

E4H-CE AND E8-CE SERIES WATER PURIFICATION MACHINES

**3 m³/hr to 45 m³/hr
18,000 gpd to 288,000 gpd**

**Control Narrative
Manual**



GE Osmonics

**GE OSMONICS E4H-CE AND E8-CE WATER
TREATMENT SYSTEMS**

**CONTROL NARRATIVE
MANUAL**

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1.0 OVERVIEW

The GE Osmonics E4H-CE and E8-CE water treatment systems consist of modular equipment that is designed to work together with the reverse osmosis (RO) machine at the heart of the system. The Programmable Logic Controller (PLC) and Operator Interface Terminal (OIT) are programmed to control a complete, integrated system. A water purification system may consist of the following modular equipment:

- Media Filter(s)
- Chemical Injection System
- Clean-In-Place (CIP) System
- Permeate Storage Tank

Your system may or may not contain all of the modular equipment listed above. To accommodate the variations possible, the control system is designed to allow the user to operate with any of the components list above.

1.1 Hardware

A SIEMENS S7-222 PLC, located in the control enclosure, controls the system. Operator interface is done with a SIEMENS TP070 OIT mounted on the enclosure door. A Hanna Instrument 983320 Conductivity Meter and a 981411 pH Meter provide display of operating conditions as well as alarm and control set points.

Electrical enclosure door mounted lights and switches are as follows:

POWER ON: A clear light which indicates that the control voltage is applied to the enclosure panel.

E-STOP: A latching push-button switch that will interrupt power to the PLC outputs and inputs causing the system equipment to immediately shut down. In case of an emergency, using this push button will bypass the normal shutdown procedure required to safeguard the equipment. The E-STOP switch must be pulled out and the E-STOP RESET button and the alarm reset button on the OIT pushed to restore power to PLC inputs and outputs and restart the machine. The E-STOP is lit when it is engaged and the control relay is not powered.

E-STOP RESET: A momentary push-button switch that will restore power after the E-STOP switch has been pushed (latched) and pulled out (unlatched).

1.2 Software

The SIEMENS S7222 PLC is programmed with SIEMENS Step 7-Micro Programming Software. The SIEMENS TP070 OIT is programmed with SIEMENS STEP 7-Toolbox Programming Software.

1.3 Operator Interface Terminal (OIT) Screen

The available screens for the PanelView are as listed:

START-UP: Contact information for customer.

OPERATION: Gives run options for machine, alarm, and status messages.

ALARM HISTORY: Displays last five alarms conditions.

STATUS: Displays last five operating conditions.

UTILITIES: Adjusts contrast, screen center, and allows user to clean display.

SET-UP: Allows user to clear alarm history, run time, and status.
Allows user to download new program information.

2.0 START-UP

The START-UP Screen is displayed upon start-up of the E-CE Series RO machine. This touch screen gives customer contact information.



Figure 2.1
Start-Up Screen

To get to the next screen, press anywhere on the screen or wait twenty (20) seconds.

2.1 Operation Screen

The Operation Screen displays the control function for the E-CE Series RO machine.

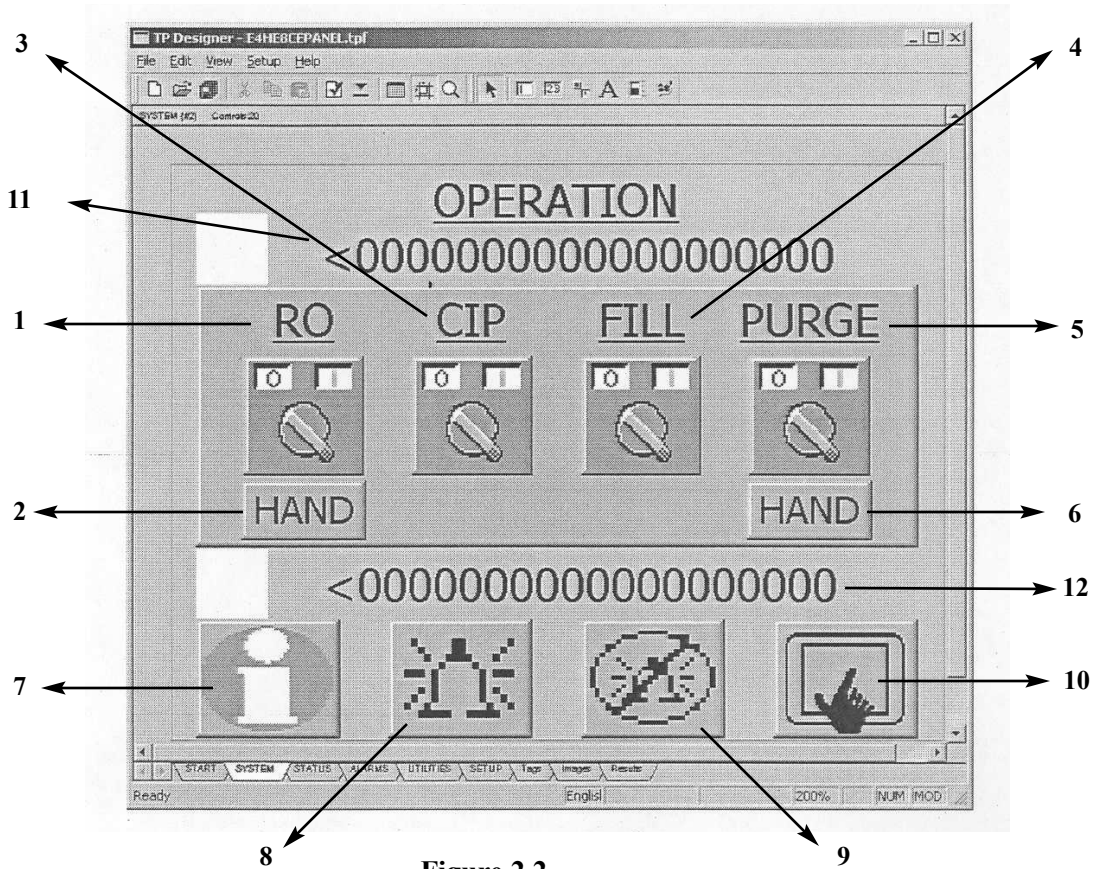


Figure 2.2
Operation Screen

NO.	FUNCTION	OPERATION	NO.	FUNCTION	OPERATION
1	RO	Switches machine to run	7	INFORMATION	Takes User to Information Screen
2	AUTO/HAND	Switches machine to Auto or Hand	8	ALARM	Takes User to Alarm Screen
3	CIP	Switches machine to CIP mode	9	ALARM RESET	Resets current Alarm
4	FILL	Energizes the inlet solenoid valve to fill machine	10	UTILITIES	Takes User to Utilities Screen
5	PURGE	Manually puts RO machine into Permeate Purge	11	ALARM MESSAGE	Displays current Alarm condition
6	AUTO/HAND	Switches the Permeate Purge to Auto or Hand	12	SYSTEM conditions	Displays current Operating conditions

The RO machine is controlled using the Operation Screen. The FILL button energizes the inlet solenoid valve allowing the RO machine to fill water. The machine will run for ten (10) minutes filling the machine. This needs to be done before the RO machine can operate. Once the machine has been filled the RO, CIP, and PURGE buttons will operate.

The RO button controls the RO machine when it is in Run Mode. If the RO machine is not in Run Mode, the RO button switches the RO machine from its current condition to Run Mode. In the AUTO position the RO machine will shut down without going into Permeate Purge.

The CIP button controls the RO machine when it is in CIP Mode. If the machine is not in CIP Mode, pressing this button (CIP) will switch the machine from its current mode to CIP Mode. See the Operation and Maintenance Manual (P/N 1161875) for details on running CIP. If the machine is in CIP Mode, pressing the button shuts the RO machine down.

The PURGE Button controls the Permeate Purge Cycle of the RO machine. If the RO machine is not in Purge Mode, pressing this button will switch the RO machine to Permeate Purge for ten (10) minutes and then turn the machine OFF. If the RO machine is in Purge Mode, pressing this button will shut down the machine.

The AUTO/HAND Button, located under the Purge Button, controls Permeate Purge operation. In the HAND position the RO machine will only go into Permeate Purge by manually pressing the Purge Button. In the AUTO position, the RO machine will go into Permeate Purge when the RO machine gets a signal from an external device, like a level switch.

The ALARM Button takes the user to the ALARM HISTORY Screen, described later (Section 2.3).

The INFORMATION Button takes the user to the MACHINE STATUS Screen, described later (Section 2.4).

The UTILITIES Button takes the user to the UTILITIES Screen, described later (Section 2.5).

The ALARM RESET Button is used to clear any alarm conditions, such as low inlet pressure, high permeate pressure, or motor overload. This button needs to be pressed before the RO machine will operate. The ALARM RESET Button on the Control Enclosure may need to be pressed as well.

The SYSTEM message, located under the Control Buttons, shows the user the current status of the machine. During shutdown, this message will display reason for shutdown.

2.2 Alarm History Screen

The ALARM Message, located above the Control Buttons, shows the user current Alarm Conditions.

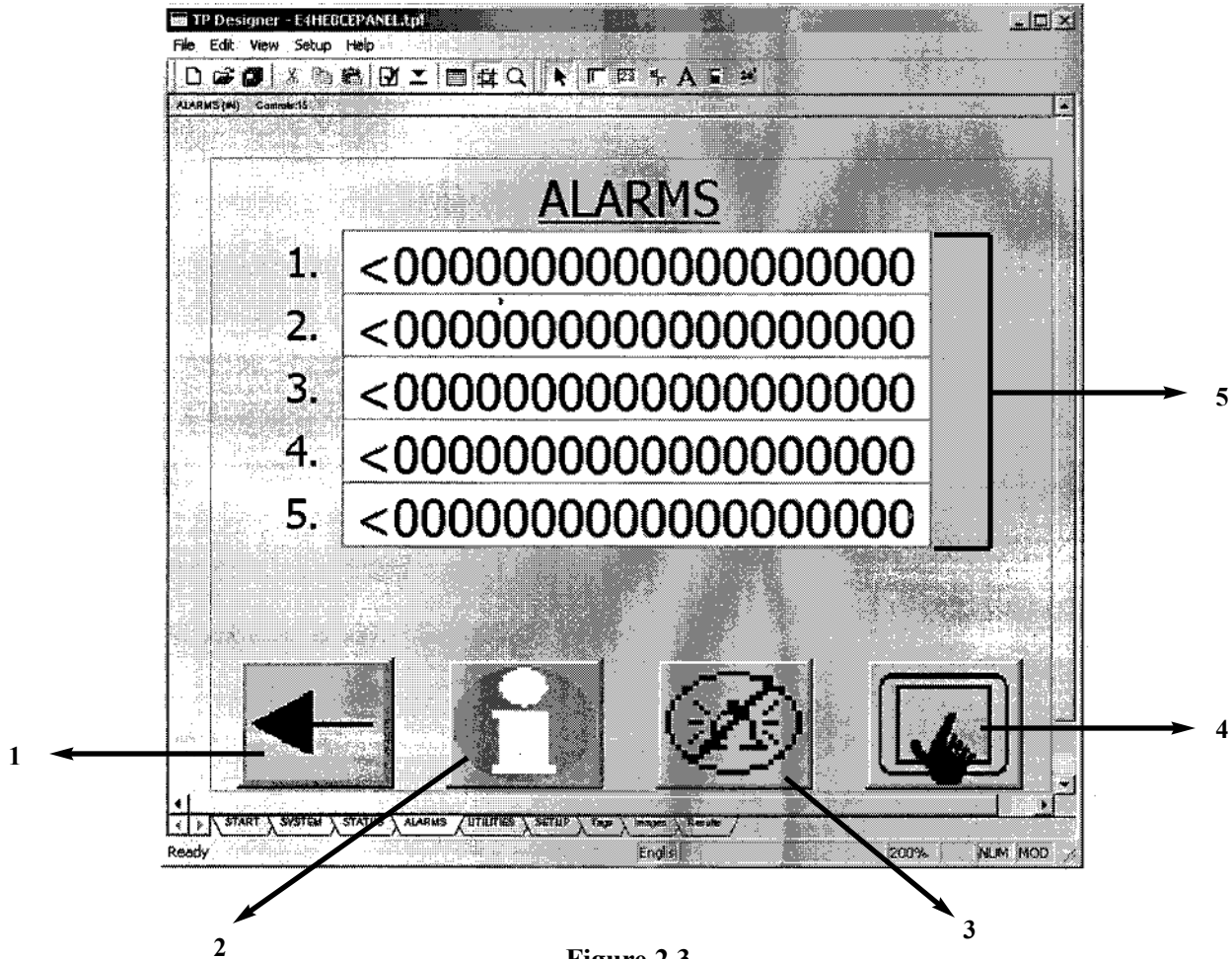


Figure 2.3
Alarm History Screen

NUMBER	FUNCTION	OPERATION
1	BACK	Takes user back to OPERATION Screen
2	ALARM	Takes user to ALARM Screen
3	ALARM RESET	Resets current ALARM conditions
4	UTILITIES	Takes users to UTILITIES Screen
5	ALARM HISTORY	Displays the last 5 Alarm Conditions

**Table 2.1
Alarm Messages**

ALARM DISPLAYED	ACTION	NOTES	DISPLAY (seconds)	FACTORY SET POINTS*
LOW INLET PRESSURE	Shuts down RO machine	Press ALARM RESET on OIT	12	Adjustable switch [set at 0.8 bar (12 psi)]
HI PERMEATE PRESSURE	Shuts down RO machine	Press ALARM RESET on OIT	0	Adjustable switch [set at 5.5 bar (80 psi)]
HI TEMP	Shuts down RO machine	Press ALARM RESET on OIT	0	Non-adjustable switch [set at 38°C (100°F)]
HIGH pH	Alarm light displayed on pH meter	RO machine will operate in alarm condition	None	Adjustable switch (set at 8.5)
HIGH CONDUCTIVITY	Shuts down RO machine	RO machine will operate in alarm condition	None	Adjustable (set at 50)
MOTOR 1 START FAILURE	Shuts down RO machine	Press ALARM RESET on OIT and on Control enclosure	0	Adjustable
E-STOPPED PRESSED	Shuts down RO machine	Press ALARM RESET on OIT on OIT and on Control enclosure	None	N/A

* Set at factory.

2.3 Machine Status Screen

The Machine Status Screen displays the last five run conditions.

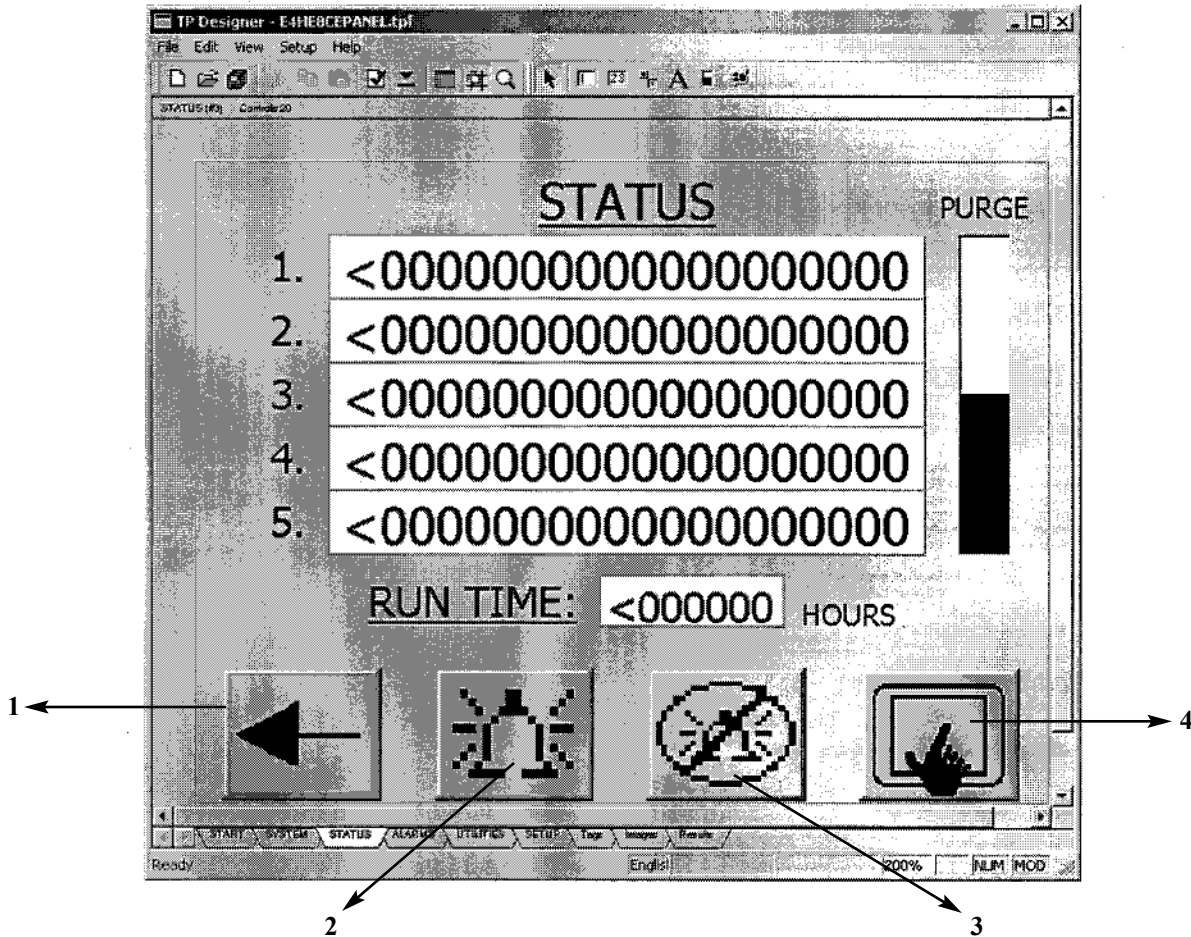


Figure 2.4
Machine Status Screen

NUMBER	FUNCTION	OPERATION
1	BACK	Takes user back to OPERATION Screen
2	ALARM	Takes user to ALARM Screen
3	ALARM RESET	Resets current ALARM Conditions
4	UTILITIES	Takes users to UTILITIES Screen

Table 2.2
Status Screen
System Message

SYSTEM MESSAGE	DEFINITION
RO MODE	Normal Operating Mode.
CIP MODE	Clean-In-Place Mode used for cleaning.
PERMEATE PURGE MODE	Permeate is “recycled” back through RO machine.
MANUAL SHUTDOWN	RO machine switched OFF by manually pressing ON/OFF button
ALARM SHUTDOWN	RO machine has shutdown due to one of the Alarms described in Table 2.1.
PRETREATMENT SERVICE	RO machine has shutdown due to a signal from pretreatment.
POST-TREATMENT SERVICE	RO machine has shutdown due to a signal from post-treatment.

2.4 Utilities Screen

The Utilities Screen allows the user to adjust contrast, screen center, and clean the display.

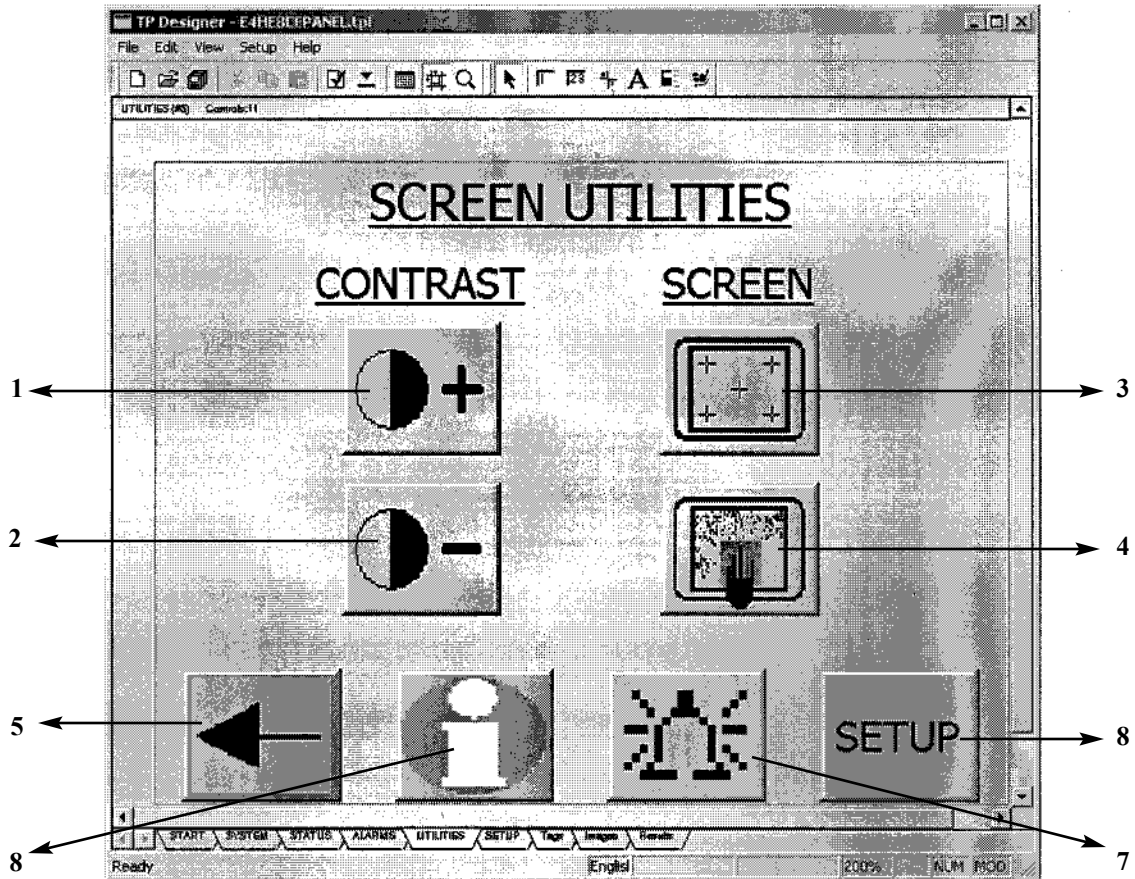


Figure 2.5
Utilities Screen

NO.	FUNCTION	OPERATION	NO.	FUNCTION	OPERATION
1	CONTRAST +	Darkens OIT Screen	5	BACK	Takes users back to previous screen
2	CONTRAST -	Lightens OIT Screen	6	INFORMATION	Takes users to Utilities Screen
3	CALIBRATE SCREEN	Allows users to adjust position of OIT Screen	7	ALARM	Takes users to Alarm Screen
4	CLEAN SCREEN	Allows users to adjust OIT Screen without changing RO machine Mode	8	SET-UP Screen	Takes users to Set-Up Screen

2.5 Set-Up Screen

The Set-Up Screen allows the users to clear Alarm History, run time, and status. This Screen allows users to download new program information.

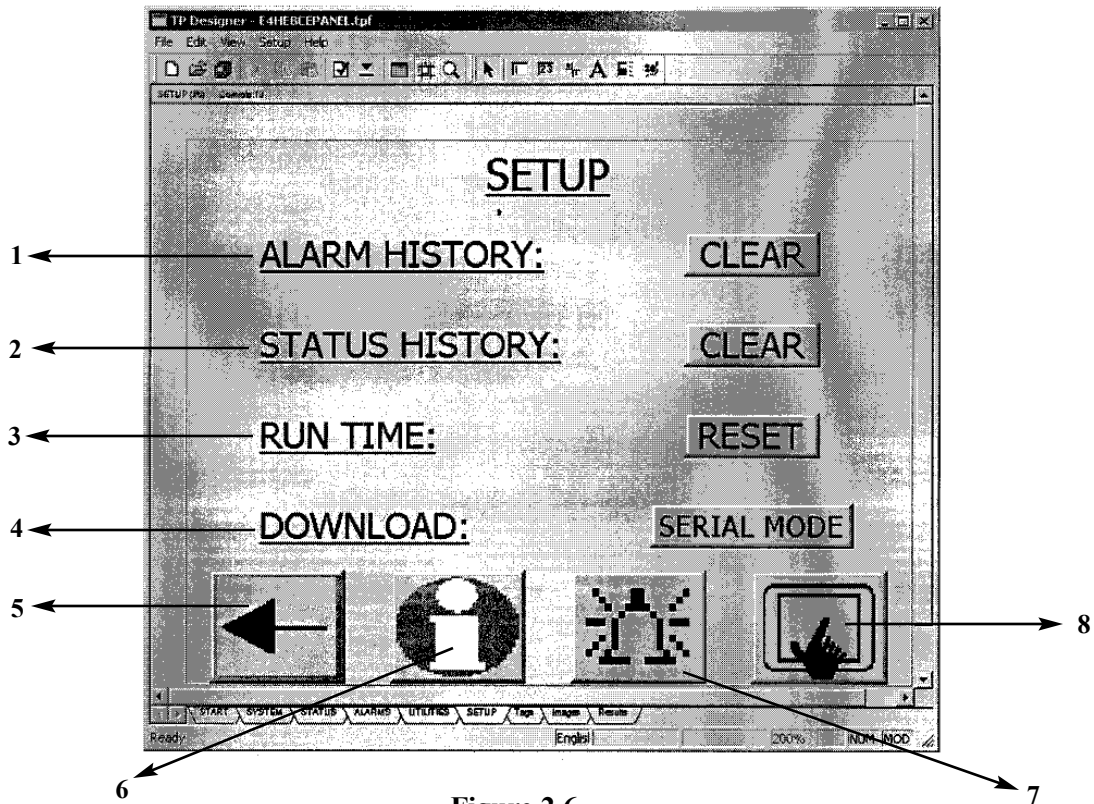


Figure 2.6
Screen Set-Up

NO.	FUNCTION	OPERATION	NO.	FUNCTION	OPERATION
1*	ALARM HISTORY	Clears history of Alarm conditions	5	BACK	Takes users back to previous screen
2*	STATUS HISTORY	Clears history of system conditions	6	INFORMATION	Takes users to Information Screen
3*	RUN TIME RESET	Allows users to adjust position of OIT Screen	7	UTILITIES Screen	Takes users to Utilities Screen
4	DOWNLOAD SERIAL MODE	Allows users to adjust OIT Screen without changing RO machine Mode	8	ALARM	Takes users to Alarm Screen

* Alarm History, Status History, and Run Time Reset Buttons must be held for 15 seconds to clear or reset.

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