

Chart Connect 3000

Chart Connect 3000 is a software program that enables the user to query and adjust TEC controller settings and download the controller event log through an easy to use computer interface. Fully compatible with TEC 2000s and TEC 3000s, it can be used with a single controller or a network of controllers. Features include a user-friendly ASCII command interface, real-time temperature and level monitoring, and an event log download button.

System Requirements

1. Microsoft Windows (Vista, XP, 2000, 98)
2. USB Port
3. TEC COM USB Interface Kit (P/N 13376947)
4. TEC Controller

Downloading Chart Connect 3000

1. Before installing Chart Connect 3000 version 1.1.1, ensure previous versions have been completely removed from your computer
2. Chart Connect 3000 is available online at www.chartbiomed.com/tec2000.cfm under Communications.
3. Click the link and open the Chart Connect 3000 Setup compressed folder.
4. Extract all files from the compressed folder to a designated location.
5. Open the SETUP icon from the extracted files.
6. Follow prompts to complete installation.
7. A Chart Connect 3000 icon should appear on your programs list.
8. Contact Technical Service if you encounter installation problems.

Connecting to TEC Controller**Controller Settings**

1. TEC 3000
 - a. Set "Com 1 Setup" to "9600 N81" in Advanced Settings under the Com 1 Menu.
 - b. Set "Com 1 Type" to "ASCII" in Advanced Settings under the Com 1 Menu.
 - c. For networked controllers, assign each controller a unique Unit ID in Advanced Settings under the MODBUS Menu.

NOTE: Either Serial / Com port 1 or 2 may be used. For simplicity, these instructions will only refer to Serial / Com port 1.

2. TEC 2000
 - a. For networked controllers, assign each controller a unique Unit ID. Press the Interface key, select "Printer On," press Enter, type in desired Unit ID, and then press Enter.
 - b. Press the Interface key, select "Printer OFF," then select "Baud 96," and press Enter.

Chart Connect 3000 Settings

1. Connect previously installed TEC COM USB Interface Kit to an open USB port on your computer.
2. Open Chart Connect 3000
3. Determine your Chart Connect 3000 COM Port by clicking "Find COM Port."
4. Note the COM Port number listed beside "RS-485 Isolated Port" in the Device Manager window.
5. Close Device Manager and click "OK."
6. Select your COM Port number in the drop down box.
7. For a Single Controller: Select "Single Controller" and click "Connect." The Unit ID is automatically detected.

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For Networked Controllers: Select “Networked Controller,” enter the Unit ID of the desired controller, and click “Connect.” In order to connect to another controller on the network, click “Disconnect,” change the Unit ID, and then click “Connect.”

8. If the controller is successfully connected, “Controller Detected” will be displayed in the Status box in the top right corner of Chart Connect, and the controllers identification will be displayed in the first window.
9. If “Controller not detected” is displayed in the Status box, ensure the above steps were completed correctly. If problems persist, contact Technical Service.

Downloading the Event Log

TEC controllers automatically monitor and store vital time stamped information including temperature, LN2 level, LN2 usage, and alarms. Events are recorded every four hours (default setting) and every time an event or alarm status changes. The event log can be accessed and downloaded using Chart Connect 3000. The event log is downloaded as a csv (comma separated values) file that can be opened in EXCEL.

1. Connect to TEC controller using Chart Connect 3000 and TEC COM USB Interface Kit.
2. Select Download Range. Event 1 is the most recent logged event. The default download range includes all events.
3. Designate a file name and save location for the event log. The default file name is the current date and time while the default save location is the c:\ drive.
4. Click “Download Event Log.”
5. When the event log has finished downloading, click “Click to Open Downloaded Data File” or open the file from its save location.

Setup Button

The Setup button allows the user to quickly query and adjust level and temperature settings and alarms. Click “Setup” to access the Setup panel. To adjust settings, simply type in the desired value and click “Set” next to that window. Click “Show Current Settings” to view current values. Click “Close” to return to the main screen.

Real-Time Temperature and LN2 Level Monitoring

Chart Connect 3000 v1.1.1 offers real-time temperature and LN2 level monitoring. If communication with the controller is interrupted without clicking “Disconnect” (i.e. USB cable unplugged), Chart Connect 3000 may need to be restarted for the temperature and LN2 level monitoring feature to function properly.

Event Log

1. A sample event log is shown below. The event log header includes the program used to download the event log, the controller's Unit ID, and firmware version.

ChartConnect 3000 v1.1.1
00200 Cha Software ver. 1.24

Record #	Unit ID	Date	Time	TempA	TempB	LN2 Level	LN2 Usage	Event Codes
1	200	2/22/2008	12:00 AM	-195.9	-190.6	8.4	0	ZO
2	200	2/21/2008	11:38 PM	-195.9	-190.6	8.4	0	
3	200	2/21/2008	11:38 PM	-195.9	-190.6	8.4	0	
4	200	2/21/2008	11:37 PM	-195.9	-190.6	8.4	0	
5	200	2/21/2008	11:25 PM	-195.9	-190.6	8.4	0.9	
6	200	2/21/2008	11:25 PM	-195.9	-190.6	8.4	0.9	
7	200	2/21/2008	10:54 PM	-195.9	-190.9	8.4	0.9	
8	200	2/21/2008	10:54 PM	-195.9	-190.9	8.4	0.9	
9	200	2/21/2008	10:54 PM	-195.9	-190.9	8.4	0.9	FD
10	200	2/21/2008	10:22 PM	-195.9	-190.9	7.9	0.9	F

2. Under certain circumstances, strings can appear in the event log. If a temperature probe is disconnected, a calibration is performed, or a setting is changed, an event is logged and will be reported as shown below.

Record #	Unit ID	Date	Time	TempA	TempB	LN2 Level	LN2 Usage	Event Codes
1	1	2/11/2008	12:53 PM	Parameter number 126 changed from 60 to 180				
75	1	2/1/2007	2:15 PM	Temp A LN2 Calibratio				
77	1	2/1/2007	2:14 PM	OPEN	OPEN	261.4	0	

3. Table 1 below lists the Event Codes and their meanings.

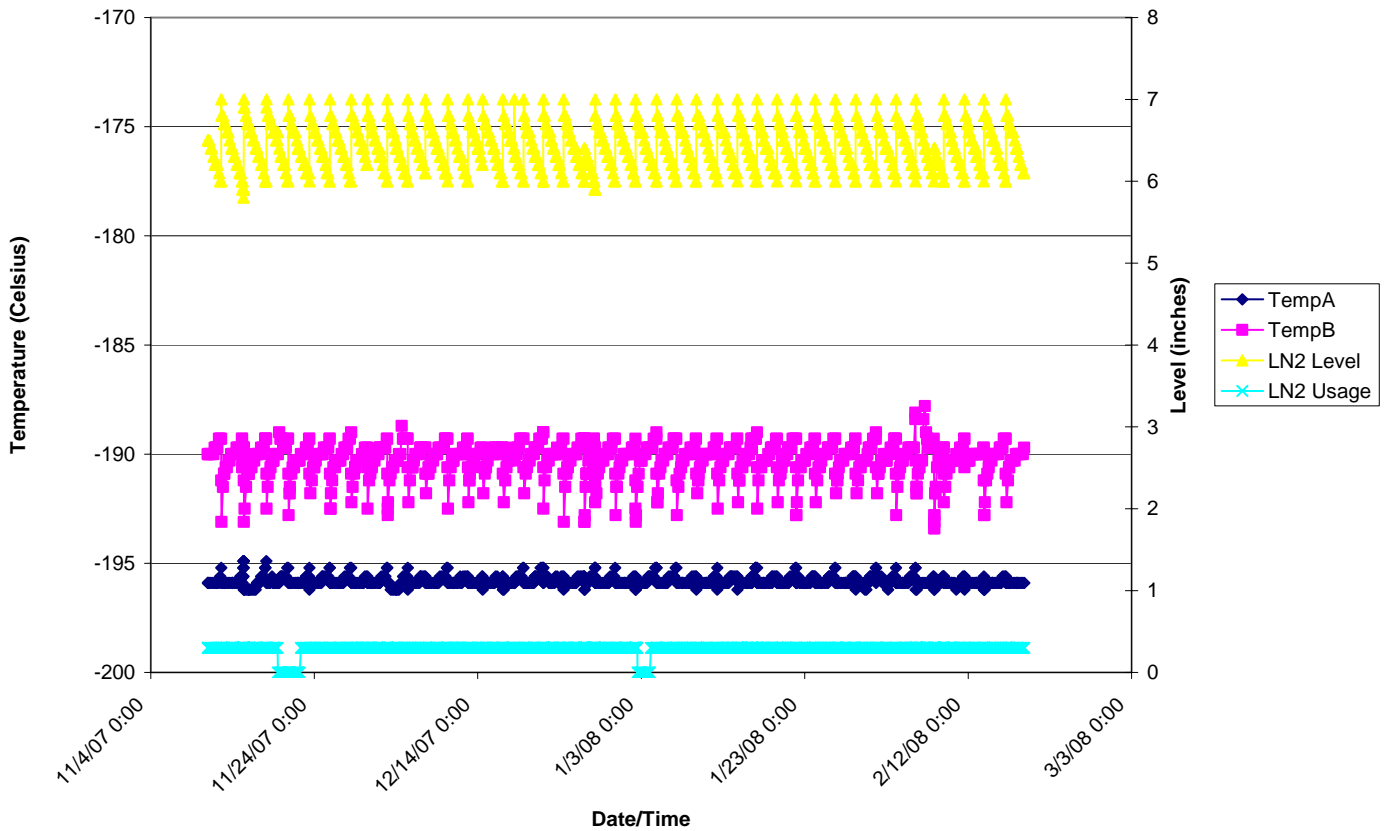
Table 1: Data Log Event Codes

Event Code	Meaning
F	Filling
LL	Low Level Alarm
LH	High Level Alarm
AL	Temp A Low Alarm
AH	Temp A High Alarm
BL	Temp B Low Alarm
BH	Temp B High Alarm
PF	Power Failure Alarm
HG	Hot Gas Bypass Alarm
BV	Low Battery Alarm
US	Usage Alarm
FT	Fill Time Alarm
LO	Lid Open
CA	Temp A Calibration Alarm
CB	Temp B Calibration Alarm
CG	Bypass Temp Calibration Alarm
BY	Bypassing
FD	Fill Disabled
ZO	Level Zeroing
AM	Alarm Muted
BB	Running on Battery Backup

Plotting the Event Log

The event log can be plotted to make analyzing the freezer's performance or diagnosing a problem easier. The event log needs to be specifically formatted to achieve a clear, readable graph. The graph below was made following these steps.

Sample Event Log Plot



1. Open downloaded event log in EXCEL.
2. Insert new column in between the Time and TEMP A columns.
3. Label this new column Date/Time.
4. In cell E4, type “=C4+D4” and press enter
5. Fill in the rest of column E by selecting E4 and then double-clicking the box in the bottom right corner of the cell.
6. Format the cells in column E by highlighting it, then selecting Format then Cells from the EXCEL menu tabs. Set the Number Category to Date and the Type to MM/DD/YY HH:MM (3/14/01 13:30).
7. Highlight cells A4 – J4 and then press Ctrl + Shift + down-arrow at the same time to select all the data points.
8. Select Data then Sort from the EXCEL menu tabs. Select the “Header row” radial button. Sort by Descending Date, then by Descending Time, and then by Ascending Record #.
9. Highlight the data to plot including the column headers. Only select columns E – I of the corresponding record numbers you wish to plot (Date/Time – LN2 Usage).
10. Select Insert then Chart from the EXCEL menu tabs.
11. Select Chart type “XY (Scatter)” and the second Chart sub-type.

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12. Click “Next” until you reach Step 4 of 4 and select the “As new sheet” radial button.
13. Click “Finish”
14. Double-click on the LN2 Level data points (yellow points). Select the “Axis” tab and then the “Secondary axis” radial button. Click “OK.”
15. Double-click on the LN2 Usage data points (light blue points). Select “Secondary axis” and click “OK.”
16. Format the primary y-axis scale so both TEMPA and TEMPB data can be seen. A good starting point is to set the primary axis “Minimum” to -200, the “Maximum” to -135, and the “Value (X) axis Crosses at:” to -200.
17. Set the secondary y-axis scale so both LN2 Level and LN2 Usage data can be seen.
18. Format the x-axis so that the Alignment is set to 45 Degrees.

ASCII Commands

ASCII commands are used to query and adjust various controller settings and alarms. The user-friendly ASCII interface automatically takes in capital letters in the Command window, and when warranted, a response is displayed in the Response window. Below is a list of ASCII commands followed by syntax and explanations.

Table 2: ASCII Commands

CALVL	HITB	TEMPA?	HFIL	EVNLOG?
CALVL?	HITB?	TEMPB?	HFIL?	LUNI
*IDN?	LOGPER	TUNI	HILA	RATE?
LNSATP	LOGPER?	FILL 0	HILA?	DATE
LNSATP?	LOTA	FILL 1	LEVL?	DATE?
BPTMP?	LOTA?	FILT	LFIL	TIME
HITA	LOTB	FILT?	LFIL?	TIME?
HITA?	LOTB?	FILTIM?	LOLA	UNID
CLEVLG	EVNCT?	EVENT?	LOLA?	UNID?

ASCII Command List

General Commands

***IDN?** Identification Query

Input: *IDN?

Returned: MVE, TEC2000, 0, 081895

Remarks: Used to query the identification data. Command must include “*” preface. Information returned is in the format: manufacturer, model number, 0, and firmware version or software (EPROM) date.

LNSATP Set the Saturation LN₂ Temperature for “Low-Temp” Range Sensor Calibration

Input: LNSATP +XXX.X

Returned: Nothing

Remarks: Used to set the saturation temperature of LN₂ at the specific altitude of the Dewar.

LNSATP? Saturation LN₂ Temperature Query

Input: LNSATP?

Returned: +XXX.X

Remarks: Used to query the saturation temperature of LN₂.

Temperature Commands

BPTMP? Hot Gas Bypass Temperature Sensor Query

Input: BPTMP?

Returned: +XXX.X

Remarks: Used to query the current hot gas bypass temperature sensor in the form + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

CALVL Set Liquid Level Offset

Input: CALVL +XXX.X

Returned: Nothing

Remarks: Used to set the liquid level offset value.

CALVL? Liquid Level Offset Query

Input: CALVL?

Returned: +XXX.X

Remarks: Used to query the liquid level offset value.

HITA Set High Temperature A Alarm Command

Input: HITA +XXX.X

Returned: Nothing

Remarks: Used to set the high temperature alarm for the Temperature A Sensor in the form + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

HITA? High Temperature A Alarm Setting Query

Input: HITA?

Returned: +XXX.X

Remarks: Used to query the current high temperature alarm setting for the Temperature A Sensor in the form + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

HITB Set High Temperature B Alarm Command

Input: HITB +XXX.X

Returned: Nothing

Remarks: Used to set the high temperature alarm for the Temperature B Sensor in the form + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

HITB? High Temperature B Alarm Setting Query

Input: HITB

Returned: +XXX.X

Remarks: Used to query the current high temperature alarm setting for the Temperature B Sensor in the form + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

LOTA Set Low Temperature A Alarm Command

Input: LOTA +XXX.X

Returned: Nothing

Remarks: Used to set the low temperature alarm for the Temperature A Sensor in the form of + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

LOTA? High Temperature Alarm Setting Query

Input: LOTA?

Returned: +XXX.X

Remarks: Used to query the current low temperature alarm setting for the Temperature A Sensor. Response is in the form of + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

LOTB Set Low Temperature B Alarm Command

Input: LOT B +XXX.X

Returned: Nothing

Remarks: Used to set the low temperature alarm for the Temperature B Sensor in the form of + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

LOTB? Low Temperature B Alarm Setting Query

Input: LOTB?

Returned: +XXX.X

Remarks: Used to query the current low temperature alarm setting for the Temperature B Sensor. Response is in the form of + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

TEMPA? Temperature A Data Setting Query

Input: TEMPA?

Returned: +XXX.X

Remarks: Used to query current temperature reading for the Temperature A Sensor where the temperature is in format + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

TEMPB? Temperature B Data Setting Query

Input: TEMPB?

Returned: +XXX.X

Remarks: Used to query the current temperature reading for the Temperature B Sensor where the temperature is in format + or - XXX.X (Celsius, Fahrenheit, or Kelvin).

TUNI Set Temperature Units

Input: TUNI C, TUNI F, or TUNI K

Returned: Nothing

Remarks: Used to set the temperature units to C = Celsius, F = Fahrenheit, or K = Kelvin.

Level Commands

FILL Set Fill Status Command

Input: FILL 0 or FILL 1

Returned: Nothing

Remarks: Used to turn fill relay off or on where 0 = Off or 1 = On.

FILT Set Max Fill Time Command

Input: FILT XXX

Returned: Nothing

Remarks: Used to set the maximum allowable filling time (in minutes from 1 to 180) before the LN₂ Supply alarm is activated and the fill valve is automatically closed.

FILT? Max Fill Time Query

Input: FILT?

Returned: XXX

Remarks: Used to query the maximum allowable filling time (in minutes from 1 to 180) before the LN₂ Supply alarm is activated and the fill valve is automatically closed.

FILTIM? Fill Time Query (TEC 3000 Only)

Input: FILTIM?

Returned: XXX

Remarks: Used to query how long the unit has been filling and is returned in seconds.

HFIL Set High Fill Point Command

Input: HFIL +XXX.X

Returned: Nothing

Remarks: Used to set the high fill point in format + or - XXX.X (inches or millimeters). If the entered value is too close to the low fill setting, it will not be accepted. However, unlike the display, the interface will not indicate that it was not accepted. The following query should be used to verify any change to this setting.

HFIL? High Fill Point Setting Query

Input: HFIL?

Returned: +XXX.X

Remarks: Used to query the current high fill point where + or - XXX.X is either inches or millimeters.

HILA Set High Level Alarm Command

Input: HILA +XXX.X

Returned: Nothing

Remarks: Used to set the high-level alarm at + or - XXX.X in inches or millimeters. If the entered value is too close to the high fill setting, it will not be accepted. However, unlike the display, the interface will not indicate that it was not accepted. The following query should be used to verify any change to this setting.

HILA? High Level Alarm Setting Query

Input: HILA?

Returned: +XXX.X

Remarks: Used to query the current high-level alarm setting where level is in format + or - XXX.X (inches or millimeters).

LEVL? Level Data Reading Query

Input: LEVL?

Returned: +XXX.X

Remarks: Used to query the current level reading in format +XXX.X (inches, millimeters or percent).

LFIL Set Low Fill Point Command

Input: LFIL +XXX.X

Returned: Nothing

Remarks: Used to set the low fill point in format + or - XXX.X (inches or millimeters). If the entered value is too close to the high fill setting, it will not be accepted. However, unlike the display, the interface will not indicate that it was not accepted. The following query should be used to verify any change to this setting.

LFIL? Low Fill Point Query

Input: LFIL?

Returned: +XXX.X

Remarks: Used to query the current low fill point where + or - XXX.X is either inches or millimeters.

LOLA Low Level Alarm Setting Command

Input: LOLA +XXX.X

Returned: Nothing

Remarks: Used to set the low-level alarm point in format + or - XXX.X (inches or millimeters). If the entered value is too close to the low fill setting, it will not be accepted. However, unlike the display, the interface will not indicate that it was not accepted. The following query should be used to verify any change to this setting.

LOLA? Low Level Alarm Setting Query

Input: LOLA?

Returned: +XXX.X

Remarks: Used to query the current low level alarm setting where level is format + or - XXX.X (inches or millimeters).

LUNI Set Level Units Command

Input: LUNI E, LUNI M, or LUNI %

Returned: Nothing

Remarks: Sets the instrument level units to E = English, M = Metric, or % = Percent.

RATE? Liquid Usage Rate Query

Input: RATE?

Returned: +XXX.X

Remarks: Used to query the latest rate of LN₂ usage in inches, millimeters, or percent per day.

Data Logging Commands

CLEVLG Clears the "Event Log"

Input: CLEVLG

Returned: Nothing

Remarks: Used to clear **ALL** data records stored in the "Event Log". The "Event Log" can store 360 'event log records', each containing the date, time, temperatures A and B, LN₂ level, LN₂ usage, and alarm (or event) codes. All 360 'event log records' are permanently erased from the log's memory by this command.

DATE Set Date Command

Input: mm/dd/yy

Returned: Nothing

Remarks: Used to set the current date in the format: mm/dd/yy (month/day/year).

DATE? Date Query

Input: DATE?

Returned: mm/dd/yy

Remarks: Used to query the current date.

EVENT? Current Event Status Query

Input: EVENT?

Return XXXXX MM/DD/YY,HH:MM,+XXX.X,+XXX.X,+XXX.X,+XXX.X,XX

Remarks: Used to query the instrument for the current "event status". Returned is a data string similar to an "event log record".

EVNCT? Current 'Event Log Record' Count Query

Input: EVNCT?

Returned: XXX

Remarks: Used to query the number (or count) of 'event log records' currently stored in the "Event Log" where XXX can be from 0 through 360.

EVNLOG? n Event Log Record #[n] Query

Input: EVNLOG? n

Returned: XXXXX MM/DD/YY,HH:MM,+XXX.X,+XXX.X,+XXX.X,+XXX.X,XX

Remarks: Used to query the 'event log record' number n, where n can be from 1 through 360 for TEC 2000 and 1 through 30,000 for TEC 3000.

LOGPER Set Event Log Record Period Command

Input: LOGPER XXX

Returned: Nothing

Remarks: Used to set the 'Event Log Record' period. The input, **XXX** can be from 1 to 240 minutes. This period defines the interval in between data recordings in the "Event Log".

LOGPER? Event Log Record Period Query

Input: LOGPER?

Returned: XXX

Remarks: Used to query the 'Event Log Record' period. The returned, **XXX** can be from 1 to 240 minutes.

TIME Set Time Command

Input: hh/mm/ss

Returned: Nothing

Remarks: Used to set the current time in military format: hh/mm/ss (hour/minute/second).

TIME? Time Query

Input: TIME?

Returned: hh/mm/ss

Remarks: Used to query the current time.

UNID Set the UNIT ID Command

Input: UNID XXXXX

Returned: Nothing

Remarks: Used to set the 5-digit Unit ID number of the instrument.

UNID? Unit ID Query

Input: UNID?

Returned: XXXXX

Remarks: Used to query an instrument's 5-digit Unit ID number.

Additional ASCII Commands for TEC 2000 only

DSPN Set Define 100% Command

Input: DSPN +XXX.X

Returned: Nothing

Remarks: Used to set the current 100% in format + or - XXX.X (inches or millimeters).

DSPN? Define 100% Setting Query

Input: DSPN?

Returned: +XXX.X

Remarks: Used to query the current reading (in inches or millimeters) of the 100% setting.

DZER Set Define Zero % Command

Input: DZER +XXX.X

Returned: Nothing

Remarks: Used to set the current 0% in format + or - XXX.X (inches or millimeters).

DZER? Define Zero % Setting Query

Input: DZER?

Returned: +XXX.X

Remarks: Used to query the current reading (in inches or millimeters) of the 0% setting.

FILAS? Fill Alarm Status Query

Input: FILAS?

Returned: 0 or 1

Remarks: Used to query the fill alarm (LN₂ Supply Alarm) status where 0 = Off or 1 = On.

FILL? Fill Status Query

Input: FILL?

Returned: 0 or 1

Remarks: Used to query the instrument for current fill relay status: 0 = Off or 1 = On.

HILS? High Level Alarm Status Query

Input: HILS?

Returned: 0 or 1

Remarks: Used to query the current high level alarm status where 0 = Off or 1 = On.

HITAS? High Temperature A Alarm Status Query

Input: HITAS?

Returned: 0 or 1

Remarks: Used to query the current high temperature alarm status for the Temperature A Sensor where 0 = Off or 1 = On.

HITBS? High Temperature B Alarm Status Query

Input: HITBS?

Returned: 0 or 1

Remarks: Used to query the current high temperature alarm status for the Temperature B Sensor where 0 = Off or 1 = On.

LOTAS? Low Temperature Alarm Status Query

Input: LOTAS?

Returned: 0 or 1

Remarks: Used to query the current low temperature alarm status for the Temperature A Sensor where 0 = Off or 1 = On.

LOTBS? Low Temperature B Alarm Status Query

Input: LOTBS?

Returned: 0 or 1

Remarks: Used to query the current low temperature alarm status for the Temperature B Sensor where 0 = Off or 1 = On.

LUNI? Level Units Status Query

Input: LUNI?

Returned: E, M, or %

Remarks: Used to query the current level units where E = English (inches), M = Metric (millimeters), and % = Percent. The default units are E = English (or inches).

PCNT? Percent Reading Query

Input: PCNT?

Returned: +XXX.X

Remarks: Used to query the current percent of fill based on 0 and 100% settings and actual liquid level. If level display units are set to percent, this query returns the same value as the LEVL? query.

User

Manual

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TUNI? Temperature Units Status Query

Input: TUNI?

Returned: C, F, or K

Remarks: Used to query the current temperature units where C = Celsius, F = Fahrenheit, and K = Kelvin.

Customer / Technical Service:

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