

CTS™ Cellmation™ Software for DeltaV™ System USER GUIDE

for use with: CTS™ DynaCollect™ Magnetic Separation System

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The information in this guide is subject to change without notice.

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Contents

■ CHAPTER 1	Product information	6
	Product description	6
	Operational description	7
	Licenses	7
	Definitions	7
	Toolbar buttons	9
	Hardware overview	10
	Software licensing requirements	12
	Physical connection	13
	DynaCollect™ instrument network setup	14
	EIOC network setup	15
	EIOC OPC UA setup	16
	Network connectivity check	17
	DynaCollect™ instrument OPC UA setup	19
	OPC UA connectivity check	20
	User interface	20
	Splash screen	21
	Overview display	22
	Main DynaCollect™ instrument display	23
	DynaCollect™ instrument interface parameters display	26
	Contextual displays (Faceplates)	27
■ CHAPTER 2	General system operation	35
	User login	35
	DynaCollect™ instrument operation	36
	DynaCollect™ instrument protocol parameters	36
	Check revision numbers	37
	Manual operation	43
	Acquire the equipment module	43
	Step 2: Setup the equipment module	45
	Step 3: Setup the equipment module to Run Protocol	47
	Step 4: Answer prompts as required	47

Step 5: Monitor Protocol state automatically selected	49
Step 6: Protocol completion	50
Recipe control operation	52
Phases	55
Phase recipe parameters	59
Recipe construction	61
Recipe execution	64
■ CHAPTER 3 Alarm management	68
Alarm banner	69
Faceplate alarm window	69
Alarms lists	70
Acknowledging and silencing alarms	71
Suppressing alarms	72
Shelving alarms	73
Alarm list shelve	73
Detail faceplate shelve	74
Alarm list OOS	75
Detail faceplate OOS	76
Restore to service	76
Suppressed alarm list	77
■ CHAPTER 4 Maintenance	78
Backup and recovery	78
Computer cleanup	78
Power outage	79
■ CHAPTER 5 Data storage	80
■ APPENDIX A Abbreviations/acronyms	83
■ APPENDIX B Faceplate details	84
GT_MOD_FP	85
GT_EM_FP	87
GT_USM_DT and GT_TimerFB_DT	89
GT_EM_Alarms_DT	90
GT_EM_FM_DT	91
GT_EM_Params_DT	92
GT_EM_Diag_DT	93

■ APPENDIX C	Compatibility matrix	94
■ APPENDIX D	Safety	95
■ APPENDIX E	Documentation and support	96
	Customer and technical support	96
	Limited product warranty	96



Product information

IMPORTANT! Before using this product, read and understand the information in the “Safety” appendix in this document.

Product description

The Gibco™ CTS™ Cellmation™ Software (based on the Emerson DeltaV™ platform) is an open, fully-configurable software solution designed to provide a flexible system for the control of Thermo Fisher Scientific cell therapy manufacturing instruments. CTS™ Cellmation™ Software is powered by the DeltaV™ system from Emerson Process Management, and is fully compatible with DeltaV™ system version 14.LTS. The software has been developed according to GAMP5 methods and conforms to regulatory requirements for use in current good manufacturing practice (cGMP)-compliant processes. It is optimized to allow easy scaling to accommodate R&D, process development, and manufacturing.

The software must be installed on all of the DeltaV™ workstations controlling/viewing cell therapy manufacturing operations. The exceptions are the application stations that may be used for purposes other than control (e.g., continuous history storage).

The CTS™ Cellmation™ Software requires a DeltaV™ MQ, MX, SQ, SX or PK controller and an OPC UA Client interface. The OPC UA Client can reside on an Ethernet Input Output Card (EIOC) – recommended or on an Application Station.

Neither Emerson Process Management nor Thermo Fisher Scientific recommend or support installation of any third-party software. Downloading files from the internet is not recommended. See Emerson KBA (knowledge based article) AP-0800-0025.

The software system is intended for use by personnel with a reasonable familiarity with bioprocesses and systems. The user is encouraged to become familiar with the manuals to obtain maximum performance from the system.

The contents of this guide may be copied into customer documents such as standard operating procedures (SOPs) as needed, but only for use with Thermo Fisher Scientific equipment.

Every effort has been made to ensure the accuracy of the information in this document. However, Thermo Fisher Scientific reserves the right to change its products without notice.

The software is designed to provide the user with the ability to use a wide range of cell therapy manufacturing instruments. It will also allow the user to:

- Use different cell therapy manufacturing instruments in the same network with no change in the operator interface.
- Create user specific batch recipes to control workflows across multiple instruments.
- Store historical data for retrieval later on.
- Allow for 3rd party batch reporting packages to retrieve data to produce batch reports containing alarm/events, continuous history and batch recipe information.

Operational description

CTS™ Cellmation™ Software provides a control solution for cell therapy process workflows that is independent of process-control hardware. It can be configured by end users without having to learn process control programming and resides on the DeltaV™ system by Emerson Process Management.

Licenses

CTS™ Cellmation™ Software is licensed per DeltaV™ system.

Definitions

DeltaV™ Books Online

A set of help files included with DeltaV™ systems. These files comprise the official documentation of the standard DeltaV™ system and include parameter and feature definitions.

Process value

Also referred to as process variable or measured variable. In process control, a measurable quality or quantity that, if changed, can cause other changes in the process or make such changes possible. Common process values are pump speed and door position.

OPC UA

Industry standard interface (Open Platform Communications, formerly known as OLE for Process Control Unified Architecture). This protocol is platform independent protocol allowing for greater integration between devices. This is the communication protocol between the DeltaV™ system and a cell therapy manufacturing instrument.

DeltaV™ Live

DeltaV™ Live is an application that provides the GUI to allow operation of the instrument and is the replacement GUI to DeltaV™ Operate. From here a user can control the instrument by the use of faceplates to monitor and enter data.

Contextual displays

Contextual display is a DeltaV™ Live terminology for a faceplate. The contextual display is a pop-up picture that contains the graphics and controls necessary to perform normal or expected control. The appearance of a faceplate varies depending upon the type of module, or device with which it is associated.

Detail faceplate

A detail faceplate is another kind of contextual display. It shows more of the module details (parameter limits, tuning constants, alarm information and diagnostic messages) than the faceplate.


















Batch list faceplate

A batch list faceplate is another kind of pop-up. It shows the current list of recipes that are loaded on the Batch Executive. From here recipes can be added and started or aborted.

Toolbar buttons

Table 1 Toolbar button icons and functionality descriptions

Icon	Function
	Opens the suppressed alarm list. Only visible when there are suppressed alarms.
	Exits operator interface.
	Opens the tools list. The following tools are available, Print, Reset Layout, Layout Scale and Themes.
	Refreshes the current display.
	Search button. Use this to search for a tag within the system. When entering the search text, the list of matching tags is displayed. From this list contextual displays, primary displays and process history displays can be selected for the listed tags.
	Navigate forward to the previous Main Screen. Holding the button will display the display history.
	Navigate forward to the previous Main Screen. Holding the button will display the display history.
	Opens the Main Overview graphic, with links to each tower and vessel graphic. An easy way to navigate quickly between vessels.
	Opens the Alarm Summary, showing all active and unacknowledged alarms.
	Opens the Alarm Filter page, excluding alarms from inactive vessels and showing only alarms from active vessels.
	DeltaV™ Utilities, provides access to Emerson Process Management functions.
	Indicates if any errors are present on the current display. If an error exists, the icon turns red.
	Opens the Process History view.
	Opens the Batch Operator Interface (BOI).
	Opens the Batch History view. Only available if the Batch Historian is installed.

Hardware overview

The CTS™ Cellmation™ Software is imported into an existing DeltaV™ system and comprises graphics and controller software modules. The method of communication between the DeltaV™ system and an instrument is OPC UA, with the instrument acting as the server and the DeltaV™ system acting as the client. Due to current DeltaV™ system constraints OPC UA client functionality is only supported on an Application Station or an EIOC controller. The CTS™ Cellmation™ Software has been developed to reside on a typical system architecture as shown with the OPC UA client residing on the EIOC (recommended) or Application Station (further validation may be required).

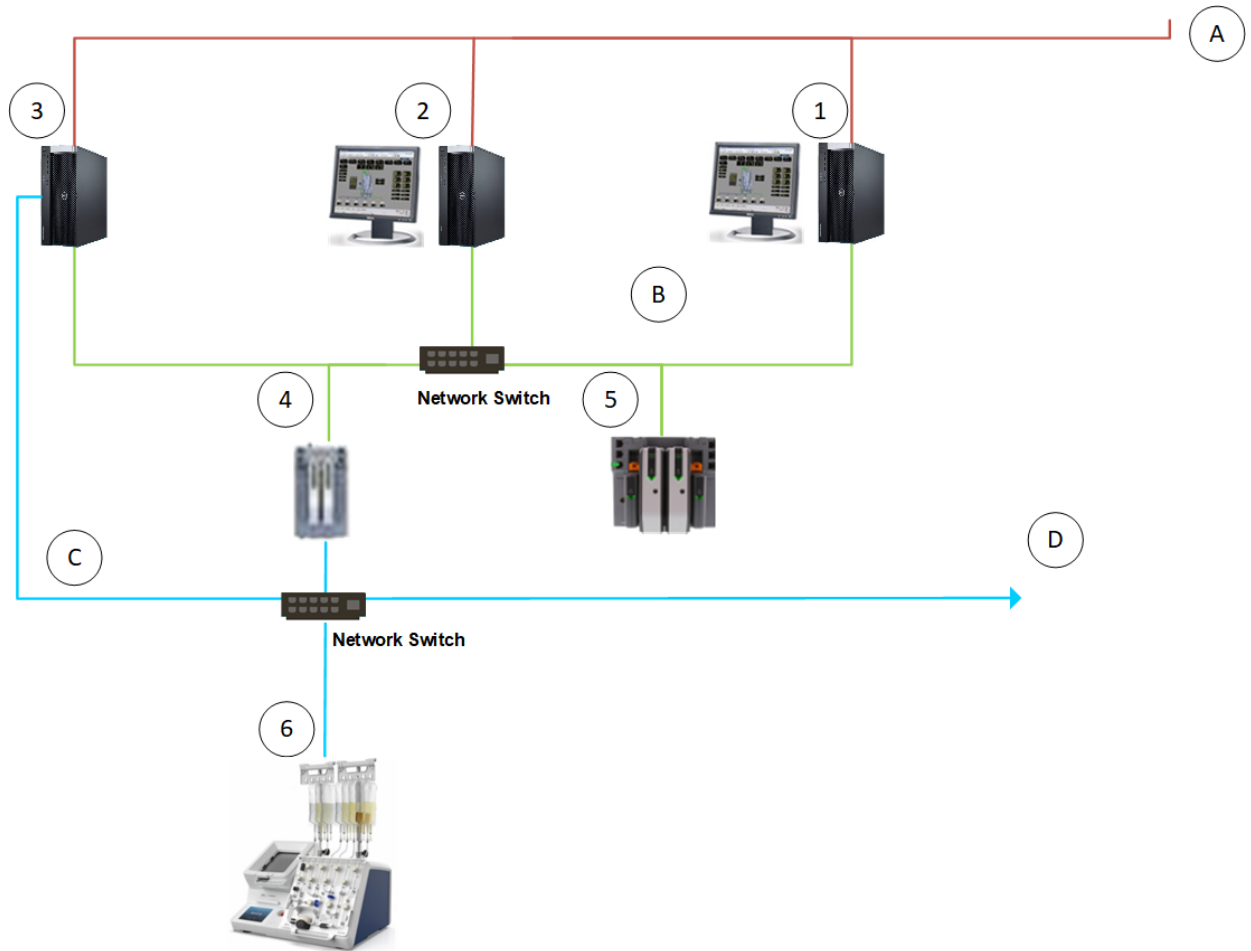


Figure 1 DeltaV™ system architecture

A: Office/Plant network

B: DeltaV™ system Area Control Network (ACN)

C: OPC Network

D: Other OPC Instruments

- ① ProPlus workstation with Alarm/Events Chronicle, Batch Executive, Continuous Historian
- ② Base Stations with remote sessions, Operation UI
- ③ Application Station (OPC UA Client) –Optional if EIOC is not utilized
- ④ EIOC (OPC UA Client)
- ⑤ PK/MX/SX Controller
- ⑥ DynaCollect™ instrument

The intention is that the OPC UA network is a separate network from either the DeltaV™ system Area Control Network or the office/plant network for security reasons.

Software licensing requirements

The DeltaV™ system should be version 14.LTS to support DeltaV™ Live applications. The DeltaV™ system should have the Continuous Historian enabled to support continuous historian of at least 50 parameters for the DynaCollect™ instrument. Also, the Batch Historian should be enabled if batch data is required for batch reporting. The following is the list of minimal software licenses required.

1. ProfessionalPLUS Premium Workstation Software; 100 DST
2. DeltaV version 14.LTS
3. DeltaV Live - DeltaV Live Operations Premium Performance Pack
4. (Optional) Application Station 250 DV (Required if using the Application Station for OPC Communication)
5. Batch licenses
 - a. Advanced Batch Units, 1 Units (should be 1 for each instrument)
 - b. Advanced Batch Unit Management, 1 Units (should be 1 for each instrument)
 - c. Batch Historian
6. Operator/Professional Station, full span of control
7. OPC UA related licenses
 - a. OPC UA Activation License (systemwide)
 - b. OPC UA client for Ethernet connected I/O (EIOC) – Optional if using the Application Station for OPC Communication
 - c. OPC UA Client Signal License, 500 Signals (100 per Instrument)
8. DST License
 - a. Analog Monitor Input 25 DSTs
 - b. Analog Control Output 25 DSTs
 - c. Discrete Monitor Input 25 DSTs

Physical connection

The connection between the DeltaV™ system and the DynaCollect™ instrument is via an ethernet network, and as such the architecture is dependent on the network infrastructure installed on the system.

To connect the Rotea™ instrument to the network, a CAT6A or CAT5 cable can be inserted into the Ethernet port.

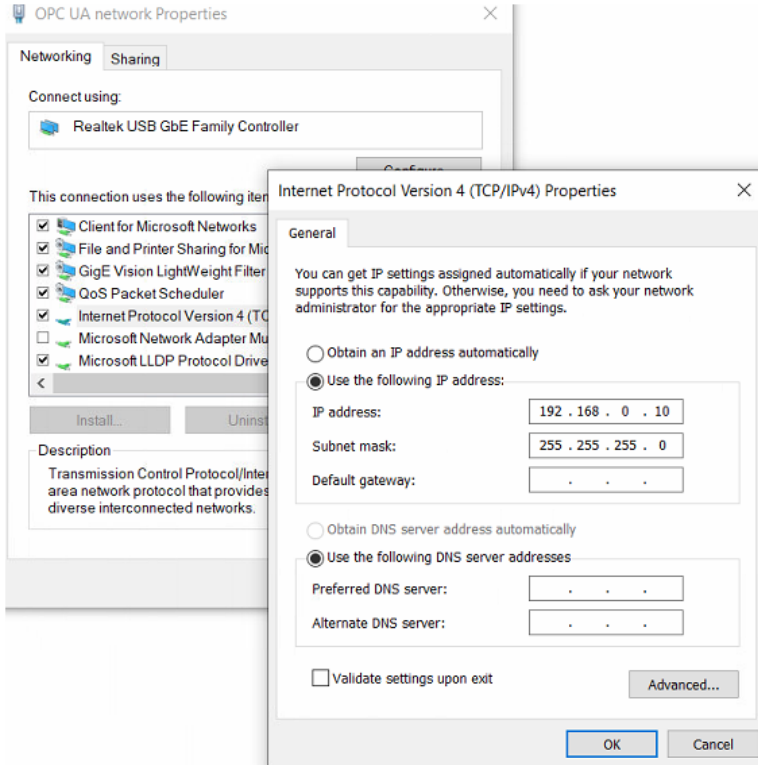


Figure 2 Rear view

- ① Exhaust filter
- ② USB 2.0 port
- ③ USB wireless adaptor port
- ④ Ethernet
- ⑤ Power switch
- ⑥ Power cable inlet

DynaCollect™ instrument network setup

The network adapter needs to be set up in the companion PC with an IPv4 address for connection to the DeltaV™ system (see the example). This address forms part of the DeltaV™ system OPC UA setup.



Note: This IP address shown in the picture can change as per user's EIOC IP address.

EIOC network setup

The EIOC network adapter needs to be set up via DeltaV™ Explorer with an IPv4 address. Select **Properties** of the EIOC port (P01) and select the **Advanced** tab. From this tab enter the required IPv4 address. Currently **Redundant connection** is not used so leave this blank.

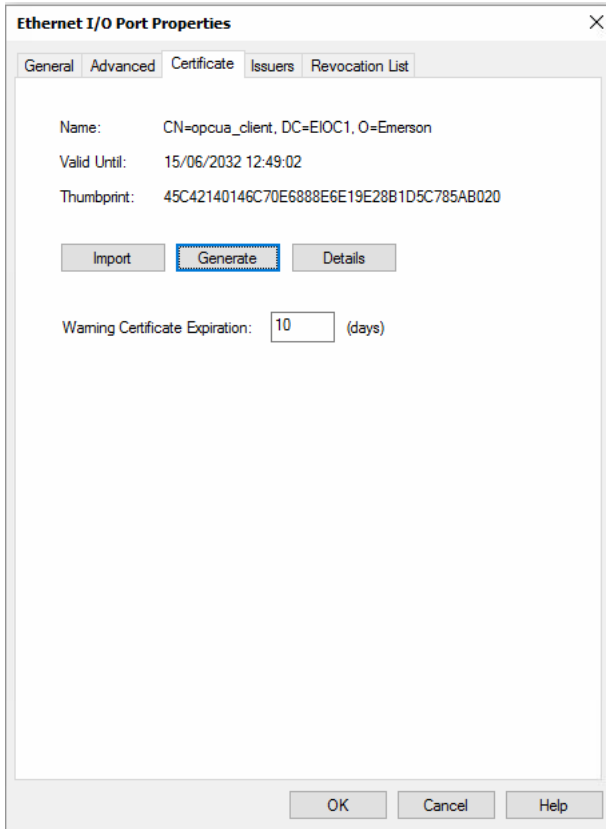
The screenshot shows the 'Ethernet I/O Port Properties' dialog box with the 'Advanced' tab selected. The 'Primary connection' section has 'IP address' set to '192 . 168 . 0 . 5' and 'Subnet mask' set to '255 . 255 . 255 . 0'. The 'Redundant connection' section has 'IP address' as an empty field and 'Subnet mask' set to '255 . 255 . 255 . 0'. The 'Interface' section has 'Protocol' set to 'OPC UA' and 'Information Model' set to 'Standard'. There is an unchecked checkbox for 'Parallel Redundancy Protocol'. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

Note: This IP address shown in the picture can change as per user's EIOC IP address.

In the **Interface** drop down box at the bottom, select **OPC UA** as the protocol to be used.

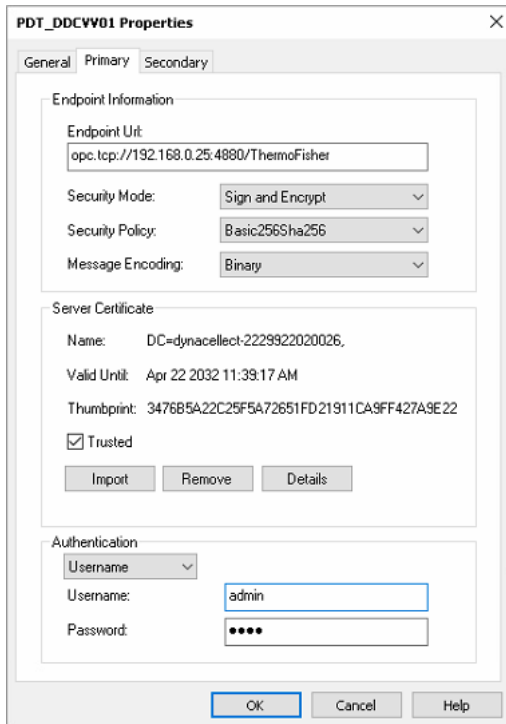
EIOC OPC UA setup

Once the EIOC has been setup to use the OPC UA protocol, if an instrument requires the OPC Client certificate then this can be generated by selecting the **Certificate** tab. Use the **Generate** button to create a certificate.



The CTS™ Cellmation™ Software for DeltaV™ System installation files for the DynaCollect™ instrument contain a configuration file that has default settings for the DynaCollect™ instrument OPC UA setup. The default setup creates a Physical Device Tag (PDT) named “PDT_DCXXXX” with all the associated Logical Device Tags underneath it. The PDT properties contain the Endpoint URL of the DynaCollect™ instrument OPC Server and if this requires modifying, then select properties of the PDT and update the URL by entering the IPv4 address.

Note: The port number is fixed as 4880 and should not be changed.



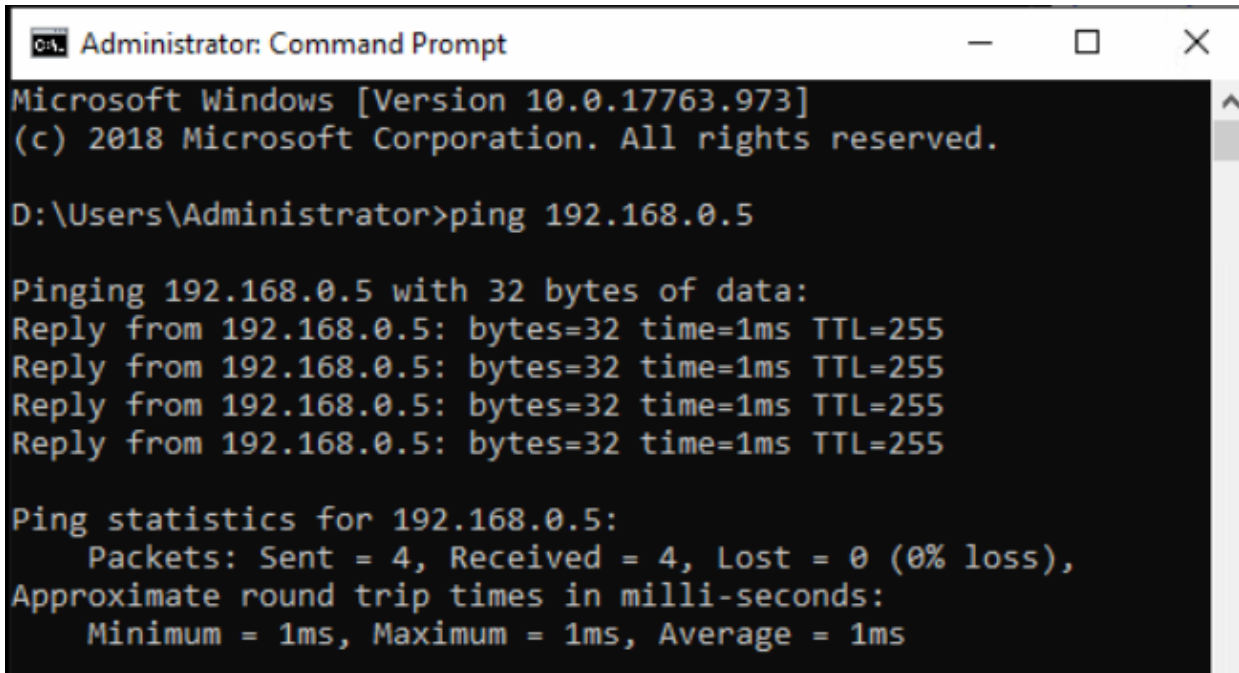
Note: This IP address shown in the picture can change as per user's DynaCollect™ address.

In addition, the OPC UA Certificate that is provided by the DynaCollect™ instrument can be imported by selecting the **Import** button. This will ensure that the correct application security settings have been applied.

Network connectivity check

Once the DeltaV™ system configuration has been downloaded, a quick test can be performed on a separate PC on the UA network connected to the DynaCollect™ instrument to check for network connectivity. Right click the Windows™ icon in the left hand corner of the task bar and select **Command Prompt** from the list when it appears.

In the command window, type “ping” in the black box and hit the space bar. Type the IP address of the EIOC (e.g., 192.168.0.5 in the following figure). If there is connectivity, then a reply will be seen. If not, then the cabling and network settings will need to be checked.



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.17763.973]
(c) 2018 Microsoft Corporation. All rights reserved.

D:\Users\Administrator>ping 192.168.0.5

Pinging 192.168.0.5 with 32 bytes of data:
Reply from 192.168.0.5: bytes=32 time=1ms TTL=255
Reply from 192.168.0.5: bytes=32 time=1ms TTL=255
Reply from 192.168.0.5: bytes=32 time=1ms TTL=255
Reply from 192.168.0.5: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

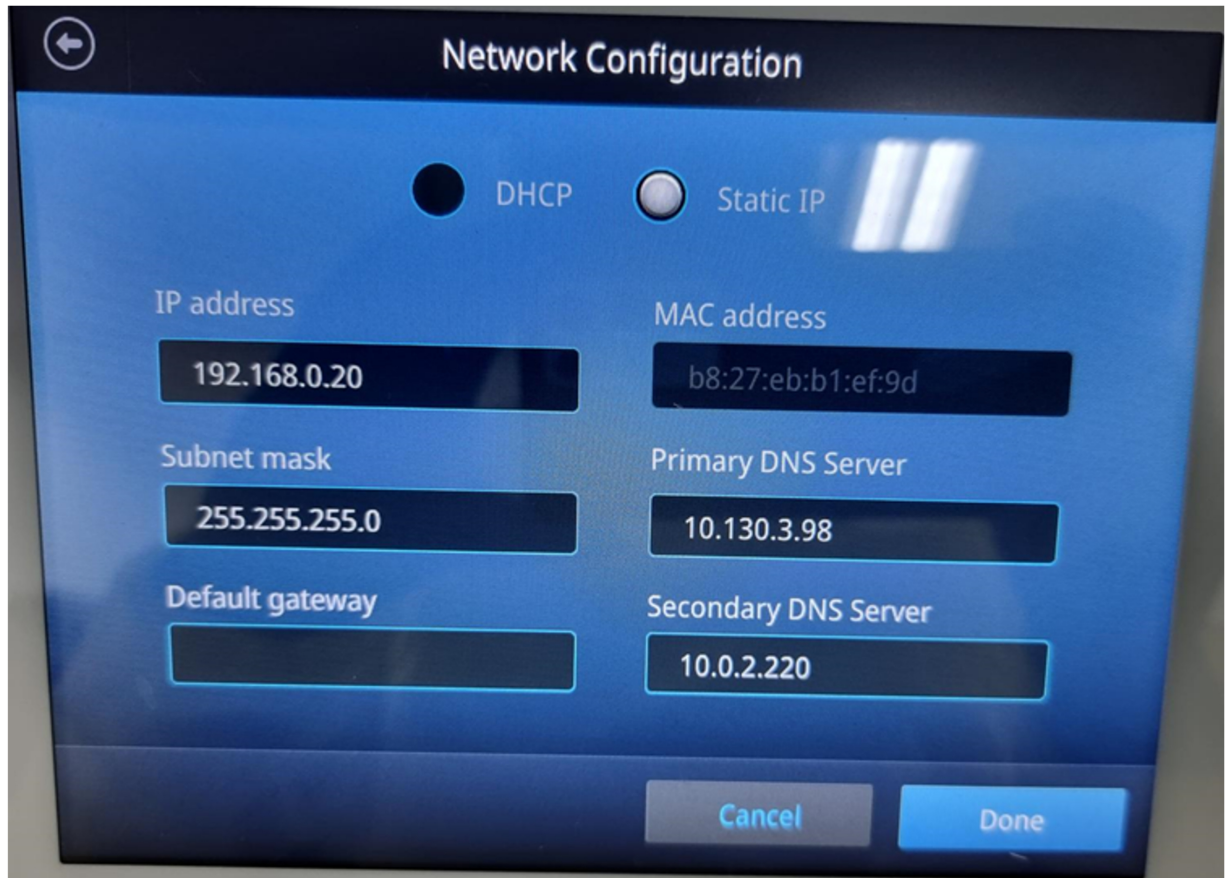
Note: This IP address shown in the picture can change as per user's EIOC IP address.

DynaCollect™ instrument OPC UA setup


Refer to DynaCollect™ GUI and DynaCollect™ instrument user manual.

From the settings page select the **Network Configuration** tab and set the entry fields as shown.

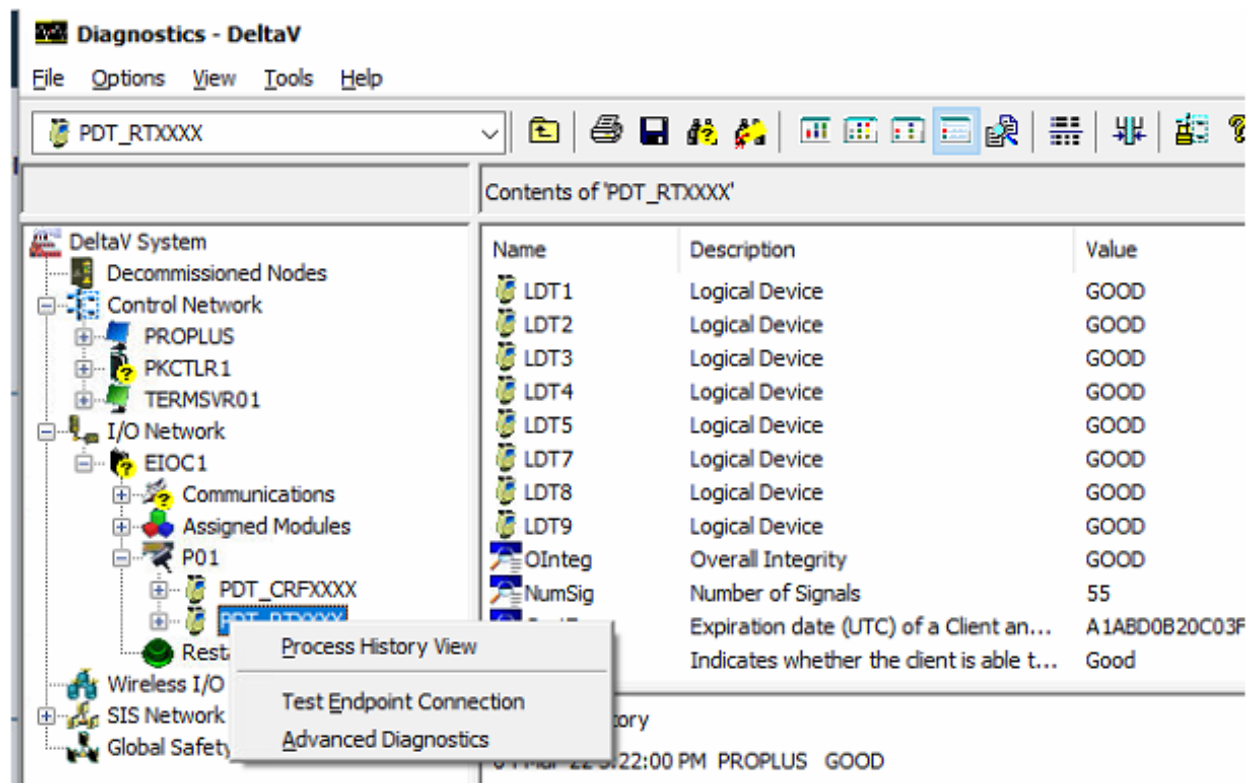
The instrument is connected to the local area network (LAN) first and IP address is obtained via **DHCP**. Once IP configuration is successful, a desired **Static IP** address and **Subnet mask** is entered, and instrument is connected to DeltaV network.



OPC UA connectivity check

Once the DeltaV™ software configuration has been downloaded, a quick test can be performed from the **Diagnostics DeltaV** application. This can be opened by selecting the  icon.

From the diagnostics application, browse to the required EIOC and port P01. Browse further to the device, right click and select **Test Endpoint Connection**.



User interface

The user interface consists of a number of screens that enable the user to interact with an instrument and run instrument protocols. DeltaV™ Live is the only supported interface as DeltaV™ Operate is being phased out. These screens are:

- Splash/opening screen
- Overview display
- Main instrument display
- Instrument parameter display

Splash screen

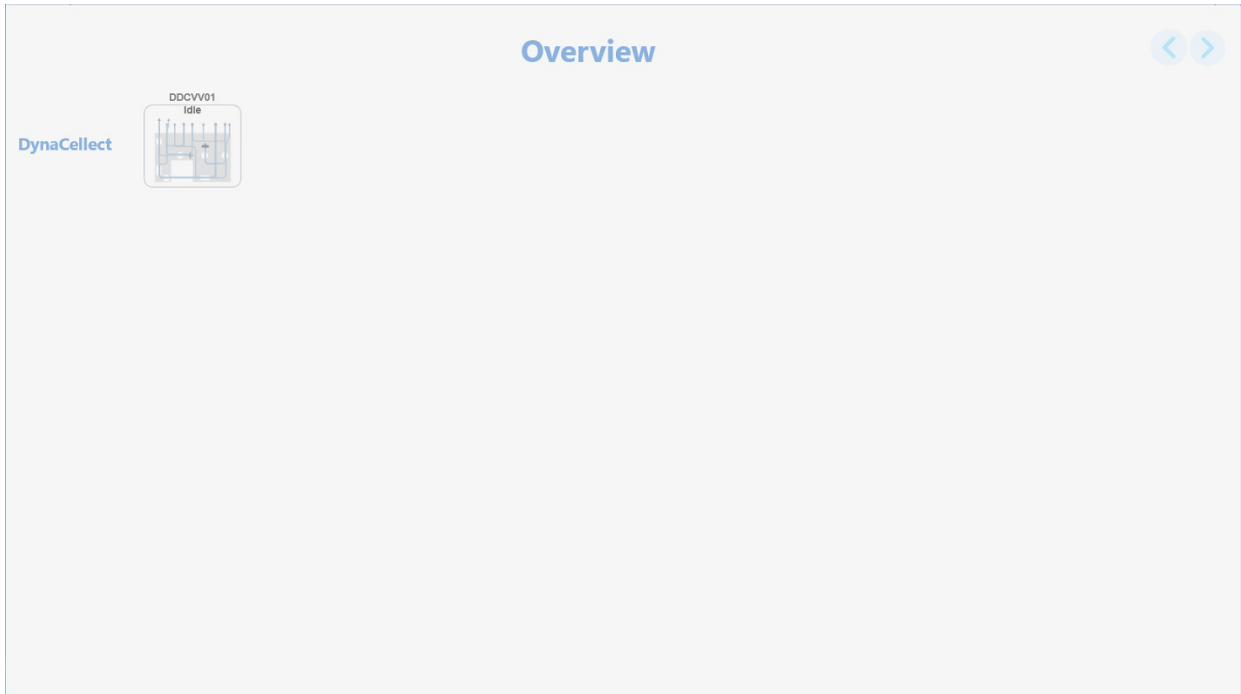
The splash screen appears when the user interface is first started and from here the user can enter the CTS™ Cellmation™ Software overview by clicking anywhere on this screen.

Note: If not using Cellmation™ splash screen, user will have to create an icon in Graphic Studio to open CTS™ Cellmation™ software overview in DeltaV™ Live.



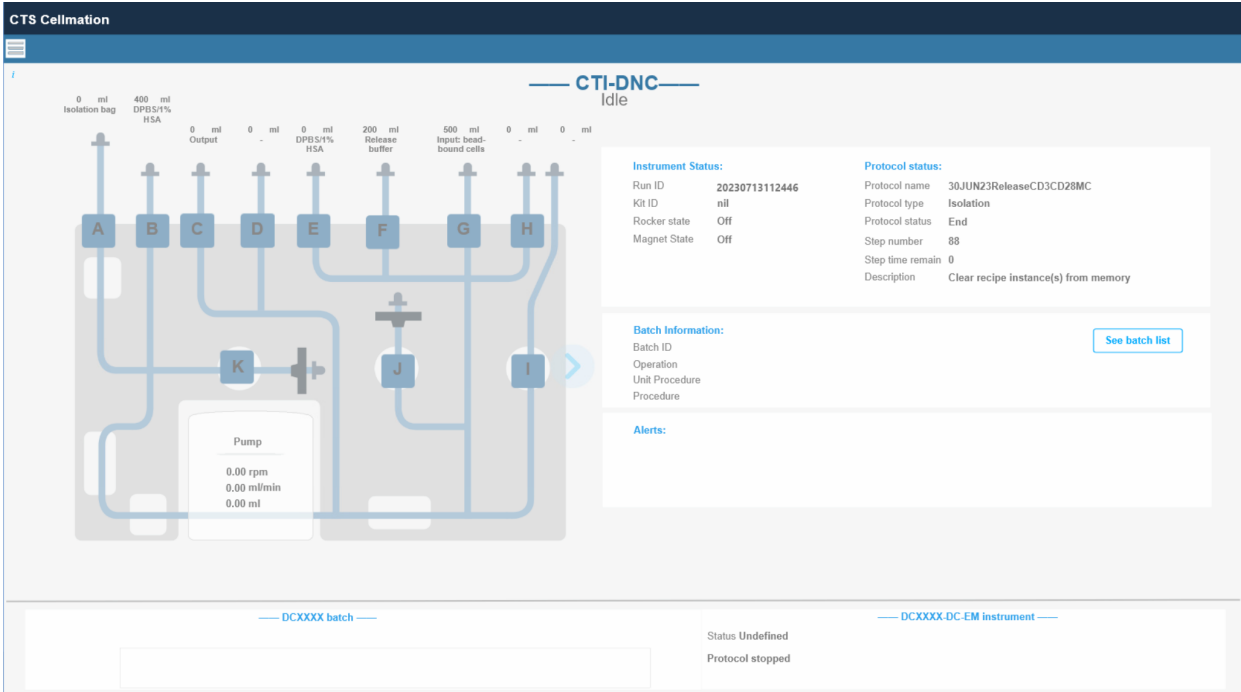
Overview display

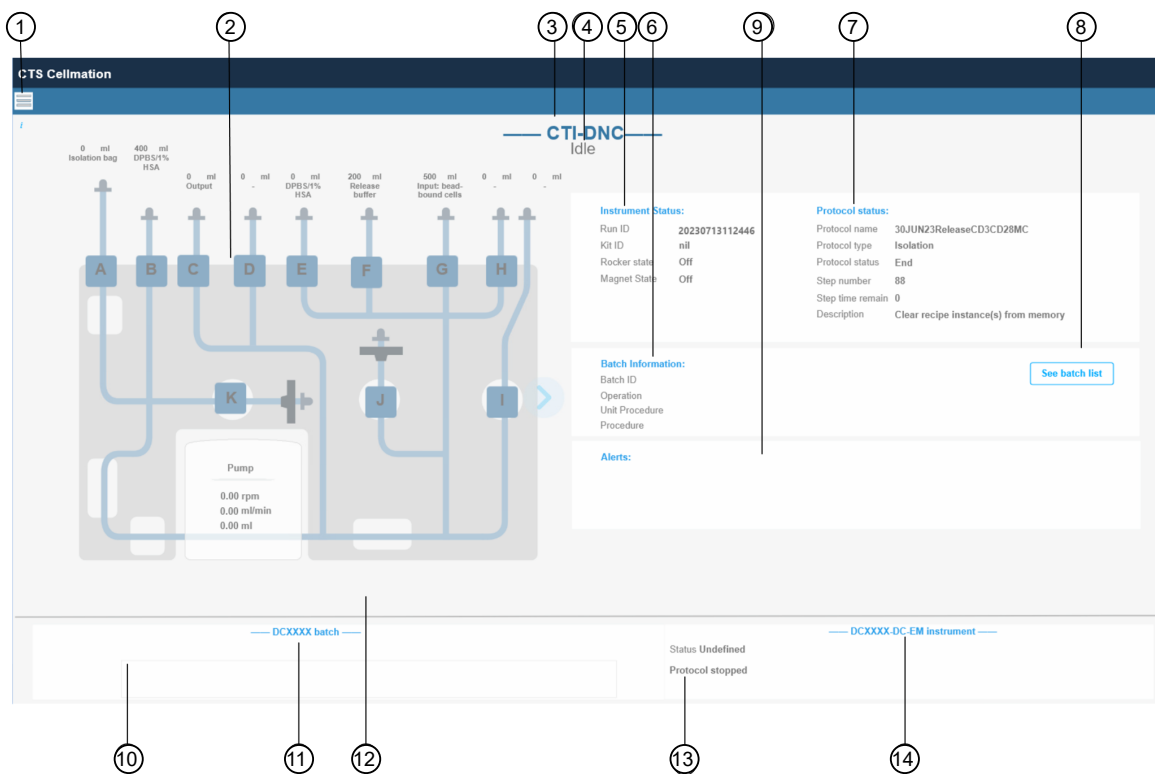
The **Overview** screen allows for an individual instrument to be selected to open more detailed information for that instrument. On the initial installation, the overview screen has a blank screen with guideline boxes. As instruments are added to a system, this overview screen will be modified to add the new instruments.



Main DynaCollect™ instrument display

The main instrument display shows the key data from the instrument.





- ① Menu display selection. Displays DynaCollect™ Interface Parameters display and Cellmation Overview display for selection. When one of the options is clicked, the displays are opened.
- ② DynaCollect™ instrument representation will indicate De-beading or Isolation kit, Pump Speed, Pump Flowrate, Pump Volume, Valve Status, Active Flow Path, Volume and Labels
- ③ Instrument Name
- ④ Instrument running state
- ⑤ Run ID, Kit ID, Rocker State, Magnet Status.
- ⑥ Batch information. Recipe details displayed here if a batch recipe is running.
- ⑦ Protocol status. Displays the protocol name, protocol type, step number, step time remaining, description.
- ⑧ Button to open the batch list view.
- ⑨ Displays the active instrument error.
- ⑩ Messages/prompts from batch/recipe displayed here.
- ⑪ Clicking here brings up Unit Module faceplate.
- ⑫ Buttons to Skip extraction, resume the protocol and cancel a protocol run. Buttons are only enabled when the Dynacollect run protocol is running.
- ⑬ Messages/prompts from equipment module displayed here.
- ⑭ Clicking here brings up Equipment Module faceplate.

The display is comprised of three sections.

1. The left-hand section represents the DynaCollect™ kit view - De-beading or Isolation kit along with Pump Speed, Pump Flowrate, Pump Volume, Valve Status, Active Flow Path, Volume and Labels. Buttons are included to:
 - a. Control the protocol, skip a step, resume, and cancel.
2. The right-hand section details data associated with the instrument and protocol running on the DynaCollect™ instrument.
 - a. Protocol name
 - b. Protocol type
 - c. Protocol Status
 - d. Step number
 - e. Step time remaining
 - f. Description
 - g. Run ID
 - h. Kit ID
 - i. Rocker State
 - j. Magnet Status
 - k. If protocol has been paused the reason for the pause
 - l. Any protocol errors.
3. The bottom of the display comprises two message boxes, one for the DynaCollect™ equipment module and one for the batch recipe. Any messages or prompts are displayed in these boxes, and prompts can be answered. The boxes also provide selection text to open faceplates and other displays to interact with the batch recipe.

DynaCollect™ instrument interface parameters display

The DynaCollect™ instrument parameters display shows all the OPC UA data that is available across the communications interface. Its use is primarily for diagnostic purposes or to see more detailed information of the instrument.

The screenshot displays the instrument interface for CTS Cellmation, specifically for the CTI-DNC instrument. The interface is divided into several sections:

- Instrument Status:**
 - Name: CTI.DNC
 - Model Number: DynaCollect
 - Manufacturer: ThermoFisher Scientific
 - Serial Number: 222992202022
 - Firmware ver: 0.6.15
 - Hardware ver: 0.6.15
 - Link status: Link Down
 - Kit ID: nil
 - Kit status: Unloaded
 - Status: Idle
 - Error: nil
- Run Status:**
 - Run ID: 20230713112446
 - Run Status: End
 - Details: Clear recipe instance(s) from memory
 - Error: nil
 - Step Number: 88
 - Total steps: 88
 - Time remaining: 0
 - Time elapsed: 6195
- Protocol Status:**
 - Name: 30JUN23ReleaseCD3CD28MC
 - Type: Isolation
 - Last mod date: 20230713091325
 - Mod by user: CTI
- Bag label / Bag volume (ml):**

Bag label	Bag volume (ml)
A: Isolation bag	0
B: DPBS/1% HSA	400
C: Output	0
D: -	0
E: DPBS/1% HSA	0
F: Release buffer	200
G: Input: bead-bound cells	500
H: -	0
I: -	0
- Valve States:**

A: Close	E: Close	I: Close
B: Close	F: Close	J: Close
C: Close	G: Close	K: Close
D: Close	H: Close	
- Pump / Rocker:**
 - Pump speed: NaN
 - Pump flowrate: NaN
 - Pump volume: NaN
 - Rocker speed: NaN
 - Rocker start angle: 0
 - Rocker end angle: 0
- Commands to instrument:**
 - Protocol index: NaN
 - Load protocol: NaN
 - Start protocol: NaN
 - Pause protocol: NaN
 - Abort protocol: NaN
 - Skip step: NaN
 - Start step: NaN

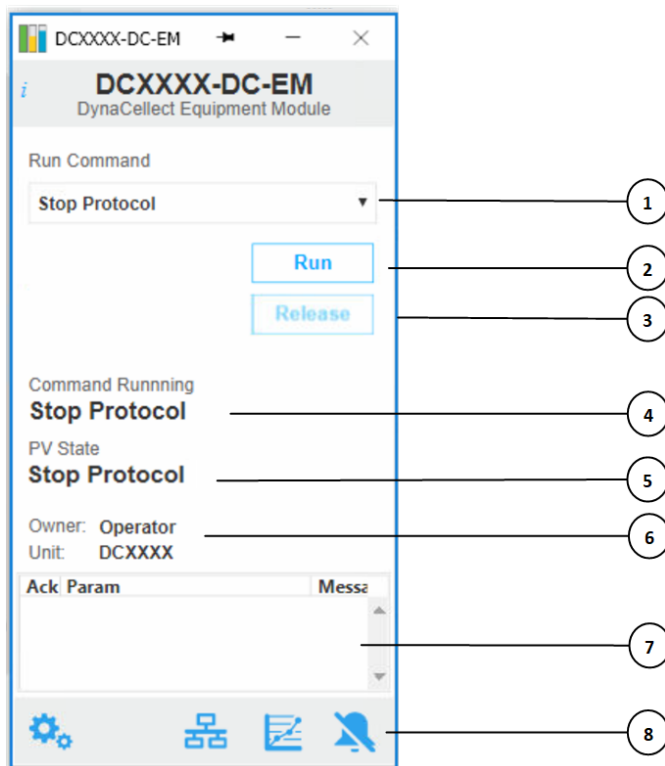
Contextual displays (Faceplates)

Faceplates contextual displays are the preferred method of interacting with CTS™ Cellmation™ Software for control and can be of various types. There are typically two types, faceplates and detail faceplates.

Contextual displays show key information of the software module they are referencing, and typically have detail faceplates that can be called up from the main faceplate to show detailed information available in the module.

Equipment module faceplate

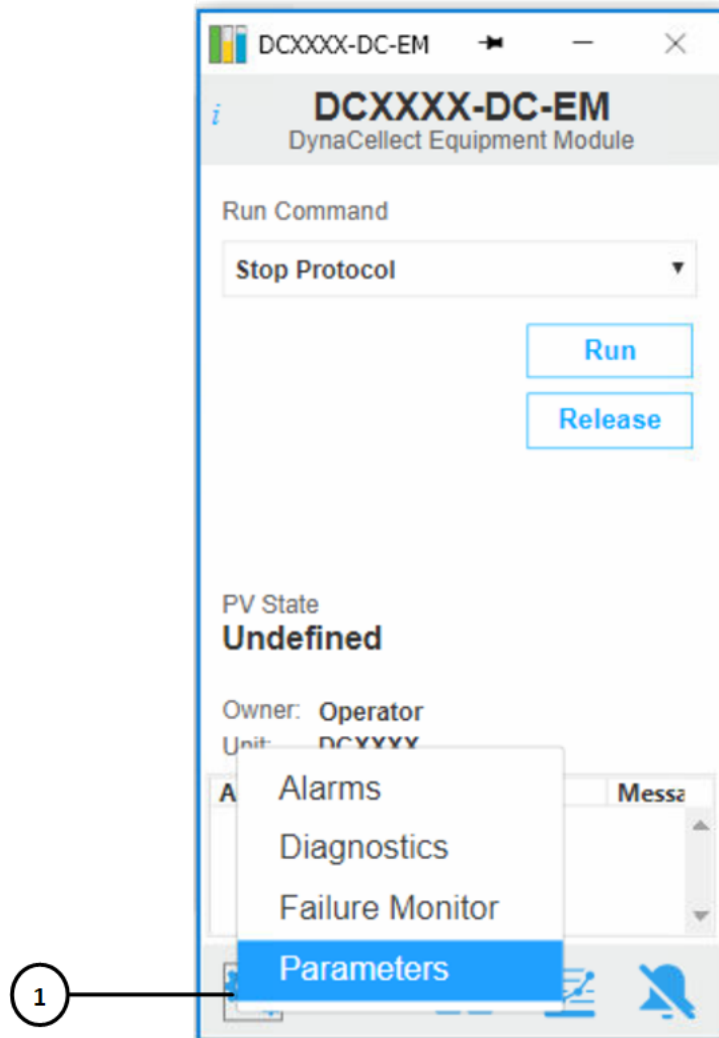
The CTS™ Cellmation™ Software primarily uses an equipment module to control the DynaCollect™ instrument. The faceplate is shown in the following figure. The most commonly used aspects of the faceplates are noted here. For a full description, see Appendix B, “Faceplate details”.



- | | |
|--------------------------------------------------------------------------------|----------------------------------------------------------|
| ① Select a command drop down box | ⑤ Current state of the command |
| ② Run button: When pressed will set the command to the drop down box selection | ⑥ Displays the current owner of the module |
| ③ Release button for ownership of the module | ⑦ Alarm window shows any active or unacknowledged alarms |
| ④ Current command being run | ⑧ Selection icons |

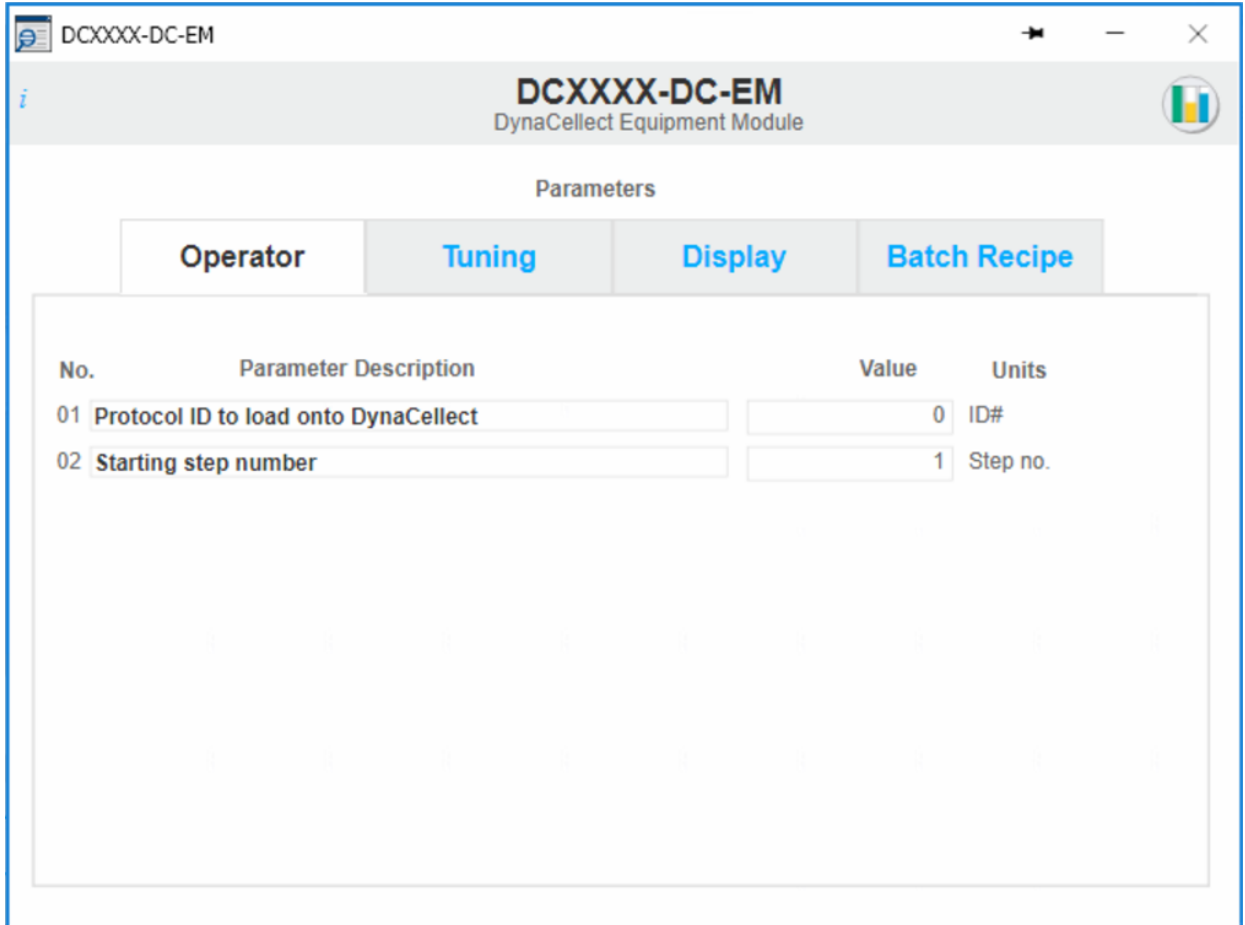
Equipment module detail faceplates

The equipment module detail faceplates show more detailed information of the module. The detail faceplates contains standard objects used within the DeltaV™ system, such as alarms and diagnostics, which can be selected via the selection gear icon on the main faceplate.



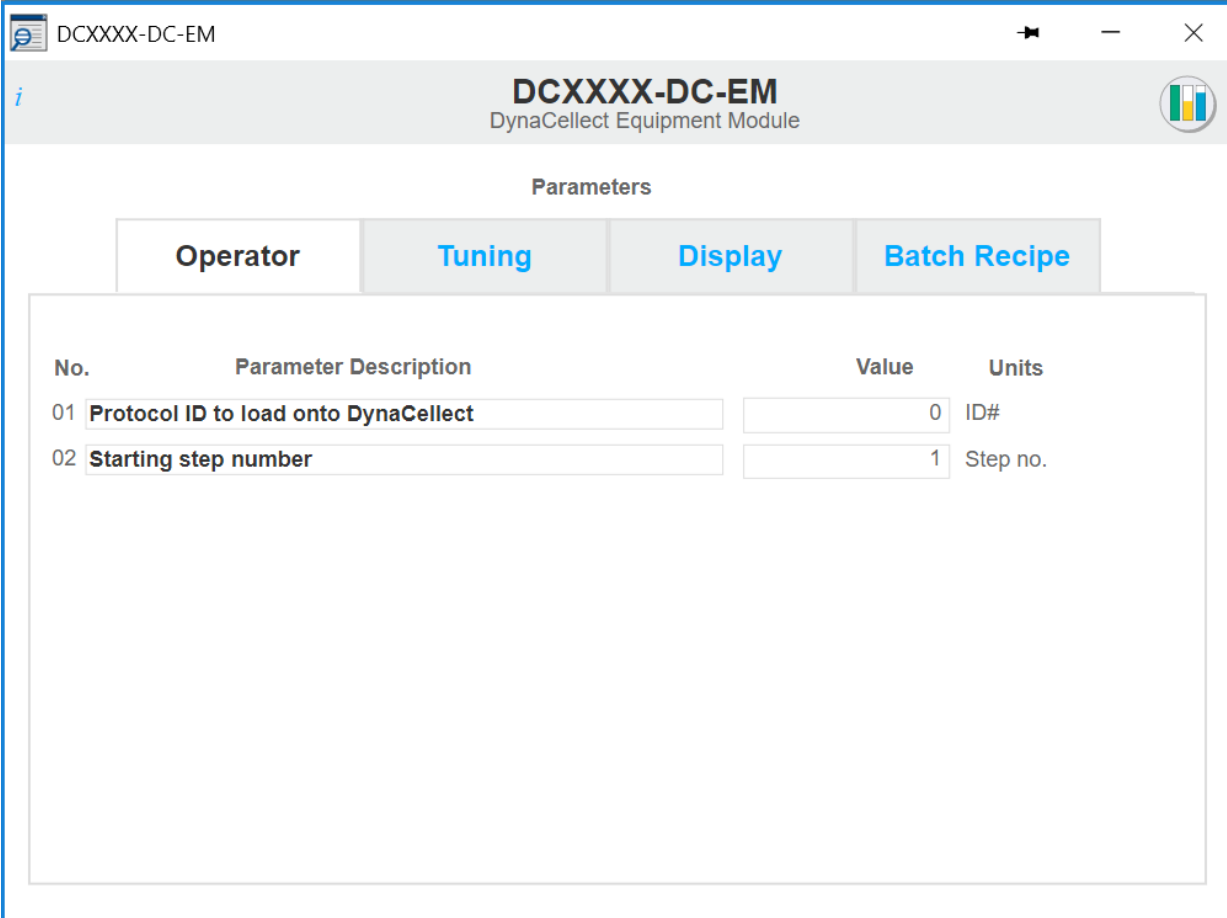
① Clicking on the gear icon (⚙️) brings up a context menu allowing for the appropriate detail faceplate to be shown.

The non-standard information displayed are DynaCollect™ instrument parameters, as show in the following figure.



There are four tabs shown which can be used to select the different types of parameters, **Operator**, **Tuning**, **Display** and **Batch Recipe**.

Operator parameters



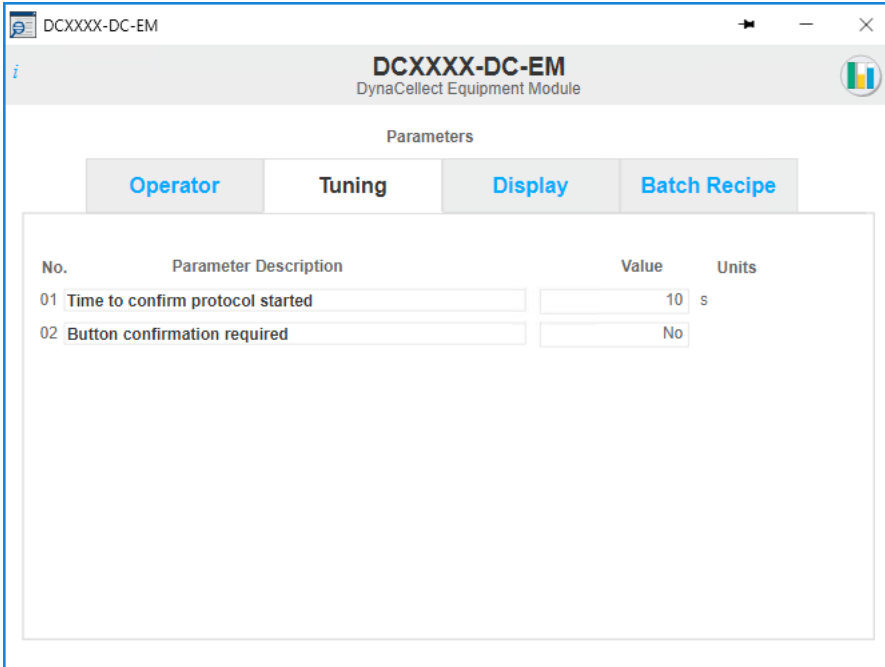
The screenshot shows a software window titled "DCXXXX-DC-EM" with a subtitle "DynaCollect Equipment Module". The main content area is titled "Parameters" and contains four sub-tabs: "Operator", "Tuning", "Display", and "Batch Recipe". The "Operator" sub-tab is selected and displays a table with the following data:

No.	Parameter Description	Value	Units
01	Protocol ID to load onto DynaCollect	0	ID#
02	Starting step number	1	Step no.

The parameters shown on this tab can be modified by a user with operator privileges. They are used to control how the protocol runs.

- **Protocol ID to load onto DynaCollect:** Enter to protocol ID to load onto the DynaCollect™ instrument.
- **Starting step number:** Enter 1 for normal run or any other number to start at that step number.

Tuning parameters



No.	Parameter Description	Value	Units
01	Time to confirm protocol started	10	s
02	Button confirmation required	No	

The parameters shown on this tab can only be modified by a user with configuration privileges. This section is used to control how the user interface functions.

- **Time to confirm protocol started:** Time in seconds to wait to monitor for errors before confirming the protocol has started.
- **Button confirmation required:** Enables/ Disables button confirmation for Play/Pause/Resume/Skip.

Display parameters

The screenshot shows a software window titled "DCXXXX-DC-EM" with a subtitle "DynaCollect Equipment Module". Below the title bar, there are four tabs: "Operator", "Tuning", "Display", and "Batch Recipe". The "Display" tab is selected. The main content area contains a table with the following structure:

No.	Parameter Description	Value	Units
01	Running Time	<input type="text"/>	

The parameters shown on this tab are internally calculated for display only and cannot be modified.

- **Running Time:** Total time that the protocol has been running. Formatted as HH:MM:SS

Batch recipe parameters

The screenshot shows the same software window as above, but with the "Batch Recipe" tab selected. The main content area contains a table with the following structure:

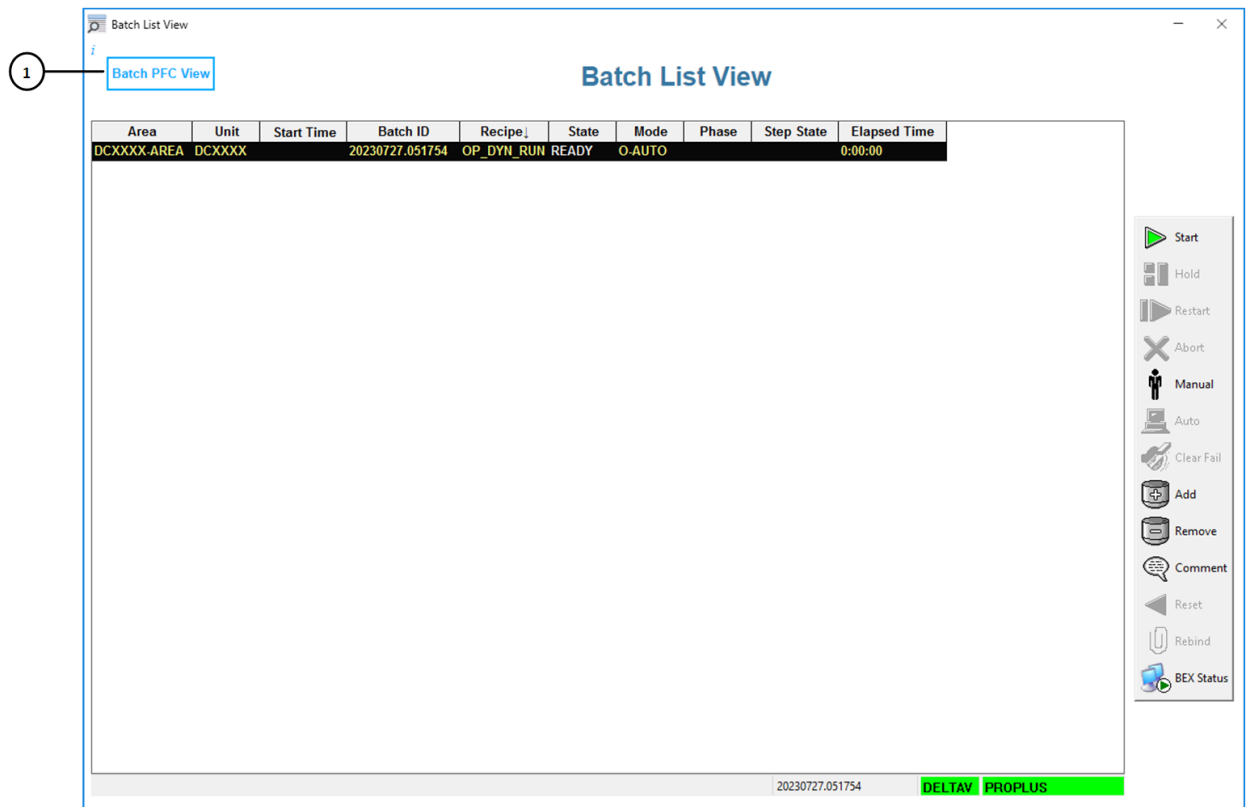
No.	Parameter Description	Value	Units
01	Protocol ID to load onto DynaCollect	<input type="text" value="0"/>	ID#
02	Starting step number	<input type="text" value="0"/>	Step no.

The parameters shown on this tab are updated by a phase running as part of a batch recipe and cannot be modified.

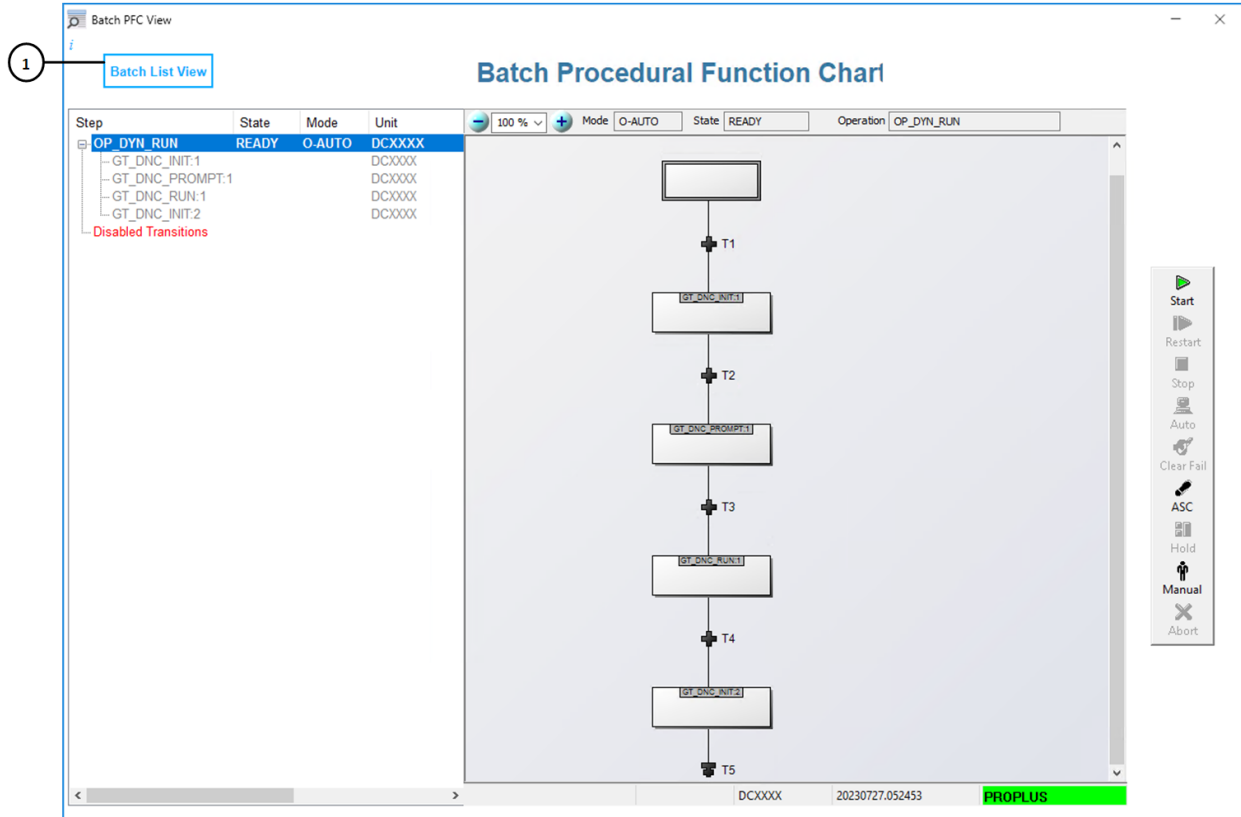
- **Protocol ID to load onto DynaCollect:** Enter a protocol ID to load onto the DynaCollect instrument.
- **Starting step number:** Enter 1 for normal run or any other number to start at that step number.

Batch faceplates

The batch faceplates are displays that allow for interaction with the batch recipes. From the main DynaCollect™ display, click on the **See batch list** button to call up the Batch List faceplate as shown.



From this faceplate, new recipes can be selected and run. This display also shows all the batch recipes currently running on the system. Selecting the **Batch PFC View** button ① calls up the **Batch Procedural Function Chart** faceplate as shown.



This faceplate will show the selected recipe in flow chart mode. The left hand pane shows the structure of the recipe, starting at the Procedure, Unit Procedure and then Operation level. The right hand pane shows the selected recipe item as a flow chart, and from here individual objects can be inspected in more detail.

Selecting the **Batch List View** button ① calls up the **Batch List View** faceplate.

2

General system operation

User login

Click the user login details found on the right side of the main toolbar. Enter a valid user name and password in the pop-up box. If using Domain in the first line, it is very important to use the correct domain name. For example, “RIPTIDE.DELTAV.THERMOSIENTIFIC.LOCAL\Emerson”, where Domain name is “RIPTIDE.DELTAV.THERMOSIENTIFIC.LOCAL” and username is “Emerson”.



Table 2 Available actions for each user level

Action	Operator	Maintainer	Supervisor	Administrator
Access Window desktop	X	X	X	✓
Exit DeltaV Operate	X	X	X	✓
Access overview page	✓	✓	✓	✓
Access configuration page	✓	✓	✓	✓
View Smart Device info	✓	✓	✓	✓
Access Details displays	✓	✓	✓	✓

Table 2 Available actions for each user level (continued)

Action	Operator	Maintainer	Supervisor	Administrator
Access Control Studio	X	X	X	✓
Access Process History view	✓	✓	✓	✓
Change alarm limits	✓	✓	✓	✓
Change conditional alarm settings	X	X	✓	✓
Shelve or remove from service alarms	✓	X	✓	✓
Set alarm priority	X	X	✓	✓
Acknowledge alarms	✓	✓	✓	✓
Bypass interlocks	X	X	✓	✓
Change tuning parameters	X	X	✓	✓
Access Diagnostics	✓	X	✓	✓

To add, change or delete a user or group, click the link **DeltaV Engineering** in the Windows™ toolbar (bottom of the screen), then click on the **User Manager** icon. For more information on the user manager, refer to DeltaV™ Books Online.

DynaCollect™ instrument operation

The DynaCollect™ instrument can be controlled manually or automatically. In either case, the Rotea™ instrument must be configured to allow for remote operation via OPC UA.

The instrument runs protocols which are defined in the instrument itself. Each time a protocol command is manually selected in DeltaV™ system, the corresponding protocol is run on the instrument.

Currently the DeltaV™ system does not support writing strings using OPC UA, therefore, a lookup method is used. To remotely select which protocol to run, the DeltaV™ system writes an integer which is the program index number.

DynaCollect™ instrument protocol parameters

The CTS™ DynaCollect™ Magnetic Separation System is designed to operate within specific parameters. The values and limits for each parameter are listed below. If your input value exceeds the maximum value, an error is displayed.

Parameters that can be modified on the instrument include:

- Magnet (engaged/disengaged)
- Pinch valves (open/closed)
- Pump speed (range 10–150 mL/min)
- Pump (specified volume or duration)

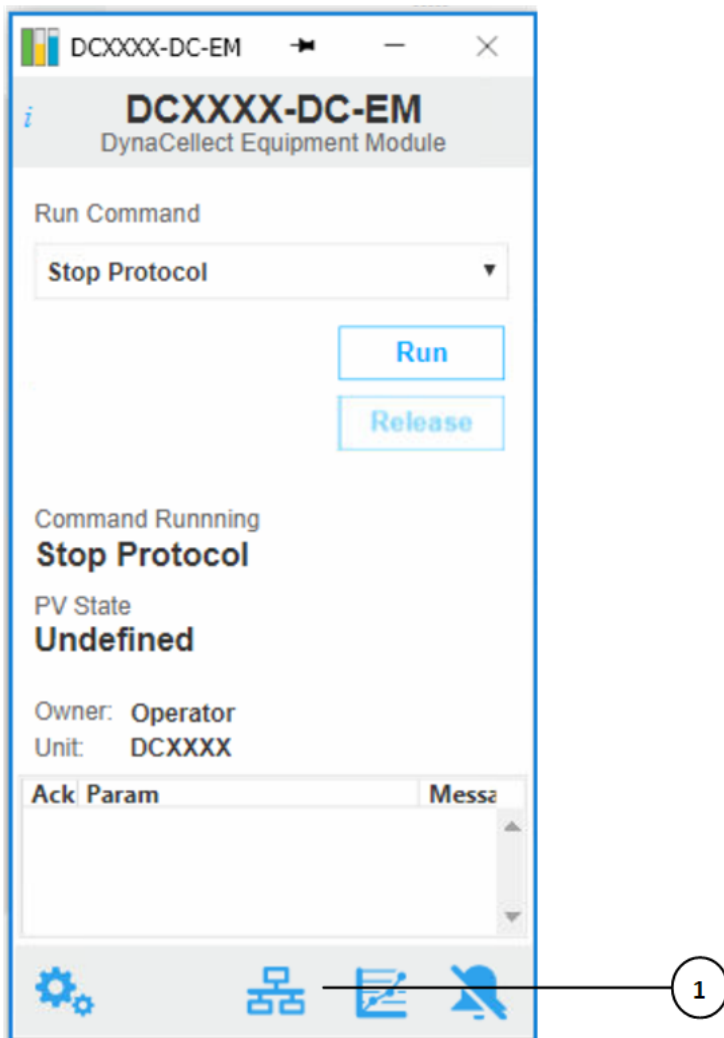
- Rocker angle (-30°–30°)
- Rocker speed (range 1–30 CPM)
- Bubble sensor (stop when dry/ stop when wet/ inactive)
- Fluid path

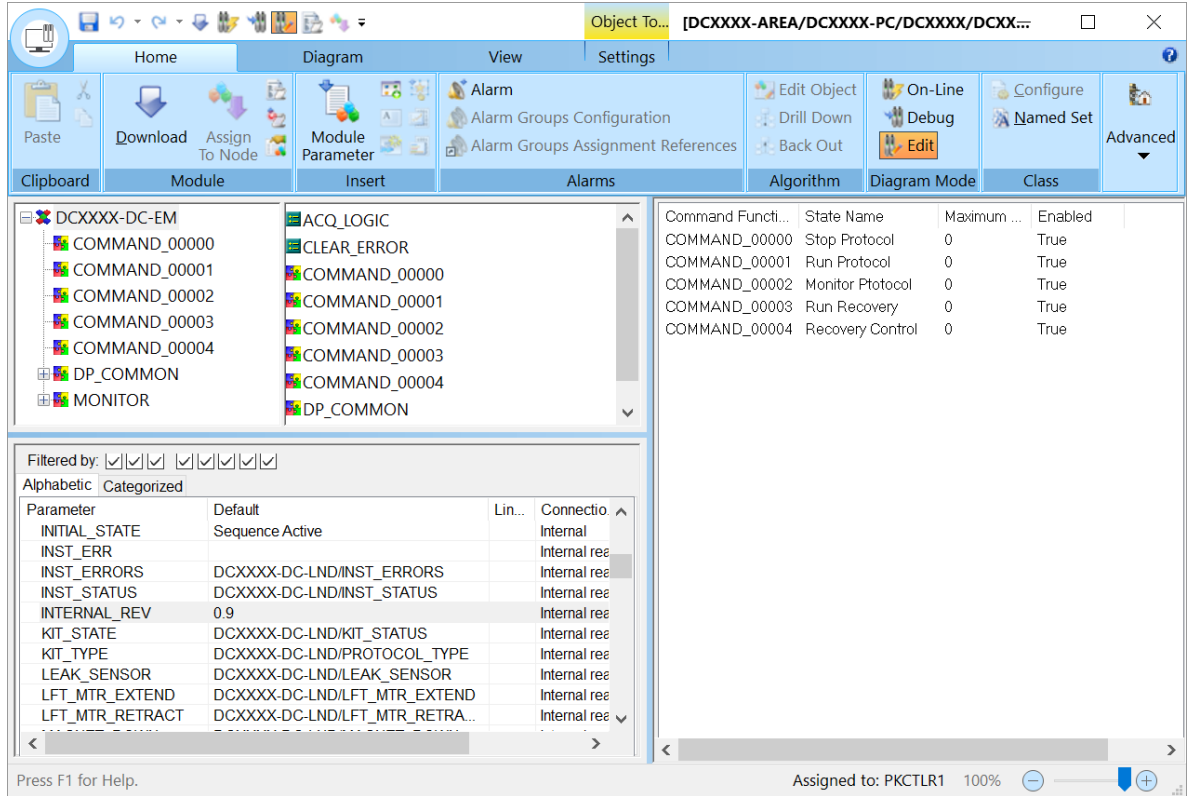
Check revision numbers

The User can check the revision history of the DynaCollect™ Equipment Module and Control Module by checking the value of the parameter “Internal Revision” in these modules.

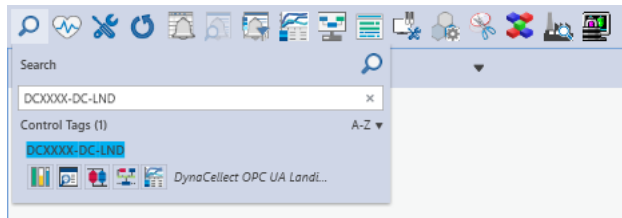
1. On DeltaV Live Graphics, navigate to the DynaCollect™ Main Display.
2. Click on the Equipment Module DCXXXX-DC-EM to open the faceplate of the Equipment Module.
3. Click on the below icon to open Control Studio.

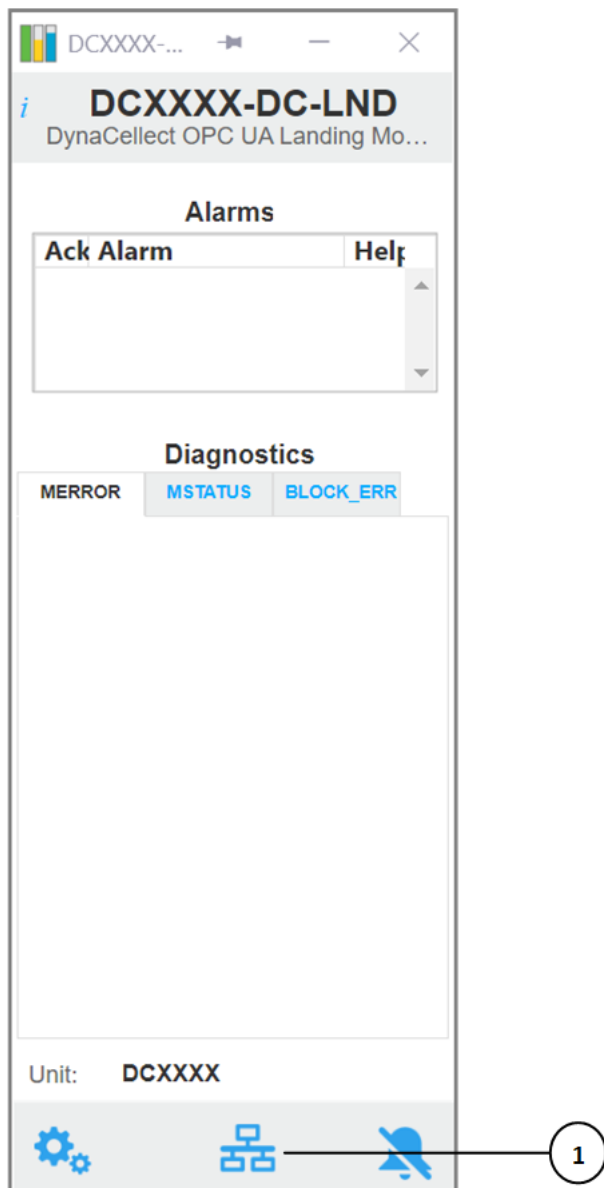
4. Navigate to the parameter “INTERNAL REV” to get the Revision Number of this module.



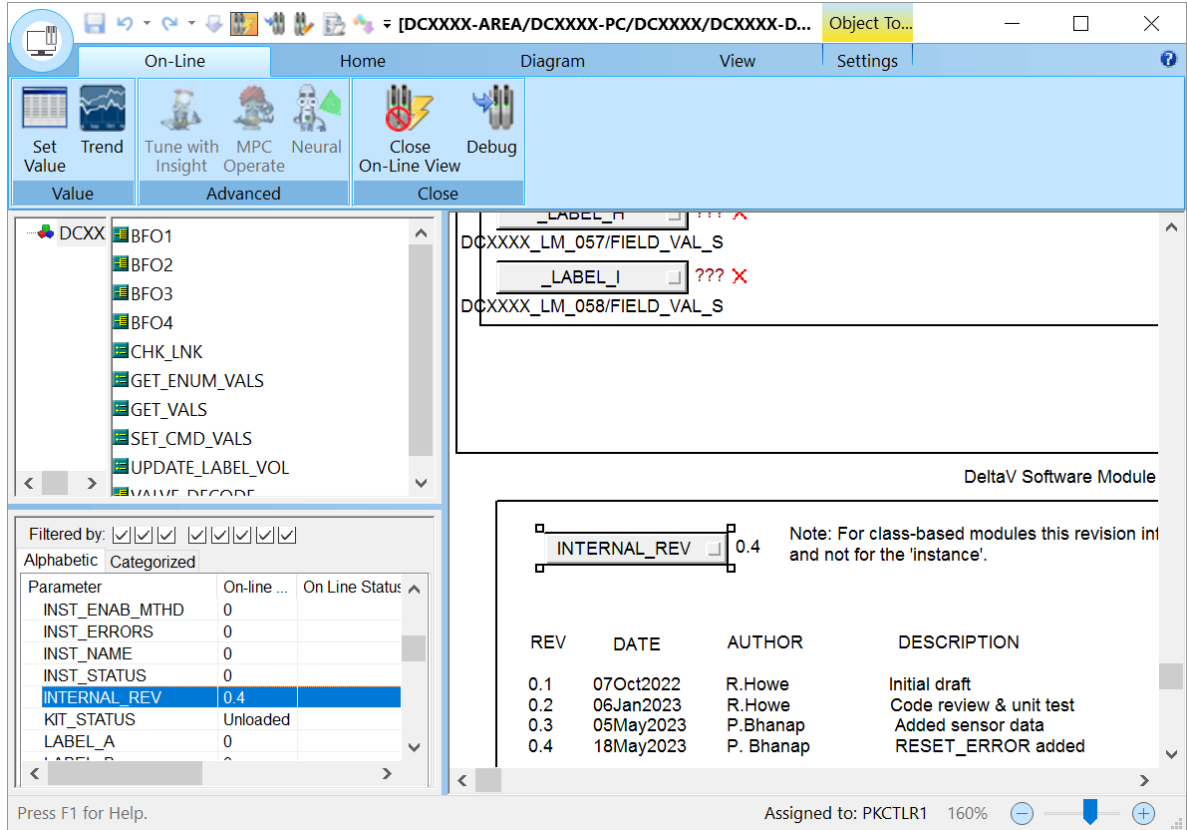


To check the revision number for the control module DCXXXX-INC-LND, navigate to the search bar on the top left corner of the DeltaV Live graphics. Enter “DCCXXX-INC-LND” and click on the faceplate of the landing module.

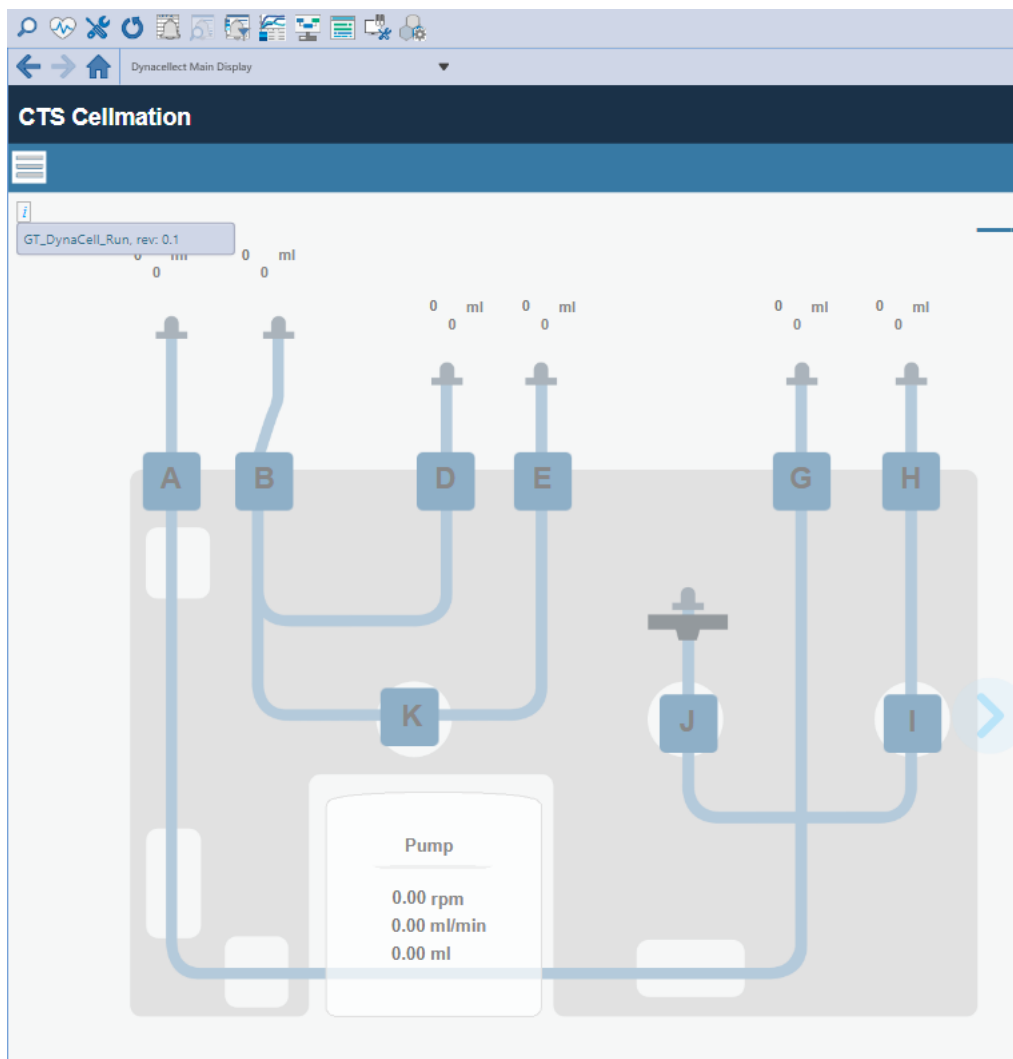




Click on icon 1 and open the control studio. Navigate to the parameter “INTERNAL REV” to get the Revision Number of this module.



To check the revision number of the graphics, navigate to the “i” icon on the top left corner of the graphic and hover over it. The revision number and the name of the graphic display will appear as show below:





Manual operation

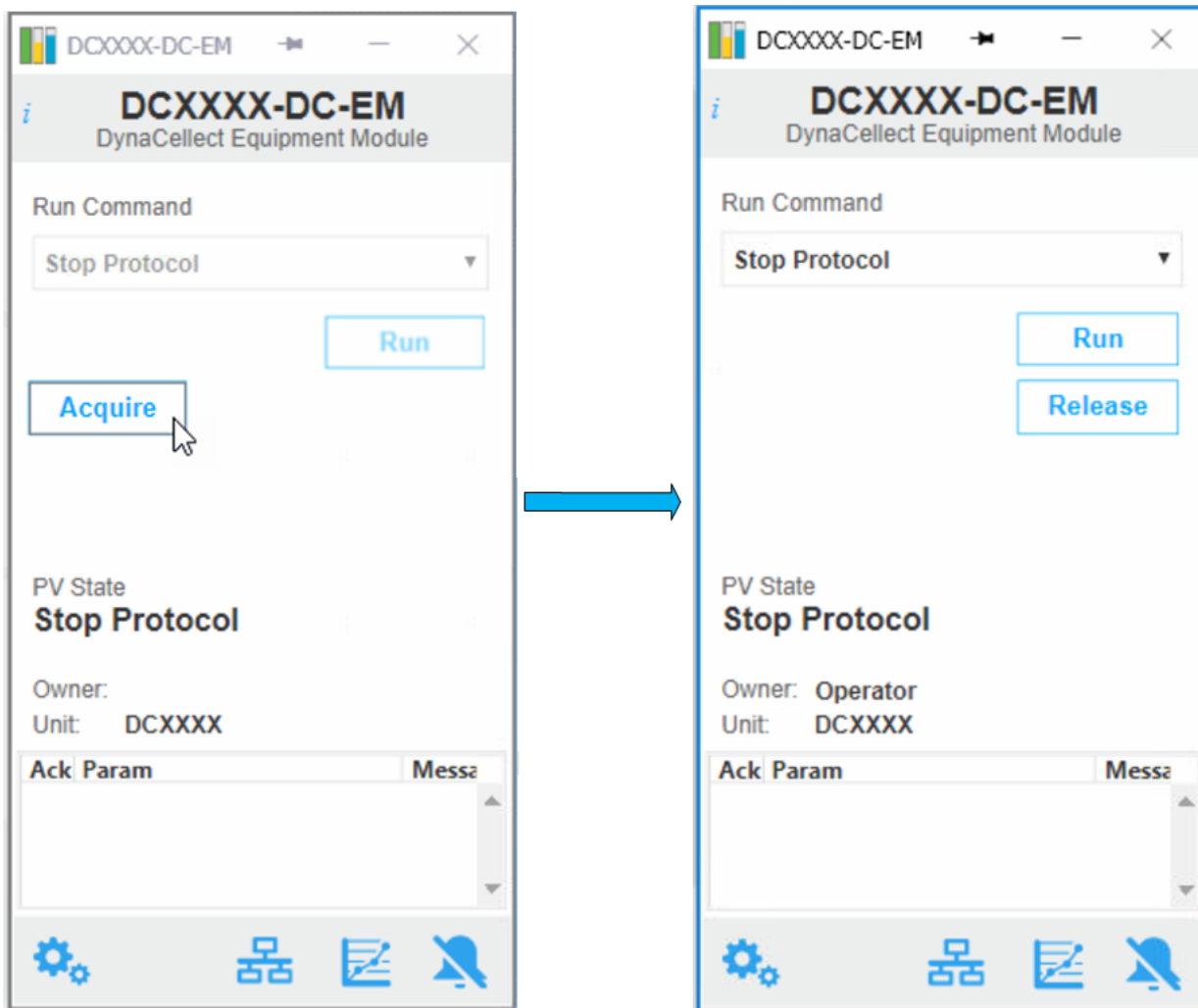
The DynaCollect™ instrument can be controlled manually from the DeltaV™ system via the equipment module faceplate.

To initiate a protocol to run on the instrument, perform the following steps.

Acquire the equipment module

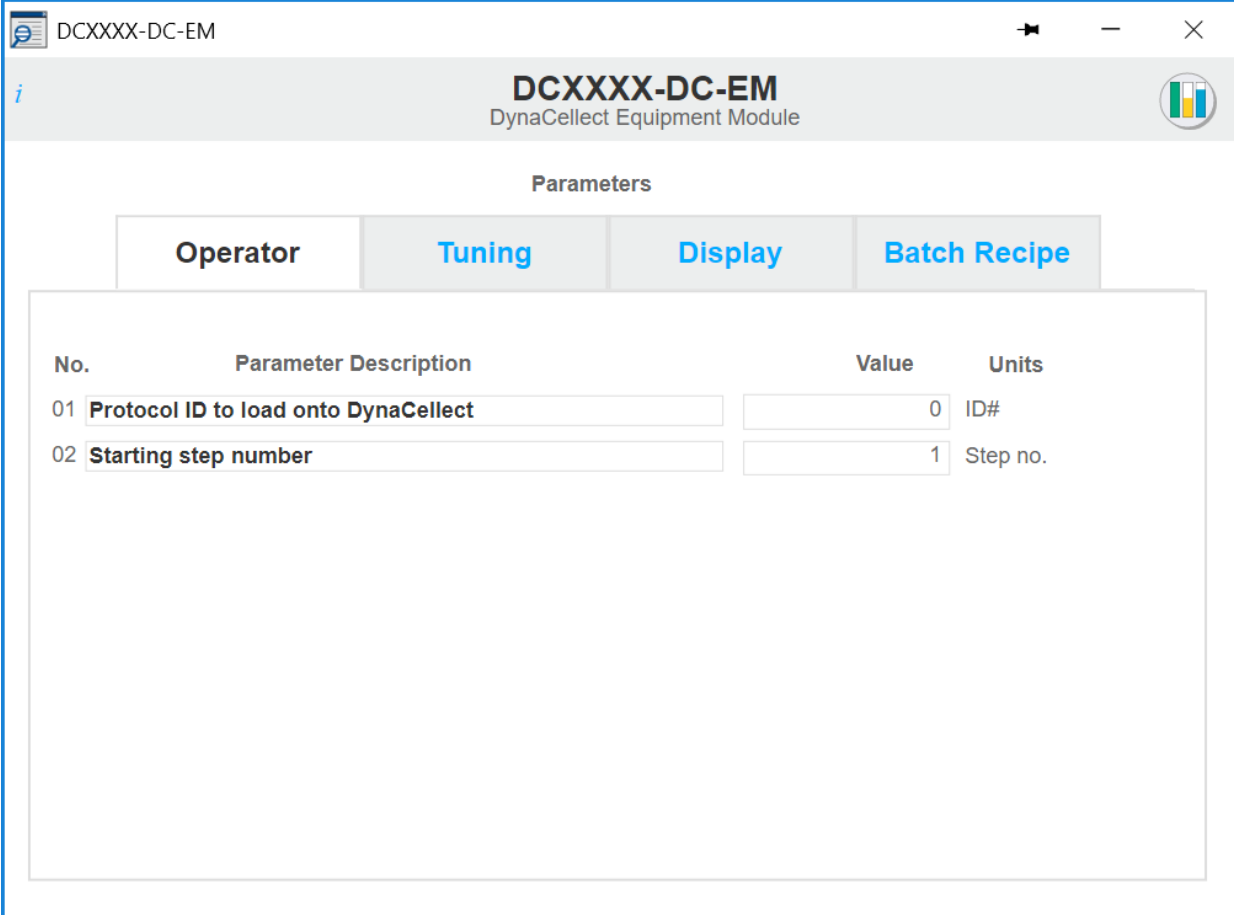
Open the equipment module faceplate and click on the **Acquire** button if available. If the button is not shown, then the module is already owned. If the **Owned by:** field shows **Operator** then proceed to step 2. If any other owner is identified, then it is most likely owned by a batch recipe and will not be available for acquiring until the batch recipe is complete.

When the user has finished using the instrument the **Release** button can be pressed to relinquish ownership. This means that the module is available to be acquired by a user or a batch recipe. A batch recipe will not be able to acquire the module unless the **Owned by:** field is empty.



Step 2: Setup the equipment module

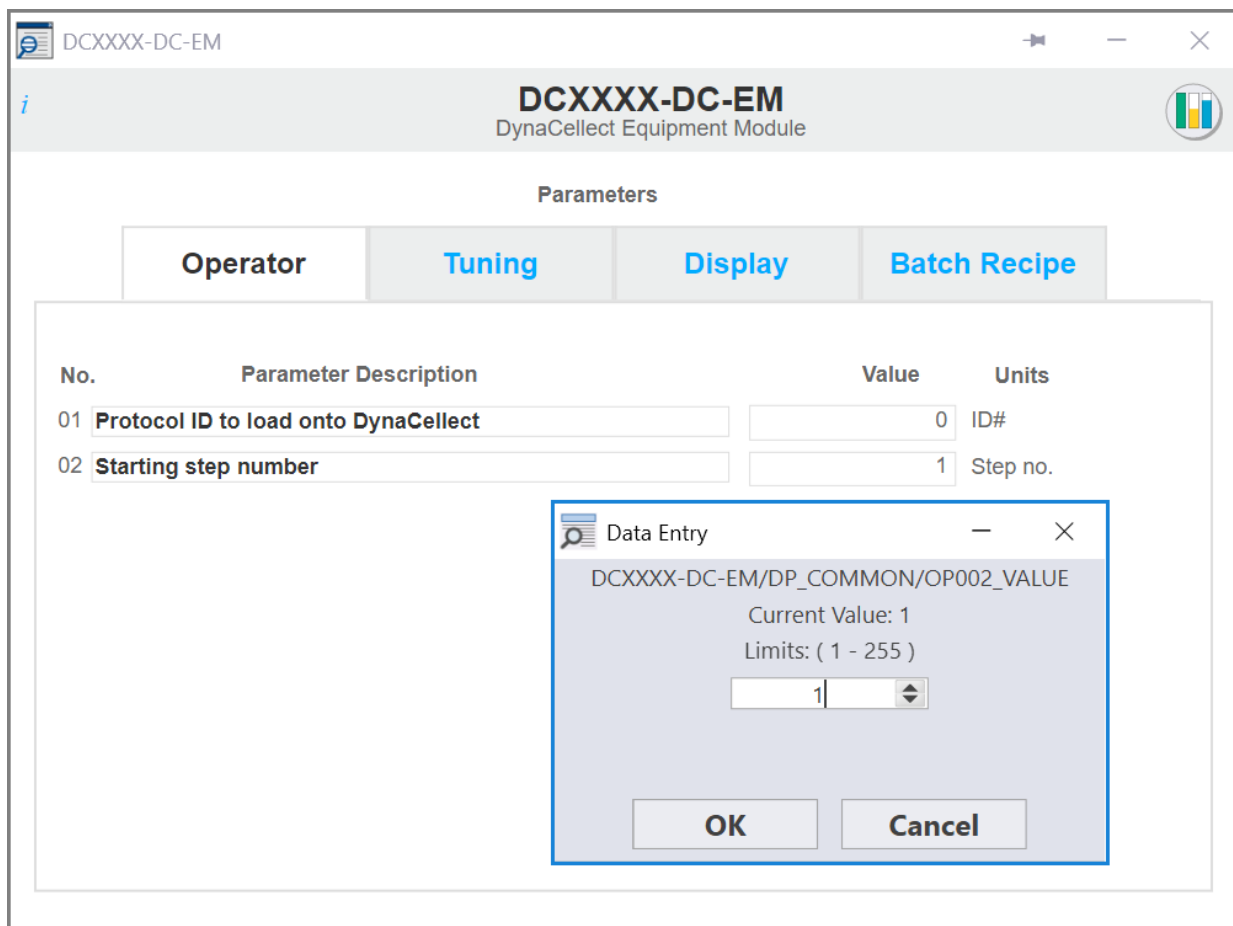
Open the equipment module detail faceplate and select the **Parameters** button. The display shown in the following figure should appear.



The screenshot shows a software interface window titled "DCXXXX-DC-EM" with the subtitle "DynaCollect Equipment Module". The window contains a "Parameters" section with four tabs: "Operator", "Tuning", "Display", and "Batch Recipe". The "Tuning" tab is currently selected. Below the tabs is a table with the following data:

No.	Parameter Description	Value	Units
01	Protocol ID to load onto DynaCollect	0	ID#
02	Starting step number	1	Step no.

Enter the exact Protocol ID that was entered in the `.yaml` file. See “DynaCollect™ instrument operation” on page 36. By clicking on the current value field, a data entry form appears as shown in the following figure. From this form enter the ID number and click **OK** to store the value.

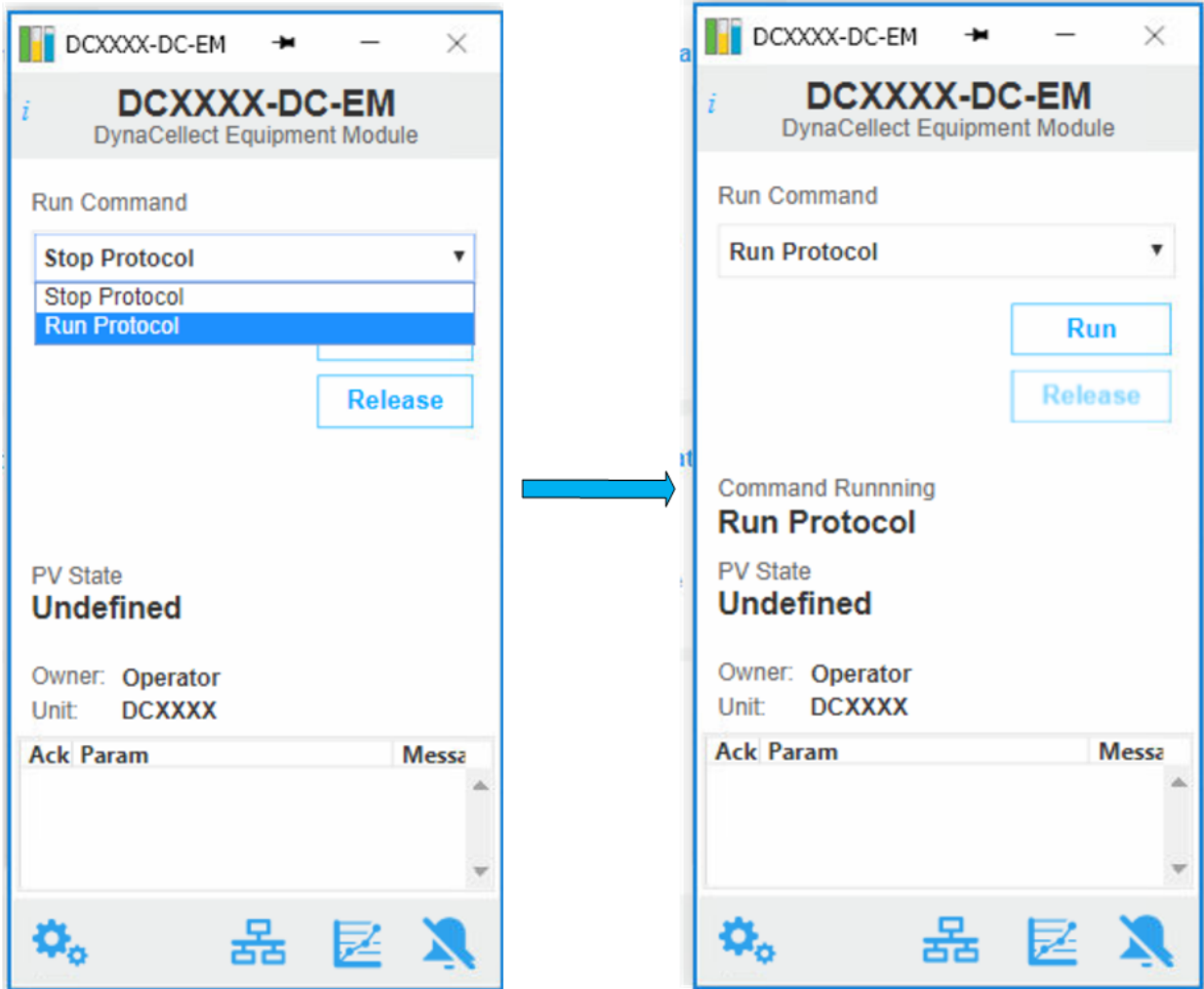


If needed, the parameters to enable/disable the DynaCollect™ instrument front panel buttons can be set from the parameter list.

Step 3: Setup the equipment module to Run Protocol

Open the equipment module faceplate.

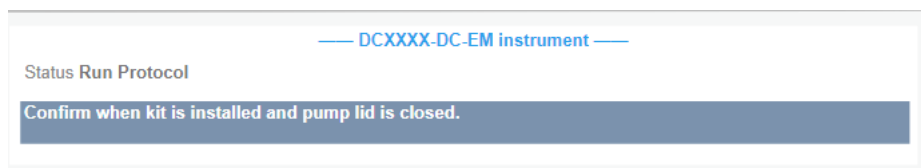
From the **Run Command** drop down box, select **Run Protocol** and then click on the **Run** button.



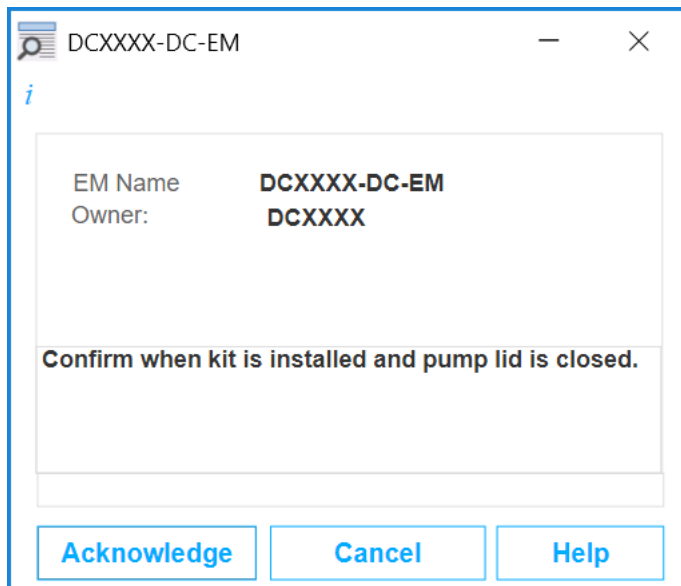
The **Run Protocol** command will now run as shown on the equipment module faceplate.

Step 4: Answer prompts as required

Prompts will be generated by the equipment module and displayed in the bottom right hand corner of the main DynaCollect™ display, as shown in the following figure.



To answer a prompt, click on the prompt text and a new contextual display will appear to answer the prompt. See the following figure.

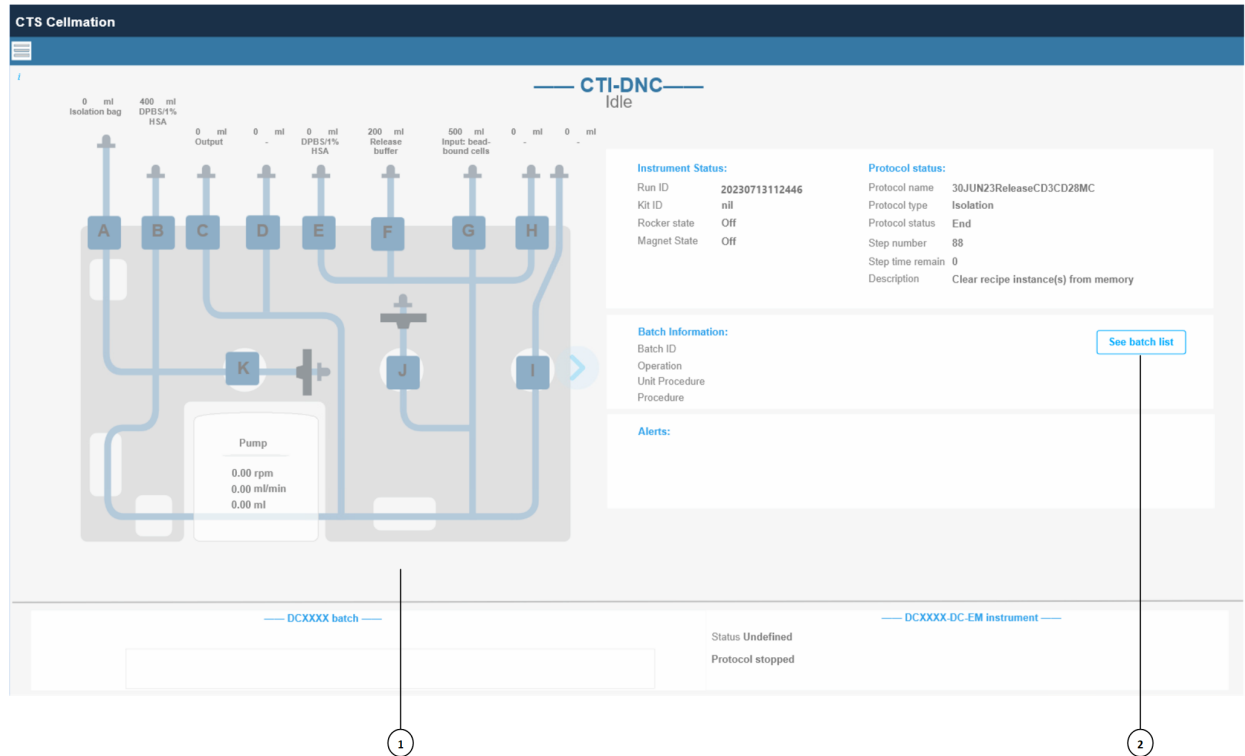


Before a protocol can run the following checks are made:

1. OPC communication is checked if enabled. If it's not, User is prompted to enable OPC communication before recipe proceeds.
2. Instrument is checked for errors. If there are errors, User is prompted to diagnose errors and clear it before recipe proceeds.
3. Protocol ID is checked.
4. User prompted to confirm the kit is installed, and pump lid closed.
5. Sequence goes to protocol Monitor sequence.

Step 5: Monitor Protocol state automatically selected

In this state, the equipment module monitors the progress of the running protocol and the current step description and number are displayed. During this state the **Skip step**, **Resume run** and **Cancel run** buttons on the main display are enabled.

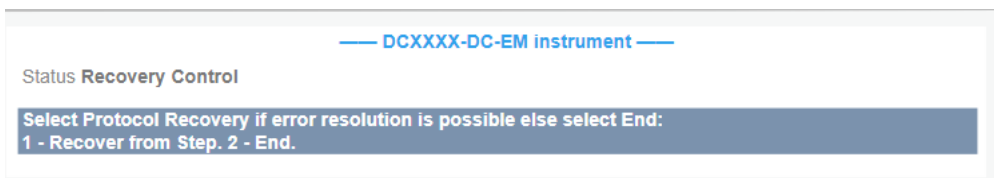


1. **Protocol buttons:** There are three buttons to mimic the buttons on the front panel of the DynaCollect™ instrument.
 - **Cancel run** will cause the running protocol to discontinue the current step and end the current run.
 - **Resume run** will cause the protocol running on DynaCollect™ instrument to resume the current step.
 - **Skip step** will cause the protocol to skip to the next step in the protocol.
2. **Batch List:** This button opens the Batch List View page, which allows the User to look at the batches currently running on individual instruments in DeltaV™ system as well as details such as which step of the recipe is being executed, the status of the recipe step and the time elapsed as well as time the batch started.

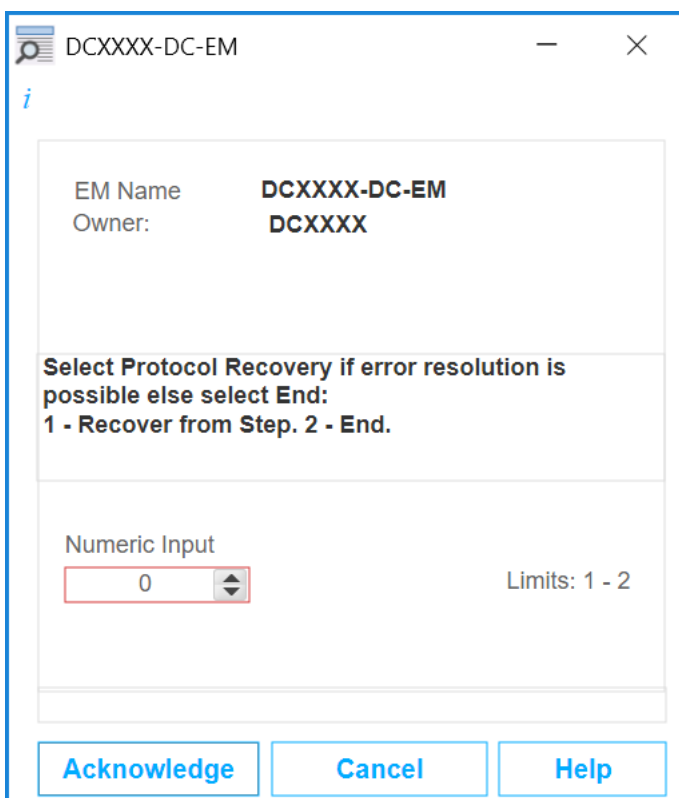
Step 6: Protocol completion

When a DynaCollect™ protocol completes it can either be successful or unsuccessful. If successful, the equipment module automatically selects the **Stop Protocol** state. If unsuccessful, the equipment module automatically selects the **Recovery Control** state. From this state the user is prompted to select from two options.

The equipment module prompt is shown in the following figure. The first line will indicate the reason for the unsuccessful completion.



By clicking on the prompt text, a data entry form will appear as shown in the following figure.



The data entry form is titled "DCXXXX-DC-EM". It contains the following information:

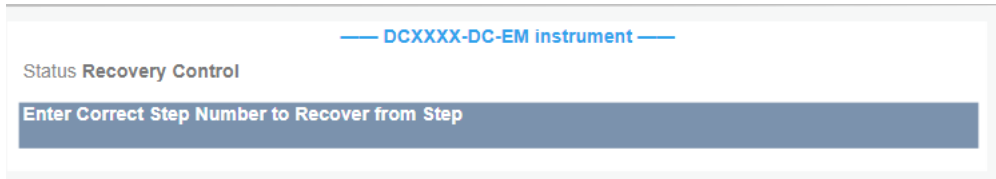
- EM Name: DCXXXX-DC-EM
- Owner: DCXXXX
- Prompt: Select Protocol Recovery if error resolution is possible else select End: 1 - Recover from Step. 2 - End.
- Numeric Input: 0 (Limits: 1 - 2)
- Buttons: Acknowledge, Cancel, Help

From here, select one the the following options:

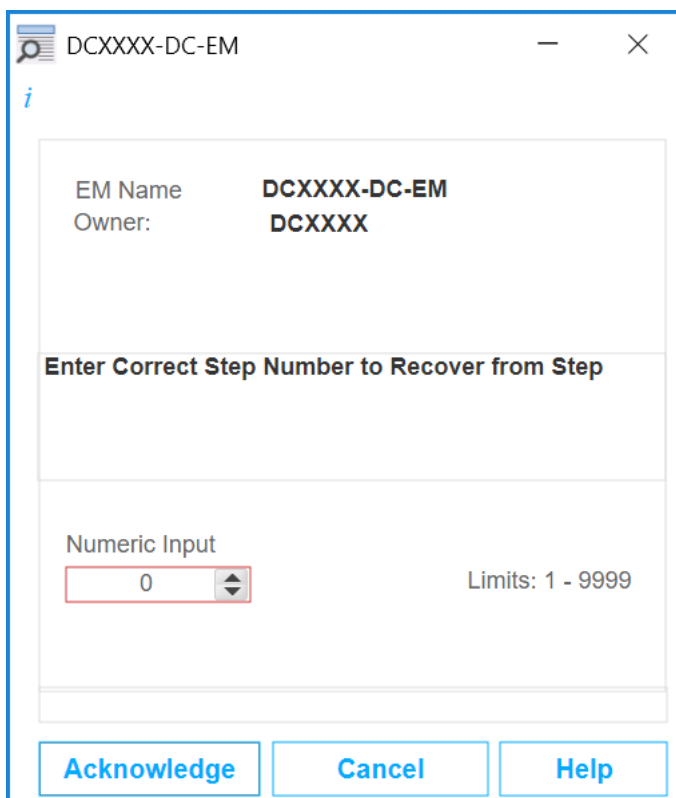
1. **Recover from Step**
2. **End**

Recover from step

When this option is selected the user is prompted to enter a step number. This step number will be the step where the protocol starts when the protocol runs.



By clicking on the prompt text a data entry form will appear as shown in the following figure.



Enter the step number to define where the protocol will restart from.

Once this prompt is acknowledged the equipment module will automatically move to the **Run Recovery** state. In this state, the door and kit statuses are checked before loading the selected protocol onto the DynaCollect™ instrument.

The protocol will restart from the selected step. When confirmed running the module automatically moves back to the **Monitor Protocol** state.

End

When this option is selected, the equipment module will move to the **Stop Protocol** state. This will reset the protocol running on the DynaCollect™ instrument.

Recipe control operation

DeltaV™ software conforms to the ISA-88 standard for batch control and the terminology used within the DeltaV™ software matches the standard definitions.

The DynaCollect™ instrument can be controlled using DeltaV™ software batch recipes. When controlling the instrument via batch recipes the equipment module is acquired by the batch recipe and can no longer be controlled manually from the equipment module faceplate.

The advantage of using batch recipe control is that a consistent approach is applied across each workflow. This means that a single recipe can be constructed and used to perform repeated operations on different batches, with the only difference between them being the recipe parameters used.

The other advantage is that the historical data associated with a recipe can be collated to form a batch report (using 3rd party packages).

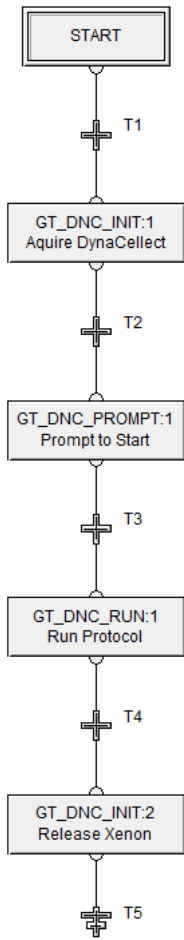
Note: Batch reports are currently not included within the DynaCollect™ DeltaV™ software.

DeltaV™ batch recipes are organized into three distinct types.

- Operations: These recipes are constructed using phase modules.
- Unit Procedures: These recipes are constructed using Operation recipes.
- Procedure: These recipes are constructed using Unit Procedures recipes.

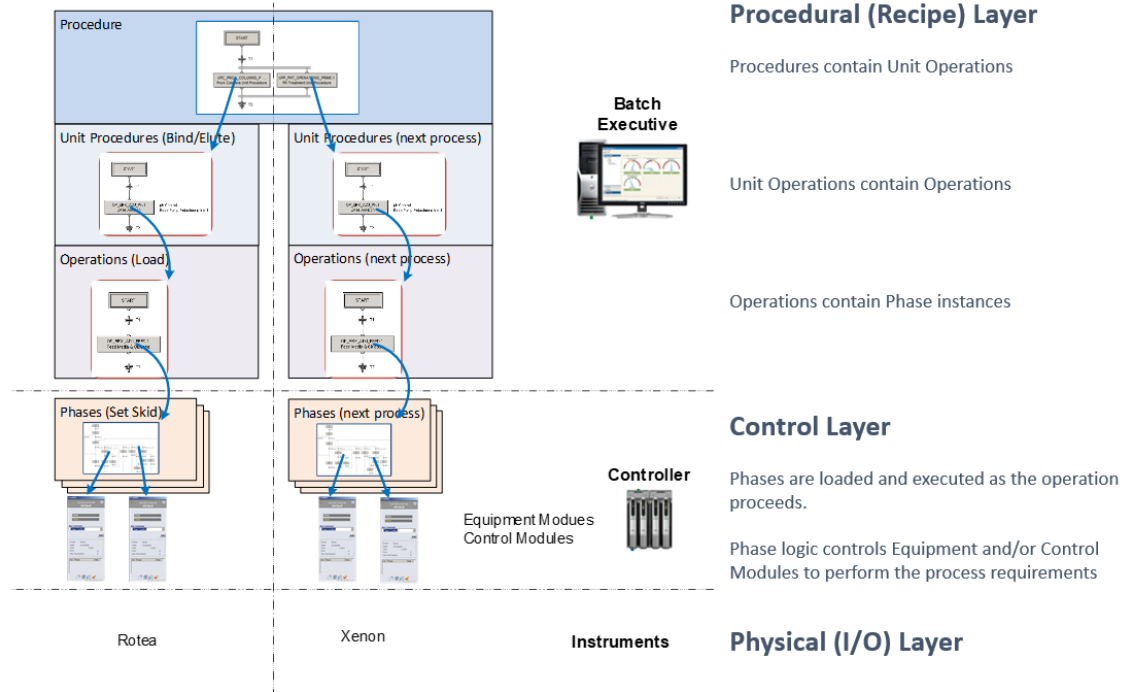
Batch recipes are stored and ran on an Application Station that has been configured to host the Batch Executive application. Standard DeltaV™ software applications are used to interact with the Batch Executive to start and control batch recipes.

Batch recipes are constructed as Sequential Flow Charts and the following figure is an example of an operation recipe. In an operation, a step is always followed by one or more transitions, and these are arranged to create the required workflow.



The following figure illustrates the DeltaV™ system batch recipe hierarchy and shows how each recipe type is constructed using the lower level software entities.

DeltaV Batch Architecture



As can be seen from the previous figure, **Operations** and **Unit Procedures** are used to control specific instruments (the DeltaV™ system terminology is a “Unit”).

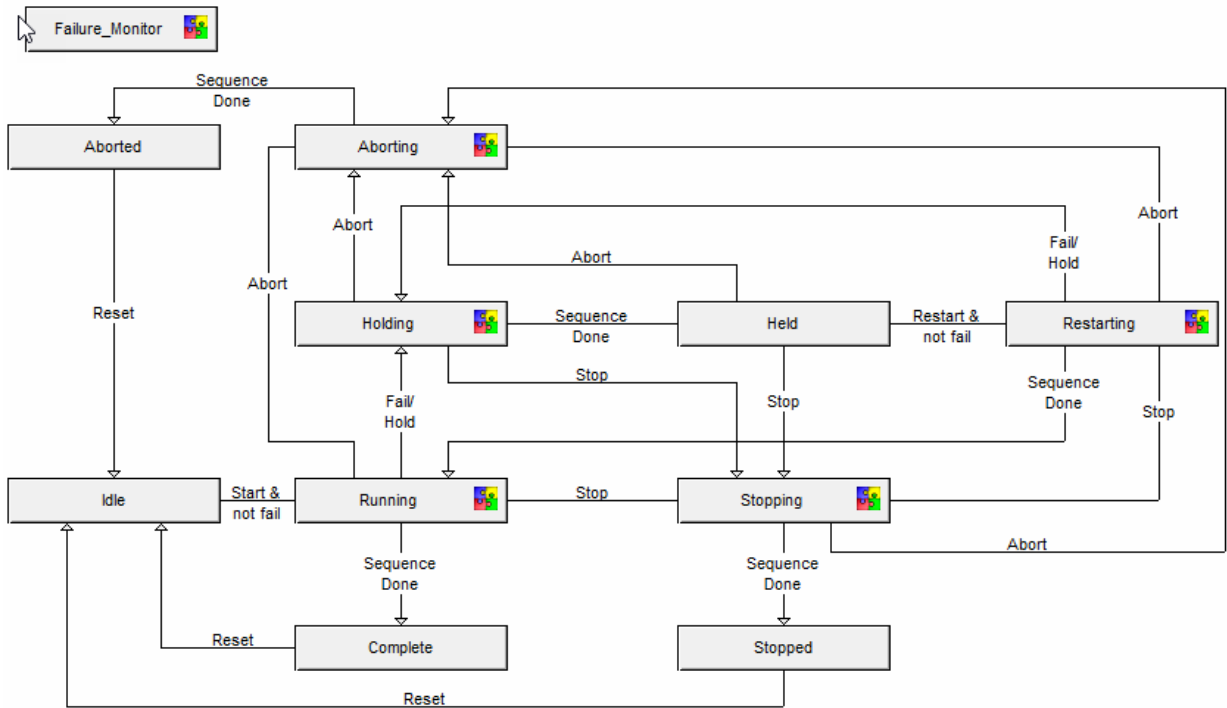
The Procedure recipe (which is the highest level recipe) can contain Unit Procedures from different Units. This feature allows a workflow to control multiple instruments within a single batch run.

To interact with and control instruments, ‘Phases’ are used as the building blocks (steps) for Operations.

Phases

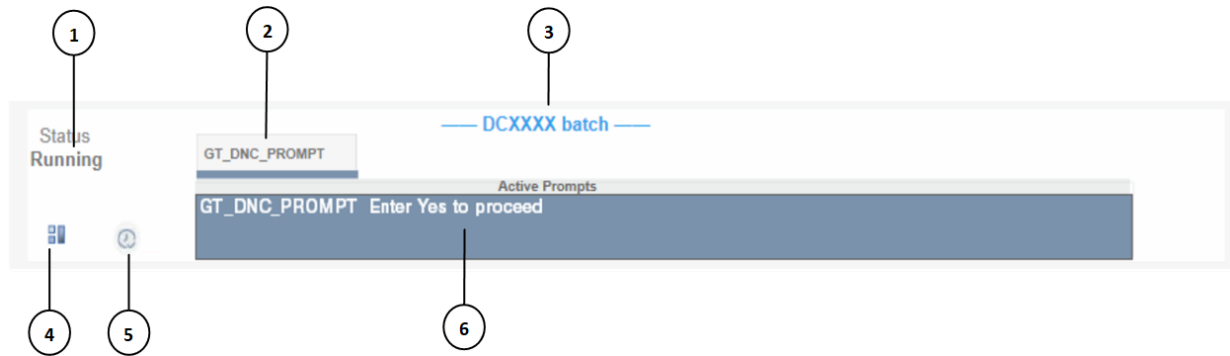
Phases are software modules that conform to the ISA-88 batch standard and run on the DeltaV™ system controllers.

Phases have states when running. The following figure shows the state transition diagram.



In all the DynaCollect™ instrument phases, the stopped state contains no logic. This allows for active step changes to be performed without causing any disruption to the instrument. Refer to DeltaV™ Books Online for more information on recipe active step changes.

When phases are running on an instrument, the phase status, messages and prompts are displayed on the main DynaCollect™ system display in the batch banner object, as shown in the following figure.



- ① Status of the currently selected phase
- ② Tab strip that displays the phase name(s). If more than one phase is running on the unit, then this is shown on another tab.
- ③ Unit Name
- ④ Hold Button. Pressing this will issue a message box to allow holding the recipe.
- ⑤ Timer button. This brings up the support module timers.
- ⑥ Message/Prompt box

Note: The colored line underneath the text ② shows the message status.

- Red indicates a failure message
- Yellow indicates a warning message
- Blue indicates a prompt message
- No color indicates standard message

Batch recipe prompts are generated in phases and displayed on the batch banner. When a prompt message is clicked a message box appears as shown in the following figure. Depending on the prompt type some extra fields are displayed to enter numeric or alphanumeric data. In addition, a prompt might require verification using a confirmer or verifier sign off.

Acknowledge Prompt [X]

BatchID: 20230727.131611

Recipe: OP_DYN_RUN\GT_DNC_PROMPT:1-1

Process Cell: DCXXXX-PC

Unit: DCXXXX

Phase: GT_DNC_PROMPT

Parameter: Enter Yes to proceed

YES

Comment

Acknowledge Cancel Help

Prompts may be configured to have a confirmer and/or verifier. For these prompts, the prompt box will appear as shown in the following figure.

There are three phases that can be used to construct Operations for the DynaCollect™ instrument.

Phase name	Description
GT_DNC_INIT	This phase acquires the DynaCollect™ Equipment Module within the DeltaV™ system which disables an operator from interacting with the instrument from the graphical interface. It is also used to release the equipment module when the recipe is complete.
GT_DNC_PROMPT	This phase allows a prompt to be inserted within an operation. A prompt can be configured as one of the following types. <ul style="list-style-type: none"> • Yes/No • Enter a number • Enter a string
GT_RTA_RUN	This phase will start the selected profile on the DynaCollect™ instrument via the equipment module and waits until it has completed. In addition, any recipe parameters associated with a DynaCollect™ instrument protocol can be defined, which are then passed down to the DynaCollect™ instrument before the protocol starts.

Phase recipe parameters

Every phase has two types of recipe parameters, 'input' (commonly referred to as recipe parameters) and 'report' parameters.

Input parameters are used to define the function of the phase, and report parameters are used to add batch data to the batch journal history file.

Report parameters are updated by the phase logic and do not need to be defined in a recipe.

The following tables define the parameters for each phase.

GT_DNC_INIT	
Input Parameter	Description
R_UNIT_ACQ_REL	Setting this parameter to Acquire will cause the phase to acquire ownership of the DynaCollect™ equipment module. This means the equipment module can no longer be used by an operator for manual control from the DeltaV™ system displays.
	Setting this parameter to Release will cause the phase to release ownership of the DynaCollect™ equipment module. This means the equipment module can now be acquired by an operator for manual control from the DeltaV™ system displays.
Report Parameter	Description
L_REPORT	Records the reason of a recipe/phase moves to the Hold state

GT_DNC_PROMPT	
Recipe Parameter	Description
R_PROMPT_TYPE	This parameter defines how the prompt is displayed and what the data entry requirements are. The types are: <ul style="list-style-type: none"> • YES_NO_PROMPT <ul style="list-style-type: none"> – The prompt box provides a YES/NO option as an answer. • INPUT_PROMPT <ul style="list-style-type: none"> – The prompt box provides for a numeric data entry. • STRING_PROMPT <ul style="list-style-type: none"> – The prompt box provides for an alpha/numeric data entry.
R_MAX_INPUT_VAL	If INPUT_PROMPT is required, then only a number less than this value can be entered.
R_MIN_INPUT_VAL	If INPUT_PROMPT is required, then only a number greater than this value can be entered.

(continued)

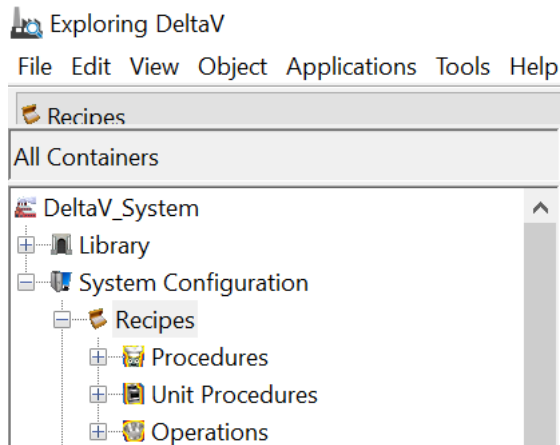
GT_DNC_PROMPT	
R_VERIFICATION	<p>Defines the electronic signature requirements for the prompt.</p> <ul style="list-style-type: none"> • None <ul style="list-style-type: none"> – The prompt requires no electronic signature. • Confirmer <ul style="list-style-type: none"> – The prompt requires an electronic signature. • Verifier <ul style="list-style-type: none"> – The prompt requires two electronic signatures from two different users.
R_OPERATOR_MSG	The message entered here appears on the first line of the batch banner.
R_WAIT_PROMPT	The message entered here appears on the second line of the batch banner. It also appears on the prompt message box.
R_ANSWER_UP	This parameter is used to define a unit parameter where the prompt response can be stored. This enables batch recipes to use the prompt responses in the transition logic between recipe steps.
Report Parameter	Description
L_REPORT	Records the reason a recipe/phase moves to the Hold state.
L_RESPONSE	When a prompt is answered, the response is stored in this parameter.

GT_DNC_RUN	
Recipe Parameter	Description
R_PROTOCOL_ID	This parameter defines the protocol ID number to run on the DynaCollect™ instrument.
R_START_STEP	This parameter defines starting step for Dynacollect protocol run.
Report Parameter	Description
L_REPORT	Records the reason a recipe/phase moves to the 'Hold' state.
L_END_CONDITION	Records the protocol end condition.
L_INST_NAME	Records the instrument name.
L_KIT_ID	Records the DynaCollect™ instrument Kit ID number.
L_KIT_TYPE	Records the DynaCollect™ instrument Kit type.
L_RUN_ID	Records the Run ID created by Dynacollect Instrument during protocol run
L_SERIAL_NO	Records the DynaCollect™ instrument serial number.
L_PROTOCOL_ID	Records the protocol ID used.
L_PROTOCOL_NAME	Records the protocol name created by Dynacollect for the protocol run.

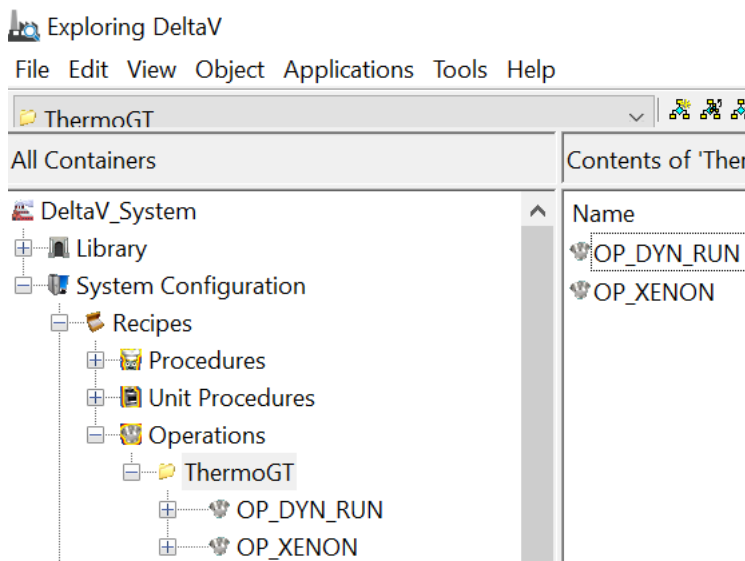
Recipe construction

Recipe Studio is used to create a recipe in the DeltaV™ system. Refer to DeltaV™ Books Online for further information on how to use this application.

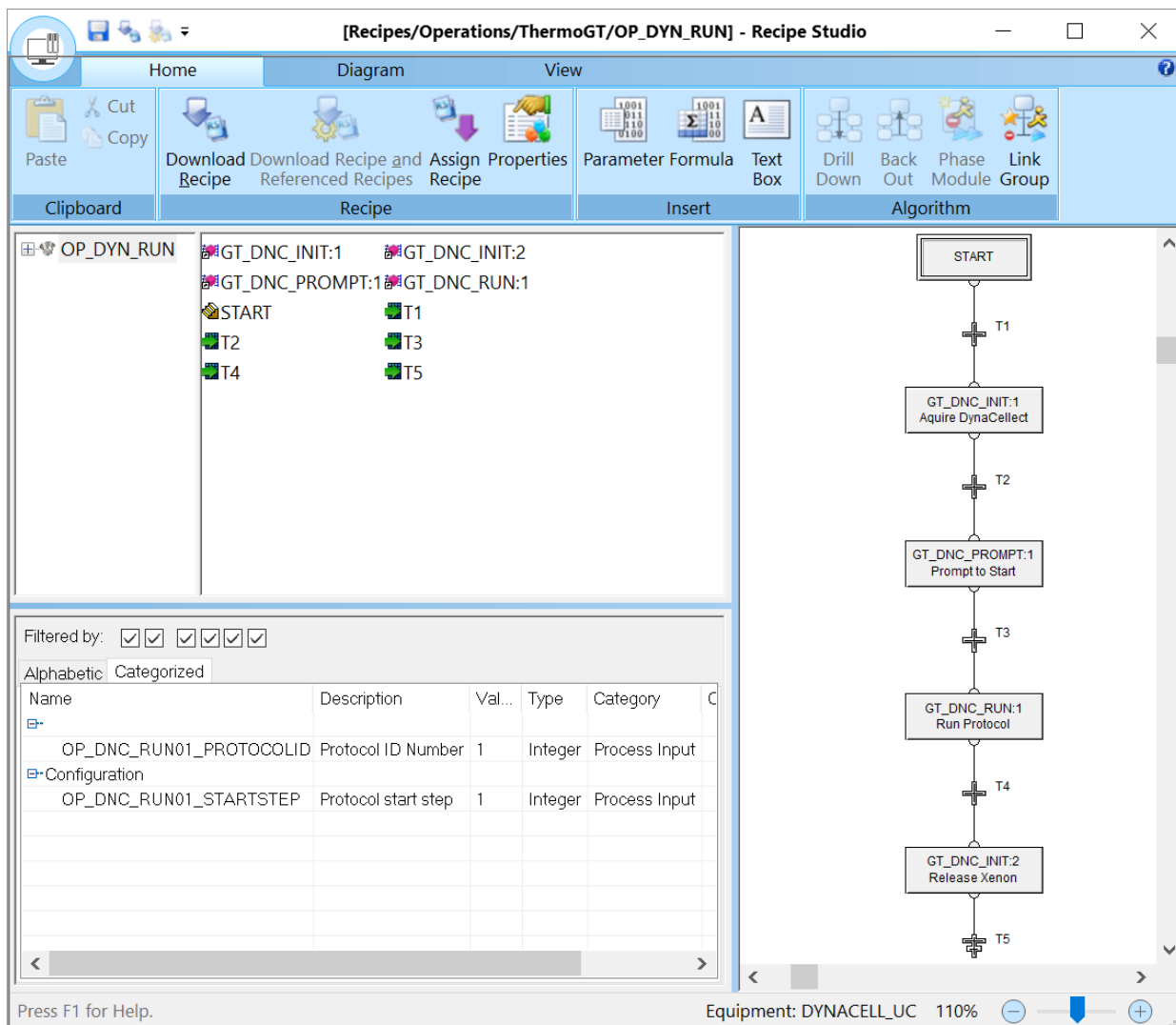
The batch recipes reside in three folders within the DeltaV™ system database and can be located using the DeltaV™ system application DeltaV Explorer. From DeltaV Explorer, the recipe folders appear as shown in the following figure – **Operations**, **Unit Procedures** and **Procedures**.



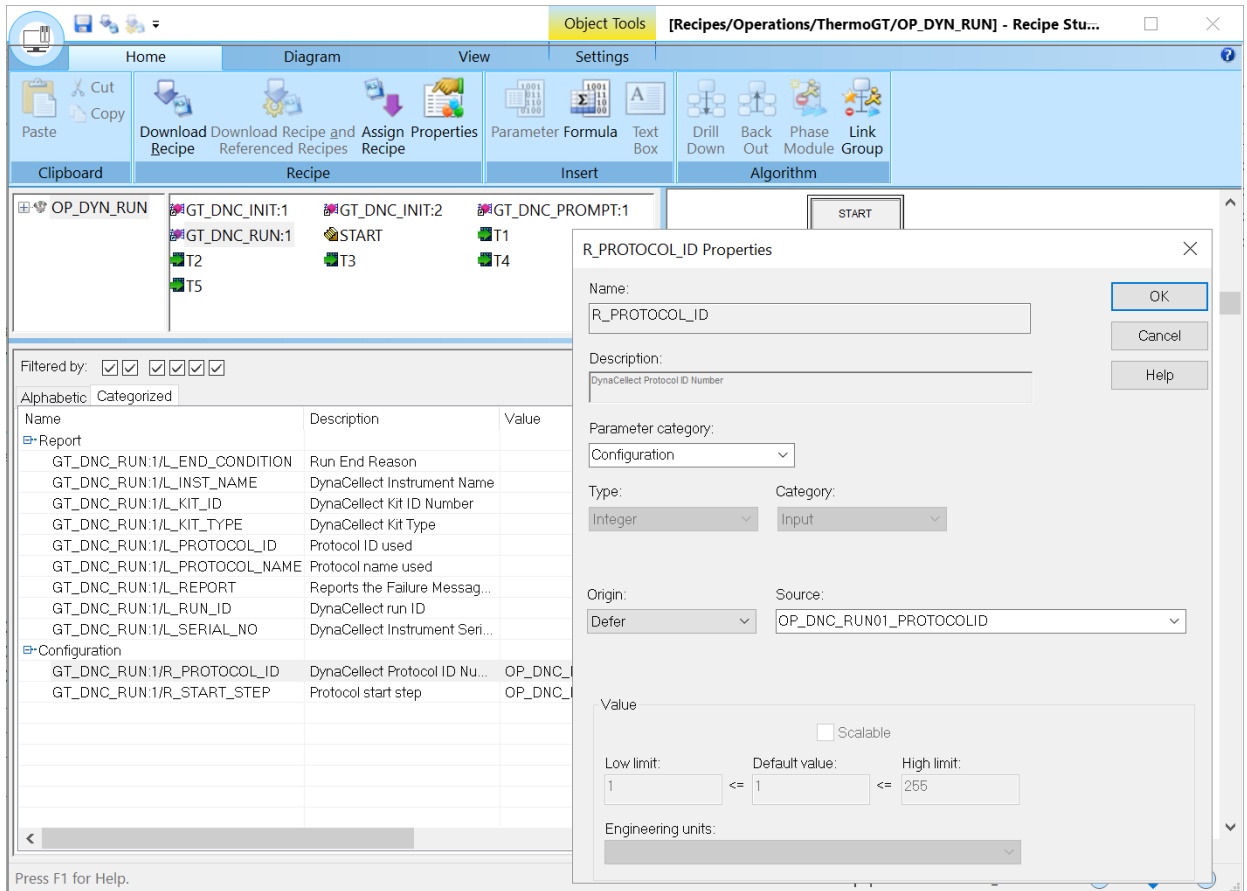
Within these folders, subfolders can be created to help organize batch recipes. In the following figure, two folders have been created and contain Operation recipes.



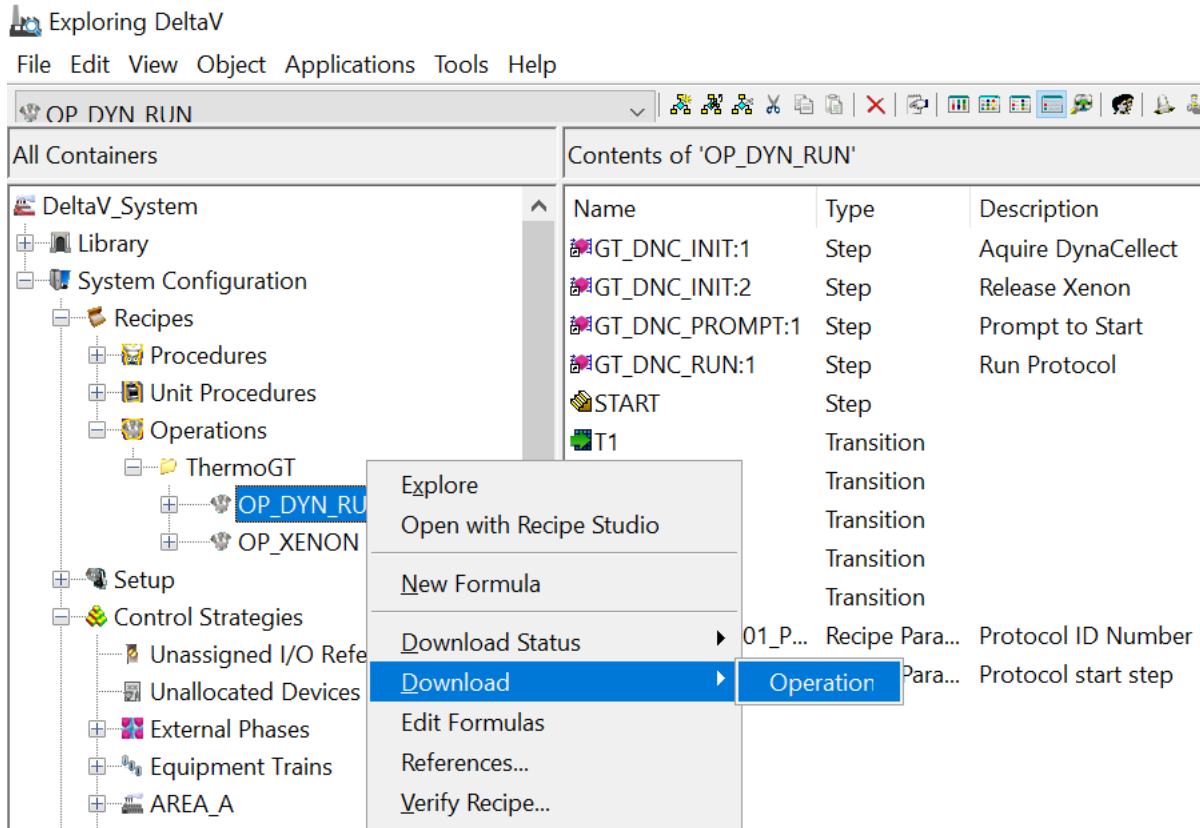
The following figure shows a simple recipe within the **Recipe Studio** application. The layout of each pane can be modified by the user. The default layout is shown in the following figure.



Clicking on a step will cause the recipe parameters for that step to be displayed in the **Parameter View** pane. These parameters can be shown alphabetically or categorized. To enter a recipe value, double click on the recipe parameter and a box will appear to allow the update.



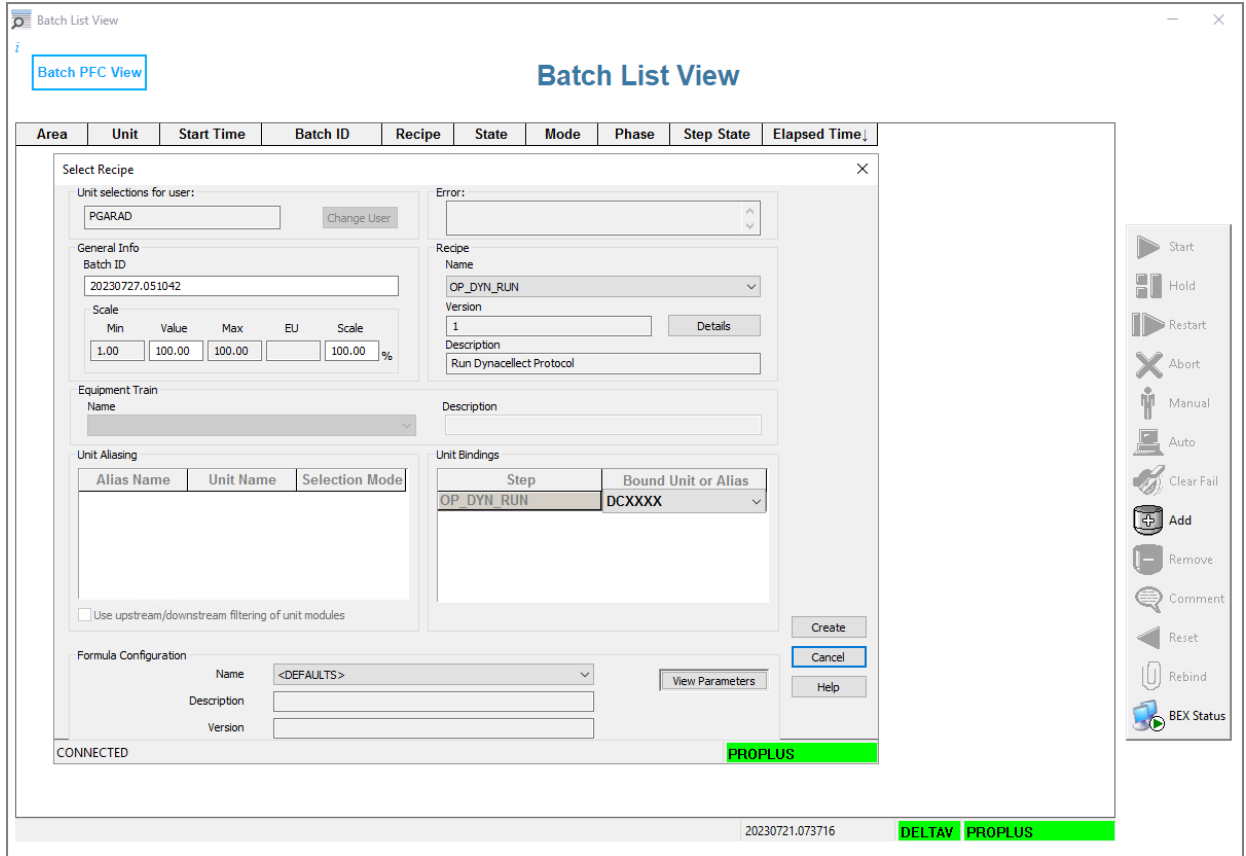
Once all the recipe parameters have been updated, save the recipe and then download to the batch executive. This is achieved by right clicking on the **operation** and selecting the download option.



Recipe execution

Once a recipe has been downloaded to the batch executive, it is available to be run on the system. There are two applications available for starting recipes, the graphics displays or the Batch Operator Interface (BOI). Functionally, the BOI is the same as using the graphic displays, but provides more granular detail of the recipe, and also allows for more low level control of the batch. Refer to DeltaV™ Books Online for detailed information on the BOI.

To start a recipe from the graphic displays, select the **Batch List View** button and the batch list view faceplate is displayed as previously shown. To add a batch ready for execution, select the **Add** button and a pop-up window will appear as shown in the following figure.



- **Batch ID:** The recipe can be assigned an automatically generated Batch ID (as shown in the following figure) or the user can type a new alphanumeric Batch ID.
- **Scale:** A recipe can be scaled. If this feature is not used, leave it as 100%.
- **Bound Unit or Alias:** Depending on how the recipe is constructed, it can be configured to run on multiple instruments. If this is the case, then the drop down box can be used to select the instrument that this batch will run on.
- **View Parameters:** Selecting this box will show any top level operation parameters that can be modified by the user before starting the run.

Unit selections for user:
PGARAD [Change User]

General Info
Batch ID: 20230727.051754
Scale:

Min	Value	Max	EU	Scale
1.00	100.00	100.00		100.00 %

Recipe
Name: OP_DYN_RUN
Version: 1 [Details]
Description: Run Dynacollect Protocol

Unit Bindings

Step	Bound Unit or Alias
OP_DYN_RUN	DCXXXX

Parameter Table:

Parameter	Description	Min	Scaled Value	Max	EU
OP_DNC_RUN01_PROTOCOLID	Protocol ID Number	1		255	
OP_DNC_RUN01_STARTSTEP	Protocol start step	1		255	

CONNECTED PROPLUS

Once the recipe has been created, it will be shown in the **Batch List View**. To start the recipe, highlight it and select the start button. The recipe will now be running and the user can switch to the PFC view to see the recipe progress.

Many recipes can be added to a run.

Note: A recipe can only run on a unit once the previous recipe has been completed.

Batch List View

Area	Unit	Start Time	Batch ID	Recipe	State	Mode	Phase	Step State	Elapsed Time
DCXXXX.AREA	DCXXXX	7/27/2023 1:26:33 PM	20230727.052453	OP_DYN_RUN	RUNNING	O.AUTO	DCXXXX/GT_DNC_INIT		0:00:21

The PFC view will display the recipe steps and transitions. The active steps are shown in green.

Batch PFC View

Batch List View

Batch Procedural Function Chart

Step	State	Mode	Unit
OP_DYN_RUN	RUNNING	O-AUTO	DCXXXX
-GT_DNC_INIT:1			DCXXXX
-GT_DNC_PROMPT:1	RUNNING	P-AUTO	DCXXXX
-GT_DNC_RUN:1			DCXXXX
GT_DNC_INIT:2			DCXXXX

Disabled Transitions

100 % Mode O-AUTO State RUNNING Operation OP_DYN_RUN

Start
Restart
Stop
Auto
Clear Fail
ASC
Hold
Manual
Abort

GT_DNC_INIT:2 DCXXXX 20230727.052453 PROPLUS

3

Alarm management

Alarms are displayed in various locations depending on the type and the module that they are associated with.

An alarm can be in the following states:

- Active and unacknowledged
- Active and acknowledged
- Cleared and unacknowledged
- Cleared and acknowledged

There are 12 possible alarm priority levels: numeric values 4 through 15 plus a special log only priority level (value 3). The highest priority value is 15 (used for the most important alarms). The lowest priority value is 4.

The alarm colors are dependent on the priority and by default are:

- Purple: Priority 4-7
- Yellow: Priority 8-11
- Red: Priority 12-15

The default alarms that exist in the system are shown in the following table.

Level value	Alarm priority name	Auto acknowledged	Auto acknowledged inactive	Horn sound
15	CRITICAL	No	No	WAS-High ©2010HCS.wav
11	WARNING	No	No	WAS-Medium ©2010HCS.wav
7	ADVISORY	Yes	No	WAS-Low ©2010HCS.wav
3	LOG	Yes	No	none

The DynaCollect™ instrument uses a prompt alarm with a priority of 5 and will appear in alarm windows/lists in purple color.

Note: The alarm priority can be changed if priority 5 is already in use by other alarms.

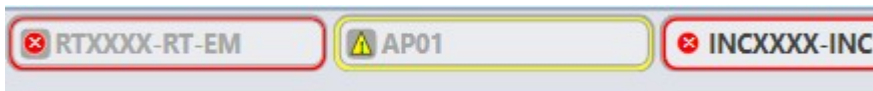
Alarm banner

The alarm banner resides at the bottom of the display.

If there is an active unacknowledged alarm, the alarm banner at the bottom of the screen displays a flashing colored box, as seen on DCXXXX-DC-EM in the following figure. If the alarm is active, but has been acknowledged, the alarm box no longer flashes and will remain in the alarm priority color.

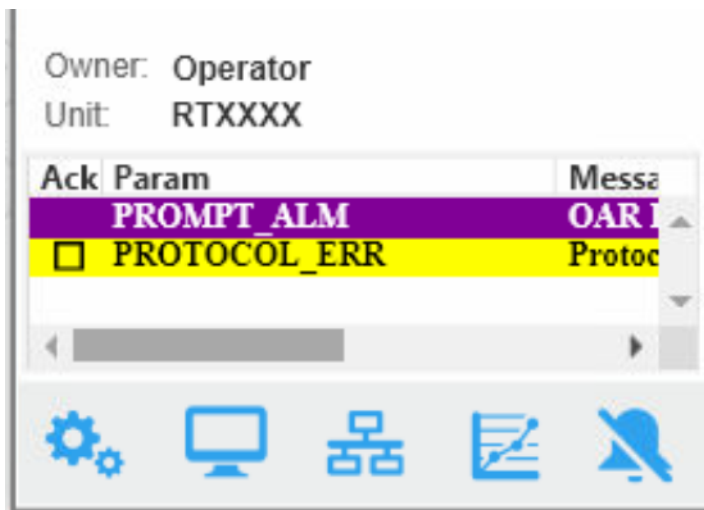


If the alarm is no longer active, and has not been acknowledged, the alarm box still flashes but the alarm symbol on the left of the alarm is crosshatched as seen in the following figure.

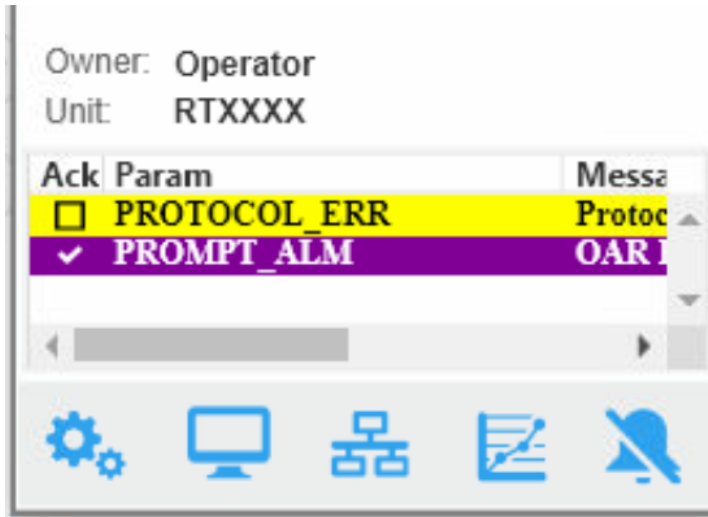


Faceplate alarm window

If an alarm is part of a module, then the module faceplate will have an alarm window showing the alarms. The following figure shows the alarm window of the DynaCollect™ equipment module. It shows a prompt alarm that is active and unacknowledged (indicating that a prompt has been raised and requires acknowledgment), and an advisory alarm (indicating a Profile error) that is no longer active and unacknowledged.



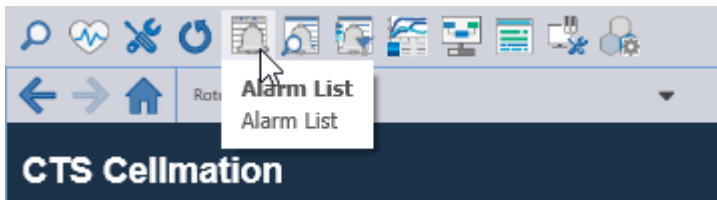
When the prompt alarm is acknowledged, a tick is shown to the right of the alarm as seen in the following figure.



When the advisory alarm is acknowledged, it will disappear from the alarm window.

Alarms lists

The alarm list can be opened by clicking on the **Alarm List** button. This button appears in the toolbar window at the top of the display.



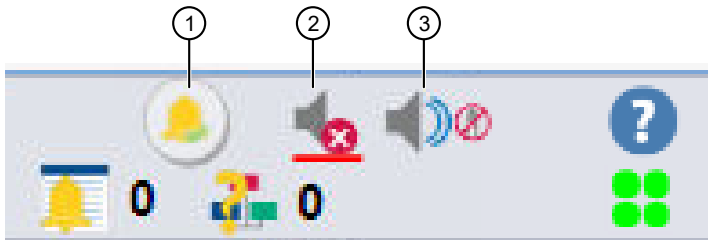
Clicking this button displays a list of all the active alarms the current workstation is monitoring for the current user.

Ack	Time In	Unit	Module/Param	Description	Alarm	Help	Message	Priority
	7/26/2023 3:39:40 PM	XN000X	XN000X-XN-EM/OPCUA_LINK_ALM	Xenon Equipment Module	OPCUA Alarm		OPC UA Link Failed	CRITICAL
	7/26/2023 3:39:39 PM	DC000X	DC000X-DC-EM/OPCUA_LINK_ALM	DynaCollect Equipment Module	OPCUA Alarm		OPC UA Link Failed	CRITICAL
	7/27/2023 10:37:00 PM		TERMSVR01/MAINT_ALM		MAINT		ACN Communications: Not Communicating - Secondary Network	WARNING
	7/26/2023 3:39:40 PM	XN0003	XN0003-XN-EM/PROTOCOL_ERR	Xenon Equipment Module	FAILED		Protocol End: Multi-Shot Protocol Error	WARNING
	7/26/2023 3:39:36 PM		PKCTRL1/MAINT_ALM		MAINT		ACN Communications: Not Communicating - Secondary Network	WARNING
	7/21/2023 3:36:46 PM		PROPLUS/MAINT_ALM		MAINT		ACN Communications: Not Communicating - Secondary Network	WARNING
	7/21/2023 2:43:25 PM		EIOCL/MAINT_ALM		MAINT		(MULTI)Ethernet I/O: Device Problem on Port 01	WARNING
	7/27/2023 10:16:47 PM	DC000X	DC000X-DC-USM/PROMPT_ALM	DynaCollect Batch Support Module	QAR PROMPT		QAR Preempt Pending	PROMPT
✓	7/27/2023 10:23:47 AM	XN000X	XN000X-XN-EM/BYPASS_ON	Xenon Equipment Module	Bypass		Interlock Bypassed	ADVISORY

Acknowledging and silencing alarms

At the bottom of all displays there is an alarm banner.

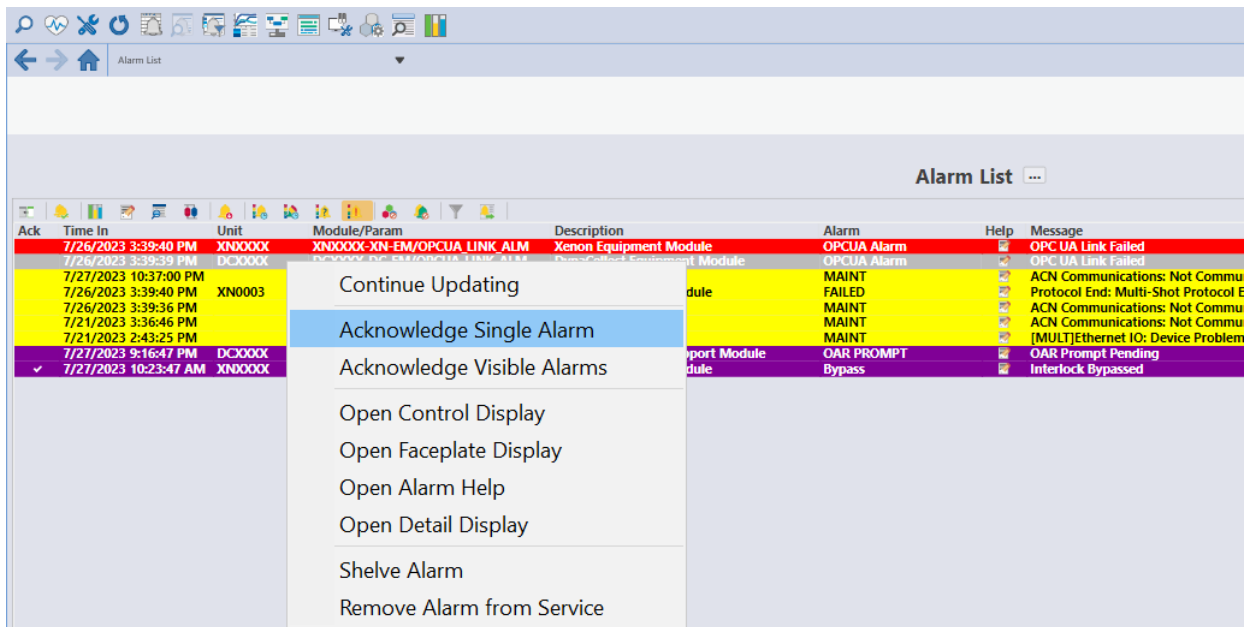
If an alarm is triggered, an audible alarm sounds, if that function has been enabled and the system provides a speaker for the alarm. To turn off the audible alarm, click the icon on the lower right corner of the screen.



1. This button acknowledges all unacknowledged alarms in the main process graphic when selected. Only alarm parameters that are part of the graphic are acknowledged.
2. Selecting this button stops the horn, but does not acknowledge the alarm. If new alarms become active and the horn is enabled, the horn sounds again.
3. Selecting this button disables or enables the horn. When the horn is disabled, new alarms do not cause the horn to sound. This setting is a parameter of the current user's session. When a new user logs on, the horn is enabled by default.

To acknowledge individual alarms the following actions can be performed.

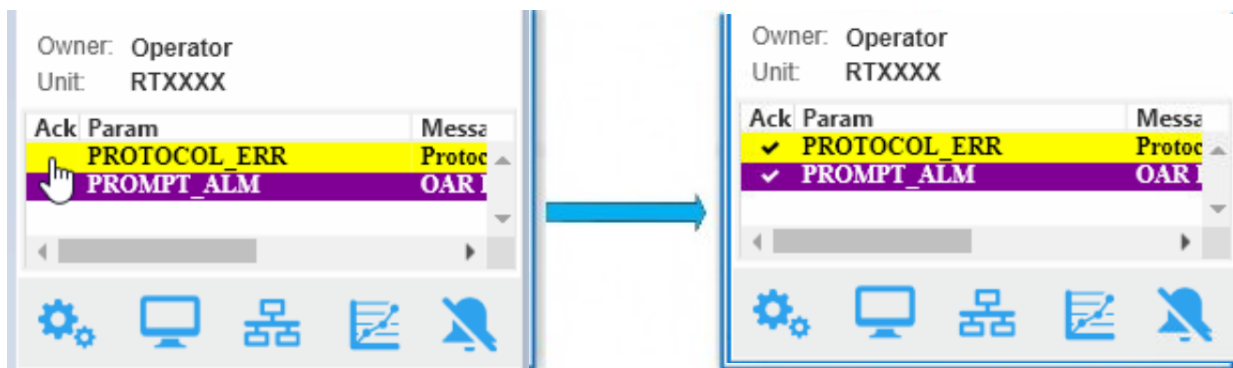
From the **Alarm List** display, right click on the alarm to be acknowledged and select **Acknowledge Single Alarm**.



Alternately, from the **Alarm List** display, move the cursor to the **Ack** column of the alarm to be acknowledged and left click with your mouse.

Ack	Time In	Unit	Mod
	16-Feb-23 10:16:53 AM	RTXXXX	RTX
	07-Feb-23 1:12:22 AM	XNXXXX	XNX
✓	31-Jan-23 7:00:29 AM	INXXXX	INC
✓	08-Jan-23 2:39:45 AM	DCXXXX	DCX
✓	15-Feb-23 8:37:37 PM		EIOC
✓	07-Feb-23 1:12:22 AM	XNXXXX	XNX
✓	09-Sep-22 11:14:13 AM		PKC
✓	16-Feb-23 10:16:40 AM	RTXXXX	RTX

Otherwise, from the module faceplate alarm window, move the cursor to the **Ack** column of the alarm to be acknowledged and left click with your mouse.



Suppressing alarms

Alarms can be suppressed in two ways, by shelving or placing them out of service.

In general, you should respond immediately to alarms. However, if you are unable to address the issue in the moment, you can temporarily shelve the alarm or permanently remove it from service. Both types of suppression move the alarm from the Alarm Banner and Alarm List pictures to the Alarm Suppress picture.

Shelving alarms

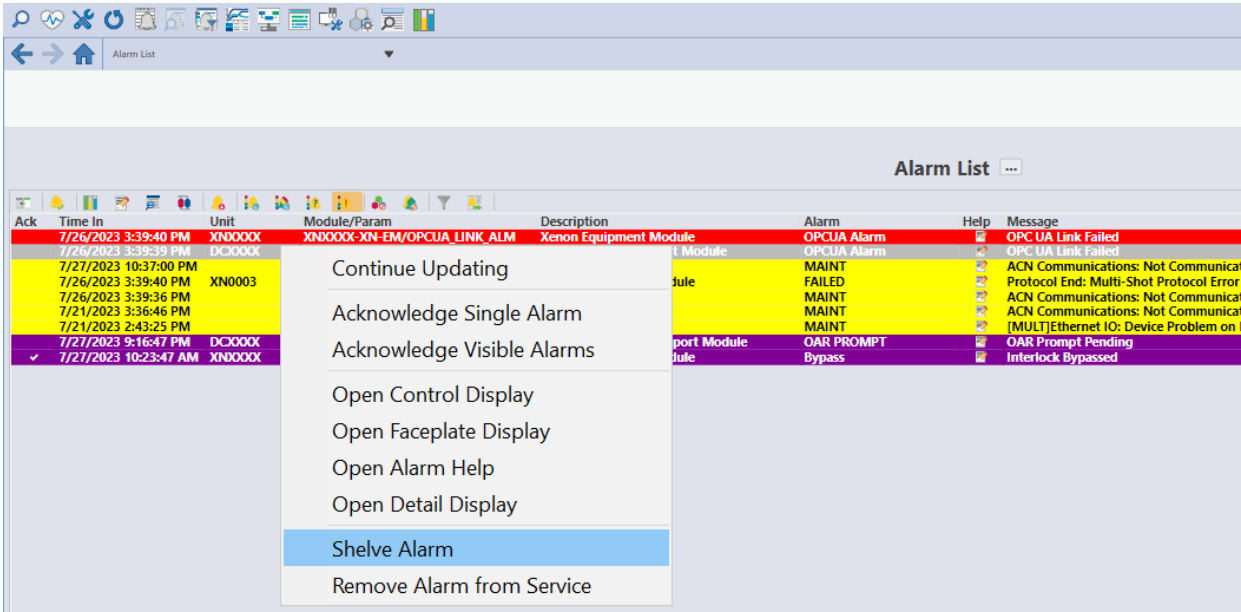
Shelving an alarm typically falls under the control of the operator and is done for the purpose of temporarily suppressing the alarm. When you are ready to respond to the alarm, unshelve the alarm in the Alarm Suppress picture and respond.

If ignored too long or forgotten, the alarm is automatically unshelved when the shelving timer runs out.

There are two ways to shelve an alarm, either from the alarm list or from the detail faceplate.

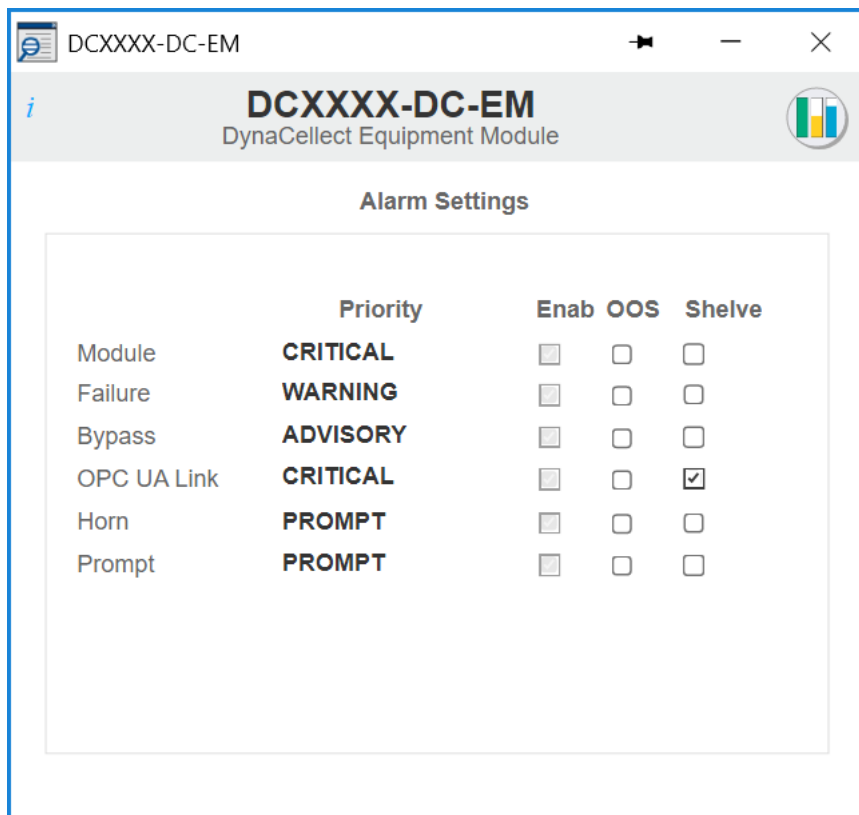
Alarm list shelve

From the **Alarm List**, right click on the alarm to be shelved and select **Shelve Alarm**.



Detail faceplate shelf

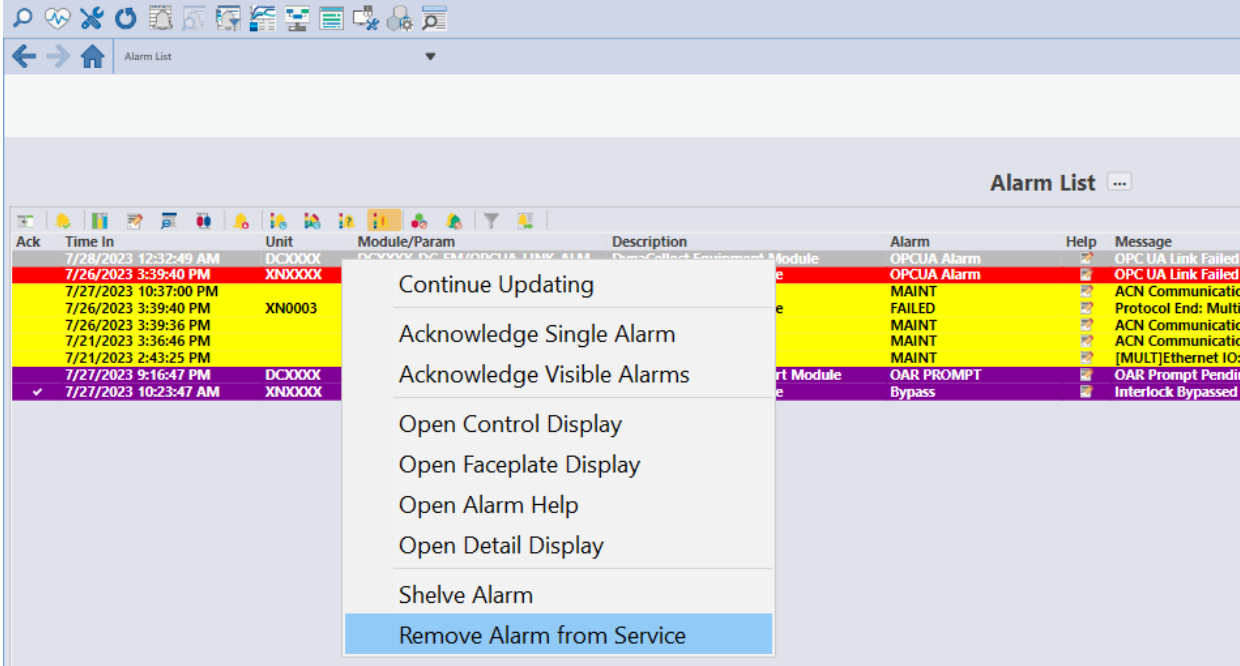
Open the detail faceplate associated with **Alarms** button. The detail faceplate will look like the following figure.



Click on the checkbox of the alarm to shelve in the **Shelve** column. The alarm can be unshelved by removing the tick in the alarm checkbox.

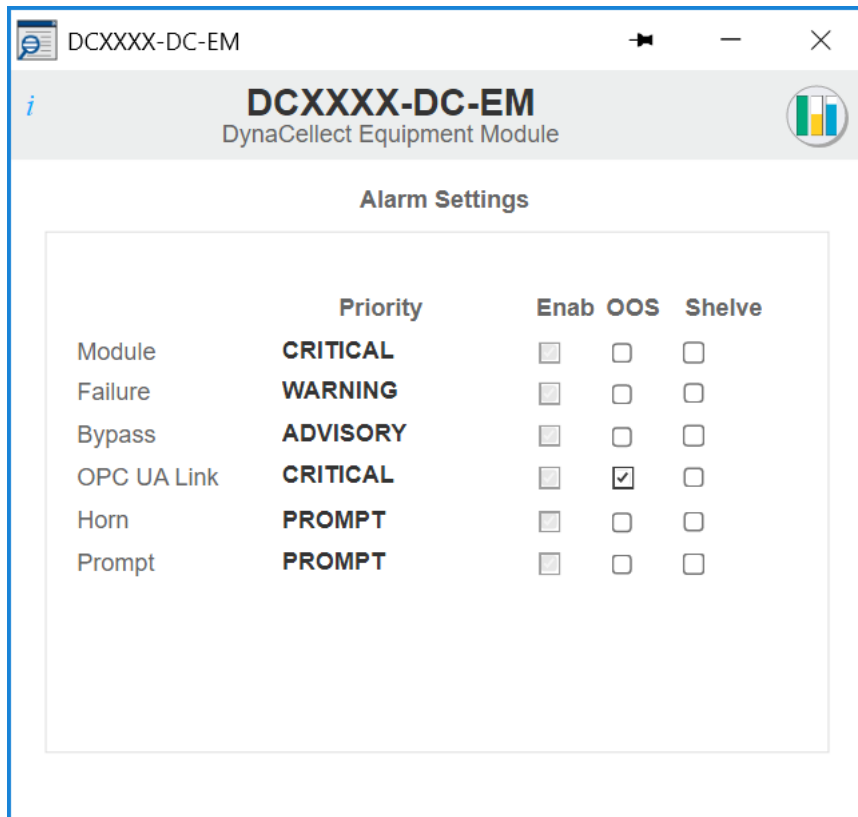
Alarm list OOS

From the alarm list right click on the alarm to be removed from service and select **Remove Alarm from Service**.



Detail faceplate OOS

Open the detail faceplate associated with **Alarms**. The detail faceplate will look like the following figure.

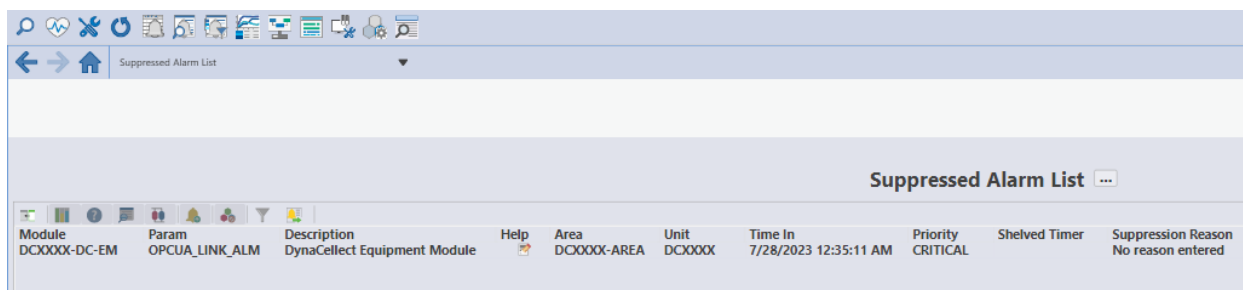


Click on the checkbox of the alarm to remove it from service in the **OOS** column. The alarm can be put back into service by removing the tick in the alarm checkbox.

Restore to service

Once the alarm has been put out of service it will be removed from all alarm windows/lists and can only be seen in the alarm suppressed display.

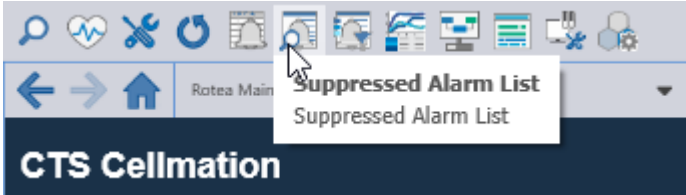
To restore the alarm to service right mouse click on the alarm and select **Restore Alarm to Service**.



Suppressed alarm list

Once the alarm has been put out of service it will be removed from all alarm windows/lists and can only be seen in the alarm suppressed display.

The suppressed alarm list can be opened by clicking on the **Suppressed Alarm List** button. This button appears in the toolbar window at the top of the display.

A screenshot of the 'Suppressed Alarm List' window. The window title is 'Suppressed Alarm List'. It displays a table with the following data:

Module	Param	Description	Help	Area	Unit	Time In	Priority	Shelved Timer	Suppression Reason
DCXXXX-DC-EM	OPCUA_LINK_ALM	DynaCollect Equipment Module		DCXXXX-AREA	DCXXXX	7/28/2023 12:35:11 AM	CRITICAL		No reason entered



Backup and recovery

Archiving, backup and disaster recovery procedures should be performed by automation/IT department personnel, in accordance with their SOPs for the system. The following files should be backed up:

- Exported configuration database (FHX text files)
- Native configuration database (objectivity database)
- VCAT SQL database
- DeltaV™ system admin database backups
- DeltaV™ Live displays and library objects
- Historical configuration (charts)
- Historical data archives

The system can be designed to automatically and regularly back up data that is stored on the server or on local PCs, without shutting down the system. If data backups are not automated, they should be performed at specified time intervals. When data is archived, the system has the ability to quickly restore data with a minimal recovery time. If a method is in place to completely restore the main system in the event of a catastrophic failure, successive restores of, for example, the operating system, application, configuration, and data, should not be required.

In addition, the system has archival capability to move data from primary storage to long term or permanent storage. The archived information can be easily retrieved from primary storage for data analysis if desired.

The system includes diagnostic functions that are used to ascertain the overall status of the system.

Computer cleanup

Routine computer maintenance is generally the responsibility of the local automation/IT department. However, if the computer system is slow, the user may consider the following suggestions.

- Check the computer disk space. To access this information, click **Start** on the lower left of the monitor screen, then click **Computer**.
- Perform a disk cleanup. Click the button below the pie chart showing available disk space.
- If the free disk space is greater than 20%, do the following, depending on the computer in question:
 - On the ProPlus workstation: access the DeltaV™ Database Administration menu and run a DeltaV™ Database clean.
 - On the Application Station: ensure that routine database backups are being performed.

- If the free disk space is less than 20%, do the following:
 - On the ProPlus workstation: remove all old files, defragment the hard drive, and run a DeltaV™ Database clean.
 - On the Application Station: remove old files by exporting old datasets to another location. If the system is idle, defragment the hard drive.
- If the previous steps do not solve the problem, or if you are uncertain about performing such maintenance, consult your IT personnel or your service representative.

Power outage

Response to power loss depends on the part of the system that suffers the loss. It is recommended that a DeltaV™ unit incorporates an uninterrupted power supply (UPS) to protect the system in case of brief power interruptions.

In case of a general power loss that extends beyond the UPS capability, the computers must be rebooted, and the DeltaV™ system restarted. In such a case, consultation with your service representative is strongly recommended.

Data storage is part of the 21 CFR Part 11 (cGMP) requirement. DeltaV™ software data storage is based on the DeltaV™ Continuous Historian and satisfies the cGMP requirements.

Click the **Event Chronicle** button for any parameter at the bottom of the faceplate to open a display of the parameter history. Options are available to select the length of time covered by the record. The data can be printed, or copied and pasted into Microsoft™ Word™ or Excel™ files, to create hard copy documentation.

The Process History Chart can be configured to display data in three formats, Events and Chart, Chart only or Event only. The following figure is an example of the PHV showing events and chart. From this application, current and historical data can be viewed.

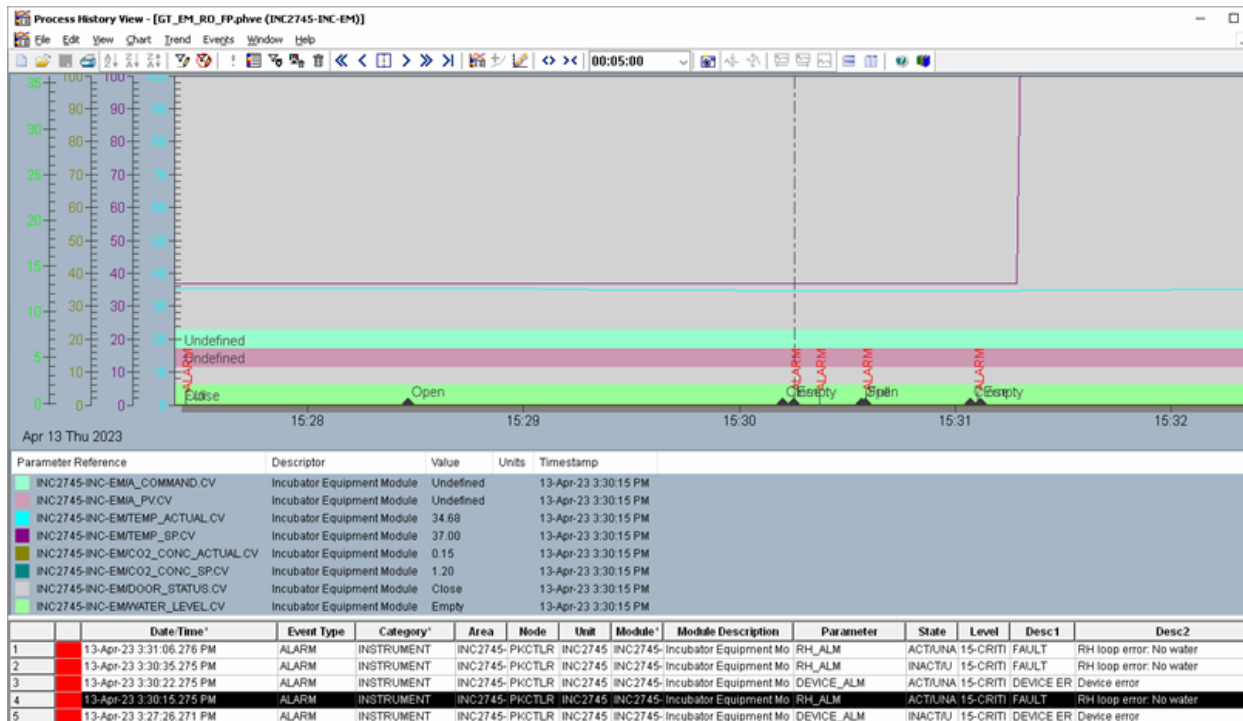


Figure 2 Display of parameter history.

The DeltaV™ Continuous Historian subsystem is used for the continuous collection and storage of process data. It is included with CTS™ Cellmation™ Software and can be configured to perform the following:

- Create a single historical database
- Open an unlimited number of trend screens with up to eight user definable values per screen
- Display trends either horizontally or vertically
- Display either process trends, alone or a combination of process trends and the associated event log
- Display trends in seconds, minutes, hours, days or weeks

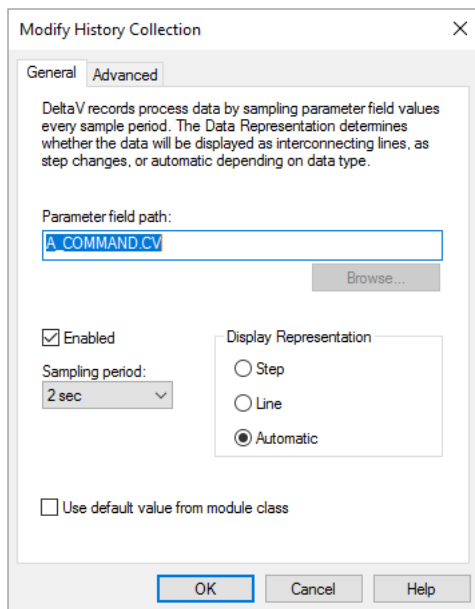


Figure 3 General settings for modifying history collection.

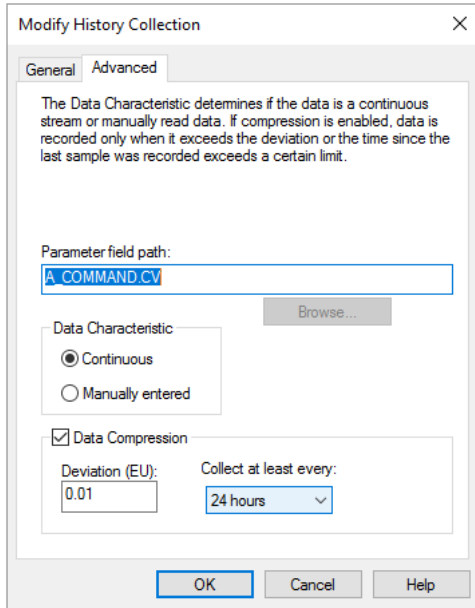


Figure 4 Advanced settings for modifying history collection.

Table 3 History collection properties for DeltaV™ system parameters.

Settings	Description
General settings	
Parameter field path	The path of the module parameter whose history is being collected.
Enable	Activates collection of field values specified in the parameter field path.
Display representation	<ul style="list-style-type: none"> • Step: Displays the values as step changes on the trend chart. Step representation is typically used for discrete values. • Line: Displays the data collected with point-to-point connection. • Automatic: Determines the representation based on data type.
Sampling period	Available sampling frequencies are 1, 2, 5, 10, 30, and 60 seconds and 5 minutes.
Advanced settings	
Data characteristic	<ul style="list-style-type: none"> • Continuous: Continuously collected data, represented with interconnecting lines. • Manually entered: Values entered by a user, displayed as markClics on the trend, with no interconnecting lines.
Enable (data compression)	Enables data compression.
Collect at least every (data compression)	Controls the maximum time between stored values, even if values change very little. Options are 15 minutes, and 1, 4, 8, 24 and 72 hours.

To exit the historian view, click **X** in the upper right corner twice.



Abbreviations/acronyms

Abbreviation	Description
BOI	Batch Operator Interface
cGMP	Current Good Manufacturing Process
DV	DeltaV
FRS	Functional Requirement Specification
GUI	Graphical User Interface
JSON	A JSON file is a file that stores simple data structures and objects in JavaScript Object Notation (JSON) format, which is a standard data interchange format.
KBA	Knowledge-Based Article
LDT	Logical Device Tag. Software items that reside under the PDT that are used to map the data exchange between the OPC UA client and server.
MQ	DeltaV Controller M-Series
MX	DeltaV Controller M-Series
OOS	Out of Service
OPC UA	Open Platform Communications Unified Architecture. Ethernet based open industry standard for data exchange between systems/applications.
PDT	Physical Device Tag. A software item that contains the OPC UA device communicate with.
PHV	Process History View
PK	DeltaV Controller that also contains ethernet ports for connectivity to external devices
PV	Process Value (or Process Variable)
SFC	Sequential Flow Chart
SP	Setpoint
SQ	DeltaV Controller S-Series
SX	DeltaV Controller S-Series
URL	Uniform Resource Locator (URL), colloquially termed a web address, is a reference to a web resource that specifies its location on a computer network



Faceplate details

- GT_MOD_FP 85
- GT_EM_FP 87
- GT_USM_DT and GT_TimerFB_DT 89
- GT_EM_Alarms_DT 90

Faceplates that are in addition to the standard DeltaV™ system faceplates are described below. For details of the standard faceplates, refer to DeltaV™ Books Online.

GT_MOD_FP

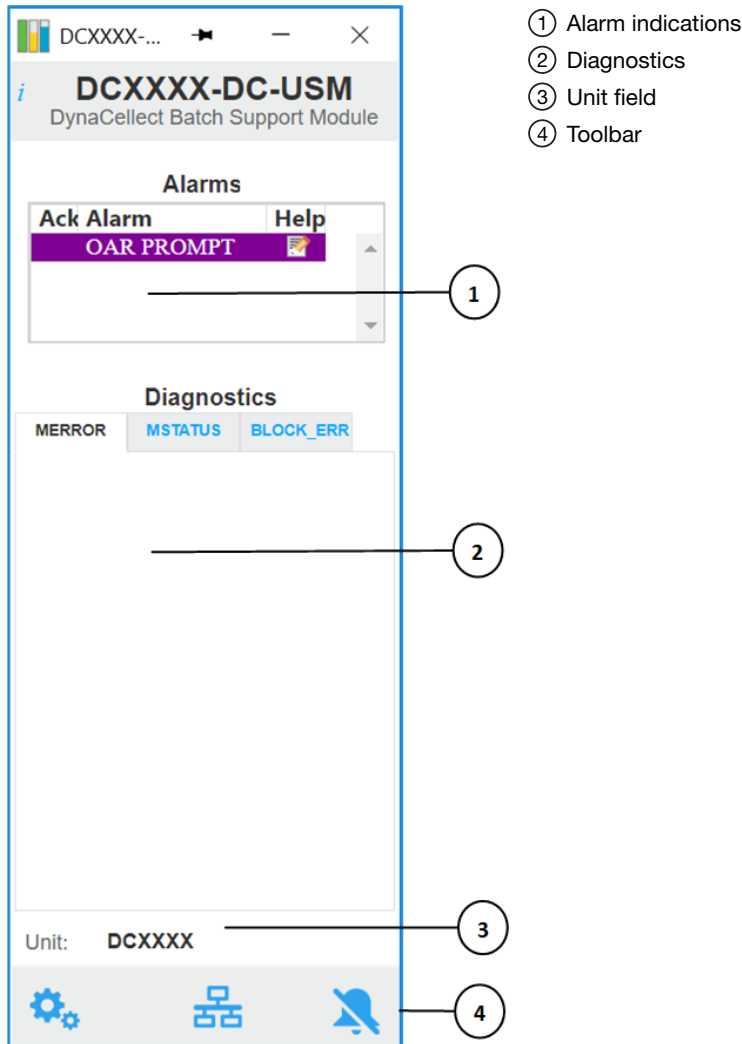


Figure 5 GT_MOD_FP

- **Alarm indications:** This is a scrollable list of the current alarms that functions like the first two columns of an alarm summary. The first column shows the state of the alarm represented by one of the following symbols:
 - Active/unacknowledged -- blank field
 - Active/acknowledged -- checkmark
 - Inactive/acknowledged -- empty box

The second column is the alarm name or parameter. The text and colors are as configured for the alarm's current state.

- **Diagnostics:** This section displays visible text for active conditions in the module's MERROR, MSTATUS and BLOCK_ERR parameters. There is a tab for each parameter. The parameter name on the tab is underlined when an active condition for that parameter is displayed. When an error has occurred in the module, a **Clear Error** button is displayed on the **MERROR** tab. Click this button to clear active errors.



- **Unit field** : This field displays the unit name.
- **Toolbar**: Click the icons from left to right to perform the following functions, respectively:
 - **Detail Display** button: open the detail display for the module.
 - **Primary Control Display** button: open the primary control display. Note, this is not visible in the CTS™ Cellmation™ Software.
 - **Control Studio** button: open Control Studio.
 - **Acknowledge Alarms** button: acknowledge all alarms on this module.

GT_EM_FP

- | | |
|-------------------------------|---------------------|
| ① Drop down command list | ⑥ Current owner |
| ② Run button Current state | ⑦ Unit field |
| ③ Acquire and Release buttons | ⑧ Alarm indications |
| ④ Current running command | ⑨ Toolbar |
| ⑤ Current end command state | |

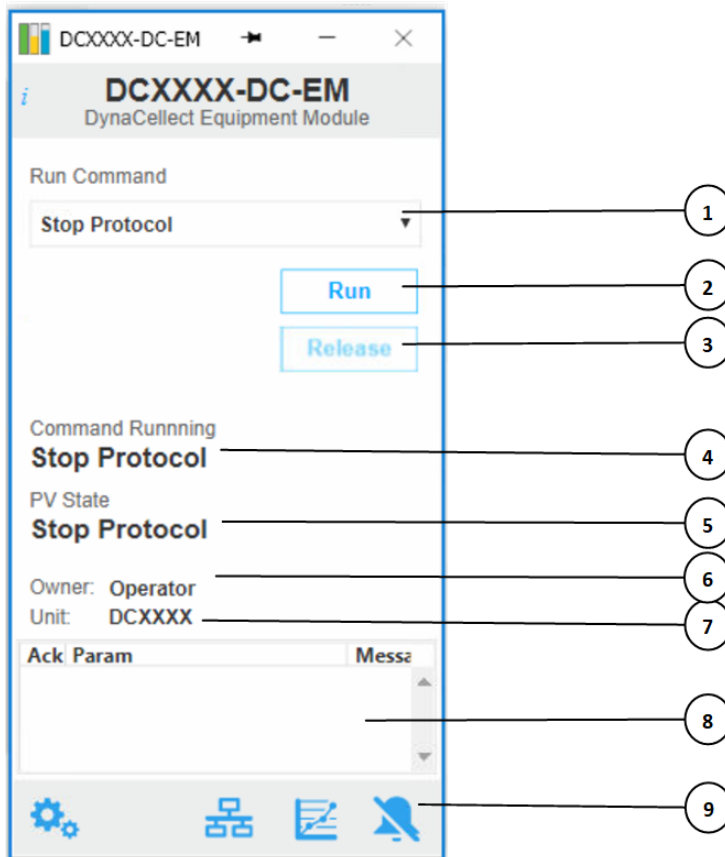


Figure 6 GT_EM_FP

- **Current command:** This displays the command that is currently being executed.
- **Current state:** This displays the current state after the current command has completed.
- **Drop down command list:** This displays the list of available commands when operating the module manually from the faceplate.
- **Run button:** Used to activate the selected command.
- **Acquire & Release buttons:** The acquire button (not shown) is used to acquire the module. Once acquired, manual commands can be selected. The release button will relinquish ownership of the module.
- **Current owner:** This displays the name of the current owner of the module.
- **Unit field:** This field displays the unit name.

- **Alarm indications:** This is a scrollable list of the current alarms that functions like the first two columns of an alarm summary. The first column shows the state of the alarm represented by one of the following symbols. The second column is the alarm name or parameter. The text and colors are as configured for the alarm's current state.
 - Active/unacknowledged -- blank field
 - Active/acknowledged -- checkmark
 - Inactive/acknowledged -- empty box

The second column is the alarm name or parameter. The text and colors are as configured for the alarm's current state.

- **Toolbar** - Click the icons from left to right to perform the following functions, respectively:
 - **Detail Display** button: opens a menu allowing for selection of the required detailed display for the module.
 - **Primary Control Display** button: open the primary control display. Note, this is not visible in the CTS™ Cellmation™ Software.
 - **Control Studio** button: open **Control Studio**.
 - **Event Chronicle** button: open the **Process History View**.
 - **Acknowledge Alarms** button: acknowledge all alarms on this module.

GT_USM_DT and GT_TimerFB_DT

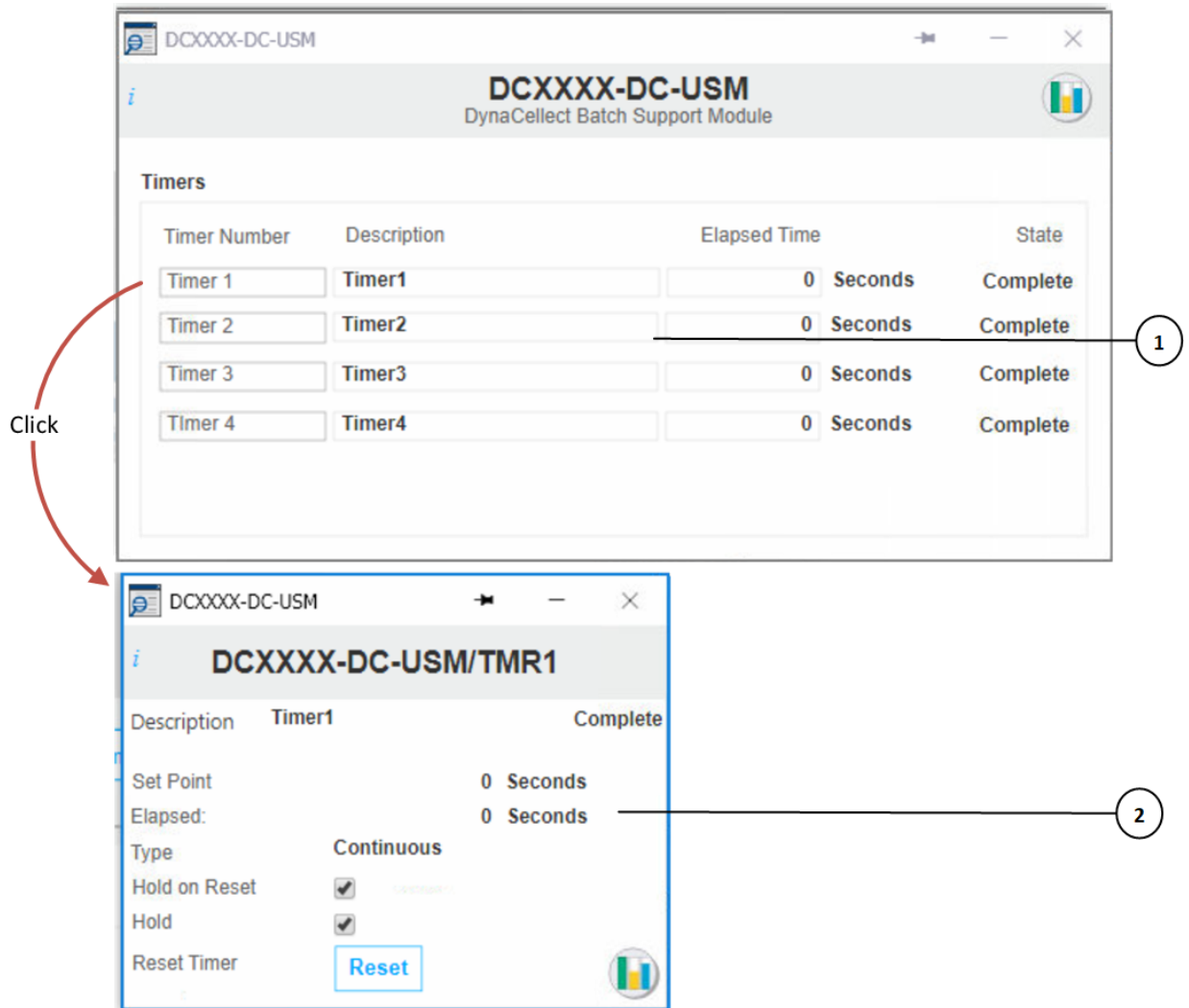


Figure 7 Timer

- ① Timer overview
- ② Timer details

- **Timer overview:** This displays the key timer information.
 - **Timer Number:** Shows the timer number. Clicking on this field will bring up the timer details detail GT_TimerFB_DT.
 - **Description:** Timer description
 - **Elapsed Time:** Shows how long the timer has been running.
 - **State:** Shows complete when the timer has reached the target.
- **Timer details:** Contextual display GT_TimerFB_DT. This displays detailed timer information.
 - **Description:** Shows the current description of the timer.
 - **Set Point:** Shows the target setpoint for the timer. Only valid when the timer type is set to Time Out.

- **Elapsed:** Shows how long the timer has been running.
- **Type:** Shows the timer type, Continuous or Time Out.
- **Hold on Reset:** If this is ticked, then when the timer is reset, the timer value is not cleared and stays at the last value.
- **Hold:** When ticked the timer is held.
- **Reset Timer:** This button stops the timer and reset internal timer values unless **Hold on Reset** is ticked.

GT_EM_Alarms_DT

	Priority		Enab	OOS	Shelve
Module	CRITICAL	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Failure	WARNING	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bypass	ADVISORY	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OPC UA Link	CRITICAL	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horn	PROMPT	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prompt	PROMPT	▼	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 8 Alarm details

Alarm details: Each alarm that exists in the module is shown on this display. Each alarm has the following fields.

- **Name:** The alarm name
- **Priority:** The current priority of the alarm
- **Enab:** A read only checkbox that, when checked, indicates that the alarm is enabled within the module.
- **OOS:** A read/write checkbox that, when checked, indicates the alarm is currently out of service.
- **Shelve:** A read/write checkbox that, when checked, indicates the alarm is currently shelved.

GT_EM_FM_DT

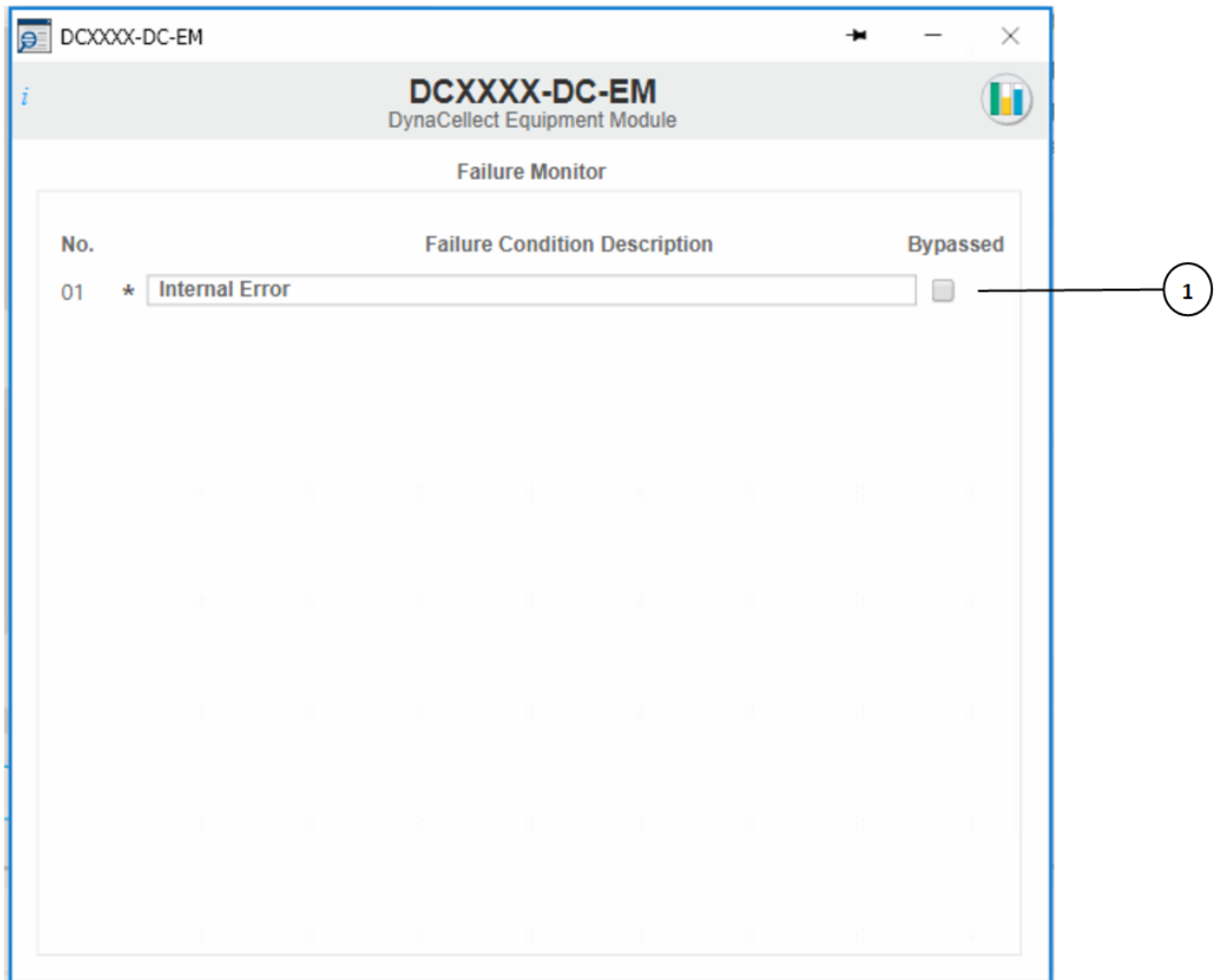


Figure 9 Failure monitor

Failure monitor: This display shows up to 16 individual failure conditions, and the associated failure description. If a failure is active, the text will turn red.

- **No.:** Individual failure monitor number. An asterisk (*) next to the number indicates that the failure monitor condition is enabled.
- **Failure Condition Description:** The description of the failure condition. This text color will turn red when the pre-out condition is true. This means if the condition is bypassed, it will still indicate that if the bypass is removed the condition will activate.
- **Bypassed:** This checkbox can be used to bypass a failure condition. Bypassing a failure condition will raise a bypass alarm to log the action.

GT_EM_Params_DT

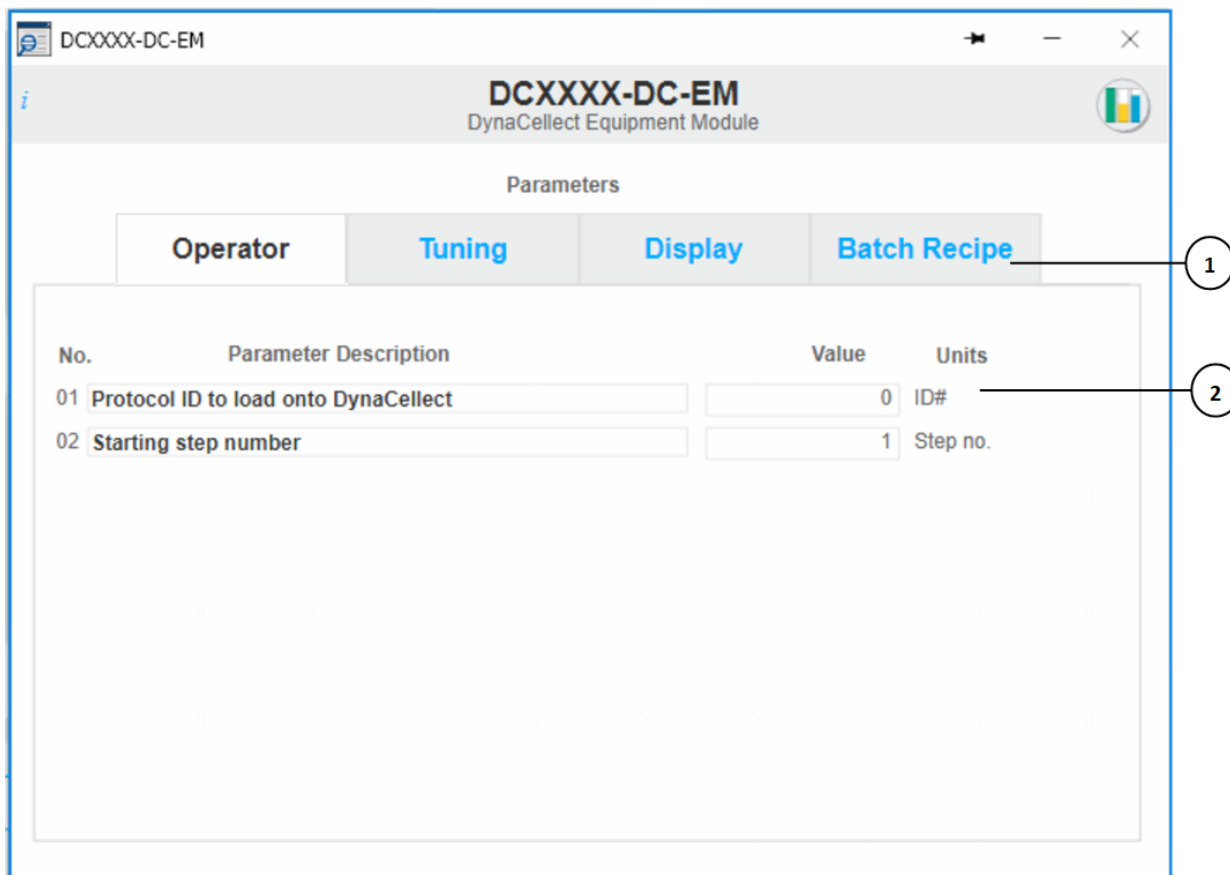


Figure 10 Parameters

① Parameter types

② Individual parameters

1. Parameter types: These buttons allow the selection of the parameters for a particular type. The following types are provided.
 - **Operator:** Clicking on this button will display parameters in the window that can be modified by an operator. To modify a parameter, click on the value and a popup will appear to allow data entry.
 - **Tuning:** Clicking on this button will display parameters in the window that can be modified only by a user with tuning rights.
 - **Display:** Clicking on this button will display parameters in the window that are internal parameters that are used as part of calculations.
 - **Batch Recipe:** Clicking on this button will display parameters in the window that are written by batch recipes and used when the batch recipe owns the module.
2. Individual parameters: If a parameter is present it will be shown as a single line with the following fields.
 - **No.:** Individual parameter number
 - **Parameter Description:** A description of the parameter.

- **Current Value:** Displays the current value of the parameter.
- **Units:** Displays the engineering units of the parameter.

GT_EM_Diag_DT

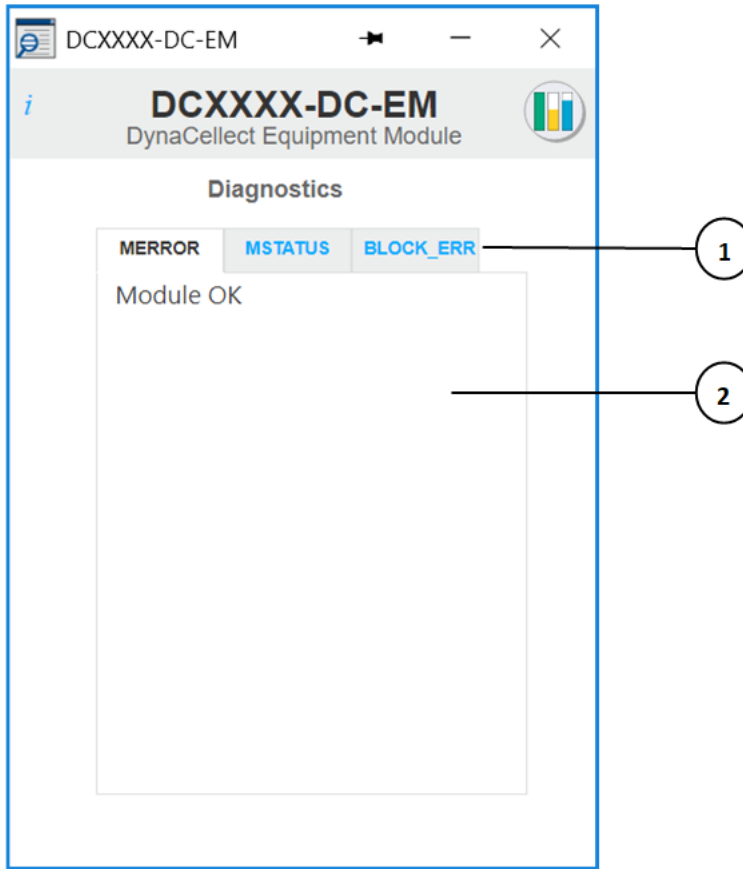


Figure 11 Diagnostics

- ① Tab strip to select the various diagnostic parameters.
- ② Diagnostic parameters are shown in this window.



Compatibility matrix

The following table lists the software compatibility of CTS™ Cellmation™ Software, DeltaV™ system and the DynaCollect™ instrument firmware. The versions listed below have been tested against the DeltaV™ and DynaCollect™ software versions.

CTS™ Cellmation™ software release	DeltaV™ system version	DynaCollect™ instrument version
Build 2.0.0.xx	DeltaV™ system 14.LTS DeltaV_1431_WS_28_CSS DeltaV_1431_EIOC_12_CSS	Main Firmware Version 1.0.2



Safety



WARNING! GENERAL SAFETY. Using this product in a manner not specified in the user documentation may result in personal injury or damage to the instrument or device. Ensure that anyone using this product has received instructions in general safety practices for laboratories and the safety information provided in this document.

- Before using an instrument or device, read and understand the safety information provided in the user documentation provided by the manufacturer of the instrument or device.
- Before handling chemicals, read and understand all applicable Safety Data Sheets (SDSs) and use appropriate personal protective equipment (gloves, gowns, eye protection, and so on). To obtain SDSs, visit [thermofisher.com/support](https://www.thermofisher.com/support).



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 - Safety Data Sheets (SDSs; also known as MSDSs)

Note: For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

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