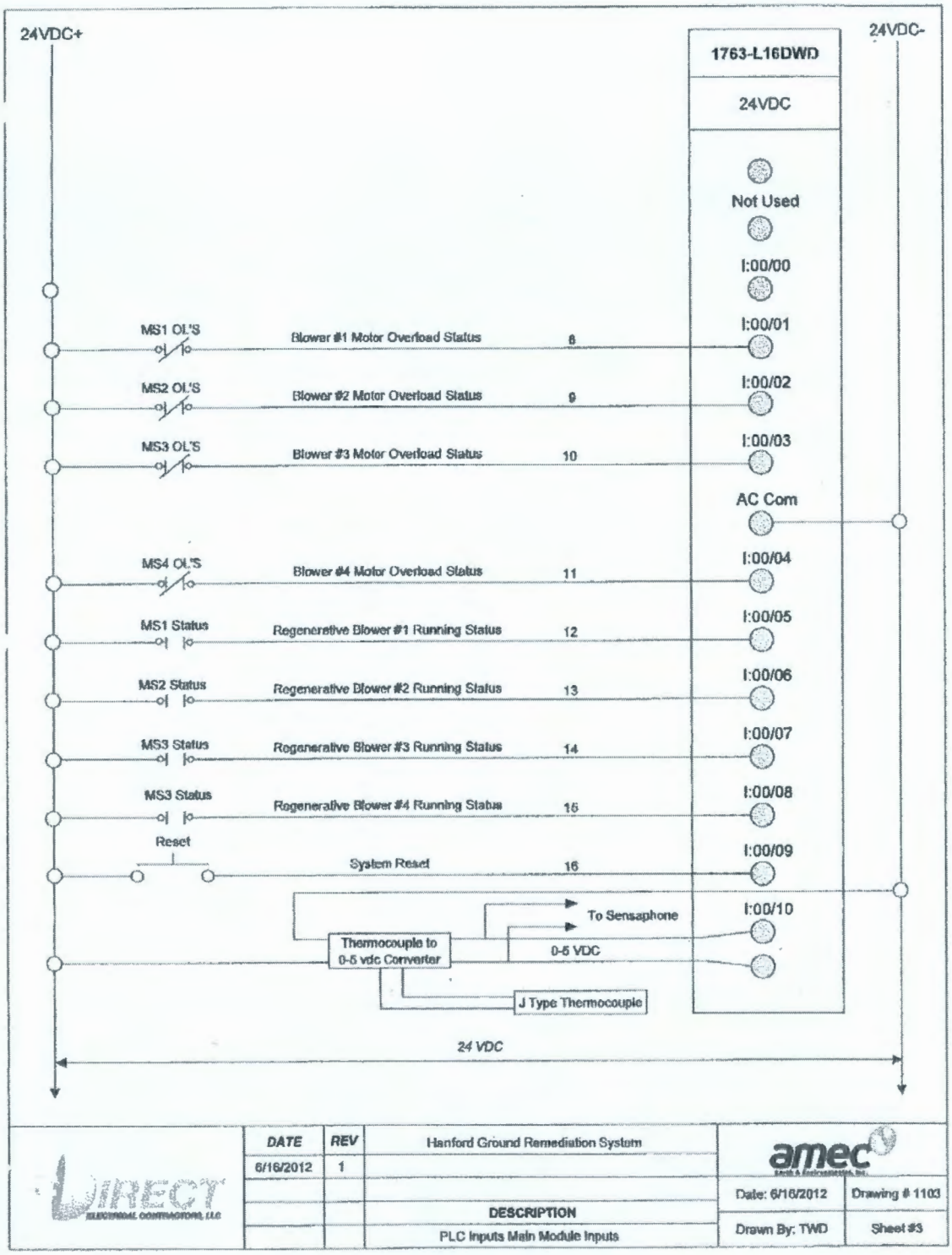
From the numeric display, the operator enters the desired number followed by pressing the enter button [ENT]. This action changes the time display on the [Main] Screen.

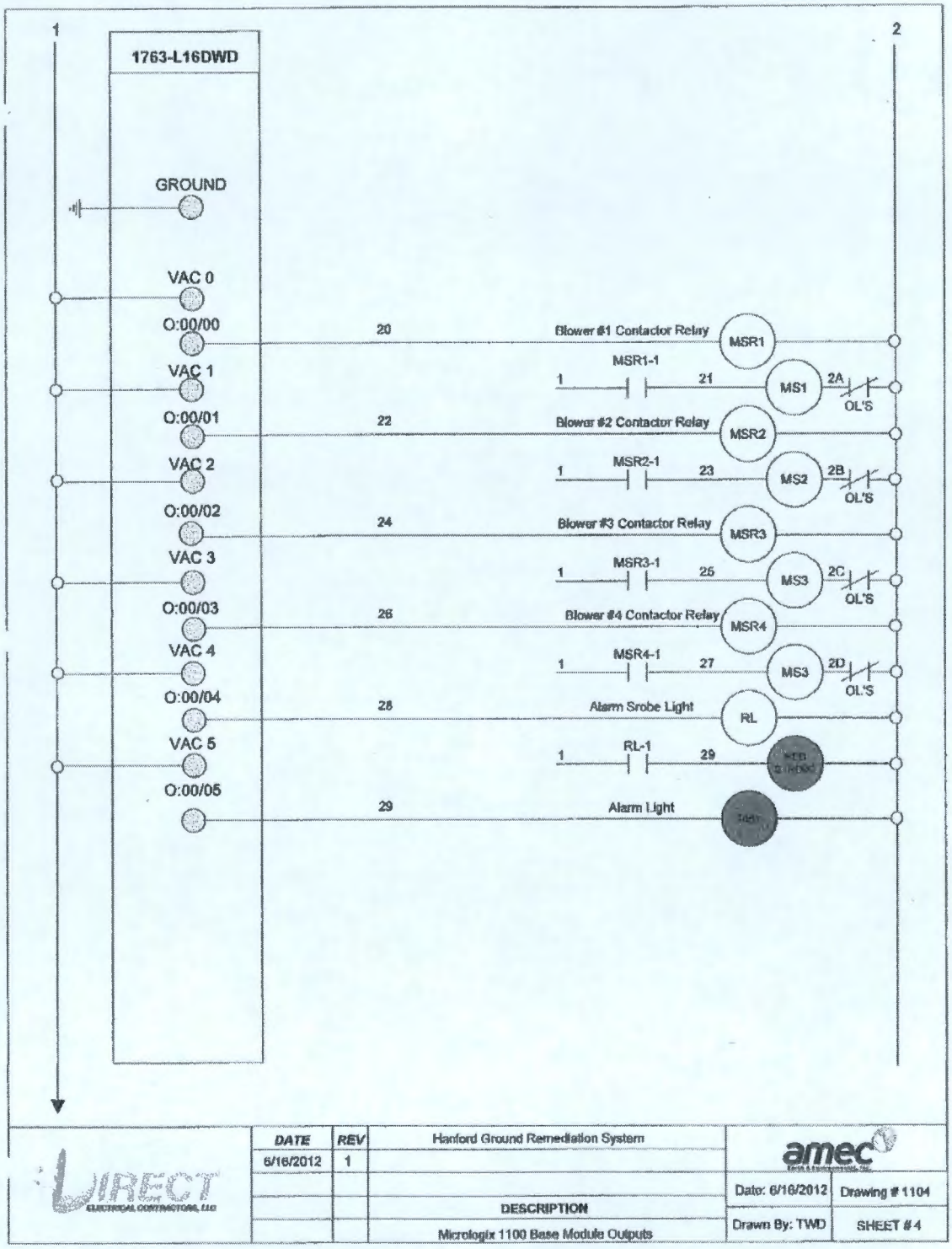
From this screen the operator may only toggle to the [Main] Screen.

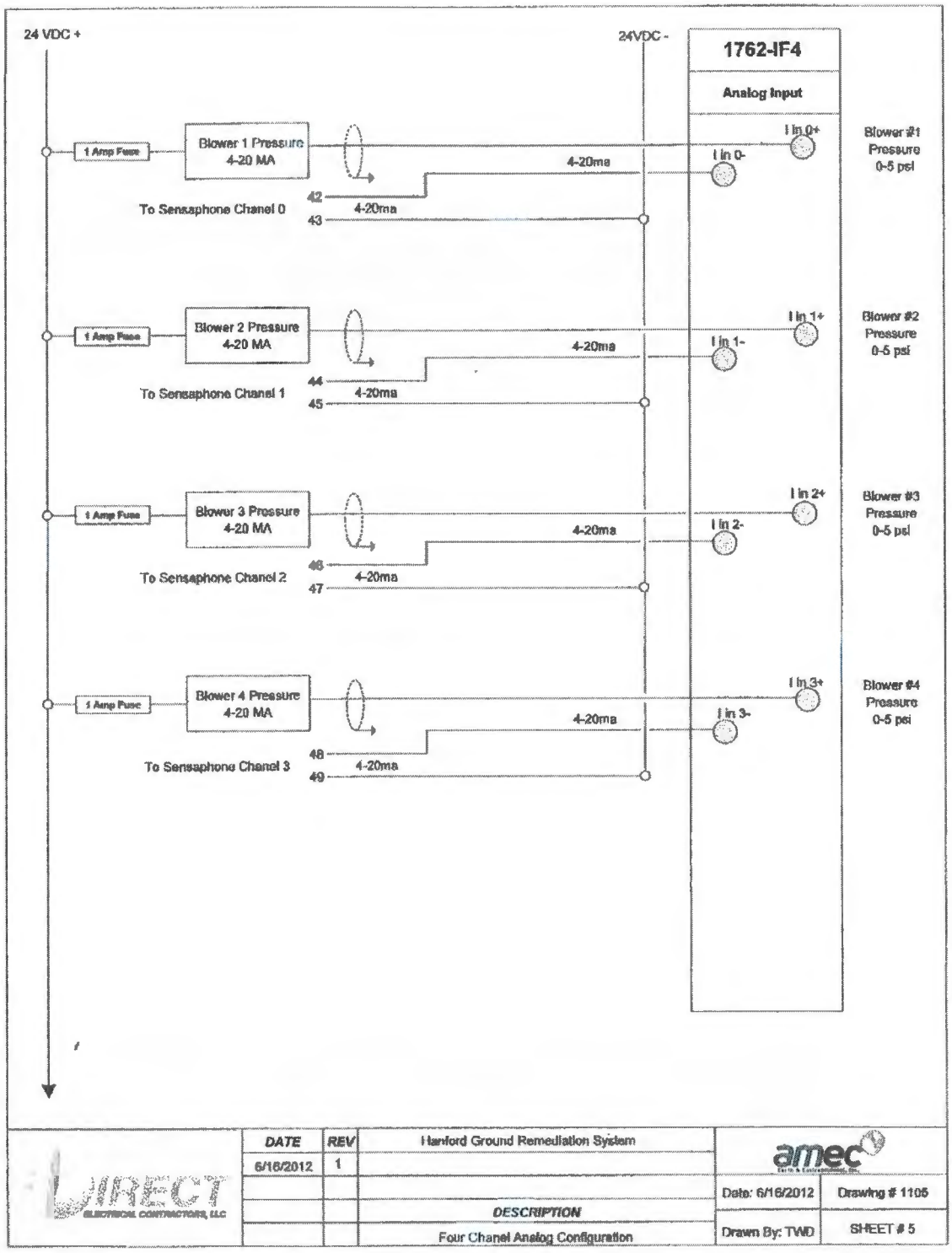


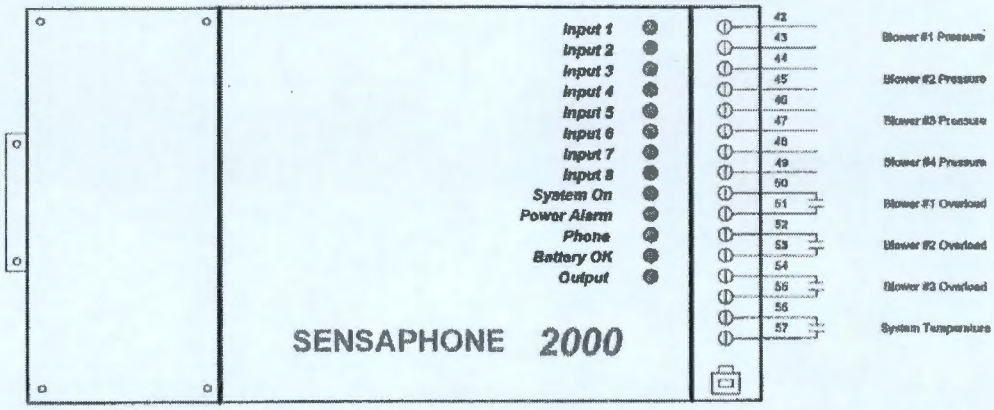
	DATE	REV	Hanford Ground Remediation System		
DIRECT ELECTRICAL CONTRACTORS, LLC	6/16/2012	1		amec	
			DESCRIPTION	DATE: 6/16/12	Drawing # 1101
			Motors and Motor Starter Diagram	Drawn By: TWD	Sheet # 1


A
2N
2
CB1 10 Amp
B
Surge Arrestor Istatrol Plus 5 Amp
C
Panel Switch Off/On
1
GRN
CB2 1 Amp
3
Thermostat
3A
Fan
CB3 1 Amp
4
Sensaphone Power Supply
CB4 1 Amp
5
Telular Wireless CDMA Modem
CB5 2 Amp
6
120v to 24VDC 5 Amp
CB6 2 Amp
24A
Allen Bradley 1766-L32BWAA
24vdc +
Allen Bradley Ethernet 5 Port Hub
24vdc -
24vdc +
24vdc -
120 VAC
1
2
DIRECT ELECTRICAL CONTRACTORS, LLC
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
Controls
amec
Date: 6/16/2012
Drawing # 1102
Drawn By: TWD
Sheet # 2


24VDC+
24VDC-
1763-L16DWD
24VDC
Not Used
I:00/00
MS1 OL'S
Blower #1 Motor Overload Status
8
I:00/01
MS2 OL'S
Blower #2 Motor Overload Status
9
I:00/02
MS3 OL'S
Blower #3 Motor Overload Status
10
I:00/03
AC Com
MS4 OL'S
Blower #4 Motor Overload Status
11
I:00/04
MS1 Status
Regenerative Blower #1 Running Status
12
I:00/05
MS2 Status
Regenerative Blower #2 Running Status
13
I:00/06
MS3 Status
Regenerative Blower #3 Running Status
14
I:00/07
MS3 Status
Regenerative Blower #4 Running Status
15
I:00/08
Reset
System Reset
16
I:00/09
To Sensaphone
I:00/10
Thermocouple to
0-5 vdc Converter
0-5 VDC
J Type Thermocouple
24 VDC
DIRECT
ELECTRICAL CONTRACTORS, LLC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
PLC Inputs Main Module Inputs
amec
Date: 6/16/2012
Drawing # 1103
Drawn By: TWD
Sheet #3


1
2
1763-L16DWD
GROUND
VAC 0
O:00/00
VAC 1
O:00/01
VAC 2
O:00/02
VAC 3
O:00/03
VAC 4
O:00/04
VAC 5
O:00/05
20
Blower #1 Contactor Relay
MSR1
MSR1-1
1
21
MS1
2A
OL'S
22
Blower #2 Contactor Relay
MSR2
MSR2-1
1
23
MS2
2B
OL'S
24
Blower #3 Contactor Relay
MSR3
MSR3-1
1
25
MS3
2C
OL'S
26
Blower #4 Contactor Relay
MSR4
MSR4-1
1
27
MS3
2D
OL'S
28
Alarm Srobe Light
RL
RL-1
1
29
29
Alarm Light
DIRECT
ELECTRICAL CONTRACTORS, LLC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
amec
DESCRIPTION
Micrologix 1100 Base Module Outputs
Date: 6/16/2012
Drawing # 1104
Drawn By: TWD
SHEET # 4


24 VDC +
24VDC -
1762-IF4
Analog Input
1 Amp Fuse
Blower 1 Pressure 4-20 MA
I in 0+
I in 0-
Blower #1 Pressure 0-5 psi
4-20ma
42
43
4-20ma
To Sensaphone Chanel 0
1 Amp Fuse
Blower 2 Pressure 4-20 MA
I in 1+
I in 1-
Blower #2 Pressure 0-5 psi
4-20ma
44
45
4-20ma
To Sensaphone Chanel 1
1 Amp Fuse
Blower 3 Pressure 4-20 MA
I in 2+
I in 2-
Blower #3 Pressure 0-5 psi
4-20ma
46
47
4-20ma
To Sensaphone Chanel 2
1 Amp Fuse
Blower 4 Pressure 4-20 MA
I in 3+
I in 3-
Blower #4 Pressure 0-5 psi
4-20ma
48
49
4-20ma
To Sensaphone Chanel 3
DIRECT ELECTRICAL CONTRACTORS, LLC
DATE
REV
6/16/2012
1
Hanford Ground Remediation System
DESCRIPTION
Four Chanel Analog Configuration
amec
Date: 6/16/2012
Drawing # 1105
Drawn By: TWD
SHEET # 5



	Date:	REV	Hanford Ground Remediation System		
DIRECT ELECTRICAL CONTRACTORS, LLC	6/16/2012	1		amec	
				Date: 6/16/2012	Drawing # 1106
			Description:		
			Scada & Wireless Telemetry	Drawn By: TWD	Drawing # 6

RSLogix 500 Project Report

AMEC HANFORD 100N

Processor Information

'rocessor Type: Bul.1763 MicroLogix 1100 Series B

'r ssor Name: UNTITLED

'otal Memory Used: 393 Instruction Words Used - 149 Data Table Words Used

'otal Memory Left: 6263 Instruction Words Left

'rogram Files: 5

'ata Files: 9

'rogram ID: e84e

age 1 Saturday, December 22, 2012 - 12:58:02

AMEC HANFORD 100N

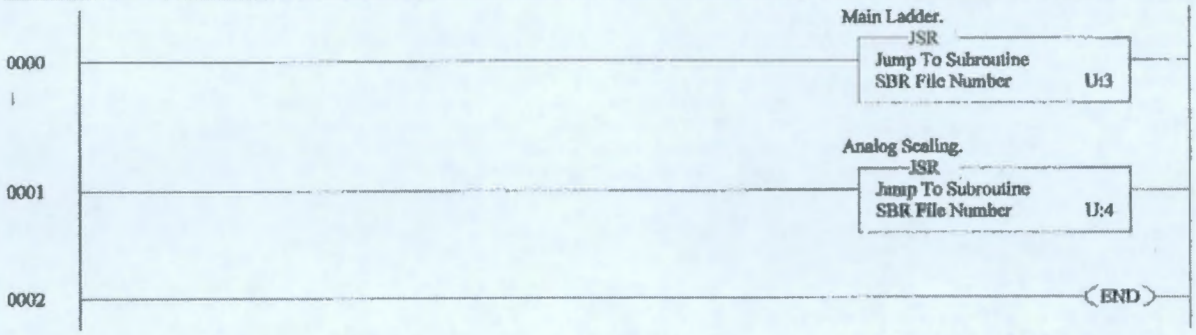
Channel Configuration

```
:HANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Edit Resource/Owner Timeout:  60
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Passthru Link ID:  1
    HANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Write Protected:  No
    IANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Comms Servicing Selection:  Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Message Servicing Selection:  Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 1st AWA Append Character:  \d
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 2nd AWA Append Character:  \a

   Source ID:  1 (decimal)
   Baud: 19200
   Parity:  NONE
   Control Line :  No Handshaking
   Error Detection:  CRC
   Embedded Responses:  Auto Detect
   Duplicate Packet Detect:  Yes
   ACK Timeout(x20 ms):  50
   NAK Retries:  3
   ENQ Retries:  3


:HANNEL 1 (SYSTEM) - Driver: Ethernet
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Edit Resource/Owner Timeout:  60
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Passthru Link ID:  1
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Write Protected:  No
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Comms Servicing Selection:  Yes
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Message Servicing Selection:  Yes

   Hardware Address:  00:00:00:00:00:00
   IP Address:  192.168.1.40
   Subnet Mask:  255.255.255.0
   Gateway Address:  0.0.0.0
   Msg Connection Timeout (x 1mS):  15000
    ıg Reply Timeout (x mS):  3000
    ıactivity Timeout (x Min):  30
   Bootp Enable:  No
   Dhcp Enable  No
   SNMP Enable:  No
   HTTP Enable:  Yes
   Auto Negotiate Enable:  Yes
   Port Speed Enable:  10/100 Mbps Full Duplex/Half Duplex
   Contact:
   Location:
```

age 1 Saturday, December 22, 2012 - 12:58:02

AMEC HANFORD 100N

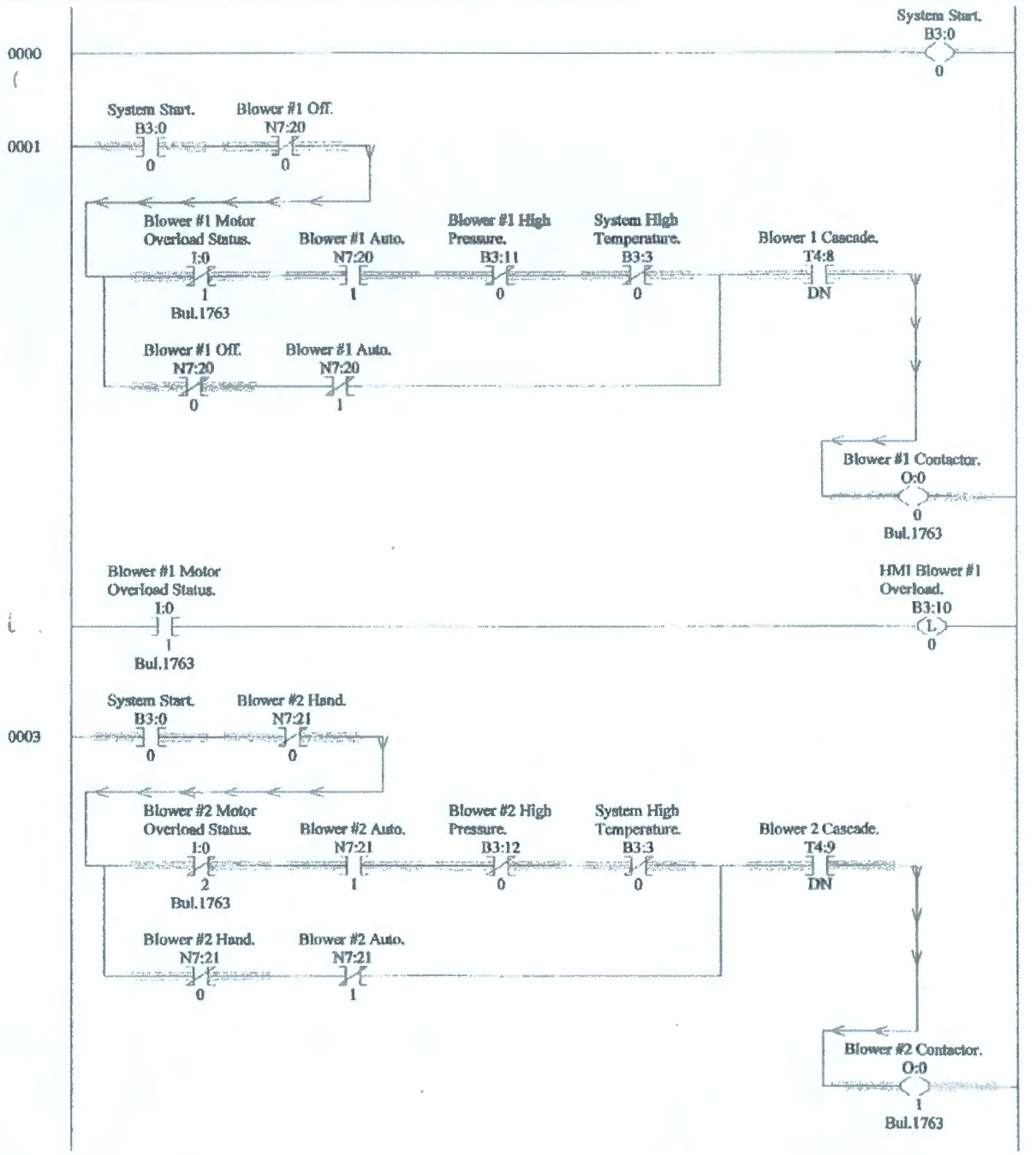
LAD 2 - SUBROUTINE --- Total Rungs in File = 3



'age 1 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

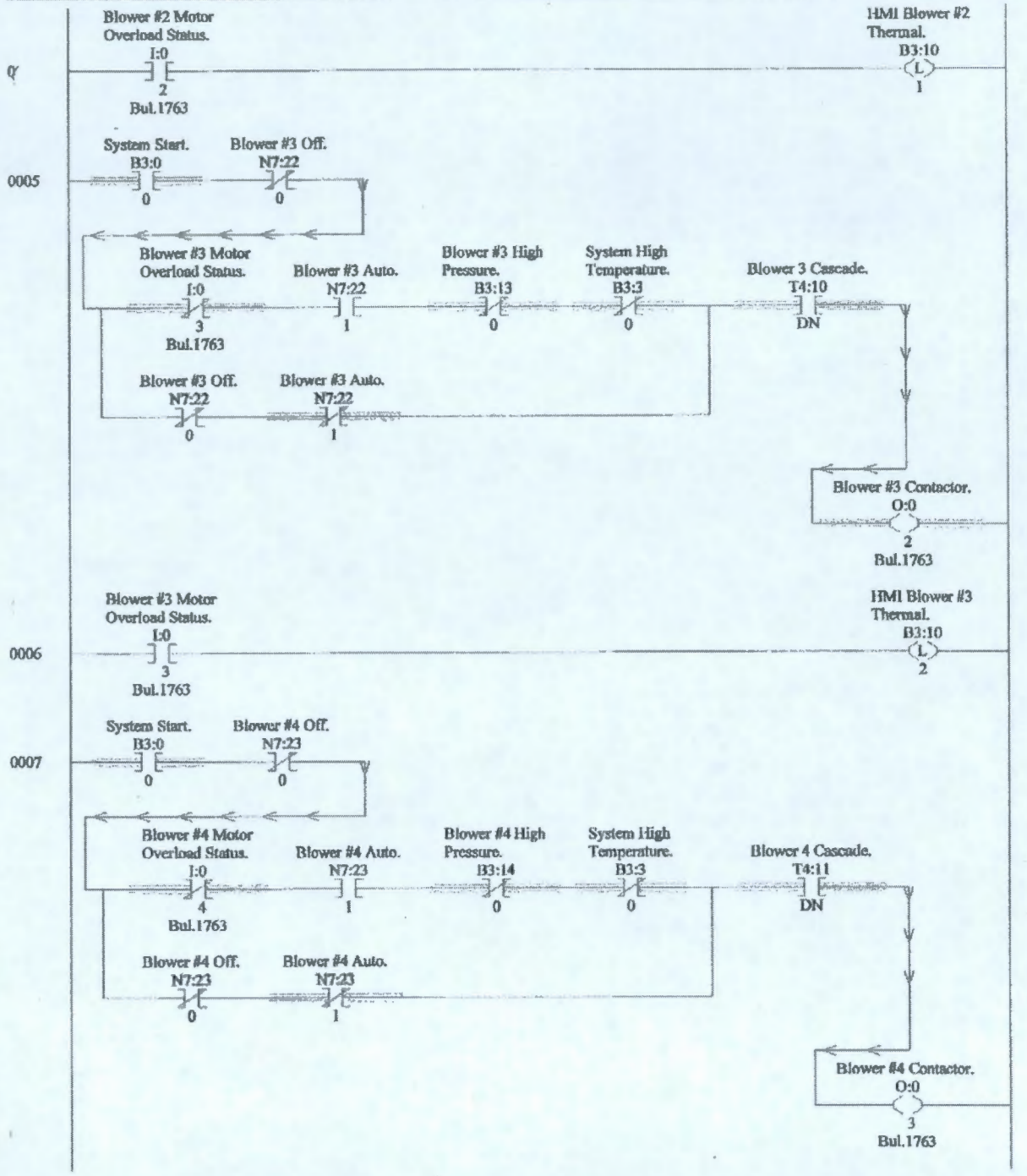
LAD 3 - MAIN --- Total Rungs in File = 17



'age 1 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

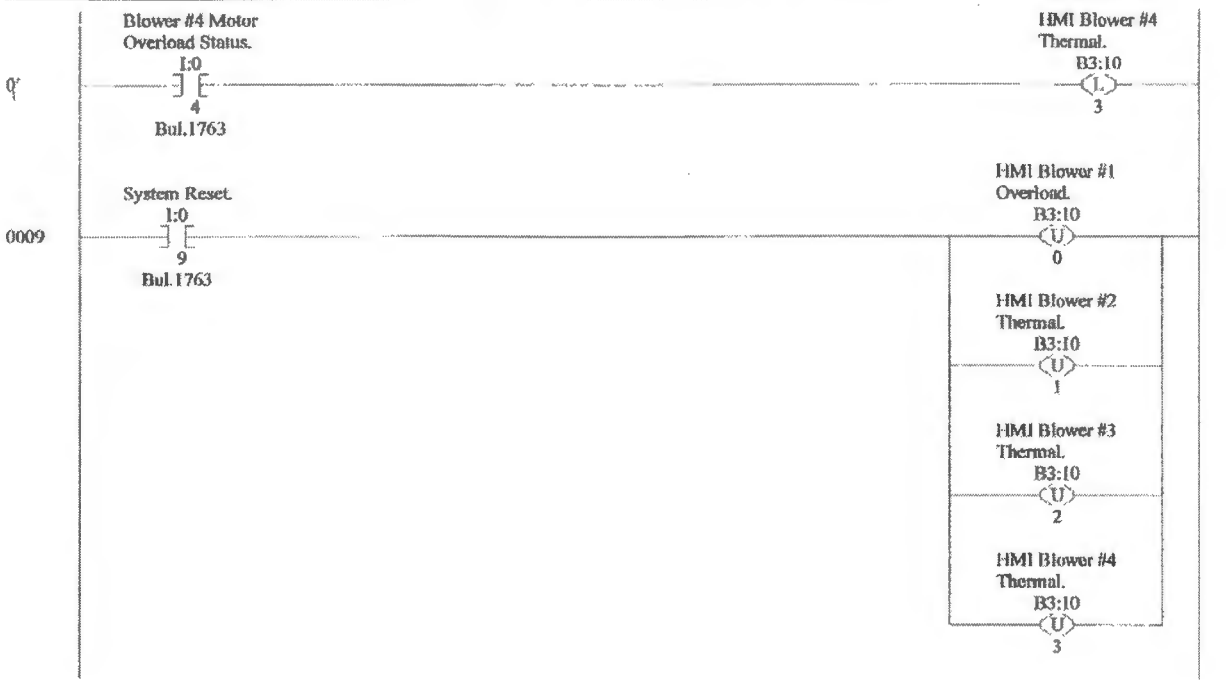
LAD 3 - MAIN --- Total Rungs in File = 17



Page 2 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

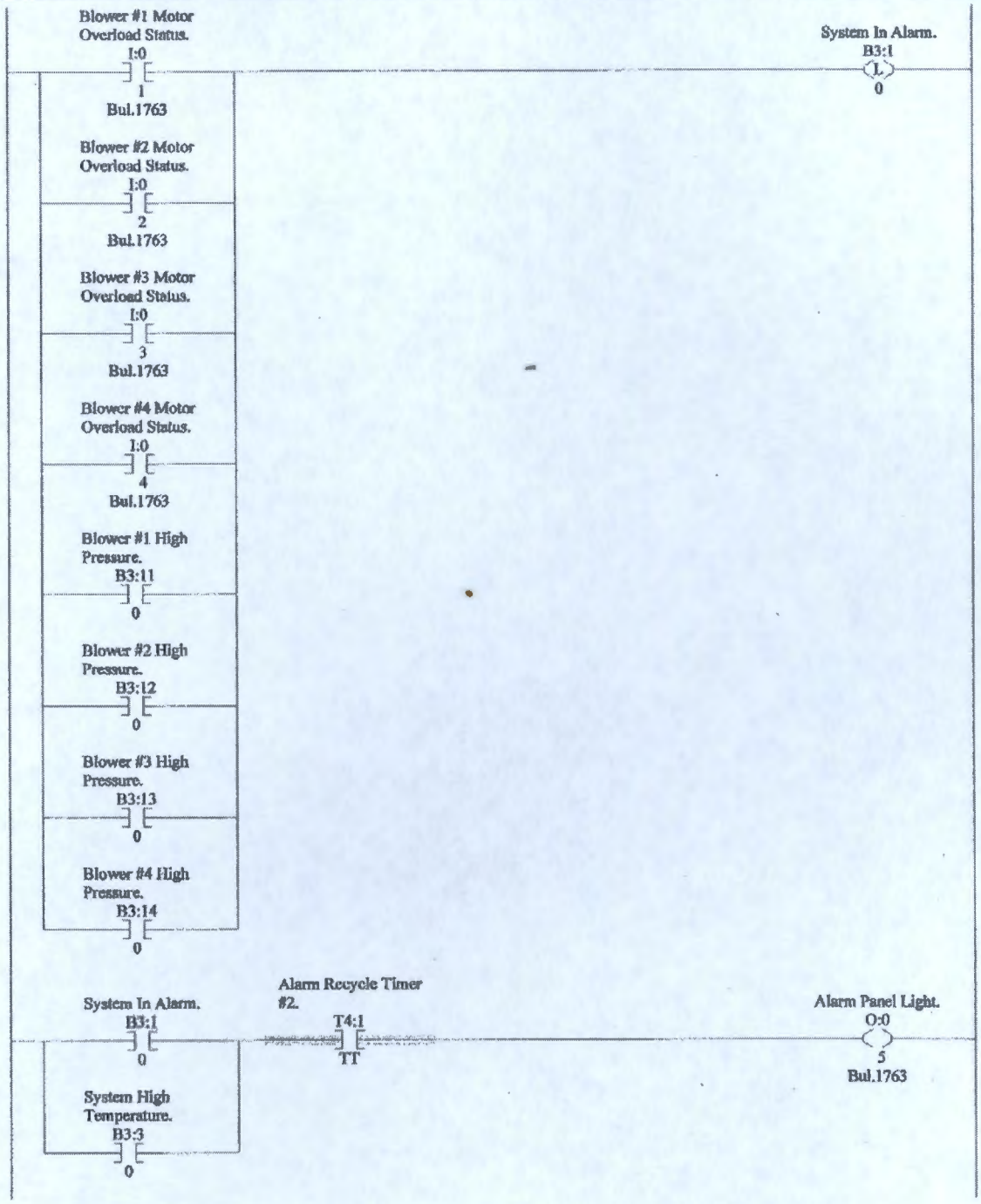
LAD 3 - MAIN ---- Total Rungs in File = 17



Page 3 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

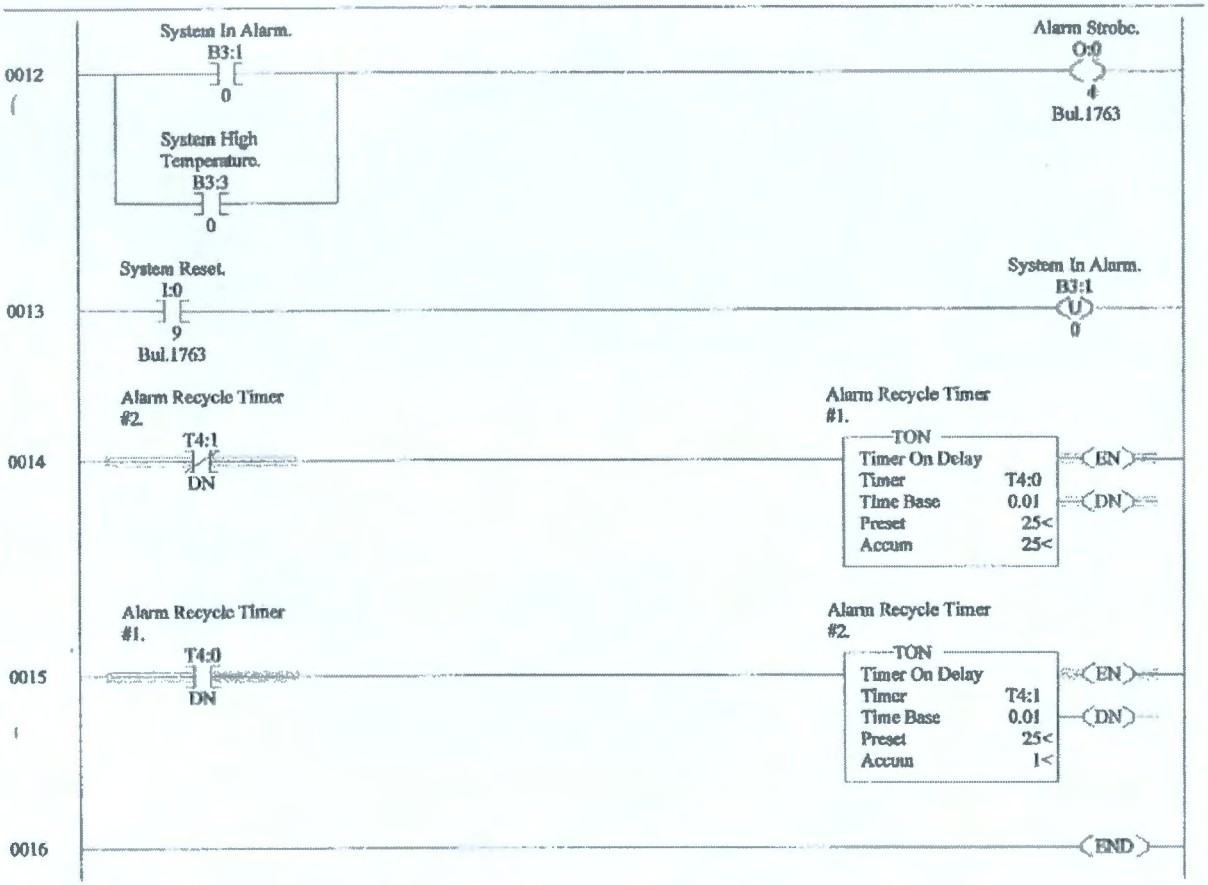
LAD 3 - MAIN --- Total Rungs in File = 17



Page 4 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

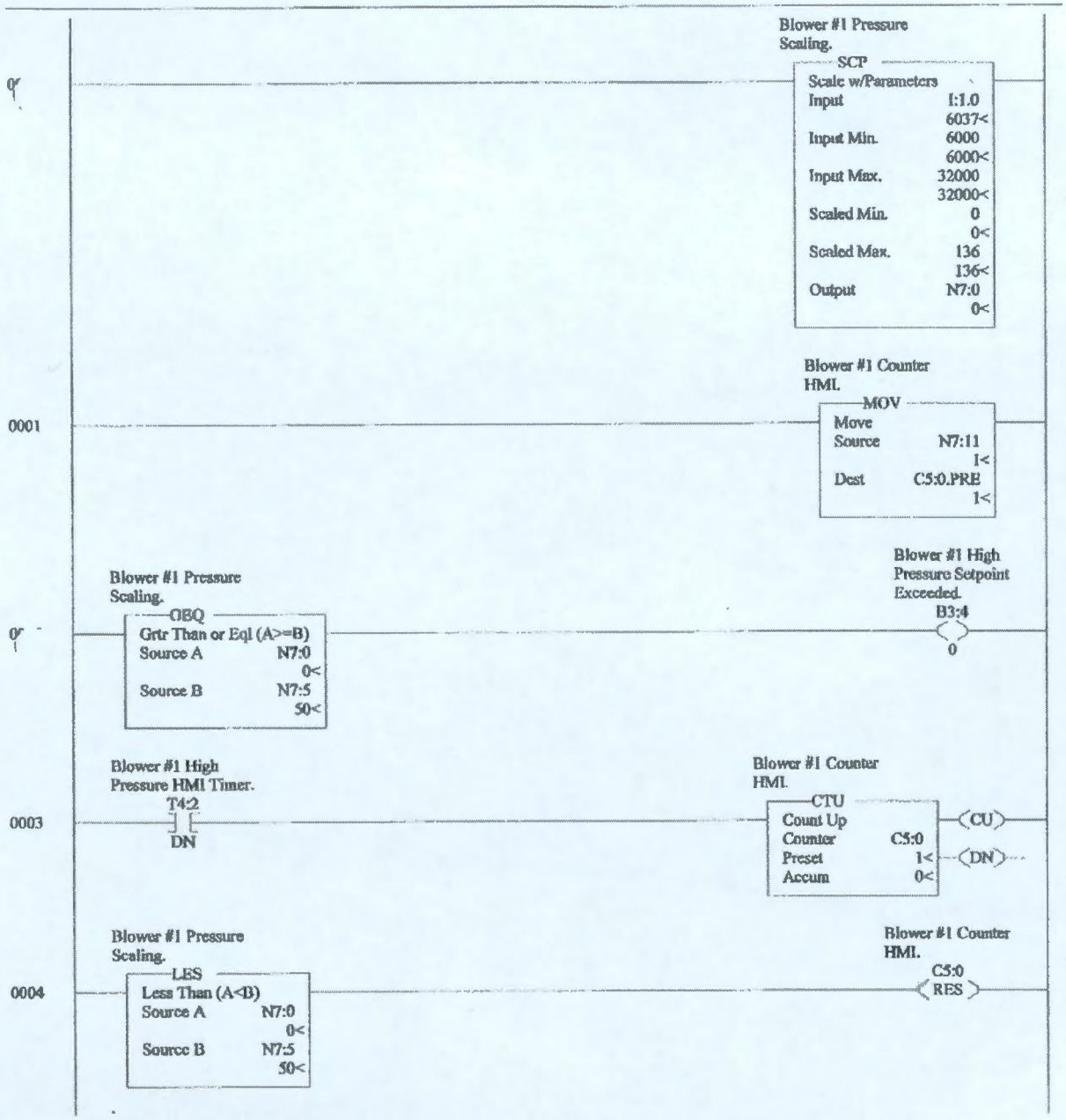
LAD 3 - MAIN --- Total Rungs in File = 17



'age 5 Saturday, December 22, 2012 - 12:58:03

AMEC HANFORD 100N

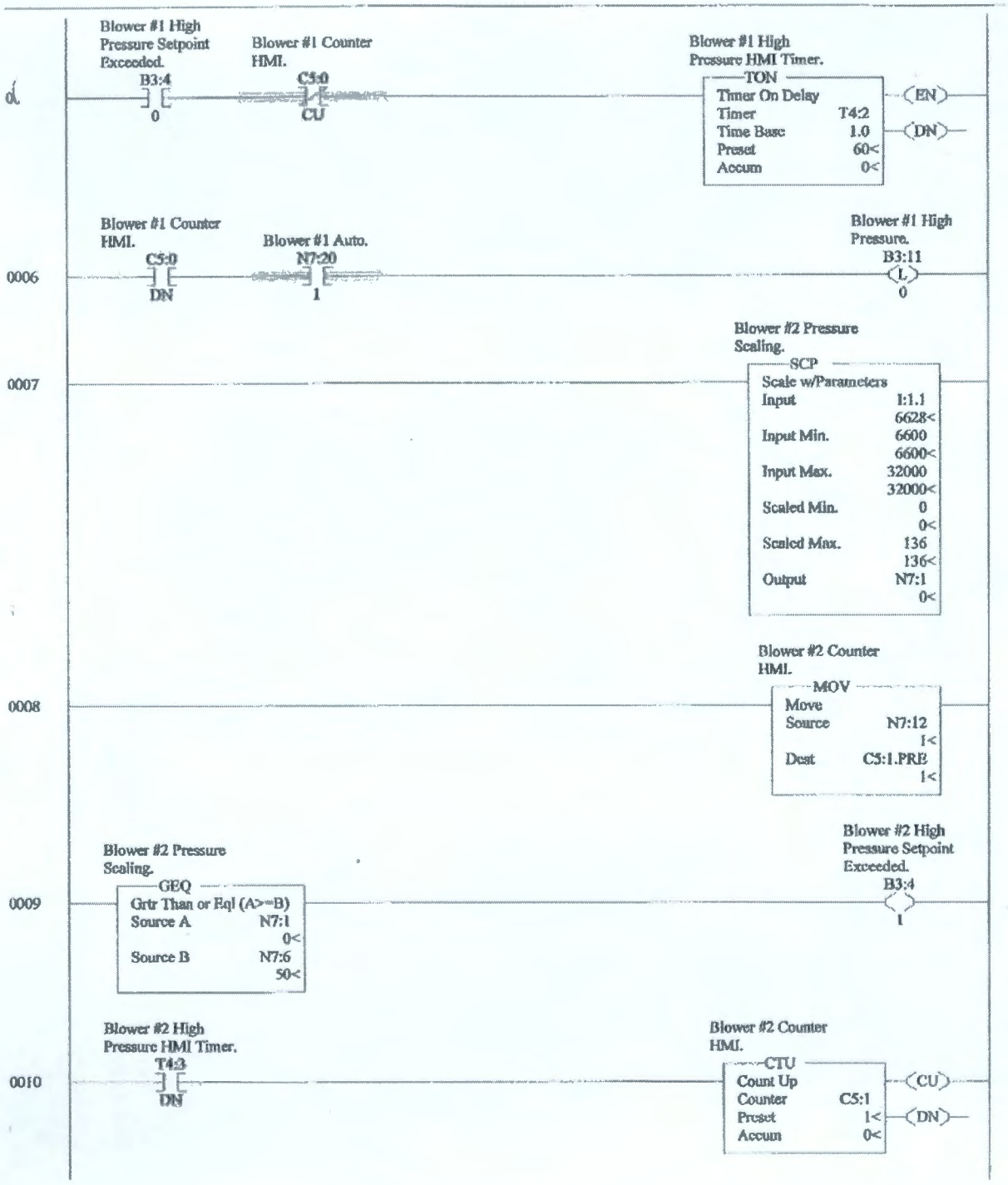
LAD 4 - ANALOG --- Total Rungs in File = 43



'age 1 Saturday, December 22, 2012 - 12:58:04

AMEC HANFORD 100N

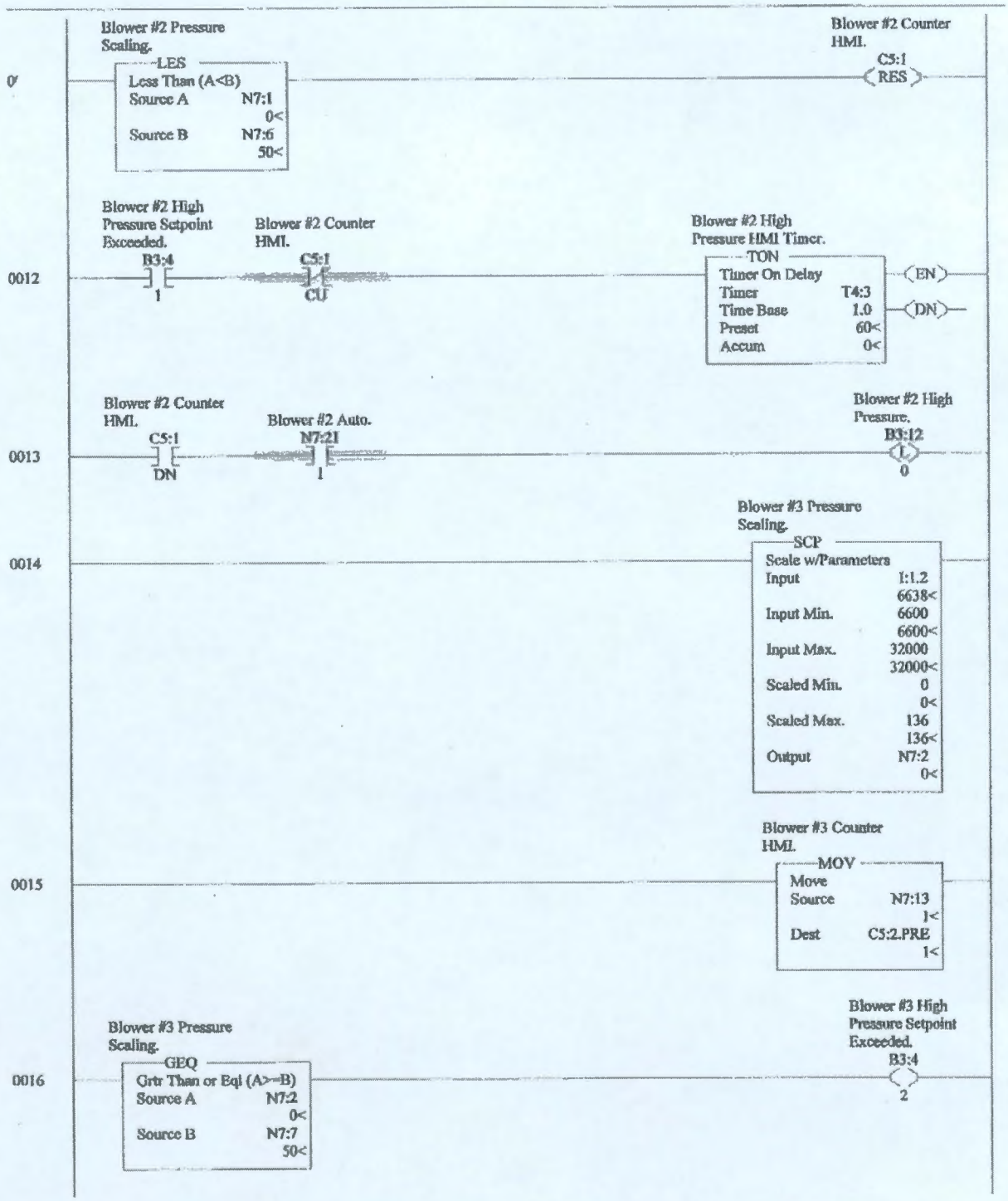
LAD 4 - ANALOG --- Total Rungs in File = 43



Page 2 Saturday, December 22, 2012 - 12:58:04

AMEC HANFORD 100N

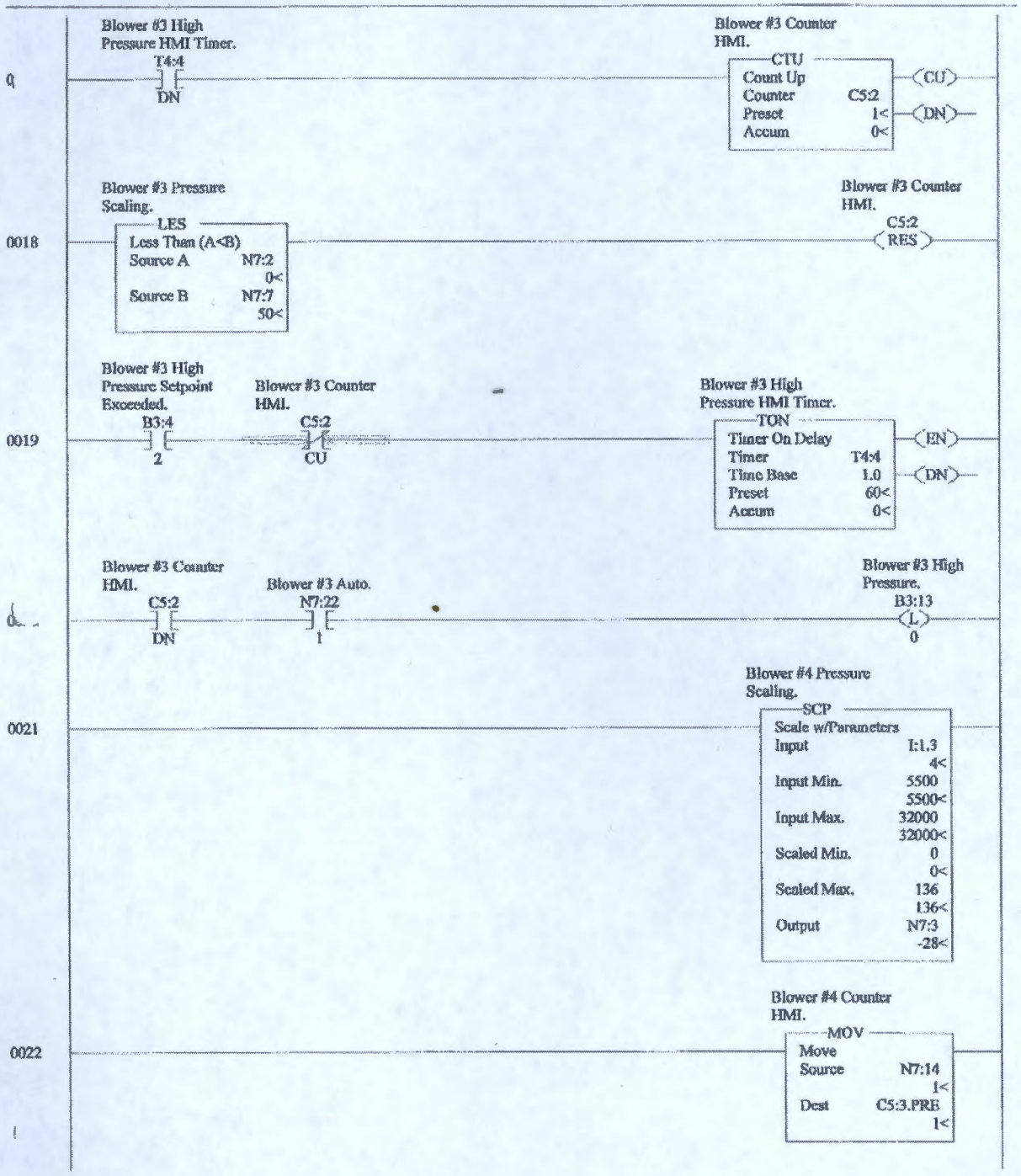
LAD 4 - ANALOG --- Total Rungs in File = 43



Page 3 Saturday, December 22, 2012 - 12:58:04

AMEC HANFORD 100N

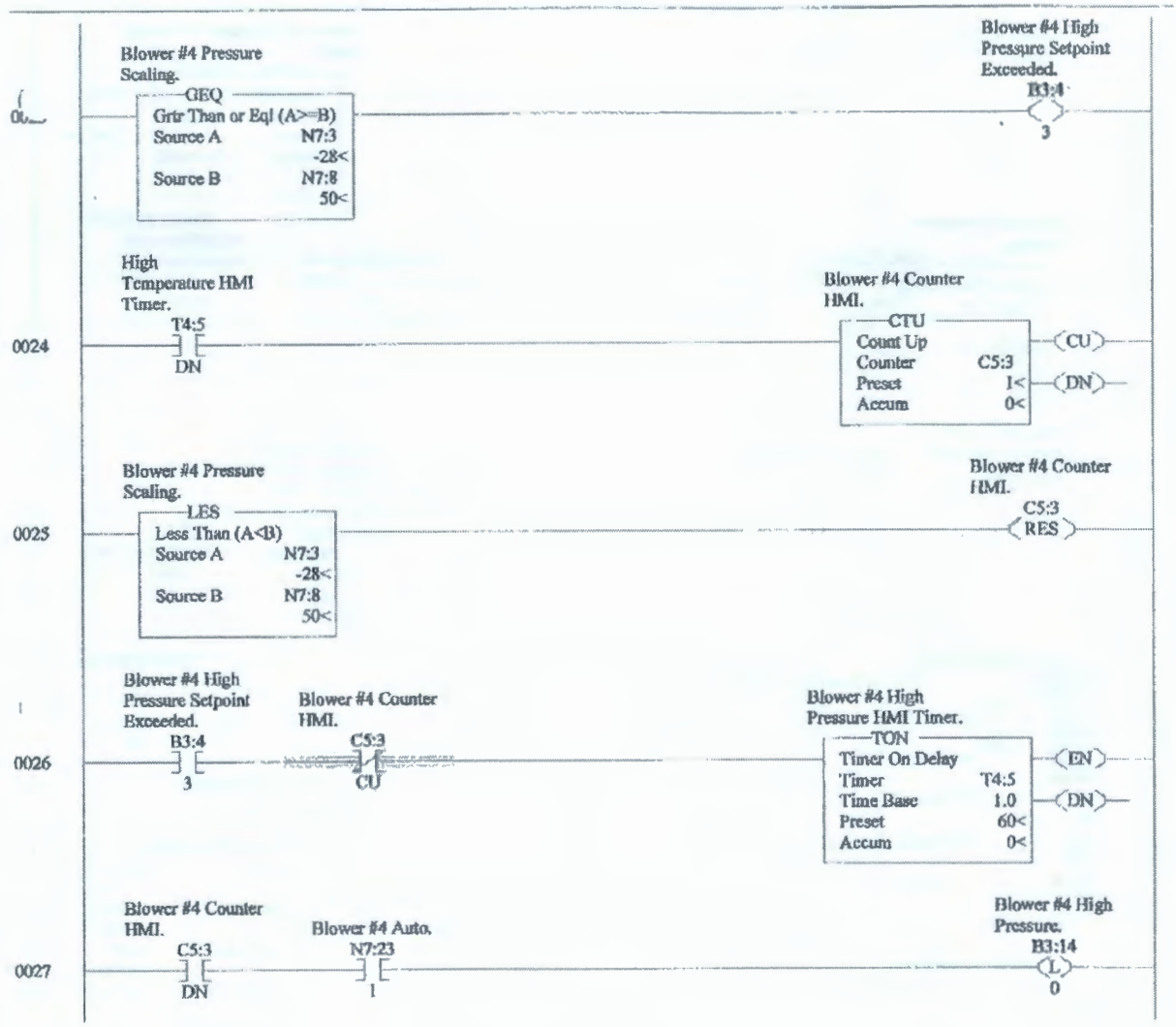
LAD 4 - ANALOG --- Total Rungs in File = 43



Page 4 Saturday, December 22, 2012 - 12:58:04

AMEC HANFORD 100N

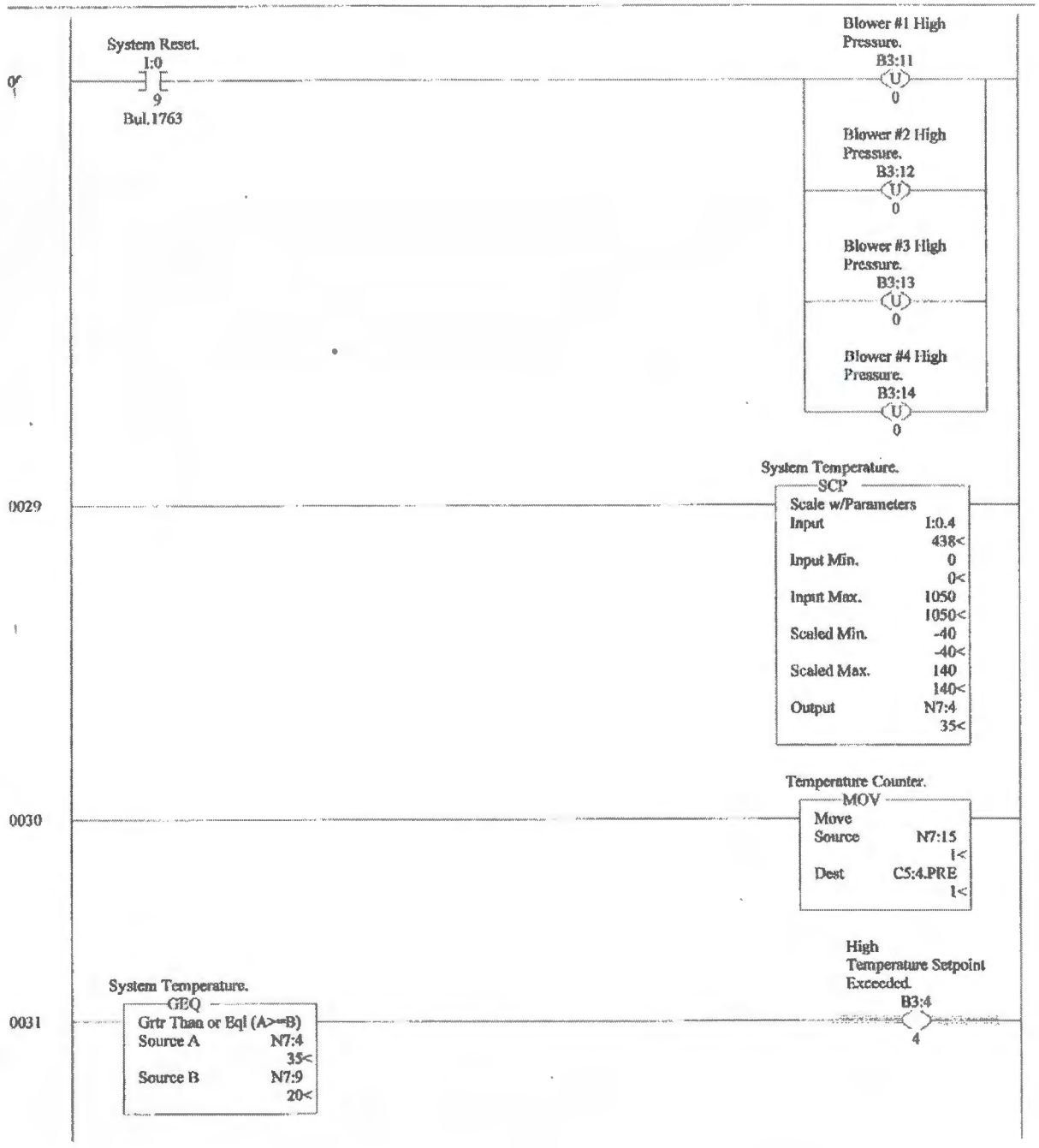
LAD 4 - ANALOG --- Total Rungs in File = 43



Page 5 Saturday, December 22, 2012 - 12:58:04

AMEC HANFORD 100N

LAD 4 - ANALOG --- Total Rungs in File = 43



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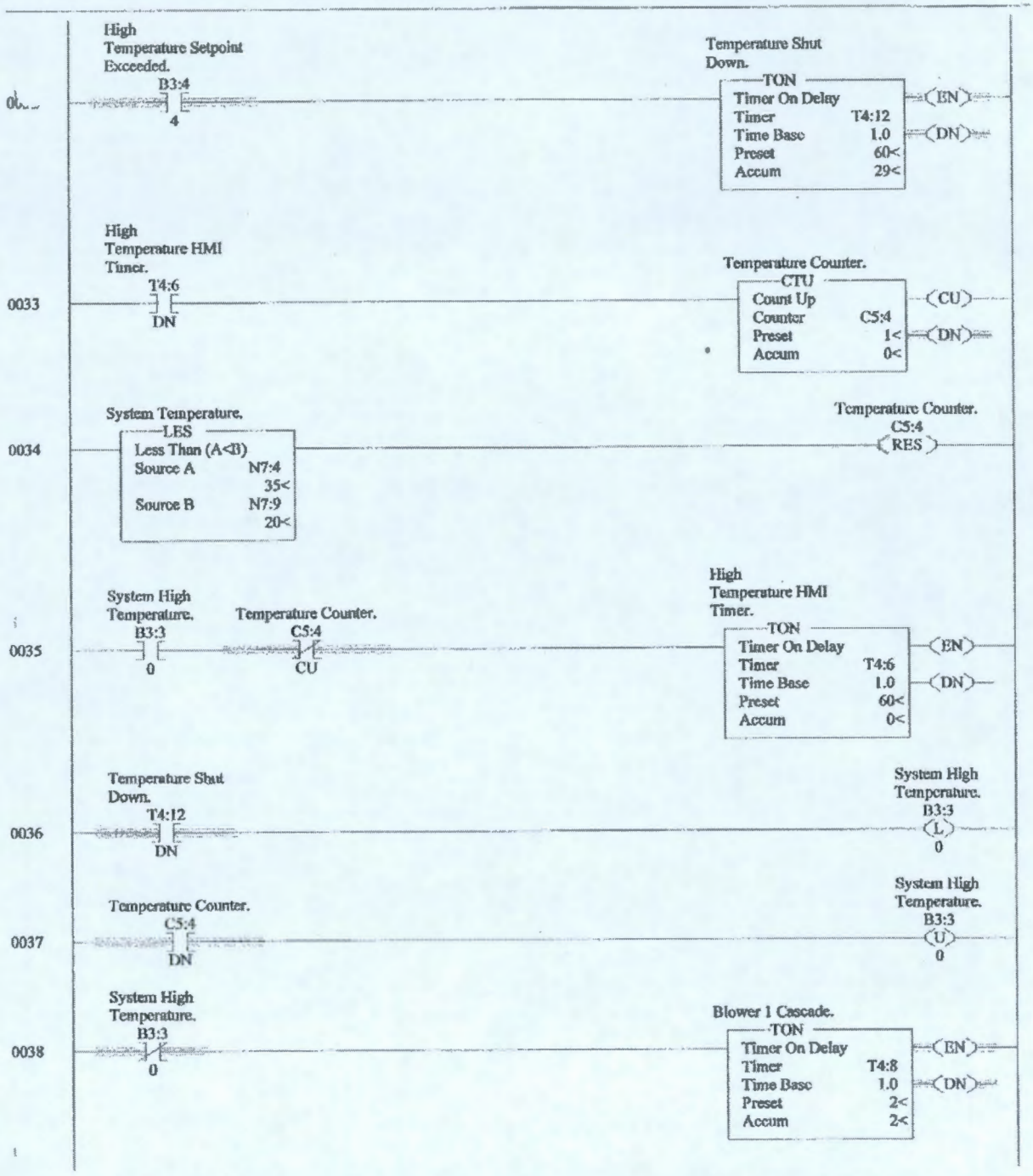
AMEC HANFORD 100N

LAD 4 - ANALOG --- Total Rungs in File = 43



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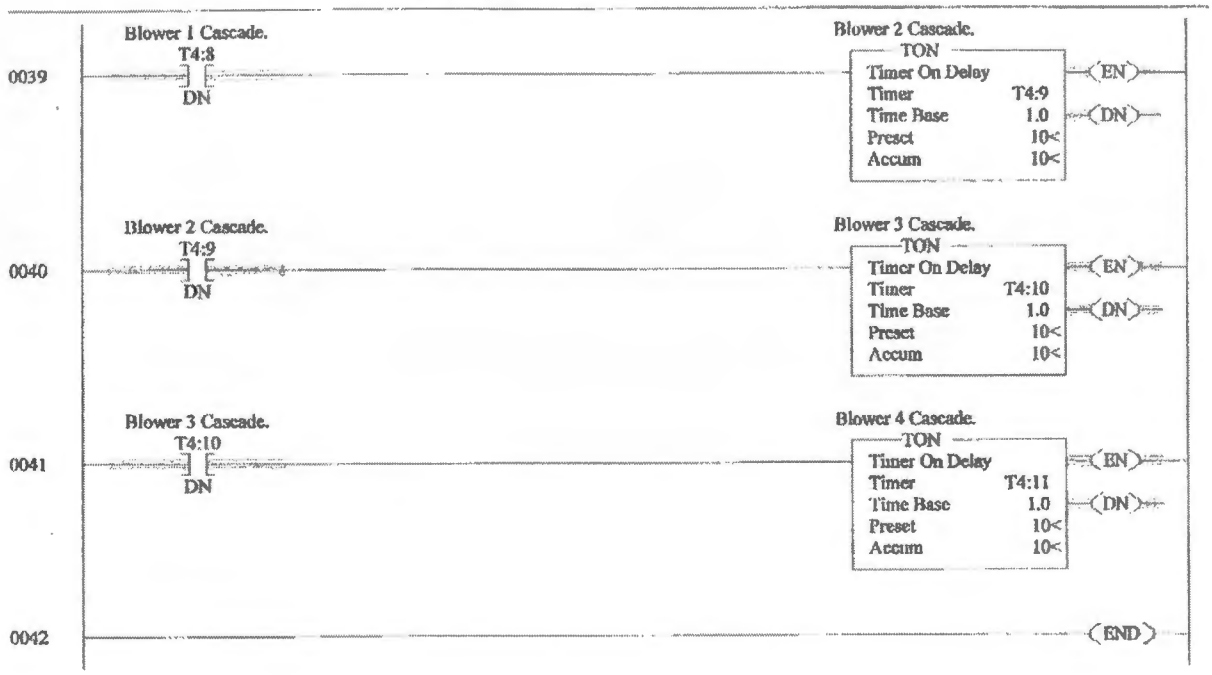
AMEC HANFORD 100N

LAD 4 - ANALOG --- Total Rungs in File = 43



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AMEC HANFORD 100N

Data File 00 (bin) -- OUTPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
O:[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	Bul.1763	MicroLogix 1100 Series B
O:[illegible].1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
O:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
O:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B

Page 1 (Radix Binary) Saturday, December 22, 2012 - 12:58:05

AMEC HANFORD 100N

Data File I1 (bin) -- INPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
I:0.0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.4	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	Bul.1763	MicroLogix 1100 Series B-Anal
I:0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	Bul.1763	MicroLogix 1100 Series B-Anal
I:1.0	0	0	0	1	0	1	1	1	1	0	0	1	0	1	0	1	1762-IF4 - Analog 4 Chan. Input	
I:1.1	0	0	0	1	1	0	0	1	1	1	1	0	0	1	0	0	1762-IF4 - Analog 4 Chan. Input	
I:1.2	0	0	0	1	1	0	0	1	1	1	1	0	1	1	1	0	1762-IF4 - Analog 4 Chan. Input	
I:1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1762-IF4 - Analog 4 Chan. Input	
I:1.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1762-IF4 - Analog 4 Chan. Input	
I:1.5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1762-IF4 - Analog 4 Chan. Input	
I:1.6	1	0	0	1	0	1	1	1	0	0	1	1	1	1	1	0	1762-IF4 - Analog 4 Chan. Input	

Page 1 (Radix Binary) Saturday, December 22, 2012 - 12:58:05

AMEC HANFORD 100N

Data File S2 (hex) -- STATUS

lain

'rocessor Mode S:1/0 - S:1/4 = Remote Run
m 'wer up Go To Run (Mode Behavior) S:1/12 = 0
'1 Pass S:1/15 = No
'ree Running Clock S:4 = 0001-1110-1011-0110

'roc

'S Catalog Number S:57 = 1100
'S Series S:58 = B
'S FRS S:59 =
'rocessor Catalog Number S:60 =
'rocessor Series S:61 = A
'rocessor FRN S:62 =

User Program Type S:63 = 0108h
Compiler Revision Number S:64 =

'can Times

laximum (x10 ms) S:22 = 53
'atchdog (x10 ms) S:3 (high byte) = 10
ast 100 uSec Scan Time S:35 = 30
'can Toggle Bit S:33/9 = 0

lath

lath Overflow Selected S:2/14 = 0
'werflow Trap S:5/0 = 0
'arry S:0/0 = 0
'werflow S:0/1 = 0
'ero Bit S:0/2 = 0
'ign Bit S:0/3 = 0

Math Register (lo word) S:13 = 0
Math Register (high word) S:14-S:13 = 0
Math Register (32 Bit) S:14-S:13 = 0

'han 0

'rocessor Mode S:1/0- S:1/4 = Remote Run
'c Address S:15 (low byte) = 0
'd Rate S:15 (high byte) = ?
'hannel Mode S:33/3 = 0
'omms Active S:33/4 = 0
'ncoming Cmd Pending S:33/0 = 0
'sg Reply Pending S:33/1 = 0

Outgoing Msg Cmd Pending S:33/2 = 0

'ebug

'uspend Code S:7 = 0
'uspend File S:8 = 0

'rrors

'ault Override At Power Up S:1/8 = 0
'tartup Protection Fault S:1/9 = 0
'ajor Error Halt S:1/13 = 0
'verflow Trap S:5/0 = 0
'ontrol Register Error S:5/2 = 0
'ajor Error Executing User Fault Rtn. S:5/3 = 0
'attery Low S:5/11 = 0
'nput Filter Selection Modified S:5/13 = 0
'SCII String Manipulation error S:5/15 = 0

Fault Routine S:29 = 0
Major Error S:6 = 0h

Error Description:

'rotection

'eny Future Access S:1/14 = No
'ata File Overwrite Protection Lost S:36/10 = False

'em Module

'y Module Loaded On Boot S:5/8 = 0
'assword Mismatch S:5/9 = 0
'oad Memory Module On Memory Error S:1/10 = 0
'oad Memory Module Always S:1/11 = 0
'n Power up Go To Run (Mode Behavior) S:1/12 = 0
'rogram Compare S:2/9 = 0

'age 1 Saturday, December 22, 2012 - 12:58:05

AMEC HANFORD 100N

Data File S2 (hex) -- STATUS

'orces

'orces Enabled S:1/5 = Yes
'c ns Installed S:1/6 = No

AMEC HANFORD 100N

Data File B3 (bin) -- BINARY

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol) Description
B3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
B3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
B3:5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B3:14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Page 1 (Radix Binary) Saturday, December 22, 2012 - 12:58:06

AMEC HANFORD 100N

Data File T4 -- TIMER

Offset	EN	TT	DN	BASE	PRE	ACC	(Symbol) Description
[illegible]	1	0	1	.01 sec	25	25	Alarm Recycle Timer #1.
[illegible]	1	1	0	.01 sec	25	1	Alarm Recycle Timer #2.
T4:2	0	0	0	1.0 sec	60	0	Blower #1 High Pressure HMI Timer.
T4:3	0	0	0	1.0 sec	60	0	Blower #2 High Pressure HMI Timer.
T4:4	0	0	0	1.0 sec	60	0	Blower #3 High Pressure HMI Timer.
T4:5	0	0	0	1.0 sec	60	0	Blower #4 High Pressure HMI Timer.
T4:6	0	0	0	1.0 sec	60	0	High Temperature HMI Timer.
T4:7	0	0	0	1.0 sec	0	0	Blower #1 Pressure Alarm Timer.
T4:8	1	0	1	1.0 sec	2	2	Blower 1 Cascade.
T4:9	1	0	1	1.0 sec	10	10	Blower 2 Cascade.
T4:10	1	0	1	1.0 sec	10	10	Blower 3 Cascade.
T4:11	1	0	1	1.0 sec	10	10	Blower 4 Cascade.
T4:12	1	0	1	1.0 sec	60	29	Temperature Shut Down.

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AMEC HANFORD 100N

Data File C5 -- COUNTER

Offset	CU	CD	DN	OV	UN	UA	PRE	ACC	(Symbol) Description
[illegible]	0	0	0	0	0	0	1	0	Blower #1 Counter HMI.
[illegible]	0	0	0	0	0	0	1	0	Blower #2 Counter HMI.
C5:2	0	0	0	0	0	0	1	0	Blower #3 Counter HMI.
C5:3	0	0	0	0	0	0	1	0	Blower #4 Counter HMI.
C5:4	0	0	1	0	0	0	1	0	Temperature Counter.

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AMEC HANFORD 100N

Data File R6 -- CONTROL

Offset	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS	(Symbol) Description
0f	0	0	0	0	0	0	0	0	0	0	

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AMEC HANFORD 100N

Data File N7 (dec) -- INTEGER

Offset	0	1	2	3	4	5	6	7	8	9
N7	0	0	0	-28	35	50	50	50	50	20
N7, J	0	1	1	1	1	1	0	0	0	0
N7:20	2	2	1	1						

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AMEC HANFORD 100N

Data File F8 -- FLOAT

Offset	0	1	2	3	4
FP	0				

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APPENDIX D

SAMPLE MAINTENANCE RECORD SHEET

Hanford Bioventing System

Technician(s): _____ **Date:** _____ **Arrival Time:** _____ **Departure Time:** _____

System Status (Operations and Alarms) Upon Arrival at Site: _____
CONEX Temperature: _____

BRS Operating Data

	Blower A	Blower B	Blower C	Blower D	Comments
Running on arrival?	Y N	Y N	Y N	Y N	
Blower Mode (circle one):	On Off Hand	On Off Hand	On Off Hand	On Off Hand	
Control Panel Reading-- Back Pressure (in. WC):					
Gauge Reading-- Back Pressure (in. WC):					
If Greater than 60, was filter inspected?	Y N	Y N	Y N	Y N	
Running at Departure?	Y N	Y N	Y N	Y N	

	Well 1	Well 2	Well 3	Well 4
Air Flow (cfm)				

Maintenance needed on future visit: _____

Monthly Inspection Performed?	Yes/No (Circle One)
Inspection of Pipe Fittings / Couplers / Power Cable / Etc (Interior and Exterior)	Y/N
Inspection/Replacement of Blower Filters	Y/N
Monitoring/Adjustments of System Pressures	Y/N
Monitoring / Switching Blowers	Y/N

Quarterly Inspection Performed?	Yes/No (Circle One)
Inspection of Wells	Y/N
Inspection of CONEX Box Outlets, Lights, Fan, Alarms	Y/N
Replace Sensaphone Batteries at Least Annually	**Replaced? Yes/No**

Note Any Maintenance Issues Encountered

Notes: _____

APPENDIX E

SAMPLING PROCEDURES

Monitoring Well Sampling Guideline

1. Go to first well to be sampled and record the monitoring well name on the Field Form

2. Connect a portable differential pressure gauge (Dwyer Magnahelic with range approximately 0 to 10 inches of WC or less, or equivalent) to the well.

   2.1. Measure the pressure at the well head and record the pressure on the Field Form.

3. Connect a sampling vacuum pump to a sample fitting at the top of the wellhead. Open the well valve to allow the pump to purge the well.

NOTE – it does not matter which well is sampled first or last.

4. Purge 3 to 5 well volumes of air from the well.

   4.1. A well volume for 199-N-169 monitoring well is 3.01 cubic feet.

   4.2. A well volume for 199-N-171 monitoring well is 3.06 cubic feet.

   4.3. Close the well valve after purging.

5. Open the well valve and attach a direct reading instrument to the wellhead sampling port.

   5.1. Allow readings to stabilize on the instrument

   5.2. Record readings from the instrument on the Field Form

   5.3. Disconnect the direct reading instrument.

   5.4. Close the well valve.

6. Go to next Monitoring Well and repeat.

Injection Well Pressure Reading

1. Go to injection well 199-N-172.
2. Record the Injection well number on the Field Form
   2.1. Record the Pressure Gauge reading (located at the well head with the injection manifold) at the injection well head on the Field Form
3. Move to injection well 199-N-167 and repeat Step 2.
4. Enter the Bio-Vent Conex Box and go to the piping manifold.
5. Read and record the air flow rate for each identified injection well and record on the Field Form.
6. Submit the completed Field Form to the Sub-Contractor Representative (STR) once sampling is complete.

100N Bioremediation System Testing Operations

Field Form

Site: 100N

Date: _____ **Sampling Equipment and S/N**_____

Time: Start_____ Finish _____

Rad Eng. Notified of Planned Sampling Activities? Yes ___ No ___ Date/Time _____

O_2 Meter Calibrated? Yes ___ No ___ **CO_2 Meter Calibrated?** Yes ___ No ___

CH_4 Meter Calibrated? Yes ___ No ___ **VOC Meter Calibrated?** Yes ___ No ___

Field Personnel: _____ _____

_____ _____

Weather
☐ **Sunny** ☐ **Partly Cloudy** ☐ **Cloudy** ☐ **Rain** ☐ **Drizzle** ☐ **Fog**

Ambient Outdoor Temperature _____**°F**

Monitoring Well	Time	Press. (in. water)	Oxygen (%)	Carbon Dioxide (PPM)	Methane* (%)	VOC (ppmv)	Comments

Injection Well #	Time	Pressure Gauge Reading (in. water)	Record Air Flow Rate At Manifold Valve (CFM)	Comments

*Per % LEL

APPENDIX F

PHOTOGRAPHIC LOG OF CONEX BOX AND COMPONENTS

PHOTOGRAPH LOG

amec
Environment and Infrastructure, Inc
7376 SW Durham Road
Portland, Oregon 97224

PROJECT NAME:	100-N Area - Bioventing Phase II		
Project No:	3-61M-120340 Task 1	**Date:**	Tuesday, October 08, 2013
Site Location:	100-N Area - Hanford Reservation, WA.	**Page:**	1 of 5

Photo 1:

PHOTOGRAPH LOG

PROJECT NAME:	100-N Area - Bioventing Phase II		
Project No:	3-61M-120340 Task 1	**Date:**	Tuesday, October 08, 2013
Site Location:	100-N Area - Hanford Reservation, WA	**Page:**	2 of 5

amec
Environment and Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon 97224

Photo 2:

PHOTOGRAPH LOG

PROJECT NAME:	100-N Area - Bioventing Phase II		
Project No:	3-61M-120340 Task 1	**Date:**	Tuesday, October 08, 2013
Site Location:	100-N Area - Hanford Reservation, WA	**Page:**	3 of 5

amec
Environment and Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon 97224

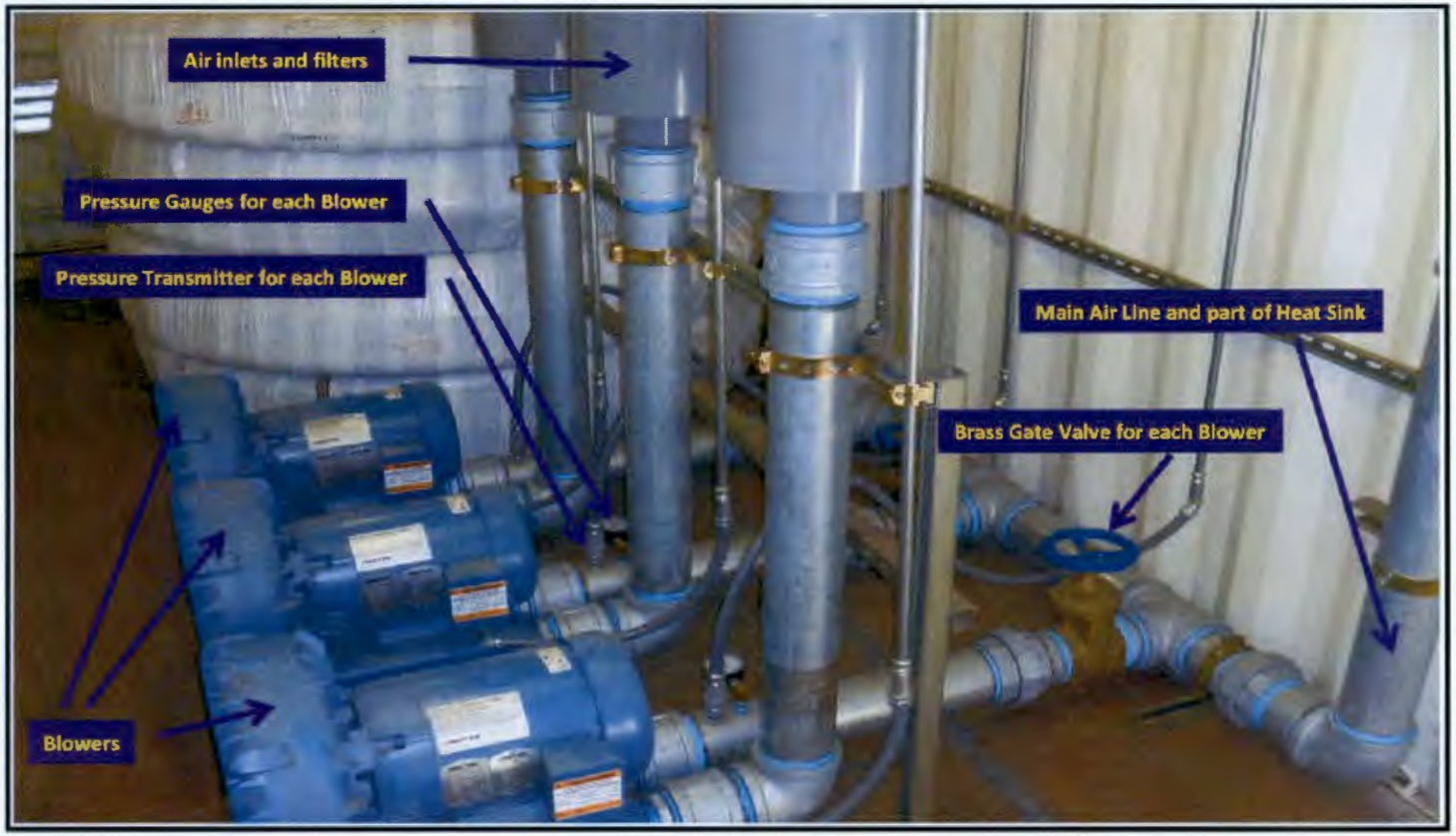

Photo 3: The three blowers (A, B, and C) and connections to main air line.

PHOTOGRAPH LOG

amec
Environment and Infrastructure, Inc
7376 SW Durham Road
Portland, Oregon 97224

PROJECT NAME:	100-N Area - Bioventing Phase II		
Project No:	3-61M-120340 Task 1	**Date:**	Tuesday, October 08, 2013
Site Location:	100-N Area - Hanford Reservation, WA.	**Page:**	4 of 5

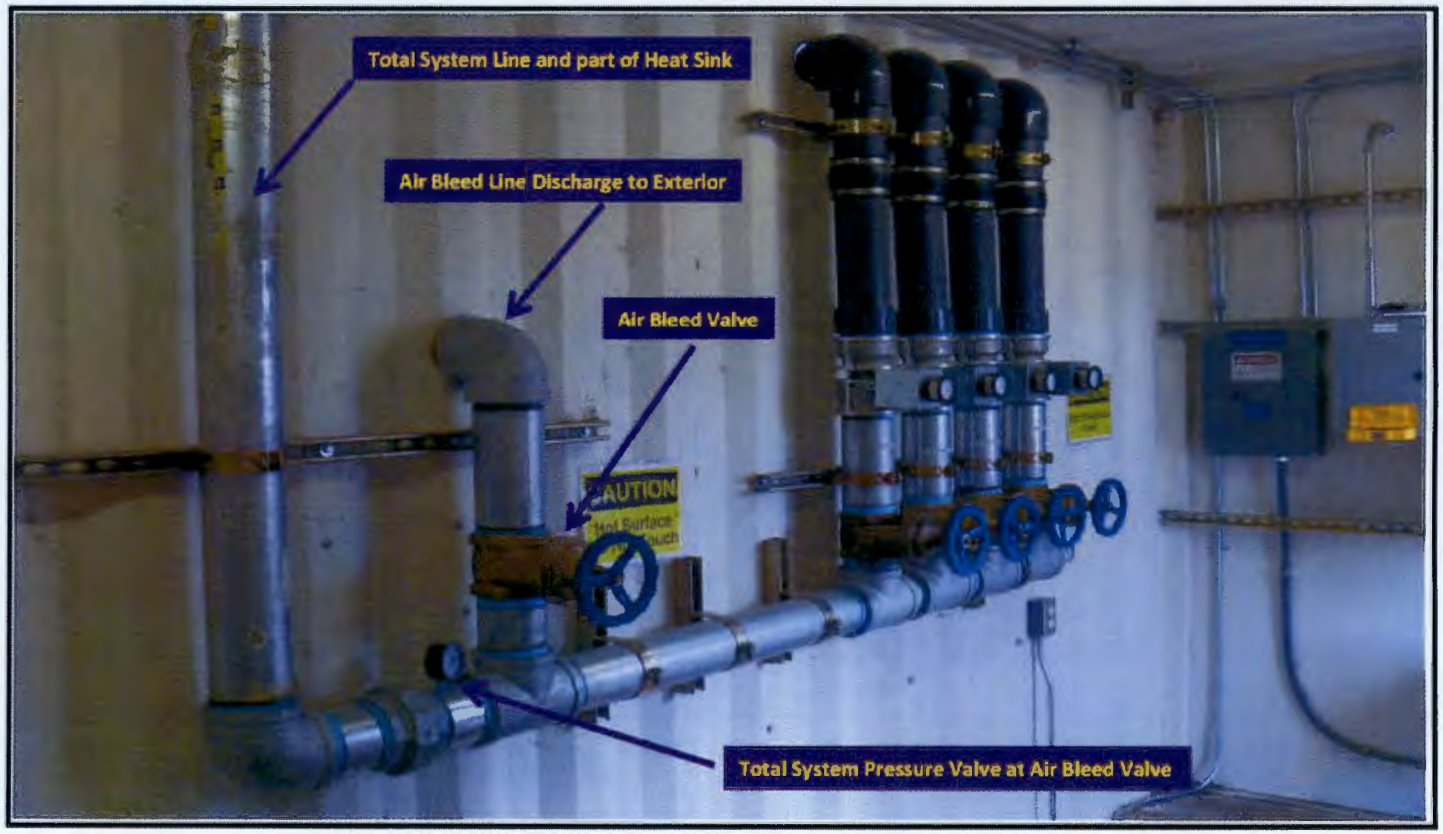

Photo 4: Piping manifold and air bleed valve

PHOTOGRAPH LOG

amec
Environment and Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon 97224

PROJECT NAME:	100-N Area - Bioventing Phase II		
Project No:	3-61M-120340 Task 1	**Date:**	Tuesday, October 08, 2013
Site Location:	100-N Area - Hanford Reservation, WA	**Page:**	5 of 5

Photo 5: View of piping manifold for the four well lines.