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General and Hardware Configurator Instructions for Yokogawa WPC Recorders

These instructions cover the Hardware Configurator software and various general things for the Yokogawa GX20 recorders, focusing on their future use as ATR WPC recorders.

This document is intended to be followed step-by-step, with each action being done in the order that they appear in this document. However, not everything is intended to be read unless problems are encountered, so skimming is encouraged.

The following configurations are included as examples:

- DevQuad[n]: a copy of the config that has been working in the development station.
    - Also has a matching excel file and config file
- DevProcess: a copy of the config that has been working in the development station.
    - Also has a matching excel file and config file
- SimTotal: an attempt at a complete simulator total recorder
    - Has completely untested portions like digital outputs and analog inputs
- SimQuad[n]: an attempt at a complete simulator quadrant recorder. This is intended to work for all 4 quad recorders, by replacing [n] with the number 1, 2, 3, or 4.
    - Has completely untested portions like analog inputs and modbus command for the selection switch.

Also included, as an appendix, is an Overview of Configurations. This is a collection of quick reference sheets for the 14 recorder configurations. It was very useful in creating both the excel files and the custom displays. If any other recorders are made, especially if they require custom displays, it is highly recommended to create a similar reference sheet.

The general format of these instructions is:

1. Section name

References to relevant Yokogawa manual(s)

Directions, descriptions, and/or *tree path >> for navigation*.

NOTE: Warnings or very important information.

- Important setting name: description or helpful observations. (Not all settings will be included.)
- Important setting name: description or helpful observations

NOTE: Less important information, optional steps, or references to related helpful sections

Instructions for specific recorder configuration(s)

- Setting name: value/setpoint
- Different setting name: value/setpoint
- Different setting name: value/setpoint

Instructions for different specific recorder configuration(s)

Setting name	Different setting name	Different setting name
Value/setpoint	Value/setpoint	Value/setpoint
Different value/setpoint	Different value/setpoint	Different value/setpoint
Different value/setpoint	Different value/setpoint	Different value/setpoint

(highlights are reminders of unfinished sections. Ignore the highlights.)

Table of Contents

Here begins the instructions.

Before beginning this guide, install the modules and power cord into the recorder, plug it in, and update the version.

- See IM04L51B01-02EN “Paperless Recorder First Steps Guide” Section “Installing and Removing I/O Modules” for info about installing modules.

Initializing/Reconfiguring the Recorder

1. Auto-detect installed modules

Also described in IM04L51B01-01EN “Paperless Recorder User’s Manual” Section 1.29.4 “Reconfiguring the GX/GP”.

On the recorder, press *menu button >> Browse >> Initialize Calibration >> Reconfiguration >> Execute >> Reconfigure*
A confirmation screen will appear. If everything looks good, press *OK.*
A popup will appear saying “M853 System Reconfiguration in progress”. After the popup disappears, check the system and module information to ensure it is what you expect.

Note: To see the module information, press the “Module information” button at the bottom of the screen.

Hardware Configurator

2. Hardware and Features Tab

Create a new file in Hardware configurator.
NOTE: If the hardware and features information is not entered correctly while creating the file, it may not be possible to change it later, or changing it later may cause disruptive edits or deletions in your configuration file.
In the first tab, enter or confirm the following information:

- Version: This is the update version.
  - The recorder’s version can be checked on the recorder by pressing *menu button >> Browse >> System Information.*
  - The recorder’s version can be updated by _____(system settings? System information? Firmware upgrade manual?)_____.

- Model: GX20-1
- Options: select “use“ for the optional features included in the recorder.
- Module: These are the input and output modules installed in the back of the recorder. Check the model name and/or number of installed modules, and confirm the slot number they are installed in.
    - See IM04L51B01-02EN “Paperless Recorder First Steps Guide” Section “Installing and Removing I/O Modules” for info about slot numbers and installing modules.

GP20 Rear

2.1. Checking the Recorder’s Optional Features and Installed Modules

The recorder’s installed options and modules can be checked in several ways:

- Check the invoice from Yokogawa for details.
- Reconfigure the recorder (see section 1 “Auto-detect installed modules”), create a new file in Hardware configurator, connect to the recorder via an ethernet cable, and press “receive settings” found near the top of the hardware configurator screen. Then navigate to *System (tab) >> System Config (button)* to view the recorder’s self-reported features.
- Reconfigure the recorder (see section 1 “Auto-detect installed modules”), Then in the recorder, press *Menu button >> Browse >> System Information*. To see module information, press the “Module information” button at the bottom of the screen.

For the DevQuad[n] recorder, set the following:

- Version: R5.02
- Model: GX20-1
- Options:
    - Fail output, 1 point
    - Mathematical function (with report function)
    - Comm. Channel function
    - USB interface (Host 2 ports)
    - Log scale
    - EtherNet/IP communication
    - OPC-UA server
- Module:
    - GX90XA-10-U2 in slot 0 (analog input)
    - GX90WD-0806-01 in slot 1 (digital input/output)

For the DevProcess recorder, set the following:

- Version: R5.02
- Model: GX20-1
- Options:

▪ Fail output, 1 point ▪ Mathematical function (with report function) ▪ Comm. Channel function ▪ USB interface (Host 2 ports) ▪ Log scale ▪ EtherNet/IP communication ▪ OPC-UA server - Module: ▪ GX90YA-04-C1 in slot 0 (analog output)
For the SimQuad[n] recorders, set the following: - Version: R5.02 - Model: GX20-1 - Options: ▪ Fail output, 1 point ▪ Mathematical function (with report function) ▪ Comm. Channel function ▪ USB interface (Host 2 ports) ▪ Log scale ▪ EtherNet/IP communication ▪ OPC-UA server - Module: ▪ GX90XA-10-U2 in slot 0 (analog input)
For the SimTotal recorder, set the following: - Version: R5.02 - Model: GX20-1 - Options: ▪ Fail output, 1 point ▪ Mathematical function (with report function) ▪ Comm. Channel function ▪ USB interface (Host 2 ports) ▪ Log scale ▪ EtherNet/IP communication ▪ OPC-UA server - Module: ▪ GX90XA-10-U2 in slot 0 (analog input) ▪ GX90WD-0806-01 in slot 1 (digital input/output)

3. Logins, Passwords, and Profiles

In order to use some features of the recorder, at least one admin-level login profile with a known password must be created.

Can also look at IM04L51B01-01EN “User’s Manual” Section 1.24 “Configuring the Security Functions”. However it is highly recommended to use the hardware configurator as I have had issues trying to create passwords for profiles on the recorder itself.

3.1. Turn on security features

Navigate to *Security Settings >> Security Basic Settings*

- Touch Operation: Set to Login to be able to limit some touchscreen operations. If you want to limit operations like setpoint changes to certain users, set this to Login. For full access to the recorder without a login, set this to Off.

- Communication: Must be set to Login, or else you will not be able to send settings and custom displays to the recorder over an ethernet cable. Even if this is set to off, the recorder will still require a login)

Note: If you turn on a security feature without also creating a login profile, it is possible to lock yourself out of the recorder. If you have been locked out, you can restart the recorder, but you may lose information stored in the recorder.

For the development station recorders (DevSimProcess and DevSimQuad1) and simulator recorders (SimTotal and SimQuad[n]), set to: - Touch Operation: Off - Communication: Login

3.2. Create a login profile

Navigate to *Security Settings >> User Settings*

- User Number: A unique identifier for each profile. It's best to start with 1
- User Level: You will need at least one Admin-level profile for some features. The first profile (User Number 1) may be required to be Admin-level.
- Username: as desired.
- Password: initialize by clicking the "change" button, then typing the desired password into the pop-up screen. There is no visible difference once the password has been initialized, so ensure that this step is completed.

Each row in Hardware Configurator is a different profile (with a different User Number). In the recorder's settings, each different User Number is a different profile.

NOTE: The User Settings tree branch will not appear unless a security feature is on. See section 3.1"Turn on security features" for more info.

For the development station recorders (DevQuad[n] and DevProcess), set: - User Number: 1 - User Level: Admin - Username: User01 - Password: (choose a password)
The simulator recorders may or may not require login profiles, aside from the initial setup.
The ATR recorders (ATRQuad[n], ATRTotal, and ATRProcess) will require more advanced logins and permissions, which are not described here, and will include the *Security settings >> User property* tree branch.

3.3. Set permissions for login profiles

Navigate to *Security settings >> User property*

(I haven't looked into this much yet. The development station recorders don't change any of these settings from default. The ATR recorders will need to assign different permissions to different users.)

4. Communication Settings

Note: You will likely need to also set up communication channels along with the communication settings. See section 5 “Communication Channels” for instructions.

4.1. Setting the recorder’s IP address

Navigate to *Communication (Ethernet) Settings >> Ethernet Basic Settings* and set the following:

- Obtain IP address automatically: _____
- IP Address: The desired IP address of the recorder that this configuration file will be uploaded to.
    - For development station IP addresses, see DWG-602048
- Subnet mask: (set as desired. It is often 255.255.255.0)

For the DevQuad[n], set to: - Obtain IP address automatically: Off - IP address: #### - Subnet mask: 255.255.255.0
For the DevProcess recorder, set to: - Obtain IP Address automatically: Off - IP address: **####** - Subnet mask: 255.255.255.0
For the SimQuad[n] recorder, set to: - Obtain IP address automatically: Off - IP address: **####** - Subnet mask: 255.255.255.0
For the SimTotal recorder, set to: (not required, only used to set it up the first time) - Obtain IP address automatically: Off - IP address: **####** - Subnet mask: 255.255.255.0

4.2. Naming servers

Navigate to *Communication (Ethernet) Settings >> Modbus Server Settings* and set the following:

- Server Name: Enter the IP address of the device you wish to communicate with.
    - For multiple devices, enter each IP address next to a different server number. Remember the server number next to the IP address of each device.

For the DevQuad[n] recorder, set: - Server Number:1, Server Name: **####** (this is the IP address for the DevProcess recorder)
For the DevProcess recorder, set: - Server Number:1, Server Name: **####** (this is the IP address for the Moore NCS AIM) - Server Number: 2, Server Name: **####** (this is the IP address for the Moore AOM to the RDAS simulator)
For the SimQuad[n] recorders, set: - Server Number: 1, Server Name: **####** (SimTotal recorder’s IP address)
The SimTotal recorder does not require any named servers

4.3. Turning on Modbus Client Function

Navigate to *Communication (Ethernet) Settings >> Modbus Client Basic Settings* and set the following:

- Modbus Client Function: Turn on to allow the recorder to be a modbus client. Read commands require this setting to be on.
- Interval: This determines how often the information from servers is updated.

NOTE: For the SimQuad[n] recorders, the selection switch information may lag by up to 500ms, as its refresh rate is determined by the Interval setting.

For development station recorders (DevQuad[n] and DevProcess) and the SimQuad[n] recorders, set: - Modbus Client Function: On - Interval: 500ms
The SimTotal recorder does not require the Modbus Client function.

4.4. Turning on Modbus Server Function

Navigate to *Communication (Ethernet) Settings >> Server List* and set the following:

- MODBUS On/Off: This allows the recorder to function as a modbus server. This setting must be on if other recorders have "Read" commands to this recorder.

4.5. Creating Modbus Commands

Navigate to *Communication (Ethernet) Settings >> Modbus Client Command Settings >> 1-20* and set the following:

- Command Number: A unique number for each command. I recommend starting with 1 and working upwards.
- Type: _____
- Server: Enter the server number you assigned earlier in section 3.2 *Modbus Server Settings* for the desired device.
- Data type: _____
- Register: If type is Read, this is the first of the registers in the device being read from where the desired information is. If Write, this is the lowest of the registers in the device being written to where the information is desired to go.
    - For read/write register numbers in a Yokogawa GX20, see the User's Manual section 4.5.3 "Register Assignments". Ensure that the register number is for the desired datatype, there are multiple registers for each channel in a Yokogawa.
    - For register numbers in the Moore NCS, see the file NCSMan.pdf found on the development station PC.
        - The AIM information registers start at ####, and are data type FLOAT_L.
        - The internal temperature registers start at #### in the development station, and although the manual says they are data type 32-bit INT they seem to actually be data type FLOAT_L.
- Channel type: The type of channel in this recorder (the one the configuration is being created for) that the data will be read into or written from.

- First-CH and Last-CH: These are the channels in the recorder that the data will be read into or written from. The number of channels in this range will be the number of registers accessed in the other device, starting at the register you specified and going up by one (or x2 and up by 2 if you chose a 32-bit data type).

For the DevQuad[n] recorder, set:

- Command Number: 1 (read the Quad 1 info from the DevProcess recorder)
  - Type: Read
  - Server: 1
  - Data type: FLOAT_L
  - Register: 305219
  - Channel type: Communication Channel
  - First-CH: C001
  - Last-CH: C004

For the DevProcess recorder, set:

- Command Number: 1 (reading the simulated flow and water temp info from the NCS Moore)
  - Type: Read
  - Server: 1
  - Data type: FLOAT_L
  - Register: **####**
  - Channel type: Communication Channel
  - First-CH: C001
  - Last-CH: C013
- Command Number: 2 (reading the internal temp info from the Moore NCS AIM)
  - Type: Read
  - Server: 1
  - Data type: FLOAT_L
  - Register: **####**
  - Channel type: Communication Channel
  - First-CH: C017
  - Last-CH: C017
- Command Number: 3 (writing the calculated values to the Moore AOM)
  - Type: Write
  - Server: 2
  - Data type: FLOAT_L
  - Register: **####**
    - NOTE: This was originally **####**, but command 4 handles the first channel in the dev station.
  - Channel type: Math channel
  - First-CH: A010
    - NOTE: This was originally A009, but command 4 handles the first channel in the dev station.
  - Last-CH: A029
- Command Number: 4 (writing the inlet temp to More AOM. The AOM's first channel has been moved so it needs a separate command from the others)
  - Type: Write
  - Server: 2
  - Data type: FLOAT_L
  - Register: **####**
  - Channel type: Math channel
  - First-CH: A009
  - Last-CH: A009

NOTE: Commands 3 and 4 are split because the development station's Moore AOM channels are not sequential. This may not be the case, and more or fewer commands may be necessary for the actual ATR's process recorders.

For the SimQuad[n] recorders, set:

- Command Number: 1 (read channel selection switch information from the SimTotal recorder)
- Type: Read
- Server: 1
- Data type: (UNKNONWN – probably INT16)
- Register: (UNKNOWN – probably 302001)
- Channel type: Communication channel
- First-CH: C001

- Last-CH: C001

The SimTotal recorder does not require any Modbus commands.

5. Communication Channels

5.1. Creating Communication Channels

Navigate to *Communication Channel Settings >> C001-C020 >> On/Off, Span* and set the following for each desired channel:

- On/Off: If this is off, the communication channel will not work.
- Decimal places: How many decimal places are stored and displayed. Depending on the data type of the associated communication command, this will either determine what the number is rounded to, or may determine which digit the decimal point is placed between. NOTE - Changing this will automatically change the decimal places in your span too, and you will have to re-type your span values each time you change this.
- Span: This is used to set the display elements' upper and lower bounds. The upper span is the upper limit of the trendline/bar graph, and the lower span is the lower limit of the trendline or bar graph.
- Units: This is used for display elements like trendlines and digital displays, as well as the overview screen.

For the DevQuad[n] recorder, set the following communication channels according to the following table:

Table ____: communication channels for the DevQuad[n] recorder

Channel	On/Off	Decimal Place	Span Lower (not required)	Span Upper (not required)	Unit	Value at Power On	Preset Value	Watchdog timer On/Off	Signal tagname and description(for reference only)
C001	On	0	0	16000	GPM	Preset value	0	On	FRS-1-1 Quad 1 flow rate
C002	On	1	0.0	60.0	degF	Preset value	0	On	DTRS-1-1 Quad 1 change in temp
C003	On	1	100.0	200.0	degF	Preset value	0	On	TRS-1-11 Quad 1 outlet temp
C004	On	1	0.0	100.0	MW	Preset value	0	On	WRS-1-1 Quad 1 power

For the DevProcess recorder, the first communication channel is given as an example. Set the other channels the same way, except for the units shown in the following table:

- CH:C001 (this is Quad 1 differential pressure)
  - On/Off: On
  - Decimal place: 4
  - Unit: inH2O
  - Value at power on: Preset value
  - Preset value: 0
  - Watchdog timer: On

Table _____. Communication channel settings for the DevSimProcess recorder

CH:	Unit: (not required)	Signal tagname and description (for reference)	CH:	Unit: (not required)	Signal tagname and description (for reference)
C001	inH2O	FTY-1-1, Quad 1 DP	C008	degF	TT-1-4B-1, Quad 4 inlet temp
C002	inH2O	FTY-1-2, Quad 2 DP	C009	degF	TRS-1-11, quad 1 outlet temp

C003	inH2O	FTY-1-3, Quad 3 DP	C010	degF	TRS-1-12, quad 2 outlet temp
C004	inH2O	FTY-1-4, Quad 4 DP	C011	degF	TRS-1-13, quad 3 outlet temp
C005	degF	TT-1-1B-1, Quad 1 inlet temp	C012	degF	TRS-1-14, quad 4 outlet temp
C006	degF	TT-1-2B-1, Quad 2 inlet temp	C013	degF	TRS-1-17, combined outlet temp
C007	degF	TT-1-3B-1, Quad 3 inlet temp	C017	degF	Cabinet (Moore) temp

For the SimQuad[n] recorders, set:

- CH: C001 (channel selection switch status)
  - On/Off: On

The SimTotal recorder does not require any communication channels.

5.2. Setting Display Settings for Communication Channels

Navigate to *Communication Channel Settings >> C001-C020 >> Display Settings* and set the following for each desired channel:

- Tag No. (or Tag Number): This is the display name of this channel, used for default display elements like trendlines and digital displays. This is useful for keeping track of the channels, but not necessary if you do not use default display elements.
- Color: Set the color of this channel for display elements like trendlines and digital displays. Click on the colored box, which creates a popup screen where you can specify an RGB value or choose from preset colors. This color is applied to both default and custom display elements.

For the DevQuad[n] recorder, set the following:

CH	Tag No. (not required)	Color
C001	FRS-1-[n]	#008000
C002	DTRS-1-[n]	#0000ff
C003	TRS-1-1[n]	#0000ff
C004	WRS-1-[n]	#ea0000

The DevProcess recorder and the simulator recorders (SimTotal and SimQuad[n]) do not require any changes to the communication channel display settings. If desired, the “Tag. No” field can be filled with signal tagnames.

5.3. Settings Alarms for Communication Channels

Navigate to Communication Channel Settings >> C001-C020 >> Alarm.

The SimQuad[n] recorders use the communication channel’s alarms to switch the screen according to the channel selection switch.

The Communication channel alarms are similar to other channel’s alarms. For more detailed information, see other sections’ Alarm instructions.

The development station (DevQuad[n] and DevProcess) and SimTotal recorders do not require any changes to the communication channel alarm settings.

For the SimQuad[n] recorders, set the following:

- CH: C001

- On/Off: on
- Type: High limit
- Value: 1
- Output type: Internal Switch
- Output No: 1

5.4. Troubleshooting for Communication Channels and Communication Commands

Communication channels on the recorder display unexpected values.

5.4.1. Recorder has TIMEDOUT or WAITING status for modbus commands.

This is not always due to incorrect settings. If changes have been recently made to a modbus command or Communication setting, it may take a moment for it to be implemented. Once both recorders start recording (the START/STOP button is glowing green), wait at least a full minute to see if communication will resume.

5.4.2. Communication channels display unexpected values that do not match expected/transmitted values, or say "+Over" or "-Over".

- Check that the data type expected is the same as the type transmitted. See section 4.5 "Creating Modbus Commands", and/or the manual of the other device.
- If the data type is a 32-bit, check the register numbers of the device you're reading from. If the first register number is off by an odd number, it may be trying to interpret two unrelated registers as one 32-bit number.

5.4.3. Communication channels are off by powers of 10. (Example: should be 12.3 but is displaying as 1.23)

- Navigate to *Communication Channel Settings >> C001-C020 >> On/Off, Span* and check the "decimal places" setting. For certain data types, this setting will determine where the decimal point is placed.

6. Math Channels

6.1. Creating Math Channels

Navigate to *Math Channel Settings >> A001-A020 >> Calculation Expression* and set the following:

- CH: _____
- On/Off: _____
- Calculation Expression: This is the desired expression/computation for this math channel. For details on how to write calculation expressions, see IM04L51B01-01EM section 1.8 "Configuring Math Channels". You may need to navigate away from this screen in Hardware Configurator to complete this step.
- Decimal place: Determines how many decimal places this channel is calculated to.

- Span: For display purposes, sets the limits of the trendline scale for this channel. For channels that have associated analog outputs, this determines the numerical data values that correspond to the analog output's voltage or current span.
- Unit: For display purposes, sets the units of this channel.

Note: Math channels are active only when the recorder is actively recording. After uploading settings to the recorder, press the square "start/stop" button on the front of the recorder under the front panel to start or stop the recording.

Note: the "active channel's…" entries in the quadrant and total recorders are for the purpose of alarms and setbacks. In order to ensure that alarms and setbacks come from the active channel, there is a math channel that selects the value of the current active channel.

For the DevQuad[n] recorder, set the math channels according to the following table:

CH	On/Off	Calculation Expression	Decimal place	Span Lower	Span Upper	Unit	Expression interpretation (for reference)	Signal tagname (for reference)
A001	On	[0101?A009:C001]	0	0	16000	GPM	Active channel's quadrant flow	FRS-1-[n,A,B,C,D]
A002	On	[0101?A010:C002]	1	0	60	degF	Active channel's quadrant differential temperature	DTRS-1-[n,A,B,C,D]
A003	On	[0101?A011:C003]	1	100	200	degF	Active channel's quadrant outlet temperature	TRS-1-1[n,A,B,C,D]
A004	On	[0101?A012:C004]	1	0	100	MW	Active channel's quadrant power	WRS-1-[n,A,B,C,D]
A005	On	ABS(C001-A009)	0	n/a	n/a	GPM	Interchannel variance in quadrant flow	dFRS
A006	On	ABS(C002-A010)	1	n/a	n/a	degF	Interchannel variance in quadrant differential temperature	dDTRS
A007	On	ABS(C002-A011)	1	n/a	n/a	degF	Interchannel variance in quadrant outlet temperature	dTS
A008	On	ABS(C004-A012)	1	n/a	n/a	MW	Interchannel variance in quadrant power	dWRS
A009	On	C001+C001*K001	0	0	16000	GPM	Fake WPC2 data	FRS-1-[A,B,C,D]
A010	On	C002+C002*K001	1	0	60	degF	Fake WPC2 data	DTRS-1-[A,B,C,D]
A011	On	C003+C003*K001	1	100	200	degF	Fake WPC2 data	TRS-1-[A,B,C,D]
A012	On	C004+C004*K001	1	0	100	MW	Fake WPC2 data	WRS-1-[A,B,C,D]

For the DevProcess recorder, set the math channels according to the following table (based on SDD-329 Table 3):
(NOTE: A029 is in its own table because it is the only math channel that requires a span to be set. This is because the math channel's span determines the associated analog output's numerical span.)

CH	On/Off	Calculation Expression	Decimal place	Unit	Expression interpretation (for reference)	Signal tagname

						(for reference)
A001	On	####	4	inH2O	If Quad1 ΔP is out of range, set to 0. Else set to Quad1 ΔP	FTY-1-1
A002	On	####	4	inH2O	If Quad2 ΔP is out of range, set to 0. Else set to Quad2 ΔP	FTY-1-2
A003	On	####	4	inH2O	If Quad3 ΔP is out of range, set to 0. Else set to Quad3 ΔP	FTY-1-3
A004	On	####	4	inH2O	If Quad4 ΔP is out of range, set to 0. Else set to Quad4 ΔP	FTY-1-4
A005	On	####	4	degF	If Quad1 inlet temp is out of range, set to 0. Else set to Quad1 inlet temp.	TT-1-1B-1
A006	On	####	4	degF	If Quad2 inlet temp is out of range, set to 0. Else set to Quad2 inlet temp.	TT-1-2B-1
A007	On	####	4	degF	If Quad3 inlet temp is out of range, set to 0. Else set to Quad3 inlet temp.	TT-1-3B-1
A008	On	####	4	degF	If Quad4 inlet temp is out of range, set to 0. Else set to Quad4 inlet temp.	TT-1-4B-1
A009	On	####	4	degF	Calculate average inlet temperature	TRS-1-18
A010	On	####	4	GPM	Calculate Quad1 flow	FRS-1-1
A011	On	####	4	degF	If Quad1 outlet temp is out of range, set to 0. Else calculate Quad1 ΔT	DTRS-1-1
A012	On	####	4	degF	Quad1 outlet temp	TRS-1-11
A013	On	####	4	MW	Calculate Quad1 power	WRS-1-1
A014	On	####	4	GPM	Calculate Quad2 flow	FRS-1-2
A015	On	####	4	degF	If Quad2 outlet temp is out of range, set to 0. Else calculate Quad2 ΔT	DTRS-1-2
A016	On	####	4	degF	Quad2 outlet temp	TRS-1-12
A017	On	####	4	MW	Calculate Quad2 power	WRS-1-2
A018	On	####	4	GPM	Calculate Quad3 flow	FRS-1-3
A019	On	####	4	degF	If Quad3 outlet temp is out of range, set to 0. Else calculate Quad3 ΔT	DTRS-1-3
A020	On	####	4	degF	Quad3 outlet temp	TRS-1-13
A021	On	####	4	MW	Calculate Quad3 power	WRS-1-3
A022	On	####	4	GPM	Calculate Quad4 flow	FRS-1-4
A023	On	####	4	degF	If Quad4 outlet temp is out of range, set to 0. Else calculate Quad4 ΔT	DTRS-1-4
A024	On	####	4	degF	Quad4 outlet temp	TRS-1-14
A025	On	####	4	MW	Calculate Quad4 power	WRS-1-4
A026	On	####	3	GPM	Calculate total flow	FRS-1-5A
A027	On	####	4	degF	If total outlet temp is out of range, set to 0. Else calculate total ΔT. If total ΔT is out of range, set to 0.	DTRS-1-5
A028	On	####	4	degF	Total outlet temp	TRS-1-17
A029	On	####	4	MW	Calculate Total power	WRS-1-5A

CH	On/Off	Calculation Expression	Decimal place	Span Lower	Span Upper	Unit	Expression interpretation (for reference)	Signal tagname (for reference)
A029	On	####	4	0.000	350.000	MW	Calculate Total power	WRS-1-5A

For the SimQuad[n] recorders, set the math channels according to the following table:

CH	On/Off	Calculation Expression	Decimal place	Span Lower	Span Upper	Unit	Expression interpretation (for reference)	Signal tagname (for reference)
A001	On	[C001?A009:0001]	0	n/a	n/a	GPM	Active channel flow	
A002	On	[C001?A010:0002]	1	n/a	n/a	degF	Active channel delta temp	
A003	On	[C001?A011:0003]	1	n/a	n/a	degF	Active channel outlet temp	
A004	On	[C001?A012:0004]	1	n/a	n/a	MW	Active channel power	
A005	On	ABS(0001-A009)	0	n/a	n/a	GPM		dFRS
A006	On	ABS(0002-A010)	1	n/a	n/a	degF		dDTRS
A007	On	ABS(0003-A011)	1	n/a	n/a	degF		dTRS
A008	On	ABS(0004-A012)	1	n/a	n/a	MW		dWRS
A009	On	0001+0001*K001	0	0	16000	GPM		FRS-1-[A,B,C,D]
A010	On	0002+0002*K001	1	0	60	degF		DTRS-1-[A,B,C,D]
A011	On	0003+0003*K001	1	100	200	degF		TRS-1-[A,B,C,D]
A012	On	0004+0004*K001	1	0	100	MW		WRS-1-[A,B,C,D]

For the SimTotal recorder, set the math channels according to the following table:

CH	On/Off	Calculation Expression	Decimal place	Span Lower	Span Upper	Unit	Expression interpretation (for reference)	Signal tagname (for reference)
A001	On	[C001?A011:0001]	0	n/a	n/a	GPM	Active channel flow	
A002	On	[C001?A012:0002]	1	n/a	n/a	degF	Active channel diff temp	
A003	On	[C001?A013:0003]	1	n/a	n/a	degF	Active channel out temp	
A004	On	[C001?A014:0004]	1	n/a	n/a	MW	Active channe; power	
A005	On	[C001?0006:0005]	1	n/a	n/a	degF	Active channel avg inlet temp	
A006	On	ABS(0001-A011)	0	n/a	n/a	GPM		dFRS
A007	On	ABS(0002-A012)	1	n/a	n/a	degF		dDTRS
A008	On	ABS(0003-A013)	1	n/a	n/a	degF		dTRS
A009	On	ABS(0004-A014)	1	n/a	n/a	MW		dWRS
A010	On	ABS(0005-0006)	1	n/a	n/a	degF		dTRS-1-18
A011	On	0001+0001*K001	0	0	64000	GPM		FRS-1-5
A012	On	0002+0002*K001	1	0	60	degF		DTRS-1-E
A013	On	0003+0003*K001	1	100	200	degF		TRS-1-E
A014	On	0004+0004*K001	1	1	100	MW		WRS-1-5

6.2. Setting Constants

Navigate to *Math channel settings >> Constant*

- Constant Number: This is a unique number for each constant.
- Constant: This is the value of the constant. The default value is 0.

For the DevProcess recorder, set the following constants:

Constant Number	Constant	Use/Reasoning (for reference)
K001	####	

…	…	
K###	####	

For the DevQuad[n] and simulator recorders (SimTotal and SimQuad[n]), set the following constant:

Constant Number	Constant	Use/Reasoning (for reference)
K001	0.01	Used to create fake WPC2 info

6.3. Creating Alarms for Math Channels

Navigate to *Math channel settings >> A001-A020 >> Alarm*

Each math channel has three alarms that can be set. Each alarm has the following options. To see the second and third alarm options, scroll to the right by dragging the horizontal scroll bar.

- CH:
- On/Off:
- Type:
- Value: The numerical value at which the alarm condition begins.
- Hysteresis:
- Output type: To have the alarm open or close a relay contact, select “Relay”
- Output No.: To have the alarm open or close a relay contact, select the channel number for the digital output channel for the desired relay.

For DevQuad[n], set the math channel alarms according to the following table:

CH	On/Off	Type	Value	Output type	Reason
A001 (Alarm level 1)	On	Low limit	Check __ for setpoint. Temporary is 1,000	Off	Low flow alarm
A0001 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 10,000	Off	High flow alarm
A002	Off				No alarms based off of quadrant deltaT
A003	On	High limit	Check __ for setpoint. Temp is 180	Off	High outlet temp alarm
A004 (Alarm level 1)	On	High limit	Check _ for setpoint. Temp is 60	Off	High quad power alarm
A004 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 80	Off	High high quad power alarm and setback
A005	On	High limit	Check _ for setpoint. Temp is 1000	Off	Flow rate interchannel comparison alarm
A006	On	High limit	Check _ for setpoint. Temp is 10.0	Off	DeltaT interchannel comparison alarm
A007	On	High limit	Check __ for setpoint. Temp is 10.0	Off	Outlet temp interchannel comparison alarm
A008	On	High limit	Check __ for setpoint. Temp is 5.0	Off	Quad power interchannel comparison alarm
A009 through A012	Off				No alarms for WPC2 fake data

The DevSimProcess recorder does not require any alarms for its math channels.

For the SimQuad[n] recorders, set the math channel alarms according to the following table:

CH	On/Off	Type	Value	Output type	Reason
A001 (Alarm level 1)	On	Low limit	Check __ for setpoint. Temporary is 1,000	Off	Low flow alarm

A0001 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 10,000	Off	High flow alarm
A002	Off			Off	No alarms based off of deltaT
A003	On	High limit	Check __ for setpoint. Temp is 180	Off	High outlet temp alarm
A004 (Alarm level 1)	On	High limit	Check _ for setpoint. Temp is 60	Off	High quad power alarm
A004 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 80	Off	High high quad power alarm and setback
A005	On	High limit	Check _ for setpoint. Temp is 1000	Off	Flow rate interchannel comparison alarm
A006	On	High limit	Check _ for setpoint. Temp is 10.0	Off	DeltaT interchannel comparison alarm
A007	On	High limit	Check __ for setpoint. Temp is 10.0	Off	Outlet temp interchannel comparison alarm
A008	on	High limit	Check __ for setpoint. Temp is 5.0	Off	Power interchannel comparison alarm

For SimTotal, set the math channel alarms according to the following table:

CH	On/Off	Type	Value	Output type	Reason
A001 (Alarm level 1)	On	Low limit	Check __ for setpoint. Temporary is 4,000	Off	Low flow alarm
A0001 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 60000	Off	High flow alarm
A002	On	High limit	Check __ for setpoint. Temp is 50	Off	High deltaT alarm
A003	Off			Off	No alarms based off of combined outlet temp
A004	On	High limit	Check __ for setpoint. Temp is 300	Off	High total power alarm
A005 (Alarm level 1)	On	High limit	Check _ for setpoint. Temp is 160	Off	High average inlet temp alarm
A005 (Alarm level 2)	On	High limit	Check __ for setpoint. Temp is 180	Off	High high average inlet temp alarm and setback
A006	On	High limit	Check _ for setpoint. Temp is 1000	Off	Flow rate interchannel comparison alarm
A007	On	High limit	Check _ for setpoint. Temp is 10.0	Off	deltaT interchannel comparison alarm
A008	On	High limit	Check __ for setpoint. Temp is 10.0	Off	Combined outlet temp interchannel comparison alarm
A009	On	High limit	Check __ for setpoint. Temp is 5.0	Off	Total power interchannel comparison alarm
A010	On	High limit	Check __ for setpoint. Temp is 10.0	Off	Average inlet temp interchannel comparison alarm

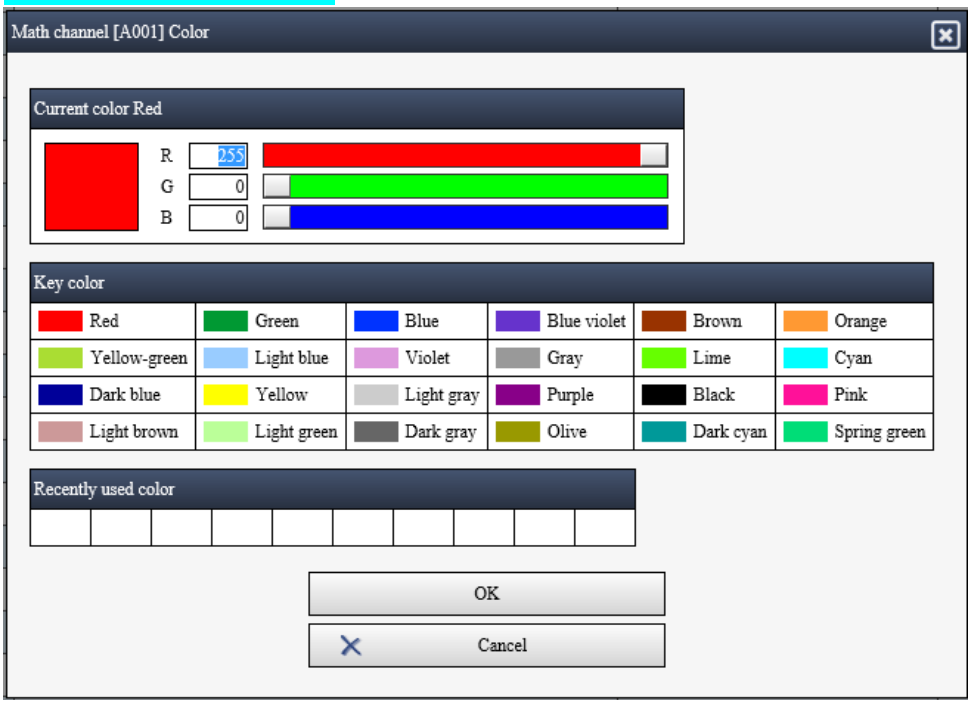
6.4. Setting Display Settings for Math Channels

Navigate to Math channel settings >> A001-A020 >> Display settings

- CH:
- Characters:
  - Tag No.: This is the display name of this channel, used for default display elements like trendlines and digital displays. This is useful for keeping track of the channels, but not necessary if you do not use default display elements.
  - Color: Set the color of this channel for display elements like trendlines and digital displays. Click on the colored box, which creates a popup screen where you can specify an RGB value

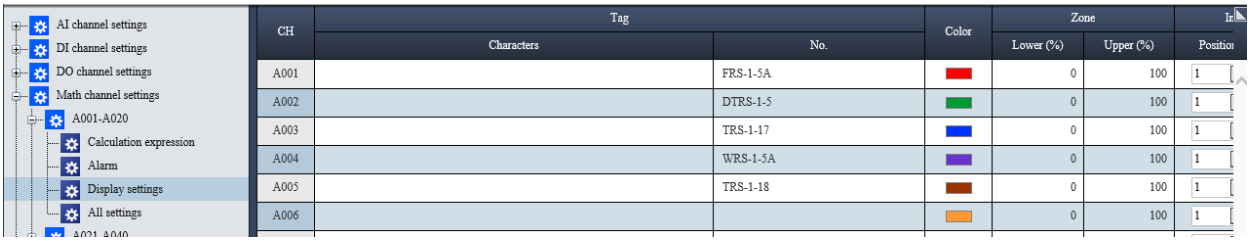
or choose from preset colors. This color is applied to both default and custom display elements.

- Indicate on Scale, Division: changes the major tickmarks on the scale, along with the displayed values. If the scale values overlap or are otherwise funky, try changing the division number until it looks better.



If you are going to use the default trendlines or digital displays, set the Tag No. to the signal name.

NOTE: Display spans (trendline scale bounds) are set under “Range”, not under “Display settings”.



For the DevQuad[n] recorder, set the following:

CH	Tag No. (not required)	Color
A001		#ff0000
A002		#009933
A003		#0033ff
A004		#6633cc
A005	dFRS	#008000
A006	dDTRS	#0000ff
A007	dTRS	#0000ff
A008	dWRS	#ea0000
A009	FRS-1-A	#008000
A010	DTRS-1-A	#0000ff

A011	TRS-1-A	#0000ff
A012	WRS-1-A	#ea0000

The DevProcess recorder does not require any display settings for its math channels. If desired for clarity, the "Tag No." field may be filled out with signal tagnames.

For the SimQuad[n] recorders, set the following:

CH	Tag No. (not required)	Color
A001		#008000
A002		#0000ff
A003		#0000ff
A004		#ea0000
A005	dFRS	#008000
A006	dDTRS	#0000ff
A007	dTRS	#0000ff
A008	dWRS	#ea0000
A009	FRS-1-A	#008000
A010	DTRS-1-A	#0000ff
A011	TRS-1-A	#0000ff
A012	WRS-1-A	#ea0000

For the SimTotal recorder, set the following:

CH	Tag No. (not required)	Color
A001		n/a
A002		n/a
A003		n/a
A004		n/a
A005		n/a
A006	dFRS	#008000
A007	dDTRS	#0000ff
A008	dTRS	#0000ff
A009	dWRS	#ea0000
A010	dTRS-1-18	#0000ff
A011	FRS-1-5	#008000
A012	DTRS-1-E	#0000ff
A013	TRS-1-E	#0000ff
A014	WRS-1-5	#ea0000

6.5. Troubleshooting for Math Channels

6.5.1. Calculation Expressions turn red or disappear when navigating away

The expression is not valid.

- Check function spelling and availability. You can see current available functions by clicking on the box to the right of the field, which will bring up a popup menu. Navigate to your desired function and click on it to insert.
- Check channel numbers. Channel numbers will change according to module configuration. You can see current available channels by clicking on the box to the right of the field, which will bring up a popup menu. Navigate to your desired channel(s) and click on them to insert.
- Check for numerical values. Typing numbers directly into the calculation expression will not work. You must create a constant and then insert that constant's name into your calculation expression. (See section 6.2 "Setting Constants" for more information.)

6.5.2. Math channels say “+Over” while recording is on.

The calculated value is greater than the channel can hold.

- Calculate to fewer decimal places, allowing a higher number to be stored. Navigate to Math channel settings >> Calculation expression and change the “Decimal place” setting to a lower number. The new upper limit of calculation can be checked by changing the “Span Upper” setting to your expected maximum value. If the “Span Upper” setting autocorrects to a lower number, then reduce the decimal places even further until the “Span Upper” setting accepts the maximum value.

7. Analog Input Channels

7.1. Creating Analog Input Channels

Navigate to *AI channel settings >> 0001-0010 >> Range*

- CH: A unique channel number for each analog input channel.
- Type: This is how to interpret this analog input, whether the data is conveyed through the voltage or current. To not use this channel, set to “Skip”
- Range: _____ Choose the smallest range that encompasses the expected voltage or current values._____
- Span Lower: The lowest voltage/current expected
- Span Upper: The highest voltage/current expected
- Calculation: The type of conversion from voltage/current to a numerical data value.
- Reference Channel: Used for some types of calculations. If the calculation type is set to “Linear scaling”, then the reference channel setting is not used.

  ---------- Scale Section ----------
- Decimal place: For display and math purposes, the decimal place to which the numerical value is calculated and displayed.
- Lower: The numerical value that corresponds to the voltage/current of the span lower setting.
- Upper: The numerical value that corresponds to the voltage/current of the span upper setting.
- Unit: For display purposes, the unit used in default display elements.

The development station recorders (DevQuad[n] and DevProcess) do not require analog inputs. If an analog input module is installed then set the following:

- Type: Skip (for all AI channels)

For the SimQuad[n] recorders, create the following AI channels:
NOTE: This has not been tested yet, so this is just my best guess as to what will work. To test it, we will need either an oscilloscope with wires that can be installed into the AI module, or figure out how to use the development station to generate a known 0-10V signal.

CH	Type	Range	Span Lower	Span Upper	Calculation	Decimal place	Scale Lower	Scale Upper	Unit (not required)
0001	Volt	20V	0	10	Linear scaling	0	0	16000	GPM
0002	Volt	20V	0	10	Linear scaling	1	0	60	degF
0003	Volt	20V	0	10	Linear scaling	1	100	200	degF
0004	Volt	20V	0	10	Linear scaling	1	0	100	MW

For the SimTotal recorder, create the following AI channels:

NOTE: This has not been tested yet, so this is just my best guess as to what will work. To test it, we will need either an oscilloscope with wires that can be installed into the AI module, or figure out how to use the development station to generate a known 0-10V signal.

CH	Type	Range	Span Lower	Span Upper	Calculation	Decimal place	Scale Lower (unknown. This is a best guess)	Scale Upper (unknown. This is a best guess)	Unit (not required)	Purpose and signal tagname (for reference)
0001	Volt	20V	0	10	Linear scaling	0	0	64000	GPM	Total flow FRS-1-5A
0002	Volt	20V	0	10	Linear scaling	1	0	60	degF	Total differential temp. DTRS-1-5
0003	Volt	20V	0	10	Linear scaling	1	100	200	degF	Combined outlet temp. TRS-1-17
0004	Volt	20V	0	10	Linear scaling	1	0	350	MW	Total power. WRS-1-5A
0005	Volt	20V	0	10	Linear scaling	1	100	200	degF	Channel 1 avg inlet temp. TRS-1-18
0006	Volt	20V	0	10	Linear scaling	1	100	200	degF	Channel 2 avg inlet temp. TRS-1-20

7.2. Setting Display Settings for Analog Input Channels

Navigate to _____.

If desired for clarity, the “Tag No.” field may be filled with signal tagnames.

For the SimQuad[n] recorders, set the following AI channel display settings:

CH	Tag No.	Color
0001	FRS-1-[n]	#008000
0002	DTRS-1-[n]	#0000ff
0003	TRS-1-1[n]	#0000ff
0004	WRS-1-[n]	#ea0000

For the SimTotal recorders, set the following AI channel display settings:

CH	Tag No.	Color
0001	FRS-1-5A	#008000
0002	DTRS-1-5	#0000ff
0003	TRS-1-17	#0000ff
0004	WRS-1-5A	#ea0000
0005	TRS-1-18	#0000ff
0006	TRS-1-20	#0000ff

8. Digital Input Channels

8.1. Creating Digital Input Channels

Navigate to *DI channel settings >> 0201-0208*

- CH:
- Type:

- Span Lower:
- Span Upper:
- Calculation:
- Reference channel:
- Decimal place:
- Lower:
- Upper:
- Unit:

(The RCR recorders will use a digital input channel for the channel selection switch)

(The ATRProcess[n] recorders will not use digital input channels)

For the DevQuad[n] recorder, set the following: - CH: 0101 - Type: DI
For the DevProcess recorder, no DI channels are used. - Type: Skip (for all DI channels)
The SimQuad[n] recorders do not require any DI channels if they have been converted to Ethernet. If they use the existing wiring, then set the following: - CH: 0101 - Type: DI
For the SimTotal recorder, set the following: - CH: 0101 - Type: DI

8.2. Setting alarms for digital input channels

Alarms can also be used to control internal switches. In the display recorders, the display screens are switched by linking together an alarm on a digital input, an internal switch, favorite displays, and custom displays. For more information, see section 12 “Switching the display screen with a digital input”.

Navigate to *DI channel settings >> 0001-0008 >> Alarm*

- CH:
- On/Off:
- Type:
- Value:
- Hysteresis:
- Output type:
- Output No.:

For the DevQuad[n], SimQuad[n], and SimTotal recorders, set the following: - CH: 0101 (alarm level 1) - On/Off: On - Type: “H: High limit” - Value: 1 - Output type: Internal Switch - Output No.: 1

The DevProcess recorder does not require any DI channel alarms.

9. Analog Output channels

9.1. Creating Analog Output channels

Navigate to _____

NOTE: When using a Re-Trans type analog output, ensure that the associated channel is configured correctly. For example, see section 6.1 "Creating Math Channels" for an associated math channel. The numerical span of the associated math channel will correspond to the voltage or current span of the associated analog output channel.

(The ATRProcess[n] and ATRTotal recorders may eventually use analogue outputs.)

For the DevProcess recorder set the following: - CH: 0001 - Type: Re-Trans - Range: 0-20mA - Span Lower: 0.000 - Span Upper: 20.000 - Chanel type: Math channel - Channel no: A029 - Preset value: 0.000 - At power on: Preset value - On error: Preset value - During stop conditions: Preset value
The DevQuad[n], SimQuad[n], and SimTotal, recorders do not require any analog output channels.

9.2. Troubleshooting for Analog Output channels

9.2.1. How to check the output of an AO channel.

- To check what the voltage/current of the AO channel currently is:
  Press the MENU button (on the recorder itself) then tap "Browse" then "Overview". Look for the AO channel's number or Tag number to see the current voltage or amperage of that output channel.

9.2.2. The analog outputs are at an incorrect value/voltage/current, but trend as expected.

- Check that the corresponding channel is set up correctly:
  In the settings of the channel that the Re-Trans is linked to, check that the Span Upper and Lower are analogous to the spans set for the analog channel.
  - For example, if Math channel A001's span upper is 64000 GPM and span lower is 0 GPM, while Analog output channel 0201's span upper is 20mA and span lower is 0mA (while set to Type: Re-Trans and Channel no: A001), then the recorder will output a signal of 0-20mA corresponding to 0-64000 GPM.

9.2.3. The analog outputs are at a constant non-zero voltage or current.

- Check that recording is started:
  If the analog output is based off of a math channel, check that the recorder is recording (and also calculating its math channels) by opening the front white panel (on the recorder itself) and checking if the square "START/STOP" button is glowing green. If the button is not lit, press it to start recording.

9.2.4. The analog outputs are at a constant zero voltage or current.

- Check if Re-Trans outputs have been disabled:
  Press the MENU button (on the recorder itself) then tap "Universal" then "All re-trans ON/OFF" then "ON". If this setting is off, then the analog outputs that are of type "Re-Trans" will drop to zero. Changing the setting back to on should fix this issue.
- Check that recording is started. (See earlier instructions 9.2.3)

10. Digital Output channels

10.1. Creating Digital Output Channels

Navigate to *DI channel settings >> 0101-0108 >> Alarm*

NOTE: The digital outputs for these configurations are not controlled in the DO settings, but rather in the alarms of the digital input.

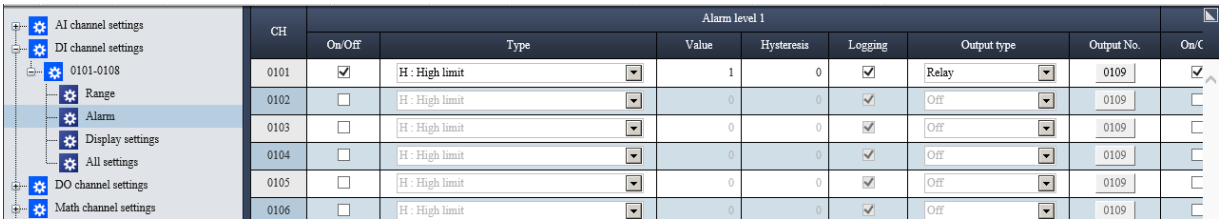
- CH: the digital input channel that is associated with the desired digital output.
- On/Off:
- Type:
- Value: The value at which the alarm is tripped (and therefore the digital output will open/close at.)
- Output type: The action taken when the alarm is tripped. For opening/closing a digital output, set to "Relay".
- Output No: Further specifies the Output type settings. For a digital output, set to the channel number of the associated digital output.

(The ATRQuad and ATRTotal recorders will use digital outputs for RCR annunciator alarms and slow setbacks. These should be based off of the associated Math or Communication channels.)

The development station recorders (DevQuad[n] and DevProcess) do not require digital output channels.
If converted to ethernet, then the SimTotal recorder will not require any DO channels. For the old version of the SimTotal recorder, create the following digital output channels: NOTE: These instructions overlap with the instructions to change the display screen. In order to make both work, changes will be necessary. This may include basing the DO channels off of an internal switch instead of alarms, or creating a math channel from which the alarms are generated. NOTE: All four of these alarms are for the same DI channel, so you will need to scroll horizontally (using the scroll bar at the bottom of the screen) to see the other alarm levels.

Navigate to *DI channel settings >> 0101-0108 >> Alarm* and set the following:

CH	On/Off	Type	Value	Output type	Output No.
0101 (alarm level 1)	On	H: High limit	1	Relay	0109
0101 (alarm level 2)	On	H: High limit	1	Relay	0110
0101 (alarm level 3)	On	H: High limit	1	Relay	0111
0101 (alarm level 4)	On	H: High limit	1	Relay	0112



The SimQuad[n] recorders do not require digital output channels.

11. Displaying Channels

11.1. Creating Display Groups

After creating the desired channel, including setting that channel's specific display settings, do the following:

If you would like to create certain display elements, you will need to create display groups for the desired information. Trendlines require these steps for both the default trendlines and custom display trendlines.

Navigate to *Display Setting >> Group Settings* and set the following:

- Group number: Create a unique group for each trendline you wish to create
    - Note: if you assign multiple channels to the same display group, the trendline made from this group will include all of the channels overlapping.
- Channel Set: Click on this field to open a popup with all available channels. Check all the desired channels and uncheck all of the undesired channels. There are multiple tabs of channels, and some channels may be on by default.

For the DevQuad[n], set the following display groups:

- Group number:1, Channel Set: C001
- Group number:2, Channel Set: C002
- Group number:3, Channel Set: C003
- Group number:4, Channel Set: C004
- Group number:5, Channel Set: A009
- Group number:6, Channel Set: A010
- Group number:7, Channel Set: A011
- Group number:8, Channel Set: A012

The DevProcess recorder does not require any display groups.

For the SimQuad[n] recorders, set the following display groups:

- Group number:1, Channel Set: 0001
- Group number:2, Channel Set: 0002

- Group number:3, Channel Set: 0003
- Group number:4, Channel Set: 0004
- Group number:5, Channel Set: A009
- Group number:6, Channel Set: A010
- Group number:7, Channel Set: A011
- Group number:8, Channel Set: A012

For the SimTotal recorder, set the following display groups:

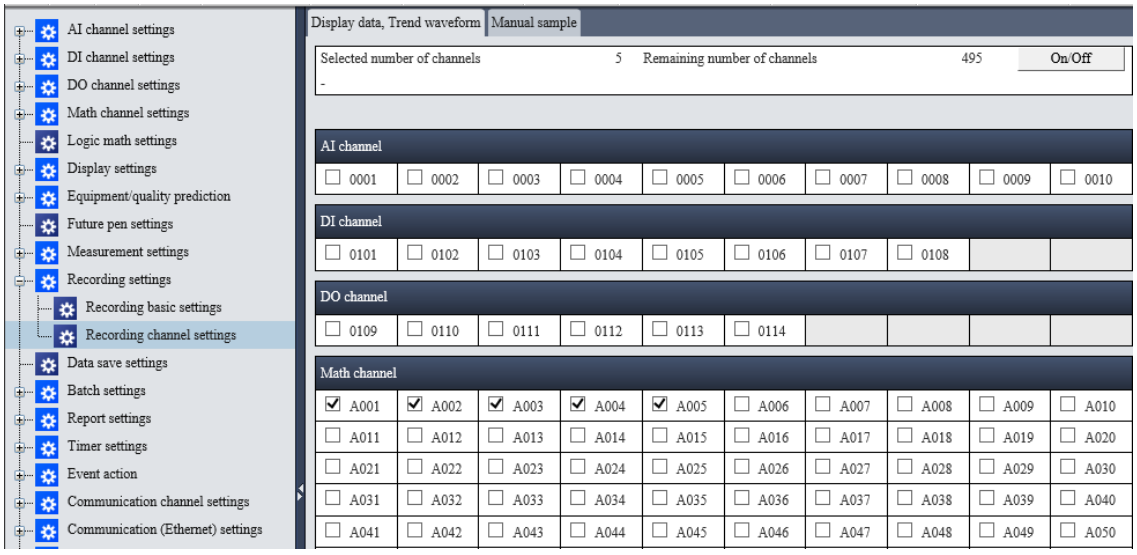
- Group number: 1, Channel Set: 0001
- Group number: 2, Channel Set: 0002
- Group number: 3, Channel Set: 0003
- Group number: 4, Channel Set: 0004
- Group number: 5, Channel Set: 0005
- Group number: 6, Channel Set: A011
- Group number: 7, Channel Set: A012
- Group number: 8, Channel Set: A013
- Group number: 9, Channel Set: A014
- Group number: 10, Channel Set: 0006

11.2. Recording Channels

In order for a trendline to display (not be blank), the channel(s) must be added to the list of recorded channels.

NOTE: It may be possible that in order to record the historical data of a channel, it must also be added to the list of recorded channels. For this reason, it is recommended that all meaningful channels be added to the list.

Navigate to *Recording Settings >> Recording channel* settings and select all the channels that will be displayed on a trendline.



For the DevQuad[n] recorder, set the following:

- Check this DI channel: 0101
- Check these math channels: A001, A002, A003, A004, A005, A006, A007, A008, A009, A010, A011, A012
- Check these communication channels: C001, C002, C003, C004
- Uncheck all other channels.

For the DevProcess recorder, set the following: - Check this analog output channel: 0001 - Check these math channels: A001 through A029 - Check these communication channels: C001 through C013 and C017
For the SimQuad[n] recorders, set the following: - Check these analog input channels: 0001, 0002, 0003, 0004 - Check these math channels: A001 through A012 - Check this communication channel: C001 - Uncheck all other channels.
For the SimTotal recorder, set the following: - Check these analog input channels: 0001 through 0006 - Check this digital input channel: 0101 - Check these math channels: A001 through A014 - Uncheck all other channels.

11.3. Trendline settings part 1

Navigate to *Display Settings >> Trend Interval*

- Trend Interval: This sets the time interval between the vertical lines on trendlines. The number in parenthesis is the time per pixel in the default trendline, which is effectively the refresh rate for the displays.

The DevProcess recorder does not require specific trend interval settings
For the DevQuad[n] recorder and the simulator recorders (SimTotal and SimQuad[n]), set the following: - Trend Interval: 2 min (4s)

11.4. Trendline settings part 2

Navigate to *Display Settings >> Trend Settings* and set the following:

- Direction: This is the axis that shows time for trendlines.
- Trend clear: _____
- Trendline: This is the thickness of the line(s) in trendlines.
- Grid: the number of vertical divisions (horizontal lines) on the trendlines

The DevProcess recorder does not change from these default settings.
For the DevQuad[n] recorder and the Simulator recorders (SimTotal and SimQuad[n]), set the following: - Direction: Horizontal - Trendline: Thick - Grid: 4

12. Switching the display screen with a digital input

12.1. Creating an Internal Switch

Navigate to the Alarm settings of the channel that is desired to control the switching. For example, DI channel settings >> 0001-0008 >> Alarm.

Set an alarm for the desired channel (see section 8.2 “Setting alarms for digital input channels” for details), and link it to an internal switch with the following settings:

- Output Type: Set to “Internal Switch”
- Output No.: The unique number of the desired internal switch. (This is usually 1).

12.2. Changing Internal Switch behavior (optional)

Navigate to *System Settings >> Internal Switch Settings*
The internal switch’s behavior can be changed between AND and OR.

All recorders keep the default switch behavior of “OR”.

12.3. Creating Event Actions

Navigate to Event action >> 1-20

- Event action:
- On/Off:
- Type: The channel or elements that controls this event action. (Usually Internal switch)
- Number: The unique number associated with the Type settings (For example, set to 1 for Internal switch number 1)
- Detail: Can be used to further define the Type setting.
- Operation mode: When to execute the event action. See [users manual and section] for more details.
- Type: The action that is done as a result of the event action. (Usually “Show the favorite display”.)
- Number: Further defines the Type setting. (For example, set to 1 to show the first favorite display.)
- Detail:
- Group number:

NOTE: The recorders use two event actions, one to switch to the WPC1 screen and a second to switch to the WPC2 screen.

For the DevQuad[n], SimQuad[n], and SimTotal recorders, set the following:
- Event action: 1
  - On/Off: On
  - Type: Internal Switch
  - Number: 1
  - Operation mode: Rising Edge (when the selection switch is turned to the WPC2 position)
  - Type: Show the favorite display
  - Number: 2 (WPC2 custom display)
- Event action: 2
  - On/Off: On
  - Type: Internal Switch
  - Number: 1
  - Operation mode: Falling Edge (when the selection switch is turned to the WPC1 position)
  - Type: Show the favorite display
  - Number: 1 (WPC1 custom display)

The DevProcess recorder does not require an internal switch.

12.4. Creating Custom Displays (see other instruction file)

Follow directions in [other instructions] to create custom displays in DAC Studio. It is recommended to do this section after finishing the configuration file in Hardware Configurator.

It may be useful to have a reference list of the channel numbers/names and display groups while creating custom displays. See “Appendix A - Overview of Configurations, Quick Reference” for an example of the reference sheets used.

12.5. Uploading custom displays to the recorder

Custom displays are more easily uploaded after a configuration with a working login and IP address is uploaded to the recorder. It is recommended to do this section after finishing the configuration file in Hardware Configurator.

- Ethernet method:
    - After creating the custom displays in and uploading a configuration with a working login and IP address, open the custom display(s) in DAC Studio.
    - Press the [??????????] button.
      [icon example image]
    - A popup will appear. Enter the required login information and the IP address of the recorder, then press [????????] to send the displays to the recorder.
- SD card method:
    - After creating the custom displays, save them to an SD card.
    - Insert the SD card into the recorder.
    - Press the MENU button, then press Browse >> Save load >> Load settings >> Custom display >> Load custom display on specified screen.

To check that the custom displays have been uploaded, on the recorder press *MENU >> Browse >> Custom* and click on the desired screen(s) to view them.

12.6. Assigning Favorite Displays

Assigning favorite displays requires interacting with the recorder itself. After uploading the custom displays to the recorder, follow these steps in the recorder:

1. Delete the existing favorite screens by pressing *MENU >> Universal >> Remove Favorite*, and selecting all of the unwanted screens (this will likely be all of them). Press OK to remove the screens from the favorites list.
    1.1. You can confirm that the favorites list has been emptied by pressing the MENU button and looking at the horizontally scrolling section of favorite screens.
2. For each desired favorite screen, complete the following steps:
    2.1. Navigate to the desired custom screen by pressing *MENU >> Browse >> Custom* and clicking on the desired custom display. Verify that the current screen is the desired one.

2.2. Add the current screen to the favorites list, by pressing MENU, then selecting the empty “Add favorite” button (with a star icon) of the desired number.
2.3. A popup will appear. Click on the textbox labeled with the number and “FAVORITE”, enter the desired name of the favorite display (this will display in the upper left corner), press “OK”, and press “OK”.

For the DevQuad[n], SimQuad[n], and SimTotal recorders, do the following in the recorder:

1. Delete the existing favorite screens by pressing *MENU >> Universal >> Remove Favorite*, selecting all the screens, then pressing “OK”.
2. Navigate to the WPC1 trendline screen by pressing *MENU >> Browse >> Custom* and clicking on “WPC1 custom trendline”. (NOTE: If the custom screens menu does not appear, repeat this step.)
3. Set the WPC1 screen as the first favorite screen by pressing MENU, pressing the “1 Add favorite” button with a star icon, pressing the textbox labeled “1 FAVORITE 1”, typing “WPC1” into the textbox, pressing “OK”, and pressing “OK” again.
4. Navigate to the WPC2 trendline screen by pressing *MENU >> Browse >> Custom* and clicking on “WPC2 custom trendline”.
5. Set the WPC2 screen as the second favorite screen by pressing MENU, pressing the “2 Add favorite” button with a star icon, pressing the textbox labeled “2 FAVORITE 2”, typing “WPC2” into the textbox, pressing “OK”, and pressing “OK” again.
6. Navigate to the alternate screen by pressing *MENU >> Browse >> Custom* and clicking on “alternate display”.
7. Set the alternate screen as the third favorite screen by pressing MENU, pressing the “3 Add favorite” button with a star icon, pressing the textbox labeled “3 FAVORITE 3”, typing “alternate” into the textbox, pressing “OK”, and pressing “OK” again.

For the DevProcess recorder, do the following in the recorder:

1. Delete the existing favorite screens by pressing *MENU >> Universal >> Remove Favorite*, selecting all the screens, then pressing “OK”.
2. Navigate to the primary screen by pressing *MENU >> Browse >> Custom* and clicking on “Primary display”. (NOTE: If the custom screens menu does not appear, repeat this step.)
3. Set the primary screen as the first favorite screen by pressing MENU, pressing the “1 Add favorite” button with a star icon, pressing the textbox labeled “1 FAVORITE 1”, typing “Primary display” into the textbox, pressing “OK”, and pressing “OK” again.
4. Navigate to the alternate screen by pressing *MENU >> Browse >> Custom* and clicking on “Alternate display”.
5. Set the alternate screen as the second favorite screen by pressing MENU, pressing the “2 Add favorite” button with a star icon, pressing the textbox labeled “2 FAVORITE 2”, typing “Alternate display” into the textbox, pressing “OK”, and pressing “OK” again.

12.7. Troubleshooting switching displays

12.7.1. The display switches screens without user input or unexpectedly.
12.7.1.1. Ensure that the DI channel alarm and internal switches are set correctly
12.7.1.2. Navigate to *Display Setting >> Screen display settings*. In the monitor section, ensure that the Jump to default display setting is set to Off.

13. Synchronizing the time using SNTP (Network Time Protocol)

13.1. Configuring the SNTP client function

Navigate to *Communication (Ethernet) Settings >> SNTP client settings*
Also described in IM04L51B01-01EN “Paperless Recorder User’s Manual” Section 1.21.5 “Setting the SNTP Client Function”

- On/Off: Turns on the SNTP client function. If this is off, the recorder will not try to synchronize its time.
- SNTP server name: This is the IP address of the clock
  - For Dev Station, the clock’s IP address is ####
- Port number: _____

- Interval: The time between synchronization attempts
- Timeout: how long the recorder waits for a response from the clock before timing out.
- Time adjust on Start action: This controls whether the recorder synchronizes when recording starts.

For the development station recorders (DevQuad[n] and DevProcess), set the following: - On/Off: On - SNTP server name: #### - Port number: 123 (default) - Time adjust on Start action: On (not required)
I'm unsure whether the simulator recorders (SimTotal and SimQuad[n]) will synchronize their time. They are not currently configured to do so.

13.2. Setting Time Basic Settings

Navigate to *System Settings >> Time basic settings*

Also described in IM04L51B01-01EN "Paperless Recorder User's Manual" Section 1.23.4 "Setting the Time Zone, Gradual Time Adjustment, and Daylight Savings Time"

- Time zone, Hour & Minute: This is the offset that the recorder adds to the time it receives from the clock. The default is 9 hours. To set the same time as the clock, set this to zero hours and zero minutes.
- Time deviation limit: This is the maximum allowable difference between the recorder's internal time and the external clock's time, before it is considered "beyond limit".
- Time adjustment beyond limit: This controls what the recorder does if the time adjustment is "beyond limit" (the clock time is off by more than the Time deviation limit.)

For the development station recorders (DevQuad[n] and DevProcess), set the following: - Time zone, Hour: 0 - Time zone, Minute: 0 - Time adjustment beyond limit: Change the time
I'm unsure whether the simulator recorders (SimTotal and SimQuad[n]) will synchronize their time. They are not currently configured to do so.

13.3. Changing the date/time format

Navigate to *System Settings >> Environment (Language) Settings*

In the "Date format" section, change the settings as desired.

13.4. Synchronizing the recorder's time at any time (in the recorder itself). (Optional)

Once a configuration with SNTP enabled has been uploaded to the recorder, you may synchronize with the clock by pressing *Menu button >> Universal >> SNTP* in the recorder itself.

This will cause the recorder to attempt to synchronize with the clock. A popup will appear that says "Now connecting to SNTP server…", which will disappear after a short time. If unsuccessful, another popup will appear after the specified timeout that says "SNTP server does not respond" or another error message, which will not disappear until dismissed.

(Note: The “SNTP” button will not appear if SNTP is not enabled on the recorder. See section 13.1 “Configuring the SNTP client function”)

To check if previous synchronization attempts have been successful, navigate to the SNTP log in the recorder by pressing *Menu button >> Browse >> Log >> SNTP.* This will display a log of previous synchronization attempts. If an attempt was successful, it will state “SUCCESS” for that attempt. If it was not successful, it will display an error code.

13.5. Troubleshooting for SNTP Time synchronization

13.5.1. Unsure if time has been synchronized.

To check if previous synchronization attempts have been successful, navigate to the SNTP log in the recorder by pressing *Menu button >> Browse >> Log >> SNTP*
This will display a log of previous synchronization attempts. If an attempt was successful, it will state “SUCCESS” for that attempt. If it was not successful, it will display some kind of error code.

13.5.2. “_____” or the recorder will connect to the clock but not synchronize its time.

If the time is off by more than a specified amount from the clock, it may not synchronize. To fix it, do one of the following:

- Have it sync anyways.
  Navigate to *System Settings >> Time basic settings* and set:
  Time adjustment beyond limit: Change the time
- Manually adjust the recorder’s time to be within the allowed limit.
  In the recorder, press *menu button >> Universal >> Date/Time setting* and set the date and time to within the allowed limit of the clock.

13.5.3. [type here]

14. Configuring the Fail Output

Navigate to *System Settings >> Status Relay*
NOTE: The various options cannot be selected unless the fail relay is set to “Status” instead of “Fail”.

15. Sending settings to the recorder

Also described in IM04L51B01-01EN “Paperless Recorder User’s Manual” Section 1.25 “Loading Settings”

15.1. SD card method

If you have not already uploaded a configuration file with a known login and IP Address, do the following. (You cannot send settings over ethernet to a recorder that does not already have a known login and IP Address.)

To create a known login, see section 3 “Logins, Passwords, and Profiles”. To assign an IP Address, see section 4.1 “Setting the recorder’s IP address”.

- Save the configuration file in hardware configurator to an SD card.
    - At the top of the Hardware configurator screen, press *Save As* and save the file to an SD card.
- Insert the SD card into the recorder.
    - The SD card port is found on the front of the recorder, behind the white panel. To open the panel, press downwards on the white tab at the top of the panel to unlatch, then let the panel swing outwards.
- Upload the setting file.
    - If a popup appears when you insert the SD card, press *Load Settings >> Load Settings >> Setting parameters >> Select file* and select your configuration file. Then Press *OK >> Execute*. A popup will appear that says “Loading file from Media”.
    - If a popup does not appear when you insert the SD card, press *Menu button >> Browse >> Save load >> Load settings >> Setting parameters >> Select file* and select your configuration file. Then Press *OK >> Execute*. A popup will appear that says “Loading file from Media”.
- If successful, a popup should appear that says “Execution Completed”

15.2. Ethernet method

If you have connected via ethernet cable to a recorder that has a known login and IP address, you can do the following. (Note: the previous SD card method will still work too):

- On hardware configurator, press the *Send Settings* button near the top of the screen. Enter your username and password (leave the User ID blank unless you have specified one), confirm that the IP address listed is the recorder’s IP address, and click *OK.*
- There may be various popups with warnings. Here are a few known ones and their fixes:
    - A popup appears saying something like ‘Communication error’
        - The username and/or password may not be correct. You can reset the logins by changing them in hardware configurator as described in section 1.2, putting that config file onto an SD card, insert the SD card in the recorder, and upload the settings into the recorder as described in section _____ “SD card method”.
    - “”W002 Send settings to connecting hardware. If user level is not “Admin”, some settings can not be set on the device. Changing the language steeings may cause the device restarted.”
        - This popup often happens, and as long as you are aware of the changes you will be sending, you can click “OK” and the configuration will upload as usual.

- If successful, a popup will appear on the hardware configurator screen saying “M003 Sending finished.”

15.2.1. Troubleshooting and Error Messages for Ethernet method

There may be various popups with warnings. Here are a few known ones and their fixes:

15.2.1.1. “Hardware and Software configurations don’t match”.

Check that the recorder has the expected features by either:

- reconfiguring the recorder (see section 1 “Auto-detect installed modules“), then pressing *Menu button >> Browse >> System Information*. To see module information, press the “Module information” button at the bottom of the screen. After confirming modules and features, try to upload the configuration again.
- reconfiguring the recorder (see section 1 “Auto-detect installed modules“), creating a new file in Hardware configurator (note: You may lose all progress on your current file.), connecting to the recorder via an ethernet cable, and pressing “receive settings” found near the top of the hardware configurator screen. Then navigate to the “_____” tab to view the recorder’s self-reported features.
- You can also find a list of features on the original invoice from Yokogawa, but this may not be a comprehensive list.

NOTE: You can still send settings to the recorder despite this popup.

15.2.1.2. ‘Communication error’ or similar (I’m not sure the exact quote)

The username and/or password may not be correct.

- You can reset the logins by:
  - Change the user name and/or password in hardware configurator as described in section 1.2,
  - put that config file onto an SD card,
  - insert the SD card in the recorder, and upload the settings into the recorder as described in section _____ “SD card method”.

15.2.1.3. “W002 Send settings to connecting hardware. If user level is not “Admin”, some settings cannot be set on the device. Changing the language settings may cause the device restarted.”

This popup often happens, and as long as you are aware of the changes you will be sending, you can click “OK” and the configuration will upload as usual.

Info for custom displays is in a separate document/file.

Appendix A- Overview of Configurations, Quick Reference

Configurations Overviews

A general overview of recorder configurations, to be used as a quick reference while editing configurations and custom displays, especially to ensure things match across softwares.

May include:

- Modules
- Active/used channels & channel numbers/references
- Display groups
- Specific settings not general to all WPC recorders

Things common to all or most recorders are not included in this overview.

(This appendix is also found as a separate word document in the internship final deliverables folder)

DevQuad[n]

Intended for the WPC development station's upper recorder.

Modules:	
Slot number:	Type of module installed:
0	Analog input (not actually necessary)
1	Digital input/output

Own IP address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	DevProcess recorder

Modbus commands	
Command number:	Purpose:
1	Read info from DevProcess recorder

Channels used/active		
Channel number:	Purpose and/or signal tagname	Alarm(s)
Communication channels		
C001	FRS-1-[n], flow	None
C002	DTRS-1-[n], diff temp	None
C003	TRS-1-1[n], out temp	None
C004	WRS-1-[n], power	None
Math channels		
A001	FRS-1-[n,A,B,C,D], active channel flow	Low limit and high limit (output off)
A002	DTRS-1-[n,A,B,C,D], active channel diff temp	None
A003	TRS-1-1[n,A,B,C,D], active channel out temp	High limit (output off)
A004	WRS-1-[n,A,B,C,D], active channel power	High limit and high limit (output off)
A005	dFRS, interchannel variance in flow	High limit (output off)
A006	dDTRS, interchannel variance in diff temp	High limit (output off)
A007	dTS, interchannel variance in out temp	High limit (output off)
A008	dWRS, interchannel variance in power	High limit (output off)
A009	FRS-1-[A,B,C,D], fake WPC2 flow	None
A010	DTRS-1-[A,B,C,D] , fake WPC2 diff temp	None
A011	TRS-1-[A,B,C,D] , fake WPC2 out temp	None
A012	WRS-1-[A,B,C,D] , fake WPC2 power	None
Digital Input		
0101	Channel selection switch	High limit (internal switch)

Constants

Constant number:	Value:	Purpose:
K001	0.01	Create fake WPC2 data

Display groups		
Group number:	Channels set:	Purpose/Signal tagname:
1	C001	FRS-1-1, channel 1 flow
2	C002	DTRS-1-1, channel 1 diff temp
3	C003	TRS-1-11, channel 1 out temp
4	C004	WRS-1-1, channel 1 power
5	A009	FRS-1-[A,B,C,D], channel 2 flow
6	A010	DTRS-1-[A,B,C,D] , channel 2 diff temp
7	A011	TRS-1-[A,B,C,D] , channel 2 out temp
8	A012	WRS-1-[A,B,C,D] , channel 2 power

Event Actions (from internal switch 1)	
Event action number:	Purpose/action:
1	show WPC2 screen
2	show WPC1 screen

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	WPC1 trendline
2	WPC2 trendline
3	Alternate display

DevProcess

Intended for the WPC development station's lower recorder.

Modules:	
Slot number:	Type of module installed:
0	Analog output

Own IP address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	Moore AIM
2	####	Moore AOM (RDAS simulator)

Modbus commands	
Command number:	Purpose:
1	Read info from Moore AIM
2	Read internal temp info from Moore AIM
3	Write info to Moore AOM
4	Write info to Moore AOM (because dev station AOM is wired differently)

Channels used/active		
Channel number:	Purpose and/or signal tagname:	Alarm(s):
Communication channels		
C001	FTY-1-1, Quad 1 DP	None
C002	FTY-1-2, Quad 2 DP	None
C003	FTY-1-3, Quad 3 DP	None
C004	FTY-1-4, Quad 4 DP	None
C005	TT-1-1B-1, Quad 1 inlet temp	None
C006	TT-1-2B-1, Quad 2 inlet temp	None
C007	TT-1-3B-1, Quad 3 inlet temp	None
C008	TT-1-4B-1, Quad 4 inlet temp	None
C009	TRS-1-11, quad 1 outlet temp	None
C010	TRS-1-12, quad 2 outlet temp	None
C011	TRS-1-13, quad 3 outlet temp	None
C012	TRS-1-14, quad 4 outlet temp	None
C013	TRS-1-17, combined outlet temp	None
C017	Cabinet (Moore) temp	None
Math channels		
A001	FTY-1-1	None
A002	FTY-1-2	None
A003	FTY-1-3	None
A004	FTY-1-4	None
A005	TT-1-1B-1	None
A006	TT-1-2B-1	None
A007	TT-1-3B-1	None
A008	TT-1-4B-1	None

A009	TRS-1-18	None
A010	FRS-1-1	None
A011	DTRS-1-1	None
A012	TRS-1-11	None
A013	WRS-1-1	None
A014	FRS-1-2	None
A015	DTRS-1-2	None
A016	TRS-1-12	None
A017	WRS-1-2	None
A018	FRS-1-3	None
A019	DTRS-1-3	None
A020	TRS-1-13	None
A021	WRS-1-3	None
A022	FRS-1-4	None
A023	DTRS-1-4	None
A024	TRS-1-14	None
A025	WRS-1-4	None
A026	FRS-1-5A	None
A027	DTRS-1-5	None
A028	TRS-1-17	None
A029	WRS-1-5A NOTE: Set span for this channel, will become analog output 0001.	None
Analog Output		
0001	WRS-1-5A-1, send to power meter (Loop DCS simulator) NOTE: Make sure that channel A029 has correct span set.	None

Constants		
Constant number:	Value:	Purpose:
K001	####	
…	…	
K###	####	

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	Primary display
2	Alternate display

SimQuad[n]

Intended for the four quadrant WPC recorders in the ATR simulator in TRA-679.

Modules:	
Slot number:	Type of module installed:
0	Analog input

Own IP address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	SimTotal recorder

Modbus commands	
Command number:	Purpose:
1	Read channel selection switch position from SimTotal recorder

Channels used/active		
Channel number:	Purpose and/or signal tagname	Alarm(s)
Communication channels		
C001	Channel selection switch	High limit (internal switch)
Math channels		
A001	FRS-1-[n,A,B,C,D], active channel flow	Low limit and high limit (output off)
A002	DTRS-1-[n,A,B,C,D], active channel diff temp	None
A003	TRS-1-[1n,A,B,C,D], active channel out temp	High limit (output off)
A004	WRS-1-[n,A,B,C,D], active channel power	High limit and high limit (output off)
A005	dFRS, interchannel variance in flow	High limit (output off)
A006	dDTRS, interchannel variance in diff temp	High limit (output off)
A007	dTRS, interchannel variance in out temp	High limit (output off)
A008	dWRS, interchannel variance in power	High limit (output off)
A009	FRS-1-[A,B,C,D], fake WPC2 flow	None
A010	DTRS-1-[A,B,C,D] , fake WPC2 diff temp	None
A011	TRS-1-[A,B,C,D] , fake WPC2 out temp	None
A012	WRS-1-[A,B,C,D] , fake WPC2 power	None
Analog Input		
0001	FRS-1-[n], flow	None
0002	DTRS-1-[n], diff temp	None
0003	TRS-1-1[n], out temp	None
0004	WRS-1-[n], power	None

Constants		
Constant number:	Value:	Purpose:

K001	0.01	Create fake WPC2 data

Display groups		
Group number:	Channels set:	Purpose/Signal tagname:
1	0001	FRS-1-1, channel 1 flow
2	0002	DTRS-1-1, channel 1 diff temp
3	0003	TRS-1-11, channel 1 out temp
4	0004	WRS-1-1, channel 1 power
5	A009	FRS-1-[A,B,C,D], channel 2 flow
6	A010	DTRS-1-[A,B,C,D] , channel 2 diff temp
7	A011	TRS-1-[A,B,C,D] , channel 2 out temp
8	A012	WRS-1-[A,B,C,D] , channel 2 power

Event Actions (from internal switch 1)	
Event action number	Purpose/action
1	show WPC2 screen
2	show WPC1 screen

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	WPC1 trendline
2	WPC2 trendline
3	Alternate display

SimTotal

Intended for the total WPC recorder in the ATR simulator in TRA-679.

Modules:	
Slot number:	Type of module installed:
0	Analog input
1	Digital input/output

Own IP address: ####

Channels used/active		
Channel number:	Purpose and/or signal tagname	Alarm(s)
Math channels		
A001	FRS-1-[5A,5], active channel flow	Low limit and high limit (output off)
A002	DTRS-1-[5,E], active channel diff temp	High limit (output off)
A003	TRS-1-1[17,E], active channel out temp	None
A004	WRS-1-[5A,5], active channel power	High limit (output off)
A005	TRS-1-[18,20], active channel avg inlet temp	High limit and high limit (output off)
A006	dFRS, interchannel variance in flow	High limit (output off)
A007	dDTRS, interchannel variance in diff temp	High limit (output off)
A008	dTRS, interchannel variance in out temp	High limit (output off)
A009	dWRS, interchannel variance in power	High limit (output off)
A010	dTRS-1-18, interchannel variance in avg inlet temp	High limit (output off)
A011	FRS-1-5, fake WPC2 flow	None
A012	DTRS-1-E, fake WPC2 diff temp	None
A013	TRS-1-E, fake WPC2 out temp	None
A014	WRS-1-5, fake WPC2 power	None
Analog Input		
0001	FRS-1-5A, flow	None
0002	DTRS-1-5, diff temp	None
0003	TRS-1-17, combined out temp	None
0004	WRS-1-5A, power	None
0005	TRS-1-18, WPC1 avg inlet temp	None
0006	TRS-1-20, WPC2 avg inlet temp	None
Digital Input		
0101	Channel selection switch	High limit (internal switch)

Constants		
Constant number:	Value:	Purpose:
K001	0.01	Create fake WPC2 data

Display groups

Group number:	Channels set:	Purpose/Signal tagname:
1	0001	FRS-1-5A, channel 1 flow
2	0002	DTRS-1-5, channel 1 diff temp
3	0003	TRS-1-17, channel 1 combined out temp
4	0004	WRS-1-5A, channel 1 power
5	0005	TRS-1-18, channel 1 avg inlet temp
6	A011	FRS-1-[A,B,C,D], channel 2 flow
7	A012	DTRS-1-[A,B,C,D] , channel 2 diff temp
8	A013	TRS-1-[A,B,C,D] , channel 2 out temp
9	A014	WRS-1-[A,B,C,D] , channel 2 power
10	0006	TRS-1-20, channel 2 avg inlet temp

Event Actions (from internal switch 1)	
Event action number	Purpose/action
1	show WPC2 screen
2	show WPC1 screen

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	WPC1 trendline
2	WPC2 trendline
3	Alternate display

ATRQuad[n]

Intended for the four quadrant WPC recorders in the ATR Reactor Control Room in TRA-670.

Modules:	
Slot number:	Type of module installed:
0	Digital input/output

Own IP address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	WPC1 Process recorder
2	####	WPC2 Process recorder

Modbus commands	
Command number:	Purpose:
1	Read info from WPC1 Process recorder
2	Read info from WPC2 Process recorder

Channels used/active		
Channel number:	Purpose and/or signal tagname	Alarm(s)
Communication channels		
C001	FRS-1-[n], channel 1 quad flow	None
C002	DTRS-1-[n], channel 1 quad diff temp	None
C003	TRS-1-1[n], channel 1 quad out temp	None
C004	WRS-1-[n], channel 1 quad power	None
C005	FRS-1-[A,B,C,D], channel 2 quad flow	None
C006	DTRS-1-[A,B,C,D], channel 2 quad diff temp	None
C007	TRS-1-1[A,B,C,D], channel 2 quad out temp	None
C008	WRS-1-[A,B,C,D], channel 2 quad power	None
Math channels		
A001	FRS-1-[n,A,B,C,D], active channel flow	Low limit and high limit (relay output)
A002	DTRS-1-[n,A,B,C,D], active channel diff temp	None
A003	TRS-1-1[n,A,B,C,D], active channel out temp	High limit (relay output)
A004	WRS-1-[n,A,B,C,D], active channel power	High limit and high limit (relay output)
A005	dFRS, interchannel variance in flow	High limit (output off)
A006	dDTRS, interchannel variance in diff temp	High limit (output off)
A007	dTS, interchannel variance in out temp	High limit (output off)
A008	dWRS, interchannel variance in power	High limit (output off)
Digital Input		
0001	Channel selection switch	High limit (internal switch)
Digital Output		
0009	Low quad flow to annunciator	From A001 low
0010	High quad flow to annunciator	From A001 high
0011	High quad outlet temp to annunciator	From A003 high
0012	High quad power to annunciator	From A004 high level 1
0013	High quad power slow setback	From A004 high level2

Display groups		
Group number:	Channels set:	Purpose/Signal tagname:
1	C001	FRS-1-5A, channel 1 quad flow
2	C002	DTRS-1-5, channel 1 quad diff temp
3	C003	TRS-1-17, channel 1 quad out temp
4	C004	WRS-1-5A, channel 1 quad power
5	C005	TRS-1-18, channel 1 avg inlet temp
6	C006	FRS-1-5, channel 2 quad flow
7	C007	DTRS-1-E, channel 2 quad diff temp
8	C008	TRS-1-1E, channel 2 quad out temp

Event Actions (from internal switch 1)	
Event action number:	Purpose/action:
1	show WPC2 screen
2	show WPC1 screen

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	WPC1 trendline
2	WPC2 trendline
3	Alternate display

ATRTotal

Intended for the total WPC recorder in the ATR Reactor Control Room in TRA-670.

Modules:	
Slot number:	Type of module installed:
0	Digital input/output
1	Digital output
2	Analog output

Own IP address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	WPC1 Process recorder
2	####	WPC2 Process recorder

Modbus commands	
Command number:	Purpose:
1	Read info from WPC1 Process recorder
2	Read info from WPC2 Process recorder

Channels used/active		
Channel number:	Purpose and/or signal tagname	Alarm(s)
Communication channels		
C001	FRS-1-5A, channel 1 quad flow	None
C002	DTRS-1-5, channel 1 quad diff temp	None
C003	TRS-1-17, channel 1 quad out temp	None
C004	WRS-1-5A, channel 1 quad power	None
C005	TRS-1-18, channel 1 avg inlet temp	None (or may be one?)
C006	FRS-1-5, channel 2 quad flow	None
C007	DTRS-1-E, channel 2 quad diff temp	None
C008	TRS-1-E, channel 2 quad out temp	None
C009	WRS-1-5, channel 2 quad power	None
C010	TRS-1-20, channel 2 avg inlet temp	None (or may be one)
Math channels		
A001	FRS-1-[5A,5], active channel flow NOTE: Make sure to assign Span values, as it will determine how the analog output is scaled.	Low limit and high limit (relay output)
A002	DTRS-1-[5,E], active channel diff temp	High limit (relay output)
A003	TRS-1-1[17,E], active channel out temp	None
A004	WRS-1-[5A,5], active channel power	High limit (relay output)
A005	TRS-1-[18,20], active channel avg inlet temp	High limit and high limit and high limit (relay output) (or may be only one alarm?)
A006	dFRS, interchannel variance in flow	High limit (output off)
A007	dDTRS, interchannel variance in diff temp	High limit (output off)
A008	dTRS, interchannel variance in out temp	High limit (output off)

A009	dWRS, interchannel variance in power	High limit (output off)
A010	dTRS-1-18, interchannel variance in avg inlet temp	High limit (output off)
Analog Output		
0201	FRS-1-[5A,5], send active channel total flow to LOOP DCS	None
Digital Input		
0001	Channel selection switch	High limit (internal switch)
Digital Output		
0009	Low total flow to annunciator	From A001 low
0010	High total flow annunciator	From A001 high
0011	High total diff temp to annunciator	From A002 high
0012	High total power to annunciator	From A004 high
0013	High avg inlet temp to annunciator	From A005 high level 1
0014	High avg inlet temp to slow setback	From A005 high level 2
0101	High avg inlet temp to slow setback	From A005 high level 3

Display groups		
Group number:	Channels set:	Purpose/Signal tagname:
1	C001	FRS-1-5A, channel 1 total flow
2	C002	DTRS-1-5, channel 1 total diff temp
3	C003	TRS-1-17, channel 1 total out temp
4	C004	WRS-1-5A, channel 1 total power
5	C005	TRS-1-18, channel 1 avg inlet temp
6	C006	FRS-1-5, channel 2 total flow
7	C007	DTRS-1-E, channel 2 total diff temp
8	C008	TRS-1-1E, channel 2 total out temp
9	C009	WRS-1-5, channel 2 total power
10	C010	TRS-1-20, channel 2 avg inlet temp

Event Actions (from internal switch 1)	
Event action number:	Purpose/action:
1	show WPC2 screen
2	show WPC1 screen

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	WPC1 trendline
2	WPC2 trendline
3	Alternate display

ATRProcess[1,2]

Intended for the two WPC process recorders for the ATR in the first basement of TRA-670.

Modules:	
Slot number:	Type of module installed:
0	Analog output

Own IP Address: ####

Servers		
Server number:	Server name (IP address):	What it is:
1	####	Moore AIM
2	####	Moore AOM (to RDAS)

Modbus commands	
Command number:	Purpose:
1	Read info from Moore AIM
2	Read internal temp info from Moore AIM
3	Write info to Moore AOM

Channels used/active		
Channel number:	Purpose and/or signal tagname:	Alarm(s):
Communication channels		
C001	FTY-1-[1,A], Quad 1 DP	None
C002	FTY-1-[2,B], Quad 2 DP	None
C003	FTY-1-[3,C], Quad 3 DP	None
C004	FTY-1-[4,D], Quad 4 DP	None
C005	TT-1-1B-[1,2], Quad 1 inlet temp	None
C006	TT-1-2B-[1,2], Quad 2 inlet temp	None
C007	TT-1-3B-[1,2], Quad 3 inlet temp	None
C008	TT-1-4B-[1,2], Quad 4 inlet temp	None
C009	TT-1-1A-[1,2], quad 1 outlet temp	None
C010	TT-1-2A-[1,2], quad 2 outlet temp	None
C011	TT-1-3A-[1,2], quad 3 outlet temp	None
C012	TT-1-4A-[1,2], quad 4 outlet temp	None
C013	TT-1-5A-[1,2], combined outlet temp	None
C017	Cabinet (Moore) temp	None
Math channels		
A001	FTY-1-[1,A], Quad 1 DP	None
A002	FTY-1-[2,B], Quad 2 DP	None
A003	FTY-1-[3,C], Quad 3 DP	None
A004	FTY-1-[4,D], Quad 4 DP	None
A005	TT-1-1B-[1,2], Quad 1 inlet temp	None
A006	TT-1-2B-[1,2], Quad 2 inlet temp	None
A007	TT-1-3B-[1,2], Quad 3 inlet temp	None
A008	TT-1-4B-[1,2], Quad 4 inlet temp	None

A009	TRS-1-[18,20], avg inlet temp	None
A010	FRS-1-[1.A]	None
A011	DTRS-1-[1,A]	None
A012	TRS-1-1[1,A]	None
A013	WRS-1-[1,A]	None
A014	FRS-1-[2,B]	None
A015	DTRS-1-[2,B]	None
A016	TRS-1-1[2,B]	None
A017	WRS-1-[2,B]	None
A018	FRS-1-[3,C]	None
A019	DTRS-1-[3,C]	None
A020	TRS-1-1[3,C]	None
A021	WRS-1-[3,C]	None
A022	FRS-1-[4,D]	None
A023	DTRS-1-[4,D]	None
A024	TRS-1-1[4,D]	None
A025	WRS-1-[4,D]	None
A026	FRS-1-[5A,5]	None
A027	DTRS-1-[5,E]	None
A028	TRS-1-[17,E]	None
A029	WRS-1-[5A,5] NOTE: Set span for this channel, will become analog output 0001.	None
Analog Output		
0001	WRS-1-5A-1, send to power meter (Loop DCS simulator) NOTE: Make sure that channel A029 has correct span set.	None

Constants		
Constant number:	Value:	Purpose:
K001	####	
…	…	
K###	####	

Custom/Favorite Displays	
Favorite screen number:	Purpose/name:
1	Primary display
2	Alternate display

Info for custom displays is in a separate document/file.