ENGINEERING CHANGE NOTICE

Page 1 of 53

1. ECN 654001

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental ○ Direct Revision ● Change ECN ☒ Temporary ○ Standby ○ Supersedure ○ Cancel/Void ○	WK THOMAS, B2-67, 376-7578	☒ Yes ● No TF-99-0831	01-26-00
	6. Project Title/No./Work Order No. W151-MIXER PUMP	7. Bldg./Sys./Fac. No. 241AZ101 AZ-156	8. Approval Designator SQ
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) RPP-5572 Rev 0	10. Related ECN No(s). N/A	11. Related PO No. NA

12a. Modification Work	12b. Work Package No.	12c. Modification Work Completed	12d. Restored to Original Condition (Temp. or Standby ECNs only)
☒ Yes (fill out Blk. 12b) ● No (NA Blks. 12b, 12c, 12d)	2E-99-2282/M	Design Authority/Cog. Engineer Signature & Date	NA Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? ● Yes ○ No

THIS ECN IS FOR DOCUMENT APPROVAL AND RELEASE

1) Added info on Historical Trending and data backup. (See section 3.4) DAW
2) Modified Appendix E, DAS I/O LIST to actual conditions in field.
3) Deleted IP address per LMSI engineering. DAW 2/06/00 (See Appendix F)

14a. Justification (mark one)	14b. Justification Details
Criteria Change ○ Design Improvement ● Environmental ○ Facility Deactivation ○ As-Found ○ Facilitate Const. ○ Const. Error/Omission ○ Design Error/Omission ○	* THIS ECN WILL NOT CHANGE COLLECTIVE DOSE SINCE IT HAS NO IMPACT ON RADIOLOGICAL SOURCES, CONTAMINATION CONTROL OR SHIELDING. • INDEPENDENT REVIEW PERFORMED PER IP-0842, VOL IV SECTION 4.24.

15. Distribution (include name, MSIN, and no. of copies)

B2-67 SG ROMERO
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S5-13 DW REBERGER
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DATE:
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ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 654001

16. Design Verification Required	17. Cost Impact		18. Schedule Impact (days)
	ENGINEERING	CONSTRUCTION	
(●) Yes	Additional ( ) $ NA	Additional ( ) $ NA	Improvement ( )
( ) No	Savings ( ) $ NA	Savings ( ) $ NA	Delay ( )

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	Tickler File	☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision
NA		

21. Approvals

	Signature	Date		Signature	Date
Design Authority	[signature]	2/8/00	Design Agent	SD Romero	1/31/00
Cog. Eng.	[signature]	2/8/00	PE		
Cog. Mgr.	[signature]	2/8/00	QA		
QA	WK Adams	2/8/00	Safety		
Safety	[signature]	2/8/00	Design		
Environ.			Environ.		
Other			Other		
	William V. Thomas	01-26-00			

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

ECN-654001

TANK WASTE REMEDIATION SYSTEM (TWRS) UNREVIEWED SAFETY QUESTION (USQ) SCREENING/DETERMINATION	Page 3 of 4
	USQ Tracking Number TF-99-0887
	Rev 0

TITLE: System Description for Tank 241-AZ-101 Waste Retrieval Data Acquisition System (RPP-5572)

IDENTIFICATION INFORMATION

Source of Review: ⊙ Proposed Activity ○ Reportable ○ PIAB

Document Type(s) and Identification Number(s): HNF-5572, Rev. 1; ECN 654001

Project Identification Number(s): N/A

Area: ⊙ East ○ West ○ General

Facility: ☐ SST ☒ DST ☒ AWF

☐ Other(specify):

INTRODUCTION

The proposed activity provides the description of the Data Acquisition System for Tank 241-AZ-101. This description is documented in HNF-5572, *Tank 241-AZ-101 Waste Retrieval Data Acquisition System (DAS)*. This activity supports the planned mixer pump tests for Tank 241-AZ-101.

Tank 241-AZ-101 has been selected for the first full-scale demonstration of a mixer pump system. The tank currently holds over 960,000 gallons of neutralized current acid waste, including approximately 12.7 inches of settling solids (sludge) at the bottom of the tank. As described in Addendum 4 of the FSAR (LMHC 2000a), two 300 HP mixer pumps with associated measurement and monitoring equipment have been installed in Tank 241-AZ-101.

The purpose of the Tank 241-AZ-101 retrieval system Data Acquisition System (DAS) is to provide monitoring and data acquisition of key parameters in order to confirm the effectiveness of the mixer pumps utilized for suspending solids in the tank. The suspension of solids in Tank 241-AZ-101 is necessary for pretreatment of the neutralized current acid waste and eventual disposal as glass via the Hanford Waste Vitrification Plant.

HNF-5572 provides a basic description of the Tank 241-AZ-101 retrieval system DAS, including the field instrumentation and application software. The DAS is provided to fulfill requirements for data collection and monitoring. This document is not an operations procedure or is it intended to describe the mixing operation.

This USQ screening provides evaluation of HNF-5572 (Revision 1) including the changes as documented on ECN 654001. The changes include (1) add information on historical trending and data backup, (2) modify DAS I/O list in Appendix E to reflect actual conditions in the field, and (3) delete IP address in Appendix F per Lockheed Martin Services, Inc. request.

ECN-654001

TANK WASTE REMEDIATION SYSTEM (TWRS) UNREVIEWED SAFETY QUESTION (USQ) SCREENING/DETERMINATION	USQ Tracking Number TF-99-0887
	Rev 0

This description involves equipment and operations that are not INTRUSIVE to Tank 241-AZ-101 or WASTE DISTURBING in Tank 241-AZ-101. Any equipment modification and updated drawing information covered will fall within the Authorization Basis for Tank 241-AZ-101.

SCOPE

This USQ screening evaluates HNF-5572 as discussed in the Introduction Section

AUTHORIZATION BASIS

The approved list of RPP Authorization Basis documents including DOE-issued documents and approval letters is provided in Attachment A of the RPP Unreviewed Safety Questions procedure (LMHC 1999). All of these documents have been reviewed for applicability. The documents cited below are those applicable to the proposed activity.

LMHC 2000a, *Tank Waste Remediation System Final Safety Analysis Report*, HNF-SD-WM-SAR-067, Rev. 1-C, Lockheed Martin Hanford Corporation, Richland, Washington

LMHC 2000b, *Tank Waste Remediation System Technical Safety Requirements*, HNF-SD-WM-TSR-006, Rev. 1-B, Lockheed Martin Hanford Corporation, Richland, Washington

RL 1999, *Contract No. DE-AC06-96RL13200 - Replacement of Approval of Tank Waste Remediation System (TWRS) Authorization Basis Amendments for Tank 241-AZ-101 Mixer Pump Test, Project W-151 and Non-approval to Couple and Electrically Rotate Tank 241-AZ-101 Mixer Pump*, 99-TSD-068, dated June 24, 1999, with attached Safety Evaluation Report for the Tank 241-AZ-101 Mixer Pump Test Project W-151 Authorization Basis Amendment SER, Addendum 1, U. S. Department of Energy, Richland Operations Office and Office of River Protection, Richland, Washington

CONCLUSION

AB Change Required/Recommended?	O Yes(detail below)	⊙ No
PRC Review Required?	O Yes	⊙ No

Screening questions have been answered "NO" and "N/A," therefore, a USQ determination is not required.

REFERENCES

CHG 2000, *System Description for Tank 241-AZ-101 Waste Retrieval Data Acquisition System (DAS)*, HNF-5572, Rev. 1, CH2M Hill Hanford Group, Inc., Richland, Washington

LMHC 1999, RPP Administration - *Unreviewed Safety Questions*, HNF-IP-0842, Volume IV, Section 5.4, Rev. 11c, Lockheed Martin Hanford Corporation, Richland, Washington

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TANK WASTE REMEDIATION SYSTEM (TWRS) UNREVIEWED SAFETY QUESTION (USQ) SCREENING/DETERMINATION	Page 7 of 7
	USQ Tracking Number TF-99-0887
	Rev 0

USQ SCREENING:

A. Does the Proposed Activity represent a change to the facility as described in the Authorization Basis?

⊙ No ○ Yes/Maybe ○ N/A

Basis: The proposed activity provides the description of the DAS for Tank 241-AZ-101. The overall description of the associated measurement and monitoring equipment to support the Tank 241-AZ-101 mixer pump tests in provided in Addendum 4, Section 2.7.2, of the FSAR (LMHC 2000a). No detailed description of the DAS is provided. Therefore, the proposed activity does not represent a change to the facility as described in the Authorization Basis.

B. Does the Proposed Activity represent a change to procedures as described in the Authorization Basis?

⊙ No ○ Yes/Maybe ○ N/A

Basis: There are no procedures listed or discussed in the Authorization Basis related to this activity, therefore, the proposed activity does not represent a change to procedures as described in the Authorization Basis.

The TSR controls such as Safety Limits (SL), Limiting Conditions of Operation (LCO), and Administrative Controls (AC), in effect, represent procedural controls for performing work at Tank Farms. Impacts to TSR controls as a result of the proposed activity are evaluated in response to screening question D.

C. Does the test or experiment represent a test or experiment not described in the Authorization Basis?

⊙ No ○ Yes/Maybe ○ N/A

Basis: The proposed activity is not a test or experiment.

D. Does the Proposed Activity or Reportable Occurrence impact any TSRs or other Authorization Basis controls?

⊙ No ○ Yes/Maybe ○ N/A

Basis: The proposed activity does not impact any TSRs or other Authorization Basis controls. Review of HNF-SD-WM-TSR-006 (LMHC 2000b) was conducted to determine the applicable TSRs for the proposed activity. The proposed activity provides a description of the DAS for the Tank 241-AZ-101 mixer pumps, therefore, there are no applicable TSRs. There are no other TSRs or other Authorization Basis controls.

ECN-654001

TANK WASTE REMEDIATION SYSTEM (TWRS) UNREVIEWED SAFETY QUESTION (USQ) SCREENING/DETERMINATION	Page 6 of 6
	USQ Tracking Number TF-99-0887
	Rev 0

E. Does the Reportable Occurrence or PIAB involve analytical errors, omissions, and/or deficiencies in the Authorization Basis?

○ No ○ Yes/Maybe ⊙ N/A

Basis: The proposed activity is not a reportable occurrence or PIAB.

NOTE: IF ANY SCREENING QUESTION IS ANSWERED "YES/MAYBE" FOR A REPORTABLE OCCURRENCE OR POTENTIAL INADEQUACY IN THE AUTHORIZATION BASIS, THEN THE COMPLETED SCREENING WILL HAVE TO BE PROMPTLY REFERRED TO THE PLANT REVIEW COMMITTEE. SEE THE RPP USQ PROCEDURE FOR DETAILS CONCERNING WHO TO CONTACT AND WHEN THESE ACTIONS MUST BE COMPLETED.

USQ SCREENER: USQ EVALUATOR:

R. F. Carlstrom	J. R. Bellomy
Print Name	Print Name
R.F. Carlstrom	
Signature	Signature
2/3/00	02/03/00
Date	Date

PRC APPROVAL/CONCURRENCE (as required):

Meeting number/date:

PRC Chairperson, Print Name

PRC Chairperson, Signature Date

System Description for Tank 241-AZ-101 Waste Retrieval Data Acquisition System

Fluor Federal Services
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: ECN 654001 UC:
Org Code: Charge Code:
B&R Code: Total Pages: 58

Key Words: W-151, DAS, Mixer Pumps, Software, Description, AZ, AZ-101, 241-AZ-101, I/O List

Abstract: Describes the hardware and software for the AZ-101 Mixer Pump Data Acquisition System.

*UNIX is a registered trademark of UNIX System Laboratories, Inc.

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2/14/00
Release Approval Date

FEB 14 2000
DATE:
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STA: 4
ID: 5
Release Stamp

Approved For Public Release

RECORD OF REVISION

(1) Document Number: RPP-5572

Page 1

(2) Title: SYSTEM DESCRIPTION For TANK 241-AZ-101 WASTE RETRIEVAL DATA ACQUISITION SYSTEM (DAS)

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initial Revision, Approval EDT 627523, 1/10/2000	N/A	N/A
RS 1	ECN 654001. Added information on the new DAS requirements, changed I/O list, added features	2/9/00	2/9/2000

A-7320-005 (10/97)

RPP-5572 Rev 1

SYSTEM DESCRIPTION

For

TANK 241-AZ-101 WASTE RETRIEVAL

DATA ACQUISTION SYSTEM (DAS)

FLUOR FEDERAL SERVICES

January 26, 2000

TANK 241-AZ-101 RETRIEVAL DAS SYSTEM OPERATION

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APPENDIX F – HLAN COMMUNICATIONS F1

1 INTRODUCTION

1.1 PURPOSE

The purpose of the tank 241-AZ-101 retrieval system Data Acquisition System (DAS) is to provide monitoring and data acquisition of key parameters in order to confirm the effectiveness of the mixer pumps utilized for suspending solids in the tank. The suspension of solids in Tank 241-AZ-101 is necessary for pretreatment of the neutralized current acid waste (NCAW), and eventual disposal as glass via the Hanford Waste Vitrification Plant.

1.2 SCOPE

This Supporting Document (SD) provides a basic description of the tank 241-AZ-101 retrieval system DAS, including the field instrumentation and application software. The DAS is provided to fulfill requirements for data collection and monitoring as requested in Lockheed Martin Hanford Corporation Contract #4978, Release #29 (Ref 4.1.3). This SD is not an operations procedure nor is it intended to describe the mixing operation.

1.3 PROCESS OVERVIEW

Instrumentation signals from tank 241-AZ-101 are routed from field sensors to specific junction boxes that are close in proximity. The collected signals in each junction box are multiplexed to enable their transmission via Ethernet. An Ethernet network is provided to link the junction boxes to an Ethernet hub located in the Utility Vault. The hub is connected via a Thinnet cable to a human machine interface (HMI) personal computer (PC) which is installed in an operator control console located in the Mixer Pump Control Facility 241-AZ-156.

Instrumentation signals from the two mixer pump variable frequency drives, located in 241-AZ-156, are connected directly to the HMI PC via Ethernet.

Selected data from the AZ-702 Ventilation System Distributed Control System (DCS), located in 241-AZ-271, and the AY-801A Programmable Logic Controller (PLC) are transmitted to the HMI PC via Hanford Local Area Network (HLAN).

Located in the bottom left hand corner of all screens are the "Heartbeat" indicators (AY801A, P701A, and P702A) that let the operator know if any data has become stale or a connection has been lost.

1.4 DEFINITIONS

CSV: Comma Separated Values, a generic data output format

DAS: Data Acquisition System based on a PLC/PC architecture to collect field data and provide a full user interface/HMI to display, manipulate, save and print data.

DCS: Distributed Control system, a control system package combining PLC and HMI functionality, with multiple autonomous controllers and interfaces.

Ethernet Hub: Device used as a connection point between two or more Ethernet devices.

HMI Software: A Human-Machine Interface software package developed by Ci Technologies, Citect®[1], is used to create the human-machine interface portion of the DAS. The PC-based package works within the Microsoft Windows NT®[2] environment to provide graphic displays of process parameters. Required for data logging.

PC: Personal computer used with HMI software to provide the human-machine interface.

PLC: The Programmable Logic Controller is the microprocessor-based industrial controller capable of real-time control.

Real-time: Indicates that monitoring and control signals are being processed and implemented in an acceptable time frame which is usually after an imperceptible time delay after the actual process events.

RTD: Resistance Temperature Detector.

RPP: River Protection Project

TCP/IP: Transmission Control Protocol /Internet Protocol (de facto Ethernet standard for UNIX and Microsoft Windows communications)

Window: Term used to describe a part or all of a complete screen display

2 GENERAL DESCRIPTION

2.1 INSTRUMENTATION (See Figure 1)

Two 100 ohm Pt Resistance Temperature Detectors (RTD's) are used to measure the upper and lower bearing temperatures at pump 702A. The RTD's are connected to a multiplexer contained in junction box JB101-100.

Three 10 ohm Cu RTD's are used to measure the motor phase stator winding temperatures of pump 702A (1 per phase). The RTD's are connected to a multiplexer contained in junction box JB101-100.

Two 100 ohm Pt RTD's are used to measure the upper and lower bearing temperatures at pump 701A. The RTD's are connected to a multiplexer contained in junction box JB101-101.

Three 10 ohm Cu RTD's are used to measure the motor phase stator winding temperatures of pump 701A (1 per phase). The RTD's are connected to a multiplexer contained in junction box JB101-101.

---

[1] Citect® is a registered trademark of Ci Technologies, Pty.

[2] Windows NT® is a registered trademark of Microsoft Corp.

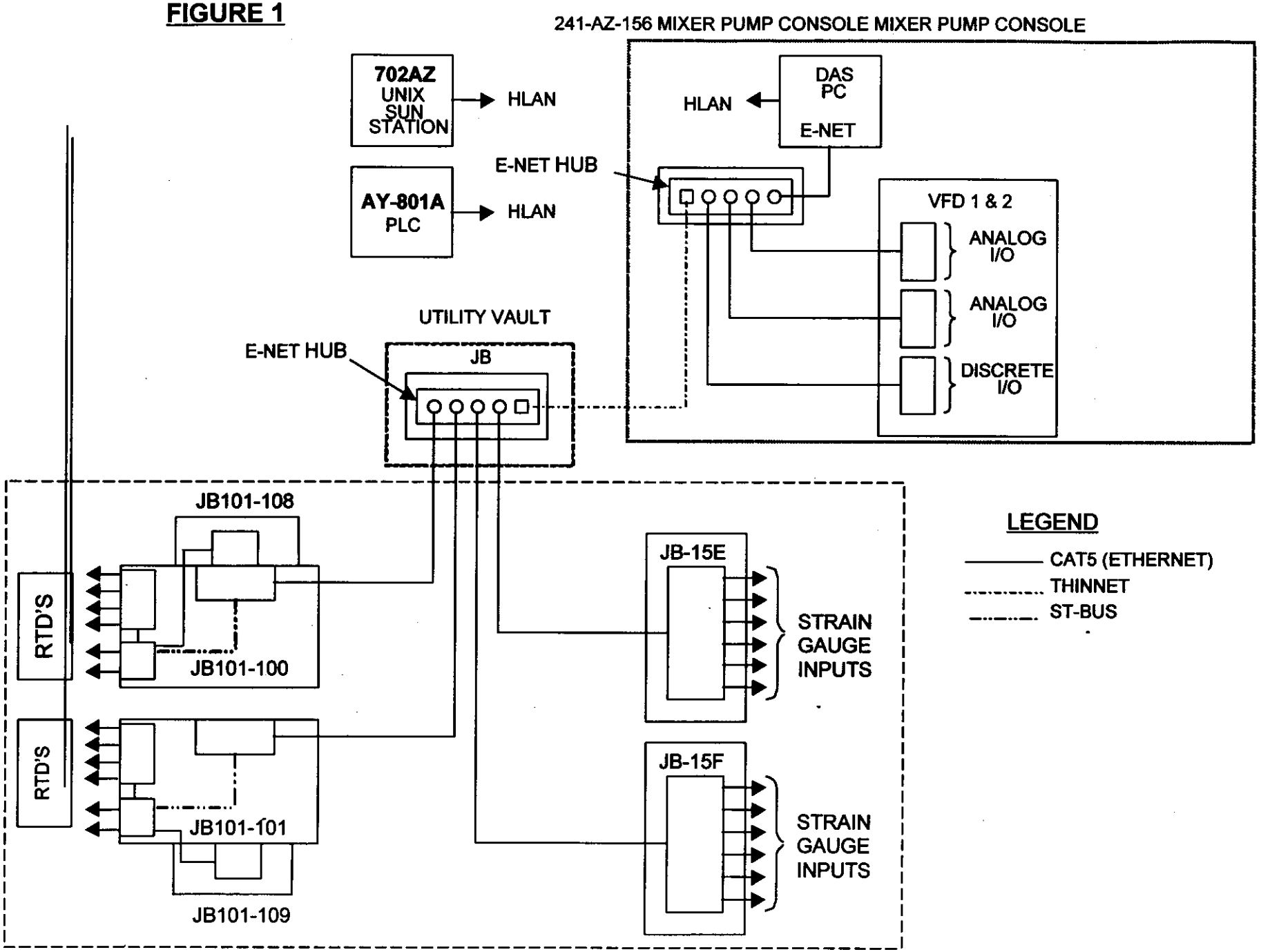
Six strain gauge transmitters are used to measure the stress/strain of the temperature profile probe installed in riser 15E, that may occur as a result of the operation of the mixer pumps. The six analog signals are connected to a multiplexer contained in junction box JB-15E.

Six strain gauge transmitters are used to measure the stress/strain of the temperature profile probe installed in riser 15F, that may occur as a result of the operation of the mixer pumps. The six analog signals are connected to a multiplexer contained in junction box JB-15F.

A 50Vdc @ 1000 rpm generator/tachometer has been installed on the top of mixer pump #1 to measure the speed of the pump. Refer to Figure 1 on the next page for the following information. The analog signal is routed to a 100V to 10V converter in JB101-109. The signal is then connected into an analog input module and the signal is routed to a multiplexer in JB101-101. A signal is routed from DAS through an analog output module to the control console speed indicator.

A 50Vdc @ 1000 rpm generator/tachometer has been installed on the top of mixer pump #2 to measure the speed of the pump. Refer to Figure 1 on the next page for the following information. The analog signal is routed to a 100V to 10V converter in JB101-108. The signal is then connected into an analog input module and the signal routed to a multiplexer in JB101-100. A signal is routed from DAS through an analog output module to the control console speed indicator.

FIGURE 1


241-AZ-156 MIXER PUMP CONSOLE MIXER PUMP CONSOLE
702AZ UNIX SUN STATION
HLAN
AY-801A PLC
HLAN
E-NET HUB
HLAN
DAS PC
E-NET
VFD 1 & 2
ANALOG I/O
ANALOG I/O
DISCRETE I/O
UTILITY VAULT
E-NET HUB
JB
JB101-108
RTD'S
JB101-100
RTD'S
JB101-101
JB101-109
JB-15E
STRAIN GAUGE INPUTS
JB-15F
STRAIN GAUGE INPUTS
LEGEND
CAT5 (ETHERNET)
THINNET
ST-BUS

The AY and AZ tank farm tank temperatures are measured using thermocouples, which are connected to a Westronics®[3] SDI-310 in the 241-AY-801A building. The Westronics® Multiplexer (MUX) communicates with the PLC in AY-801A via Modbus®[4]. The Mixer Pump Test DAS PC communicates with the AY-801A PLC over HLAN to retrieve the 101-AZ tank temperatures.

Existing instrumentation signals associated with the 241-AZ-702 HVAC System are connected to a UNIX Sun Microsystems®[5] Station located in the 702AZ control room. The Sun Microsystems® Station communicates with the DAS PC via HLAN.

2.2 DAS HMI SCREEN FUNCTIONS

The purpose of this section is to describe the DAS HMI screens. The actual startup and sequence of operations for the tank 241-AZ-101 retrieval system has been addressed in the Operational Test Procedure (OTP) document.

The HMI provides continuous historical trending and reporting for all process variable inputs. Operations has the option of copying the data on the hard disks of the PC to a compact disk (CD) using a CD recorder (CD-R), which is provided with the PC.

The main screens for the retrieval system DAS can be selected by clicking on "folder tabs" that appear at the top of each screen. Clicking on a tab brings that screen to the front. The following options are available:

Overview
Pump status
Strain
Temp profiles (7 total accessible from this tab)
Micon Data
Alarms (System, Hardware and Summary)

The following sections describe the contents of each screen and give the options available from each. See Appendix S for a screen-print of each screen. All screens are included except the trending chart popup screens.

2.2.1 OVERVIEW

This is the HMI screen displayed on system startup. A diagram of tank 241-AZ-101 is displayed showing a plan view of the tank and the status of the two mixing pumps contained in it. Other screens are accessed by clicking on the appropriate screen targets (e.g. clicking on Mixer 1 causes the Pump Status screen to be displayed) or by using the tab menu at the top of the screen. Located in the bottom right corner of the Overview screen are two buttons for creating or editing new or existing users. The access level is engineer or above to create or edit users. The login and print screens are available from all screens. The "Update All Trend Files" has an operator or above access

[3] Westronics® is a registered trademark of Westronics Inc.

[4] Modbus® is a registered trademark of Square D Corp.

[5] Sun Microsystems® is a registered trademark of Sun Microsystems Corp.

and when clicked on will update all appropriate folders on the C drive with a weeks worth of data.

2.2.2 PUMP STATUS

This screen is monitored for information associated with the operation of the mixing pumps WST-P-702A (Pump #1) and WST-P-701A (Pump #2). Also located on this screen are the reset buttons for resetting the total pump run time. To reset the "Total Time" of the pumps the user has to have Operator or above access. When selected the total time the pump has been running will be reset to zero. Before it resets you will be asked if you are sure that you want to reset the total time of the pump and you can cancel out or reset the time.

2.2.3 STRAIN

This screen is monitored for information associated with the thermocouple trees contained in tank risers 15E and 15F. This screen also monitors the 15E and 15F excitation voltages and the Internal Temperatures of the 15E and 15F sixnet modules containing the electronics. The stress/strain measurements quantify the effects of the mixer pump operation. Left clicking on an individual data point activates a historical (trending) popup chart for that measuring element.

2.2.4 TEMPERATURE PROFILES

There are seven screens for monitoring tank 241-AZ-101 temperatures. Tank AZ-101 temperatures are monitored at various points in the tank: Airlift Circulators, Insulation Concrete, Sludge (Drywell), Tank Foundation, Tank Dome, Tank Wall, and Profile Trees. Each portion of the tank and waste is associated with a button that causes the current data for that screen to be displayed. For example, pressing the AIRLIFT CIRCULATORS button shows the entire available tank thermocouples associated with airlift circulators. Left clicking on an individual data point causes a historical (trending) chart to popup for that temperature element. Only thermocouples listed in the Appendix E - DAS I/O list will be displayed.

In addition to the individual tank temperatures, an average of selected tank temperatures is calculated and shown as the "Running Average Temperature". Above each individual temperature indication is a green or blue bar if logged in with the appropriate access. If the bar is green above the temperature status tag, then that temperature is not included in the average. If it is light blue, it is included.

2.2.5 MICON®[6] DATA

[6] Micon® is a registered trademark of Micon Corp.

This screen is for monitoring information associated with the 241-AZ-702 HVAC system, which provides tank ventilation for AY and AZ tank farms.

2.2.6 ALARMS

The alarm screen contains a combination of alarm annunciators and a list of active alarms to provide quick notification and access to alarms. The operator may acknowledge individual alarms as needed or acknowledge an entire category/area at once. See section 3.1.4, Alarm Handling, for details. Located in the bottom right corner of the alarm screens is a button labeled "Enable/Disable". A Supervisor or above has access to these buttons. When the "Enable/Disable" button is clicked on it brings up a Disable or Enable Alarms form listing all the alarms for the project. The user has the choice from this form of disabling any individual alarm by highlighting the specific alarm and clicking on "Disable". To ensure the alarm is disabled click on the "View Disabled" button and it will show all alarms that are currently disabled. When an alarm is disabled an alarm clock with a red slash through it will appear at the top above the Micon tab. To view all current alarms that are active with the project you can click on the "View Active" button and a list of active alarms for the project will be displayed. To enable an individual alarm select the specific alarm tag and click on the "Enable" button. To Enable or Disable all alarms just click on the "Enable All" or "Disable All" button. If you click on the "Disable All" button a message box will appear stating "All Alarms are Disabled" and click on OK. To put all the alarms back in service just click on the "Enable All" button and a message button will stating "All Alarms are Enabled" and click on OK.

Located in the bottom right corner of every screen with alarm status tags is a button labeled "Set Alarms". This button allows a Supervisor or above to reset the alarm setpoints for that screen. When the "Set Alarms" button is clicked on all that needs to be done by the Supervisor is position the mouse arrow over whichever alarm setpoint he/she wishes to change and type in the new setpoint and press enter. When entering the new setpoint a yellow box will appear next to the pointer with the new value you are entering.

2.3 USER CHARACTERISTICS

2.3.1 OPERATORS AND SUPERVISORS

Process operators design the HMI for use. All computer displays and windows are representative of process parameters and flow. All persons who operate the DAS must receive training.

2.3.2 SYSTEM ENGINEERS

System Engineers are River Protection Project (RPP) engineers trained to provide support for the Tank 241-AZ-101 Retrieval System. The System Engineers must be familiar with the Windows NT® environment, and the Citect® human-machine interface software. The System Engineers will have access to all of the process control

documentation, software, keys and passwords required to build/rebuild/modify graphic screens, databases and any other software components of the system.

2.3.3 REMOTE MANAGER NODE

The Tank 241-AZ-101 Retrieval System DAS data and process views are made available to data users through use of Citect's Manager Node functionality. A hardware key (dongle) connected to the parallel (printer) port on the DAS server workstation contains authorization for running the server for the remote manager nodes.

The manager node provides a remote link to the project over HLAN. When connected as a manager node, the user need not log into the system and will only be able to monitor the system.

The manager node computer must be configured to connect to the server. The Citect® Explorer's Computer Setup Wizard is used to configure the following parameters:

Network Computer: Server and Display Client

Primary Server Name: W151

Enable Events: All

(All other settings can be left at their defaults.)

3 SPECIFIC REQUIREMENTS

3.1 INTERFACE REQUIREMENTS

3.1.1 HUMAN-MACHINE INTERFACE (HMI)

The HMI is a graphical user interface primarily designed to be used with a two-button pointing device, such as a mouse or trackball. Most functions require an appropriate pointing device.

3.1.1.1 Frequently used functions are provided with keyboard shortcuts.

3.1.1.2 The HMI screens allow the user to select a new screen or control the display of data by clicking on designated buttons and icons.

3.1.1.3 Data points defined in the Tank 241-AZ-101 Retrieval System DAS I/O list are displayed on the HMI monitor.

3.1.1.4 The HMI has historical trending capabilities.

3.1.1.4.1 Real-time variable inputs are stored for online graphical viewing and extraction.

3.1.1.4.2 Trend history files (more detailed than CSV text reports) are stored on the HMI PC hard drive. The trend configurations are stored in the project folder under the path C:\W151\(various folders) in the format TrnData_new.CSV. The files consist of one week of data and takes approximately 11/2 hours to download into the folders on the C drive. All old files are time stamped and put into backup folders automatically to save for future use.

3.1.1.4.3 The trend data may be plotted, saved to a CSV file, or copied for use in other applications (e.g., Microsoft Excel®[7]).

3.1.1.4.4 Trend plot configurations may be saved and recalled.

3.1.1.5 Security – To prevent unauthorized personnel from accessing the DAS, a login sequence is established which, upon a successful login, assigns the user to a predefined access group. Table 1 lists the user groups and their access to different types of functions.

3.1.1.5.1 A user may not quit or send the DAS to the background unless his/her access group is permitted to do so.

3.1.1.5.2 The DAS PC operating system software (Windows NT® Workstation 4.0) is configured to automatically log in to a default account and start the DAS program *in place of* the normal log screen.

Table 1. User Groups and Accessible Functions

User Group	Accessible Functions
Not Logged In	Monitor data and alarms only.
Operator	Monitor all data and alarms, acknowledge alarms, view alarm setpoints, change trend configurations, reset pump run time and update trend files.
Shift Supervisor	All Operator functions plus enable/disable alarms, change alarm setpoints.
Nodal Manager	Monitor Data and Alarms
System Engineer	All Shift Supervisor functions plus the ability to make software changes in the PLC and HMI PC add users and edit user security levels.

Note: Use of the terms Operator, Shift Supervisor, and System Engineer refers to a DAS security access level only, not job titles or other functions.

[7] Excel is a registered trademark of Microsoft Corp.

3.1.2 SYSTEM INTERFACES

The Citect® HMI software is capable of exporting data to another program running on the HMI PC.

3.1.2.1 The DAS periodically stores most direct inputs in CSV (Comma Separated Values) format, which can be ported to Microsoft Windows®-based spreadsheets (i.e., Excel®).

3.1.2.1.1 The report file organization is based on the report period and tagnames listed in the Tank 241-AZ-101 Retrieval System DAS I/O list.

3.1.2.1.2 Each report file contains a header row, which lists the tags recorded therein.

3.1.2.1.3 The report files may be accessed remotely over the Hanford Local Area Network (HLAN).

3.1.3 COMMUNICATION INTERFACES

The following paragraphs describe requirements for implementation of communication links described in Figure 1 of this document.

3.1.3.1 **AY-801A PLC:** The Allen-Bradley®[8] PLC-5/20E processor communicates with the Tank 241-AZ-101 Retrieval System DAS PC via Transmission Control Protocol/Internet Protocol (TCP/IP) over HLAN. Process values originating in the PLC will be transferred to the DAS PC at least once each report period.

[8] Allen-Bradley® is a registered trademark of Rockwell Automation.

3.1.3.2 **AY-801A Westronics MUX:** The Westronics® MUX (SDI-310) communicates with the PLC in AY-801A via Modbus® protocol using the ProSoft®[9] Modbus Communications Module in the PLC rack.

3.1.3.3 **AZ-702 Ventilation System DCS in AZ-271 Control Room:** The Micon® Distributed Control System (DCS) also communicates with the Tank 241-AZ-101 Retrieval System DAS PC via TCP/IP over HLAN.

3.1.3.4 **101-AZ Mixer Pump Variable Frequency Drives (VFD's):** Discrete inputs from the mixer pump VFD's are connected to a SixNet EtherTrak®[10] ET-16DI2 I/O module. The module communicates with the DAS PC by TCP/IP. The hardware connection is an Ethernet LAN.

Analog inputs from the mixing pump VFD's are connected to a Sixnet EtherTrak® ET-8INS I/O module. The module communicates with the DAS PC by TCP/IP. The hardware connection is an Ethernet LAN.

3.1.3.5 **101-AZ Mixer Pump Bearing and Stator Winding Resistance Temperature Detectors (RTD's):** The RTD's are connected to SixNet SixTrak modules which are connected to a SixNet Ethernet Gateway module which communicates with the DAS PC over an Ethernet LAN.

3.1.3.6 **101-AZ Risers 15E and 15F T/C Tree Strain Gages:** The Strain Gages are connected to a SixNet Ethernet Gateway module which communicates with the DAS PC over an Ethernet LAN.

3.1.4 ALARM HANDLING

This section defines the alarm handling requirements. See the Tank 241-AZ-101 Retrieval System DAS I/O list for a list of alarms.

3.1.4.1 Alarm annunciators flash when unacknowledged.

3.1.4.2 An unacknowledged alarm will continue to flash red until it has been acknowledged or the alarm has returned to normal operating parameters. At which time it will turn to a solid yellow.

3.1.4.3 An acknowledged alarm's annunciator will hold the alarm color code until the alarm condition has cleared.

3.1.4.4 Changes to alarm conditions, including acknowledgements, create a new line in the alarm log, as listed in the Tank 241-AZ-101 Retrieval System DAS I/O list.

3.1.4.4.1 The alarm log is available on the HMI (from the Alarms screen).

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[9] ProSoft is a registered trademark of ProSoft Technology Inc.

[10] EtherTrak is a registered trademark of SixNet Corp.

3.1.4.4.2 Log entries are listed in chronological order (new entries are added to the bottom).

3.1.4.5 A new alarm produces the following:

3.1.4.5.1 A red flashing HMI monitor graphic display symbol.

3.1.4.5.2 Audible beeps from the PC.

3.1.4.6 On the page where the variable tag is displayed, the status tag will have the same color and flashing properties as the alarm text message on the Alarms screen.(see sections 3.1.4.1-3).

3.1.4.6.1 Individual alarms may be acknowledged by clicking on the flashing alarm text message on the Alarms screen. The entire Alarm page can be acknowledged by clicking on the alarm clock icon with a green check mark inside it located on the right hand side of the Alarm page.

3.1.4.6.2 The operator may acknowledge alarms by clicking on the flashing alarm text on the Alarm Screen.

3.1.4.6.3 Once acknowledged, the flashing of the alarm clock icon at the top of the screen and the audible alarm should stop.

3.1.4.6.4 When the alarm condition clears on an acknowledged alarm, the solid red alarm text automatically clears.

3.1.4.6.5 An unacknowledged alarm indication will not clear (i.e., will remain colored and flashing) until acknowledged. It will turn solid yellow if the alarm condition clears itself.

3.1.4.7 The Alarm screen shows the status for all active and unacknowledged alarms.

3.1.4.7.1 Two different audible alarms are used for this project. One audible alarm is used for Hardware alarms and the other is used for System alarms.

3.1.4.7.2 The text list of active alarms shows the most recent alarm at the top.

3.1.4.8 The Shift Supervisor may modify alarm parameters.

3.1.4.8.1 Alarm setpoints may be set for DAS inputs currently configured with alarms (as listed in the Tank 241-AZ-101 Retrieval System DAS I/O list).

3.1.4.8.2 The Shift Supervisor may Disable or Enable individual alarms or all alarms on the alarms screen.

3.1.5 CONTROL

Currently, the DAS is not being used for process control.

3.2 ANALOG SIGNAL PROCESSING

This section describes requirements for display linearity, reliability, and precision for analog inputs connected to the DAS.

3.2.1 RESISTANCE TEMPERATURE DETECTOR (RTD) INPUTS

RTD inputs required to be recorded by the DAS are simulated with an appropriate signal-generating device during the acceptance testing process. The following conditions are tested.

3.2.1.1 Out of range response on the DAS will initiate the appropriate alarm.

3.2.1.2 DAS screen display agreed with all simulated inputs within 4^0F.

3.2.2 STRAIN GAUGE INPUTS

Each strain gauge input value on the DAS screen is simulated with an equivalent scaled value from 0 to 32,767 (raw data range of EtherTrak registers) during the acceptance testing process.

The following conditions are tested:

3.2.2.1 Out of range response on the DAS will initiate the appropriate alarm.

3.2.2.2 Response on the DAS at 0 – 50 –100% of the input signal is the 0 – 50 – 100% values calculated from DAS I/O list +/- 1% of the span.

3.2.2.3 Precision on the DAS is < 0.1% of the full range.

3.2.3 ANALOG INPUTS

Each analog input value on the DAS screen is simulated with an equivalent scaled value from 0 to 32,767 during the acceptance testing process. The following conditions are tested:

3.2.3.1 Out of range response on the DAS will initiate the appropriate alarm.

3.2.3.2 Response on the DAS 0 – 50 –100% of the input signal is the 0 – 50 – 100% values calculated from DAS I/O list +/ - 1% of the span.

3.2.3.3 Precision on the DAS is < 0.1% of the full range.

3.3 DISCRETE SIGNAL PROCESSING

Each discrete input value on the DAS screen is simulated during the acceptance testing process

3.4 HISTORICAL TRENDS AND DATA BACKUP

All Thermocouples, Strain Gauge inputs, Pump Status parameters, Micon 702AZ Ventilation System and Pump history are configured for historical logging. Located on the Overview screen is a button labeled "Update all Trend Files", when selected it will export all the trend data from Citect to folders located under W151 on the C drive. Currently all trend data will store 1 week of data before needing to be updated again. When the "Update all Trend Files" is selected again it copies all the old files into the "Backup" folder on the C drive (so no information is lost) and time stamps them for future use. All excel files are limited to 65,001 records, so they can be opened by Excel. After 65,001 records is reached a new file is opened.

3.5 TESTING AND ACCEPTANCE CRITERIA

The software and hardware are tested to ensure that all requirements documented in Section 3 are met. The tank 241-AZ-101 retrieval system DAS is considered a General Service Design. All software documentation is prepared in accordance with LMH-PRO-2778 (IRM Application System Life Cycle Standards) and LMH-PRO-309 (Computer Software Quality Assurance Requirements).

4 REFERENCES

4.1 DOCUMENTS

4.1.1 LMH-PRO-2778 (IRM Application System Life Cycle Standards)

4.1.2 LMH-PRO-309 (Computer Software Quality Assurance Requirements).

4.1.3 Cortez, Laurie N., LMHC to Steen, R.T., FDNW, "Contract #4978, Requisition #35780, Release #29, 101-AZ Mixer Pump Test Engineering Support, Rev. 0; dated October 27, 1999.

4.1.4 Westronics®, Inc. User Manual for model SDI-31-/340,with special section on Modbus communications (P/N M01 00044-01).

4.1.5 Prosoft Technology, Inc. User Manual for models 3100/3150-MCM Modbus Communications, Revision 2, April 1997.

4.1.6 RPP-5529, Revision 0 (User Manual for DAS).

4.1.7 RPP-5530, Revision 0 (Programmers Guide).

4.2 DRAWINGS:

H-2-68330 SH2	Tank AZ-101 Elec/Inst Equipment Conduit Schedule
H-2-68330 SH3-4	Tank AZ-101 Elec/Inst Equipment Wire Run List
H-2-78948 SH2-3	Tank AZ-101 Elec/Inst Equipment Interconnection Diagram
H-2-78975 SH1-2	Tank AZ-101 Inst. Junction Box Assembly
H-2-78975 SH3	Tank AZ-101 Inst. Junction Box JB101-100 Wiring Diagram
H-2-78975 SH4	Tank AZ-101 Inst. Junction Box JB101-101 Wiring Diagram
H-2-78977 SH1-2	TC/Strain Gauge Junction Box 15E Wiring Diagram
H-2-78978 SH1-2	TC/Strain Gauge Junction Box 15F Assembly
H-2-78978 SH3	TC/Strain Gauge Junction Box 15F Wiring Diagram

APPENDIX A – FUNCTION KEYS

GENERAL KEYS FOR DAS		
Key	Name	Description
F1 or Home	Overview	Displays the RPP DAS PROCESS OVERVIEW screen.
F2	Pump Status	Displays the Mixer Pumps STATUS screen.
F3	Strain	Displays the Tank 241-AZ-101 thermocouple tree stress/strain information screen.
F4	Temp Profiles	Displays the Tank 241-AZ-101 Temperature Profile screens.
F5	Micon Data	Displays the Tank 241-AZ-101 HVAC Screen.
F6	System Alarms	Displays the ALARMS screens.
F7	Hardware Alarm	Displays the Hardware Alarm Screen.
F8	Alarm Summary	Displays the Alarm Summary Screen.
F9	Login	Displays the Login Screen.
F10	Information	Displays the Information Screen.
F12	Logout	Logs out current user

APPENDIX B – DAS/WESTRONICS® MUX COMMUNICATIONS

The Westronics® multiplexer/data logger (model SDI-310) that is installed in AY-801A scans thermocouples installed in AY- and AZ-Farm tanks (totaling 360 points). The MUX is equipped with special firmware that provides Modbus protocol.

The ProSoft® Modbus Communication Module has two ports which may be configured independently (for speed, parity, stop bits and for RS-232, or RS-485 input). In the master mode, Port 1 on the ProSoft® module will be used to communicate with the SDI-310 at 4800 baud rate. The SDI-310 emulates a Modbus RTU slave.

The Allen-Bradley® PLC used block transfer commands to poll the Minimum Critical Mass (MCM) through the PLC backplane. Ladder logic is used to configure the MCM for the particular application.

Each data point and status in the Westronics memory that is required for the DAS (see Appendix B) may be requested individually by referring to the address structure described in SPECIAL 95E031DE at the front of the Westronics® User Manual (Ref. 4.1.3).

To make a data request, the Modbus® RTU address and point numbers must be known. The SDI-310 with Modbus allows addresses between 1 and 255, and defaults to an address of 001. Point numbers may be determined by adding 87 to the temperature element number, listed in the DAS I/O list. A request for data consists of an address, a transfer command, and an input register address (the point number). The commands entered into the AY-801A PLC logic consist of blocks of these data requests. See the manual on the Prosoft® MCM (Ref. 4.1.4) for a description of Modbus command formatting and port configuration.

Note: All AY and AZ thermocouples scanned by the Westronics® unit in AY-801A were added to the periodic data request sent to the MCM. This is to allow future wireless access to the temperature data.

APPENDIX C - DAS STARTUP/RECOVERY

Actions required for successful system startup/recovery following a system crash or related failure are largely determined by the Citect® HMI system.

Step-by-step instructions for system recovery will be given in the DAS Users Manual. An outline of the files required is provided here.

A. CITECT® HMI SOFTWARE

The Citect software used to display and record DAS instrumentation values is separated into two portions: the Project File and the configuration applications (Citect® Explorer, Project Editor, Graphics Builder, and Cicode® Editor). To recover the DAS configuration, first verify that Citect® has been installed, then use the Recover option in the Citect® Explorer Tools menu to uncompress the backup from the Tank 241-AZ-101 Retrieval System DAS configuration CD. When uncompressed, the backup file (CTBackup.001) contains numerous files used to control the behavior of the Citect runtime application (Citect® 32.3x3). These include the file types listed in the following table.

FILE EXT.	DESCRIPTION	EXAMPLE
DBF	DBase III files created by Project Editor	Variable.dbf
RDB	Runtime database files for page animation, variable display, historical trends, and alarming.	_trend.rdb
CTG, CTF	Citect graphics files created by Graphics Builder (one of each is created with each screen/page)	Enraf.ctg, tanktemp.ctf
TXT	Text report definition files	Vent.txt
INI	General configuration settings	Citect.ini
CI	Cicode source files created in Cicode Editor	Trendsel.ci
CTT	Template libraries for Graphics Builder	Special.ctt
CTM, CTL	Genie/Supergenie libraries for Graphics Builder	Global.ctm, gobal.ctl
DAT	System log files	Syslog.dat
SQX, NDX	Supporting files for Graphics Builder/Project Editor	Anaalm.sqx, pgbutton.ndx

APPENDIX D – DAS DOCUMENTATION

The following table lists and describes the documentation trail completed during the DAS development, as required by the procedure "IRM Application System Life Cycle Standards", LMH-PRO-2778, Rev. 0.

DAS Documentation Per LMH-PRO-2778, IRM Application System Life Cycle Standards		
PROJECT PHASE	**DOCUMENTATION**	**DESCRIPTION**
Work Planning	Task Order Dated October 27, 1999	Statement of Work from LMHC to FDNW describing DAS scope.
Concept	RPP-5572, Revision 0, Section 1.3	Describes the functions that the DAS will accomplish at a systems level.
Requirement	RPP-5572, Revision 0, Section 3	Describes specific requirements that are utilized to generate testing documentation for validation.
Design	1) RPP-5572, Revision 0, Appendix A – C 2) DWGS. H-2-78948, H-2-78978, H-2-78977, and H-2-78978	Describes the HMI design for screens, taglists, function buttons, and general operations. Wiring Diagrams for DAS
Testing	1) DAS QTP/ATP (RPP-5571, Revision 0)	Qualification/Acceptance Test Procedure documents to perform initial tests of DAS
Turnover	1) RPP-5529, Revision 0 2) RPP-5530, Revision 0	User Manual for DAS Programmers Guide

APPENDIX E – DAS I/O

Alarm priority (pri):

			Range		Process alarm		Alar
Tag	Description	Units	lo	hi	alm	db	setpn
FI_AZ1_K1_2	AZ1OtPV Flow	SCFM	0	700	1	3	
PDI_AZ_K18_1	PVCdsr Dp	IN WC	0	20	1	0.1	11
PDI_AZ_K14_1A	PVHepa1A Dp	IN WC	0	6	1	0.03	3
PDI_AZ_K14_2A	PVHepa2A Dp	IN WC	0	6	1	0.03	3
PDI_AZ_K110_1A	PVHega1A Dp	IN WC	0	5	1	0.03	2.5
FI_AZ_K1_3	PVStk Flow	SCFM	0	1100	1	6	1050
RI_AZ_K1_1	PVStk Rad	DPM/ft3	0	10000			
PDI_AZ_K14_1B	PVHepa1B Dp	IN WC	0	6	1	0.03	3
PDI_AZ_K14_2B	PVHepa2B Dp	IN WC	0	6	1	0.03	3
PDI_AZ_K110_1B	PVHega1B Dp	IN WC	0	5	1	0.03	2.5
TI_AZ_K18_1A	PVCdsrInVapTemp	DEG F	0	150			
TI_AZ_K18_1B	PVCdsrOtVapTemp	DEG F	0	100			
RI_AZ_K19_1	PVHeme Rad	Mrem/Hr	0	1000	1	0.02	270
PDI_AZ_K19_1	PVHeme Dp	IN WC	0	20	1		10
TI_AZ1_K48_1A	AZ1CdsrInVapTemp	DEG F	0	200			
TI_AZ1_K48_1B	AZ1CdsrOtVapTemp	DEG F	0	200			
TI_AZ1_EWR_1	AZ1CdsrEWRtnTemp	DEG F	0	150			
TI_AZ1_EWS_1	AZ1CdsrEWSupTemp	DEG F	0	150			
PI_AZ1_K1_1	AZ1Tank Press	IN WC	-6	4	1	0.05	-0.5
PDI_AZ1_K45_1	AZ1Rec FanDp	IN WC	0	25			
PDI_AZ1_K48_1	AZ1Rec CdsrDp	IN WC	0	20	1	0.1	18
FI_AZ1_EWR_1	AZ1_EW RtnFlow	GPM	0	400	1	2	
TI_AZ1_P701A_A	AZ101P2WindingTemp-Phase A	DEG F	0	400		4	330
TI_AZ1_P701A_B	AZ101P2WindingTemp-Phase B	DEG F	0	400		4	330
TI_AZ1_P701A_C	AZ101P2WindingTemp-Phase C	DEG F	0	400		4	330
TI_AZ1_P702A_A	AZ101P1WindingTemp-Phase A	DEG F	0	400		4	330
TI_AZ1_P702A_B	AZ101P1WindingTemp-Phase B	DEG F	0	400		4	330
TI_AZ1_P702A_C	AZ101P1WindingTemp-Phase C	DEG F	0	400		4	330
TI_AZ1_P701A_DE	AZ101P2LowerBearingTemp	DEG F	0	300		4	195
TI_AZ1_P702A_DE	AZ101P1LowerBearingTemp	DEG F	0	300		4	195
TI_AZ1_P701A_ODE	AZ101P2UpperBearingTemp	DEG F	0	300		4	195
TI_AZ1_P702A_ODE	AZ101P1UpperBearingTemp	DEG F	0	300		4	195
II_AZ1_P702A_1	AZ101P1Current	AMPS	0	364		15	320
II_AZ1_P701A_1	AZ101P2Current	AMPS	0	364		15	320
SI_AZ1_P702A_OUT	AZ101P1Speed	RPM	0	2000			
SI_AZ1_P701A_OUT	AZ101P2Speed	RPM	0	2000			
YS_AZ1_P702A_OFF	AZ101P1OFF	DISCRETE		Fault			
YS_AZ1_P701A_OFF	AZ101P2OFF	DISCRETE		Fault			
PDIS_750_HI	AZ101DifferentialPressHigh	DISCRETE		Hi			
PSL_750_LOW	AZ101P1WaterPressLow	DISCRETE		Low			

APPENDIX E – DAS I/O

Alarm priority (pri):

			Range		Process alarm		Alar
Tag	Description	Units	lo	hi	alm	db	setpn
PSL_751_LOW	AZ101P2WaterPressLow	DISCRETE		Low			
VSH_AZ1_P701A_1	AZ101P2UpperVibration	DISCRETE		Hi Vib			
VSH_AZ1_P701A_2	AZ101P2LowerVibration	DISCRETE		Hi Vib			
VSH_AZ1_P702A_1	AZ101P1UpperVibration	DISCRETE		Hi Vib			
VSH_AZ1_P702A_2	AZ101P1LowerVibration	DISCRETE		Hi Vib			
WI_AZ1_15E_701A	AZ101StrainGage15ETop	uV	-10000	10000			
WI_AZ1_15E_702A	AZ101StrainGage15EMid	uV	-10000	10000			
WI_AZ1_15E_703A	AZ101StrainGage15EBot	uV	-10000	10000			
WI_AZ1_15E_704A	AZ101StrainGage15ETop	uV	-10000	10000			
WI_AZ1_15E_705A	AZ101StrainGage15EMid	uV	-10000	10000			
WI_AZ1_15E_706A	AZ101StrainGage15EBot	uV	-10000	10000			
WI_AZ1_15F_707A	AZ101StrainGage15FTop	uV	-10000	10000			
WI_AZ1_15F_708A	AZ101StrainGage15FMid	uV	-10000	10000			
WI_AZ1_15F_709A	AZ101StrainGage15FBot	uV	-10000	10000			
WI_AZ1_15F_710A	AZ101StrainGage15FTop	uV	-10000	10000			
WI_AZ1_15F_711A	AZ101StrainGage15FMid	uV	-10000	10000			
WI_AZ1_15F_712A	AZ101StrainGage15FBot	uV	-10000	10000			
TI_AZ1_15E_1	JB 15E Internal Temp	degrees F	-40	212			
TI_AZ1_15F_1	JB 15F Internal Temp	degrees F	-40	212			
EI_AZ1_P702A_1	AZ101Pump1Volts	V	0	460			
EI_AZ1_P701A_1	AZ101Pump2Volts	V	0	460			
SFI_AZ1_P702A_1	AZ101Pump1Frequency	Hz	0	62			
SFI_AZ1_P701A_1	AZ101Pump2Frequency	Hz	0	62			
ZT_AZ1_P702A_1	AZ101Pump1NozzlePos	degrees	-90	90			
ZT_AZ1_P701A_1	AZ101Pump2NozzlePos	degrees	-90	90			
YS_AZ1_P702A_1	AZ101Pump1Running	DISCRETE		Run			
YS_AZ1_P701A_1	AZ101Pump2Running	DISCRETE		Run			
PDIS_750_NORM	AZ101DifferentialPressNormal	DISCRETE		Norm			
PSL_750_NORM	AZ101P1WaterPressNormal	DISCRETE		Norm			
PSL_751_NORM	AZ101P2WaterPressNormal	DISCRETE		Norm			
TI_101_AZ_1 to 13	Insulating Concrete	F	0	300			
TI_101_AZ_15 to 24	Insulating Concrete	F	0	300			
TI_101_AZ_25	Tank Knuckle	F	0	300			
TI_101_AZ_28 to36	Tank Foundation	F	0	300			
TI_101_AZ_37	Airlift Circulator - 1	F	0	300	1	2	190
TI_101_AZ_38	Airlift Circulator - 2	F	0	300	1	2	190
TI_101_AZ_39	Airlift Circulator - 3	F	0	300	1	2	190
TI_101_AZ_40	Airlift Circulator - 4	F	0	300	1	2	190
TI_101_AZ_41	Airlift Circulator - 5	F	0	300	1	2	190
TI_101_AZ_42	Airlift Circulator - 6	F	0	300	1	2	190

APPENDIX E – DAS I/O

Alarm priority (pri):

			Range		Process alarm		Alar
Tag	Description	Units	lo	hi	alm	db	setpn
[redacted]	Airlift Circulator - 7	F	0	300	1	2	190
[redacted]	Airlift Circulator - 8	F	0	300	1	2	190
[redacted]	Airlift Circulator - 9	F	0	300	1	2	190
[redacted]	Airlift Circulator - 10	F	0	300	1	2	190
[redacted]	Airlift Circulator - 11	F	0	300	1	2	190
[redacted]	Airlift Circulator - 12	F	0	300	1	2	190
[redacted]	Airlift Circulator - 13	F	0	300	1	2	190
[redacted]	Airlift Circulator - 14	F	0	300	1	2	190
[redacted]	Airlift Circulator - 15	F	0	300	1	2	190
[redacted]	Airlift Circulator - 16	F	0	300	1	2	190
[redacted]	Airlift Circulator - 17	F	0	300	1	2	190
[redacted]	Airlift Circulator - 18	F	0	300	1	2	190
[redacted]	Airlift Circulator - 19	F	0	300	1	2	190
[redacted]	Airlift Circulator - 20	F	0	300	1	2	190
[redacted]	Airlift Circulator - 21	F	0	300	1	2	190
[redacted]	Airlift Circulator - 22	F	0	300	1	2	190
[redacted]	AZ101 Profile SE 300	F	0	300	1	2	190
[redacted]	AZ101 Profile SE 158	F	0	300	1	2	190
[redacted]	AZ101 Profile SE 4	F	0	300	1	2	190
[redacted]	AZ101 Profile SW 300	F	0	300	1	2	190
[redacted]	AZ101 Profile SW158	F	0	300	1	2	190
[redacted]	AZ101 Profile SW 4	F	0	300	1	2	190
[redacted]	AZ101 Profile NW 300	F	0	300	1	2	190
[redacted]	AZ101. Profile NW 158	F	0	300	1	2	190
[redacted]	AZ101 Profile NW 4	F	0	300	1	2	190
[redacted]	AZ101 Profile NE 300	F	0	300	1	2	190
[redacted]	AZ101 Profile NE 158	F	0	300	1	2	190
[redacted]	AZ101 Profile NE 4	F	0	300	1	2	190
[redacted]	Sludge Temp SE	F	0	300	1	2	190
[redacted]	Sludge Temp SW	F	0	300	1	2	190
[redacted]	Sludge Temp N	F	0	300	1	2	190
TI_101_AZ_74	Tank Dome W	F	0	300			
TI_101_AZ_75	Tank Dome NE	F	0	300			
TI_101_AZ_76	Tank Dome SE	F	0	300			
TI_101_AZ_77	Tank Dome W	F	0	300			
TI_101_AZ_78	Tank Dome NE	F	0	300			
TI_101_AZ_79	Tank Dome SE	F	0	300			
TI_101_AZ_80	Tank Dome W	F	0	300			
TI_101_AZ_81	Tank Dome E	F	0	300			
TI_101_AZ_82	Tank Dome SE	F	0	300			

APPENDIX E – DAS I/O

Alarm priority (pri):

			Range		Process alarm		Alar
Tag	Description	Units	lo	hi	alm	db	setpn
TI_101_AZ_83	Tank Dome W	F	0	300			
TI_101_AZ_84	Tank Dome NE	F	0	300			
TI_101_AZ_85	Tank Dome SE	F	0	300			
TI_101_AZ_86	Tank Wall W	F	0	300			
TI_101_AZ_87	Tank Wall NE	F	0	300			
TI_101_AZ_88	Tank Wall SE	F	0	300			
TI_101_AZ_89	Tank Wall W	F	0	300			
TI_101_AZ_90	Tank Wall NE	F	0	300			
TI_101_AZ_91	Tank Wall SE	F	0	300			
TI_101_AZ_92	Tank Wall W	F	0	300			
TI_101_AZ_93	Tank Wall NE	F	0	300			
TI_101_AZ_94	Tank Wall SE	F	0	300			
TI_101_AZ_95	Tank Wall W	F	0	300			
TI_101_AZ_96	Tank Wall NE	F	0	300			
TI_101_AZ_97	Tank Wall SE	F	0	300			
TQI_101_AZ_01	Average of 37 TCs	F	0	300			
Note: Shaded thermocouples can be included in the running temp average for TQI_101_AZ_01							

APPENDIX F – HLAN COMMUNICATIONS

The control system for the AZ-702 Ventilation System is a Micon Distributed Control System (DCS) running on Sun Sparc workstations under SunOS 4.1.4 (UNIX). Some of the data collected by the DCS is used in WRSS thermal balance calculations. A "Third Party Software Interface" (TPSI) program on the DCS is configured to provide the required data in a semicolon-delimited format which Citect can use as an input database.

To access these files on the UNIX system, a special network protocol is required. A standard method for connecting Windows 95 and NT workstations using TCP/IP is Server Message Block (SMB) protocol. UNIX systems do not use SMB by default, but a freely available and well-supported package, Samba, provides SMB connectivity for UNIX systems. Samba allows Windows 95 and NT workstations to mount a remote UNIX directory as a network volume (e.g., X:) through the **Map Network Drive...** or **NET USE** functions without any additional software, e.g.:

C:\> NET USE X: \\130.97.111.25\PUBLIC

Two Micon workstations are configured to provide a redundant connection between the AZ-702 ventilation system and the WRSS DAS. The directories where the data is stored are mapped as drives X: and Y:. The WRSS DAS attempts to acquire data every 60 seconds from the most recently successful network connection. If this connection is unsuccessful, the WRSS DAS

automatically switches to the other network connection. The following IP addresses have been assigned for equipment associated with the WRSS DAS and the Mixer Pump Test DAS:

Hostname (DNS)	Description
	WIRELESS BRIDGE IN MO-211 (HLAN ACCESS POINT)
	WIRELESS BRIDGE IN AY-801A (FOR AY-FARM PLC)
	WIRELESS BRIDGE IN DCS/CONTROL ROOM
plc241ay	PLC IN AY-801A
plcm211	PLC IN MO-211
micon02	DCS OPERATOR INTERFACE STATION #1
micon11	DCS OPERATOR INTERFACE STATION #2
micon126	DCS OPERATOR INTERFACE STATION #3
micon14	DCS ENGINEERING STATION
	WRSS DAS HMI IN MO-211 (IP ADDRESS DYNAMICALLY ASSIGNED BY DHCP)
101_az_das	241-AZ-101 MIXER PUMP TEST DAS HMI IN 241-AZ-156 MIXER PUMP CONSOLE (IP ADDRESS DYNAMICALLY ASSIGNED BY DHCP)

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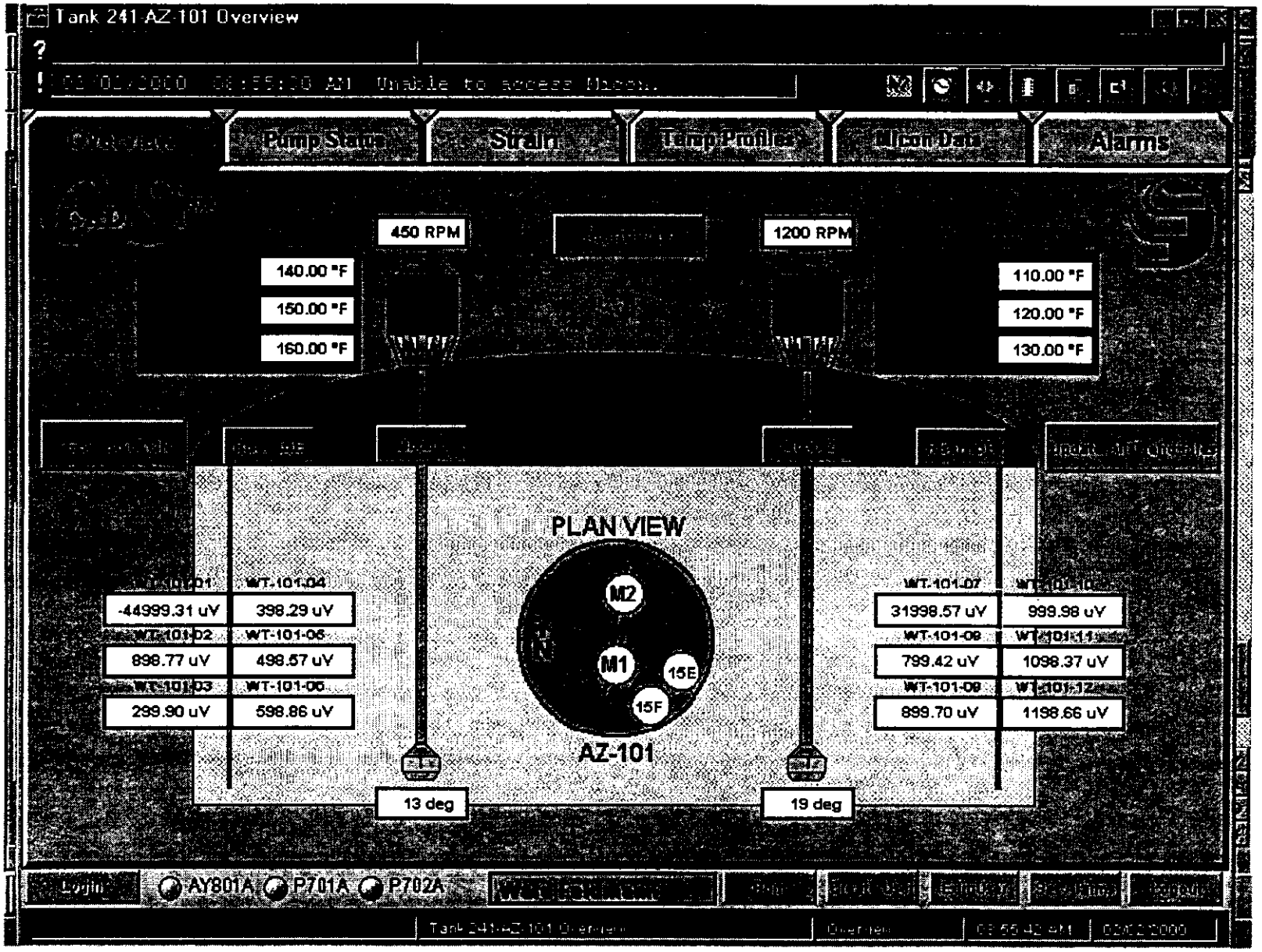

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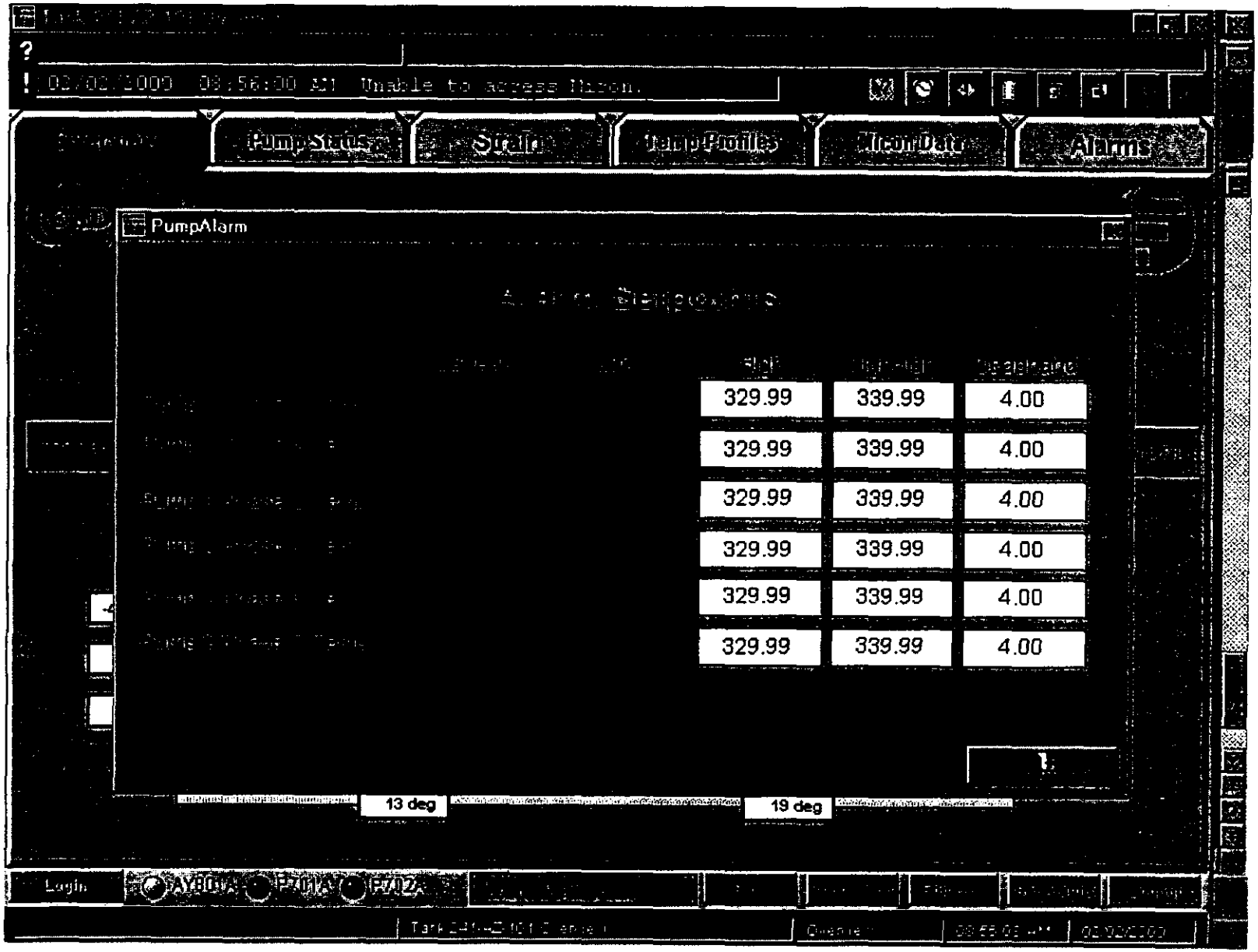
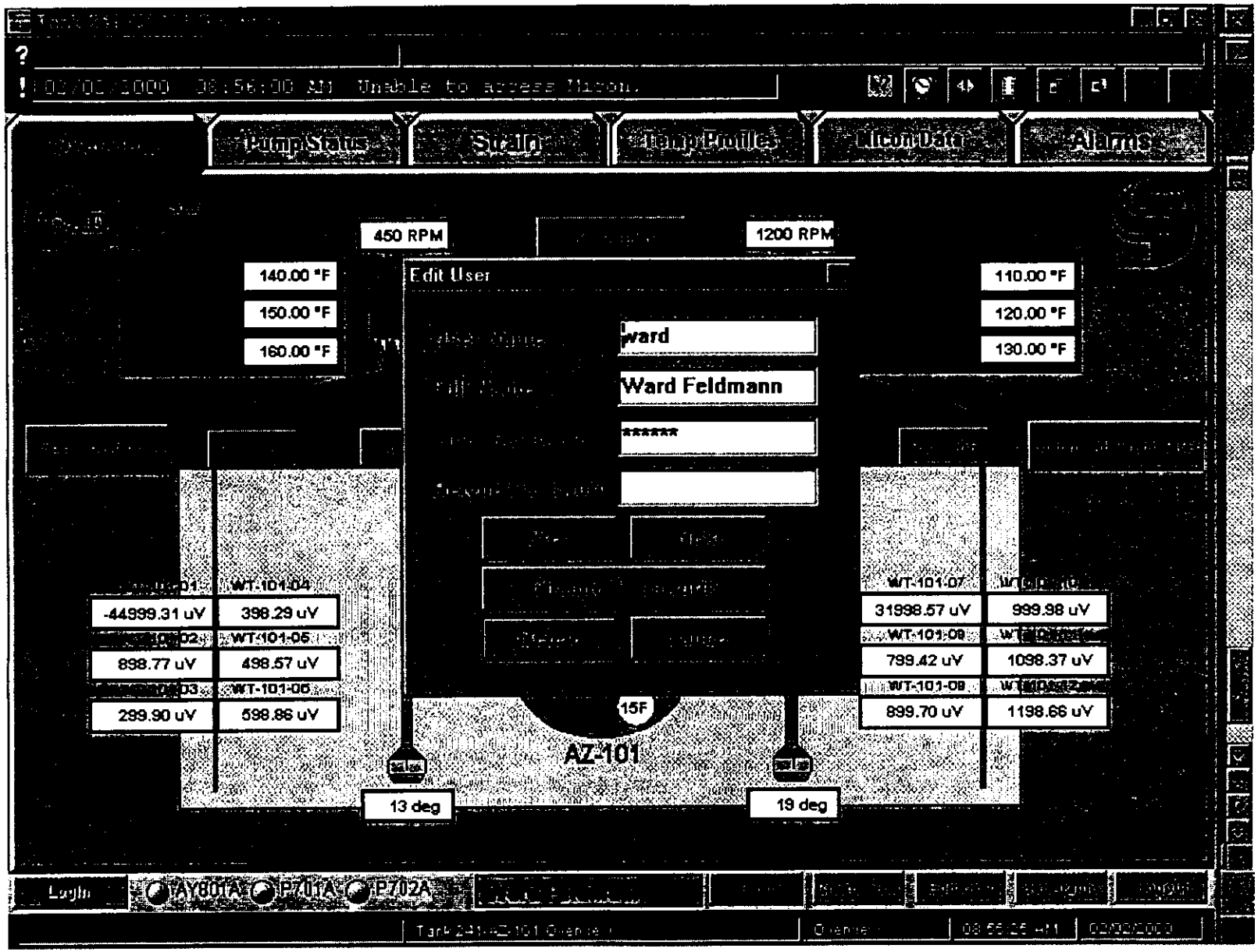


APPENDIX S – OPERATOR INTERFACE SCREENS



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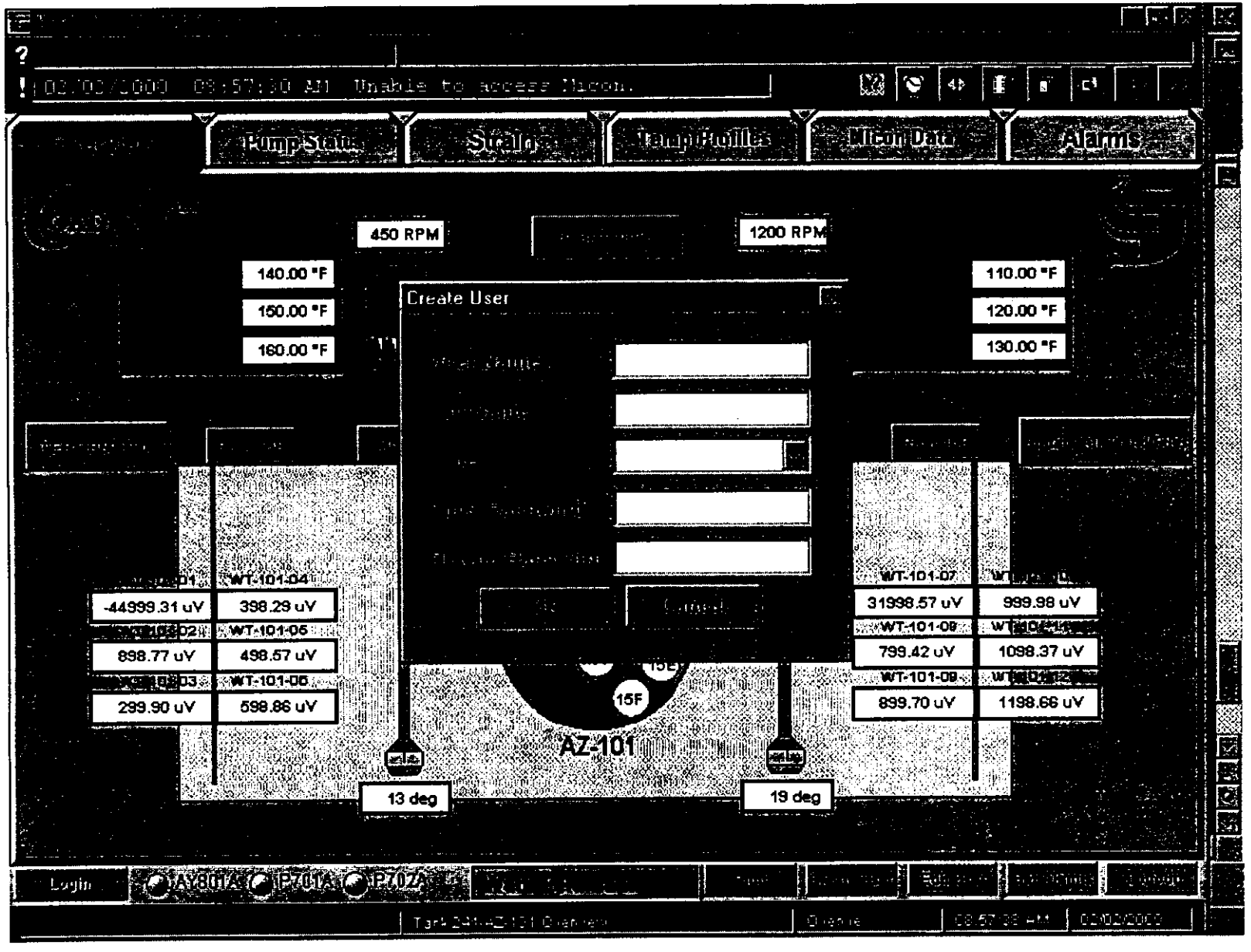
APPENDIX S – OPERATOR INTERFACE SCREENS



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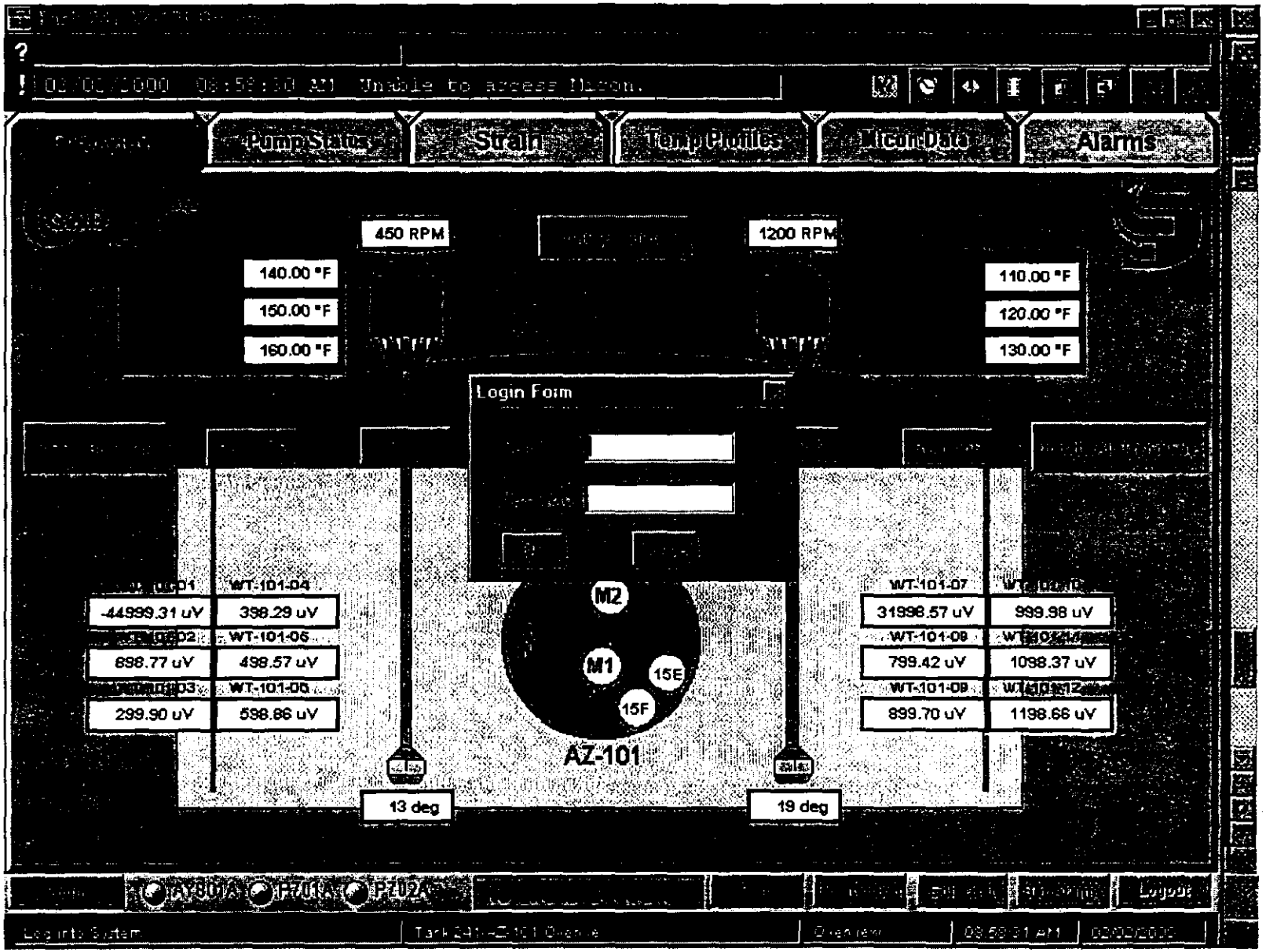
APPENDIX S – OPERATOR INTERFACE SCREENS



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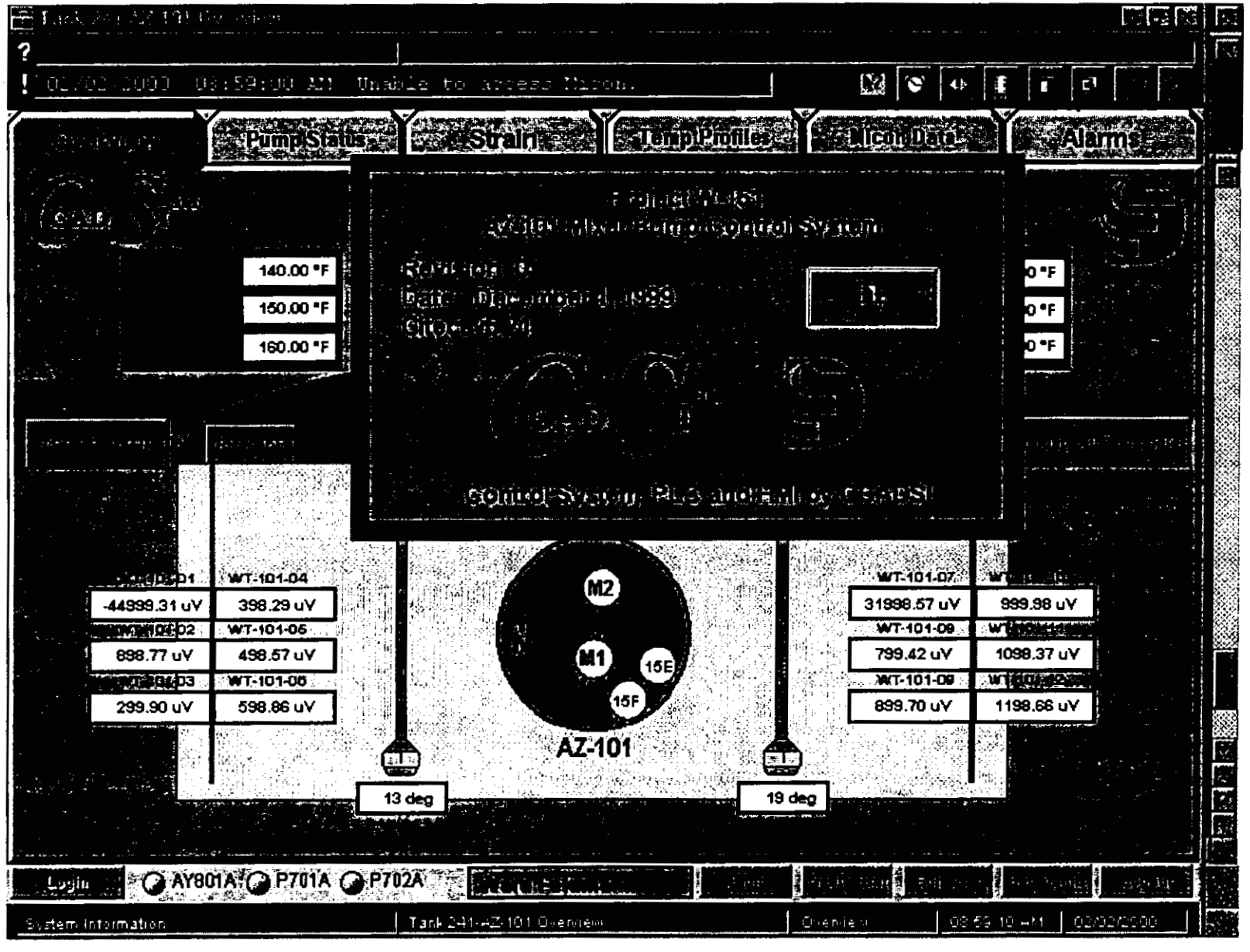
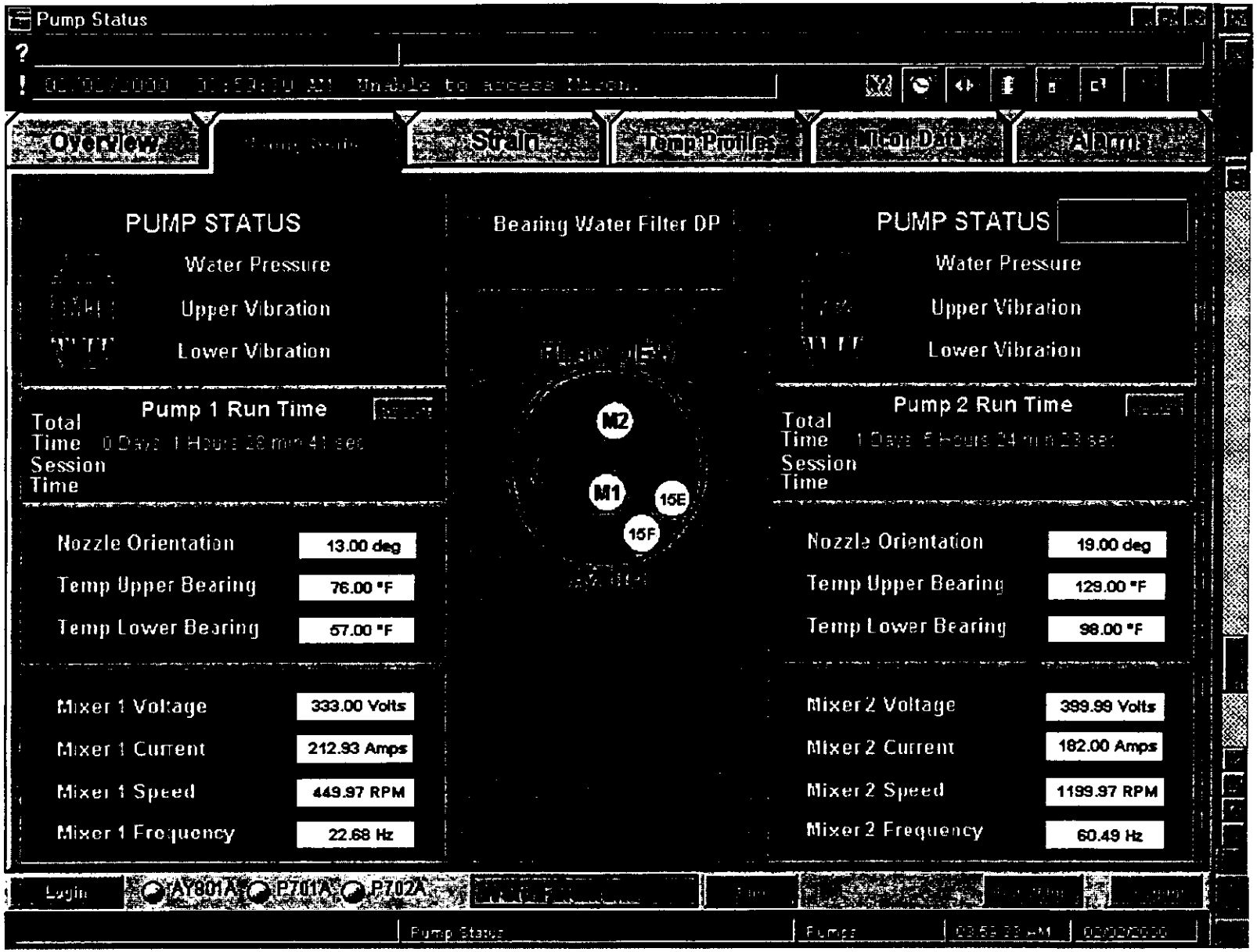


APPENDIX S – OPERATOR INTERFACE SCREENS



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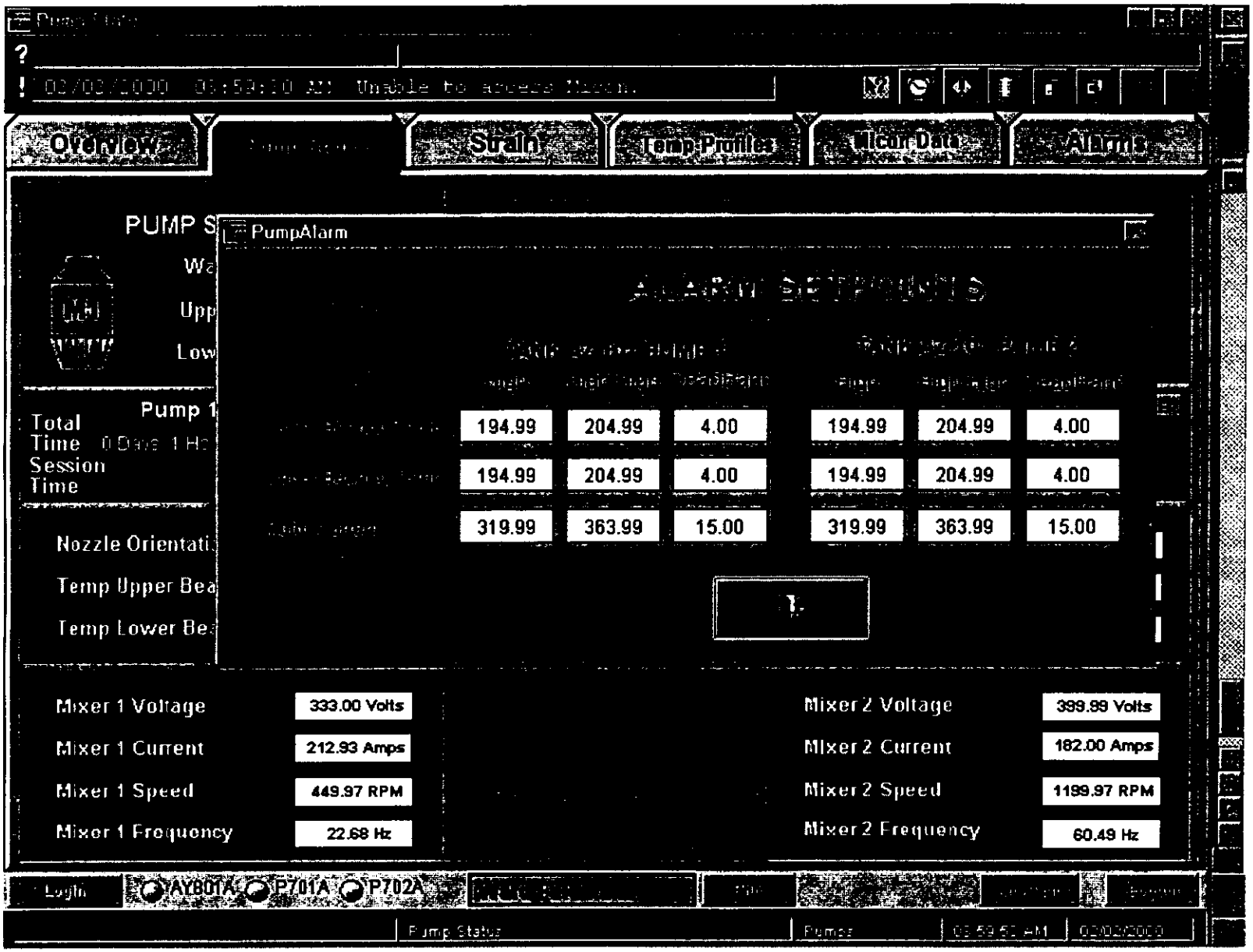

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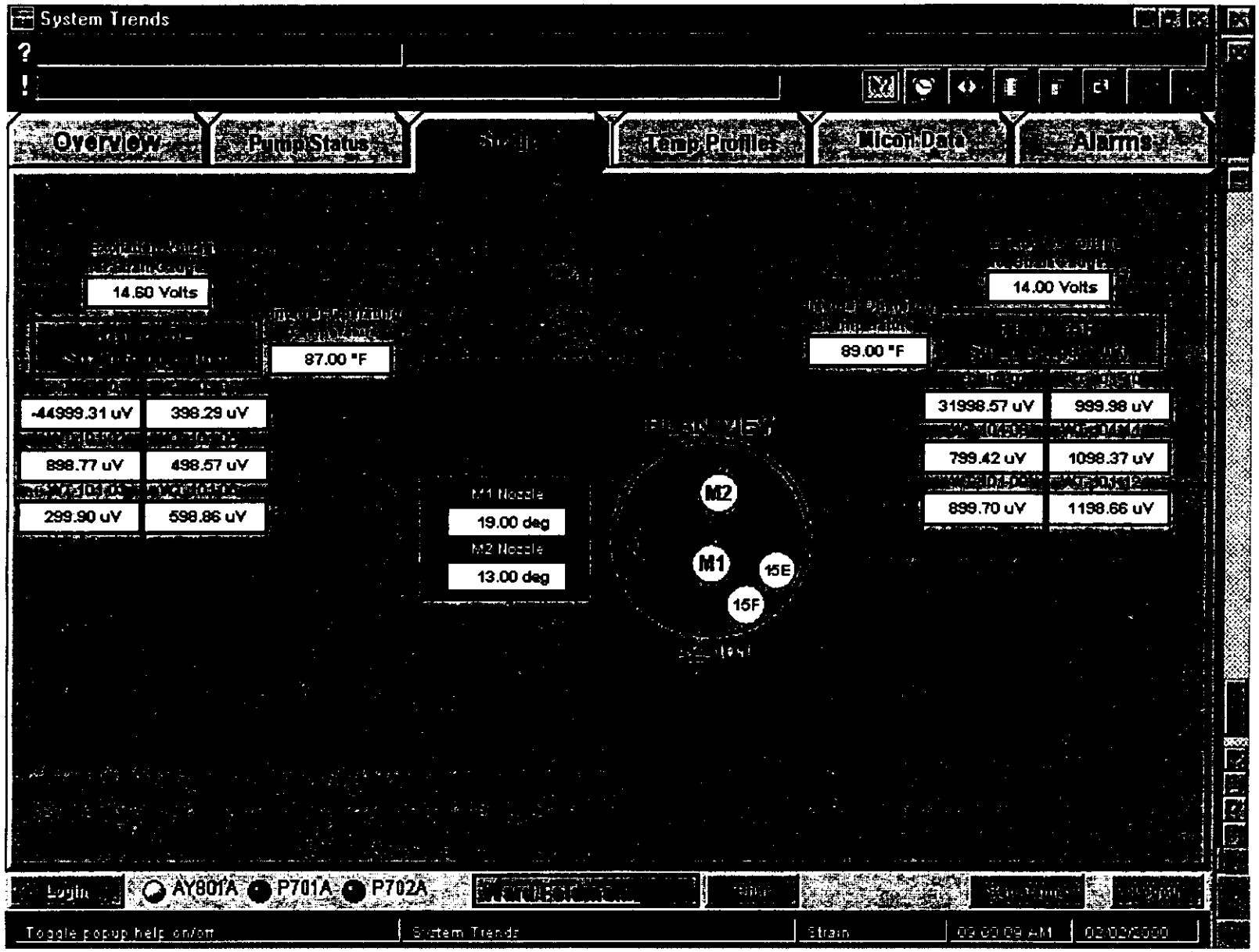

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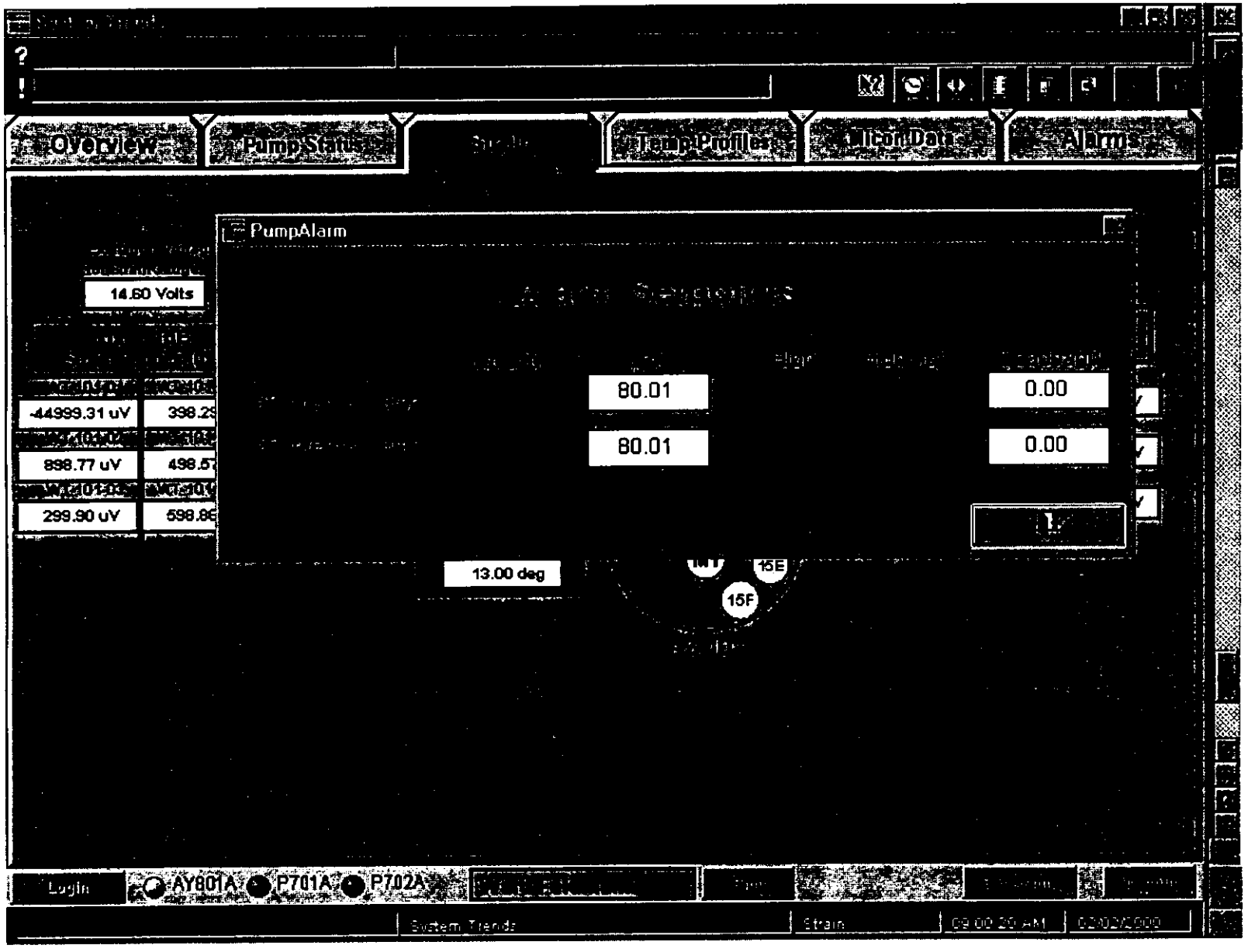

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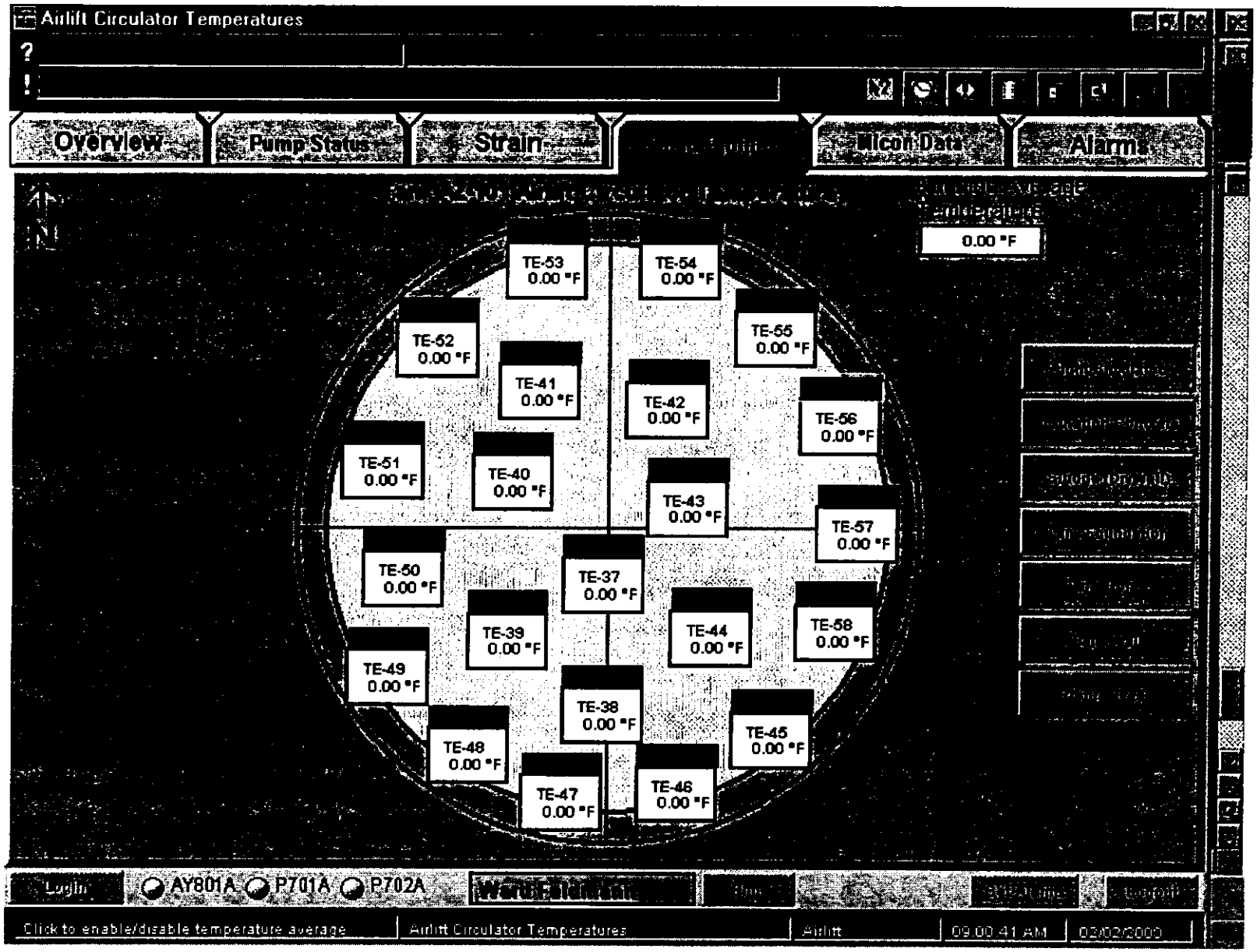

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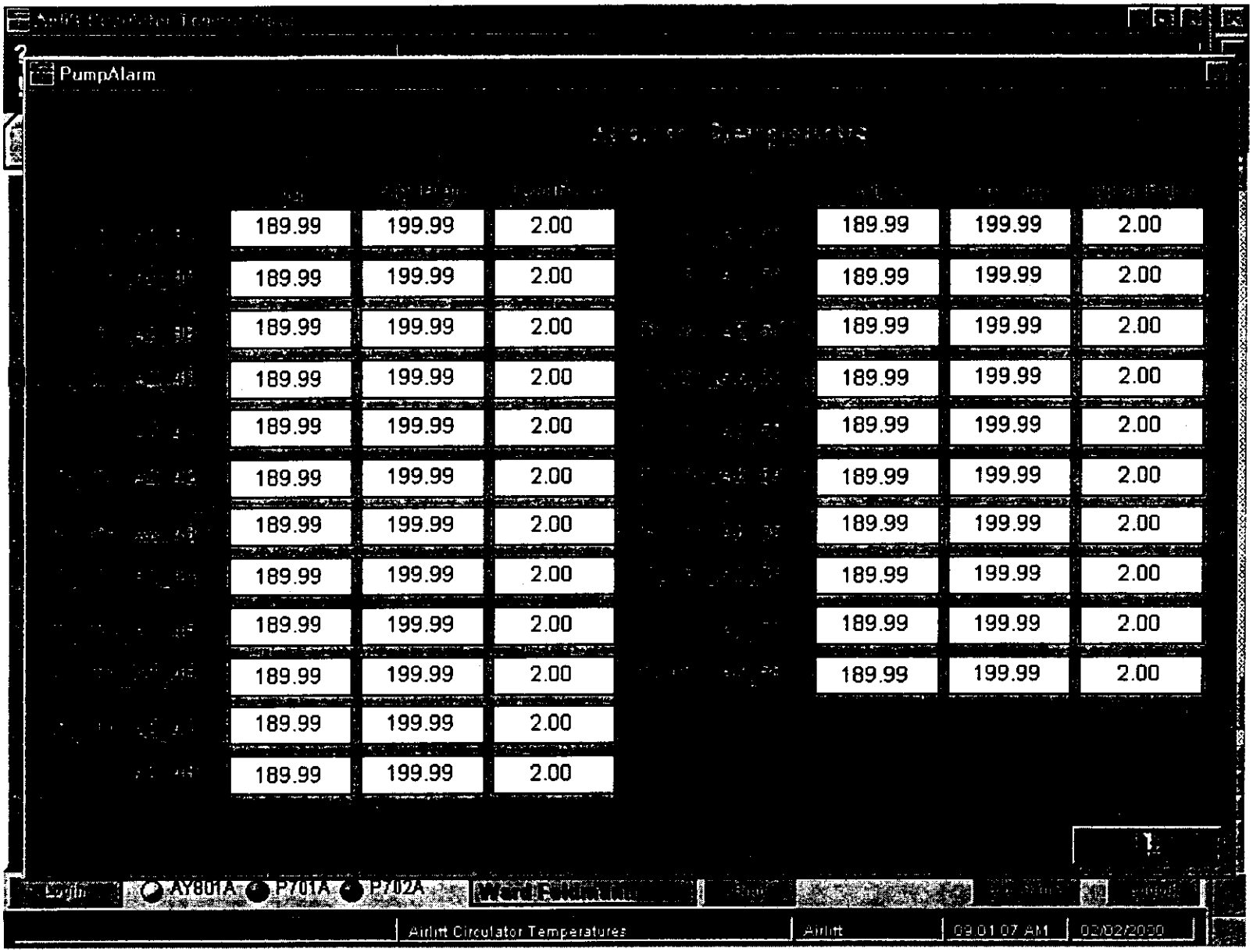
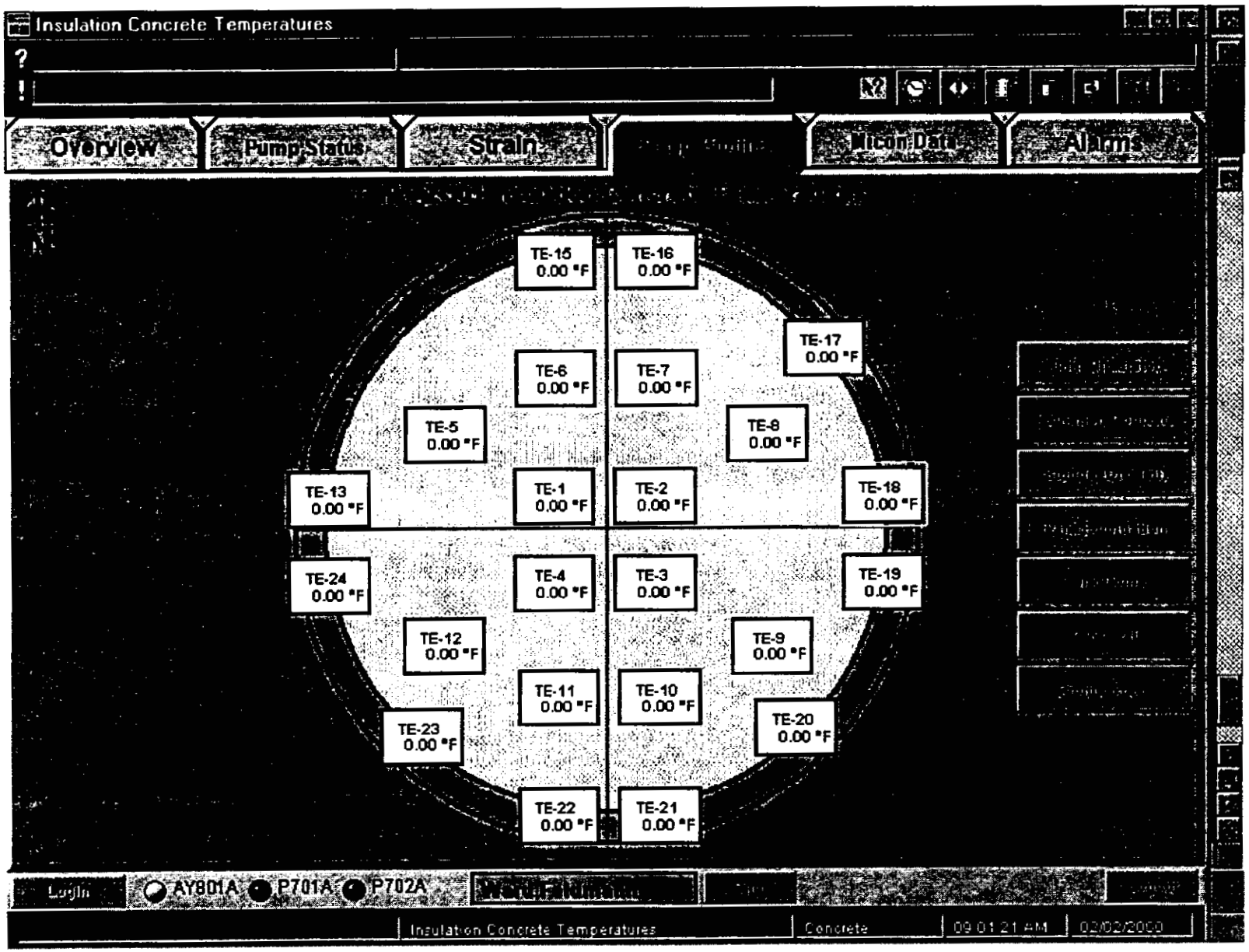
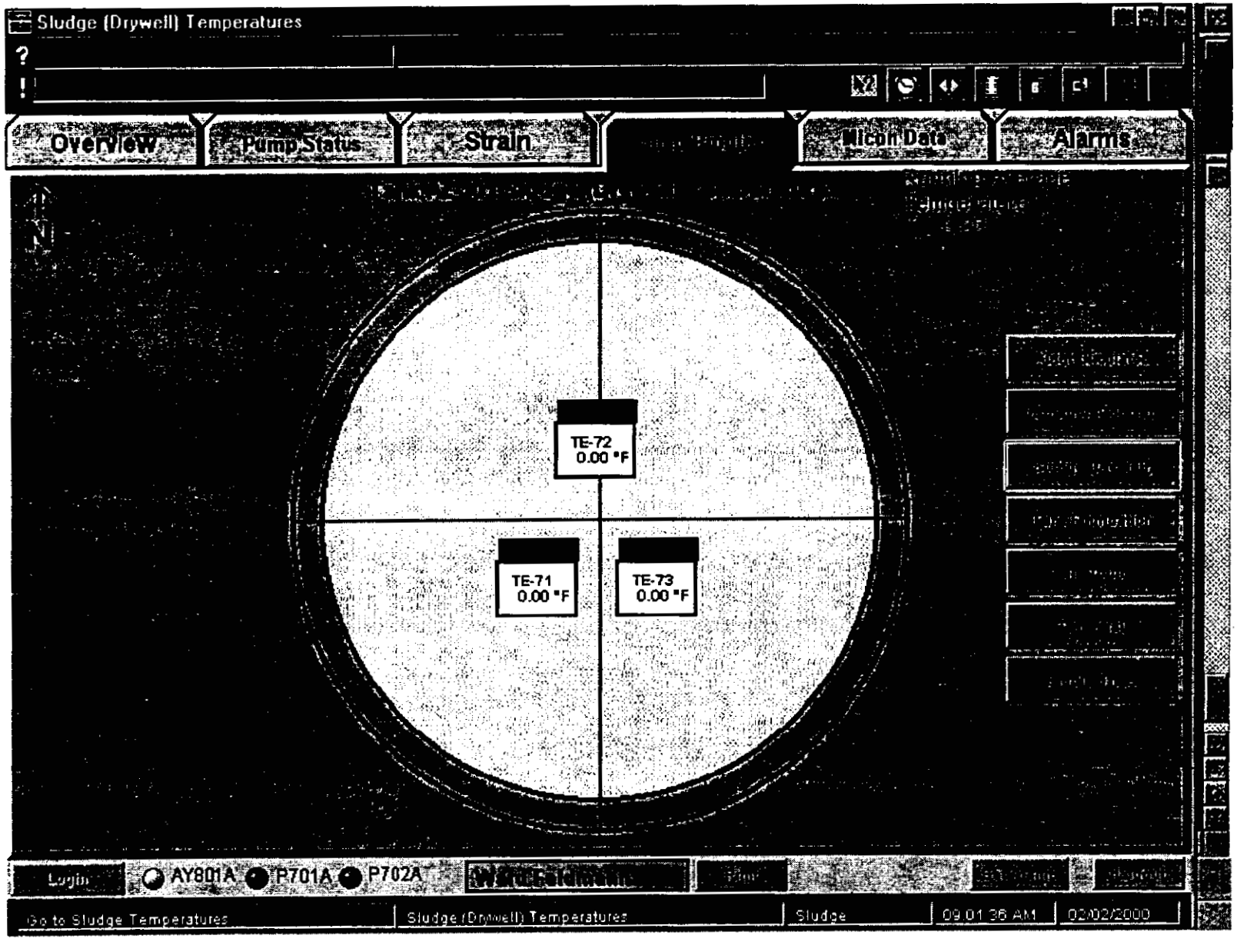
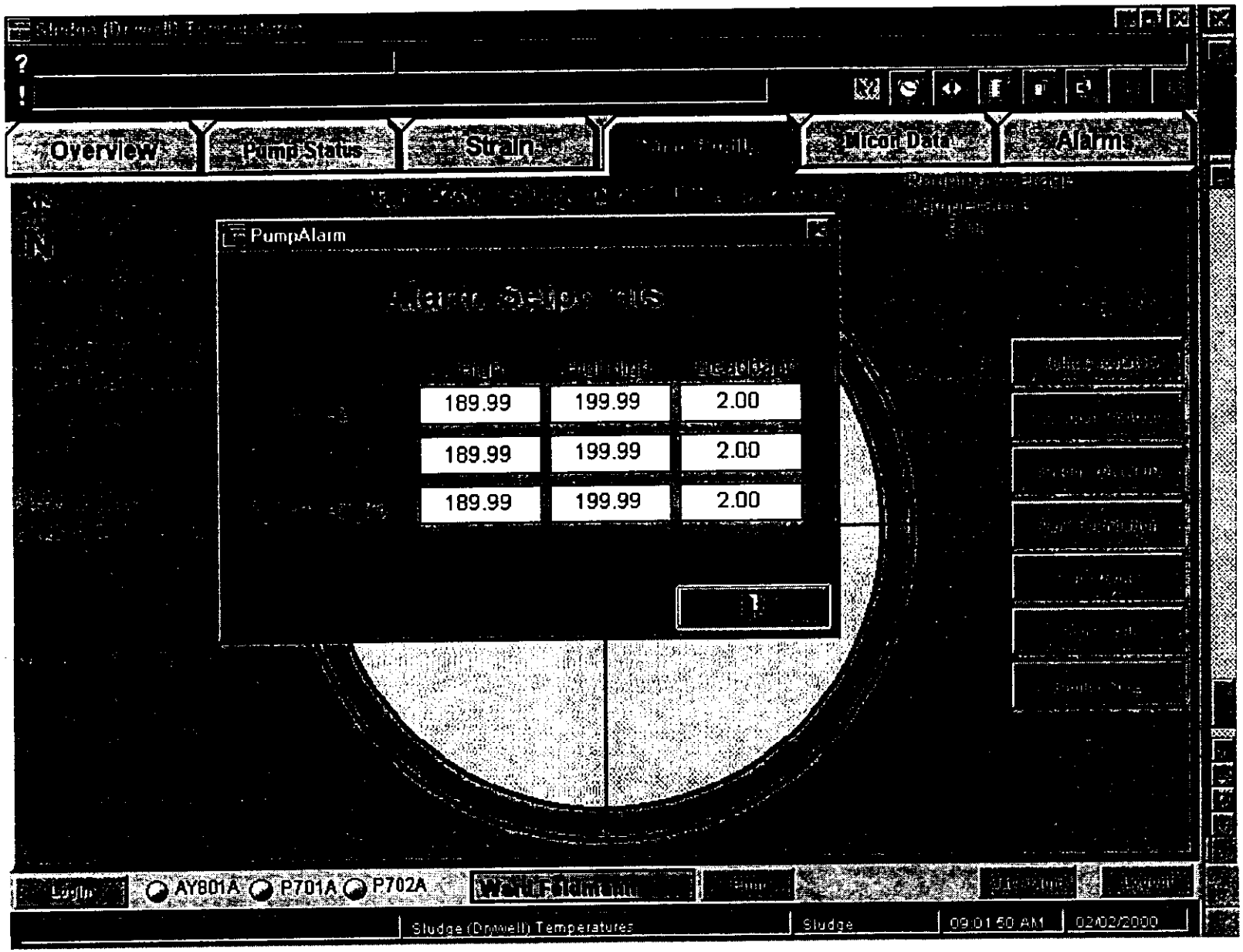
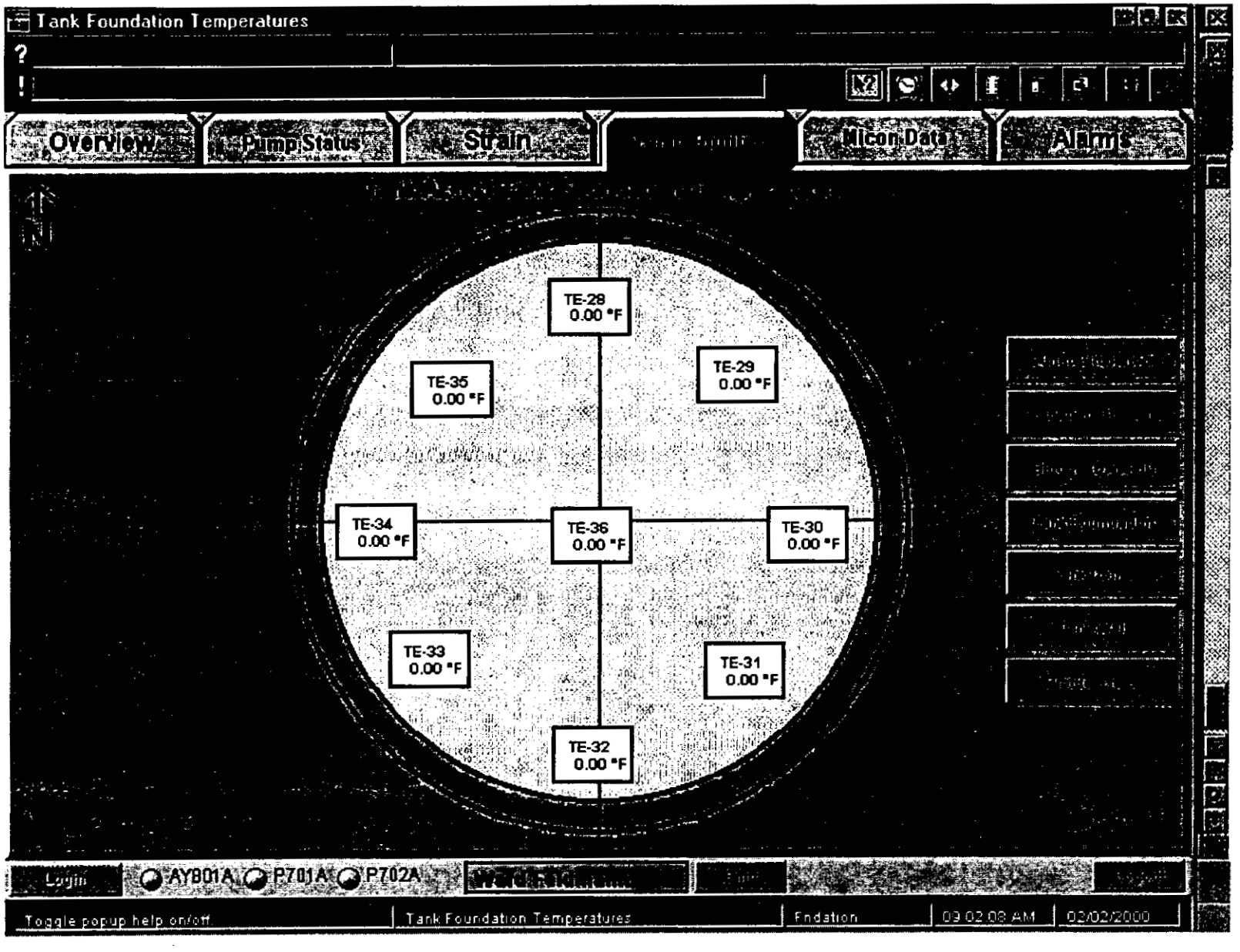



Insulation Concrete Temperatures
Overview
Pump Status
Strain
Micon Data
Alarms
TE-15 0.00 °F
TE-16 0.00 °F
TE-17 0.00 °F
TE-6 0.00 °F
TE-7 0.00 °F
TE-5 0.00 °F
TE-8 0.00 °F
TE-13 0.00 °F
TE-1 0.00 °F
TE-2 0.00 °F
TE-18 0.00 °F
TE-24 0.00 °F
TE-4 0.00 °F
TE-3 0.00 °F
TE-19 0.00 °F
TE-12 0.00 °F
TE-9 0.00 °F
TE-11 0.00 °F
TE-10 0.00 °F
TE-23 0.00 °F
TE-20 0.00 °F
TE-22 0.00 °F
TE-21 0.00 °F
Login
AY801A
P701A
P702A
Insulation Concrete Temperatures
Concrete
09:01:21 AM
02/02/2000


Sludge (Drywell) Temperatures
Overview
Pump Status
Strain
Micon Data
Alarms
TE-72
0.00 °F
TE-71
0.00 °F
TE-73
0.00 °F
Login
AY801A
P701A
P702A
Go to Sludge Temperatures
Sludge (Drywell) Temperatures
Sludge
09:01:36 AM
02/02/2000


Overview
Pump Status
Strain
Silicon Data
Alarms
PumpAlarm
189.99
199.99
2.00
189.99
199.99
2.00
189.99
199.99
2.00
AY801A
P701A
P702A
Sludge (Drywell) Temperatures
Sludge
09:01:50 AM
02/02/2000

APPENDIX S – OPERATOR INTERFACE SCREENS



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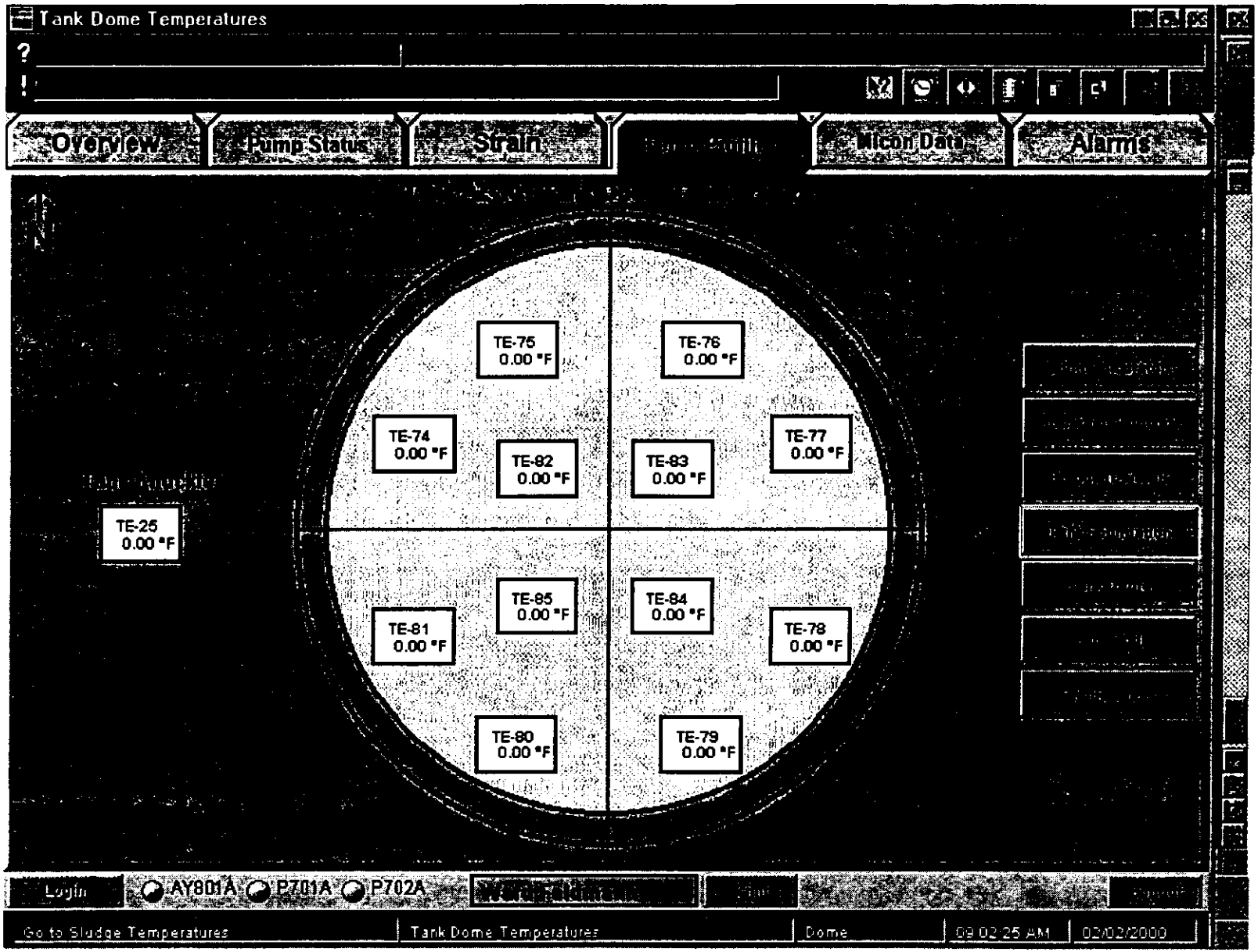
APPENDIX S – OPERATOR INTERFACE SCREENS



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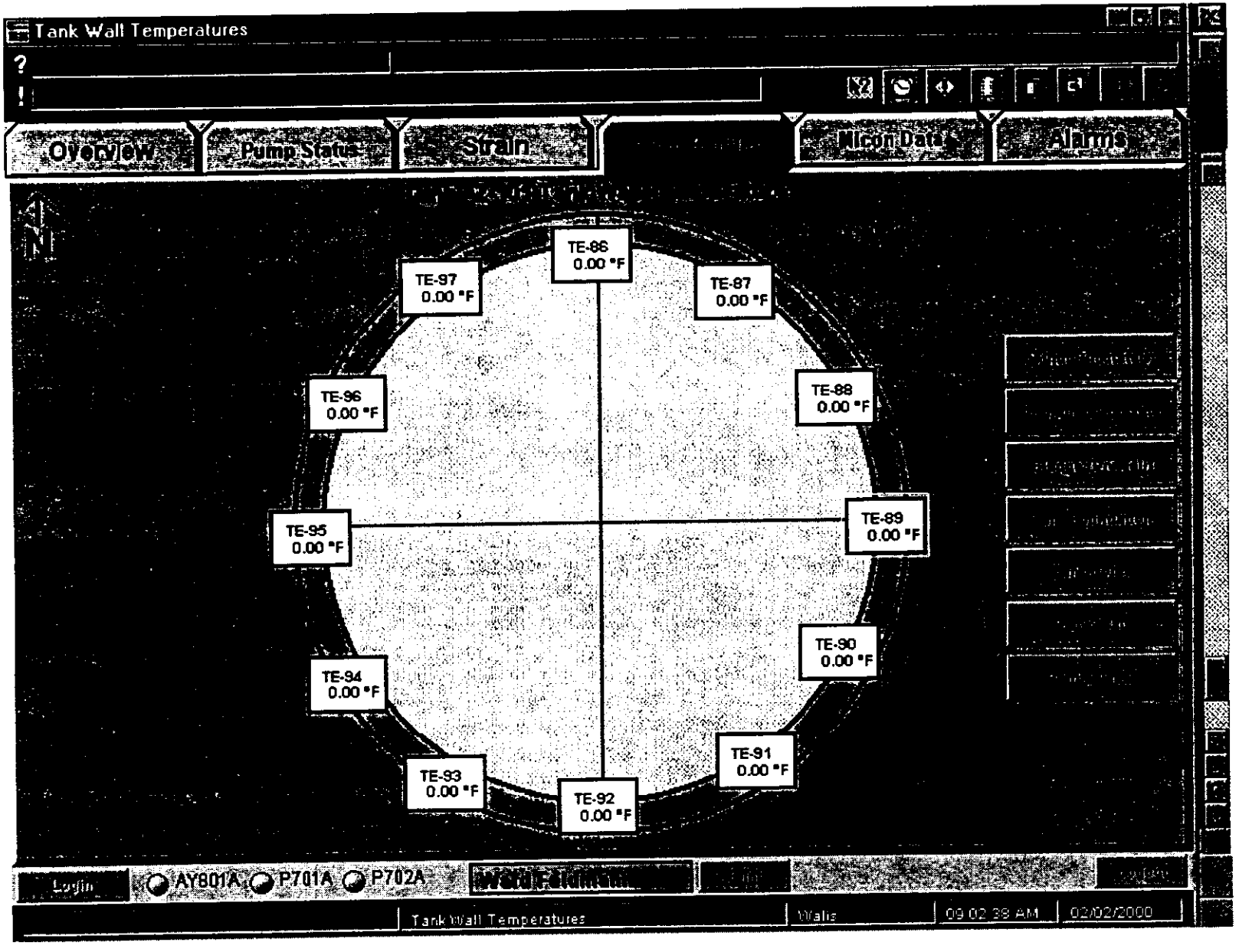
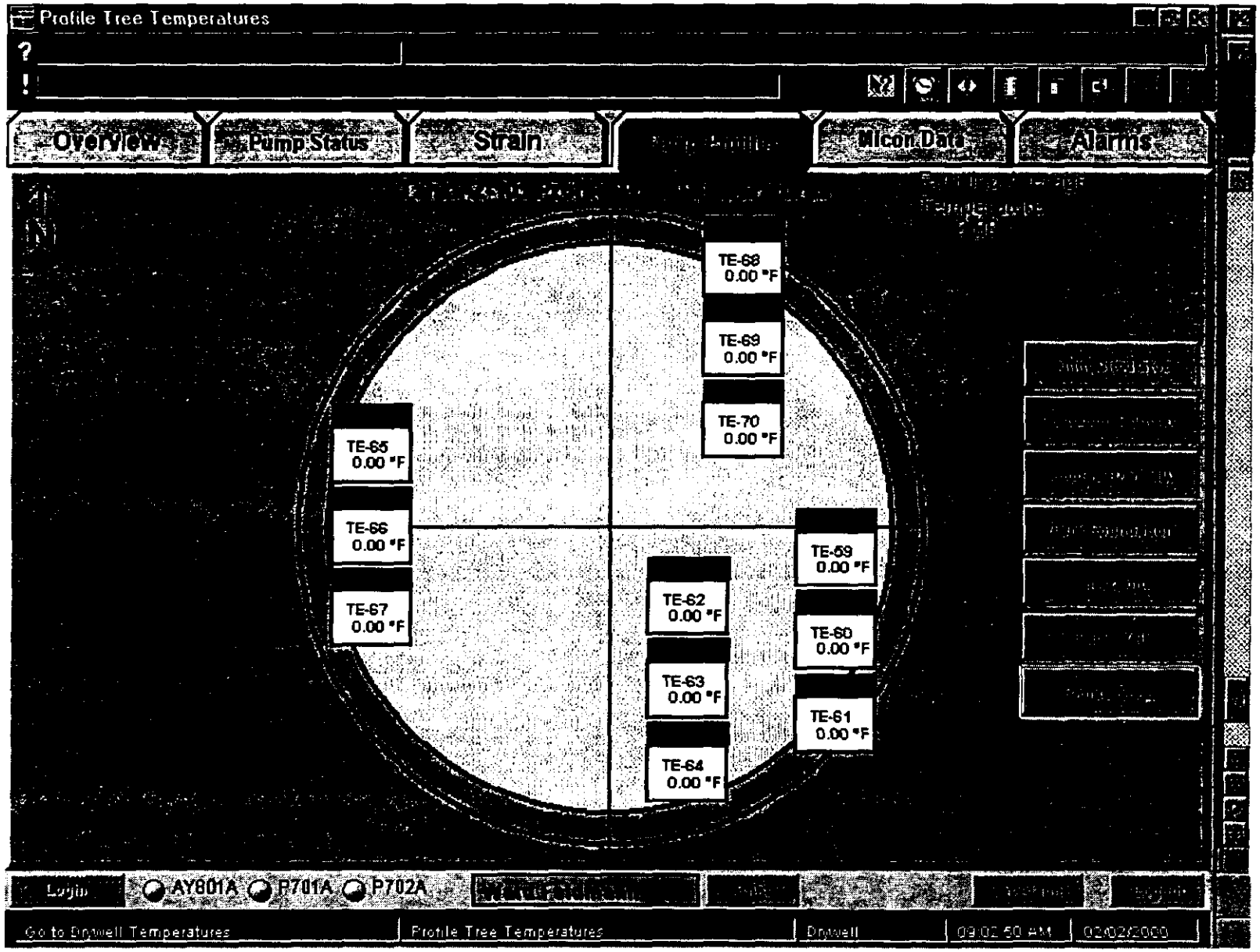

Tank Wall Temperatures
Overview
Pump Status
Strain
Nicon Data
Alarms
TE-86 0.00 °F
TE-87 0.00 °F
TE-88 0.00 °F
TE-89 0.00 °F
TE-90 0.00 °F
TE-91 0.00 °F
TE-92 0.00 °F
TE-93 0.00 °F
TE-94 0.00 °F
TE-95 0.00 °F
TE-96 0.00 °F
TE-97 0.00 °F
Login
AY801A
P701A
P702A
Tank Wall Temperatures
Walis
09:02:38 AM
02/02/2000



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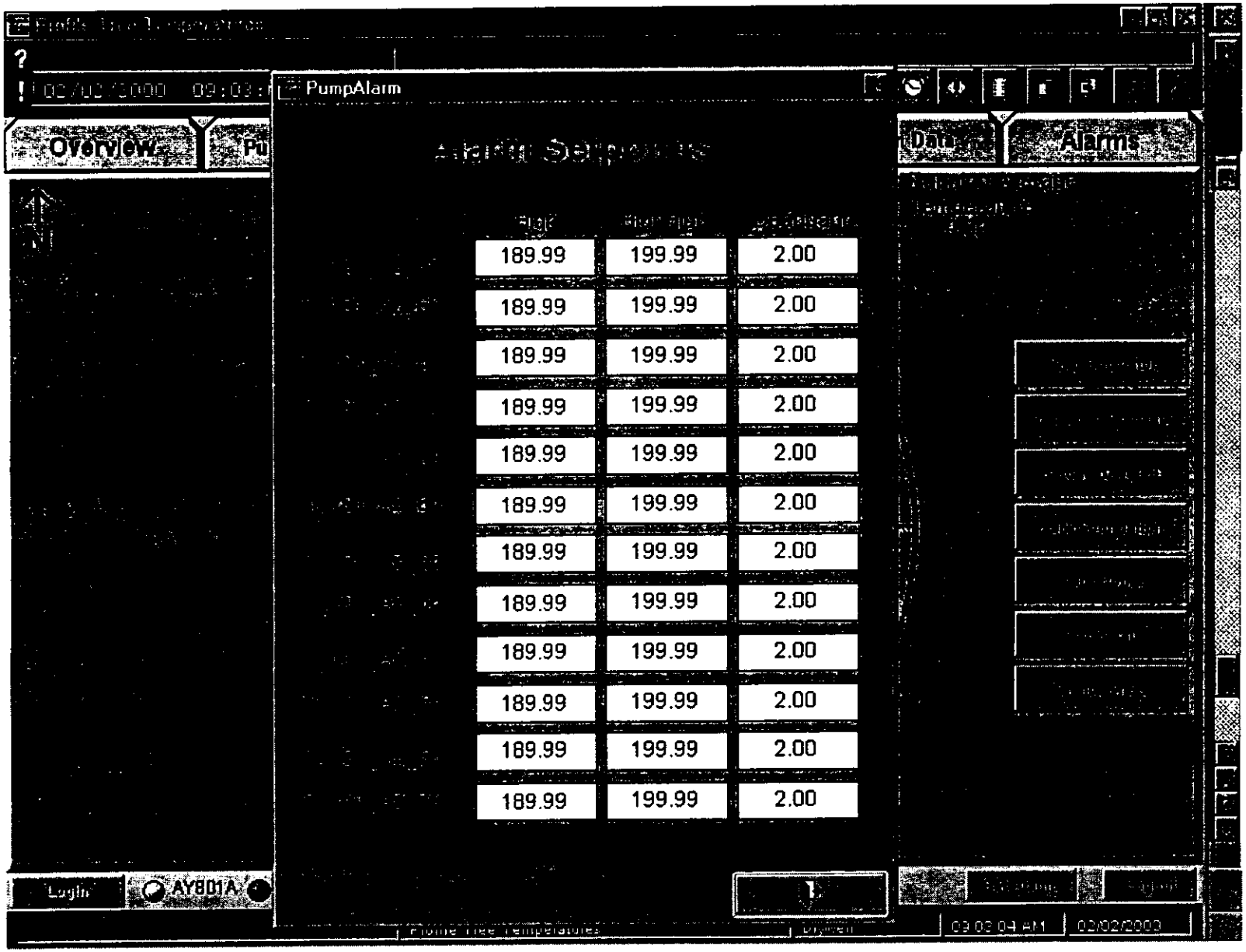

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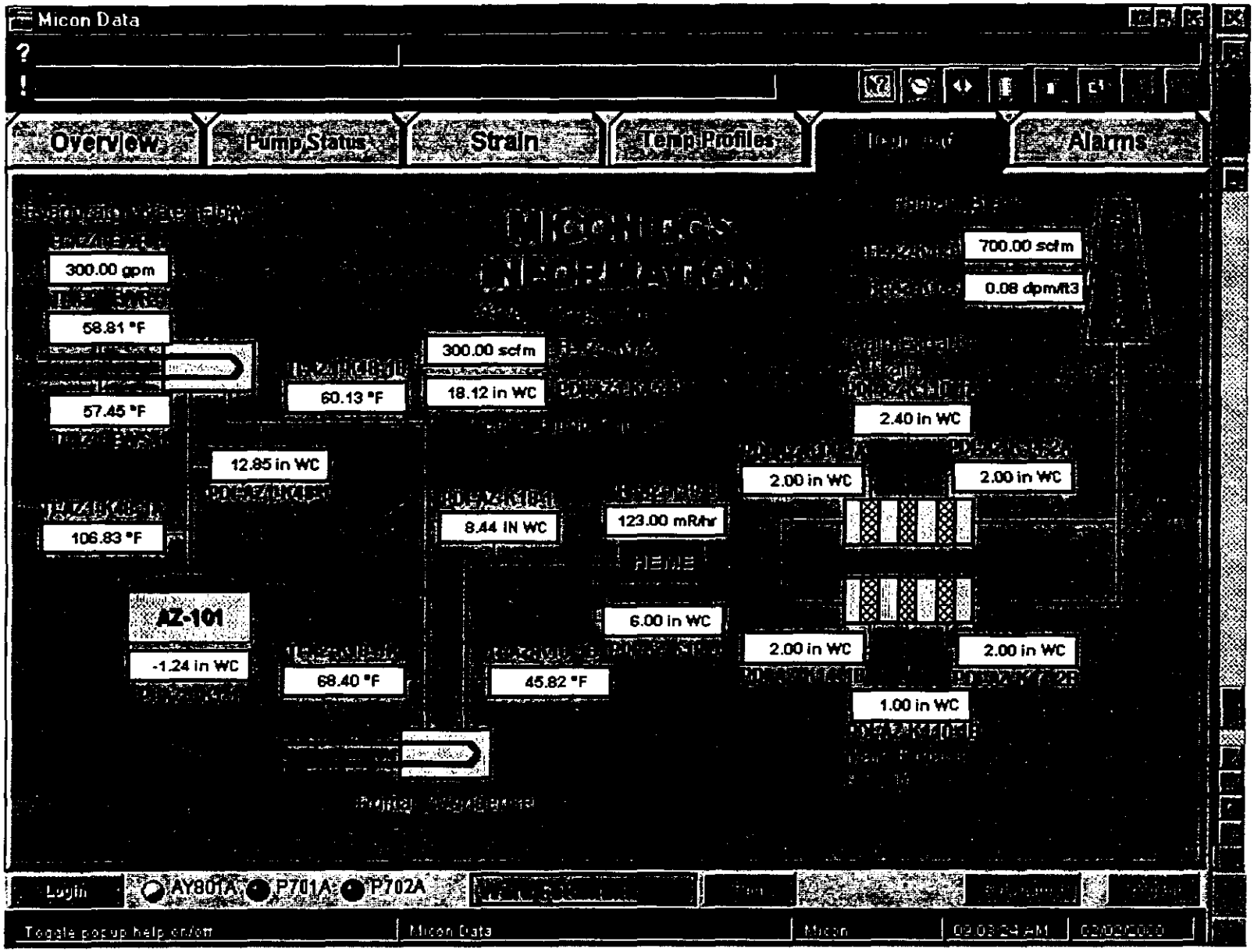
APPENDIX S – OPERATOR INTERFACE SCREENS



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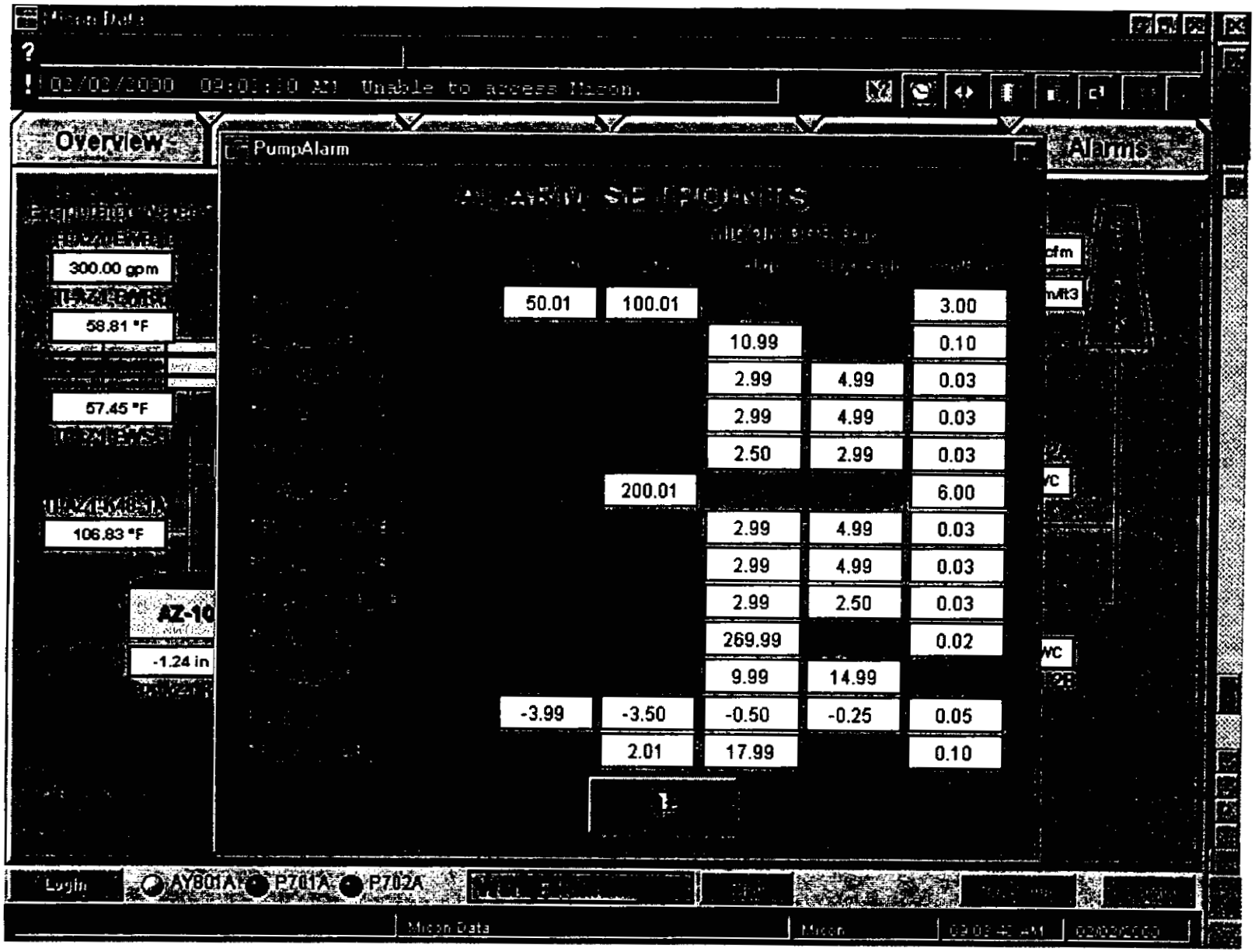

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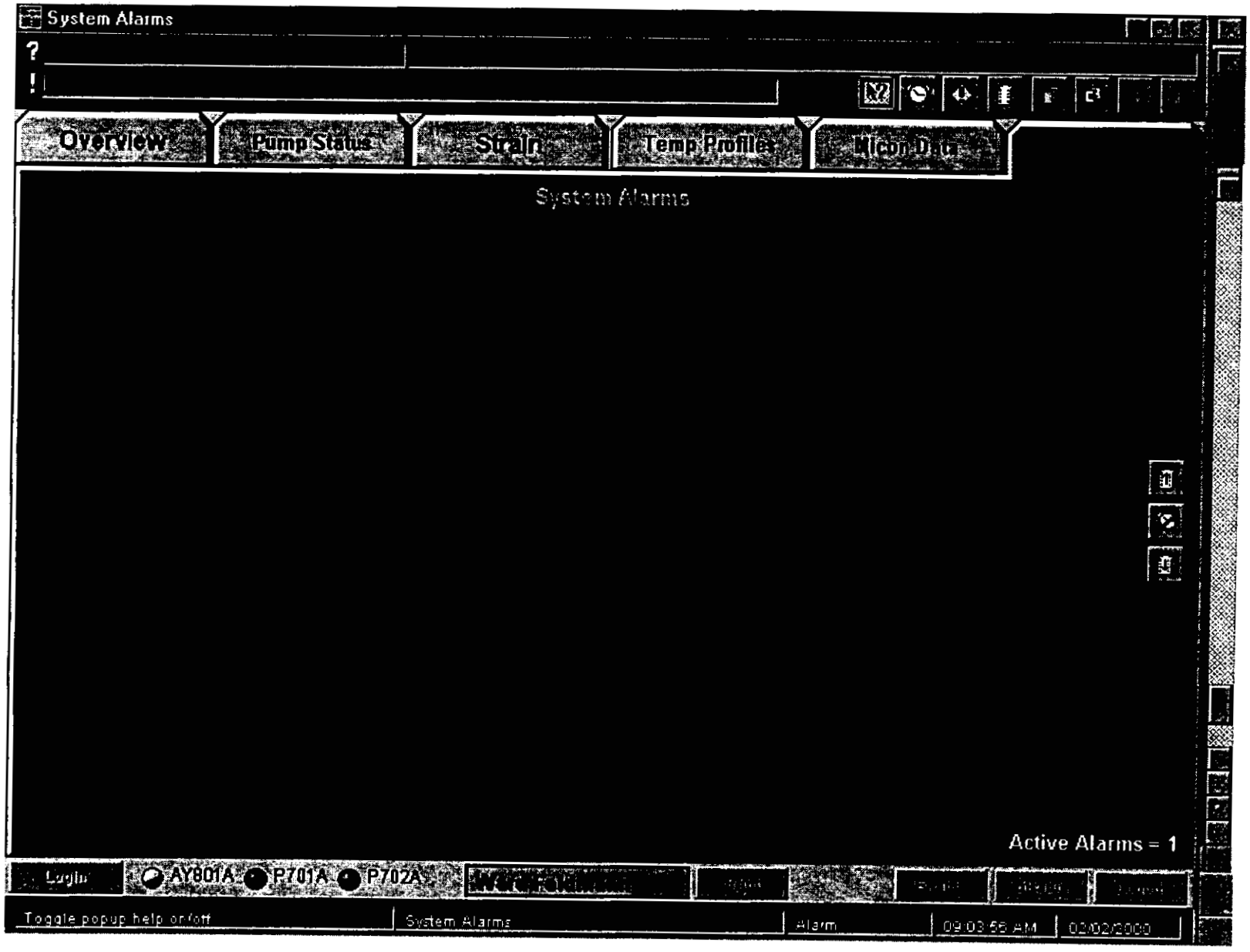

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APPENDIX S – OPERATOR INTERFACE SCREENS

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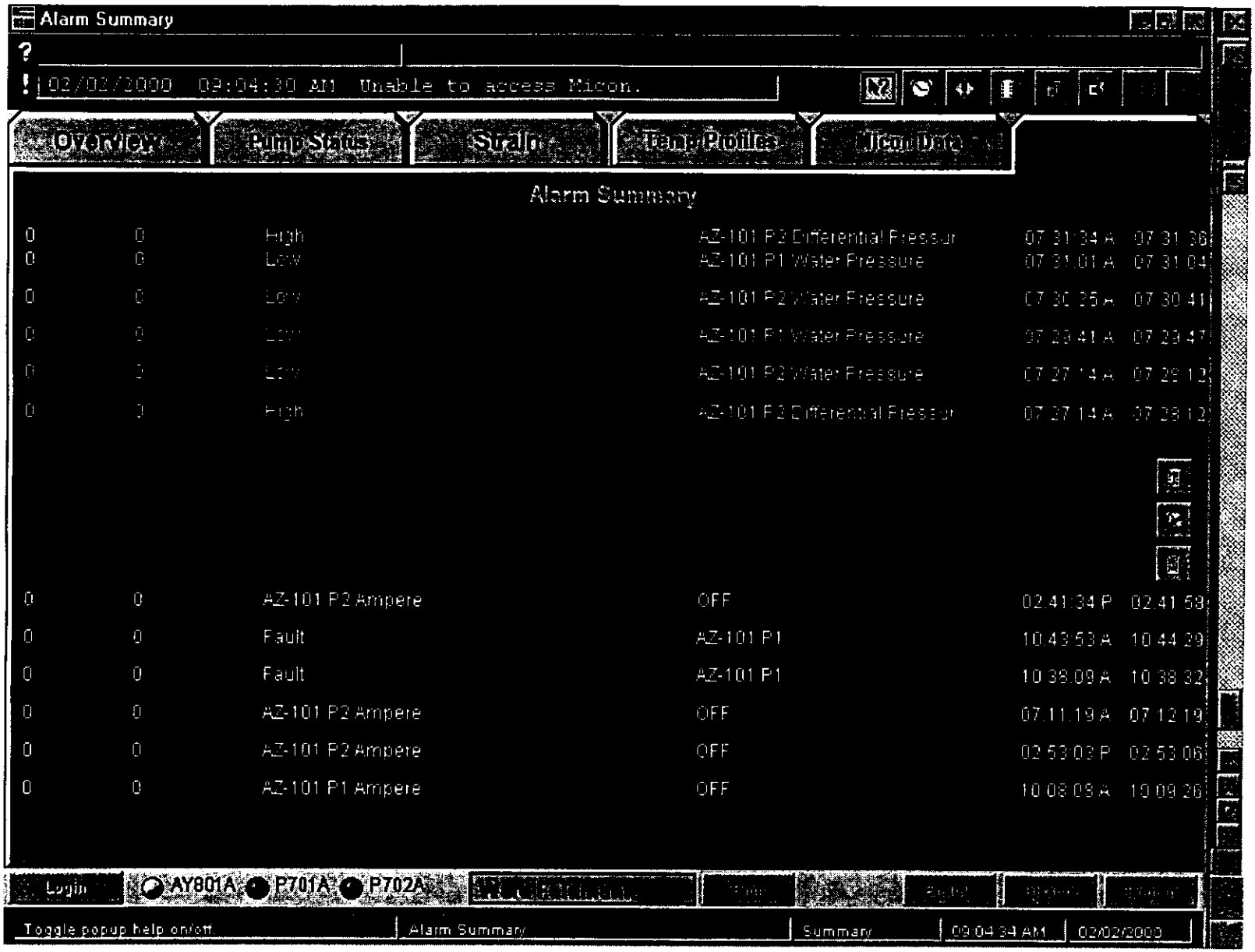

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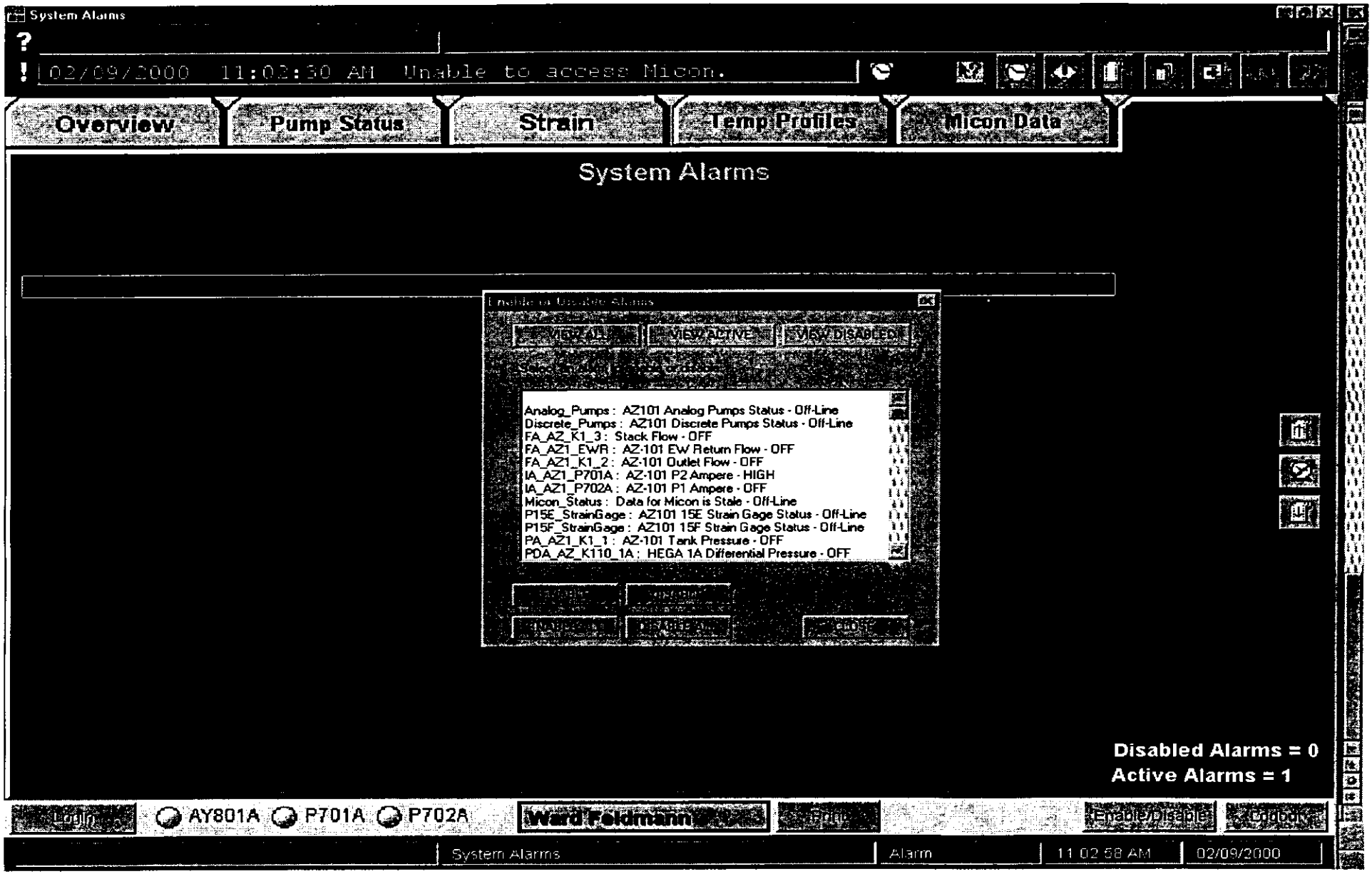

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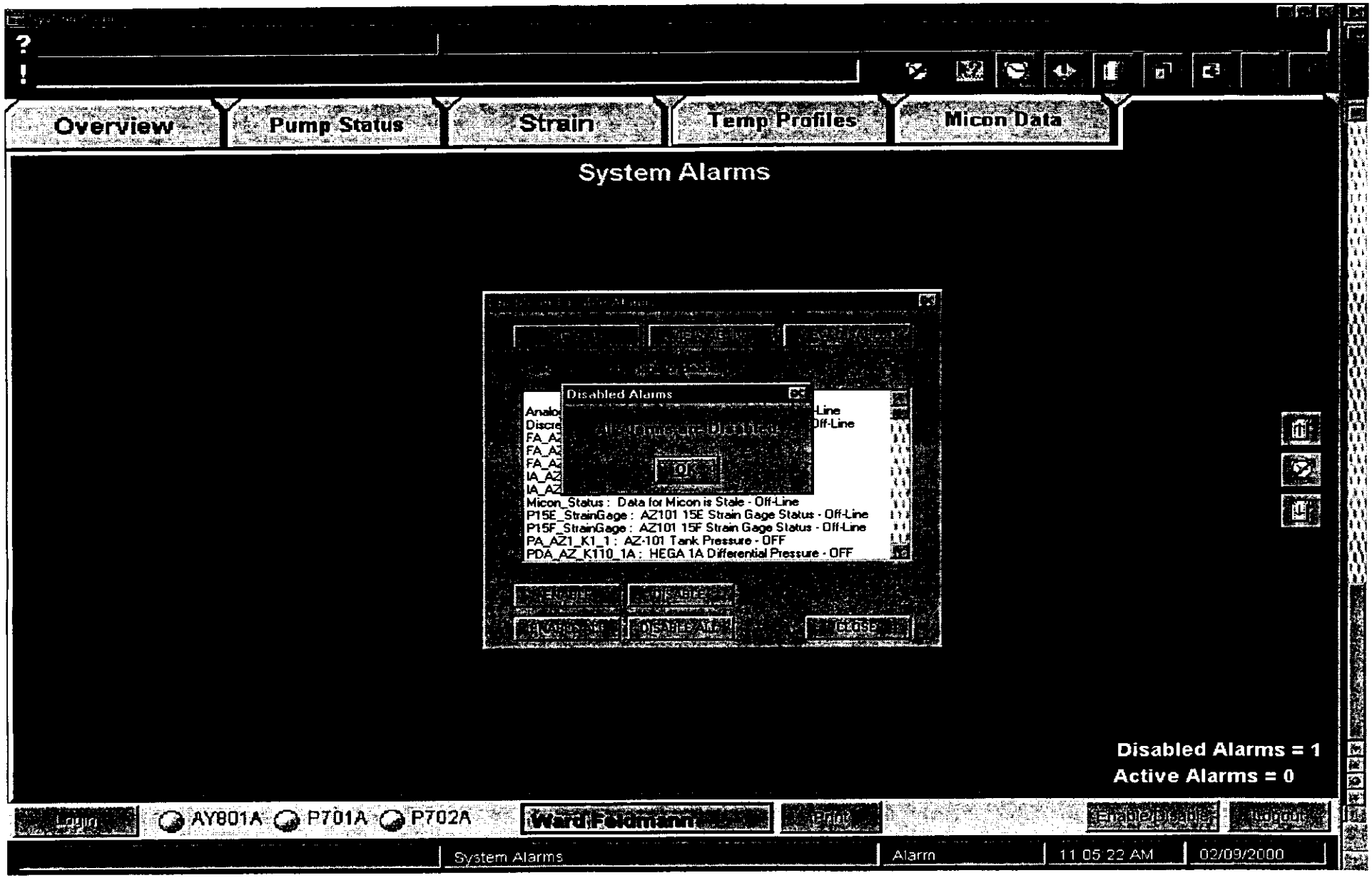
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