

# E1039 Polarized Target Monitoring & Maintenance Guide

*SpinQuest (E1039) Polarized Target group*

Revised on 02/26/2023

If you are "new" for the helper shift, please contact the Target Expert on shift in advance to arrange the initial walkthrough together...

Link to the spreadsheet to record the values:

<https://docs.google.com/spreadsheets/d/1EDTHSeUDGJ9b6beYizHEAJ8-Z1rAiQbZMgKhmloPLw8/>

(navigate to the tables using the labels at the bottom)

# Target Shifts & elog entry

Thanks Steve! for helping setting this up



## SpinQuest (E-1039)

### Electronic Logbook

Logbook Members Projects Shifts

Entries

#### Logbook entries

Search

(sorted by Created) [Sort by Updated](#)

RSS

[Show Entries ID in collapsed mode](#)

New Entry

[Show Sticky Entries First](#)

Preferences

[Who is on shift now](#)

Category: (all)  subcategories

Quick search:

[< newer](#)

[collapse all](#) [expand all](#)

Legend for symbols: ● Private entry. ! Entry has new

11:27

**Target** [zji] Target Maintenance

14:47

**Target** [zji] Target Maintenance

#### Create New Entry

Form:

Chamber Gas Walkthrough

Target Maintenance

✓ default

Category:

--select category-- (required)

Private:

Entry will be visible only to authenticated users



## SpinQuest (E-1039)

### Shift Scheduler

Logbook Members Projects Shifts

Calendar

#### Shifts for August 2022

Schedule intervals

[week view](#) [< July 2022](#) [August 2022](#) [September 2022 >](#)

Shift quotas

Target Shift

Shifts by institution

Open shifts

My shifts

Who is on shift now

Mon 01	Tue 02	Wed 03	Thu 04
Mon 08	Tue 09	Wed 10	Thu 11
Mon 15	Tue 16	Wed 17	Thu 18
<b>Target Shift</b> Mon-Sun 00:00-23:59 Target Expert (0.0) Ishara Fernando Target Helper (0.0) Zhaohuizi Ji			

Please sign-up for target shifts!

# Outline

Target Shift Helper tasks can be categorized into two main sections in these slides:

**A** ➤ Target System Monitoring [Once per hour through 08:00 to 18:00]  
In addition to the basic monitoring tasks, discussed in these slides, target expert can ask additional monitoring help if needed and those depends on system's status/tests at the moment. Target expert will provide guidance if that's the case.

**B** ➤ Target Maintenance & ECL entry information  
> Make sure the supplies are available (or arranged to be delivered)  
> One elog-entry per day is needed  
[attend daily 8:30 am meeting for access requests]

Also, please coordinate with the Target expert on shift to help with other routine maintenance tasks (eg: filling LN2 to purifier, filling gHe to outside tanks, etc.)

Please don't forget record the numbers on the spreadsheet below when you get readings for the elog entry:

<https://docs.google.com/spreadsheets/d/1EDTHSeUDGJ9b6beYizHEAJ8-Z1rAiQbZMgKhmloPLw8/>

(navigate to the tables using the labels at the bottom)

# Trainings needed on your ITNA

- Please contact Rick to add the following training modules to your ITNA. These trainings will be required in case you are helping for some maintenance tasks such as replacing gas bottles, handling LN2, etc.

**FN000213** Compressed Gas Cylinder Safety

**FN000304** Fall Protection

**FN000654** Ladder User Safety

**FN000271** Pressure Safety Orientation

**FN000115** Cryogenic Safety (General)

**FN000475** Large portable Dewar handling

Please don't forget record the numbers on the spreadsheet below when you get readings for the elog entry:

<https://docs.google.com/spreadsheets/d/1EDTHSeUDGJ9b6beYizHEAJ8-Z1rAiQbZMgKhmlPLw8/>

(navigate to the tables using the labels at the bottom)

# A Target System Monitoring

Navigate to : <https://e906-gat1.fnal.gov/data-summary/e1039/>

## E1039 Data Summary

### Presets for Target Parameter Monitor

Run Data

Run

Decoder

Auto-Update 1x1 Display

Spill

Sc

Total LHe in System

Magnet Return Flow in Liquid Volume and Outside Tank Pressure

Total LHe in System (Old)

OnlMon Status

Auto-Update 1x2 Display

Transfer-Line Cool Down

LHe Transfer

Semi-Online Reco. Status

IVC & Magnet Pressures

Magnet LHe Level & Tank/Coil T/B Temperatures

Magnet Pressure & Return Flow

Fridge Temperature & Level

Return Flow

Slow Control

Auto-Update 2x2 Display

ACNET

Hodo HV

C

Magnet Ramp

Control Room #1

Fridge Temperature, Fridge Level & Return Flow

Target Control

Auto-Update 3x2 Display

Target Helper

All Parameters (Time Range)

All Parameters (Auto U

Auto-Update 2x3 Display

Presets

Formula (Time Range)

Formula (Auto

Target TV

Fridge

Tools

Click on  
"Presets"



Then select this. "Target Helper" display

A

# Target Helper Displays

## Presets for Target Parameter Monitor

### Auto-Update 1x1 Display

- Total LHe in System
- Magnet Return Flow in Liquid Volume and Outside Tank Pressure
- Total LHe in System (Old)

### Auto-Update 1x2 Display

- Transfer-Line Cool Down
- LHe Transfer
- IVC & Magnet Pressures
- Magnet LHe Level & Tank/Coil T/B Temperatures
- Magnet Pressure & Return Flow
- Fridge Temperature & Level
- Return Flow

### Auto-Update 2x2 Display

- Magnet Ramp
- Control Room #1
- Fridge Temperature, Fridge Level & Return Flow

### Auto-Update 3x2 Display

- Target Helper #1
- Target Helper #2
- QT parameters only

### Auto-Update 2x3 Display

- Overall System Summary Status
- Target TV
- Fridge

IVC, LHe levels  
 LN2 levels, Magnet coils' Temps, LCW parameters,  
 and LCW temps. On QT compressors

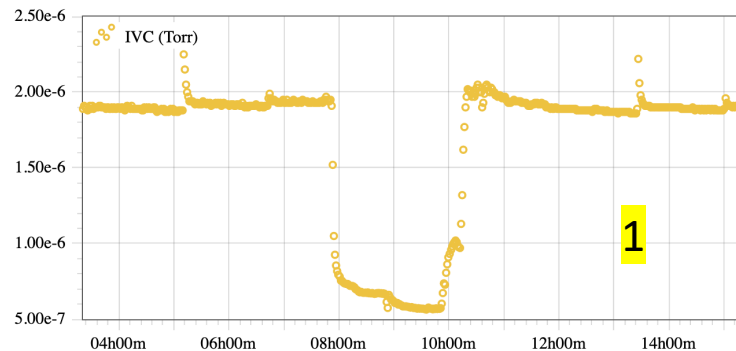
QT parameters only

# Target Helper Displays

## Target-Helper Monitor [top]

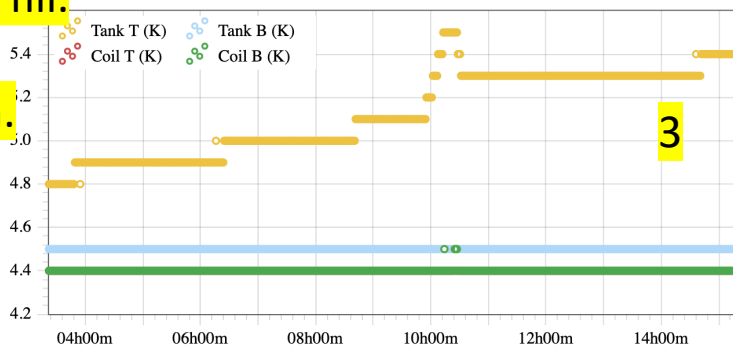
For 12 h 0 m 0 s |  Auto-Update in 23 / 30 sec | Manual-Update  
Last updated @ 2023/01/19 15:20:27

Last Record	IVC (Torr)
2023/01/19 15:20:18	9
	1.90E-6



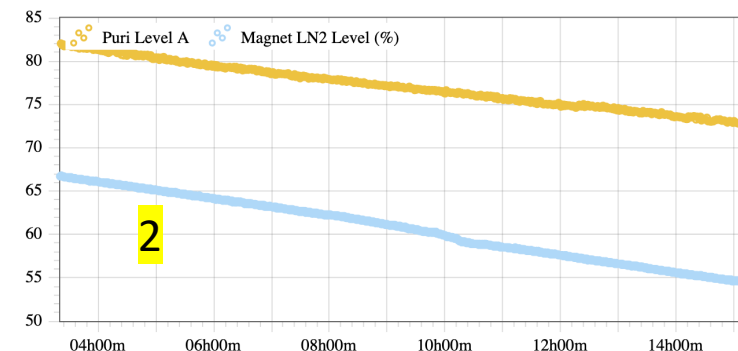
For 12 h 0 m 0 s |  Auto-Update in 23 / 30 sec | Manual-Update  
Last updated @ 2023/01/19 15:20:56

Last Record	Tank T (K)	Tank B (K)	Coil T (K)	Coil B (K)
2023/01/19 15:20:51	5	5.4	4.5	4.4



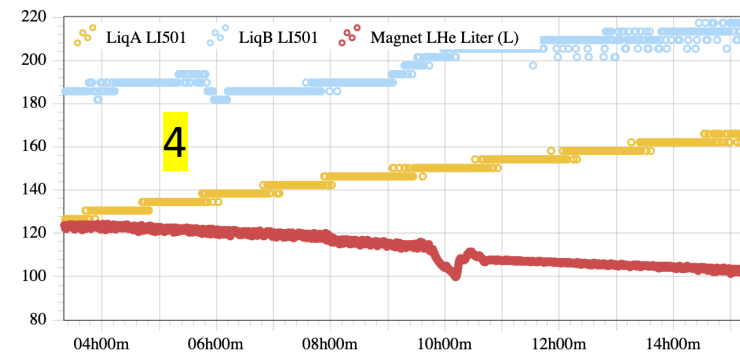
For 12 h 0 m 0 s |  Auto-Update in 3 / 30 sec | Manual-Update  
Last updated @ 2023/01/19 15:20:24

Last Record	Puri Level A	Magnet LN2 Level (%)
2023/01/19 15:19:24	61	72.75895
		54.5



For 12 h 0 m 0 s |  Auto-Update in 16 / 30 sec | Manual-Update  
Last updated @ 2023/01/19 15:20:27

Last Record	LiqA LI501	LiqB LI501	Magnet LHe Liter (L)
2023/01/19 15:19:29	59	166	217.3
			102.660859



We would recommend you to check this screen at least once every hour and communicate with Target Expert on the shift if you see the following conditions (or outside the given range).

- 1) Insulation Vacuum:  
Peak(s) higher than  $1 \times 10^{-5}$  Torr.
- 2) LN2 levels on the purifier and Magnet shield:  
Both levels should be > 50%. Otherwise, need fill.
- 3) Magnet Coils' Temperatures:  
If the Tank B (blue) starts going above 5 Kelvin.
- 4) LHe levels in the,  
> Magnet ( should be ~80 L. - 145 L )  
> LQ A and LQ B (should be ~ 50 L – 225 L)

A

# Target System Monitoring (Customized)

Navigate to : <https://e906-gat1.fnal.gov/data-summary/e1039/>

The screenshot displays the 'E1039 Data Summary' web interface. It features a main title bar at the top, followed by a 'Run Data' section with buttons for 'Run', 'Decoder', 'Shifter Log', 'Spill', 'Scaler Prod', 'OnlMon Status', 'OnlMon Plots', 'Semi-Online Reco. Status', and 'Online Reco. Status'. Below this is the 'Slow Control Data' section with buttons for 'ACNET', 'Hodo HV', 'Chamber HV', and 'Hall Env'. The 'Target Control Data' section contains buttons for 'All Parameters (Time Range)', 'All Parameters (Auto Update)', and 'All Parameters (Multi Auto Update)'. At the bottom, there is a 'Tools' section with buttons for 'Presets', 'Formula (Time Range)', 'Formula (Auto Update)', 'Active Alarm', and 'Other UIs'. A red arrow points from the text 'Click on "All Parameters"' to the 'All Parameters (Time Range)' button.

Click on "All Parameters"



# A Target System Monitoring (Customized)

Navigate to : <https://e906-gat1.fnal.gov/data-summary/e1039/>

## All Target Parameters

[top]

| From 2023 / 01 / 19 14 : 36 : 49 to 2023 / 01 / 19 15 : 36 : 49 | Draw | Chart Option »  
 No parameter is selected.

You can access almost all the target parameters through this panel by

- 1) Selecting Check boxes
- 2) Providing time-frame
- 3) Or use “Auto” update functionality on the previous page.

QT LiqA	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI
QT LiqB	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI
QT Purifier	<input type="checkbox"/> T1A <input type="checkbox"/> Level B <input type="checkbox"/> Level A <input type="checkbox"/> PRTY_Calibrated <input type="checkbox"/> PRTY <input type="checkbox"/> PBB <input type="checkbox"/> PBA <input type="checkbox"/> PRTY_Calibrated_B_Out <input type="checkbox"/> PRTY_Calibrated_B_Mid <input type="checkbox"/> PRTY_Calibrated_A_Out <input type="checkbox"/> PTB <input type="checkbox"/> PRTY_Calibrated_A_Mid <input type="checkbox"/> Flow Controller Flow <input type="checkbox"/> Vfc <input type="checkbox"/> DPfc <input type="checkbox"/> Pfc <input type="checkbox"/> T2B <input type="checkbox"/> T1B <input type="checkbox"/> T2Amv <input type="checkbox"/> T1Amv <input type="checkbox"/> T2A <input type="checkbox"/> PTA
QT System	<input type="checkbox"/> Manifolds PT8 <input type="checkbox"/> Manifolds Magnet Dewar Level <input type="checkbox"/> Manifolds TCD_Smooth <input type="checkbox"/> Manifolds TX1 <input type="checkbox"/> Manifolds FMR <input type="checkbox"/> Manifolds Magnet Dewar Pressure <input type="checkbox"/> Manifolds PC1 <input type="checkbox"/> ODH EV-105-N <input type="checkbox"/> ODH TE-104N <input type="checkbox"/> ODH TE-107N <input type="checkbox"/> ODH TE-108N <input type="checkbox"/> ODH LL-106-N <input type="checkbox"/> ODH TE-109N <input type="checkbox"/> HR3 Enabled <input type="checkbox"/> ODH PT-106-N <input type="checkbox"/> ODH PT-110-N
Cryo Pressure	<input type="checkbox"/> IVC <input type="checkbox"/> Fridge/1000 <input type="checkbox"/> Fridge/100 <input type="checkbox"/> He3 Probe <input type="checkbox"/> Return Manifold <input type="checkbox"/> Main Return #1 <input type="checkbox"/> Roots-Pump Top <input type="checkbox"/> Roots-Pump Middle <input type="checkbox"/> Separator Return <input type="checkbox"/> Magnet Return <input type="checkbox"/> Main Return #2 <input type="checkbox"/> n/c
Cryo Purity	<input type="checkbox"/> He Purity
Cryo Temperature	<input type="checkbox"/> Fridge/1000 <input type="checkbox"/> Fridge/100 <input type="checkbox"/> Fridge/He3 <input type="checkbox"/> Tank T <input type="checkbox"/> Tank B <input type="checkbox"/> Coil T <input type="checkbox"/> Coil B <input type="checkbox"/> Coil T1 <input type="checkbox"/> Coil T2 <input type="checkbox"/> Coil T3 <input type="checkbox"/> Coil T4 <input type="checkbox"/> Coil B1 <input type="checkbox"/> Coil B2 <input type="checkbox"/> Coil B3 <input type="checkbox"/> Coil B4 <input type="checkbox"/> IVC Side Bottom <input type="checkbox"/> IVC Side Top <input type="checkbox"/> Fridge Top <input type="checkbox"/> LHe FL Stinger <input type="checkbox"/> LHe FL #1 <input type="checkbox"/> LHe FL #2 <input type="checkbox"/> Cooldown Line TX3 <input type="checkbox"/> Cooldown Line TX2 <input type="checkbox"/> Annealing A <input type="checkbox"/> Annealing B <input type="checkbox"/> Microwave A <input type="checkbox"/> Microwave B <input type="checkbox"/> He Riser <input type="checkbox"/> IVC Top <input type="checkbox"/> Baffle Top <input type="checkbox"/> Baffle Bottom <input type="checkbox"/> Separator Top <input type="checkbox"/> Separator Bottom <input type="checkbox"/> Heat-Ex Top <input type="checkbox"/> Heat-Ex Bottom <input type="checkbox"/> Ann-Plate Bar <input type="checkbox"/> Ann-Plate Top <input type="checkbox"/> QT 1A <input type="checkbox"/> QT 2A <input type="checkbox"/> QT 3A <input type="checkbox"/> QT 4A <input type="checkbox"/> QT 5A <input type="checkbox"/> QT 1B <input type="checkbox"/> QT 2B <input type="checkbox"/> QT 3B <input type="checkbox"/> QT 4B <input type="checkbox"/> QT 5B
Cryo Level	<input type="checkbox"/> Nose LHe Level <input type="checkbox"/> Run Valve <input type="checkbox"/> Bypass Valve <input type="checkbox"/> Magnet LHe Level <input type="checkbox"/> Magnet LN2 Level <input type="checkbox"/> Magnet LHe Liter
Cryo Magnet	<input type="checkbox"/> Output Current <input type="checkbox"/> Persistent Current <input type="checkbox"/> Output Voltage
Cryo Flow	<input type="checkbox"/> Magnet Return <input type="checkbox"/> Separator Return <input type="checkbox"/> Main Return
Roots-Pump P&T	<input type="checkbox"/> P1 <input type="checkbox"/> P2 <input type="checkbox"/> P3 <input type="checkbox"/> T1 <input type="checkbox"/> T2 <input type="checkbox"/> T3
Roots-Pump LCW	<input type="checkbox"/> M1 <input type="checkbox"/> M2 <input type="checkbox"/> M3 <input type="checkbox"/> M4 <input type="checkbox"/> WFS1
ACNet	<input type="checkbox"/> F:NM4LCWFLOW <input type="checkbox"/> F:NM4LCWP1 <input type="checkbox"/> F:NM4LCWP2 <input type="checkbox"/> F:NM4LCWP3 <input type="checkbox"/> F:NM4LCWT1 <input type="checkbox"/> F:NM4LCWT2 <input type="checkbox"/> F:NM4LCWT3

# A Monitoring QT Dewar Parameters

QT LiqA	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input checked="" type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI
QT LiqB	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input checked="" type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI

Please check both Liquefier parameters once in every three-hours.

Important parameters for QT Liquefiers can be accessed by checking the relevant box(es). Check both Liquefiers **A** and **B**.

Param	Meaning	Operational Range
PT501	Main Inlet pressure	Usually, ~ 20 psi less than outside tank pressure
PT502	Regulated inlet pressure to LQ	~ 3 – 8 psi
PT503	Dewar Pressure	~ 3 – 8 psi
LI501	Dewar LHe level	50L – 225L
TI502-10	Coldhead Temps.	Usually 4 K – 7 K (During a fill it will be 30K – 80 K) when LQ is on "Manual" mode
FC501Q,I	Inlet flow	~ 20 - 60slm
FCQ, FCI	Outlet flow	~ 0-2slm

If you see any of these outside the operational range, please **immediately** inform the target expert on shift!

# A Monitoring Main LCW Inlet/Outlet P & T

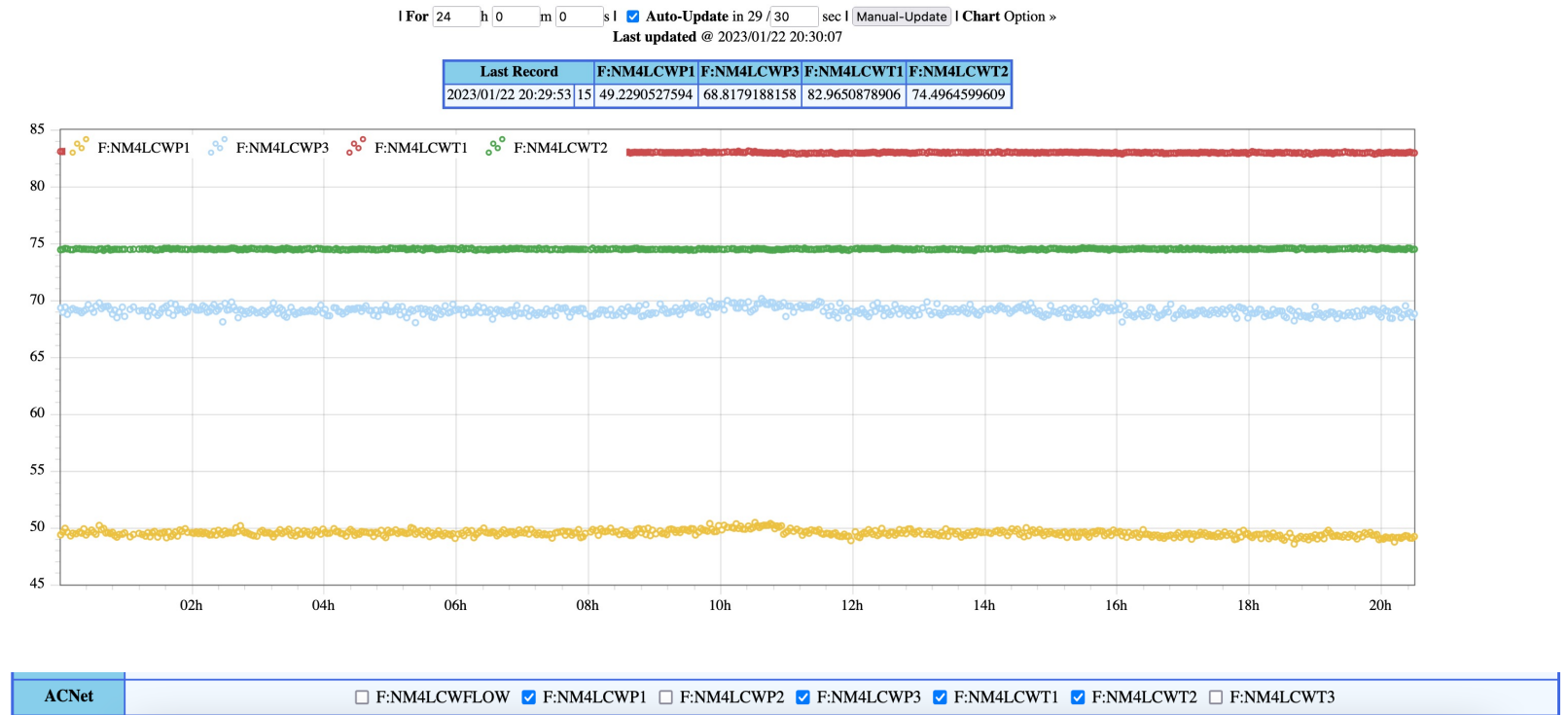
link: <https://e906-gat1.fnal.gov/data-summary/e1039/>

Check the LCW flow, pressures and temperatures by checking the boxes as shown.

Please contact target expert on shift if you notice any of the following (in magnitude).

- 1) If the flow is less than "30"
- 2) If P\_in is less than "55"
- 3) If P\_out is less than "30"
- 4) If T\_in is higher than "90"
- 5) If T\_out is higher than "100"

Usually these curves should be flat (as shown in this plot), if you see any spikes, or unusual behavior, then please inform the target expert on shift immediately!



NM4LCWP1=P\_out  
NM4LCWP3=P\_in  
NM4LCWT1=T\_out  
NM4LCWT2=T\_in

# A

# Monitoring QT compressor LCW temperatures

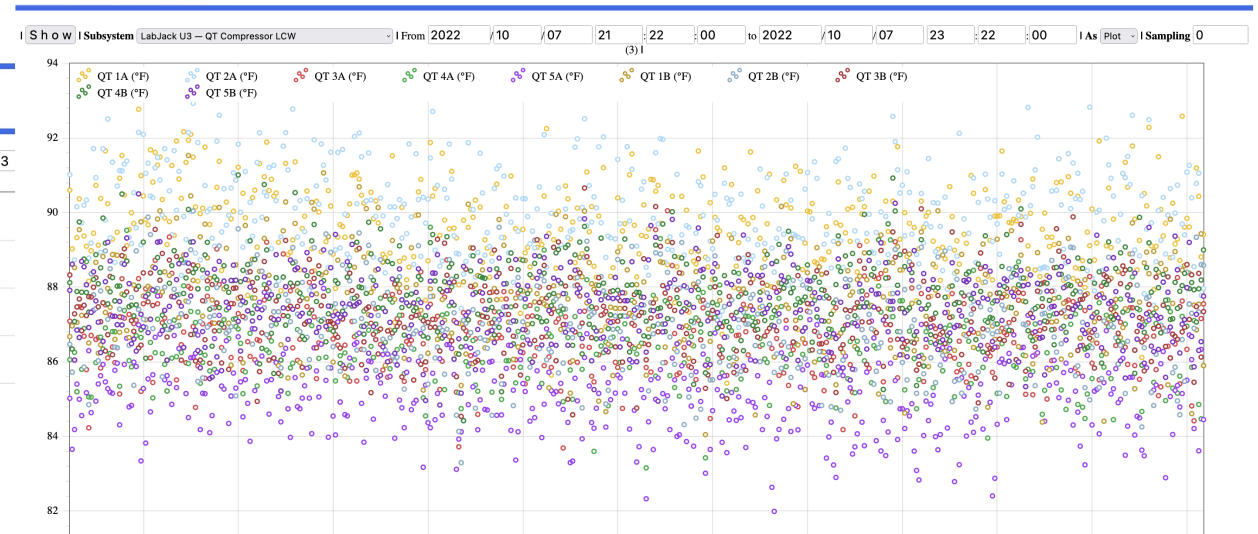
Navigate to: <https://e906-gat1.fnal.gov/data-summary/e1039> the select “Cryo Control” under “Target Control Data” Section.

Select the “LabJack U3 – QT Compressor LCW” from the drop down menu under “Subsystem” field selection.

Leave the default times as it is and hit “Show” button

[Direct link: <https://e906-gat1.fnal.gov/data-summary/e1039/target-cryo-cont.php?subsyst=LabJack+U3> ]

Look at the plot and confirm that the last recording time is within one minute and all the temperature readings are below the limit (115 F).

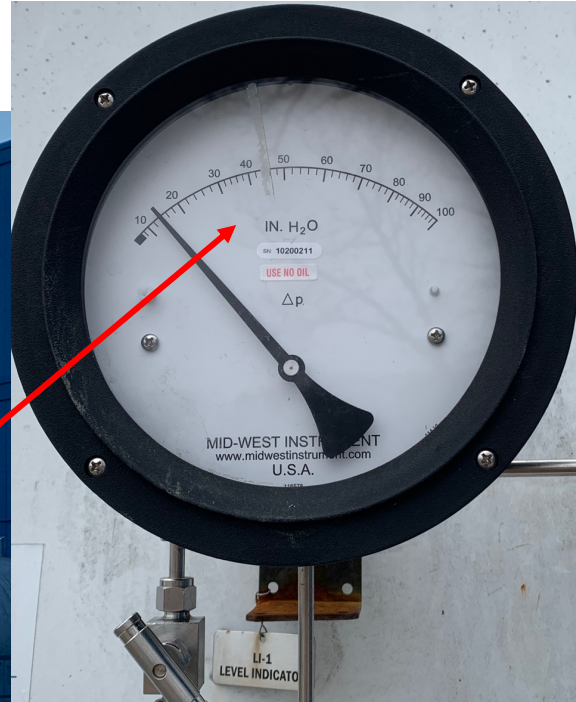


# Record the number of gHe and gN2 bottles at the outside rack



- Read the labels/tags on each bottle to identify for gHe or gN2
- If the number of **full** bottles from either type is less than 4, then please send an email to Kun Liu ([liuk.pku@gmail.com](mailto:liuk.pku@gmail.com)) to order more bottles

# Check gHe pressure and LN2 pressure of the outside tanks



LN2 Tank Pressure:  
Send an email to Jordan Bohn [jbohn@fnal.gov](mailto:jbohn@fnal.gov) and cc Target Expert and Rick if the indicator is less than ~15 IN.H<sub>2</sub>O), so they will arrange a refill.

gHe Tank Pressure  
[Note: Both gHe tanks are connected](Notify Kun [liuk.pku@gmail.com](mailto:liuk.pku@gmail.com)

if the pressure is less than 25 psi) [Coordinate with Target Expert if a refill is needed] Notify Target Expert if this is 118 PSI



You can monitor the gHe tank pressure remotely from strip charts

QT System	<input type="checkbox"/> Manifolds PT8	<input type="checkbox"/> Manifolds Magnet Dewar Level
	<input type="checkbox"/> ODH TE-104N	<input type="checkbox"/> ODH TE
	<input type="checkbox"/> IVC	<input type="checkbox"/> Fridge/1000
	<input type="checkbox"/> Fridge/100	<input type="checkbox"/> He3 Probe

If you notice a difference larger than 4 psi between PT8 and the actual gauge the inform Target Expert

# Filling gHe outside tanks using tube-trailer



**Please contact the Target Expert on Shift to coordinate to fill gHe tanks using a tube trailer**

The filling procedure can be found here:

<https://seaquest-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=10198>

# Check the number of LN2 portable Dewars outside the loading dock



- Check the number of “full” Dewars which are usually placed near this door (whereas the empty ones towards the East side of the loading dock door).
- On some of the Dewars there is a liquid level indicator on the top.
- If there isn't a liquid level indicator or it's not clear, then contact the target expert on shift.
- If the number of portable Dewars are less than or equal to 2, then please send an email to Kun Liu ([liuk.pku@gmail.com](mailto:liuk.pku@gmail.com)) to order more.



# Checking two gHe bottles' levels on the west-wall of the cryoplatform



Location: Hall

Do not do this without FN000213/CR training

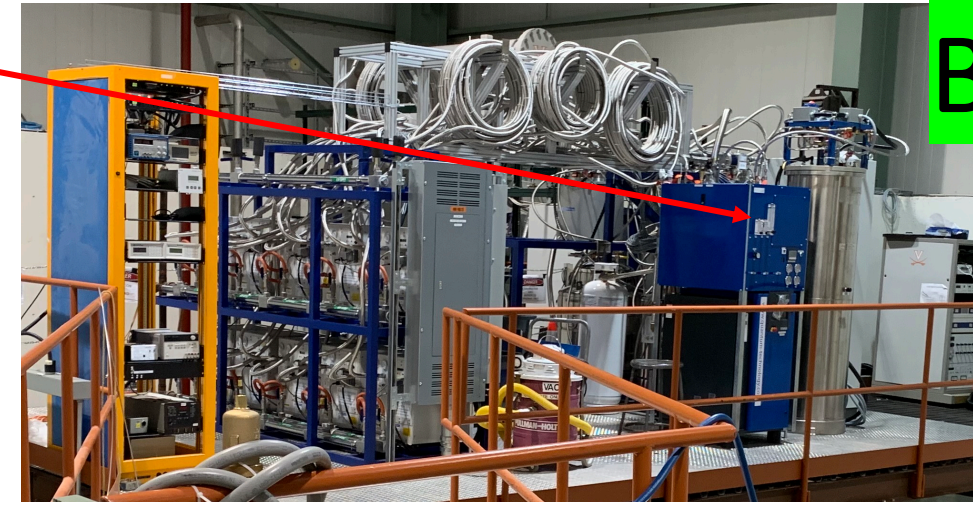
1. Open the Gas bottle using the rotating knob on the top of the bottle (turning anti-clockwise) to read the value of this meter on the right hand-side. Close the rotating knob (turning clockwise) once you are done reading the pressure.
2. If this level is low (or below 100psi) then replace cylinder(s) with new one(s).  
Contact Target Expert on shift  
Slide #12 shows the gas rack location
3. Make sure to keep the bottle closed (by tightening clockwise), unless target expert asked you to leave it open.



Item #21 (In-person section)

# Check QT HR3 gauges

Location



B

If "MANUAL START" button is not green then please contact the Target expert on shift

Buffer tank pressure



Check for the labels P10, P6, P8, P40, P41 and record on the spreadsheet

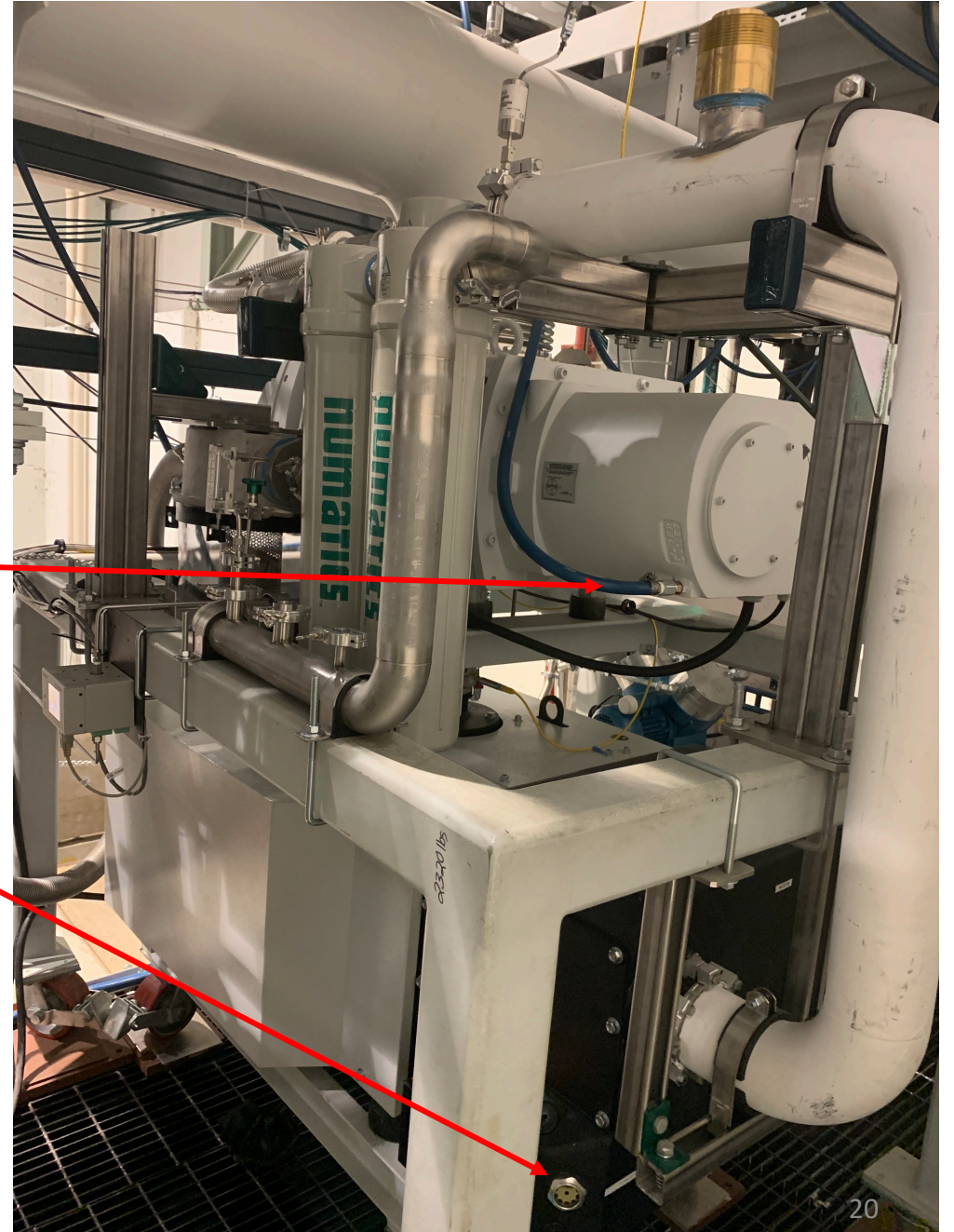
Item #22 (In-person section)

# Check oil levels of all 4 pumps

There are 4 pumps in the ROOTs pumps setup

- Check the oil level on each pump
- Oil-level indicators
- When the pumps are running
  - > Level should be close to 40%-60%
- When the pumps are not running
  - > Level should be close to “full” (~60% for the top three pumps, and ~80% for bottom pump)

Notify Target Expert shift contact if the levels are different from the above mentioned levels.



# Check QT liquid (Dewar) levels

Item #23 See slide #6 to compare with Target Helper Screen

LHe levels



★ LHe Dewars A and B



Liquid levels can be read using these meters on each Dewar separately

Also, check the level shown in the online strip charts and report to the target expert if the levels are off by more than 10 L

QT LiqA	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input checked="" type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI
QT LiqB	<input type="checkbox"/> PT501 <input type="checkbox"/> PT502 <input type="checkbox"/> PT503 <input type="checkbox"/> PD <input checked="" type="checkbox"/> LI501 <input type="checkbox"/> PT <input type="checkbox"/> TID <input type="checkbox"/> TI502 <input type="checkbox"/> TI504 <input type="checkbox"/> TI506 <input type="checkbox"/> TI508 <input type="checkbox"/> TI510 <input type="checkbox"/> FC501Q <input type="checkbox"/> FC501I <input type="checkbox"/> FCQ <input type="checkbox"/> FCI