Implementing Logic Using the OrionLX
Use Cases for Logic at the RTU vs. Master or IED

John L. Powell, PE
Engineer II
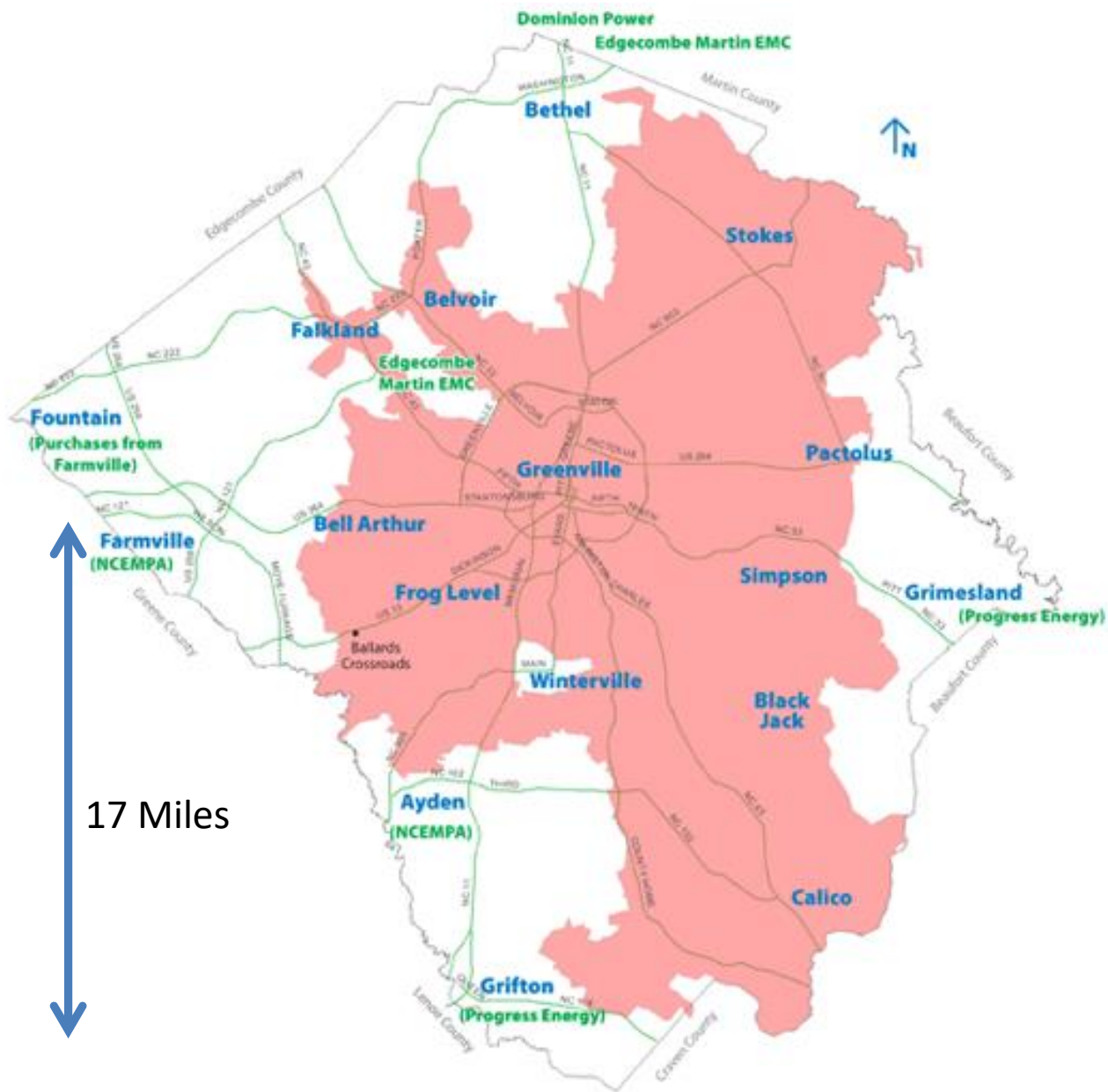Substations and Controls
Greenville Utilities Commission

Introduction

- John L. Powell, P.E.
- Substation & Controls, Engineer II
- Greenville Utilities Commission

- 252-551-3388
- powelljl@guc.com

- Responsible for SCADA Integrations with other systems and special projects

- 18 Years of Electric Utility Experience
- Prior Experience with Industrial Controls at Procter and Gamble

Greenville Utilities Commission Electric Department

- Serves City of Greenville and about 75% of Pitt County

- Pitt County is about 650 square miles

- Second Largest Municipal Electric Utility in NC

- 66,252 Customer Connections

- 77 miles of 115kV and 34.5kV lines

- 1195 miles of overhead 12kV lines

- 1629 miles of underground 12kV lines

- 22 substations

- 85 miles of fiber optic cable

- Purchase power as a member of NCEMPA

  (North Carolina Eastern Municipal Power Agency)

- Founded in 1905

- www.guc.com

17 Miles

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Substation and Controls Group

- Divided into two groups...Engineering and Operations
  - 16 Operations and 5 Engineering Personnel

- 22 Substations
  - 3 230/115Kv Point of Delivery Transmission Stations (6000MVA of capacity)
  - 2 115/34Kv Sub-Transmission Substations (50MVA of capacity co-located with distribution stations)
  - 17 115/12Kv Distribution Substations (535MVA of capacity)
  - 2 34/12Kv Distribution Substations (25MVA of capacity)

- Survalent SCADA system

- IED's
  - SEL
  - ABB
  - Cooper
  - Beckwith
  - Qualitrol

- IED's
  - C&D
  - SBS
  - FCI
  - Puleo
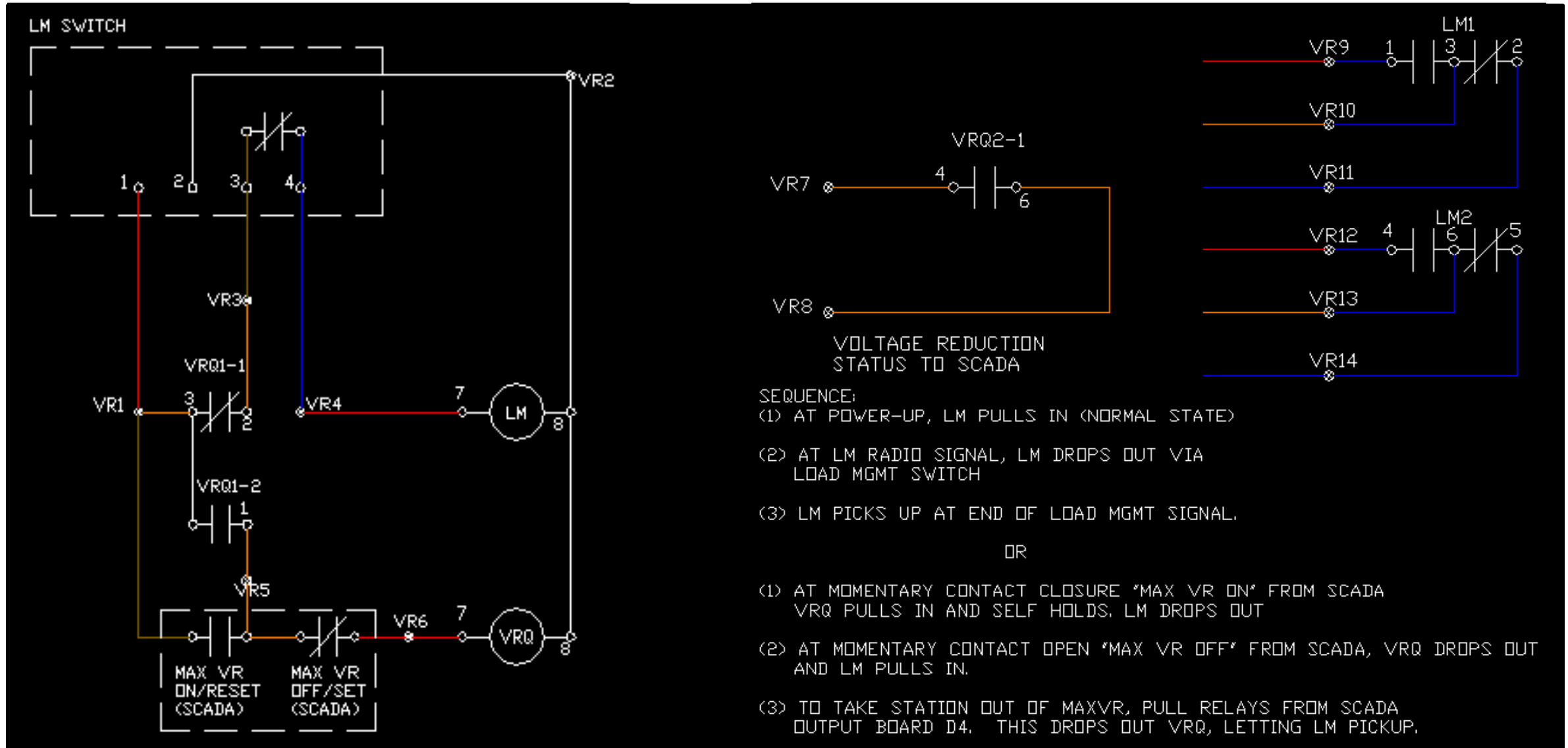 - Kelman/GE

History with NovaTech

- Introduced to the product at NC Association of Municipal Electric Systems conference in 2006
  - Impressed with the ease of use of NCD software
  - Impressed with the integration with SEL products

- First install was a successful pilot in 2007
  - Hardwired, but populated with communications cards for future station upgrade

- Over the years, we have used the following
  - Orion5R
  - Orion5
  - OrionLX
  - OrionLXm
  - Orion DDIO
  - Orion DCIO

Use Case #1 - LTC and Regulator Control

NovaTech NC/SC Users' Group Meeting
September 13, 2018

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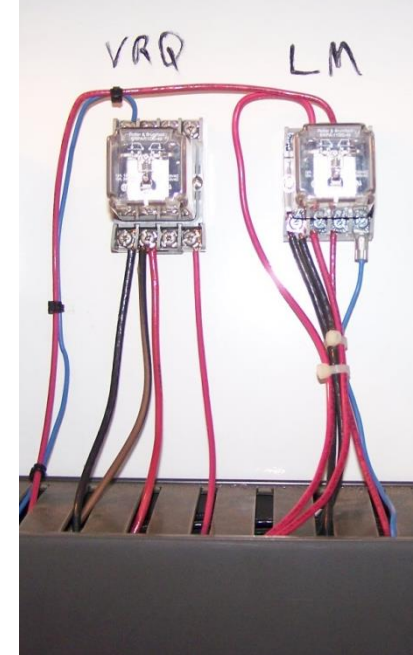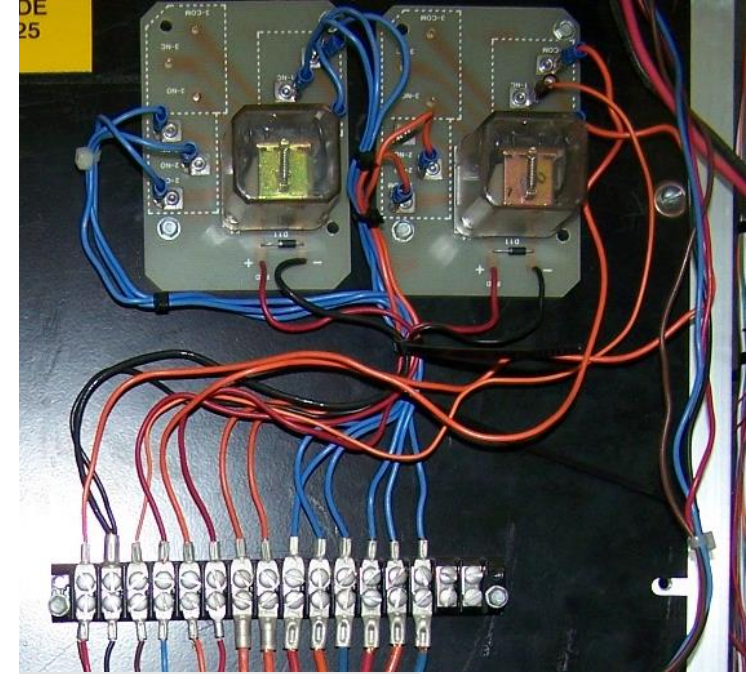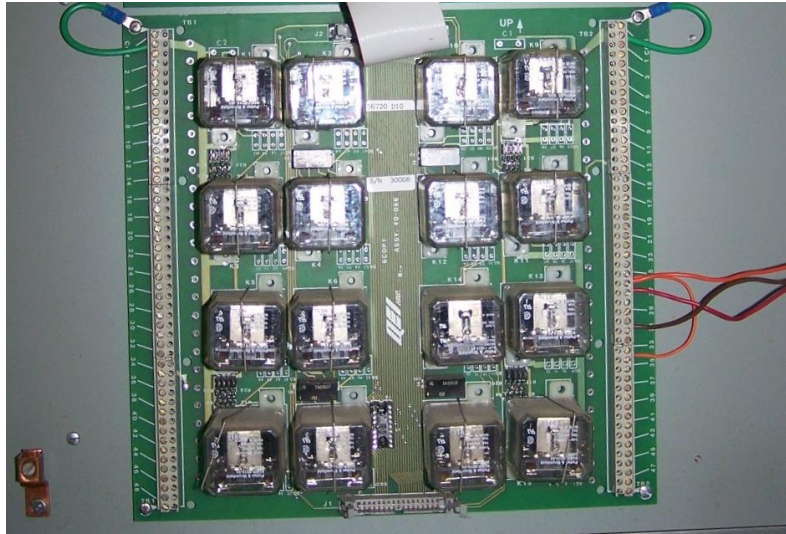
Use Case #1 - LTC and Regulator Control

Using Orion "Math and Logic" or "Advanced Math and Logic"

These are "text-based" logic editors

Terms and Concepts
- Inputs
- Outputs
- Logic Inputs
- Logic Outputs
- Events

Commonly Used Instructions
- "Dim"
- GetPoint
- If, Then, Else, Or
- SetPoint

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Use Case #1 - LTC and Regulator Control

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Use Case #1 - LTC and Regulator Control

```
Logic
Sub VoltageReduction_Timer()
    Dim RegencySwitchIn  'Normal is High-Low is in MAXVR
    RegencySwitchIn = GetPoint("Input02- Load Mangement Switch @Onboard I/O")  'Regency switch input
    Dim MaxVR_Scada_Control
    MaxVR_Scada_Control = GetPoint("MaxVR Control @Logic")  'Scada MaxVR control point
    Dim CommFail_LTC2
    CommFail_LTC2 = GetPoint("Comm Fail @LTC 2")  'test for online
    Dim CommFail_VR1A
    CommFail_VR1A = GetPoint("Comm Fail @VR1A")  '1=offline--DONT SEND COMMAND
    Dim CommFail_VR1B
    CommFail_VR1B = GetPoint("Comm Fail @VR1B")  '1=offline--DONT SEND COMMAND
    Dim CommFail_VR1C
    CommFail_VR1C = GetPoint("Comm Fail @VR1C")  '1=offline--DONT SEND COMMAND
    Dim VR_LTC2_Status
    VR_LTC2_Status = GetPoint("Voltage Reduction @LTC 2")'feedback from LTC
    Dim VR_VR1A_Status
    VR_VR1A_Status = GetPoint("Voltage Reduction @VR1A")'Feedback from 1a
    Dim VR_VR1B_Status
    VR_VR1B_Status = GetPoint("Voltage Reduction @VR1B")'Feedback from 1b
    Dim VR_VR1C_Status
    VR_VR1C_Status = GetPoint("Voltage Reduction @VR1C")'Feedback from 1c
    Dim Any_Reg_CommFail
    Any_Reg_CommFail = CommFail_VR1A Or CommFail_VR1B Or CommFail_VR1C 'If any regulator is offline, dont send command to other 2
    Dim MaxVR_Control
    MaxVR_Control = MaxVR_Scada_Control Or RegencySwitchIn
    If CommFail_LTC2 = 0 And MaxVR_Control <> VR_LTC2_Status Then       'Check for good comms @ LTC2 and Control needs to be sent
        SetPoint("Volt Red  Step #1 En - 1 @LTC 2", MaxVR_Control, 1)
    End If
    If Any_Reg_CommFail = 0 And MaxVR_Control <> VR_VR1A_Status Then    'Check for good comms @ ALL Regs and Control needs to be sent
        SetPoint("Volt Red  Step #1 En - 1 @VR1A", MaxVR_Control, 1)
    End If
    If Any_Reg_CommFail = 0 And MaxVR_Control <> VR_VR1B_Status Then    'Check for good comms @ ALL Regs and Control needs to be sent
        SetPoint("Volt Red  Step #1 En - 1 @VR1B", MaxVR_Control, 1)
    End If
    If Any_Reg_CommFail = 0 And MaxVR_Control <> VR_VR1C_Status Then    'Check for good comms @ ALL Regs and Control needs to be sent
        SetPoint("Volt Red  Step #1 En - 1 @VR1C", MaxVR_Control, 1)
    End If
```

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Use Case #1 - LTC and Regulator Control

- PROS
  - Better reliability
  - Desktop troubleshooting
  - Wiring was simplified
  - Repeatable
  - Cleaner install / less rack space used
  - Safeguards – no mismatched voltages

- Rational
  - RTU was a Central Component, already communicating with all of the IED's that needed control and the SCADA Master
  - Allowed us to put in some safeguards
    - Regulators don't get a control signal unless all 3 are communicating
    - Prevents Regulators putting only 1 or 2 into Voltage Reduction
  - Allowed us to save rack space by removing hardwired relays
  - Allowed us to keep all of the SCADA Master programming the same (retrofit)

- CONS
  - Techs can't troubleshoot with a meter, must use a laptop
  - Techs don't have a good feel for the logic
  - Can't use a "jumper" to enable voltage reduction

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Use Case #2 -- Transfer Trip to Solar Farm

CYPRESS CREEK
RENEWABLES

Flemming Solar Center

1772 Flemming School Road, Greenville, NC 27834

CONTACT
(888) 316-6856

DEVELOPED BY
CYPRESS CREEK RENEWABLES, LLC

OWNED BY
FLEMMING SOLAR CENTER, LLC

SYSTEM SIZE
6.49 MW DC
5.00 MW AC

OPERATED BY
CYPRESS CREEK O&M

CYPRESS CREEK
RENEWABLES

Rams Horn Solar Center

1229 Rams Horn Road, Greenville, NC 27834

CONTACT
(888) 316-6856

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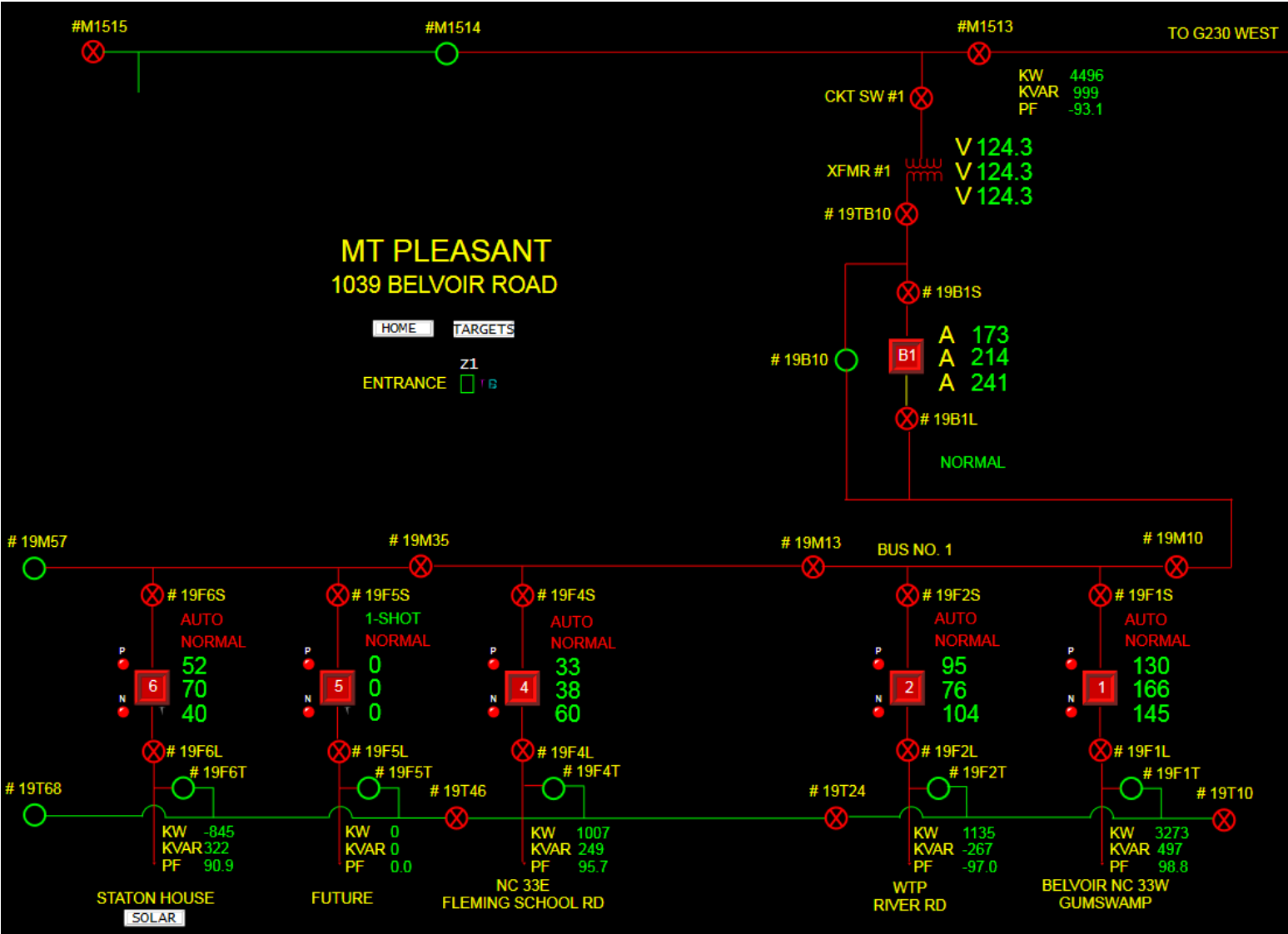
Use Case #2 -- Transfer Trip to Solar Farm

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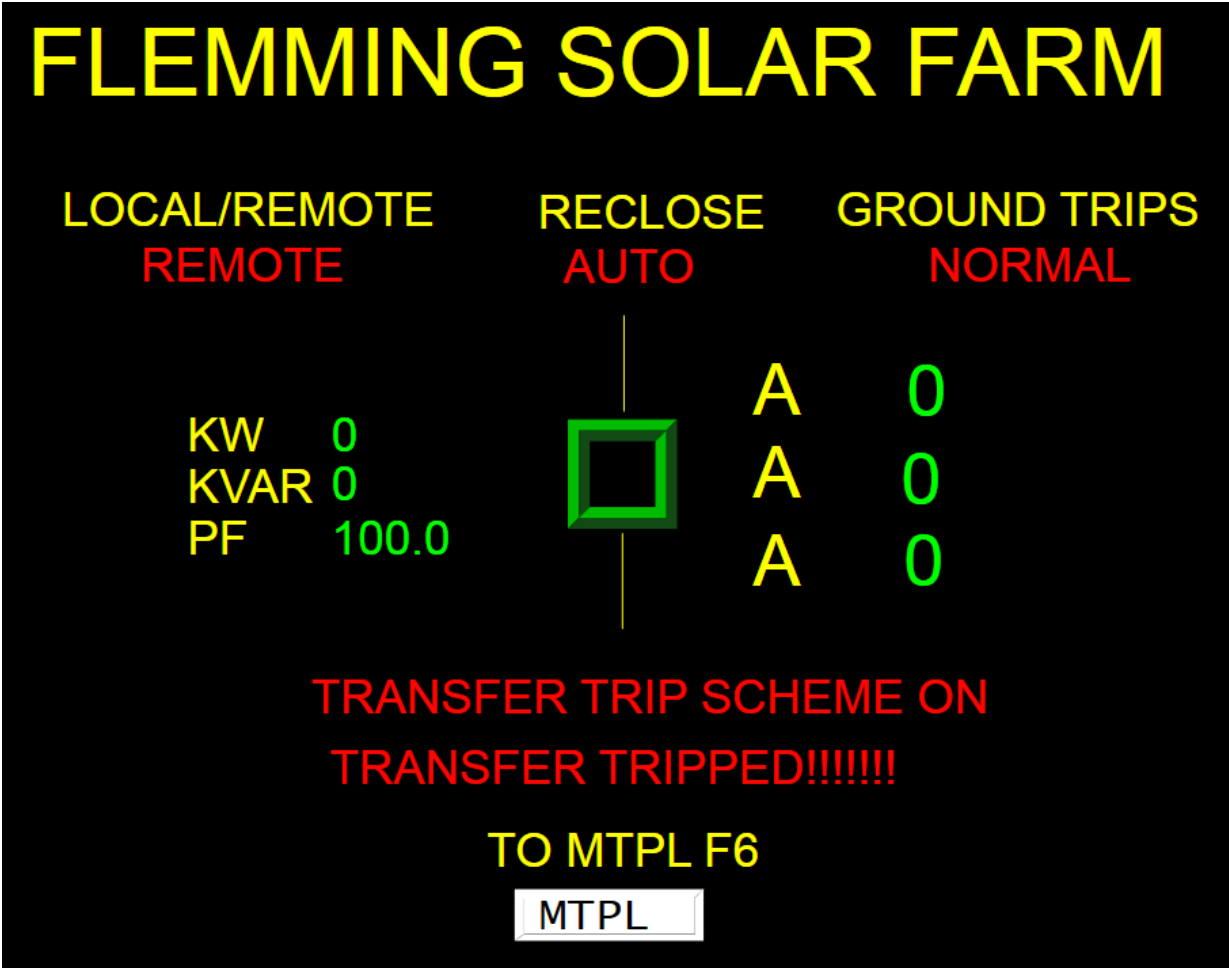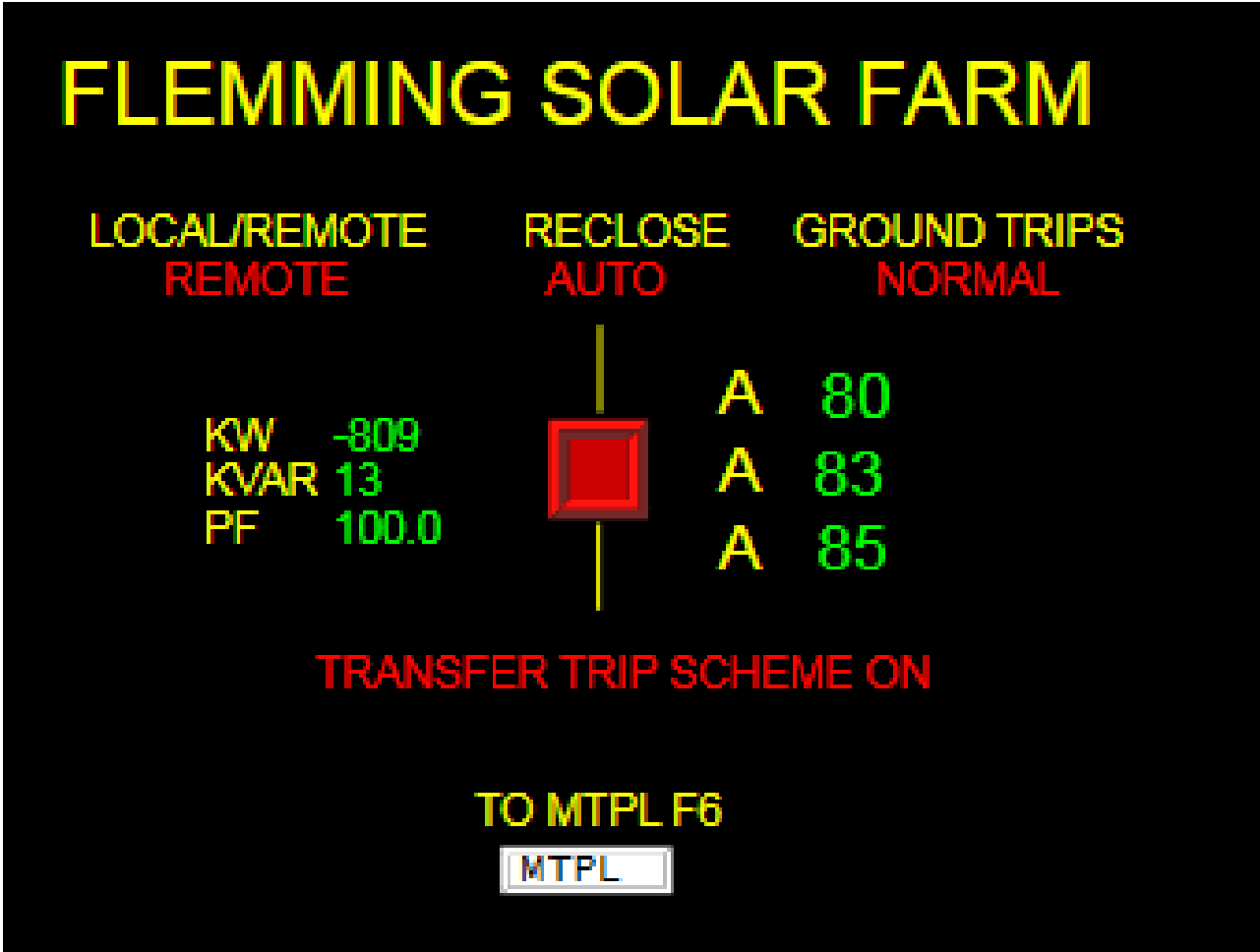
Use Case #2 -- Transfer Trip to Solar Farm

- Option 1 – Logic at the Master
  - Master polls RTU for Feeder Breaker and Bus Breaker Status and Scheme Permissives
  - Master polls Recloser at Solar Farm and sends Trip signals when necessary
  - Pros
    - Repeatable
    - Fast rollout for new Solar Farms
  - Cons
    - Dependent on timing of Master to Substation and Master to Recloser poll times
    - Dependent on two radio links
    - Adds additional points of failure

- Option 2 – Logic in SEL relay
  - SEL Relay communicates with upstream Bus Breaker and Downstream Solar Farm Recloser via Mirrored Bits
  - Pros
    - Speed of signaling
  - Cons
    - Only works with SEL not ABB DPU's

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Use Case #2 -- Transfer Trip to Solar Farm

- Option 3 – Logic in NovaTech RTU
  - NovaTech communicates with all devices: SCADA Master, Bus Breaker, Feeder Breaker, and Solar Farm Recloser
  - Pros
    - Repeatable
    - Works at all locations
    - Only dependent on one radio link
  - Cons
    - Techs not familiar with scripting language for logic

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File   Edit   Configure   Communications   Window   Help

Port Options: Delete Port   Close Port

Commands | Events | Inputs | Outputs | Logic Inputs | Logic Outputs

Sub List (Save Logic to Update)
```
DefaultStart
VoltageReduction_Timer
TransferTrip_Timer
TransferTripOUTPUT_Timer
TransferTripRESET_Timer
```

Event List
```
DefaultStart
VoltageReduction
TransferTrip
TransferTripOUTPUT
TransferTripRESET
```

Event Name: TransferTrip
Event Type: Timer
Timer Interval: 1000
Timer Enabled: True

Accept   Cancel   New   Delete

Show Code

Logic   Line: 70

```vb
Sub TransferTrip_Timer()      'routine to determine whether to send transfer trip to solar farm
    Dim TT_Initiate           'Set high if BBKR or FBKR is locked out
    Dim TT_Delay              'Set high if Initiate is high, comms ok and Transfer trip is enabled at all devices
    Dim F6_Comm_OK
    Dim B1_Comm_OK
    Dim SF_Comm_OK
    Dim All_Comm_OK           'aggregates comms to 1 point
    Dim All_TT_Enabled        'aggregates Enabled switches to 1 point
    F6_Comm_OK = Abs(1 - GetPoint("Comm Fail @Feeder Breaker 6"))
    B1_Comm_OK = Abs(1 - GetPoint("Comm Fail @Bus Breaker 1"))
    SF_Comm_OK = Abs(1 - GetPoint("Comm Fail @Solar Farm"))
    All_Comm_OK = F6_Comm_OK And B1_Comm_OK And SF_Comm_OK      'are all comms OK?
    'check for transfer trip enabled on all devices
    All_TT_Enabled = All_Comm_OK And GetPoint("FMD_IN202 @Feeder Breaker 6") And GetPoint("FMD_IN202 @Bus Breaker 1") And GetPoint("TT_Enable_RTU @Logic")
    SetPoint("All_TT_Enable @Logic",All_TT_Enabled)
    'Initiate Transfer Trip if BBKR is open or FBKR is locked out
    TT_Initiate = GetPoint("FMD_SV10 @Bus Breaker 1") Or GetPoint("FMD_79LO @Feeder Breaker 6")
    TT_Delay = TT_Initiate And All_TT_Enabled 'check for all conditions to move to delay sequence
    If (TT_Delay = 1) Then
        EnableTimer("TransferTripOutput")
        DisableTimer("TransferTripRESET")
        'Print("TT_Timer TRIP Output Started")
    Else
        DisableTimer ("TransferTripOUTPUT")
        EnableTimer("TransferTripRESET")
        'Print("TT_Timer RESET Started")
    End If

End Sub
```

Hide ToolBox   Check Syntax   Accept Logic   Cancel

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Use Case #2 -- Transfer Trip to Solar Farm

Use Case #2 -- Transfer Trip to Solar Farm
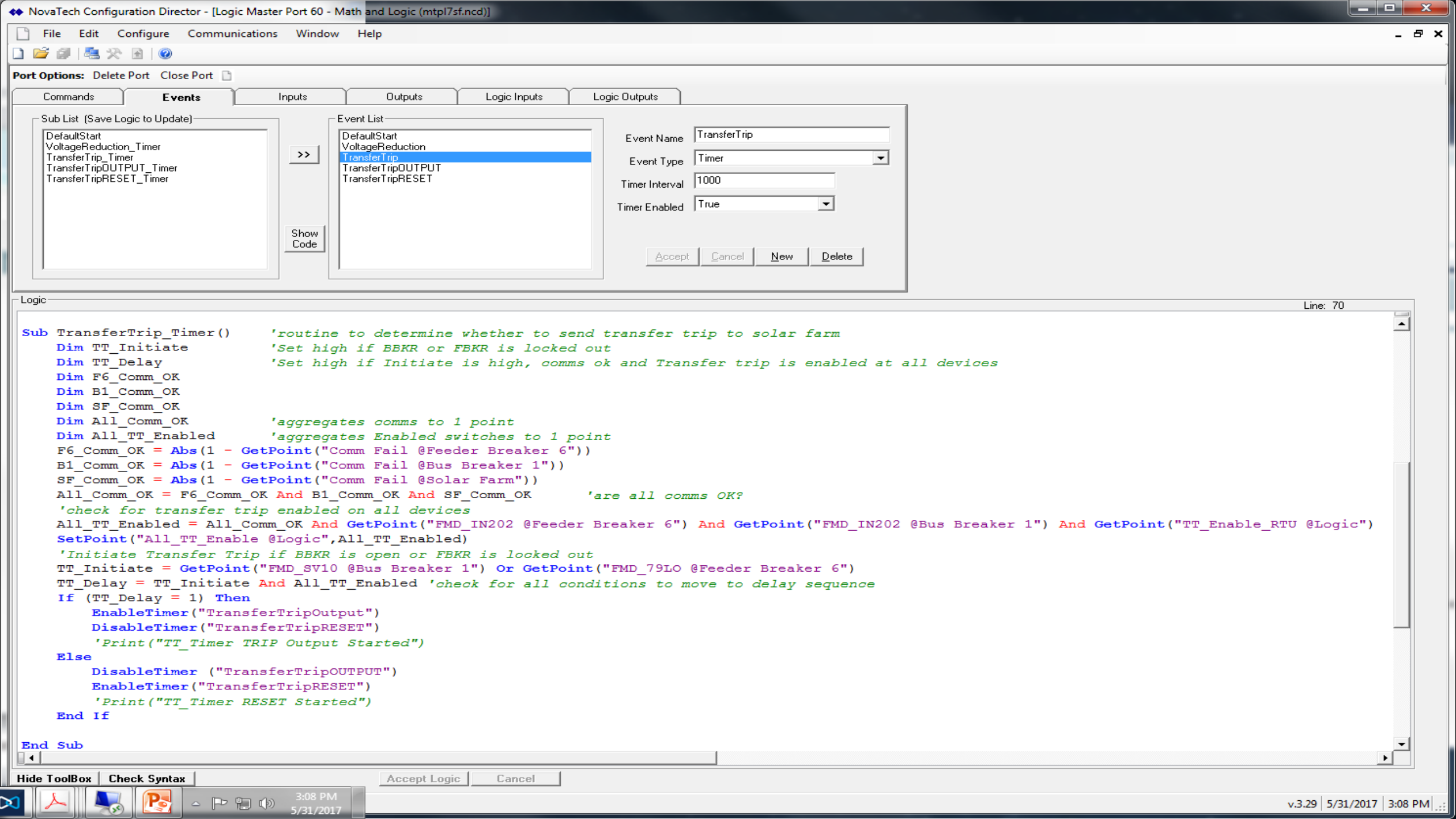
Use Case #2 -- Transfer Trip to Solar Farm

(* Solar Farm Transfer Trip Scheme --- Scheme to send a trip to the solar farm if Bus Breaker is open or Feeder Breaker is Locked Out for 45 seconds. *)

(* 5 second delay for reset on the transfer trip signal. *)

(* Rung 1 - Test for good communications to set All_Comm_Ok bit. *)

R1 FeederBreaker5_CommFail.VALUE BusBreaker1_CommFail.VALUE SolarFarm_CommFail.VALUE All_Comm_Ok

(* Rung 2 - 3 - Scheme is enabled by switches at each breaker, and point controlled by scada master. *)

(* Each switch can only enable or disable the scheme if it is online and communicating properly. *)

(* Rung 4 - SCHEME_ENABLED bit is a RETAINED variable and is non-volitale. *)

(* IEC_TT_Scheme _Enabled is the point used to send the status back to the SCADA Master *)

R2 IEC_TT_ENABLE_RTU.VALUE IEC_TT_ENABLE_RTU.ONLINE BusBreaker1_FMD_IN202.VALUE BusBreaker1_FMD_IN202.ONLINE FeederBreaker5_FMD_IN202.VALUE FeederBreaker5_FMD_IN202.ONLINE SCHEME_ENABLED (S)

R3 IEC_TT_ENABLE_RTU.VALUE IEC_TT_ENABLE_RTU.ONLINE SCHEME_ENABLED (R)
    BusBreaker1_FMD_IN202.VALUE BusBreaker1_FMD_IN202.ONLINE
    FeederBreaker5_FMD_IN202.VALUE FeederBreaker5_FMD_IN202.ONLINE

R4 SCHEME_ENABLED IEC_TT_Scheme_Enabled.VALUE

R5 IEC_TT_Scheme_Enabled.ONLINE

(* Rung 5 - Initiat Transfer trip when Bus Breaker is open (sv10) or when Feeder Breaker is Locked out (79LO). *)

R6 BusBreaker1_FMD_SV10.VALUE TT_INITIATE
    FeederBreaker5_FMD_79LO.VALUE

(* Rung 6 - Set TT_Delay bit when all comms are good, scheme is enabled and trip is initiated from feeder or bus breaker. *)

R7 TT_INITIATE All_Comm_Ok SCHEME_ENABLED TT_DELAY

Use Case #2 -- Transfer Trip to Solar Farm

(* Rung 7- TT_Delay bit drives 45 second delay timer. Timer sets TT_Output latching bit when done. Timer cant start unless TT_Output is unlatched or reset. *)

R8   TT_DELAY   ─┤ ├─   TT_OUTPUT   ─┤/├─

```
            TRANSFER_TRIP_TIMER
      IN            TON            Q
                   ___
      C45─PT       _| |_          ET─TRANSFER_TRIP_TIMER_COUNTER
```

TT_OUTPUT (S)

(* Rung 8 - Reset timer is enabled when logic is no longer calling for a tranfer trip, (TT_Delay is low). *)

(* Timer can only start if the logic was calling for a trip (TT_Output latch) and then needs a reset. *)

(* Reset time set at 5 seconds before latch bit TT_Output is unlatched. *)

R9   TT_DELAY   ─┤/├─   TT_OUTPUT   ─┤ ├─

```
            TRANSFER_RESET_TIMER
      IN            TON            Q
                   ___
      C5─PT        _| |_          ET─TRANSFER_RESET_TIMER_COUNTER
```

TT_OUTPUT (R)

(* Rung 9 - IEC_TT_OUTPUT is the trip output to the MATH and LOGIC program TransferTrip_Timer. *)

(* It follows the TT_Output latch bit. The MATH AND LOGIC program controls the communications of RB12, based on IEC_TT_OUTPUT, and the feedback from FMD_RB12 *)

R10   TT_OUTPUT   ─┤ ├─   IEC_TT_OUTPUT.VALUE ( )

Use Case #2 -- Transfer Trip to Solar Farm


```
Sub TranferTrip_Timer() 'subroutine runs every 5 seconds to check if output needs to be sent to Solar Farm
    'FMD_RB12 is a status point in SF recloser that shows what the last control on RB12 (tranfer trip) was
    'TT_OUTPUT @IEC comes from LADDER LOGIC and is what RB12 should be.  If FMD_RB12 and TT_OUTPUT are different
    'RB12 is set to TT_OUTPUT.  RB12 is sent every 5 seconds until FMD_RB12 changes.
    If GetPoint("FMD_RB12 @Solar Farm") <> GetPoint("TT_OUTPUT @IEC") Then 'Test for last command different than present command
        SetPoint("RB12 @Solar Farm",GetPoint("TT_OUTPUT @IEC")) 'send OUTPUT to Solar Farm
    End If
End Sub
```

Use Case #3 – Process Control and Reverse Power Trip for Generators

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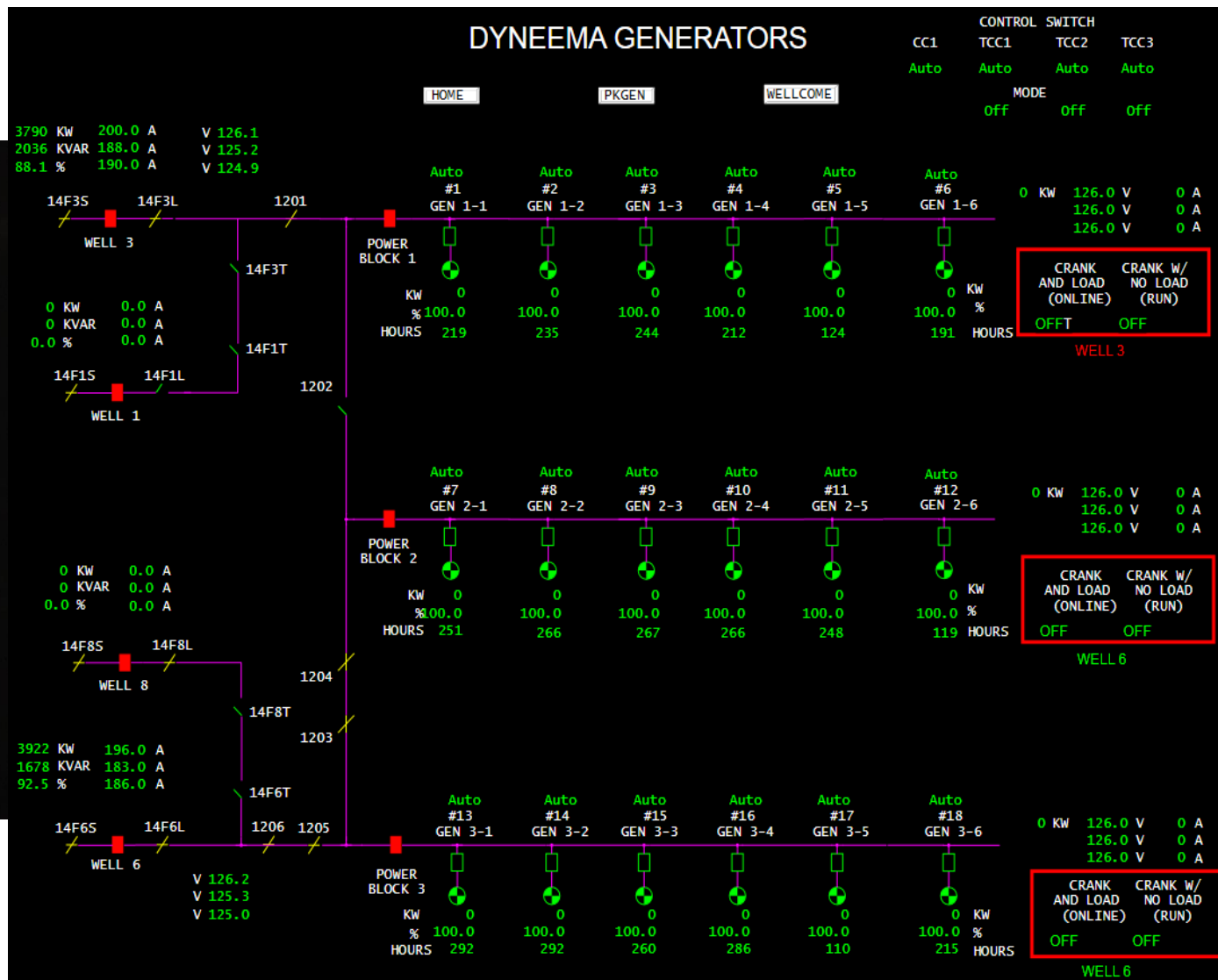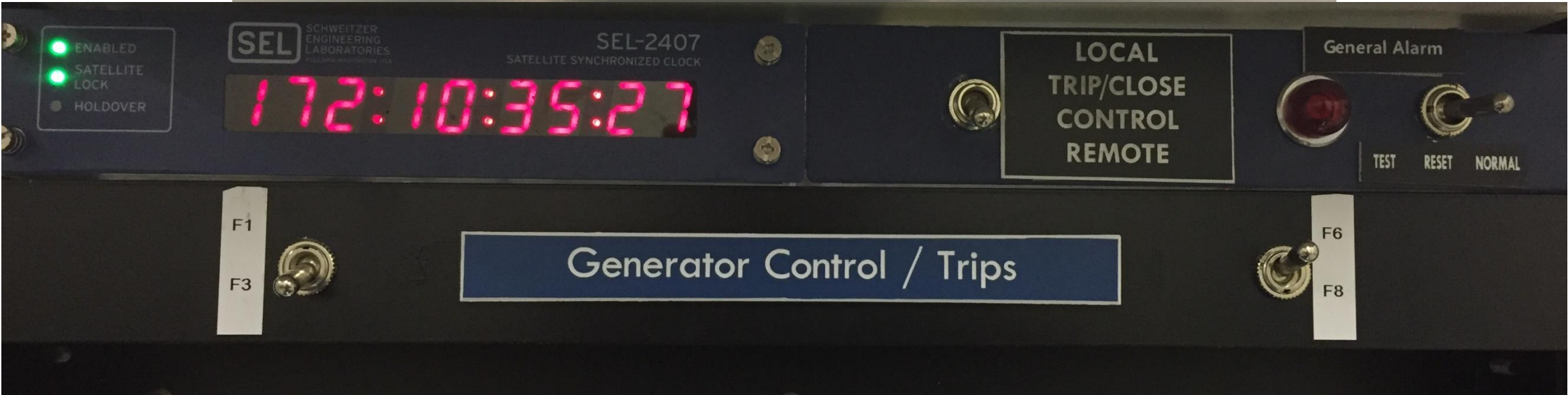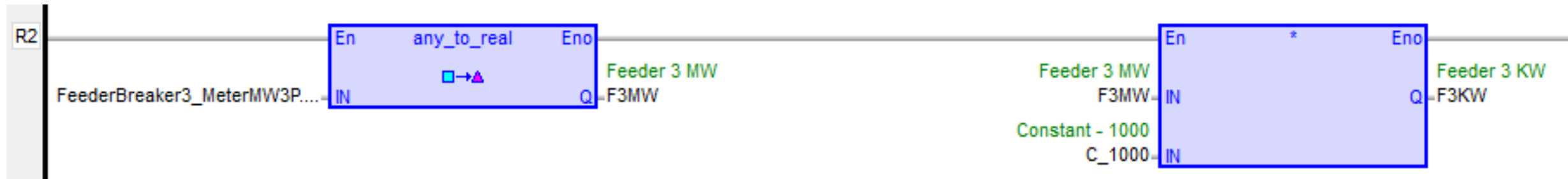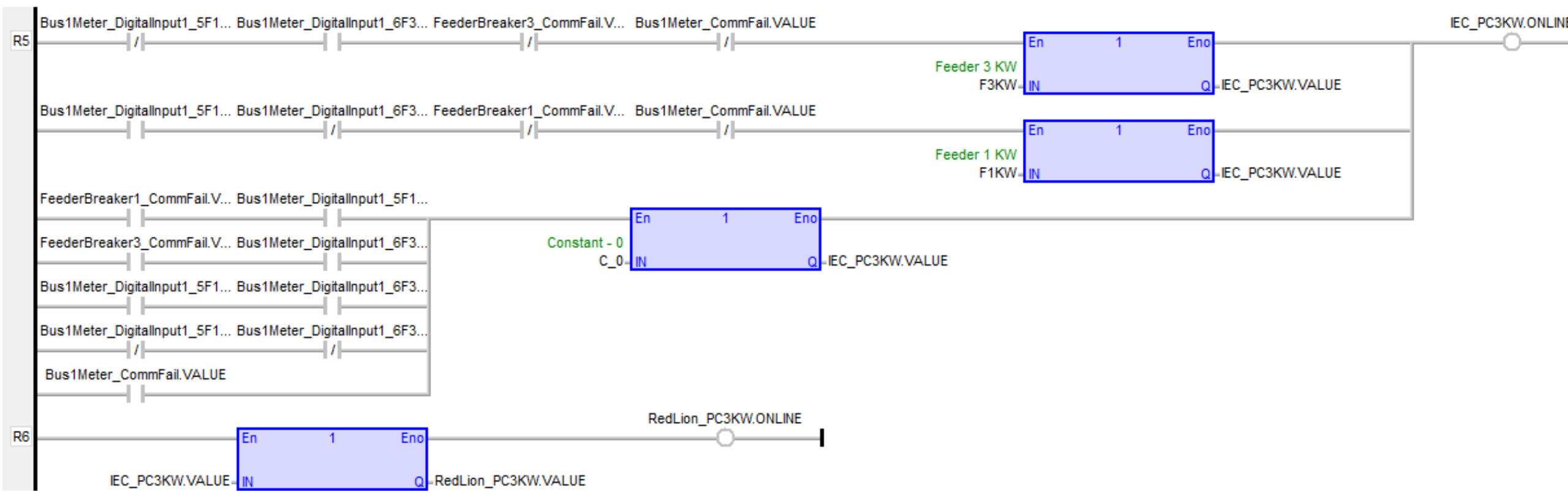
Use Case #3 – Process Control and Reverse Power Trip for Generators

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Use Case #3 – Process Control and Reverse Power Trip for Generators
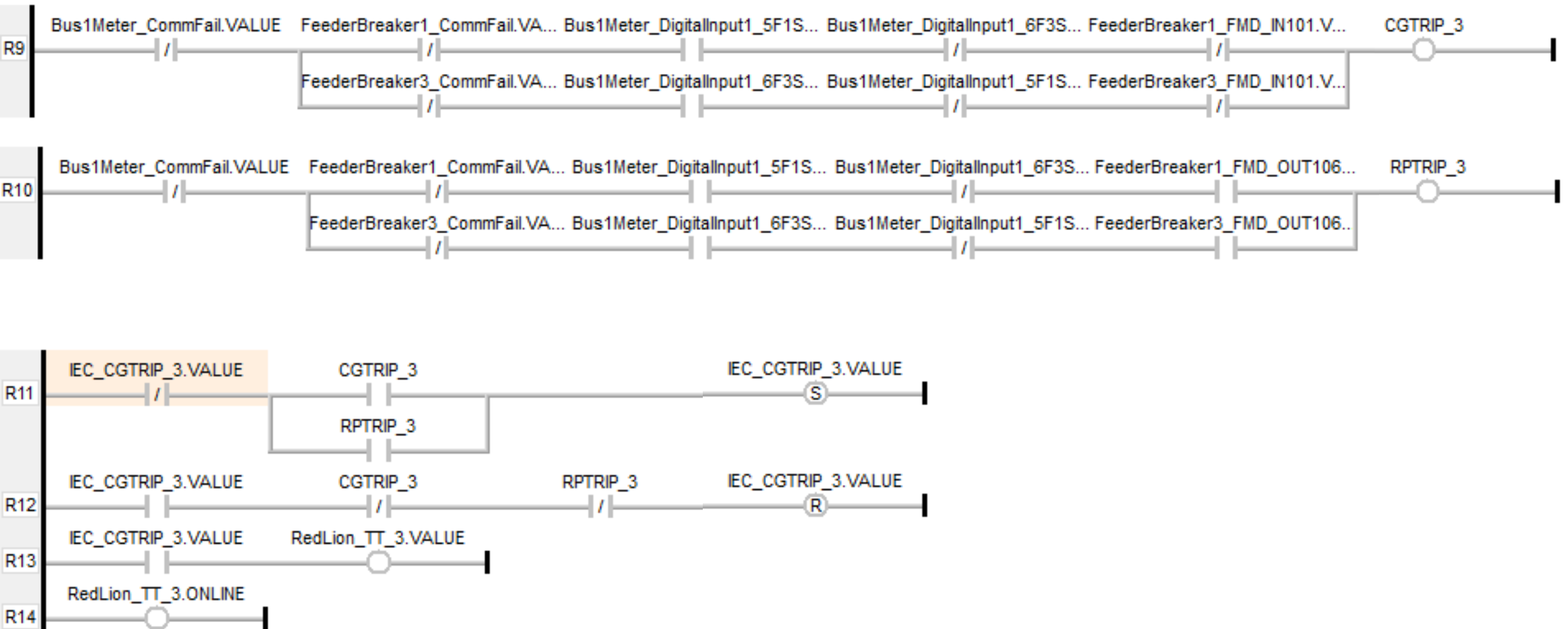
Final Notes, Gotchas and Future Plans

- IEC6113 – Ladder Logic - May be better suited for technicians to troubleshoot in the field
- SIMULATE, SIMULATE, SIMULATE!
  - Use Logic Simulator Tool
  - Set up I/O if necessary
- Put comments in your logic
- Don't buy hardware when the RTU can solve the issue

- Pay attention to the variable types in Ladder Logic
- Use Print Statements to track the code
- Timing is everything

- We will be converting our scripts to IEC61131 where feasible
- Currently use LogicPak for a Trip/Close cutout scheme at the substations
- Currently use LogicPak for a General Alarm Indicator Light
  - Using Alarm/Archive/Retentive for a display of substation alarms on a webpage
  - General Alarm light triggers Techs to check the webpage
- Also have a routine for masking false alarms on a perimeter alarm system (Math and Logic)
- Also have a routine to match voltages with large customer when their Generators are running and Cap banks are closed.

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Final Notes, Gotchas and Future Plans

- Future plans are for another 6MW Peakshaving /standby generator site with possible transfer scheme between two utility feeds
- Water/Wastewater personnel are looking into moving from Modbus to DNP3 – May use LXm as a protocol convertor
- Upgrading all existing OrionLX standard RTU's to MMB models
- Adding IEC61131 and Tile Annunciator to all RTU's
- Using NovaTech IO for hardwired applications particularly integrates well with 24VDC security system components

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LTC logic for stepping down based on KVar


```
Sub T2VoltageReduction_Timer()
    'T2 needs to step down its voltage to sync w/ PCMH when their Gen is running.  Amount of VR will depend on KVAR load
    ' Routine will only step on level at a time in the direction needed. i.e. In level 2, you can only go to level 3 or 1
    ' Dead band of 200 Kvar is built into the program to prevent hunting
    '
    If GetPoint("Comm Fail @LTC 2")=0 Then  'Dont run routine if comm is down
        If GetPoint("Comm Fail @Feeder 5 DPU2000R")=0 Then  'dont run routine if comm is down
            Dim F5Kvar
            F5Kvar = GetPoint("KVAR3 @Feeder 5 DPU2000R")
            'Print(F5Kvar)
            Dim T2VR1 ' Level 1 voltage reduction status
            T2VR1 = GetPoint("VR step 1 via comm @LTC 2")
            'Print(T2VR1)
            Dim T2VR2 ' Level 2 voltage reduction status
            T2VR2 = GetPoint("VR step 2 via comm @LTC 2")
            'Print(T2VR2)
            Dim T2VR3 ' Level 3 voltage reduction status
            T2VR3 = GetPoint("VR step 3 via comm @LTC 2")
            'Print(T2VR3)
            Dim T2VR0 ' all VR off Level 0 voltage reduction
            If (T2VR1 = 1) Or (T2VR2 = 1) Or (T2VR3 = 1) Then
                T2VR0 = 0
                Else
                    T2VR0 = 1
            End If
            SetPoint("VRC Level 3 Stat @Logic", T2VR3, 1)
            SetPoint("VRC Level 2 Stat @Logic", T2VR2, 1)
            SetPoint("VRC Level 1 Stat @Logic", T2VR1, 1)
```

Security System Logic for aggregating discrete alarms into zones

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Security System Logic for aggregating discrete alarms into zones

NovaTech Configuration Director - [IEC61131-3 Master Port 123 - IEC61131-3 (G230S_G.ncd)]

File   Edit   Configure   Communications   Window   Help

Port Options: Delete Port   Close Port | Build Release   Accept   Settings   Simulate   Go Online   0,0

Programs
  Create New Program
  SFC
  FBD
  LD
    SECU_LOGIC
  ST
  IL

Inputs | Outputs | Virtual Inputs | Virtual Outputs | Variables | Runtime Log

Point Name	Min	Max	Alias	IEC 61131-3 Name	Value Type	Online Type	Changes Type	Text Type	Date Type	Time Type
ZONE_1_ENTRY @IEC	0	1	IEC_ZONE_1_ENTRY	IEC_ZONE_1_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_2_ENTRY @IEC	0	1	IEC_ZONE_2_ENTRY	IEC_ZONE_2_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_3_ENTRY @IEC	0	1	IEC_ZONE_3_ENTRY	IEC_ZONE_3_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_4_ENTRY @IEC	0	1	IEC_ZONE_4_ENTRY	IEC_ZONE_4_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_5_ENTRY @IEC	0	1	IEC_ZONE_5_ENTRY	IEC_ZONE_5_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_6_ENTRY @IEC	0	1	IEC_ZONE_6_ENTRY	IEC_ZONE_6_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_1_DISQ @IEC	0	1	IEC_ZONE_1_DISQ	IEC_ZONE_1_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_2_DISQ @IEC	0	1	IEC_ZONE_2_DISQ	IEC_ZONE_2_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_3_DISQ @IEC	0	1	IEC_ZONE_3_DISQ	IEC_ZONE_3_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_4_DOSQ @IEC	0	1	IEC_ZONE_4_DOSQ	IEC_zONE_4_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_5_DISQ @IEC	0	1	IEC_ZONE_5_DISQ	IEC_ZONE_5_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
ZONE_6_DISQ @IEC	0	1	IEC_ZONE_6_DISQ	IEC_ZONE_6_DISQ	BOOL	BOOL	UDINT	STRING	DINT	DINT
SITE_ENTRY @IEC	0	1	IEC_SITE_ENTRY	IEC_SITE_ENTRY	BOOL	BOOL	UDINT	STRING	DINT	DINT
SENSOR_TROUBLE @IEC	0	1	IEC_SENSOR_TROUBLE	IEC_SENSOR_TROU...	BOOL	BOOL	UDINT	STRING	DINT	DINT

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Security System Logic for aggregating discrete alarms into zones

NovaTech NC/SC Users' Group Meeting
September 13, 2018

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Security System Logic for aggregating discrete alarms into zones

SENSOR TROUBLE ALARMS ROUTINE

R8 - is for Zone 1 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R8
SEL2440_FMD_IN102.VALUE
SEL2440_FMD_IN113.VALUE
IEC_ZONE_1_DISQ.VALUE

R9 - is for Zone 2 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R9
SEL2440_FMD_IN110.VALUE
SEL2440_FMD_IN205.VALUE
IEC_ZONE_2_DISQ.VALUE

R10 - is for Zone 3 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R10
SEL2440_FMD_IN202.VALUE
SEL2440_FMD_IN213.VALUE
IEC_ZONE_3_DISQ.VALUE

R11 - is for Zone 4 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R11
SEL2440_FMD_IN210.VALUE
SEL2440_FMD_IN305.VALUE
IEC_ZONE_4_DISQ.VALUE

R12 - is for Zone 5 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R12
SEL2440_FMD_IN302.VALUE
SEL2440_FMD_IN313.VALUE
IEC_ZONE_5_DISQ.VALUE

R13 - is for Zone 6 Sensor Disqualifer Alarm. All sensor inputs needed are in this rung. This rung will roll up to the "SENSOR_TROUBLE" Alarm.

R13
SEL2440_FMD_IN310.VALUE
SEL2440_FMD_IN105.VALUE
IEC_ZONE_6_DISQ.VALUE

R14 - is for the SENSOR_TROUBLE ALARM. All Zone DISQ Alarms are rolled up to this Alarm. This is the point that Station 1 gets an alarm for.

R14
IEC_ZONE_1_DISQ.VALUE
IEC_ZONE_2_DISQ.VALUE
IEC_ZONE_3_DISQ.VALUE
IEC_ZONE_4_DISQ.VALUE
IEC_ZONE_5_DISQ.VALUE
IEC_ZONE_6_DISQ.VALUE
IEC_SENSOR_TROUBLE.VAL...

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LTC logic for stepping down based on KVar

```
        SetPoint("VRC Level 0 Stat @Logic", T2VR0, 1)
        'Print(T2VR0)
        If T2VR3 = 1 Then 'Check for Level 3 VR active
            If -3300 <= F5KVar Then 'Check for condition to step back to Level 2 VR
            SetPoint("Volt Red  Step #2 En - 1 @LTC 2", 1, 1) ' Turn Level 2 on
            End If
        End If
        If (T2VR2 = 1) Then 'Check for Level 2 VR Active
            If -2550 <= F5Kvar Then 'Check for condition to step back to Level 1 VR
                SetPoint("Volt Red  Step #1 En - 1 @LTC 2", 1, 1) ' Turn Level 1 VR on
            ElseIf -3500 >= F5Kvar Then ' Check for condition to step up to Level 3 VR
                SetPoint("Volt Red  Step #3 En - 1 @LTC 2", 1, 1) ' Turn Level 3 VR on
            End If
        End If
        If (T2VR1 = 1) Then ' Check for Level 1 VR Active
            If -1800 <= F5KVar Then ' Check for condition to step back to Level 0 VR
                SetPoint("Volt Red  Step #1 En - 1 @LTC 2", 0, 1)
            ElseIf -2750 >= F5Kvar Then ' Check for condition to step up to Level 2 VR
            SetPoint("Volt Red  Step #2 En - 1 @LTC 2", 1, 1) ' Turn Level 2 VR on
            End If
        End If
        If (T2VR0 = 1) Then ' Check for Level 0 VR Active and condition to step up to Level 1
            If -2000 >= F5Kvar Then
                SetPoint("Volt Red  Step #1 En - 1 @LTC 2", 1, 1) ' Turn Level 1 VR on
            End If
        End If
        End If
    End If
End Sub

Sub NotGate_Timer()
    Dim a
    a = GetPoint("Input01-RTU LOCAL REMOTE @Local I/O")
    Dim b
    b = Abs(1 - a)
    SetPoint("RTU T-C Cutout Alarm @Logic", b ,1)
End Sub
```

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