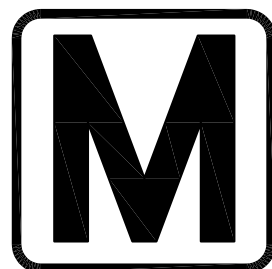


WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY



metro

SIX (6) TIE BREAKER STATION UPGRADES ORANGE AND BLUE LINES DC, MD AND VA

G01 - BENNING ROAD TBS

G02TB2 - 67TH AVE TBS

K07TB1 - OGDEN ST. TBS

G02TB1 - 56TH STREET TBS

K06TB2 - GREENWICH ST. TBS

K07TB2 - PROSPERITY AVE. TBS

VOLUME 3B- SCADA DRAWINGS

CONTRACT NO. FQ15237

JULY 20, 2015

SCADA INDEX OF DRAWINGS

S. NO.	TITLE
1	INDEX OF DRAWINGS
2	TYPICAL INSTALLATION DETAILS
3	TYPICAL TPSS NETWORK SWITCH CABINET LAYOUT
4	HMI CABINET LAYOUT
5	HMI CABINET WIRING DIAGRAM
6	TYPICAL ETS-RTU INTERCONNECTION DIAGRAM
7	TYPICAL DTR CABINET LAYOUT
8	TBS DTR-DC SWITCHGEAR INTERCONNECTION
9	TYPICAL DC BREAKER DIO CONTROL SCHEMATIC
10	TYPICAL TBS RTU CABINET LAYOUT - SHEET 1 OF 2
11	TYPICAL TBS RTU CABINET LAYOUT - SHEET 2 OF 2
12	RTU CONTROL POWER
13	RTU INTERCONNECTION DIAGRAM - SHEET 1 OF 2
14	RTU INTERCONNECTION DIAGRAM - SHEET 2 OF 2
15	TIE BREAKER CONTROL AND SCHEMATIC DIAGRAM
16	TYPICAL TBS SCADA BLOCK DIAGRAM
17	TYPICAL TBS SCADA CABLING DIAGRAM
18	TBS SCADA EQUIPMENT SCHEDULE
19	TBS FIBER CONNECTION POINTS SUMMARY SHEET 1 OF 2
20	TBS FIBER CONNECTION POINTS SUMMARY SHEET 2 OF 2
21	TYPICAL TBS SCADA CONDUIT AND CABLE SCHEDULE
22	TYPICAL TBS CAT 6 CABLE TERMINATION DIAGRAM
23	TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 1 OF 5
24	TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 2 OF 5
25	TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 3 OF 5
26	TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 4 OF 5
27	TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 5 OF 5
28	TBS NETWORK TERMINATION DIAGRAM CABLE SCHEDULE - SHEET 1 OF 2
29	TBS NETWORK TERMINATION DIAGRAM CABLE SCHEDULE - SHEET 2 OF 2

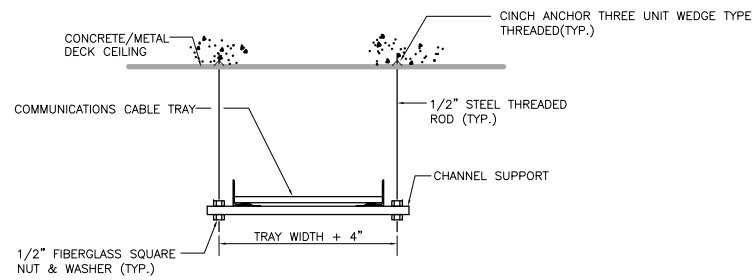


"PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND."

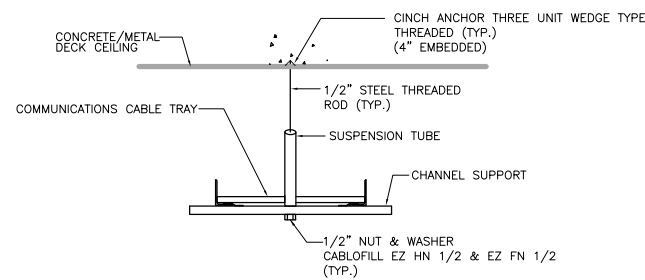
LICENSE No. 39970
EXPIRATION DATE: 1/17/2017

-COMAR 09.23.03.10

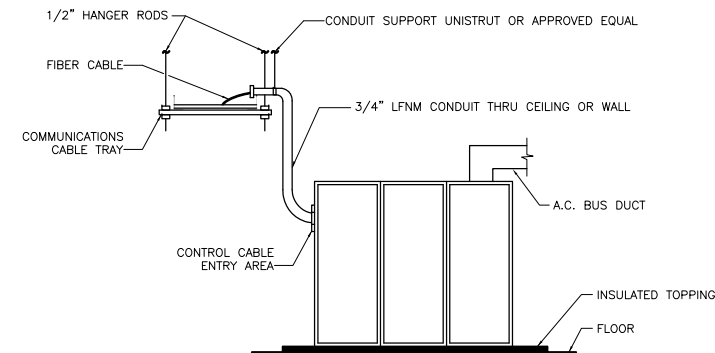
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	INDEX OF DRAWINGS					CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-001	SHEET NO. 1 OF 29



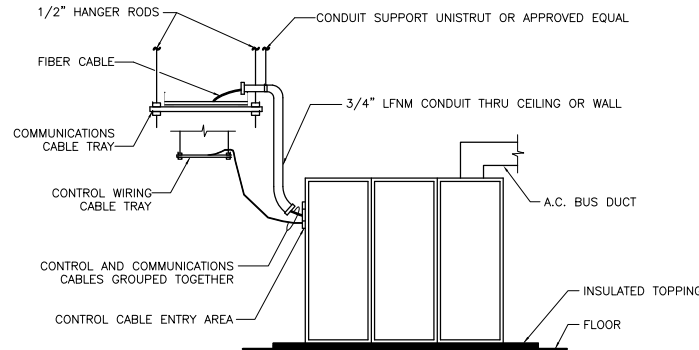
DETAIL 1
TYPICAL METHOD OF SUPPORTING WIRE MESH
TYPE COMMUNICATIONS CABLE TRAY (OPTION 1)



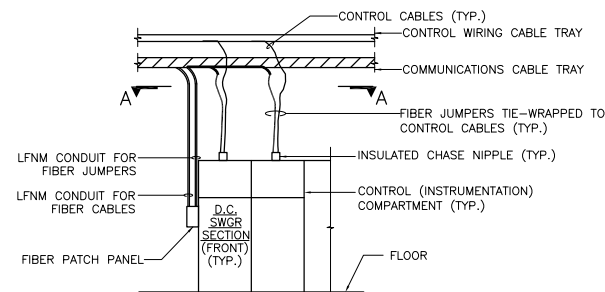
DETAIL 2
TYPICAL METHOD OF SUPPORTING WIRE MESH
TYPE COMMUNICATIONS CABLE TRAY (OPTION 2)



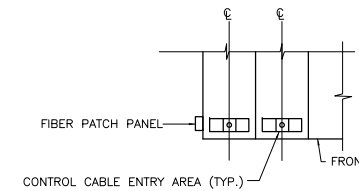
DETAIL 3
TYPICAL METHOD OF RUNNING CONTROL CABLES
FROM CABLE TRAY TO RECTIFIER (OPTION 1)



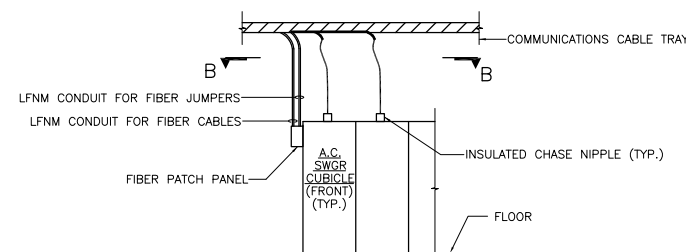
DETAIL 4
TYPICAL METHOD OF RUNNING CONTROL CABLES
FROM CABLE TRAY TO RECTIFIER (OPTION 2)



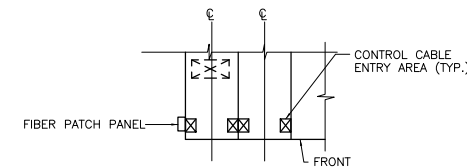
DETAIL 5
TYPICAL METHOD OF ROUTING FIBER CABLES/FIBER
JUMPERS FROM CABLE TRAY TO D.C. SWITCHGEAR



SECTION A-A
(DETAIL 5)



DETAIL 6
TYPICAL METHOD OF ROUTING FIBER CABLES
TO A.C. SWITCHGEAR



SECTION B-B
(DETAIL 6)



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LICENSE No. 39970
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		DATE

REFERENCE DRAWINGS	
NUMBER	TITLE

REVISIONS		
DATE	NUM	DESCRIPTION

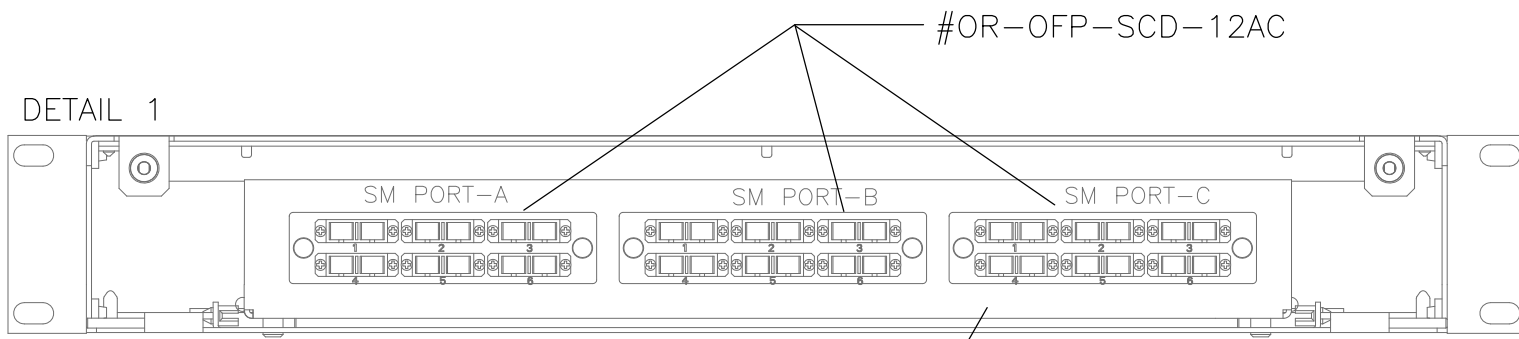
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
CENI - POWER SYSTEMS ENGINEERING

REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

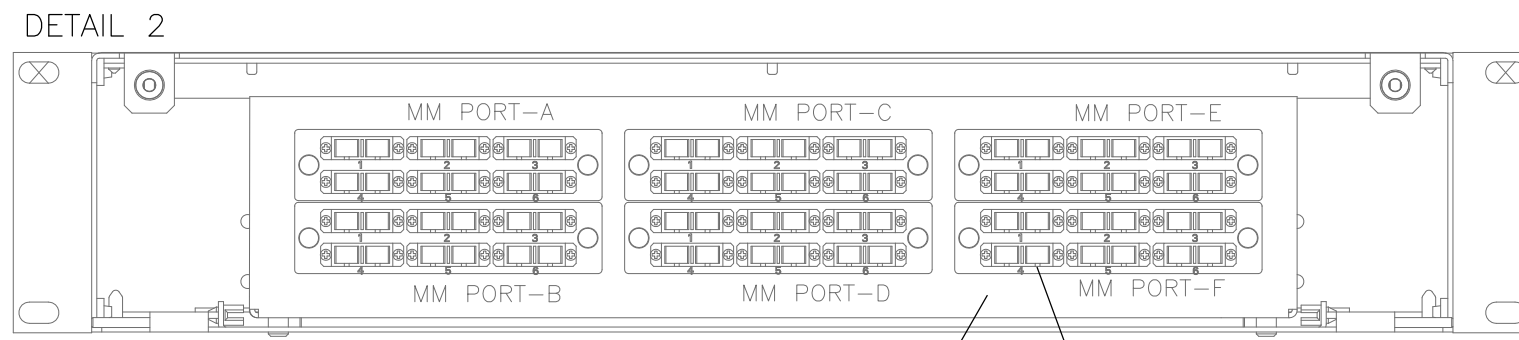
SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

TYPICAL INSTALLATION DETAILS

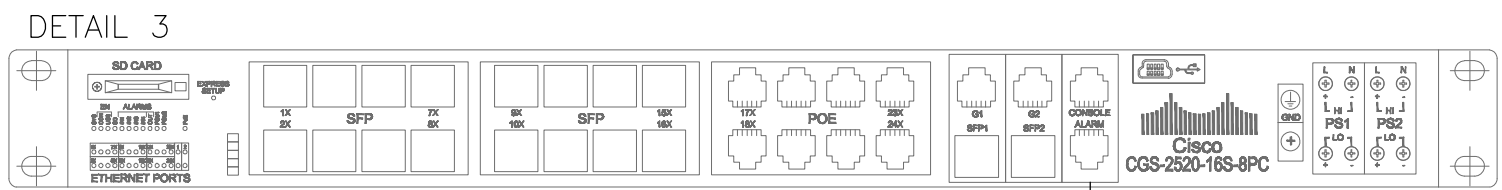
CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-002	SHEET NO. 2 OF 29
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FIBER PATCH PANEL (Ortronics #OR-FC01U-C)



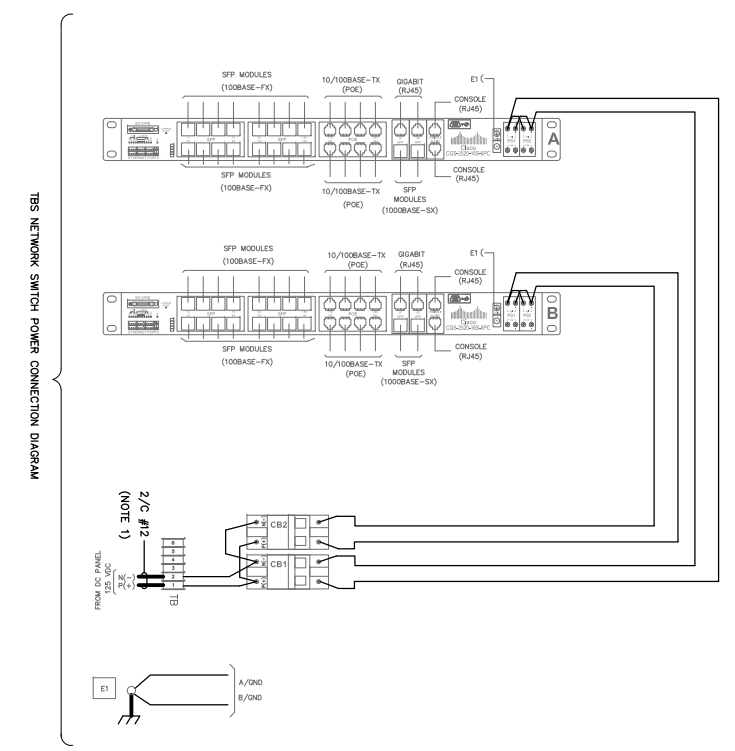
FIBER PATCH PANEL (Ortronics #OR-FC02U-C)



NETWORK SWITCH (CISCO CGS 2520-16S-8PC)

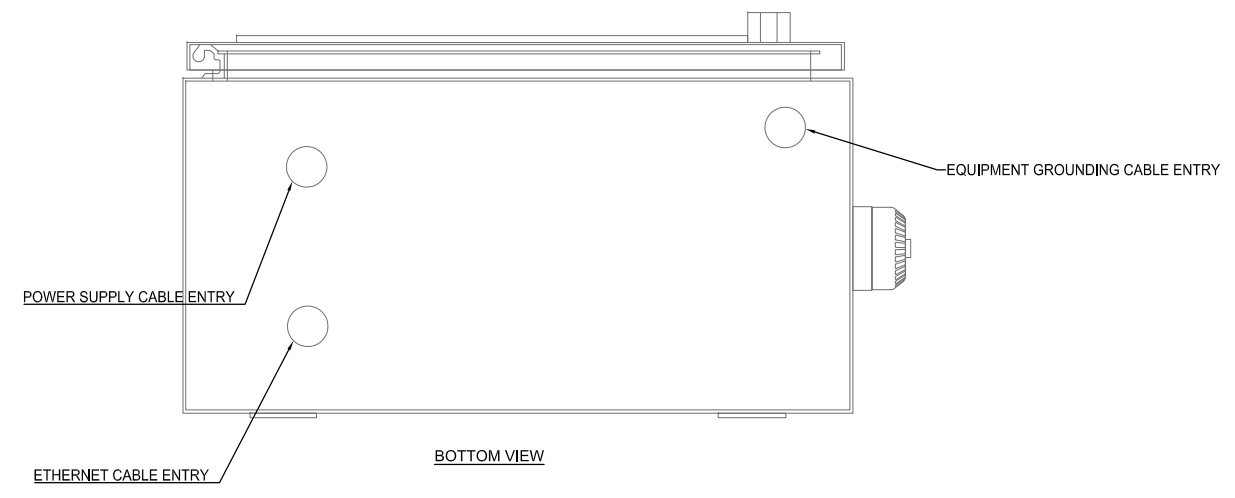
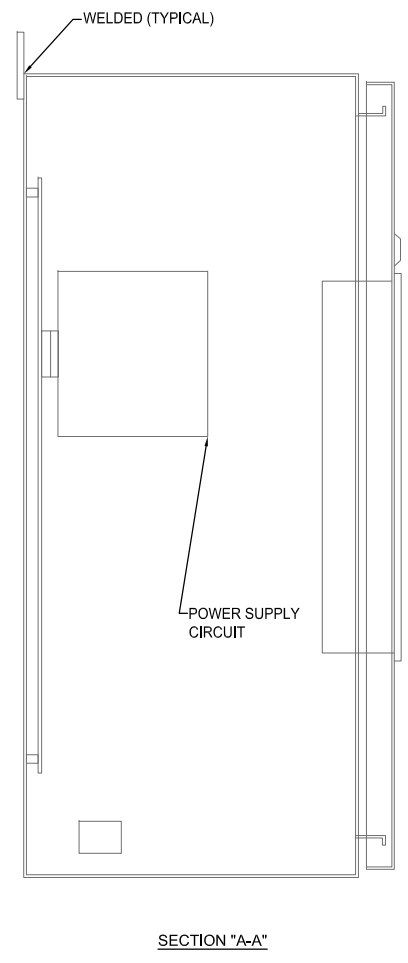
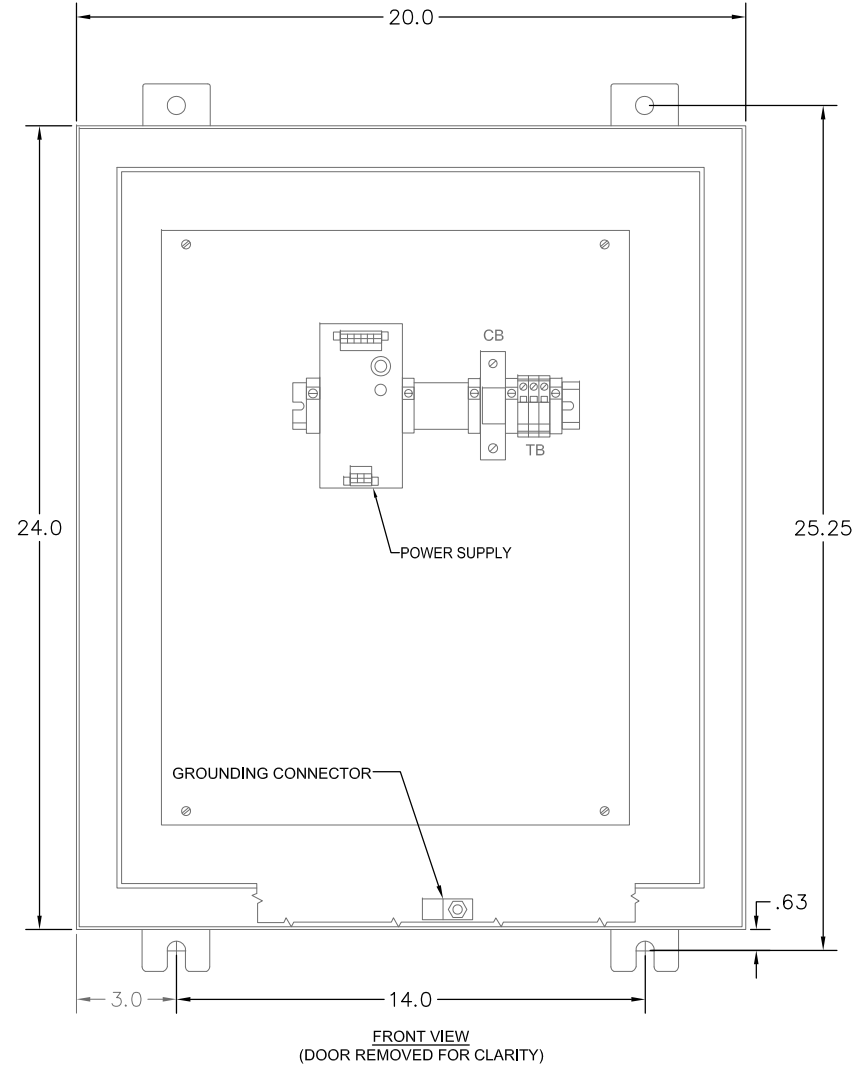
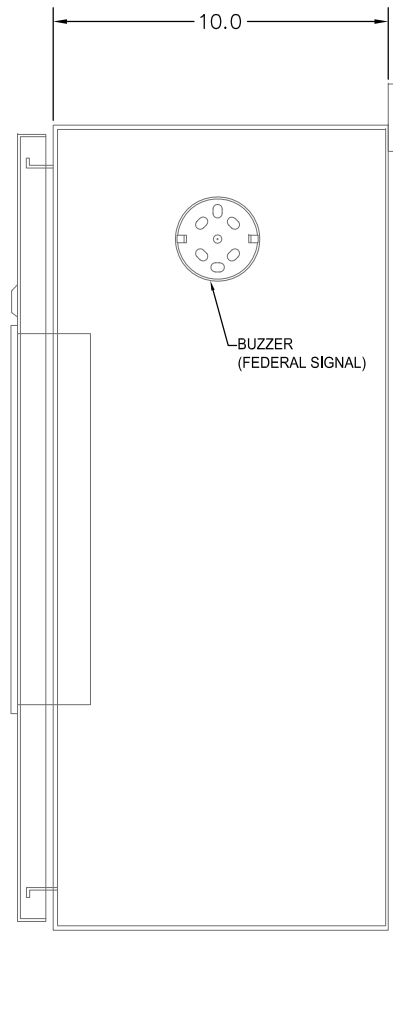
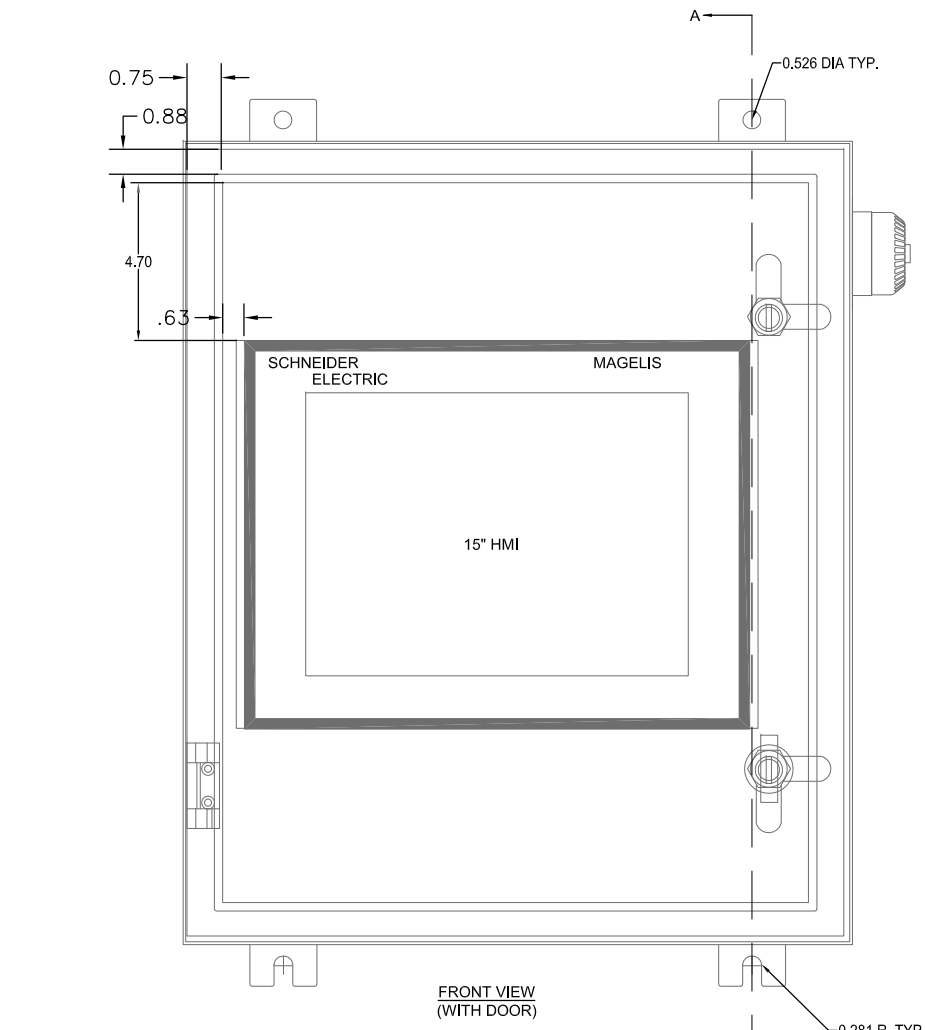
NOTES:

- TBS NETWORK SWITCH SYSTEM:
1. NETWORK SWITCHES AND PATCH PANELS ARE MOUNTED IN THE RTU CABINET.
 2. PROVIDE AND INSTALL ONE (1) Ortronics #OR-FC01U-C FIBER PATCH PANEL FOR INCOMING SINGLE MODE FIBERS FROM COMMUNICATION ROOM WITH THREE (2) 6 SC DUPLEX SC 50um 10GIG COUPLING PANELS, ORTRONICS #OR-OFP-SCD12AC
 3. PROVIDE AND INSTALL ONE (1) ORTRONICS #OR-FC02U-C FIBER PATCH PANEL TO TERMINATE OUTGOING MULTIMODE FIBER TO EQUIPMENT IED WITH SIX (4) 6 SC DUPLEX SC 50um 10GIG COUPLING PANELS, ORTRONICS #OR-OFP-SCD12LC
 4. WMATA WILL PROVIDE AND INSTALL TWO (2) CISCO CGS 2520-16S-8PC
 5. PROVIDES AND INSTALLS BRANCH CIRCUIT WIRING FROM THE DC PANEL TO THE TERMINAL BLOCK INSIDE THE NETWORK SWITCH AS SHOWN. NETWORK SWITCH SYSTEM IS FED FROM 2P, 15A BREAKER INSTALLED AT THE STATION 125VDC PANEL.
 6. PROVIDE AND INSTALL REDUNDANT POWER CONNECTIONS FOR EACH SWITCH AS SHOWN. 5A DIN RAIL CIRCUIT BREAKER TO BE INSTALLED FOR EACH NETWORK SWITCH.



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 LICENSE No. 39970
 EXPIRATION DATE: 1/17/2017

DESIGNED JAJ 4/4/15 DATE DRAWN JAJ 5/20/15 DATE CHECKED PK 6/1/15 DATE	REFERENCE DRAWINGS NUMBER TITLE DATE NUM DESCRIPTION		REVISIONS DATE DESCRIPTION		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TPSS NETWORK SWITCH CABINET LAYOUT			
	REVISION SUBMITTED	DATE	APPROVED	DATE					



- NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
 2. FOR TPSS, TBS AND AC SWITCHGEAR ROOMS



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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
CEN1 - POWER SYSTEMS ENGINEERING

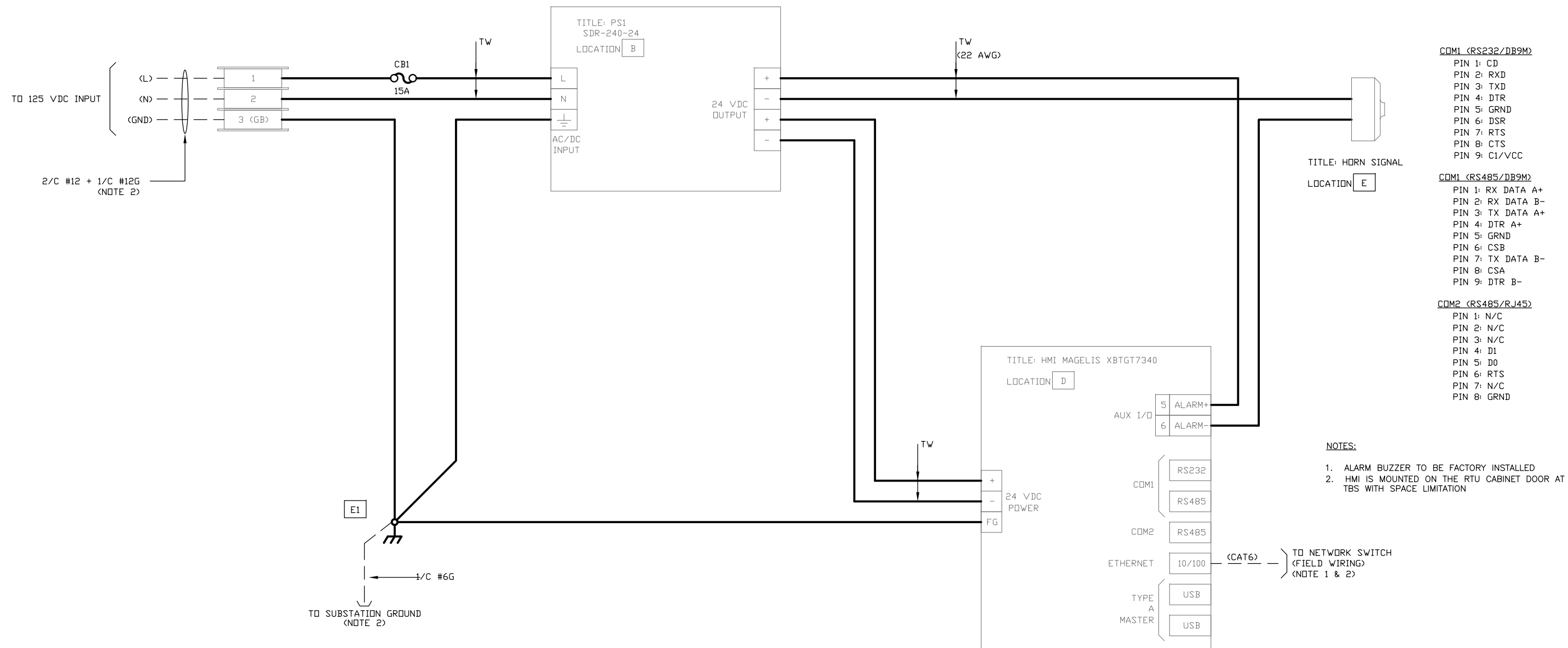
REVISION SUBMITTED _____ DATE _____
APPROVED _____ DATE _____
DEPUTY CHIEF ENGINEER

**SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA**

HMI CABINET LAYOUT

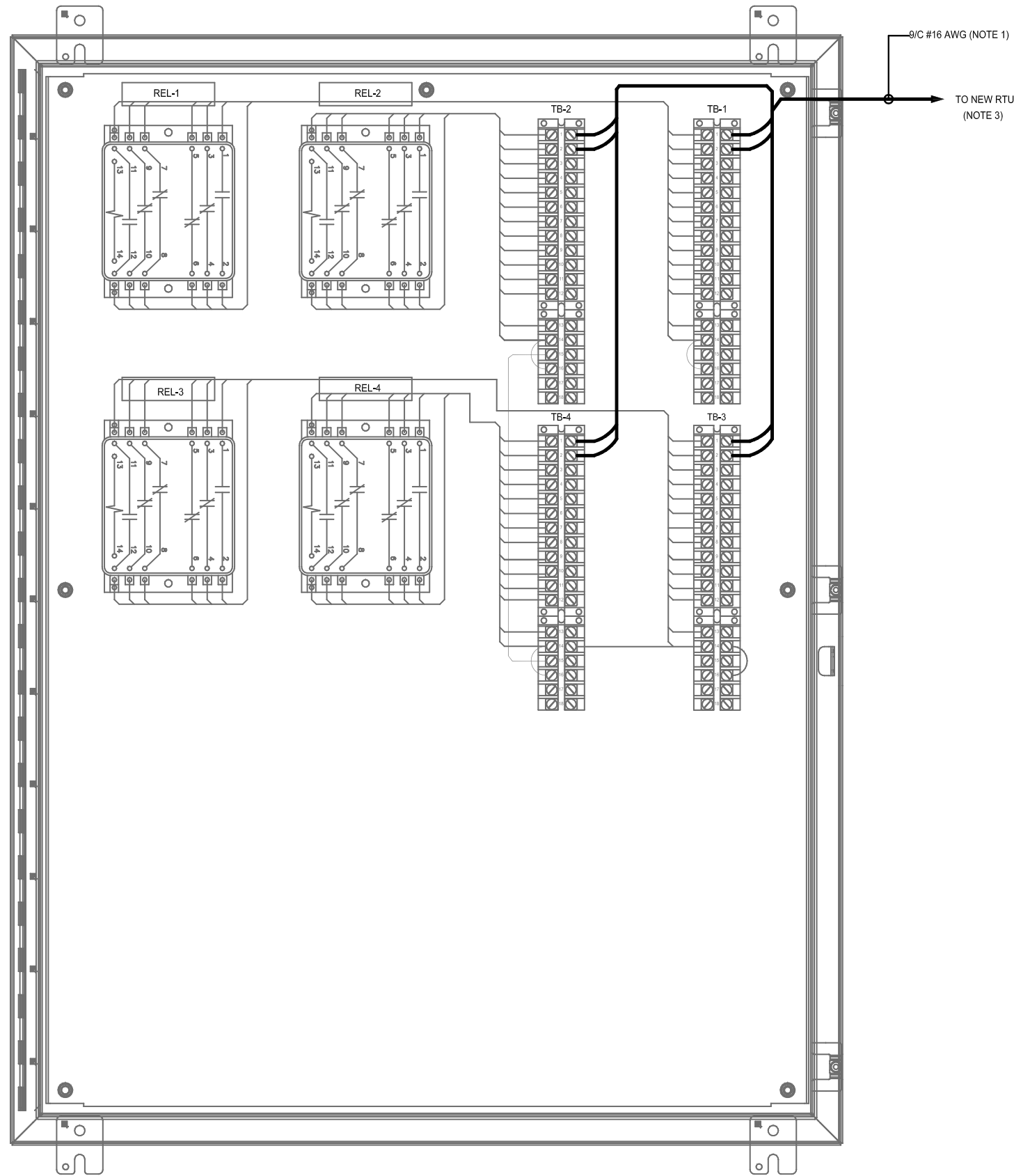
CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-004	SHEET NO. 4 OF 29
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DESIGNED	DATE	REFERENCE DRAWINGS		REVISIONS	
		NUMBER	TITLE	DATE	DESCRIPTION
JAJ	4/4/15				
JAJ	5/20/15				
PK	6/1/15				



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 EXPIRATION DATE: 1/17/2017

DESIGNED JAJ 4/4/15 DATE DRAWN JAJ 5/20/15 DATE CHECKED PK 6/1/15 DATE			REFERENCE DRAWINGS NUMBER TITLE DATE NUM DESCRIPTION			REVISIONS DATE NUM DESCRIPTION			WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY metro DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING			SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA HMI CABINET WIRING DIAGRAM		
REVISION SUBMITTED DATE APPROVED DATE DEPUTY CHIEF ENGINEER			CONTRACT NO. FQ15237			SCALE NONE			DRAWING NO. ST-SC-G-SSI-005			SHEET NO. 5 OF 29		



NOTE:

1. FOR ALL STATIONS USE 9/C #16 AWG CABLE.
2. WHERE CONTACT 1 & 2 ARE ALREADY USED, CONTACT 11 & 12 SHALL BE USED TO PROVIDE CONNECTION TO THE RTU.
3. NEW WIRING AND TERMINATION TO BE PROVIDED BY INSTALLATION CONTRACTOR. REFER TO DRAWING "RTU INTERCONNECTION DIAGRAM" FOR CONNECTION OF ETS CIRCUIT TO RTU.



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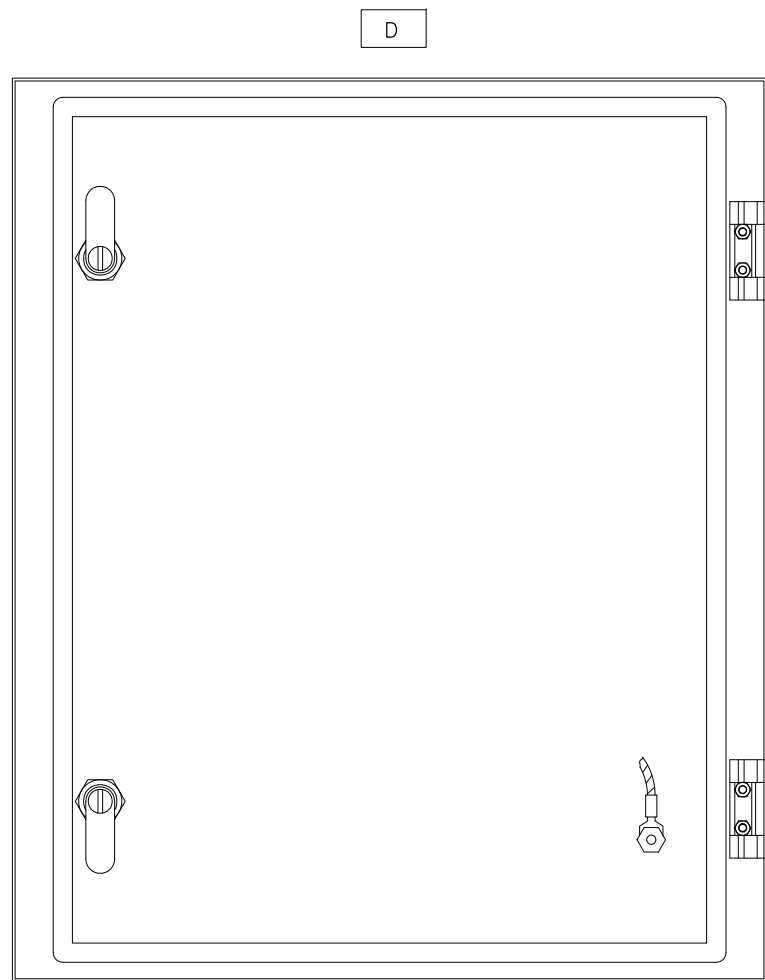
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DATE	NUM	DESCRIPTION

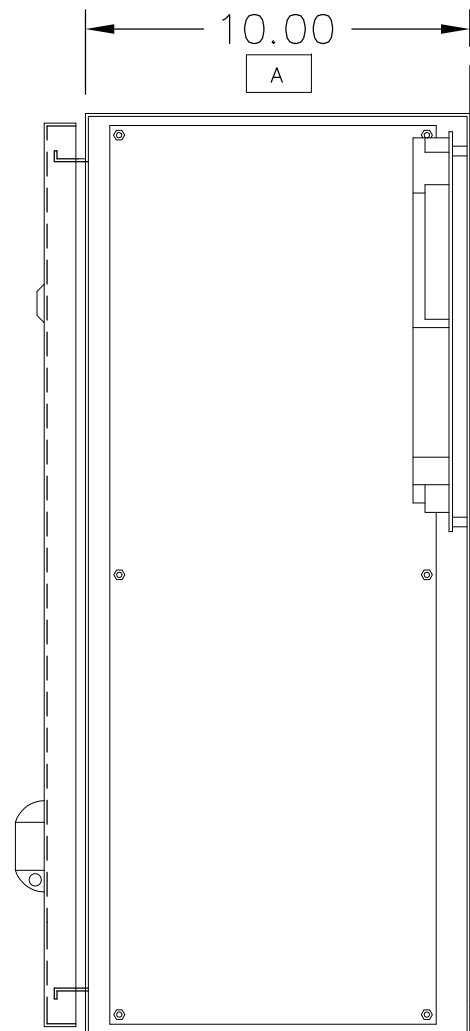
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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 CENI - POWER SYSTEMS ENGINEERING

REVISION SUBMITTED _____ DATE _____
 APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

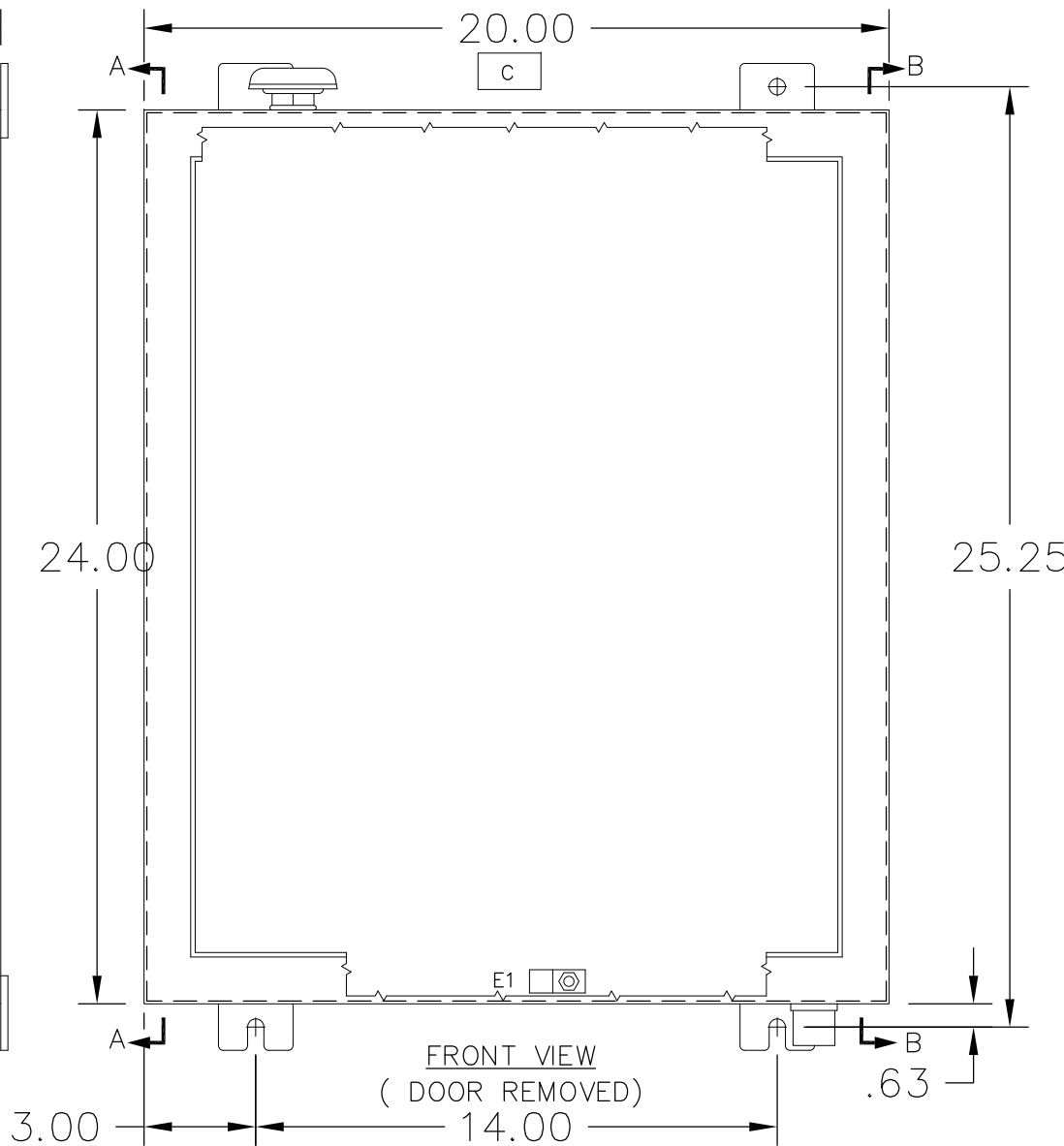
SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA		TYPICAL ETS-RTU INTERCONNECTION DIAGRAM	
CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-006	SHEET NO. 6 OF 29



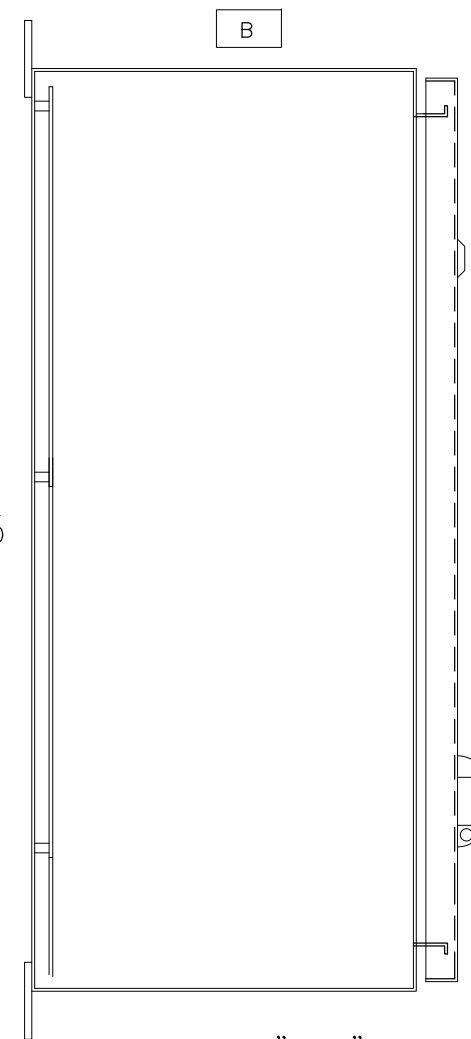
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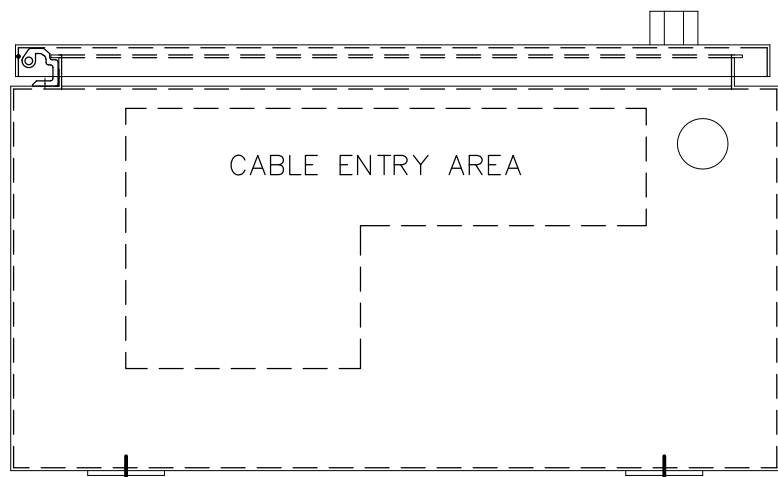
SECTION "A-A"



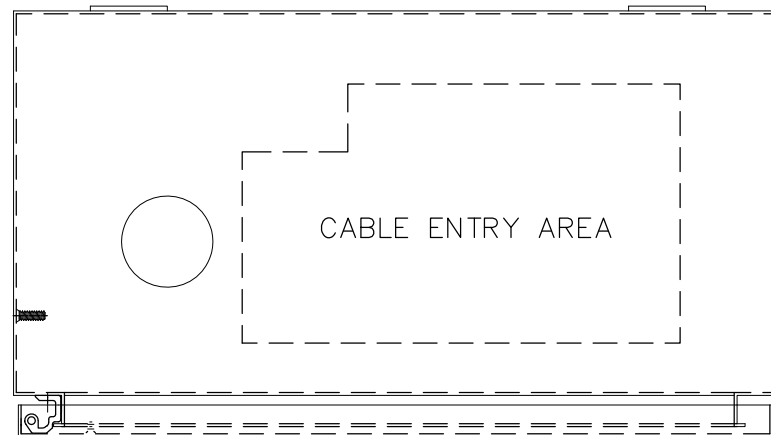
FRONT VIEW
(DOOR REMOVED)



SECTION "B-B"



BOTTOM VIEW



TOP VIEW

NOTES:

1. DTR CABINET IS FACTORY MOUNTED ON THE DC SWITCHGEAR BY THE DC SWITCHGEAR MANUFACTURER.
2. DC SWITCHGEAR MANUFACTURER TO PROVIDE POWER AND GROUNDING CONNECTIONS.
3. FIELD INSTALLATION OF FIBER.



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REFERENCE DRAWINGS	
NUMBER	TITLE

REVISIONS		
DATE	NUM	DESCRIPTION

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CENI - POWER SYSTEMS ENGINEERING

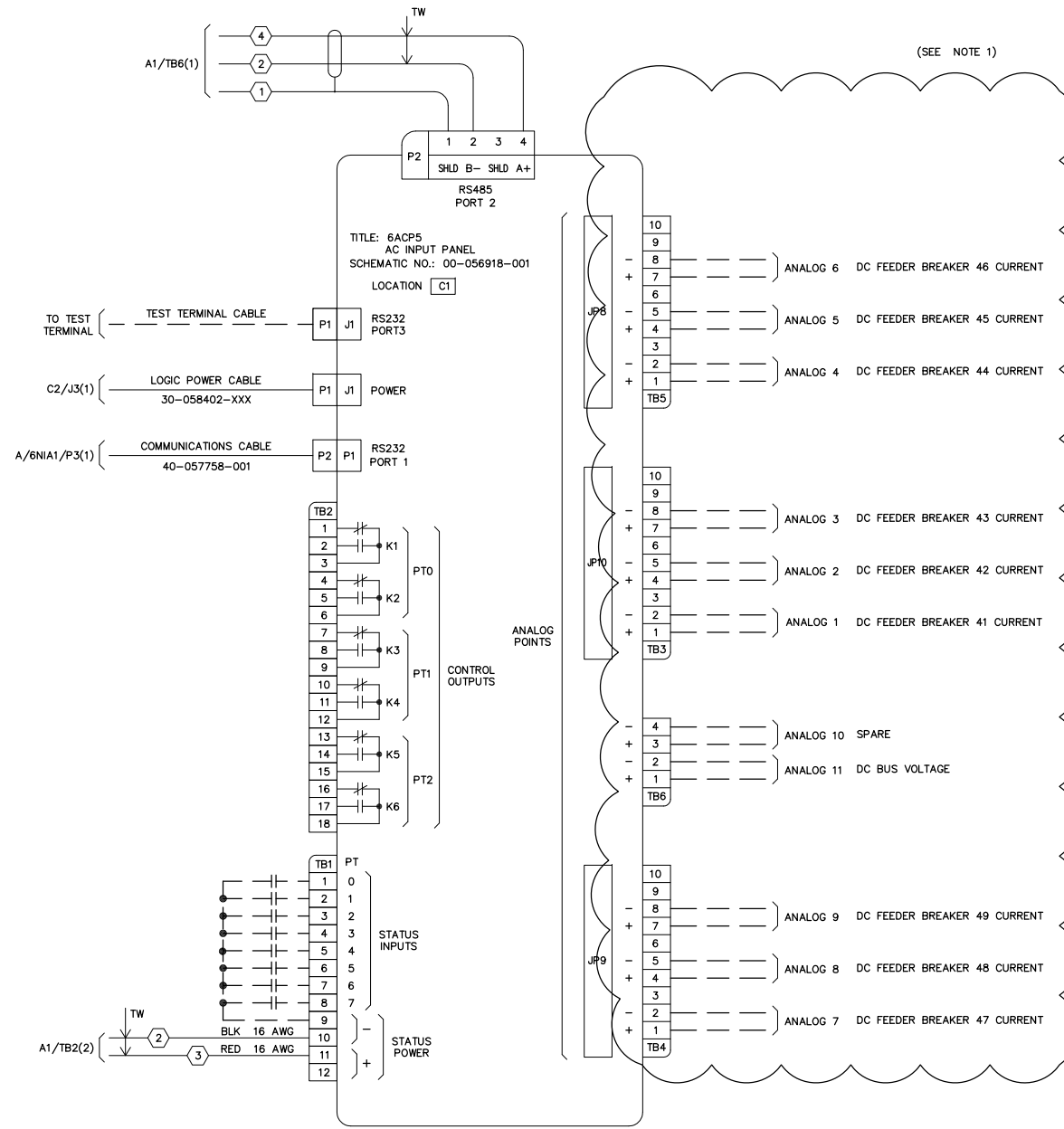
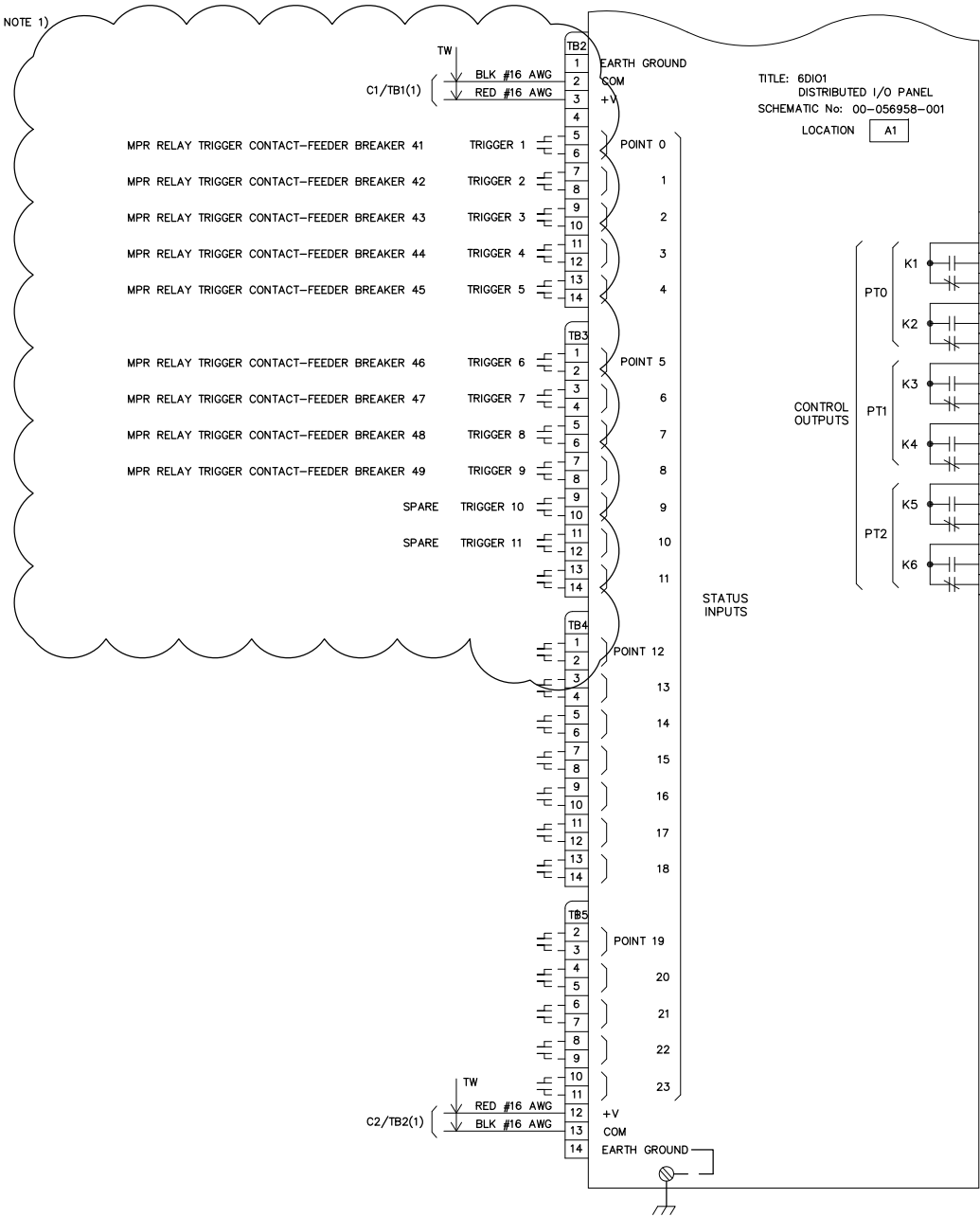
REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

TYPICAL DTR CABINET LAYOUT

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-007	SHEET NO. 7 OF 29
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(SEE NOTE 1)



- NOTE:
1. LAYOUTS AND INTERCONNECTIONS ARE FOR INFORMATION ONLY
 2. NEW WIRING AND TERMINATION TO BE PROVIDED BY INSTALLATION CONTRACTOR
 3. ANALOG AND TRIGGER POINTS ARE SPARES IF BREAKER IS NOT INSTALLED
 4. UNLESS OTHERWISE SHOWN, ALL WIRES TO BE #22 AWG (TWISTED PAIR FOR ANALOG INPUTS)

DESIGNED JAJ 4/4/15
DATE
DRAWN JAJ 5/20/15
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DATE

REFERENCE DRAWINGS		REVISIONS	
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CENI - POWER SYSTEMS ENGINEERING

REVISION SUBMITTED _____ DATE _____
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DEPUTY CHIEF ENGINEER

**SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA**

TBS DTR-DC SWITCHGEAR INTERCONNECTION

CONTRACT NO. FQ15237
SCALE NONE
DRAWING NO. ST-SC-G-SSI-008
SHEET NO. 8 OF 29

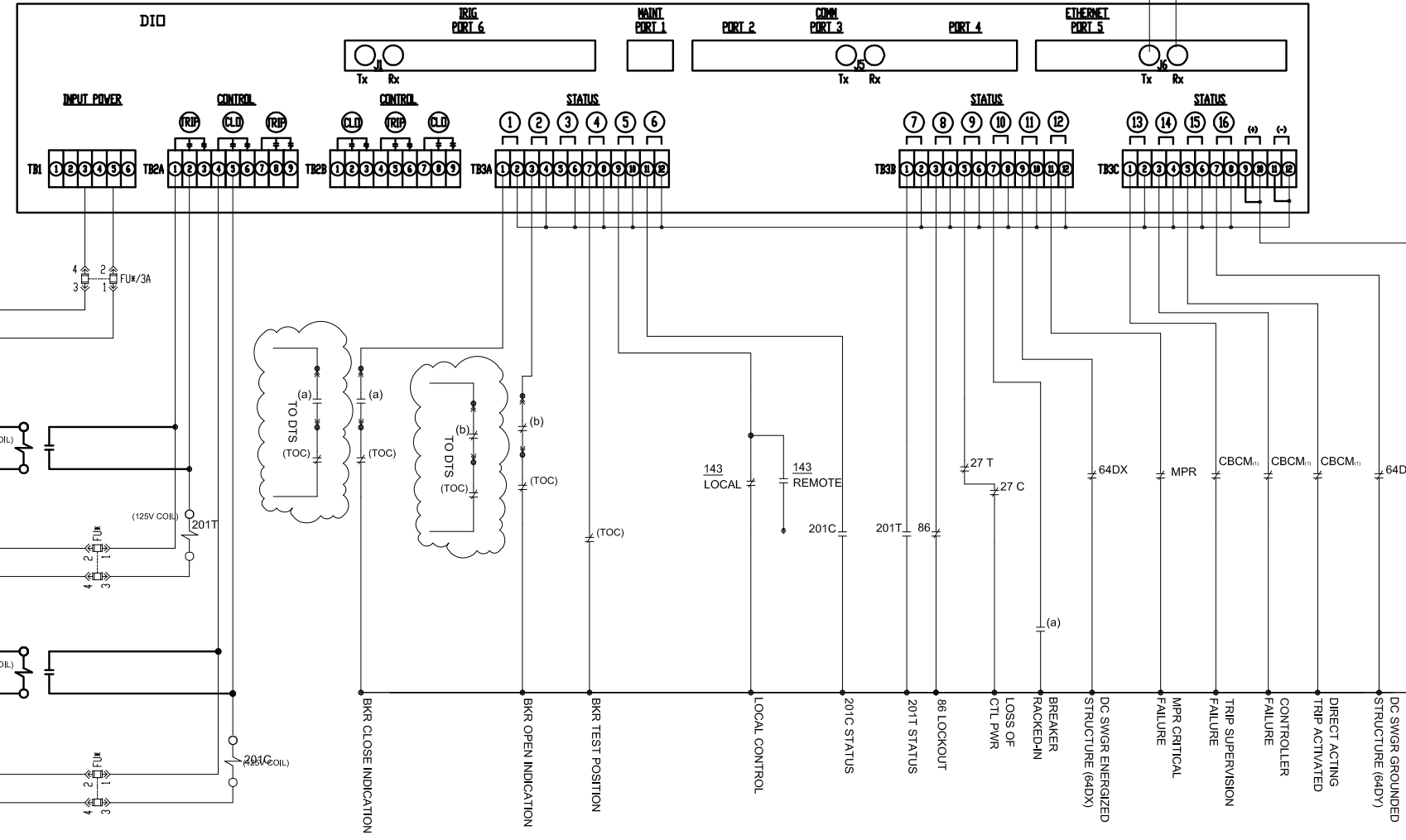


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MM, DUPLEX FIBER JUMPER TO NETWORK SWITCH VIA DC SWGR FDP



DC LINE SWITCHGEAR DIO TERMINAL BLOCK ASSIGNMENTS					
TERMINAL BLOCK NUMBER	FUNCTION	DESCRIPTION	OPEN CONTACT WHEN	CLOSED CONTACT WHEN	
CONTROLS	TB2A-1/2	CONTROL TRIP (NOTE 1)	TO ENERGIZE RELAY 201 TRIP COIL	NORMAL	TRIP CONTROL (MOMENTARY)
	TB2A-4/5	CONTROL CLOSE (NOTE 1)	TO ENERGIZE RELAY 201 CLOSE COIL	NORMAL	CLOSE CONTROL (MOMENTARY)
TB3A-1/2	CLOSE	BREAKER CLOSED	SEE NOTE 4	SEE NOTE 4	
TB3A-3/4	TRIP	BREAKER OPEN	SEE NOTE 3	SEE NOTE 3	
TB3A-5/6				NORMAL	
TB3A-7/8	TEST POSITION	BREAKER POSITION	RACKED IN OR OUT	TEST POSITION	
TB3A-9/10	LOCAL POSITION	LOCAL/REMOTE POSITION SWITCH	IN REMOTE POSITION	IN LOCAL POSITION	
TB3A-11/12	RELAY 201C PICKUP	201C RELAY CONTACT	NORMAL	PICKED UP	
TB3B-1/2	RELAY 201T PICKUP	201T RELAY CONTACT	NORMAL	PICKED UP	
TB3B-3/4	DC SWG 86 LOCKOUT	201C RELAY CONTACT	NORMAL	PICKED UP	
TB3B-5/6	LOSS OF CONTROL POWER (27)	LOSS OF DC CONTROL POWER	LOSS OF CONTROL POWER	NORMAL	
TB3B-7/8	RACKED IN	BREAKER POSITION	RACKED OUT	RACKED IN	
TB3B-9/10	DC SWGR ENERGIZED STRUCTURE (64DX)	CONTACT FROM AUX 64DX RELAY	ALARM	NORMAL	
TB3B-11/12	DC MPR CRITICAL FAILURE	DC RELAY FAILURE	FAILED	NORMAL	
TB3C-1/2	NDC BRK CBCM TRIP CKT SUPERVISION FAILURE 1	CBCM TCS HEALTHY CONTACT	NORMAL	FAILED	
TB3C-3/4	NDC BRK CBCM CONTROLLER FAILURE 1	CBCM CONTROL HEALTHY CONTACT	NORMAL	FAILED	
TB3C-5/6	NDC BRK CBCM OVERLOAD OPERATION1	CBCM OVERLOAD OPERATION CONTACT	NORMAL	FAILED	
TB3C-7/8	DC SWGR GROUNDED STRUCTURE (64DY)	CONTACT FROM 64 RELAY	ALARM	NORMAL	
TB3C-9/10	SPARE				
TB3C-11	COMMON WIRE (-) IS CONNECTED TO EVEN NUMBERS				

- NOTES:
- INTERPOSING RELAYS 201C AND 201T WITH 125V DC COILS ARE REQUIRED FOR ALL BREAKER CONTROLS
 - USE EXTERNAL 125VDC CONTROL POWER SOURCE FOR THE INTERPOSING RELAYS.
 - FOR BREAKER OPEN STATUS INDICATION, A BREAKER MOC "b" CONTACT IS CONNECTED IN SERIES WITH A BREAKER TOC "a" CONTACT.
 - FOR BREAKER CLOSED STATUS INDICATION, A BREAKER MOC "a" CONTACT IS CONNECTED IN SERIES WITH A BREAKER TOC "b" CONTACT.
- NOTES:
- CONTACTS ON DRAWING ARE SHOWN FOR INFORMATION ONLY. REFER TO TABLE FOR THE CORRECT CONTACT TO USE FOR STATUS INDICATIONS.
 - CBCM IS FOR BREAKER WITH MICROPROCESSOR BASED CONTROLLER.
 - FOR LOCATIONS WITH DTS, SEPARATE CONTACTS SHALL BE PROVIDED FOR DTS SYSTEM. DTS AND DIO SHALL OPERATE IN PARALLEL.
 - USE SWITCHGEAR 125VDC CONTROL VOLTAGE FOR DIO ACCEPTING 125VDC WETTING VOLTAGE.
 - USE INTERNAL DIO 24VDC FOR DIO ACCEPTING 24VDC WETTING VOLTAGE.



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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
 CENI - POWER SYSTEMS ENGINEERING

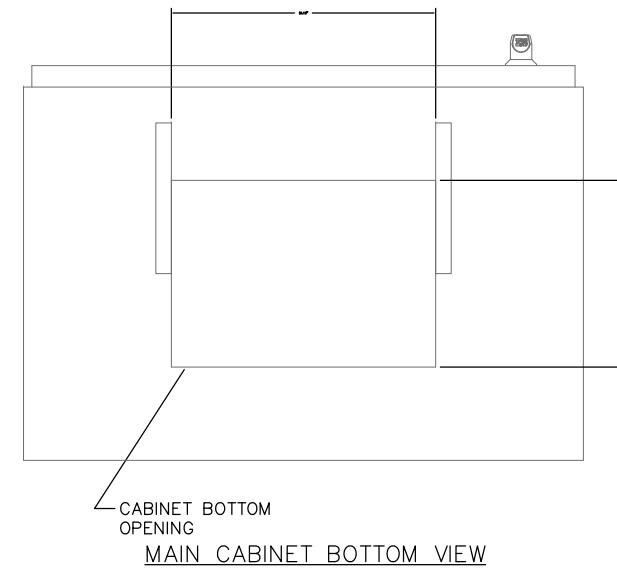
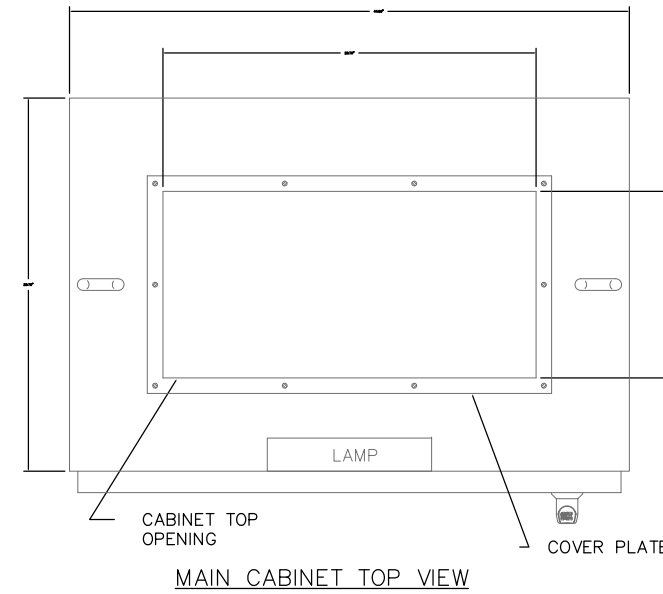
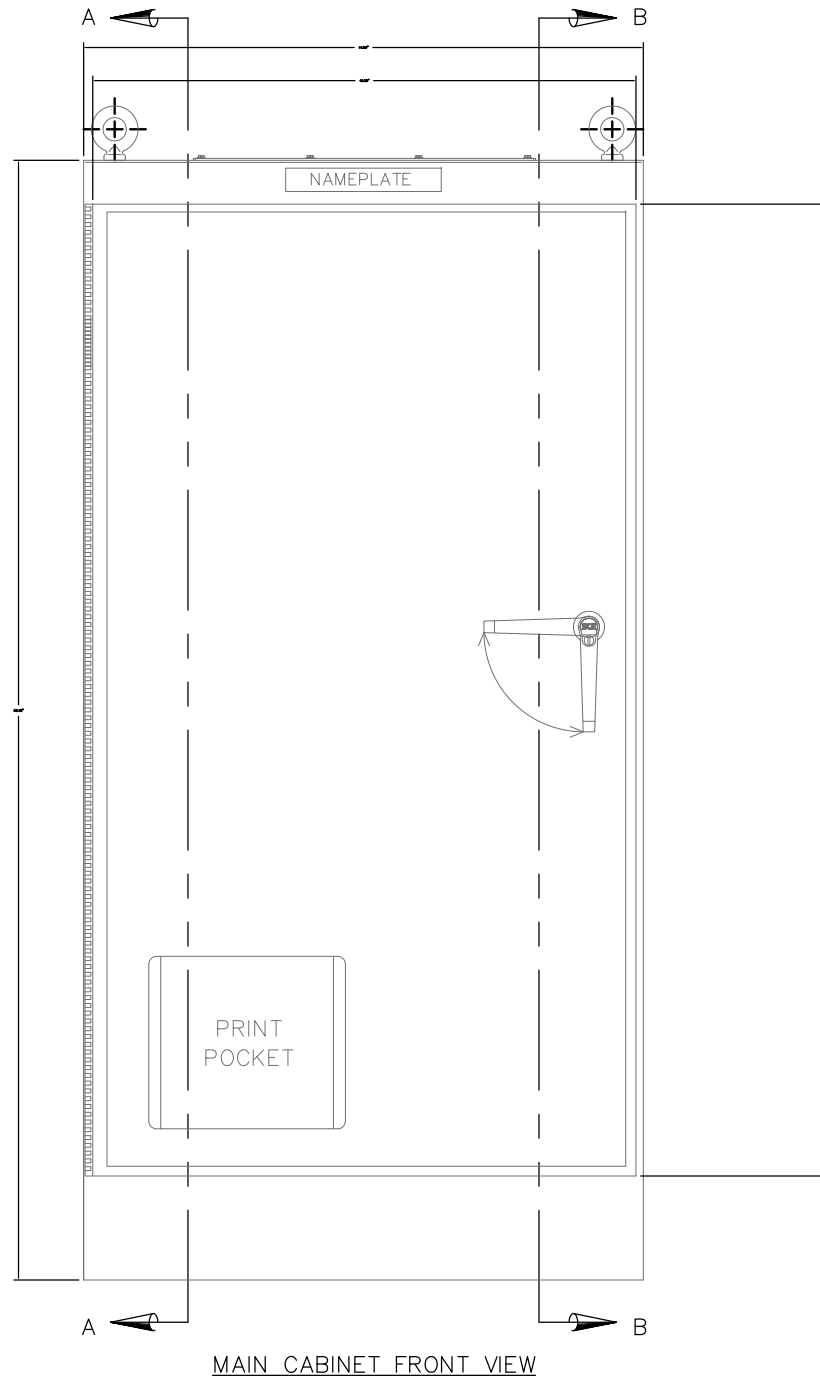
REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

TYPICAL DC BREAKER DIO CONTROL SCHEMATIC

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-009	SHEET NO. 9 OF 29
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Typical Bill of Materials (BOM)				
REF	Description	Function	Purpose	Qty
TB1 1-2-3	DIN-Rail Terminal Blocks M 6/8 (8 mm)	120 VAC Input Power	Connection points for 120 VAC input power	3
TB1 4-5-6	DIN-Rail Terminal Blocks M 6/8 (8 mm)	125 VDC Input Power	Connection points for 125 VDC input power	3
TB1 7-18	DIN-Rail Terminal Blocks M 6/8 (8 mm)	24 VDC Power Distribution	Connection points for 24 VDC power for cabinet	12
TB1 19-23	Phoenix (PT 5-HF-12DC-ST)	RS-485 Surge Suppression	Used to provide 3-wire surge suppression for all RS-485 wiring harness. Ground connected via DIN-Rail	5
TB2/TB3	Phoenix Terminal Blocks	Hardwire Connections - Status	Provides hardwire connection points for all 24 VDC status inputs (minimum Qty=32)	32
TB3 1-32	Phoenix Terminal Blocks	Hardwire Connections - Analogs (0-1ma)	Provides hardwire connection points for all 0-1ma analog inputs (minimum Qty=32)	32
TB4	Phoenix Terminal Blocks	Hardwire Connections - Controls	Provides hardwire connection points for all Control outputs (minimum Qty=16)	16
L/R	SPST Switch w/ Cover	Local/Remote Switch	Provides local control for 30 VDC control relay power is required	1
AC1	GFI Receptacle	AC Power	Distribution point for AC power for maintenance use	1
CB1	15 Amp Thermal Circuit Breaker	AC Power Control (AC)	Provides protection and control of 120 VAC input power	1
CB2	5 Amp Thermal Circuit Breaker	Main Power Control (DC)	Provides fusing, protection and control of 125 VDC input power	1
CB3	5 Amp Thermal Circuit Breaker	NS#1 Power Control (DC)	Provides fprotection and control of 125 VDC input power	1
CB4	5 Amp Thermal Circuit Breaker	NS#2 Power Control (DC)	Provides fprotection and control of 125 VDC input power	1
F1/F2	1 Amp Fuses	Keying Voltage	Provides fusing, of 125 VDC Status Keying Voltage as required	2
F3/F4	5 Amp Fuses	For Future HMI	Provides fusing, of 125 VDC Status Keying Voltage as required	2
G1/CB	Ground Block	Main Ground Connection	Provides anchor point for all grounding requirements	1
LAMP	Fluorescent Lamp	Main Illumination	Provides cabinet interior illumination for maintenance use	1
DO	Latching Relay Panel	Digital Control Outputs (16)	Provides Control Outputs rated for 10 Amps @ 240 VAC	1
DI	Module	Digital Status Inputs (24)	Accepts Status & Indication Inputs rated for 24 or 125VDC keying (minimum Qty=24)	1
AN	0-1ma or higher	Analog Inputs (16)	Accepts Analog Inputs rated as specified	1
PS1	Power Supply	DC-to-DC Converter	125 VDC Input to 24 VDC converter for cabinet electronics	1
PS2	Power Supply	AC-to-DC Converter	120 VAC Input to 24 VDC converter for cabinet electronics	1
F/O	F/O Box (SPH-OIP)	Patch Panel	Allow F/O cable terminations	1
IED-1	SCADA RTU	DATA CONCENTRATOR	Rack Mount Real-Time Automation Controller with Integrated HMI	1
IED-2	RTU I/O Module	I/O MODULE	Rack Mount Integrated, modular input/output (I/O) system	1



NOTES:

- CABINET MAXIMUM DIMENSIONS ARE 72"H x 36"W x 24" DEEP, NEMA 12, WITH HINGED AND LOCKABLE DOOR.
- CABINET MATERIAL: GALVANNEALED STEEL, 11 GA.
- CABINET FINISH:
WHITE EPOXY POLYESTER POWDER COATED INSIDE AND ANSI-61 HIGH SOLIDS RE-COATABLE GRAY FINISH OUTSIDE OVER PHOSPHATIZED SURFACES.
- ENTRY FOR FIELD CABLING IS THROUGH THE TOP.
- TBS TYPE RTU CABINET

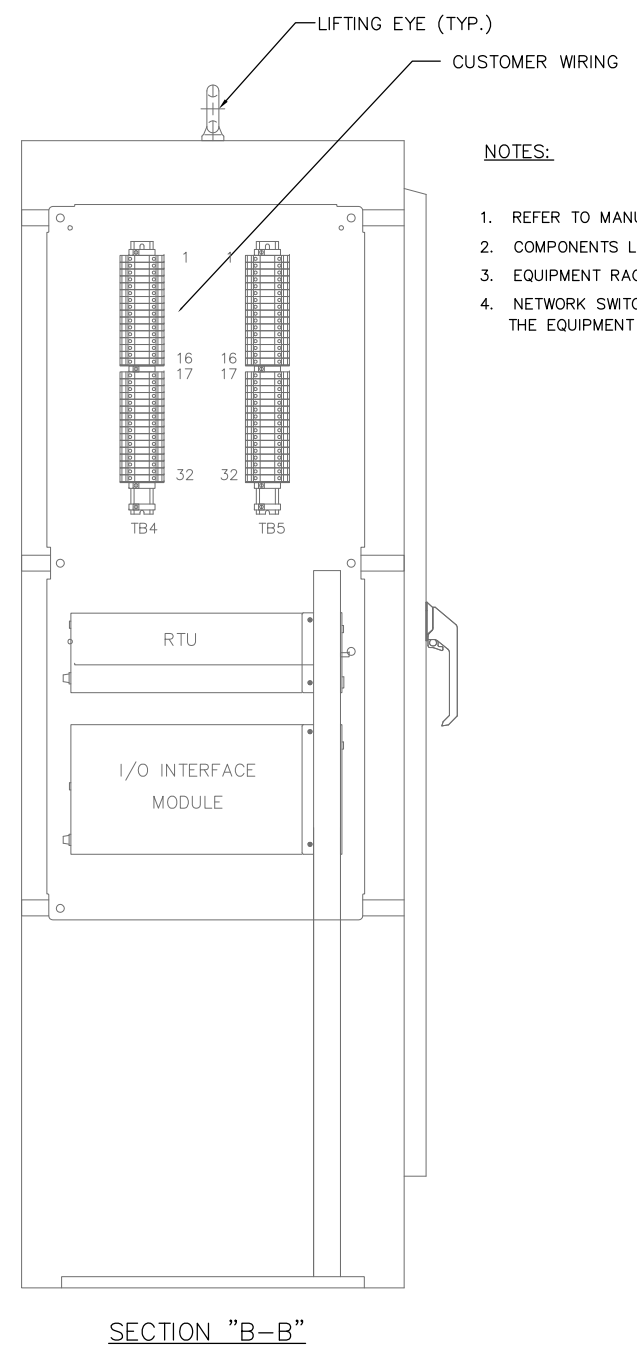
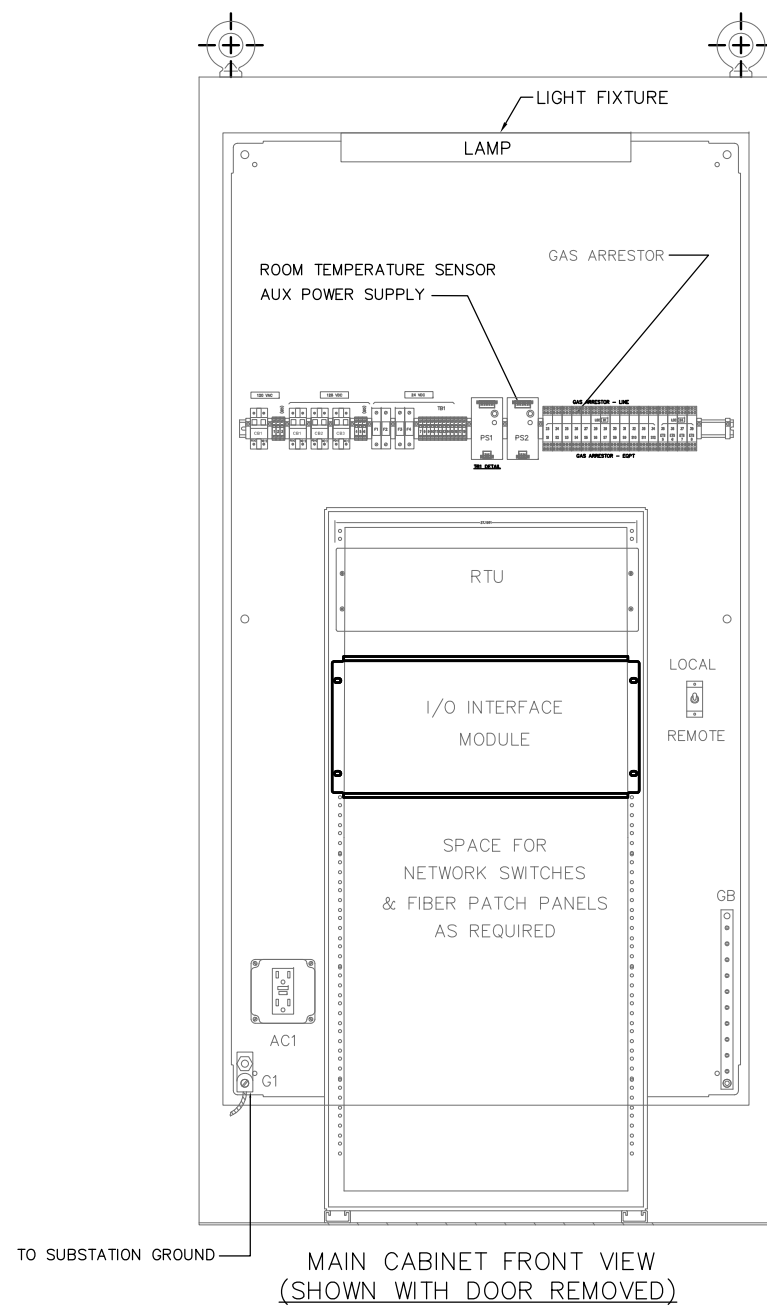
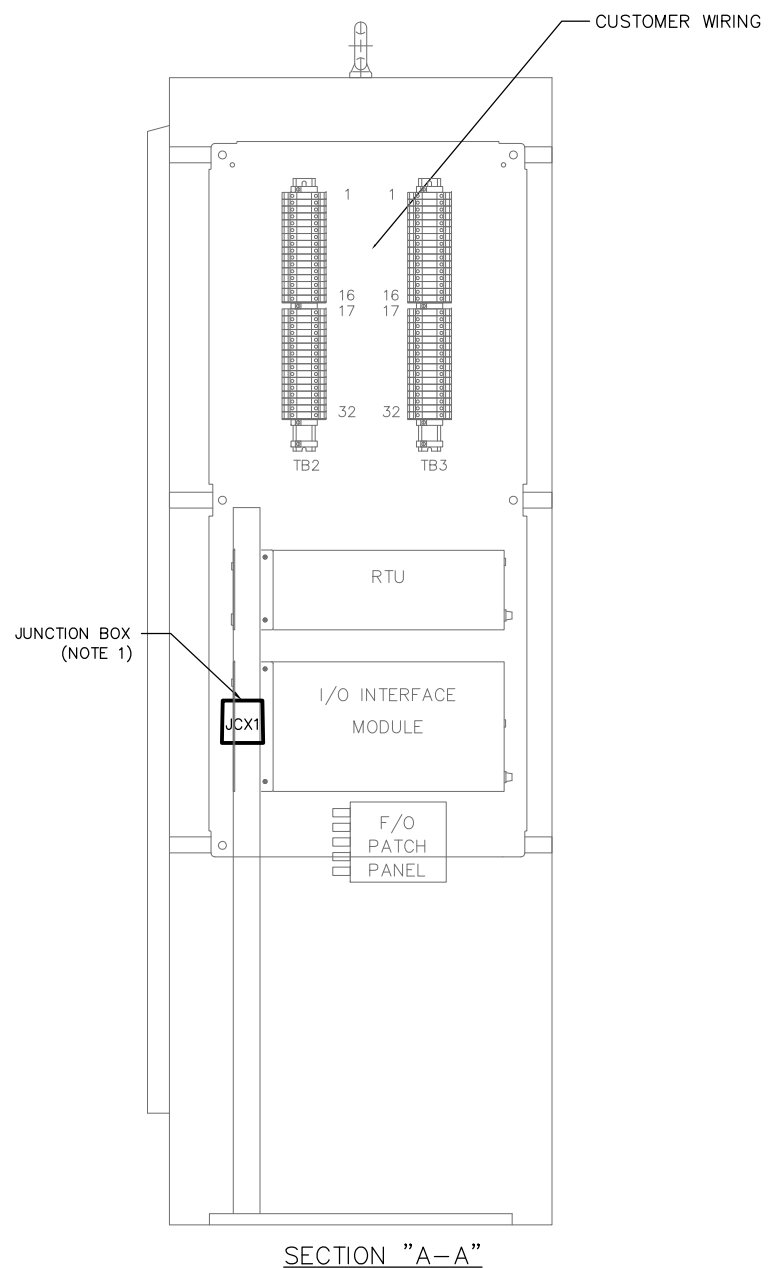


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LICENSE No. 39970
EXPIRATION DATE: 1/17/2017

-COMAR 09.23.03.10

DESIGNED _____ DATE _____	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS RTU CABINET LAYOUT - SHEET 1 OF 2				
	DRAWN _____ DATE _____	NUMBER	TITLE	DATE						NUM
CHECKED _____ DATE _____							CONTRACT NO.	SCALE	DRAWING NO.	SHEET NO.
							FQ15237	NONE	ST-SC-G-SSI-010	10 OF 29



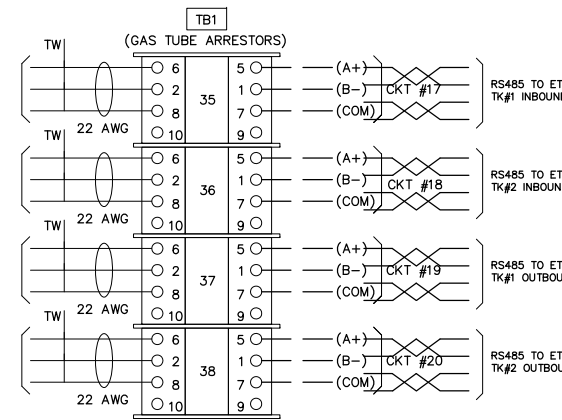
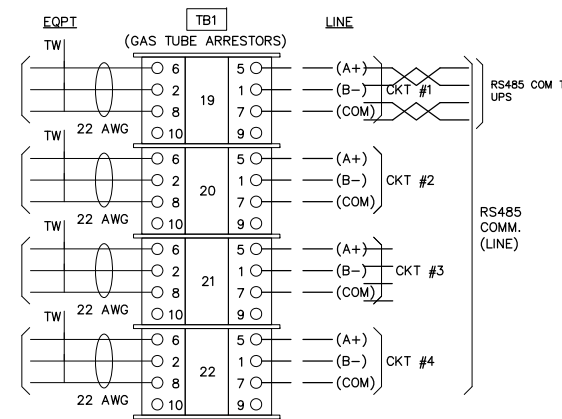
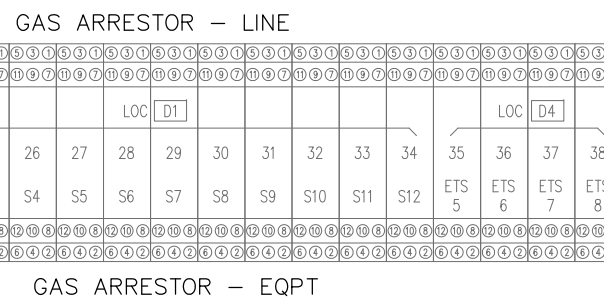
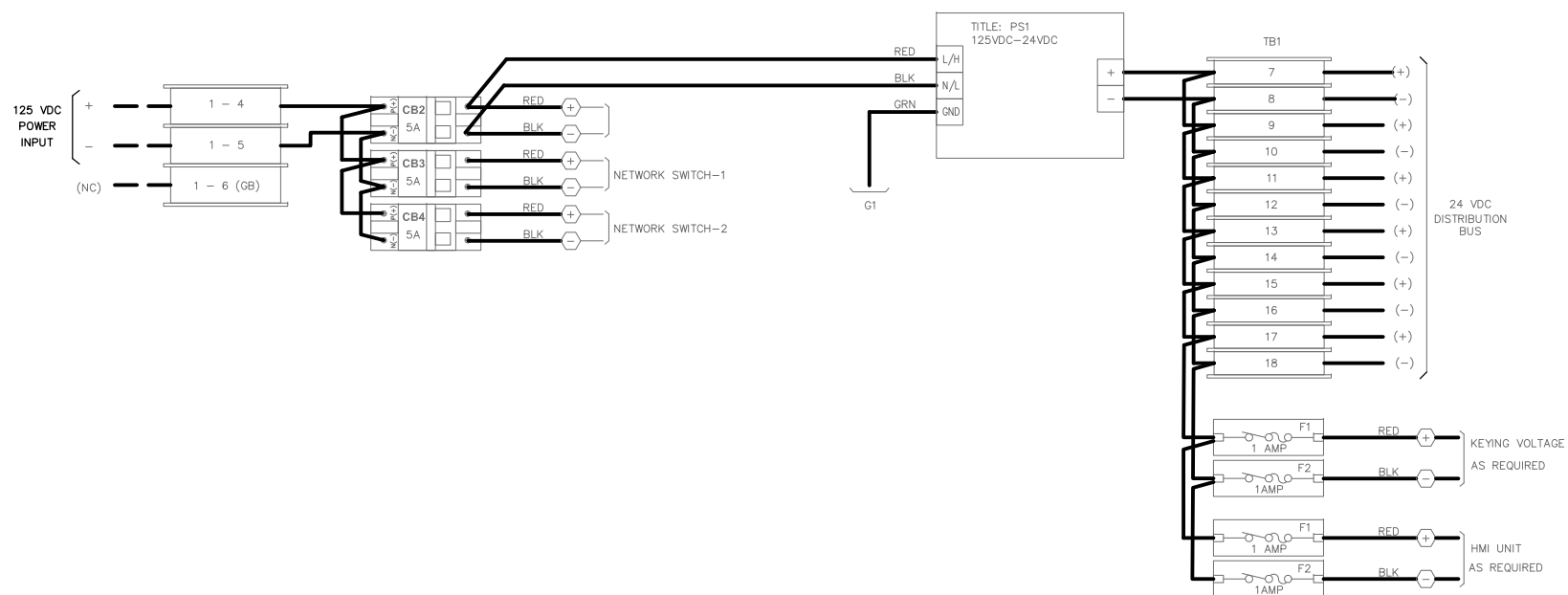
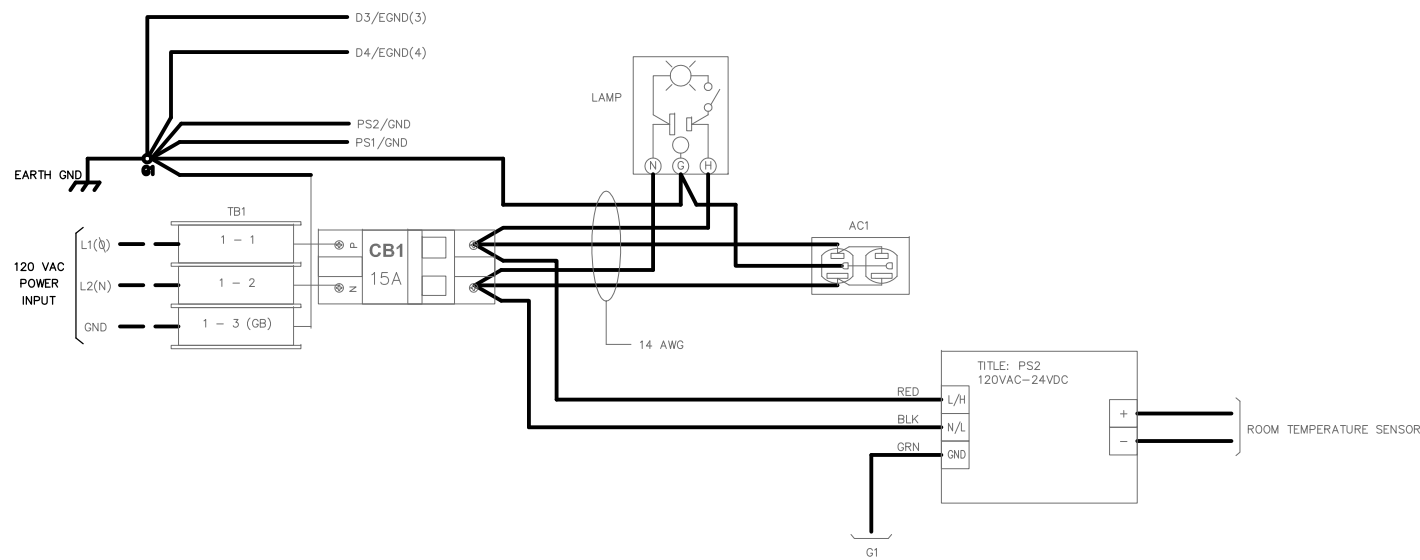
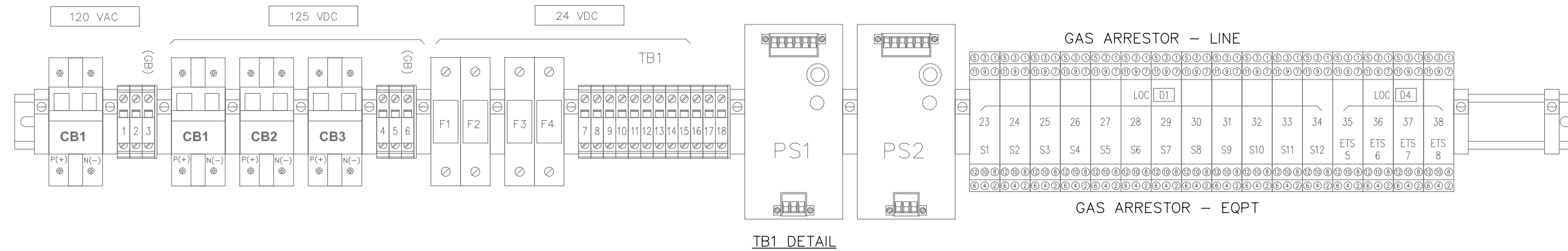
- NOTES:
1. REFER TO MANUFACTURER DRAWINGS FOR INTERCONNECTIONS .
 2. COMPONENTS LAYOUT IS FOR INFORMATION ONLY.
 3. EQUIPMENT RACK IS 19" WIDE, 46" HIGH WITH 25RU RACK OPENING 19".
 4. NETWORK SWITCHES AND FIBER PATCH PANELS ARE MOUNTED ON THE EQUIPMENT RACK.

STATE OF MARYLAND
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	DRAWN _____ DATE _____	NUMBER	TITLE	DATE		NUM	DESCRIPTION	CONTRACT NO. FQ15237	SCALE NONE
CHECKED _____ DATE _____						REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____ DEPUTY CHIEF ENGINEER			



NOTES:

1. INSTALL RS495 TERMINATION RESISTORS AS NEEDED
2. FIELD WIRING AND TERMINATIONS ARE REQUIRED.
3. REFER TO DRAWING 'RTU INTERCONNECTION DIAGRAM' FOR ADDITIONAL INFORMATION.
4. REFER TO DRAWING 'SCADA CONDUIT AND CABLE SCHEDULE' FOR EACH SITE FOR ADDITIONAL WIRING DETAILS.
5. PROVIDE SPARE CIRCUIT BREAKERS FOR NETWORK SWITCHES
6. PROVIDE 24VDC TO HMI MOUNTED ON RTU DOOR.



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JAJ	5/20/15				
PK	6/1/15				

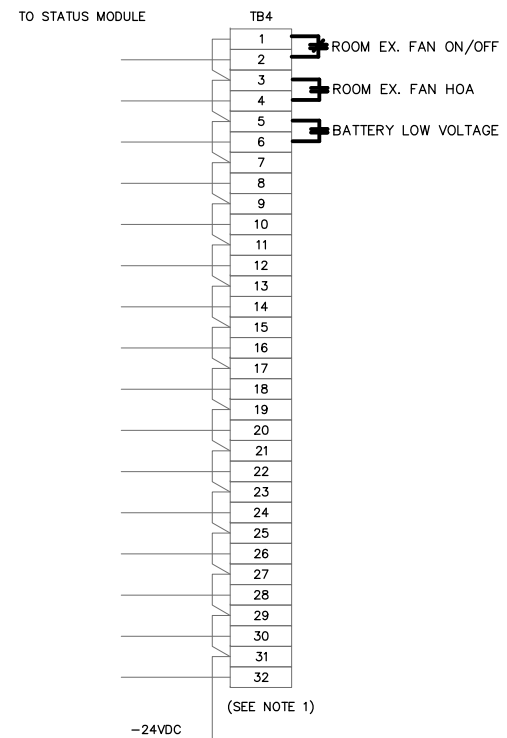
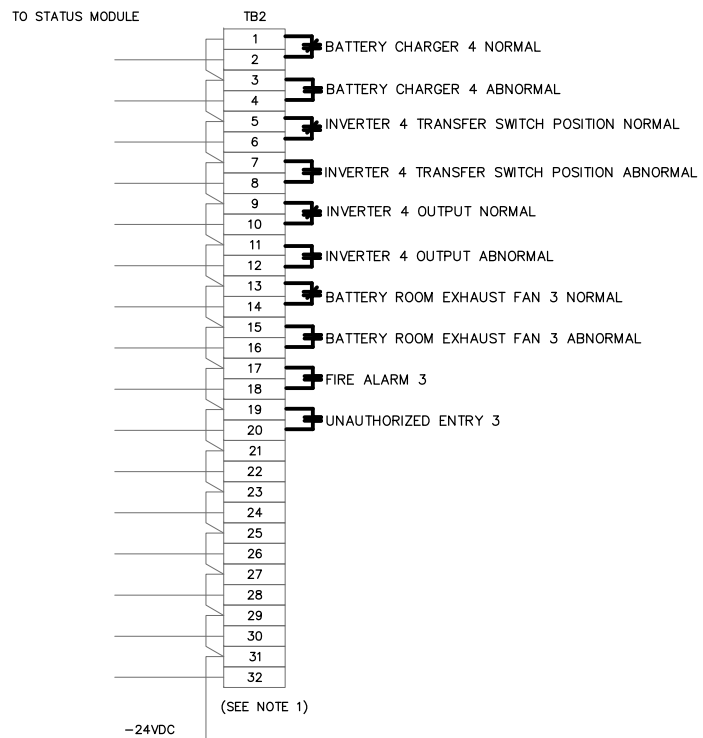
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CENI - POWER SYSTEMS ENGINEERING

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 DEPUTY CHIEF ENGINEER

SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

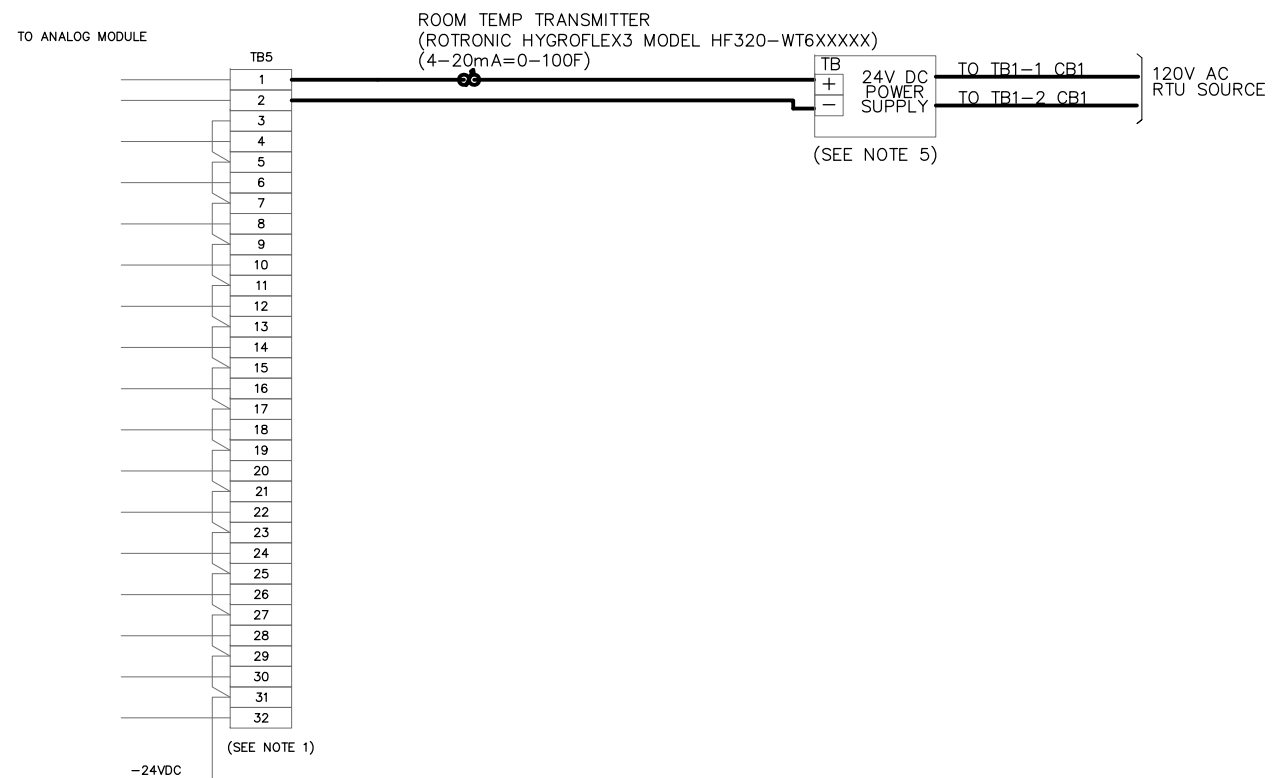
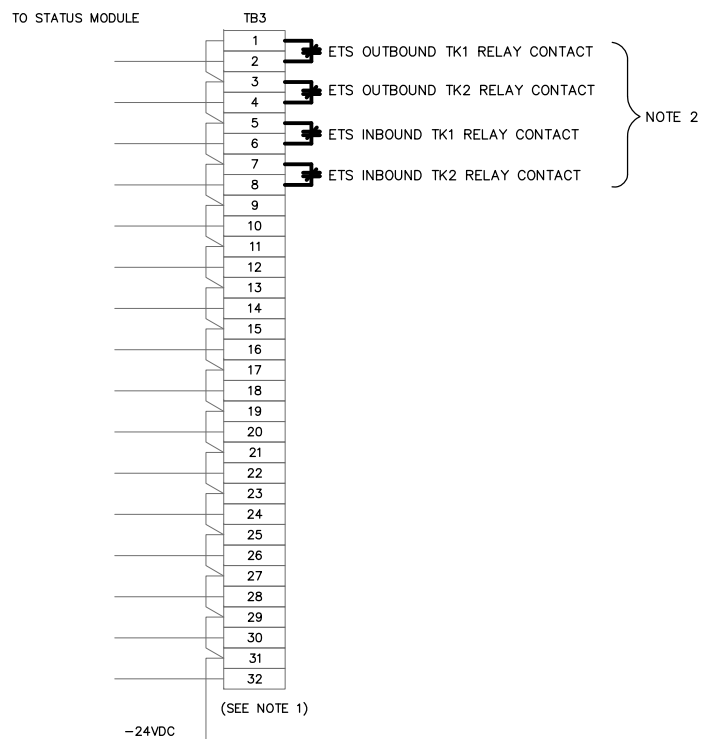
RTU CONTROL POWER

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-012	SHEET NO. 12 OF 29
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NOTES:

1. WIRING AND TERMINATIONS TO TERMINAL BLOCKS SHALL BE STANDARDIZED FOR EACH TYPE OF RTU.
2. REFER TO DRAWING 'TYPICAL ETS-RTU INTERCONNECTION DIAGRAM' FOR TERMINATION INSIDE ETS RELAY CABINET.
3. EXTERNAL +24 VDC KEYING VOLTAGE IS REQUIRED.
4. ALL CONTACTS ARE SHOWN IN THEIR NORMAL OPERATING STATES.
5. ROOM TEMPERATURE TRANSMITTER IS CONNECTED TO THE AUX POWER SUPPLY.



TYPICAL FIELD WIRING AND CONNECTIONS



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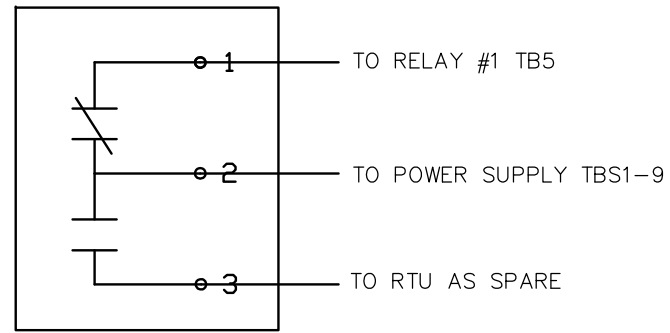
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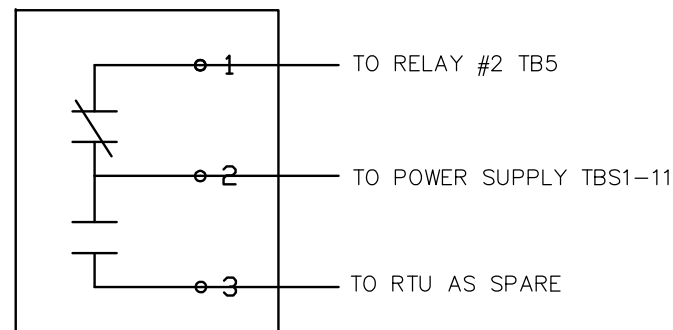
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DESIGNED	JAJ	4/4/15	DATE	REFERENCE DRAWINGS			REVISIONS			WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA RTU INTERCONNECTION DIAGRAM - SHEET 1 OF 2		
	DRAWN	JAJ		5/20/15	NUMBER	TITLE	DATE	NUM	DESCRIPTION				
CHECKED	PK	6/1/15	DATE							FQ15237	NONE	ST-SC-G-SSI-013	13 OF 29

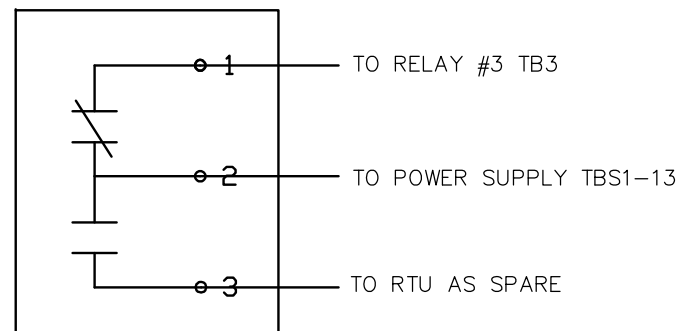
FORM C CONTACTS IN EQUIPMENTS



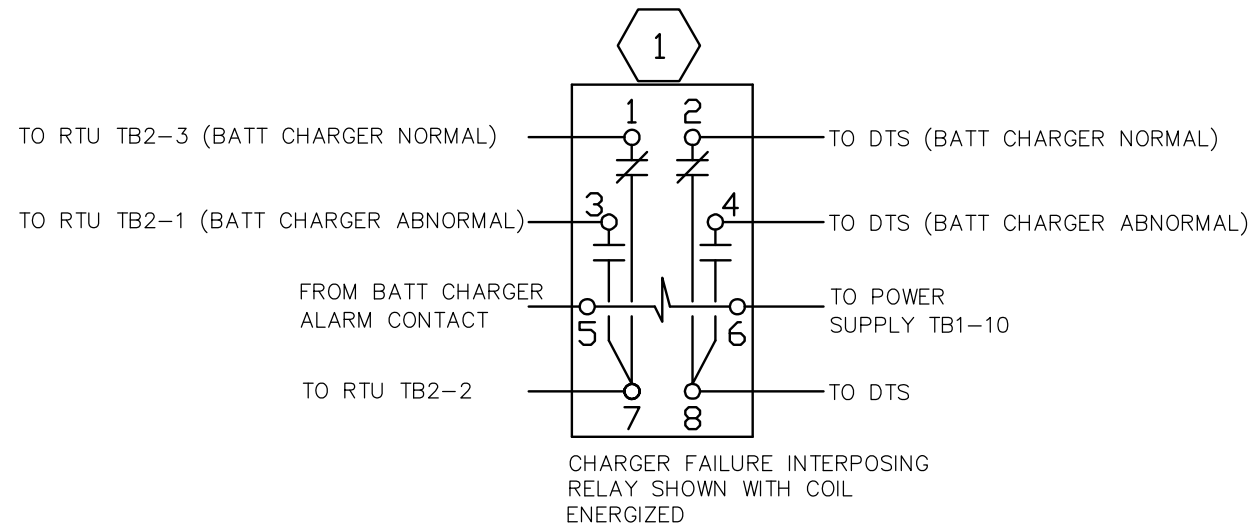
BATT CHARGER ALARM CONTACTS SHOWN IN NORMAL OPERATION STATE



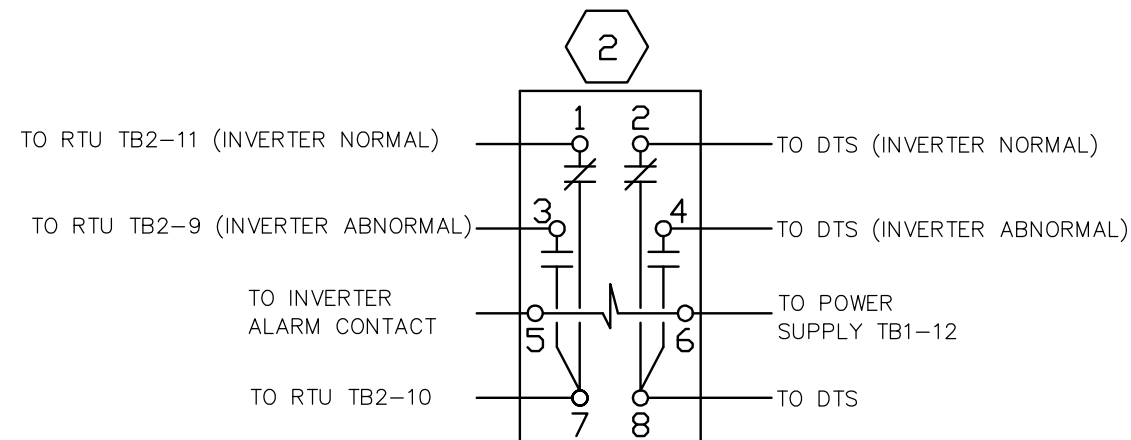
INVERTER FAILURE ALARM CONTACTS SHOWN IN NORMAL OPERATION STATE



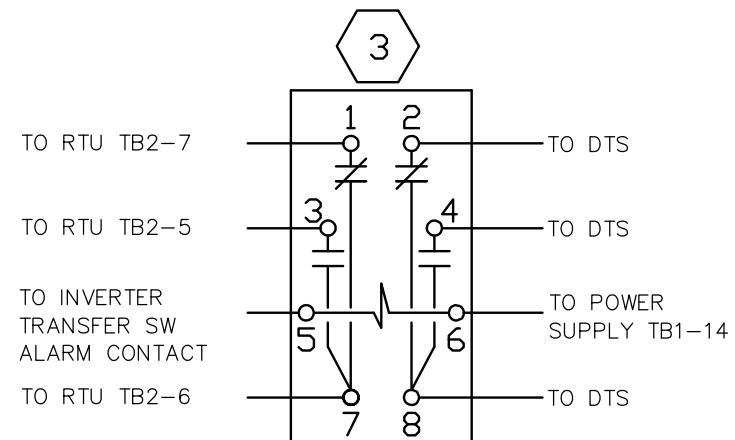
INVERTER TRANSFER SWITCH POSITION CONTACTS SHOWN IN NORMAL OPERATION STATE



CHARGER FAILURE INTERPOSING RELAY SHOWN WITH COIL ENERGIZED



INVERTER FAILURE INTERPOSING RELAY SHOWN WITH COIL ENERGIZED



INVERTER XFER SW INTERPOSING RELAY SHOWN WITH COIL ENERGIZED

NOTES:

- FOR LOCATIONS WHERE THE DTS SYSTEM IS TO REMAIN FUNCTIONAL, INTERPOSING RELAYS ARE USED TO PROVIDE ALARM SIGNALS TO BOTH THE DTS AND NEW RTU.
- NEW RTUs SHALL BE PROVIDED WITH FACTORY INSTALLED 24V DC INTERPOSING RELAYS.
- FOR OLDER RTUs, 24VDC INTERPOSING RELAYS SHALL BE FIELD INSTALLED.
- INTERPOSING RELAY COILS SHALL BE CONNECTED TO CLOSED ALARM CONTACTS, AND SHALL BE ENERGIZED IN NORMAL OPERATION.
- "ALARM NORMAL" INDICATION POINT FOR DTS AND RTU SHALL BE CONNECTED TO A NORMALLY CLOSED CONTACT WHEN THE SYSTEM IS IN NORMAL OPERATION.
- "ALARM ABNORMAL" INDICATION POINT FOR DTS AND RTU SHALL BE CONNECTED TO A NORMALLY OPEN CONTACT WHEN THE SYSTEM IS IN NORMAL OPERATION.

24VDC INTERPOSING RELAYS IN THE RTU CABINET



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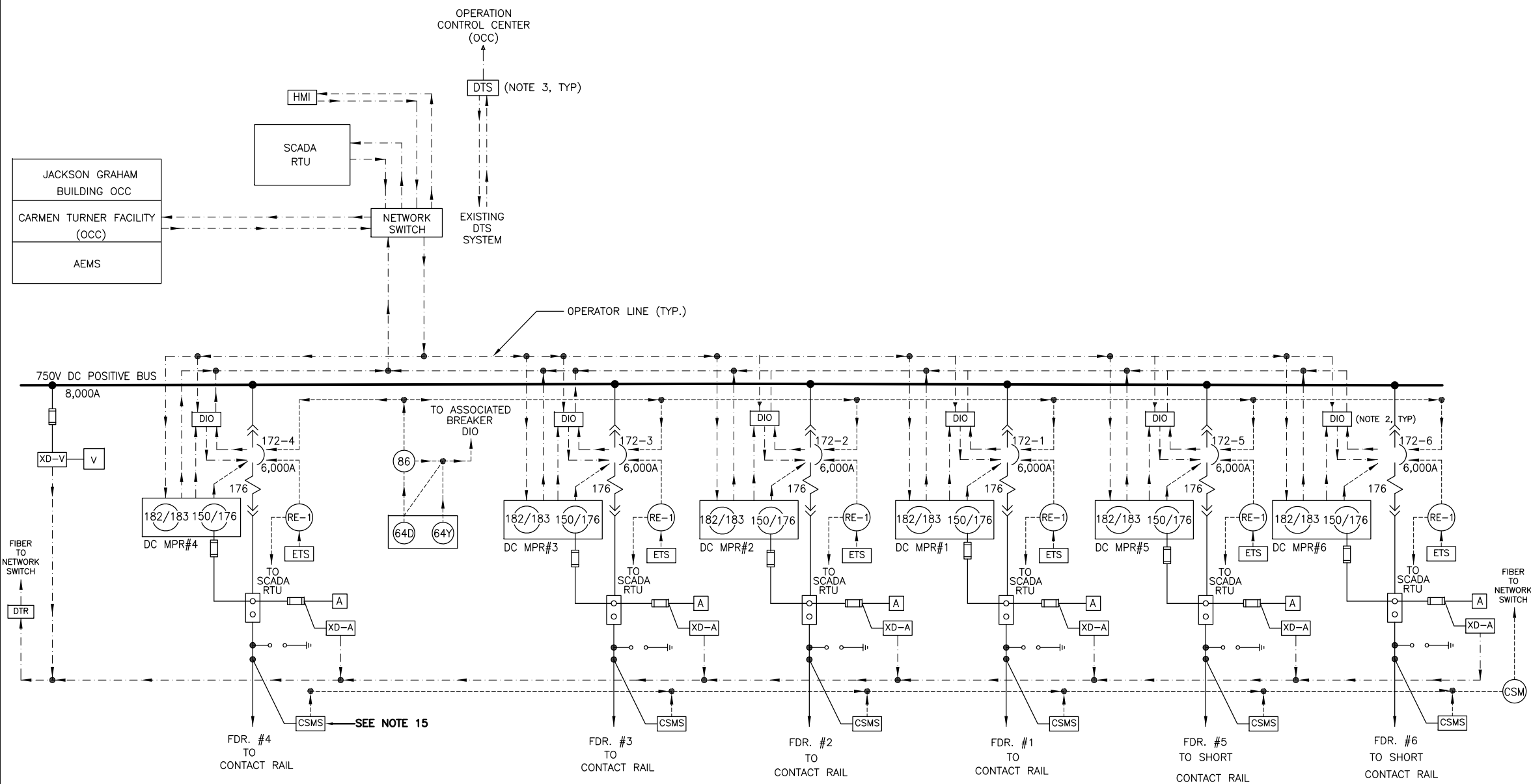
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 APPROVED: _____ DATE: _____
 DEPUTY CHIEF ENGINEER

SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA			
RTU INTERCONNECTION DIAGRAM - SHEET 2 OF 2			
CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-G-SSI-014	SHEET NO. 14 OF 29



LEGEND	
DEVICE	DESCRIPTION
A	AMMETER
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
ETS	EMERGENCY TRIP STATION AT TRACKSIDE
HMI	HUMAN MACHINE INTERFACE
RE-1	ETS AUXILIARY RELAY
V	VOLT METER
XD-A	CURRENT TRANSDUCER
XD-V	VOLTAGE TRANSDUCER
64D	DC SWGR. GRD. RELAY HOT STRUCTURE
64Y	DC SWGR. GRD. RELAY GRD. STRUCTURE
86	LOCK-OUT RELAY HAND RESET
172	DC AIR CKT. BKR.
176	DC BKR SERIES TRIP DEVICE
DC MPR	DC MULTI-PURPOSE PROTECTION RELAY
150/176	DC OVERCURRENT/RATE-OF-RISE RELAY
182/183	DC LOAD MEASURING/RECLOSEING RELAY
[Symbol]	FUSE
[Symbol]	SHUNT
[Symbol]	SURGE ARRESTER
[Symbol]	DISTIBUTED INPUT OUTPUT MODULE
[Symbol]	CABLE SHIELD MONITOR
[Symbol]	CABLE SHIELD MONITOR SENSOR
[Symbol]	DIGITAL TRACE RECORDER

- NOTES:**
- CONTROL VOLTAGE FOR ALL FEEDER BREAKERS IS INDIVIDUALLY FUSED 125VDC.
 - DIO CONTROL CONNECTIONS TO CIRCUIT BREAKERS REQUIRE INTERPOSING RELAYS
 - DTS CONTROL CONNECTIONS TO CIRCUIT BREAKERS REQUIRE INTERPOSING RELAYS.
 - DIO CONTROLS/INDICATIONS TO OPERATE IN PARALLEL WITH DTS CONTROLS/INDICATIONS.
 - ALL CIRCUIT BEAKERS ARE 6000A RATED.

TIE BREAKER STATION - ONE LINE DIAGRAM



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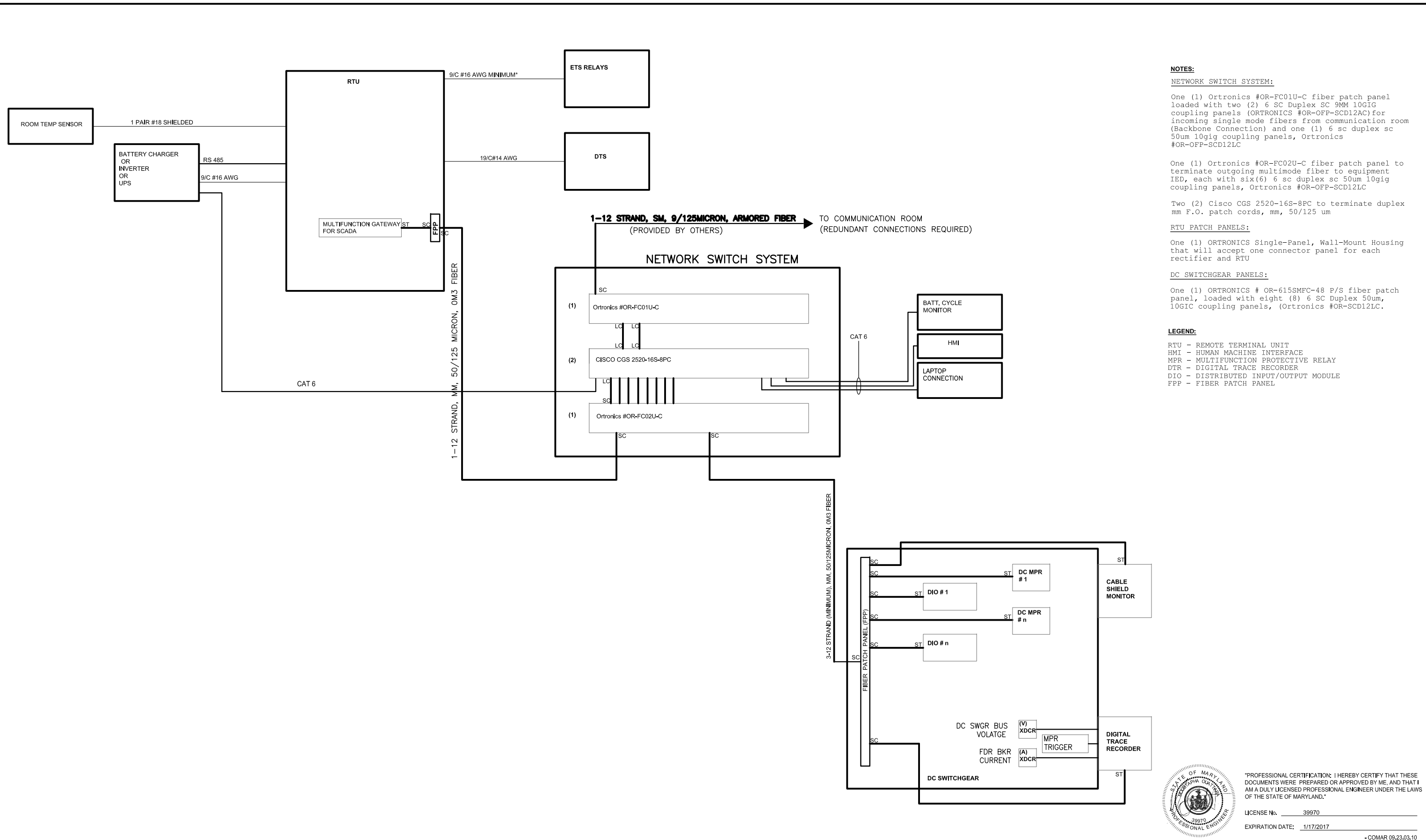
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SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA	
TIE BREAKER CONTROL AND SCHEMATIC DIAGRAM	
CONTRACT NO. FQ15237	SCALE NONE
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NOTES:

NETWORK SWITCH SYSTEM:

One (1) Ortronics #OR-FC01U-C fiber patch panel loaded with two (2) 6 SC Duplex SC 9MM 10GIG coupling panels (ORTRONICS #OR-OF-SCD12AC) for incoming single mode fibers from communication room (Backbone Connection) and one (1) 6 sc duplex sc 50um 10gig coupling panels, Ortronics #OR-OF-SCD12LC

One (1) Ortronics #OR-FC02U-C fiber patch panel to terminate outgoing multimode fiber to equipment IED, each with six(6) 6 sc duplex sc 50um 10gig coupling panels, Ortronics #OR-OF-SCD12LC

Two (2) Cisco CGS 2520-16S-8PC to terminate duplex mm F.O. patch cords, mm, 50/125 um

RTU PATCH PANELS:

One (1) ORTRONICS Single-Panel, Wall-Mount Housing that will accept one connector panel for each rectifier and RTU

DC SWITCHGEAR PANELS:

One (1) ORTRONICS # OR-615SMFC-48 P/S fiber patch panel, loaded with eight (8) 6 SC Duplex 50um, 10GIG coupling panels, (Ortronics #OR-SCD12LC.

LEGEND:

RTU - REMOTE TERMINAL UNIT
 HMI - HUMAN MACHINE INTERFACE
 MPR - MULTIFUNCTION PROTECTIVE RELAY
 DTR - DIGITAL TRACE RECORDER
 DIO - DISTRIBUTED INPUT/OUTPUT MODULE
 FPP - FIBER PATCH PANEL

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SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

TYPICAL TBS SCADA BLOCK DIAGRAM

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-201	SHEET NO. 16 OF 29
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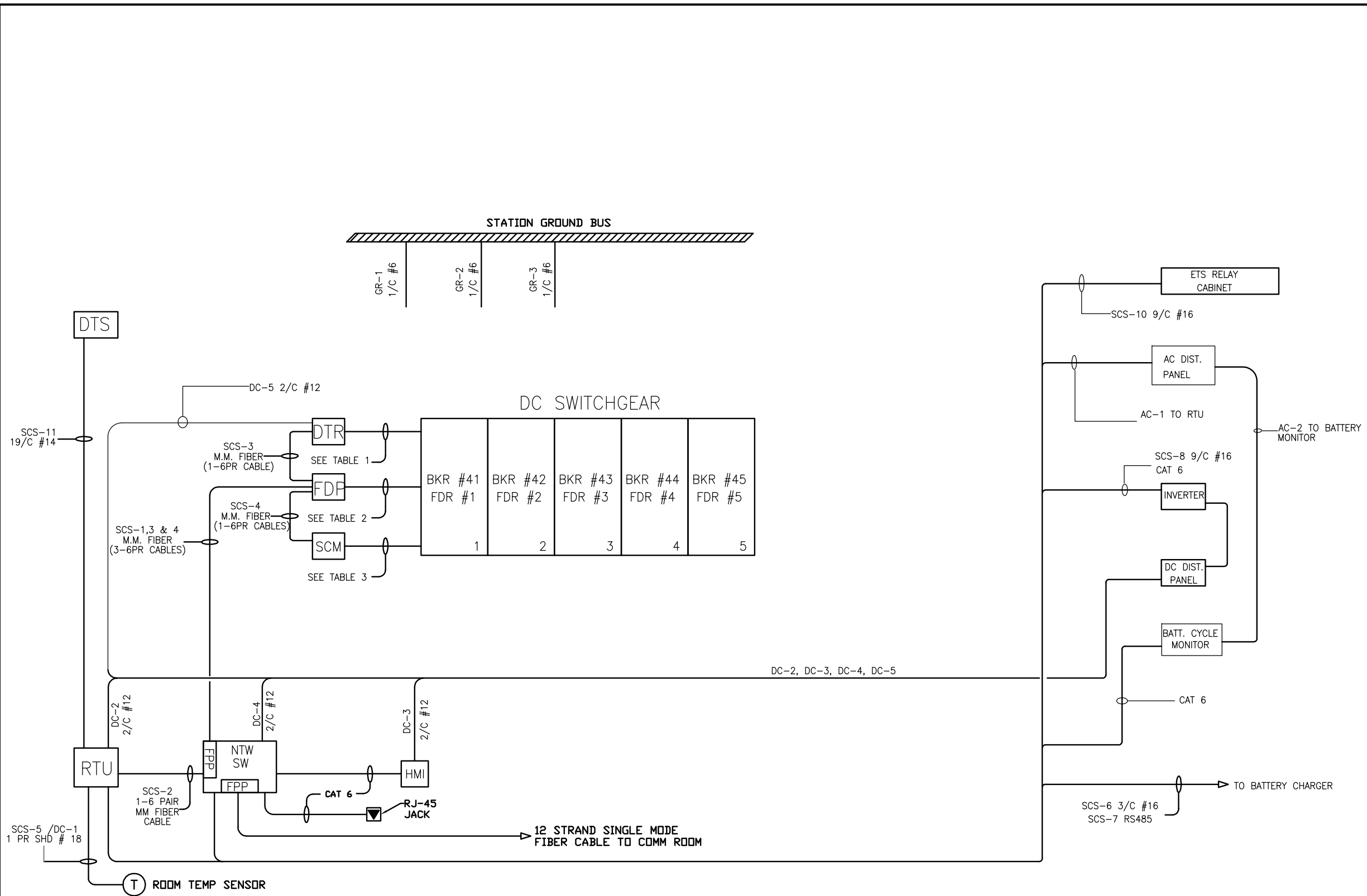


TABLE 1	
DC SWBD TO DTR, 2/C #16 TWP CABLES	
1.	BREAKER CURRENT TRANSDUCER (1 PER BREAKER)
2.	BREAKER MPR TRIGGER CONTACT (1 PER BREAKER)
3.	TRACK 1 - RAIL TO EARTH VOLTAGE TRANSDUCER
4.	TRACK 2 - RAIL TO EARTH VOLTAGE TRANSDUCER
5.	BUS VOLTAGE TRANSDUCER
6.	STRAY CURRENT TRANSDUCER (FUTURE)
7.	125VDC INPUT POWER (2/C #12)

TABLE 2	
DC SWBD TO FPP, MM FIBER PATCH CORDS	
1.	BREAKER MULTIFUNCTION RELAY (MPR) (1 PER BREAKER)
2.	BREAKER DISTRIBUTED I/O (DIO) (1 PER BREAKER)

TABLE 3		
	CIRCUIT	PANEL CB
RTU	DC-2	125V, 20A DC INPUT
	AC-2	120V, 20A AC
HMI	DC-3	125V, 20A DC INPUT
NTW	DC-4	125V, 20A DC INPUT
DTR	DC-5	125V, 20A DC INPUT
BCM		120V, 10A AC

RTU - REMOTE TERMINAL UNIT
 NTW SW - NETWORK SWITCH
 HMI - HUMAN MACHINE INTERFACE
 DTR - DIGITAL TRACE RECORDER
 DTS - DATA TRANSMISSION SYSTEM
 ETS - EMERGENCY TRIP SYSTEM
 FDP - FIBER DISTRIBUTION PANEL
 FPP - FIBER PATCH PANEL
 SCS - SUPERVISORY CONTROL CABLES SCADA

NOTE: CABLES SCS-11 TO BE TERMINATED AT BOTH ENDS BY WMATA



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REVISIONS		
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SIX (6) TIE BREAKER STATIONS UPGRADES
ORANGE AND BLUE LINES DC, MD AND VA

TYPICAL TBS SCADA CABLING DIAGRAM

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-202	SHEET NO. 17 OF 29
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TYPICAL TIE BREAKER STATION SCADA EQUIPMENT SCHEDULE

TIE BREAKER STATIONS	STATION ID	NETWORK SWITCH ASSEMBLY							COMM ROOM PATCH CORDS			TBS PATCH CORDS		TBS EQUIPMENT WITH SCADA CONNECTIONS					
		NETWORK SWITCH (NOTE 4)	NETWORK SWITCH ENCLOSURE (HOFFMAN'S ECL1207060P) (NOTE 2)	1R FIBER PATCH PANEL (OR-FC01U-C) (NOTE 2)	2R FIBER PATCH PANEL (OR-FC02U-C) (NOTE 2)	COUPLER PANEL MULTIMODE (SCD-12LC) (NOTE 2)	COUPLER PANEL SINGLEMODE (SCD-12AC) (NOTE 2)	POWER DISC. SWITCH FOR NET. SW (NOTE 2)	SC TO SC SM DUPLEX 1M (N2)	SC TO SC SM DUPLEX 5M (N2)	SC TO SC OM3 DUPLEX 2M (N2)	LC TO SC SM DUPLEX 2M (N2)	LC TO SC OM3 DUPLEX 2M (N2)	RTU (NOTE 2)	HMI (NOTE 2)	POS DTR (NOTE 3)	DIO FOR DC SWITCHGEAR (NOTE 3)	COMM CABLE TRAY (NOTE 2)	CABLE SHIELD MONITOR (NOTE 3)
GREENWICH ST	K06TB2	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	4	AS REQUIRED	1
OGDEN ST	K07TB1	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	4	AS REQUIRED	1
PROSPERITY AVE	K07TB2	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	4	AS REQUIRED	1
BENNING BOARD	G01TB1	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	5	AS REQUIRED	1
56TH PLACE	G02TB1	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	4	AS REQUIRED	1
67TH AVE	G02TB2	2	0	1	1	7	2	2	1	1	1	2	20	1	1	1	4	AS REQUIRED	1

NOTE 1: EQUIPMENT FURNISHED BY WMATA FOR INSTALLATION BY CONTRACTOR
 NOTE 2: EQUIPMENT FURNISHED AND INSTALLED BY CONTRACTOR
 NOTE 3: EQUIPMENT FURNISHED WITH DC SWITCHGEAR.
 NOTE 4: EQUIPMENT FURNISHED AND INSTALLED BY WMATA

TYPICAL TIE BREAKER STATION SCADA EQUIPMENT SCHEDULE

TIE BREAKER STATIONS	STATION ID	DC SWITCHGEAR FIBER PRODUCTS							MISCELLANEOUS				
		DC SWG FIBER PATCH PANEL (OR-615SMFC-48P/S) (NOTE 2)	COUPLER PANEL (OR-SCD12LC) (NOTE 2)	PATCH CORDS 1ST TO SC OM3 DUPLEX 2M AC & DC SWG (NOTE 2)	MULTIMODE FIBER INSIDE TBS (NOTE 2)	10/100 BASE-T CAT-6 CABLE (NOTE 2)	BATTERY MONITOR (NOTE 2)	ROOM TEMP SENSOR (NOTE 2)	RELAY IDEC TYPE RR2BA-UDC24V	RELAY SOCKET IDEC SR3B-05	SINGLEMODE FIBER TO COMM ROOM (NOTE 2)		
GREENWICH ST	K06TB2	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0	REQUIRED		
OGDEN ST	K07TB1	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0			
PROSPERITY AVE	K07TB2	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0			
BENNING BOARD	G01TB1	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0	REQUIRED		
56TH PLACE	G02TB1	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0			
67TH AVE	G02TB2	1	8	25	AS REQUIRED	AS REQUIRED	1	1	0	0			



PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
 LICENSE No. 39970
 EXPIRATION DATE: 1/17/2017

-COMAR 09.23.03.10

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 metro
 DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
 CENI - POWER SYSTEMS ENGINEERING

REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

**SIX (6) TIE BREAKER STATIONS UPGRADES
 ORANGE AND BLUE LINES DC, MD AND VA**

TBS SCADA EQUIPMENT SCHEDULE

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-203	SHEET NO. 18 OF 29
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DESIGNED	DATE	REFERENCE DRAWINGS		REVISIONS	
		NUMBER	TITLE	DATE	DESCRIPTION
JAJ	4/4/15				
JAJ	5/20/15				
PK	6/1/15				

TBS: BENNING RD (G01)				EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT	TBS: GREENWICH ST (K06TBS2)				EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT						
EQUIPMENT: DC SWITCHGEAR							EQUIPMENT: DC SWITCHGEAR												
DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS		10	3-12 COUNT	15	DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS		8	3-12 COUNT	13						
		DIO	DC MPR											DIO	DC MPR				
E-G01TB-41	FEEDER BREAKER	YES	YES							E-K06TBS2-61				FEEDER BREAKER	YES	YES			
E-G01TB-42	FEEDER BREAKER	YES	YES							E-K06TBS2-62				FEEDER BREAKER	YES	YES			
E-G01TB-43	FEEDER BREAKER	YES	YES							E-K06TBS2-63				FEEDER BREAKER	YES	YES			
E-G01TB-44	FEEDER BREAKER	YES	YES							E-K06TBS2-64				FEEDER BREAKER	YES	YES			
E-G01TB-46	FEEDER BREAKER	YES	YES																
EQUIPMENT: SHIELDED CABLE MONITOR							EQUIPMENT: SHIELDED CABLE MONITOR												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1			EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1								
SCM	SHIELDED CABLE MONITOR	SCM								SCM				SHIELDED CABLE MONITOR	SCM				
YES							YES												
EQUIPMENT: DIGITAL TRACE RECORDER							EQUIPMENT: DIGITAL TRACE RECORDER												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1			EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1								
DTR-1	POSITIVE DIGITAL TRACE RECORDER	DTR								DTR-1				POSITIVE DIGITAL TRACE RECORDER	DTR				
YES							YES												
EQUIPMENT: RTU							EQUIPMENT: RTU												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		3	1-12 COUNT		EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		3	1-12 COUNT							
RTU	NEW SUBSTATION SCADA RTU	SCADA CONCENTRATOR	YES							RTU				NEW SUBSTATION SCADA RTU	SCADA CONCENTRATOR	YES			
		ETS CONCENTRATOR	YES												ETS CONCENTRATOR	YES			
		TERMINAL SERVER	YES												TERMINAL SERVER	YES			
TBS: OGDEN ST (K07TBS1)				EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT	TBS: PROSPERITY AVE (K07TBS2)				EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT						
EQUIPMENT: DC SWITCHGEAR							EQUIPMENT: DC SWITCHGEAR												
DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS		8	3-12 COUNT	13	DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS		8	3-12 COUNT	13						
		DIO	DC MPR											DIO	DC MPR				
E-K07TB-41	FEEDER BREAKER	YES	YES							E-K07TBS2-61				FEEDER BREAKER	YES	YES			
E-K07TB-42	FEEDER BREAKER	YES	YES							E-K07TBS2-62				FEEDER BREAKER	YES	YES			
E-K07TB-43	FEEDER BREAKER	YES	YES							E-K07TBS2-63				FEEDER BREAKER	YES	YES			
E-K07TB-44	FEEDER BREAKER	YES	YES				E-K07TBS2-64	FEEDER BREAKER	YES	YES									
EQUIPMENT: SHIELDED CABLE MONITOR							EQUIPMENT: SHIELDED CABLE MONITOR												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1			EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1								
SCM	SHIELDED CABLE MONITOR	SCM								SCM				SHIELDED CABLE MONITOR	SCM				
YES							YES												
EQUIPMENT: DIGITAL TRACE RECORDER							EQUIPMENT: DIGITAL TRACE RECORDER												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1			EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		1								
DTR-1	POSITIVE DIGITAL TRACE RECORDER	DTR								DTR-1				POSITIVE DIGITAL TRACE RECORDER	DTR				
YES							YES												
EQUIPMENT: RTU							EQUIPMENT: RTU												
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		3	1-12 COUNT		EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS		3	1-12 COUNT							
RTU	NEW SUBSTATION SCADA RTU	SCADA CONCENTRATOR	YES							RTU				NEW SUBSTATION SCADA RTU	SCADA CONCENTRATOR	YES			
		ETS CONCENTRATOR	YES												ETS CONCENTRATOR	YES			
		TERMINAL SERVER	YES												TERMINAL SERVER	YES			

NOTES:
1. FOR TYPE OF FIBER JUMPER AND FIBER CABLE NEEDED FOR EACH EQUIPMENT, REFER TO 'TYP.TBS FIBER CABLE TERM. SCHED SHEETS'



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LICENSE No. 39970
EXPIRATION DATE: 1/17/2017
-COMAR 09.23.03.10

DESIGNED	JAJ	4/4/15	DATE	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING				SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TBS FIBER CONNECTION POINTS SUMMARY SHEET 1 OF 2			
DRAWN	JAJ	5/20/15	DATE	NUMBER	TITLE	DATE	NUM								
CHECKED	PK	6/1/15	DATE						FQ15237	NONE	ST-SC-TB-SSI-204	19 OF 29			
								REVISION SUBMITTED	DATE	APPROVED	DATE				
										DEPUTY CHIEF ENGINEER					

TBS: 56TH PLACE (G02TBS1)					TBS: 67TH AVE (G02TBS2)										
EQUIPMENT: DC SWITCHGEAR					EQUIPMENT: DC SWITCHGEAR										
DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS			EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT	DC BKR SUP. CON. ID	DESCRIPTION	CONNECTION POINTS			EQUIP. SIDE DUPLEX MM, FIBER JUMPER COUNT	MULTIMODE FIBER CABLE REQUIREMENT	NET. SWITCH SIDE DUPLEX MM, FIBER JUMPER COUNT
		DIO	DC MPR							DIO	DC MPR				
E-G02TB-41	FEEDER BREAKER	YES	YES		8	3-12 COUNT	15	E-G02TBS2-61	FEEDER BREAKER	YES	YES		8	3-12 COUNT	13
E-G02TB-42	FEEDER BREAKER	YES	YES					E-G02TBS2-62	FEEDER BREAKER	YES	YES				
E-G02TB-43	FEEDER BREAKER	YES	YES					E-G02TBS2-63	FEEDER BREAKER	YES	YES				
E-G02TB-44	FEEDER BREAKER	YES	YES					E-G02TBS2-64	FEEDER BREAKER	YES	YES				
EQUIPMENT: SHIELDED CABLE MONITOR					EQUIPMENT: SHIELDED CABLE MONITOR										
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS			1	EQUIPMENT ID		DESCRIPTION	CONNECTION POINTS			1			
		SCM							SCM						
SCM	SHIELDED CABLE MONITOR	YES			SCM	SHIELDED CABLE MONITOR		YES							
EQUIPMENT: DIGITAL TRACE RECORDER					EQUIPMENT: DIGITAL TRACE RECORDER										
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS			1	EQUIPMENT ID		DESCRIPTION	CONNECTION POINTS			1			
		DTR							DTR						
DTR-1	POSITIVE DIGITAL TRACE RECORDER	YES			DTR-1	POSITIVE DIGITAL TRACE RECORDER		YES							
EQUIPMENT: RTU					EQUIPMENT: RTU										
EQUIPMENT ID	DESCRIPTION	CONNECTION POINTS			3	EQUIPMENT ID		DESCRIPTION	CONNECTION POINTS			3			
		SCADA CONCENTRATOR	ETS CONCENTRATOR	TERMINAL SERVER					YES	SCADA CONCENTRATOR	ETS CONCENTRATOR		TERMINAL SERVER	YES	
RTU	NEW SUBSTATION SCADA RTU	YES	YES	YES	RTU	NEW SUBSTATION SCADA RTU	YES	YES	YES						

NOTES:
1. FOR TYPE OF FIBER JUMPER AND FIBER CABLE NEEDED FOR EACH EQUIPMENT, REFER TO 'TYP.TBS FIBER CABLE TERM. SCHED SHEETS'



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DRAWN	JAJ	5/20/15	DATE	NUMBER	TITLE	DATE	NUM	DESCRIPTION	CONTRACT NO.	SCALE	DRAWING NO.								
CHECKED	PK	6/1/15	DATE						FQ15237	NONE	ST-SC-TB-SSI-205	20 OF 29							
								REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____ DEPUTY CHIEF ENGINEER											

ABBREVIATIONS
 AC - ALTERNATING CURRENT
 DC - DIRECT CURRENT
 GR - GROUNDING
 PR - PAIR
 SCS - SUPERVISORY CONTROL SCADA
 SHD - SHIELDED

NUMBER	CONSTRUCT.	SIZE (AWG)	INSULATION		VOLTAGE (V)	A.C. OR D.C.	COND. SIZE	SPARE COND.	ROUTING				REV. NO.
			VOLTAGE	TYPE					FROM	VIA	TO	FOR	
SCS-1	3-12 STRAND MM, FIBER	50/125μ	-	-	-		3/4"	0	D.C. SWITCHGEAR FDP	CONDUIT AND COMM. CABLE TRAY	NETWORK SWITCH FPP	SCADA MONITORING	0
SCS-2	1-12 STRAND MM, FIBER		-	-	-		3/4"	0	RTU	CONDUIT AND COMM. CABLE TRAY	NETWORK SWITCH FPP		0
SCS-3	1-12 STRAND MM, FIBER		-	-	-		3/4"	0	DTR	CONDUIT AND COMM. CABLE TRAY	NETWORK SWITCH FPP		0
SCS-4	1-12 STRAND MM, FIBER		-	-	-		3/4"	0	SHIELDED CABLE MONITOR	CONDUIT AND COMM. CABLE TRAY	NETWORK SWITCH FPP		0
SCS-5	1 PR SHD	#18	300V	75°C	24	DC	3/4"	0	ROOM TEMPERATURE SENSOR	CONDUIT/ CABLE TRAY	RTU		0
SCS-6	3/C	#16	300V	75°C	125	DC	3/4"	0	BATTERY CHARGER	CONDUIT/ CABLE TRAY	RTU		0
SCS-7	2 PR SHD (RS-485)	#22	300V	75°C	-		3/4"	0					0
SCS-8	9/C	#16	300V	75°C	125	DC	3/4"	0	INVERTER	CONDUIT/ CABLE TRAY	RTU		0
SCS-9	CAT 6	-	-	-	-		3/4"	0	INVERTER	CONDUIT/ CABLE TRAY	NETWORK SWITCH		0
SCS-10	9/C	#16	300V	75°C	24	DC	3/4"	0	ETS RELAY CABINET	CONDUIT/ CABLE TRAY	RTU		0
SCS-11	19/C	#14	300V	75°C	24	DC	1"	0	DTS	CONDUIT/ CABLE TRAY	RTU		0
SCS-12	CAT 6	-	-	-	-		3/4"	0	BATTERY CYCLE MON.	CONDUIT	NETWORK SWITCH		0
AC-1	2/C	#12	600V	75°C	120	AC	3/4"	0	AC PANEL	CONDUIT	RTU	POWER	0
AC-2	2/C	#12	600V	75°C	120	AC	3/4"	0	AC PANEL	CONDUIT	BATTERY CYCLE MON.	POWER	0
DC-1	2/C	#14	600V	75°C	24	DC	3/4"	0	RTU POWER SUPPLY	CONDUIT	ROOM TEMPERATURE SENSOR	POWER	0
DC-2	2/C	#12	600V	75°C	125	DC	3/4"	0	DC PANEL	CONDUIT	RTU	POWER	0
DC-3	2/C	#12	600V	75°C		DC	3/4"	0	DC PANEL	CONDUIT	HMI	POWER	0
DC-4	2/C	#12	600V	75°C		DC	3/4"	0	DC PANEL	CONDUIT	NETWORK SWITCH	POWER	0
DC-5	2/C	#12	600V	75°C		DC	3/4"	0	DC PANEL	CONDUIT	DTR-1	POWER	0
DC-6	2/C	#12	600V	75°C		DC	3/4"	0	DC PANEL	CONDUIT	CABLE SHILED MONITOR	POWER	0
GR-1	1-C	#6	600V	75°C		-	3/4"	0	NETWORK SWITCH	CONDUIT	STATION GROUND BUS	GROUNDING	0
GR-2	1-C		600V	75°C		-			RTU	CONDUIT	STATION GROUND BUS	GROUNDING	0
GR-3	1-C		600V	75°C		-			HMI	CONDUIT	STATION GROUND BUS	GROUNDING	0

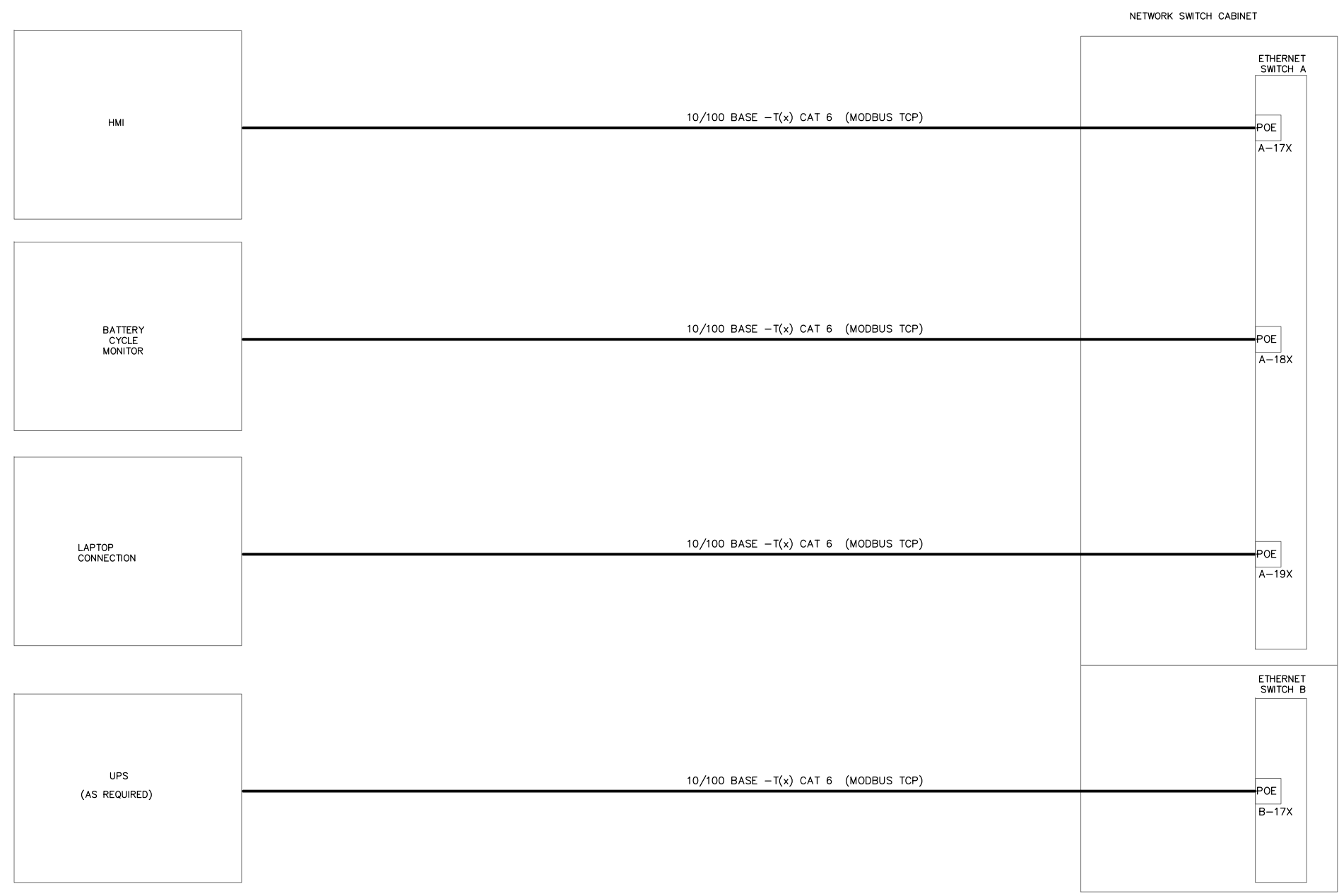
REFER TO POWER DRAWINGS FOR POWER SOURCE CONNECTIONS



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 LICENSE No. 39970
 EXPIRATION DATE: 1/17/2017

-COMAR 09.23.03.10

DESIGNED	JAJ	4/4/15	DATE	REFERENCE DRAWINGS		REVISIONS		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING		SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS SCADA CONDUIT AND CABLE SCHEDULE				
DRAWN	JAJ	5/20/15	DATE	NUMBER	TITLE	DATE	NUM							DESCRIPTION
CHECKED	PK	6/1/15	DATE						REVISION SUBMITTED	APPROVED	FQ15237	NONE	ST-SC-TB-SSI-206	21 OF 29
									DATE	DEPUTY CHIEF ENGINEER				



NOTES:
 1. NEW WIRING AND TERMINATIONS TO BE PROVIDED BY INSTALLATION CONTRACTOR.

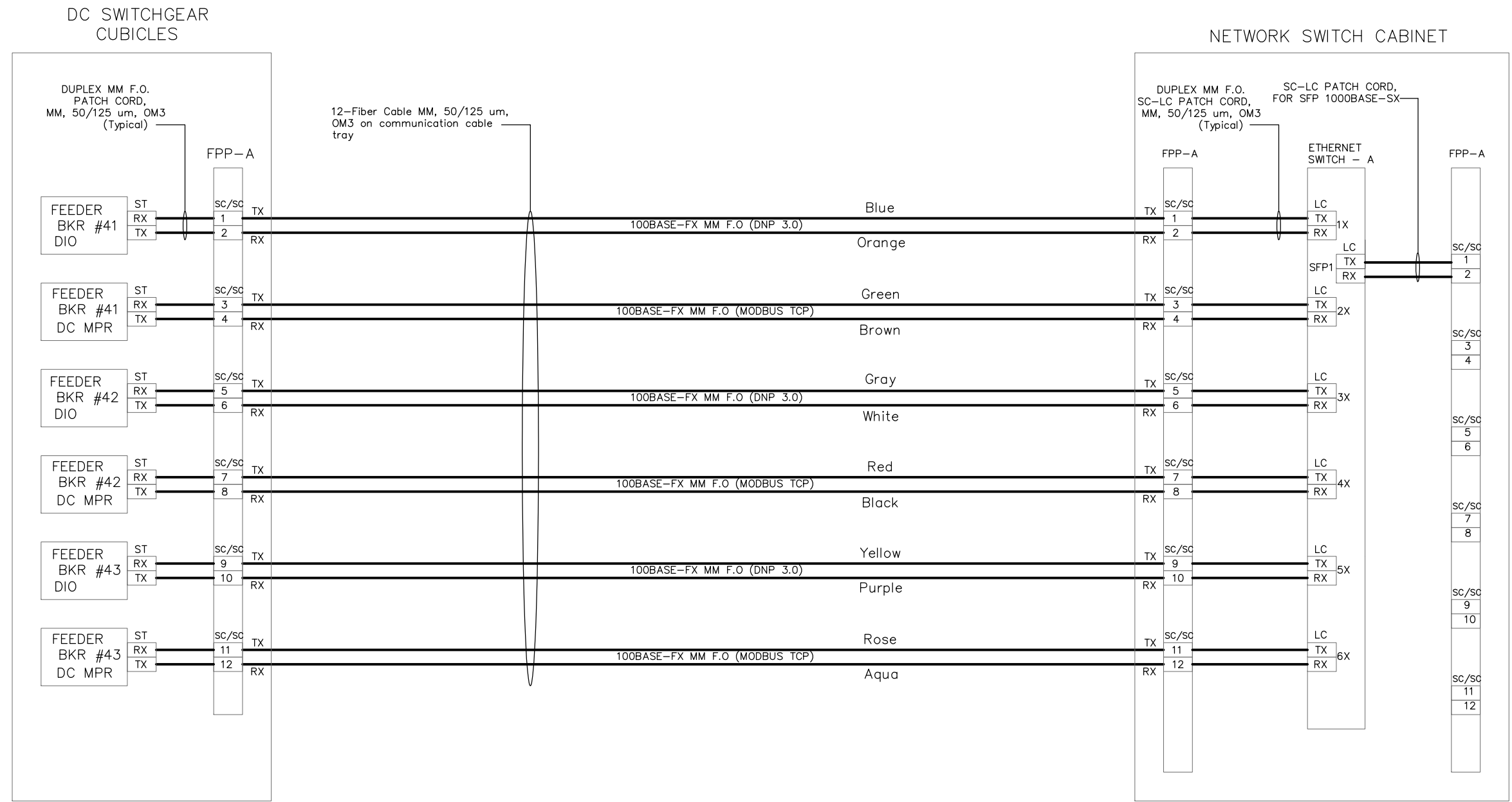


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-COMAR 09.23.03.10

DESIGNED JAJ 4/4/15 <small>DATE</small> DRAWN JAJ 5/20/15 <small>DATE</small> CHECKED PK 6/1/15 <small>DATE</small>	REFERENCE DRAWINGS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NUMBER</th> <th>TITLE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	NUMBER	TITLE									REVISIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DATE</th> <th>NUM</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	DATE	NUM	DESCRIPTION										WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____ <small>DEPUTY CHIEF ENGINEER</small>	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS CAT 6 CABLE TERMINATION DIAGRAM <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">CONTRACT NO. FQ15237</td> <td style="width: 25%;">SCALE NONE</td> <td style="width: 25%;">DRAWING NO. ST-SC-TB-SSI-207</td> <td style="width: 25%;">SHEET NO. 22 OF 29</td> </tr> </table>	CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-207	SHEET NO. 22 OF 29
NUMBER	TITLE																													
DATE	NUM	DESCRIPTION																												
CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-207	SHEET NO. 22 OF 29																											

NOTE:
 1. FOR THE ACTUAL DEVICES CONNECTED AT EACH TBS, REFER TO DRAWING 'FIBER CONNECTION POINTS SUMMARY- SHEET'.



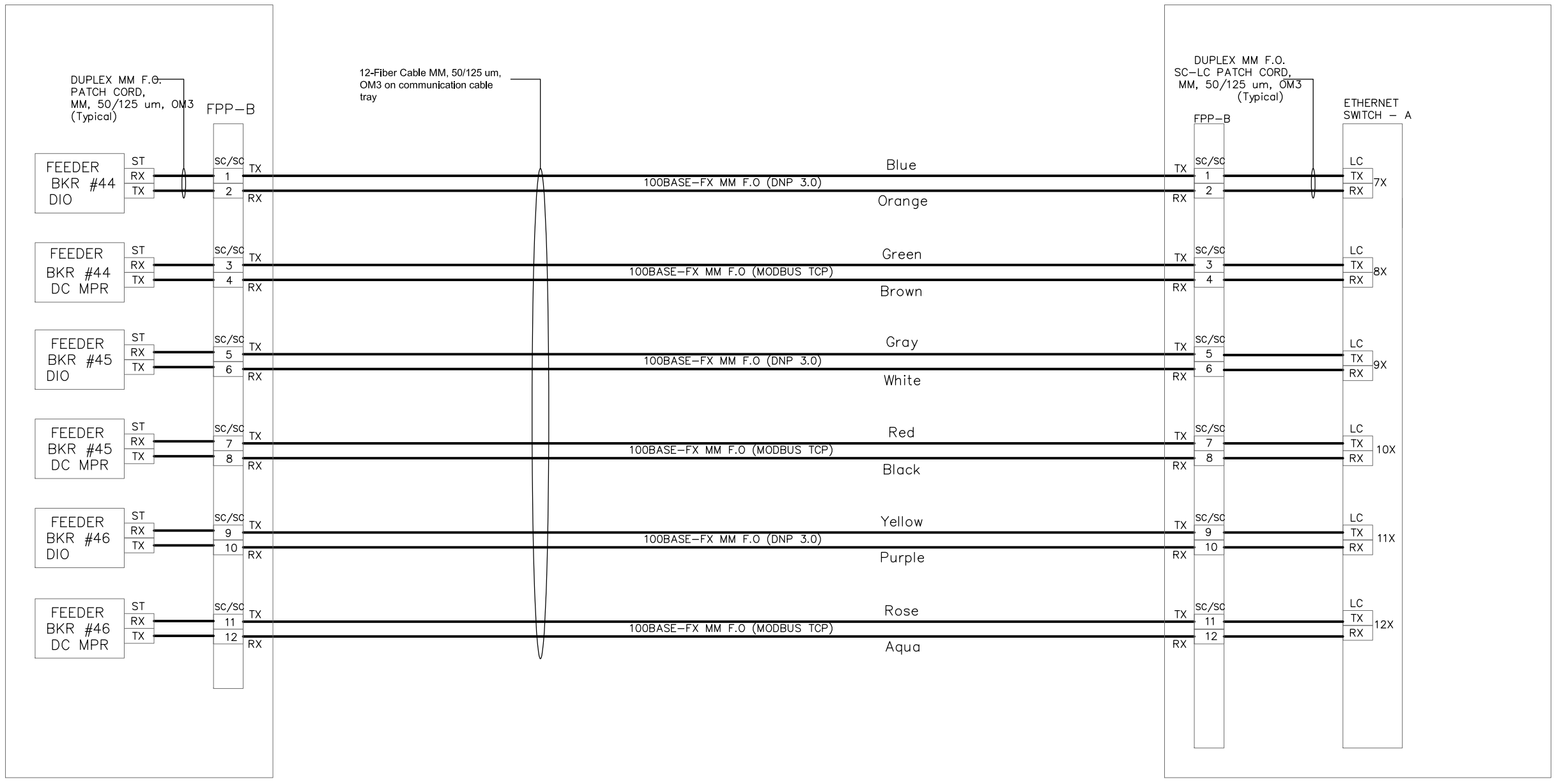
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 LICENSE No. 39970
 EXPIRATION DATE: 1/17/2017

DESIGNED JAJ 4/4/15 DATE DRAWN JAJ 5/20/15 DATE CHECKED PK 6/1/15 DATE	REFERENCE DRAWINGS NUMBER TITLE DATE NUM DESCRIPTION		REVISIONS DATE NUM DESCRIPTION		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING REVISION SUBMITTED DATE APPROVED DATE DEPUTY CHIEF ENGINEER	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 1 OF 5			
	CONTRACT NO. FQ15237		SCALE NONE			DRAWING NO. ST-SC-TB-SSI-208		SHEET NO. 23 OF 29	

NOTE:
 1. FOR THE ACTUAL DEVICES CONNECTED AT EACH TBS, REFER TO DRAWING 'FIBER CONNECTION POINTS SUMMARY- SHEET'.

DC SWITCHGEAR CUBICLES

CISCO SWITCH CABINET



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 DRAWN JAJ 5/20/15
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 DATE

REFERENCE DRAWINGS		REVISIONS	
NUMBER	TITLE	DATE	DESCRIPTION

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES
 CENI - POWER SYSTEMS ENGINEERING

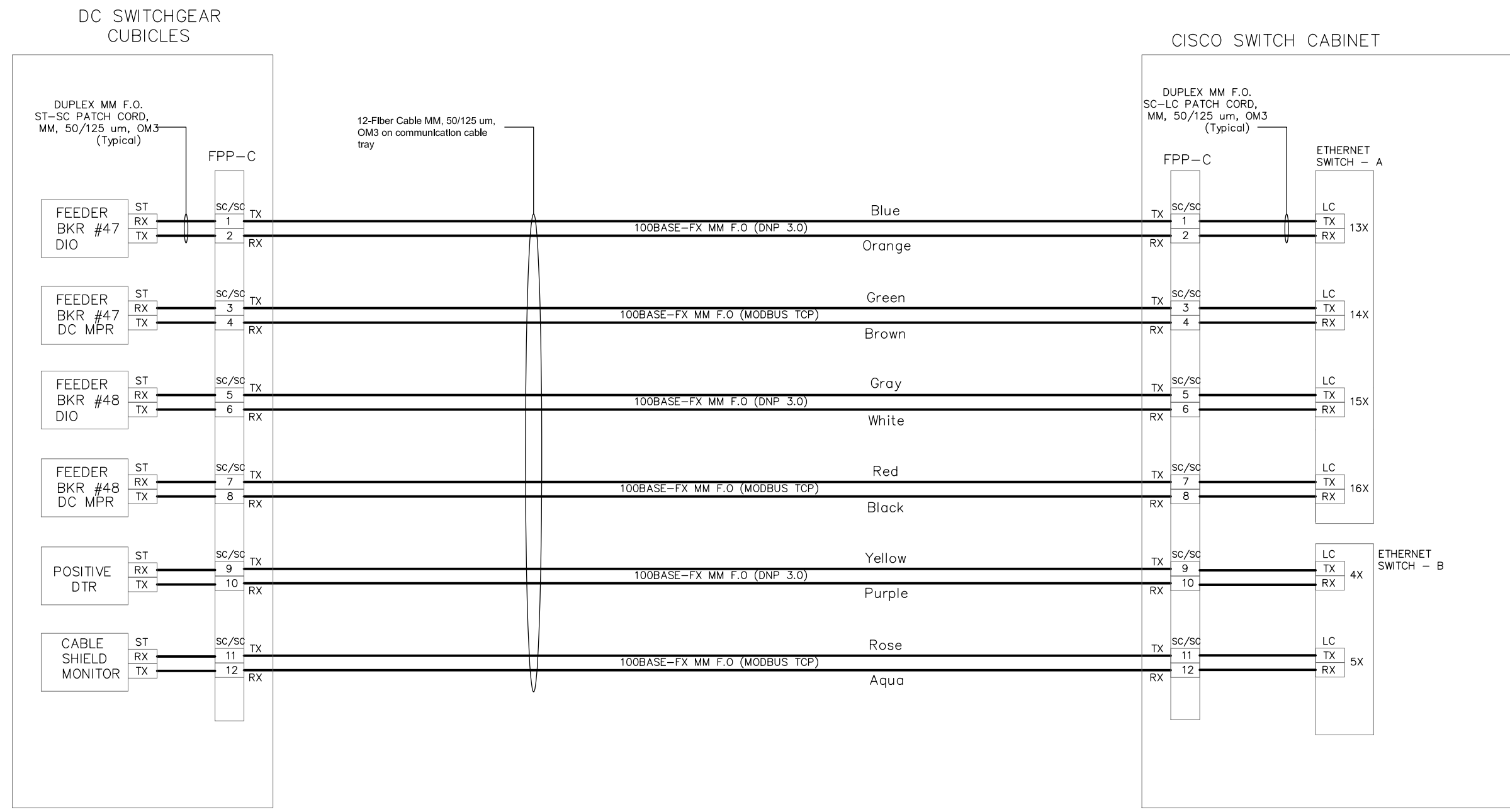
REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____
 DEPUTY CHIEF ENGINEER

**SIX (6) TIE BREAKER STATIONS UPGRADES
 ORANGE AND BLUE LINES DC, MD AND VA**

TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 2 OF 5

CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-209	SHEET NO. 24 OF 29
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NOTE:
 1. FOR THE ACTUAL DEVICES CONNECTED AT EACH TBS, REFER TO DRAWING 'FIBER CONNECTION POINTS SUMMARY- SHEET'.

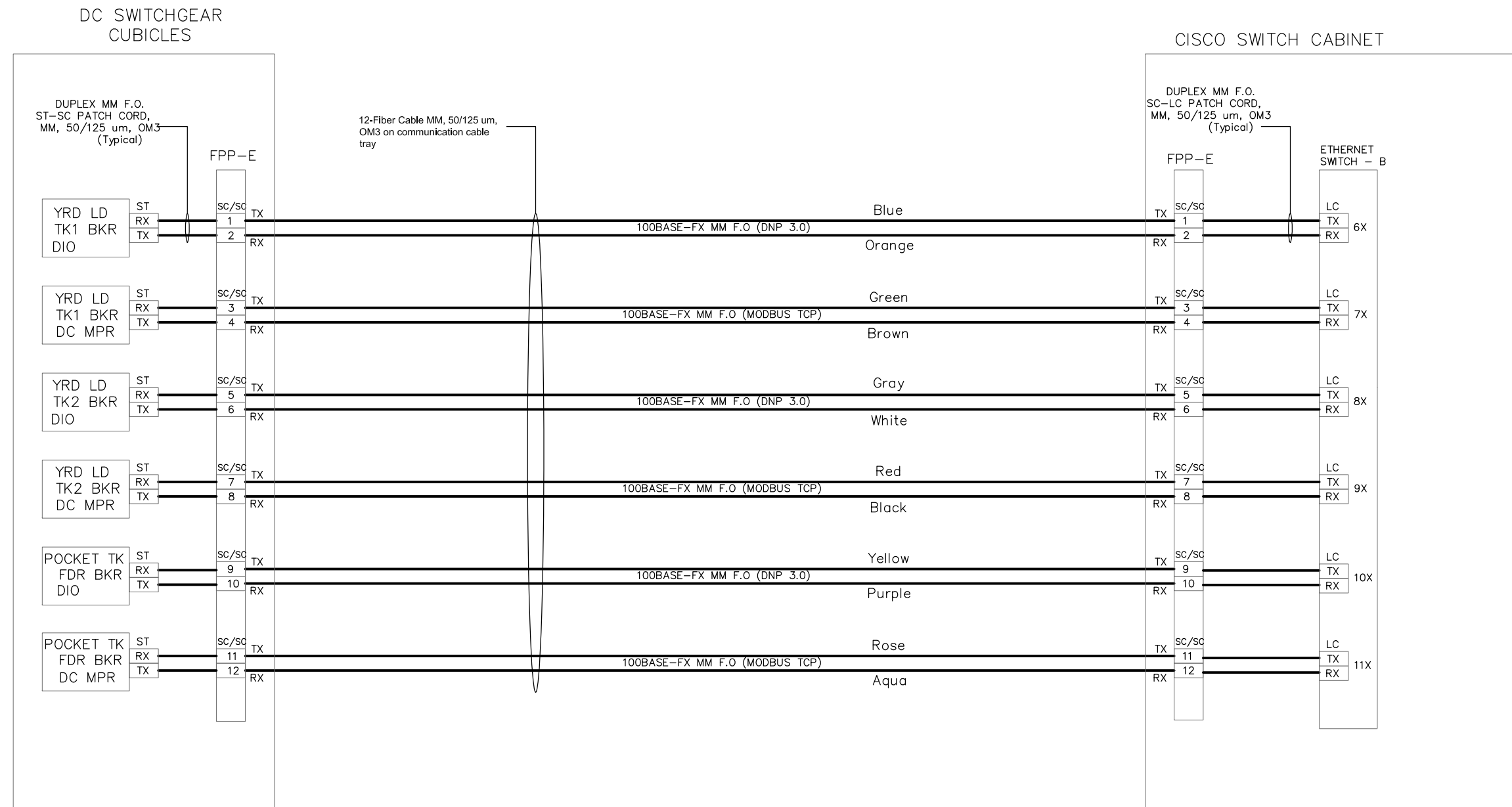


STATE OF MARYLAND
 PROFESSIONAL ENGINEER
 LICENSE No. 39970
 EXPIRATION DATE: 1/17/2017
 PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
 -COMAR 09.23.03.10

DESIGNED: JAJ 4/4/15 DATE	REFERENCE DRAWINGS	REVISIONS	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 3 OF 5			
DRAWN: JAJ 5/20/15 DATE	NUMBER TITLE	DATE NUM DESCRIPTION				CONTRACT NO. FQ15237	SCALE NONE
CHECKED: PK 6/1/15 DATE			REVISION SUBMITTED DATE	APPROVED DEPUTY CHIEF ENGINEER DATE			

NOTE:

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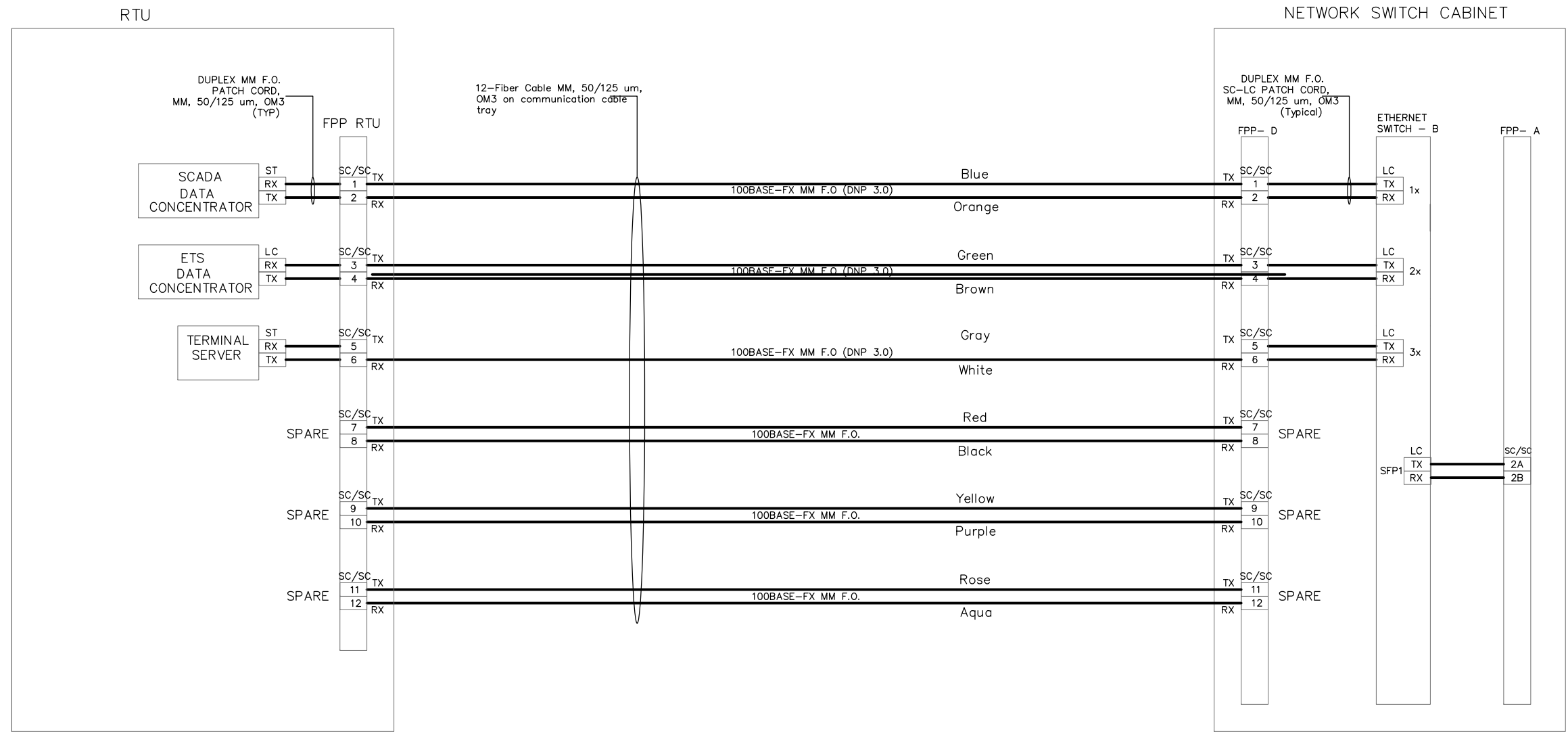
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DESIGNED JAJ 4/4/15 DATE DRAWN JAJ 5/20/15 DATE CHECKED PK 6/1/15 DATE	REFERENCE DRAWINGS NUMBER TITLE DATE NUM DESCRIPTION		REVISIONS DATE NUM DESCRIPTION		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TYPICAL TBS FIBER CABLE TERMINATION SCHEDULE - SHEET 4 OF 5			
	REVISION SUBMITTED DATE APPROVED DATE DEPUTY CHIEF ENGINEER								

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	DRAWN	JAJ		5/20/15	NUMBER	TITLE	DATE	NUM	DESCRIPTION					
CHECKED	PK	6/1/15	DATE						REVISION SUBMITTED	APPROVED	FQ15237	NONE	ST-SC-TB-SSI-212	27 OF 29
									DATE	DATE				

CABLE SCHEDULE SHEET 1

EQUIPMENT	VIA PATCH CORD TO	EQUIP. FPP PORT			CABLE TAG NUMBER		VIA CABLE TO	CABLE TAG NUMBER		N.SWITCH FPP PORT			VIA PATCH CORD TO	N.SWITCH PORT
					TX	RX		TX	RX					
1 FEEDER BKR 41 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 1/2	SC	MM PORT A	BLUE	ORANGE	Gigalite-10, 50/125 OM3 Multimode Fiber	BLUE	ORANGE	SC 1/2	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-1X	
2 FEEDER BKR 41 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 3/4	SC		GREEN	BROWN	Gigalite-10, 50/125 OM3 Multimode Fiber	GREEN	BROWN	SC 3/4	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-2X	
3 FEEDER BKR 42 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 5/6	SC		GRAY	WHITE	Gigalite-10, 50/125 OM3 Multimode Fiber	GRAY	WHITE	SC 5/6	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-3X	
4 FEEDER BKR 42 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 7/8	SC	MM PORT B	RED	BLACK	Gigalite-10, 50/125 OM3 Multimode Fiber	RED	BLACK	SC 7/8	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-4X	
5 FEEDER BKR 43 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 9/10	SC		YELLOW	PURPLE	Gigalite-10, 50/125 OM3 Multimode Fiber	YELLOW	PURPLE	SC 9/10	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-5X	
6 FEEDER BKR 43 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 11/12	SC		ROSE	EQUA	Gigalite-10, 50/125 OM3 Multimode Fiber	ROSE	EQUA	SC 11/12	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-6X	
7 FEEDER BKR 44 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 1/2	SC	MM PORT C	BLUE	ORANGE	Gigalite-10, 50/125 OM3 Multimode Fiber	BLUE	ORANGE	SC 1/2	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-7X	
8 FEEDER BKR 44 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 3/4	SC		GREEN	BROWN	Gigalite-10, 50/125 OM3 Multimode Fiber	GREEN	BROWN	SC 3/4	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-8X	
9 FEEDER BKR 45 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 5/6	SC		GRAY	WHITE	Gigalite-10, 50/125 OM3 Multimode Fiber	GRAY	WHITE	SC 5/6	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-9X	
10 FEEDER BKR 45 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 7/8	SC	MM PORT D	RED	BLACK	Gigalite-10, 50/125 OM3 Multimode Fiber	RED	BLACK	SC 7/8	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-10X	
11 FEEDER BKR 46 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 9/10	SC		YELLOW	PURPLE	Gigalite-10, 50/125 OM3 Multimode Fiber	YELLOW	PURPLE	SC 9/10	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-11X	
12 FEEDER BKR 46 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 11/12	SC		ROSE	EQUA	Gigalite-10, 50/125 OM3 Multimode Fiber	ROSE	EQUA	SC 11/12	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-12X	
13 FEEDER BKR 47 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 1/2	SC	MM PORT E	BLUE	ORANGE	Gigalite-10, 50/125 OM3 Multimode Fiber	BLUE	ORANGE	SC 1/2	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-13X	
14 FEEDER BKR 47 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 3/4	SC		GREEN	BROWN	Gigalite-10, 50/125 OM3 Multimode Fiber	GREEN	BROWN	SC 3/4	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-14X	
15 FEEDER BKR 48 DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 5/6	SC		GRAY	WHITE	Gigalite-10, 50/125 OM3 Multimode Fiber	GRAY	WHITE	SC 5/6	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-15X	
16 FEEDER BKR 48 MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 7/8	SC	MM PORT F	RED	BLACK	Gigalite-10, 50/125 OM3 Multimode Fiber	RED	BLACK	SC 7/8	SC	DUPLEX MM F.O., 50/125 um, OM3	LC A-16X	
17 QEI POS. DTR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 9/10	SC		YELLOW	PURPLE	Gigalite-10, 50/125 OM3 Multimode Fiber	YELLOW	PURPLE	SC 9/10	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-4X	
18 CABLE SHEILD MON.	ST DUPLEX MM F.O., 50/125 um, OM3	SC 11/12	SC		ROSE	EQUA	Gigalite-10, 50/125 OM3 Multimode Fiber	ROSE	EQUA	SC 11/12	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-5X	
19 RTU SCADA	ST DUPLEX MM F.O., 50/125 um, OM3	SC 1/2	SC	MM PORT G	BLUE	ORANGE	Gigalite-10, 50/125 OM3 Multimode Fiber	BLUE	ORANGE	SC 1/2	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-1X	
20 RTU ETS	ST DUPLEX MM F.O., 50/125 um, OM3	SC 3/4	SC		GREEN	BROWN	Gigalite-10, 50/125 OM3 Multimode Fiber	GREEN	BROWN	SC 3/4	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-2X	
21 RTU SERVER	ST DUPLEX MM F.O., 50/125 um, OM3	SC 5/6	SC		GRAY	WHITE	Gigalite-10, 50/125 OM3 Multimode Fiber	GRAY	WHITE	SC 5/6	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-3X	
22 SPARE	ST DUPLEX MM F.O., 50/125 um, OM3	SC 7/8	SC	MM PORT H	RED	BLACK	Gigalite-10, 50/125 OM3 Multimode Fiber	RED	BLACK	SC 7/8	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-4X	
23 SPARE	ST DUPLEX MM F.O., 50/125 um, OM3	SC 9/10	SC		YELLOW	PURPLE	Gigalite-10, 50/125 OM3 Multimode Fiber	YELLOW	PURPLE	SC 9/10	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-5X	
24 SPARE	ST DUPLEX MM F.O., 50/125 um, OM3	SC 11/12	SC		ROSE	EQUA	Gigalite-10, 50/125 OM3 Multimode Fiber	ROSE	EQUA	SC 11/12	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-6X	
25 YL TK1 BKR DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 1/2	SC	MM PORT I	BLUE	ORANGE	Gigalite-10, 50/125 OM3 Multimode Fiber	BLUE	ORANGE	SC 1/2	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-7X	
26 YL TK1 BKR MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 3/4	SC		GREEN	BROWN	Gigalite-10, 50/125 OM3 Multimode Fiber	GREEN	BROWN	SC 3/4	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-8X	
27 YL TK2 BKR DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 5/6	SC		GRAY	WHITE	Gigalite-10, 50/125 OM3 Multimode Fiber	GRAY	WHITE	SC 5/6	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-9X	
28 YL TK2 BKR MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 7/8	SC	MM PORT J	RED	BLACK	Gigalite-10, 50/125 OM3 Multimode Fiber	RED	BLACK	SC 7/8	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-10X	
29 POCKET TK BKR DIO	ST DUPLEX MM F.O., 50/125 um, OM3	SC 9/10	SC		YELLOW	PURPLE	Gigalite-10, 50/125 OM3 Multimode Fiber	YELLOW	PURPLE	SC 9/10	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-11X	
30 POCKET TK BKR MPR	ST DUPLEX MM F.O., 50/125 um, OM3	SC 11/12	SC		ROSE	EQUA	Gigalite-10, 50/125 OM3 Multimode Fiber	ROSE	EQUA	SC 11/12	SC	DUPLEX MM F.O., 50/125 um, OM3	LC B-11X	



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LICENSE No. 39970
EXPIRATION DATE: 1/17/2017

-COMAR 09.23.03.10

DESIGNED <u>JAJ</u> <u>4/4/15</u> DATE	DRAWN <u>JAJ</u> <u>5/20/15</u> DATE	CHECKED <u>PK</u> <u>6/1/15</u> DATE	REFERENCE DRAWINGS NUMBER TITLE DATE NUM DESCRIPTION	REVISIONS NUMBER DESCRIPTION	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DEPARTMENT OF TRANSIT INFRASTRUCTURE AND ENGINEERING SERVICES CENI - POWER SYSTEMS ENGINEERING	SIX (6) TIE BREAKER STATIONS UPGRADES ORANGE AND BLUE LINES DC, MD AND VA TBS NETWORK TERMINATION DIAGRAM CABLE SCHEDULE - SHEET 1 OF 2		
REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____ DEPUTY CHIEF ENGINEER					CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-213	SHEET NO. 28 OF 29

CABLE SCHEDULE SHEET 2

CABLE				ROUTE				N. SWITCH
NUMBER	TYPE	SIZE	FROM	VIA	TO	FOR		
1	HMI	10/100 BASE TX -CAT 6 (MODBUS/TCP)	HMI	COMM. CABLE TRAY	CISCO SWITCH # A	RTU INPUT	A-18X	
2	BATT CYCLE	10/100 BASE TX -CAT 6 (MODBUS/TCP)	BATTERY CYCLE MONITOR	COMM. CABLE TRAY	CISCO SWITCH # A	RTU INPUT	A-19X	
3	UPS/CHARGER	RS-485 (MODBUS)	UPS / BATTERY CHARGER	COMM. CABLE TRAY	RTU	UPS/CHARGER MONITORING		
4	UPS	COPPER	#12 UPS / BATTERY CHARGER	CONTRL CABLE TRAY	RTU	UPS/CHARGER MONITORING		
5	ETS PATCH	RS-485 (DNP3)	ETS PATCH PANEL	COMM. CABLE TRAY	RTU	ETS MONITORING		
6	TEMP	COPPER TWISTED PAIRS	#18 ROOM TEMPERATURE SENSORS	CONTRL CABLE TRAY	RTU	MONITORING		
7	ETS RELAY	COPPER	#12 ETS RELAY CONTACTS	CONTRL CABLE TRAY	RTU	MONITORING		
8	DTS	COPPER	DTS	CONTRL CABLE TRAY	RTU	MONITORING		
9	VENT	COPPER	#16 ROOM VENTILATION	CONTRL CABLE TRAY	RTU	MONITORING		
10								
11								



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			REVISION SUBMITTED _____ DATE _____ APPROVED _____ DATE _____ DEPUTY CHIEF ENGINEER		CONTRACT NO. FQ15237	SCALE NONE	DRAWING NO. ST-SC-TB-SSI-214	SHEET NO. 29 OF 29