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CITY OF WINNIPEG

-WATER AND WASTE DEPARTMENT-

Perimeter Road Pumping Station 2024 Upgrades

Control Narrative

Automatic Utility Transfer System

Winnipeg

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ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
MPE, a division of Englobe Corp.
No. 4968 Date: June 19, 2024

Prepared by MPE a division of Englobe

Introduction

This control narrative describes the automatic utility transfer system within the Perimeter Road Pumping Station (PRPS). This document is meant as a high-level description of the intended transfer function for the programming of the transfer controller. The transfer logic is to be accomplished using an SEL-700BT bus transfer relay. Programming will be completed by SEL Engineering Services as outlined in the contract documents. This document is intended for the programming scope only, refer to the contract specifications for additional requirements such as installation and commissioning. All fail safe discrete inputs to the DCS will be such that a Boolean value of 0 indicates an alarm condition and a Boolean value of 1 indicates a normal state. City staff (depending on security level access) will be able to change setpoints via the transfer relay HMI. The control philosophy/relay programming report should be reviewed prior to making any changes to setpoints. A mechanical interlock is present between the two main breakers, a minimum of 10 seconds (value to be confirmed during commissioning) transfer delay must be maintained to allow for mechanical switch clearing and ensure an electronic interlock is present.

1.1 Background

The Perimeter Road Pumping Station is supplied by two Manitoba Hydro utility feeds, feed 'A' (Preferred) from the Rannock Substation and feed 'B' (Secondary) from the Headingly Substation. As part of the 2024 upgrade project, feed 'B' will be upgraded to match the power capacity of feed 'A' and the automatic switching system controls are to be modernised.

The new automatic transfer system is to be operated by an SEL-700BT bus transfer relay utilising the existing the shunt trip breakers. The transfer relay is to be equipped with an HMI showing the event logs and status of the system as well as allowing for manual operation and configuration of timer variables, as outlined in section 2.1.

1.2 Bus Transfer Relay Configuration

The supplied SEL-700BT relay shall have the following configuration:

- Part Number: 0700BT1A1A1A7585A601
- User Interface: English
- Slot A Power Supply Voltage: 110-250 Vdc (110-240 Vac)
- Slot A Digital Input Voltage: 125 Vdc/Vac
- Slot B Ethernet (Port 1): Dual 10/100BASE-T
- Slot B Rear Serial Port (Port 3) : EIA-232
- IEC 61850 Protocol: No
- DNP3 Protocol: No
- IEC 60870-5-103 Protocol: No
- EtherNet/IP Protocol: No

- Slot C: 4 DI / 4 DO Electromechanical (Form A)
- Slot C: Digital Input Voltage 125 Vdc/Vac
- Slot D: 4 DI / 4 DO Electromechanical (Form A)
- Slot D: Digital Input Voltage 125 Vdc/Vac
- Slot E: 3-Phase 5 Amp AC Current Input / 3-Phase AC Voltage (300 Vac) Input and Vsync Input (SELECT 3 ACI / 4 AVI)
- Slot Z: Current and/or Voltage Inputs 3-Phase 5 Amp AC Current Input / 5 Amp Neutral AC Current Input / 3-Phase AC Voltage (300 Vac) (SELECT 4 ACI / 3 AVI)
- Conformal Coat: Yes

1.3 Reference Drawings

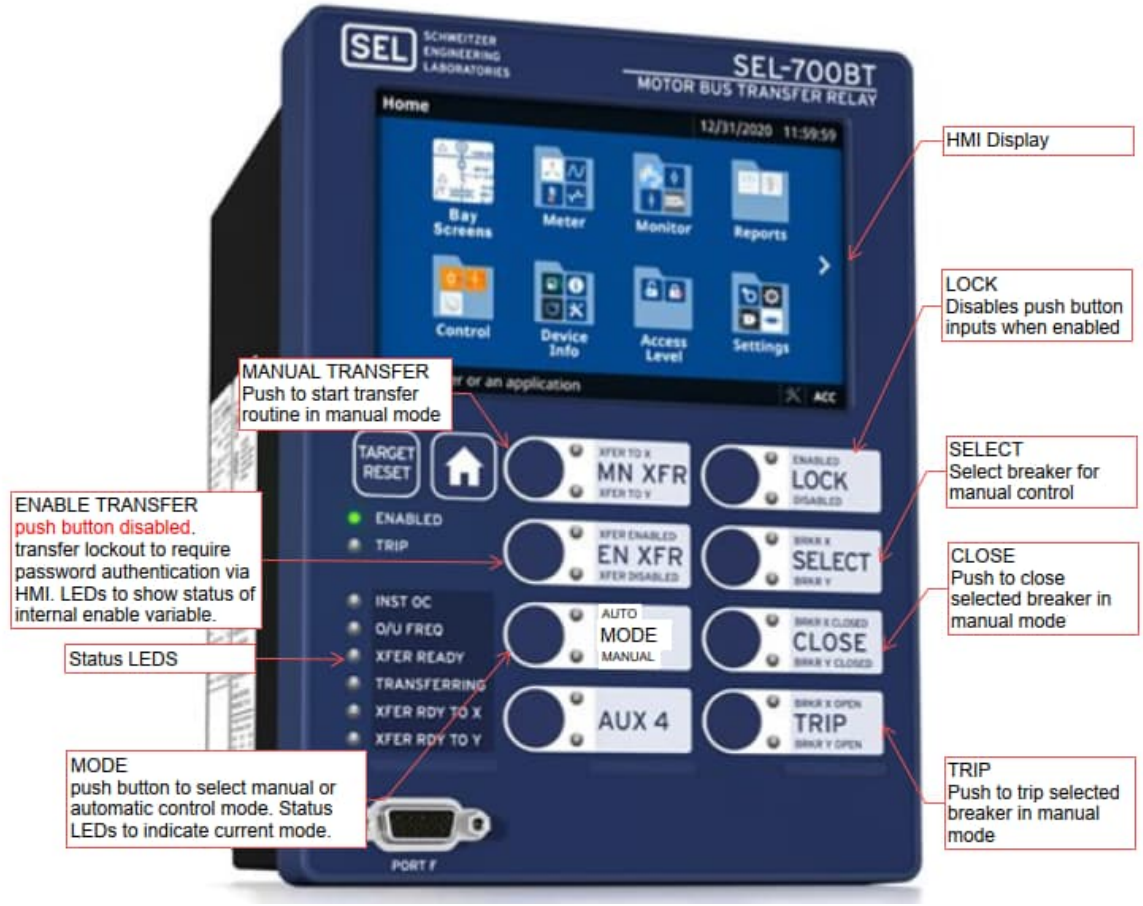
The following drawings should be referenced for supplementary information.

Drawing Number	Title
1-0103-EWDG-M001-001-00	Wiring Diagram – Utility Transfer System Demolition
1-0103-EWDG-M001-001-01	Wiring Diagram – Utility Transfer System

1.4 SELogic Variable Settings

See Appendix A for example settings letter. Programmer to complete settings letter and submit to contract administrator for review and approval. Provide program files alongside final settings letter as part of record documents.

Equipment and System Requirements



SEL-700BT Bus Transfer Relay Front

2.1 Human Machine Interface (HMI) Graphics Display

The relay HMI will display a graphical representation of the status of the breakers and power supplies. All HMI graphics shall follow the City of Winnipeg HMI Animation Guidelines. HMI display will include, but is not limited to:

- Main Supply Window
  - Display of current status for each breaker and availability of transfer.
  - Manual Breaker Control Window
    - Allows for manual tripping and closing of selected breakers. Software and hardware interlocks will prevent both breakers from closing simultaneously.
- Phasor
  - Graphical display of voltage and current phasors for current supply source.

- Metering Window
    - Display of power monitoring points for both power supplies with trends including but not limited to:
        - L-L and L-N voltage on each phase
        - Vsync voltage
        - Current on each phase and common neutral
        - Per phase and overall Instantaneous kW, kVA, and kVAR
        - Per phase and overall kWh, kVAh, and kVARh
        - Per phase and overall power factor
- Settings Window
    - The settings window will be read only and require a password for changes to be made.
    - Display of all system setpoints.
- Event logging
    - Displays timestamped event history. Alarms will display the alarm tag and description with each row colored red for existing alarms and green for cleared alarms.

2.2 Interlocks

A mechanical interlock is present between the two main breakers at the pumping station. The interlock utilizes a lever and pulley system where a motorized lever on the breaker changes state based on the status of the breaker. When the breaker closes the motorized lever activates and pushes a paddle which in turn pulls a cord connected to a lever in the alternate breaker compartment. The lever then pulls a switch at the bottom of the alternate breaker which acts as a permissive input, preventing the breaker from closing. This system is mirrored on the alternate breaker.

In addition to the mechanical interlock, a software transfer interlock will be required to delay the transfer in a neutral state before switching utility feeds. The interlock delay shall be minimum 10 seconds (value to be confirmed during commissioning).

2.3 Description of Operation (Automatic Mode)

Selection of operation mode shall be done via the relay pushbutton 'Aux 3', This push button shall be programmed to allow for changing of the mode, with the LED indication lights indicating the currently selected mode. Hardwired status signals indicating the currently selected mode will be brought to the DCS for monitoring.

The events outlined below will occur when the transfer relay is in auto mode to transfer power when a loss of potential is detected. The relay will continuously monitor both power feeds, if stable power is present on the alternate line for longer than the programmed pickup time, the relay will indicate that transfer is ready. If transfer is not possible for any reason (including power loss to the relay) an alarm will be raised via the failsafe hardwired fault alarm to the DCS.

1. Power loss is detected on the currently selected utility feed for longer than the programmed dropoff delay. (Breaker X closed, Breaker Y open)

2. The shunt trip signal from the bus transfer relay trips the currently selected breaker. (Breaker X open, Breaker Y open)
3. The mechanical interlock enables the alternate breaker. Software interlock delay begins, system in neutral for the duration. (Breaker X open, Breaker Y open)
4. Signal from the bus transfer relay closes the alternate breaker after the delay to complete the transfer. (Breaker X open, Breaker Y closed)
5. The transfer relay will monitor the original utility feed for return of power, when stable power is detected for longer than the pickup delay the relay will indicate that it is ready to transfer. (Breaker X open, Breaker Y closed)
6. The system will remain on the alternate power source until a power loss event occurs requiring transfer to the original power source. (Breaker X open, Breaker Y closed)

2.4 Description of Operation (Manual Mode)

All push button manual controls described below shall also be accessible via HMI.

When the relay is in manual mode the operators will have the option to manually begin the transfer via the 'MN XFR' pushbutton on the front of the relay. Transfer must be enabled for transfer to occur, by default transfer will be enabled. The enable transfer push button 'EN XFR' shall be disabled and the option to lockout the transfer function shall be moved to the authenticated section of the relay HMI, requiring a password to lockout the transfer function.

If manual tripping and closing of the individual breakers is required, the operators must manually trip the current breaker by selecting it using the 'select' push button then tripping it using the 'trip' push button. The transfer delay will still apply when in manual mode to allow the mechanical interlock time to clear before closing the alternate breaker. Attempting to close the alternate breaker before the delay has elapsed will be blocked in the relay programming, this will include the existing manual trip and close pushbuttons at the front of the main switchgear which shall be programmed to function similarly to the relay pushbuttons.

Transfer Relay Monitoring IO

This section outlines the required IO to be included in the program. The following IO is intended as a minimum, additional signals shall be assigned as required during testing and commissioning.

3.1 Alarms

All alarms generated by the relay, minor or critical, shall be enunciated on the relay HMI. The programmer shall include a list of alarms with an alarm tag and description in the programming report.

The following critical alarms shall be tied to the hardwired failsafe fault input to the DCS.

- Fail to transfer alarm
- Fail to close source 1 alarm
- Fail to trip source 1 alarm
- Fail to close source 2 alarm
- Fail to trip source 2 alarm
- Ground fault alarm

3.2 Hardwired IO

Refer to the transfer relay wiring diagram, contract drawing 1-0103-EDWG-M001-001-01, for hardwired IO to the existing DCS.

3.3 Modbus IO

The programmer shall provide the signals below for DCS monitoring over Modbus. Programmer to coordinate with CoW E&I for addressing of each signal. Include all signals and addresses in the completed Appendix A sheets. The signals below are intended as a minimum, additional signals shall be added as required during testing and commissioning.

Tag Name	Description
52-A.Va	Headingly Supply A phase LN Voltage
52-A.Vb	Headingly Supply B phase LN Voltage
52-A.Vc	Headingly Supply C phase LN Voltage
52-A.Vab	Headingly Supply AB phase LL Voltage
52-A.Vbc	Headingly Supply BC phase LL Voltage
52-A.Vca	Headingly Supply CA phase LL Voltage
52-A.Ia	Headingly Supply A phase Current
52-A.Ib	Headingly Supply B phase Current
52-A.Ic	Headingly Supply C phase Current
52-A.Ig	Headingly Supply Calculated Residual Current

52-A.kW	Headingly Supply Instantaneous kW Power Usage
52-A.kVA	Headingly Supply Instantaneous kVA Power Usage
52-A.kWh	Headingly Supply kWh Power Usage
52-A.kVAh	Headingly Supply kVAh Power Usage
52-A.Pf	Headingly Supply 3 Phase Power Factor
52-A.Freq	Headingly Supply Instantaneous Frequency
52-B.Va	Rannock Supply A phase LN Voltage
52-B.Vb	Rannock Supply B phase LN Voltage
52-B.Vc	Rannock Supply C phase LN Voltage
52-B.Vab	Rannock Supply AB phase LL Voltage
52-B.Vbc	Rannock Supply BC phase LL Voltage
52-B.Vca	Rannock Supply CA phase LL Voltage
52-B.Ia	Rannock Supply A phase Current
52-B.Ib	Rannock Supply B phase Current
52-B.Ic	Rannock Supply C phase Current
52-B.Ig	Rannock Supply Calculated Residual Current
52-B.kW	Rannock Supply Instantaneous kW Power Usage
52-B.kVA	Rannock Supply Instantaneous kVA Power Usage
52-B.kWh	Rannock Supply kWh Power Usage
52-B.kVAh	Rannock Supply kVAh Power Usage
52-B.Pf	Rannock Supply 3 Phase Power Factor
52-B.Freq	Rannock Supply Instantaneous Frequency
52-C.In	Main Bus Neutral Current
52-C.Vs	Main Bus Synchronism Voltage
52-C.FreqS	Main Bus Synchronism Frequency

Deliverables

The following documentation at minimum shall be provided by the programmer prior to commissioning and updated for record stage:

- Programming report
    - The programming report shall include, at minimum:
        - HMI screenshots of each window
        - A list of alarms and monitoring signals with addressing
        - Description of operation
        - Default values for internal variables
        - Alarm and switching logic
        - Mapping Routine
- Completed Appendix A Settings Sheets
- Digital copy of the relay program and HMI files
- Commissioning checklists

APPENDIX A: SEL-700BT SETTINGS SHEETS

SEL-700BT Settings Sheets

These settings sheets include the definition and input range for each setting in the relay. You can access the settings from the relay front panel and the communications ports. See *Section 4: Protection and Logic Functions* in the instruction manual for detailed descriptions of the settings.

- Some settings require an optional module. QuickSet, which shows and hides settings depending on the MOT part number selected, is the best way to view settings available in a specific model. Some of the settings ranges may be more restrictive than shown because of settings interdependency checks performed when new settings are saved (see *Setting Entry Error Messages on page 6.4* of the instruction manual)
- The settings are not case sensitive.

Group Settings (SET Command)

Identifier

UNIT ID LINE 1 (16 Characters)	**RID :=** ATS-M7001
UNIT ID LINE 2 (16 Characters)	**TID :=**

Configuration

PHASE ROTATION (ABC, ACB)	**PHROT :=** ABC

X-side HEADINGLY FEED 'A'

X PH CT RATIO (1–10000 [5 A I_{XNOM}]; 1–50000 [1 A I_{XNOM}])	**CTRX :=** 1000:5A
NOMINAL CURRENT (1.0–10.0 A [5 A I_{XNOM}]; 0.2–2.0 A [1 A I_{XNOM}])	**INOM :=** 5A
X SIDE PT CONN (DELTA, WYE)	**DELTAY_X :=** WYE
X PH PT RATIO (1.00–10000.00)	**PTRX :=** 3:1
X SIDE VNOM (0.02–1000.00 kV)	**VNOM_X :=** 200V

Y-side RANNOCK FEED 'B'

Y PH CT RATIO (1–10000 [5 A I_{YNOM}] 1–50000 [1 A I_{YNOM}]) (Hidden if Slot E = empty/74)	**CTRY :=** 1000:5A
Y SIDE PT CONN (DELTA, WYE)	**DELTAY_Y :=** WYE
Y PH PT RATIO (1.00–10000.00)	**PTRY :=** 3:1
Y SIDE VNOM (0.02–1000.00 kV)	**VNOM_Y :=** 200V

Other

SYNCV PT RATIO (1.00–10000.00)	**PTRS :=** 3:1
NEUT CT RATIO (1–10000 [5 A I_{NNOM}], 1–50000 [1 A I_{NNOM}])	**CTRN :=** 1000:5A

X-Side Phase Overcurrent

PHASE IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50PX1P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PX1P := OFF) **50PX1D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PX1P := OFF) **50PX1TC :=**_____

PHASE IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50PX2P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PX2P := OFF) **50PX2D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PX2P := OFF) **50PX2TC :=**_____

PHASE IOC LEVEL (OFF, 0.50–96.00 A (5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50PX3P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PX3P := OFF) **50PX3D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PX3P := OFF) **50PX3TC :=**_____

X-Side Residual Overcurrent

RES IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50GX1P :=**_____

RES IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50GX1P := OFF) **50GX1D :=**_____

RES IOC TRQCTRL (SELOGIC) (Hidden if 50GX1P := OFF) **50GX1TC :=**_____

RES IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50GX2P :=**_____

RES IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50GX2P := OFF) **50GX2D :=**_____

RES IOC TRQCTRL (SELOGIC) (Hidden if 50GX2P := OFF) **50GX2TC :=**_____

X-Side Negative-Sequence Overcurrent

NSEQ IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50QX1P :=**_____

NSEQ IOC DELAY (OFF, 0.10–400.00 s) (Hidden if 50QX1P := OFF) **50QX1D :=**_____

NSEQ IOC TRQCTRL (SELOGIC) (Hidden if 50QX1P := OFF) **50QX1TC :=**_____

NSEQ IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{XNOM}], 0.10–19.20 A [1 A I_{XNOM}]) **50QX2P :=**_____

NSEQ IOC DELAY (OFF, 0.10–400.00 s) (Hidden if 50QX2P := OFF) **50QX2D :=**_____

NSEQ IOC TRQCTRL (SELOGIC) (Hidden if 50QX2P := OFF) **50QX2TC :=**_____

X-Side Phase Time-Overcurrent

PHASE TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}]) **51PXP :=**_____

PHASE TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) (Hidden if 51PXP := OFF) **51PXC :=**_____

PHASE TOC TDIAL (0.50–15.00 [if 51P_C := U_], 0.05–1.00 [if 51P_C := C_]) (Hidden if 51PXP := OFF) **51PXTD :=**_____

EM RESET DELAY (Y, N) (Hidden if 51PXP := OFF) **51PXRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51PXP := OFF) **51PXCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51PXP := OFF) **51PXMR :=**_____

PH TOC TRQCTRL (SELOGIC) (Hidden if 51PXP := OFF) **51PXTC :=**_____

X-Side Residual Time-Overcurrent

RES TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}]) **51GXP :=**_____

RES TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) (Hidden if 51GXP := OFF) **51GXC :=**_____

RES TOC TDIAL (0.50–15.00 [if 51G_C := U_], 0.05–1.00 [if 51G_C := C_]) (Hidden if 51GXP := OFF) **51GXTD :=**_____

EM RESET DELAY (Y, N) (Hidden if 51GXP := OFF) **51GXRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51GXP := OFF) **51GXCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51GXP := OFF) **51GXMR :=**_____

RES TOC TRQCTRL (SELOGIC) (Hidden if 51GXP := OFF) **51GXTC :=**_____

X-Side Negative-Sequence Time-Overcurrent

NSEQ TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}]) **51QXP :=**_____

NSEQ TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) (Hidden if 51QXP := OFF) **51QXC :=**_____

NSEQ TOC TDIAL (0.50–15.00 [if 51Q_C := U_], 0.05–1.00 [if 51Q_C := C_]) (Hidden if 51QXP := OFF) **51QXTD :=**_____

EM RESET DELAY (Y, N) (Hidden if 51QXP := OFF) **51QXRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51QXP := OFF) **51QXCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51QXP := OFF) **51QXMR :=**_____

NSEQ TOC TRQCTRL (SELOGIC) (Hidden if 51QXP := OFF) **51QXTC :=**_____

Y-Side Phase Overcurrent

PHASE IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50PY1P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PY1P := OFF) **50PY1D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PY1P := OFF) **50PY1TC :=**_____

PHASE IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50PY2P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PY2P := OFF) **50PY2D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PY2P := OFF) **50PY2TC :=**_____

PHASE IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50PY3P :=**_____

PHASE IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50PY3P := OFF) **50PY3D :=**_____

PH IOC TRQCTRL (SELOGIC) (Hidden if 50PY3P := OFF) **50PY3TC :=**_____

Y-Side Residual Overcurrent

RES IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50GY1P :=**_____

RES IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50GY1P := OFF) **50GY1D :=**_____

RES IOC TRQCTRL (SELOGIC) (Hidden if 50GY1P := OFF) **50GY1TC :=**_____

RES IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50GY2P :=**_____

RES IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50GY2P := OFF) **50GY2D :=**_____

RES IOC TRQCTRL (SELOGIC) (Hidden if 50GY2P := OFF) **50GY2TC :=**_____

Y-Side Negative-Sequence Overcurrent

NSEQ IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50QY1P :=**_____

NSEQ IOC DELAY (OFF, 0.10–400.00 s) (Hidden if 50QY1P := OFF) **50QY1D :=**_____

NSEQ IOC TRQCTRL (SELOGIC) (Hidden if 50QY1P := OFF) **50QY1TC :=**_____

NSEQ IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{YNOM}], 0.10–19.20 A [1 A I_{YNOM}]) **50QY2P :=**_____

NSEQ IOC DELAY (OFF, 0.10–400.00 s) (Hidden if 50QY2P := OFF) **50QY2D :=**_____

NSEQ IOC TRQCTRL (SELOGIC) (Hidden if 50QY2P := OFF) **50QY2TC :=**_____

Y-Side Phase Time-Overcurrent

PHASE TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{YNOM}], 0.10–3.20 A [1 A I_{YNOM}]) **51PYP :=**_____

PHASE TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) (Hidden if 51PYP := OFF) **51PYC :=**_____

PHASE TOC TDIAL (0.50–15.00 [if 51P_C := U_], 0.05–1.00 [if 51P_C := C_]) (Hidden if 51PYP := OFF) **51PYTD :=**_____

EM RESET DELAY (Y, N) (Hidden if 51PYP := OFF) **51PYRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51PYP := OFF) **51PYCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51PYP := OFF) **51PYMR :=**_____

PH TOC TRQCTRL (SELOGIC) (Hidden if 51PYP := OFF) **51PYTC :=**_____

Y-Side Residual Time-Overcurrent

RES TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{YNOM}], 0.10–3.20 A [1 A I_{YNOM}]) **51GYP :=**_____

RES TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) (Hidden if 51GYP := OFF) **51GYC :=**_____

RES TOC TDIAL (0.50–15.00 [if 51G_C := U_], 0.05–1.00 [if 51G_C := C_]) (Hidden if 51GYP := OFF) **51GYTD :=**_____

EM RESET DELAY (Y, N) (Hidden if 51GYP := OFF) **51GYRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51GYP := OFF) **51GYCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51GYP := OFF) **51GYMR :=**_____

RES TOC TRQCTRL (SELOGIC) (Hidden if 51GYP := OFF) **51GYTC :=**_____

Y-Side Negative-Sequence Time-Overcurrent

NSEQ TOC LEVEL (OFF, 0.50 to 16.00 A [5 A I_{YNOM}], 0.10 to 3.20 A [1 A I_{YNOM}]) **51QYP :=**_____

NSEQ TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) **51QYC :=**_____
(Hidden if 51QYP := OFF)

NSEQ TOC TDIAL (0.50 to 15.00 [if 51Q_C := U_], 0.05 to 1.00 [if 51Q_C := C_]) **51QYTD :=**_____
(Hidden if 51QYP := OFF)

EM RESET DELAY (Y, N) (Hidden if 51QYP := OFF) **51QYRS :=**_____

CONST TIME ADDER (0.00 to 1.00 s) (Hidden if 51QYP := OFF) **51QYCT :=**_____

MIN RESPONSE TIM (0.00 to 1.00 s) (Hidden if 51QYP := OFF) **51QYMR :=**_____

NSEQ TOC TRQCTRL (SELOGIC) (Hidden if 51QYP := OFF) **51QYTC :=**_____

Neutral Overcurrent

NEUT IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{NNOM}], 0.10–19.20 A [1 A I_{NNOM}]) **50N1P :=**_____

NEUT IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50N1P := OFF) **50N1D :=**_____

NEUT IOC TRQCTRL (SELOGIC) (Hidden if 50N1P := OFF) **50N1TC :=**_____

NEUT IOC LEVEL (OFF, 0.50–96.00 A [5 A I_{NNOM}], 0.10–19.20 A [1 A I_{NNOM}]) **50N2P :=**_____

NEUT IOC DELAY (OFF, 0.00–400.00 s) (Hidden if 50N2P := OFF) **50N2D :=**_____

NEUT IOC TRQCTRL (SELOGIC) (Hidden if 50N2P := OFF) **50N2TC :=**_____

Neutral Time-Overcurrent

NEUT TOC LEVEL (OFF, 0.50–16.00 A [5 A I_{NNOM}], 0.10–3.20 A [1 A I_{NNOM}]) **51NP :=**_____

NEUT TOC CURVE (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5) **51NC :=**_____
(Hidden if 51NP := OFF)

NEUT TOC TDIAL (0.50–15.00 [if 51N_C := U_], 0.05–1.00 [if 51N_C := C_]) **51NTD :=**_____
(Hidden if 51NP := OFF)

EM RESET DELAY (Y, N) (Hidden if 51NP := OFF) **51NRS :=**_____

CONST TIME ADDER (0.00–1.00 s) (Hidden if 51NP := OFF) **51NCT :=**_____

MIN RESPONSE TIM (0.00–1.00 s) (Hidden if 51NP := OFF) **51NMR :=**_____

NEUT TOC TRQCTRL (SELOGIC) (Hidden if 51NP := OFF) **51NTC :=**_____

Y-Side Directional Elements

DIR CONTROL ENBL (Y, AUTO, N) **EDIRY :=**_____

(All Y-Side Directional Elements settings are hidden if EDIRY := N)

FWD DIR ON LOP (Y, N) **EFWDLOPY:=**_____

POS SQ LN Z MAG (0.10–510.00 ohm [5 A I_{YNOM}], 0.50–2550.00 ohm [1 A I_{YNOM}]) **Z1MAGY :=**_____

POS SQ LN Z ANG (50.00–90.00°) **Z1ANGY :=**_____

ZERO SQ LN Z MAG (0.10–510.00 ohm [5 A I_{YNOM}], 0.50–2550.00 ohm [1 A I_{YNOM}]) **Z0MAGY :=**_____

ZERO SQ LN Z ANG (50.00–90.00°) **Z0ANGY :=**_____

DIR CONTROL LVL1 (F, R, N) **DIR1Y :=**_____

DIR CONTROL LVL2 (F, R, N) **DIR2Y :=**_____

GND DIR PRIORITY (I, V, Q, IV, VI, QV, VQ, IQ, QI, IVQ, IQV, VQI, VIQ, QIV, QVI, OFF) (V is hidden if DELTAY_Y := DELTA) **ORDERY :=**_____

PH DIR 3PH LVL (0.50–10.00 A [5 A I_{YNOM}], 0.10–2.00 A [1 A I_{YNOM}]) (Hidden if ELOADY:=Y) **50PDIRPY :=**_____

FWD DIR Z2 LVL (–128.00 to 128.00 ohm [5 A I_{YNOM}], –640.00 to 640.00 ohm [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO) **Z2FY :=**_____

REV DIR Z2 LVL (–128.00 to 128.00 ohm [5 A I_{YNOM}], –640.00 to 640.00 ohm [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO) **Z2RY :=**_____

FWD DIR NSEQ LVL (0.25–5.00 A [5 A I_{YNOM}], 0.05–1.00 A [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO) **50QFPY :=**_____

REV DIR NSEQ LVL (0.25–5.00 A [5 A I_{YNOM}], 0.05–1.00 A [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO) **50QRPY :=**_____

I1 RST FAC I2/I1 (0.02–0.50) (Hidden if EDIRY := AUTO) **a2Y :=**_____

I0 RST FAC I2/I0 (0.10–1.20) (Hidden if EDIRY := AUTO) **k2Y :=**_____

FWD DIR RES LVL (0.05–5.00 A [5 A I_{YNOM}], 0.01–1.00 A [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO or ORDERY does not contain V or I when EDIRY := Y) **50GFPY :=**_____

REV DIR RES LVL (0.05–5.00 A [5 A I_{YNOM}], 0.01–1.00 A [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO or ORDERY does not contain V or I when EDIRY := Y) **50GRPY :=**_____

I1 RST FAC I0/I1 (0.02–0.50) (Hidden if EDIRY := AUTO or ORDERY does not contain V or I when EDIRY := Y) **a0Y :=**_____

FWD DIR Z0 LVL (–128.00 to 128.00 ohm [5 A I_{YNOM}], –640.00 to 640.00 ohm [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO or ORDERY does not contain V when EDIRY := Y) **Z0FY :=**_____

REV DIR Z0 LVL (–128.00 to 128.00 ohm [5 A I_{YNOM}], –640.00 to 640.00 ohm [1 A I_{YNOM}]) (Hidden if EDIRY := AUTO or ORDERY does not contain V when EDIRY := Y) **Z0RY :=**_____

ZRO SQ MX TQ ANG (–90.00 to 90.00°) (Hidden if EDIRY := AUTO or ORDERY does not contain V when EDIRY := Y) **Z0MTAY :=**_____

X-Side Frequency Elements

ENABLE 81X (N, 1–6) **E81X:=**_____

(All X-Side Frequency Elements settings are hidden if E81X := N)

FREQX TRIP1 LVL (OFF, 15.00–70.00 Hz) **81X1TP :=**_____

FREQX TRIP1 DLY (0.00–400.00 s) (Hidden if 81X1TP := OFF) **81X1TD :=**_____

FREQX TRIP2 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81X < 2) **81X2TP :=**_____

FREQX TRIP2 DLY (0.00–400.00 s) (Hidden if 81X2TP := OFF) **81X2TD :=**_____

FREQX TRIP3 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81X < 3) **81X3TP :=**_____

FREQX TRIP3 DLY (0.00–400.00 s) (Hidden if 81X3TP := OFF) **81X3TD :=**_____

FREQX TRIP4 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81X < 4) **81X4TP :=**_____

FREQX TRIP4 DLY (0.00–400.00 s) (Hidden if 81X4TP := OFF) **81X4TD :=**_____

FREQX TRIP5 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81X < 5) **81X5TP :=**_____

FREQX TRIP5 DLY (0.00–400.00 s) (Hidden if 81X5TP := OFF) **81X5TD :=**_____

FREQX TRIP6 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81X < 6) **81X6TP :=**_____

FREQX TRIP6 DLY (0.00–400.00 s) (Hidden if 81X6TP := OFF) **81X6TD :=**_____

FREQX TRQCTL (SELOGIC) **81XTC :=**_____

Y-Side Frequency Elements

ENABLE 81Y (N, 1—6) **E81Y:=**_____

(All Y-Side Frequency Elements settings are hidden if E81Y := N)

FREQY TRIP1 LVL (OFF, 15.00–70.00 Hz) **81Y1TP :=**_____

FREQY TRIP1 DLY (0.00–400.00 s) (Hidden if 81Y1TP := OFF) **81Y1TD :=**_____

FREQY TRIP2 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81Y < 2) **81Y2TP :=**_____

FREQY TRIP2 DLY (0.00–400.00 s) (Hidden if 81Y2TP := OFF) **81Y2TD :=**_____

FREQY TRIP3 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81Y < 3) **81Y3TP :=**_____

FREQY TRIP3 DLY (0.00–400.00 s) (Hidden if 81Y3TP := OFF) **81Y3TD :=**_____

FREQY TRIP4 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81Y < 4) **81Y4TP :=**_____

FREQY TRIP4 DLY (0.00–400.00 s) (Hidden if 81Y4TP := OFF) **81Y4TD :=**_____

FREQY TRIP5 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81Y < 5) **81Y5TP :=**_____

FREQY TRIP5 DLY (0.00–400.00 s) (Hidden if 81Y5TP := OFF) **81Y5TD :=**_____

FREQY TRIP6 LVL (OFF, 15.00–70.00 Hz) (Hidden if E81Y < 6) **81Y6TP :=**_____

FREQY TRIP6 DLY (0.00–400.00 s) (Hidden if 81Y6TP := OFF) **81Y6TD :=**_____

FREQY TRQCTL (SELOGIC) **81YTC :=**_____

X-Side Rate-of-Change-of-Frequency Elements

ENABLE 81RX (N, 1–4) **E81RX :=**_____

(All X-Side Rate-of-Change-of-Frequency Elements settings are hidden if E81RX := N)

FREQX ROC LEVEL (OFF, 0.10–15.00 Hz/s) **81RX1TP :=**_____

FREQX ROC TREND (INC, DEC, ABS) (Hidden if 81RX1TP := OFF) **81RX1TRN :=**_____

FREQX ROC PU DLY (0.10–60.00 s) (Hidden if 81RX1TP := OFF) **81RX1TD :=**_____

FREQX ROC DO DLY (0.00–60.00 s) (Hidden if 81RX1TP := OFF) **81RX1DO :=**_____

FREQX ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RX < 2) **81RX2TP :=**_____

FREQX ROC TREND (INC, DEC, ABS) (Hidden if 81RX2TP := OFF) **81RX2TRN :=**_____

FREQX ROC PU DLY (0.10–60.00 s) (Hidden if 81RX2TP := OFF) **81RX2TD :=**_____

FREQX ROC DO DLY (0.00–60.00 s) (Hidden if 81RX2TP := OFF) **81RX2DO :=**_____

FREQX ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RX < 3) **81RX3TP :=**_____

FREQX ROC TREND (INC, DEC, ABS) (Hidden if 81RX3TP := OFF) **81RX3TRN :=**_____

FREQX ROC PU DLY (0.10–60.00 s) (Hidden if 81RX3TP := OFF) **81RX3TD :=**_____

FREQX ROC DO DLY (0.00–60.00 s) (Hidden if 81RX3TP := OFF) **81RX3DO :=**_____

FREQX ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RX < 4) **81RX4TP :=**_____

FREQX ROC TREND (INC, DEC, ABS) (Hidden if 81RX4TP := OFF) **81RX4TRN :=**_____

FREQX ROC PU DLY (0.10–60.00 s) (Hidden if 81RX4TP := OFF) **81RX4TD :=**_____

FREQX ROC DO DLY (0.00–60.00 s) (Hidden if 81RX4TP := OFF) **81RX4DO :=**_____

FREQX ROC VSUPER (OFF, 12.5–300.0 V) **81RXVSUP :=**_____

FREQX ROC TRQCTRL (SELOGIC) **81RXTC :=**_____

Y-Side Rate-of-Change-of-Frequency Elements

ENABLE 81RY (N, 1–4) **E81RY :=**_____

(All Y-Side Rate-of-Change-of-Frequency settings are hidden if E81RY := N)

FREQY ROC LEVEL (OFF, 0.10–15.00 Hz/s) **81RY1TP :=**_____

FREQY ROC TREND (INC, DEC, ABS) (Hidden if 81RY1TP := OFF) **81RY1TRN :=**_____

FREQY ROC PU DLY (0.10–60.00 s) (Hidden if 81RY1TP := OFF) **81RY1TD :=**_____

FREQY ROC DO DLY (0.00–60.00 s) (Hidden if 81RY1TP := OFF) **81RY1DO :=**_____

FREQY ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RY < 2) **81RY2TP :=**_____

FREQY ROC TREND (INC, DEC, ABS) (Hidden if 81RY2TP := OFF) **81RY2TRN :=**_____

FREQY ROC PU DLY (0.10–60.00 s) (Hidden if 81RY2TP := OFF) **81RY2TD :=**_____

FREQY ROC DO DLY (0.00–60.00 s) (Hidden if 81RY2TP := OFF) **81RY2DO :=**_____

FREQY ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RY < 3) **81RY3TP :=**_____

FREQY ROC TREND (INC, DEC, ABS) (Hidden if 81RY3TP := OFF) **81RY3TRN :=**_____

FREQY ROC PU DLY (0.10–60.00 s) (Hidden if 81RY3TP := OFF) **81RY3TD :=**_____

FREQY ROC DO DLY (0.00–60.00 s) (Hidden if 81RY3TP := OFF) **81RY3DO :=**_____

FREQY ROC LEVEL (OFF, 0.10–15.00 Hz/s) (Hidden if E81RY < 4) **81RY4TP :=**_____

FREQY ROC TREND (INC, DEC, ABS) (Hidden if 81RY4TP := OFF) **81RY4TRN :=**_____

FREQY ROC PU DLY (0.10–60.00 s) (Hidden if 81RY4TP := OFF) **81RY4TD :=**_____

FREQY ROC DO DLY (0.00–60.00 s) (Hidden if 81RY4TP := OFF) **81RY4DO :=**_____

FREQY ROC VSUPER (OFF, 12.5–300.0 V) **81RYVSUP :=**_____

FREQY ROC TRQCTRL (SELOGIC) **81RYTC :=**_____

Loss of Potential

LOPX BLOCK (SELOGIC) **LOPBLKX :=**_____

LOPY BLOCK (SELOGIC) **LOPBLKY :=**_____

X-Side Phase Undervoltage Elements

PHASE UV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_X = DELTA) **27PX1P :=**_____

PHASE UV DELAY (0.00–120.00 s) (Hidden if 27PX1P := OFF) (Hidden if DELTAY_X = DELTA) **27PX1D :=**_____

PHASE UV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_X = DELTA) **27PX2P :=**_____

PHASE UV DELAY (0.00–120.00 s) (Hidden if 27PX2P := OFF) (Hidden if DELTAY_X = DELTA) **27PX2D :=**_____

PH_PH UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = DELTA] or 2.0–520.0 V [DELTAY_X = WYE]) **27PPX1P :=**_____

PH_PH UV DELAY (0.00–120.00 s) (Hidden if 27PPX1P := OFF) **27PPX1D :=**_____

PH_PH UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = DELTA] or 2.0–520.0 V [DELTAY_X = WYE]) **27PPX2P :=** _____

PH_PH UV DELAY (0.00–120.00 s) (Hidden if 27PPX2P := OFF) **27PPX2D :=** _____

Y-Side Phase Undervoltage Elements

PHASE UV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_Y = DELTA) **27PY1P :=** _____

PHASE UV DELAY (0.00–120.00 s) (Hidden if 27PY1P := OFF) (Hidden if DELTAY_Y = DELTA) **27PY1D :=** _____

PHASE UV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_Y = DELTA) **27PY2P :=** _____

PHASE UV DELAY (0.00–120.00 s) (Hidden if 27PY2P := OFF) (Hidden if DELTAY_Y = DELTA) **27PY2D :=** _____

PH_PH UV LEVEL (OFF, 2.0–300.0 V [DELTAY_Y = DELTA] or 2.0–520.0 V [DELTAY_Y = WYE]) **27PPY1P :=** _____

PH_PH UV DELAY (0.00–120.00 s) (Hidden if 27PPY1P := OFF) **27PPY1D :=** _____

PH_PH UV LEVEL (OFF, 2.0–300.0 V [DELTAY_Y = DELTA] or 2.0–520.0 V [DELTAY_Y = WYE]) **27PPY2P :=** _____

PH_PH UV DELAY (0.00–120.00 s) (Hidden if 27PPY2P := OFF) **27PPY2D :=** _____

X-Side Phase Overvoltage Elements

PHASE OV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_X = DELTA) **59PX1P :=** _____

PHASE OV DELAY (0.00–120.00 s) (Hidden if 59PX1P := OFF) (Hidden if DELTAY_X = DELTA) **59PX1D :=** _____

PHASE OV LEVEL (OFF, 2.0–300.0 V) (Hidden if DELTAY_X = DELTA) **59PX2P :=** _____

PHASE OV DELAY (0.00–120.00 s) (Hidden if 59PX2P := OFF) (Hidden if DELTAY_X = DELTA) **59PX2D :=** _____

PH_PH OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = DELTA]; 2.0–520.0 V [DELTAY_X = WYE]) **59PPX1P :=** _____

PH_PH OV DELAY (0.00–120.00 s) (Hidden if 59PPX1P := OFF) **59PPX1D :=** _____

PH_PH OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = DELTA]; 2.0–520.0 V [DELTAY_X = WYE]) **59PPX2P :=** _____

PH_PH OV DELAY (0.00–120.00 s) (Hidden if 59PPX2P := OFF) **59PPX2D :=** _____

Y-Side Phase Overvoltage Elements

PHASE OV LEVEL (OFF, 2.0–300.0 V) **59PY1P :=** _____

PHASE OV DELAY (0.00–120.00 s) (Hidden if 59PY1P := OFF) **59PY1D :=** _____

PHASE OV LEVEL (OFF, 2.0–300.0 V) **59PY2P :=** _____

PHASE OV DELAY (0.00–120.00 s) (Hidden if 59PY2P := OFF) **59PY2D :=** _____

PH_PH OV LEVEL (OFF, 2.0–300.0 V [DELTAY_Y = DELTA] or 2.0–520.0 V [DELTAY_Y = WYE]) **59PPY1P :=** _____

PH_PH OV DELAY (0.00–120.00 s) (Hidden if 59PPY1P := OFF) **59PPY1D :=** _____

PH_PH OV LEVEL (OFF, 2.0–300.0 V [DELTAY_Y = DELTA] or 2.0–520.0 V [DELTAY_Y = WYE]) **59PPY2P :=** _____

PH_PH OV DELAY (0.00–120.00 s) (Hidden if 59PPY2P := OFF) **59PPY2D :=** _____

X-Side Positive-Sequence Under/Overvoltage Elements

ENABLE P-SEQ UV (N, 1–6) **E27V1X :=** _____

(All P-SEQ UV settings are hidden if E27V1X := N) _____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) **27V1X1P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X1P := OFF) **27V1X1D :=**_____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E27V1X <2) **27V1X2P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X2P := OFF) (Hidden if E27V1X <2) **27V1X2D :=**_____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E27V1X <3) **27V1X3P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X3P := OFF) (Hidden if E27V1X <3) **27V1X3D :=**_____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E27V1X <4) **27V1X4P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X4P := OFF) (Hidden if E27V1X <4) **27V1X4D :=**_____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E27V1X <5) **27V1X5P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X5P := OFF) (Hidden if E27V1X <5) **27V1X5D :=**_____

POS SEQ UV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E27V1X <6) **27V1X6P :=**_____

POS SEQ UV DELAY (0.00–120.00 s) (Hidden if 27V1X6P := OFF) (Hidden if E27V1X <6) **27V1X6D :=**_____

ENABLE P-SEQ OV (N, 1–6) **E59V1X :=**_____

(All P-SEQ OV settings are hidden if E59V1X := N)

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) **59V1X1P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X1P := OFF) **59V1X1D :=**_____

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E59V1X <2) **59V1X2P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X2P := OFF) (Hidden if E59V1X <2) **59V1X2D :=**_____

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E59V1X <3) **59V1X3P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X3P := OFF) (Hidden if E59V1X <3) **59V1X3D :=**_____

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E59V1X <4) **59V1X4P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X4P := OFF) (Hidden if E59V1X <4) **59V1X4D :=**_____

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E59V1X <5) **59V1X5P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X5P := OFF) (Hidden if E59V1X <5) **59V1X5D :=**_____

POS SEQ OV LEVEL (OFF, 2.0–300.0 V [DELTAY_X = WYE]; 2.0–170.0 V [DELTAY_X = DELTA]) (Hidden if E59V1X <6) **59V1X6P :=**_____

POS SEQ OV DELAY (0.00–120.00 s) (Hidden if 59V1X6P := OFF) (Hidden if E59V1X <6) **59V1X6D :=**_____

X-Side Negative-Sequence Overvoltage Elements

NSEQ OV LEVEL (OFF, 2.0–200.0 V) **59QX1P :=**_____

NSEQ OV DELAY (0.00–120.00 s) (Hidden if 59QX1P := OFF) **59QX1D :=**_____

NSEQ OV LEVEL (OFF, 2.0–200.0 V) **59QX2P :=**_____

NSEQ OV DELAY (0.00–120.00 s) (Hidden if 59QX2P := OFF) **59QX2D :=**_____

Y-Side Negative-Sequence Overvoltage Elements

NSEQ OV LEVEL (OFF, 2.0–200.0 V) **59QY1P :=**_____

NSEQ OV DELAY (0.00–120.00 s) (Hidden if 59QY1P := OFF) **59QY1D :=**_____

NSEQ OV LEVEL (OFF, 2.0–200.0 V) **59QY2P :=**_____

NSEQ OV DELAY (0.00–120.00 s) (Hidden if 59QY2P := OFF) **59QY2D :=**_____

X-Side Zero-Sequence Overvoltage Elements (Hidden if DELTAY_X=DELTA)

GND OV LEVEL (OFF, 2.0–200.0 V) **59GX1P :=**_____

GND OV DELAY (0.00–120.00 s) (Hidden if 59GX1P := OFF) **59GX1D :=**_____

GND OV LEVEL (OFF, 2.0–200.0 V) **59GX2P :=**_____

GND OV DELAY (0.00–120.00 s) (Hidden if 59GX2P := OFF) **59GX2D :=**_____

Y-Side Zero-Sequence Overvoltage Elements (Hidden if DELTAY_Y = DELTA)

GND OV LEVEL (OFF, 2.0–200.0 V) **59GY1P :=**_____

GND OV DELAY (0.00–120.00 s) (Hidden if 59GY1P := OFF) **59GY1D :=**_____

GND OV LEVEL (OFF, 2.0–200.0 V) **59GY2P :=**_____

GND OV DELAY (0.00–120.00 s) (Hidden if 59GY2P := OFF) **59GY2D :=**_____

Synchronism Over- and Undervoltage Elements

SYNC PH UV LEVEL (OFF, 2.0–300.0 V) **27S1P :=**_____

SYNC PH UV DELAY (0.00–120.00 s) (Hidden if 27S1P := OFF) **27S1D :=**_____

SYNC PH UV LEVEL (OFF, 2.0–300.0 V) **27S2P :=**_____

SYNC PH UV DELAY (0.00–120.00 s) (Hidden if 27S2P := OFF) **27S2D :=**_____

SYNC PH OV LEVEL (OFF, 2.0–300.0 V) **59S1P :=**_____

SYNC PH OV DELAY (0.00–120.00 s) (Hidden if 59S1P := OFF) **59S1D :=**_____

SYNC PH OV LEVEL (OFF, 2.0–300.0 V) **59S2P :=**_____

SYNC PH OV DELAY (0.00–120.00 s) (Hidden if 59S2P := OFF) **59S2D :=**_____

27 Inverse-Time Undervoltage

27I ENABLE (Y, N) **E27I1 :=**_____

(The following 27I1 inverse-time undervoltage settings are hidden if E27I1 := N)

OPERATING QTY
See Table SET.1 for range dependencies. **27I1OQ :=**_____

Table SET.1 Range Dependencies for 27I Operating Quantities

Settings	Operating Quantities Available in 27InOQ Range									
DELTAY_m	VABm	VBCm	VCAm	VAm	VBm	VCm	VS	V1m	MINLLm	MINLNm
DELTA	#	#	#	—	—	—	#	#	#	—
WYE	$	$	$	#	#	#	#	#	$	#

= 2.00–300.00 V $ = 2.00–520.00 V — Operating quantity is not available

The "#" and "$" signs indicate the setting range for 27InP (n = 1 or 2). m = X and/or Y

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.1*) **27I1P :=**_____

CURVE (CURVEA, CURVEB, COEF) **27I1CRV :=**_____

COEFF A (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I1CFA :=**_____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I1CFB :=**_____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I1CFC :=**_____

TIME DIAL (0.00–16.00) **27I1TD :=**_____

RESET TIME (0.00–1.00 s) **27I1TTR :=**_____

TRQ CONTROL (SELOGIC) **27I1TC :=**_____

27I ENABLE (Y, N) **E27I2 :=**_____

(The following 27I2 settings are hidden if E27I2 := N)

OPERATING QTY
See Table SET.1 for range dependencies. **27I2OQ :=**_____

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.1*) **27I2P :=**_____

CURVE (CURVEA, CURVEB, COEF) **27I2CRV :=**_____

COEFF A (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I2CFA :=**_____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I2CFB :=**_____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **27I2CFC :=**_____

TIME DIAL (0.00–16.00) **27I2TD :=**_____

RESET TIME (0.00–1.00 s) **27I2TTR :=**_____

TRQ CONTROL (SELOGIC) **27I2TC :=**_____

59 Inverse-Time Overvoltage

59I ENABLE (Y, N) **E59I1 :=**_____

(The following 59I1 inverse-time overvoltage settings are hidden if E59I1 := N)

OPERATING QTY
See Table SET.2 for range dependencies. **59I1OQ :=**_____

Table SET.2 Range Dependencies for 59I Operating Quantities

Settings	Operating Quantities Available in 59InOQ Setting Range												
DELTAY_m	VABm	VBCm	VCAm	VN	VAm	VBm	VCm	VS	VGm	V1m	3V2m	MAXLLm	MAXLNm
DELTA	#	#	#	#	—	—	—	#	—	#	#	#	—
WYE	$	$	$	#	#	#	#	#	#	#	#	$	#

= 2.00–300.00 V $ = 2.00–520.00 V — Operating quantity is not available

The "#" and "$" signs indicate the setting range for 59InP (n = 1, 2, 3, or 4). m = X and/or Y

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.2*) **59I1P :=** _____

CURVE (CURVEA, CURVEB, COEF) **59I1CR :=** _____

COEFF A (0.00–6.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I1CFA :=** _____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I1CFB :=** _____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I1CFC :=** _____

TIME DIAL (0.00–16.00) **59I1TD :=** _____

RESET TIME (0.00–1.00 s) **59I1TTR :=** _____

TRQ CONTROL (SELOGIC) **59I1TC :=** _____

59I ENABLE (Y, N) **E59I2 :=** _____

(The following 59I2 settings are hidden if E59I2 := N)

OPERATING QTY **59I2OQ :=** _____
See Table SET.2 for range dependencies.

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.2*) **59I2P :=** _____

CURVE (CURVEA, CURVEB, COEF) **59I2CRV :=** _____

COEFF A (0.00–6.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I2CFA :=** _____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I2CFB :=** _____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I2CFC :=** _____

TIME DIAL (0.00–16.00) **59I2TD :=** _____

RESET TIME (0.00–1.00 s) **59I2TTR :=** _____

TRQ CONTROL (SELOGIC) **59I2TC :=** _____

59I ENABLE (Y, N) **E59I3 :=** _____

(The following 59I3 settings are hidden if E59I3 := N)

OPERATING QTY **59I3OQ :=** _____
See Table SET.2 for range dependencies.

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.2*) **59I3P :=** _____

CURVE (CURVEA, CURVEB, COEF) **59I3CRV :=** _____

COEFF A (0.00–6.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I3CFA :=** _____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I3CFB :=** _____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I3CFC :=** _____

TIME DIAL (0.00–16.00) **59I3TD :=** _____

RESET TIME (0.00–1.00 s) **59I3TTR :=** _____

TRQ CONTROL **59I3TC :=** _____

59I ENABLE (Y, N) **E59I4 :=** _____

(The following 59I4 settings are hidden if E59I4 := N)

OPERATING QTY **59I4OQ :=** _____
See Table SET.2 for range dependencies.

PICKUP LVL (2.00–300.00 V or 2.00–520.00 V from *Table SET.2*) **59I4P :=** _____

CURVE (CURVEA, CURVEB, COEF) **59I4CRV :=** _____

COEFF A (0.00–6.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I4CFA :=** _____

COEFF B (0.00–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I4CFB :=** _____

COEFF C (0.01–3.00) *(Hidden if CURVE is set to CURVEA or CURVEB)* **59I4CFC :=** _____

TIME DIAL (0.00–16.00) **59I4TD :=** _____

RESET TIME (0.00–1.00 s) **59I4TTR :=**_____

TRQ CONTROL (SELOGIC) **59I4TC :=**_____

RTD Settings

RTD ENABLE (INT, EXT, NONE) **E49RTD :=**_____

(All RTD settings are hidden if E49RTD := NONE)

RTD1 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD1LOC :=**_____

RTD1 IDENTIFIER (10 Characters) (Hidden unless RTD1LOC:= OTH) **RTD1NAM :=**_____

RTD1 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD1LOC := OFF) **RTD1TY :=**_____

RTD1 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD1LOC := OFF) **TRTMP1 :=**_____

RTD1 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD1LOC := OFF) **ALTMP1 :=**_____

RTD2 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD2LOC :=**_____

RTD2 IDENTIFIER (10 Characters) (Hidden unless RTD2LOC:= OTH) **RTD2NAM :=**_____

RTD2 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD2LOC := OFF) **RTD2TY :=**_____

RTD2 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD2LOC := OFF) **TRTMP2 :=**_____

RTD2 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD2LOC := OFF) **ALTMP2 :=**_____

RTD3 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD3LOC :=**_____

RTD3 IDENTIFIER (10 Characters) (Hidden unless RTD3LOC := OTH) **RTD3NAM :=**_____

RTD3 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD3LOC := OFF) **RTD3TY :=**_____

RTD3 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD3LOC := OFF) **TRTMP3 :=**_____

RTD3 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD3LOC := OFF) **ALTMP3 :=**_____

RTD4 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD4LOC :=**_____

RTD4 IDENTIFIER (10 Characters) (Hidden unless RTD4LOC:= OTH) **RTD4NAM :=**_____

RTD4 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD4LOC := OFF) **RTD4TY :=**_____

RTD4 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD4LOC := OFF) **TRTMP4 :=**_____

RTD4 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD4LOC := OFF) **ALTMP4 :=**_____

RTD5 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD5LOC :=**_____

RTD5 IDENTIFIER (10 Characters) (Hidden unless RTD5LOC:= OTH) **RTD5NAM :=**_____

RTD5 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD5LOC := OFF) **RTD5TY :=**_____

RTD5 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD5LOC := OFF) **TRTMP5 :=**_____

RTD5 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD5LOC := OFF) **ALTMP5 :=**_____

RTD6 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD6LOC :=**_____

RTD6 IDENTIFIER (10 Characters) (Hidden unless RTD6LOC:= OTH) **RTD6NAM :=**_____

RTD6 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD6LOC := OFF) **RTD6TY :=**_____

RTD6 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD6LOC := OFF) **TRTMP6 :=**_____

RTD6 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD6LOC := OFF) **ALTMP6 :=**_____

RTD7 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD7LOC :=**_____

RTD7 IDENTIFIER (10 Characters) (Hidden unless RTD7LOC := OTH) **RTD7NAM :=**_____

RTD7 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD7LOC := OFF) **RTD7TY :=**_____

RTD7 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD7LOC := OFF) **TRTMP7 :=**_____

RTD7 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD7LOC := OFF) **ALTMP7 :=**_____

RTD8 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD8LOC :=**_____

RTD8 IDENTIFIER (10 Characters) (Hidden unless RTD8LOC := OTH) **RTD8NAM :=**_____

RTD8 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD8LOC := OFF) **RTD8TY :=**_____

RTD8 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD8LOC := OFF) **TRTMP8 :=**_____

RTD8 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD8LOC := OFF) **ALTMP8 :=**_____

RTD9 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD9LOC :=**_____

RTD9 IDENTIFIER (10 Characters) (Hidden unless RTD9LOC := OTH) **RTD9NAM :=**_____

RTD9 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD9LOC := OFF) **RTD9TY :=**_____

RTD9 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD9LOC := OFF) **TRTMP9 :=**_____

RTD9 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD9LOC := OFF) **ALTMP9 :=**_____

RTD10 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD10LOC :=**_____

RTD10 IDENTIFIER (10 Characters) (Hidden unless RTD10LOC := OTH) **RTD10NAM :=**_____

RTD10 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD10LOC := OFF) **RTD10TY :=**_____

RTD10 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD10LOC := OFF) **TRTMP10 :=**_____

RTD10 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD10LOC := OFF) **ALTMP10 :=**_____

RTD11 LOCATION (OFF, WDG, BRG, AMB, OTH) (Hidden if E49RTD := INT) **RTD11LOC :=**_____

RTD11 IDENTIFIER (10 Characters) (Hidden unless RTD11LOC:= OTH) **RTD11NAM :=**_____

RTD11 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD11LOC := OFF or E49RTD := INT) **RTD11TY :=**_____

RTD11 TRIP LEVE (OFF, 1–250°C) (Hidden if RTD11LOC := OFF or E49RTD := INT) **TRTMP11 :=**_____

RTD11 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD11LOC := OFF or E49RTD := INT) **ALTMP11 :=**_____

RTD12 LOCATION (OFF, WDG, BRG, AMB, OTH) (Hidden if E49RTD := INT) **RTD12LOC :=**_____

RTD12 IDENTIFIER (10 Characters) (Hidden unless RTD12LOC:= OTH) **RTD12NAM :=**_____

RTD12 TYPE (PT100, NI100, NI120, CU10) (Hidden if RTD12LOC := OFF or E49RTD := INT) **RTD12TY :=**_____

RTD12 TRIP LEVEL (OFF, 1–250°C) (Hidden if RTD12LOC := OFF or E49RTD := INT) **TRTMP12 :=**_____

RTD12 WARN LEVEL (OFF, 1–250°C) (Hidden if RTD12LOC := OFF or E49RTD := INT) **ALTMP12 :=**_____

WIND TRIP VOTING (Y, N) (Hidden if less than 2 locations are WDG) **EWDGV :=**_____

BEAR TRIP VOTING (Y, N) (Hidden if less than 2 locations are BRG) **EBRGV :=**_____

TMP RTD BIASING? (Y, N) (Hidden unless one AMB and one WDG RTD enabled) **ERTDBIAS :=**_____

Vector Shift

EN VECTOR SHIFT (OFF, VX, VY) **E78VS :=**_____

The following vector shift element settings are hidden if E78VS := OFF.

VS ANGLE PU THR (2.0–30.0 deg) **78VSAPU :=**_____

VS VOLT SUPV THR (20.0–100.0%) **78VS59 :=**_____

VS BLOCK (SELOGIC) **78VSBL :=**_____

X-Side Synchronism-Check Elements

SYNC CHECK EN (Y, N)	**E25X :=**
(All X-Side Synchronism-Check Elements settings are hidden if E25X := N)	
V-WINDOW LOW (0.00–300.00 V) (25VHIX must be greater than 25VLOX)	**25VLOX :=**
V-WINDOW HIGH (0.00–300.00 V) (25VHIX must be greater than 25VLOX)	**25VHIX :=**
MAX VOLTAGE DIFF (OFF, 1.0–15.0 %)	**25VDIFX :=**
VOLT RATIO CORR (0.500–2.000)	**25RCFX :=**
GEN-VOLTAGE HIGH (Y, N)	**GENV+ :=**
MIN SLIP FREQ (–1.00 to +0.99 Hz)	**25SLO :=**
MAX SLIP FREQ (–0.99 to +1.00 Hz)	**25SHI :=**
MAX ANGLE 1 (0–80°)	**25ANG1X :=**
MAX ANGLE 2 (0–80°)	**25ANG2X :=**
TARGET CLOSE ANG (–15 to +15°)	**CANGLE :=**
SYNCP PHASE (VAX, VBX, VCX, VABX, VBCX, VCAX, 0, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VAX) (Hidden if DELTAY_X := DELTA)	**SYNCPX :=**
SYNCP PHASE (VABX, VBCX, VCAX, 0, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VABX) (Hidden if DELTAY_X := WYE)	**SYNCPX :=**
BRKR CLOSE TIME (OFF, 1–1000 ms)	**TCLOSDX :=**
CLOSE FAIL INIT (SELOGIC)	**CFI :=**
CLOSE FAIL ANGLE (OFF, 3–120°)	**CFANGLE :=**
BLK SYNC CHECK (SELOGIC)	**BSYNCHX :=**

Y-Side Synchronism-Check Elements

SYNC CHECK EN (Y, N)	**E25Y :=**
(All Y-Side Synchronism-Check Elements settings are hidden if E25Y := N.)	
V-WINDOW LOW (0.00–300.00 V)	**25VLOY :=**
V-WINDOW HIGH (0.00–300.00 V)	**25VHIY :=**
MAX VOLTAGE DIFF (OFF, 1.0–15.0 %)	**25VDIFY :=**
VOLT RATIO CORR (0.500–2.000)	**25RCFY :=**
MAX SLIP FREQ (0.05–0.5 Hz)	**25SF :=**
MAX ANGLE 1 (0–80°)	**25ANG1Y :=**
MAX ANGLE 2 (0–80°)	**25ANG2Y :=**
SYNCP PHASE (VAY, VBY, VCY, VABY, VBCY, VCAY, 0, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VAY) (Hidden if DELTAY_Y := DELTA)	**SYNCPY :=**
SYNCP PHASE (VABY, VBCY, VCAY, 0, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VABY) (Hidden if DELTAY_Y := WYE)	**SYNCPY :=**
BRKR CLOSE TIME (OFF, 1–1000 ms)	**TCLOSDY :=**
BLK SYNC CHECK (SELOGIC)	**BSYNCHY :=**

Motor Bus Transfer

ENABLE MOTOR XFER (Y, N)	**EMBT :=**_____
SYNC PHASE X (VAX, VBX, VCX, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VAX) (Hidden if DELTAY_X := DELTA)	**MBTVSX :=**_____
SYNC PHASE X (VABX, VBCX, VCAX, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VABX) (Hidden if DELTAY_X := WYE)	**MBTVSX :=**_____
SYNC PHASE Y (VAY, VBY, VCY, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VAY) (Hidden if DELTAY_Y := DELTA)	**MBTVSY :=**_____
SYNC PHASE Y (VABY, VBCY, VCAY, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330° lag VABY) (Hidden if DELTAY_Y := WYE)	**MBTVSY :=**_____
ENABLE SIM XFER (SELOGIC)	**MBTESIM :=**_____
BREAKER X N/O (SELOGIC)	**MBT52AX :=**_____
BREAKER Y N/O (SELOGIC)	**MBT52AY :=**_____
MANUAL XFR START (SELOGIC)	**MBTXST :=**_____
RESET XFER (SELOGIC)	**MBTRST :=**_____
ENABLE FAST XFER (OFF, 16–300 ms)	**MBTEFST :=**_____
FAST MOTOR LEVEL (0.00–30.00 V)	**MBTVMF :=**_____
FAST SRCX LEVEL (0.00–300.00 V)	**MBTVSXF :=**_____
FAST SRCY LEVEL (0.00–300.00 V)	**MBTVSYF :=**_____
ENABLE IPH XFER (Y, N)	**MBTEIPH :=**_____
BKX CLOSE TIME (0–100 ms)	**MBTBKCLX ;=**_____
BKY CLOSE TIME (0–100 ms)	**MBTBKCLY :=**_____
IPH SLIP LEVEL (0.0–15.0 Hz)	**MBTSLP :=**_____
IPH MOTOR LEVEL (20.00–300.00 V)	**MBTVMP :=**_____
BKR UNCERTAINTY (0–20 ms)	**MBTBKUC :=**_____
ENABLE RES XFER (Y, N)	**MBTERES :=**_____
RESIDUAL LEVEL (0.00–300.00 V)	**MBTVMR :=**_____
RESIDUAL DELAY (0.10–3000.00 s)	**MBTRESD :=**_____

Demand Metering

ENABLE DEM MTR (THM, ROL)	**EDEM :=**_____
DEM TIME CONSTNT (5, 10, 15, 30, 60 min)	**DMTC :=**_____

X-Side Demand Metering

PH CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}])	**PHDEMPX :=**_____
RES CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}])	**GNDEMPX :=**_____
3I2 CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{XNOM}], 0.10–3.20 A [1 A I_{XNOM}])	**3I2DEMPX :=**_____

Y-Side Demand Metering

PH CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{YNOM}], 0.10–3.20 A [1 A I_{YNOM}])	**PHDEMPY :=**_____
RES CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{YNOM}], 0.10–3.20 A [1 A I_{YNOM}])	**GNDEMPY :=**_____
3I2 CURR DEM LVL (OFF, 0.50–16.00 A [5 A I_{YNOM}], 0.10–3.20 A [1 A I_{YNOM}]}	**3I2DEMPY :=**_____

X-Side Pole Open Element

LOAD DETECTION (OFF, 0.25–96.00 A [5 A I_{XNOM}], 0.05–19.20 A [1 A I_{XNOM}]) **50LXP :=** _____

3POLE OPEN DELAY (0.00–1.00 s) **3POXD :=** _____

Y-Side Pole Open Element

LOAD DETECTION (OFF, 0.25–96.00 A [5 A I_{YNOM}], 0.05–19.20 A [1 A I_{YNOM}]) **50LYP :=** _____

3POLE OPEN DELAY (0.00–1.00 s) **3POYD :=** _____

Trip/Close Logic

MIN TRIP TIME (0.00–400.00 s) **TDURD :=** _____

CLOSE X FAIL DLY (0.00–400.00 s) **CFDX :=** _____

CLOSE Y FAIL DLY (0.00–400.00 s) **CFDY :=** _____

X-SIDE BRKR TRIP EQN (SELOGIC) **TRX :=** _____

GEN FIELD BRKR TRIP EQN (SELOGIC) **TR1 :=** _____

PRIME MOVER TRIP EQN (SELOGIC) **TR2 :=** _____

GEN LOCKOUT TRIP EQN (SELOGIC) **TR3 :=** _____

Y-SIDE BRKR TRIP EQN (SELOGIC) **TRY :=** _____

REMOTE TRIP EQN (SELOGIC) **REMTRIP :=** _____

UNLATCH X-SIDE TRIP (SELOGIC) **ULTRX :=** _____

UNLATCH TRIP1 (SELOGIC) **ULTR1 :=** _____

UNLATCH TRIP2 (SELOGIC) **ULTR2 :=** _____

UNLATCH TRIP3 (SELOGIC) **ULTR3 :=** _____

UNLATCH Y-SIDE TRIP (SELOGIC) **ULTRY :=** _____

BREAKER X N/O CONT (SELOGIC) **52AX :=** _____

BREAKER X N/C CONT (SELOGIC) **52BX :=** _____

CLOSE X EQUATION (SELOGIC) **CLX :=** _____

UNLATCH CLOSE X (SELOGIC) **ULCLX :=** _____

BREAKER Y N/O CONT (SELOGIC) **52AY :=** _____

BREAKER Y N/C CONT (SELOGIC) **52BY :=** _____

CLOSE Y EQUATION (SELOGIC) **CLY :=** _____

UNLATCH CLOSE Y (SELOGIC) **ULCLY :=** _____

Logic Settings (SET L Command)

SELOGIC Enables

SELOGIC LATCHES (N, 1–32) **ELAT :=** _____

SV/TIMERS (N, 1–32) **ESV :=** _____

SELOGIC COUNTERS (N, 1–32) **ESC :=** _____

MATH VARIABLES (N, 1–32) **EMV :=** _____

Latch Bits Equations

SET01 := _____

RST01 := _____

SET02 := _____

RST02 := _____

SET03 := _____

RST03 := _____

SET04 := _____

RST04 := _____

SET05 := _____

RST05 := _____

SET06 := _____

RST06 := _____

SET07 := _____

RST07 := _____

SET08 := _____

RST08 := _____

SET09 := _____

RST09 := _____

SET10 := _____

RST10 := _____

SET11 := _____

RST11 := _____

SET12 := _____

RST12 := _____

SET13 := _____

RST13 := _____

SET14 := _____

RST14 := _____

SET15 := _____

RST15 := _____

SET16 := _____

RST16 := _____

SET17 := _____

RST17 := _____

SET18 := _____

RST18 := _____

SET19 := _____

RST19 := _____

SET20 := _____

RST20 := _____

SET21 := _____

RST21 := _____

SET22 := _____

RST22 := _____

SET23 := _____

RST23 := _____

SET24 := _____

RST24 := _____

SET25 := _____

RST25 := _____

SET26 := _____

RST26 := _____

SET27 := _____

RST27 := _____

SET28 := _____

RST28 := _____

SET29 := _____

RST29 := _____

SET30 := _____

RST30 := _____

SET31 := _____

RST31 := _____

SET32 := _____

RST32 := _____

SV/Timers

SV TIMER PICKUP (0.00–3000.00 s)	**SV01PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV01DO :=** _____
SV INPUT (SELOGIC)	**SV01 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV02PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV02DO :=** _____
SV INPUT (SELOGIC)	**SV02 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV03PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV03DO :=** _____
SV INPUT (SELOGIC)	**SV03 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV04PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV04DO :=** _____
SV INPUT (SELOGIC)	**SV04 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV05PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV05DO :=** _____
SV INPUT (SELOGIC)	**SV05 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV06PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV06DO :=** _____
SV INPUT (SELOGIC)	**SV06 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV07PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV07DO :=** _____
SV INPUT (SELOGIC)	**SV07 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV08PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV08DO :=** _____
SV INPUT (SELOGIC)	**SV08 :=** _____
SV TIMER PICKUP (0.00–3000.00 s)	**SV09PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s)	**SV09DO :=** _____
SV INPUT (SELOGIC)	**SV09 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV10PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV10DO :=** _____
SV INPUT (SELOGIC) **SV10 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV11PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV11DO :=** _____
SV INPUT (SELOGIC) **SV11 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV12PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV12DO :=** _____
SV INPUT (SELOGIC) **SV12 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV13PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV13DO :=** _____
SV INPUT (SELOGIC) **SV13 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV14PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV14DO :=** _____
SV INPUT (SELOGIC) **SV14 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV15PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV15DO :=** _____
SV INPUT (SELOGIC) **SV15 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV16PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV16DO :=** _____
SV INPUT (SELOGIC) **SV16 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV17PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV17DO :=** _____
SV INPUT (SELOGIC) **SV17 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV18PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV18DO :=** _____
SV INPUT (SELOGIC) **SV18 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV19PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV19DO :=** _____
SV INPUT (SELOGIC) **SV19 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV20PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV20DO :=** _____
SV INPUT (SELOGIC) **SV20 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV21PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV21DO :=** _____
SV INPUT (SELOGIC) **SV21 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV22PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV22DO :=** _____
SV INPUT (SELOGIC) **SV22 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV23PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV23DO :=** _____
SV INPUT (SELOGIC) **SV23 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV24PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV24DO :=** _____
SV INPUT (SELOGIC) **SV24 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV25PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV25DO :=** _____
SV INPUT (SELOGIC) **SV25 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV26PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV26DO :=** _____
SV INPUT (SELOGIC) **SV26 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV27PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV27DO :=** _____
SV INPUT (SELOGIC) **SV27 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV28PU :=** _____
SV TIMER DROPOUT (0.00–3000.00 s) **SV28DO :=** _____
SV INPUT (SELOGIC) **SV28 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV29PU :=** _____

SV TIMER DROPOUT (0.00–3000.00 s) **SV29DO :=** _____

SV INPUT (SELOGIC) **SV29 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV30PU :=** _____

SV TIMER DROPOUT (0.00–3000.00 s) **SV30DO :=** _____

SV INPUT (SELOGIC) **SV30 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV31PU :=** _____

SV TIMER DROPOUT (0.00–3000.00 s) **SV31DO :=** _____

SV INPU (SELOGIC) **SV31 :=** _____

SV TIMER PICKUP (0.00–3000.00 s) **SV32PU :=** _____

SV TIMER DROPOUT (0.00–3000.00 s) **SV32DO :=** _____

SV INPUT (SELOGIC) **SV32 :=** _____

Counters Equations

SC PRESET VALUE (1–65000) **SC01PV :=** _____

SC RESET INPUT (SELOGIC) **SC01R :=** _____

SC LOAD PV INPUT (SELOGIC) **SC01LD :=** _____

SC CNT UP INPUT (SELOGIC) **SC01CU :=** _____

SC CNT DN INPUT (SELOGIC) **SC01CD :=** _____

SC PRESET VALUE (1–65000) **SC02PV :=** _____

SC RESET INPUT (SELOGIC) **SC02R :=** _____

SC LOAD PV INPUT (SELOGIC) **SC02LD :=** _____

SC CNT UP INPUT (SELOGIC) **SC02CU :=** _____

SC CNT DN INPUT (SELOGIC) **SC02CD :=** _____

SC PRESET VALUE (1–65000) **SC03PV :=** _____

SC RESET INPUT (SELOGIC) **SC03R :=** _____

SC LOAD PV INPUT (SELOGIC) **SC03LD :=** _____

SC CNT UP INPUT (SELOGIC) **SC03CU :=** _____

SC CNT DN INPUT (SELOGIC) **SC03CD :=** _____

SC PRESET VALUE (1–65000) **SC04PV :=** _____

SC RESET INPUT (SELOGIC) **SC04R :=** _____

SC LOAD PV INPUT (SELOGIC) **SC04LD :=** _____

SC CNT UP INPUT (SELOGIC) **SC04CU :=** _____

SC CNT DN INPUT (SELOGIC) **SC04CD :=** _____

SC PRESET VALUE (1–65000) **SC05PV :=** _____

SC RESET INPUT (SELOGIC) **SC05R :=** _____

SC LOAD PV INPUT (SELOGIC)	**SC05LD :=**
SC CNT UP INPUT (SELOGIC)	**SC05CU :=**
SC CNT DN INPUT (SELOGIC)	**SC05CD :=**
SC PRESET VALUE (1–65000)	**SC06PV :=**
SC RESET INPUT (SELOGIC)	**SC06R :=**
SC LOAD PV INPUT (SELOGIC)	**SC06LD :=**
SC CNT UP INPUT (SELOGIC)	**SC06CU :=**
SC CNT DN INPUT (SELOGIC)	**SC06CD :=**
SC PRESET VALUE (1–65000)	**SC07PV :=**
SC RESET INPUT (SELOGIC)	**SC07R :=**
SC LOAD PV INPUT (SELOGIC)	**SC07LD :=**
SC CNT UP INPUT (SELOGIC)	**SC07CU :=**
SC CNT DN INPUT (SELOGIC)	**SC07CD :=**
SC PRESET VALUE (1–65000)	**SC08PV :=**
SC RESET INPUT (SELOGIC)	**SC08R :=**
SC LOAD PV INPUT (SELOGIC)	**SC08LD :=**
SC CNT UP INPUT (SELOGIC)	**SC08CU :=**
SC CNT DN INPUT (SELOGIC)	**SC08CD :=**
SC PRESET VALUE (1–65000)	**SC09PV :=**
SC RESET INPUT (SELOGIC)	**SC09R :=**
SC LOAD PV INPUT (SELOGIC)	**SC09LD :=**
SC CNT UP INPUT (SELOGIC)	**SC09CU :=**
SC CNT DN INPUT (SELOGIC)	**SC09CD :=**
SC PRESET VALUE (1–65000)	**SC10PV :=**
SC RESET INPUT (SELOGIC)	**SC10R :=**
SC LOAD PV INPUT (SELOGIC)	**SC10LD :=**
SC CNT UP INPUT (SELOGIC)	**SC10CU :=**
SC CNT DN INPUT (SELOGIC)	**SC10CD :=**
SC PRESET VALUE (1–65000)	**SC11PV :=**
SC RESET INPUT (SELOGIC)	**SC11R :=**
SC LOAD PV INPUT (SELOGIC)	**SC11LD :=**
SC CNT UP INPUT (SELOGIC)	**SC11CU :=**
SC CNT DN INPUT (SELOGIC)	**SC11CD :=**
SC PRESET VALUE (1–65000)	**SC12PV :=**
SC RESET INPUT (SELOGIC)	**SC12R :=**
SC LOAD PV INPUT (SELOGIC)	**SC12LD :=**
SC CNT UP INPUT (SELOGIC)	**SC12CU :=**
SC CNT DN INPUT (SELOGIC)	**SC12CD :=**
SC PRESET VALUE (1–65000)	**SC13PV :=**
SC RESET INPUT (SELOGIC)	**SC13R :=**

SC LOAD PV INPUT (SELOGIC)	**SC13LD :=**
SC CNT UP INPUT (SELOGIC)	**SC13CU :=**
SC CNT DN INPUT (SELOGIC)	**SC13CD :=**
SC PRESET VALUE (1–65000)	**SC14PV :=**
SC RESET INPUT (SELOGIC)	**SC14R :=**
SC LOAD PV INPUT (SELOGIC)	**SC14LD :=**
SC CNT UP INPUT (SELOGIC)	**SC14CU :=**
SC CNT DN INPUT (SELOGIC)	**SC14CD :=**
SC PRESET VALUE (1–65000)	**SC15PV :=**
SC RESET INPUT (SELOGIC)	**SC15R :=**
SC LOAD PV INPUT (SELOGIC)	**SC15LD :=**
SC CNT UP INPUT (SELOGIC)	**SC15CU :=**
SC CNT DN INPUT (SELOGIC)	**SC15CD :=**
SC PRESET VALUE (1–65000)	**SC16PV :=**
SC RESET INPUT (SELOGIC)	**SC16R :=**
SC LOAD PV INPUT (SELOGIC)	**SC16LD :=**
SC CNT UP INPUT (SELOGIC)	**SC16CU :=**
SC CNT DN INPUT (SELOGIC)	**SC16CD :=**
SC PRESET VALUE (1–65000)	**SC17PV :=**
SC RESET INPUT (SELOGIC)	**SC17R :=**
SC LOAD PV INPUT (SELOGIC)	**SC17LD :=**
SC CNT UP INPUT (SELOGIC)	**SC17CU :=**
SC CNT DN INPUT (SELOGIC)	**SC17CD :=**
SC PRESET VALUE (1–65000)	**SC18PV :=**
SC RESET INPUT (SELOGIC)	**SC18R :=**
SC LOAD PV INPUT (SELOGIC)	**SC18LD :=**
SC CNT UP INPUT (SELOGIC)	**SC18CU :=**
SC CNT DN INPUT (SELOGIC)	**SC18CD :=**
SC PRESET VALUE (1–65000)	**SC19PV :=**
SC RESET INPUT (SELOGIC)	**SC19R :=**
SC LOAD PV INPUT (SELOGIC)	**SC19LD :=**
SC CNT UP INPUT (SELOGIC)	**SC19CU :=**
SC CNT DN INPUT (SELOGIC)	**SC19CD :=**
SC PRESET VALUE (1–65000)	**SC20PV :=**
SC RESET INPUT (SELOGIC)	**SC20R :=**
SC LOAD PV INPUT (SELOGIC)	**SC20LD :=**
SC CNT UP INPUT (SELOGIC)	**SC20CU :=**
SC CNT DN INPUT (SELOGIC)	**SC20CD :=**
SC PRESET VALUE (1–65000)	**SC21PV :=**
SC RESET INPUT (SELOGIC)	**SC21R :=**

SC LOAD PV INPUT (SELOGIC)	**SC21LD :=**
SC CNT UP INPUT (SELOGIC)	**SC21CU :=**
SC CNT DN INPUT (SELOGIC)	**SC21CD :=**
SC PRESET VALUE (1–65000)	**SC22PV :=**
SC RESET INPUT (SELOGIC)	**SC22R :=**
SC LOAD PV INPUT (SELOGIC)	**SC22LD :=**
SC CNT UP INPUT (SELOGIC)	**SC22CU :=**
SC CNT DN INPUT (SELOGIC)	**SC22CD :=**
SC PRESET VALUE (1–65000)	**SC23PV :=**
SC RESET INPUT (SELOGIC)	**SC23R :=**
SC LOAD PV INPUT (SELOGIC)	**SC23LD :=**
SC CNT UP INPUT (SELOGIC)	**SC23CU :=**
SC CNT DN INPUT (SELOGIC)	**SC23CD :=**
SC PRESET VALUE (1–65000)	**SC24PV :=**
SC RESET INPUT (SELOGIC)	**SC24R :=**
SC LOAD PV INPUT (SELOGIC)	**SC24LD :=**
SC CNT UP INPUT (SELOGIC)	**SC24CU :=**
SC CNT DN INPUT (SELOGIC)	**SC24CD :=**
SC PRESET VALUE (1–65000)	**SC25PV :=**
SC RESET INPUT (SELOGIC)	**SC25R :=**
SC LOAD PV INPUT (SELOGIC)	**SC25LD :=**
SC CNT UP INPUT (SELOGIC)	**SC25CU :=**
SC CNT DN INPUT (SELOGIC)	**SC25CD :=**
SC PRESET VALUE (1–65000)	**SC26PV :=**
SC RESET INPUT (SELOGIC)	**SC26R :=**
SC LOAD PV INPUT (SELOGIC)	**SC26LD :=**
SC CNT UP INPUT (SELOGIC)	**SC26CU :=**
SC CNT DN INPUT (SELOGIC)	**SC26CD :=**
SC PRESET VALUE (1–65000)	**SC27PV :=**
SC RESET INPUT (SELOGIC)	**SC27R :=**
SC LOAD PV INPUT (SELOGIC)	**SC27LD :=**
SC CNT UP INPUT (SELOGIC)	**SC27CU :=**
SC CNT DN INPUT (SELOGIC)	**SC27CD :=**
SC PRESET VALUE (1–65000)	**SC28PV :=**
SC RESET INPUT (SELOGIC)	**SC28R :=**
SC LOAD PV INPUT (SELOGIC)	**SC28LD :=**
SC CNT UP INPUT (SELOGIC)	**SC28CU :=**
SC CNT DN INPUT (SELOGIC)	**SC28CD :=**
SC PRESET VALUE (1–65000)	**SC29PV :=**
SC RESET INPUT (SELOGIC)	**SC29R :=**

SC LOAD PV INPUT (SELOGIC) **SC29LD :=** _____
SC CNT UP INPUT (SELOGIC) **SC29CU :=** _____
SC CNT DN INPUT (SELOGIC) **SC29CD :=** _____
SC PRESET VALUE (1–65000) **SC30PV :=** _____
SC RESET INPUT (SELOGIC) **SC30R :=** _____
SC LOAD PV INPUT (SELOGIC) **SC30LD :=** _____
SC CNT UP INPUT (SELOGIC) **SC30CU :=** _____
SC CNT DN INPUT (SELOGIC) **SC30CD :=** _____
SC PRESET VALUE (1–65000) **SC31PV :=** _____
SC RESET INPUT (SELOGIC) **SC31R :=** _____
SC LOAD PV INPUT (SELOGIC) **SC31LD :=** _____
SC CNT UP INPUT (SELOGIC) **SC31CU :=** _____
SC CNT DN INPUT (SELOGIC) **SC31CD :=** _____
SC PRESET VALUE (1–65000) **SC32PV :=** _____
SC RESET INPUT (SELOGIC) **SC32R :=** _____
SC LOAD PV INPUT (SELOGIC) **SC32LD :=** _____
SC CNT UP INPUT (SELOGIC) **SC32CU :=** _____
SC CNT DN INPUT (SELOGIC) **SC32CD :=** _____

Math Variables

MV01 := _____
MV02 := _____
MV03 := _____
MV04 := _____
MV05 := _____
MV06 := _____
MV07 := _____
MV08 := _____
MV09 := _____
MV10 := _____
MV11 := _____
MV12 := _____
MV13 := _____
MV14 := _____
MV15 := _____
MV16 := _____
MV17 := _____
MV18 := _____
MV19 := _____
MV20 := _____

MV21 := _____

MV22 := _____

MV23 := _____

MV24 := _____

MV25 := _____

MV26 := _____

MV27 := _____

MV28 := _____

MV29 := _____

MV30 := _____

MV31 := _____

MV32 := _____

Base Output

OUT101 FAIL-SAFE (Y, N) **OUT101FS :=** _____

OUT101 := _____

OUT102 FAIL-SAFE (Y, N) **OUT102FS :=** _____

OUT102 := _____

OUT103 FAIL-SAFE (Y, N) **OUT103FS :=** _____

OUT103 := _____

Slot C Output (Hidden if output option not included; OUT305–OUT308 only available with 8 DO card)

OUT301 FAIL-SAFE (Y, N) **OUT301FS :=** _____

OUT301 := _____

OUT302 FAIL-SAFE (Y, N) **OUT302FS :=** _____

OUT302 := _____

OUT303 FAIL-SAFE (Y, N) **OUT303FS :=** _____

OUT303 := _____

OUT304 FAIL-SAFE (Y, N) **OUT304FS :=** _____

OUT304 := _____

OUT305 FAIL-SAFE (Y, N) **OUT305FS :=** _____

OUT305 := _____

OUT306 FAIL-SAFE (Y, N) **OUT306FS :=** _____

OUT306 := _____

OUT307 FAIL-SAFE (Y, N) **OUT307FS :=** _____

OUT307 := _____

OUT308 FAIL-SAFE (Y, N) **OUT308FS :=** _____

OUT308 := _____

Slot D Output (Hidden if output option not included; OUT405–OUT408 only available with 8 DO card)

OUT401 FAIL-SAFE (Y, N) **OUT401FS :=** _____

OUT401 := _____

OUT402 FAIL-SAFE (Y, N) **OUT402FS :=** _____

OUT402 := _____

OUT403 FAIL-SAFE (Y, N) **OUT403FS :=** _____

OUT403 := _____

OUT404 FAIL-SAFE (Y, N) **OUT404FS :=** _____

OUT404 := _____

OUT405 FAIL-SAFE (Y, N) **OUT405FS :=** _____

OUT405 := _____

OUT406 FAIL-SAFE (Y, N) **OUT406FS :=** _____

OUT406 := _____

OUT407 FAIL-SAFE (Y, N) **OUT407FS :=** _____

OUT407 := _____

OUT408 FAIL-SAFE (Y, N) **OUT408FS :=** _____

OUT408 := _____

Mirrored Bits Transmit SELogic Control Equations

(Hidden if PROTO is not MBxx on any of the communications ports)

TMB1A := _____

TMB2A := _____

TMB3A := _____

TMB4A := _____

TMB5A := _____

TMB6A := _____

TMB7A := _____

TMB8A := _____

TMB1B := _____

TMB2B := _____

TMB3B := _____

TMB4B := _____

TMB5B := _____

TMB6B := _____

TMB7B := _____

TMB8B := _____

Global Settings (SET G Command)

General

RATED FREQ. (50, 60 Hz) **FNOM :=** _____

PRIORITY FRQ TRK (X, Y) **FRQTRK :=** _____

DATE FORMAT (MDY, YMD, DMY) **DATE_F :=** _____

MET CUTOFF THRES (Y, N) **METHRES :=** _____

FAULT CONDITION (SELOGIC) **FAULT :=** _____

Event Messenger Points

EVE MSG PTS ENABL (N, 1–32) **EMP :=** _____

(Only the points enabled by EMP are visible)

MESSENGER POINT MP01 TRIGGER (Off, 1 Relay Word bit) **MPTR01 :=** _____

MESSENGER POINT MP01 AQ (None, 1 analog quantity) **MPAQ01 :=** _____

MESSENGER POINT MP01 TEXT (148 characters) **MPTX01 :=** _____

MESSENGER POINT MP02 TRIGGER (Off, 1 Relay Word bit) **MPTR02 :=** _____

MESSENGER POINT MP02 AQ (None, 1 analog quantity) **MPAQ02 :=** _____

MESSENGER POINT MP02 TEXT (148 characters) **MPTX02 :=** _____

MESSENGER POINT MP03 TRIGGER (Off, 1 Relay Word bit) **MPTR03 :=** _____

MESSENGER POINT MP03 AQ (None, 1 analog quantity) **MPAQ03 :=** _____

MESSENGER POINT MP03 TEXT (148 characters) **MPTX03 :=** _____

MESSENGER POINT MP04 TRIGGER (Off, 1 Relay Word bit) **MPTR04 :=** _____

MESSENGER POINT MP04 AQ (None, 1 analog quantity) **MPAQ04 :=** _____

MESSENGER POINT MP04 TEXT (148 characters) **MPTX04 :=** _____

MESSENGER POINT MP05 TRIGGER (Off, 1 Relay Word bit) **MPTR05 :=** _____

MESSENGER POINT MP05 AQ (None, 1 analog quantity) **MPAQ05 :=** _____

MESSENGER POINT MP05 TEXT (148 characters) **MPTX05 :=** _____

MESSENGER POINT MP06 TRIGGER (Off, 1 Relay Word bit) **MPTR06 :=** _____

MESSENGER POINT MP06 AQ (None, 1 analog quantity) **MPAQ06 :=** _____

MESSENGER POINT MP06 TEXT (148 characters) **MPTX06 :=** _____

MESSENGER POINT MP07 TRIGGER (Off, 1 Relay Word bit) **MPTR07 :=** _____

MESSENGER POINT MP07 AQ (None, 1 analog quantity) **MPAQ07 :=** _____

MESSENGER POINT MP07 TEXT (148 characters) **MPTX07 :=** _____

MESSENGER POINT MP08 TRIGGER (Off, 1 Relay Word bit) **MPTR08 :=**_____
MESSENGER POINT MP08 AQ (None, 1 analog quantity) **MPAQ08 :=**_____
MESSENGER POINT MP08 TEXT (148 characters) **MPTX08 :=**_____

MESSENGER POINT MP09 TRIGGER (Off, 1 Relay Word bit) **MPTR09 :=**_____
MESSENGER POINT MP09 AQ (None, 1 analog quantity) **MPAQ09 :=**_____
MESSENGER POINT MP09 TEXT (148 characters) **MPTX09 :=**_____

MESSENGER POINT MP10 TRIGGER (Off, 1 Relay Word bit) **MPTR10 :=**_____
MESSENGER POINT MP10 AQ (None, 1 analog quantity) **MPAQ10 :=**_____
MESSENGER POINT MP10 TEXT (148 characters) **MPTX10 :=**_____

MESSENGER POINT MP11 TRIGGER (Off, 1 Relay Word bit) **MPTR11 :=**_____
MESSENGER POINT MP11 AQ (None, 1 analog quantity) **MPAQ11 :=**_____
MESSENGER POINT MP11 TEXT (148 characters) **MPTX11 :=**_____

MESSENGER POINT MP12 TRIGGER (Off, 1 Relay Word bit) **MPTR12 :=**_____
MESSENGER POINT MP12 AQ (None, 1 analog quantity) **MPAQ12 :=**_____
MESSENGER POINT MP12 TEXT (148 characters) **MPTX12 :=**_____

MESSENGER POINT MP13 TRIGGER (Off, 1 Relay Word bit) **MPTR13 :=**_____
MESSENGER POINT MP13 AQ (None, 1 analog quantity) **MPAQ13 :=**_____
MESSENGER POINT MP13 TEXT (148 characters) **MPTX13 :=**_____

MESSENGER POINT MP14 TRIGGER (Off, 1 Relay Word bit) **MPTR14 :=**_____
MESSENGER POINT MP14 AQ (None, 1 analog quantity) **MPAQ14 :=**_____
MESSENGER POINT MP14 TEXT (148 characters) **MPTX14 :=**_____

MESSENGER POINT MP15 TRIGGER (Off, 1 Relay Word bit) **MPTR15 :=**_____
MESSENGER POINT MP15 AQ (None, 1 analog quantity) **MPAQ15 :=**_____
MESSENGER POINT MP15 TEXT (148 characters) **MPTX15 :=**_____

MESSENGER POINT MP16 TRIGGER (Off, 1 Relay Word bit) **MPTR16 :=**_____
MESSENGER POINT MP16 AQ (None, 1 analog quantity) **MPAQ16 :=**_____
MESSENGER POINT MP16 TEXT (148 characters) **MPTX16 :=**_____

MESSENGER POINT MP17 TRIGGER (Off, 1 Relay Word bit) **MPTR17 :=**_____
MESSENGER POINT MP17 AQ (None, 1 analog quantity) **MPAQ17 :=**_____
MESSENGER POINT MP17 TEXT (148 characters) **MPTX17 :=**_____

MESSENGER POINT MP18 TRIGGER (Off, 1 Relay Word bit) **MPTR18 :=** _____
MESSENGER POINT MP18 AQ (None, 1 analog quantity) **MPAQ18 :=** _____
MESSENGER POINT MP18 TEXT (148 characters) **MPTX18 :=** _____

MESSENGER POINT MP19 TRIGGER (Off, 1 Relay Word bit) **MPTR19 :=** _____
MESSENGER POINT MP19 AQ (None, 1 analog quantity) **MPAQ19 :=** _____
MESSENGER POINT MP19 TEXT (148 characters) **MPTX19 :=** _____

MESSENGER POINT MP20 TRIGGER (Off, 1 Relay Word bit) **MPTR20 :=** _____
MESSENGER POINT MP20 AQ (None, 1 analog quantity) **MPAQ20 :=** _____
MESSENGER POINT MP20 TEXT (148 characters) **MPTX20 :=** _____

MESSENGER POINT MP21 TRIGGER (Off, 1 Relay Word bit) **MPTR21 :=** _____
MESSENGER POINT MP21 AQ (None, 1 analog quantity) **MPAQ21 :=** _____
MESSENGER POINT MP21 TEXT (148 characters) **MPTX21 :=** _____

MESSENGER POINT MP22 TRIGGER (Off, 1 Relay Word bit) **MPTR22 :=** _____
MESSENGER POINT MP22 AQ (None, 1 analog quantity) **MPAQ22 :=** _____
MESSENGER POINT MP22 TEXT (148 characters) **MPTX22 :=** _____

MESSENGER POINT MP23 TRIGGER (Off, 1 Relay Word bit) **MPTR23 :=** _____
MESSENGER POINT MP23 AQ (None, 1 analog quantity) **MPAQ23 :=** _____
MESSENGER POINT MP23 TEXT (148 characters) **MPTX23 :=** _____

MESSENGER POINT MP24 TRIGGER (Off, 1 Relay Word bit) **MPTR24 :=** _____
MESSENGER POINT MP24 AQ (None, 1 analog quantity) **MPAQ24 :=** _____
MESSENGER POINT MP24 TEXT (148 characters) **MPTX24 :=** _____

MESSENGER POINT MP25 TRIGGER (Off, 1 Relay Word bit) **MPTR25 :=** _____
MESSENGER POINT MP25 AQ (None, 1 analog quantity) **MPAQ25 :=** _____
MESSENGER POINT MP25 TEXT (148 characters) **MPTX25 :=** _____

MESSENGER POINT MP26 TRIGGER (Off, 1 Relay Word bit) **MPTR26 :=** _____
MESSENGER POINT MP26 AQ (None, 1 analog quantity) **MPAQ26 :=** _____
MESSENGER POINT MP26 TEXT (148 characters) **MPTX26 :=** _____

MESSENGER POINT MP27 TRIGGER (Off, 1 Relay Word bit) **MPTR27 :=** _____
MESSENGER POINT MP27 AQ (None, 1 analog quantity) **MPAQ27 :=** _____
MESSENGER POINT MP27 TEXT (148 characters) **MPTX27 :=** _____

MESSENGER POINT MP28 TRIGGER (Off, 1 Relay Word bit) **MPTR28 :=**_____
MESSENGER POINT MP28 AQ (None, 1 analog quantity) **MPAQ28 :=**_____
MESSENGER POINT MP28 TEXT (148 characters) **MPTX28 :=**_____

MESSENGER POINT MP29 TRIGGER (Off, 1 Relay Word bit) **MPTR29 :=**_____
MESSENGER POINT MP29 AQ (None, 1 analog quantity) **MPAQ29 :=**_____
MESSENGER POINT MP29 TEXT (148 characters) **MPTX29 :=**_____

MESSENGER POINT MP30 TRIGGER (Off, 1 Relay Word bit) **MPTR30 :=**_____
MESSENGER POINT MP30 AQ (None, 1 analog quantity) **MPAQ30 :=**_____
MESSENGER POINT MP30 TEXT (148 characters) **MPTX30 :=**_____

MESSENGER POINT MP31 TRIGGER (Off, 1 Relay Word bit) **MPTR31 :=**_____
MESSENGER POINT MP31 AQ (None, 1 analog quantity) **MPAQ31 :=**_____
MESSENGER POINT MP31 TEXT (148 characters) **MPTX31 :=**_____

MESSENGER POINT MP32 TRIGGER (Off, 1 Relay Word bit) **MPTR32 :=**_____
MESSENGER POINT MP32 AQ (None, 1 analog quantity) **MPAQ32 :=**_____
MESSENGER POINT MP32 TEXT (148 characters) **MPTX32 :=**_____

Group Selection

GRP CHG DELAY (0–400 s) **TGR :=**_____
SELECT GROUP1 (SELOGIC) **SS1 :=**_____

SELECT GROUP2 (SELOGIC) **SS2 :=**_____

SELECT GROUP3 (SELOGIC) **SS3 :=**_____

SELECT GROUP4 (SELOGIC) **SS4 :=**_____

Time and Date Management

CTRL BITS DEFN (NONE, C37.118) **IRIGC :=**_____
OFFSET FROM UTC (–24.00 to 24.00) rounded up to quarter **UTC_OFF :=**_____
MONTH TO BEGIN DST (OFF, 1–12) **DST_BEGM :=**_____
WEEK OF THE MONTH TO BEGIN DST (1–3, L) L = Last week of the month (Hidden if DST_BEGM := OFF) **DST_BEGW :=**_____
DAY OF THE WEEK TO BEGIN DST (SUN, MON, TUE, WED, THU, FRI, SAT) (Hidden if DST_BEGM := OFF) **DST_BEGD :=**_____
LOCAL HOUR TO BEGIN DST (0–23) (Hidden if DST_BEGM := OFF) **DST_BEGH :=**_____
MONTH TO END DST (1–12) (Hidden if DST_BEGM := OFF) **DST_ENDM :=**_____

WEEK OF THE MONTH TO END DST (1–3, L) L = Last week of the month (Hidden if DST_BEGM := OFF) **DST_ENDW :=** _____

DAY OF THE WEEK TO END DST (SUN, MON, TUE, WED, THU, FRI, SAT) (Hidden if DST_BEGM := OFF) **DST_ENDD :=** _____

LOCAL HOUR TO END DST (0–23) (Hidden if DST_BEGM := OFF) **DST_ENDH :=** _____

Breaker Failure

52A INTERLOCK (Y, N) **52ABF :=** _____

BRKRX FAIL DELAY (0.00–2.00 s) **BFDX :=** _____

BRKRX FAIL INIT (SELOGIC) **BFIX :=** _____

BRKRY FAIL DELAY (0.00–2.00 s) **BFDY :=** _____

BRKRY FAIL INIT (SELOGIC) **BFIY :=** _____

Analog Inputs/Outputs

For the Analog Inputs/Outputs settings, x is the card position (3 or 4 in Slot C or D, respectively) (Settings are hidden if Analog I/O are not included.)

AIx01

AI*x*01 TAG NAME (8 characters 0–9, A–Z, _) **AI*x*01NAM :=** _____

AI*x*01 TYPE (I, V) **AI*x*01TYP :=** _____

If AIx01TYP = I

AI*x*01 LOW IN VAL (–20.480 to +20.480 mA) **AI*x*01L :=** _____

AI*x*01 HI IN VAL (–20.480 to +20.480 mA) **AI*x*01H :=** _____

If AIx01TYP = V

AI*x*01 LOW IN VAL (–10.240 to +10.240 V) **AI*x*01L :=** _____

AI*x*01 HI IN VAL (–10.240 to +10.240 V) **AI*x*01H :=** _____

Note: Set Warn and Alarm to a value between Engr Low and Engr High settings.

AI*x*01 ENG UNITS (16 characters) **AI*x*01EU :=** _____

AI*x*01 EU LOW (–99999.000 to +99999.000) **AI*x*01EL :=** _____

AI*x*01 EU HI (–99999.000 to +99999.000) **AI*x*01EH :=** _____

AI*x*01 LO WARN L1 (OFF, –99999.000 to +99999.000) **AI*x*01LW1 :=** _____

AI*x*01 LO WARN L2 (OFF, –99999.000 to +99999.000) **AI*x*01LW2 :=** _____

AI*x*01 LO ALARM (OFF, –99999.000 to +99999.000) **AI*x*01LAL :=** _____

AI*x*01 HI WARN L1 (OFF, –99999.000 to +99999.000) **AI*x*01HW1 :=** _____

AI*x*01 HI WARN L2 (OFF, –99999.000 to +99999.000) **AIx01HW2 :=** _____

AI*x*01 HI ALARM (OFF, –99999.000 to +99999.000) **AIx01HAL :=** _____

AIx02

AI*x*02 TAG NAME (8 characters 0–9, A–Z, _) **AIx02NAM :=** _____

AI*x*02 TYPE (I, V) **AIx02TYP :=** _____

If AIx02TYP = I

AI*x*02 LOW IN VAL (–20.480 to +20.480 mA) **AIx02L :=** _____

AIx02 HI IN VAL (–20.480 to +20.480 mA) **AIx02H :=** _____

If AIx02TYP = V

AIx02 LOW IN VAL (–10.240 to +10.240 V) **AIx02L :=** _____

AIx02 HI IN VAL (–10.240 to +10.240 V) **AIx02H :=** _____

AIx02 ENG UNITS (16 characters) **AIx02EU :=** _____

AIx02 EU LOW (–99999.000 to +99999.000) **AIx02EL :=** _____

AIx02 EU HI (–99999.000 to +99999.000) **AIx02EH :=** _____

AIx02 LO WARN L1 (OFF, –99999.000 to +99999.000) **AIx02LW1 :=** _____

AIx02 LO WARN L2 (OFF, –99999.000 to +99999.000) **AIx02LW2 :=** _____

AIx02 LO ALARM (OFF, –99999.000 to +99999.000) **AIx02LAL :=** _____

AIx02 HI WARN L1 (OFF, –99999.000 to +99999.000) **AIx02HW1 :=** _____

AIx02 HI WARN L2 (OFF, –99999.000 to +99999.000) **AIx02HW2 :=** _____

AIx02 HI ALARM (OFF, –99999.000 to +99999.000) **AIx02HAL :=** _____

AIx03

AIx03 TAG NAME (8 characters 0–9, A–Z, _) **AIx03NAM :=** _____

AIx03 TYPE (I, V) **AIx03TYP :=** _____

If AIx03TYP = I

AIx03 LOW IN VAL (–20.480 to +20.480 mA) **AIx03L :=** _____

AIx03 HI IN VAL (–20.480 to +20.480 mA) **AIx03H :=** _____

If AIx03TYP = V

AIx03 LOW IN VAL (–10.240 to +10.240 V) **AIx03L :=** _____

AIx03 HI IN VAL (–10.240 to +10.240 V) **AIx03H :=** _____

AIx03 ENG UNITS (16 characters) **AIx03EU :=** _____

AIx03 EU LOW (–99999.000 to +99999.000) **AIx03EL :=** _____

AIx03 EU HI (–99999.000 to +99999.000) **AIx03EH :=** _____

AIx03 LO WARN L1 (OFF, –99999.000 to +99999.000) **AIx03LW1 :=** _____

AIx03 LO WARN L2 (OFF, –99999.000 to +99999.000) **AIx03LW2 :=** _____

AIx03 LO ALARM (OFF, –99999.000 to +99999.000) **AIx03LAL :=** _____

AIx03 HI WARN L1 (OFF, –99999.000 to +99999.000) **AIx03HW1 :=** _____

AIx03 HI WARN L2 (OFF, –99999.000 to +99999.000) **AIx03HW2 :=** _____

AIx03 HI ALARM (OFF, –99999.000 to +99999.000) **AIx03HAL :=** _____

AIx04

AIx04 TAG NAME (8 characters 0–9, A–Z, _) **AIx04NAM :=** _____

AIx04 TYPE (I, V) **AIx04TYP :=** _____

If AIx04TYP = I

AIx04 LOW IN VAL (–20.480 to +20.480 mA) **AIx04L :=** _____

AIx04 HI IN VAL (–20.480 to +20.480 mA) **AIx04H :=** _____

If AIx04TYP = V

AI*x*04 LOW IN VAL (–10.240 to +10.240 V)	**AIx04L :=** _____
AI*x*04 HI IN VAL (–10.240 to +10.240 V)	**AIx04H :=** _____
AI*x*04 ENG UNITS (16 characters)	**AIx04EU :=** _____
AI*x*04 EU LOW (–99999.000 to +99999.000)	**AIx04EL :=** _____
AI*x*04 EU HI (–99999.000 to +99999.000)	**AIx04EH :=** _____
AI*x*04 LO WARN L1 (OFF, –99999.000 to +99999.000)	**AIx04LW1 :=** _____
AI*x*04 LO WARN L2 (OFF, –99999.000 to +99999.000)	**AIx04LW2 :=** _____
AI*x*04 LO ALARM (OFF, –99999.000 to +99999.000)	**AI*x*04LAL :=** _____
AI*x*04 HI WARN L1 (OFF, –99999.000 to +99999.000)	**AI*x*04HW1 :=** _____
AI*x*04 HI WARN L2 (OFF, –99999.000 to +99999.000)	**AI*x*04HW2 :=** _____
AI*x*04 HI ALARM (OFF, –99999.000 to +99999.000)	**AI*x*04HAL :=** _____

AOx01

AO*x*01 ANALOG QTY (Off, 1 analog quantity)	**AO*x*01AQ :=** _____
AO*x*01 TYPE (I, V)	**AO*x*01TYP :=** _____
AO*x*01 AQTY LOW (–2147483647 to +2147483647)	**AO*x*01AQL :=** _____
AO*x*01 AQTY HI (–2147483647 to +2147483647)	**AO*x*01AQH :=** _____

If AOx01TYP = I

AO*x*01 LO OUT VAL (–20.480 to +20.480 mA)	**AO*x*01L :=** _____
AO*x*01 HI OUT VAL (–20.480 to +20.480 mA)	**AO*x*01H :=** _____

If AOx01TYP = V

AO*x*01 LO OUT VAL (–10.240 to +10.240 V)	**AO*x*01L :=** _____
AO*x*01 HI OUT VAL (–10.240 to +10.240 V)	**AO*x*01H :=** _____

AOx02

AO*x*02 ANALOG QTY (Off, 1 analog quantity)	**AO*x*02AQ :=** _____
AO*x*02 TYPE (I, V)	**AO*x*02TYP :=** _____
AO*x*02 AQTY LOW (–2147483647 to +2147483647)	**AO*x*02AQL :=** _____
AO*x*02 AQTY HI (–2147483647 to +2147483647)	**AO*x*02AQH :=** _____

If AOx02TYP = I

AO*x*02 LO OUT VAL (–20.480 to +20.480 mA)	**AO*x*02L :=** _____
AO*x*02 HI OUT VAL (–20.480 to +20.480 mA)	**AO*x*02H :=** _____

If AOx02TYP = V

AO*x*02 LO OUT VAL (–10.240 to +10.240 V)	**AO*x*02L :=** _____
AO*x*02 HI OUT VAL (–10.240 to +10.240 V)	**AO*x*02H :=** _____

AOx03

AO*x*03 ANALOG QTY (Off, 1 analog quantity)	**AO*x*03AQ :=** _____
AO*x*03 TYPE (I, V)	**AO*x*03TYP :=** _____
AO*x*03 AQTY LOW (–2147483647 to +2147483647)	**AO*x*03AQL :=** _____
AO*x*03 AQTY HI (–2147483647 to +2147483647)	**AO*x*03AQH :=** _____

If AOx03TYP = I

AO*x*03 LO OUT VAL (–20.480 to +20.480 mA) **AO*x*03L :=** _____

AO*x*03 HI OUT VAL (–20.480 to +20.480 mA) **AO*x*03H :=** _____

If AOx03TYP = V

AO*x*03 LO OUT VAL (–10.240 to +10.240 V) **AO*x*03L :=** _____

AO*x*03 HI OUT VAL (–10.240 to +10.240 V) **AO*x*03H :=** _____

AOx04

AO*x*04 ANALOG QTY (Off, 1 analog quantity) **AO*x*04AQ :=** _____

AO*x*04 TYPE (I, V) **AO*x*04TYP :=** _____

AO*x*04 AQTY LOW (–2147483647 to +2147483647) **AO*x*04AQL :=** _____

AO*x*04 AQTY HI (–2147483647 to +2147483647) **AO*x*04AQH :=** _____

If AOx04TYP = I

AO*x*04 LO OUT VAL (–20.480 to +20.480 mA) **AO*x*04L :=** _____

AO*x*04 HI OUT VAL (–20.480 to +20.480 mA) **AO*x*04H :=** _____

If AOx04TYP = V

AO*x*04 LO OUT VAL (–10.240 to +10.240 V) **AO*x*04L :=** _____

AO*x*04 HI OUT VAL (–10.240 to +10.240 V) **AO*x*04H :=** _____

Input Debounce Settings (Base Unit)

IN101 Debounce (AC, 0–65000 ms) **IN101D :=** _____

IN102 Debounce (AC, 0–65000 ms) **IN102D :=** _____

Input Debounce Settings (Slot C) (Hidden if input option not included)

IN301 Debounce (AC, 0–65000 ms) **IN301D :=** _____

IN302 Debounce (AC, 0–65000 ms) **IN302D :=** _____

IN303 Debounce (AC, 0–65000 ms) **IN303D :=** _____

IN304 Debounce (AC, 0–65000 ms) **IN304D :=** _____

IN305 Debounce (AC, 0–65000 ms) **IN305D :=** _____

IN306 Debounce (AC, 0–65000 ms) **IN306D :=** _____

IN307 Debounce (AC, 0–65000 ms) **IN307D :=** _____

IN308 Debounce (AC, 0–65000 ms) **IN308D :=** _____

IN309 Debounce (AC, 0–65000 ms) **IN309D :=** _____

IN310 Debounce (AC, 0–65000 ms) **IN310D :=** _____

IN311 Debounce (AC, 0–65000 ms) **IN311D :=** _____

IN312 Debounce (AC, 0–65000 ms) **IN312D :=** _____

IN313 Debounce (AC, 0–65000 ms) **IN313D :=** _____

IN314 Debounce (AC, 0–65000 ms) **IN314D :=** _____

Input Debounce Settings (Slot D) (Hidden if input option not included)

IN401 Debounce (AC, 0–65000 ms) **IN401D :=** _____

IN402 Debounce (AC, 0–65000 ms) **IN402D :=** _____

IN403 Debounce (AC, 0–65000 ms) **IN403D :=** _____

IN404 Debounce (AC, 0–65000 ms) **IN404D :=** _____

IN405 Debounce (AC, 0–65000 ms) **IN405D :=** _____

IN406 Debounce (AC, 0–65000 ms) **IN406D :=** _____

IN407 Debounce (AC, 0–65000 ms) **IN407D :=** _____
IN408 Debounce (AC, 0–65000 ms) **IN408D :=** _____
IN409 Debounce (AC, 0–65000 ms) **IN409D :=** _____
IN410 Debounce (AC, 0–65000 ms) **IN410D :=** _____
IN411 Debounce (AC, 0–65000 ms) **IN411D :=** _____
IN412 Debounce (AC, 0–65000 ms) **IN412D :=** _____
IN413 Debounce (AC, 0–65000 ms) **IN413D :=** _____
IN414 Debounce (AC, 0–65000 ms) **IN414D :=** _____

Breaker Monitor Settings

BRK X MONITOR (Y, N) **EBMONX :=** _____

(All X Breaker Monitor settings are hidden if EBMONX := N)

X CL/OPN OP SET1 (0–65000) **COSP1X :=** _____
X CL/OPN OP SET2 (0–65000) **COSP2X :=** _____
X CL/OPN OP SET3 (0–65000) **COSP3X :=** _____
X kA PRI INTRPT1 (0.00–999.00) **KASP1X :=** _____
X kA PRI INTRPT2 (0.00–999.00) **KASP2X :=** _____
X kA PRI INTRPT3 (0.00–999.00) **KASP3X :=** _____
BRK X MON CTRL (SELOGIC) **BKMONX :=** _____

BRK Y MONITOR (Y, N) **EBMONY :=** _____

(All Y Breaker Monitor settings are hidden if EBMONY := N)

Y CL/OPN OP SET1 (0–65000) **COSP1Y :=** _____
Y CL/OPN OP SET2 (0–65000) **COSP2Y :=** _____
Y CL/OPN OP SET3 (0–65000) **COSP3Y :=** _____
Y kA PRI INTRPT1 (0.00–999.00) **KASP1Y :=** _____
Y kA PRI INTRPT2 (0.00–999.00) **KASP2Y :=** _____
Y kA PRI INTRPT3 (0.00–999.00) **KASP3Y :=** _____
BRK Y MON CTRL (SELOGIC) **BKMONY :=** _____

Data Reset

RESET TARGETS (SELOGIC) **RSTTRGT :=** _____

RESET ENERGY (SELOGIC) **RSTENRGY :=** _____

RESET MAX/MIN (SELOGIC) **RSTMXMN :=** _____

RESET DEMAND (SELOGIC) **RSTDEM :=** _____

RESET PK DEMAND (SELOGIC) **RSTPKDEM :=** _____

Access Control

DISABLE SETTINGS (SELOGIC) **DSABLSET :=**_____

Time-Synchronization Source

IRIG TIME SOURCE (IRIG1, IRIG2) **TIME_SRC :=**_____

Two-Position Disconnect

EN 2P DISC (N, 1–8) **89EN2P :=**_____
2P DISC 1 NAME (16 characters) **89NM2P1 :=**_____
DISC 1 N/O CONT (SELOGIC) **89A2P1 :=**_____
DISC 1 N/C CONT (SELOGIC) **89B2P1 :=**_____
DISC 1 ALM PU (0.00–300.00 sec) **89A2P1D :=**_____
DISC 1 SEALIN (0.00–300.00 sec) **89S2P1D :=**_____
DISC 1 IMMOBI (0.00–300.00 sec) **89I2P1D :=**_____
DISC 1 CL CONT (SELOGIC) **89RC2P1 :=**_____
DISC 1 CL BLK (SELOGIC) **89CB2P1 :=**_____
DISC 1 CL RST (SELOGIC) **89CR2P1 :=**_____
DISC 1 CL IM RS (SELOGIC) **89CT2P1 :=**_____
DISC 1 OP CONT (SELOGIC) **89RO2P1 :=**_____
DISC 1 OP BLK (SELOGIC) **89OB2P1 :=**_____
DISC 1 OP RST (SELOGIC) **89OR2P1 :=**_____
DISC 1 OP IM RS (SELOGIC) **89OT2P1 :=**_____
2P DISC 2 NAME (16 characters) **89NM2P2 :=**_____
DISC 2 N/O CONT (SELOGIC) **89A2P2 :=**_____
DISC 2 N/C CONT (SELOGIC) **89B2P2 :=**_____
DISC 2 ALM PU (0.00–300.00 sec) **89A2P2D :=**_____
DISC 2 SEALIN (0.00–300.00 sec) **89S2P2D :=**_____
DISC 2 IMMOBI (0.00–300.00 sec) **89I2P2D :=**_____
DISC 2 CL CONT (SELOGIC) **89RC2P2 :=**_____
DISC 2 CL BLK (SELOGIC) **89CB2P2 :=**_____
DISC 2 CL RST (SELOGIC) **89CR2P2 :=**_____
DISC 2 CL IM RS (SELOGIC) **89CT2P2 :=**_____
DISC 2 OP CONT (SELOGIC) **89RO2P2 :=**_____
DISC 2 OP BLK (SELOGIC) **89OB2P2 :=**_____
DISC 2 OP RST (SELOGIC) **89OR2P2 :=**_____
DISC 2 OP IM RS (SELOGIC) **89OT2P2 :=**_____
2P DISC 3 NAME (16 characters) **89NM2P3 :=**_____
DISC 3 N/O CONT (SELOGIC) **89A2P3 :=**_____
DISC 3 N/C CONT (SELOGIC) **89B2P3 :=**_____

DISC 3 ALM PU (0.00–300.00 sec)	**89A2P3D :=**_____
DISC 3 SEALIN (0.00–300.00 sec)	**89S2P3D :=**_____
DISC 3 IMMOBI (0.00–300.00 sec)	**89I2P3D :=**_____
DISC 3 CL CONT (SELOGIC)	**89RC2P3 :=**_____
DISC 3 CL BLK (SELOGIC)	**89CB2P3 :=**_____
DISC 3 CL RST (SELOGIC)	**89CR2P3 :=**_____
DISC 3 CL IM RS (SELOGIC)	**89CT2P3 :=**_____
DISC 3 OP CONT (SELOGIC)	**89RO2P3 :=**_____
DISC 3 OP BLK (SELOGIC)	**89OB2P3 :=**_____
DISC 3 OP RST (SELOGIC)	**89OR2P3 :=**_____
DISC 3 OP IM RS (SELOGIC)	**89OT2P3 :=**_____
2P DISC 4 NAME (16 characters)	**89NM2P4 :=**_____
DISC 4 N/O CONT (SELOGIC)	**89A2P4 :=**_____
DISC 4 N/C CONT (SELOGIC)	**89B2P4 :=**_____
DISC 4 ALM PU (0.00–300.00 sec)	**89A2P4D :=**_____
DISC 4 SEALIN (0.00–300.00 sec)	**89S2P4D :=**_____
DISC 4 IMMOBI (0.00–300.00 sec)	**89I2P4D :=**_____
DISC 4 CL CONT (SELOGIC)	**89RC2P4 :=**_____
DISC 4 CL BLK (SELOGIC)	**89CB2P4 :=**_____
DISC 4 CL RST (SELOGIC)	**89CR2P4 :=**_____
DISC 4 CL IM RS (SELOGIC)	**89CT2P4 :=**_____
DISC 4 OP CONT (SELOGIC)	**89RO2P4 :=**_____
DISC 4 OP BLK (SELOGIC)	**89OB2P4 :=**_____
DISC 4 OP RST (SELOGIC)	**89OR2P4 :=**_____
DISC 4 OP IM RS (SELOGIC)	**89OT2P4 :=**_____
2P DISC 5 NAME (16 characters)	**89NM2P5 :=**_____
DISC 5 N/O CONT (SELOGIC)	**89A2P5 :=**_____
DISC 5 N/C CONT (SELOGIC)	**89B2P5 :=**_____
DISC 5 ALM PU (0.00–300.00 sec)	**89A2P5D :=**_____
DISC 5 SEALIN (0.00–300.00 sec)	**89S2P5D :=**_____
DISC 5 IMMOBI (0.00–300.00 sec)	**89I2P5D :=**_____
DISC 5 CL CONT (SELOGIC)	**89RC2P5 :=**_____
DISC 5 CL BLK (SELOGIC)	**89CB2P5 :=**_____
DISC 5 CL RST (SELOGIC)	**89CR2P5 :=**_____
DISC 5 CL IM RS (SELOGIC)	**89CT2P5 :=**_____
DISC 5 OP CONT (SELOGIC)	**89RO2P5 :=**_____
DISC 5 OP BLK (SELOGIC)	**89OB2P5 :=**_____
DISC 5 OP RST (SELOGIC)	**89OR2P5 :=**_____
DISC 5 OP IM RS (SELOGIC)	**89OT2P5 :=**_____

2P DISC 6 NAME (16 characters)	**89NM2P6 :=**_____
DISC 6 N/O CONT (SELOGIC)	**89A2P6 :=**_____
DISC 6 N/C CONT (SELOGIC)	**89B2P6 :=**_____
DISC 6 ALM PU (0.00–300.00 sec)	**89A2P6D :=**_____
DISC 6 SEALIN (0.00–300.00 sec)	**89S2P6D :=**_____
DISC 6 IMMOBI (0.00–300.00 sec)	**89I2P6D :=**_____
DISC 6 CL CONT (SELOGIC)	**89RC2P6 :=**_____
DISC 6 CL BLK (SELOGIC)	**89CB2P6 :=**_____
DISC 6 CL RST (SELOGIC)	**89CR2P6 :=**_____
DISC 6 CL IM RS (SELOGIC)	**89CT2P6 :=**_____
DISC 6 OP CONT (SELOGIC)	**89RO2P6 :=**_____
DISC 6 OP BLK (SELOGIC)	**89OB2P6 :=**_____
DISC 6 OP RST (SELOGIC)	**89OR2P6 :=**_____
DISC 6 OP IM RS (SELOGIC)	**89OT2P6 :=**_____
2P DISC 7 NAME (16 characters)	**89NM2P7 :=**_____
DISC 7 N/O CONT (SELOGIC)	**89A2P7 :=**_____
DISC 7 N/C CONT (SELOGIC)	**89B2P7 :=**_____
DISC 7 ALM PU (0.00–300.00 sec)	**89A2P7D :=**_____
DISC 7 SEALIN (0.00–300.00 sec)	**89S2P7D :=**_____
DISC 7 IMMOBI (0.00–300.00 sec)	**89I2P7D :=**_____
DISC 7 CL CONT (SELOGIC)	**89RC2P7 :=**_____
DISC 7 CL BLK (SELOGIC)	**89CB2P7 :=**_____
DISC 7 CL RST (SELOGIC)	**89CR2P7 :=**_____
DISC 7 CL IM RS (SELOGIC)	**89CT2P7 :=**_____
DISC 7 OP CONT (SELOGIC)	**89RO2P7 :=**_____
DISC 7 OP BLK (SELOGIC)	**89OB2P7 :=**_____
DISC 7 OP RST (SELOGIC)	**89OR2P7 :=**_____
DISC 7 OP IM RS (SELOGIC)	**89OT2P7 :=**_____
2P DISC 8 NAME (16 characters)	**89NM2P8 :=**_____
DISC 8 N/O CONT (SELOGIC)	**89A2P8 :=**_____
DISC 8 N/C CONT (SELOGIC)	**89B2P58 :=**_____
DISC 8 ALM PU (0.00–300.00 sec)	**89A2P8D :=**_____
DISC 8 SEALIN (0.00–300.00 sec)	**89S2P8D :=**_____
DISC 8 IMMOBI (0.00–300.00 sec)	**89I2P8D :=**_____
DISC 8 CL CONT (SELOGIC)	**89RC2P8 :=**_____
DISC 8 CL BLK (SELOGIC)	**89CB2P8 :=**_____
DISC 8 CL RST (SELOGIC)	**89CR2P8 :=**_____
DISC 8 CL IM RS (SELOGIC)	**89CT2P8 :=**_____
DISC 8 OP CONT (SELOGIC)	**89RO2P8 :=**_____
DISC 8 OP BLK (SELOGIC)	**89OB2P8 :=**_____

DISC 8 OP RST (SELOGIC) **89OR2P8 :=**_____

DISC 8 OP IM RS (SELOGIC) **89OT2P8 :=**_____

Three-Position Disconnect

EN 3P DISC (N, 1–2) **89EN3P :=**_____

3P DISC 1 NAME (16 characters) **89NM3P1 :=**_____

LDISC 1 N/O CONT (SELOGIC) **89A3PL1 :=**_____

LDISC 1 N/C CONT (SELOGIC) **89B3PL1 :=**_____

LDISC 1 ALM PU CONT (0.00–300.00 sec) **89A3PL1D :=**_____

LDISC 1 SEALIN (0.00–300.00 sec) **89S3PL1D :=**_____

LDISC 1 IMMOBI (0.00–300.00 sec) **89I3PL1D :=**_____

LDISC 1 CL CONT (SELOGIC) **89RC3PL1 :=**_____

LDISC 1 CL BLK (SELOGIC) **89CB3PL1 :=**_____

LDISC 1 CL RST (SELOGIC) **89CR3PL1 :=**_____

LDISC 1 CL IM RS (SELOGIC) **89CT3PL1 :=**_____

LDISC 1 OP CONT (SELOGIC) **89RO3PL1 :=**_____

LDISC 1 OP BLK (SELOGIC) **89OB3PL1 :=**_____

LDISC 1 OP RST (SELOGIC) **89OR3PL1 :=**_____

LDISC 1 OP IM RS (SELOGIC) **89OT3PL1 :=**_____

EDISC 1 N/O CONT (SELOGIC) **89A3PE1 :=**_____

EDISC 1 N/C CONT (SELOGIC) **89B3PE1 :=**_____

EDISC 1 ALM PU CONT (0.00–300.00 sec) **89A3PE1D :=**_____

EDISC 1 SEALIN (0.00–300.00 sec) **89S3PE1D :=**_____

EDISC 1 IMMOBI (0.00–300.00 sec) **89I3PE1D :=**_____

EDISC 1 CL CONT (SELOGIC) **89RC3PE1 :=**_____

EDISC 1 CL BLK (SELOGIC) **89CB3PE1 :=**_____

EDISC 1 CL RST (SELOGIC) **89CR3PE1 :=**_____

EDISC 1 CL IM RS (SELOGIC) **89CT3PE1 :=**_____

EDISC 1 OP CONT (SELOGIC) **89RO3PE1 :=**_____

EDISC 1 OP BLK (SELOGIC) **89OB3PE1 :=**_____

EDISC 1 OP RST (SELOGIC) **89OR3PE1 :=**_____

EDISC 1 OP IM RS (SELOGIC) **89OT3PE1 :=**_____

3P DISC 2 NAME (16 characters) **89NM3P2 :=**_____

LDISC 2 N/O CONT (SELOGIC) **89A3PL2 :=**_____

LDISC 2 N/C CONT (SELOGIC) **89B3PL2 :=**_____

LDISC 2 ALM PU CONT (0.00–300.00 sec) **89A3PL2D :=**_____

LDISC 2 SEALIN (0.00–300.00 sec) **89S3PL2D :=**_____

LDISC 2 IMMOBI (0.00–300.00 sec) **89I3PL2D :=**_____

LDISC 2 CL CONT (SELOGIC) **89RC3PL2 :=**_____

LDISC 2 CL BLK (SELOGIC) **89CB3PL2 :=**_____

LDISC 2 CL RST (SELOGIC) **89CR3PL2 :=**_____

LDISC 2 CL IM RS (SELOGIC)	**89CT3PL2 :=**_____
LDISC 2 OP CONT (SELOGIC)	**89RO3PL2 :=**_____
LDISC 2 OP BLK (SELOGIC)	**89OB3PL2 :=**_____
LDISC 2 OP RST (SELOGIC)	**89OR3PL2 :=**_____
LDISC 2 OP IM RS (SELOGIC)	**89OT3PL2 :=**_____
EDISC 2 N/O CONT (SELOGIC)	**89A3PE2 :=**_____
EDISC 2 N/C CONT (SELOGIC)	**89B3PE2 :=**_____
EDISC 2 ALM PU CONT (0.00–300.00 sec)	**89A3PE2D :=**_____
EDISC 2 SEALIN (0.00–300.00 sec)	**89S3PE2D :=**_____
EDISC 2 IMMOBI (0.00–300.00 sec)	**89I3PE2D :=**_____
EDISC 2 CL CONT (SELOGIC)	**89RC3PE2 :=**_____
EDISC 2 CL BLK (SELOGIC)	**89CB3PE2 :=**_____
EDISC 2 CL RST (SELOGIC)	**89CR3PE2 :=**_____
EDISC 2 CL IM RS (SELOGIC)	**89CT3PE2 :=**_____
EDISC 2 OP CONT (SELOGIC)	**89RO3PE2 :=**_____
EDISC 2 OP BLK (SELOGIC)	**89OB3PE2 :=**_____
EDISC 2 OP RST (SELOGIC)	**89OR3PE2 :=**_____
EDISC 2 OP IM RS (SELOGIC)	**89OT3PE2 :=**_____

Control Configuration

ENABLE LOC REM CON (Y, N)	**EN_LRC :=**_____
LOCAL CONTROL (SELOGIC)	**LOCAL :=**_____

61850 Mode Control (Hidden when IEC 61850 is not supported)

CONTROL FOR IEC 61850 BLOCKED MODE (SELOGIC)	**SC850BM :=**_____
CONTROL FOR IEC 61850 TEST MODE (SELOGIC)	**SC850TM :=**_____

61850 Simulation Mode (Hidden when IEC 61850 is not supported)

SELOGIC CONTROL FOR IEC 61850 SIMULATION MODE (SELOGIC)	**SC850SM :=**_____

61850 Local Remote (Hidden when IEC 61850 is not supported)

SELOGIC CONTROL FOR CONTROL AUTHORITY AT STATION LEVEL (SELOGIC)	**SC850LS :=**_____
SELOGIC CONTROL FOR CONTROL AUTHORITY AT LOCAL/BAY LEVEL (SELOGIC)	**LOC :=**_____
SELOGIC CONTROL FOR MULTILEVEL MODE OF CONTROL AUTHORITY (SELOGIC)	**MLTLEV :=**_____

SET PORT p (p = F, 1, 2, 3, or 4) Command

Port F

ENABLE PORT (Y, N) **EPORT** := _____

PROTOCOL (SEL, MOD, EVMSG) **PROTO** := _____

MAXIMUM ACCESS LEVEL (1, 2, C) **MAXACC** := _____

Communications

SPEED (300, 1200, 2400, 4800, 9600, 19200, 38400 bps) **SPEED** := _____

DATA BITS (7, 8 bits) **BITS** := _____
(Hidden if PROTO := MOD or EVMSG)

PARITY (O, E, N) **PARITY** := _____
(Hidden if PROTO := EVMSG)

STOP BITS (1, 2 bits) **STOP** := _____
(Hidden if PROTO := MOD or EVMSG)

PORT TIME-OUT (0–30 min) **T_OUT** := _____
(Hidden and forced to 0 if PROTO := MOD or EVMSG)

HDWR HANDSHAKING (Y, N) **RTSCTS** := _____
(Hidden if PROTO := MOD or EVMSG)

SEL Protocol

LANGUAGE (ENGLISH, SPANISH) **LANG** := _____

SEND AUTOMESSAGE (Y, N) **AUTO** := _____
(Hidden and forced to N if PROTO := MOD or EVMSG)

Modbus Protocol

MODBUS SLAVE ID (1–247) **SLAVEID** := _____
(Hidden if PROTO := SEL or EVMSG)

Port 1

(Ethernet Port in Slot B; all Ethernet settings are hidden if an Ethernet option is not available;
IP addresses are entered using zzz = 1–126, 128–223; yyy = 0–255; xxx = 0–255; www = 0–255)

ENABLE PORT (Y, N) **EPORT** := _____

ENABLE ETHERNET FIRMWARE UPGRADE (Y, N) **EETHFWU** := _____

IP ADDRESS (zzz.yyy.xxx.www) (15 characters) **IPADDR** := _____

SUBNET MASK (zzz.yyy.xxx.www) (15 characters) **SUBNETM** := _____

DEFAULT ROUTER (zzz.yyy.xxx.www) (15 characters) **DEFRTR** := _____
(NOTE: Settings DEFRTR := 0.0.0.0 disables the default router)

Enable TCP Keep-Alive (Y, N) **ETCPKA** := _____

TCP Keep-Alive Idle Range (1–20 sec) **KAIDLE** := _____
(Hidden if ETCPKA := N; KAIDLE ≥ KAINTV)

TCP Keep-Alive Interval Range (1–20 sec) **KAINTV** := _____
(Hidden if ETCPKA := N; KAIDLE ≥ KAINTV)

TCP Keep-Alive Count Range (1–20) **KACNT** := _____
(Hidden if ETCPKA := N)

OPERATING MODE (FIXED, FAILOVER, SWITCHED, PRP) **NETMODE** := _____
(Hidden when the dual redundant Ethernet port option is not included)

FAILOVER TIMEOUT (OFF, 0.10–65.00 sec) **FTIME** := _____
(Hidden when the dual redundant Ethernet port option is not included or if NETMODE ≠ FAILOVER)

PRIMARY NETPORT (A, B) **NETPORT** := _____
(Hidden when the dual redundant Ethernet port option is not included)

PRP ENTRY TIMEOUT (400–10000 ms) **PRPTOUT** := _____
(Hidden when the dual redundant Ethernet port option is not included or if NETMODE ≠ PRP)

PRP DESTINATION ADDR LSB (0–255) **PRPADDR** := _____
(Hidden when the dual redundant Ethernet port option is not included or if NETMODE ≠ PRP)

PRP SUPERVISION TX INTERVAL (1–10 sec) **PRPINTV** := _____
(Hidden when the dual redundant Ethernet port option is not included or if NETMODE ≠ PRP)

NETWRK PORTA SPD (AUTO, 10, 100 Mbps) **NETASPD** := _____
(Hidden when the dual redundant Ethernet port option is not included)

NETWRK PORTB SPD (AUTO, 10, 100 Mbps) **NETBSPD** := _____
(Hidden when the dual redundant Ethernet port option is not included)

ENABLE TELNET (Y, N) **ETELNET** := _____

MAXIMUM ACCESS LEVEL (1, 2, C) **MAXACC** := _____

LANGUAGE (ENGLISH, SPANISH) **LANG** := _____

TELNET PORT (23, 1025–65534) **TPORT** := _____
(NOTE: See Table SET.3 and the note at the end of Port 1 settings)

TELNET CONNECT BANNER (254 characters) **TCBAN** := _____

TELNET TIME-OUT (1–30 min) **TIDLE** := _____

FAST OP MESSAGES (Y, N) **FASTOP** := _____
Note: The FAST OP MESSAGES setting only functions when using SEL Fast Operate protocol to operate/set/pulse breaker bits and remote bits. This setting has no effect on other protocols.

ENABLE FTP (Y, N) **EFTPSERV** := _____

FTP MAXIMUM ACCESS LEVEL (1, 2 C) **FTPACC** := _____

FTP USER NAME (20 Characters) **FTPUSER** := _____

FTP CONNECT BANNER (254 characters) **FTPCBAN** := _____

FTP IDLE TIME-OUT (5–255 min) **FTPIDLE** := _____

Enable IEC 61850 Protocol (Y, N) **E61850** := _____
(Hidden when IEC 61850 is not supported)

Enable IEC 61850 GSE (Y, N) **EGSE** := _____
(Hidden and forced to N if E61850 := N)

ENABLE MMS FILE SERVICES (Y, N) **EMMSFS** := _____

ENABLE 61850 MODE/BEHAVIOR CONTROL (Y, N) **E850MBC** := _____

ENABLE GOOSE Tx IN OFF MODE (Y, N) **EOFFMTX** := _____

Enable Modbus Sessions (0–2) **EMOD** := _____

MODBUS MASTER IP ADDRESS (zzz.yyy.xxx.www) **MODIP1** := _____
(Hidden if EMOD := 0)

MODBUS MASTER IP ADDRESS (zzz.yyy.xxx.www) **MODIP2** := _____
(Hidden if EMOD := 0 or 1)

NOTE: MODIP1 and MODIP2 cannot share an address and must be unique (except when 0.0.0.0, which effectively disables security and allows any master to communicate).

Modbus TCP Port1 (1–65534)* **MODNUM1** := _____
(Hidden if EMOD := 0)
(NOTE: See Table SET.3 and the note at the end of Port 1 settings)

Modbus TCP Port2 (1–65534)* **MODNUM2** := _____
(Hidden if EMOD := 0 or 1)
(NOTE: See Table SET.3 and the note at the end of Port 1 settings)

Modbus Timeout 1 (15–900 sec) **MTIMEO1** := _____
(Hidden if EMOD := 0)

Modbus Timeout 2 (15–900 sec) **MTIMEO2** := _____
(Hidden if EMOD := 0 or 1)

ENABLE HTTP SERVER (Y, N) **EHTTP** := _____

HTTP MAXIMUM ACCESS LEVEL (1, 2, C) **HTTPACC** := _____
(Hidden when EHTTP := N)

HTTP SERVER TCP/IP PORT NUMBER (1–65534) **HTTPPORT** := _____
(Hidden when EHTTP := N)
(NOTE: See Table SET.3 and the note at the end of Port 1 settings)

HTTP CONNECT BANNER (254 ASCII printable characters **HTTPBAN** := _____
(Hidden when EHTTP := N)

HTTP WEB SERVER TIMEOUT (1–60 min) **HTTPIDLE** := _____
(Hidden when EHTTP := N)

ENABLE RSTP (Y, N) **ERSTP** := _____
(Hidden when the dual redundant Ethernet port option is not included or if NETMODE ≠ SWITCHED)

BRIDGE PRIORITY (0–61440) **BRDGPRI** := _____
(Hidden when ERSTP := N; input must be set in increments of 4096)

PORTA PRIORITY (0–240) **PORTAPRI** := _____
(Hidden when ERSTP := N; input must be set in increments of 16)

PORTB PRIORITY (0–240) **PORTBPRI** := _____
(Hidden when ERSTP := N; input must be set in increments of 16)

DNP3 Protocol

(The following DNP3 settings are hidden if DNP3 is not an option)

Enable DNP3 Sessions (0–5) **EDNP** := _____
(The following DNP3 settings are hidden if EDNP := 0)

DNP TCP and UDP Port (1–65534) **DNPNUM** := _____
(NOTE: See Table SET.3 and the note at the end of Port 1 settings)

DNP Address (0–65519) **DNPADR** := _____

Session 1

(NOTE: The DNP IP address of each session (DNPIP1, DNPIP2, etc.) must be unique.)

DNP Master IP Address {zzz.yyy.xxx.www} (15 Characters) **DNPIP1** := _____

Transport Protocol (UDP, TCP) **DNPTR1** := _____

UDP Response Port (REQ, 1–65534) **DNPUDP1** := _____

DNP Address to Report to (0–65519) **REPADR1** := _____

DNP Map (1–3) **DNPMAP1** := _____

Analog Input Default Variation (1–6) **DVARAI1** := _____
(Only applies to objects 30 and 32)

Class for Binary Event Data (0–3) **ECLASSB1** := _____

Class for Counter Event Data (0–3) **ECLASSC1** := _____

Class for Analog Event Data (0–3) **ECLASSA1** := _____

Currents Scaling Decimal Places (0–3) **DECPLA1** := _____

Voltages Scaling Decimal Places (0–3) **DECPLV1** := _____

Misc Data Scaling Decimal Places (0–3) **DECPLM1** := _____

Amps Reporting Deadband Counts (0–32767) **ANADBA1** := _____
(Hidden if ECLASSA1 := 0)

Volts Reporting Deadband Counts (0–32767) **ANADBV1** := _____
(Hidden if ECLASSA1 := 0)

Misc Data Reporting Deadband Counts (0–32767) **ANADBM1** := _____
(Hidden if ECLASSA1 := 0 and ECLASSC1 := 0)

Minutes for Request Interval (I, M, 1–32767) **TIMERQ1** := _____

Seconds to Select/Operate Time-Out (0.0–30.0) **STIMEO1** := _____

Seconds to send Data Link Heartbeat (0–7200) **DNPINA1** := _____
(Hidden if DNPTR1 := UDP)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO1** := _____

Enable Unsolicited Reporting (Y, N) **UNSOL1** := _____
(Hidden and forced to N if ECLASSA1 := 0, ECLASSB1 := 0, and ECLASSC1 := 0)
(All subsequent settings are hidden and forced to N if UNSOL1 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL1** := _____

Number of Events to Transmit On (1–200) **NUMEVE1** := _____

Oldest Event to Tx On (0.0–99999.0 sec) **AGEEVE1** := _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY1** := _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO1** := _____

Session 2

(All Session 2 settings are hidden if EDNP < 2)

DNP Master IP Address {zzz.yyy.xxx.www} (15 Characters) **DNPIP2** := _____

Transport Protocol (UDP, TCP) **DNPTR2** := _____

UDP Response Port (REQ, 1–65534) **DNPUDP2** := _____

DNP Address to Report to (0–65519) **REPADR2** := _____

DNP Map (1–3) **DNPMAP2** := _____

Analog Input Default Variation (1–6) **DVARAI2** := _____

Class for Binary Event Data (0–3) **ECLASSB2** := _____

Class for Counter Event Data (0–3) **ECLASSC2** := _____

Class for Analog Even Data (0–3) **ECLASSA2** := _____

Currents Scaling Decimal Places (0–3) **DECPLA2** := _____

Voltages Scaling Decimal Places (0–3) **DECPLV2** := _____

Misc Data Scaling Decimal Places (0–3) **DECPLM2** := _____

Amps Reporting Deadband Counts (0–32767) **ANADBA2** := _____
(Hidden if ECLASSA2 := 0)

Volts Reporting Deadband Counts (0–32767) **ANADBV2** := _____
(Hidden if ECLASSA2 := 0)

Misc Data Reporting Deadband Counts (0–32767) **ANADBM2** := _____
(Hidden if ECLASSA2 := 0 and ECLASSC2 := 0)

Minutes for Request Interval (I, M, 1–32767) **TIMERQ2** := _____

Seconds to Select/Operate Time-Out (0.0–30.0) **STIMEO2** := _____

Seconds to send Data Link Heartbeat (0–7200) **DNPINA2** := _____
(Hidden if DNPTR2 := UDP)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO2** := _____

Enable Unsolicited Reporting (Y, N) **UNSOL2** := _____
(Hidden and forced to N if ECLASSA2 := 0, ECLASSB2 := 0, ECLASSC2 := 0, and ECLASSV2 := 0)
(All subsequent settings are hidden and forced to N if UNSOL2 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL2** := _____

Number of Event to Transmit On (1–200) **NUMEVE2** := _____

Oldest Even to Tx On (0.0–99999.0 sec) **AGEEVE2** := _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY2** := _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO2** := _____

Session 3

(All Session 3 settings are hidden if EDNP < 3)

DNP Master IP Address {zzz.yyy.xxx.www} (15 Characters)	**DNPIP3**:=
Transport Protocol (UDP, TCP)	**DNPTR3**:=
UDP Response Port (REQ, 1–65534)	**DNPUDP3**:=
DNP Address to Report to (0–65519)	**REPADR3**:=
DNP Map (1–3)	**DNPMAP3**:=
Analog Input Default Variation (1–6)	**DVARAI3**:=
Class for Binary Event Data (0–3)	**ECLASSB3**:=
Class for Counter Event Data (0–3)	**ECLASSC3**:=
Class for Analog Even Data (0–3)	**ECLASSA3**:=
Currents Scaling Decimal Places (0–3)	**DECPLA3**:=
Voltages Scaling Decimal Places (0–3)	**DECPLV3**:=
Misc Data Scaling Decimal Places (0–3)	**DECPLM3**:=
Amps Reporting Deadband Counts (0–32767) *(Hidden if ECLASSA3 := 0)*	**ANADBA3**:=
Volts Reporting Deadband Counts (0–32767) *(Hidden if ECLASSA3 := 0)*	**ANADBV3**:=
Misc Data Reporting Deadband Counts (0–32767) *(Hidden if ECLASSA3 := 0 and ECLASSC3 := 0)*	**ANADBM3**:=
Minutes for Request Interval (I, M, 1–32767)	**TIMERQ3**:=
Seconds to Select/Operate Time-Out (0.0–30.0)	**STIMEO3**:=
Seconds to Send Data Link Heartbeat (0–7200) *(Hidden if DNPTR3 := UDP)*	**DNPINA3**:=
Event Message Confirm Time-Out (1–50 sec)	**ETIMEO3**:=
Enable Unsolicited Reporting (Y, N) *(Hidden and forced to N if ECLASSA3 := 0, ECLASSB3 := 0, ECLASSC3 := 0, and ECLASSV3 := 0)* *(All subsequent settings are hidden and forced to N if UNSOL3 := N)*	**UNSOL3**:=
Enable Unsolicited Reporting at Power-Up (Y, N)	**PUNSOL3**:=
Number of Event to Transmit On (1–200)	**NUMEVE3**:=
Oldest Event to Tx On (0.0–99999.0 sec)	**AGEEVE3**:=
Unsolicited Message Max Retry Attempts (2–10)	**URETRY3**:=
Unsolicited Message Offline Time-Out (1–5000 sec)	**UTIMEO3**:=

Session 4

(All Session 4 settings are hidden if EDNP < 4)

DNP Master IP Address {zzz.yyy.xxx.www} (15 Characters)	**DNPIP4**:=
Transport Protocol (UDP, TCP)	**DNPTR4**:=
UDP Response Port (REQ, 1–65534)	**DNPUDP4**:=
DNP Address to Report to (0–65519)	**REPADR4**:=
DNP Map (1–3)	**DNPMAP4**:=
Analog Input Default Variation (1–6)	**DVARAI4**:=
Class for Binary Event Data (0–3)	**ECLASSB4**:=
Class for Counter Event Data (0–3)	**ECLASSC4**:=
Class for Analog Even Data (0–3)	**ECLASSA4**:=

Currents Scaling Decimal Places (0–3) **DECPLA4**:=
Voltages Scaling Decimal Places (0–3) **DECPLV4**:=
Misc Data Scaling Decimal Places (0–3) **DECPLM4**:=
Amps Reporting Deadband Counts (0–32767) **ANADBA4**:=
(Hidden if ECLASSA4 := 0)
Volts Reporting Deadband Counts (0–32767) **ANADBV4**:=
(Hidden if ECLASSA4 := 0)
Misc Data Reporting Deadband Counts (0–32767) **ANADBM4**:=
(Hidden if ECLASSA4 := 0 and ECLASSC4 := 0)
Minutes for Request Interval (I, M, 1–32767) **TIMERQ4**:=
Seconds to Select/Operate Time-Out (0.0–30.0) **STIMEO4**:=
Seconds to Send Data Link Heartbeat (0–7200) **DNPINA4**:=
(Hidden if DNPTR4 := UDP)
Event Message Confirm Time-Out (1–50 sec) **ETIMEO4**:=
Enable Unsolicited Reporting (Y, N) **UNSOL4**:=
(Hidden and forced to N if ECLASSA4 := 0, ECLASSB4 := 0, ECLASSC4 := 0, and ECLASSV4 := 0)
(All subsequent settings are hidden and forced to N if UNSOL4 := N)
Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL4**:=
Number of Event to Transmit On (1–200) **NUMEVE4**:=
Oldest Event to Tx On (0.0–99999.0 sec) **AGEEVE4**:=
Unsolicited Message Max Retry Attempts (2–10) **URETRY4**:=
Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO4**:=

Session 5

(All Session 5 settings are hidden if EDNP < 5)

DNP Master IP Address {zzz.yyy.xxx.www} (15 Characters) **DNPIP5**:=
Transport Protocol (UDP, TCP) **DNPTR5**:=
UDP Response Port (REQ, 1–65534) **DNPUDP5**:=
DNP Address to Report to (0–65519) **REPADR5**:=
DNP Map (1–3) **DNPMAP5**:=
Analog Input Default Variation (1–6) **DVARAI5**:=
Class for Binary Event Data (0–3) **ECLASSB5**:=
Class for Counter Event Data (0–3) **ECLASSC5**:=
Class for Analog Even Data (0–3) **ECLASSA5**:=
Currents Scaling Decimal Places (0–3) **DECPLA5**:=
Voltages Scaling Decimal Places (0–3) **DECPLV5**:=
Misc Data Scaling Decimal Places (0–3) **DECPLM5**:=
Amps Reporting Deadband Counts (0–32767) **ANADBA5**:=
(Hidden if ECLASSA5 := 0)
Volts Reporting Deadband Counts (0–32767) **ANADBV5**:=
(Hidden if ECLASSA5 := 0)
Misc Data Reporting Deadband Counts (0–32767) **ANADBM5**:=
(Hidden if ECLASSA5 := 0 and ECLASSC5 := 0)
Minutes for Request Interval (I, M, 1–32767) **TIMERQ5**:=
Seconds to Select/Operate Time-Out (0.0–30.0) **STIMEO5**:=
Seconds to Send Data Link Heartbeat (0–7200) **DNPINA5**:=
(Hidden if DNPTR5 := UDP)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO5** := _____

Enable Unsolicited Reporting (Y, N) **UNSOL5** := _____
(Hidden and forced to N if ECLASSA5 := 0, ECLASSB5 := 0, ECLASSC5 := 0, and ECLASSV5 := 0)
(All subsequent settings are hidden and forced to N if UNSOL5 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL5** := _____

Number of Event to Transmit On (1–200) **NUMEVE5** := _____

Oldest Event to Tx On (0.0–99999.0 sec) **AGEEVE5** := _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY5** := _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO5** := _____

SNTP Client Protocol Settings

Enable SNTP Client **ESNTP** := _____
(OFF, UNICAST, MANYCAST, BROADCAST)
(All subsequent category settings are hidden if ESNTP := OFF)

Make the following settings when ESNTP ≠ MANYCAST

Primary Server IP Address (zzz.yyy.xxx.www) **SNTPPSIP** := _____
(NOTE: To accept updates from any server when ESNTP := BROADCAST, set SNTPPSIP to 0.0.0.0.
NOTE: Only IP addresses in the range 224.0.0.1 through 239.255.255.255 are valid when ESNTP = MANYCAST.)

Make the following setting when ESNTP := UNICAST

Backup Server IP Address (zzz.yyy.xxx.www) **SNTPBSIP** := _____
(Hidden if ESNTP ≠ UNICAST)

SNTP IP (Local) Port Number (1–65534) **SNTPPORT** := _____
(NOTE: See Table SET.3 and the note at the end of Port 1 settings.)

SNTP Update Rate (15–3600 sec) **SNTPRATE** := _____

Make the following setting when ESNTP := UNICAST or MANYCAST

SNTP Timeout (5–20 sec) **SNTPTO** := _____
(Hidden and forced to 5 if ESNTP := BROADCAST
NOTE: SNTPTO must be less than setting SNTPRATE.)

PTP Settings

Enable PTP (Y, N) **EPTP** := _____
(All subsequent category settings are hidden if EPTP := N)
(Hidden and forced to N if NETMODE := SWITCHED)

PTP Profile (DEFAULT, C37.238) **PTPPRO** := _____
(Hidden and forced to C37.238 if NETMODE := PRP)

PTP Transport Mechanism (UDP, LAYER2) **PTPTR** := _____
(Hidden and forced to LAYER2 if PTPPRO := C37.238 or if NETMODE := PRP)

PTP Domain Number (0–255) **DOMNUM** := _____

PTP Path Delay Mechanism (P2P, E2E, OFF) **PTHDLY** := _____
(Hidden and forced to P2P if PTPPRO := C37.238 or if NETMODE := PRP)

Peer Delay Request Interval (1, 2, 4, 8, 16, 32, 64 seconds) **PDINT** := _____
(Hidden if PTHDLY ≠ P2P, PTPPRO ≠ C37.238, and NETMODE ≠ PRP)

PTP Number of Acceptable Masters, (OFF, 1–5) **AMNUM** := _____

PTP Acceptable Master *n* IP (zzz.yyy.xxx.www) **AMIP*n*** := _____
(Hidden if n > AMNUM or if AMNUM := OFF or if PTPTR := LAYER2 or if NETMODE := PRP or if PTPPRO := C37.238)

PTP Acceptable Master *n* MAC (xx:xx:xx:xx:xx:xx) **AMMAC*n*** := _____
(Hidden if AMNUM := OFF or if NETMODE ≠ PRP and if PTPTR ≠ LAYER2 and if PTPPRO ≠ C37.238)

PTP Alternative Priority1 for Master *n* (0–255) **ALTPRI*n* :=** _____
(Hidden if n > AMNUM or if AMNUM := OFF)

PTP VLAN Identifier (1–4094) **PVLAN :=** _____
(Hidden if NETMODE ≠ PRP and PTPPRO ≠ C37.238)

PTP VLAN Priority (0–7) **PVLANPR :=** _____
(Hidden if NETMODE ≠ PRP and PTPPRO ≠ C37.238)

EtherNet/IP Settings

ENABLE ETHERNET IP (Y, N) **EEIP :=** _____

Configuration ID (0–255) **CONFIGID :=** _____

Major EDS Revision (1–255) **MAJOREDS :=** _____

Minor EDS Revision (1–255) **MINOREDS :=** _____

Number of IP Addresses for EIP Scanner (OFF, 1–8) **NUMIP :=** _____
(OFF allows anonymous clients)

IP Address (zzz.yyy.xxx.www) **EIPIP*n* :=** _____
(Hidden if NUMIP := OFF, or if n > NUMIP
NOTE: EIPIPn settings shall not be equal to the value of the IPADDR setting. EIPIP1 through EIPIP8 must be unique)

Number of IO Connections (1–6) **NUMCONN :=** _____

Application Type (EXCLUSIVE_OWNER, INPUT_ONLY) **APPTYP*n* :=** _____
(NOTE: At most, three EXCLUSIVE_OWNER types are allowed)

Input Assembly (IA1, IA2, IA3, OA1, OA2, OA3) **INASSM*n* :=** _____

Output Assembly (OA1, OA2, OA3) **OUTASSM*n* :=** _____
(Hidden if APPTYPn := INPUT_ONLY)

Port Number Settings Must be Unique

When making the SEL-700BT Port 1 settings, port number settings cannot be used for more than one protocol. The relay checks all of the settings shown in *Table SET.3* before saving changes. If a port number is used more than once, or if it matches any of the fixed port numbers (20, 21, 23, 102, 502), the relay displays an error message and returns to the first setting that is in error or contains a duplicate value.

Table SET.3 Port Number Settings That Must be Unique

Setting	Name	Setting Required When
TPORT	Telnet Port	Always
MODNUM1[a]	Modbus TCP Port 1	EMOD > 0
MODNUM2[a]	Modbus TCP Port 2	EMOD > 1
DNPNUM	DNPTCP and UDP Port	EDNP > 0
SNTPPORT	SNTPIP (Local) Port Number	ESNTP ≠ OFF
EPTP	Enable PTP	PTPPRO = DEFAULT and PTPTR = UDP (Ports 319 and 320 are reserved)
EEIP	Enable EtherNet/IP	EEIP ≠ N (Ports 2222/44818 are reserved)

[a] MODNUM1 and MODNUM2 can have the same port number. The relay displays an error message if this number matches with the port numbers of the other protocols.

Port 2

(Fiber-optic serial port in Slot B; the following settings are autoset and hidden if E49RTD := EXT)

ENABLE PORT (Y, N) **EPORT:=** _____

PROTOCOL (SEL, DNP, MOD, EVMSG, MBA, MBB, MB8A, MB8B, MBTA, MBTB, 103) **PROTO:=** _____

MAXIMUM ACCESS LEVEL (1, 2, C) **MAXACC:=** _____

Communications

SPEED (300, 1200, 2400, 4800, 9600, 19200, 38400 bps) **SPEED:=** _____

DATA BITS (7, 8 bits) **BITS:=** _____
(Hidden if PROTO := MOD, DNP, EVMSG, 103, or MB_)

PARITY (O, E, N) **PARITY:=** _____
(Hidden if PROTO := EVMSG, or MB_)

STOP BITS (1, 2 bits) **STOP:=** _____
(Hidden if PROTO := MOD, EVMSG, or MB_)

PORT TIME-OUT (0–30 min) **T_OUT:=** _____
(Hidden and forced to 0 if PROTO := MOD, EVMSG, 103, or MB_)

HDWR HANDSHAKING (Y, N) **RTSCTS:=** _____
(Hidden and forced to N if PROTO := MOD, EVMSG, DNP, SEL, or MB_)

LANGUAGE (ENGLISH, SPANISH) **LANG:=** _____

SEND AUTOMESSAGE (Y, N) **AUTO:=** _____
(Hidden and forced to N if PROTO := MOD, DNP, EVMSG, 103, or MB_)

FAST OP MESSAGES (Y, N) **FASTOP:=** _____
(Hidden if PROTO := MOD, EVMSG, DNP, 103, or MB_)

Modbus

MODBUS SLAVE ID (1–247) **SLAVEID:=** _____
(Hidden if PROTO := SEL, EVMSG, MB_, 103, or DNP)

DNP3 Protocol

(Hidden if PROTO := SEL, EVMSG, MB, 103, or MOD)

DNP Address (0–65519) **DNPADR:=** _____

DNP Address to Report to (0–65519) **REPADR1:=** _____

DNP Map (1–3) **DNPMAP1:=** _____

Analog Input Default Variation (1–6) **DVARAI1:=** _____

Class for Binary Event Data (0–3) **ECLASSB1:=** _____

Class for Counter Event Data (0–3) **ECLASSC1:=** _____

Class for Analog Event Data (0–3) **ECLASSA1:=** _____

Current Scaling Decimal Places (0–3) **DECPLA1:=** _____

Voltages Scaling Decimal Places (0–3) **DECPLV1:=** _____

Misc Data Scaling Decimal Places (0–3) **DECPLM1:=** _____

Amps Reporting Deadband Counts (0–32767) **ANADBA1:=** _____
(Hidden if ECLASSA1 := 0)

Volts Reporting Deadband Counts (0–32767) **ANADBV1:=** _____
(Hidden if ECLASSA1 := 0)

Misc Data Reporting Deadband Counts (0–32767) **ANADBM1:=** _____
(Hidden if ECLASSA1 := 0 and ECLASSC1 := 0

Minutes for Request Interval (I, M, 1–32767) **TIMERQ1:=** _____

Seconds to Select/Operate Time-Out (0.0–30.0) **STIMEO1:=** _____

Data Link Retries (0–51) **DRETRY1:=** _____

Seconds to Data Link Time-Out (0–5 sec) **DTIMEO1:=** _____
(Hidden if DRETRY1 := 0)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO1:=** _____

Enable Unsolicited Reporting (Y, N) **UNSOL1:=** _____
(Hidden and forced to N if ECLASSA1 := 0, ECLASSB1 := 0, and ECLASSC1 := 0)
(All subsequent settings are hidden and forced to N if UNSOL1 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL1:=** _____

Number of Events to Transmit On (1–200) **NUMEVE1:=** _____

Oldest Event to Tx On (0.0–99999.0 sec) **AGEEVE1:=** _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY1:=** _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO1:=** _____

Mirrored Bits Protocol

(All subsequent settings are hidden if PROTO := SEL, DNP, EVMSG, 103, or MOD)

MB Transmit Identifier (1–4) **TXID:=** _____

MB Receive Identifier (1–4) **RXID:=** _____

MB RX Bad Pickup Time (0–10000 sec) **RBADPU:=** _____

MB Channel Bad Pickup (1–10000 ppm) **CBADPU:=** _____

MB Receive Default State (8 Characters) **RXDFLT:=** _____

RMB1 Pickup Debounce Messages (1–8) **RMB1PU:=** _____

RMB1 Dropout Debounce Messages (1–8) **RMB1DO:=** _____

RMB2 Pickup Debounce Messages (1–8) **RMB2PU:=** _____

RMB2 Dropout Debounce Messages (1–8) **RMB2DO:=** _____

RMB3 Pickup Debounce Messages (1–8) **RMB3PU:=** _____

RMB3 Dropout Debounce Messages (1–8) **RMB3DO:=** _____

RMB4 Pickup Debounce Messages (1–8) **RMB4PU:=** _____

RMB4 Dropout Debounce Messages (1–8) **RMB4DO:=** _____

RMB5 Pickup Debounce Messages (1–8) **RMB5PU:=** _____

RMB5 Dropout Debounce Messages (1–8) **RMB5DO:=** _____

RMB6 Pickup Debounce Messages (1–8) **RMB6PU:=** _____

RMB6 Dropout Debounce Messages (1–8) **RMB6DO:=** _____

RMB7 Pickup Debounce Messages (1–8) **RMB7PU:=** _____

RMB7 Dropout Debounce Messages (1–8) **RMB7DO:=** _____

RMB8 Pickup Debounce Messages (1–8) **RMB8PU:=** _____

RMB8 Dropout Debounce Messages (1–8) **RMB8DO:=** _____

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(Hidden unless serial port with PROTO := 103)

103 DEVICE ADDRESS (0–254) **103ADDR:=** _____

CYCLIC DATA REPORTING PERIOD (1–3600 sec) **103CYC:=** _____

ACCUMULATOR REPORTING PERIOD (OFF, 1–3600 sec) **103ACYC:=** _____

ACCUMULATOR REPORTING TRIGGER (1 Relay Word Bit) **103ATRI:=** _____

ENABLE TIME SYNCHRONIZATION (Y, N) **103TIME:=** _____

Port 3

(EIA-232 or EIA-485 Port in Slot B)

ENABLE PORT (Y, N) **EPORT:=** _____

PROTOCOL (SEL, DNP, MOD, EVMSG, MBA, MBB, MB8A, MB8B, MBTA, MBTB, 103) **PROTO:=** _____

MAXIMUM ACCESS LEVEL (1, 2, C) **MAXACC:=** _____

Communications

SPEED (300, 1200, 2400, 4800, 9600, 19200, 38400 bps) **SPEED:=** _____

DATA BITS (7, 8 bits) **BITS:=** _____
(Hidden if PROTO := MOD, DNP, EVMSG, 103, or MB_)

PARITY (O, E, N) **PARITY:=** _____
(Hidden if PROTO := EVMSG or MB_)

STOP BITS (1, 2 bits) **STOP:=** _____
(Hidden if PROTO := MOD, EVMSG, or MB_)

PORT TIME-OUT (0–30 min) **T_OUT:=** _____
(Hidden and forced to 0 if PROTO := MOD, EVMSG, 103, or MB_)

HDWR HANDSHAKING (Y, N) **RTSCTS:=** _____
(Hidden and forced to N if EIA-485 Port or PROTO := MOD, DNP, EVMSG, or MB_)

LANGUAGE (ENGLISH, SPANISH) **LANG:=** _____

SEND AUTOMESSAGE (Y, N) **AUTO:=** _____
(Hidden and forced to N if PROTO := MOD, DNP, EVMSG, 103, or MB_)

FAST OP MESSAGES (Y, N) **FASTOP:=** _____
(Hidden if PROTO := MOD, DNP, EVMSG, 103, or MB_)

MINIMUM SECONDS FROM DCD TO TX (0.00–1.00 sec) **MINDLY:=** _____
(Hidden if PROTO ≠ DNP)

MAXIMUM SECONDS FROM DCD TO TX (0.0–1.00 sec) **MAXDLY:=** _____
(Hidden if PROTO ≠ DNP)

SETTLE TIME FROM RTS ON TO TX (OFF, 0.00–30.00 sec) **PREDLY:=** _____
(Hidden if PROTO ≠ DNP or 103)

SETTLE TIME FROM TX TO RTD OFF (0.00–30.00 sec) **PSTDLY:=** _____
(Hidden if PROTO ≠ DNP or 103)

Modbus

MODBUS SLAVE ID (1–247) **SLAVEID:=** _____
(Hidden if PROTO := SEL, EVMSG, 103, DNP, or MB_)

DNP3 Protocol

(Hidden if PROTO := SEL, EVMSG, MB, 103, or MOD)

DNP Address (0–65519) **DNPADR:=** _____

DNP Address to Report to (0–65519) **REPADR1:=** _____

DNP Map (1–3) **DNPMAP1:=** _____

Analog Input Default Variation (1–6) **DVARAI1:=** _____

Class for Binary Event Data (0–3) **ECLASSB1:=** _____

Class for Counter Event Data (0–3) **ECLASSC1:=** _____

Class for Analog Event Data (0–3) **ECLASSA1:=** _____

Current Scaling Decimal Places (0–3) **DECPLA1:=** _____

Voltages Scaling Decimal Places (0–3) **DECPLV1:=** _____

Misc Data Scaling Decimal Places (0–3) **DECPLM1:=** _____

Amps Reporting Deadband Counts (0–32767) **ANADBA1:=** _____
(Hidden if ECLASSA1 := 0

Volts Reporting Deadband Counts (0–32767) **ANADBV1:=** _____
(Hidden if ECLASSA1 := 0)

Misc Data Reporting Deadband Counts (0–32767) **ANADBM1:=** _____
(Hidden if ECLASSA1 := 0 and ECLASSC1 := 0)

Minutes for Request Interval (I, M, 1–32767) **TIMERQ1:=** _____

Seconds to Select/Operate Time-Out (0.0–30.0 sec) **STIMEO1:=** _____

Data Link Retries (0–15) **DRETRY1:=** _____

Seconds to Data Link Time-Out (0–5 sec) **DTIMEO1:=** _____
(Hidden if DRETRY1 := 0)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO1:=** _____

Enable Unsolicited Reporting (Y, N) **UNSOL1:=** _____
(Hidden and forced to N if ECLASSA1 := 0, ECLASSB1 := 0, and ECLASSC1 := 0)
(All subsequent settings are hidden and forced to N when UNSOL1 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL1:=** _____

Number of Events to Transmit On (1–200) **NUMEVE1:=** _____

Oldest Event to Tx On (0.0–99999.0 sec) **AGEEVE1:=** _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY1:=** _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO1:=** _____

Modem Protocol

(For DNP3 session and EIA-232 port only)

Modem Connected to Port (Y, N) **MODEM:=** _____

Modem Startup String (30 Characters) **MSTR:=** _____

Phone Number for Dial-Out (30 Characters) **PH_NUM1:=** _____

Phone Number for Dial-Out (30 Characters) **PH_NUM2:=** _____

Retry Attempts for Phone 1 Dial-Out (1–20) **RETRY1:=** _____

Retry Attempts for Phone 2 Dial-Out (1–20) **RETRY2:=** _____

Time to Attempt Dial (5–300 sec) **MDTIME:=** _____

Time Between Dial-Out Attempts (5–3600 sec) **MDRET:=** _____

Mirrored Bits Protocol

(Hidden if PROTO := SEL, DNP, EVMSG, 103, or MOD)

MB Transmit Identifier (1–4) **TXID:=** _____

MB Receive Identifier (1–4) **RXID:=** _____

MB RX Bad Pickup Time (0–10000 sec) **RBADPU:=** _____

MB Channel Bad Pickup (1–10000 ppm) **CBADPU:=** _____

MB Receive Default State (8 Characters) **RXDFLT:=** _____

RMB1 Pickup Debounce Messages (1–8) **RMB1PU:=** _____

RMB1 Dropout Debounce Messages (1–8) **RMB1DO:=** _____

RMB2 Pickup Debounce Messages (1–8) **RMB2PU:=** _____

RMB2 Dropout Debounce Messages (1–8) **RMB2DO:=** _____

RMB3 Pickup Debounce Messages (1–8) **RMB3PU:=** _____

RMB3 Dropout Debounce Messages (1–8) **RMB3DO:=** _____

RMB4 Pickup Debounce Messages (1–8) **RMB4PU:=** _____

RMB4 Dropout Debounce Messages (1–8) **RMB4DO:=** _____

RMB5 Pickup Debounce Messages (1–8) **RMB5PU:=** _____

RMB5 Dropout Debounce Messages (1–8) **RMB5DO:=** _____

RMB6 Pickup Debounce Messages (1–8) **RMB6PU:=** _____

RMB6 Dropout Debounce Messages (1–8) **RMB6DO:=** _____

RMB7 Pickup Debounce Messages (1–8) **RMB7PU:=** _____

RMB7 Dropout Debounce Messages (1–8) **RMB7DO:=** _____

RMB8 Pickup Debounce Messages (1–8) **RMB8PU:=** _____

RMB8 Dropout Debounce Messages (1–8) **RMB8DO:=** _____

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(Hidden unless serial port with PROTO := 103)

103 DEVICE ADDRESS (0–254) **103ADDR:=** _____

CYCLIC DATA REPORTING PERIOD (1–3600 sec) **103CYC:=** _____

ACCUMULATOR REPORTING PERIOD (OFF, 1–3600 sec) **103ACYC** _____

ACCUMULATOR REPORTING TRIGGER (1 Relay Word Bit) **103ATRI** _____

ENABLE TIME SYNCHRONIZATION (Y, N) **103TIME** _____

Port 4

(EIA-232/485 port in Slot C)

ENABLE PORT (Y, N) **EPORT:=** _____

PROTOCOL (SEL, DNP, MOD, EVMSG, MBA, MBB, MB8A, MB8B, MBTA, MBTB, 103) **PROTO:=** _____

MAXIMUM ACCESS LEVEL (1, 2, C) **MAXACC:=** _____

Interface Select

COMM INTERFACE (232, 485) **COMMINF:=** _____

Communications

SPEED (300, 1200, 2400, 4800, 9600, 19200, 38400 bps) **SPEED:=** _____

DATA BITS (7, 8 bits) **BITS:=** _____
(Hidden if PROTO := DNP, MOD, EVMSG, MB_, or 103)

PARITY (O, E, N) **PARITY:=** _____
(Hidden and forced to 0 if PROTO := EVMSG or MB_)

STOP BITS (1, 2 bits) **STOP:=** _____
(Hidden if PROTO := MOD, EVMSG, or MB_)

PORT TIME-OUT (0–30 min) **T_OUT:=** _____
(Hidden if PROTO := MOD, EVMSG, MB_, or 103)

HDWR HANDSHAKING (Y, N) **RTSCTS:=** _____
(Hidden and forced to N if COMMINF := 485 or PROTO := MOD, DNP, EVMSG, or MB_)

LANGUAGE (ENGLISH, SPANISH) **LANG:=** _____

SEND AUTOMESSAGE (Y, N) **AUTO:=** _____
(Hidden and forced to N if PROTO := DNP, MOD, EVMSG, MB_, or 103)

FAST OP MESSAGES (Y, N) **FASTOP:=** _____
(Hidden if PROTO := DNP, MOD, EVMSG, MB_, PMU, or 103)

MINIMUM SECONDS FROM DCD TO TX (0.00–1.00) **MINDLY:=** _____
(Hidden if PROTO ≠ DNP)

MAXIMUM SECONDS FROM DCD TO TX (0.0–1.00) **MAXDLY:=** _____
(Hidden if PROTO ≠ DNP)

SETTLE TIME FROM RTD ON TO TX (OFF, 0.00–30.00 sec) **PREDLY:=** _____
(Hidden if PROTO ≠ DNP or 103)

SETTLE TIME FROM TX TO RTS OFF (0.00–30.00 sec) **PSTDLY:=** _____
(Hidden if PROTO ≠ DNP or 103)

Modbus

MODBUS SLAVE ID (1–247) **SLAVEID:=** _____
(Hidden if PROTO := SEL, EVMSG, MB_, 103, or DNET)

DNP3

(Hidden if PROTO := SEL, EVMSG, MB, 103, or MOD)

DNP Address (0–65519) **DNPADR:=** _____

DNP Address to Report to (0–65519) **REPADR1:=** _____

DNP Map (1–3) **DNPMAP1:=** _____

Analog Input Default Variation (1–6) **DVARAI1:=** _____

Class for Binary Event Data (0–3) **ECLASSB1:=** _____

Class for Counter Event Data (0–3) **ECLASSC1:=** _____

Class for Analog Event Data (0–3) **ECLASSA1:=** _____

Current Scaling Decimal Places (0–3) **DECPLA1:=** _____

Voltages Scaling Decimal Places (0–3) **DECPLV1:=** _____

Misc Data Scaling Decimal Places (0–3) **DECPLM1:=** _____

Amps Reporting Deadband Counts (0–32767) **ANADBA1:=** _____
(Hidden if ECLASSA1 := 0)

Volts Reporting Deadband Counts (0–32767) **ANADBV1:=** _____
(Hidden if ECLASSA1 := 0)

Misc Data Reporting Deadband Counts (0–32767) **ANADBM1:=** _____
(Hidden if ECLASSA1 := 0 and ECLASSC1 := 0)

Minutes for Request Interval (I, M, 1–32767) **TIMERQ1:=** _____

Seconds to Select/Operate Time-Out (0.0–30.0 sec) **STIMEO1:=** _____

Data Link Retries (0–15) **DRETRY1:=** _____

Seconds to Data Link Time-Out (0–5 sec) **DTIMEO1:=** _____
(Hidden if DRETRY := 0)

Event Message Confirm Time-Out (1–50 sec) **ETIMEO1:=** _____

Enable Unsolicited Reporting (Y, N) **UNSOL1:=** _____
(Hidden and forced to N if ECLASSA1 := 0, ECLASSB1 := 0, ECLASSC1 := 0, and ECLASSV1 := 0)
(All subsequent settings are hidden and forced to N when UNSOL1 := N)

Enable Unsolicited Reporting at Power-Up (Y, N) **PUNSOL1:=** _____

Number of Event to Transmit On (1–200) **NUMEVE1:=** _____

Oldest Event on Tx On (0.0–99999.0 sec) **AGEEVE1:=** _____

Unsolicited Message Max Retry Attempts (2–10) **URETRY1:=** _____

Unsolicited Message Offline Time-Out (1–5000 sec) **UTIMEO1:=** _____
(Hidden if UNSOL1 := N)

Modem Protocol

(For DNP3 session and EIA-232 port only)

Modem Connected to Port (Y, N) **MODEM:=** _____

Modem Startup String (30 Characters) **MSTR:=** _____

Phone Number for Dial-Out (30 Characters) **PH_NUM1:=** _____

Phone Number for Dial-Out (30 Characters) **PH_NUM2:=** _____

Retry Attempts for Phone 1 Dial-Out (1–20) **RETRY1:=** _____

Retry Attempts for Phone 2 Dial-Out (1–20) **RETRY2:=** _____

Time to Attempt Dial (5–300 sec) **MDTIME:=** _____

Time Between Dial-Out Attempts (5–3600 sec) **MDRET:=** _____

Mirrored Bits Protocol

(Hidden if PROTO := SEL, EVMSG, DNP, 103, or MOD)

MB Transmit Identifier (1–4) **TXID:=** _____
MB Receive Identifier (1–4) **RXID:=** _____
MB RX Bad Pickup Time (0–10000 sec) **RBADPU:=** _____
MB Channel Bad Pickup (1–10000 ppm) **CBADPU:=** _____
MB Receive Default State (8 Characters) **RXDFLT:=** _____
RMB1 Pickup Debounce Messages (1–8) **RMB1PU:=** _____
RMB1 Dropout Debounce Messages (1–8) **RMB1DO:=** _____
RMB2 Pickup Debounce Messages (1–8) **RMB2PU:=** _____
RMB2 Dropout Debounce Messages (1–8) **RMB2DO:=** _____
RMB3 Pickup Debounce Messages (1–8) **RMB3PU:=** _____
RMB3 Dropout Debounce Messages (1–8) **RMB3DO:=** _____
RMB4 Pickup Debounce Messages (1–8) **RMB4PU:=** _____
RMB4 Dropout Debounce Messages (1–8) **RMB4DO:=** _____
RMB5 Pickup Debounce Messages (1–8) **RMB5PU:=** _____
RMB5 Dropout Debounce Messages (1–8) **RMB5DO:=** _____
RMB6 Pickup Debounce Messages (1–8) **RMB6PU:=** _____
RMB6 Dropout Debounce Messages (1–8) **RMB6DO:=** _____
RMB7 Pickup Debounce Messages (1–8) **RMB7PU:=** _____
RMB7 Dropout Debounce Messages (1–8) **RMB7DO:=** _____
RMB8 Pickup Debounce Messages (1–8) **RMB8PU:=** _____
RMB8 Dropout Debounce Messages (1–8) **RMB8DO:=** _____

IEC 60870-5-103 Protocol

(Hidden unless serial port with PROTO := 103)

103 DEVICE ADDRESS (0–254) **103ADDR:=** _____
CYCLIC DATA REPORTING PERIOD (1–3600 sec) **103CYC:=** _____
ACCUMULATOR REPORTING PERIOD (OFF, 1–3600 sec) **103ACYC:=** _____
ACCUMULATOR REPORTING TRIGGER (1 Relay Word Bit) **103ATRI:=** _____
ENABLE TIME SYNCHRONIZATION (Y, N) **103TIME:=** _____

Front-Panel Settings (SET F Command)

General

LOCAL BITS ENABL (N, 1–32) **ELB :=** _____
CLOSE RESET LEDS (Y, N) **RSTLED :=** _____
TRIP_COLOR LED (R = Red, G = Green, A = Amber) **LEDTRPC :=** _____
(Hidden if Relay Word bit TRICOLOR is deasserted)

Target LED

(R = Red, G = Green, A = Amber)

TRIP LATCH T_LED (Y, N) **T01LEDL :=** _____
TARGET T_LED ASSERTED COLOR (R, G, A) **T01LEDC :=** _____
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted)
LED1 EQUATION (SELOGIC) **T01_LED :=** _____

TRIP LATCH T_LED (Y, N) **T02LEDL :=**_____
TARGET T_LED ASSERTED COLOR (R, G, A)
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted) **T02LEDC :=**_____
LED2 EQUATION (SELOGIC) **T02_LED :=**_____

TRIP LATCH T_LED (Y, N) **T03LEDL :=**_____
TARGET T_LED ASSERTED COLOR (R, G, A)
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted) **T03LEDC :=**_____
LED3 EQUATION (SELOGIC) **T03_LED :=**_____

TRIP LATCH T_LED (Y, N) **T04LEDL :=**_____
TARGET T_LED ASSERTED COLOR (R, G, A)
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted) **T04LEDC :=**_____
LED4 EQUATION (SELOGIC) **T04_LED :=**_____

TRIP LATCH T_LED (Y, N) **T05LEDL :=**_____
TARGET T_LED ASSERTED COLOR (R, G, A)
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted) **T05LEDC :=**_____
LED5 EQUATION (SELOGIC) **T05_LED :=**_____

TRIP LATCH T_LED (Y, N) **T06LEDL :=**_____
TARGET T_LED ASSERTED COLOR (R, G, A)
(Hidden and forced to R if Relay Word bit TRICOLOR is deasserted) **T06LEDC :=**_____
LED6 EQUATION (SELOGIC) **T06_LED :=**_____

Operator Control LED

(Asserted/deasserted color choices: R = Red, G = Green, A = Amber, O = Off. Asserted and deasserted colors must be different)

PB_LED ASSERTED/DEASSERTED COLORS **PB1ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)
PB1A_LED EQUATION (SELOGIC) **PB1A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB1BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)
PB1B_LED EQUATION (SELOGIC) **PB1B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB2ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)
PB2A_LED EQUATION (SELOGIC) **PB2A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB2BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)
PB2B_LED EQUATION (SELOGIC) **PB2B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB3ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)
PB3A_LED EQUATION (SELOGIC) **PB3A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB3BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)

PB3B_LED EQUATION (SELOGIC) **PB3B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB4ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)

PB4A_LED EQUATION (SELOGIC) **PB4A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB4BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)
(Hidden and forced to AO if Relay Word bit TRICOLOR is deasserted)

PB4B_LED EQUATION (SELOGIC) **PB4B_LED :=**_____

(The following operator control LED settings are hidden if the Relay Word bit TRICOLOR is deasserted)

PB_LED ASSERTED/DEASSERTED COLORS **PB5ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB5A_LED EQUATION (SELOGIC) **PB5A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB5BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB5B_LED EQUATION (SELOGIC) **PB5B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB6ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB6A_LED EQUATION (SELOGIC) **PB6A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB6BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB6B_LED EQUATION (SELOGIC) **PB6B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB7ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB7A_LED EQUATION (SELOGIC) **PB7A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB7BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB7B_LED EQUATION (SELOGIC) **PB7B_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB8ALEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB8A_LED EQUATION (SELOGIC) **PB8A_LED :=**_____

PB_LED ASSERTED/DEASSERTED COLORS **PB8BLEDC :=**_____
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)

PB8B_LED EQUATION (SELOGIC) **PB8B_LED :=**_____

Local Bits Labels

LB_NAME (14 characters) **NLB01 :=**_____

CLEAR LB_ LABEL (7 characters) **CLB01 :=**_____

SET LB_ LABEL (7 characters) **SLB01 :=**_____

PULSE LB_ LABEL (7 characters) **PLB01 :=**_____

LB_NAME (14 characters) **NLB02 :=**_____

CLEAR LB_ LABEL (7 characters) **CLB02 :=**_____

SET LB_ LABEL (7 characters) **SLB02 :=**_____

PULSE LB_ LABEL (7 characters) **PLB02 :=**_____

LB_NAME (14 characters) **NLB03 :=**_____

CLEAR LB_ LABEL (7 characters) **CLB03 :=**_____

SET LB_ LABEL (7 characters)	**SLB03 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB03 :=** _____
LB_NAME (14 characters)	**NLB04 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB04 :=** _____
SET LB_ LABEL (7 characters)	**SLB04 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB04 :=** _____
LB_NAME (14 characters)	**NLB05 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB05 :=** _____
SET LB_ LABEL (7 characters)	**SLB05 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB05 :=** _____
LB_NAME (14 characters)	**NLB06 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB06 :=** _____
SET LB_ LABEL (7 characters)	**SLB06 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB06 :=** _____
LB_NAME (14 characters)	**NLB07 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB07 :=** _____
SET LB_ LABEL (7 characters)	**SLB07 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB07 :=** _____
LB_NAME (14 characters)	**NLB08 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB08 :=** _____
SET LB_ LABEL (7 characters)	**SLB08 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB08 :=** _____
LB_NAME (14 characters)	**NLB09 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB09 :=** _____
SET LB_ LABEL (7 characters)	**SLB09 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB09 :=** _____
LB_NAME (14 characters)	**NLB10 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB10 :=** _____
SET LB_ LABEL (7 characters)	**SLB10 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB10 :=** _____
LB_NAME (14 characters)	**NLB11 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB11 :=** _____
SET LB_ LABEL (7 characters)	**SLB11 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB11 :=** _____
LB_NAME (14 characters)	**NLB12 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB12 :=** _____
SET LB_ LABEL (7 characters)	**SLB12 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB12 :=** _____
LB_NAME (14 characters)	**NLB13 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB13 :=** _____

SET LB_ LABEL (7 characters)	**SLB13 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB13 :=** _____
LB_NAME (14 characters)	**NLB14 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB14 :=** _____
SET LB_ LABEL (7 characters)	**SLB14 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB14 :=** _____
LB_NAME (14 characters)	**NLB15 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB15 :=** _____
SET LB_ LABEL (7 characters)	**SLB15 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB15 :=** _____
LB_NAME (14 characters)	**NLB16 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB16 :=** _____
SET LB_ LABEL (7 characters)	**SLB16 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB16 :=** _____
LB_NAME (14 characters)	**NLB17 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB17 :=** _____
SET LB_ LABEL (7 characters)	**SLB17 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB17 :=** _____
LB_NAME (14 characters)	**NLB18 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB18 :=** _____
SET LB_ LABEL (7 characters)	**SLB18 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB18 :=** _____
LB_NAME (14 characters)	**NLB19 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB19 :=** _____
SET LB_ LABEL (7 characters)	**SLB19 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB19 :=** _____
LB_NAME (14 characters)	**NLB20 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB20 :=** _____
SET LB_ LABEL (7 characters)	**SLB20 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB20 :=** _____
LB_NAME (14 characters)	**NLB21 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB21 :=** _____
SET LB_ LABEL (7 characters)	**SLB21 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB21 :=** _____
LB_NAME (14 characters)	**NLB22 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB22 :=** _____
SET LB_ LABEL (7 characters)	**SLB22 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB22 :=** _____
LB_NAME (14 characters)	**NLB23 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB23 :=** _____

SET LB_ LABEL (7 characters)	**SLB23 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB23 :=** _____
LB_NAME (14 characters)	**NLB24 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB24 :=** _____
SET LB_ LABEL (7 characters)	**SLB24 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB24 :=** _____
LB_NAME (14 characters)	**NLB25 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB25 :=** _____
SET LB_ LABEL (7 characters)	**SLB25 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB25 :=** _____
LB_NAME (14 characters)	**NLB26 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB26 :=** _____
SET LB_ LABEL (7 characters)	**SLB26 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB26 :=** _____
LB_NAME (14 characters)	**NLB27 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB27 :=** _____
SET LB_ LABEL (7 characters)	**SLB27 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB27 :=** _____
LB_NAME (14 characters)	**NLB28 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB28 :=** _____
SET LB_ LABEL (7 characters)	**SLB28 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB28 :=** _____
LB_NAME (14 characters)	**NLB29 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB29 :=** _____
SET LB_ LABEL (7 characters)	**SLB29 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB29 :=** _____
LB_NAME (14 characters)	**NLB30 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB30 :=** _____
SET LB_ LABEL (7 characters)	**SLB30 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB30 :=** _____
LB_NAME (14 characters)	**NLB31 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB31 :=** _____
SET LB_ LABEL (7 characters)	**SLB31 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB31 :=** _____
LB_NAME (14 characters)	**NLB32 :=** _____
CLEAR LB_ LABEL (7 characters)	**CLB32 :=** _____
SET LB_ LABEL (7 characters)	**SLB32 :=** _____
PULSE LB_ LABEL (7 characters)	**PLB32 :=** _____

Touchscreen Settings

(Note: The touchscreen settings category is only available in QuickSet, with the exception of the settings FPTO, FPDUR, and FPBAB, which are also available to set via the touchscreen display.)

Touchscreen Configuration

DISPLAY HOME SCREEN (Refer to *Table 8.15* for setting range)	**FPHOME :=**_____
DISPLAY TIME-OUT (1–30 min)	**FPTO :=**_____
ROTATING DISPLAY TRANSITION TIME (3–15 sec)	**FPDUR :=**_____
BACKLIGHT ACTIVE BRIGHTNESS (1–10)	**FPBAB :=**_____

Rotating Display

(Refer to *Table 8.15* for the setting range)

ROTATING DISPLAY 01	**FPRD01 :=**_____
ROTATING DISPLAY 02	**FPRD02 :=**_____
ROTATING DISPLAY 03	**FPRD03 :=**_____
ROTATING DISPLAY 04	**FPRD04 :=**_____
ROTATING DISPLAY 05	**FPRD05 :=**_____
ROTATING DISPLAY 06	**FPRD06 :=**_____
ROTATING DISPLAY 07	**FPRD07 :=**_____
ROTATING DISPLAY 08	**FPRD08 :=**_____
ROTATING DISPLAY 09	**FPRD09 :=**_____
ROTATING DISPLAY 10	**FPRD10 :=**_____
ROTATING DISPLAY 11	**FPRD11 :=**_____
ROTATING DISPLAY 12	**FPRD12 :=**_____
ROTATING DISPLAY 13	**FPRD13 :=**_____
ROTATING DISPLAY 14	**FPRD14 :=**_____
ROTATING DISPLAY 15	**FPRD15 :=**_____
ROTATING DISPLAY 16	**FPRD16 :=**_____

Pushbuttons

(OFF, refer to *Table 8.15* for the setting range)

PUSHBUTTON 01 HMI SCREEN	**FPPB01 :=**_____
PUSHBUTTON 02 HMI SCREEN	**FPPB02 :=**_____
PUSHBUTTON 03 HMI SCREEN	**FPPB03 :=**_____
PUSHBUTTON 04 HMI SCREEN	**FPPB04 :=**_____
PUSHBUTTON 05 HMI SCREEN	**FPPB05 :=**_____
PUSHBUTTON 06 HMI SCREEN	**FPPB06 :=**_____
PUSHBUTTON 07 HMI SCREEN	**FPPB07 :=**_____
PUSHBUTTON 08 HMI SCREEN	**FPPB08 :=**_____

Bay Control Breaker

BREAKER TRIP TYPE (3)	**BK01TTY :=**_____
BREAKER MODE (CONTROL, MONITOR)	**BK01MOD :=**_____

BREAKER CLOSE STATUS (Relay Word bit) **BK01CS :=**_____
BREAKER OPEN STATUS (Relay Word bit) **BK01OS :=**_____
BREAKER ALARM STATUS (Relay Word bit) **BK01AS :=**_____
BREAKER HMI CLOSE COMMAND (Relay Word bit) **BK01CLC :=**_____
BREAKER HMI OPEN COMMAND (Relay Word bit) **BK01OPC :=**_____
BREAKER TRIP TYPE (3) **BK02TTY :=**_____
BREAKER MODE (CONTROL, MONITOR) **BK02MOD :=**_____
BREAKER CLOSE STATUS (Relay Word bit) **BK02CS :=**_____
BREAKER OPEN STATUS (Relay Word bit) **BK02OS :=**_____
BREAKER ALARM STATUS (Relay Word bit) **BK02AS :=**_____
BREAKER HMI CLOSE COMMAND (Relay Word bit) **BK02CLC :=**_____
BREAKER HMI OPEN COMMAND (Relay Word bit) **BK02OPC :=**_____

Bay Control Two-Position Disconnect

TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D01MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS01CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS01OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS01IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS01AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS01CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS01OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D02MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS02CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS02OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS02IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS02AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS02CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS02OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D03MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS03CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS03OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS03IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS03AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS03CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS03OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D04MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS04CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS04OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS04IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS04AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS04CL :=**_____

TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS04OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D05MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS05CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS05OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS05IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS05AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS05CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS05OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D06MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS06CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS06OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS06IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS06AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS06CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS06OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D07MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS07CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS07OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS07IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS07AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS07CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS07OP :=**_____
TWO-POSITION DISCONNECT MODE (CONTROL, MONITOR) **2D08MOD :=**_____
TWO-POSITION DISCONNECT CLOSE STATUS (Relay Word bit) **2DS08CS :=**_____
TWO-POSITION DISCONNECT OPEN STATUS (Relay Word bit) **2DS08OS :=**_____
TWO-POSITION DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **2DS08IS :=**_____
TWO-POSITION DISCONNECT ALARM STATUS (Relay Word bit) **2DS08AS :=**_____
TWO-POSITION DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **2DS08CL :=**_____
TWO-POSITION DISCONNECT HMI OPEN COMMAND (Relay Word bit) **2DS08OP :=**_____

Bay Control Three-Position Disconnect

THREE-POSITION DISCONNECT MODE (CONTROL, MONITOR) **3D01MOD :=**_____
THREE-POSITION IN-LINE DISCONNECT CLOSE STATUS (Relay Word bit) **3ID01CS :=**_____
THREE-POSITION IN-LINE DISCONNECT OPEN STATUS (Relay Word bit) **3ID01OS :=**_____
THREE-POSITION IN-LINE DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **3ID01IS :=**_____
THREE-POSITION IN-LINE DISCONNECT ALARM STATUS (Relay Word bit) **3ID01AS :=**_____
THREE-POSITION IN-LINE DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **3ID01CL :=**_____
THREE-POSITION IN-LINE DISCONNECT HMI OPEN COMMAND (Relay Word bit) **3ID01OP :=**_____

THREE-POSITION EARTHING DISCONNECT CLOSE STATUS (Relay Word bit) **3ED01CS :=**_____

THREE-POSITION EARTHING DISCONNECT OPEN STATUS (Relay Word bit) **3ED01OS :=**_____

THREE-POSITION EARTHING DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **3ED01IS :=**_____

THREE-POSITION EARTHING DISCONNECT ALARM STATUS (Relay Word bit) **3ED01AS :=**_____

THREE-POSITION EARTHING DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **3ED01CL :=**_____

THREE-POSITION EARTHING DISCONNECT HMI OPEN COMMAND (Relay Word bit) **3ED01OP :=**_____

THREE-POSITION DISCONNECT MODE (CONTROL, MONITOR) **3D02MOD :=**_____

THREE-POSITION IN-LINE DISCONNECT CLOSE STATUS (Relay Word bit) **3ID02CS :=**_____

THREE-POSITION IN-LINE DISCONNECT OPEN STATUS (Relay Word bit) **3ID02OS :=**_____

THREE-POSITION IN-LINE DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **3ID02IS :=**_____

THREE-POSITION IN-LINE DISCONNECT ALARM STATUS (Relay Word bit) **3ID02AS :=**_____

THREE-POSITION IN-LINE DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **3ID02CL :=**_____

THREE-POSITION IN-LINE DISCONNECT HMI OPEN COMMAND (Relay Word bit) **3ID02OP :=**_____

THREE-POSITION EARTHING DISCONNECT CLOSE STATUS (Relay Word bit) **3ED02CS :=**_____

THREE-POSITION EARTHING DISCONNECT OPEN STATUS (Relay Word bit) **3ED02OS :=**_____

THREE-POSITION EARTHING DISCONNECT IN-PROGRESS STATUS (Relay Word bit) **3ED02IS :=**_____

THREE-POSITION EARTHING DISCONNECT ALARM STATUS (Relay Word bit) **3ED02AS :=**_____

THREE-POSITION EARTHING DISCONNECT HMI CLOSE COMMAND (Relay Word bit) **3ED02CL :=**_____

THREE-POSITION EARTHING DISCONNECT HMI OPEN COMMAND (Relay Word bit) **3ED02OP :=**_____

Analog Label

ANALOG QUANTITY **ALAB01 :=**_____

ANALOG QUANTITY **ALAB02 :=**_____

ANALOG QUANTITY **ALAB03 :=**_____

ANALOG QUANTITY **ALAB04 :=**_____

ANALOG QUANTITY **ALAB05 :=**_____

ANALOG QUANTITY **ALAB06 :=**_____

ANALOG QUANTITY **ALAB07 :=**_____

ANALOG QUANTITY **ALAB08 :=**_____

ANALOG QUANTITY **ALAB09 :=**_____

ANALOG QUANTITY **ALAB10 :=**_____

ANALOG QUANTITY **ALAB11 :=**_____

ANALOG QUANTITY **ALAB12 :=**_____

ANALOG QUANTITY	**ALAB13 :=** _____
ANALOG QUANTITY	**ALAB14 :=** _____
ANALOG QUANTITY	**ALAB15 :=** _____
ANALOG QUANTITY	**ALAB16 :=** _____
ANALOG QUANTITY	**ALAB17 :=** _____
ANALOG QUANTITY	**ALAB18 :=** _____
ANALOG QUANTITY	**ALAB19 :=** _____
ANALOG QUANTITY	**ALAB20 :=** _____
ANALOG QUANTITY	**ALAB21 :=** _____
ANALOG QUANTITY	**ALAB22 :=** _____
ANALOG QUANTITY	**ALAB23 :=** _____
ANALOG QUANTITY	**ALAB24 :=** _____
ANALOG QUANTITY	**ALAB25 :=** _____
ANALOG QUANTITY	**ALAB26 :=** _____
ANALOG QUANTITY	**ALAB27 :=** _____
ANALOG QUANTITY	**ALAB28 :=** _____
ANALOG QUANTITY	**ALAB29 :=** _____
ANALOG QUANTITY	**ALAB30 :=** _____
ANALOG QUANTITY	**ALAB31 :=** _____
ANALOG QUANTITY	**ALAB32 :=** _____

Digital Label

RELAY WORD BIT	**DLAB01 :=** _____
RELAY WORD BIT	**DLAB02 :=** _____
RELAY WORD BIT	**DLAB03 :=** _____
RELAY WORD BIT	**DLAB04 :=** _____
RELAY WORD BIT	**DLAB05 :=** _____
RELAY WORD BIT	**DLAB06 :=** _____
RELAY WORD BIT	**DLAB07 :=** _____
RELAY WORD BIT	**DLAB08 :=** _____
RELAY WORD BIT	**DLAB09 :=** _____
RELAY WORD BIT	**DLAB10 :=** _____
RELAY WORD BIT	**DLAB11 :=** _____
RELAY WORD BIT	**DLAB12 :=** _____
RELAY WORD BIT	**DLAB13 :=** _____
RELAY WORD BIT	**DLAB14 :=** _____
RELAY WORD BIT	**DLAB15 :=** _____
RELAY WORD BIT	**DLAB16 :=** _____
RELAY WORD BIT	**DLAB17 :=** _____
RELAY WORD BIT	**DLAB18 :=** _____
RELAY WORD BIT	**DLAB19 :=** _____

RELAY WORD BIT	**DLAB20 :=** _____
RELAY WORD BIT	**DLAB21 :=** _____
RELAY WORD BIT	**DLAB22 :=** _____
RELAY WORD BIT	**DLAB23 :=** _____
RELAY WORD BIT	**DLAB24 :=** _____
RELAY WORD BIT	**DLAB25 :=** _____
RELAY WORD BIT	**DLAB26 :=** _____
RELAY WORD BIT	**DLAB27 :=** _____
RELAY WORD BIT	**DLAB28 :=** _____
RELAY WORD BIT	**DLAB29 :=** _____
RELAY WORD BIT	**DLAB30 :=** _____
RELAY WORD BIT	**DLAB31 :=** _____
RELAY WORD BIT	**DLAB32 :=** _____

Report Settings (SET R Command)

SER Chatter Criteria

Auto-Removal Enable (Y, N)	**ESERDEL :=** _____
Number of Counts (2–20 counts)	**SRDLCNT :=** _____
Removal Time (0.1–90.0 s)	**SRDLTIM :=** _____

SER Trigger Lists

SER*n* = As many as 24 Relay Word elements separated by spaces or commas. Use NA to disable setting.

SER1 := _____

SER2 := _____

SER3 := _____

SER4 := _____

Relay Word Bit Aliases

ALIAS*n*= "RW Bit" (space) "Alias" (space) "Asserted Text" (space) "Deasserted Text". Alias, Asserted, and Deasserted text strings can be as long as 15 characters. Use NA to disable setting.

Enable ALIAS (N, 1–32)

(All subsequent ALIAS settings are hidden and forced to NA if EALIAS := N)

EALIAS := _____	**ALIAS17 :=** _____
ALIAS1 := _____	**ALIAS18 :=** _____
ALIAS2 := _____	**ALIAS19 :=** _____
ALIAS3 := _____	**ALIAS20 :=** _____
ALIAS4 := _____	**ALIAS21 :=** _____
ALIAS5 := _____	**ALIAS22 :=** _____
ALIAS6 := _____	**ALIAS23 :=** _____
ALIAS7 := _____	**ALIAS24 :=** _____
ALIAS8 := _____	**ALIAS25 :=** _____

ALIAS9 :=_____
ALIAS10 :=_____
ALIAS11 :=_____
ALIAS12 :=_____
ALIAS13 :=_____
ALIAS14 :=_____
ALIAS15 :=_____
ALIAS16 :=_____
ALIAS26 :=_____
ALIAS27 :=_____
ALIAS28 :=_____
ALIAS29 :=_____
ALIAS30 :=_____
ALIAS31 :=_____
ALIAS32 :=_____

Event Report

EVENT TRIGGER (SELOGIC) **ER :=**_____

EVENT LENGTH (15, 64, 180 cyc) **LER :=**_____

PREFAULT LENGTH (1–10 cyc [if LER := 15], 1–59 cyc [if LER := 64], 1-175 cyc [if LER := 180]) **PRE :=**_____

Fast Message Read Settings

FMRnNAM = Any valid string. (No spaces allowed; should be different from other FMRxNAM)
FMRn = As many as 24 analog quantities separated by spaces or commas. (Analog quantities listed here will be included in the Fast Message read request)
Use NA to disable setting.

FMR1 Name (9 characters) **FMR1NAM :=**_____

Fast Message Read FMR1 (24 analog quantities) **FMR1 :=**_____

FMR2 Name (9 characters) **FMR2NAM :=**_____

Fast Message Read FMR2 (24 analog quantities) **FMR2 :=**_____

FMR3 Name (9 characters) **FMR3NAM :=**_____

Fast Message Read FMR3 (24 analog quantities) **FMR3 :=**_____

FMR4 Name (9 characters) **FMR4NAM :=**_____

Fast Message Read FMR4 (24 analog quantities) **FMR4 :=**_____

Fast Message Remote Analog Settings

Remote Analog Value Type (I, F, L), I = Integer, F = Float, L = Long

RA01TYPE :=_____
RA02TYPE :=_____
RA03TYPE :=_____
RA04TYPE :=_____
RA05TYPE :=_____
RA06TYPE :=_____
RA07TYPE :=_____
RA08TYPE :=_____
RA09TYPE :=_____
RA10TYPE :=_____
RA11TYPE :=_____
RA12TYPE :=_____
RA13TYPE :=_____
RA14TYPE :=_____
RA15TYPE :=_____
RA16TYPE :=_____
RA17TYPE :=_____
RA18TYPE :=_____
RA19TYPE :=_____
RA20TYPE :=_____
RA21TYPE :=_____
RA22TYPE :=_____
RA23TYPE :=_____
RA24TYPE :=_____
RA25TYPE :=_____

RA26TYPE :=_____ **RA30TYPE :=**_____

RA27TYPE :=_____ **RA31TYPE :=**_____

RA28TYPE :=_____ **RA32TYPE :=**_____

RA29TYPE :=_____

Load Profile

LDP LIST (NA, As many as 17 Analog Quantities) **LDLIST :=**_____

LDP ACQ RATE (5, 10, 15, 30, 60 min.) **LDAR :=**_____

Modbus Map Settings (SET M Command)

Modbus User Map

User Map Register Label Name (8 characters)
(See *Appendix E: Modbus Communications* for additional details)

MOD_001 :=_____ **MOD_027 :=**_____

MOD_002 :=_____ **MOD_028 :=**_____

MOD_003 :=_____ **MOD_029 :=**_____

MOD_004 :=_____ **MOD_030 :=**_____

MOD_005 :=_____ **MOD_031 :=**_____

MOD_006 :=_____ **MOD_032 :=**_____

MOD_007 :=_____ **MOD_033 :=**_____

MOD_008 :=_____ **MOD_034 :=**_____

MOD_009 :=_____ **MOD_035 :=**_____

MOD_010 :=_____ **MOD_036 :=**_____

MOD_011 :=_____ **MOD_037 :=**_____

MOD_012 :=_____ **MOD_038 :=**_____

MOD_013 :=_____ **MOD_039 :=**_____

MOD_014 :=_____ **MOD_040 :=**_____

MOD_015 :=_____ **MOD_041 :=**_____

MOD_016 :=_____ **MOD_042 :=**_____

MOD_017 :=_____ **MOD_043 :=**_____

MOD_018 :=_____ **MOD_044 :=**_____

MOD_019 :=_____ **MOD_045 :=**_____

MOD_020 :=_____ **MOD_046 :=**_____

MOD_021 :=_____ **MOD_047 :=**_____

MOD_022 :=_____ **MOD_048 :=**_____

MOD_023 :=_____ **MOD_049 :=**_____

MOD_024 :=_____ **MOD_050 :=**_____

MOD_025 :=_____ **MOD_051 :=**_____

MOD_026 :=_____ **MOD_052 :=**_____

MOD_053 := _____
MOD_054 := _____
MOD_055 := _____
MOD_056 := _____
MOD_057 := _____
MOD_058 := _____
MOD_059 := _____
MOD_060 := _____
MOD_061 := _____
MOD_062 := _____
MOD_063 := _____
MOD_064 := _____
MOD_065 := _____
MOD_066 := _____
MOD_067 := _____
MOD_068 := _____
MOD_069 := _____
MOD_070 := _____
MOD_071 := _____
MOD_072 := _____
MOD_073 := _____
MOD_074 := _____
MOD_075 := _____
MOD_076 := _____
MOD_077 := _____
MOD_078 := _____
MOD_079 := _____
MOD_080 := _____
MOD_081 := _____
MOD_082 := _____
MOD_083 := _____
MOD_084 := _____
MOD_085 := _____
MOD_086 := _____
MOD_087 := _____
MOD_088 := _____
MOD_089 := _____
MOD_090 := _____
MOD_091 := _____
MOD_092 := _____
MOD_093 := _____
MOD_094 := _____
MOD_095 := _____
MOD_096 := _____
MOD_097 := _____
MOD_098 := _____
MOD_099 := _____
MOD_100 := _____
MOD_101 := _____
MOD_102 := _____
MOD_103 := _____
MOD_104 := _____
MOD_105 := _____
MOD_106 := _____
MOD_107 := _____
MOD_108 := _____
MOD_109 := _____
MOD_110 := _____
MOD_111 := _____
MOD_112 := _____
MOD_113 := _____
MOD_114 := _____
MOD_115 := _____
MOD_116 := _____
MOD_117 := _____
MOD_118 := _____
MOD_119 := _____
MOD_120 := _____
MOD_121 := _____
MOD_122 := _____
MOD_123 := _____
MOD_124 := _____
MOD_125 := _____

DNP3 Map Settings (SET DNP n Command)

(Hidden if DNP Option Not Included)

Use SET DNP *n* command with *n* = 1, 2, or 3 to create as many as three DNP User Maps. Refer to *Appendix D: DNP3 Communications* for details. This is DNP Map 1 (DNP Map 2 and DNP Map 3 tables are identical to DNP Map 1 table).

Binary Input Map

DNP Binary Input Label Name (10 characters)

BI_00 := _____
BI_01 := _____
BI_02 := _____
BI_03 := _____
BI_04 := _____
BI_05 := _____
BI_06 := _____
BI_07 := _____
BI_08 := _____
BI_09 := _____
BI_10 := _____
BI_11 := _____
BI_12 := _____
BI_13 := _____
BI_14 := _____
BI_15 := _____
BI_16 := _____
BI_17 := _____
BI_18 := _____
BI_19 := _____
BI_20 := _____
BI_21 := _____
BI_22 := _____
BI_23 := _____
BI_24 := _____
BI_25 := _____
BI_26 := _____
BI_27 := _____
BI_28 := _____
BI_29 := _____
BI_30 := _____
BI_31 := _____
BI_32 := _____
BI_33 := _____
BI_34 := _____
BI_35 := _____
BI_36 := _____
BI_37 := _____
BI_38 := _____
BI_39 := _____
BI_40 := _____
BI_41 := _____
BI_42 := _____
BI_43 := _____
BI_44 := _____
BI_45 := _____
BI_46 := _____
BI_47 := _____
BI_48 := _____
BI_49 := _____
BI_50 := _____
BI_51 := _____
BI_52 := _____
BI_53 := _____
BI_54 := _____
BI_55 := _____
BI_56 := _____
BI_57 := _____
BI_58 := _____
BI_59 := _____
BI_60 := _____
BI_61 := _____
BI_62 := _____
BI_63 := _____
BI_64 := _____
BI_65 := _____
BI_66 := _____
BI_67 := _____

BI_68 := _____
BI_69 := _____
BI_70 := _____
BI_71 := _____
BI_72 := _____
BI_73 := _____
BI_74 := _____
BI_75 := _____
BI_76 := _____
BI_77 := _____
BI_78 := _____
BI_79 := _____
BI_80 := _____
BI_81 := _____
BI_82 := _____
BI_83 := _____
BI_84 := _____
BI_85 := _____
BI_86 := _____
BI_87 := _____
BI_88 := _____
BI_89 := _____
BI_90 := _____
BI_91 := _____
BI_92 := _____
BI_93 := _____
BI_94 := _____
BI_95 := _____
BI_96 := _____
BI_97 := _____
BI_98 := _____
BI_99 := _____

Binary Output Map

DNP Binary Output Label Name (10 characters)

BO_00 := _____
BO_01 := _____
BO_02 := _____
BO_03 := _____
BO_04 := _____
BO_05 := _____
BO_06 := _____
BO_07 := _____
BO_08 := _____
BO_09 := _____
BO_ 10 := _____
BO_ 11 := _____
BO_ 12 := _____
BO_ 13 := _____
BO_ 14 := _____
BO_ 15 := _____
BO_ 16 := _____
BO_ 17 := _____
BO_ 18 := _____
BO_ 19 := _____
BO_ 20 := _____
BO_ 21 := _____
BO_ 22 := _____
BO_ 23 := _____
BO_ 24 := _____
BO_ 25 := _____
BO_ 26 := _____
BO_ 27 := _____
BO_ 28 := _____
BO_ 29 := _____
BO_ 30 := _____
BO_ 31 := _____

Analog Input Map

DNP Analog Input Label Name (24 characters)

AI_00 := _____
AI_01 := _____
AI_02 := _____
AI_03 := _____
AI_04 := _____
AI_05 := _____
AI_06 := _____
AI_07 := _____
AI_08 := _____
AI_09 := _____
AI_10 := _____
AI_11 := _____
AI_12 := _____
AI_13 := _____
AI_14 := _____
AI_15 := _____
AI_16 := _____
AI_17 := _____
AI_18 := _____
AI_19 := _____
AI_20 := _____
AI_21 := _____
AI_22 := _____
AI_23 := _____
AI_24 := _____
AI_25 := _____
AI_26 := _____
AI_27 := _____
AI_28 := _____
AI_29 := _____
AI_30 := _____
AI_31 := _____
AI_32 := _____
AI_33 := _____
AI_34 := _____
AI_35 := _____
AI_36 := _____
AI_37 := _____
AI_38 := _____
AI_39 := _____
AI_40 := _____
AI_41 := _____
AI_42 := _____
AI_43 := _____
AI_44 := _____
AI_45 := _____
AI_46 := _____
AI_47 := _____
AI_48 := _____
AI_49 := _____
AI_50 := _____
AI_51 := _____
AI_52 := _____
AI_53 := _____
AI_54 := _____
AI_55 := _____
AI_56 := _____
AI_57 := _____
AI_58 := _____
AI_59 := _____
AI_60 := _____
AI_61 := _____
AI_62 := _____
AI_63 := _____
AI_64 := _____
AI_65 := _____
AI_66 := _____
AI_67 := _____
AI_68 := _____
AI_69 := _____
AI_70 := _____
AI_71 := _____
AI_72 := _____
AI_73 := _____
AI_74 := _____
AI_75 := _____

AI_76 := _____ **AI_88 :=** _____
AI_77 := _____ **AI_89 :=** _____
AI_78 := _____ **AI_90 :=** _____
AI_79 := _____ **AI_91 :=** _____
AI_80 := _____ **AI_92 :=** _____
AI_81 := _____ **AI_93 :=** _____
AI_82 := _____ **AI_94 :=** _____
AI_83 := _____ **AI_95 :=** _____
AI_84 := _____ **AI_96 :=** _____
AI_85 := _____ **AI_97 :=** _____
AI_86 := _____ **AI_98 :=** _____
AI_87 := _____ **AI_99 :=** _____

Analog Output Map

DNP Analog Output Label Name (6 characters)

AO_00 := _____ **AO_16 :=** _____
AO_01 := _____ **AO_17 :=** _____
AO_02 := _____ **AO_18 :=** _____
AO_03 := _____ **AO_19 :=** _____
AO_04 := _____ **AO_20 :=** _____
AO_05 := _____ **AO_21 :=** _____
AO_06 := _____ **AO_22 :=** _____
AO_07 := _____ **AO_23 :=** _____
AO_08 := _____ **AO_24 :=** _____
AO_09 := _____ **AO_25 :=** _____
AO_10 := _____ **AO_26 :=** _____
AO_11 := _____ **AO_27 :=** _____
AO_12 := _____ **AO_28 :=** _____
AO_13 := _____ **AO_29 :=** _____
AO_14 := _____ **AO_30 :=** _____
AO_15 := _____ **AO_31 :=** _____

Counter Map

DNP Counter Label Name (11 characters)

CO_00 := _____
CO_01 := _____
CO_02 := _____
CO_03 := _____
CO_04 := _____
CO_05 := _____
CO_06 := _____
CO_07 := _____
CO_08 := _____
CO_09 := _____
CO_10 := _____
CO_11 := _____
CO_12 := _____
CO_13 := _____
CO_14 := _____
CO_15 := _____
CO_16 := _____
CO_17 := _____
CO_18 := _____
CO_19 := _____
CO_20 := _____
CO_21 := _____
CO_22 := _____
CO_23 := _____
CO_24 := _____
CO_25 := _____
CO_26 := _____
CO_27 := _____
CO_28 := _____
CO_29 := _____
CO_30 := _____
CO_31 := _____

IEC 60870-5-103 Map Settings (SET I Command)

(Hidden if the IEC 60870-5-103 option is not included)
Use the SET I command to input the map required for the IEC 60870-5-103 protocol.

Binary Input Map

103BI00 := _____
103BI01 := _____
103BI02 := _____
103BI03 := _____
103BI04 := _____
103BI05 := _____
103BI06 := _____
103BI07 := _____
103BI08 := _____
103BI09 := _____
103BI10 := _____
103BI11 := _____
103BI12 := _____
103BI13 := _____
103BI14 := _____
103BI15 := _____
103BI16 := _____
103BI17 := _____
103BI18 := _____
103BI19 := _____
103BI20 := _____
103BI21 := _____
103BI22 := _____
103BI23 := _____
103BI24 := _____
103BI25 := _____
103BI26 := _____
103BI27 := _____
103BI28 := _____
103BI29 := _____
103BI30 := _____
103BI31 := _____

103BI32 := _____
103BI33 := _____
103BI34 := _____
103BI35 := _____
103BI36 := _____
103BI37 := _____
103BI38 := _____
103BI39 := _____
103BI40 := _____
103BI41 := _____
103BI42 := _____
103BI43 := _____
103BI44 := _____
103BI45 := _____
103BI46 := _____
103BI47 := _____
103BI48 := _____
103BI49 := _____
103BI50 := _____
103BI51 := _____
103BI52 := _____
103BI53 := _____
103BI54 := _____
103BI55 := _____
103BI56 := _____
103BI57 := _____
103BI58 := _____
103BI59 := _____
103BI60 := _____
103BI61 := _____
103BI62 := _____
103BI63 := _____
103BI64 := _____
103BI65 := _____
103BI66 := _____
103BI67 := _____
103BI68 := _____
103BI69 := _____
103BI70 := _____
103BI71 := _____
103BI72 := _____
103BI73 := _____
103BI74 := _____
103BI75 := _____
103BI76 := _____
103BI77 := _____
103BI78 := _____
103BI79 := _____
103BI80 := _____
103BI81 := _____
103BI82 := _____
103BI83 := _____
103BI84 := _____
103BI85 := _____
103BI86 := _____
103BI87 := _____
103BI85 := _____
103BI88 := _____
103BI89 := _____
103BI90 := _____
103BI91 := _____
103BI92 := _____
103BI93 := _____
103BI94 := _____
103BI95 := _____
103BI96 := _____
103BI97 := _____
103BI98 := _____
103BI99 := _____

Binary Target Map

103BT00 := _____
103BT01 := _____
103BT02 := _____
103BT03 := _____
103BT04 := _____
103BT05 := _____
103BT06 := _____
103BT07 := _____

Fault Analog Map

103FA00 := _____
103FA01 := _____
103FA02 := _____
103FA03 := _____
103FA04 := _____
103FA05 := _____
103FA06 := _____
103FA07 := _____
103FA08 := _____
103FA09 := _____
103FA10 := _____
103FA11 := _____
103FA12 := _____
103FA13 := _____
103FA14 := _____
103FA15 := _____
103FA16 := _____
103FA17 := _____
103FA18 := _____
103FA19 := _____
103FA20 := _____
103FA21 := _____
103FA22 := _____
103FA23 := _____
103FA24 := _____
103FA25 := _____
103FA26 := _____
103FA27 := _____
103FA28 := _____
103FA29 := _____
103FA30 := _____
103FA31 := _____

Binary Control Map

103BO00 := _____
103BO01 := _____
103BO02 := _____
103BO03 := _____
103BO04 := _____
103BO05 := _____
103BO06 := _____
103BO07 := _____
103BO08 := _____
103BO09 := _____
103BO10 := _____
103BO11 := _____
103BO12 := _____
103BO13 := _____
103BO14 := _____
103BO15 := _____
103BO16 := _____
103BO17 := _____
103BO18 := _____
103BO19 := _____
103BO20 := _____
103BO21 := _____
103BO22 := _____
103BO23 := _____
103BO24 := _____
103BO25 := _____

103BO26:=_____
103BO27:=_____
103BO28:=_____
103BO29:=_____
103BO30:=_____
103BO31:=_____

Measurand Map

3MLB000:=_____
3MLB001:=_____
3MLB002:=_____
3MLB003:=_____
3MLB004:=_____
3MLB005:=_____
3MLB006:=_____
3MLB007:=_____
3MLB008:=_____
3MLB009:=_____
3MLB010:=_____
3MLB011:=_____
3MLB012:=_____
3MLB013:=_____
3MLB014:=_____
3MLB015:=_____
3MLB016:=_____
3MLB017:=_____
3MLB018:=_____
3MLB019:=_____
3MLB020:=_____
3MLB021:=_____
3MLB022:=_____
3MLB023:=_____
3MLB024:=_____
3MLB025:=_____
3MLB026:=_____
3MLB027:=_____
3MLB028:=_____
3MLB029:=_____
3MLB030:=_____
3MLB031:=_____
3MLB032:=_____
3MLB033:=_____
3MLB034:=_____
3MLB035:=_____
3MLB036:=_____
3MLB037:=_____
3MLB038:=_____
3MLB039:=_____
3MLB040:=_____
3MLB041:=_____
3MLB042:=_____
3MLB043:=_____
3MLB044:=_____
3MLB045:=_____
3MLB046:=_____
3MLB047:=_____
3MLB048:=_____
3MLB049:=_____
3MLB050:=_____
3MLB051:=_____
3MLB052:=_____
3MLB053:=_____
3MLB054:=_____
3MLB055:=_____
3MLB056:=_____
3MLB057:=_____
3MLB058:=_____
3MLB059:=_____
3MLB060:=_____
3MLB061:=_____
3MLB062:=_____
3MLB063:=_____

3MLB064 := _____
3MLB065 := _____
3MLB066 := _____
3MLB067 := _____
3MLB068 := _____
3MLB069 := _____
3MLB070 := _____
3MLB071 := _____
3MLB072 := _____
3MLB073 := _____
3MLB074 := _____
3MLB075 := _____
3MLB076 := _____
3MLB077 := _____
3MLB078 := _____
3MLB079 := _____
3MLB080 := _____
3MLB081 := _____
3MLB082 := _____
3MLB083 := _____
3MLB084 := _____
3MLB085 := _____
3MLB086 := _____
3MLB087 := _____
3MLB088 := _____
3MLB089 := _____
3MLB090 := _____
3MLB091 := _____
3MLB092 := _____
3MLB093 := _____
3MLB094 := _____
3MLB095 := _____
3MLB096 := _____
3MLB097 := _____
3MLB098 := _____
3MLB099 := _____
3MLB100 := _____
3MLB101 := _____
3MLB102 := _____
3MLB103 := _____
3MLB104 := _____
3MLB105 := _____
3MLB106 := _____
3MLB107 := _____
3MLB108 := _____
3MLB109 := _____
3MLB110 := _____
3MLB111 := _____
3MLB112 := _____
3MLB113 := _____
3MLB114 := _____
3MLB115 := _____
3MLB116 := _____
3MLB117 := _____
3MLB118 := _____
3MLB119 := _____
3MLB120 := _____
3MLB121 := _____
3MLB122 := _____
3MLB123 := _____
3MLB124 := _____
3MLB125 := _____
3MLB126 := _____
3MLB127 := _____

EtherNet/IP Assembly Map Settings (SET E Command)

EtherNet/IP Assembly Map

(See Appendix F: EtherNet/IP Communications for additional details)
(EtherNet/IP Assembly Map settings are hidden if EtherNet/IP is not included)
(Use SET E n command where n = 1, 2, or 3 to create as many as three EtherNet/IP Assembly Maps)
(This is EtherNet/IP Assembly Map 1 (EtherNet/IP Assembly Map 2 and EtherNet/IP Assembly Map 3 are identical to EtherNet/IP Assembly Map 1))

Input Assembly (IA) Binary

EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_00**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_01**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_02**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_03**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_04**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_05**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_06**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_07**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_08**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_09**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_10**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_11**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_12**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_13**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_14**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_15**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_16**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_17**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_18**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_19**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_20**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_21**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_22**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_23**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_24**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_25**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_26**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_27**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_28**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_29**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_30**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_31**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_32**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_33**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_34**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_35**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_36**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_37**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_38**:= _____
EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_39**:= _____

EIP INPUT ASSEMBLY BINARY LABEL NAME (10 characters)	**IAB_40**:= _____
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APPENDIX B: CITY OF WINNIPEG HMI ANIMATION GUIDELINES

Winnipeg

The City of Winnipeg

Water & Waste Department

HMI Layout and Animation Plan

Document Code:

Revision: 01

Approved By:	Duane Griffin, Branch Head – WW Planning & Projects	June 30, 2017 Date

REVISION REGISTER					
Rev.	**Description**	**Date**	**By**	**Checked**	**Approved**
00	Issued for City Use	2016-03-09	B. Cleven	P. Chicatun	T. Church
01	Miscellaneous Revisions	2016-06-29	B. Cleven	C. Reimer	D. Griffin

TABLE OF CONTENTS

1 INTRODUCTION

This Wastewater Department HMI Layout and Animation Plan is intended to serve as a reference for consistent implementation of new HMI software applications for City of Winnipeg owned wastewater facilities. This document provides guidance to department personnel, as well as external consultants and external contractors, in the implementation of HMI systems for the Winnipeg Sewage Treatment Program (WSTP).

1.1 Scope of the Document

These implementation requirements apply to HMI systems at the following facilities:

- North End Sewage Treatment Plant (NEWPCC),
- South End Sewage Treatment Plant (SEWPCC),
- West End Sewage Treatment Plant (WEWPCC).

These requirements will also be applied to the collection system where relevant and useful.

1.2 Application

The scope and intent of this document is to convey guidance regarding implementation of HMI applications. The standard shall apply to facility HMI systems as well as local touchscreen HMIs that are specific to a piece of equipment. The document will indicate where specific standards are applicable to facility HMI systems only.

The information is presented without knowledge of the specific process implementation. It is not within the scope of this document to provide detailed implementation direction, and it will be the responsibility of the respective system designers to fully develop the HMI application details with general conformance to the concepts presented herein. This document shall not be construed as comprehensive implementation requirements or negate the requirement for professional engineering involvement. Any design and implementation must be executed under the responsibility and seal of the respective engineer in each instance, and must be performed in conformance with all applicable codes and standards, as well as good engineering practice.

Where significant deviations from this guide are deemed to be appropriate by the design engineer, these shall be approved by the City.

As technology evolves and new application requirements are identified, it is recommended that this document is updated to ensure that it remains relevant and applicable.

Existing facilities do not necessarily comply with this guide. The expectations regarding application of this guide to new HMI systems at existing facilities must be assessed on a case-by-case basis, however general guidelines for application are presented as follows:

- All new implementations, not related to an existing facility, are expected to comply with this guide.
- All major upgrades to a facility, or a larger facility's process area, are expected to comply with this document, however in some cases compromise with the configuration of the existing facility implementation may be required.
- All minor upgrades should utilize this document as far as practical, however in some cases compromise with the implementation of the existing facility HMI system, which will be retained after an upgrade, will be required. Where these compromises are made they shall be kept to a minimum and agreed by the City.

1.3 Definitions

A	Amperes
CPU	Central Processing Unit
CV	Control Variable (PID control)
FRS	Functional Requirements Specification
HMI	Human-Machine Interface
HOA	Hand - Off - Auto (switch)
HOR	Hand - Off - Remote (switch)
HP, hp	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
kW	Kilo Watts
I/O	Input/Output
MCC	Motor Control Centre
PDF	Portable Document Format
PLC	Programmable Logic Controller
PV	Process Variable (PID control)
SI	International System (of Units) (Système International (d'Unités))
SP	Setpoint Variable (PID control)
WSTP	Winnipeg Sewage Treatment Program
V	Volts
VFD	Variable Frequency Drive

1.4 References

The following City of Winnipeg standards and guides are applicable to HMI systems:

1. Electrical Design Guide, document code 510276-0000-47ER-0001.
2. Automation Design Guide, document code 612620-0013-40ER-0001.
3. Tagname Identification Standard, document code 612620-0014-40ER-0001.
4. Historical Data Retention Standard, document code 612620-0016-40ER-0001.

2 GRAPHIC DISPLAYS

2.1 General Principles

Graphic displays shall be designed and implemented in a manner that promotes operator situational awareness. Operators shall be provided with an HMI system that allows them to quickly identify and react to abnormal conditions, thereby reducing equipment downtime and improving overall facility operation.

Use the following general principles when designing and implementing HMI applications for facility desktop HMI and touchscreen HMI systems:

1. Utilize a “shades-of-grey” approach to show all process and systems, other than those in an abnormal state.
2. Design graphic displays around the tasks and goals of the operators, rather than the sensors and equipment that produce the data.
3. Organize information in a way that allows operators to make effective decisions. Group related information together, and make important information stand out.
4. Keep users aware of the state of the system. Avoid providing too much information on any one display, but ensure that enough information is provided that operators are not blind to the facility operation.
5. Illustrate equipment on graphic displays using a flat, 2-dimensional (2D) style. Use of 3-dimensional (3D) style is only accepted for pushbuttons.
6. Do not use gradients, drop shadows, or other similar graphics techniques to enhance the visual appearance of graphic displays.
7. Use the minimum amount of detail to represent equipment. Excessive detail does not promote operator understanding, but rather acts as a visual distraction.
8. Do not incorporate unnecessary animation that is distracting to operators. Examples of unnecessary animation include rotating equipment, flowing water, and flickering flames.
9. Use colour to facilitate discrimination between important information and less-important information. Important information shall be shown in red, orange, yellow, and blue. Less important information is typically shown in a shade of grey. Further information is provided in Section 2.2.
10. Use different shapes, in addition to different colours, to facilitate discrimination between important information such as alarm icons.
11. Use different shades of grey to differentiate between running and stopped equipment, opened and closed valves, and energized/de-energized cables.
12. Do not depict instruments on overview displays or process mimic displays. Only display the instrument reading, along with the units of measure.
13. Use toggle buttons to allow operators to show and hide details that are useful, but clutter the display. For example, a toggle could be used to show and hide minor equipment identifiers, process control loops, and process interlocks on the graphic displays.
14. Configure all operator setting/setpoint tags with an engineering zero scale and full scale to ensure operators do not input an out-of-range value.
15. Minimize the amount of typing that is required by operators by providing selection lists, radio buttons, up/down arrows, or check boxes where possible.
16. Ensure that sufficient space is provided between selectable display objects, and that the objects are appropriately sized, to ensure compatibility with touchscreen HMI clients.

2.2 Colour Scheme

Process graphics are to be implemented using the *Shades of Grey* colour scheme. Equipment and process lines are shown using a shade of grey, and abnormal conditions are shown in bright colours such as red, orange, yellow, and blue.

Refer to Table 2-1 for the standard colours used within City of Winnipeg HMI systems.

Table 2-1: RGB Colour Reference

Colour	Sample	RGB Value	Typical Purpose
White		255, 255, 255	Background of numeric displays, text displays, bar graphs, and gauges.
Grey 242		242, 242, 242	Active tab fill colour on the Header display.
Grey 230		230, 230, 230	Graphic Display Background, Stopped Equipment Fill.
Grey 208		208, 208, 208	Popup Window Inactive Background
Grey 192		192, 192, 192	Piping, fill colour of static equipment such as tanks and vessels, object outlines for equipment that is “Not Ready” or are out of service, and bar graph alarm ranges.
Grey 160		160, 160, 160	Border colour of static equipment such as tanks and vessels, Bar graph process variable.
Grey 154		154, 154, 154	Background colour of trend displays
Grey 128		128, 128, 128	Fill colour for Running Equipment, Bar graph alarm ranges.
Grey 96		96, 96, 96	Process Loops, Object outlines for equipment that is ready
Black		0, 0, 0	Text, Setpoint (SP) indicator arrows.
Red		255, 0, 0	Priority 1 Alarms (High Priority)
Orange		255, 128, 0	Priority 2 Alarms (Medium Priority)
Yellow		255, 255, 0	Priority 3 Alarms (Low Priority)
Light Blue		66, 186, 255	Abnormal States (e.g. Equipment in Manual Mode)
Blue		0, 0, 255	Hyperlinks

2.3 Standard Graphic Display Objects

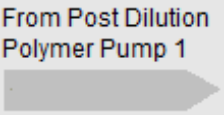
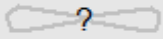
Refer to Table 2-2 for standard graphic display objects. If additional objects are required, use the same style as that shown in this standard.

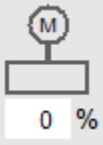
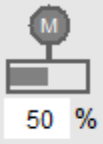
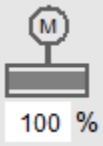
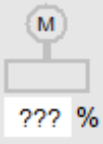
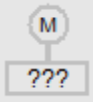
Table 2-2: Standard Graphic Display Objects

Object	State	Colour	Sample	Notes
Display Background	-	Grey 230		
Primary Titles	-	Black	**Primary Title**	Arial, 14 point, bold
Secondary Titles	-	Black	**Secondary Title**	Arial, 12 point, bold
General Text	-	Black	General Text	Arial 10 point, regular
Medium Text	-	Black	Medium Text	Arial 9 point, regular
Small Text	-	Black	Small Text	Arial 8 point, regular
Hyperlink	-	Blue	Hyperlink	Arial 10 point, underlined
Display Navigation Button	-	Grey 160, Grey 208		Located in the Header Display of a facility HMI application.
Back Button	-	Grey 160, Grey 208, White		Located in the Header Display of a facility HMI application.
Forward Button	-	Grey 160, Grey 208, White		Located in the Header Display of a facility HMI application.
Pushbutton	Enabled	System Default , Black Text	Button	Pushbuttons are to appear enabled or disabled as applicable. Do not change the text on a pushbutton. Disabled buttons are to appear flat.
	Disabled	Grey 230 Fill, Grey 160 Text, Grey 160 Border	Button	
Input Field	Enabled (read/write)	White Fill, Black Border	56 %	Use *General Text*
	Disabled (read only)	Grey 230 Fill, Grey 160 Text, Black Border	56 %	Use *General Text*

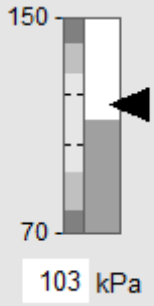
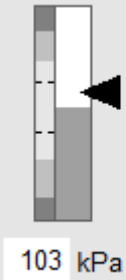
Object	State	Colour	Sample	Notes
Lock Icon	Locked	Grey 160		Show beside a secured object (eg. an *Input Field*) that is locked.
Priority 1 Alarm Icon	Active	Red		Blink when unacknowledged, solid when acknowledged.
	Inactive	-	Invisible	
Priority 2 Alarm Icon	Active	Orange		Blink when unacknowledged, solid when acknowledged.
	Inactive	-	Invisible	
Priority 3 Alarm Icon	Active	Yellow		Blink when unacknowledged, solid when acknowledged.
	Inactive	-	Invisible	
Control Mode Icon (PLC)	Manual	Light Blue		Not blinking
	Auto	-	Invisible	
Control Mode Icon (Physical Switch)	Local	Light Blue		Not blinking
	Hand	Light Blue		Not blinking
	Remote	-	Invisible	
Not Ready Icon	Not Ready	Light Blue		Used if equipment is not ready to run (eg. power is switched off). Not blinking
	Ready	-	Invisible	
Alarms Disabled Icon	Alarms Disabled	Light Blue		Show next to equipment that has one or more alarms disabled. Not blinking.
	No Alarms Disabled	-	Invisible	

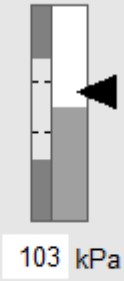
Object	State	Colour	Sample	Notes
Override Icon	Override Active	Light Blue	O	Show next to an instrument or equipment that has one or more signals overridden. Not blinking.
	No Override Active	-	Invisible	
Static Tank / Vessel	-	Grey 160, Grey 192, Black text	TK-D415	May adjust shape to reflect actual tank or vessel shape. Do not show inner detail. Show equipment identifier inside object.
Non-Static Equipment	Running	Grey 96, Grey 128, White text	RDT-D415	Adjust the shape to reflect the shape of the equipment (typically as it is shown on the P&IDs). Do not show inner detail unless required to help clarify equipment type or operation. Show equipment identifier inside object.
	Stopped	Grey 96, Grey 230, Black text	RDT-D416	
Large Pipe (300+ mm) or Channel	-	Grey 192, Black text	FOA	11 Pixels in width/height. Indicate Fluid Commodity Code using *Small Text*.
Medium Pipe (90 - 250 mm)	-	Grey 192, Black text	MP	7 Pixels in width/height. Indicate Fluid Commodity Code using *Small Text*.
Small Pipe (3 - 80 mm)	-	Grey 192, Black text	PD	3 Pixels in width/height. Indicate Fluid Commodity Code using *Small Text*.
Process Loops	-	Grey 96		1 Pixel

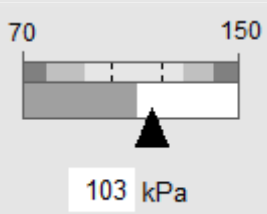
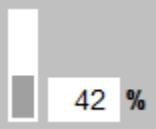
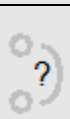
Object	State	Colour	Sample	Notes
Process/Signal Continuation	-	Grey 192		Provide touch link to the referenced display. Use *Medium Text* (9 point).
Pump / Fan	Running	Grey 96, Grey 128		For variable speed pumps/fans, indicate the speed in units of percent using an *Indicator* object.
	Stopped	Grey 96, Grey 230		
	Not Ready	Grey 192, Grey 230		
	Unknown State	Grey 192, Grey 230, Black text		Show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3.
Mixer	Running	Grey 96, Grey 128		For variable speed mixers, indicate the speed in units of percent using an *Indicator* object.
	Stopped	Grey 192, Grey 230		
	Not Ready	Grey 192, Grey 230		
	Unknown State	Grey 192, Grey 230, Black text		Show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3.

Object	State	Colour	Sample	Notes
Actuated Modulating Valve or Damper	Closed	Grey 96, Grey 128, Grey 230		The width of the bar graph inside the object reflects percentage open. Show the actual position in units of % open using an *Indicator* object. The actuator shown is a motor actuator. Other actuator symbols are provided below. The actuator may be colour animated to reflect the running state if known.
	Intermediary Position	Grey 96, Grey 128, Grey 230		
	Open	Grey 96, Grey 128, Grey 230		
	Unknown State or Position	Grey 192, Grey 230, Black text		Show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3.
Actuated On/Off Valve or Damper	Closed	Grey 96, Grey 230, Black text		The actuator shown is a motor actuator. Other actuator symbols are provided below. The actuator may be colour animated to reflect the running state if known.
	Intermediary Position	Grey 96, Grey 128, Grey 230, White text		
	Open	Grey 96, Grey 128, Grey 230, White text		
	Unknown State or Position	Grey 192, Grey 230, Black text		Show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3.

Object	State	Colour	Sample	Notes
Valve Actuator - Motor	Energized (Running)	Grey 96, Grey 128, White text		Use in combination with a valve symbol. See ISA 5.1 for additional actuator symbols.
	De-Energized (Stopped)	Grey 192, Grey 230, Black text		
	Out of Service	Grey 192, Grey 230, Black text		
Valve Actuator - Pneumatic Spring Return	Stopped or Unknown if Moving	Grey 96, Grey 128		Use in combination with a valve symbol. See ISA 5.1 for additional actuator symbols.
	Actuator Moving (if known)	Grey 96, Grey 230		
	Out of Service	Grey 192, Grey 230		
Valve Actuator - Solenoid	In Service (Energized or De-energized)	Grey 95, Grey 230, Black text		Use in combination with a valve symbol. See ISA 5.1 for additional actuator symbols.
	Out of Service	Grey 192, Grey 230, Black text		
Indicator	-	White, Black		Use *General Text.* Show the units outside the white box.
Gauge	-	Black, Grey 128, Grey 192, White		Setpoint or control limits indicated with dashed line(s) (as required). Process reading indicated with black arrow. Alarm limits indicated with darker shades of grey.

Object	State	Colour	Sample	Notes
Bar Graph, Vertical	All elements shown	Black, Grey 92, Grey 128, Grey 160, Grey 192, Grey 230, White		Process variable (PV) is shown inside the right-hand rectangle using Grey 160 vertical fill animation. Left-hand rectangle is filled with Grey 230, and has the alarm limits and control limits overlaid on it. Low-Low and Hi-Hi alarm ranges are shown using Grey 128. Low and Hi alarm ranges are shown using Grey 192. Control limits are indicated in the left-hand rectangle with black dashed lines. Setpoint (SP) indicated on the right with a black arrow (triangle). PV is indicated in text below the bar graph. SP indication in text is shown on the faceplate only. Min/max values indicated in text to the left of the alarm limits. Object outlines using Grey 92.
	Hi-Hi, Hi-, Low, Low-Low alarm ranges, control limits, PV, and SP are shown. Min/max values are not shown.	Black, Grey 92, Grey 128, Grey 160, Grey 192, Grey 230, White		Alarm ranges for Low-Low, Low, Hi, and Hi-Hi are shown. PV is indicated in text below the bar graph. SP indication in text is shown on a faceplate.

Object	State	Colour	Sample	Notes
	Hi, Low alarm ranges, control limits, PV, and SP are shown. Hi-Hi, Low-Low alarm ranges, Min/max values are not shown.	Black, Grey 92, Grey 128, Grey 160, Grey 230, White		Alarm limits for Low and Hi are shown using Grey 128. Alarm limits for Low-Low and Hi-Hi are not applicable. PV is indicated in text below the bar graph. SP indication in text is shown on a faceplate.
	Alarm ranges and PV are shown. Min/max values, control limits, and SP are not shown.	Black, Grey 92, Grey 128, Grey 160, Grey 192, Grey 230, White		Show min/max values as required.
	PV and SP are shown. Min/max values, alarm ranges, and control limits not shown.	Black, Grey 92, Grey 160, White		Show min/max values as required.
	Only PV is shown. Min/max values, alarm ranges, control limits, and SP not shown.	Black, Grey 92, Grey 160, White		Show min/max values as required.

Object	State	Colour	Sample	Notes
	All elements shown.	Black, Grey 92, Grey 128, Grey 160, Grey 192, Grey 230, White		Elements may be removed as required in a similar manner as the vertical bar graph. SP indication in text is only to be shown on an equipment faceplate.
Bar Graph, Horizontal	-	White, Grey 160, Black		The vertical bar graph is animated to reflect the tank level. Typically used on process mimic displays.
Tank Level Indicator	Racked in and Closed	Grey 96, Grey 128		
Power Circuit Breaker	Racked in and Open	Grey 96, Grey 230		Also show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3.
	Racked Out, Out of Service	Grey 192		
	Unknown State	Grey 192, Black text		
	Closed	Grey 128		State feedback is not typically from the breaker itself. State may be inferred based on data from protection relays, power meters, or intelligent overloads, etc.
Moulded Case Circuit Breaker	Open	Grey 192		Also show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3 as required.
	Unknown State	Grey 192, Black text		

Object	State	Colour	Sample	Notes
	Energized	Grey 128		State feedback is not from the fuse itself. State may be inferred based on data from protection relays, power meters, or intelligent overloads, etc.
Fuse	De-Energized	Grey 192		Also show an *Alarm Icon* and an appropriately coloured rectangle around the object as per Table 2-3 as required.
	Unknown State	Grey 192, Black text		
	Energized	Grey 128		3 pixels. Energized state is inferred based on other data.
Bus or Cable	De-Energized	Grey 192		3 pixels. De-energized state is inferred based on other data.
	Unknown State	Grey 192, Black text		3 pixels.
	-	Grey 230		Refer to Section 2.7.7 for information on Equipment Faceplates.
Equipment Faceplate Active Tab Background	-	Grey 208		
Equipment Faceplate Inactive Tab Background	-	Grey 128		
Equipment Faceplate Tab Icon, Home		Grey 128		
Equipment Faceplate Tab Icon, Details	-	Grey 128		
Equipment Faceplate Tab Icon, Configuration	-	Grey 128		Overlay an alarm icon if an alarm is active.

Object	State	Colour	Sample	Notes
Equipment Faceplate Tab Icon, Alarms	-	Grey 128		
Equipment Faceplate Tab Icon, Trends	-	Grey 128		
Equipment Faceplate Link, Webpage	-	Grey 128		Not normally provided. Provide only if required.
Equipment Faceplate Link, Help				

2.4 Display of Text Values

Text values on graphic displays are shown using either the *Input Field* or *Indicator* graphic objects that are listed in Table 2-2. The *Input Field* graphic object has a black border to convey the fact that it is a field that accepts input by the operator. The *Indicator* field does not have a black border, which signifies that this field does not ever accept input by the operator.

Use the fill colour of an *Input Field* object to indicate whether the field is currently accepting input by the operator. When an *Input Field* is enabled it shall be filled with white colour. When an *Input Field* is disabled it shall be filled with grey colour.

The *Input Field* object may be linked to a discrete point or an expression to control whether it is enabled or disabled. For example, the manual speed setpoint field on an equipment faceplate for a VFD-driven pump should be linked to the auto/manual mode status to enable the field when the equipment is in manual mode.

Instrument readings on process mimic displays shall use the *Indicator* object.

2.5 Units of Measure

All units of measure shall be in the International System of Units (SI). One exception is that motor ratings shall be displayed in both SI units (kW) and the imperial horsepower (hp) with the horsepower rating shown in brackets.

Follow these rules when units of measure are shown on HMI systems:

1. The first letter of the unit of measure is upper-case when the name of the unit is derived from the name of a person. Examples: Volt (V), Amp (A), Watt (W),
2. The first letter of the unit of measure is lower-case when the name of the unit is not derived from the name of a person. Examples: litre (l), meter (m), gram (g), second (s), day (d),
3. Units of measure are unaltered in the plural. Example: 5 cm, not 5 cms,
4. Capitalization of unit prefixes (p, n, µ, m, c, k, M, G, etc.) shall be as per standard convention,
5. Provide a space between numeric readings and the unit of measure.
6. Percentage (%) is typically used to indicate the position of valves (percent open), the speed of variable-speed motors (percent of full speed), tank level (percent full), and for other process readings that natively use percentage as the unit of measure. However, exceptions to these may be applied in specific cases. It is also permissible to indicate a process measurement in units of percent along with another unit of measure (eg. wetwell level may be shown in units of percent and in meters).

2.6 Display of Equipment Status

Equipment shall be shown on graphic displays using the standard graphic symbols shown in Table 2-2. Where the status of equipment is provided to the control system, the colour and inner detail of the equipment is changed to reflect the current state, as per the following.

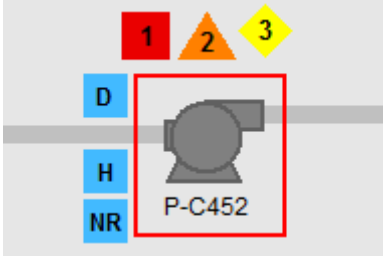
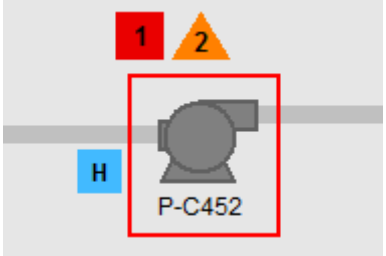
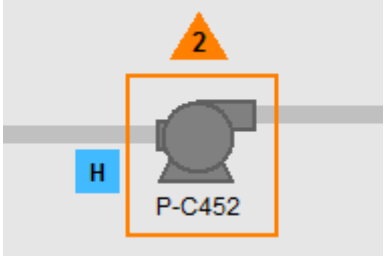
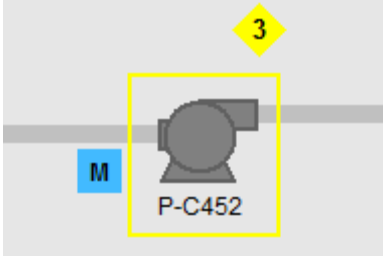
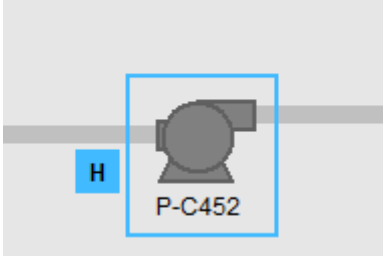
1. For equipment such as motors, pumps, fans, and mixers that have the capability of being started and stopped, colour is used to represent the equipment running status. Equipment that is running is shown using Grey 128 fill with a Grey 96 border, and equipment that is stopped is shown using Grey 230 fill with a Grey 96 border.
2. Equipment that is Not Ready, in an unknown state, or in an unknown position, should be shown using Grey 230 fill and a Grey 192 border. If the equipment is in an unknown state or position then question marks are shown on the equipment (eg. equipment control is via an intelligent motor starter using Modbus/TCP but the communication link is down).
3. For on/off valves, fill colour is used to indicate whether the valve is opened or closed. Do not animate the fill colour of the valve based on the running status (eg. running open or running closed) – this information can be provided on a faceplate if needed. However, if the "running" state of the actuator is known then the actuator fill colour is to be animated based on the running status. On/off valves in the open state are shown using Grey 128 fill and Grey 96 border, and in the closed state using Grey 230 fill and Grey 96 border. Diagonal lines are shown in the body of the valve if the valve is known to be in an intermediary position (the open limit and closed limit switches are not made). Question marks are shown on the valve if it is in an unknown position (eg. an intelligent on/off actuator using Profibus communication, but the communication link is down).
4. On/off dampers are shown in an identical manner as on/off valves.
5. Modulating valves do not change colour. The width of the horizontal bar graph within the body of the valve changes to reflect the valve position. When the valve is fully open, the width of the horizontal bar graph shall be at its maximum. When the valve is fully closed, the width of the horizontal bar graph shall be zero. However, if the "running" state of the actuator is known then the actuator fill colour is to be animated based on the running status.
6. Modulating dampers are shown in an identical manner as modulating valves.
7. For *Indicator objects*, indicate three question marks inside the indicator if the value is unknown as a result of some failure in the system (eg. a communication failure).

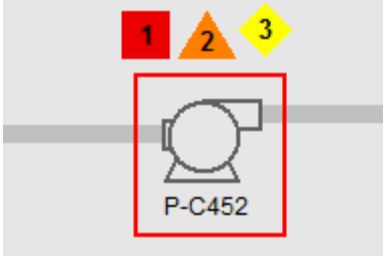
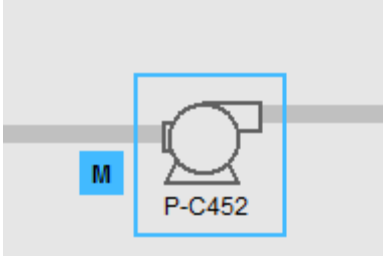
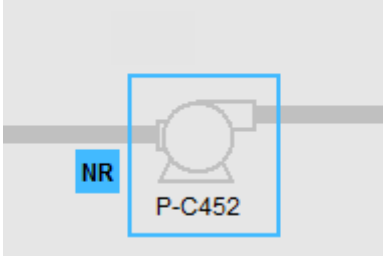
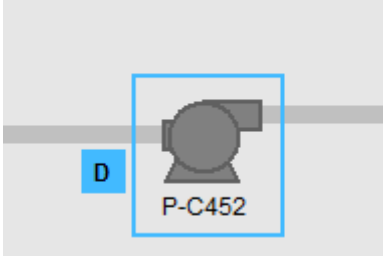
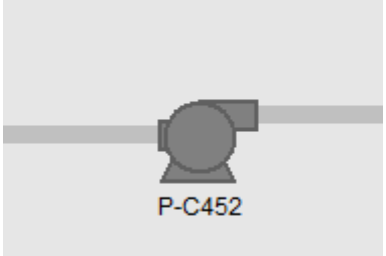
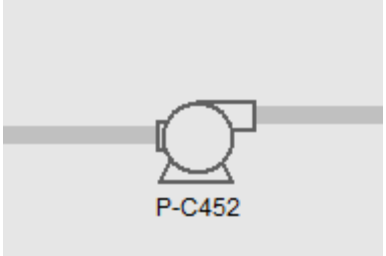
The applicable alarm and abnormal condition icons, as per Table 2-2, shall be shown adjacent to each piece of equipment that have alarms or abnormal states. Standard icons are provided for each alarm priority level, and for indicating the equipment is in hand mode, manual mode, not ready, has alarms disabled, or a signal is overridden. Use visibility animation to show and hide these icons depending on the state of the equipment. Some operating modes are mutually exclusive and therefore the icons may overlap each-another since they will not both be shown at the same time. For example, the 'Hand' control mode is mutually exclusive with the 'Manual' PLC mode, therefore the "H" and "M" icons may overlap.

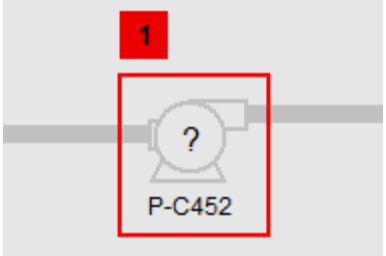
When an alarm or control mode flag icon for an equipment appears visible, a rectangle of the same colour as the icon shall be shown around the equipment. The rectangle is coloured the same colour as the highest priority alarm or abnormal condition to handle cases where multiple alarms of different priority levels may be active at the same time. If no alarms are active but a control mode icon is shown, show a light blue rectangle around the equipment.

Refer to the sample figures in Table 2-3 for the standard method of displaying equipment status.

Table 2-3: Display of Equipment Status

State	Sample	Notes
All symbols shown (in development environment)		All symbols are organized around the equipment in close proximity. The “Hand” (H) icon overlaps the “Manual” (M) icon as these are mutually exclusive. As such, the “Manual” (M) icon is unseen.
Equipment Running in Hand with a Priority 1 and Priority 2 alarm.		The rectangle is shown in red since the Priority 1 alarm condition supersedes both the Priority 2 alarm condition and the “Hand” abnormal condition.
Equipment Running in Hand with Priority 2 alarm.		The rectangle is shown in orange since the alarm condition supersedes the abnormal condition (Hand).
Equipment Running in Manual mode with a Priority 3 alarm.		The rectangle is shown in yellow colour since the alarm condition supersedes the abnormal condition (Manual).
Equipment Running in Hand mode with no alarms.		The rectangle is shown in blue because there are no active alarms.

State	Sample	Notes
Equipment stopped with Priority 1, Priority 2, and Priority 3 alarms active.		The rectangle is shown in red since the Priority 1 alarm condition supersedes the Priority 2 and Priority 3 alarms.
Equipment stopped in Manual mode with no alarms.		The rectangle is shown in blue because there are no active alarms and blue matches the Manual (M) icon.
Equipment Not Ready and stopped with no alarms.		The rectangle is shown in blue because there are no active alarms and blue matches the Not Ready (NR) icon.
Equipment running in remote with one or more disabled alarms.		The rectangle is shown in blue because there are no active alarms and blue matches the Disabled Alarms (D) icon.
Equipment running in Remote with no alarms.		No rectangle is shown around the equipment since there are no alarms.
Equipment stopped in Remote with no alarms.		No rectangle is shown around the equipment since there are no alarms.

State	Sample	Notes
Unknown State – Communication Failure between PLC and equipment		A question mark is shown inside the equipment to reflect that the equipment state is unknown. A Priority 1 alarm is shown as a result of the communication failure, however the priority level may vary depending on the application.

2.7 Display Types

2.7.1 General

HMI applications will include several types of displays for viewing various levels of detail, and for operator tasks such as viewing trends and alarms. Displays are generally broken down into the following categories:

1. Header/Footer Displays
2. Navigation Displays
3. Overview Displays
4. Process Mimic Displays
5. Equipment Detail Displays
6. Equipment Faceplates (Popups)
7. Trend Displays
8. Alarm Summary Displays

Where a header or footer display is provided in an HMI system, the term “full-screen display” refers to a display that occupies all of the remaining screen space that is not already occupied by the header or footer.

Each of these display types are discussed in the following sections.

2.7.2 Header/Footer Displays

A header or footer display shall be provided on each HMI system for locating elements that are common to all displays. The header or footer will always be present on the screen, and not covered or replaced by other displays.

For facility HMI systems, a header display shall be provided which contains the following:

1. The facility name (eg. NEWPCC, SEWPCC, or WEWPCC) to convey to operators which site they are operating, which is useful for remote applications (eg. control of SEWPCC from NEWPCC),
2. A Display Navigation button (icon) that links to the primary navigation display,
3. Back and forward buttons (icons) for display navigation,
4. A breadcrumb trail showing the path to the current display within the display hierarchy,
5. A table of alarms by process area,
6. An alarm list that shows the three most recent alarms at the facility,
7. The currently logged in user,
8. The present date and time, and
9. A row of tabs listing the open full-screen displays.

A sample header for a wastewater treatment facility HMI is shown in Figure 2-1.

Figure 2-1: Sample Facility HMI Header

The Display Navigation button is located on the far left of the header, below the facility name. This button takes operators to the top-most navigation display for the HMI system. Refer to Section 2.7.3 for further information on navigation displays.

The back and forward buttons shall behave like the back and forward buttons in a web browser. These buttons shall return the operator to the previous full-screen display they were on. The forward button is normally disabled unless the operator presses the back button.

The breadcrumb trail indicates the path to the current full-screen display within the display hierarchy, and allows operators to navigate to other displays. Levels within the hierarchy are separated by right-hand arrows. Clicking an arrow opens a list of all displays at that level in the hierarchy, and clicking on a display in the list shall open the display. This is similar to the breadcrumb navigation system of Windows Explorer (File Explorer) in Windows 7 and above.

The table of alarms lists the quantity of unacknowledged alarms and acknowledged alarms in each process area. Coloured triangles are used to indicate the priority level of the highest priority alarm. Clicking on a column (process area) within the table of alarms brings the operator to an Alarm Summary Display that lists only the alarms in that process area. If no alarms are active in a specific process area, a hyphen rather than a zero (“0”) shall be shown.

The alarm list shows the three most recent alarms at the facility, along with the date/time that the alarm occurred and the associated alarm icons (without the numbers “1”, “2”, or “3” inside the icons). Clicking on the alarm list brings the operator to a full-screen Alarm Summary display that lists all of the alarms for the facility. In the three-line alarm list, unacknowledged alarms are shown using bold and blinking text and acknowledged alarms are shown using non-bold and non-blinking text. The state of the alarms (eg. “ON” or “OFF”) are shown at the far right of the alarm list.

Along the bottom of the header is tab bar that may be used to immediately go to any open display. When an operator opens a new display a new tab is added to the tab bar. New tabs are added to the right-hand side of the list of tabs. The active tab is shown using Grey 242 fill with black text, and non-active tabs are shown using Grey 208 fill and Grey 128 text. Clicking an in-active tab brings the associated display to the foreground. Left of the tabs are three buttons that allow operators to scroll through and select tabs:

1. A double-left arrow to scroll the list of tabs leftward.
2. A double-right arrow to scroll the list of tabs rightward.
3. A down arrow to show a list of all tabs, and allows the operator to click an item in the list to bring the associated display to the foreground.

The background (fill) colour of the items the header display (except for the active tab) shall be Grey 208.

Regarding touchscreen HMIs used for local equipment control, a footer display shall be provided which contains a button bar for display navigation, an indication of the number of unacknowledged and acknowledged alarms, the current user, and the present date and time, as applicable. Header displays are generally not provided on local touchscreen HMIs.

Additional information or controls that are common to all full-screen displays may be added to header/footer displays as required.

2.7.3 Navigation Displays

Navigation displays are provided within facility HMI applications as the primary means for display navigation, and to open external applications and documentation used by operators. Navigation displays are implemented as full-screen displays.

Navigation displays contain links to all the full-screen displays in the HMI application. Equipment faceplates or other popup displays are not typically listed on navigation displays.

Each link is implemented using a rectangle that contains a description of the item it links to. The rectangles are sufficiently sized to ensure compatibility with touchscreen HMI clients. The borders of the rectangles are colour coded based on the type of display or item they link to. Use blue colour for overview displays, green for process mimic displays, and purple for equipment detail displays. Other colours may be used as required, but do not use alarm colours (red, orange, and yellow).

Design and implement navigation displays such that the operator is able to access any full-screen display with ideally three (3) or fewer clicks. Note that clicking on the Display Navigation button in the header counts as one click, leaving two more clicks on the navigation display to open the desired item.

Organize links to operator displays in a hierarchical-grid arrangement to mimic the organization of the displays within the application, as per the following:

1. Locate all links to facility-wide displays in the top row of the grid. Typical examples of these include the Facility Process Overview (dashboard), the Facility Process Flow Diagram, the Facility Security System Overview, and the Control System Overview.
2. In the second row, list all of process areas in the facility using similar rectangles.
3. Below the second row, list all of the process overview displays, mimic displays, and equipment detail displays for each process area. When a process area rectangle is clicked on, the display links for the selected process area are shown.

In the top-right corner, provide links to the “Tools” navigation display and the “Help System”. The “Tools” navigation display contains links to external applications, documentation, and drawings that are used by operations personnel. The “Help System” link takes the operator to a help system that displays the standard equipment symbols and provides guidance on the use of the HMI system.

A sample navigation display is shown in Figure 2-2.

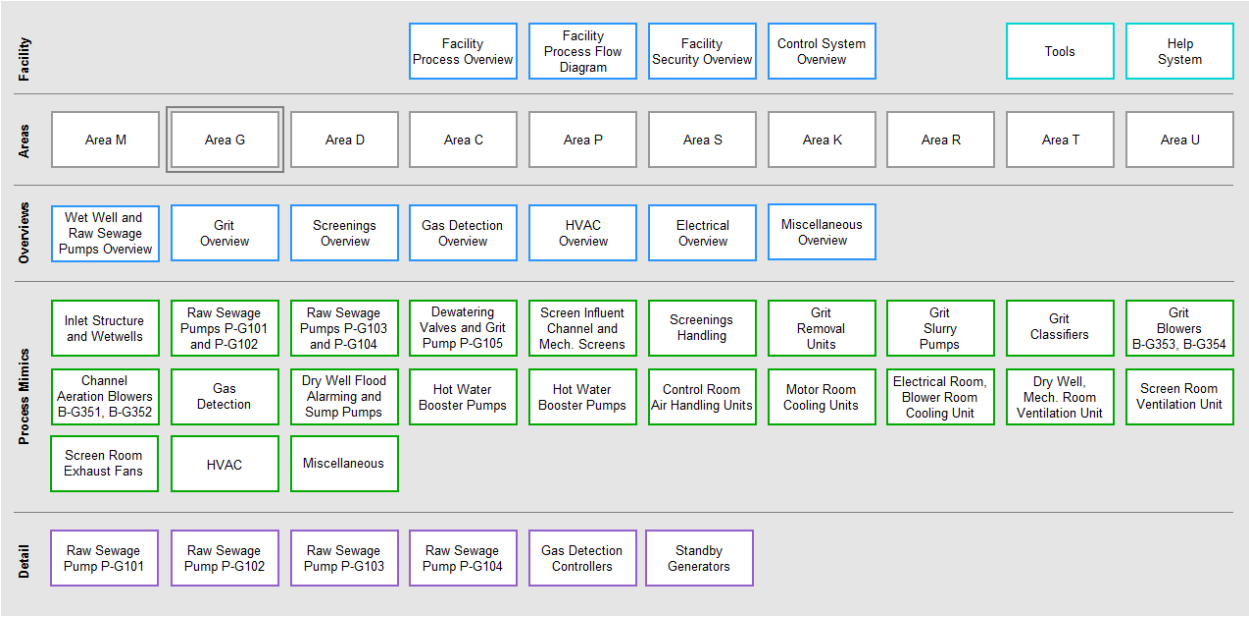


Figure 2-2: Sample Navigation Display

Notes:

1. *Links to the facility overview displays, tools, and the help system are shown in the top row.*
2. *A row of process area links (rectangles with grey outline) are provided in the 2nd row. These are used to show the display links for each process area.*
3. *Area G has been selected. A darker grey rectangle is shown around the Area G rectangle.*
4. *The display links below the row of process areas are associated with Area G, since it is the selected area.*
5. *A typical navigation screen for a major process area would contain more Detail Displays.*

A sample “Tools” navigation display is shown in Figure 2-3. Links are provided to process-related software tools such as the historian client, information server client, and a field device analytical tool. Below this are links to commonly used Windows applications such as Microsoft Word, Excel, Calculator, Notepad, WordPad, Paint, Internet Explorer, and a screen capture tool. The bottom row contains links to other information and systems such as the weather and the collections SCADA system. Additional links to other applications and documents may be provided as required.

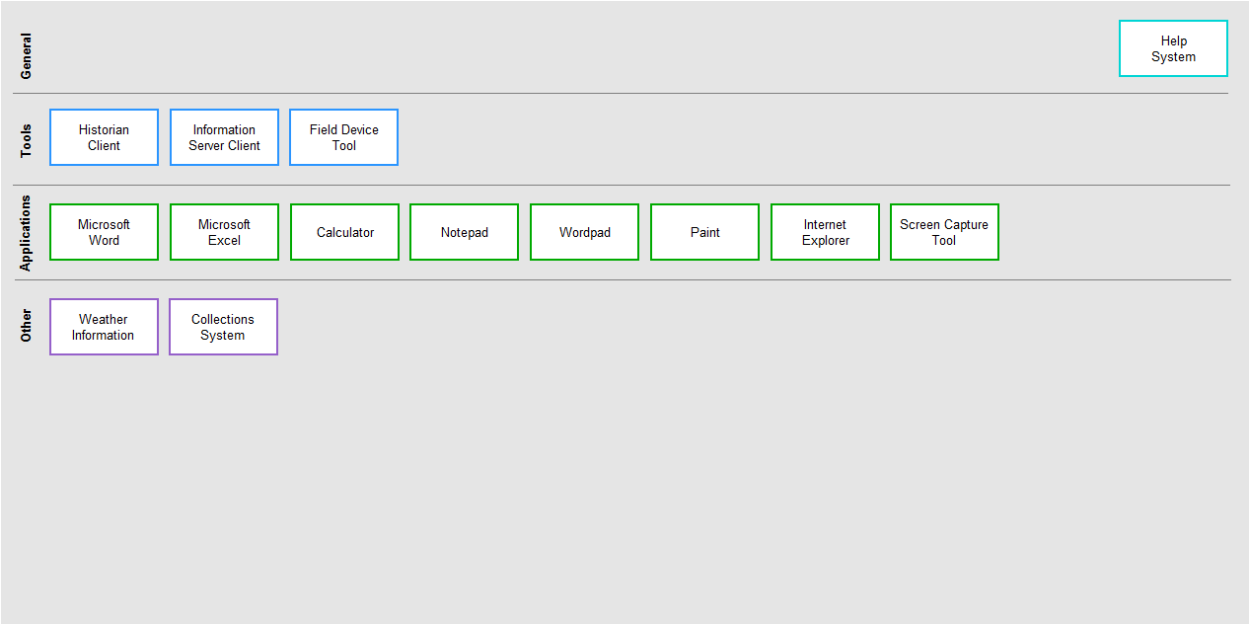


Figure 2-3: Sample Navigation Display – Tools

Notes:

1. *The first row contains links to process control system related tools.*
2. *The second row contains links to commonly used Windows applications.*
3. *The third row contains links to facility documentation and drawings, weather information, and the Wastewater Collections system.*
4. *To return to the main navigation display (*Figure 2-2*), the operator may click the "Navigation" button or the "Back" button in the header display.*

2.7.4 Overview Displays

An overview display shows an overview of a facility, process area, or one or more process trains and appears like a dashboard or instrument panel.

A facility HMI system will incorporate numerous overview displays, one for the entire facility, one for each small process area, and multiple overview screens as required for larger process areas.

A local touchscreen HMI will typically have a single overview display, but additional overview displays may be provided if required.

The content and organization of overview displays shall be focused on the operators' tasks and goals. The display should not appear like a process mimic, but rather a dashboard or instrument panel. Show only the important operating modes and major process readings such as major flows, levels, and analytical readings.

Overview displays should not be designed to represent the physical configuration of the facility or process. They should generally be organized left to right, top to bottom, in terms of major process flow.

Group related information together. In some cases it may be useful to group together all elements associated with a single piece of equipment. In other cases it may be useful to group together one element from multiple pieces of equipment for the sake of comparison.

Important numerical information shall be presented inside a gauge or bar graph to give the operator a sense of where the reading lies with respect to the control and alarm limits. Indicate control and alarm limits on gauges and bar graphs wherever possible.

If a fraction of a reading, difference between two readings, or an average of two readings is important to operators, provide the information on the display rather than making operators do the mental arithmetic. Note that the computation of these shall be in the PLC, and the HMI is used for display only.

Where practical, incorporate small trends into overview displays to allow operators to anticipate future alarm conditions, and react before the alarm occurs. The trends should have minimal detail, showing only the applicable setpoint, control limits, and alarm limits, and do not need to be fully-functional in terms of zooming and scrolling back in time. Link these small trends to full-screen trend displays that have the complete functionality.

A small process flow diagram should be included on overview displays where applicable. A process flow diagram is a high-level flow diagram without all the detail that would be shown on a process mimic display. The process flow diagram helps operators understand the process and may also be used as an alternative means to navigate between displays. The process flow diagram may appear like a typical block diagram, or the standard equipment symbols of Table 2-2 may be used. Where the standard equipment symbols are used, they may be reduced in size.

Indicate alarms and abnormal conditions using the standard icons listed in Table 2-2. In addition, a coloured rectangle shall be shown around the equipment, as per Section 2.6.

A sample overview display for an intake wetwell and the raw sewage pumps at a wastewater treatment facility is shown in Figure 2-4.

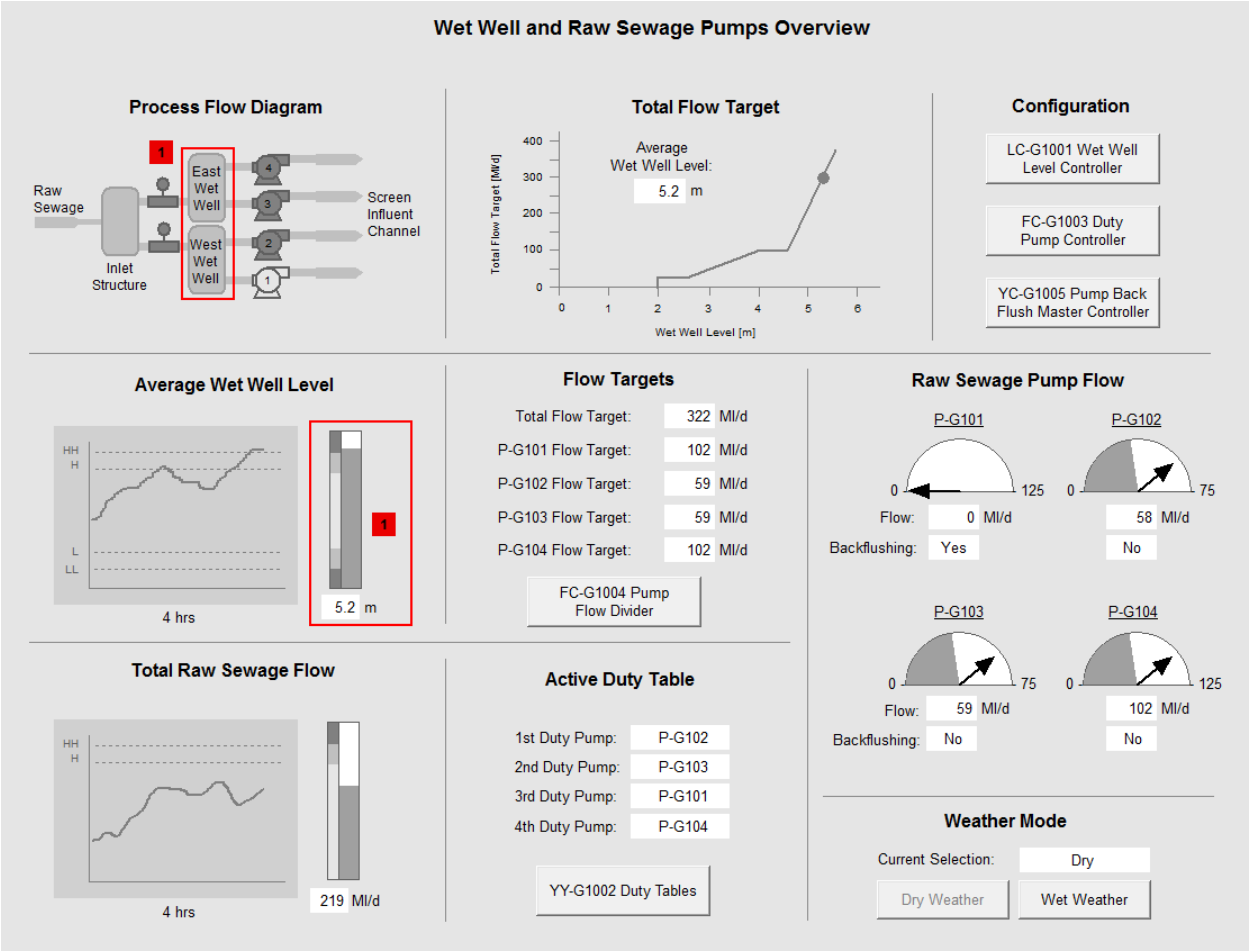


Figure 2-4: Sample Overview Display – Wet Well and Raw Sewage Pumps

Notes:

1. *This overview display is applicable to a portion of the Headworks Area at a wastewater treatment facility. Additional overview displays would be provided for the remaining equipment in the Headworks Area.*
2. *Small trends are incorporated into the display to show the wet well level. This allows operators to predict future low or high level conditions, and react before they occur.*
3. *Bar graphs and gauges are used to indicate process readings and are accompanied by text displays to give the exact value.*
4. *Text displays (without bar graphs and gauges) are used for information that does not change frequently and does not have alarm limits, such as the pump duty assignments.*
5. *A Priority 1 high-high level alarm associated with the Average Wet Well Level is shown. The wet wells in the process flow diagram and the wet well level bar graph are highlighted with a red rectangle, which matches the Priority 1 alarm colour.*
6. *Only the important information is shown on the display. Setpoints and operating modes that are infrequently changed are accessible via equipment faceplates. Pushbuttons are provided to open the equipment faceplates where not available by clicking on the equipment.*

2.7.5 Process Mimic Displays

Process mimic displays are full-screen displays that show a mimic of the process, similar to a P&ID drawing but without unnecessary detail. Equipment that is not controlled or monitored by the PLC system shall be omitted from the process mimic. Examples of such equipment include hand valves, strainers, flex couplings, reducers, pressure regulators, and back-flow preventers. Instruments, PLC I/O, and PLC functions that are typically shown on P&IDs are also omitted from process mimic displays, though instrument readings are still shown.

Instrument readings are shown using the *Indicator* graphic symbol (see Table 2-2). Instrument readings for tanks are shown inside the tank, whereas readings for instruments installed within pipes are shown adjacent to the pipe. Provide touch animation on instrument readings as required to open the associated instrument faceplate display.

Where a particular piece of equipment is outfitted with numerous sensors, it may be appropriate to display only the important readings and show the other readings on an equipment detail display or equipment faceplate.

Equipment such as pumps, motors, mixers, and valves that have state feedback to the PLC shall be colour animated, using shades of grey, to reflect their state. Refer to Table 2-2 for standard graphic display objects. Note that Table 2-2 only lists typical objects and additional objects may be created as required.

Pipes are shown using Grey 192. Pipes are shown in three different widths (see Table 2-2) to reflect the sizes (diameters) of pipes in the field.

Tanks and other static equipment are shown using a Grey 160 border and Grey 192 fill.

Indicate alarms and abnormal conditions using the standard icons listed in Table 2-2. In addition, a coloured rectangle shall be shown around the equipment or instrument reading, as per Section 2.6.

Display equipment identifiers for major and minor pieces of equipment. Identifiers for tanks should be shown inside the tank wherever possible. For equipment other than tanks, the identifier should be located below the equipment. Use *Medium Text* (see Table 2-2) for major equipment identifiers and *Small Text* for minor equipment identifiers.

Provide a means to navigate across the process mimic displays, such as with pushbuttons or with touch links on process line continuation symbols. Provide pushbuttons to navigate up to the associated overview display as required.

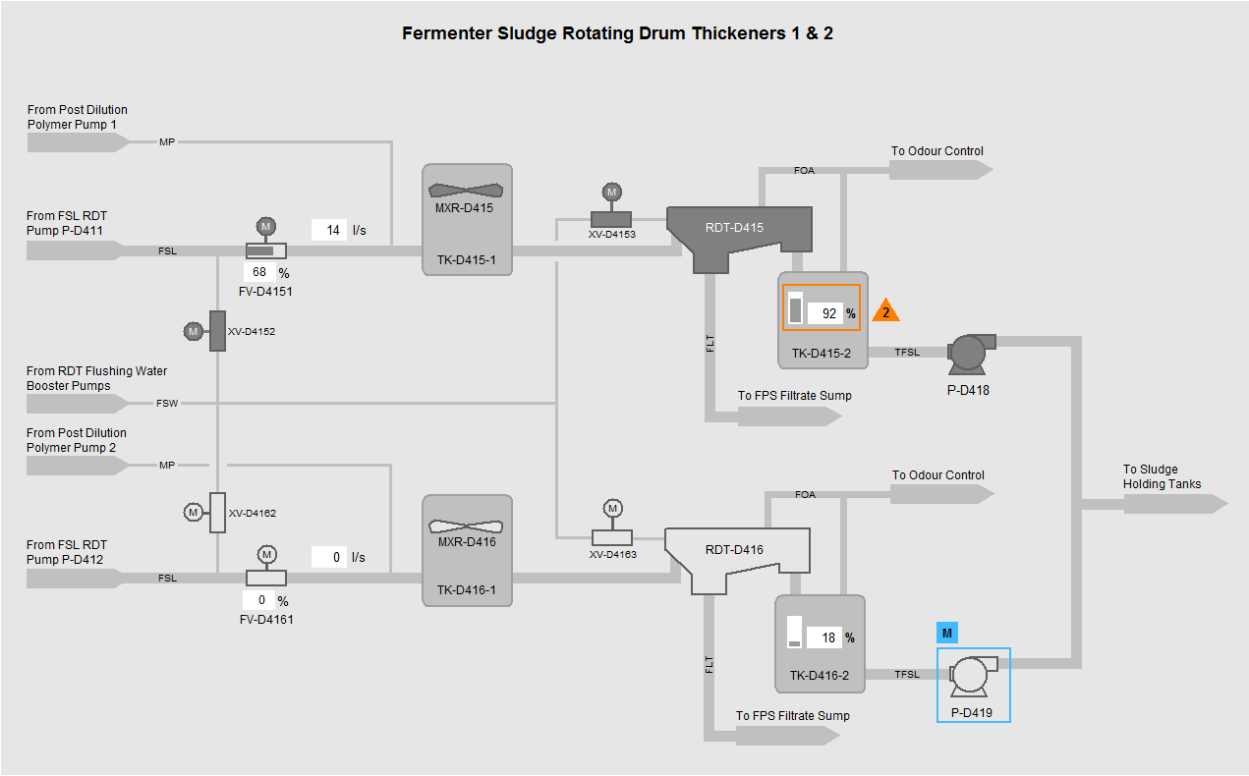


Figure 2-5: Sample Process Mimic Display

Notes:

1. *A high-level alarm in tank TK-D415-2 is shown with a Priority 2 Alarm. An orange rectangle is shown around the level indicator.*
2. *Mixers MXR-D415 and MXR-D416 are shown as running and stopped, respectively.*
3. *Rotating drum thickeners RDT-D415 and RDT-D416 are shown as running and stopped, respectively.*
4. *Pump D-D419 is in Manual mode, therefore a blue rectangle is shown around the equipment.*
5. *The width of the pipes shown is indicative of the pipe size in the field, as per* Table 2-2*.*

2.7.6 Detail Displays

2.7.6.1 General

Detail displays are full-screen displays that contain detailed information and controls for a specific piece of equipment or part of the process.

Detail displays are typically provided for equipment that has many status and control points that cannot fit on an equipment faceplate (popup). As such, equipment detail displays are not usually provided for pieces of equipment that have an equipment faceplate, such as a motor or valve.

Detail displays can be implemented in several ways, depending on the type of information to be displayed. Several types of detail displays are defined below.

2.7.6.2 Equipment Detail Displays

Sophisticated pieces of equipment typically require a dedicated full-screen display to show all the equipment information and HMI controls. While process mimic displays typically only show high-level information, equipment detail displays show most or all of the information associated with the equipment.

The exact equipment shape and inner detail is omitted from process mimic displays but may be shown on equipment detail displays if required. This may help convey instrument locations, etc..

The typical information to present on equipment detail displays includes equipment operating modes, status information, operating statistics, and instrument readings. Pushbuttons, numeric input fields, and sliders are provided to facilitate control and setpoint adjustment. A small process or equipment mimic diagram may be provided as required to assist operators, and may also be used for navigation.

Pushbuttons may be provided to open popup windows that contain additional information and controls that would not fit on the equipment detail display. However, if the information is critical to operators it should be shown on the equipment detail display rather than a popup.

A sample equipment detail display for a UV reactor is shown in Figure 2-6 below.

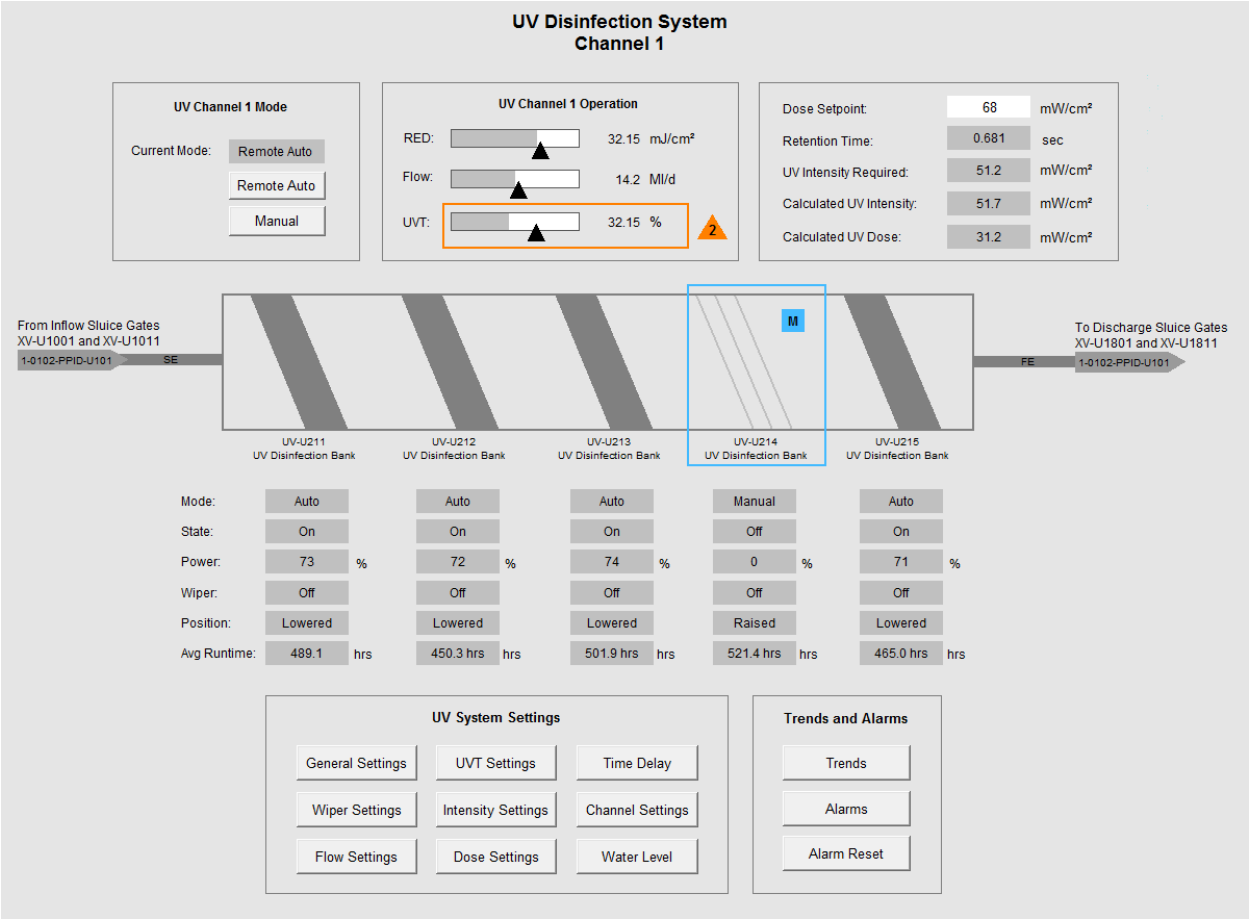


Figure 2-6: Sample Equipment Detail Display – UV Reactor

Notes:

1. *The most important operating modes and status information are provided at the top of the display.*
2. *The equipment is shown with some inner detail to reflect the equipment in the field.*

3. *Pushbuttons are provided at the bottom of the display to open popup windows with additional information and controls.*
4. *A Priority 2 alarm is shown next to the UVT bar graph. The bar graph is also outlined with an orange rectangle.*
5. *UV Disinfection Bank UV-U214 is in manual mode and therefore a blue rectangle is shown around this bank.*

2.7.6.3 Sequencer Detail Displays

Where equipment is controlled via sequencing logic in the PLC system, the details of the sequence shall be provided on a sequencer display. The following is applicable to process displays associated with sequencing logic.

Show all states of the sequence on the left side of the display. Each state is represented with a rectangle containing the state number at the top and a brief description within. The state rectangles shall normally be grey, and turn green when the associated state is active. Arrows are used to illustrate the normal progression through the sequence. Arrows may be shown to illustrate abnormal progression through the sequence (eg. for fault conditions) but may be omitted if there is insufficient room for them.

Clicking on a specific state will show information regarding that state on the right side of the display. Additionally, when the sequencing logic in the PLC transitions from one state to the next, the information area shall be automatically updated to show the information related to the new state.

The information area on the right side of the screen contains a brief description of the state, the actions that will be taken in that state, and the conditions required to progress to the next state(s). In the list of actions, list all actions that are performed by the sequencer, such as starting/stopping of equipment. Note that actions are the commands generated by the sequencer, and are not based on feedback from the field. In the list of conditions to transition to the next state, list all the conditions that are required to progress to the next state, such as seeing that equipment is currently running/stopped, seeing that equipment is running/stopped for a period of time, or waiting for a certain process condition. Provide circular indicator lights beside each action and condition to indicate whether they have been satisfied. The indicator light shall be grey if not satisfied, and green if satisfied. Alarm conditions are shown using a red, orange, or yellow indicator lights, coloured based on the priority of the alarm.

Provide hyperlinks to equipment faceplates inside the information area using blue underlined text. Operators may use these hyperlinks to view equipment faceplates or equipment detail displays to reset equipment-specific alarms, should they occur.

Near the bottom of the information area, indicate the current status of the sequencer, such as “Running”, “Waiting”, “Faulted”. This status information shall be customized for the associated sequencer.

Some sequencers have maximum step timers that generate an alarm if the sequencer becomes stuck. Where maximum step timers are used, show the elapsed time and maximum allowable time for each state in the sequence at the bottom of the information area.

Pushbuttons are provided at the bottom of the display to pause, resume, and reset the operation of the sequence. These buttons may not always be required, and shall be customized for the applicable sequencer.

A sample sequencing display for a high-rate clarifier is shown in Figure 2-7.

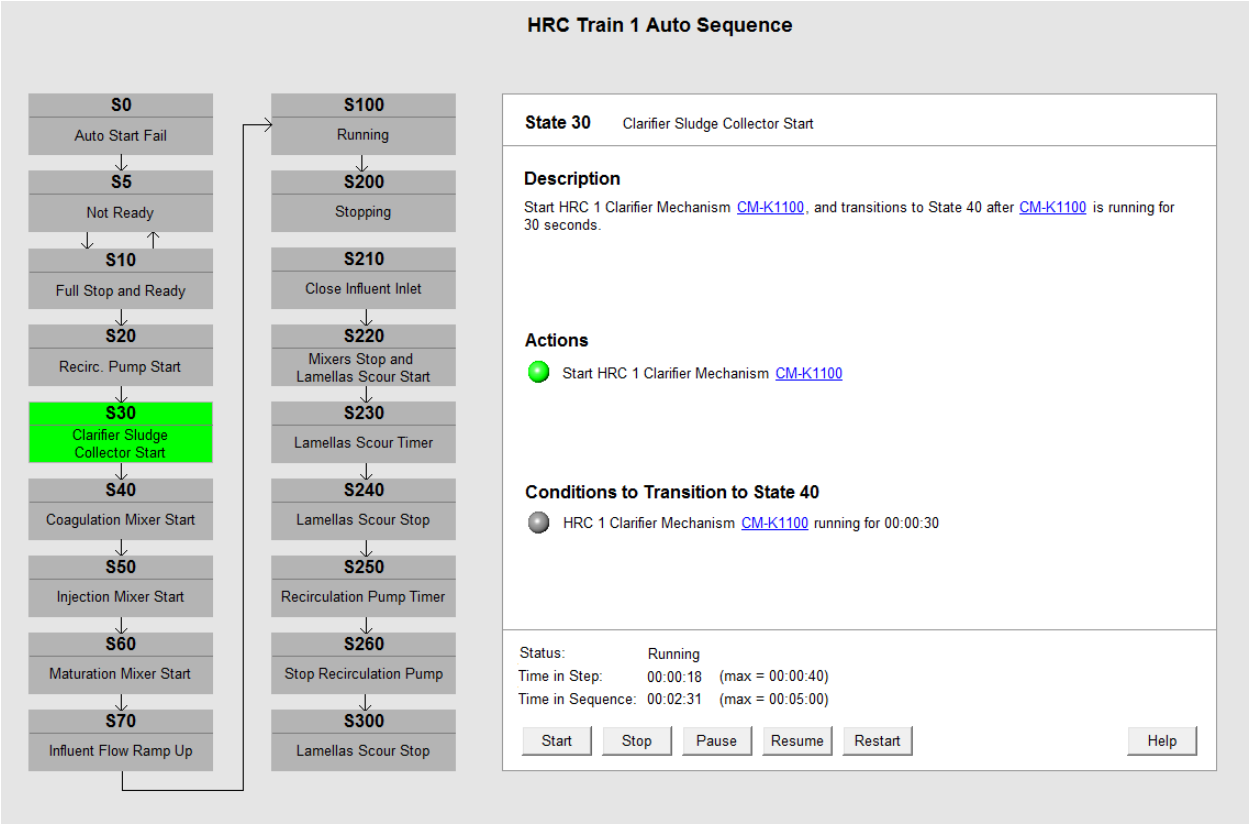


Figure 2-7: Sample Process Detail Display for a Sequencer

Notes:

1. *State 30 is the active state and is shown in green colour.*
2. *Information regarding State 30 is shown on the right side of the screen.*
3. *Hyperlinks to the CM-K1100 equipment faceplate are provided in blue, underlined text.*
4. *In the list of Actions, the HRC 1 clarifier mechanism has been commanded to start, which is represented using a green indicator light.*
5. *If the list of conditions, the sequencer has not seen the clarifier mechanism running for 30 seconds, therefore the indicator light is still grey.*

2.7.6.4 Electrical Single Line Detail Displays

Single line diagrams are provided in the facility HMI system to view the operation of the electrical system. The electrical system should be shown down to the lowest monitored level, which at minimum shall include the 600V buses.

For switchgear that contains power meters or feeder protection relays, provide the voltage and ampere readings from these devices on the detail display. Clicking these will open the associated power meter or protection relay equipment faceplate (popup).

Electrical equipment detail displays are also shown using the “shades of grey” colour scheme. Energized equipment is shown in darker grey, and de-energized equipment is shown in lighter grey. If the state of the equipment is unknown, it is shown in light grey with a question mark. Provide a legend at the top corner for all electrical single line displays.

Refer to Table 2-1 and Table 2-2 for the specific colours and symbology used on electrical single line detail displays.

Avoid showing transformer kVA or MVA ratings, circuit breaker ampere ratings, or fuse ampere ratings as these details are not required for normal operations.

A sample electrical equipment detail display is shown in Figure 2-8 below.

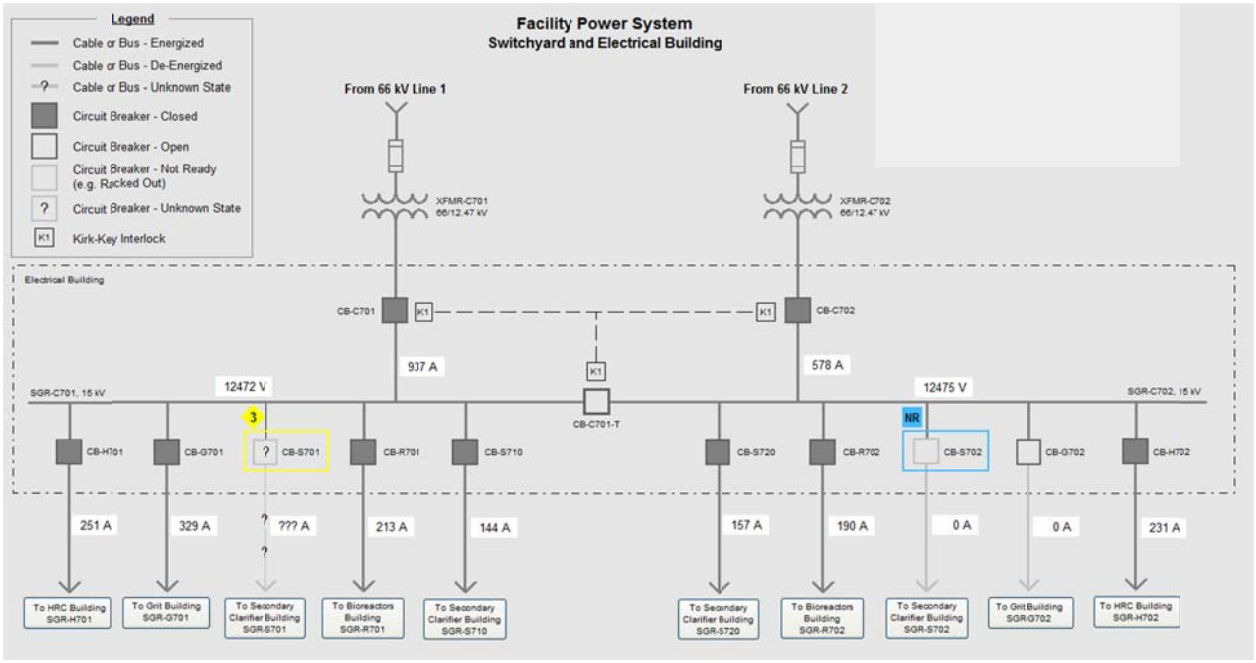


Figure 2-8: Sample Electrical Single Line Detail Display

Notes:

1. *Circuit breaker CB-S701 status is unknown and therefore the breaker and downstream cable are shown in the unknown state.*
2. *Circuit breaker CB-S702 is shown as "Not Ready" (eg. racked out).*
3. *Circuit breakers CB-C701-T and CB-G702 are shown in the open state.*

2.7.7 Equipment Faceplates

Equipment faceplates are provided for individual instruments and equipment such as pumps, fans, and valves to view equipment status and facilitate control. Some control system functions, such as PID controllers, will also require a faceplate for viewing the process value and control value.

Equipment faceplates may be sized as required to accommodate the required status and control objects. If a particular faceplate needs to be larger than approximately 600x800 (WxH) pixels then an equipment detail display, rather than an equipment faceplate, should be used.

If possible, configure equipment faceplates such that they can be pinned or unpinned. When pinned, the equipment faceplate shall not automatically close when the operator navigates to a new full-screen display. However, when un-pinned the faceplates do automatically close when navigating to a new full-screen display. This allows multiple equipment faceplates to be open at a time for simultaneous control and monitoring.

Provide a title at the top of the faceplate containing the equipment identifier and a description of the equipment. Use the *Primary Title* font style for the equipment identifier and the *Secondary Title* font style for the equipment description. Refer to Table 2-2 for standard font styles.

Provide a series of tabbed pages on equipment faceplates for grouping common elements. Refer to Table 2-2 for standard tab icons. The following tabs are typically provided, but may be customized to suit the equipment:

- Home: primary tab for viewing status information and for manual control.
- Details: tab for viewing detailed equipment status information, and for adjusting equipment control setpoints and alarm setpoints.
- Alarms: filtered alarm list, showing only those alarms that are applicable to the equipment.
- Trends: integrated trend viewer for viewing equipment trends.

The specific content on each tabbed page is dependent on the type of equipment the faceplate is associated with, and will be detailed in the equipment class definitions of the project's Functional Requirements Specifications. Typical equipment faceplate content for various types of equipment is provided in Table 2-4.

Table 2-4: Typical Equipment Faceplate Status and Controls Information

Equipment	Tabbed Page	Typical Content
Motors (FVNR)	Home	• Ready indication • Running indication • Interlocked indication • Local/Remote mode indication • Auto/Manual mode indication • Auto/Manual mode pushbuttons • Manual mode Start/Stop pushbuttons • Fault indication • Alarm Reset pushbutton
	Details	• Contactor Delay setting • Start Time Delay after Power On setting • Runtime Totalizer • Elapsed time of current run • Elapsed time since last run • Pushbuttons to reset runtime totalizers

Equipment	Tabbed Page	Typical Content
Motors (VFD)	Home	Typical content for Motors (FVNR) plus: • Motor Speed (feedback) indication • Manual Motor Speed setting
	Details	Typical content for Motors (FVNR)
Pumps	Home	Typical content for Motors (FVNR or VFD) plus: • Low Flow status • Low Seal Water Pressure status
	Details	Typical content for Motors (FVNR or VFD) plus: • Low Flow alarm delay setting • Low Seal Water Pressure alarm delay setting
Valves	Home	• Power Fail Indication • Interlocked indication • Local/Remote mode indication • Auto/Manual mode indication • Auto/Manual mode pushbuttons • Position command (Open / Close, or % Open) • Position indication (Open / Closed, or % Open) • Manual mode Open/Close pushbuttons • Interlocked indication • Fault indication • Alarm Reset pushbutton
	Details	• Feedback delay setting
Instruments	Home	• Process Variable(s) • Alarm / Fault indication • Alarm Reset pushbutton
	Details	• Hi-Hi Alarm setpoint • Hi-Hi Alarm delay setting • Hi Alarm setpoint • Hi Alarm delay setting • Low Alarm setpoint • Low Alarm delay setting • Low-Low Alarm setpoint • Low-Low Alarm delay setting

Equipment	Tabbed Page	Typical Content

Electrical Power Meters	Home	• Voltage
		  o Line-to-line (Vab, Vbc, Vca)
		• Current:
		  o Per Phase (Ia, Ib, Ic)
		  o Demand (average of phases, Ia, Ib, Ic, and date/timestamp of peak demand)
		• Power
		  o Real Power
		  o Reactive Power
		  o Apparent Power
		• Energy
		  o kWh with timestamp since start of accumulated value
		• Power Factor
		  o Per phase
		  o Total
		• Frequency
		• Harmonics
		  o TDD
		  o THD (Ia, Ib, Ic), (Vab, Vbc, Vca)

Power Circuit Breakers	Home	• State (open / closed) (from protection relay)
		• Open / Close Command (if available)
		• Average Line-to-Line Voltage (from protection relay)
		• 3 Phase Currents (from protection relay)
		• Power Factor (from protection relay)
		• Average Reactive Power (from protection relay)
		• Average Apparent Power (from protection relay)
		• On the details page (tab):
		  o Date of last trip / operation,
		  o Cause of trip (first out),
		  o Readings (Current, Voltage, Power) prior to trip.

On the right side of the tab bar, provide links to resources that open in an external popup window or an external application. Links may be provided for, but not limited to, the following:

- Device Webpage: link to open the device webpage in a web browser window.
- Drawings: link to a set of drawings (typically in PDF format) for the equipment.
- Documents: link to an external document associated with the equipment.
- Help: link to help system.

Regarding the device webpage link, some field devices such as the Schneider Electric TeSys T intelligent overload have a built-in device webpage that is accessible through a web browser. The device webpage may be used by operators and maintenance personnel to view detailed information that is not provided on the HMI system.

The Help system link may be provided on equipment faceplates to open a help system for the specific equipment. Help systems are typically implemented with PDF documents and as such the Help link is right-aligned on the toolbar. If the help system is implemented within the HMI system (eg. the information appears within the equipment faceplate, or a different popup) then the Help link in the toolbar should be left-aligned on the toolbar.

Numeric values and strings shall be shown on equipment faceplates using either the *Indicator* or *Input Field* graphic display objects. If the field shows a read-only variable, such as equipment running status, then an *Indicator* shall be used. If the field is read/write, such as the manual speed entry field for a VFD, then an *Input Field* shall be used.

A sample equipment faceplate for a VFD-driven pump is provided in Figure 2-9.

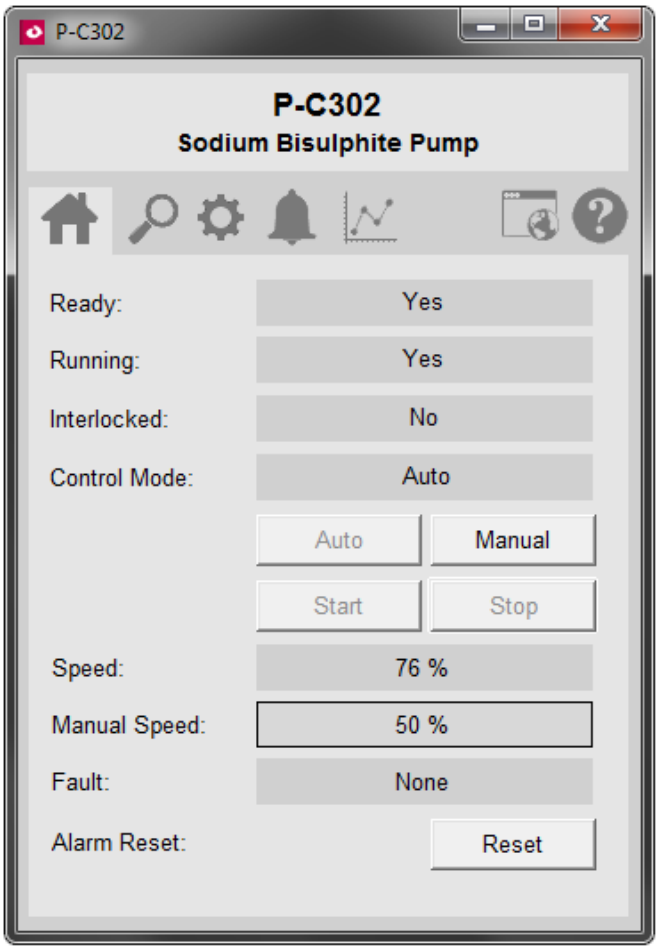


Figure 2-9: Sample VFD Pump Equipment Faceplate

Notes:

1. *The sample shown is for a VFD driven pump. The specific layout and information provided on equipment faceplates is dependent on the equipment.*
2. *The equipment faceplate comprises multiple tab pages of information to group together common information and controls.*
3. *The device webpage and help system icons in the toolbar are on the right-side, implying these will open in a new window.*

A sample PID controller faceplate is provided in Figure 2-10, and shall be used as the basis for PID controller faceplates.

The PID controller faceplate is organized in a specific manner, as follows:

1. The units of measure of the process variable are indicated in the top left corner.
2. The process variable (PV) is indicated in the centre with a vertical bar graph.
3. The shaded grey areas left of the PV bar graph represent alarm limits of the process variable.
4. The numeric display to the left of the PV bar graph represents the current process value.
5. The arrow and numeric indicator to the right of the PV bar graph represent the setpoint (SP).
6. The control variable (CV) output is indicated using a horizontal bar graph.

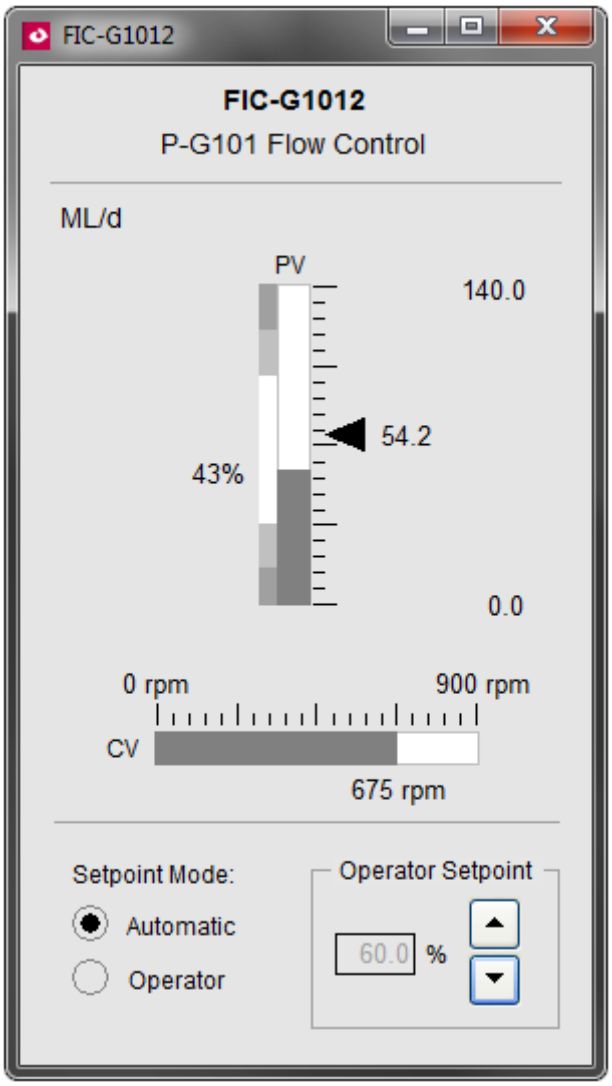


Figure 2-10: Sample PID Controller Equipment Faceplate

2.7.8 Trend Displays

Trend displays are provided for operators to view real-time and historical signals associated with an instrument or equipment. Trend displays may also be used to view setpoints, control limits, and alarm limits.

Trend displays are full screen displays and typically contain a single trend viewer object. For facility HMI systems that use Schneider Electric Vijeo Citect, the trend viewer object shall be the Process Analyst object. Historical data shall be read from the facility historian system.

Set the background colour of the trend object to *Grey 154*. Use red, orange, and yellow coloured pens to represent alarm limits and white pens to represent control limits. Colours other than these shall be used for the process signals.

The trend object shall show the engineering units of measure on the vertical axis, and time on the horizontal axis. It is generally preferred to use automatic scaling of the vertical axis, but fixed values may be specified if appropriate. The horizontal time axis should be scaled appropriately for the given signals. For example, if the trend is used to view daily flows, the range of the time axis should be set to 24 hours.

2.7.9 Alarm Summary Displays

Alarm summary displays are full-screen displays that show a listing of all active and historical alarms for the facility or a process area.

For facility HMI systems, clicking the three-line alarm summary in the header display takes the operator to an unfiltered alarm summary, showing all alarms at the facility. Clicking on a process area in the header's table of alarms takes the operator to a filtered alarm summary showing only the alarms for the selected process area.

Alarms shall be sorted by alarm occurrence with the most recent alarms appearing at the top.

Each alarm shall be colour coded as per the assigned priority; red for Priority 1, orange for Priority 2, and yellow for Priority 3 alarms. Unacknowledged alarms are shown using blinking text, and acknowledged alarms are shown using solid (non-blinking) text.

For each alarm, indicate the date and time of alarm occurrence, and the date and time of alarm acknowledgement.

For facility HMI systems using Schneider Electric Vijeo Citect, provide the ability to right-click on an alarm to view additional information on the alarm, disable the alarm, and acknowledge the alarm.

Provide pushbuttons on the display to acknowledge alarms as follows:

- ACK – Acknowledge the selected alarm.
- ACK AREA – Acknowledge all unacknowledged alarms for the current process area (applicable only to filtered alarm summary displays for a specific process area).
- ACK PAGE – Acknowledge all unacknowledged alarms on the current alarm page.
- ACK ALL – Acknowledge all unacknowledged alarms.

Provide a means for operators to filter alarms by one or more user-defined text filters, including an ability for operators to filter or display disabled alarms.

2.8 Organization

Organize graphic displays in a hierarchical manner that allows operators to drill down for further information on a process area and/or equipment of interest. The display hierarchy shall mimic the facility equipment hierarchy.

Four display levels are defined within the display hierarchy, as follows:

- Level 1 displays are for facility overview displays such as the Facility Process Overview, Facility Process Flow Diagram, the Facility Security Overview, and help system.
- Level 2 displays are for process area overview displays.
- Level 3 displays are for process mimic displays.
- Level 4 displays are for equipment detail displays.

While distinct levels are defined within the display hierarchy, it is not required to follow a strict drill-down approach to display navigation. Shortcuts may be provided to jump from any level to any other level if it is practical for the operator.

In most cases there will be a one-to-one relationship between the Level 3 and Level 4 displays but there may be cases where a one-to-one relationship does not exist.

A typical facility HMI application would have a display hierarchy like that shown in Figure 2-11.

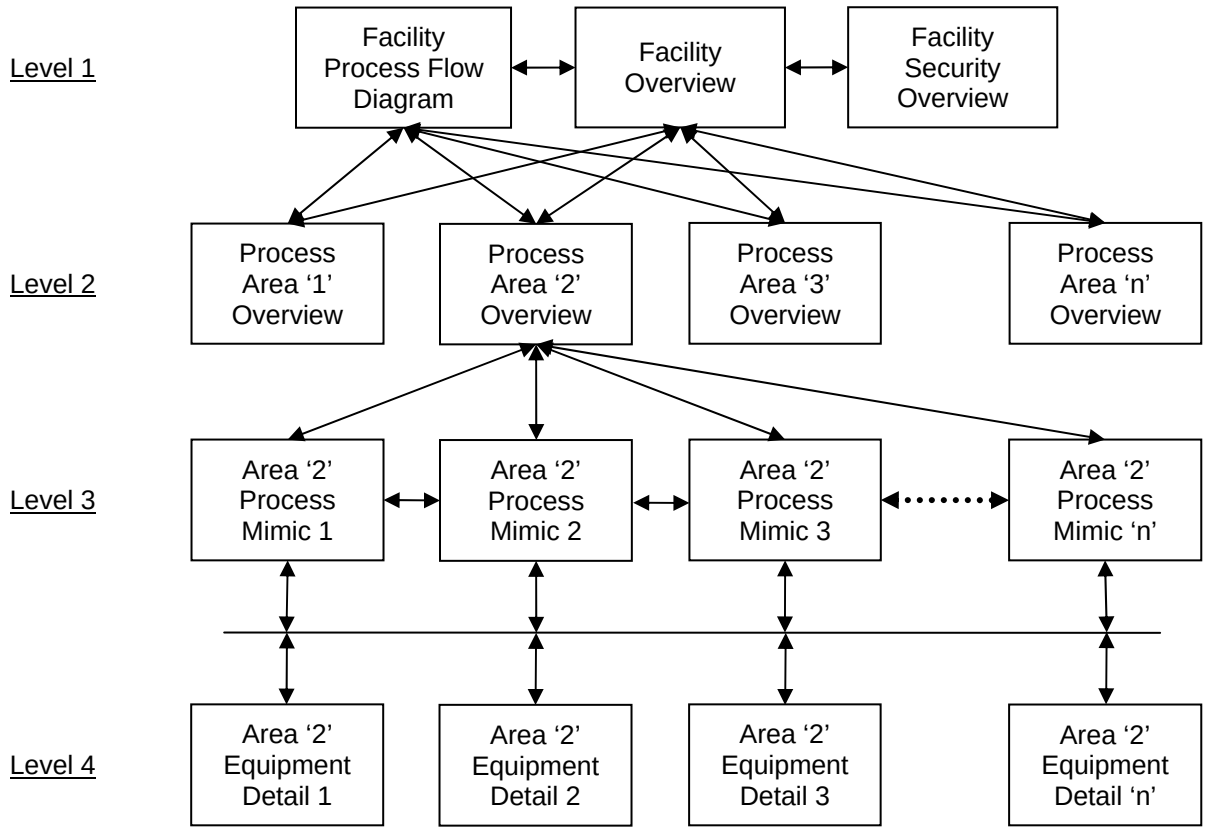


Figure 2-11: Typical Facility HMI Application Display Hierarchy

Notes regarding Figure 2-11*:*

1. *The Level 3 and Level 4 displays shown are associated with Process Area '2' only. A similar arrangement would exist for the other process areas.*
2. *Links between the Level 3 displays (process mimics) are typically provided using process and signal line continuation symbols.*

3. *A mesh is shown to represent the relationship between process mimics at Level 3 and the equipment detail displays at Level 4. The specific relationship is dependent on the equipment and the implementation of the displays.*
4. *Shortcuts between displays are omitted for clarity. For example, it may be possible to link from a Level 2 process area overview to a Level 4 process detail display if such a shortcut was provided.*

3 ALARMING SYSTEM

3.1 Alarm Presentation Philosophy

For facility HMI systems, new alarms are presented in the three-line alarm banner within the header display. Unacknowledged alarms are to appear blinking in order to get the attention of the operator, and acknowledged alarms are shown using non-blinking text.

For touchscreen HMIs used for local equipment control based on the Schneider Electric Magelis HMI, new alarms shall appear in a scrolling marquee across the top of the screen, which is the default method for display alarms on the Magelis HMI terminal.

An alarm summary screen shall also be provided which lists the active and historical alarms.

Alarms associated with equipment shall be shown on the overview displays, process mimics, and equipment detail displays as per Section 2.6 for both facility HMIs and touchscreen HMIs for local equipment control.

3.2 Alarm Priorities

Three priority levels of alarms are defined within the HMI alarming system:

- Priority 1 – High Priority / Emergency. The alarm indicates a condition that required manual or automatic functions to avoid unacceptable operating conditions or product. Also, indicates a callout when unmanned. See Section 3.3 for further information on Alarm Callouts.
- Priority 2 – Medium Priority. The alarm indicates a condition that requires manual or automatic functions to avoid unacceptable operating conditions or product. The alarm requires attention, but on its own, does not require a callout when unmanned.
- Priority 3 – Low Priority. The alarm indicates a condition that may result in off-quality product or may lead to more severe consequences.
- Priority 4 – Abnormal Condition. This priority indicates an abnormal condition that does not require immediate attention. In general, Local, Manual, or Not Remote mode alarms will be in this category.

Alarm priority levels for new alarms are to be specified in the project's Functional Requirements Specification (FRS).

3.3 Alarm Callouts

SEWPCC and WEWPCC are not manned 24 hours per day. When a Priority 1 alarm occurs at SEWPCC or WEWPCC, the alarm shall be forwarded to NEWPCC to notify the operators.

Until such time that NEWPCC is upgraded with a PLC-based control system, a temporary alarming gathering system is required at NEWPCC for collection of PLC-based alarms from SEWPCC and WEWPCC.

4 MISCELLANEOUS

4.1 Help System

A help system shall be provided for each HMI system that include the following:

1. A symbol legend for equipment, alarm icons, and abnormal state icons,
2. Display navigation procedures,
3. User login/logout procedures,
4. User security information, and
5. Operating procedures for complex equipment as required.

4.2 Commands Originating from the HMI

Commands that originate from the HMI shall utilize the SET action, rather than the Momentary ON action. The PLC shall reset the bit after it is utilized in the program. This prevents discrete PLC tags from being stuck on in the event of communication failures, timing issues, or control from multiple HMI nodes.

4.3 HMI Security

HMI systems shall incorporate security to prevent unauthorized setpoint changes and to prevent unauthorized control of equipment. All graphic display objects that can change a tag value in a PLC shall incorporate user security. Typical examples of such display objects include pushbuttons for starting/stopping equipment and numeric input fields for setpoint adjustment.

Where a graphic display object is secured and the current user does not have the required access privileges, show the *Lock* icon inside the field to represent the fact that the field is currently locked.

Three levels of security are to be implemented as per Table 4-1, below.

Table 4-1: HMI User Security Levels

Security Level	User Job Function	Typical Capabilities	Typical Restrictions
High (H)	Senior Operator	• Viewing HMI • Automatic mode control limit and control setpoint adjustment • Manual equipment control • Alarm acknowledgement • Alarm limit adjustment • Enabling and disabling alarms • Viewing reports, trends, and alarms	• None
Low (L)	Operator	• Viewing HMI • Manual equipment control • Alarm acknowledgement • Viewing reports, trends, and alarms	• Automatic mode control limit and control setpoint adjustment • Alarm limit adjustment • Enabling and disabling alarms
None (N)	N/A	• Viewing HMI in read-only mode	• Manual equipment control • Equipment setpoint adjustment • Alarm acknowledgement • Alarm setpoint adjustment

Notes:

1. *The capabilities and restrictions indicated above are typical. The functional requirements specification for each project may have different user security requirements.*