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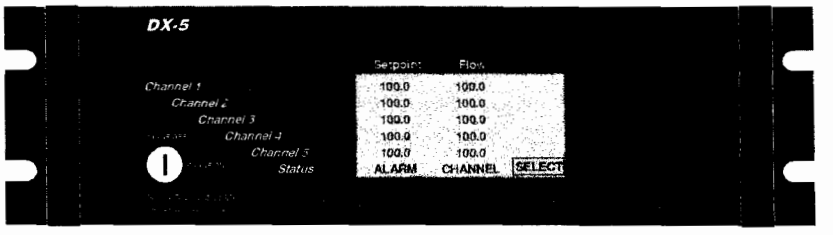
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DX-5
Digital Power Supply

Operating Manual



UNIT INSTRUMENTS, INC.

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Contents

1 Overview of the DX-5 1

2 Installation and Removal From Service 2

Unpacking 2
Back Panel Connections 3

3 Operating the DX-5 4

Turning Power On and Off 4
Operation and High-Strength RF Fields 4
The Front Panel 5
Starting the Flow for a Channel 5
Alarms 7
Purging a Channel 9
Removing the Unit From Service 9

4 Service Centers 10

5 Troubleshooting 11

Glossary 12

Warranty 13

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1

Overview of the DX-5

The DX-5 Digital Power Supply from UNIT Instruments, Inc. is designed to digitally control up to five mass flow controllers (MFCs) or meters and one pressure controller output. The DX-5 is a versatile system that can be used for a variety of applications, including gas chromatography, gas analysis, gas blending, biological atmospheres, and air pollution analysis.

Each MFC channel controls and displays the set point and actual flow for the channel as a percentage of full scale units. The DX-5 display is a touch screen which is used to control the unit by pressing the "buttons" displayed on the screen. The touch screen also displays setpoint, actual flow, purge status, active/inactive status, and alarm status. Built-in alarms are high and low flow limits. An alarm condition generates both audible and visible alarm indicators.

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2

Installation and Removal From Service

Unpacking

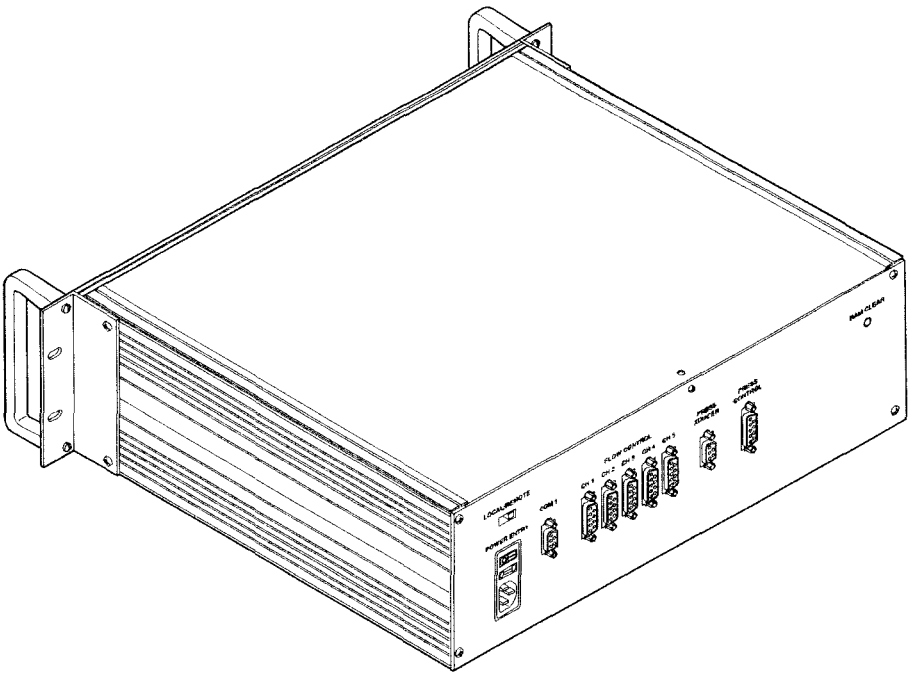
When the DX-5 is received, perform the following steps to ensure that it will operate properly:

1. Remove the unit carefully from the shipping carton.
2. Verify that all screws are tight.
3. Remove the cover and check for any obviously loose parts. Replace any loose parts that can be easily replaced. If there are loose parts which cannot be easily replaced, contact a UNIT Instruments Service Center.

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Back Panel Connections

As shown below, the back panel has connections for the electrical cord, five flow control cable connectors (one for each channel), and a communications port for connecting the unit to an IBM PC-compatible computer.



For each channel that will be used, connect a control cable to the connector on the back panel and the MFC for the channel. If you will use the pressure loop feature, connect the pressure transducer to the PRESS XDUCER connector, and connect the pressure controller MFC to the PRESS CONTROL connector.

Connect the power cord supplied with the unit to the back of the unit and to the appropriate power receptacle for your facility. The DX-5 can be ordered to operate on 100/120 VAC at 50-60 Hz or 220/240 VAC at 50-60 Hz.

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3

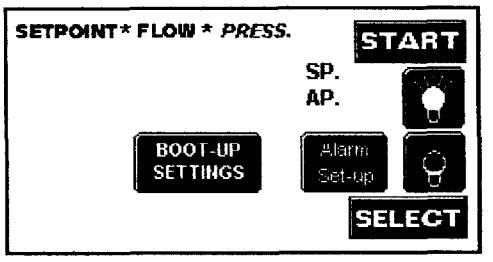
Operating the DX-5

Turning Power On and Off

To turn power on

1. Verify that the unit is connected properly.
2. Set the Remote/Local switch on the back panel to the desired setting. The Remote setting is used when the unit will be controlled with the remote software.
3. Turn power on using the switch directly above the power cord connector on the back panel.

The first time power is turned on, the display on the front panel looks like this:



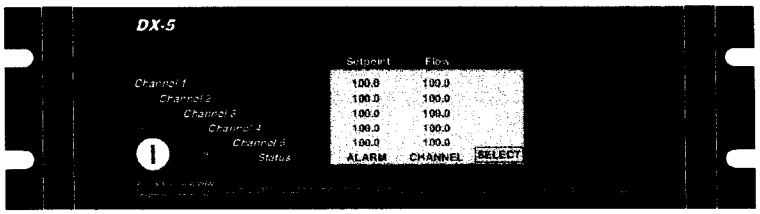
Operation and High-Strength RF Fields

While high-strength radio frequency (RF) fields may cause the unit to momentarily deviate from its operating characteristics, removal of the field will restore normal operation.

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The Front Panel

As shown below, the front panel of the DX-5 includes a touch screen and purge keyswitch.



The following sections describe how to use the front panel to operate the unit.

Starting the Flow for a Channel

There are two numbers used to set and display the flow for a channel:

- The *set percentage* determines the flow rate for the channel as a percentage of the full scale flow rating for the channel's mass flow controller (MFC).
- The *actual flow* is the rate as a percentage of the full scale flow that gas actually flows through the channel.

If the MFC for a channel has a flow rating of 100 sccm, then entering a set percentage of 50% produces an actual flow of 50 sccm. If the MFC has a flow rating of 200 sccm, entering a set percentage of 50% produces an actual flow of 100 sccm.

Note The examples throughout this manual show set percentages and actual flows produced with 100 sccm MFCs. The flow ratings of the MFCs for your unit may be different. When entering the set percentage for a channel, be sure to keep in mind the flow rate of the channel's MFC.

This section includes the following procedures:

- Starting the flow for multiple channels using the previous setpoints
- Starting the flow for one channel
- Stopping the flow for a channel
- Changing the set percentage for a channel while the flow is on

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To start the flow for multiple channels using the previous setpoints

1. Power up the unit. The Main screen is displayed.
2. To start all channels, press Boot-up Settings and then press Start. Flow is started for all channels.

   You can also start selected channels now and then start the remaining channels later using the previous setpoints. For example, you can start channels 1 and 2 after booting up the unit, and then at a later time, you can start channels 3, 4, and 5 simultaneously using the previous setpoints. To start selected channels now and the remaining channels later, follow these steps:

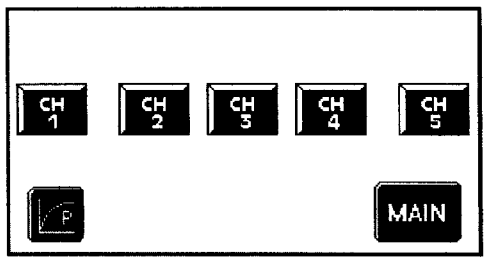
   a. Press Boot-up Settings.

   b. Start one or more channels individually as described in *To start the flow for one channel.*

   c. When you are ready to start the remaining channels, return to the Main screen and press Start. Flow is started for the remaining channels using the previous setpoints for the channels.

To start the flow for one channel

1. Press SELECT. The channel select buttons are displayed:



2. Press the channel select button for the desired channel, or press the P button at the lower left to select the pressure loop.
3. Press SET and then press ENTER.
3. Use the TENS, UNITS, and +/- buttons to adjust the set percentage as needed.
   - When the +/- button is set to +, the TENS and UNITS buttons increase the set percentage. When the +/- button is set to -, the TENS and UNITS buttons decrease the set percentage.
   - When you press TENS, the set percentage increases by 10% (when the +/- button is set to +) or decreases by 10% (when the +/- button is set to -).
   - When you press UNITS, the set percentage increases by 1% (when the +/- button is set to +) or decreases by 1% (when the +/- button is set to -).
5. Press START to start the gas flow for the channel. The set percentage and actual flow are displayed on the screen:

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The set percentage and actual flow are also displayed for each channel on the Main screen.

To stop the flow for a channel

1. Press SELECT to display the channel selection screen, then select the desired channel or the pressure loop (the P button).
2. When the channel screen is displayed, press OFF and then press ENTER. The display shows that the flow for the channel is off, as shown here for channel 1:

To change the set percentage for a channel while the flow is on

1. Press SELECT to display the channel selection screen, then select the desired channel or the pressure loop (the P button).
2. With the flow on, use the TENS, UNITS, and +/- buttons to adjust the set percentage.

   When the +/- button is set to +, the TENS and UNITS buttons increase the set percentage. When the +/- button is set to -, the TENS and UNITS buttons decrease the set percentage.

   - When you press TENS, the set percentage increases by 10% (when the +/- button is set to +) or decreases by 10% (when the +/- button is set to -).
   - When you press UNITS, the set percentage increases by 1% (when the +/- button is set to +) or decreases by 1% (when the +/- button is set to -).

   When you change the set percentage while the flow is on, the actual flow adjusts immediately. It is not necessary to press START.

Alarms

There are two types of alarms: high flow limit and low flow limit. An alarm is triggered when the flow for a channel exceeds +/-5% variance from the set percentage.

Note There is no alarm for the pressure loop.

Alarms can be activated at any time and can be activated separately for each channel. If you want to use alarms, however, it is recommended to turn alarms on immediately after turning power on for the unit.

Once alarms are turned on, they do not take effect until 20 seconds after flow is started in order to let the flow stabilize. If the set percentage for a channel is modified when the flow is on, alarms again are not activated until 20 seconds after the set percentage is changed so that the flow can stabilize at the new flow rate.

When an alarm condition occurs, the unit "beeps" and a description of the alarm is displayed at the bottom of the Main screen.

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To turn alarms on for a channel

1. It is recommended to turn alarms on after turning the unit power on and before starting flow for any channel.

   If you want to turn alarms on for a channel after flow has started, you need to turn off the flow for the channel. To turn off the flow for a channel, select the channel, press OFF at the channel screen, and then press ENTER.

2. With the flow off for the channel, display the Main screen and press Alarm Set-up. The alarm channel selection screen is displayed:

3. Select a channel on the alarm channel selection screen. The alarm set-up screen is for the channel displayed:

4. Press ON to turn alarms on for the channel.

To clear an alarm

1. To silence the alarm beep:

   a. Display the Main screen.

   b. Press Alarm Set-up. The beep is silenced and an alarm message is displayed at the bottom of the screen.

      If you display the channel screen for the channel, the alarm message is also displayed in place of the ALARM ON indicator.

2. Do one of the following:

   - Leave the flow on with the alarm message displayed.
   - Turn off the channel that triggered the alarm by pressing SELECT, selecting the channel, and pressing OFF and then ENTER when the channel screen is displayed.

3. If necessary, correct the condition that caused the alarm. (Depending upon the condition, it may correct itself.)

4. If the alarm message is still displayed and the alarm condition has been corrected, you can clear the message by leaving the Main screen and then returning to the Main screen.

5. If alarms were turned off, turn alarms back on as described in the previous section.

6. If flow for a channel was turned off, turn the flow back on.

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To turn alarms off for a channel

1. Display the Main screen and press Alarm Set-up. The alarm channel selection screen is displayed:
2. Select a channel on the alarm channel selection screen. The alarm set-up screen is for the channel is displayed:
3. Press OFF to turn alarms off for the channel.

Purging a Channel

Purging a channel requires using both the purge keyswitch and the PURGE button for the channel. The purge function will *not* work unless the purge keyswitch is in the ON position when power for the unit is turned on.

Note To purge a channel, the flow for the channel must be off. Purge will not work with the flow on.

To purge a channel

1. With the unit power off, turn the purge keyswitch on the front panel to the ON position.
2. Turn the unit power on.
3. Press SELECT and then select the channel to be purged.
4. At the channel screen, press PURGE and then press ENTER to begin the purge. The display shows that the purge for the channel is on:
5. To purge another channel, select the channel and press PURGE and then ENTER when the channel screen for the channel is displayed.
6. To stop the purge for a channel, select the channel and press OFF and then ENTER when the channel screen for the channel is displayed. The display shows that the purge is off.

Removing the Unit from Service

Before removing the DX-5 from service, all used gas lines *must* be competely purged with nitrogen or argon which is free from moisture and oxygen. This can be done by cycle purging the channels for 2-4 hours or purge alone for 8-24 hours.

If you are sending the unit for cleaning or maintenance, package it in a heavy carton and ship it to the service center. Contact UNIT Instruments for your RMA number and the location of the service center for shipping.

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4

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5

Troubleshooting

The following information is provided to identify and resolve common problems.

Alarms do not work for a channel.

Alarms were not turned on for the channel. It is recommended to turn alarms on as soon as power for the unit is turned on, before starting flow for any channel.

Purge does not work.

The purge keyswitch is off, or the keyswitch was turned on after the unit was turned on. For purge to work, you must turn the unit power off, turn the purge keyswitch on, and then turn the unit power on.

The control panel on the unit does not work.

The Remote/Local switch on the back of the unit is set to Remote. Turn the unit power off, set the Remote/Local switch to Local, and turn the unit power back on.

I want to open a log file using the remote software, but I cannot select the Open option on the File menu.

A log file is already open, and you can only open one log file at a time. Either continue to use the log file that is open, or use the Close option on the File menu to close it and then use the Open option to open another one.

The DX-5 display shows garbage characters.

RAM for the unit is corrupted. To reset, move the RAM CLEAR switch on the back panel to the Clear position, then power up the unit. After booting up the unit, move the switch back to the normal (0) position.

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Glossary

Actual flow. The rate in sccm that gas actually flows through the channel.

Alarms. Audible and visible warnings for specific error conditions. There are two types of alarms: no flow and high/low flow limits. The no-flow alarm is triggered when flow is set for a channel but there is zero flow due to an empty gas tank, closed valve, or other condition. The high/low flow limit alarm is triggered when the flow for a channel is too high or low due to a pressure problem.

Channel. An individual gas line controlled by the DX-5. The DX-5 has five channels.

Local mode. *See* **Remote/Local switch**.

Mass flow controller. A device which regulates the flow of gas.

MFC. *See* **Mass flow controller**.

Purge. The process of flushing a channel with an inert gas, such as nitrogen or argon.

Purge keyswitch. A keyswitch on the front panel of the DX-5 which can be turned on or off to enable/disable purging of channels in the unit. **Note:** The position of the keyswitch (on or off) is only detected when the unit power is turned on.

Remote/Local switch. A switch on the back of a DX-5 which changes the operating mode of the unit. When the DX-5 is in local mode, all commands are entered using the control panel on the unit and the remote software can only be used to monitor operation of the unit. When the DX-5 is in remote mode, the buttons on the control panel for the unit are disabled and all commands are entered using the simulated control panel in the remote software.

Set percentage. The value used to determine the flow rate for a channel as a percentage of the full scale flow rating for the channel's MFC.

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Warranty

Unit Instruments DX products are warranted against defects in materials and workmanship for a period of one year from the date of shipment, when used in accordance with specifications and not subjected to physical damage, abuse or contamination. If units are judged to be out of warranty, Unit Instruments will notify owner of replacement or repair costs before proceeding. Factory service and repairs include a ninety-day warranty on all parts and labor. Normal turnaround time is five working days or less, on any standard range item returned for warranty service.

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