

**On-Board[®] IS Cryopump System
Operation Guide**

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Any correspondence regarding this document should be forwarded to:

Helix Technology Corporation

Mansfield Corporate Center

Nine Hampshire Street

Mansfield, Massachusetts 02048-9171 U.S.A.

Telephone: (508) 337-5000

FAX: (508) 337-5464

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Safety Conventions

Introduction




All CTI-Cryogenics products are safe and dependable when used properly. Follow all safety precautions during installation, normal operation, and when servicing CTI-Cryogenics products.

This chapter explains the safety conventions used throughout this manual. CTI uses a specific format for cautions and warnings, which includes standard signal words and safety shapes.

See also the *Customer Support* appendix or call your local Customer Support Center for assistance.




Signal Word Descriptions

All cautions and warnings contain signal words, which call attention to safety messages and designate the degree of hazard seriousness. The following table shows the signal words and their meanings that may be used in this document.

Term	Example	Definition
CAUTION		A signal word accompanied by a safety shape that indicates a potentially hazardous situation or unsafe practice. If not avoided, the action may result in minor or moderate personal injury or equipment damage . A CAUTION is highlighted in yellow.
CAUTION		A signal word that indicates a situation or unsafe practice, which if not avoided may result in equipment damage . A CAUTION is highlighted in yellow.
WARNING		A signal word accompanied by a safety shape that indicates indicates a potentially hazardous situation. If not avoided, the action may result in serious injury or death . A WARNING is highlighted in orange.

Safety Shape Descriptions

All cautions and warnings contain safety shapes, which have specific safety meanings. The following table shows some of the safety shapes used in this document and their meanings.

Example	Term	Shape Definition
	General Warning	Indicates a general hazard. Details about this hazard should be noted in the safety notice explanation. Note that this shape may also be used with specific signal words.
	High Voltage	Indicates a high voltage hazard.
	Hot Surface	Indicates a surface is hot enough to cause discomfort or a burn.

References

For more information about safety standards, see the following documents:

- ISO 7010: 2003(E), Graphic symbols - Safety colours and safety signs - Safety signs used in workplaces and public areas
- ISO 3864-1: 2002(E), Graphic symbols - Safety colours and safety signs - Part 1: Design principles for safety signs in workplaces and public areas

Section 1 - Getting Started

Introduction

After you install the On-Board *IS* Cryopump System, use this guide to do the following:

- set system parameters
- start the system properly
- operate the system

The flowchart in [Figure 1-1](#) lists the steps required to verify proper installation of On-Board *IS* Cryopump components, system setup, and operation.

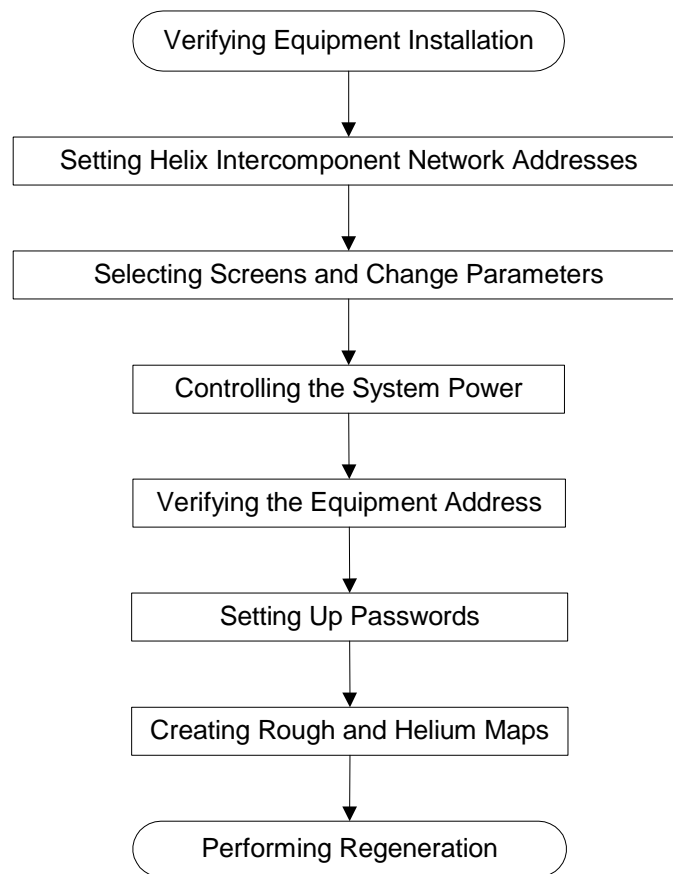


Figure 1-1: On-Board *IS* Cryopump System Operations

Verifying Equipment Installation

Make sure that all On-Board IS Cryopump System components are installed and connected to the Helix Intercomponent Network before beginning process tool operation.

On-Board IS Cryopumps

Make sure the On-Board IS Cryopumps are installed according to the directions found in the appropriate ***On-Board IS Cryopump Quick Installation Guide*** included with each Cryopump.

IS 1000 Compressor

Make sure the IS 1000 Compressors are installed according to the directions found in the ***On-Board IS 1000 Compressor Quick Installation Guide*** included with each Compressor.

IS Controller

Make sure the IS Controller is installed according to the directions found in either the *Rack Mount* or *Pump Mount* ***On-Board IS Controller Quick Installation Guide*** included with the Controller.

On-Board IS Remote

Make sure the On-Board IS Remote is installed according to the directions found in the ***On-Board IS Remote Quick Installation Guide***, included with the Remote.

Setting Helix Intercomponent Network Addresses

The Helix Intercomponent Network contains three channels; A, B and C. On-Board IS Cryopumps are connected to Channels A and B.

IS 1000 Compressors are connected to Channel C. Refer to [Figure 1-2](#) for an example of an On-Board IS Cryopump System.

After the On-Board IS Cryopumps, IS 1000 Compressors, and IS Controller are properly installed, set the respective network address for each system component.

Make sure the network communication does not fail, a network terminator is installed in the network cable connector on the last On-Board IS Cryopump or IS 1000 Compressor on each network channel.

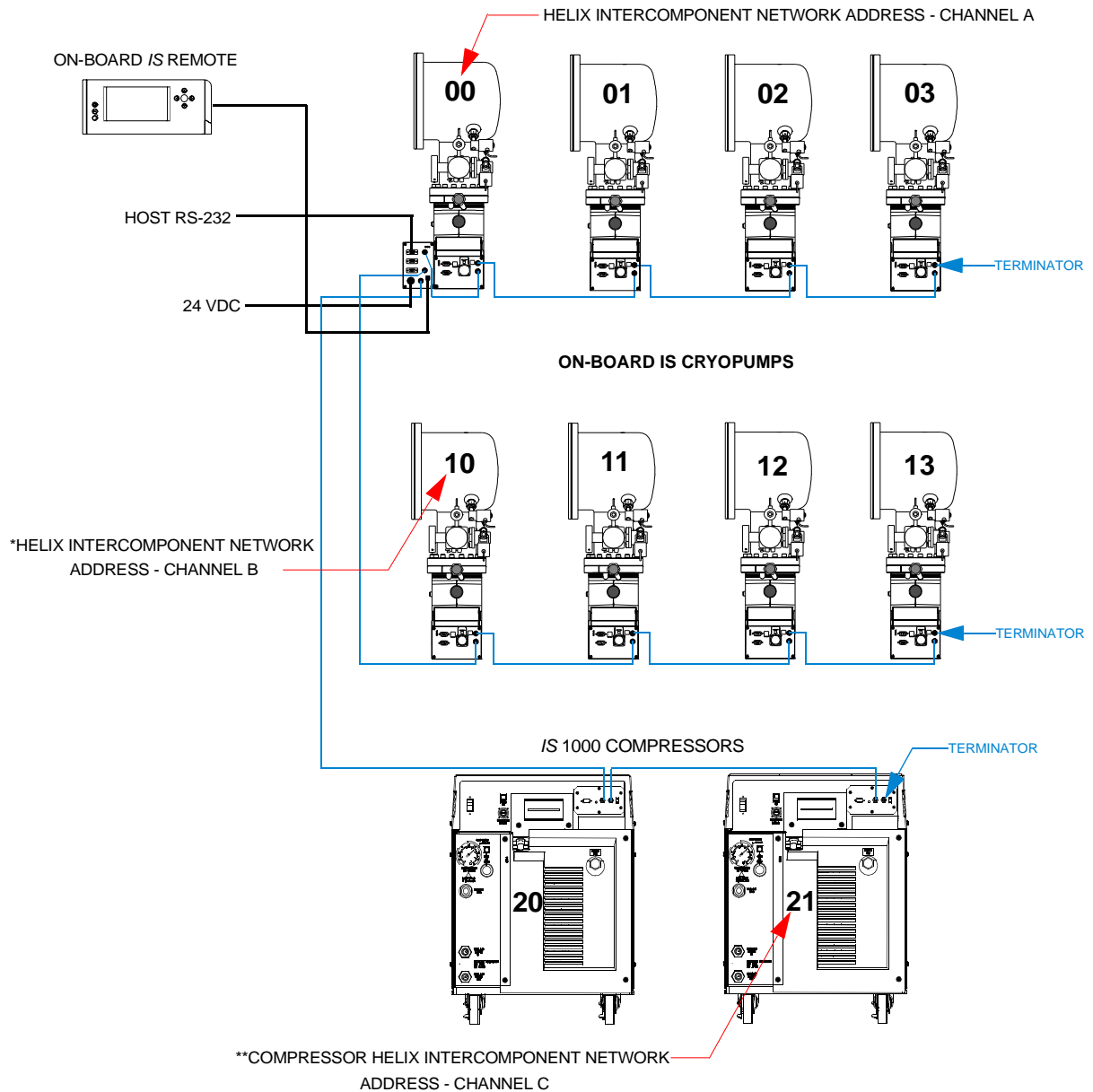


Figure 1-2: Typical Helix Intercomponent Network

**Note: If the address is set to 0, it appears as 10 on Channel B.*

***Note: If the address is set to 2, it appears as 20 on Channel C.*

On-Board IS Cryopump Addresses

1. Set the address switch for each On-Board IS Cryopump on channel A to the appropriate network address as shown in [Figure 1-3](#).
2. Set the address switch for each On-Board IS Cryopump on channel B to the appropriate network address as shown in [Figure 1-3](#).

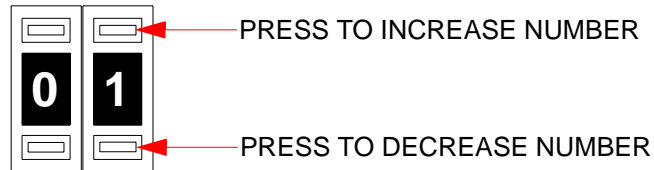
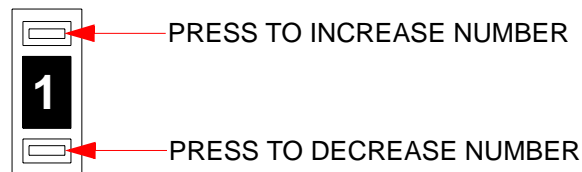


Figure 1-3: On-Board IS Cryopump Network Address Settings

IS 1000 Compressor Addresses

1. Set the address switch for each IS 1000 Compressor on channel C to the appropriate network address as shown in [Figure 1-4](#).



NOTE: The IS 1000 Compressor Address switch settings (0 - 9) are converted by the IS Controller and displayed as (20 - 29) on On-Board IS Remote.

Figure 1-4: IS 1000 Compressor Network Address Switch

Selecting Screens and Changing Parameters

Select screens and change values the same way, regardless of the screen. Use the following procedures to select screens and change values on the On-Board *IS* Remote shown in [Figure 1-5](#).

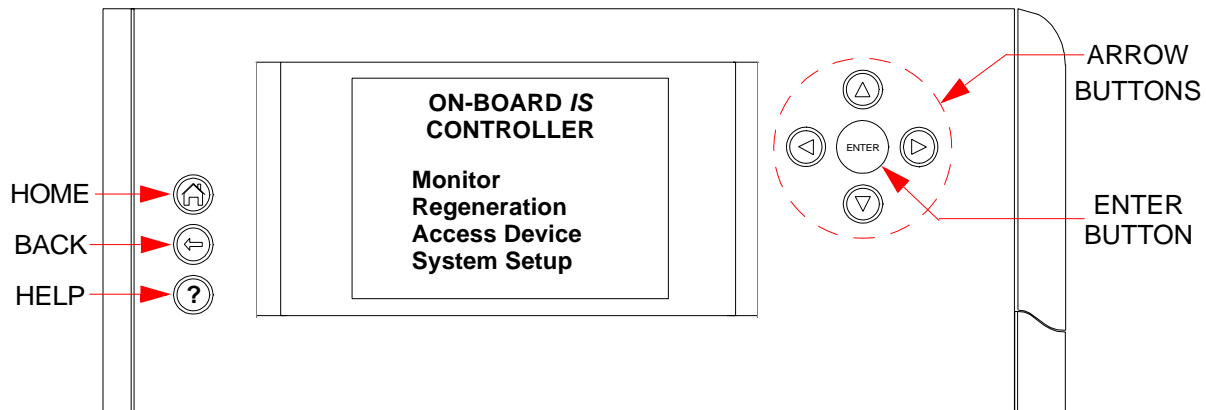


Figure 1-5: On-Board *IS* Remote

Screen Selection

1. Use the arrow buttons to select a screen.
2. Press the **ENTER** button. The selected screen appears.
3. Use the arrow buttons to move the cursor to a screen item.
4. Press the **ENTER** button. The selected screen appears.

Changing a Screen Parameter

1. Use the arrow buttons to select a screen.
2. Press the **ENTER** button. The selected screen appears.
3. Use the **LEFT/RIGHT** arrow buttons to move the cursor under the parameter you want to change.
4. Press the **ENTER** button. The parameter is underlined.
5. Use the **UP/DOWN** arrow buttons to change the value.
6. Press the **ENTER** button. The parameter shows the new value.

When the Remote Display is idle for 15 minutes, a screen saver appears and the display dims to its lowest level. Press any of the buttons on the remote display to turn off the screen saver and return the screen to its normal brightness.


Controlling the System Power

Turning Power On

After you set the Helix Intercomponent Network, turn power ON by doing the following:

1. Close all process chamber Hi-Vac valves.
2. Set the *IS* 1000 Compressor System Circuit Breaker to the **ON** (UP) position.
3. Set the *IS* 1000 Compressor Control Circuit Breaker to the **ON** (UP) position.
4. Set the power switch on the front panel of the *IS* 1000 Compressors to the **ON** position.
5. Set the local circuit breaker that supplies power to each On-Board *IS* Cryopump to the **ON** position.
6. Set the power switch on the 24 VDC *IS* Controller power supply to the **ON** position.
7. Proceed with “Selecting Screens and Changing Parameters”.

Turning Power Off

	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Pump Contamination</p> <p>To prevent pump contamination, perform a full regeneration cycle or a safe shutdown before you turn off the power to the On-Board <i>IS</i> Cryopump System.</p>
---	--

To perform a Full regeneration on a group of cryopumps:

1. Plug the remote display into the *IS* Controller.
2. Close all Hi-Vac valves between the On-Board *IS* Cryopumps and the vacuum system.
3. Use the arrow buttons to select **REGENERATION** from the *IS* Controller screen, and then press **ENTER**.
The Regeneration screen appears.
4. Use the arrow buttons to select **START** from the Regeneration screen.
5. Press the **ENTER** button. The Choose Regen Pumps screen appears.

6. Choose all pumps in the full regeneration cycle as follows:
 - a. Use the arrow buttons to select each pump for the full regeneration cycle.
 - b. Press **ENTER**. The box is highlighted.
 - c. Repeat steps [step a](#) through [step b](#) for each pump.
 - d. Press **ENTER**. The List to Regen screen appears.
7. Select **FULL** and press **ENTER**.
8. Select **YES** from the Start Regen screen. A full regeneration cycle starts.
9. After the **2nd Stage** temperature reaches 310K or 330K, use the arrow buttons to select **ABORT** from the Regeneration Status screen.
10. Press the **ENTER**.
11. Select **YES** from the Abort Regeneration screen, and then press **ENTER**. The full regeneration cycle aborts.
12. Turn the compressor **ON/OFF** switch to the **OFF** position.
13. Turn power **OFF** to each On-Board *IS* Cryopump.
14. Turn the roughing pump **OFF**.

To perform a safe shutdown on an individual cryopump:

Also see the safe shutdown description in [Section 3 - Performing Regeneration](#).

***NOTE:** This feature is only available on On-Board *IS* Cryopumps designed for Ion Implant processes, and only for individual cryopumps.*

1. Go to the Main Cryopump Screen.
2. Use the arrow buttons to select **CONTROL** and then press **ENTER**.
3. Use the arrow buttons to select **PUMP CONTROL** from the and then press **ENTER**.
4. Use the arrow buttons to select **SAFE SHUTDOWN** from the and then press **ENTER**.
5. Use the arrow buttons to select **YES** and then press **ENTER**.
This initiates the cryopump safe shutdown.

Verifying Equipment Address

After the address settings have been set and power is ON, verify the presence of each On-Board *IS* Cryopump and *IS* 1000 Compressor on the Helix Intercomponent Network by performing the following steps from the On-Board *IS* Remote.

Helix Intercomponent Network Addresses

Verify that each On-Board *IS* Cryopump appears as follows:

1. Select **MONITOR** and press **ENTER**. The Monitor Network screen appears.
2. Select **SHOW DEVICES** and press **ENTER**. The Network Devices screen appears.
3. Verify the number of actual pumps and compressors on the network with the number on the Network Devices screen.
4. Select **PUMPS** and press **ENTER**. The Network Pumps screen appears. Verify that each On-Board *IS* Cryopump is displayed as shown in [Figure 1-6](#).

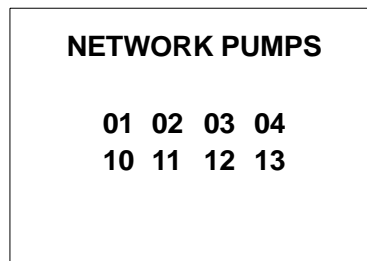


Figure 1-6: Network Pumps Screen Example

5. Press **BACK**. The Network Devices screen appears.
6. Select **COMPRESSORS**.
7. Press **ENTER**. The Network Compressor screen appears. Verify that each *IS* 1000 Compressor appears as shown in [Figure 1-7](#).

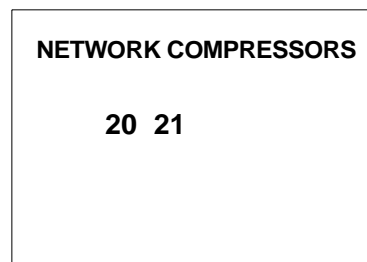


Figure 1-7: Network Compressor Screen Example

If an On-Board IS Cryopump or IS 1000 Compressor does not appear on the screen, make sure power is ON and all Helix Intercomponent Network cables are connected. Make sure a terminator is installed on the last Cryopump and Compressor on each network channel and the address switch is correct.

On-Board IS Cryopump Temperatures

Verify that first and second stage temperatures for each On-Board IS Cryopump appear as follows:

1. Select **MONITOR** then press **ENTER**. The Monitor Network screen appears.
2. Select **NETWORK STATUS** then press **ENTER**. The Network Status screen appears.
3. Select **PUMPS** then press **ENTER**. The Pump Temperature screen appears and the first and second stage temperatures are displayed as shown in [Figure 1-8](#).

PUMP TEMPS ID T1/T2 (K)			
01	290/295	02	289/291
03	289/291	04	290/294
10	287/290	11	289/290
12	290/289	13	288/289

Figure 1-8: Pump Address and Temperature Display Example

For example: *01 290/295* indicates that pump 01 has a first stage room temperature of 290K and second stage room temperature of 295K.

IS 1000 Compressor Information

Verify IS 1000 Compressor helium pressure, water temperature, and operating hours for each compressor appear as follows:

1. Select **ACCESS DEVICE** then press **ENTER**. The Access Network Device screen appears.
2. Select **COMPRESSORS** and press **ENTER**. The Network Compressors screen appears.
3. Select a compressor number from the Network Compressor Screen and press **ENTER**. The Compressor screen appears.

4. Verify that the helium supply and return pressure, delta pressure, water in/out temperature, and operating hours information appears as in [Figure 1-9](#).

COMPRESSOR 20	
Supply (psig)	378
Return (psig)	179
Delta (psig)	199
Water In (F)	77
Water Out (F)	93
Operating (h)	462

Figure 1-9: Compressor Display Example

Setting Up Passwords

This procedure establishes password protection for the IS Controller.

You can a numeric password to prevent unauthorized users from changing system parameters. Use the following procedure to establish a password.

1. Select **SYSTEM SETUP** from the Helix Intercomponent Network Controller screen and press **ENTER**. The System Setup screen appears.
2. Select **PASSWORD** and press **ENTER**. The Password Setup screen appears.
3. Select **PROTECTION** then press **ENTER**. The cursor moves under **OFF**.
4. Use the **UP/DOWN** arrow buttons to change the value from **OFF** to **ON**.
5. Press the **ENTER** button. The password protection parameter changes to **ON** and the password screen appears with the cursor located in the first number field of the password.
6. Enter the password as follows:
 - a. Use the **UP/DOWN** arrow buttons to change the first digit to the desired value.
 - b. Press the **RIGHT** arrow button to move the cursor to the next digit.
 - c. Use the **UP/DOWN** arrow buttons to change the number to the desired value.
 - d. Repeat [step b](#) through [step c](#) for each digit in the password.

The digits change to an asterisk after you press the right arrow.

- e. Press **ENTER**. The Confirm Password screen appears.
7. Repeat [step 6](#) to confirm the password. After you press **ENTER**, password is protected.

Performing the Next Step

Refer to [Section 2 - Creating Rough and Helium Maps](#) to establish rough and helium maps for the On-Board *IS* Cryopump System.



Section 2 - Creating Rough and Helium Maps

Introduction

This section explains how to create Rough maps and Helium maps. You must establish these maps to ensure optimum On-Board *IS* Cryopump performance.

Rough Maps

Use a rough map for multiple pump systems that share a rough pump through a rough manifold. See rough map examples shown in [Figure 2-1](#) and the equipment configuration for the map in [Figure 2-2](#).

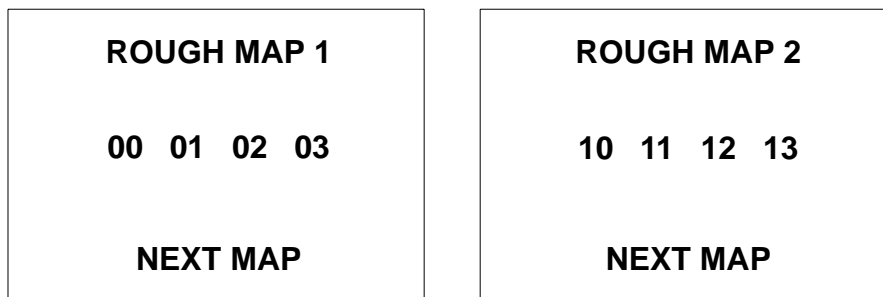


Figure 2-1: Rough Map Example

A rough map keeps track of the pumps are on each rough manifold. All On-Board *IS* Cryopumps connected to a single rough manifold are in the same map.

If your system has more than one rough manifold, then you can have more than one rough map. It is possible to have up to five rough maps in a multi-pump On-Board *IS* System. When the On-Board *IS* Cryopumps are properly mapped, the *IS* Controller coordinates the rough valves for both Full regeneration and FastRegen cycles.

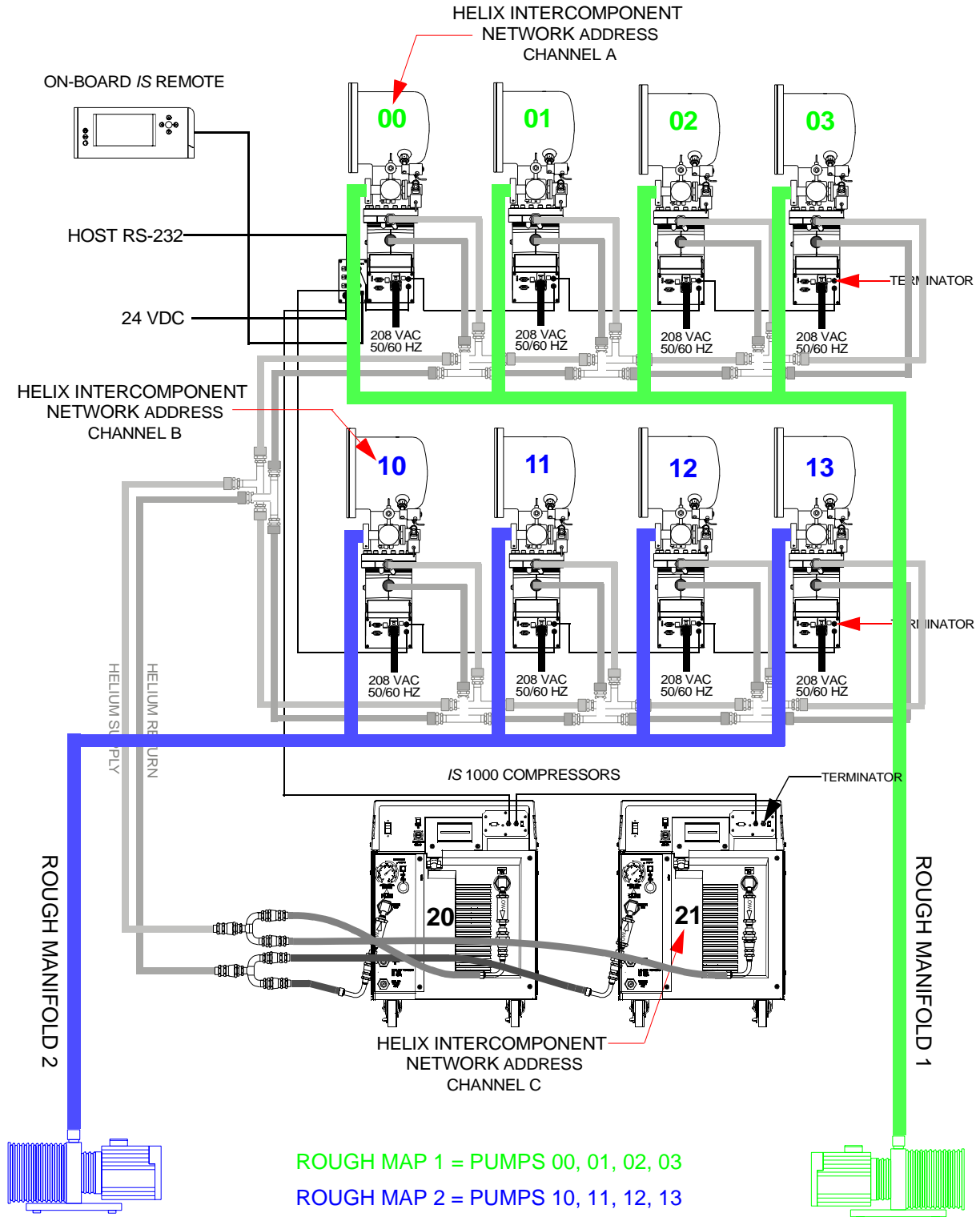


Figure 2-2: Rough Map Equipment Configuration Example

Creating a Rough Map

1. Use the arrow buttons to select **SYSTEM SETUP** from the *IS* Controller screen, and then press **ENTER**.
2. Select **REGENERATION** from the System Setup screen and then press Enter.
3. Select **ROUGH MAP** from the Regeneration Setup screen and then press **ENTER**.
4. Use the arrow buttons to change the map number to the appropriate value and then press **ENTER**.
5. Choose the pumps for the helium map as follows:
 - a. Use the arrow buttons to select a pump for the helium map.
 - b. Press **ENTER**. The box is highlighted.
 - c. Repeat [step a](#) through [step b](#) for each pump in the map.
 - d. Press **ENTER**. The Verify Rough Map screen appears.
6. Verify that the rough map information is correct.

If the information is correct, press **ENTER** to create the rough map.

If the information is *not* correct, press **BACK** to the appropriate screen and change the rough map parameters.

Coordinating Roughing

Ensure Full Rough Coordination and Power Fail Coordination are On. See the [System Setup Screen Description on page 5-16](#) for more information.

Helium Maps

A *helium map* establishes which On-Board *IS* Cryopumps are connected to the *IS* 1000 Compressor for each process tool. See the helium map example in [Figure 2-3](#) and the equipment configuration for the map in [Figure 2-4](#).

HELIUM MAP 1			
Pumps/Compressors:			
00	01	02	03
10	11	12	13
20	21		

Figure 2-3: Helium Map Example

Create a helium map for each process tool so that the IS Controller optimizes the flow of helium to all On-Board IS Cryopumps.

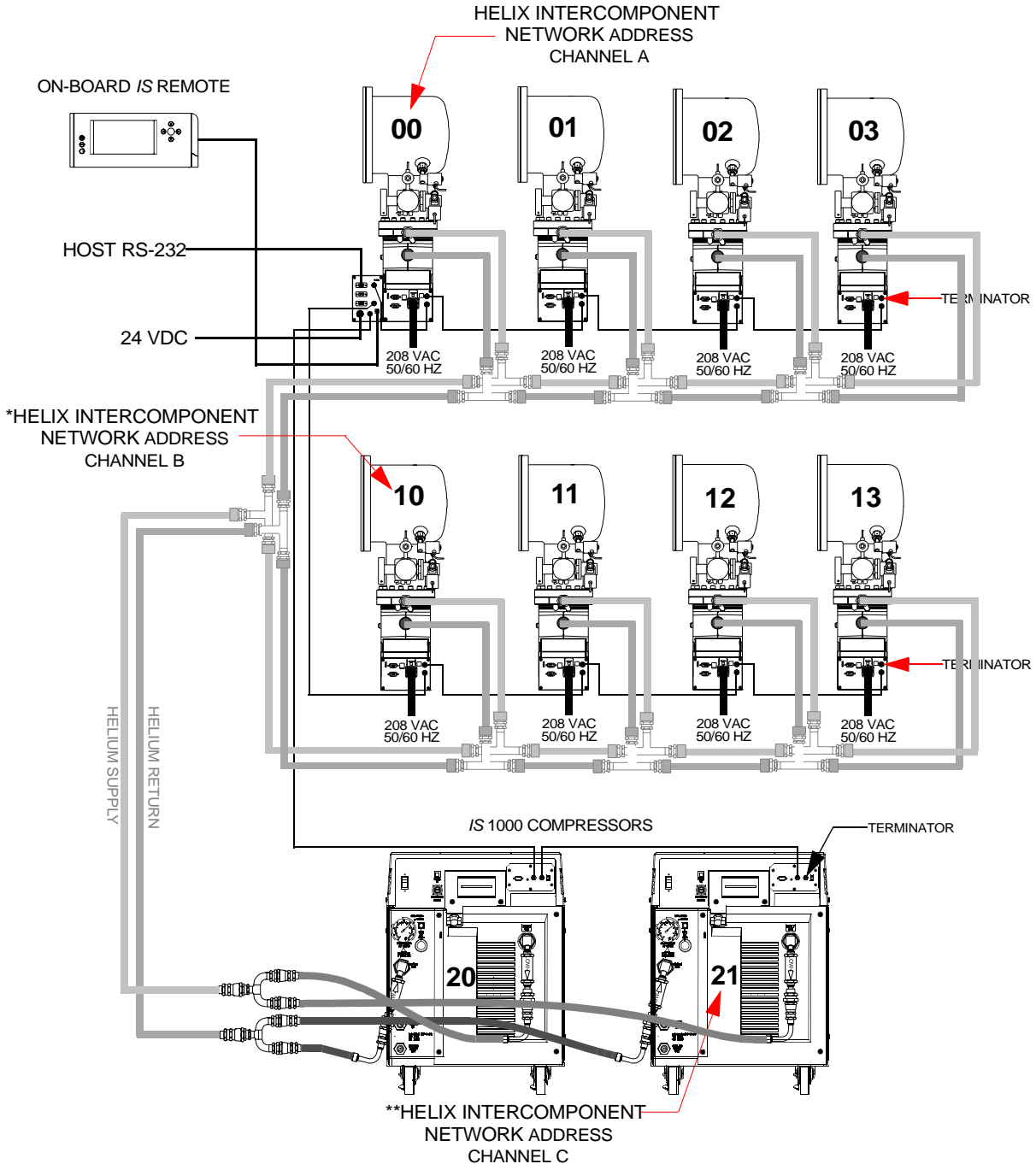


Figure 2-4: Helium Map Equipment Configuration Example

**Note: If the address is set to 0, it appears as 10 on Channel B.*

***Note: If the address is set to 2, it appears as 20 on Channel C.*

Creating a Helium Map

1. Use the arrow buttons to select **SYSTEM SETUP** from the *IS* Controller screen and then press **ENTER**.
2. Select **HELIUM** from the System Setup screen and then press **ENTER**.
3. Use the arrow buttons to select the helium map number and then press **ENTER**.
4. Choose the pumps for in the helium map as follows:
 - a. Use the arrow buttons to select a pump for the helium map.
 - b. Press **ENTER**. The box is highlighted.
 - c. Repeat [step a](#) through [step b](#) for each pump in the map.
 - d. Press **ENTER**. The Choose Compressors screen appears.
5. Choose the compressors to be included in the map as follows:
 - a. Use the arrow buttons to select a compressor for the helium map.
 - b. Press **ENTER**. The box is highlighted.
 - c. Repeat [step a](#) through [step b](#) for each compressor in the map.
 - d. Press **ENTER**. The Verify Helium Map screen appears.
6. Verify that the helium map information is correct.

If the information is correct, press **ENTER** to create the helium map.

If the information is *not* correct, press **BACK** to the appropriate screen and change the helium map parameters.

Performing the Next Step

Refer to “Performing Regeneration” to establish regeneration parameters, create a regeneration map and initiate a full regeneration cycle for the On-Board *IS* Cryopump System.



Section 3 - Performing Regeneration

Introduction

After the regeneration parameters have been established, a Full regeneration cycle is required to cool the On-Board *IS* Cryopumps to operating temperature.

Description of Regeneration

Use the Regeneration function of the *IS* Controller to initiate a Full or Fast regeneration cycle on your cryopump. After initiated, the On-Board *IS* System automatically sequences your pump through the various phases of the regeneration cycle.

A Full regeneration cycle allows the cryopump to warm-up to room temperature (or slightly higher for Implant pumps) so that both gases and water vapor collected on the arrays are purged from the pump. After the contaminants are purged, the cryopump becomes cold again.

In many cases, there is little water pumped and so it is not necessary to warm the pump to room temperature. If the pump is primarily filled with such gases as argon, nitrogen, or hydrogen, then the pump can be regenerated using a Fast Regeneration cycle. A Fast regeneration cycle only warms the cryopump enough to release the gases condensed on the arrays and trapped within the charcoal. This allows the regeneration cycle to be completed in less than an hour in many cases.


One of the key process steps in a Fast regeneration cycle is the removal of the condensed gas by means of the rough pump. It is important that the condensed gas be removed quickly as the pump warms up, and that a certain minimum base pressure in the cryopump be achieved quickly. Because of these requirements, it is necessary for cryopumps that share a common rough pump to be coordinated. That is, the start of regeneration, the opening and closing of the rough valves and the purge valves on multi-pump On-Board *IS* Cryopump systems must happen at very specific times and in unison. These are coordinated by the *IS* Controller. The rough valves are coordinated for both Fast and Full regeneration cycles although for different reasons.

Typically, regeneration is a function that is part of overall periodic maintenance for a cryopump system: frequency is dependent upon your particular pump application, but the cycle can be manually started at any time.

The Regeneration program incorporates a number of parameters that are preset at the factory, such as RATE-OF-RISE (10u/min.) and default base pressure (50 microns). Use the On-Board IS Remote Controller to reprogram the settings, within limits. This is normally done prior to the start of a regeneration cycle. You can also delay the start and completion of a regeneration cycle. For example, you may want to do this to regenerate and start up your cryopump system during a weekend shutdown.

Description of Partial Regeneration Through Safe Shutdown

Safe shutdown is a partial regeneration of the cryopump. This automated procedure vents all gases from within the cryopump as with a normal implant-specific regeneration. All normal interlocks associated with regeneration are enforced. When the cryopump completes the warm-up phase of the regeneration cycle, the process finishes. This leaves a cryopump ready to be serviced.

	<p style="text-align: center;">⚠ WARNING</p> <p style="text-align: center;">Toxic Materials</p> <p>Internal surfaces of the cryopump may contain process specific toxic or corrosive materials, even after regeneration is complete. Adhere to all safety protocols as appropriate, and avoid touching internal surfaces.</p>
--	---

Safe shutdown is available on cryopumps specifically designed for Ion Implant processes. Contact Helix Technology Corporation (see [Appendix A - Customer Support Information](#)) for an application review if you have questions regarding whether your cryopumps should have implant-specific software.

Setting Regeneration Parameters

The On-Board IS Cryopump Module contains factory-set regeneration parameters that are listed in [Table B-1](#). To change the default regeneration parameters, the Remote Display must either be directly on through the Access Device of the Controller or connected to each On-Board IS Cryopump.

Change the Regeneration parameters on each On-Board *IS* Cryopump as follows:

NOTE: Refer to the [Selecting Screens and Changing Parameters in Section 6 - Using On-Board IS Cryopump Screens](#) for more information on Regeneration screen parameters.

1. Select **SYSTEM SETUP** from the On-Board *IS* Cryopump Controller screen and then press **ENTER**. The System Setup screen appears.
2. Select **REGENERATION** and press **ENTER**. The Regeneration Setup screen appears.
For default regeneration parameters, see [Table B-1](#).
3. Select **PURGE** then press **ENTER**. The Purge Setup screen appears.
4. Set the Purge Setup values as follows:
 - a. Use the arrow buttons to move the cursor under the parameter to be changed.
 - b. Press the **ENTER** button. The parameter to be changed will be underlined.
 - c. Use the arrow buttons to change the value.
 - d. Press the **ENTER** button. The parameter will be changed to the new value.
5. Press **BACK**. The Regeneration Setup screen appears.
6. Select **ROUGHING** then press **ENTER**. The Rough Setup screen appears.
 - a. Use the arrow buttons to move the cursor under the parameter to be changed.
 - b. Press the **ENTER** button. The parameter you want to change is underlined.
 - c. Use the arrow buttons to change the value.
 - d. Press the **ENTER** button. The parameter changes to the new value.
7. Press **BACK**. The Regeneration Setup screen appears.
8. Select **DELAY** and then press **ENTER**. The Delay Setup screen appears.
 - a. Use the arrow buttons to move the cursor under the parameter you want to change.

- b. Press the **ENTER** button. The parameter you want to change is underlined.
- c. Use the arrow buttons to change the value.
- d. Press the **ENTER** button. The parameter changes to the new value.

Regeneration Maps

Create a *regeneration map* when you want to regenerate a group of On-Board IS Cryopumps together. See the regeneration map in [Figure 3-1](#) and the equipment configuration for the map in [Figure 3-2](#).

NOTE: *The Cryopumps in the regeneration map may or may not be in the same rough map.*

<p>LIST TO REGEN</p> <p>01 02 12 13</p> <p>START FAST REGEN START FULL REGEN</p>
--

Figure 3-1: Regeneration Map Example

An On-Board IS Cryopump System can have up to five Regeneration Groups. When the regeneration starts, the IS Controller coordinates the rough manifold for each Regeneration Group and rough map.

For the FastRegen cycle, an On-Board IS Cryopump must use the rough valve at specific times, so if there is more than one On-Board IS Cryopump on a rough manifold, they must all be roughed at the same time. To do this, start and run all On-Board IS Cryopump on the same rough manifold at the same time.

This also means that if there is a On-Board IS Cryopump in the process of FastRegen cycle, then no other Cryopump on that rough manifold can start a FastRegen cycle until that Cryopump is finished.

Note that if you restart a single pump regeneration while others are in a group regeneration, the restarted pump finishes last.

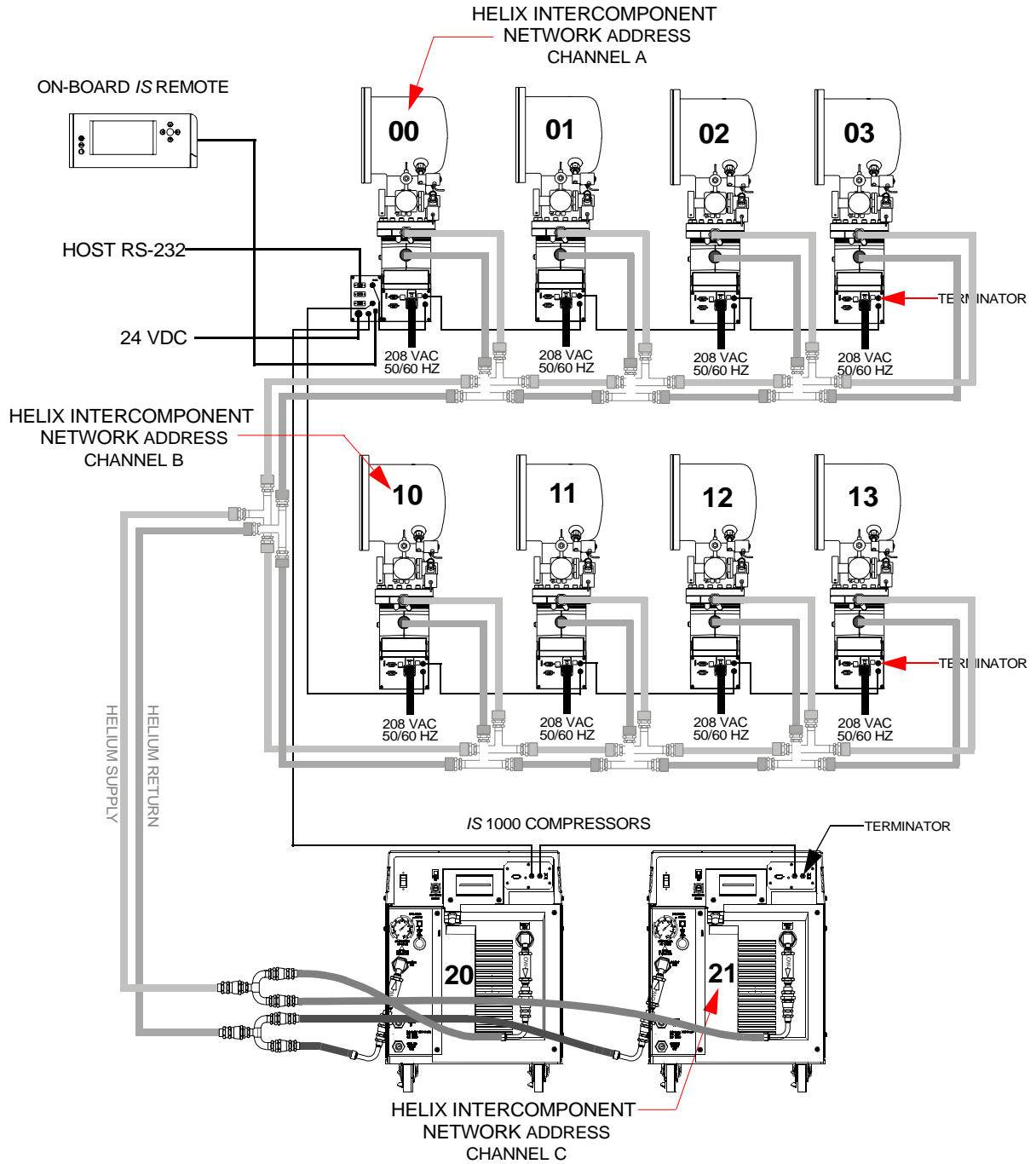


Figure 3-2: Regeneration Map Equipment Configuration Example

Initiating a Full Regeneration Cycle

After setting all the regeneration parameters, run a full regeneration cycle to cool the On-Board *IS* Cryopumps to operating temperature.

1. Close all process tool chamber gate valves.
2. Use the arrow buttons to select **REGENERATION** from the *IS* Controller screen and press **ENTER**. The Regeneration screen will be displayed.
3. Use the arrow buttons to select **START** from the Regeneration screen.
4. Press the **ENTER** button. The Choose Regen Pumps screen appears.
5. Choose the pumps for the full regeneration cycle as follows:
 - a. Use the arrow buttons to select a pump for the full regeneration cycle.
 - b. Press **ENTER**. The box is highlighted.
 - c. Repeat [step a](#) through [step b](#) for each pump in the full regeneration cycle.
 - d. Select **ENTER** and then press **ENTER**. The List to Regen screen appears.
6. Select **FULL** and press **ENTER**.
7. Select **YES** from the Start Regen screen. A full regeneration cycle starts.

Performing the Next Step

After completing the full regeneration cycle, use the On-Board *IS* Cryopump system for process tool operation.

Section 4 - IntelliPurge

Introduction

IntelliPurge is available on cryopumps specifically designed for ion implant applications. Contact Helix Technology Corporation for an application review if you have questions regarding whether your cryopumps should have IntelliPurge.

IntelliPurge is a fully integrated, intelligent power-loss management system. This system is responsible for safely minimizing the amount of downtime associated with unexpected power loss. The IntelliPurge system consists of several key components:

1. IntelliPurge control board (integrated into the cryopump control system).

This board includes:

- a. Gate valve control circuitry.
 - b. Uninterruptible Power Supply back-up for the normally open pump purge valve.
2. Normally open, UPS-protected pump purge valve.
 3. Normally open, non-UPS protected exhaust purge valve.

IntelliPurge does not supply back-up power for the entire cryopump. Only the purge valve that controls whether nitrogen enters the vacuum space (the “pump purge valve”) is backed by the UPS.

IntelliPurge is designed to react under the following general conditions:

1. There is a loss of power to a cryopump that was running and cold.
2. There is an unexpected rise in cryopump temperature.
3. The cryopump cannot read its temperature.

In each case, the On-Board IS Cryopump for Implant isolates, interlocks, and purges the cryopump as appropriate.

One possible exception to these rules is that upon recovery from power failure the cryopump is not be purged if the second stage temperature is below the “Power Failure Recovery” (PFR) temperature set-point. PFR parameters are On or Cool (see following sections). In this case the cryopump attempts to cooldown and resume normal operation.

The normally open exhaust purge valve purges the exhaust line during periods of power failure or regeneration. When any regeneration has been initiated, the cryopump exhaust purge will pre-purge for 2 minutes while the pump is still running (it is not technically in regeneration yet and, at this stage, can be aborted). This action is intended to completely clear the exhaust line of the cryopump of air before any potentially combustible gases that are condensed in the cryopump reach that region.

During FastRegen™, the exhaust purge will stay open during the initial purge / rough cycles of the cryopump itself. During Full Regeneration, the exhaust purge will stay open as part of the initial “safe-purge” period, then close.

If a second stage bad diode (temperature sensor) is detected for 3 seconds, the cryopump closes the gate valve and initiates “safe-purge.”

Safe Purge

Safe purge is a 5-minute purge with the pump purge and exhaust purge valves locked open. A safe purge may be initiated immediately by the cryopump if condition 2 or condition 3 arises. During a host or operator initiated Full Regeneration, the safe purge is included as part of the Regeneration process. The user or host is not allowed to close the purge valves during this portion of the regeneration. An automatically initiated “safe purge” cannot be aborted, and a Full Regeneration should be initiated after the safe purge period has elapsed. FastRegen performs the duty of the “safe purge” (i.e. hydrogen removal from the pump) but does not include a “safe purge” as defined within this document.

Gate Valve Integration

The cryopump has the ability to close the gate valve when certain conditions arise. It can only open the gate valve if the host commands it to do so, and no unsafe conditions exist.

The cryopump also senses the gate valve position. If the pump reads that the gate valve is sensed in a different position than last commanded, the pump will generate an error. This error must be acknowledged by the system user either through the On-Board IS remote or through the host system. When the error is acknowledged, the cryopump will close the gate valve and verify that the gate valve is in the closed position to reset itself. Refer to the On-Board IS Command Set document, part number 8040677, for the host commands required to acknowledge and clear a gate valve error. The remote display sequence for acknowledging and clearing a gate valve error are included in [Section 6 - Using On-Board IS Cryopump Screens](#).

Cryopump hardware generates square waves that are used for the gate valve sensing. This is to avoid the possibility of other signals causing an improperly read position.

Loss of Power

IntelliPurge is built with a limited energy storage uninterruptible power supply. If there is a loss of power, the cryopump does not purge the cryopump body for two minutes. These two minutes are considered a conservative amount of time that the cryopump “coasts” before its temperature rises above a point at which the pump would not be able to recover.

When power is restored, the cryopump performs a power failure recovery procedure, which checks the cryopump temperature and compares it to a user programmable value (Power Fail Recovery [PFR] set-point, default = 25K). The cryopump attempts to recover itself (cool back down if PFR is On or Cool) if its temperature is below the set-point. If it is above the set-point, then it initiates a “safe purge,” and possibly a Full Regeneration (if PFR setting is On). If the PFR is set to Cool, the cryopump remains idle until the temperature is greater than 34K.

If the power failure occurs during regeneration, the cryopump actions are dependent on the PFR setting. If Power Failure Recovery is set to On, the pump checks where it was in the regeneration cycle, and its current temperature and pressure conditions. It uses this information to decide whether to complete the regeneration or initiate a new one. If Power Failure Recover is set to Cool, then the cryopump stays idle. At a minimum, if the pump had not completed a safe purge, then one is completed prior to allowing the host to act.

During any loss of power, the gate valve immediately closes (normally closed valve), and the exhaust purge valve (normally open valve) immediately opens.

Unexpected Temperature Rise

If an unexpected temperature rise occurs, the cryopump provides a user programmable value (18-34K, with default of 22K), at which the cryopump automatically closes the gate valve. If the temperature exceeds a hard-coded value of 35K, then the cryopump attempts to close the gate valve, and initiates a safe purge of the cryopump and the exhaust line. In this condition, confirmation of the gate valve position (through position sensors) is not required to allow safe purge to commence. A second user programmable value (20-34K) is available within the cryopump to provide a relay operation to signal a high temperature alarm. See [Section 3 - Performing Regeneration](#) for details about setting the high temperature

alarm value through the Remote Display or the On-Board IS Command Set. See part number 8040677 for details about setting this value through the host interface.

Temperature Sensor (Diode) Failure

If the cryopump is not able to determine its temperatures due to a diode failure, the cryopump closes the gate valve, and initiates safe purge. Though this may cause unexpected downtime, safe operation of the cryopump in a hydrogen-rich environment requires the cryopump to accurately know its temperature.

Over-ride Relay

IntelliPurge hardware allows for the host (by applying a 12V-72V signal) to disable power to the IntelliPurge hardware. This action closes the cryopump gate valve and opens the exhaust purge valve. After two minutes, the body purge opens. This is not used in normal operations, but allows for the host to bring the pump to a safe condition if there are no responses from the cryopump system.

IntelliPurge I/O

Refer to the *On-Board IS Installation Manual*, part number 8040596, for the pin descriptions of the IntelliPurge control module.

Other Features

When regeneration is initiated, the pump attempts to close the gate valve. If it cannot confirm that the gate valve was closed, the regeneration is aborted, and the pump remains on.

Some OEMs may run the gate valve control cabling through an OEM provided chamber pressure interlock relay.

Section 5 - IS Controller Screen Descriptions

Introduction to IS Controller Functions

With the *IS* Controller Main screen, shown in [Figure 5-1](#), you can choose various software functions. You may do this when the On-Board *IS* Remote is connected to the *IS* Controller.

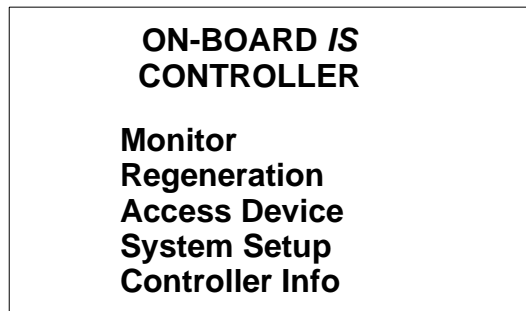


Figure 5-1: IS Controller Main Screen

Monitor Function

Use the Monitor function to view the status of network data and configurations. Refer to the [Monitor Screen Description](#) within this section for more information.

Regeneration Function

Use the Regeneration function to establish regeneration cycle information on user-selected On-Board *IS* Cryopumps. Refer to [Regeneration Screen](#) within this section for more information.

Access Device Function

Use the Access Device function to start a session with an On-Board *IS* Cryopump or other device on the network. Refer to [Access Device Screen Description](#) within this section for more information.

System Setup Function

Use the System Setup function to change and display the configuration of the *IS* Controller. Refer to [System Setup Screen Description](#) within this section for more information.

Monitor Screen Description

With the Monitor Network screen you can observe the cryopump state, regeneration information, valve status, and temperature control information of the On-Board IS Cryopump.

NOTE: You cannot change the screen parameters while you use the MONITOR function.

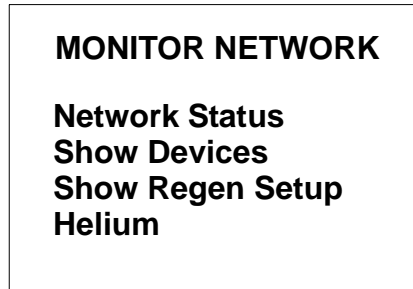


Figure 5-2: Monitor Screen

Network Status

Use the Network Status screen to monitor pumps and compressors on the network.

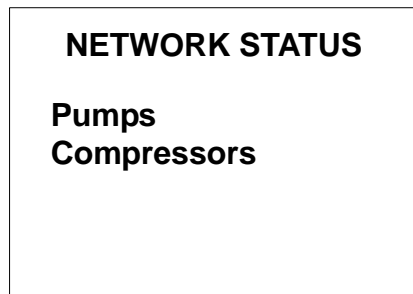


Figure 5-3: Network Status Screen

Pump Temperatures

The Pump Temperatures screen displays the first and second stage cryopump temperatures for all pumps on the network. Use the down arrow button to scroll down the pump list.

If an On-Board IS Waterpump is on the network, the temperature appears as NA.

PUMP TEMPS ID T1/T2 (K)		
01	35/12	02 120/108
03	150/84	04 50/37
05	43/40	06 123/75
07	99/8	

Figure 5-4: Pump Temperatures Screen

Compressor Pressures

The Compressor Pressures screen shows the supply and difference in supply and return pressure for all compressors on the network.

IS COMPRESSORS (SupplyP/DeltaP)	
20	390/205

Figure 5-5: Compressor Pressures Screen

Show Devices

The Network Devices screen shows a list of equipment types and quantity of equipment on the network.

NETWORK DEVICES	
Pumps	12
Compressors	6

Figure 5-6: Show Devices Screen

Network Pumps

The Network Pumps screen identifies all On-Board *IS* Cryopumps on the network.

NETWORK PUMPS				
00	01	02	03	04
05	06	09	12	17
18	19			

Figure 5-7: Network Pumps Screen

Network Compressors

The Network Compressors screen identifies all *IS* 1000 Compressors on the network.

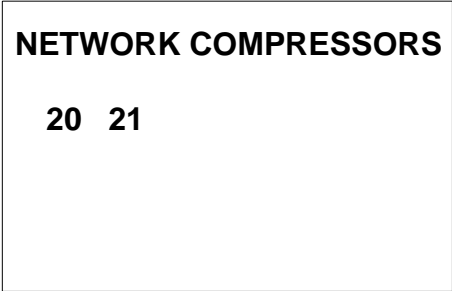


Figure 5-8: Network Compressors Screen

Show Regeneration Setup

Use the Regeneration screen to turn rough valve coordination and power failure recovery ON or OFF, and to review rough maps.

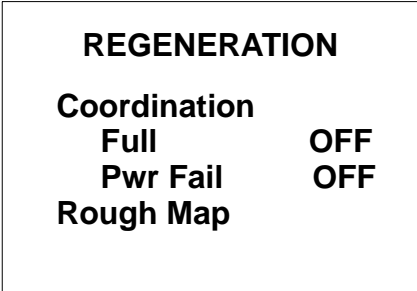


Figure 5-9: Regeneration Screen

Rough Map

The Rough Map screen shows the first of 5 rough maps.

To view additional rough maps, select NEXT MAP.

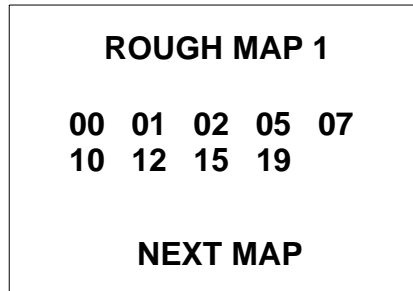


Figure 5-10: Rough Map Screen

Helium

Use the Helium Management screen to review helium maps.

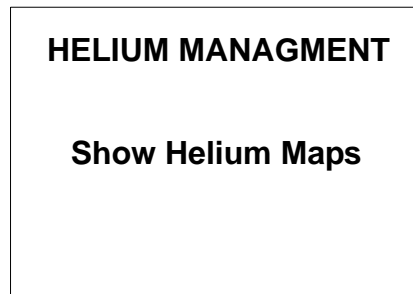


Figure 5-11: Helium Management Screen

Show Helium Maps

The Show Helium Maps screen shows helium maps 1 through 5.

To view additional helium maps, select NEXT MAP.

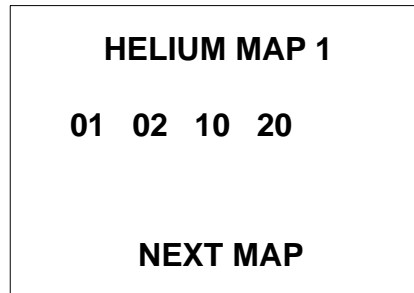


Figure 5-12: Show Helium Maps Screen

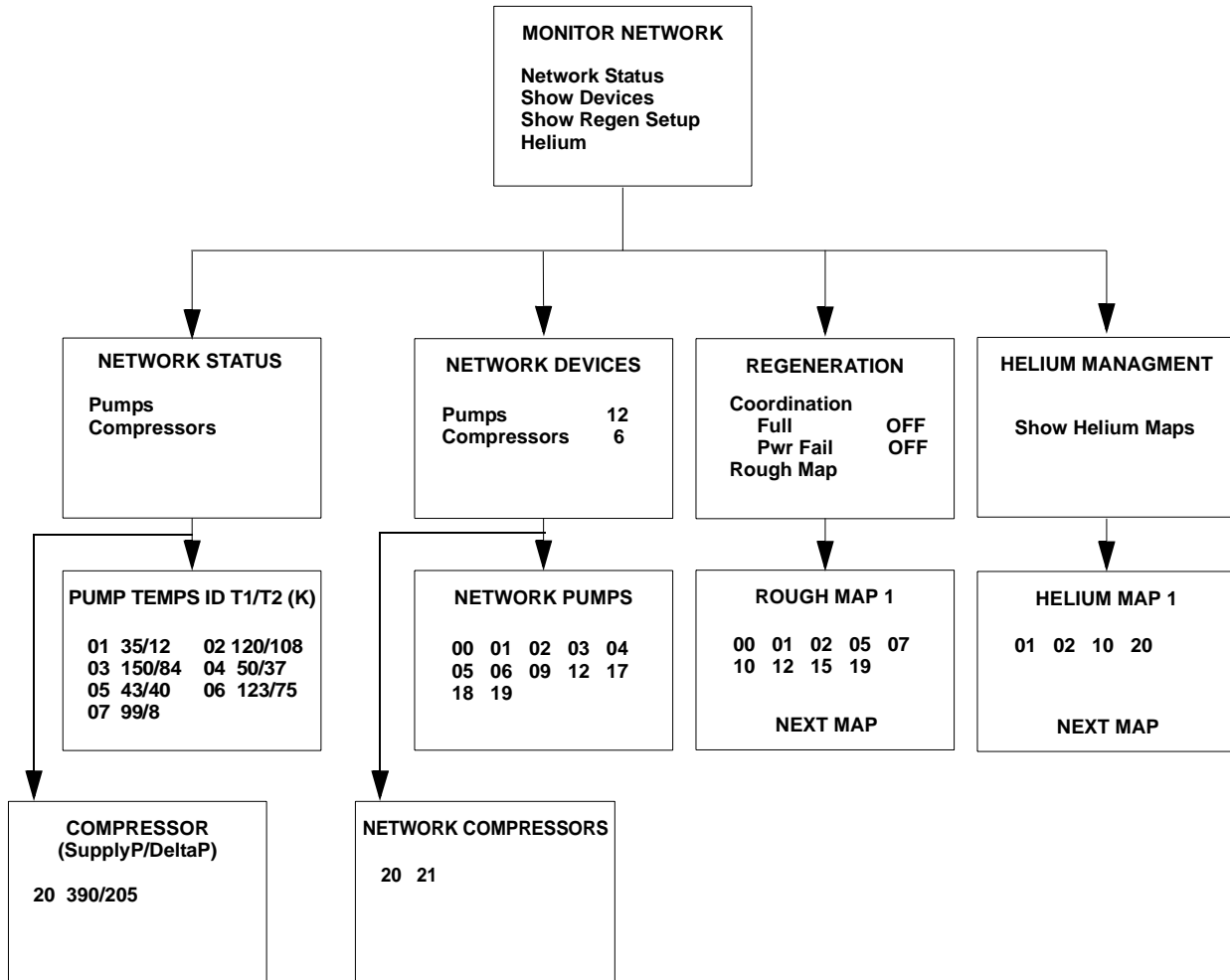
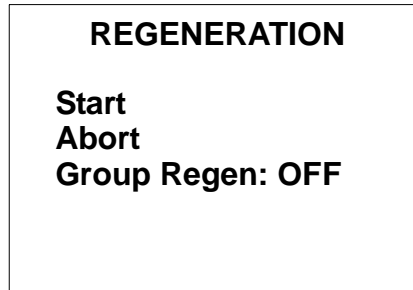


Figure 5-13: Monitor Screens

Regeneration Screen

Use the Regeneration screen to start or abort a group regeneration cycle. The current group regeneration state also appears.

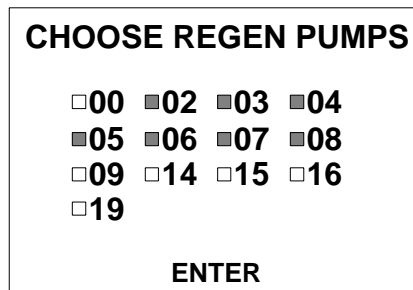


A rectangular screen with a black border. At the top, the word "REGENERATION" is centered in bold. Below it, the words "Start" and "Abort" are listed vertically. At the bottom, the text "Group Regen: OFF" is displayed.

Figure 5-14: Regeneration Screen

Group Regeneration

Use the Group Regeneration to select the On-Board *IS* Cryopumps on the network to be regenerated.



A rectangular screen with a black border. At the top, the text "CHOOSE REGEN PUMPS" is centered in bold. Below it, there are four rows of checkboxes with numbers: the first row has checkboxes for 00, 02, 03, and 04; the second row has checkboxes for 05, 06, 07, and 08; the third row has checkboxes for 09, 14, 15, and 16; and the fourth row has a checkbox for 19. At the bottom, the word "ENTER" is centered.

Figure 5-15: Group Regeneration Pumps Screen

Regeneration List Verification

The Regeneration List Verification screen shows the previously selected On-Board IS Cryopumps to be regenerated. Then you can choose a Fast or a Full regeneration cycle.

NOTE: If *NO* is selected, the Regeneration screen appears.

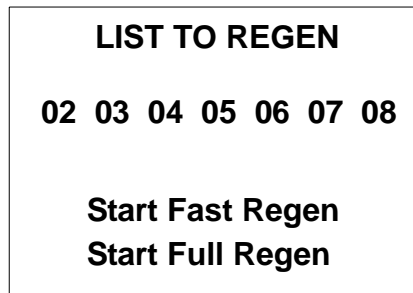


Figure 5-16: Start Fast Regeneration Cycle Screen

Regeneration Verification Screen

Use the Regeneration Verification screen to verify the regeneration cycle selected.

Selecting *YES* initiates the desired regeneration cycle.

Selecting *NO* returns you to the previous screen.

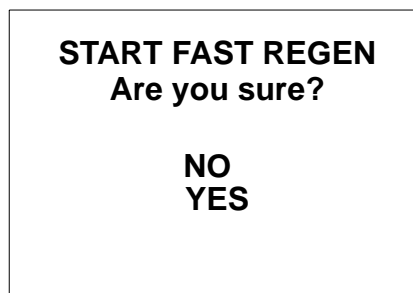


Figure 5-17: Regeneration Verification Screen

NOTE: If the selected On-Board IS Cryopumps cannot be regenerated, a screen appears explaining the reason.

Regeneration Abort

The Regeneration Abort screen verifies that you want to abort a regeneration cycle.

Selecting *YES* causes the regeneration cycle to be aborted. You must press the **BACK** button to return to the Regeneration screen.

Selecting *NO* causes the Regeneration Status screen to appear.

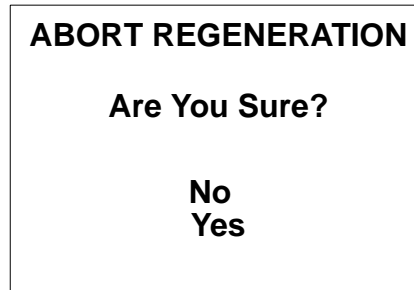


Figure 5-18: Regeneration Abort Screen

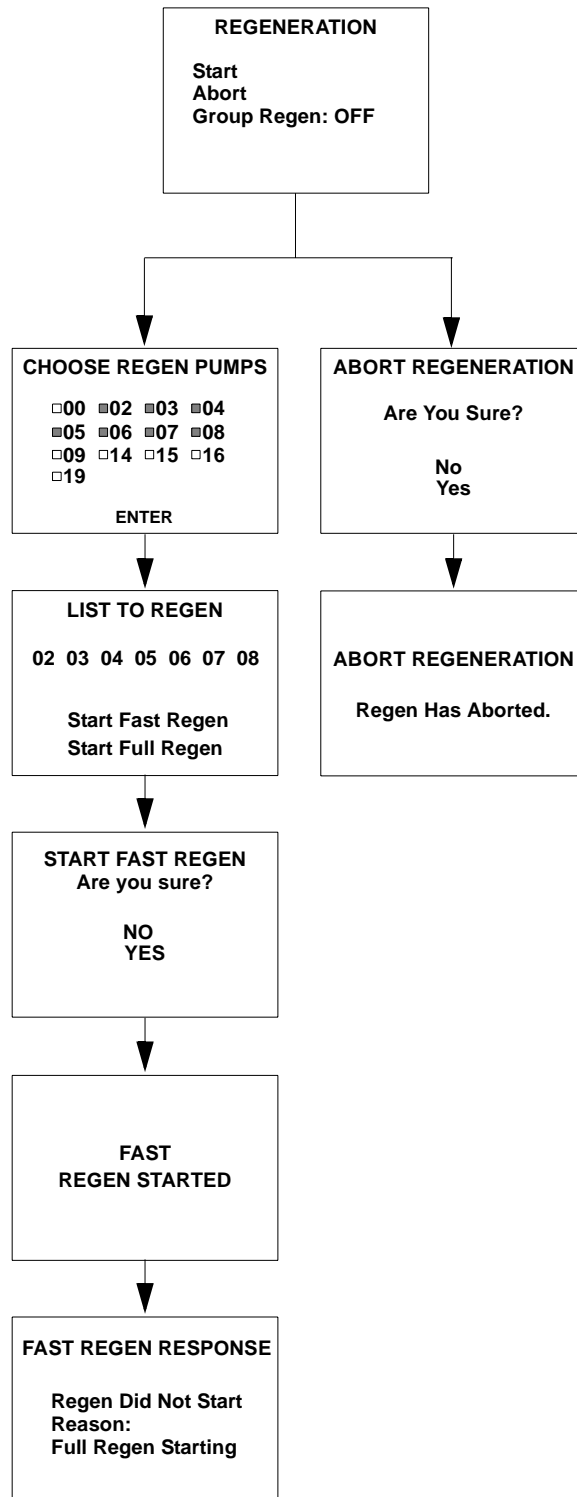
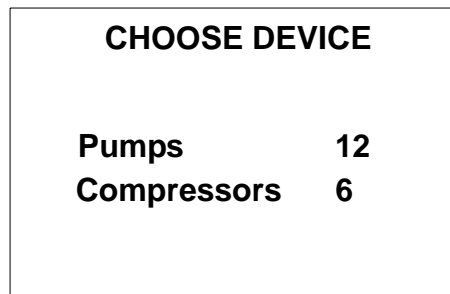


Figure 5-19: Regeneration Screens

Access Device Screen Description

Use the Choose Device screen to choose an individual On-Board *IS* Cryopump or other network device. The Choose Device display indicates the type and number of devices currently on the On-Board *IS* Intercomponent Network.

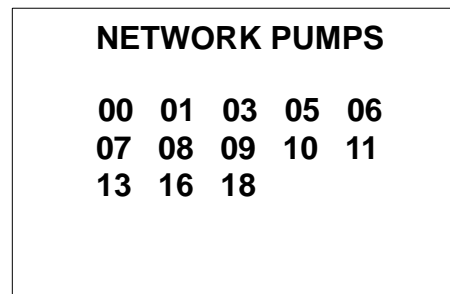


CHOOSE DEVICE	
Pumps	12
Compressors	6

Figure 5-20: Choose Device Screen

Network Pumps

Use the Network Pumps screen to select a pump number from a list of pumps on the network.



NETWORK PUMPS				
00	01	03	05	06
07	08	09	10	11
13	16	18		

Figure 5-21: Network Pump Screen

After you select a pump, the main On-Board *IS* Cryopump screen appears as shown in [Figure 5-22](#).

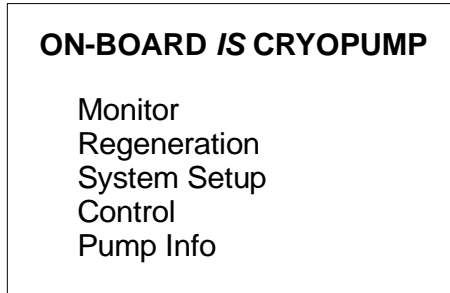


Figure 5-22: On-Board *IS* Pump Information Screen

Network Compressors

Use the Network Compressors screen to select an *IS* 1000 Compressor number from a list of pumps on the network.

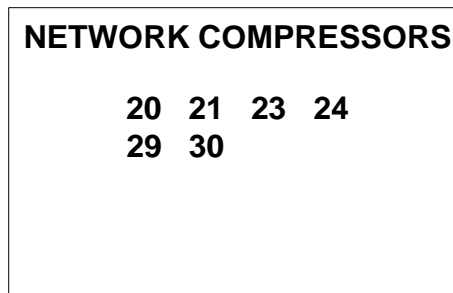


Figure 5-23: Network Compressor Screen

After the compressor has been selected, the *IS* 1000 Compressor information screen appears as shown in [Figure 5-24](#).

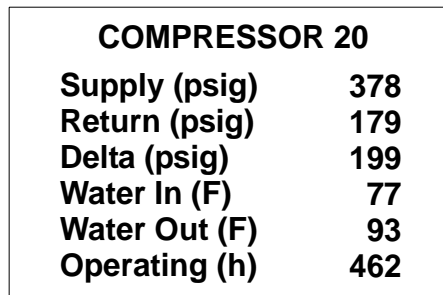


Figure 5-24: *IS* 1000 Compressor Information Screen

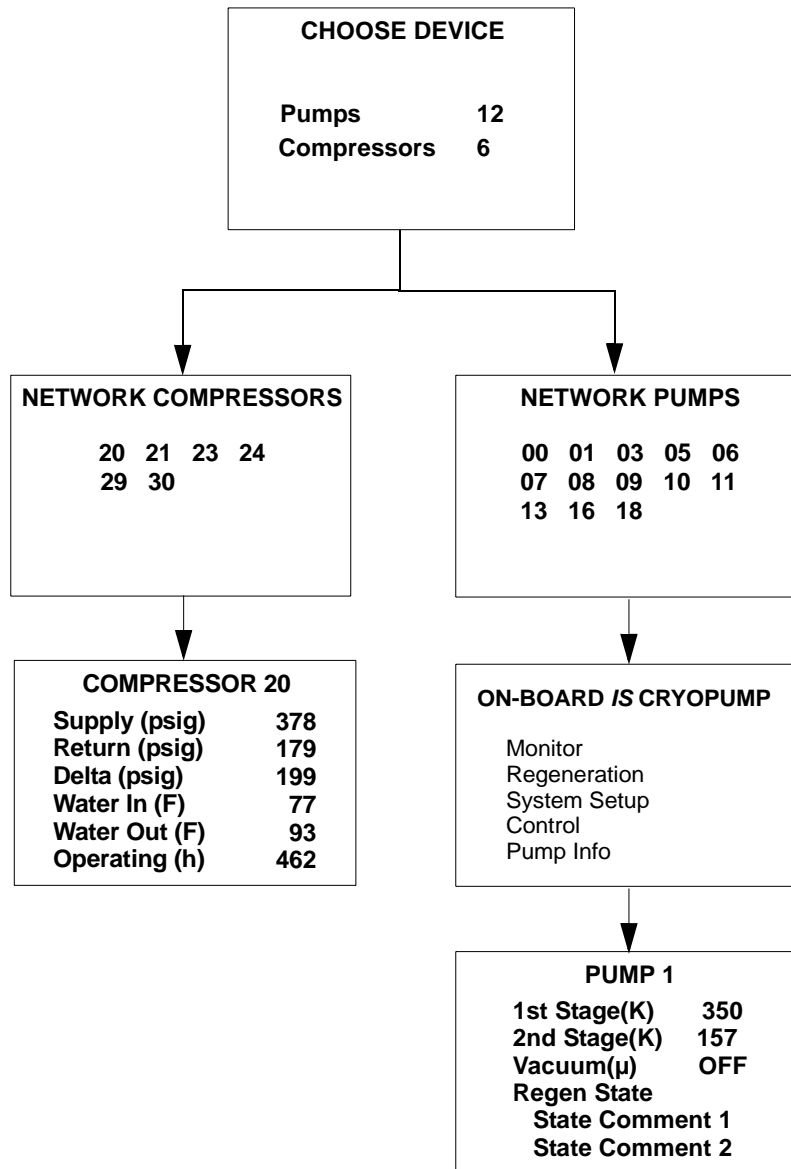


Figure 5-25: Access Network Device Screens

System Setup Screen Description

Through the System Setup screen, you can access regeneration, security, communication station ID, power failure, and relay subsystem configurations. The screen is password protected.

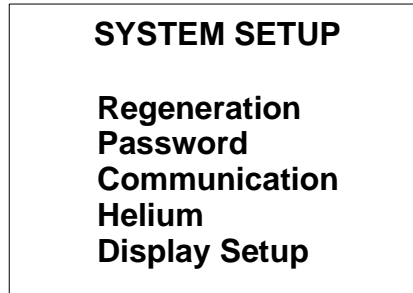


Figure 5-26: System Setup Screen

Regeneration Setup

Use the Regeneration Setup screen to configure regeneration parameters. You can also control Full coordination or power fail coordination with this screen.

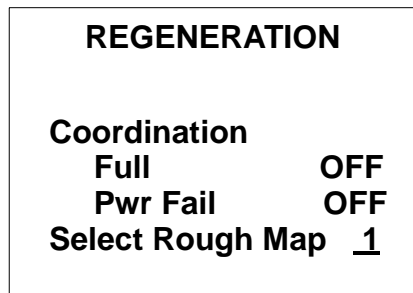
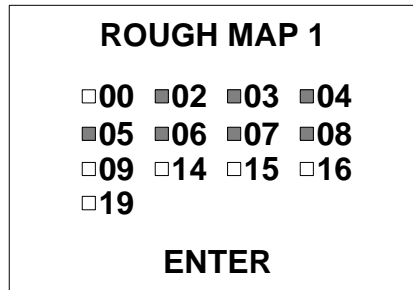


Figure 5-27: Regeneration Setup Screen

Rough Map

Use the Rough Map screen to select the On-Board *IS* Cryopumps to include in the rough map.



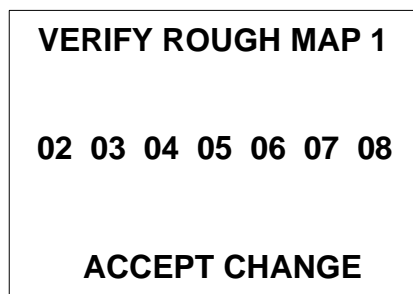
ROUGH MAP 1

00 02 03 04
05 06 07 08
09 14 15 16
19

ENTER

Figure 5-28: Rough Map Screen

After you select **ACCEPT CHANGE**, the rough map screen appears with the On-Board *IS* Cryopumps included in the rough map.



VERIFY ROUGH MAP 1

02 03 04 05 06 07 08

ACCEPT CHANGE

Figure 5-29: Verify Rough Map Screen

Password Setup

Use the Password Setup screen to establish or change a numeric password and enable or disable password protection.



Figure 5-30: Password Setup Screen

When password protection is turned ON, you are prompted to enter a password to access *IS* Controller software.



Figure 5-31: Entering a Password Screen

After you enter a password, a password confirmation screen appears.



Figure 5-32: Confirm Password Screen

Password Reset

If you forget a password, you can reset it to a factory default value of 9999.

Use the password reset function from the Main screen by pressing the *Left* and *Right* arrow keys simultaneously.

A password verification screen appears to verify the password must be reset. Answering Yes resets the password to 9999. Answering NO does not change the password.

Communication

Use the Communication screen to set the communication baud rate to the *IS* Controller.

Baud Rate

The *IS* Controller determines which ports are available (a minimum of two and maximum of three) and lists the ports on the Communication screen.

COMMUNICATION	
Set Port BAUD Rate:	
Host	9600
Service	9600
Aux	9600

Figure 5-33: Communication Baud Rate Screen

Helium

Use the Helium screen to select which helium map to configure. Enter the number of the helium map and press enter to view the helium map.

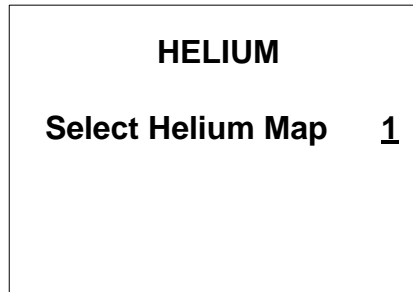


Figure 5-34: Choosing Helium Maps Screen

Choose Helium Map for Pumps

Use the Choose Map Pumps screen to select which On-Board *IS* Cryopumps are included in the helium map.

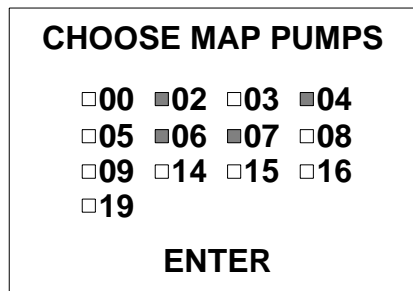


Figure 5-35: Choosing Helium Maps Screen

Choose Helium Map for Compressors

Use the Choose Compressors screen to select which On-Board *IS* Compressors are included in the helium map.

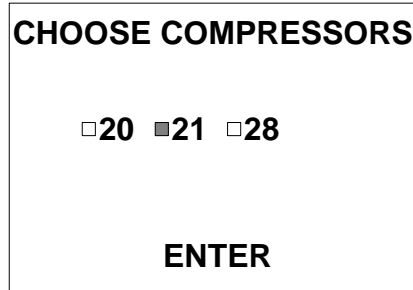


Figure 5-36: Choosing Helium Maps Screen

Verify Helium Map Setup

Use the Verify Helium Map Setup screen to verify and accept the On-Board *IS* Cryopumps and *IS* 1000 Compressors in the helium map.

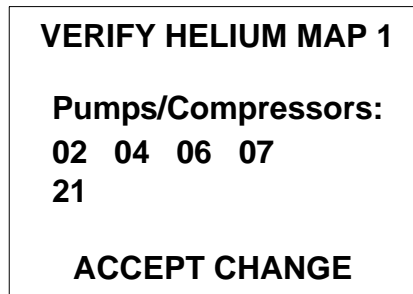


Figure 5-37: Verify Helium Map Screen

Display Setup

Use the IS Remote Setup screen to configure the On-Board IS Remote parameters. Refer to [Table 5-1](#) for parameter values.

IS REMOTE SETUP	
RD Ver. X.X	
Brightness	5
Volume	5
Screen Time out	60
Set Default	

Figure 5-38: On-Board IS Remote Setup Screen

Table 5-1: IS Remote Setup Parameters

Parameter	Default Value	Range of Values
Brightness	0	0 (Brightest) - 15
Volume	16	0 - 16 (Loudest)
Screen Time-out	15	0 - 60 minutes

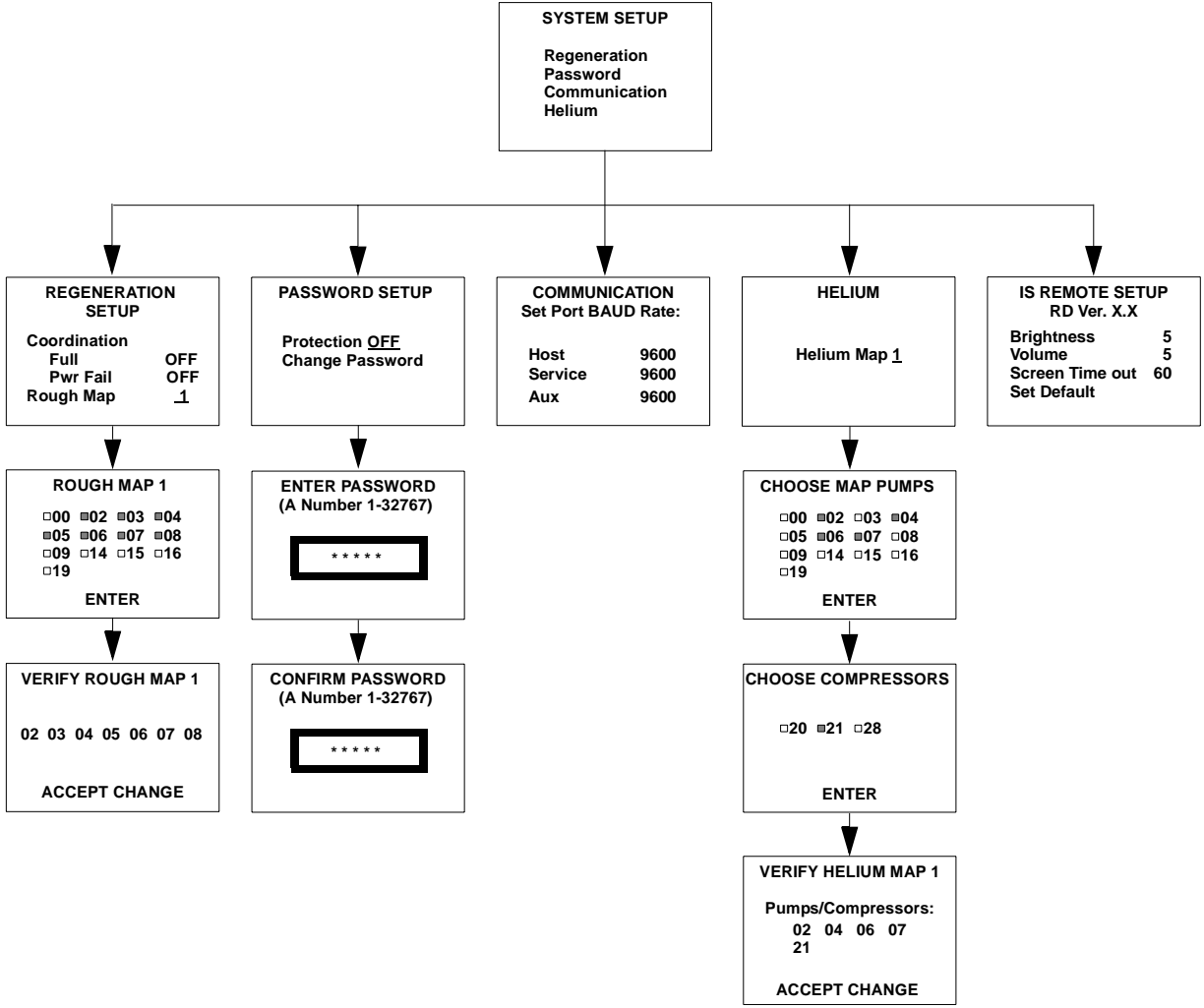


Figure 5-39: System Setup Screens



Section 6 - Using On-Board *IS* Cryopump Screens

Introduction

This section describes how to program and operate the On-Board *IS* FastRegen Control Module software. You can do this when the On-Board *IS* Remote is connected to a specific On-Board *IS* Cryopump.

*The On-Board *IS* Cryopump Module contains factory-set parameters. If you must change the default parameters, then connect the Remote Display to each On-Board *IS* Cryopump.*

Selecting Screens and Changing Parameters

Select Screens and change values the same way, regardless of the screen. Use the following procedures to select screens and change values on the Remote Display shown in [Figure 6-1](#).

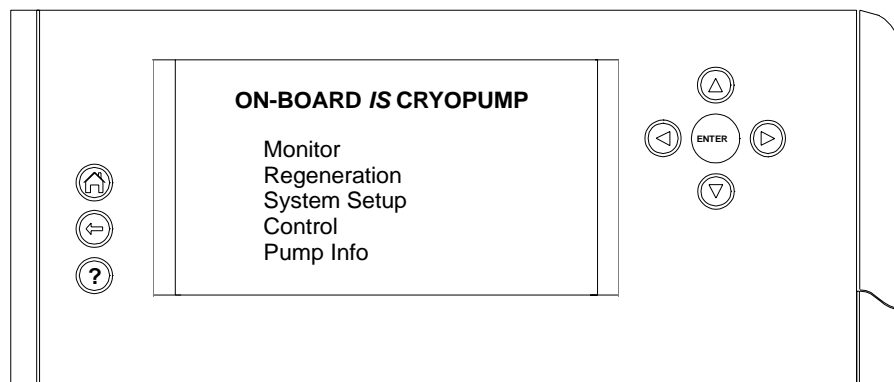


Figure 6-1: On-Board *IS* Remote

Screen Selection

1. Use the arrow buttons to select a screen.
2. Press the **ENTER** button. The selected screen appears.
3. Use the arrow buttons to move the cursor to an item.
4. Press the **ENTER** button. The selected screen appears.

Changing a Screen Parameter

1. Use the arrow buttons to select a screen.

2. Press the **ENTER** button. The selected screen appears.
3. Use the arrow buttons to move the cursor under the parameter you want to change.
4. Press the **ENTER** button. The parameter is underlined.
5. Use the arrow buttons to change the value.
6. Press the **ENTER** button. The parameter changes to the new value.

When the On-Board IS Remote is idle for 15 minutes, a screen saver appears, and dim the display to its lowest level. Pressing any button on the remote display turns off the screen saver and returns the screen to its normal brightness.

Monitor Function

Use the Monitor function to observe the cryopump state, regeneration information, valve status, and temperature control information of the On-Board IS Cryopump.

NOTE: *You cannot change screen parameters while you use the Monitor function.*

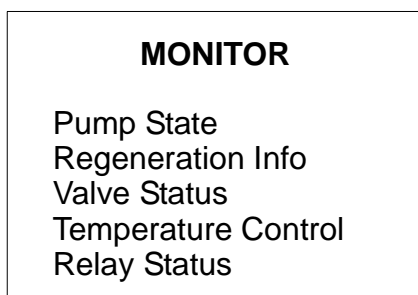


Figure 6-2: Monitor Screen

NOTE: *Relay Status is available on Implant cryopumps only.*

Pump State

Use the Pump State screen to view T1 and T2 temperatures, Cryopump thermocouple gauge, and the current regeneration state. This information is continuously updated.

If the temperature of the first or second goes below 5K, the display indicates *Open*.

If the temperature of the first or second goes above 350K, the display indicates *Short*.

If the Cryopump thermocouple gauge is disabled, the display indicates OFF.

PUMP STATE	
1st Stage (K)	XXX
2nd Stage (K)	XXX
Vacuum (μ)	XXX
Pump	OFF
Regen Status	XXX
Full in progress	

Figure 6-3: Pump State Screen

Regeneration Information

The Regeneration Information screen displays the current state of the Rough Valve Coordination feature and the time since the last Fast and Full regeneration cycle.

REGENERATION INFORMATION	
Rough Valve Coord ON	
Time Since...	
Last Full (h)	XXX hrs
Last Fast (h)	XXX hrs

Figure 6-4: Regeneration Information Screen

Valve Status

The Valve Status screen displays the status of the rough, pump purge, exhaust purge, and gate valves.

VALVE STATUS	
Rough	Closed
Pump Purge	Closed
Exhaust Purge	Closed
Gate	Closed

Figure 6-5: Valve Status Screen

Temperature Control

The Temperature Control screen displays the first and second stage temperatures and set point values.

TEMPERATURE CONTROL	
1st Stage	ON
Set point (K)	100
2nd Stage	ON

Figure 6-6: Temperature Control Screen

NOTE: 2nd Stage is available on Implant cryopumps only.

Relay Status

The Relay Status screen shows the status of the warmup relay, On or Off.

RELAY STATUS	
Warmup Relay	OFF

Figure 6-7: Relay Status Screen

NOTE: Relay Status is available on Implant cryopumps only.

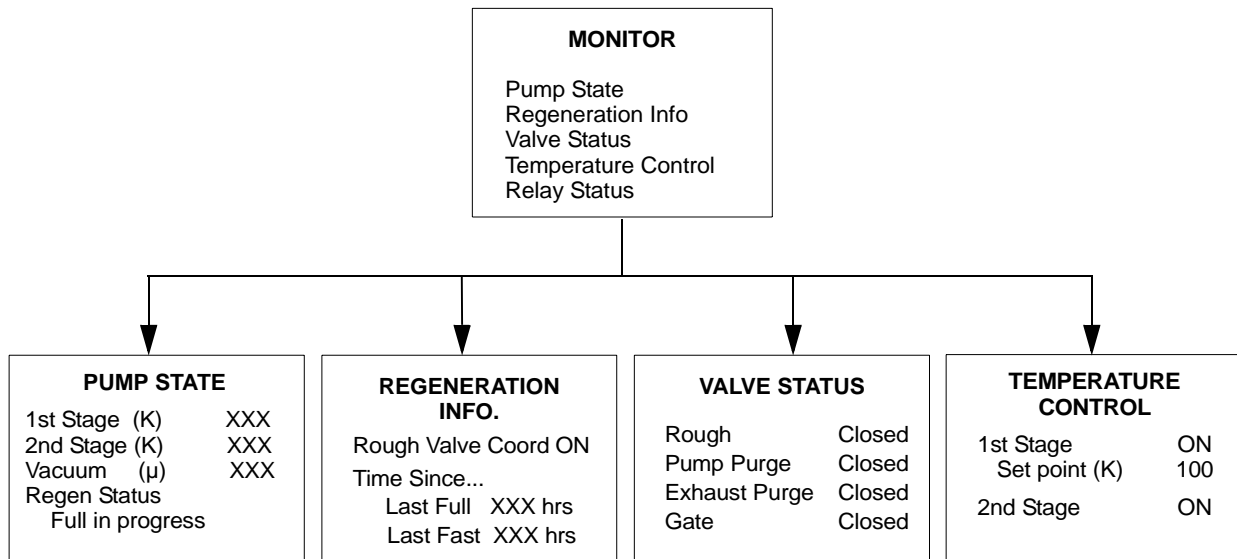


Figure 6-8: Monitor Function Screens

Regeneration Screen

Use the Regeneration screen to start a Fast or Full regeneration cycle, or abort a cycle that is running. If a regeneration cycle is being aborted, the user will be asked to confirm the abort.

Note that the screen is password protected if the password option on the Security screen is ON.

For regeneration parameters, see [Table B-1](#).

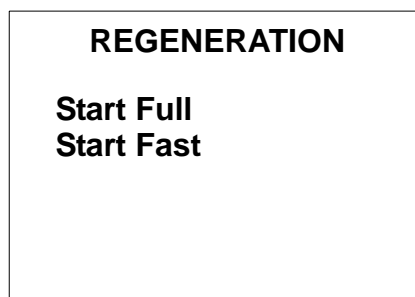


Figure 6-9: Regeneration Screen

Start Full Regeneration

The Start Full Regeneration screen requires you to confirm the start of a Full regeneration cycle.

If NO is selected, the Regeneration screen appears.



Figure 6-10: Start Full Regeneration Cycle Screen

Start Fast Regeneration

The Start Fast Regeneration screen requires you to confirm the start of a Fast regeneration cycle.

If NO is selected, the Regeneration screen appears.

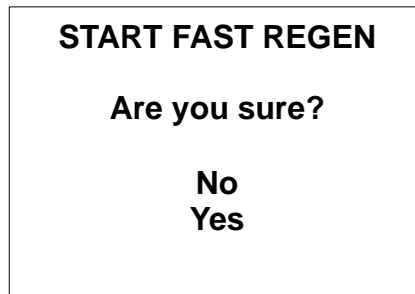


Figure 6-11: Start Fast Regeneration Cycle Screen

Regeneration Status

The Regeneration Status screen is constantly updated while the current regeneration cycle is in progress. The regeneration cycle can also be aborted from this screen. If a regeneration cycle is being aborted, you must confirm the command.

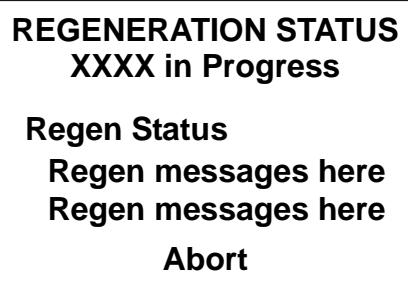


Figure 6-12: Regeneration Status Screen

Regeneration Abort

The Regeneration Abort screen verifies that you want to abort a regeneration cycle.

If YES is selected, the regeneration cycle is aborted. You must press the BACK button to return to the Regeneration screen.

If NO is selected, the Regeneration Status screen appears.

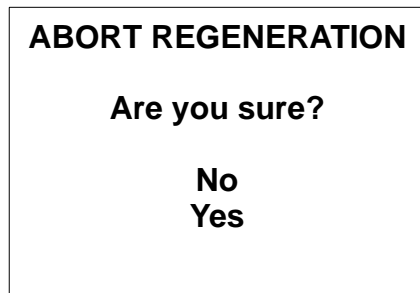


Figure 6-13: Regeneration Abort Screen

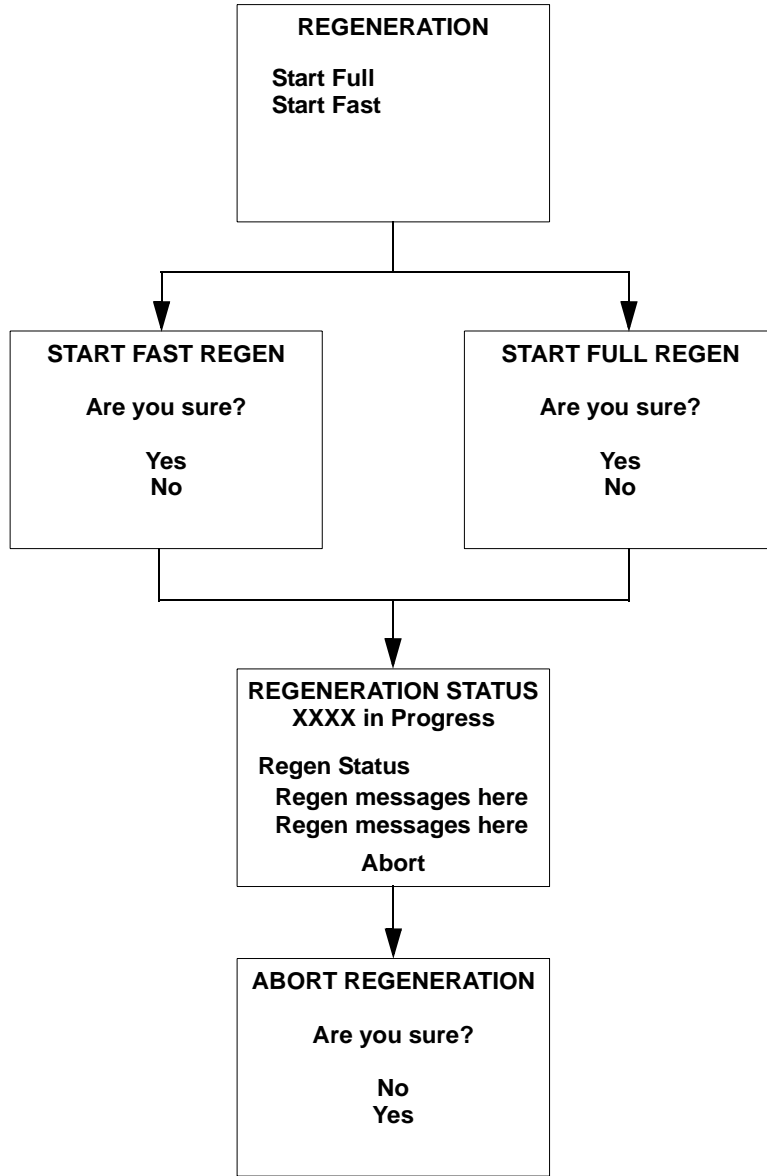


Figure 6-14: Regeneration Function Screens

System Setup Function

The System Setup screen provides access to regeneration, security, communication station ID, power failure, and relay subsystem configurations. The screen is password protected.

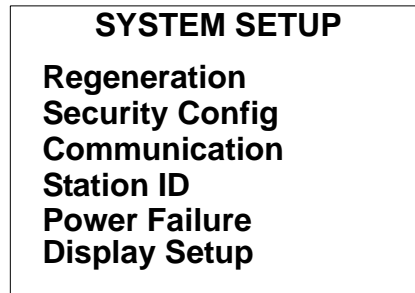


Figure 6-15: PVD System Setup Screen

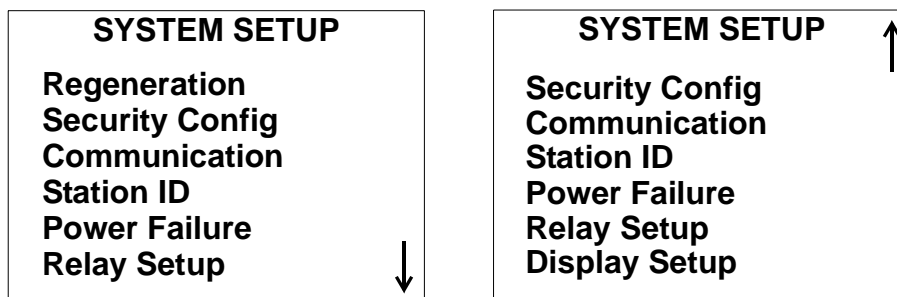


Figure 6-16: Implant System Setup Screens

To see all the options on the Implant system setup screens, press the up or down arrows as necessary. [Figure 6-16](#) shows both possible system setup screens.

Regeneration Setup

Use the Regeneration Setup screen to select the Purge, Rough, and Regeneration Delay sub screens.

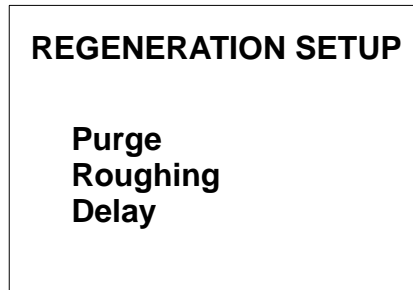


Figure 6-17: Regeneration Setup Screen

Purge Setup

Use the Purge Setup screen to set the extended time, repurge time and number of repurge cycles. The purge setup values appear in [Table B-2](#).

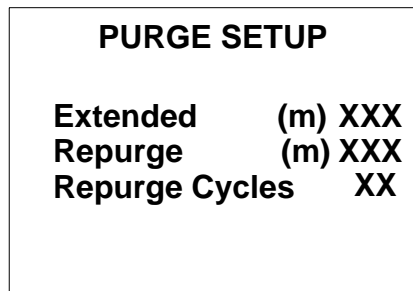


Figure 6-18: Purge Setup Screen

Rough Setup

Use the Rough Setup screen to set the base pressure, maximum rate-of-rise, maximum rate-of-rise cycles, rough test values, and turn Rough Coordination ON or OFF. The Rough Setup values appear in [Table B-3](#).

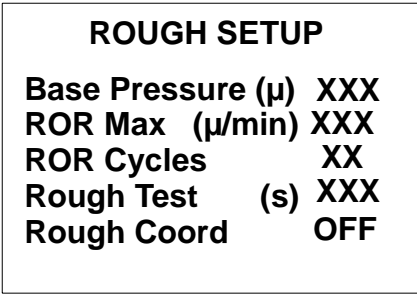


Figure 6-19: Rough Setup Screen

Delay Setup

Use the Delay Setup screen to set the start delay and restart delay parameters. The Delay Setup parameters appear in [Table 6-1](#).

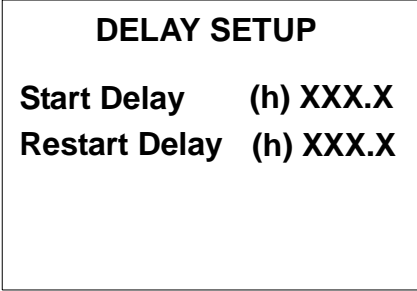


Figure 6-20: Delay Setup Screen

Table 6-1: Delay Setup Parameters

Parameter	Minimum	Maximum	Units
Start Delay	0	999.9	Minutes
Re-Start Delay	0	999.9	Minutes

Security Configuration

Use the Security Setup screen to turn ON password protection, change passwords, and to lock/unlock regeneration and relay settings. Password protection provides restricted access to these On-Board IS Cryopump configuration parameters. After password protection is turned ON, the user must enter a valid password to gain access.

In the event a password is forgotten, the password can be reset to a default value (9999). Refer to “Change Password” in this section for more information.

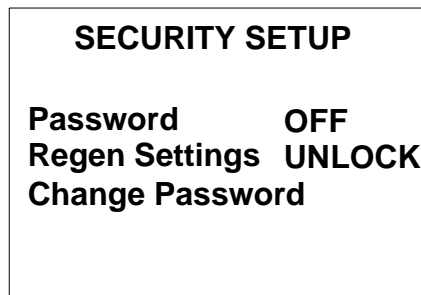


Figure 6-21: Security Setup Screen

Change Password

If Password Protection is turned ON, or the *Change Password* selection was made from the Security Setup screen, you are prompted to enter a password.

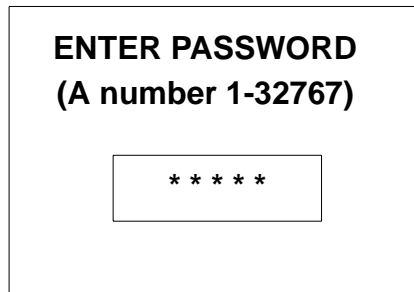


Figure 6-22: Change Password Screen

After you enter the new password, you must confirm the password.

Communication

Use the Communication Setup screen to configure the baud rate of the external RS-232 port. The baud rate values are listed in [Table 6-2](#).

COMMUNICATION Set Port Baud Rate	
Host	9600
Service	9600

Figure 6-23: Communication Setup Screen

Table 6-2: Communication Baud Rate Values

Parameter	Choices
Baud Rate	2400, 9600, 19200, 38400

Station ID

Use the station ID screen to identify the vacuum system chamber on which the On-Board *IS* Cryopump has been installed.

STATION ID SETUP	
Station ID	abcdfgh

Figure 6-24: Station ID Setup Screen

Power Failure

Use the Power Failure setup screen to configure power failure parameters. Choices for recovery are; ON, OFF (PVD cryopumps only), and Cool.

If ON is selected and the power is interrupted and then restored, the second stage temperature is monitored.

If the current temperature of the second stage exceeds the power fail temperature limit, a regeneration cycle is performed.

The range of temperature values are listed in [Table B-4](#).

If you use an Implant cryopump, see [Section 4 - IntelliPurge](#) for information about power failure recovery, and pump behavior.

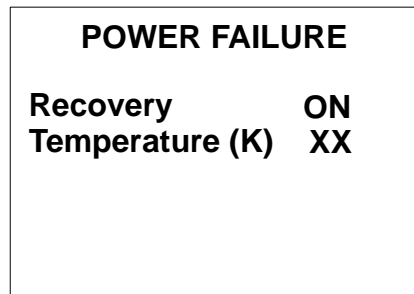


Figure 6-25: Power Failure Screen

Relay Setup

Use the relay setup screen to configure the warm-up alarm relay. You can set a value between 20 and 34K inclusive. After the cryopump completes regeneration, the warm-up alarm relay is ready to respond to unexpected temperature rises in the second stage.

If the cryopump temperature exceeds the set point value, then the relay state changes from de-energized to energized. Use the RELAY SETUP screen to adjust the set point, shown in [Figure 6-26](#). Access the relay contacts through the IntelliPurge module interface (see [Section 4 - IntelliPurge](#)). The pin description of the IntelliPurge module interface are in the On-Board IS Installation Instructions, part number 8040596.

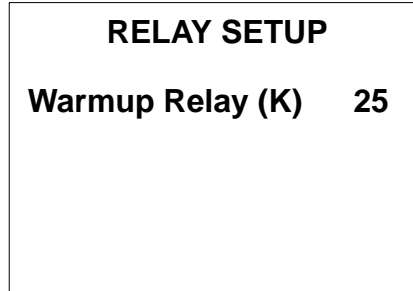


Figure 6-26: Relay Setup Screen

IS Remote Setup (Display Setup)

Use the IS Remote Setup screen to configure the On-Board *IS* Remote Display parameters. Refer to [Table 6-3](#) for parameter values.

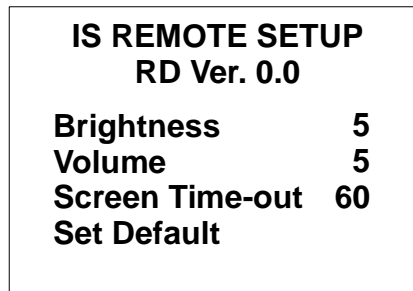
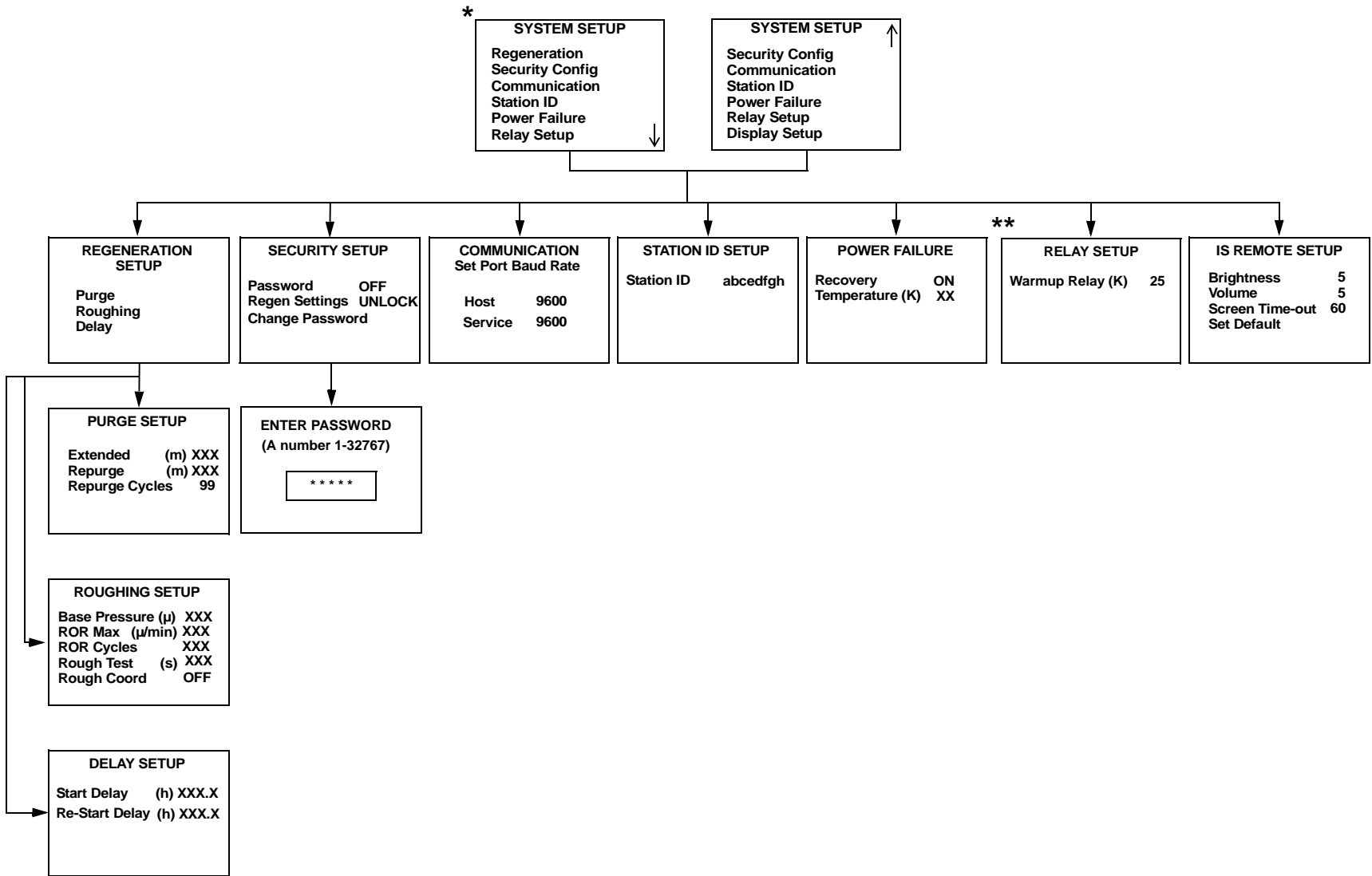


Figure 6-27: Display Setup Screen

Table 6-3: Display Setup Parameters

Parameter	Default Value	Range of Values
Brightness	0	0 (Brightest) - 15
Volume	16	0 - 16 (Loudest)
Screen Time-out	15	0 - 60 minutes



*See [Figure 6-15](#) for the PVD Screen.

**Only available with Implant cryopumps.

Figure 6-28: System Setup Function Screens

Control Function

Use the Control function to turn on the On-Board *IS* Cryopump motor, thermocouple gauge and relays ON or OFF, and open or close the rough and purge valves. The Control parameters appear in [Table 6-4](#) for PVD cryopumps, [Table 6-5](#) for Implant pump controls and [Table 6-6](#) for Implant valve controls.

PUMP CONTROL	
Motor	On
Cryo TC	Off
Rough Valve	Open
Purge Valve	Closed
HFI Status	OK

Figure 6-29: PVD Control Screen

Table 6-4: PVD Control Parameters

Parameter	Value
Motor	ON/OFF
Cryo TC	ON/OFF
Rough Valve	Open/Closed
Purge Valve	Open/Closed

NOTE: You cannot use the Control Function to turn on the Cryo TC when the On-Board *IS* Cryopump second stage temperature is above 20K.

Also, to prevent possible cryopump contamination, you cannot use the Control Function to open the Rough or Purge valves when the On-Board *IS* Cryopump motor is ON.

CONTROL
Pump Control
Valve Control

Figure 6-30: Implant Control Screen

Pump Control, Implant Only

Use the pump control function to start the On-Board IS Cryopump, use safe shutdown, turn on the motor, and thermocouple gauge and relays ON or OFF. The pump control parameters appear in [Table 6-5](#).

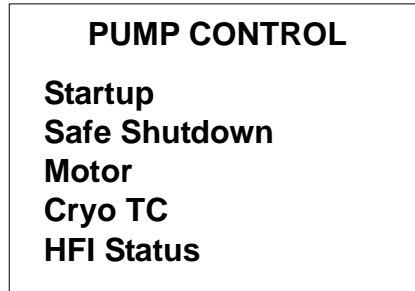


Figure 6-31: Control Screen

Table 6-5: Implant Pump Control Parameters

Parameter	Value
Motor	ON/OFF
Cryo TC	ON/OFF

Safe Shutdown

After choosing safe shutdown from the pump control screen, the following screen appears:

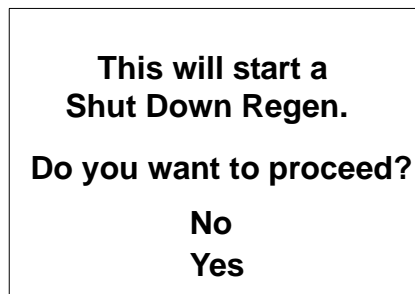


Figure 6-32: Control Screen

For more information about safe shutdown and the IntelliPurge system in which it is used, see [Section 4 - IntelliPurge](#).

Valve Control, Implant Only

For On-Board *IS* Implant cryopumps, you can control the pump purge and exhaust purge valves independently from all other valves on the cryopump. These two valves are listed separately on the valve control screen. You can also manage gate valve control through this screen. The valve control parameters appear in [Table 6-6](#).

VALVE CONTROL	
Rough	Closed
Pump Purge	Closed
Exhaust Purge	Closed
Gate	Closed

Figure 6-33: Valve Control Screen

Table 6-6: Implant Valve Control Parameters

Parameter	Value
Rough Valve	Open/Closed
Pump Purge Valve	Open/Closed
Exhaust Purge Valve	Open/Closed
Gate Valve	Open/Closed/ Error/Transition

Gate Valve

A gate valve error can be the result of four possible error states. The control screen shows ERROR if any of the following conditions exist:

- The gate valve sensors indicate that it is open, but it should be closed.
- The gate valve sensors indicate that it is closed, but it should be open.
- The gate valve sensors indicate that it is in transition, but it should be open or closed.
- The gate valve sensors indicate that it is both open and closed at the same time.

To clear a gate valve error, ensure the gate valve control cable is properly installed (see the On-Board *IS* Installation Instructions, part number 8040596). Then acknowledge the gate valve error by pressing the ENTER key. The following screen appears.

**This will clear the
error and close the
Gate Valve.
(This could take
several seconds)**

Do you want to proceed?

▶ **No**

Yes

Figure 6-34: Gate Valve Error Clearing Screen

If the problem causing the gate valve error has been corrected, use the arrow keys to select YES and press ENTER. The cryopump attempts to close the gate valve and confirm (through the gate valve sensors) that the gate valve is closed. If this is successful, then normal operation can resume. If it is not successful, then the gate valve returns to the error state.

Section 7 - Troubleshooting Procedures

Introduction

Section 6 provides information on how to troubleshoot Helix Intercomponent Network communication problems and provides references to on-line product manuals for troubleshooting the On-Board *IS* Cryopump or *IS* 1000 Compressor.

NOTE: You can also refer to **Appendix A** for customer support information and contact Helix Technology Corporation for assistance if required.

Helix Intercomponent Network

Refer to [Table 7-1](#) if you are experiencing Helix Intercomponent Network communication problems.

Table 7-1: Helix Intercomponent Network Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
1. On-Board <i>IS</i> Cryopumps are not visible on <i>IS</i> Controller screens.	1. A network terminator is not installed in the last cryopump on channel A or B. 2. The cryopump is connected to channel C. 3. Defective network cable.	1. Refer to the On-Board <i>IS</i> Cryopump Quick Installation Guide and install a network terminator in the last cryopump on channels A or B. 2. Disconnect the cryopump from channel C and connect it to channels A or B. 3. Replace network cable.

Table 7-1: Helix Intercomponent Network Troubleshooting Procedures (Continued)

Problem	Possible Cause	Corrective Action
2. Compressors are not visible on On-Board IS Controller screens.	1. A network terminator is not installed in the last compressor on channel C. 2. The compressor is connected to channels A or B. 3. Defective network cable.	1. Refer to the On-Board IS 1000 Compressor Quick Installation Guide and install a network terminator in the last compressor on channel C. 2. Disconnect the compressor from channels A or B and connect it to channel C. 3. Replace network cable.
3. Status LED III on the IS Controller is <i>not</i> blinking.	1. Channel A, B or C network cable is disconnected from controller. 2. Defective network cable.	1. Connect the network cable(s) to the controller. 2. Replace network cable.

Appendix A - Customer Support Information

Customer Support Center Locations

To locate a Customer Support Center near you, please visit our website www.helixtechnology.com on the world wide web and select *CONTACT* on the home page.

Guaranteed Up-Time Support (GUTS)

For 24 hour, 7 day per week Guaranteed Up-Time Support (GUTS) dial:

800-367-4887 - Inside the United States of America

508-337-5599 - Outside the United States of America

Product Information

Please have the following information available when calling so that we may assist you:

- Product Part Number
- Product Serial Number
- Product Application
- Specific Problem Area
- Hours of Operation
- Equipment Type
- Vacuum System Brand/Model/Date of Manufacture

E-mail

For your convenience, you may also e-mail us at:

techsupport@helixtechnology.com



Appendix B - System Parameters

Default Regeneration Parameters

The following table shows the default settings for regeneration. To change these settings, see *Performing Regeneration*. The check mark (✓) in the Fast and Full columns in Table B-1 indicates whether the regeneration parameters are used during the Fast and/or Full regeneration cycles.

Table B-1: Default Regeneration Parameters

Regeneration Parameter	Default Value PVD Applications	Default Value Implant Applications	Range of Values	Fast	Full
Extended Purge	1 minute	60 minute	0 - 9999 minutes		✓
Repurge	15 minutes	5 minutes	0 - 9999 minutes		✓
Repurge Cycles	15	10	0 - 20 cycles		✓
Base Pressure	50 microns	50 microns	25 - 200 microns	✓	✓
Rate-of-Rise (ROR)	10 microns/minute	10 microns/minute	1 -100 microns/minute		✓
ROR Cycles	20	40	0 - 40 cycles		✓
Fast Rough Test	150 seconds	500 seconds	10 - 999 seconds	✓	
Rough Coordination	OFF	OFF	ON/OFF	✓	✓
Start Delay	0	0	0 - 999.9 hours	✓	✓
Restart Delay	0	0	0 - 999.9 hours		✓
Power Fail Recovery	OFF	COOL	ON/OFF/COOL*	✓	✓
Power Fail Recovery Temperature	25K	25K	0 - 80K, 0 - 34K [‡]	✓	✓

*You *cannot* turn off the Power Fail Recovery feature for On-Board IS Cryopumps designed for Ion Implant processes. Only ON and COOL are available.

[‡]For On-Board IS Cryopumps designed for Ion Implant processes.

Purge Setup Parameters

Table B-2: Purge Setup Parameters

Parameter	Minimum	Maximum	Units
Extended Purge	0	9999	Minutes
RePurge	0	9999	Minutes
Repurge Cycles	0	20	Cycles

Rough Setup Parameters

Table B-3: Rough Setup Parameters

Parameter	Minimum	Maximum	Units
Base Pressure	25	200	Microns
Rate of Rise	1	100	Microns/Minute
Rate of Rise Cycles	0	40	Cycles
Fast Rough Test	10	999	Seconds

Power Failure Temperature Range

Table B-4: Power Failure Temperature Ranges

Parameter	Minimum	Maximum	Units
Temperature	0	80	K

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