

**SECTION 261000 – POWER DISTRIBUTION SYSTEM AND EQUIPMENT****1.0 GENERAL CONFIGURATION AND REQUIREMENTS**

- A. Approved manufacturers for electrical equipment, except VFD's, are as follows:
  - 1. Siemens Industry, Building Technology Division
  - 2. Square-d, a brand of Schneider Electric
  - 3. Eaton Electrical Inc., Cutler-Hammer Business Unit
  - 4. Penn Panel and Box Company.
- B. The building electrical power distribution systems shall be designed so that a high level of reliability and ease of operation is provided, as well as facilitating preventative maintenance while minimizing the impact to building operations during maintenance activities.
- C. The exact nature and design of the distribution system varies with project size, building occupancy, level of risk and other factors, all of which must be considered when making a recommendation to the University. The design professional is responsible for assessing how these factors affect the needs of the University and determining what is an appropriate power system configuration, given these considerations.
- D. In general, all buildings will have two (2) primary (13.2KV system operating voltage) service feeders that are sourced from a University substation, to be assigned to the project by the University Engineering Department. The design professional shall consult with the University Engineering Department to determine the tie-in sequence for the connections to the University service feeders, and this sequence shall be documented on the design professional's project drawings.
- E. Typically, a building power distribution system will include two sources for redundancy. Buildings with main-tie-main configurations will operate in a double-ended, open tie breaker alignment for both the primary and secondary switchgear. All efforts should be made to achieve an equal balance of building loads on each primary feeder, and each secondary transformer. Redundant building equipment loads (fans, pumps, etc.) should be fed from opposite sides of tie breakers, and/or from different substations, so as to provide the greatest diversity of equipment power sources and reduction of impacts to building operations during electrical system disturbances.
- F. Each substation transformer shall be individually protected by a protective relay or by an E rated fuse.
- G. Switchboard and switchgear enclosures shall be suitable for the environment. At a minimum, enclosures shall be NEMA 2 (drip-proof).
- H. All power cable terminations shall be copper with compression type lugs, including all factory terminations. Molded case circuit breakers may utilize mechanical set-screw connections.
- I. A ground bus shall be run the full length of the switchgear/substation and shall be connected at both ends to the building ground loop.
- J. The design professional shall prepare all calculations to verify the required ratings for the equipment, cables, etc.

K. The electrical power system as a whole shall be sized for present load along with future anticipated load plus 30% spare capacity. The exact requirements are to be defined in the project formation phase and shall be approved by the University Engineering Department.

L. All equipment shall be listed and labeled by UL.

## 2.0 MISSION CRITICAL CONSIDERATIONS

A. The electrical system shall be designed to meet all requirements of the applicable University design standards. This is considered by the University Engineering Department to be essential in order to meet Mission Critical goals. Options for Value Engineering of critical electrical system components, materials or configurations will not be considered; as such modifications could potentially increase the risk to the University. For example, it is considered essential that all conductor materials shall be copper and the use aluminum should not be considered.

B. All new switchgear and substations shall be located above ground whenever possible to avoid flooding risk.

C. The Design Professional shall include a generator quick-connect switchboard or roll-up generator termination box, sized such that the full building load can be carried by a portable generator. The location of the generator connection point shall be chosen so that the need for routing temporary cables through the building is minimized or, preferably, eliminated. In no case shall temporary cables be routed through any public access pathways.

D. The building design shall document the rigging pathway for all major electrical equipment, including, but, not limited to transformers and switchgear. In no case shall the pathway be compromised in such a way that any methods other than normal rigging procedures would be required for equipment removal and replacement.

E. All generator fuel tanks shall be installed with an easily accessible fuel fill extension.

F. All devices and equipment required to support the operation of critical infrastructure should be connected to the appropriate branch of the emergency power system. This shall include, at a minimum, all lighting in switchgear rooms, basement sump pumps, storm water and sewage lift pumps and fuel pumps that supply or transfer fuel to the generator system.

G. The University follows best industry work methods as they pertain to the electrical power distribution system. For example, it is not considered a good work practice to apply multiple splices on the same phase conductor of a feeder in one manhole. The extra splice exposes the University to reduced electrical service reliability, which defeats the Mission Critical reliability goal.

## 3.0 RETROFITS AND SERVICE EQUIPMENT REPLACEMENT REQUIREMENTS

A. Retrofit and Service Equipment Replacement projects present a unique set of challenges in light of the fact that these projects invariably take place in a building that will be occupied throughout the construction process.

- B. The design professional shall determine the best combination of equipment configuration, equipment type, space utilization and construction phasing that fits the particular constraints and operational needs of the University.
- C. The design professional shall determine the best available pathway for moving the new equipment into the building. This shall be documented in the contract documents.

#### 4.0 STANDARD BUILDING SERVICE CONFIGURATIONS

- A. The University has established two standard configurations for building service:
  - 1. Primary 15kV Main-Tie-Main metalclad switchgear.
  - 2. Secondary (480/277 or 208/120V) Main-Tie-Main switchgear.
- B. The University has developed standard wiring diagrams along with standard protection and control device bills of material for each configuration. The University's approved manufacturers mentioned earlier in this standard have reviewed and are familiar with the intended operation and construction of each. For this reason, the professional shall secure a list of local manufacturer representatives before start of design. It is the responsibility of the professional to review and fully understand these wiring diagrams prior to start of design. These diagrams will be an integral part of the professional's construction/contract documents to be distributed for bids.
  - 1. Attachment A of this standard contains the wiring diagrams for the Primary 15kV Main-Tie-Main metalclad switchgear.
  - 2. Attachment B of this standard contains the wiring diagrams for the Secondary (480/277 or 208/120V) Main-Tie-Main switchgear.
- C. The University Engineering department will determine and direct the professional regarding which configuration shall be used for a given project.

#### 5.0 TRANSFER SCHEMES

- A. Unless specifically permitted otherwise by the University Engineering Department, main-tie-main systems shall be equipped with automatic throwover schemes on the primary switchgear. The timing of the primary automatic throwover operations shall be coordinated so that the primary scheme reacts to disturbances that originate outside the building on the University substation feeders.
- B. Auto Throwover: Upon detecting a failure on either of the two sources, the main circuit breaker on the affected side shall open and the tie circuit breaker shall close. Where an automatic throwover scheme is provided with secondary equipment, time delays shall be coordinated with the secondary unit substation throwover scheme time delay such that the medium voltage switchgear reacts to disturbances before the secondary unit substation.
- C. Auto/Manual Mode: Selector switch on front of switchgear shall toggle between automatic and manual circuit breaker operation.
- D. Live Source Seeking: While under single ended alignment (One main open, tie closed), should the live source fail, the load shall be transferred to a live source from either side once a live source becomes available. The live source seeking feature shall be operable in automatic mode only. Live source seeking is only to be used on building level transfer schemes, not Campus switching substations (Substation #1, Substation #2, etc.).

- E. Trip Select: Automatically trips the selected circuit breaker after a parallel closed transition transfer operation. Closed transition transfer operation is only permitted in manual control mode. All closed transition transfers shall be supervised by the synch check function of the SEL-451 relay.
- F. Auto Fail Mode: Initiated when attempting to put the system into automatic mode when conditions required for automatic mode are not met. No automatic operations occur. Only manual tripping or tripping due to an overload or fault is permitted. To exit this mode of operation, the system must be placed in manual control mode.
- G. The University standard configurations utilize Schweitzer (SEL) relays and controllers for protection and control. The primary switchgear utilizes an SEL 451 relay for protection and control and the secondary switchgear utilizes an SEL 2242 Axion Real-Time Automation Controller (RTAC). Attachment C of this guideline contains automation setting files for the SEL 451 relay and 2242 Axion RTAC. These setting files should be incorporated into the project specifications. An AcSELerator template with these settings files can be obtained from the University's Engineering Department.
- H. The setting files and templates mentioned in G above are offered as a guideline to provide consistency of switchgear installation throughout the University. Use of this material does not alleviate design professional or the equipment manufacturer of responsibility for providing a fully and properly operating system. The design professional and equipment manufacturer are still responsible to understand and implement the controls scheme described by the sequence of operations listed above in this guideline. The design professional and the equipment manufacturer shall be well versed in the operation and programming of SEL relays and their functionality.
- I. Where permitted by the University Engineering Department, manual-only transfer schemes without electrical interlocks shall incorporate key interlocks or other non-defeatable features that prevent parallel operation of multiple sources.
- J. Witness testing at the manufacturer's factory shall be required for all equipment that is equipped with automatic transfer schemes.

## 6.0 RELAY AND CIRCUIT BREAKER PROTECTION AND COORDINATION

- A. The design professional shall perform a coordination study to determine relay and circuit breaker trip unit settings and plot time-current curves (TCC) to demonstrate that the overcurrent protective devices are selectively coordinated at all values of load current and fault current (phase and ground), in accordance with NEC requirements and IEEE standards as well as generally accepted power system design practices.
- B. Relay and circuit breaker trip settings shall provide proper protection of the power system equipment and cables. This shall be demonstrated by plotting equipment and cable damage curves on the TCC.
- C. Relay and circuit breaker trip settings shall provide proper coordination with transformer magnetization and inrush currents so that nuisance tripping is avoided.
- D. Primary phase and ground overcurrent protection settings shall coordinate with upstream University Substation feeder circuit breaker overcurrent relays.
- E. Along with TCC's, the coordination study shall include a listing, in tabular form, of setting values for each circuit breaker or fuse. Actual currents and time delays shall be listed, as

well as, relay parameter and time dial values. Corresponding CT primary and secondary values shall also be listed.

- F. Refer to section 260500 for additional requirements for power system studies.

## 7.0 PRIMARY SWITCHGEAR

### A. PRIMARY SWITCHGEAR GENERAL CONSTRUCTION

1. The primary switchgear shall be metal-clad type as described in ANSI standards, unless other primary equipment types are specifically permitted by the University Engineering Department.
2. The switchgear shall be rated for 25,000 amperes symmetrical short circuit current (nominal 500 MVA class) at rated maximum voltage (15 kV class/95 kV BIL), in accordance with all applicable ANSI standards.
3. The switchgear shall be split into shipping groups/splits that are sized so that they can be maneuvered into the building to the electrical room, via available pathways (to be detailed on construction plans). If the rigging plan calls for the switchgear to be moved from its normal vertical position, this must be specified in the contract documents.
4. The switchgear shipping groups/splits shall be factory assembled and all controls, interlocks and protective devices functionally tested.
5. The design shall be coordinated so that shipping groups/splits are easily re-connected at the site into a continuous line-up. Necessary connecting materials shall be furnished. All interconnecting wiring shall be clearly identified on manufacturer's drawings and shall be marked to identify the terminal block and terminal point to which it is to be terminated.
6. Incoming service cable and conduit entry shall be at the top of the incoming line section, unless specifically permitted otherwise by the University Engineering Department.
7. The switchgear assembly shall consist of one or more vertical sections, each of which shall have the following, as appropriate for the application:
  - a. Main bus compartment.
  - b. Primary connection compartment housing cable / bus duct connections, current transformers and surge protection equipment.
  - c. Primary circuit breaker compartment.
  - d. Auxiliary compartment drawers housing voltage and/or control power transformers.
  - e. Low voltage compartment housing relays, instruments and other low voltage equipment, as indicated in the detailed specification.
  - f. Vertical bus extended to upper and lower breaker positions.
8. Each main bus compartment shall contain fully rated copper bus bars silver plated at electrical connection points 3 phase, 3-wire, fully insulated epoxy powder coating (sleeve type insulation is not permitted), with joints covered with preformed PVC boots held together with nylon hardware for easy installation and removal during servicing. Taped joints are not permitted except in unusual joint configurations and with specific approval from the University Engineering Department. Boots shall be provided for all cable connection lugs.
9. The ground bus shall be bare silver-plated copper, in minimum size of  $\frac{1}{4}$  by 2 inches and shall extend the full length of switchgear.

10. Each circuit breaker compartment shall include:

- a. Vacuum circuit breaker with continuous 1200A current rating.
- b. Protective relays.
- c. Hinged front door, interlocked with the breaker to prevent racking unless the door is closed. The door may not be opened until the breaker is in the test or fully disconnected position.
- d. Primary (line and load side) and secondary (control circuit) disconnecting devices.
- e. Secondary disconnects. The secondary connections shall engage automatically during the racking operation when the breaker is moved from the disconnect position to test position. Secondary disconnects using plug and socket arrangement with an umbilical cord is not permitted. No requirement for manual intervention to make the secondary connections shall be permitted.
- f. Mechanical position (operate/test/disconnected) and status (open/closed) indicators shall be visible with the compartment door closed.
- g. Circuit breaker position actuated automatic shutters. Shutters shall be independently operated and shall have provisions for installation of padlocks on each shutter to prevent inadvertent opening when the breaker is removed from the compartment.
- h. Safety interlocks. The racking mechanism of the circuit breaker shall be integral with the circuit breaker to minimize alignment problems and facilitate inspection and maintenance. Racking mechanisms installed directly in the switchgear structure, or which permit exposure to primary conductors during maintenance are not acceptable.
- i. Interlocks to prevent breakers of a lower than required continuous current rating from being inserted into the breaker cell.
- j. Pistol-grip rotary control switch -hard wired to directly trip the breaker. Closing shall be supervised by the appropriate interlocks and the SEL 451 relay on all transfer scheme control modes.
- k. Ball type grounding studs shall be installed on each phase bus of the outgoing cable connection in a location that is readily accessible to maintenance personnel, so that safety ground cables can be connected during maintenance procedures.

11. Each auxiliary compartment shall include the following:

- a. A separate compartment front panel for each drawout position.
- b. Necessary terminal blocks, control wiring, fuses and buses.
- c. VT, CPT or fuse rollouts, as needed.
- d. All VT or CPT rollout assemblies shall include a secondary circuit breaker that is interlocked to prevent withdrawing the VT or CPT unit under load.

12. Control Wiring: Factory installed, complete with bundling, lacing, and protection (refer to Attachment A of this specification).

- a. Control schematics consistent with existing systems currently installed at the University have been provided in Attachment A of this guideline and should be incorporated into specifications.
- b. Control schematics mentioned in item 1 above are presented as a guideline to provide consistency of installations throughout the University. Use of this material does not alleviate design professional or

the manufacturer of responsibility for providing a fully and properly operating system. Design professional and manufacturer are still responsible to understand and implement controls scheme described by the sequence of operations listed below in this specification.

13. Provide taped mimic bus on each switchgear section that indicates all breakers, buses, VTs, CPTs, CTs, surge arrestors, transformers, fuses, lugs, flex connections, etc.
14. All indicating lamps shall be LED type, push to test with replaceable LED lamps.
15. All current transformer (CT) circuits shall be wired using ring-tongue lugs.
16. Shorting terminal blocks shall be provided for all CT sets. As a minimum, one shorting terminal block shall be wired in the CT circuit ahead of all other devices connected to the CT's. If CT wiring leaves the switchgear enclosure, additional shorting terminal blocks shall be provided at that point also.

#### B. REQUIRED ACCESSORIES

1. Circuit breaker racking tool
2. Circuit breaker compartment door tool
3. Circuit breaker manual spring charging tool
4. Manual circuit breaker trip & close tool
5. Relay and meter test plugs for drawout devices that accept test plugs.
6. Supply one breaker dolly per six breakers.
7. Wall mounted cabinet for organized storage of small accessories, special tools and consumable spare parts supplied for the switchgear. Include spares for all installed fuses.
8. Circuit breaker cubicle extension rails.
9. Switchgear room plans shall allocate space for organized storage of all switchgear accessories and storage cabinet.

#### C. CONTROL BATTERIES

1. Switchgear control power shall be 125V DC, unless specifically permitted otherwise by the University Engineering Department.
2. Multi-cell stationary batteries shall be the source of 125V DC control power. Batteries shall be of the flooded cell lead calcium type. Sealed or valve-regulated lead acid type are not permitted.
3. Battery cells shall be installed on corrosion-resistant battery racks that meet local seismic requirements.
4. Batteries shall be sized for the present and future switchgear control power load in accordance with IEEE standards.
5. The batteries shall be located either in the room containing the primary switchgear, or in a room immediately adjacent to the primary switchgear (preferred). The battery installation shall be in accordance with IEEE requirements.
6. Battery chargers shall be compatible with the charging requirements of the battery, and shall completely recharge the battery in 8 hours or less. Power for battery chargers shall be backed up by the building's emergency generator, if available.
7. A Battery charger general alarm shall be reported through switchgear meters to the University's SCADA system for display at the Operations Control Center (OCC).
8. Eye-wash stations shall be provided within all battery rooms/locations.

**D. ALTERNATE PRIMARY SWITCHGEAR TYPES AND CONFIGURATIONS**

1. When utilizing the secondary Main-Tie-Main configuration (refer to Section 4.0 and attachment B), 15kV fused air load interrupter switches shall be used for primary disconnect and protection of double-end unit substations.
2. 15kV air load interrupter switches shall be provided with a viewing window that permits view of position of all three switchblades through the closed door. Interrupter switch ratings shall be as follows:
  - a. Nominal system voltage – 13.2kV three phase
  - b. Maximum design voltage – 15kV
  - c. BIL – 95kV
  - d. Fuse Type – S&C Type SM-4 with 180 degree vertical opening disconnect holder, porcelain station post insulator and base
  - e. Fuse interrupting rating – 63kA symmetrical RMS
  - f. Fused switch Fault close – 101kA symmetrical RMS
  - g. Entire fuse and switch assembly shall be UL and CSA certified.
3. When permitted by the University Engineering Department, equipment complying with ANSI requirements for metal-enclosed switchgear may be used. In general, this will be limited to non-critical building occupancies or retro-fit space with constrained conditions. As a minimum, a primary selective arrangement that will accept two 13.2 kV University service feeders is required.
4. Where fused primary selector switches that are fed directly by University substation feeders are provided on transformers/substations, load break switches shall be provided upstream of the fuses to allow for isolation and maintenance of the selector switches without requiring de-energizing the University substation primary service feeder.

**8.0 SUBSTATION TRANSFORMERS****A. Type**

1. Transformers located in climate conditioned electrical equipment rooms shall be of the cast-coil (cast primary and secondary windings) with copper windings and 115 deg. C temperature rise.
2. Primary surge protection shall be provided for all 13.2 kV primary windings. Arrestors shall be rated as per the attached Penn Standard Wiring Diagrams.

**B. Rating**

1. Primary voltage rating shall be 13.2 kV (delta), 95 kV BIL.
2. Secondary voltage rating shall be 480Y/277V wye. 208Y/120V secondary voltage rating shall not be used unless specifically permitted otherwise by the University Engineering Department (for example, in building service retrofits when required to comply with existing conditions). Secondary winding BIL rating shall be 30 kV.
3. Transformer impedance shall be 5.75%, based on the self-cooled kVA rating, unless permitted otherwise by the University Engineering Department.
4. Transformer capacity rating shall not exceed 1500 kVA (self-cooled rating), without specific permission from the University Engineering Department. The normal loading of the substation transformer shall not exceed the self-cooled rating of the transformer.

**C. Cooling**

1. Transformers shall be supplied with temperature controller and fans as original equipment. Transformers may be supplied without fans only with specific permission of the University Engineering Department. If the transformer is not to be equipped with forced air cooling, the transformer, primary power source, and the associated secondary substations shall be fully outfitted for the future forced air rating. All breakers, bus, etc. shall be sized to accommodate future forced air capacity. Transformers equipped with future forced air provisions shall include temperature indicator, control unit and alarm devices. The manufacturer shall furnish all documentation that is required to depict the installation of the future forced cooling equipment and wiring.

**D. Connections**

1. Bus connections (in lieu of cable) with flexible braided connectors for vibration isolation shall be provided to secondary side of the transformer in unit substation applications.
2. Transformers shall be equipped with primary and/or secondary air terminal chambers when required to accommodate cable connections. Air terminal chamber shall completely enclose the transformer bushings and cable terminators, allowing sufficient space for terminators such that terminator skirts are not deformed and cable bending radius limitations are accommodated.
3. When bus duct connections are required, the transformer shall be equipped with air terminal chambers that accommodate the bus duct termination, and allow sufficient space for the required flexible cable (primary) or braided (secondary) connectors.

**E. Loading**

1. Transformers shall be sized so that the projected diversified demand building load (considering typical floor and lighting loads for the design occupancy, equipment loads with diversity factors, power factor, etc.) does not load the transformer beyond 70% of its self-cooled kVA rating.
2. Transformers used in diversified demand double-ended substation configurations shall be sized to carry the projected normal (tie breaker open) load at 70% or less of the self-cooled kVA rating. Under single-ended conditions, the transformer shall be sized to carry the projected single-ended diversified demand load at 70% or less of the maximum fan cooled rating.

**F. Losses and Efficiency**

1. Substation transformers shall comply with DOE-2016 energy requirements for transformer efficiency.

**9.0 SECONDARY SWITCHGEAR AND DISTRIBUTION EQUIPMENT**

- A. When Primary metalclad main-tie-main configuration is used (refer to Section 4.0), the secondary switchgear will be manually controlled and operated. When secondary Main-Tie-Main configuration is used, the secondary switchgear shall be wired as indicated in Attachment B. The University Engineering Department will direct the professional on whether distribution circuit breakers should be metal enclosed group mounted or metalclad drawout based on the building and application.

**B. Secondary Switchgear General Construction**

1. In general, all secondary switching devices shall be circuit breaker type.
2. All mains and all ties shall be 100% ANSI rated stored energy, drawout power air circuit breaker type.
3. All mains, all ties, and feeders requiring electrical interlocks shall be equipped with electrically operated stored energy mechanisms.
4. Feeder breakers rated 1000 amperes or larger shall be either 100% ANSI rated stored energy, drawout power air circuit breaker type or group mounted, insulated case type as appropriate for the application, with consideration for maintenance requirements and criticality of building occupancy. These breakers shall be equipped the electronic trip units and rating plugs.
5. Feeder breakers rated less than 1000 amperes shall be either ANSI rated stored energy, drawout power air circuit breaker type or group mounted, insulated case type as appropriate for the application, with consideration for maintenance requirements and criticality of building occupancy. In general, breakers with 600 to 1000A trip settings shall be 100% rated, fixed insulated case ANSI type with electronic trip units and rating plugs. Breakers with trip settings lower than 600A shall be molded case type.
6. SPD equipment shall be provided at the main 480-volt service switchboard or switchgear -both sides of tie breakers on double ended configurations.
7. All removable cover panels for all switchgear and switchboards shall be bolted, hinged type, with lift-off hinges.

**C. ANSI Switchgear -General Construction**

1. Where ANSI rated stored energy, drawout power air circuit breakers are provided, the switchgear shall meet the requirements of ANSI C37.20.1.
2. Shipping sections shall be configured so as to enable moving them into the electrical rooms.
3. The switchgear shipping groups shall be factory assembled and all controls, interlocks and protective devices functionally tested.
4. The design shall be coordinated so that shipping groups are easily re-connected at the site into a continuous line-up. Necessary connecting materials shall be furnished. All interconnecting wiring shall be clearly identified on manufacturer's drawings and shall be marked to identify the terminal block and terminal point to which it is to be terminated.
5. Maintenance accessories similar to those required for metal-clad switchgear shall be provided, including, special tools, consumable spare parts, fuses, etc. Provide wall-mounted storage cabinet suitable for organized storage of maintenance accessories.

**D. Switchboards – General Construction**

1. Switchboard shall be of the modular type construction, constructed in accordance with the latest NEMA PB-2 and UL 891 standards, with the required number of vertical sections bolted together to form one metal enclosed rigid switchboard.
2. The sides, top and rear shall be covered with removable screw on code gauge steel plates.
3. Switchboard shall include all protective devices and equipment as listed on drawings with necessary interconnections, instrumentation and control wiring. Switchboards shall be the barriered, compartmentalized type.
4. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable identification.

5. Service entrance switchboards shall be suitable for use as service entrance equipment and shall be labeled in accordance with UL requirements.

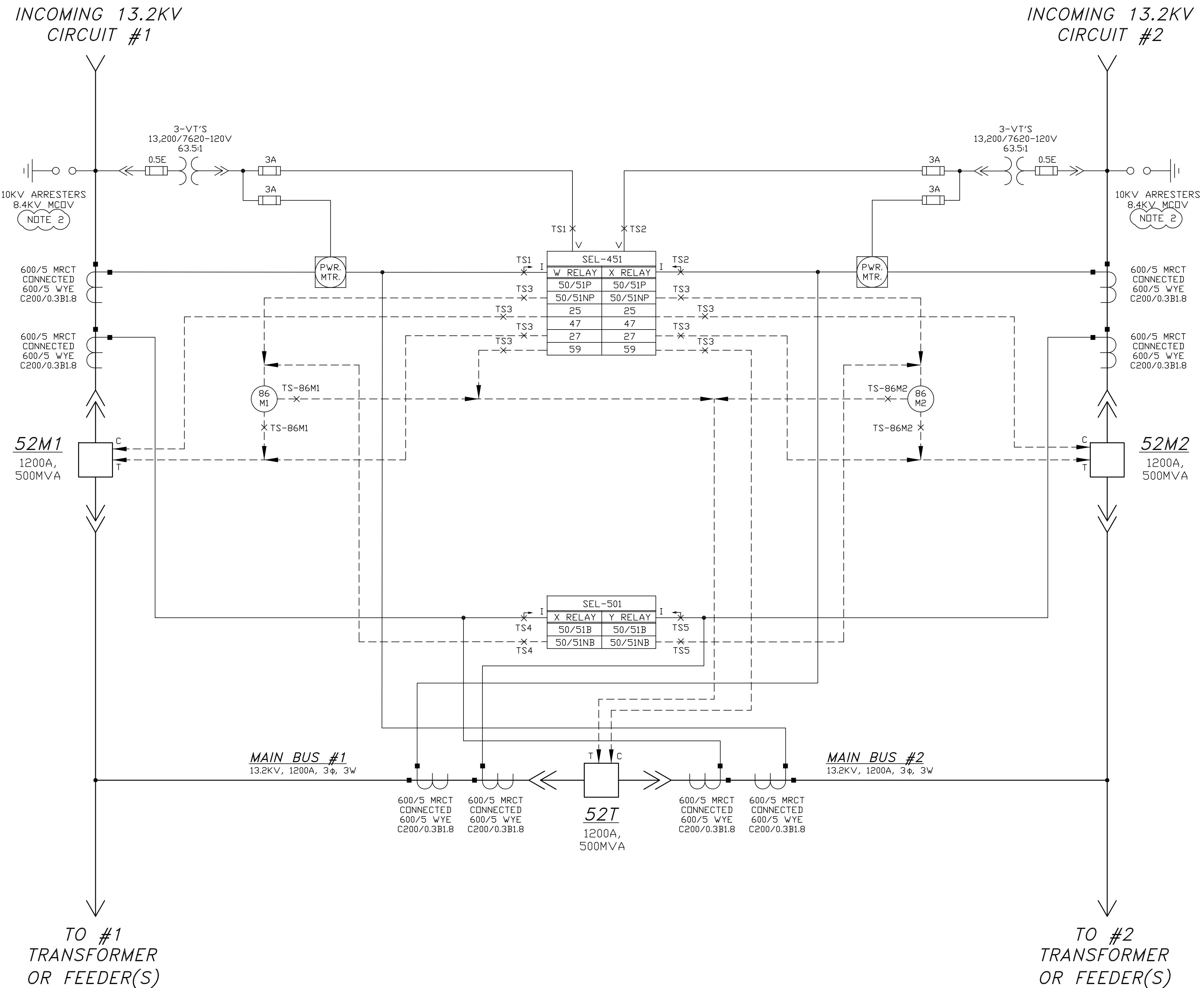
## 10.0 METERING

- A. Metering shall be provided in accordance with section 260913.

## 11.0 REQUIREMENTS FOR ELECTRICAL ROOMS AND SPACES

- A. The main power distribution equipment described herein shall be located in a dedicated electrical room designed to house such equipment.
- B. The space must be adequately ventilated and positive pressure outdoor ventilation should be utilized. Air conditioning should be used when use of outdoor is impractical or not possible. Where positive pressure outdoor air is the cooling method, inline easily maintainable filters shall be provided at intake.
- C. The switchgear shall be accessible from all sides. NEC working space requirements governing access to energized parts shall be met. Elsewhere, the minimum requirements of OSHA shall be met.
- D. The room shall be located and spaces designed so that the largest piece of equipment can be replaced without major disturbances to the architectural elements of the building. The design professional is required to coordinate all requirements with the architect.
- E. The preferred location for this room shall be the first floor of the building. Any location other than the first floor will require the specific approval of the University Engineering Department.
- F. Walls, floors, and ceilings shall have a minimum 1-hour fire rating, Lighting shall meet the requirements of Section 265000, and emergency lighting shall be provided in electrical rooms to allow service and operation by University personnel during power loss on building feeders.
- G. Acoustical considerations shall be addressed when the electrical room is located adjacent to building program space.
- H. Electrical rooms containing primary switchgear and main substations shall be protected by a dry-pipe, single interlock pre-action sprinkler system. The sprinkler system shall include a supplementary water flow switch with adjustable time delay.

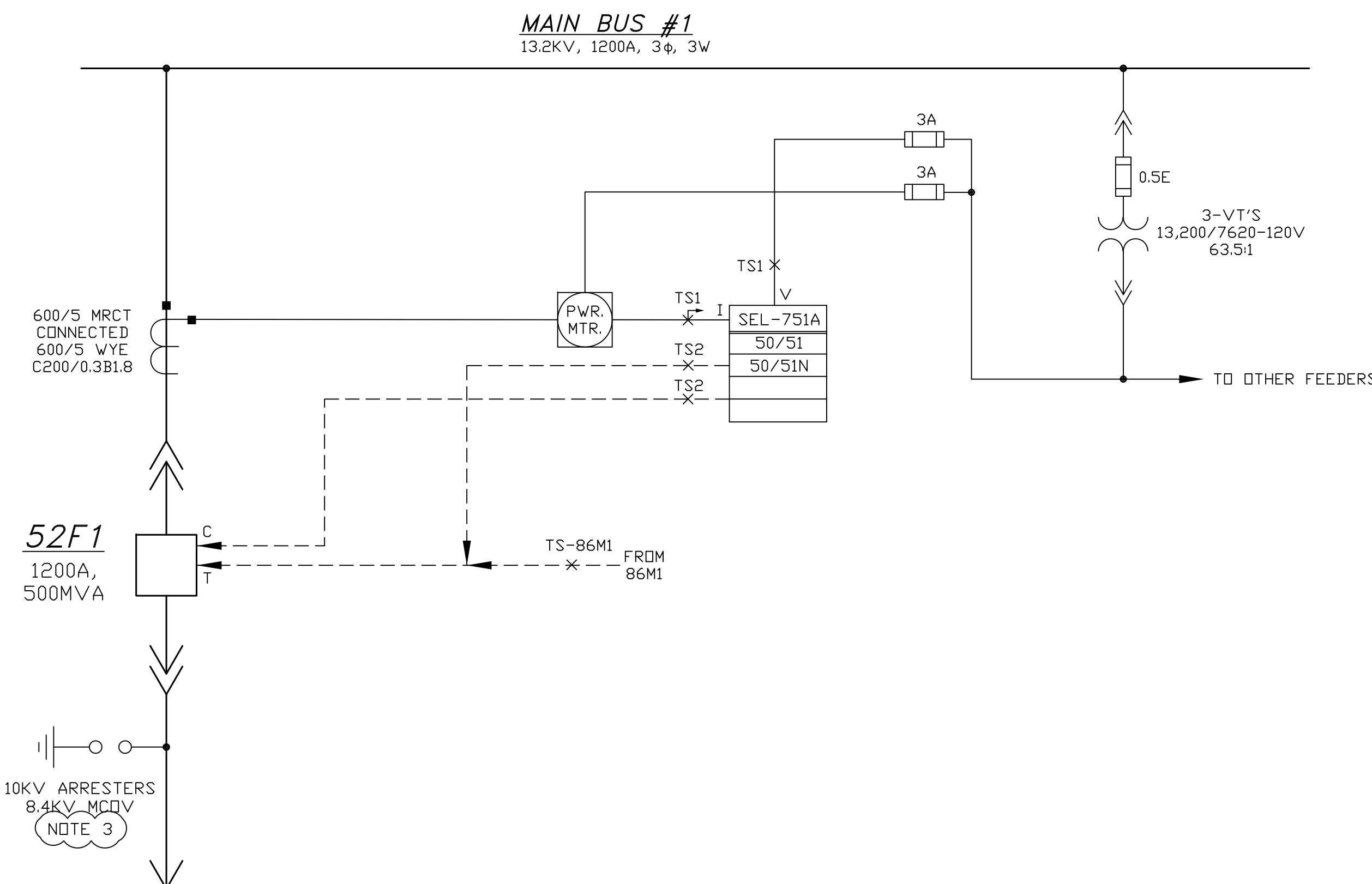
**ATTACHMENT A**



PROTECTIVE DEVICE FUNCTION MATRIX					
PROTECTION ZONE	RELAY	ELEMENT	ELEMENT DESCRIPTION	FUNCTION	NOTES
13.2KV CIRCUIT #1 & MAIN BUS #1	SEL-451 (W)	50/51P	PHASE OVERCURRENT	TRIP 86M1	
		50/51NP	NEUTRAL OVERCURRENT		
		25	SYNC CHECK	SUPERVISE CLOSE	
		47	NEGATIVE SEQUENCE VOLTAGE	INITIATE TRANSFER	
		27	UNDERVOLTAGE	INITIATE TRANSFER	
	SEL-501 (X)	59	OVERVOLTAGE	SUPERVISE TRANSFER	
13.2KV CIRCUIT #1 & MAIN BUS #2	SEL-501 (X)	50/51B	PHASE OVERCURRENT	TRIP 86M1	
		50/51NB	NEUTRAL OVERCURRENT		
	86M1	86	MAIN #1 LOCKOUT RELAY	TRIP & BLOCK CLOSE 52M1 & 52T	
	SEL-451 (X)	50/51P	PHASE OVERCURRENT	TRIP 86M2	
		50/51NP	NEUTRAL OVERCURRENT		
		25	SYNC CHECK	SUPERVISE CLOSE	
		47	NEGATIVE SEQUENCE VOLTAGE	INITIATE TRANSFER	
		27	UNDERVOLTAGE	INITIATE TRANSFER	
	SEL-501 (Y)	59	OVERVOLTAGE	SUPERVISE TRANSFER	
		50/51B	PHASE OVERCURRENT	TRIP 86M2	
		50/51NB	NEUTRAL OVERCURRENT		
	86M2	86	MAIN #2 LOCKOUT RELAY	TRIP & BLOCK CLOSE 52M2 & 52T	

2	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG THG
1	9/22/13	REVISE TO ADD OPTIONAL FEEDERS	THG THG

Orien Technical Services, LLC	43 Freemansville Road Reading, PA 19607 610-796-7900	UNIVERSITY OF PENNSYLVANIA STANDARD 13.2KV MAIN-TIE-MAIN SWITCHGEAR SINGLE LINE DIAGRAM		
DRAWN GWB	DATE 2/20/2013	APPROVED T. GROSCUP	DATE 2/27/2013	WORK ORDER NO.
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-1		



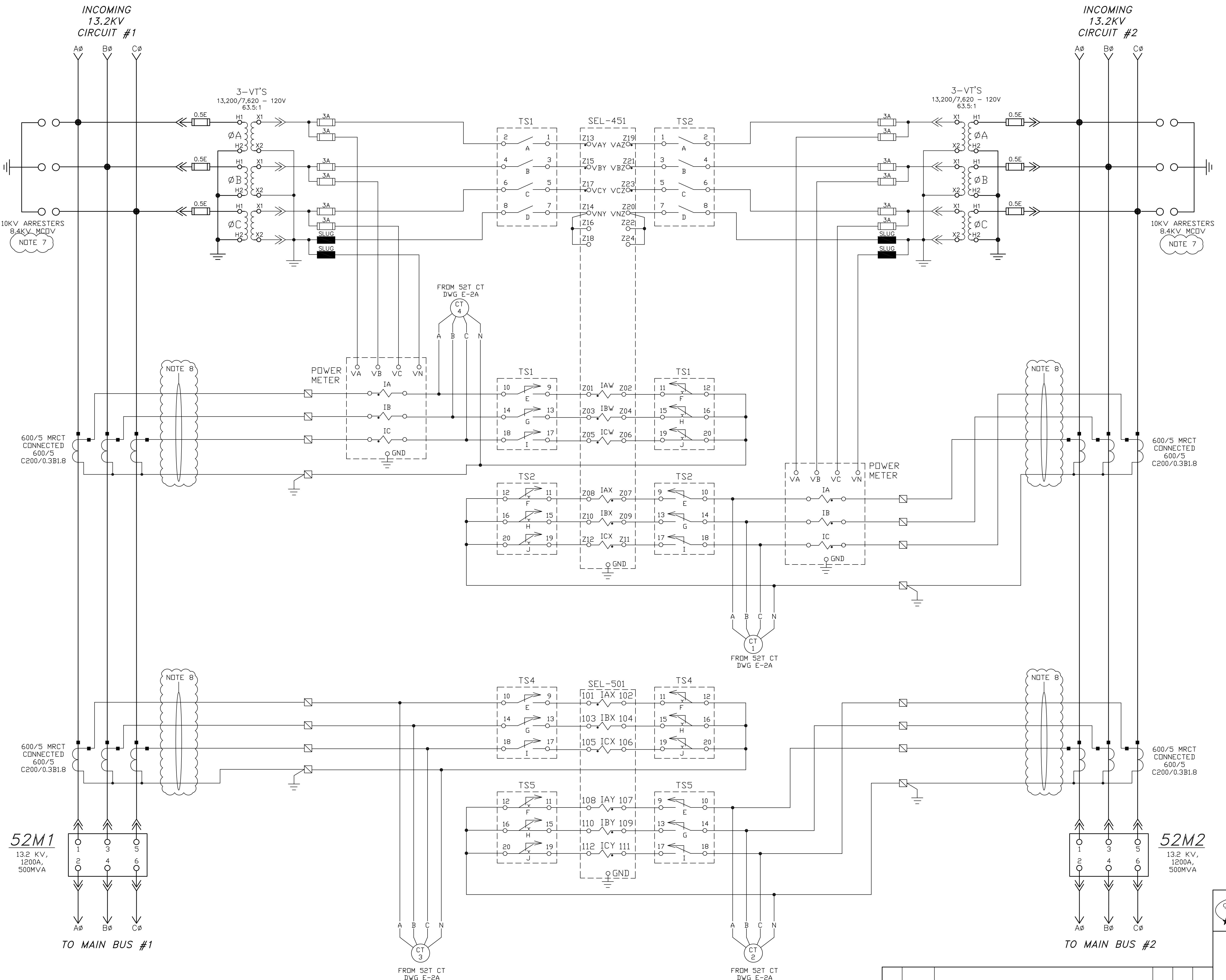
PROTECTIVE DEVICE FUNCTION MATRIX					
PROTECTION ZONE	RELAY	ELEMENT	ELEMENT DESCRIPTION	FUNCTION	NOTES
13.2KV FEEDER #1	SEL-751A	50/51	PHASE OVERCURRENT	TRIP 52F1	
		50/5IN	NEUTRAL OVERCURRENT		

**NOTES**

1. FOR MAIN SINGLE LINE DETAILS, REFER TO DWG E-1
2. DETAILS TO BE REPLICATED ON FINAL PROJECT SINGLE LINE FOR THE APPROPRIATE NUMBER OF FEEDERS.
3. FOR PECO INTERTIE SUBSTATIONS, ARRESTER RATING MUST BE 15KV(12.7KV MCQV)

1	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
REV.	REV. DATE	REVISION & JOB NO.	BY	CK.

 43 Freemansville Road Reading, PA 19607 610-796-7900	UNIVERSITY OF PENNSYLVANIA STANDARD			
	DRAWN THG	DATE 9/2/2013	APPROVED T. GROSCUP	DATE 9/2/2013
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-1A		

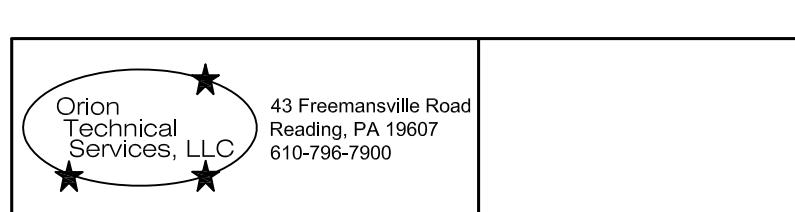


**NOTES:**

1. CONNECTIONS TO RELAYS TO BE AS SHOWN.
2. FOR RELAY CATALOG NUMBERS, SEE DWG. E-7.
3. 13.2KV BUS IS TO PROVIDE EITHER A LOAD TAP OR FEEDER BREAKERS DEPENDING ON PROJECT SPECIFICATIONS.
4. FOR FEEDER APPLICATIONS, SEE DWG E-4A FOR FEEDER THREE LINE DIAGRAM.
5. BUS POTENTIAL TRANSFORMERS ONLY REQUIRED FOR APPLICATIONS WITH FEEDER BREAKERS. REFER TO PROJECT SPECIFICATION FOR REQUIREMENTS.
6. CT CIRCUIT GROUNDING TO BE AS SHOWN. ONLY ONE GROUND IS TO BE PROVIDED PER CT CIRCUIT.
7. FOR PECO INTERTIE SUBSTATIONS, ARRESTOR RATING MUST BE 15KV (12.7KV MCDV).
8. ALL CURRENT CIRCUIT WIRING TO BE DONE WITH #12 AWG WIRE. ALL TERMINATIONS FOR THE ENTIRE CT CIRCUIT TO USE RING TONGUE CONNECTORS. CLAMP TYPE CONNECTIONS ARE UNACCEPTABLE.

**LEGEND**

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



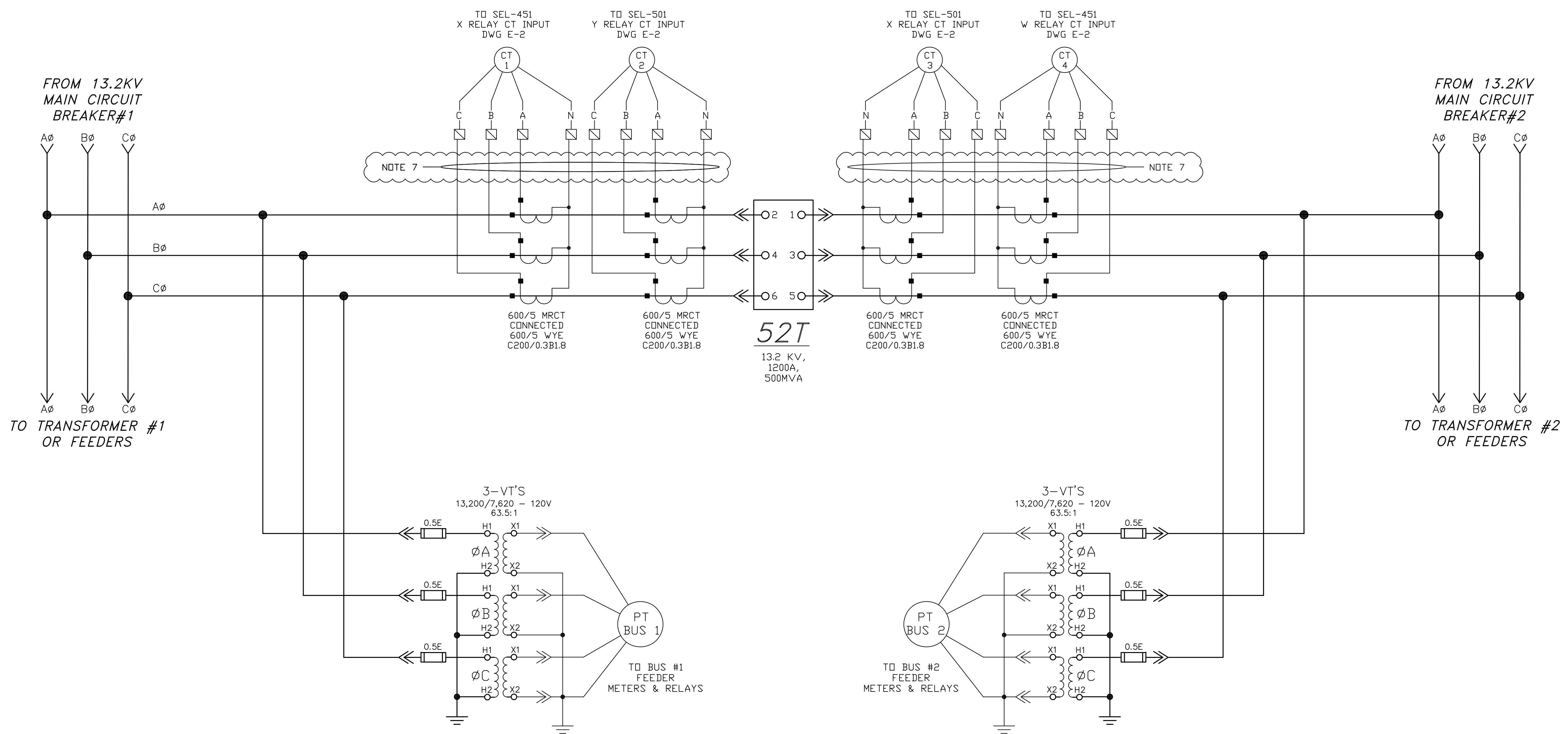
43 Freemansville Road  
Reading, PA 19607  
610-796-7900

UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
THREE LINE DIAGRAM

DRAWN GWB	DATE 2/20/2006	APPROVED T. GROSCUP	DATE 2/27/2013	WORK ORDER NO.
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-2		

REV.	REV. DATE	REVISION & JOB NO.	BY CK.	APP.
3	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
2	10/08/13	CORRECT METER 2 POLARITY	THG	THG
1	9/22/13	REVISE TO ADD OPTIONAL FEEDERS	THG	THG

E-2

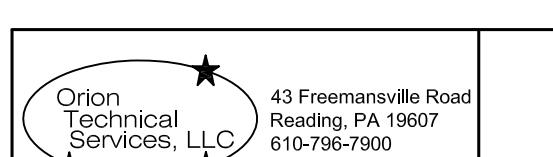


**NOTES:**

- 1. CONNECTIONS TO RELAYS TO BE AS SHOWN.
- 2. FOR RELAY CATALOG NUMBERS, SEE DWG. E-7.
- 3. 13.2KV BUS IS TO PROVIDE EITHER A LOAD TAP OR FEEDER BREAKERS DEPENDING ON PROJECT SPECIFICATIONS.
- 4. FOR FEEDER APPLICATIONS, SEE DWG E-4A FOR FEEDER THREE LINE DIAGRAM.
- 5. BUS POTENTIAL TRANSFORMERS ONLY REQUIRED FOR APPLICATIONS WITH FEEDER BREAKERS. REFER TO PROJECT SPECIFICATION FOR REQUIREMENTS.
- 6. CT CIRCUIT GROUNDING TO BE AS SHOWN. ONLY ONE GROUND PER CT CIRCUIT IS TO BE PROVIDED.
- 7. ALL CURRENT CIRCUIT WIRING TO BE DONE WITH #12 AWG WIRE. ALL TERMINATIONS FOR THE ENTIRE CT CIRCUIT TO USE RING TONGUE CONNECTORS. CLAMP TYPE CONNECTIONS ARE UNACCEPTABLE.

#### LEGEND

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



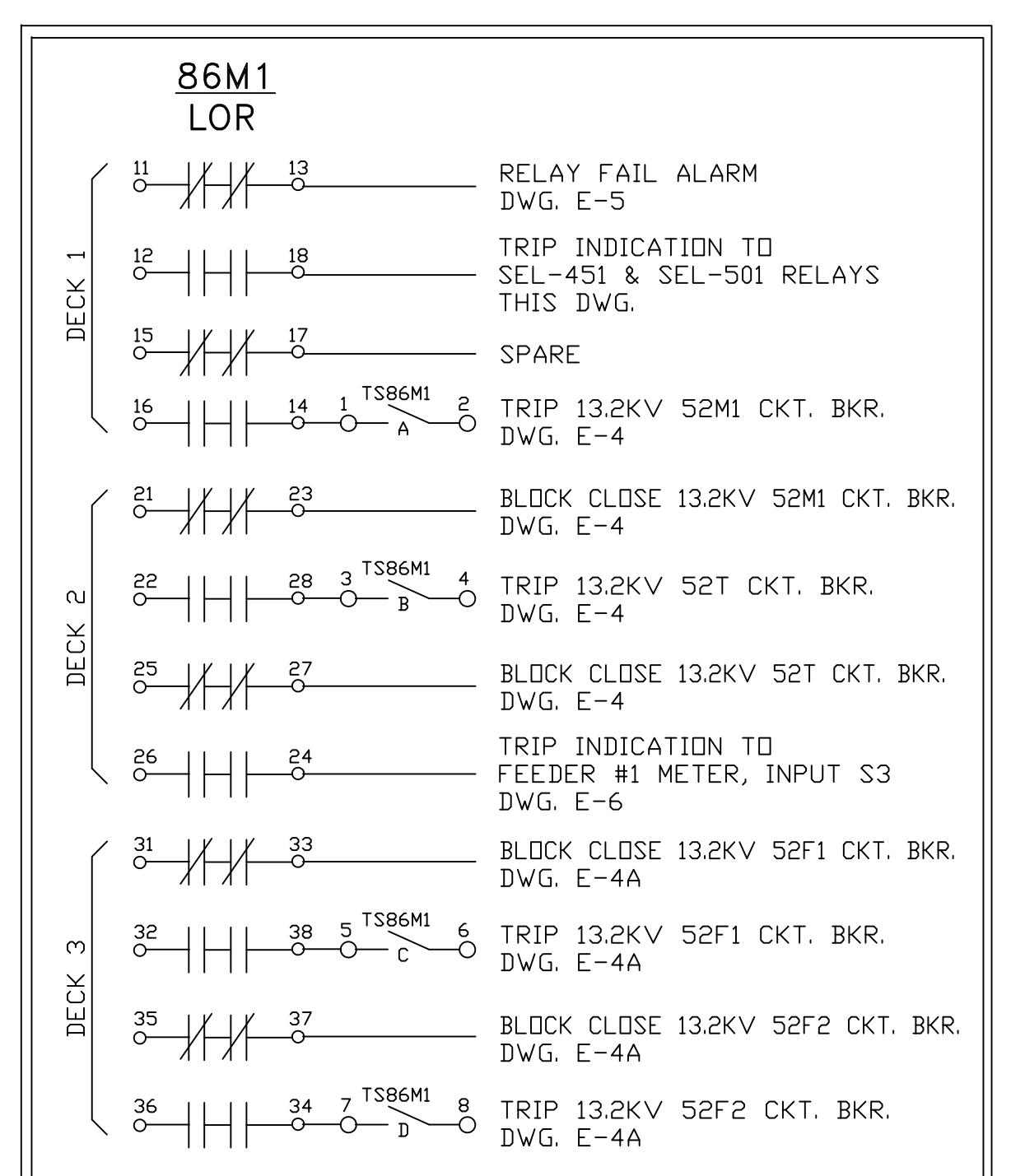
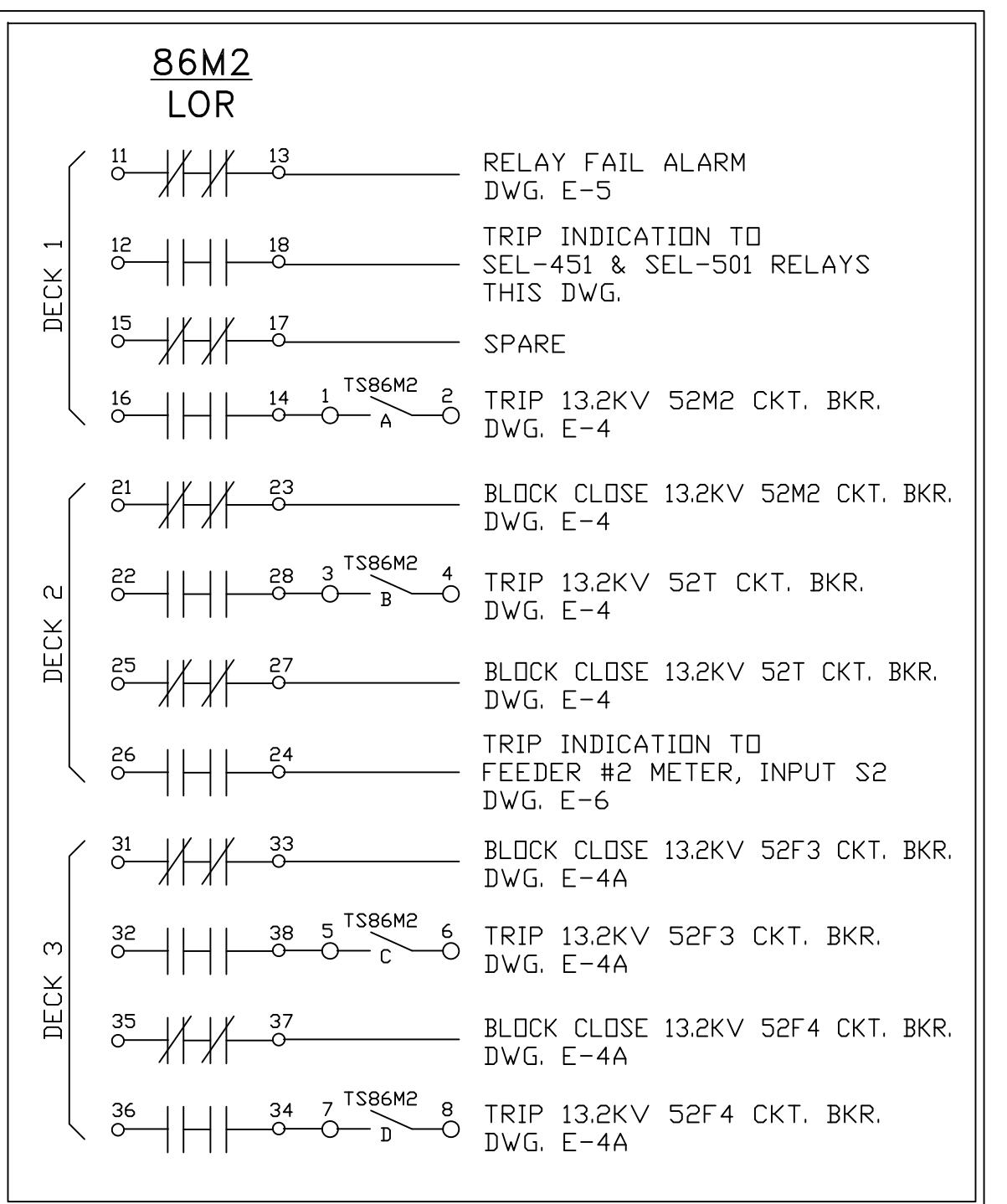
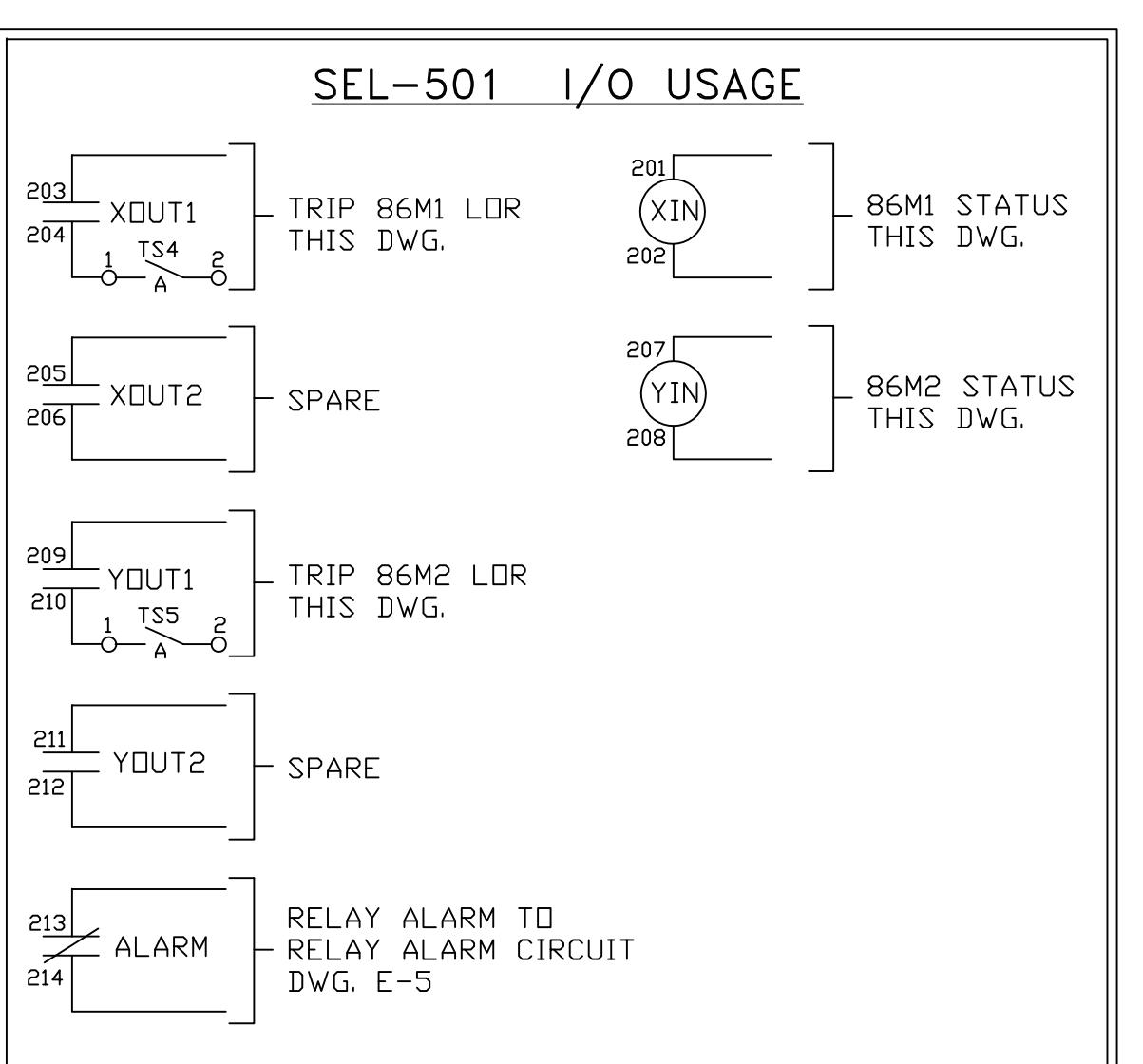
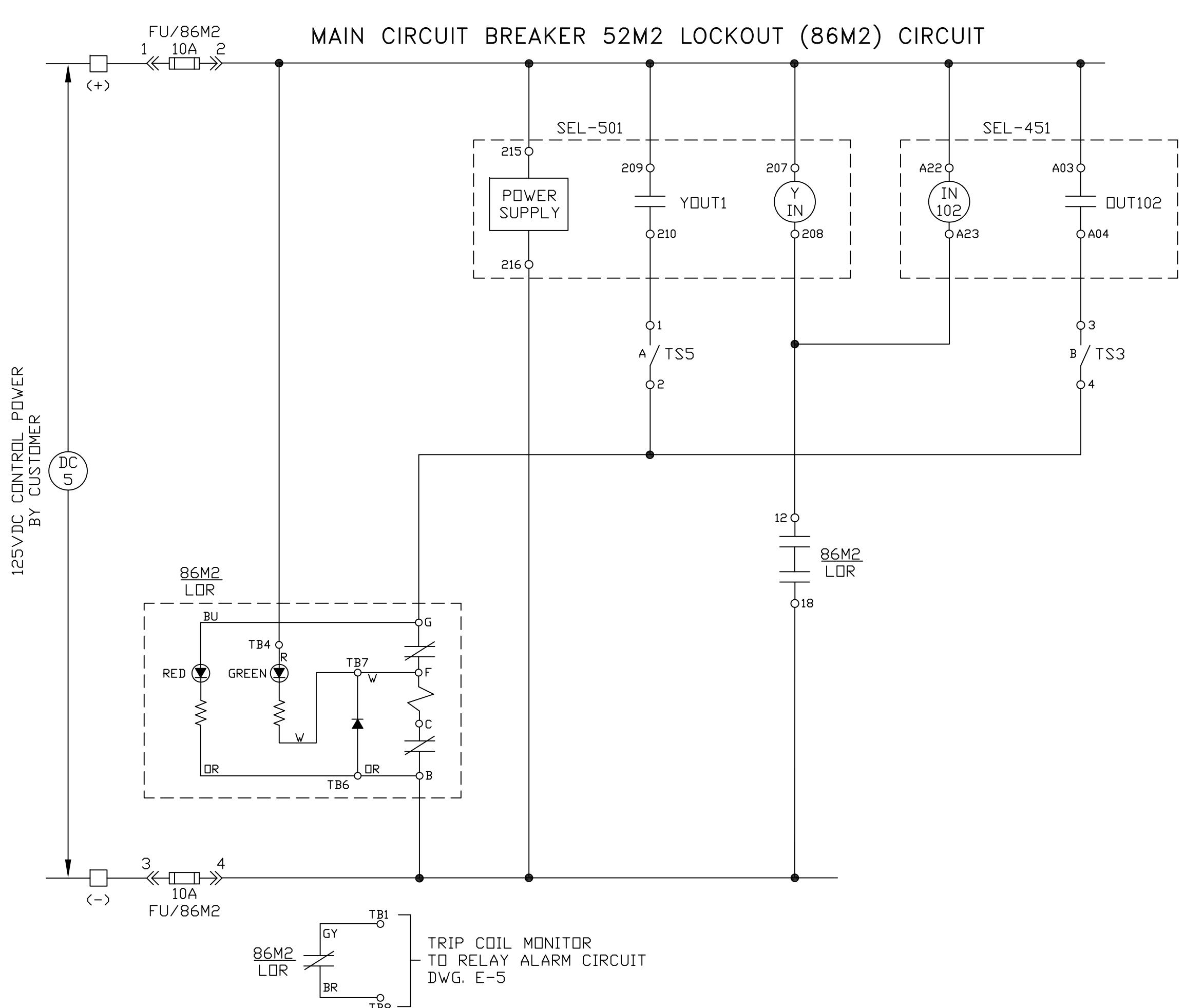
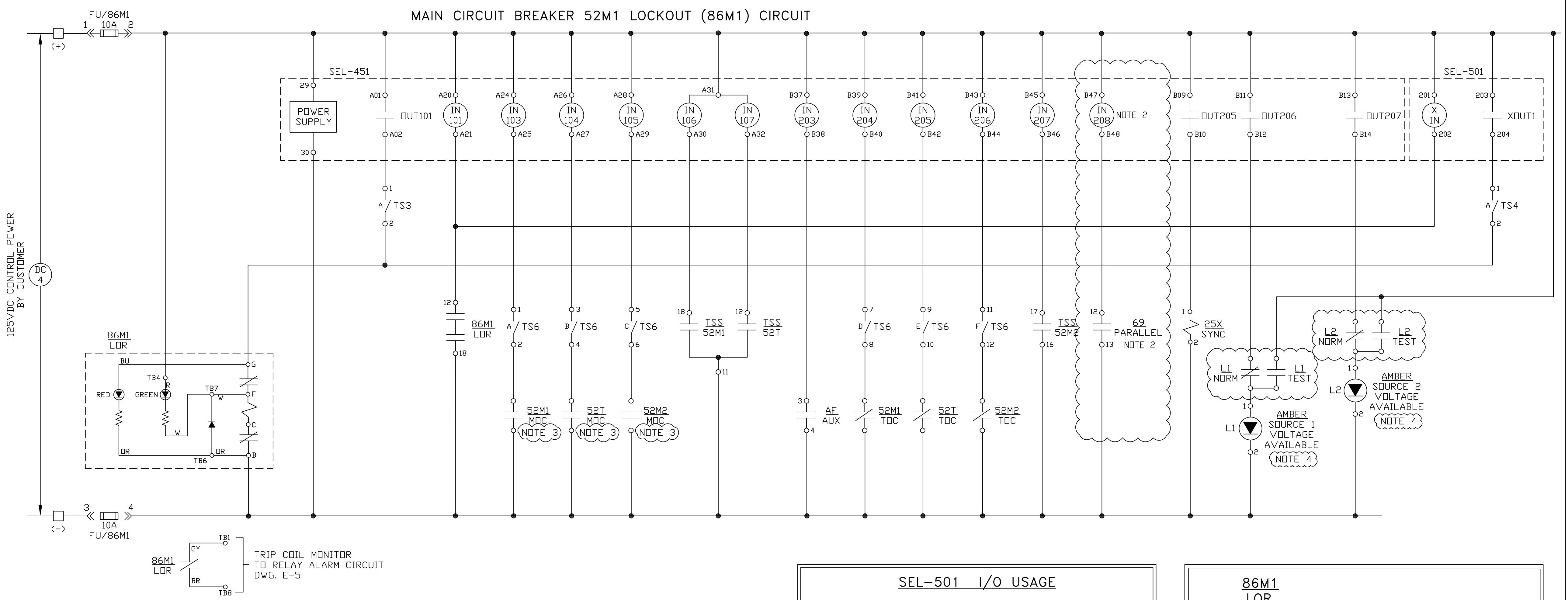
UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
BUS #1 & #2 THREE LINE DIAGRAM

DRAWN BY THG DATE 9/24/2013 APPROVED T. GROSCUP DATE 9/24/2013 WORK ORDER NO.

SCALE NONE SHEET NO. 1 OF 1 Dwg. NO.

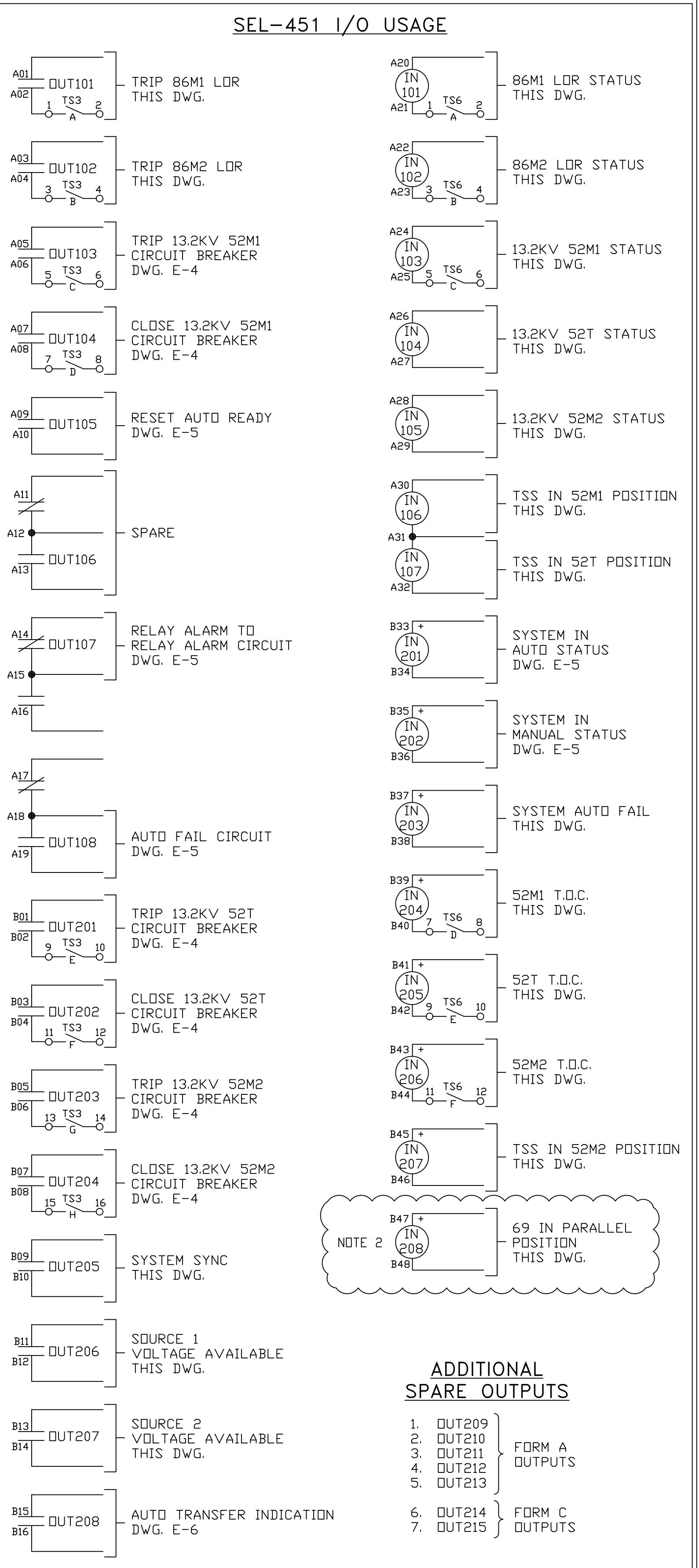
E-2A

1	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
REV.	REV. DATE	REVISION & JOB NO.	BY	CK.



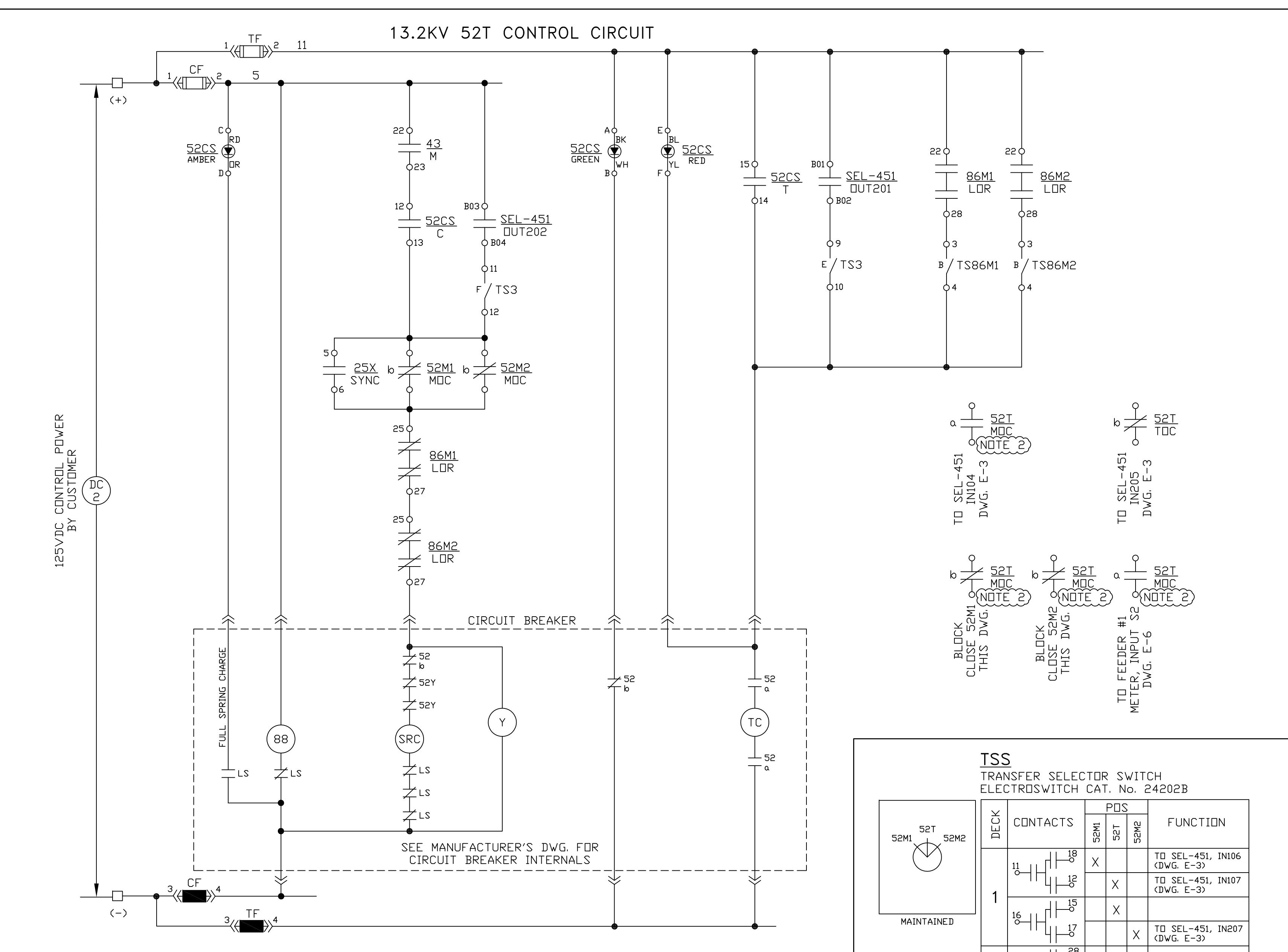
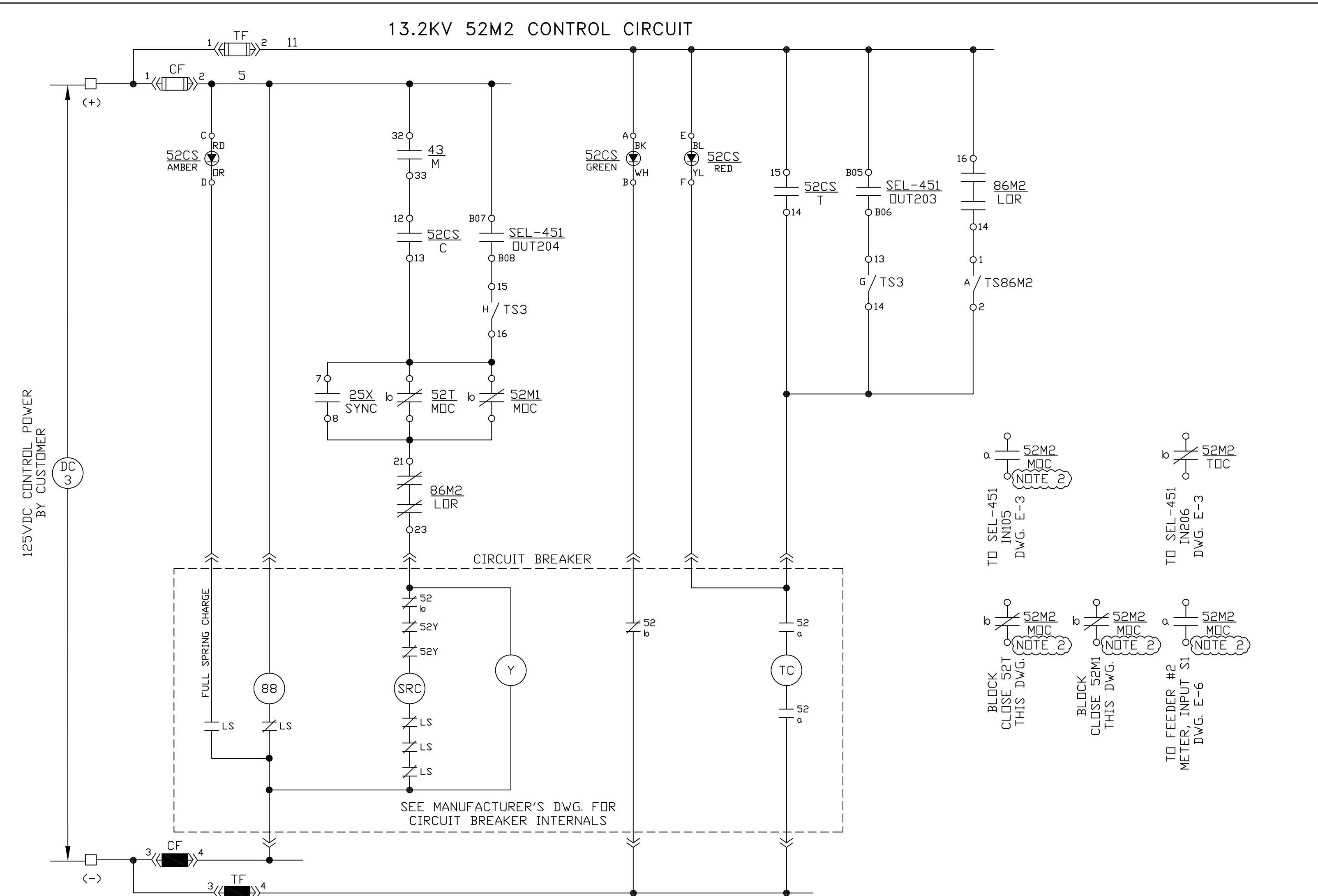
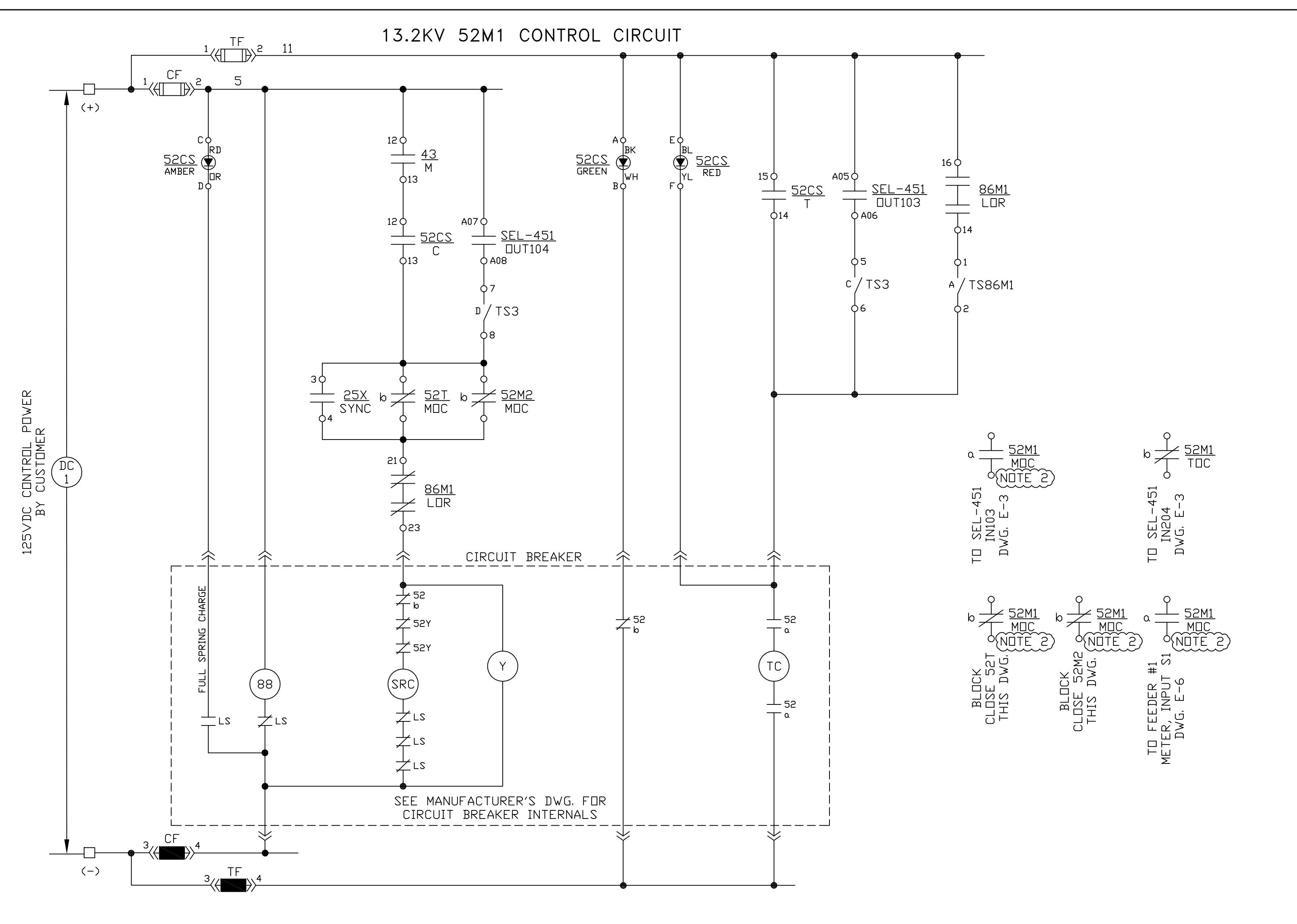
**NOTES:**

- FOR RELAY CATALOG NUMBERS, REFER TO DWG. E-7.
- FOR PECO INTERTIE SUBSTATIONS ONLY
- CIRCUIT BREAKER MDC CONTACTS MUST FUNCTION IN BOTH THE CONNECTED AND TEST POSITIONS.
- INDICATING LIGHTS TO BE PROVIDED WITH PUSH TO TEST FEATURE.



**LEGEND**

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



52CS	
CIRCUIT BREAKER CONTROL SWITCH	
ELECTROSWITCH CAT. No. 24PC43D	
DECK	CONTACTS
1	12 13 TRIP NAC CLOSE X CB CLOSE (THIS DWG.) 15-16 14 17 X CB TRIP (THIS DWG.)
2	21 22 23 X X AUTO MODE INDICATION (DWG. E-6) 26 27 X X MANUAL MODE INDICATION (DWG. E-6)
3	32 33 34 X X SAT CB CLOSE (THIS DWG.) 36 37 X X AUTO MODE INDICATION (DWG. E-5)
4	42 43 44 X X MANUAL MODE INDICATION (DWG. E-5)

25X	
SYNC AUX. RELAY	
SQUARE D CAT. No. 8501-XD0-40-125VDC	
CONTACTS	FUNCTION
3 4	52M1 CB CLOSE (THIS DWG.)
5 6	52T CB CLOSE (THIS DWG.)
7 8	52M2 CB CLOSE (THIS DWG.)
9 10	

43	
AUTO/MANUAL SWITCH	
ELECTROSWITCH CAT. No. 24204B	
DECK	CONTACTS
1	12 13 TRIP NAC CLOSE X AUTO 15-16 14 17 X MAN
2	21 22 23 X X AUTO MODE INDICATION (DWG. E-6) 26 27 X X MANUAL MODE INDICATION (DWG. E-6)
3	32 33 34 X X SAT CB CLOSE (THIS DWG.) 36 37 X X AUTO MODE INDICATION (DWG. E-5)
4	42 43 44 X X MANUAL MODE INDICATION (DWG. E-5)

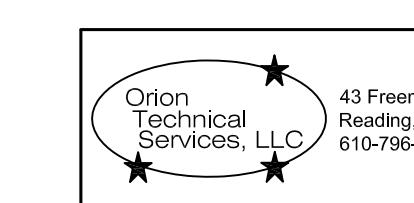
69	
PECO PARALLEL SWITCH	
ELECTROSWITCH CAT. No. 24202B	
NOTE 1	NORM PAR
MAINTAINED	DECK CONTACTS POS FUNCTION
1	12 13 NORM X TO SEL-451 IN108 (DWG. E-3) 16 17 PAR X 69/NORM INDICATION (DWG. E-6)
2	21 22 23 X X 69/PAR INDICATION (DWG. E-6)

- NOTES:
- FOR PECO INTERTIE SUBSTATIONS ONLY. SWITCH TO BE PROVIDED WITH LOCKABLE COVER.
  - CIRCUIT BREAKER MOC CONTACTS TO FUNCTION IN BOTH CONNECTED AND TEST POSITIONS.

#### LEGEND

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)

1	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
REV.	REV. DATE	REVISION & JOB NO.	BY CK.	APP.

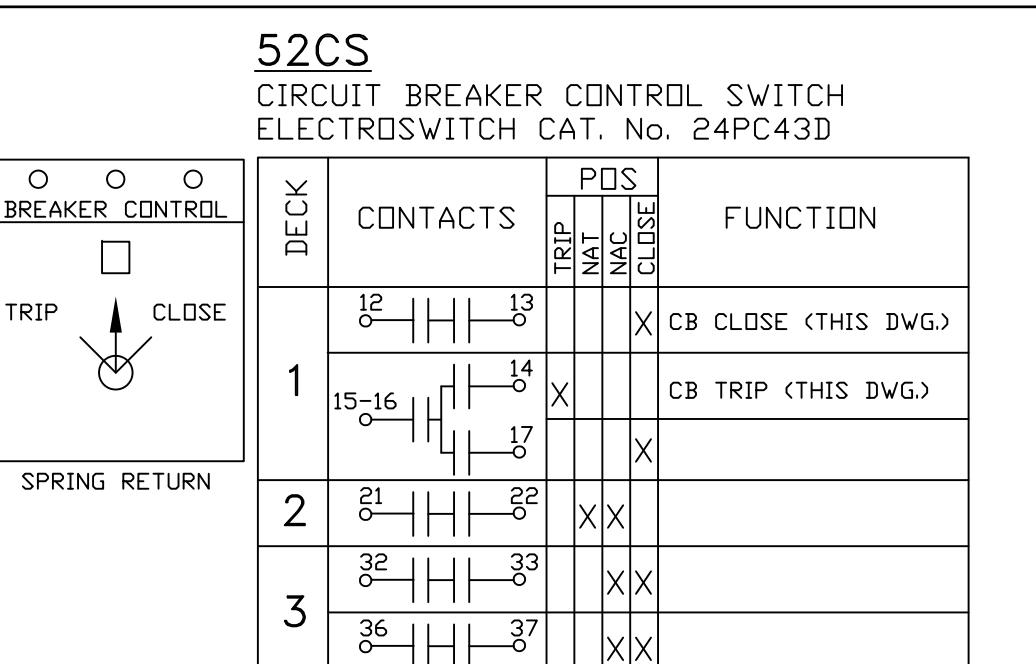
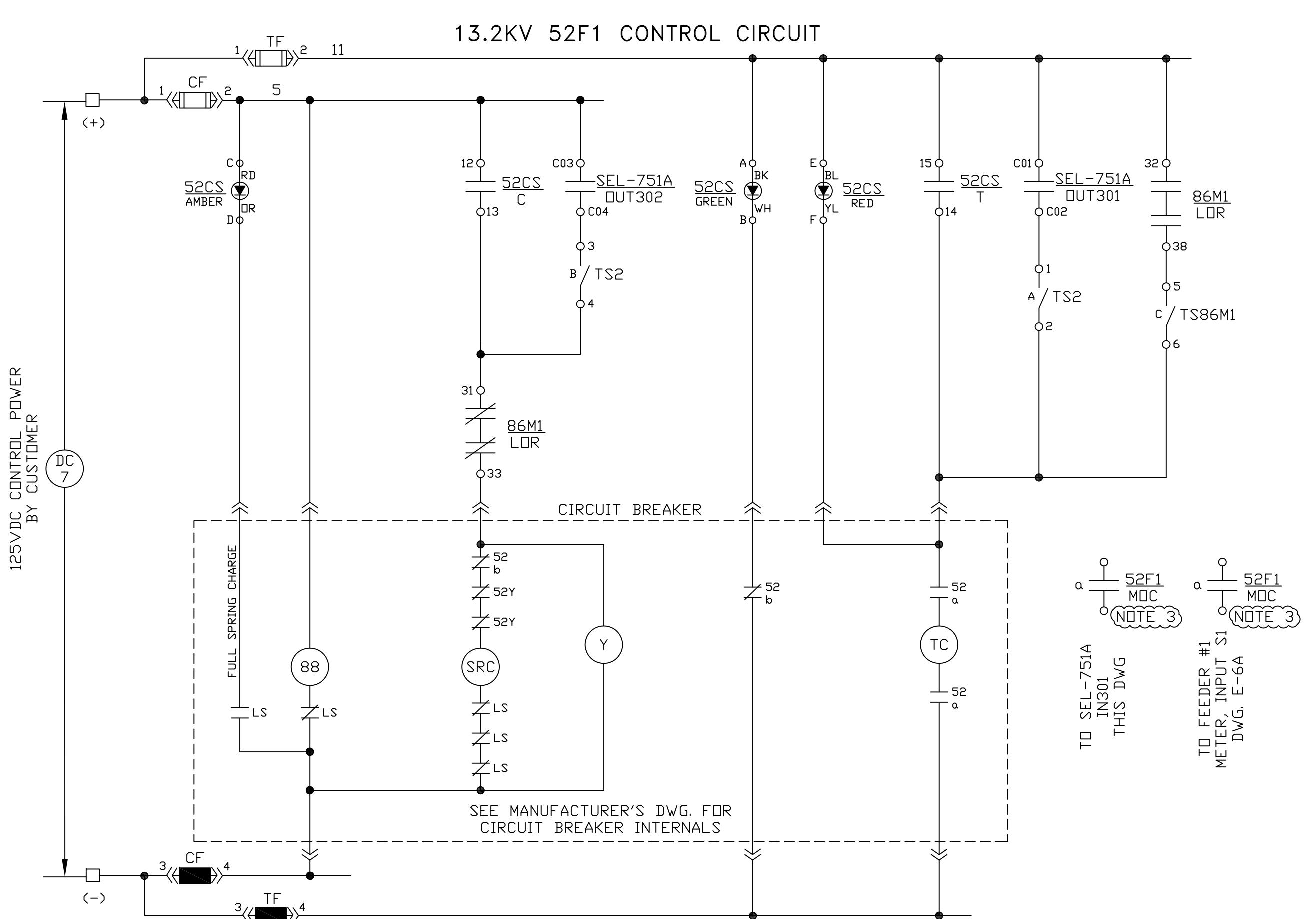
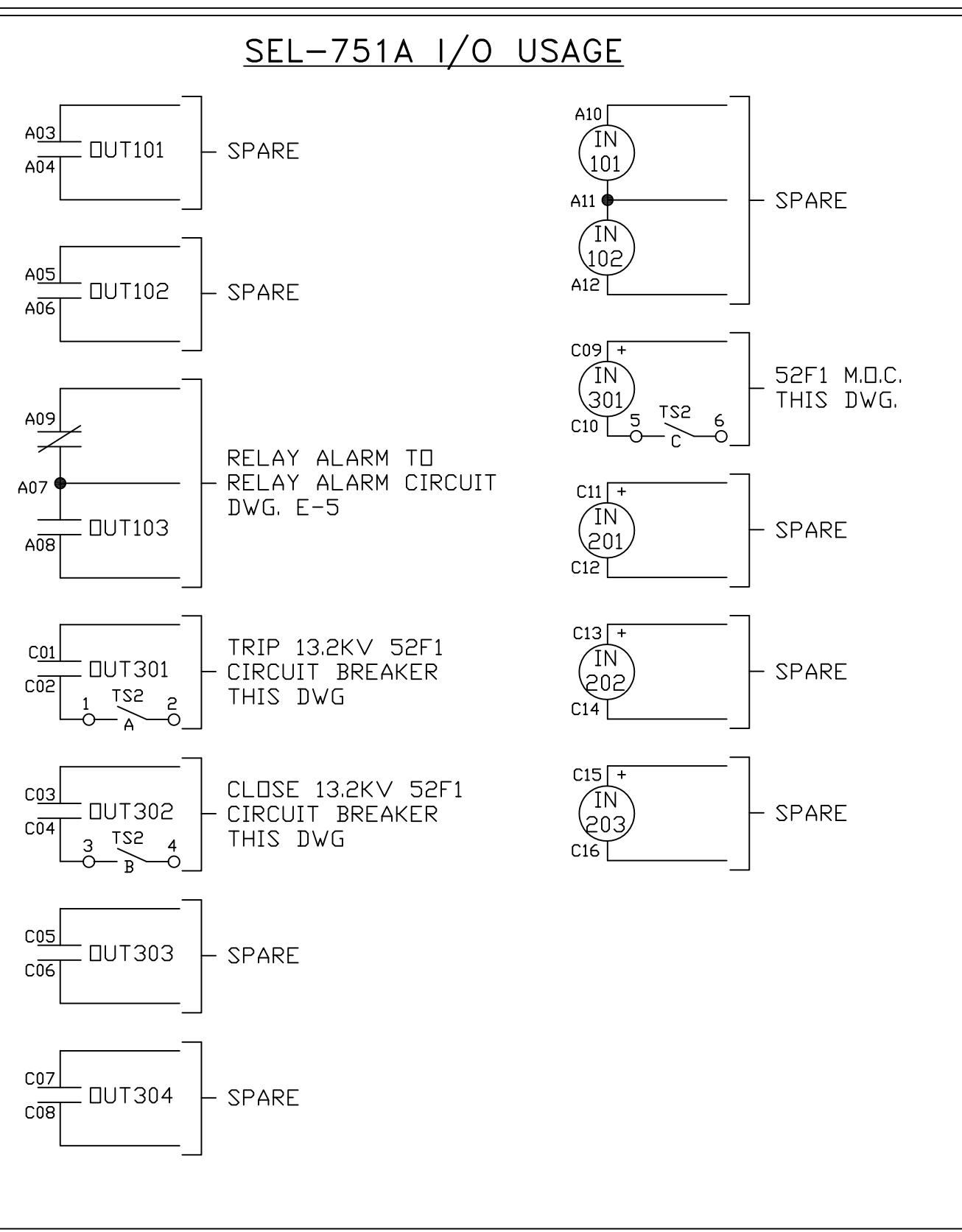
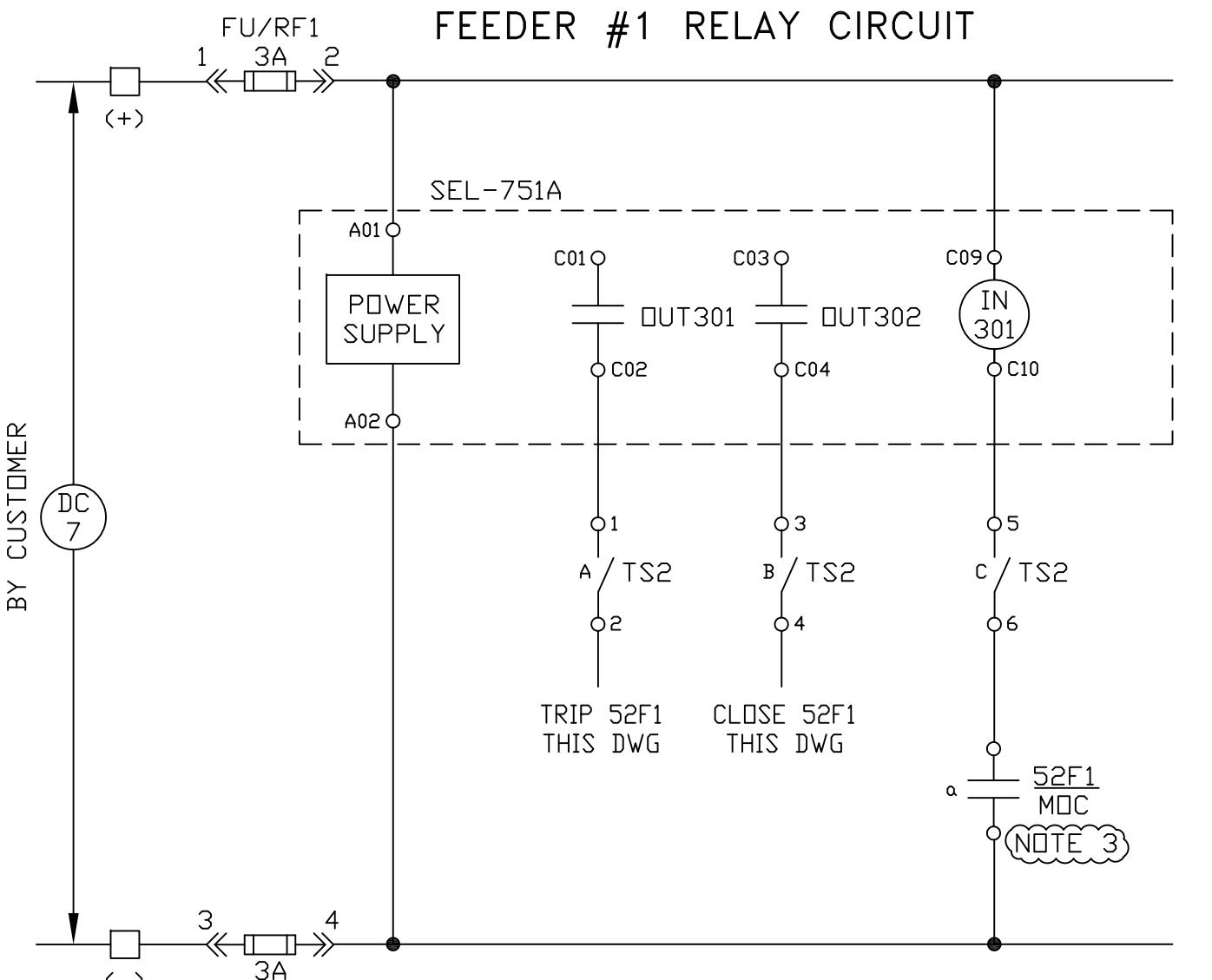
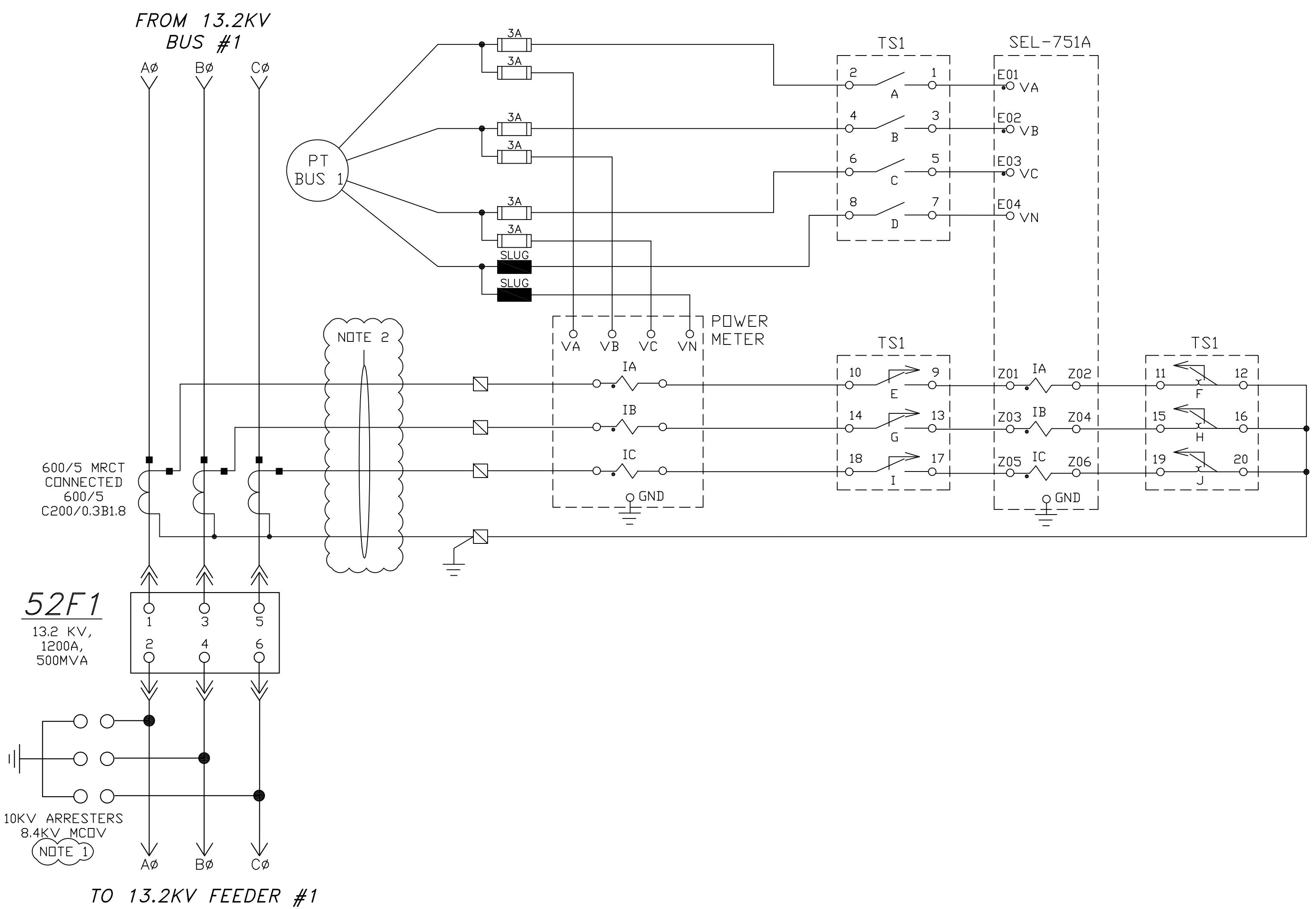


43 Freemansville Road  
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UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
CONTROL SCHEMATIC

DRAWN  
GBW DATE  
2/21/2013 APPROVED  
T. GROSCUP DATE  
2/27/2013 WORK ORDER  
NO.

E-4

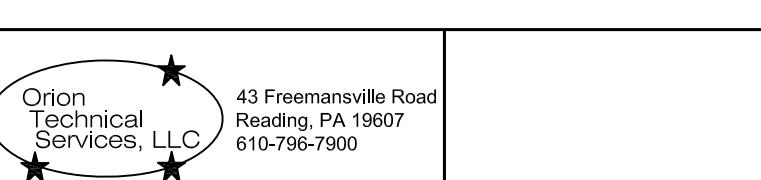


**NOTES:**

- FOR PECO INTERTIE SUBSTATIONS, ARRESTER RATING IS TO BE 15KV (12.7KV MC0V)
- ALL CURRENT CIRCUIT WIRING TO BE DONE WITH #12 AWG WIRE. ALL TERMINATIONS FOR THE ENTIRE CT CIRCUIT TO USE RING TONGUE CONNECTORS. CLAMP TYPE CONNECTIONS ARE UNACCEPTABLE.
- CIRCUIT BREAKER MDC CONTACTS MUST FUNCTION IN BOTH CONNECTED AND TEST POSITION.

**LEGEND**

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
FEEDER AC/DC SCHEMATIC

DRAWN BY: **GWB** DATE: **2/21/2013** APPROVED BY: **T. GROSCUP** DATE: **2/27/2013** WORK ORDER NO. **E-4A**

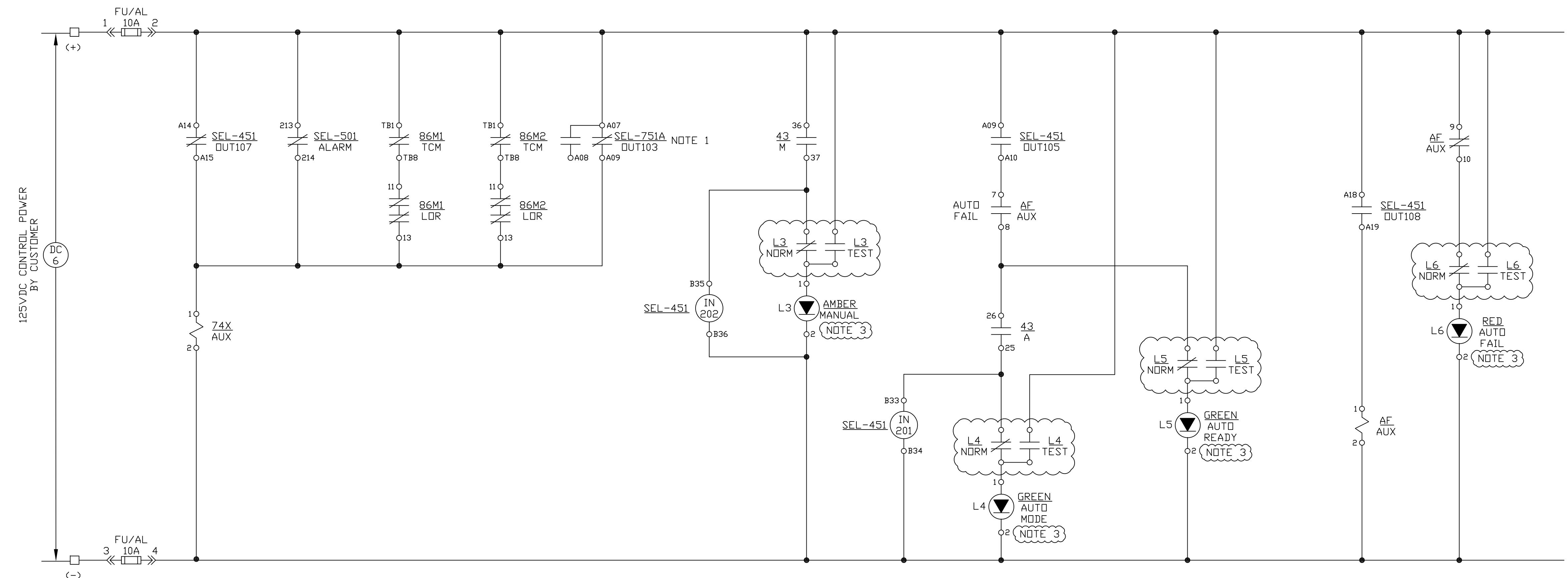
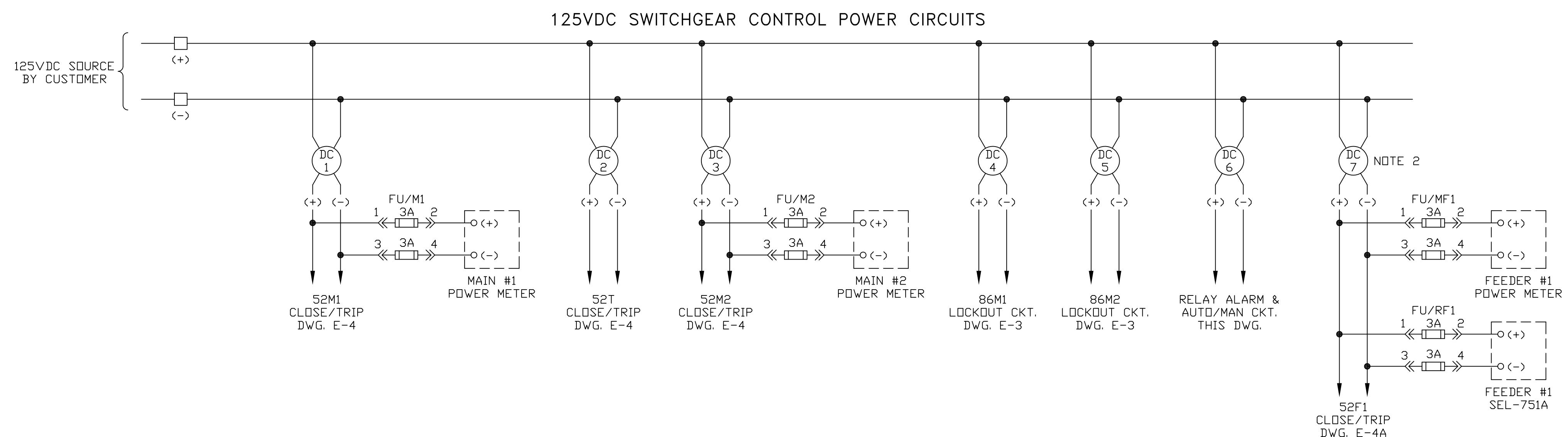
SCALE: **NONE** SHEET NO.: **1 OF 1** Dwg. NO. **E-4A**

2	1/15/15 REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
1	10/08/13 REVISE PER COMMENTS	THG	THG

REV. **REV. DATE**

REVISION & JOB NO.

BY **CK.** APP.



**NOTES:**

1. SEL-751A ALARM CONTACT ONLY EXISTS FOR APPLICATIONS WITH FEEDERS. ALARM CONTACTS FROM ALL SEL-751A RELAYS PRESENT SHOULD BE ADDED TO THIS CIRCUIT AS SHOWN.
2. ADDITIONAL DC CIRCUITS TO BE ADDED TO DRAWING AS REQUIRED FOR THE NUMBER OF FEEDERS TO BE SUPPLIED.
3. INDICATING LIGHTS TO BE PROVIDED WITH PUSH TO TEST FEATURE.

#### LEGEND

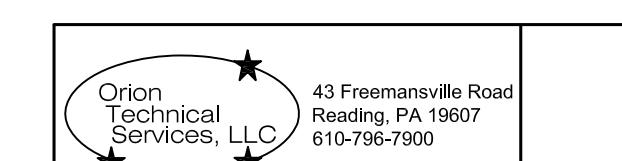
- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)

**74X**  
RELAY ALARM AUX. RELAY  
SQUARE D CAT. No. 8501-XD0-40-125VDC

1	2	RELAY FAILURE ALARM (THIS DWG.)
CONTACTS	FUNCTION	
3	4	
5	6	RELAY FAILURE ALARM (DWG. E-6)
7	8	
9	10	

**AF**  
AUTO FAIL AUX. RELAY  
SQUARE D CAT. No. 8501-XD0-40-125VDC

1	2	AUTO FAIL CKT. (THIS DWG.)
CONTACTS	FUNCTION	
3	4	SEL-451 IN203 (DWG. E-3)
5	6	AUTO FAIL IND. (DWG. E-6)
7	8	AUTO READY (THIS DWG.)
9	10	AUTO FAIL IND. (THIS DWG.)

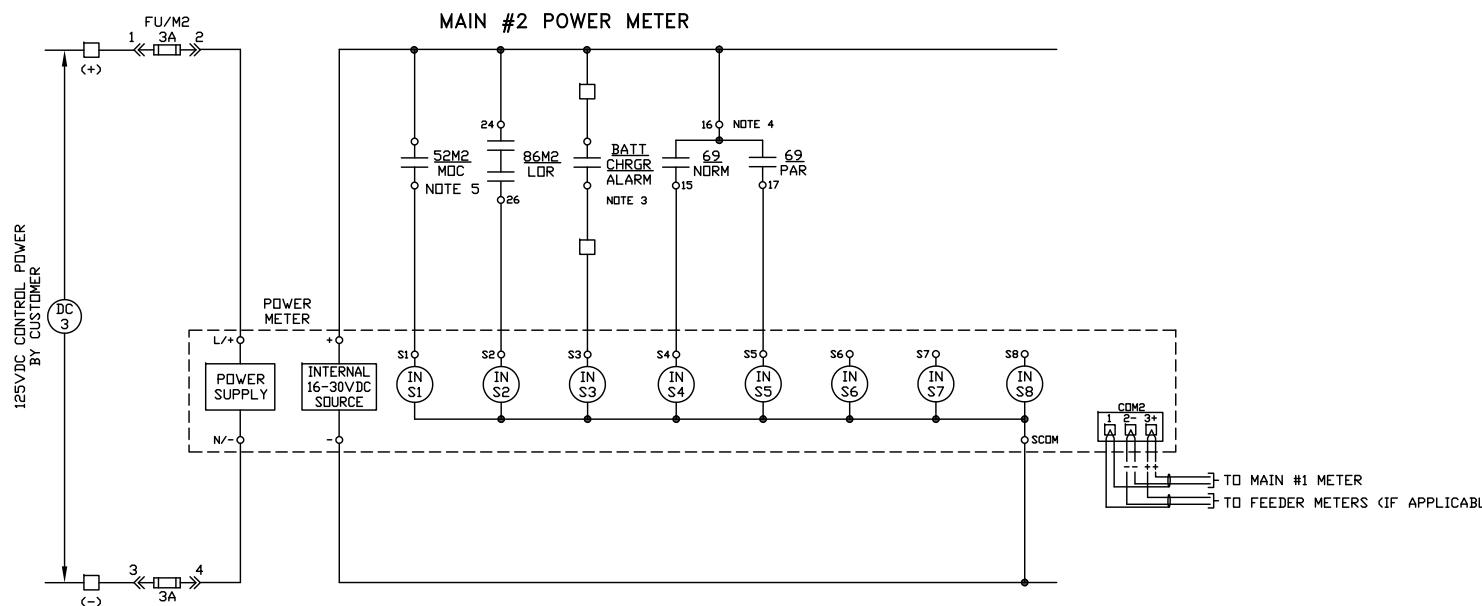
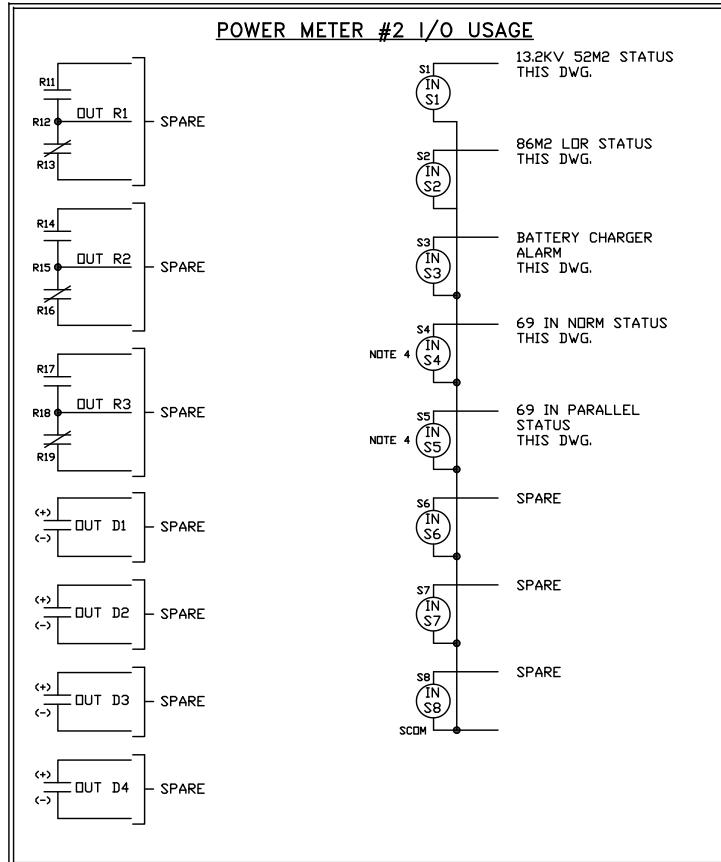
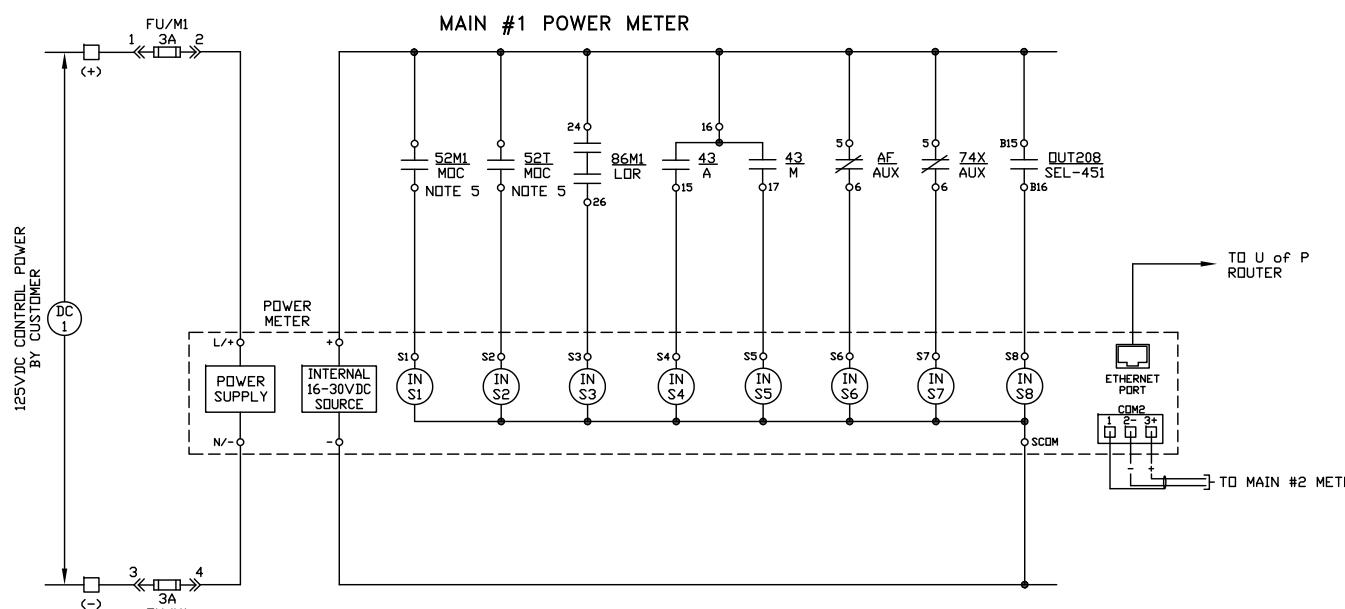
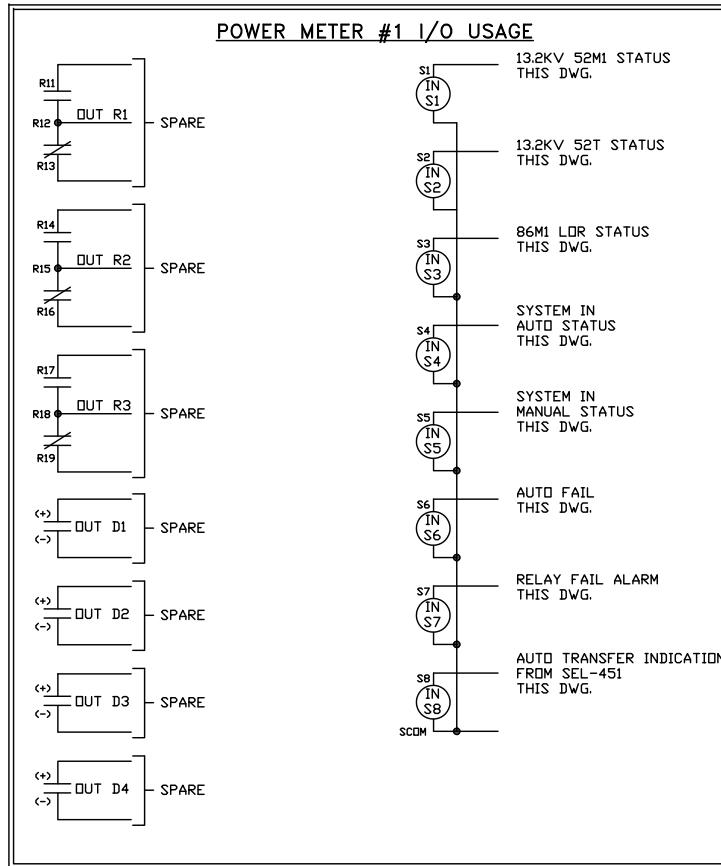


UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
POWER SUPPLY & ALARM SCHEMATIC

DRAWN DATE APPROVED DATE WORK ORDER NO.  
GWB 2/21/2013 T. GROSCUP 2/27/2013

SCALE SHEET NO. Dwg. NO.  
NONE 1 OF 1 E-5

REV.	REV. DATE	REVISION & JOB NO.	BY	CK.	APP.
3	1/15/15	REVISE PER COMMENTS	THG	THG	
2	10/08/13	REVISE PER COMMENTS	THG	THG	
1	9/23/13	REVISE TO ADD OPTIONAL FEEDERS	THG	THG	



- NOTES:**
1. FOR AC CIRCUITS, REFER TO DWG E-2.
  2. METER COMMUNICATIONS SHOWN WITH MAIN #1 METER CONFIGURED AS MODBUS GATEWAY TO COMMUNICATE VIA RS-485 WITH ALL OTHER SWITCHGEAR METERS AND CONNECTED TO PENN NET VIA AN ETHERNET CONNECTION.
  3. IF MULTIPLE BATTERY CHARGER ALARMS ARE AVAILABLE (IE. DC GROUND, LOSS OF AC, LOSS OF DC, ETC) THESE SHOULD BE PARALLELED INTO ONE GROUP ALARM.
  4. FOR PECO INTERTIE SUBSTATIONS ONLY.
  5. CIRCUIT BREAKER MOC CONTACTS MUST FUNCTION IN BOTH CONNECTED AND TEST POSITIONS.

**LEGEND**

SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)

NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
METER SCHEMATIC

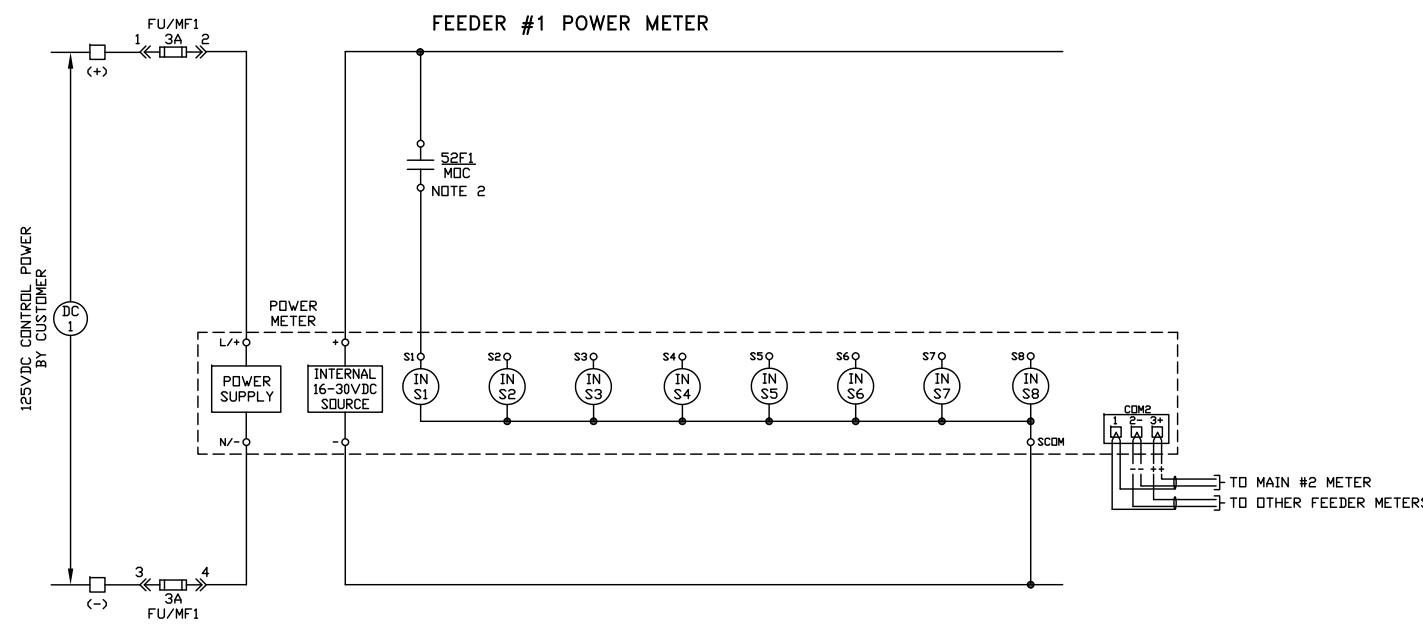
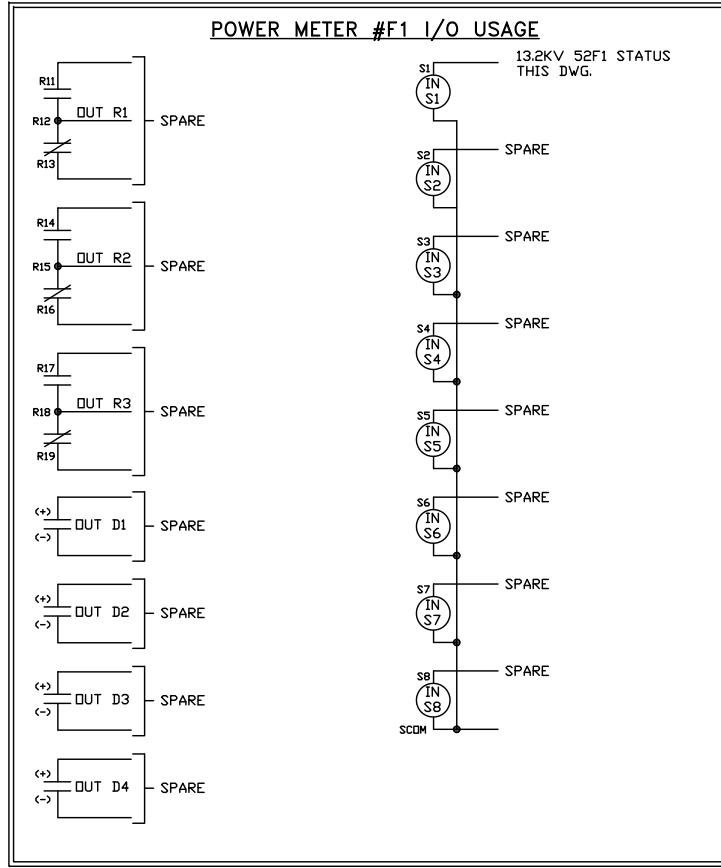
DRAWN BY GWB DATE 4/8/2013 APPROVED BY T.GROSCUP DATE 4/9/2013 WORK ORDER NO.

SCALE NONE SHEET NO. 1 OF 1 Dwg. No. E-6

4	12/15/16	REVISE METER INPUTS SOURCE	GWB	THG	
3	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG	
2	9/30/13	ADD BATTERY CHARGER GROUP ALARM	THG	THG	
1	9/23/13	REVISE TO ADD OPTIONAL FEEDERS	THG	THG	

REV. REV. DATE REVISION & JOB NO.

BY OK APP.



**NOTES:**

1. FOR A.C. CIRCUITS, REFER TO DWG. E-2A.
2. CIRCUIT BREAKER MOC CONTACTS MUST FUNCTION IN BOTH CONNECTED AND TEST POSITIONS.

**LEGEND**

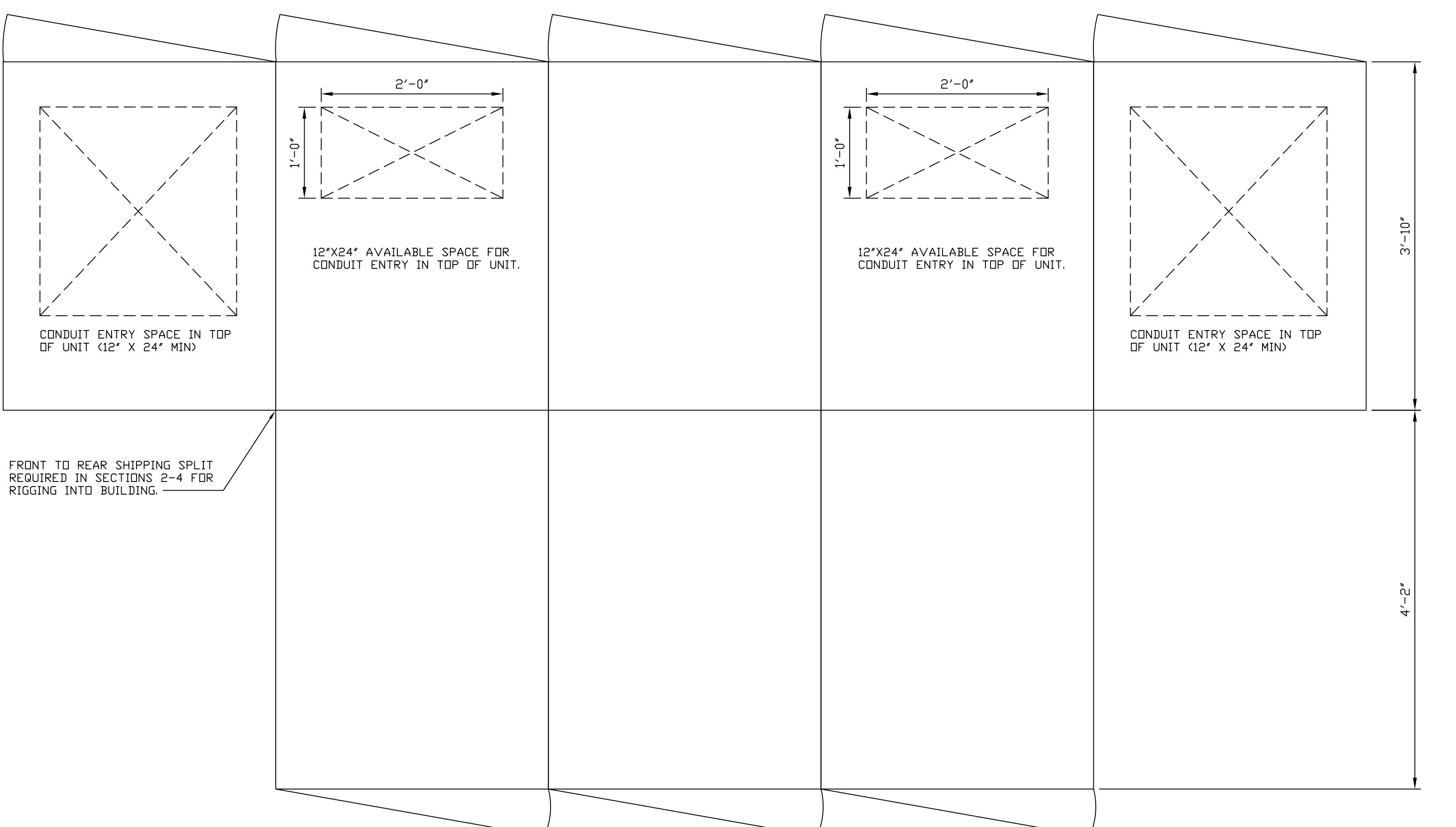
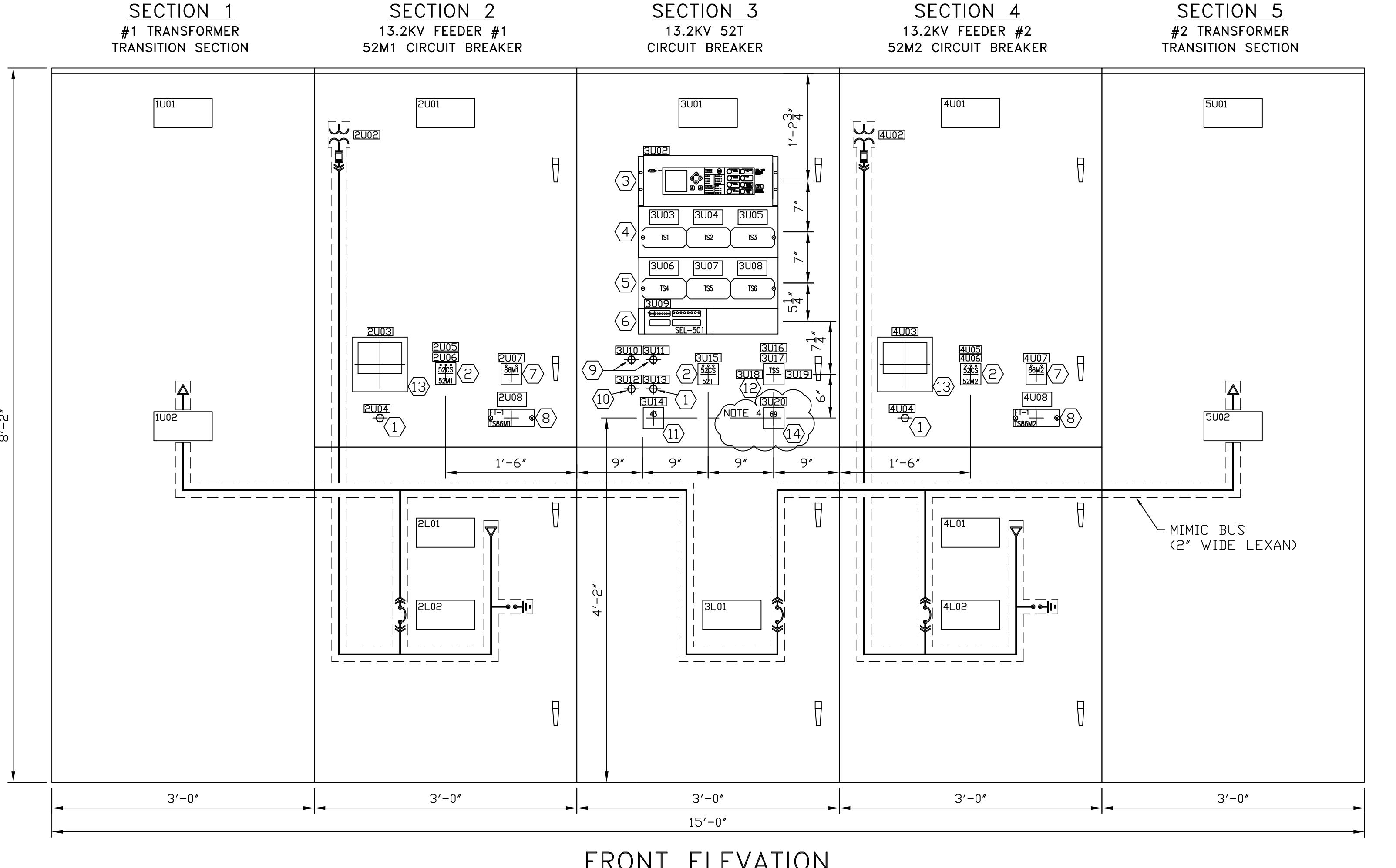
- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)

Orion Technical Services, LLC  
43 Freemansville Road  
Reading, PA 19607  
610-796-7900

UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR  
METER SCHEMATIC

DRAWN BY	DATE	APPROVED BY	DATE	WORK ORDER NO.
THG	9/23/2013	T. GROSCUP	9/23/2013	
SCALE	SHEET NO.			
NONE	1 OF 1			
E-6A				

REV.	REV. DATE	REVISION & JOB NO.	BY	OK	APP.
2	12/15/16	REVISE METER INPUTS SOURCE	GWB	THG	
1	1/15/15	REVISE PER COMMENTS	THG	THG	



PLAN VIEW

PROTECTION & CONTROL EQUIPMENT BILL OF MATERIAL			
ITEM #	DESCRIPTION	MANUFACTURER	CATALOG #
1	INDICATING LIGHT, LED, 125VDC, AMBER LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L38LYAH13
2	CIRCUIT BREAKER CONTROL SWITCH, 3 DECK, WITH LIGHTED NAMEPLATE WITH GREEN, AMBER, AND RED LEDs	ELECTROSWITCH	24PC43D
3	SEL-451 PROTECTION, AUTOMATION AND CONTROL SYSTEM, 48/125VDC OR 120VAC PS, 300V PHASE-NEUT, 5A PHASE INPUTS, SCREW TERMINAL BLOCK, MAINBOARD B, 125VDC INPUTS, HORIZONTAL RACK MOUNT, 4 RU, INT2 POSITION B BOARD	SEL	04515415XXXH21XXXX
4	FT-191 19" RACK MOUNT TEST SWITCH ASSEMBLY, 4 RU, STUD & NUT CONNECTION, GRAY SURFACE, CLEAR COVER, PDS A - 4 PDT, 6 CUR, PDS B - 4 PDT, 6 CUR, PDS C - 10 PDT	ABB	FS4G119119001
5	FT-191 19" RACK MOUNT TEST SWITCH ASSEMBLY, 4 RU, STUD & NUT CONNECTION, GRAY SURFACE, CLEAR COVER, PDS A - 4 PDT, 6 CUR, PDS B - 4 PDT, 6 CUR, PDS C - 4 PDT, 6 CUR	ABB	FS4G119119001
6	SEL-501 DUAL OVERCURRENT RELAY, DC1 APPLICATION ONLY, 48/125VDC OR 125VAC PS, 125VDC INPUTS, 5A PHASE, 60HZ, ABC ROTATION RS-232 PORT, HORIZONTAL RACK MOUNT, STD PLUS MODBUS COMM PROTOCOL	SEL	0501203X561B2B
7	HAND RESET LOCKOUT RELAY, 3 DECK, 125VDC COIL, LIGHTED NAMEPLATE WITH RED & GREEN LENS	ELECTROSWITCH	78PB03D
8	FT-1 TEST SWITCH, STUD & NUT CONNECTIONS, CLEAR COVER, 10 POTENTIAL POLES	ABB	CS129A501G01
9	INDICATING LIGHT, LED, 125VDC, GREEN LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L38LGGH13
10	INDICATING LIGHT, LED, 125VDC, RED LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L38RRH13
11	AUTO/MANUAL SWITCH, 4 DECKS, DUAL HANDLE	ELECTROSWITCH	24204B
12	TRANSFER SELECTOR SWITCH, 2 DECKS, DUAL HANDLE	ELECTROSWITCH	24202B
13	DIGITAL POWER METER	EATON SIEMENS SQUARED	PXM4051A1BB 95-001156-H2A PM870 V/A PMECC, PM9M26
14	69 PARALLEL SWITCH, 2 DECKS, DUAL HANDLE. PROVIDE PAD-LOCKABLE COVER.	ELECTROSWITCH	24202B

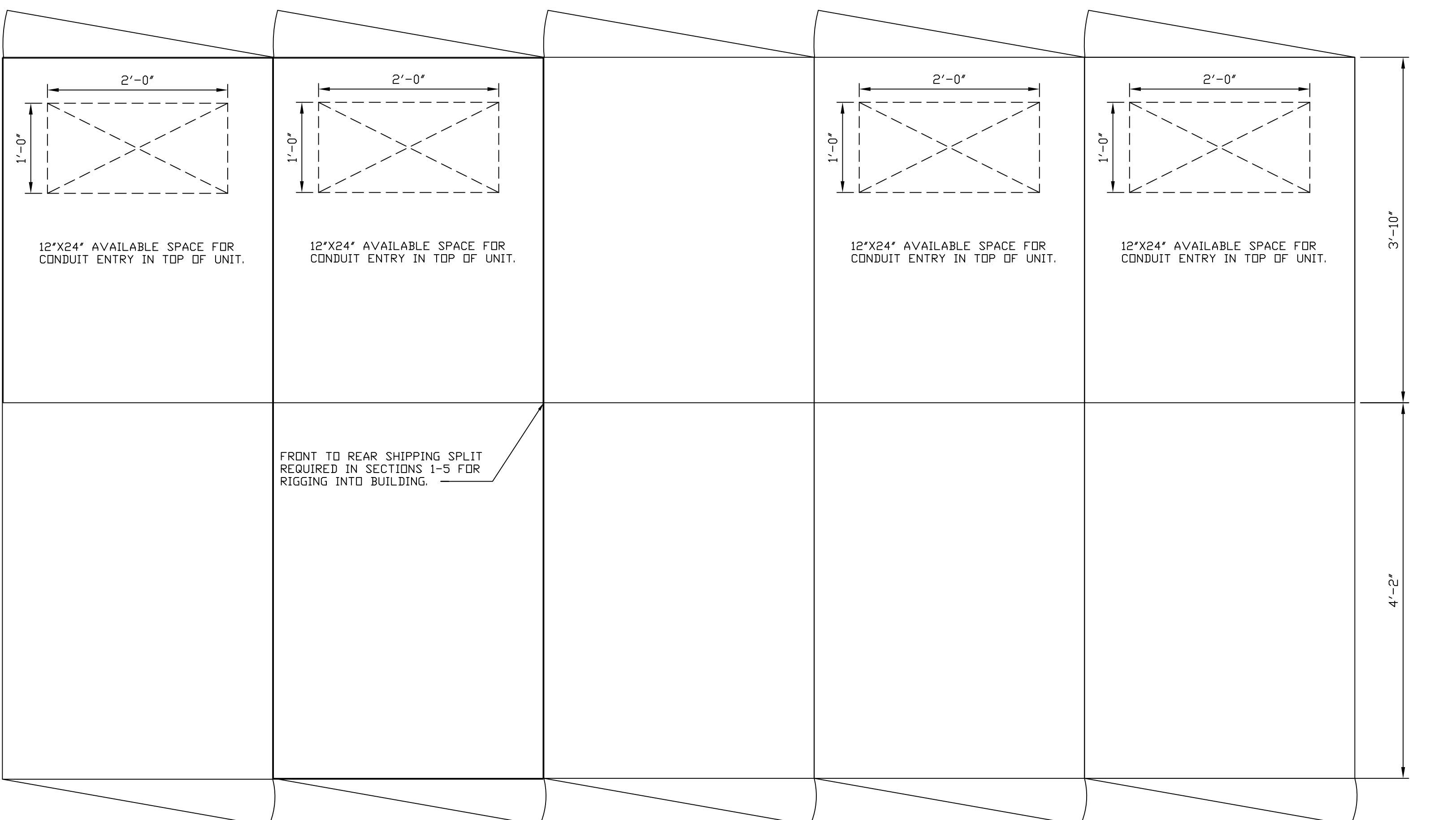
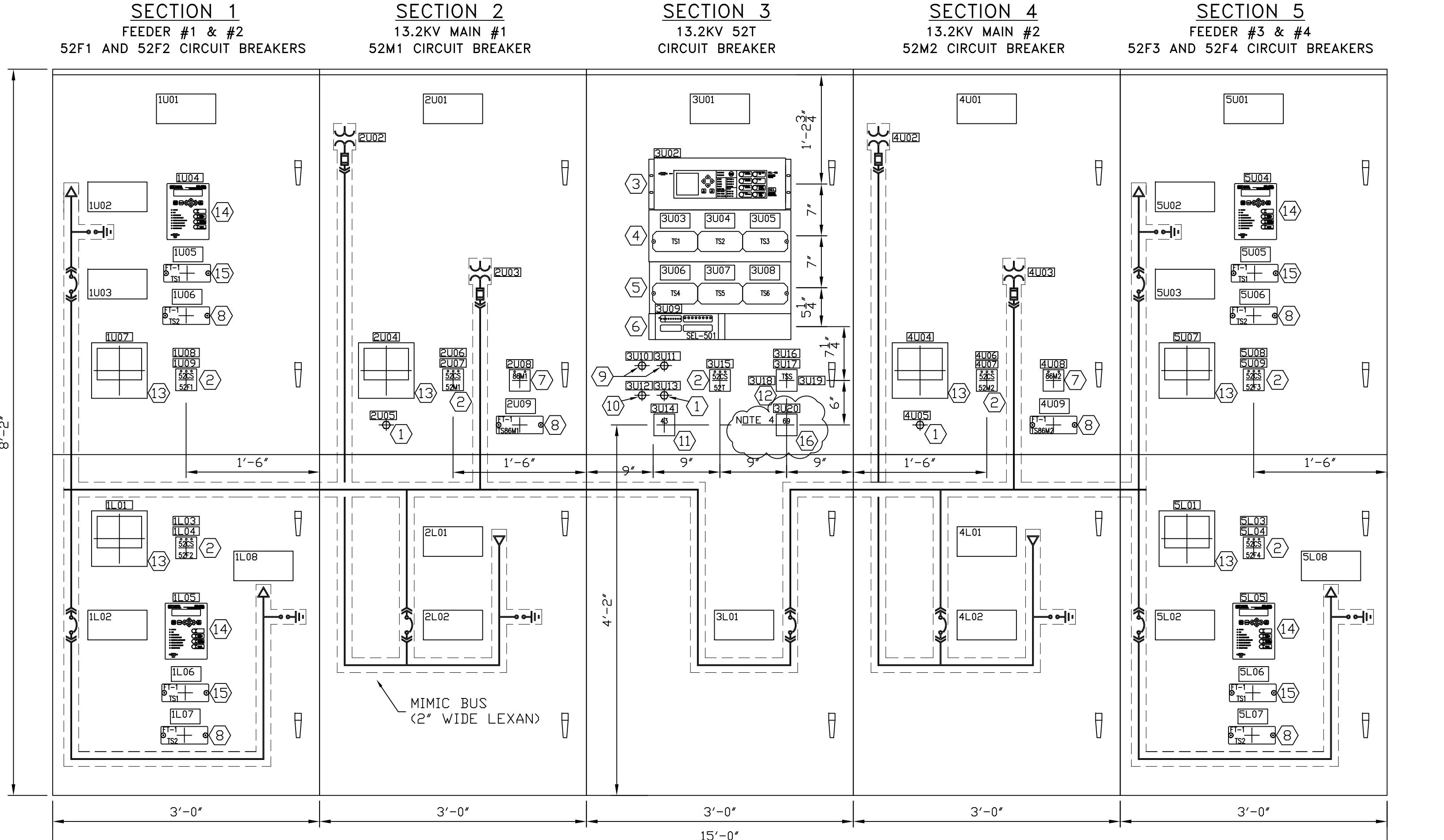
NAMEPLATE SCHEDULE			
NO.	SIZE	ENGRAVING	
1U01	4" X 8"	#1 TRANSFORMER TRANSITION SECTION	
1U02	4" X 8"	TD TRANSFORMER #1	
2U01	4" X 8"	13.2KV CIRCUIT #1 LINE POTENTIAL TRANSFORMERS	
2U02	1" X 3"	13.2KV CIRCUIT #1 LINE POTENTIAL TRANSFORMERS 7620V-120V	
2U03	1" X 3"	MAIN #1 POWER METER	
2U04	1" X 3"	SOURCE 1 VOLTAGE AVAILABLE	
2U05	1" X 3"	MAIN #1	
2U06	1" X 3"	13.2KV 52M1 CIRCUIT BREAKER CONTROL SWITCH	
2U07	1" X 3"	86MI LOCKOUT RELAY	
2U08	2" X 4"	TEST SWITCH - TS86M1 A - TRIP 13.2KV 52M1 CB B - TRIP 13.2KV 52T CB C - D - E -	F - G - H - I - J -
2L01	4" X 8"	13.2KV CIRCUIT# 1 SERVICE ENTRANCE	
2L02	4" X 8"	13.2KV 52M1 CIRCUIT BREAKER	
3U01	4" X 8"	MAIN-TIE-MAIN RELAYING	
3U02	1" X 3"	MAIN #1 & MAIN #2 PRIMARY OVERCURRENT & MAIN-TIE-MAIN TRANSFER RELAY	
3U03	2" X 4"	TEST SWITCH - TS1/SEL-451 A - CIRCUIT #1 - VA B - CIRCUIT #1 - VB C - CIRCUIT #1 - VC D - CIRCUIT #1 - VN E - CIRCUIT #1 - IA	F - CIRCUIT #1 - IAR G - CIRCUIT #1 - IB H - CIRCUIT #1 - IBR I - CIRCUIT #1 - IC J - CIRCUIT #1 - ICR
3U04	2" X 4"	TEST SWITCH - TS2/SEL-451 A - CIRCUIT #2 - VA B - CIRCUIT #2 - VB C - CIRCUIT #2 - VC D - CIRCUIT #2 - VN E - CIRCUIT #2 - IA	F - CIRCUIT #2 - IAR G - CIRCUIT #2 - IB H - CIRCUIT #2 - IBR I - CIRCUIT #2 - IC J - CIRCUIT #2 - ICR
3U05	2" X 4"	TEST SWITCH - TS3/SEL-451 A - TRIP 86M1 B - TRIP 86M2 C - TRIP 13.2KV 52M1 CB D - CLOSE 13.2KV 52M1 CB E - TRIP 13.2KV 52T CB	F - CLOSE 13.2KV 52T CB G - TRIP 13.2KV 52M2 CB H - CLOSE 13.2KV 52M2 CB I - J -
3U06	2" X 4"	TEST SWITCH - TS4/SEL-501 A - TRIP 86M1 B - C - D - E - CIRCUIT #1 - IA	F - CIRCUIT #1 - IAR G - CIRCUIT #1 - IB H - CIRCUIT #1 - IBR I - CIRCUIT #1 - IC J - CIRCUIT #1 - ICR
3U07	2" X 4"	TEST SWITCH - TS5/SEL-501 A - TRIP 86M2 B - C - D - E - CIRCUIT #2 - IA	F - CIRCUIT #2 - IAR G - CIRCUIT #2 - IB H - CIRCUIT #2 - IBR I - CIRCUIT #2 - IC J - CIRCUIT #2 - ICR
3U08	2" X 4"	TEST SWITCH - TS6/SEL-451 A - 52M1 CB STATUS B - 52T CB STATUS C - 52M2 CB STATUS D - 52M1 CB TDC STATUS E - 52T CB TDC STATUS	F - 52M2 CB TDC STATUS G - H - I - J -
3U09	1" X 3"	MAIN #1 & MAIN #2 BACKUP OVERCURRENT RELAY	
3U10	1" X 3"	AUTO READY	
3U11	1" X 3"	AUTO MODE	
3U12	1" X 3"	AUTO FAIL	
3U13	1" X 3"	MANUAL	
3U14	1" X 3"	AUTO/MANUAL SWITCH	
3U15	1" X 3"	13.2KV 52T CIRCUIT BREAKER CONTROL SWITCH	
3U16	1" X 3"	TRIP SELECTOR SWITCH	
3U17	1" X 3"	TRIP 52T	
3U18	1" X 3"	TRIP 52M1	
3U19	1" X 3"	TRIP 52M2	
3U20	1" X 3"	69 PARALLEL SWITCH PECO USE ONLY	
3L01	4" X 8"	13.2KV 52T CIRCUIT BREAKER	

NOTES:

1. NAMEPLATE ENGRAVINGS TO BE CUSTOMIZED WITH APPROPRIATE CIRCUIT/BREAKER DESIGNATIONS PER PROJECT REQUIREMENTS.
2. ALL NAMEPLATE ENGRAVING TO BE APPROVED BY UNIVERSITY OF PENNSYLVANIA PERSONNEL PRIOR TO ENGRAVING.
3. SHIPPING SPLIT DETAILS TO BE ACCORDING TO PROJECT SPECIFICATIONS.
4. 69 SWITCH REQUIRED FOR PECO INTERTIE SUBSTATIONS ONLY. SWITCH IS TO BE PROVIDED WITH A PAD-LOCKABLE COVER.

	UNIVERSITY OF PENNSYLVANIA STANDARD 13.2 KV MAIN-TIE-MAIN SWITCHGEAR (NO FEEDERS) ELEVATION & DETAILS			
	DRAWN GWB	DATE 2/21/2013	APPROVED T. GROSCUP	DATE 2/27/2013
	SCALE NONE	SHEET NO. 1 OF 1	WORK ORDER NO.	E-7

REV.	REV. DATE	REVISION & JOB NO.	BY CK.	APP.
3	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG
2	10/08/13	REVISE PER COMMENTS	THG	THG
1	9/23/13	REVISE TO ADD OPTIONAL FEEDERS	THG	THG

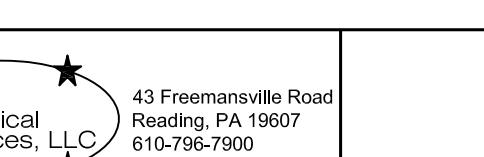


PLAN VIEW

PROTECTION & CONTROL EQUIPMENT BILL OF MATERIAL			
ITEM #	DESCRIPTION	MANUFACTURER	CATALOG #
1	INDICATING LIGHT, LED, 125VDC, AMBER LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L3BLYAH13
2	24PC43D 2 POSITION CONTROL SWITCH, DECK, WITH LIGHTED NAMEPLATE WITH GREEN, AMBER, AND RED LEDs	ELECTROSWITCH	24PC43D
3	SEL-451 PROTECTION, AUTOMATION, AND CONTROL SYSTEM, 48/125VDC OR 120VAC PS, 300V PHASE-NEUT, 5A PHASE, SCREW TERMINAL BLOCK, MAINBOARD B, 125VDC INPUTS, HORIZONTAL RACK MOUNT, 4 RU, INT2 POSITION B BOARD	SEL	04515415XXXH4H21XXXX
4	FT-19R 19" RACK MOUNT TEST SWITCH ASSEMBLY, 4 RU, STUD & NUT CONNECTION, GRAY SURFACE, CLEAR COVER, PGS A - 4 PDT, 6 CUR, PGS B - 4 PDT, 6 CUR, PGS C - 4 PDT, 6 CUR	ABB	FS4G1191I9001
5	FT-19R 19" RACK MOUNT TEST SWITCH ASSEMBLY, 4 RU, STUD & NUT CONNECTION, GRAY SURFACE, CLEAR COVER, PGS A - 10 PDT, 6 CUR, PGS B - 4 PDT, 6 CUR, PGS C - 4 PDT, 6 CUR	ABB	FS4G1191I9001
6	SEL-501 DUAL OVERCURRENT RELAY, DC1 APPLICATION ONLY, 48/125VDC OR 125VAC PS, 125VDC INPUTS, 5A PHASE, 60HZ, ABB ROTATION, RS-232 PORT, HORIZONTAL RACK MOUNT, STD PLUS MODBUS COMM PROTOCOL	SEL	0501203X561B2B
7	HAND RESET LOCKOUT RELAY, 3 DECK, 125VDC COIL, LIGHTED NAMEPLATE WITH RED & GREEN LEDS	ELECTROSWITCH	78PB03D
8	FT-1 TEST SWITCH, STUD & NUT CONNECTIONS, CLEAR COVER, 10 POTENTIAL POLES	ABB	CS129A501G01
9	INDICATING LIGHT, LED, 125VDC, GREEN LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L3BLGGH13
10	INDICATING LIGHT, LED, 125VDC, RED LENS, WITH PUSH TO TEST FEATURE AND REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K1L3LRRH13
11	AUTO/MANUAL SWITCH, 4 DECKS, OVAL HANDLE	ELECTROSWITCH	24204B
12	TRANSFER SELECTOR SWITCH, 2 DECKS, OVAL HANDLE	ELECTROSWITCH	24202B
13	DIGITAL POWER METER	EATON SIEMENS SQUARED	PXM4051A1B PM870 W/ PM86CC, PM8M26
14	SEL-751A OVERCURRENT RELAY, STD FIRMWARE, 110-250VDC/110-240VAC PS, CARD C 4DI/4DO 125VDC, CARD D EMPTY, CARD E 3 PHASE AC VOLTAGE INPUT, 2 SLOT 4 AC CURRENT INPUT 5A PHASE/ SA NEUTRAL	SEL	751A01A1AOX71850000
15	FT-1 TEST SWITCH, STUD & NUT CONNECTIONS, CLEAR COVER, 4 POTENTIAL POLES/6 CURRENT POLES	ABB	CS1586C4ZG05
16	69 PARALLEL SWITCH, 2 DECKS, OVAL HANDLE, PROVIDE PAD-LOCKABLE COVER.	ELECTROSWITCH	24202B

NOTES:

1. NAMEPLATE ENGRAVINGS TO BE CUSTOMIZED WITH APPROPRIATE CIRCUIT/BREAKER DESIGNATIONS PER PROJECT REQUIREMENTS.
2. ALL NAMEPLATE ENGRAVING TO BE APPROVED BY UNIVERSITY OF PENNSYLVANIA PERSONNEL PRIOR TO ENGRAVING.
3. SHIPPING SPLIT DETAILS TO BE ACCORDING TO PROJECT SPECIFICATIONS.
4. 69 SWITCH REQUIRED FOR PECO INTERTIE SUBSTATIONS ONLY. SWITCH IS TO BE PROVIDED WITH A PAD-LOCKABLE COVER.



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
13.2 KV MAIN-TIE-MAIN SWITCHGEAR W/ FEEDERS  
ELEVATION & DETAILS

DRAWN BY THG DATE 9/23/2013 APPROVED BY T. GROSCUP DATE 9/23/2013 WORK ORDER NO.

SCALE NONE SHEET NO. 1 OF 1 DWG. NO. E-7A

3	1/15/15 REVISE FOR PECO INTERTIE SUBSTATIONS	THG	THG	
2	10/08/13 REVISE PER COMMENTS	THG	THG	
1	9/30/13 REVISE BOM ITEM #15 CATALOG NUMBER	THG	THG	

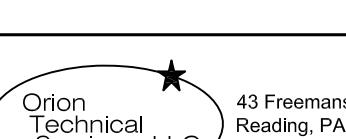
REV. REV. DATE REVISION & JOB NO. BY CK. APP.

NAMEPLATE SCHEDULE		
NO.	SIZE	ENGRAVING
IU01	4" X 8"	FEEDER #1 & #2 13.2KV 52F1 & 52F2 CIRCUIT BREAKERS 13.2KV FEEDER #1
IU03	4" X 8"	13.2KV 52F1 CIRCUIT BREAKER
IU04	1" X 3"	FEEDER #1 OVERCURRENT RELAY SEL-751A-1
IU05	2" X 4"	TEST SWITCH - TS1/SEL-751A-1 A - FEEDER #1 - VA B - FEEDER #1 - VB C - FEEDER #1 - VC D - FEEDER #1 - VN E - FEEDER #1 - IA F - FEEDER #1 - IAR G - FEEDER #1 - IB H - FEEDER #1 - IBR I - FEEDER #1 - IC J - FEEDER #1 - ICR
IU06	2" X 4"	TEST SWITCH - TS2/SEL-751A-1 A - TRIP 13.2KV 52F1 CB B - CLOSE 13.2KV 52F1 CB C - 52F1 CB STATUS D - E - F - G - H - I - J -
IU07	1" X 3"	FEEDER #1 POWER METER
IU08	1" X 3"	FEEDER #1
IU09	1" X 3"	13.2KV 52F1 CIRCUIT BREAKER CONTROL SWITCH
IL01	1" X 3"	FEEDER #2 POWER METER
IL02	4" X 8"	13.2KV 52F2 CIRCUIT BREAKER
IL03	1" X 3"	FEEDER #2
IL04	1" X 3"	13.2KV 52F2 CIRCUIT BREAKER CONTROL SWITCH
IL05	1" X 3"	FEEDER #2 OVERCURRENT RELAY SEL-751A-2
IL06	2" X 4"	TEST SWITCH - TS1/SEL-751A-2 A - FEEDER #2 - VA B - FEEDER #2 - VB C - FEEDER #2 - VC D - FEEDER #2 - VN E - FEEDER #2 - IA F - FEEDER #2 - IAR G - FEEDER #2 - IB H - FEEDER #2 - IBR I - FEEDER #2 - IC J - FEEDER #2 - ICR
IL07	2" X 4"	TEST SWITCH - TS2/SEL-751A-2 A - TRIP 13.2KV 52F2 CB B - CLOSE 13.2KV 52F2 CB C - 52F2 CB STATUS D - E - F - G - H - I - J -
IL08	4" X 8"	13.2KV FEEDER #2
2U01	4" X 8"	13.2KV CIRCUIT #1 LINE & BUS #1 POTENTIAL TRANSFORMERS
2U02	1" X 3"	CIRCUIT #1 LINE POTENTIAL TRANSFORMERS 7620V-120V
2U03	1" X 3"	BUS #1 POTENTIAL TRANSFORMERS 7620V-120V
2U04	1" X 3"	MAIN #1 POWER METER
2U05	1" X 3"	SOURCE 1 VOLTAGE AVAILABLE
2U06	1" X 3"	MAIN #1
2U07	1" X 3"	13.2KV 52M1 CIRCUIT BREAKER CONTROL SWITCH
2U08	1" X 3"	86M1 LOCKOUT RELAY
2U09	2" X 4"	TEST SWITCH - TS86M1 A - TRIP 13.2KV 52M1 CB B - TRIP 13.2KV 52T CB C - TRIP 13.2KV 52F1 CB D - TRIP 13.2KV 52F2 CB E - F - G - H - I - J -
2L01	4" X 8"	13.2KV CIRCUIT #1 SERVICE ENTRANCE
2L02	4" X 8"	13.2KV 52M1 MAIN CIRCUIT BREAKER
3U01	4" X 8"	MAIN-TIE-MAIN RELAYING
3U02	1" X 3"	MAIN #1 & MAIN #2 PRIMARY OVERCURRENT & MAIN-TIE-MAIN TRANSFER RELAY
3U03	2" X 4"	TEST SWITCH - TS1/SEL-451 A - CIRCUIT #1 - VA B - CIRCUIT #1 - VB C - CIRCUIT #1 - VC D - CIRCUIT #1 - VN E - CIRCUIT #1 - IA F - CIRCUIT #1 - IAR G - CIRCUIT #1 - IB H - CIRCUIT #1 - IBR I - CIRCUIT #1 - IC J - CIRCUIT #1 - ICR
3U04	2" X 4"	TEST SWITCH - TS2/SEL-451 A - CIRCUIT #2 - VA B - CIRCUIT #2 - VB C - CIRCUIT #2 - VC D - CIRCUIT #2 - VN E - CIRCUIT #2 - IA F - CIRCUIT #2 - IAR G - CIRCUIT #2 - IB H - CIRCUIT #2 - IBR I - CIRCUIT #2 - IC J - CIRCUIT #2 - ICR
3U05	2" X 4"	TEST SWITCH - TS3/SEL-451 A - TRIP 86M1 B - TRIP 86M2 C - TRIP 13.2KV 52M1 CB D - CLOSE 13.2KV 52M1 CB E - TRIP 13.2KV 52T CB F - CLOSE 13.2KV 52T CB G - TRIP 13.2KV 52M2 CB H - CLOSE 13.2KV 52M2 CB I - J -
3U06	2" X 4"	TEST SWITCH - TS4/SEL-501 A - TRIP 86M1 B - TRIP 86M2 C - D - E - CIRCUIT #1 - IA F - CIRCUIT #1 - IAR G - CIRCUIT #1 - IB H - CIRCUIT #1 - IBR I - CIRCUIT #1 - IC J - CIRCUIT #1 - ICR
3U07	2" X 4"	TEST SWITCH - TS5/SEL-501 A - TRIP 86M2 B - C - D - E - CIRCUIT #2 - IA F - CIRCUIT #2 - IAR G - CIRCUIT #2 - IB H - CIRCUIT #2 - IBR I - CIRCUIT #2 - IC J - CIRCUIT #2 - ICR
3U08	2" X 4"	TEST SWITCH - TS6/SEL-451 A - 52M1 CB STATUS B - 52T CB STATUS C - 52F1 CB STATUS D - 52F2 CB STATUS E - 52M2 CB TDC STATUS F - 52M2 CB TDC STATUS G - H - I - J -
3U09	1" X 3"	MAIN #1 & MAIN #2 BACKUP OVERCURRENT RELAY
3U10	1" X 3"	AUTO READY
3U11	1" X 3"	AUTO MODE
3U12	1" X 3"	AUTO FAIL
3U13	1" X 3"	MANUAL
3U14	1" X 3"	AUTO/MANUAL SWITCH
3U15	1" X 3"	13.2KV 52T CIRCUIT BREAKER CONTROL SWITCH
3U16	1" X 3"	TRIP SELECTOR SWITCH
3U17	1" X 3"	TRIP 52T
3U18	1" X 3"	TRIP 52M1
3U19	1" X 3"	TRIP 52M2
3U20	1" X 3"	69 PARALLEL SWITCH PECO USE ONLY
3L01	4" X 8"	13.2KV 52T TIE CIRCUIT BREAKER
4U01	4" X 8"	13.2KV CIRCUIT #2 LINE & BUS #2 POTENTIAL TRANSFORMERS
4U02	1" X 3"	CIRCUIT #2 LINE POTENTIAL TRANSFORMERS 7620V-120V
4U03	1" X 3"	BUS #2 POTENTIAL TRANSFORMERS 7620V-120V
4U04	1" X 3"	MAIN #2 POWER METER

NAMEPLATE SCHEDULE		
NO.	SIZE	ENGRAVING
4U05	1" X 3"	SOURCE 2 VOLTAGE AVAILABLE
4U06	1" X 3"	MAIN #2
4U07	1" X 3"	13.2KV 52M2 CIRCUIT BREAKER CONTROL SWITCH
4U08	1" X 3"	86M2 LOCKOUT RELAY
4U09	2" X 4"	TEST SWITCH - TS86M2 A - TRIP 13.2KV 52M2 CB B - TRIP 13.2KV 52T CB C - TRIP 13.2KV 52F3 CB D - TRIP 13.2KV 52F4 CB E - F - G - H - I - J -
4L01	4" X 8"	13.2KV CIRCUIT #2 SERVICE ENTRANCE
4L02	4" X 8"	13.2KV 52M2 MAIN CIRCUIT BREAKER
5U01	4" X 8"	FEEDER #3 & #4 13.2KV 52F3 & 52F4 CIRCUIT BREAKERS
5U02	4" X 8"	13.2KV 52F3 CIRCUIT BREAKER
5U03	4" X 8"	FEEDER #3 OVERCURRENT RELAY SEL-751A-3
5U04	1" X 3"	TEST SWITCH - TS1/SEL-751A-3 A - FEEDER #3 - VA B - FEEDER #3 - VB C - FEEDER #3 - VC D - FEEDER #3 - VN E - FEEDER #3 - IA F - FEEDER #3 - IAR G - FEEDER #3 - IB H - FEEDER #3 - IBR I - FEEDER #3 - IC J - FEEDER #3 - ICR
5U05	2" X 4"	TEST SWITCH - TS2/SEL-751A-3 A - TRIP 13.2KV 52F3 CB B - CLOSE 13.2KV 52F3 CB C - 52F3 CB STATUS D - E - F - G - H - I - J -
5U06	2" X 4"	TEST SWITCH - TS3/SEL-751A-3 A - FEEDER #3 POWER METER FEEDER #3
5U07	1" X 3"	13.2KV 52F3 CIRCUIT BREAKER CONTROL SWITCH
5L01	1" X 3"	FEEDER #4 POWER METER
5L02	4" X 8"	13.2KV 52F4 CIRCUIT BREAKER
5L03	1" X 3"	FEEDER #4 POWER METER
5L04	1" X 3"	13.2KV 52F4 CIRCUIT BREAKER CONTROL SWITCH
5L05	1" X 3"	FEEDER #4 OVERCURRENT RELAY SEL-751A-4
5L06	2" X 4"	TEST SWITCH - TS1/SEL-751A-4 A - FEEDER #4 - VA B - FEEDER #4 - VB C - FEEDER #4 - VC D - FEEDER #4 - VN E - FEEDER #4 - IA F - FEEDER #4 - IAR G - FEEDER #4 - IB H - FEEDER #4 - IBR I - FEEDER #4 - IC J - FEEDER #4 - ICR
5L07	2" X 4"	TEST SWITCH - TS2/SEL-751A-4 A - TRIP 13.2KV 52F4 CB B - CLOSE 13.2KV 52F4 CB C - 52F4 CB STATUS D - E - F - G - H - I - J -
5L08	4" X 8"	13.2KV FEEDER #4

NOTES:

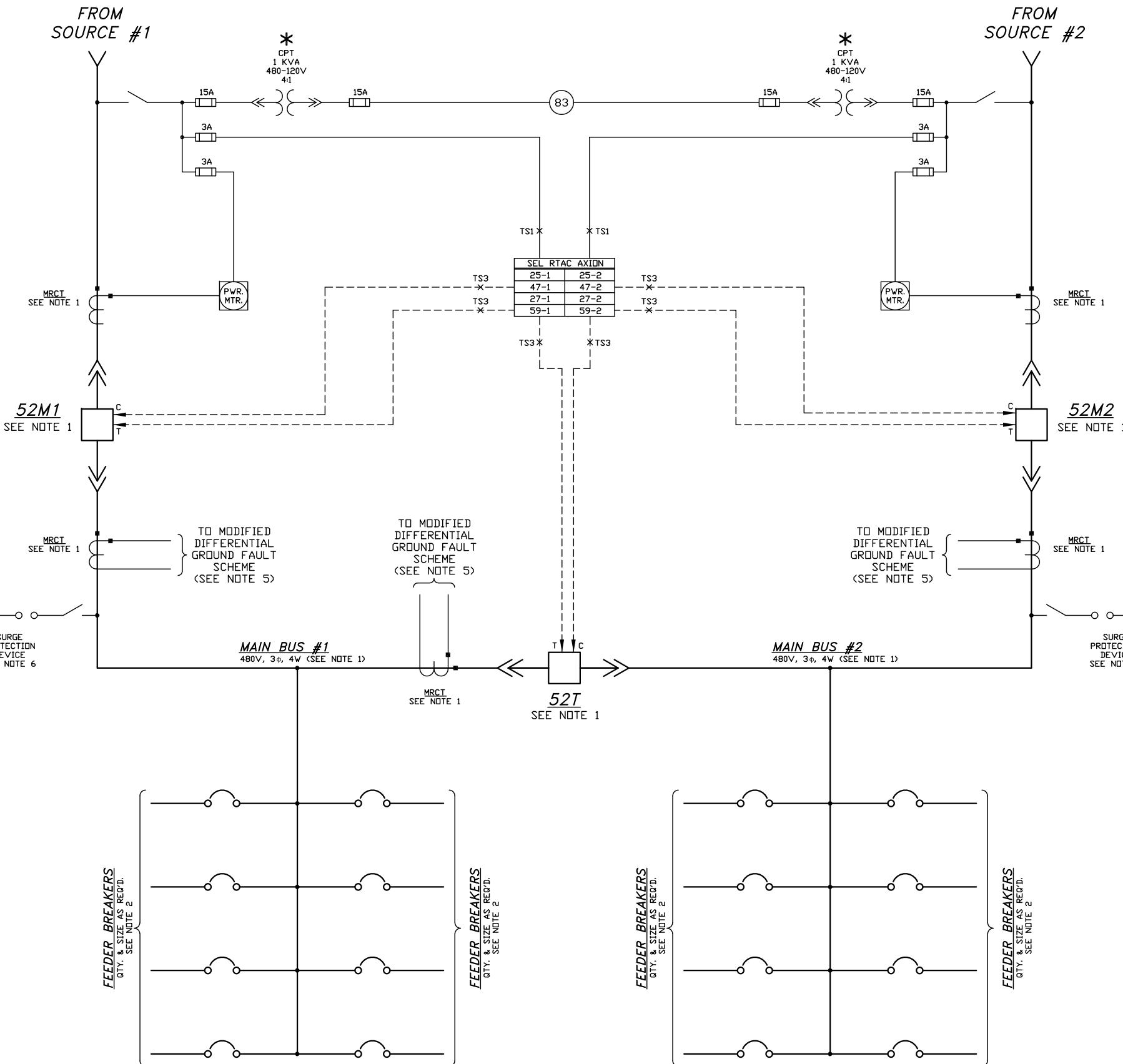
1. NAMEPLATE ENGRAVINGS TO BE CUSTOMIZED WITH APPROPRIATE CIRCUIT/BREAKER DESIGNATIONS PER PROJECT REQUIREMENTS.
2. ALL NAMEPLATE ENGRAVING TO BE APPROVED BY UNIVERSITY OF PENNSYLVANIA PERSONNEL PRIOR TO ENGRAVING.

 43 Freemansville Road Reading, PA 19607 610-796-7900	UNIVERSITY OF PENNSYLVANIA STANDARD 13.2 KV MAIN-TIE-MAIN SWITCHGEAR W/ FEEDERS NAMEPLATE DETAILS			
	DRAWN THG	DATE 9/23/2013	APPROVED T. GROSCUP	DATE 9/23/2013
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-7B	REV. NO.	
REV. NO.	REV. DATE	BY CK.	APP.	

1	1/15/15	REVISE FOR PECO INTERTIE SUBSTATIONS	THG THG
REV.	REV. DATE	REVISION & JOB NO.	BY CK. APP.

E-7B

**ATTACHMENT B**



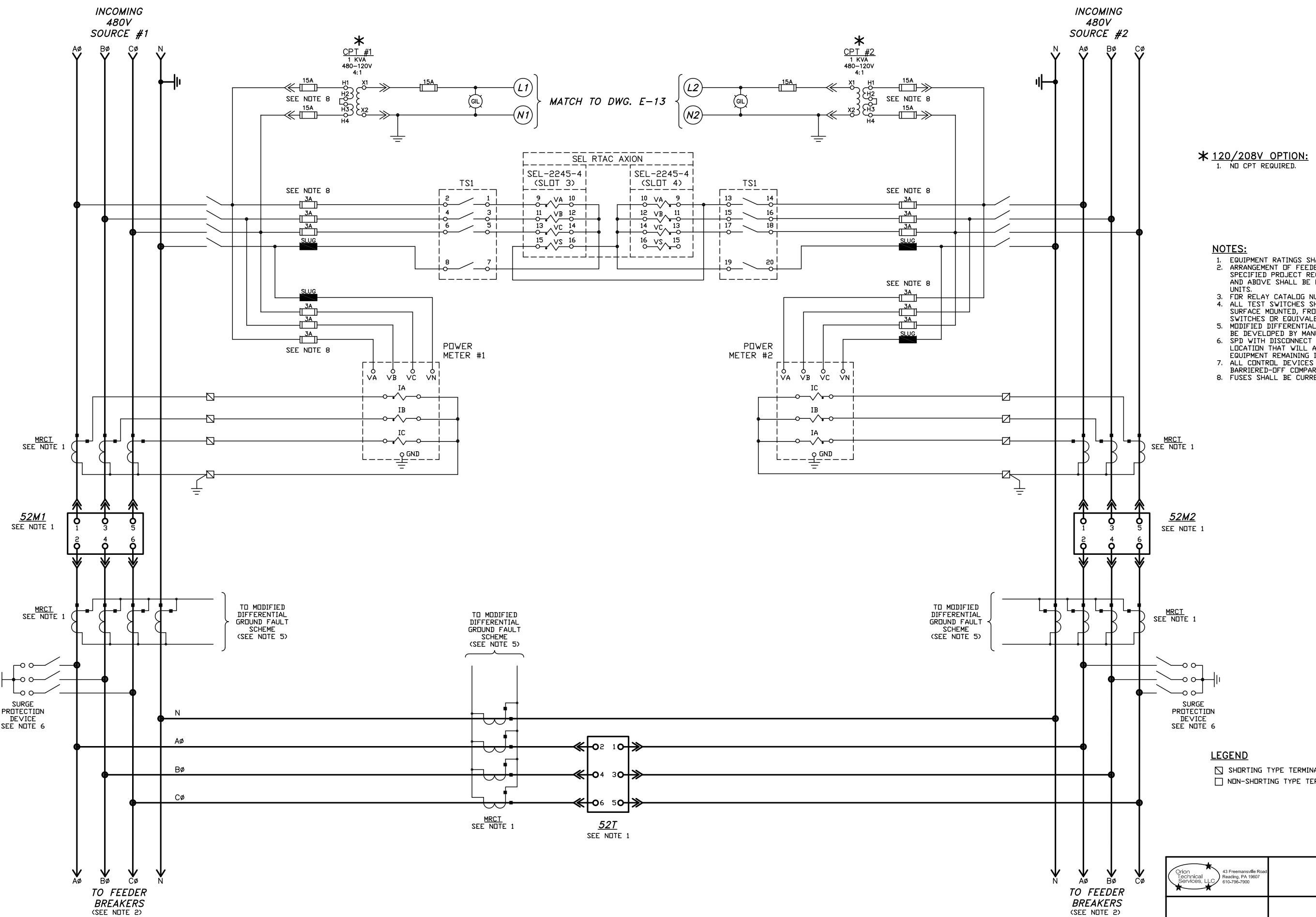
REV.	REV. DATE	REVISION & JOB NO.	BY	OK.	APP.



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR  
SINGLE LINE DIAGRAM

DRAWN BY GWB DATE 7/6/2016 APPROVED T. GROSCUP DATE 10/10/2016 WORK ORDER NO.

SCALE NONE SHEET NO. 1 OF 1 Dwg. No. E-11



\* 120/208V OPTION:

- 1. NO CPT REQUIRED.**

## NOTES:

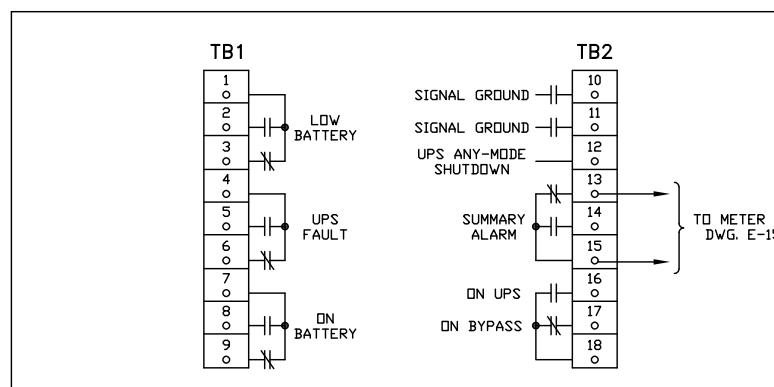
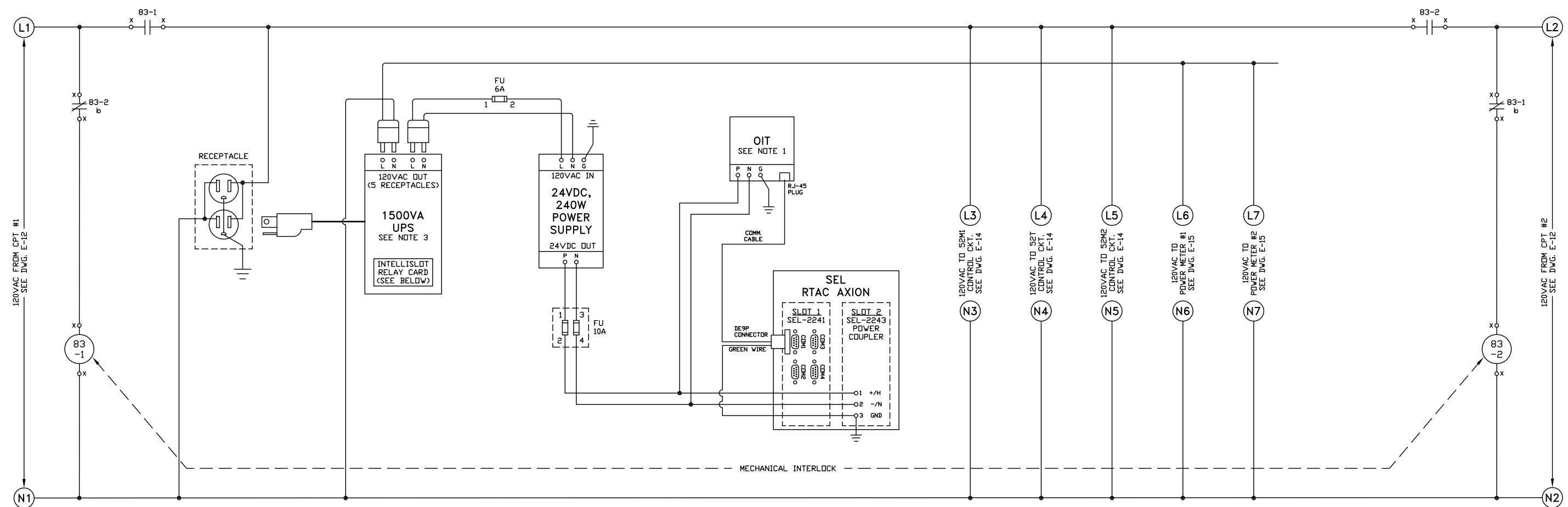
1. EQUIPMENT RATINGS SHALL BE PROJECT SPECIFIC.
  2. ARRANGEMENT OF FEEDER BREAKERS SHALL BE BASED ON SPECIFIED PROJECT REQUIREMENTS. LOAD BREAKERS 400A AND ABOVE SHALL BE PROVIDED WITH STATIC TRIP UNITS.
  3. FDR RELAY CATALOG NUMBERS, SEE DWG. E-18.
  4. ALL TEST SWITCHES SHALL BE STATES TYPE MTS, SURFACE MOUNTED, FRONT CONNECTED MINIATURE TEST SWITCHES OR EQUIVALENT.
  5. MODIFIED DIFFERENTIAL GROUND FAULT CIRCUIT SHALL BE DEVELOPED BY MANUFACTURER.
  6. SPD WITH DISCONNECT SWITCH SHALL BE MOUNTED IN A LOCATION THAT WILL ALLOW REPLACEMENT WITH EQUIPMENT REMAINING IN SERVICE.
  7. ALL CONTROL DEVICES SHALL BE MOUNTED IN A BARRIRED-OFF COMPARTMENT.
  8. FUSES SHALL BE CURRENT LIMITING.

#### LEGEND

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)  
 NON-SHORTING TYPE TERMINAL BLOCK, (GE FR25 OR EQUIV)



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR  
A.C. SCHEMATIC DIAGRAM

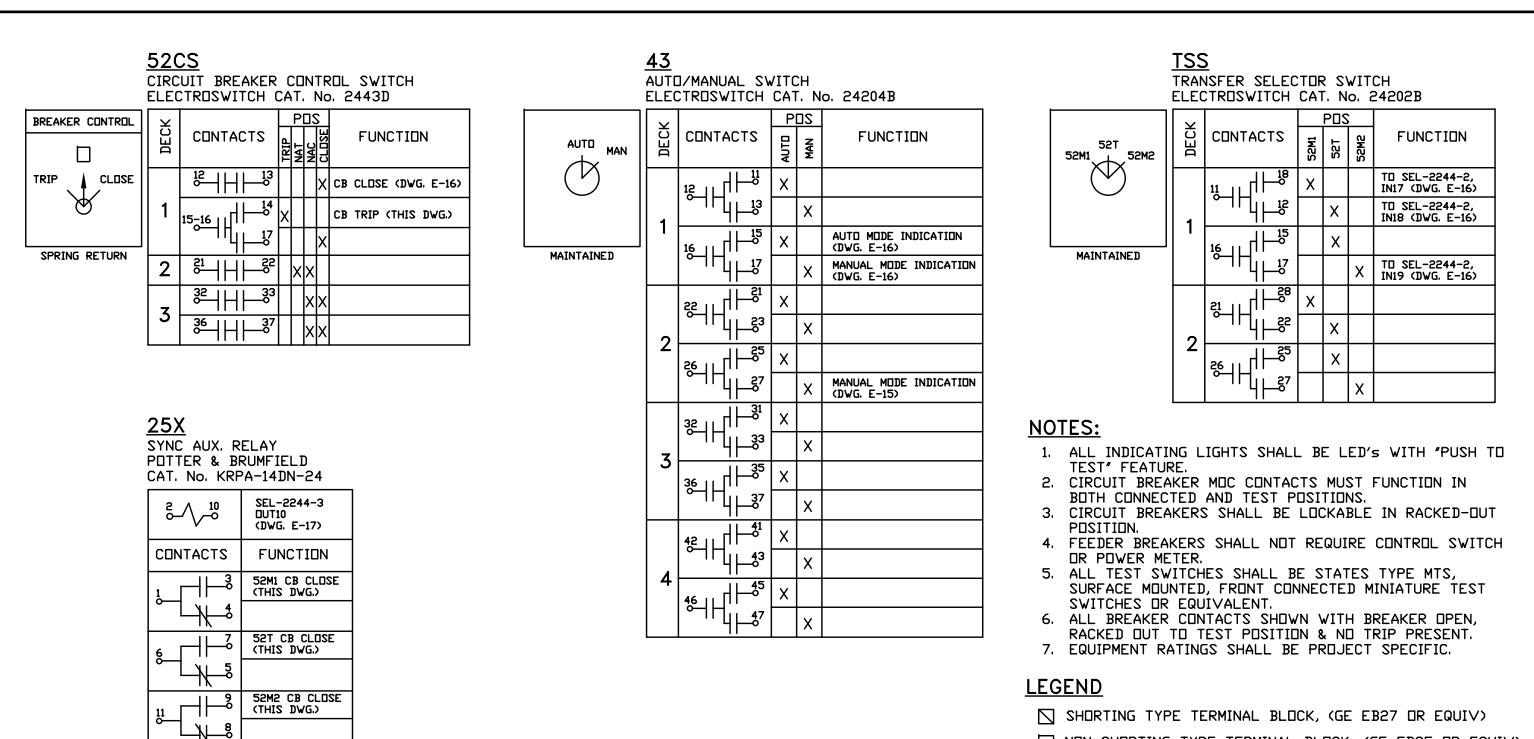
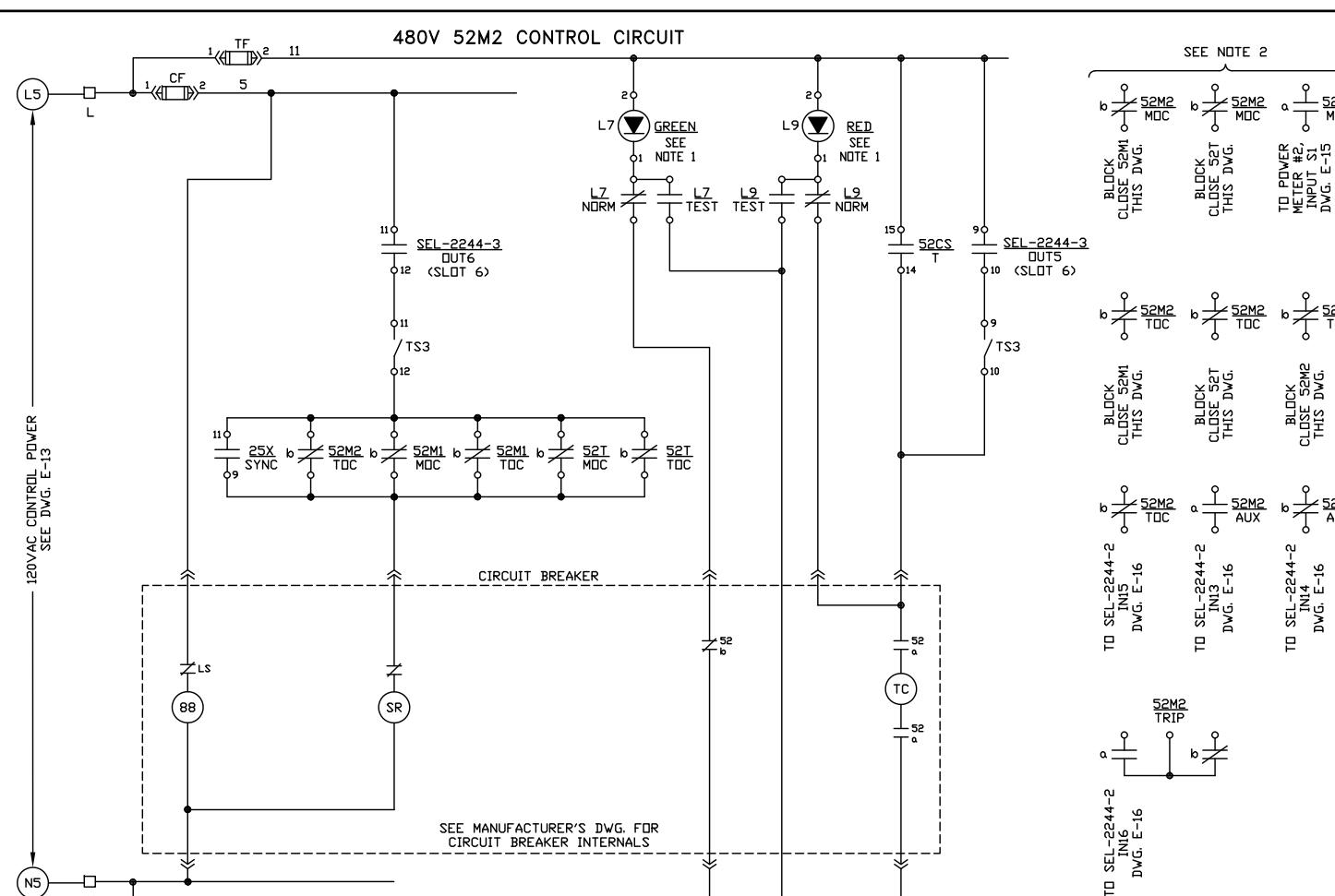
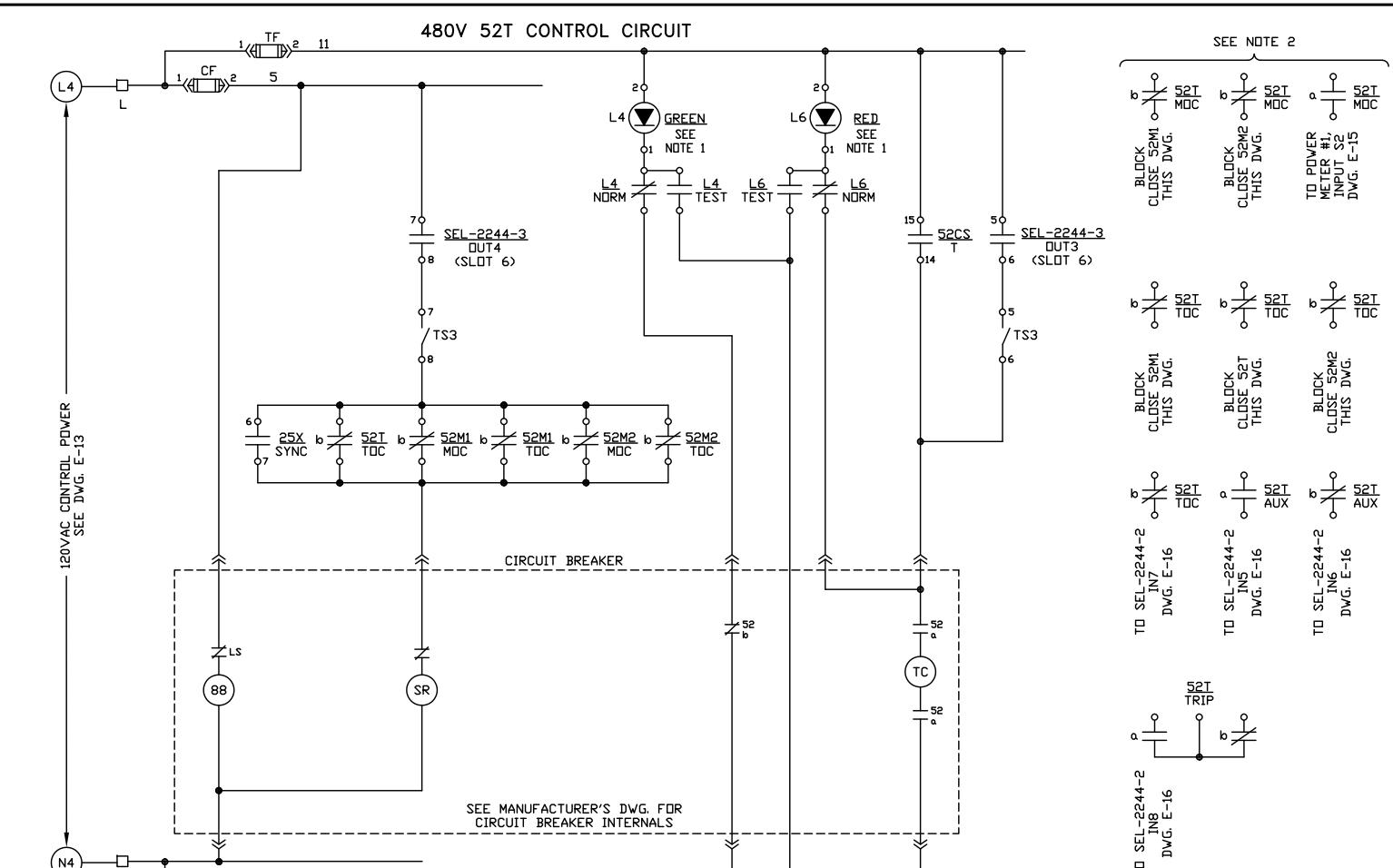
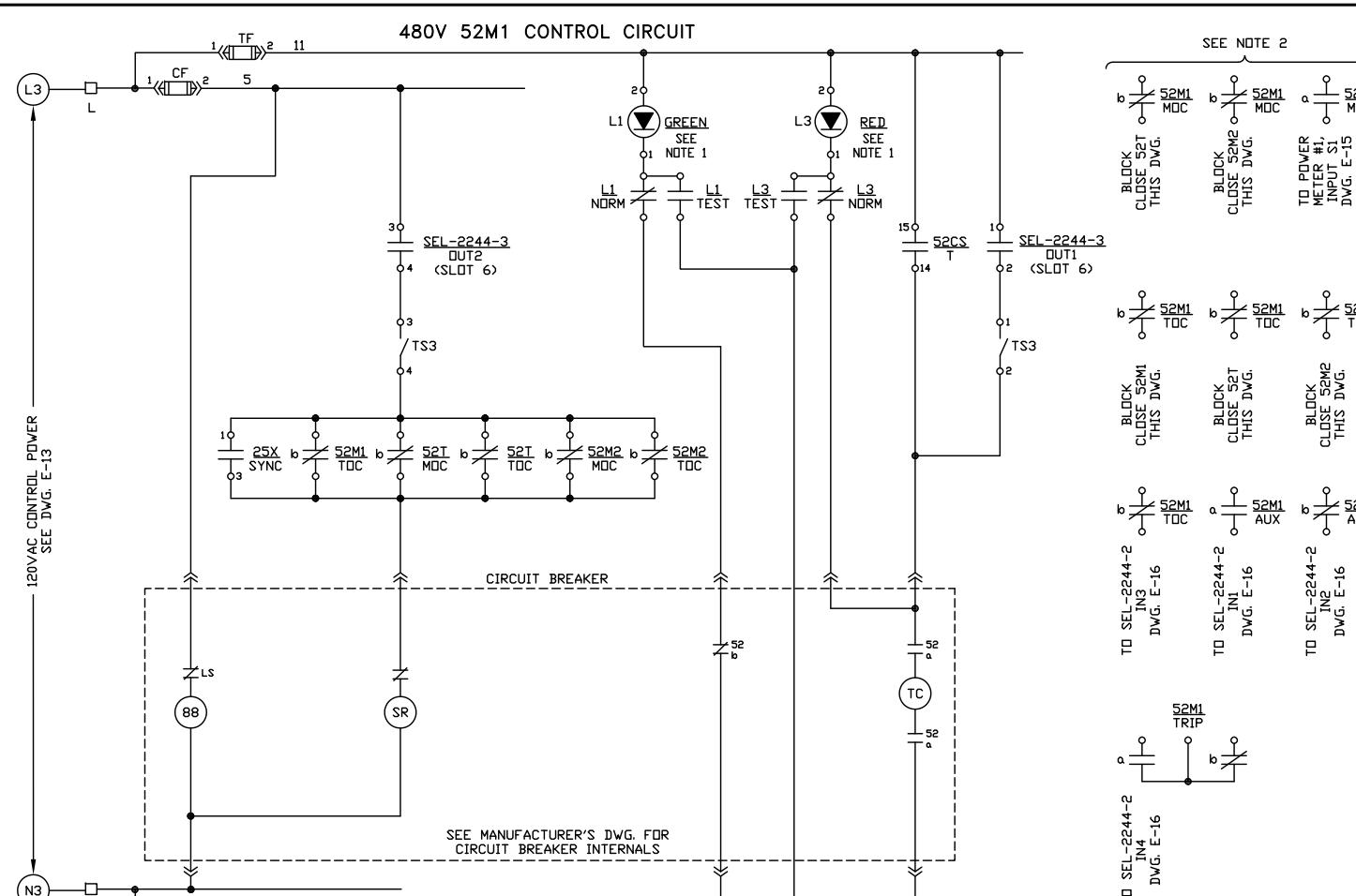


INTELLISLOT RELAY CARD PIN CONFIGURATION  
BATTERY-OK, NO UPS FAILURE, NOT ON BATTERY, NO ALARMS, ON BYPASS

- NOTES:**
1. OPERATOR INTERFACE TERMINAL (OIT) SHALL BE MAPLE SYSTEMS OIT3160. AN RS-232 SERIAL COMMUNICATIONS CABLE (P/N 7442-0002-5) SHALL BE REQUIRED FOR CONNECTION TO SEL RTAC AXION.
  2. ALL CONTROL DEVICES SHALL BE MOUNTED IN A BARRIRED-OFF COMPARTMENT.
  3. UPS SHALL BE A SOLA HD 120VAC, 1500VA, 1350W MODEL (CAT. No. S4K2U1500-C) WITH INTELLISLOT RELAY CARD. UPS SHALL BE MOUNTED IN AN EASILY ACCESSIBLE LOCATION FOR SAFE MAINTENANCE PURPOSES.

REV.	REV. DATE	REVISION & JOB NO.	BY	OK.	APP.

		UNIVERSITY OF PENNSYLVANIA STANDARD LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR POWER SUPPLY SCHEMATIC			
DRAWN	DATE	APPROVED	DATE	WORK ORDER	
GWB	7/7/2016	T. GROSCUP	10/10/2016		
SCALE	SHEET NO.	1 OF 1	DWG. NO.	E-13	
NONE					

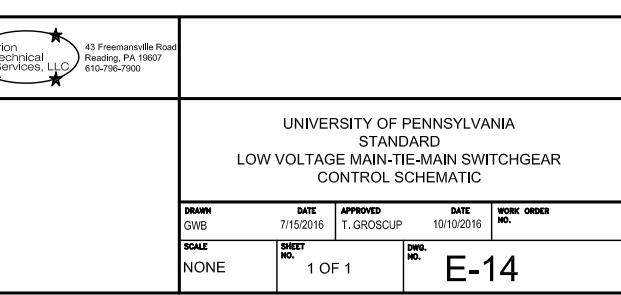
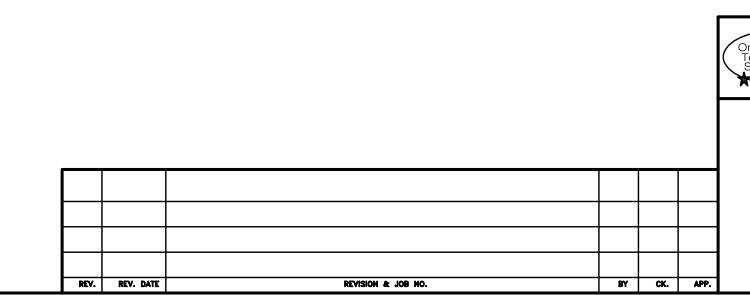


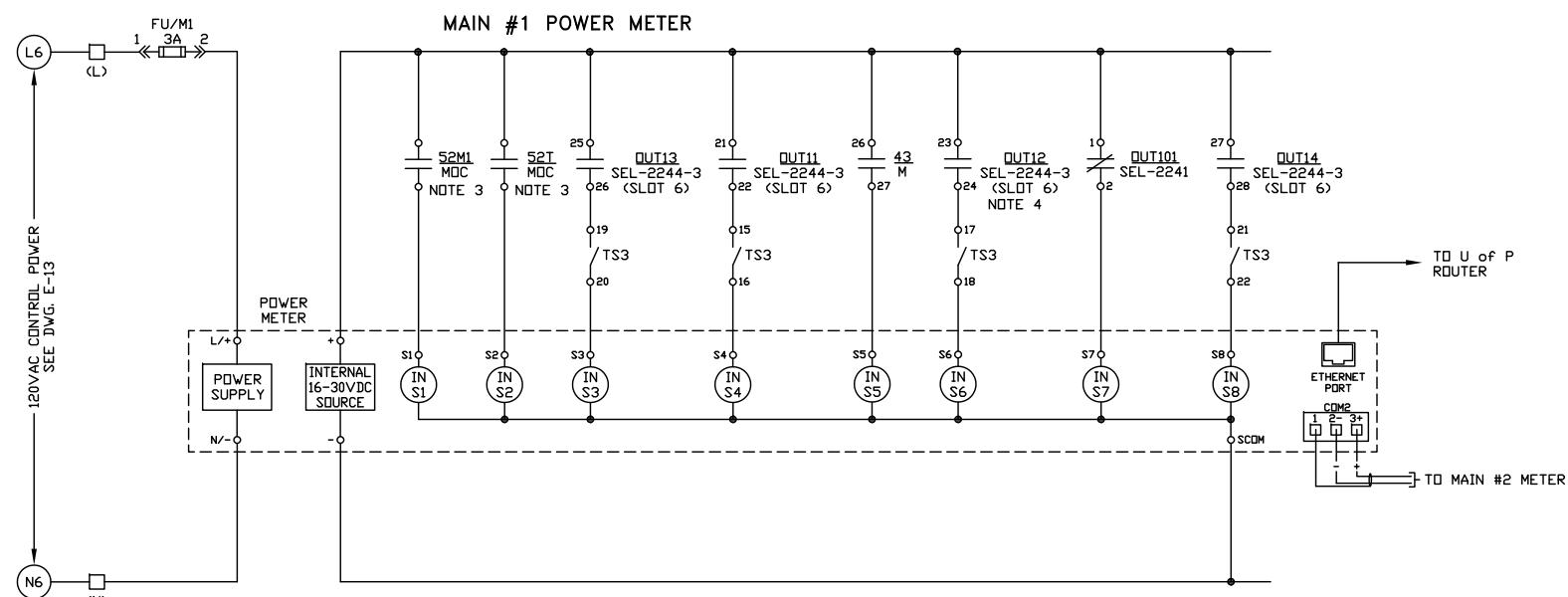
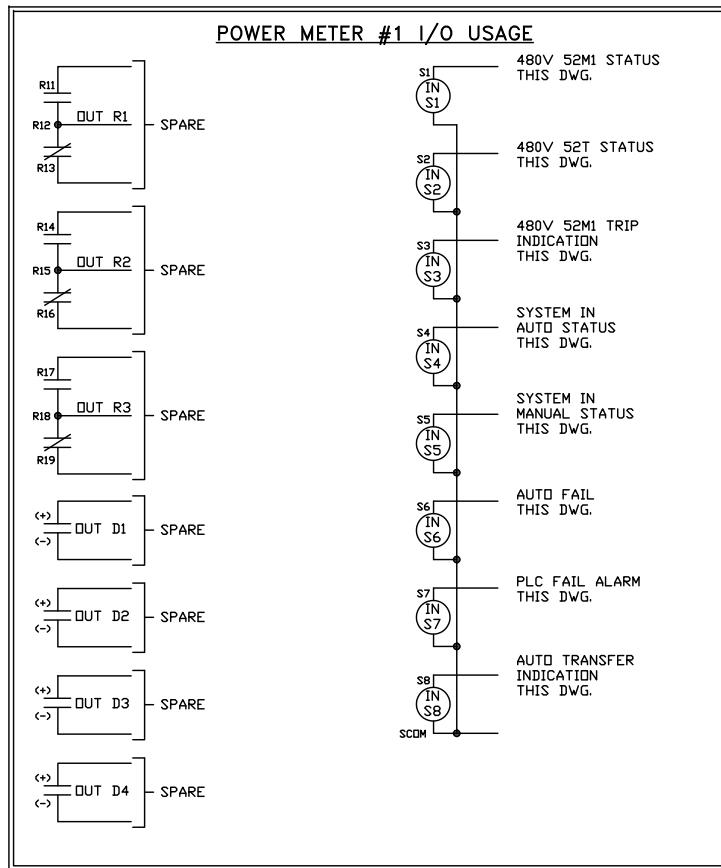
**NOTES:**

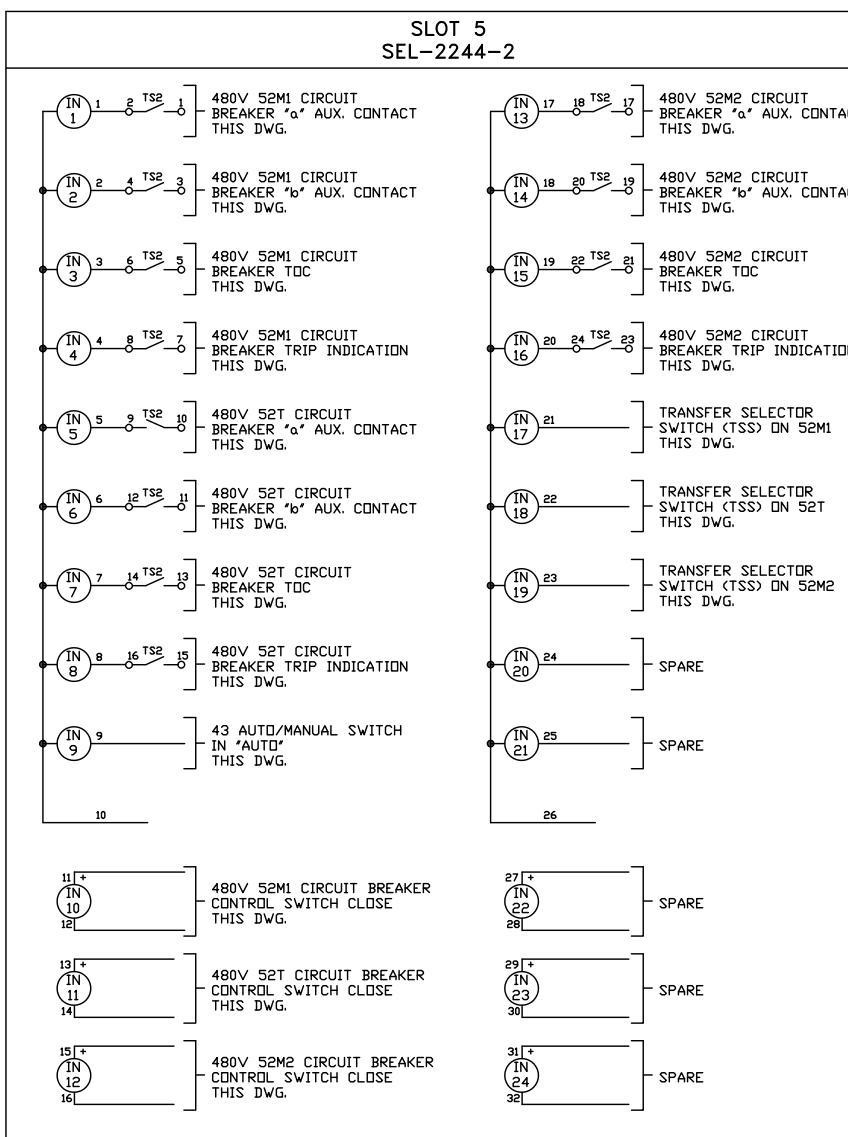
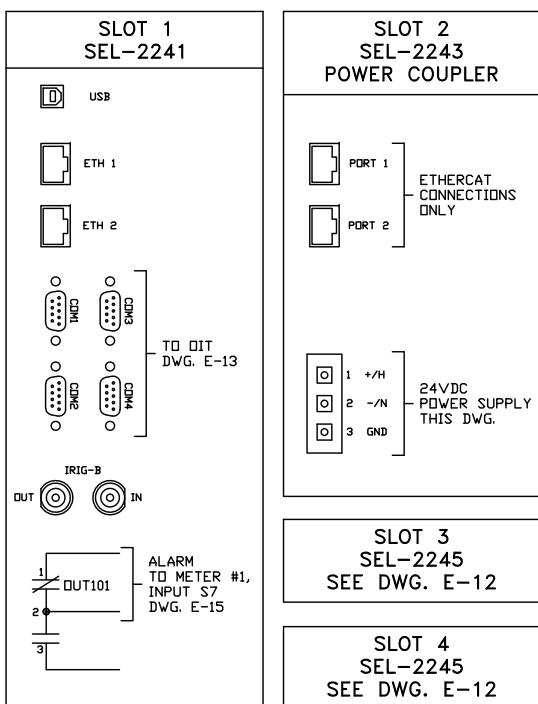
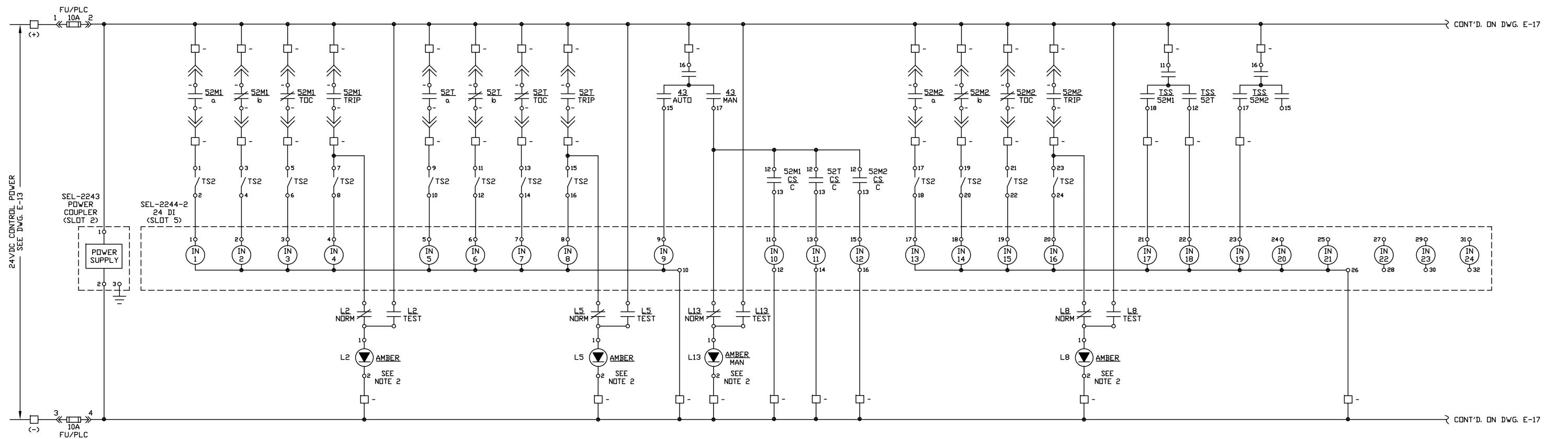
1. ALL INDICATING LIGHTS SHALL BE LED's WITH "PUSH TO TEST" FEATURE.
2. CIRCUIT BREAKER MDC CONTACTS MUST FUNCTION IN BOTH CONNECTED AND TEST POSITIONS.
3. CIRCUIT BREAKERS SHALL BE LOCKABLE IN RACKED-OUT POSITION.
4. FEEDER BREAKERS SHALL NOT REQUIRE CONTROL SWITCH OR POWER METER.
5. ALL TEST SWITCHES SHALL BE STATES TYPE MTS, SURFACE MOUNTED, FRONT CONNECTED MINIATURE TEST SWITCHES OR EQUIVALENT.
6. ALL BREAKER CONTACTS SHOWN WITH BREAKER OPEN, RACKED OUT TO TEST POSITION & NO TRIP PRESENT.
7. EQUIPMENT RATINGS SHALL BE PROJECT SPECIFIC.

## LEGEND

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)







- NOTES:**
- FOR RELAY CATALOG NUMBERS, REFER TO DWG. E-18.
  - ALL INDICATING LIGHTS SHALL BE LED's WITH "PUSH TO TEST" FEATURE.
  - ALL TEST SWITCHES SHALL BE STATES TYPE MTS, SURFACE MOUNTED, FRONT CONNECTED MINIATURE TEST SWITCHES OR EQUIVALENT.
  - ALL CONTROL DEVICES SHALL BE MOUNTED IN A BARRIERED-OFF COMPARTMENT.
  - ALL BREAKER CONTACTS SHOWN WITH BREAKER OPEN, RACKED OUT TO TEST POSITION & NO TRIP PRESENT.
  - EQUIPMENT RATINGS SHALL BE PROJECT SPECIFIC.

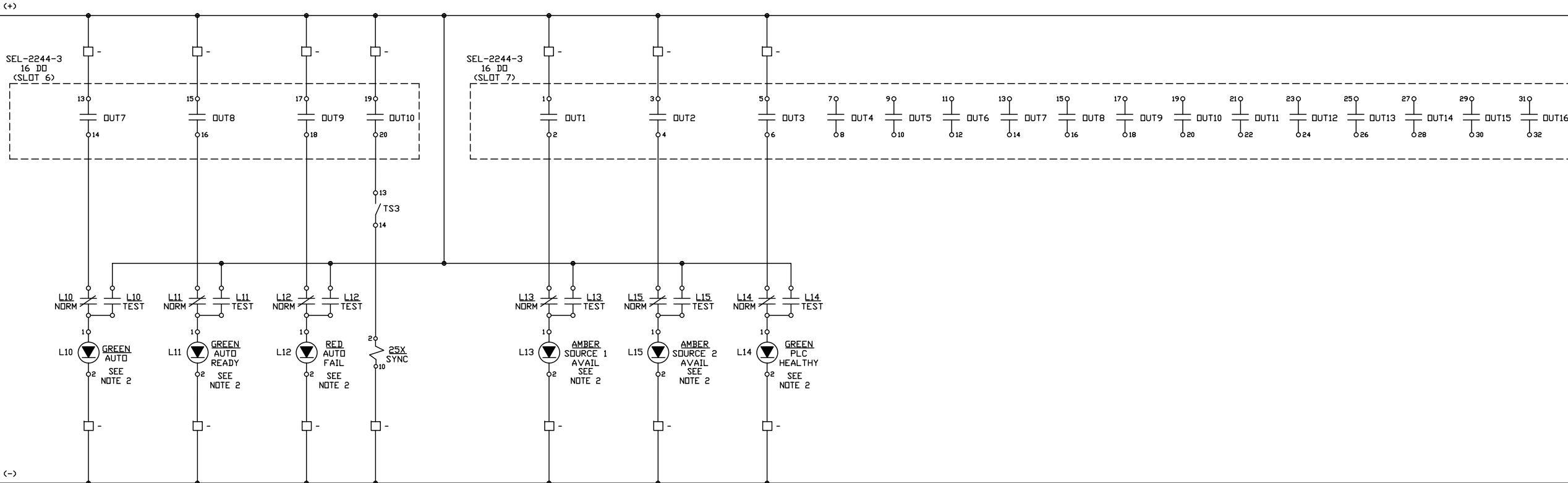
**LEGEND**

SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)

NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)

<p>43 Freemansville Road Reading, PA 19607 610-796-7900</p>	UNIVERSITY OF PENNSYLVANIA STANDARD LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR PLC (SEL RTAC AXION) INPUT SCHEMATIC			
	DRAWN GWB	DATE 7/7/2016	APPROVED T. GROSCUP	DATE 10/10/2016
SCALE NONE	SHEET NO. 1 OF 1	Dwg. No. E-16		
REV. <input type="text"/>	REV. DATE <input type="text"/>	REVISION & JOB NO. <input type="text"/>	BY <input type="text"/> OK <input type="text"/> APP. <input type="text"/>	

CONT'D. FROM DWG. E-16



CONT'D. FROM DWG. E-16

SLOT 6 SEL-2244-3	
1 DUT1	TRIP 480V 52M1 CIRCUIT BREAKER DWG. E-14
2 TS3	17 DUT9 'AUTO FAIL' INDICATION LIGHT THIS DWG.
3 DUT2	CLOSE 480V 52M1 CIRCUIT BREAKER DWG. E-14
4 TS3	18 DUT10 SYNC CHECK AUX. RELAY THIS DWG.
5 DUT3	TRIP 480V 52T CIRCUIT BREAKER DWG. E-14
6 TS3	21 DUT11 AUTO STATUS TO METER #1, INPUT S4 DWG. E-15
7 DUT4	CLOSE 480V 52T CIRCUIT BREAKER DWG. E-14
8 TS3	23 DUT12 AUTO FAIL STATUS TO METER #1, INPUT S6 DWG. E-15
9 DUT5	TRIP 480V 52M2 CIRCUIT BREAKER DWG. E-14
10 TS3	25 DUT13 TO METER #1, INPUT S3 DWG. E-15
11 DUT6	CLOSE 480V 52M2 CIRCUIT BREAKER DWG. E-14
12 TS3	27 DUT14 AUTO TRANSFER INDICATION TO METER #1, INPUT S8 DWG. E-15
13 DUT7	'AUTO' INDICATION LIGHT THIS DWG.
14	29 DUT15 480V 52T CB TRIP INDICATION TO METER #2, INPUT S3 DWG. E-15
15 DUT8	'AUTO READY' INDICATION LIGHT THIS DWG.
16	31 DUT16 480V 52M2 CB TRIP INDICATION TO METER #2, INPUT S2 DWG. E-15

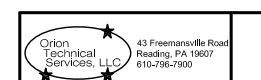
SLOT 7 SEL-2244-3	
1 DUT1	'SOURCE 1 AVAIL.' INDICATION LIGHT THIS DWG.
2 TS3	17 DUT9 SPARE
3 DUT2	'SOURCE 2 AVAIL.' INDICATION LIGHT THIS DWG.
4 TS3	19 DUT10 SPARE
5 DUT3	AUTO FAIL STATUS TO METER #1, INPUT S4 DWG. E-15
6 TS3	21 DUT11 SPARE
7 DUT4	SPARE
8 TS3	23 DUT12 SPARE
9 DUT5	SPARE
10 TS3	25 DUT13 SPARE
11 DUT6	SPARE
12 TS3	27 DUT14 SPARE
13 DUT7	SPARE
14	29 DUT15 SPARE
15 DUT8	SPARE
16	31 DUT16 SPARE

NOTES:

1. FOR RELAY CATALOG NUMBERS, REFER TO DWG. E-18.
2. ALL INDICATING LIGHTS SHALL BE LED's WITH 'PUSH TO TEST' FEATURE.
3. ALL TEST SWITCHES SHALL BE STATES TYPE MTS, SURFACE MOUNTED, FRONT CONNECTED MINIATURE TEST SWITCHES OR EQUIVALENT.
4. ALL CONTROL DEVICES SHALL BE MOUNTED IN A BARRIRED-OFF COMPARTMENT.
5. EQUIPMENT RATINGS SHALL BE PROJECT SPECIFIC.

LEGEND

- SHORTING TYPE TERMINAL BLOCK, (GE EB27 OR EQUIV)
- NON-SHORTING TYPE TERMINAL BLOCK, (GE EB25 OR EQUIV)



UNIVERSITY OF PENNSYLVANIA  
STANDARD  
LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR  
PLC (SEL RTAC AXION) OUTPUT SCHEMATIC

DRAWN BY T. GROSCUP DATE 7/7/2016 APPROVED 10/10/2016 WORK ORDER NO.

SCALE NONE SHEET NO. 1 OF 1 Dwg. No. E-17

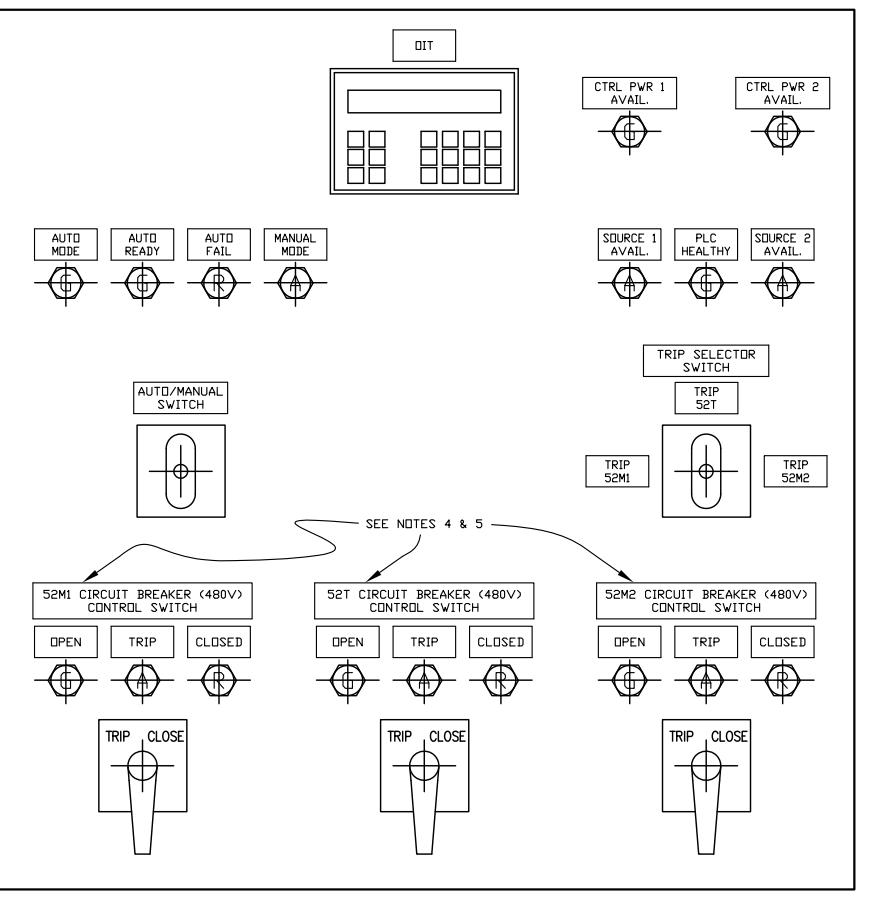
REV.	REV. DATE	REVISION & JOB NO.	BY	CK.	APP.

PROTECTION & CONTROL EQUIPMENT BILL OF MATERIAL

ITEM #	DESCRIPTION	MANUFACTURER	CATALOG #	QTY
1	DIGITAL POWER METER	EATON SIEMENS SQUARE D	PXM4051A1BB 9510DC-1156-HZAA PM6000 W/METSEPM892600	2
2	CIRCUIT BREAKER CONTROL SWITCH, 3 DECK, PISTOL-GRIP HANDLE	ELECTROSWITCH	2443D	3
3	AUTO/MANUAL SWITCH, 4 DECKS, DVAL HANDLE	ELECTROSWITCH	24204B	1
4	TRANSFER SELECTOR SWITCH, 2 DECKS, OVAL HANDLE	ELECTROSWITCH	24202B	1
5	INDICATING LIGHT, LED, 120VAC, GREEN LENS, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001KP3BLGG9	2
6	INDICATING LIGHT, LED, 120VAC, GREEN LENS, "PUSH TO TEST" FEATURE, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K13BLGGH13	3
7	INDICATING LIGHT, LED, 120VAC, RED LENS, "PUSH TO TEST" FEATURE, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K13BLRRH13	3
8	INDICATING LIGHT, LED, 24VDC, GREEN LENS, "PUSH TO TEST" FEATURE, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K13L5LGGH13	3
9	INDICATING LIGHT, LED, 24VDC, AMBER LENS, "PUSH TO TEST" FEATURE, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K13L5LYAH13	6
10	INDICATING LIGHT, LED, 24VDC, RED LENS, "PUSH TO TEST" FEATURE, REPLACEABLE LED	SCHNEIDER ELECTRIC	9001K13L5LRRH13	1
11	SEL-2242 AXION REAL-TIME AUTOMATION CONTROLLER (RTAC) BACKPLANE, HDRIZ SURFACE MOUNT, SRO, 10 SLOTS, 19" RACK WIDTH	SEL	2242S1X0	1
12	SLOT 1: SEL-2241 RTAC, (2) 10/100BASE-T ETHERNET CONNECTIONS	SEL	2241X0211X0XXXXXX	1
13	SLOT 2: SEL-2243 POWER COUPLER, 24/48 VDC POWER SUPPLY, (2) 10/100BASE-T ETHERNET COMMUNICATIONS PORTS	SEL	224321X0	1
14	SLOTS 3 & 4: SEL-2245-4 AC METERING MODULE, 4CT/4PT METERING (0-22A, 5-400V) INPUTS	SEL	2245410XXX0	2
15	SLOT 5: SEL-2244-2 DIGITAL INPUT MODULE, 24 DIGITAL INPUTS-24VDC/VAC	SEL	22442121X0	1
16	SLOTS 6 & 7: SEL-2244-3 DIGITAL OUTPUT MODULE, 16 DIGITAL OUTPUTS-FORM A	SEL	22443131X0	2
17	OPERATOR INTERFACE TERMINAL (OIT), 2 LINE X 20 CHARACTER LCD DISPLAY, 12-30VDC PS	MAPLE SYSTEMS	OIT3160	1
18	CONFIGURATION CABLE, RS-232 SERIAL COMMUNICATIONS TO RJ-45 PLUG	MAPLE SYSTEMS	7431-0096	1
19	COMMUNICATIONS CABLE, RS-232 TO RJ-45, TO CONNECT TO RTAC	MAPLE SYSTEMS	7442-0002-5	1

NAMEPLATE SCHEDULE

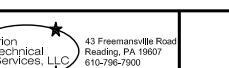
NO.	SIZE	ENGRAVING
NP1	4' X 8'	480V SOURCE #1
NP2	2' X 4'	CPT #1
NP3	1' X 3'	MAIN #1
NP4	4' X 8'	POWER METER 480V 52M1 CIRCUIT BREAKER
NP5	4' X 8'	480V BUS #1 FEEDER BREAKERS
NP6	4' X 8'	MAIN-TIE-MAIN RELAYING & CONTROLS
NP7	1' X 3'	PLC SEL RTAC AXION
NP8	1' X 2'	OIT
NP9	1' X 3'	CTRL PWR 1 AVAIL.
NP10	1' X 3'	CTRL PWR 2 AVAIL.
NP11	1' X 2'	AUTO MODE
NP12	1' X 2'	AUTO READY
NP13	1' X 2'	AUTO FAIL
NP14	1' X 2'	MANUAL MODE
NP15	1' X 3'	AUTO/MANUAL SWITCH
NP16	1' X 2'	SOURCE #1 AVAIL.
NP17	1' X 2'	PLC HEALTHY
NP18	1' X 2'	SOURCE #2 AVAIL.
NP19	1' X 4'	TRIP SELECTOR SWITCH
NP20	1' X 2'	TRIP 52M1
NP21	1' X 2'	TRIP 52T
NP22	1' X 2'	TRIP 52M2
NP23	1' X 7"	52M1 CIRCUIT BREAKER (480V) CONTROL SWITCH
NP24	1' X 2'	OPEN
NP25	1' X 2'	TRIP
NP26	1' X 2'	CLOSED
NP27	1' X 7"	52T CIRCUIT BREAKER (480V) CONTROL SWITCH
NP28	1' X 2'	OPEN
NP29	1' X 2'	TRIP
NP30	1' X 2'	CLOSED
NP31	1' X 7"	52M2 CIRCUIT BREAKER (480V) CONTROL SWITCH
NP32	1' X 2'	OPEN
NP33	1' X 2'	TRIP
NP34	1' X 2'	CLOSED
NP35	4' X 8'	480V 52T CIRCUIT BREAKER
NP36	4' X 8'	480V BUS #2 FEEDER BREAKERS
NP37	4' X 8'	480V SOURCE #2
NP38	2' X 4'	CPT #2
NP39	1' X 3'	MAIN #2
NP40	4' X 8'	POWER METER 480V 52M2 CIRCUIT BREAKER



ENLARGED VIEW OF  
CONTROLS & INDICATION

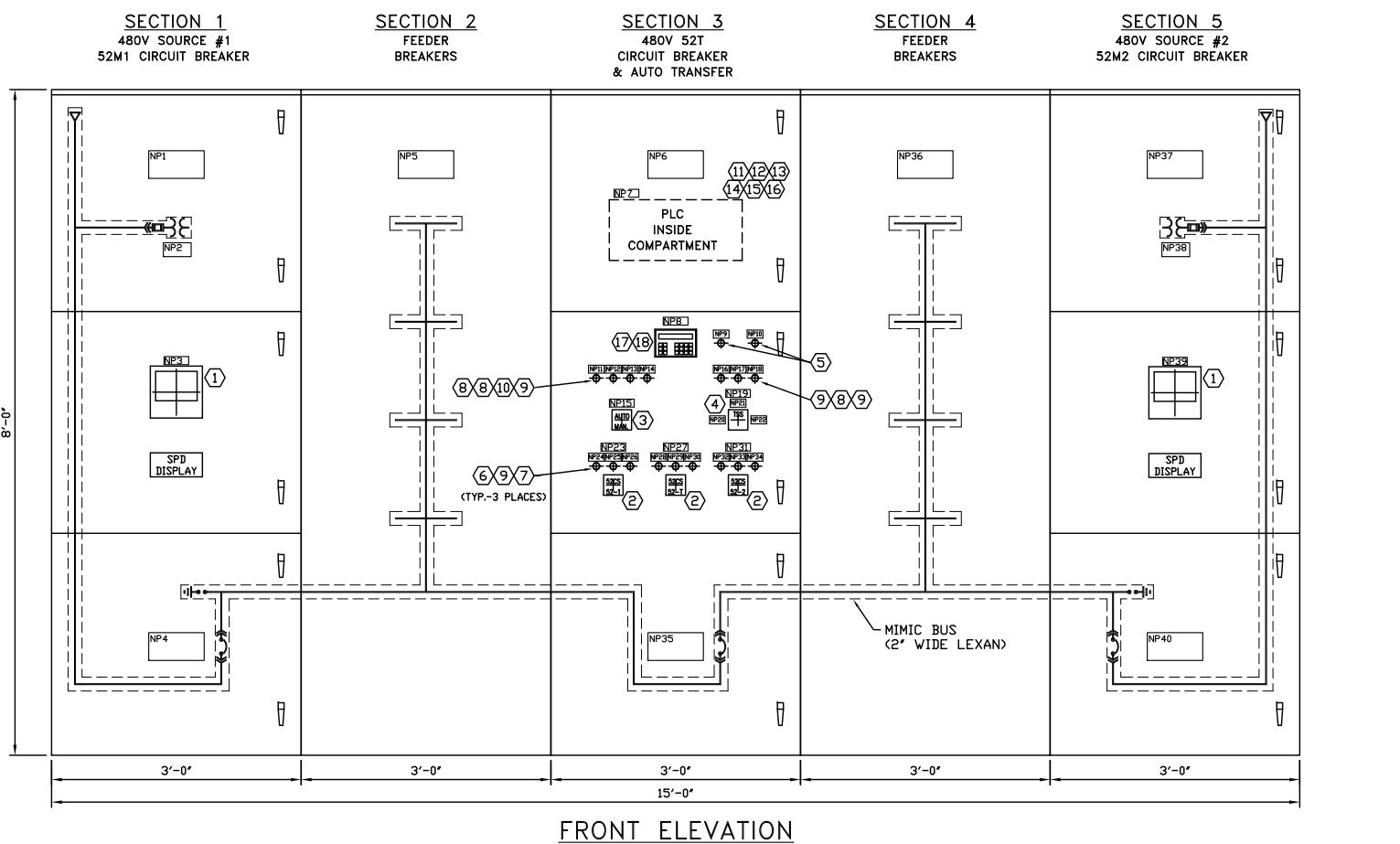
NOTES:

- OVERALL PHYSICAL DIMENSIONS OF SWITCHGEAR SHALL BE DETERMINED BY PROJECT SPACE REQUIREMENTS.
- ALL REQUIRED DEVICES ARE NOT SHOWN ON THIS DRAWING.
- ALL CONTROL SWITCHES SHALL BE STATES TYPE MIS, SURFACE MOUNTED, FRONT CONNECTED MINIATURE TEST SWITCHES OR EQUIVALENT.
- NAMERELATE ENGRAVINGS TO BE CUSTOMIZED WITH APPROPRIATE VOLTAGE, CIRCUIT & CIRCUIT BREAKER DESIGNATIONS PER PROJECT REQUIREMENTS.
- ALL NAMEPLATES AND DRAWINGS TO BE PROVIDED BY UNIVERSITY OF PENNSYLVANIA PERSONNEL PRIOR TO ENGRAVING.
- ALL CONTROL DEVICES SHALL BE MOUNTED IN A BARRIED-OFF COMPARTMENT.
- ALL ACCESSIBLE COMPARTMENTS SHALL BE PROVIDED WITH HINGED COVERS AND DOOR LATCHES.
- EQUIPMENT RATINGS SHALL BE PROJECT SPECIFIC.

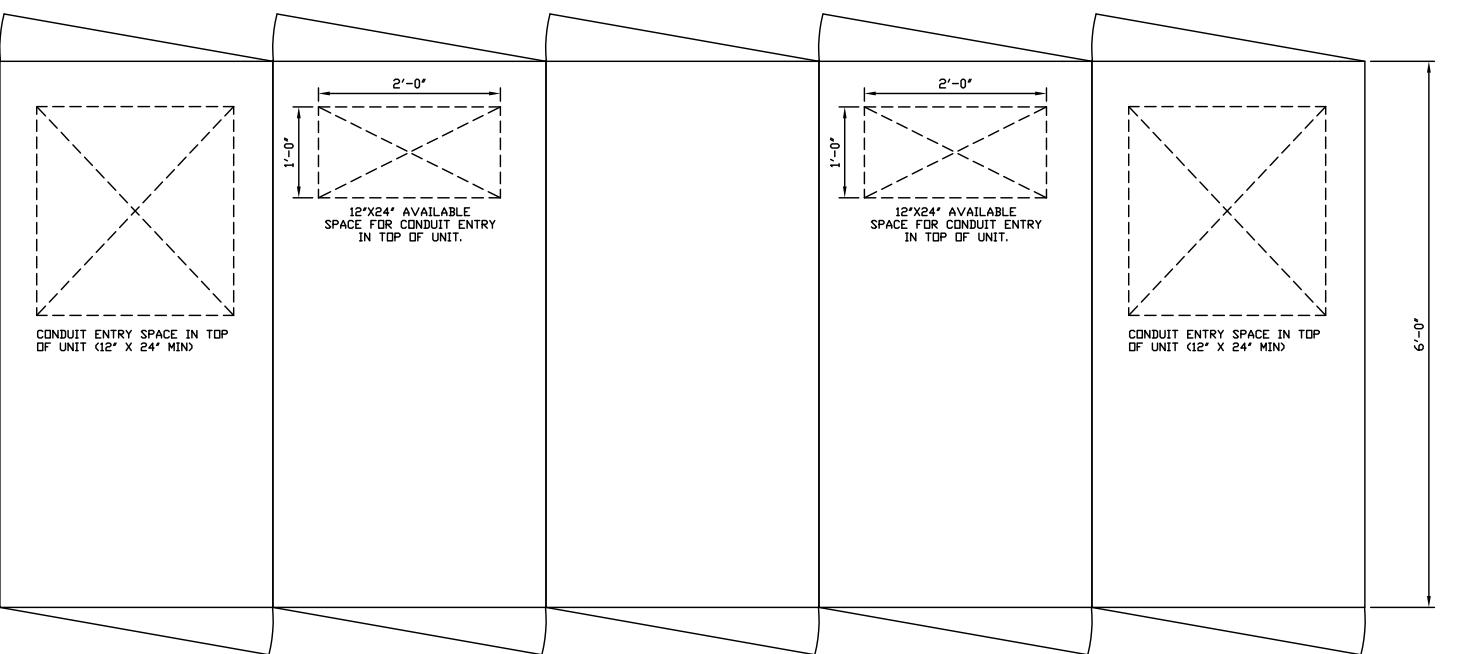


UNIVERSITY OF PENNSYLVANIA  
STANDARD  
LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR  
ELEVATION & DETAILS

DRAWN GWB	DATE 7/5/2016	APPROVED T. GROSUP	DATE 10/10/2016	WORK ORDER NO.
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-18		



FRONT ELEVATION



PLAN VIEW

CONDITIONS WHICH MUST BE MET PRIOR TO PLACING SYSTEM IN AUTO

1. 43A/M SWITCH SHOULD BE IN THE MANUAL POSITION.
2. MAIN & TIE CIRCUIT BREAKERS MUST ALL BE RACKED IN TO THE CONNECTED POSITION OR ALL RACKED OUT TO THE TEST POSITION.
3. ALL BREAKER TRIP INDICATIONS MUST BE RESET.
4. THE PLC HEALTHY GREEN INDICATING LIGHT MUST BE LIT.
5. ACCEPTABLE VOLTAGE MUST BE PRESENT ON AT LEAST ONE SOURCE.
6. A TWO OUT OF THREE BREAKER CLOSED CONDITION MUST BE PRESENT (I.E. 52M1 & 52M2 CLOSED WITH 52T OPEN, OR 52M1 OR 52M2 CLOSED WITH 52T CLOSED). THE BREAKERS IN THE CLOSED POSITION MUST AGREE WITH THE SOURCE VOLTAGES PRESENT.
7. THE AUTO READY GREEN INDICATING LIGHT SHOULD BE LIT. IF LIGHT IS NOT LIT, CHECK THE ABOVE STEPS.
8. PLACE THE 43A/M SWITCH IN THE AUTO POSITION. THE AUTO MODE GREEN INDICATING LIGHT SHOULD ILLUMINATE. NOTE THAT THE AUTO READY LIGHT WILL REMAIN LIT. THE MANUAL MODE AMBER INDICATING LIGHT SHOULD GO OUT.
9. THE SCHEME IS NOW IN THE AUTOMATIC MODE AND READY TO RESPOND AS REQUIRED TO A LOSS OF SOURCE.

SWITCHGEAR AUTOMATIC OPERATION

1. NORMAL CONDITIONS
  - a. 52M1 & 52M2 MAIN BREAKERS ARE CLOSED
  - b. 52T TIE BREAKER IS OPEN
  - c. 43A/M SWITCH IS IN THE AUTO POSITION
2. LOSS OF SOURCE 1 OR SOURCE 2
  - a. VOLTAGE FAILURE IS SENSED BY THE 27 OR 47 FUNCTIONS IN THE SEL-RTAC.
  - b. AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 5.0 SECONDS), THE MAIN CIRCUIT BREAKER ON THE LOST SOURCE SIDE OPENS.
  - c. AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 2.0 SECONDS), THE 52T TIE CIRCUIT BREAKER IS CLOSED.
3. RETURN OF LOST SOURCE - MANUAL RE-TRANSFER
  - a. SOURCE 1 AND SOURCE 2 AMBER INDICATING LIGHTS SHOULD BE LIT.
  - b. PLACE THE 43A/M SWITCH IN THE MANUAL POSITION.
  - c. PLACE THE TRIP SELECT SWITCH (TSS) IN THE TRIP 52T POSITION.
  - d. CLOSE THE OPEN MAIN CIRCUIT BREAKER.
  - e. AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 3.0 SECONDS), THE 52T TIE CIRCUIT BREAKER WILL BE OPENED.
  - f. THE AUTO READY GREEN INDICATING LIGHT SHOULD BE LIT.
  - g. PLACE THE 43A/M SWITCH IN THE AUTO POSITION TO PLACE THE SCHEME IN AUTO. THE MANUAL MODE AMBER INDICATING LIGHT SHOULD GO OUT AND THE AUTO MODE GREEN INDICATING LIGHT SHOULD LIGHT.
4. LOSS OF SOURCE AFTER TRANSFER - LIVE LINE SEEK
  - a. LOSS OF SOURCE 1 (OR SOURCE 2) FOLLOWING TRANSFER TO SOURCE 1 (OR SOURCE 2) WILL BE DETECTED BY THE 27 OR 47 FUNCTIONS IN THE SEL-RTAC.
  - b. AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 5.0 SECONDS), THE MAIN CIRCUIT BREAKER ON THE LOST SOURCE SIDE WILL OPEN.
  - c. IF SOURCE 2 (OR SOURCE 1) IS AVAILABLE, THE MAIN CIRCUIT BREAKER ON THE AVAILABLE SOURCE SIDE WILL CLOSE AFTER A FACTORY ADJUSTABLE TIME DELAY (FACTORY SET AT 20 CYCLES).
  - d. THE SYSTEM WILL REMAIN IN A LIVE LINE SEEKING MODE. UPON RESTORATION OF BOTH SOURCES, THE SYSTEM WILL REMAIN IN ITS CURRENT CONFIGURATION AND AWAIT A MANUAL RE-TRANSFER TO BE PERFORMED AS DESCRIBED IN ITEM #3.
5. LOSS OF BOTH SOURCES - COMPLETE UTILITY LOSS
  - a. THE LOSS OF THE SOURCES WILL BE DETECTED BY THE 27 OR 47 FUNCTIONS IN THE SEL-RTAC.
  - b. IF BOTH SOURCES ARE LOST AT THE SAME TIME, THE MAIN CIRCUIT BREAKERS WILL REMAIN CLOSED AND THE 52T TIE CIRCUIT BREAKER WILL REMAIN OPEN.
  - c. UPON RESTORATION OF A SINGLE SOURCE, THE MAIN CIRCUIT BREAKER ON THE UNAVAILABLE SOURCE SIDE WILL OPEN AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 5.0 SECONDS).
  - d. AFTER AN ADJUSTABLE TIME DELAY (FACTORY SET AT 2.0 SECONDS) AFTER THE MAIN CIRCUIT BREAKER HAS BEEN OPENED, THE 52T TIE CIRCUIT BREAKER WILL BE CLOSED.

DESCRIPTION OF SCHEME CONTROLS AND INDICATIONS

1. INDICATING LIGHTS
  - a. CTRL. PWR 1 AVAIL. - ILLUMINATED GREEN INDICATING LIGHT INDICATES THAT CONTROL POWER FROM THE SOURCE 1 SIDE IS AVAILABLE.
  - b. CTRL. PWR 2 AVAIL. - ILLUMINATED GREEN INDICATING LIGHT INDICATES THAT CONTROL POWER FROM THE SOURCE 2 SIDE IS AVAILABLE.
  - c. AUTO MODE - ILLUMINATED GREEN INDICATING LIGHT INDICATES THAT THE SCHEME IS IN THE AUTOMATIC MODE.
  - d. AUTO READY - ILLUMINATED GREEN INDICATING LIGHT INDICATES THAT THE REQUIRED CONDITIONS HAVE BEEN SATISFIED TO PLACE THE SCHEME INTO THE AUTOMATIC MODE BY PLACING THE 43A/M SWITCH IN THE AUTO POSITION.
  - e. AUTO FAIL - ILLUMINATED RED INDICATING LIGHT INDICATES THAT AN ABNORMAL CONDITION HAS BEEN DETECTED WHILE IN THE AUTOMATIC MODE. CONDITIONS THAT WILL PLACE THE SCHEME IN AUTO FAIL ARE THE FOLLOWING:
    - i. MANUAL TRIP OF ONE OF THE CIRCUIT BREAKERS
    - ii. RACKING A CIRCUIT BREAKER OUT TO THE TEST POSITION WITH ALL OTHER BREAKERS RACKED INTO THE CONNECTED POSITION.
    - iii. TRIP INDICATION RECEIVED FROM ONE OF THE CIRCUIT BREAKERS
    - iv. ALARM CONDITION DETECTED BY THE SEL-RTAC
  - f. MANUAL MODE - ILLUMINATED AMBER INDICATING LIGHT INDICATES THAT THE SCHEME IS IN THE MANUAL MODE AND WILL NOT PERFORM AUTOMATIC SWITCHING OPERATIONS.
  - g. SOURCE 1 AVAIL. - ILLUMINATED AMBER INDICATING LIGHT INDICATES THAT THE SOURCE 1 IS AVAILABLE.
  - h. PLC HEALTHY - ILLUMINATED GREEN INDICATING LIGHT INDICATES THAT NO ALARM CONDITIONS HAVE BEEN DETECTED BY THE SEL-RTAC.
  - i. SOURCE 2 AVAIL. - ILLUMINATED AMBER INDICATING LIGHT INDICATES THAT THE SOURCE 2 IS AVAILABLE.
  - j. CIRCUIT BREAKER OPEN - ILLUMINATED GREEN INDICATING LIGHTS INDICATES THAT THE CIRCUIT BREAKER IS OPEN.
  - k. CIRCUIT BREAKER TRIP - ILLUMINATED AMBER INDICATING LIGHT INDICATES THAT A TRIP CONDITION HAS BEEN SIGNALLED BY THE CIRCUIT BREAKER TRIP UNIT.
  - l. CIRCUIT BREAKER CLOSED - ILLUMINATED RED INDICATING LIGHT INDICATES THAT THE CIRCUIT BREAKER IS CLOSED.
2. CONTROLS
  - a. AUTO/MANUAL SWITCH - USED TO SWITCH THE SCHEME INTO THE AUTOMATIC AND MANUAL MODES.
  - b. TRIP SELECTOR SWITCH - USED TO SELECT THE BREAKER TO BE TRIPPED DURING CLOSED TRANSITION SWITCHING.
  - c. OPERATOR INTERFACE TERMINAL (OIT) - USED TO MANIPULATE TIME DELAY SETTINGS FOR THE AUTOMATIC SCHEME.

 <p>43 Freemansville Road Reading, PA 19607 610-796-7900</p>					
UNIVERSITY OF PENNSYLVANIA STANDARD LOW VOLTAGE MAIN-TIE-MAIN SWITCHGEAR SEQUENCE OF OPERATION					
DRAWN GWB	DATE 9/28/2016	APPROVED T. GROSCUP	DATE 10/10/2016	WORK ORDER NO.	
SCALE NONE	SHEET NO. 1 OF 1	DWG. NO. E-19			
REV. _____	REV. DATE _____	REVISION & JOB NO. _____	BY _____	OK. _____	APP. _____

**ATTACHMENT C**

# University of Pennsylvania

## Standard Main-Tie-Main Scheme

### SEL-451 Relay Setting Template

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#### 1. Introduction

This document outlines the settings available on the relay setting template that has been developed in the Schweitzer Engineering Laboratories, Inc (SEL) AcSELerator software. This template greatly simplifies the application of the relay settings required for the protection and automation functions of the relay and increases the level of standardization across numerous switchgear projects.

This document is not intended to be an instruction manual on the use of the SEL AcSELerator software package but rather to document the settings available.

#### 2. Template Description

When the standard Main-Tie-Main setting file is opened in the SEL AcSELerator software the user will be presented with the screen shown in Figure I. As can be seen in the figure, the General tab will be selected. A description of the settings to be entered on this tab is the following:

Setting	Use
Station ID	Sets the Station ID – Normally set to building or substation name
Relay ID	Sets the Relay ID – Normally set to identify the relay
Line 1 Breaker Name	This field will allow the breaker name for Main 1 to be entered in numerous places in the settings
Line 1 PT Ratio	Enter the PT ratio on the line 1 side
Line 1 Nominal Voltage	Enter the nominal voltage based on system voltage and PT ratio
Line 1 CT Ratio	Enter the CT ratio used for Line 1
Line 2 Breaker Name	This field will allow the breaker name for Main 2 to be entered in numerous places in the settings
Line 2 PT Ratio	Enter the PT ratio on the line 2 side
Line 2 Nominal Voltage	Enter the nominal voltage based on system voltage and PT ratio
Line 2 CT Ratio	Enter the CT ratio used for Line 2
Tie Breaker Name	Enter the designation for the tie breaker

After the General settings have been entered, the overcurrent protection settings can be accessed and entered by clicking on the Overcurrent tab. This will display the settings shown in Figure II. A description of these settings is provided in the table below.

Setting	Use
Line 1 Phase TOC PU	Enter the pickup of the phase time overcurrent unit for Line 1 in secondary amps
Line 1 Phase TOC Curve	Enter the appropriate code for the phase time overcurrent characteristic desired for Line 1
Line 1 Phase TOC Time	Enter the desired time dial for the Line 1 phase time overcurrent element

**University of Pennsylvania  
Standard Main-Tie-Main Scheme  
SEL-451 Relay Setting Template**

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<b>Dial</b>	
<b>Line 1 Phase TOC E/M Reset</b>	This allows the user to specify whether or not the Line 1 phase time overcurrent unit should have an electromechanical reset characteristic or an instantaneous one. Set Y for electromechanical or N for instantaneous
<b>Line 1 Ground TOC PU</b>	Enter the pickup of the ground time overcurrent unit for Line 1 in secondary amps
<b>Line 1 Ground TOC Curve</b>	Enter the appropriate code for the ground time overcurrent characteristic desired for Line 1
<b>Line 1 Ground TOC Time Dial</b>	Enter the desired time dial for the Line 1 ground time overcurrent element
<b>Line 1 Ground TOC E/M Reset</b>	This allows the user to specify whether or not the Line 1 ground time overcurrent unit should have an electromechanical reset characteristic or an instantaneous one. Set Y for electromechanical or N for instantaneous
<b>Line 2 Phase TOC PU</b>	Enter the pickup of the phase time overcurrent unit for Line 2 in secondary amps
<b>Line 2 Phase TOC Curve</b>	Enter the appropriate code for the phase time overcurrent characteristic desired for Line 2
<b>Line 2 Phase TOC Time Dial</b>	Enter the desired time dial for the Line 2 phase time overcurrent element
<b>Line 2 Phase TOC E/M Reset</b>	This allows the user to specify whether or not the Line 2 phase time overcurrent unit should have an electromechanical reset characteristic or an instantaneous one. Set Y for electromechanical or N for instantaneous
<b>Line 2 Ground TOC PU</b>	Enter the pickup of the ground time overcurrent unit for Line 2 in secondary amps
<b>Line 2 Ground TOC Curve</b>	Enter the appropriate code for the ground time overcurrent characteristic desired for Line 2
<b>Line 2 Ground TOC Time Dial</b>	Enter the desired time dial for the Line 2 ground time overcurrent element
<b>Line 2 Ground TOC E/M Reset</b>	This allows the user to specify whether or not the Line 2 ground time overcurrent unit should have an electromechanical reset characteristic or an instantaneous one. Set Y for electromechanical or N for instantaneous

After all of the overcurrent settings have been entered, the settings for the Synch-check element of the relay can be accessed by clicking on the Sync-Check tab. The user will be presented with the screen shown in Figure III. A description of the settings available on this tab is provided in the table below.

**University of Pennsylvania  
Standard Main-Tie-Main Scheme  
SEL-451 Relay Setting Template**

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<b>Setting</b>	<b>Use</b>
<b>Sync Check Phase Reference</b>	Set this to the phase of the voltage input to be used as the reference
<b>Sync Check Source 1</b>	This should be set to the same phase voltage input on the second group of voltage inputs on the relay
<b>Sync Check Low Voltage Cutoff</b>	Set this at the voltage that the sync check element should stop checking the phase relationship of the voltage inputs (ie. Low voltage)
<b>Sync Check High Voltage Cutoff</b>	Set this at the voltage that the sync check element should stop checking the phase relationship of the voltage inputs (ie. High voltage)
<b>Sync Check Slip Frequency Cutoff</b>	Set this at the maximum desired slip frequency
<b>Sync Check Max Angle</b>	Set this at the maximum allowed angular difference between the two voltage sources

After all of the sync check settings have been entered, the settings for the Main-Tie-Main transfer scheme can be accessed by clicking on the MTM Transfer tab. The user will be presented with the screen shown in Figure IV. A description of the settings available on this tab is provided in the table below.

<b>Setting</b>	<b>Use</b>
<b>Line 1 Dead Voltage Level</b>	Set this to the voltage level that if the source drops below a transfer will be initiated
<b>Line 1 Live Voltage Level</b>	Set this to the voltage level that if the source is at or above a good source will be asserted
<b>Line 1 High Negative Sequence Voltage Level</b>	Set this at the negative sequence level (3V2) in secondary volts that a transfer will be initiated
<b>Line 2 Dead Voltage Level</b>	Set this to the voltage level that if the source drops below a transfer will be initiated
<b>Line 2 Live Voltage Level</b>	Set this to the voltage level that if the source is at or above a good source will be asserted
<b>Line 2 High Negative Sequence Voltage Level</b>	Set this at the negative sequence level (3V2) in secondary volts that a transfer will be initiated
<b>Main 1 Trip Time</b>	Set this for the desired trip time upon the loss of Line 1
<b>Main 2 Trip Time</b>	Set this for the desired trip time upon the loss of Line 2
<b>Simultaneous Source Loss Main Breaker Trip Time</b>	Set this for the desired trip time upon simultaneous loss of both sources
<b>Tie Close Time</b>	Set this at the desired time for a close of the tie breaker after a trip of a main
<b>Tie Trip Time</b>	Set this at the desired time delay for tripping of the tie

# University of Pennsylvania Standard Main-Tie-Main Scheme SEL-451 Relay Setting Template

<b>Trip Selector Switch Trip Time</b>	Set this at the desired trip time to be used to trip the breaker selected by the trip selector switch after closure of the third breaker (ie. closed transition switching)
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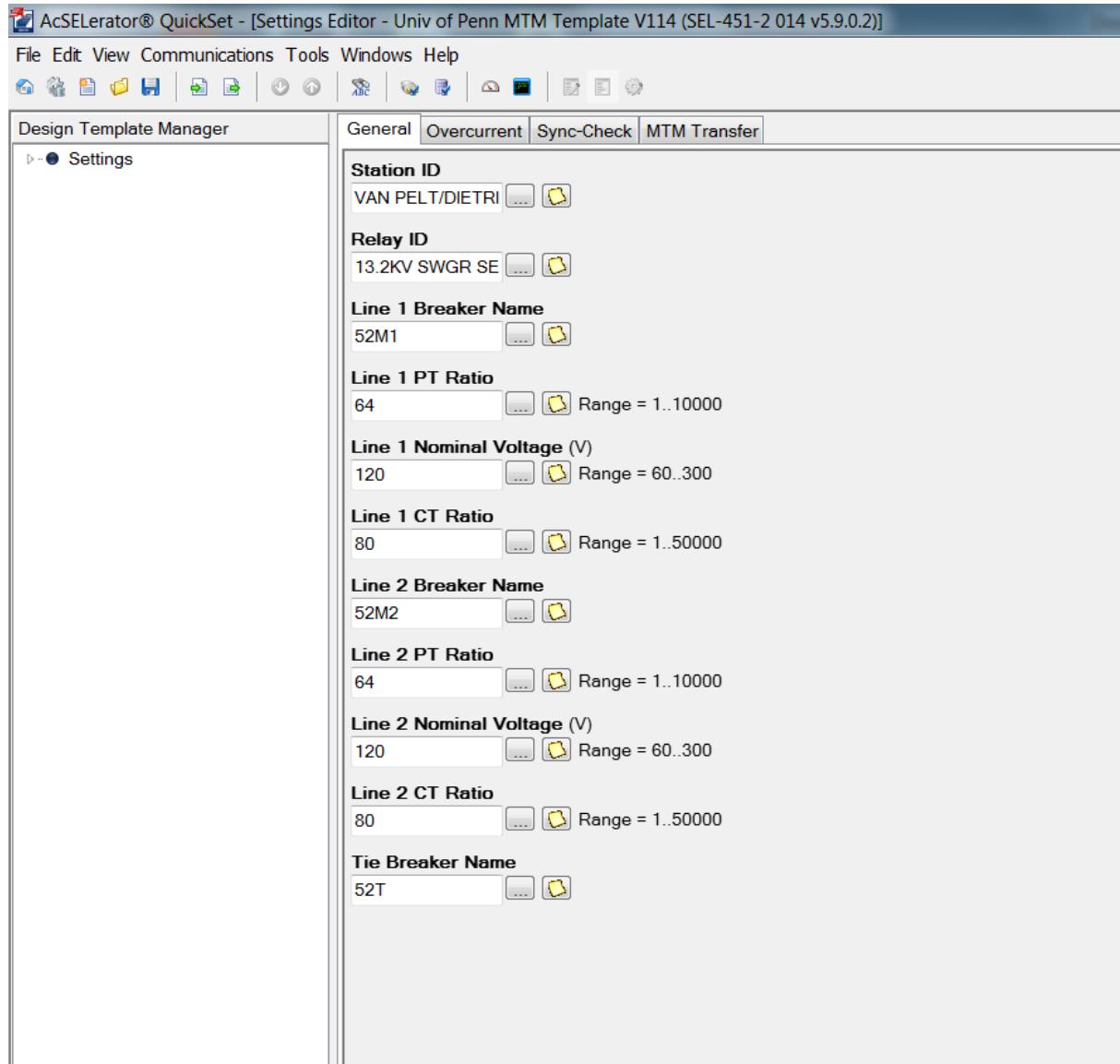


Figure I

# University of Pennsylvania Standard Main-Tie-Main Scheme SEL-451 Relay Setting Template

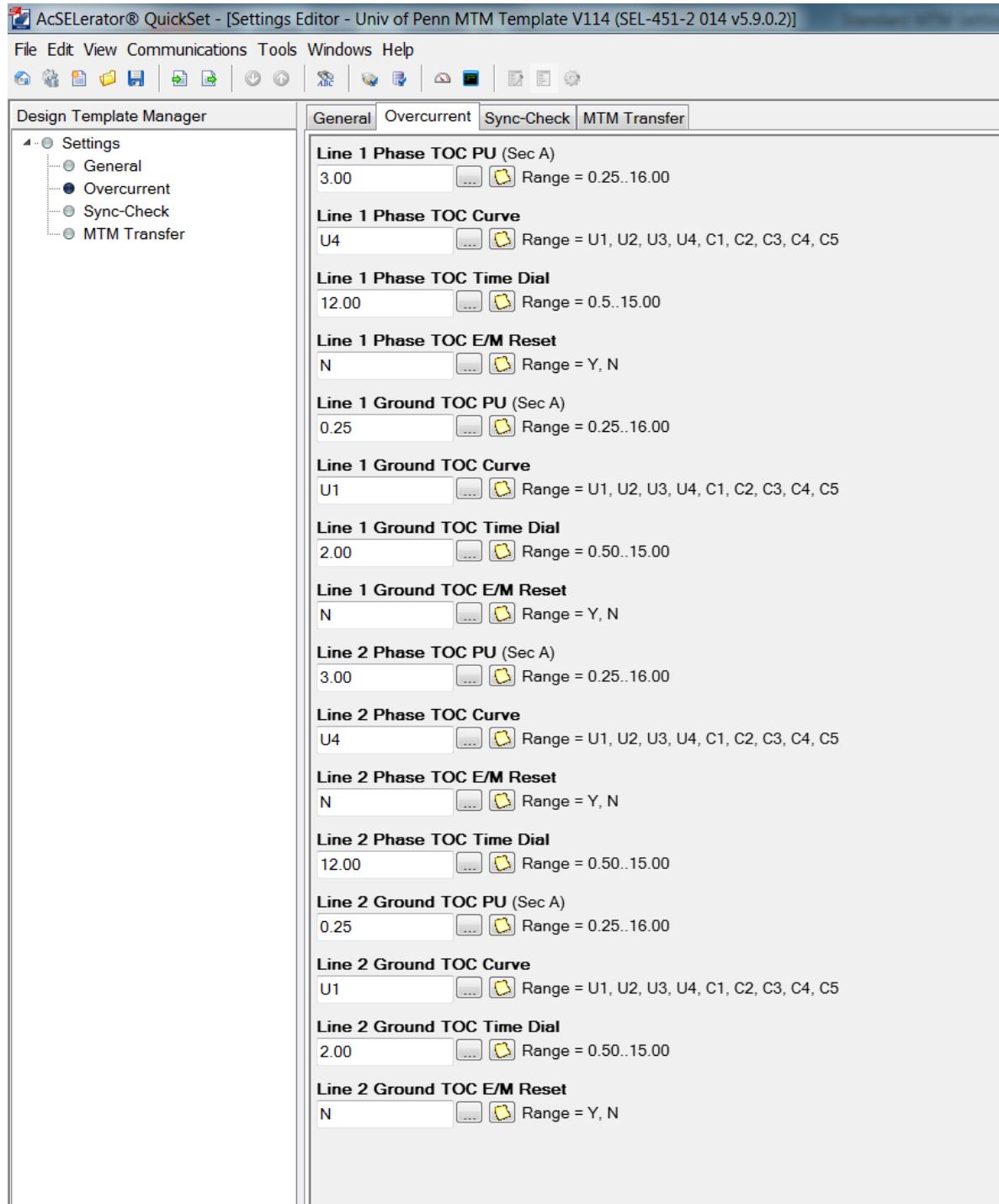


Figure II

# University of Pennsylvania Standard Main-Tie-Main Scheme SEL-451 Relay Setting Template

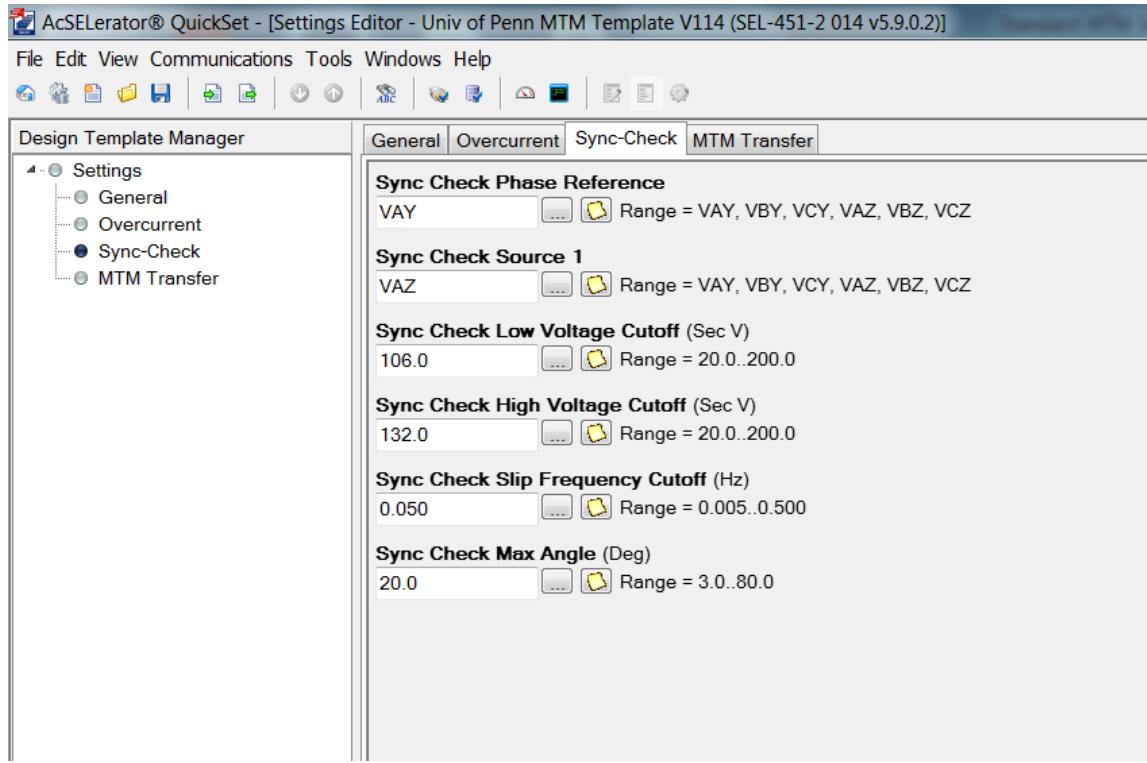


Figure III

# University of Pennsylvania Standard Main-Tie-Main Scheme SEL-451 Relay Setting Template

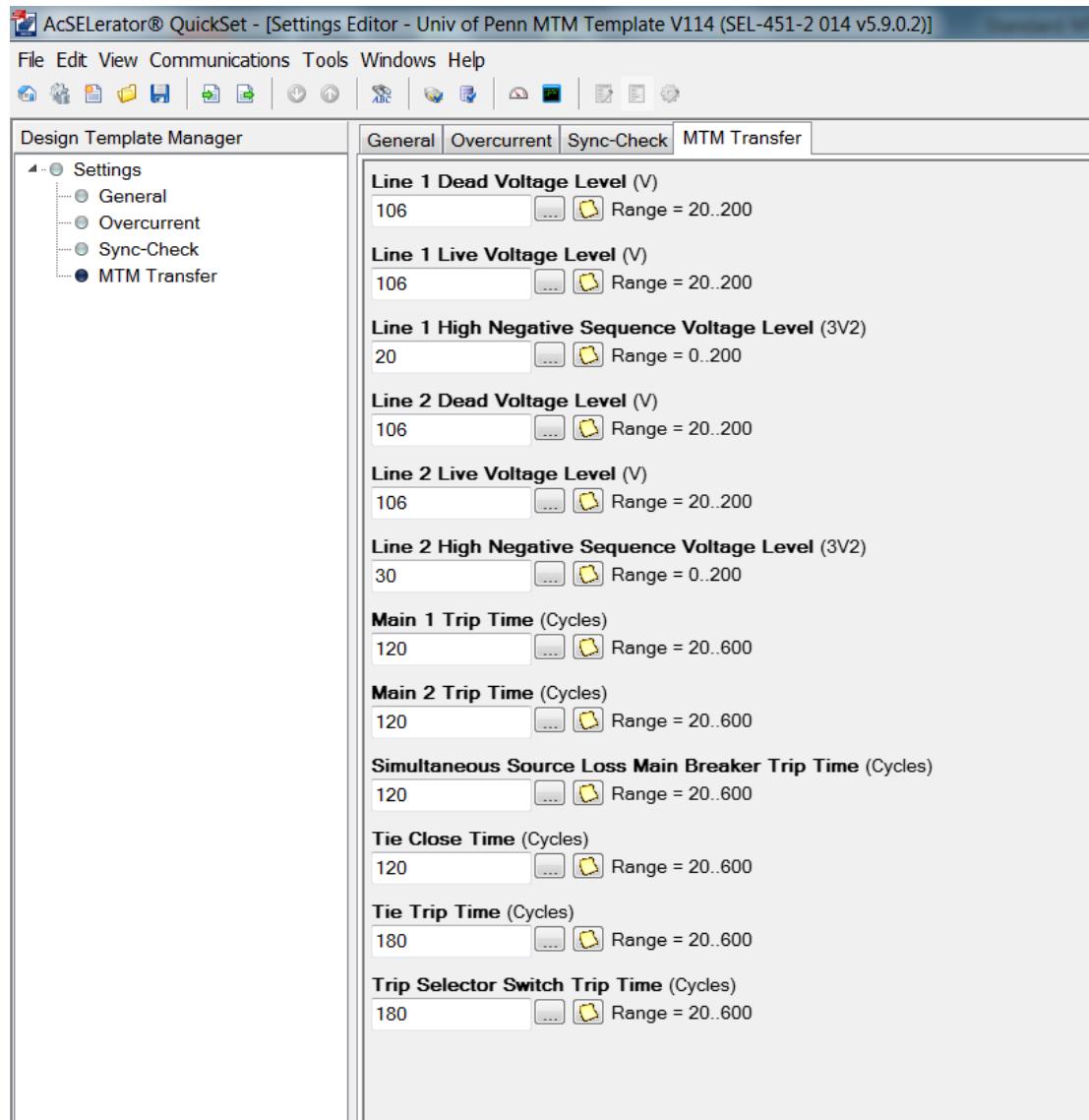


Figure IV

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
G1	SID	Range = ASCII string with a maximum length of 40.	Station A	VANPELT/DIETRICH	True	SID Station Identifier (40 characters)		False
G1	RID	Range = ASCII string with a maximum length of 40.	Relay 1	13.2KV SWGR SEL-451	True	RID Relay Identifier (40 characters)		False
G1	NUMBK	Select: 1, 2	1	2	True	NUMBK Number of Breakers in Scheme		False
G1	BID1	Range = ASCII string with a maximum length of 40.	Breaker 1	52M1	True	BID1 Breaker 1 Identifier (40 characters)		False
G1	BID2	Range = ASCII string with a maximum length of 40.	Breaker 2	52M2	True	BID2 Breaker 2 Identifier (40 characters)		False
G1	NFREQ	Select: 50, 60	60	60	False	NFREQ Nominal System Frequency (Hz)		False
G1	PHROT	Select: ABC, ACB	ABC	ABC	False	PHROT System Phase Rotation		False
G1	DATE_F	Select: MDY, YMD, DMY	MDY	MDY	False	DATE_F Date Format		False
G1	FAULT	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	51S1 OR 51S2 OR 50P1	51S1 OR 51S2 OR 51S3 OR 51S4	True	FAULT Fault Condition Equation (SELogic)		False
G1	EDCMON	Select: N, 1, 2	N	N	False	EDCMON Station DC Battery Monitor		False
G1	EICIS	Select: Y, N	N	Y	True	EICIS Independent Control Input Settings		False
G1	EDRSTC	Select: Y, N	N	N	False	EDRSTC Data Reset Control		False
G1	EGADVS	Select: Y, N	N	N	False	EGADVS Advanced Global Settings		False
G1	EPMU	Select: Y, N	N	N	False	EPMU Synchronized Phasor Measurement		False
G1	SS1	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PB4 AND NOT SG1	NA	True	SS1 Select Setting Group 1 (SELogic)		False
G1	SS2	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PB4 AND SG1	NA	True	SS2 Select Setting Group 2 (SELogic)		False
G1	SS3	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	SS3 Select Setting Group 3 (SELogic)		False
G1	SS4	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	SS4 Select Setting Group 4 (SELogic)		False
G1	SS5	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	SS5 Select Setting Group 5 (SELogic)		False
G1	SS6	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	SS6 Select Setting Group 6 (SELogic)		False
G1	TGR	Range = 0 to 54000	180	180	False	TGR Group Change Delay (cycles)		False
G1	STALLTE	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	STALLTE Time-Error Calculation (SELogic)		False
G1	LOADTE	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	LOADTE Load TECORR Factor (SELogic)		False
G1	ESS	Select: Y, N, 3, 4	N	Y	True	ESS Current and Voltage Source Selection		False
G1	LINEI	Select: IW, COMB	IW	IW	False	LINEI Line Current Source		False
G1	ALINEI	Select: IX, NA	NA	IX	True	ALINEI Alternate Line Current Source		False
G1	ALTI	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	ALTI Alternate Current Source (SELogic)		False
G1	BK1I	Select: IX, IW, NA	IW	IW	False	BK1I Breaker 1 Current Source		False
G1	BK2I	Select: IX, COMB, NA	NA	IX	True	BK2I Breaker 2 Current Source		False
G1	IPOS	Select: NA	NA	NA	False	IPOS Polarizing Current		False
G1	ALINEV	Select: VZ, NA	NA	VZ	True	ALINEV Alternate Line Voltage Source		False
G1	ALTV	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	ALTV Alternate Voltage Source (SELogic)		False
G1	IN101PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN101PU Input IN101 Pickup Delay		False
G1	IN102PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN102PU Input IN102 Pickup Delay		False
G1	IN103PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN103PU Input IN103 Pickup Delay		False
G1	IN104PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN104PU Input IN104 Pickup Delay		False
G1	IN105PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN105PU Input IN105 Pickup Delay		False
G1	IN106PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN106PU Input IN106 Pickup Delay		False
G1	IN107PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN107PU Input IN107 Pickup Delay		False
G1	IN101DO	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN101DO Input IN101 Dropout Delay		False
G1	IN102DO	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN102DO Input IN102 Dropout Delay		False
G1	IN103DO	Range = 0.0000 to 5.0000	0.1250	0.5000	True	IN103DO Input IN103 Dropout Delay		False
G1	IN104DO	Range = 0.0000 to 5.0000	0.1250	0.5000	True	IN104DO Input IN104 Dropout Delay		False
G1	IN105DO	Range = 0.0000 to 5.0000	0.1250	0.5000	True	IN105DO Input IN105 Dropout Delay		False
G1	IN106DO	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN106DO Input IN106 Dropout Delay		False
G1	IN107DO	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN107DO Input IN107 Dropout Delay		False
G1	IN201PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN201PU Input IN201 Pickup Delay		False
G1	IN202PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN202PU Input IN202 Pickup Delay		False
G1	IN203PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN203PU Input IN203 Pickup Delay		False
G1	IN204PU	Range = 0.0000 to 5.0000	0.1250	0.1250	False	IN204PU Input IN204 Pickup Delay		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)



Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
G1	IN205PU	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN205PU Input IN205 Pickup Delay		False
G1	IN206PU	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN206PU Input IN206 Pickup Delay		False
G1	IN207PU	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN207PU Input IN207 Pickup Delay		False
G1	IN208PU	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN208PU Input IN208 Pickup Delay		False
G1	IN201DO	Range = 0.0000 to 50.0000	0.1250	0.5000	True	IN201DO Input IN201 Dropout Delay		False
G1	IN202DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN202DO Input IN202 Dropout Delay		False
G1	IN203DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN203DO Input IN203 Dropout Delay		False
G1	IN204DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN204DO Input IN204 Dropout Delay		False
G1	IN205DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN205DO Input IN205 Dropout Delay		False
G1	IN206DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN206DO Input IN206 Dropout Delay		False
G1	IN207DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN207DO Input IN207 Dropout Delay		False
G1	IN208DO	Range = 0.0000 to 50.0000	0.1250	0.1250	False	IN208DO Input IN208 Dropout Delay		False
G1	IRIGC	Select: NONE, C37.118	NONE	NONE	False	IRIGC IRIG-B Control Bits Definition		False
S1	CTRW	Range = 1 to 50000	120	80	True	CTRW Current Transformer Ratio - Input W		False
S1	CTRX	Range = 1 to 50000	120	80	True	CTRX Current Transformer Ratio - Input X		False
S1	PTRY	Range = 1 to 10000	180	64	True	PTRY Potential Transformer Ratio - Input Y		False
S1	VNOMY	Range = 60 to 300	115	120	True	VNOMY PT Nominal Voltage (L-L) - Input Y (volts, sec)		False
S1	PTRZ	Range = 1 to 10000	180	64	True	PTRZ Potential Transformer Ratio - Input Z		False
S1	VNOMZ	Range = 60 to 300	115	120	True	VNOMZ PT Nominal Voltage (L-L) - Input Z (volts, sec)		False
S1	Z1MAG	Range = 0.05 to 255.00	2.14	1.00	True	Z1MAG Pos.-Seq. Line Impedance Magnitude (ohms, sec)		False
S1	Z1ANG	Range = 5.00 to 90.00	68.86	70.00	True	Z1ANG Pos.-Seq. Line Impedance Angle (degrees)		False
S1	Z0MAG	Range = 0.05 to 255.00	6.38	3.00	True	Z0MAG Zero-Seq. Line Impedance Magnitude (ohms, sec)		False
S1	Z0ANG	Range = 5.00 to 90.00	72.47	70.00	True	Z0ANG Zero-Seq. Line Impedance Angle (degrees)		False
S1	EFLOC	Select: Y, N	Y	N	True	EFLOC Fault Location		False
S1	ESOTF	Select: Y, N	Y	N	True	ESOTF Switch-On-to-Fault		False
S1	ELOAD	Select: Y, N	N	N	False	ELOAD Load Encroachment		False
S1	E50P	Select: N, 1-4	1	N	True	E50P Phase Inst./Definite-Time O/C Elements		False
S1	E50G	Select: N, 1-4	N	N	False	E50G Res. Ground Inst./Definite-Time O/C Elements		False
S1	E50O	Select: N, 1-4	N	N	False	E50O Neg.-Seq. Inst./Definite-Time O/C Elements		False
S1	E51S	Select: N, 1-6	2	4	True	E51S Selectable Inverse-Time O/C Elements		False
S1	E32	Select: Y, N, AUTO	N	N	False	E32 Directional Control		False
S1	ECOMM	Select: N, DCB, POTT, DCUB1, DCUB2	N	N	False	ECOMM Comm. Scheme		False
S1	EBFL1	Select: Y, N	N	N	False	EBFL1 Breaker 1 Failure Logic		False
S1	EBFL2	Select: Y, N	N	N	False	EBFL2 Breaker 2 Failure Logic		False
S1	E25BK1	Select: Y, N	N	Y	True	E25BK1 Synchronism Check for Breaker 1		False
S1	E25BK2	Select: Y, N	N	N	False	E25BK2 Synchronism Check for Breaker 2		False
S1	E79	Select: Y, Y1, N	Y	N	True	E79 Reclosing		False
S1	EMANCL	Select: Y, N	Y	N	True	EMANCL Manual Closing		False
S1	ELOP	Select: Y, Y1, N	Y	N	True	ELOP Loss-of-Potential		False
S1	EDEM	Select: N, THM, ROL	THM	THM	False	EDEM Demand Metering		False
S1	51S1O	Select: IAL, IA1, IA2, IALR, IA1R, IA2R, IBL, IB1, IB2, IBLR, IB1R, IB2R, ICL, IC1, IC2, ICLR, IC1R, IC2R, ImaxL, Imax1, Imax2, ImaxLR, Imax1R, Imax2R, I1L, 3I2L, 3I0L, 3I01, 3I02	IMAXL	Imax1	True	51S1O 51S1 Operating Quantity		False
S1	51S1P	Range = 0.25 to 16.00	5.00	3.00	True	51S1P 51S1 O/C Pickup (amps, sec)		False
S1	51S1C	Select: U1, U2, U3, U4, U5, C1, C2, C3, C4, C5	U3	U4	True	51S1C 51S1 Inv-Time O/C Curve		False
S1	51S1TD	Range = 0.50 to 15.00	1.00	12.00	True	51S1TD 51S1 Inv-Time O/C Time Dial		False
S1	51S1RS	Select: Y, N	N	N	False	51S1RS 51S1 Inv-Time O/C EM Reset		False
S1	51S1TC	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	1	1	False	51S1TC 51S1 Torque Control (SELogic)		False
S1	51S2O	Select: IAL, IA1, IA2, IALR, IA1R, IA2R, IBL, IB1, IB2, IBLR, IB1R, IB2R, ICL, IC1, IC2, ICLR, IC1R, IC2R, ImaxL, Imax1, Imax2, ImaxLR, Imax1R, Imax2R, I1L, 3I2L, 3I0L, 3I01, 3I02	3I0L	3I01	True	51S2O 51S2 Operating Quantity		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
S1	51S2P	Range = 0.25 to 16.00	1.5	0.25	True	51S2P 51S2 O/C Pickup (amps, sec)		False
S1	51S2C	Select: U1, U2, U3, U4, U5, C1, C2, C3, C4, C5	U3	U1	True	51S2C 51S2 Inv-Time O/C Curve		False
S1	51S2TD	Range = 0.50 to 15.00	1.00	2.00	True	51S2TD 51S2 Inv-Time O/C Time Dial		False
S1	51S2RS	Select: Y, N	N	N	False	51S2RS 51S2 Inv-Time O/C EM Reset		False
S1	51S2TC	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT01 # GROUND ENABLED	1	True	51S2TC 51S2 Torque Control (SELogic)		False
S1	51S3O	Select: IAL, IA1, IA2, IALR, IA1R, IA2R, IBL, IB1, IB2, IBLR, IB1R, IB2R, ICL, IC1, IC2, ICLR, IC1R, IC2R, ImaxL, Imax1, Imax2, ImaxLR, Imax1R, Imax2R, I1L, 312L, 310L, 3101, 3102	IMAXL	Imax2	True	51S3O 51S3 Operating Quantity		False
S1	51S3P	Range = 0.25 to 16.00	5.00	3.00	True	51S3P 51S3 O/C Pickup (amps, sec)		False
S1	51S3C	Select: U1, U2, U3, U4, U5, C1, C2, C3, C4, C5	U3	U4	True	51S3C 51S3 Inv-Time O/C Curve		False
S1	51S3TD	Range = 0.50 to 15.00	1.00	12.00	True	51S3TD 51S3 Inv-Time O/C Time Dial		False
S1	51S3RS	Select: Y, N	N	N	False	51S3RS 51S3 Inv-Time O/C EM Reset		False
S1	51S3TC	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	1	1	False	51S3TC 51S3 Torque Control (SELogic)		False
S1	51S4O	Select: IAL, IA1, IA2, IALR, IA1R, IA2R, IBL, IB1, IB2, IBLR, IB1R, IB2R, ICL, IC1, IC2, ICLR, IC1R, IC2R, ImaxL, Imax1, Imax2, ImaxLR, Imax1R, Imax2R, I1L, 312L, 310L, 3101, 3102	IMAXL	3102	True	51S4O 51S4 Operating Quantity		False
S1	51S4P	Range = 0.25 to 16.00	5.00	0.25	True	51S4P 51S4 O/C Pickup (amps, sec)		False
S1	51S4C	Select: U1, U2, U3, U4, U5, C1, C2, C3, C4, C5	U3	U1	True	51S4C 51S4 Inv-Time O/C Curve		False
S1	51S4TD	Range = 0.50 to 15.00	1.00	2.00	True	51S4TD 51S4 Inv-Time O/C Time Dial		False
S1	51S4RS	Select: Y, N	N	N	False	51S4RS 51S4 Inv-Time O/C EM Reset		False
S1	51S4TC	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	1	1	False	51S4TC 51S4 Torque Control (SELogic)		False
S1	EPO	Select: 52, V	52	52	False	EPO Pole Open Detection		False
S1	3POD	Range = 0.000 to 60.000	0.500	0.500	False	3POD Three Pole Open Dropout Delay (cycles in steps of 0.125)		False
S1	SYNCP	Select: VAY, VBY, VCY, VAZ, VBZ, VCZ	VAY	VAY	False	SYNCP Synch Reference		False
S1	25VL	Range = 20.0 to 200.0	55.0	106.0	True	25VL Voltage Window Low Thresh (volts, sec)		False
S1	25VH	Range = 20.0 to 200.0	70.0	132.0	True	25VH Voltage Window High Thresh (volts, sec)		False
S1	SYNCS1	Select: VAY, VBY, VCY, VAZ, VBZ, VCZ	VAZ	VAZ	False	SYNCS1 Synch Source 1		False
S1	KS1M	Range = 0.10 to 3.00	1.00	1.00	False	KS1M Synch Source 1 Ratio Factor		False
S1	KS1A	Range = 0 to 330	0	0	False	KS1A Synch Source 1 Angle Shift (degrees in steps of 30)		False
S1	25SFBK1	Range = 0.005 to 0.500, OFF	0.05	0.050	False	25SFBK1 Maximum Slip Frequency -BK1 (Hz)		False
S1	ANG1BK1	Range = 3.0 to 80.0	10	20.0	True	ANG1BK1 Maximum Angle Difference 1 -BK1 (degrees)		False
S1	ANG2BK1	Range = 3.0 to 80.0	10	20.0	True	ANG2BK1 Maximum Angle Difference 2 -BK1 (degrees)		False
S1	TCLSBK1	Range = 1.00 to 30.00	8	5.00	True	TCLSBK1 Breaker 1 Close Time (cycles in steps of 0.25)		False
S1	BSYNBK1	Valid range = The legal operators: AND OR NOT NA R_TRIG F_TRIG	NA	NA	False	BSYNBK1 Block Synchronism Check -BK1 (SELogic)		False
S1	DMTC	Range = 5 to 300	15	15	False	DMTC Demand Metering Time Constant (minutes in steps of 5)		False
S1	PDEMP	Range = 0.50 to 16.00, OFF	OFF	OFF	False	PDEMP Phase Current Pickup (amps, sec)		False
S1	GDEMP	Range = 0.50 to 16.00, OFF	OFF	OFF	False	GDEMP Residual Ground Current Pickup (amps, sec)		False
S1	QDEMP	Range = 0.50 to 16.00, OFF	OFF	OFF	False	QDEMP Neg.-Seq. Current Pickup (amps, sec)		False
S1	TR	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	51S1T OR 51S2T OR 51S3T OR 51S4T	True	TR Trip (SELogic)			False
S1	BK1MTR	Valid range = The legal operators: AND OR NOT OC1 OR PBB_PUL	NA	True	BK1MTR Breaker 1 Manual Trip (SELogic)			False
S1	BK2MTR	Valid range = The legal operators: AND OR NOT NA R_TRIG F_TRIG	NA	False	BK2MTR Breaker 2 Manual Trip (SELogic)			False
S1	ULTR	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	TRGTR	NOT 51S1 AND NOT 51S2 AND NOT 51S3 AND NOT 51S4	True	ULTR Unlatch Trip (SELogic)		False
S1	ULMTR1	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NOT 52AA1	NA	True	ULMTR1 Unlatch Manual Trip -BK1 (SELogic)		False
S1	ULMTR2	Valid range = The legal operators: AND OR NOT NA R_TRIG F_TRIG	NA	NA	False	ULMTR2 Unlatch Manual Trip -BK2 (SELogic)		False
S1	TULO	Select: 1-4	3	4	True	TULO Trip Unlatch Option		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
S1	TDUR3D	Range = 2.000 to 8000.000	12	9.000	True	TDUR3D 3PT Min Trip Duration Time Delay (cycles in steps of 0.125)		False
S1	ER	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	R_TRIG 51S1 OR R_TRIG 51S2	R_TRIG 51S1 OR R_TRIG 51S2 OR R_TRIG 51S3 OR R_TRIG 51S4	True	ER Event Report Trigger Equation (SELogic)		False
L1	PROTSEL1	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT01S := PB1_PUL AND NOT PLT01 # GROUND ENABLED	#NEGATIVE SEQUENCE VOLTAGE CALCULATION	True	Protection SELogic Row 001		False
L1	PROTSEL2	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT01R := PB1_PUL AND PLT01	PMV01 := (VAYM * COS(VAYA) + VBYM * COS(VBYA + 240.000000) + VCYM * COS(VCYA + 120.000000)) #REAL COMP OF VY	True	Protection SELogic Row 002		False
L1	PROTSEL3	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT02S := PB2_PUL AND NOT PLT02 # RECLOSE ENABLED	PMV02 := (VAYM * COS(VAYA) + VBYM * COS(VBYA + 240.000000) + VCYM * COS(VCYA + 120.000000)) #IMAG COMP OF VY	True	Protection SELogic Row 003		False
L1	PROTSEL4	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT02R := PB2_PUL AND PLT02 OR NOT PLT04 # HOT LINE TAG DISABLES RECLOSE	PMV03 := SQRT(PMV01 * PMV01 + PMV02 * PMV02) / 3.000000 #NEG SEQ VY MAG	True	Protection SELogic Row 004		False
L1	PROTSEL5	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT03S := PB3_PUL AND NOT PLT03 # REMOTE ENABLED	PMV04 := (VAZM * COS(VAZA) + VBZM * COS(VBZA + 240.000000) + VCZM * COS(VCZA + 120.000000)) #REAL COMP OF VZ	True	Protection SELogic Row 005		False
L1	PROTSEL6	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT03R := PB3_PUL AND PLT03	PMV05 := (VAZM * COS(VAZA) + VBZM * COS(VBZA + 240.000000) + VCZM * COS(VCZA + 120.000000)) #IMAG COMP OF VZ	True	Protection SELogic Row 006		False
L1	PROTSEL7	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT04S := PB5_PUL AND NOT PLT04	PMV06 := SORT(PMV04 * PMV04 + PMV05 * PMV05) / 3.000000 #NEG SEQ VZ MAG	True	Protection SELogic Row 007		False
L1	PROTSEL8	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT04R := PB5_PUL AND PLT04 # HOT LINE TAG (WHEN DEASSERTED)	PLT01S := R_TRIG PB1 #PUSHBUTTON 1 PUSHED TO SIMULATE LOSS OF LINE 1	True	Protection SELogic Row 008		False
L1	PROTSEL9	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT05S := PB6_PUL AND NOT PLT05 # AUX	PLT01R := PLT01 AND R_TRIG PB1 #PUSHBUTTON PUSHED AGAIN TO RESET	True	Protection SELogic Row 009		False
L1	PROTSEL10	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PLT05R := PB6_PUL AND PLT05	PLT02S := R_TRIG PB5 #PUSHBUTTON 5 PUSHED TO SIMULATE LOSS OF LINE 2	True	Protection SELogic Row 010		False
L1	PROTSEL11	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PSV01 := 51S1 OR 51S2 OR 50P1	PLT02R := PLT02 AND R_TRIG PB5 #PUSHBUTTON PUSHED AGAIN TO RESET	True	Protection SELogic Row 011		False
L1	PROTSEL12	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PCT01PU := 3.000 # MAIN-TIE-MAIN TRANSFER LOGIC		True	Protection SELogic Row 012		False
L1	PROTSEL13	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PCT01DO := 0.000	PSV01 := VAYM < 106 OR VBYM < 106 OR VCYM < 106 OR PMV03 >= 20 OR PLT01 #DEAD LINE 1 OR HIGH NEG SEQ	True	Protection SELogic Row 013		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL14	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	PCT01IN := PSV01 # FOR INST TARGET LED	PSV02 := VAYM >= 106 AND VBYM >= 106 AND VCYM >= 106 AND PMV03 < 20 AND NOT PLT01 #HOT LINE 1 AND LOW NEG SEQ	True	Protection SELogic Row 014		False
L1	PROTSEL15	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV03 := VAZM < 106 OR VBZM < 106 OR VCZM < 106 OR PMV06 >= 30 OR PLT02 #DEAD LINE 2 OR HIGH NEG SEQ	True	Protection SELogic Row 015		False
L1	PROTSEL16	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV04 := VAZM >= 106 AND VBZM >= 106 AND VCZM >= 106 AND PMV06 < 30 AND NOT PLT02 #HOT LINE 2 AND LOW NEG SEQ	True	Protection SELogic Row 016		False
L1	PROTSEL17	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIME DELAY DROPOUT OF AUTO READY TO RIDE THROUGH BREAKER OPERATIONS	True	Protection SELogic Row 017		False
L1	PROTSEL18	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT04PU := 0.000000	True	Protection SELogic Row 018		False
L1	PROTSEL19	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT04DO := 0.000000 #DROPOUT TIME SET FOR 0 CYCLES (0 SEC)	True	Protection SELogic Row 019		False
L1	PROTSEL20	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT04IN := IN201 AND NOT PLT03 #AUTO READY STATUS	True	Protection SELogic Row 020		False
L1	PROTSEL21	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#NORMAL TRANSFER UPON LOSS OF LINE 1 OR TRIP FOR LIVE LINE SEEK	True	Protection SELogic Row 021		False
L1	PROTSEL22	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT01DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES #LINE 1 TIMER RESET	True	Protection SELogic Row 022		False
L1	PROTSEL23	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT01PU := 120.000000 #MAIN 1 TRIP TIME	True	Protection SELogic Row 023		False
L1	PROTSEL24	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT01IN := PSV01 AND 52AA1 AND PCT04Q #DEAD LINE 1, CLOSED BREAKER 1, AND ENABLED TRANSFER	True	Protection SELogic Row 024		False
L1	PROTSEL25	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#NORMAL TRANSFER UPON LOSS OF LINE 2 OR TRIP FOR LIVE LINE SEEK	True	Protection SELogic Row 025		False
L1	PROTSEL26	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT02DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES #LINE 2 TIMER RESET	True	Protection SELogic Row 026		False
L1	PROTSEL27	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT02PU := 120.000000 #MAIN 2 TRIP TIME	True	Protection SELogic Row 027		False
L1	PROTSEL28	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT02IN := PSV03 AND 52AA2 AND PCT04Q #DEAD LINE 2, , CLOSED BREAKER 2, AND ENABLED TRANSFER	True	Protection SELogic Row 028		False
L1	PROTSEL29	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#SIMULTANEOUS LOSS OF BOTH SOURCES WITH BOTH MAINS CLOSED	True	Protection SELogic Row 029		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL30	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT05DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES	True	Protection SELogic Row 030		False
L1	PROTSEL31	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT05PU := 120.000000 #SIMULTANEOUS LOSS TRIP TIME	True	Protection SELogic Row 031		False
L1	PROTSEL32	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT05IN := PCT04Q AND PSV01 AND PSV03 AND 52AA1 AND 52AA2	True	Protection SELogic Row 032		False
L1	PROTSEL33	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR LIVE LINE SEEK TO SOURCE 1 (CLOSE BREAKER 1)	True	Protection SELogic Row 033		False
L1	PROTSEL34	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT06DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES	True	Protection SELogic Row 034		False
L1	PROTSEL35	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT06PU := 20.000000 #TIME DELAY FOR MAIN 1 CLOSE SET AT 20 CYCLES	True	Protection SELogic Row 035		False
L1	PROTSEL36	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT06IN := PCT04Q AND PSV02 AND PSV03 AND NOT 52AA2 AND NOT 52AA1 AND IN104	True	Protection SELogic Row 036		False
L1	PROTSEL37	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR LIVE LINE SEEK TO SOURCE 2 (CLOSE 52M2)	True	Protection SELogic Row 037		False
L1	PROTSEL38	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT07DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES	True	Protection SELogic Row 038		False
L1	PROTSEL39	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT07PU := 20.000000 #TIME DELAY FOR MAIN 2 CLOSE SET AT 20 CYCLES	True	Protection SELogic Row 039		False
L1	PROTSEL40	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT07IN := PCT04Q AND PSV04 AND PSV01 AND NOT 52AA1 AND NOT 52AA2 AND IN104	True	Protection SELogic Row 040		False
L1	PROTSEL41	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR RESTORATION TO LINE 1 AFTER LOSS OF BOTH SOURCES	True	Protection SELogic Row 041		False
L1	PROTSEL42	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT08DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES	True	Protection SELogic Row 042		False
L1	PROTSEL43	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT08PU := 300.000000 #STABILIZATION TIME SET TO 5 SEC	True	Protection SELogic Row 043		False
L1	PROTSEL44	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT08IN := PCT04Q AND PSV02 AND NOT 52AA1 AND NOT IN104	True	Protection SELogic Row 044		False
L1	PROTSEL45	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR RESTORATION TO LINE 2 AFTER LOSS OF BOTH SOURCES	True	Protection SELogic Row 045		False
L1	PROTSEL46	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT09DO := 30.000000 #RESET OF TIMER SET AT 30 CYCLES	True	Protection SELogic Row 046		False
L1	PROTSEL47	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT09PU := 300.000000 #STABILIZATION TIME SET TO 5 SEC	True	Protection SELogic Row 047		False
L1	PROTSEL48	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT09IN := PCT04Q AND PSV04 AND NOT 52AA2 AND NOT IN104	True	Protection SELogic Row 048		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL49	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR 52T CLOSE	True	Protection SELogic Row 049		False
L1	PROTSEL50	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT03PU := 120.00000 #TIE CB CLOSE TIME	True	Protection SELogic Row 050		False
L1	PROTSEL51	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT03IN := ((NOT 52AA1 AND PSV01 AND PSV04) OR (NOT 52AA2 AND PSV03 AND PSV02)) AND PCT04Q AND NOT IN104 #TIMER FOR 52T CLOSE	True	Protection SELogic Row 051		False
L1	PROTSEL52	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIMER FOR 52T TRIP	True	Protection SELogic Row 052		False
L1	PROTSEL53	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT10DO := 30.00000 #RESET OF TIMER SET FOR 30 CYCLES	True	Protection SELogic Row 053		False
L1	PROTSEL54	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT10PU := 180.00000 #TIE CB TRIP TIME	True	Protection SELogic Row 054		False
L1	PROTSEL55	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT10IN := PCT04Q AND NOT 52AA1 AND PSV01 AND NOT 52AA2 AND PSV03 AND IN104	True	Protection SELogic Row 055		False
L1	PROTSEL56	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV05 := PCT04Q AND PSV01 AND 52AA1 AND (PCT01Q OR PCT05Q) #TRIP BREAKER 1	True	Protection SELogic Row 056		False
L1	PROTSEL57	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV06 := PCT04Q AND PSV02 AND NOT 52AA1 AND (PCT06Q OR PCT08Q) #CLOSE BREAKER 1	True	Protection SELogic Row 057		False
L1	PROTSEL58	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV07 := PCT04Q AND PCT10Q #TRIP TIE BREAKER	True	Protection SELogic Row 058		False
L1	PROTSEL59	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV08 := PCT03Q AND PCT04Q AND NOT IN104 #CLOSE TIE BREAKER	True	Protection SELogic Row 059		False
L1	PROTSEL60	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV09 := PCT04Q AND PSV03 AND 52AA2 AND (PCT02Q OR PCT05Q) #TRIP BREAKER 2	True	Protection SELogic Row 060		False
L1	PROTSEL61	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV10 := PCT04Q AND PSV04 AND NOT 52AA2 AND (PCT07Q OR PCT09Q) #CLOSE BREAKER 2	True	Protection SELogic Row 061		False
L1	PROTSEL62	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV11 := IN204 AND IN205 AND IN206 OR NOT (IN204 AND IN205 AND IN206) #ALL CBS RACKED IN OR ALL RACKED OUT	True	Protection SELogic Row 062		False
L1	PROTSEL63	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#LOGIC FOR AUTO READY RESET	True	Protection SELogic Row 063		False
L1	PROTSEL64	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PSV20 := NOT (TLED_2 OR TLED_9 OR TRIPLED OR TLED_10 OR TLED_11 OR TLED_12)	True	Protection SELogic Row 064		False
L1	PROTSEL65	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#LOGIC FOR AUTO FAIL	True	Protection SELogic Row 065		False
L1	PROTSEL66	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PLT03S := PCT04Q AND (F_TRIG 52AA1 AND NOT PCT11Q OR F_TRIG 52AA2 AND NOT PCT12Q OR F_TRIG IN104 AND NOT PSV07)	True	Protection SELogic Row 066		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL67	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PLT03R := R_TRIG IN202	True	Protection SELogic Row 067		False
L1	PROTSEL68	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIME DELAY OF TRIP DROPOUT FOR AUTO FAIL LOGIC	True	Protection SELogic Row 068		False
L1	PROTSEL69	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT11PU := 0.000000	True	Protection SELogic Row 069		False
L1	PROTSEL70	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT11DO := 10.000000 #DROPOUT SET FOR 10 CYCLES	True	Protection SELogic Row 070		False
L1	PROTSEL71	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT11IN := PSV05	True	Protection SELogic Row 071		False
L1	PROTSEL72	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT12PU := 0.000000	True	Protection SELogic Row 072		False
L1	PROTSEL73	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT12DO := 10.000000 #DROPOUT SET FOR 10 CYCLES	True	Protection SELogic Row 073		False
L1	PROTSEL74	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT12IN := PSV09	True	Protection SELogic Row 074		False
L1	PROTSEL75	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TIME DELAYED LOGIC FOR PROPER VOLTAGE CHECK FOR AUTO READY	True	Protection SELogic Row 075		False
L1	PROTSEL76	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT13PU := 0.000000	True	Protection SELogic Row 076		False
L1	PROTSEL77	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT13DO := 300.000000 #TIMER SET FOR 5 SEC	True	Protection SELogic Row 077		False
L1	PROTSEL78	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT13IN := (PSV02 AND PSV04) OR (NOT PSV02 AND NOT 52AA1 AND PSV04) OR (PSV02 AND NOT PSV04 AND NOT 52AA2) OR (PSV01 AND NOT 52AA1 AND PSV03 AND NOT 52AA2)	True	Protection SELogic Row 078		False
L1	PROTSEL79	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#AUTO TRANSFER INDICATION	True	Protection SELogic Row 079		False
L1	PROTSEL80	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PLT04S := PSV05 OR PSV06 OR PSV07 OR PSV08 OR PSV09 OR PSV10	True	Protection SELogic Row 080		False
L1	PROTSEL81	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PLT04R := R_TRIG TRGTR	True	Protection SELogic Row 081		False
L1	PROTSEL82	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#CHECK FOR PROPER BREAKER POSITIONS FOR AUTO READY LOGIC	True	Protection SELogic Row 082		False
L1	PROTSEL83	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT14PU := 0.000000	True	Protection SELogic Row 083		False
L1	PROTSEL84	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT14DO := 600.000000	True	Protection SELogic Row 084		False
L1	PROTSEL85	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT14IN := 52AA1 AND 52AA2 AND NOT IN104 OR 52AA1 AND IN104 AND NOT 52AA2 OR NOT 52AA1 AND IN104 AND 52AA2	True	Protection SELogic Row 085		False
L1	PROTSEL86	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TRIP SELECTOR SWITCH TRIP LOGIC FOR BREAKER 1	True	Protection SELogic Row 086		False
L1	PROTSEL87	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT15PU := 180.000000 #TSS TIME FOR MAIN 1	True	Protection SELogic Row 087		False
L1	PROTSEL88	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT15DO := 10.000000	True	Protection SELogic Row 088		False
L1	PROTSEL89	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT15IN := IN202 AND PSV11 AND 52AA1 AND 52AA2 AND IN104 AND IN106	True	Protection SELogic Row 089		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL90	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TRIP SELECTOR SWITCH TRIP LOGIC FOR TIE BREAKER	True	Protection SELogic Row 090		False
L1	PROTSEL91	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT16PU := 180.000000 #TSS TIME FOR TIE BREAKER	True	Protection SELogic Row 091		False
L1	PROTSEL92	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT16DO := 10.000000	True	Protection SELogic Row 092		False
L1	PROTSEL93	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT16IN := IN202 AND PSV11 AND 52AA1 AND 52AA2 AND IN104 AND IN107	True	Protection SELogic Row 093		False
L1	PROTSEL94	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		#TRIP SELECTOR SWITCH TRIP LOGIC FOR BREAKER 2	True	Protection SELogic Row 094		False
L1	PROTSEL95	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT17PU := 180.000000 #TSS TIME FOR MAIN 2	True	Protection SELogic Row 095		False
L1	PROTSEL96	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT17DO := 10.000000	True	Protection SELogic Row 096		False
L1	PROTSEL97	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG		PCT17IN := IN202 AND PSV11 AND 52AA1 AND 52AA2 AND IN104 AND IN207	True	Protection SELogic Row 097		False
L1	PROTSEL98	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 098		False
L1	PROTSEL99	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 099		False
L1	PROTSEL100	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 100		False
L1	PROTSEL101	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 101		False
L1	PROTSEL102	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 102		False
L1	PROTSEL103	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 103		False
L1	PROTSEL104	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 104		False
L1	PROTSEL105	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 105		False
L1	PROTSEL106	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 106		False
L1	PROTSEL107	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 107		False
L1	PROTSEL108	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 108		False
L1	PROTSEL109	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 109		False
L1	PROTSEL110	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 110		False
L1	PROTSEL111	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 111		False
L1	PROTSEL112	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 112		False
L1	PROTSEL113	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 113		False
L1	PROTSEL114	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 114		False
L1	PROTSEL115	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 115		False
L1	PROTSEL116	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 116		False
L1	PROTSEL117	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 117		False
L1	PROTSEL118	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 118		False
L1	PROTSEL119	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 119		False
L1	PROTSEL120	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 120		False
L1	PROTSEL121	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 121		False
L1	PROTSEL122	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 122		False
L1	PROTSEL123	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 123		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
L1	PROTSEL241	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 241		False
L1	PROTSEL242	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 242		False
L1	PROTSEL243	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 243		False
L1	PROTSEL244	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 244		False
L1	PROTSEL245	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 245		False
L1	PROTSEL246	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 246		False
L1	PROTSEL247	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 247		False
L1	PROTSEL248	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 248		False
L1	PROTSEL249	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 249		False
L1	PROTSEL250	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG			False	Protection SELogic Row 250		False
O1	OUT101	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	T3P1 #BREAKER 1 TRIP	51S1T OR 51S2T #TRIP 86M1	True	OUT101 Main Board Output OUT101 (SELogic)		False
O1	OUT102	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	T3P1 # EXTRA BREAKER 1 TRIP	51S3T OR 51S4T #TRIP 86M2	True	OUT102 Main Board Output OUT102 (SELogic)		False
O1	OUT103	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	BK1CL #BREAKER 1 CLOSE	PSV05 OR PCT15Q #TRIP 52M1	True	OUT103 Main Board Output OUT103 (SELogic)		False
O1	OUT104	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV06 #CLOSE 52M1	True	OUT104 Main Board Output OUT104 (SELogic)		False
O1	OUT105	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV20 AND PSV11 AND PCT13Q AND NOT IN101 AND NOT IN102 #AUTO READY RESET (NO TARGETS)	True	OUT105 Main Board Output OUT105 (SELogic)		False
O1	OUT106	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	OUT106 Main Board Output OUT106 (SELogic)		False
O1	OUT107	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NOT (HALARM OR SALARM) #RELAY ALARM	True	OUT107 Main Board Output OUT107 (SELogic)		False
O1	OUT108	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NOT (SALARM OR HALARM)	NOT (HALARM OR SALARM) AND NOT PLT03 AND NOT IN101 AND NOT IN102 AND PSV11 #RELAY ALARM FOR AUTO FAIL	True	OUT108 Main Board Output OUT108 (SELogic)		False
O1	OUT201	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV07 OR PCT16Q #TRIP 52T	True	OUT201 Interface Board 1 Output OUT201 (SELogic)		False
O1	OUT202	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV08 #CLOSE 52T	True	OUT202 Interface Board 1 Output OUT202 (SELogic)		False
O1	OUT203	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV09 OR PCT17Q #TRIP 52M2	True	OUT203 Interface Board 1 Output OUT203 (SELogic)		False
O1	OUT204	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV10 #CLOSE 52M2	True	OUT204 Interface Board 1 Output OUT204 (SELogic)		False
O1	OUT205	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	59VP AND 59VS1 AND 25W1BK1 #SYNC CHECK OUTPUT	True	OUT205 Interface Board 1 Output OUT205 (SELogic)		False
O1	OUT206	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV02 #SOURCE 1 VOLTAGE AVAIL	True	OUT206 Interface Board 1 Output OUT206 (SELogic)		False
O1	OUT207	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PSV04 #SOURCE 2 VOLTAGE AVAIL	True	OUT207 Interface Board 1 Output OUT207 (SELogic)		False
O1	OUT208	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	PLT04 #TRANSFER INDICATION	True	OUT208 Interface Board 1 Output OUT208 (SELogic)		False
O1	OUT209	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT209 Interface Board 1 Output OUT209 (SELogic)			False
O1	OUT210	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT210 Interface Board 1 Output OUT210 (SELogic)			False
O1	OUT211	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT211 Interface Board 1 Output OUT211 (SELogic)			False
O1	OUT212	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT212 Interface Board 1 Output OUT212 (SELogic)			False
O1	OUT213	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT213 Interface Board 1 Output OUT213 (SELogic)			False
O1	OUT214	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT214 Interface Board 1 Output OUT214 (SELogic)			False
O1	OUT215	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	False	OUT215 Interface Board 1 Output OUT215 (SELogic)			False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
O1	TMB1A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB1A Mirrored Bit 1 Channel A (SELogic)		False
O1	TMB2A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB2A Mirrored Bit 2 Channel A (SELogic)		False
O1	TMB3A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB3A Mirrored Bit 3 Channel A (SELogic)		False
O1	TMB4A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB4A Mirrored Bit 4 Channel A (SELogic)		False
O1	TMB5A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB5A Mirrored Bit 5 Channel A (SELogic)		False
O1	TMB6A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB6A Mirrored Bit 6 Channel A (SELogic)		False
O1	TMB7A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB7A Mirrored Bit 7 Channel A (SELogic)		False
O1	TMB8A	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB8A Mirrored Bit 8 Channel A (SELogic)		False
O1	TMB1B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB1B Mirrored Bit 1 Channel B (SELogic)		False
O1	TMB2B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB2B Mirrored Bit 2 Channel B (SELogic)		False
O1	TMB3B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB3B Mirrored Bit 3 Channel B (SELogic)		False
O1	TMB4B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB4B Mirrored Bit 4 Channel B (SELogic)		False
O1	TMB5B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB5B Mirrored Bit 5 Channel B (SELogic)		False
O1	TMB6B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB6B Mirrored Bit 6 Channel B (SELogic)		False
O1	TMB7B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB7B Mirrored Bit 7 Channel B (SELogic)		False
O1	TMB8B	Valid range = The legal operators: AND OR NOT R_TRIG F_TRIG	NA	NA	False	TMB8B Mirrored Bit 8 Channel B (SELogic)		False
R1	ESERDEL	Select: Y, N	N	N	False	ESERDEL Automatic Removal of Chattering SER Points		False
R1	SRATE	Select: 1, 2, 4, 8	2	2	False	SRATE Sample Rate of Event Report (kHz)		False
R1	LER	Range = 0.25 to 4.00	0.50	0.50	False	LER Length of Event Report (seconds)		False
R1	PRE	Range = 0.05 to 3.95	0.10	0.10	False	PRE Length of Pre-Fault (seconds)		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
R1	ERDG	Valid range = Word Elements	T3P1,T3P2,#,VPOL51S1T,51S2T,#,PSV,ZLOAD,LOP,#,F3V01,PSV02,PSV03,P2P,R32P,#,32QF,3SV04,#,PSV05,PSV2QR,32VE,32GF,32O6,PSV07,PSV08,PSGR,#,SOTFT,#,50V09,PSV10,#,52AA P1,50P2,67P1,67P1,52AA2,IN104,#,I2,67P1T,67P2T,#,N101,IN102 50G1,50G2,67G1,67G2,67G1T, #,50Q1,50Q2,67Q1,67Q2,67Q1T,67Q2T,#,51S1,51S1T,51S1R,#,51S2,51S2T,51S2R,#,51S3,51S3T,51S3R,#,B K1RS,BK1LO,BK1C L,BK1CFT,BFTTRIP1 ,#,BK2RS,BK2LO,BK2L,BK2CFT,BFT RIP2,#,79CY3,3PS HOTO,3PSHOT1,3P SHOT2,3PSHOT3,3 PSHOT4,#,25A1BK 1,25A1BK2,#,52AA 1,52AA2,3PO,#,IN101,IN102,IN103,IN104,IN105,IN106,IN107,#,OUT101,OUT102,OUT103,OUT104,OUT105,OUT106,OUT107,O UT108,#,RMB1A,RMB2A,RMB3A,RMB4A,RMB5A,RMB6A,RMB7A,RMB8A,#,TMB1A,TMB2A,TMB3A,TMB4A,TMB5A,TMB6A,TMB7A,TMB8A,#,ROKA,RBAD,A,CBADA,LBOKA,A,NOKA,DOKA,#,PSV01,PSV02,PSV03,PSV04,PSV05,PSV06,PSV07,PSV08,#,PLT01,PLT02,PLT03,PLT04,PLT05,PLT06,PLT07,PLT08,#,PCT01Q,PCT02Q,PCT03Q,PCT04Q,PC T05Q,PCT06Q,PCT07Q,PCT08Q,#,PT,Z3RB,KEY,COMPRM,#,PB7,PB8,CC1,OC1		True	ERDG		False
R1	SITM1	DeviceWord Element, AliasName, AssertedText, DeAssertedText	T3P1,"Breaker 1 TRIP",Asserted,De asserted	51S1T,"52M1 TRIP",ON,OFF,N	True	SITM1 SER Points and Aliases, Point 1		False
R1	SITM2	DeviceWord Element, AliasName, AssertedText, DeAssertedText	T3P2,"Breaker 2 TRIP",Asserted,De asserted	51S2T,"52M2 TRIP",ON,OFF,N	True	SITM2 SER Points and Aliases, Point 2		False
R1	SITM3	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK1CL,"Breaker 1 CLOSE",Asserted,De asserted	PSV01,"DEAD LINE 1",On,Off,N	True	SITM3 SER Points and Aliases, Point 3		False
R1	SITM4	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK2CL,"Breaker 2 CLOSE",Asserted,De asserted	PSV02,"HOT LINE 1",On,Off,N	True	SITM4 SER Points and Aliases, Point 4		False
R1	SITM5	DeviceWord Element, AliasName, AssertedText, DeAssertedText	52AA1,"Breaker 1 Status",Closed,Open	PSV03,"DEAD LINE 2",On,Off,N	True	SITM5 SER Points and Aliases, Point 5		False
R1	SITM6	DeviceWord Element, AliasName, AssertedText, DeAssertedText	52AA2,"Breaker 2 Status",Closed,Open	PSV04,"HOT LINE 2",On,Off,N	True	SITM6 SER Points and Aliases, Point 6		False
R1	SITM7	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK1CFT,"Breaker 1 Close Fail",Asserted,De asserted	PSV05,"TRIP 52M1",ON,OFF,N	True	SITM7 SER Points and Aliases, Point 7		False
R1	SITM8	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK2CFT,"Breaker 2 Close Fail",Asserted,De asserted	PSV06,"CLOSE 52M1",ON,OFF,N	True	SITM8 SER Points and Aliases, Point 8		False
R1	SITM9	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK1RS,"Breaker 1 Reset",Asserted,De asserted	PSV07,"TRIP 52T",ON,OFF,N	True	SITM9 SER Points and Aliases, Point 9		False
R1	SITM10	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK2RS,"Breaker 2 Reset",Asserted,De asserted	PSV08,"CLOSE 52T",ON,OFF,N	True	SITM10 SER Points and Aliases, Point 10		False
R1	SITM11	DeviceWord Element, AliasName, AssertedText, DeAssertedText	79CY3,"Reclose Cycle",Asserted,De asserted	PSV09,"TRIP 52M2",ON,OFF,N	True	SITM11 SER Points and Aliases, Point 11		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
R1	SITM12	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK1LO,"Breaker 1 Lockout",Asserted,Deasserted	PSV10,"CLOSE 52M2",ON,OFF,N	True	SITM12 SER Points and Aliases, Point 12		False
R1	SITM13	DeviceWord Element, AliasName, AssertedText, DeAssertedText	BK2LO,"Breaker 2 Lockout",Asserted,Deasserted	52AA1,"52M1 STATUS",CLOSED,O PEN,N	True	SITM13 SER Points and Aliases, Point 13		False
R1	SITM14	DeviceWord Element, AliasName, AssertedText, DeAssertedText	SOTFT,"SOTF TRIP",Asserted,Deasserted	52AA2,"52M2 STATUS",CLOSED,O PEN,N	True	SITM14 SER Points and Aliases, Point 14		False
R1	SITM15	DeviceWord Element, AliasName, AssertedText, DeAssertedText	3PSHOT0,"Reclose Shot 0",Asserted,Deasserted	IN104,"52T STATUS",CLOSED,O PEN,N	True	SITM15 SER Points and Aliases, Point 15		False
R1	SITM16	DeviceWord Element, AliasName, AssertedText, DeAssertedText	3PSHOT1,"Reclose Shot 1",Asserted,Deasserted		True	SITM16 SER Points and Aliases, Point 16		False
R1	SITM17	DeviceWord Element, AliasName, AssertedText, DeAssertedText	3PSHOT2,"Reclose Shot 2",Asserted,Deasserted		True	SITM17 SER Points and Aliases, Point 17		False
R1	SITM18	DeviceWord Element, AliasName, AssertedText, DeAssertedText	3PSHOT3,"Reclose Shot 3",Asserted,Deasserted		True	SITM18 SER Points and Aliases, Point 18		False
R1	SITM19	DeviceWord Element, AliasName, AssertedText, DeAssertedText	3PSHOT4,"Reclose Shot 4",Asserted,Deasserted		True	SITM19 SER Points and Aliases, Point 19		False
R1	SITM20	DeviceWord Element, AliasName, AssertedText, DeAssertedText	PB7_PUL,"Close Pushbutton",Asserted,Deasserted		True	SITM20 SER Points and Aliases, Point 20		False
R1	SITM21	DeviceWord Element, AliasName, AssertedText, DeAssertedText	PB8_PUL,"Trip Pushbutton",Asserted,Deasserted		True	SITM21 SER Points and Aliases, Point 21		False
R1	SITM22	DeviceWord Element, AliasName, AssertedText, DeAssertedText	OC1,"Open Command 1",Asserted,Deasserted		True	SITM22 SER Points and Aliases, Point 22		False
R1	SITM23	DeviceWord Element, AliasName, AssertedText, DeAssertedText	OC2,"Open Command 2",Asserted,Deasserted		True	SITM23 SER Points and Aliases, Point 23		False
R1	SITM24	DeviceWord Element, AliasName, AssertedText, DeAssertedText	CC1,"Close Command 1",Asserted,Deasserted		True	SITM24 SER Points and Aliases, Point 24		False
R1	SITM25	DeviceWord Element, AliasName, AssertedText, DeAssertedText	CC2,"Close Command 2",Asserted,Deasserted		True	SITM25 SER Points and Aliases, Point 25		False
R1	SITM26	DeviceWord Element, AliasName, AssertedText, DeAssertedText	51S1T,51S1T,Asserted,Deasserted		True	SITM26 SER Points and Aliases, Point 26		False
R1	SITM27	DeviceWord Element, AliasName, AssertedText, DeAssertedText	51S2T,51S2T,Asserted,Deasserted		True	SITM27 SER Points and Aliases, Point 27		False
R1	SITM28	DeviceWord Element, AliasName, AssertedText, DeAssertedText	51S1,51S1,Asserted,Deasserted		True	SITM28 SER Points and Aliases, Point 28		False
R1	SITM29	DeviceWord Element, AliasName, AssertedText, DeAssertedText	51S2,51S2,Asserted,Deasserted		True	SITM29 SER Points and Aliases, Point 29		False
R1	SITM30	DeviceWord Element, AliasName, AssertedText, DeAssertedText	50P1,50P1,Asserted,Deasserted		True	SITM30 SER Points and Aliases, Point 30		False
R1	SITM31	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM31 SER Points and Aliases, Point 31		False
R1	SITM32	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM32 SER Points and Aliases, Point 32		False
R1	SITM33	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM33 SER Points and Aliases, Point 33		False
R1	SITM34	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM34 SER Points and Aliases, Point 34		False
R1	SITM35	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM35 SER Points and Aliases, Point 35		False
R1	SITM36	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM36 SER Points and Aliases, Point 36		False
R1	SITM37	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM37 SER Points and Aliases, Point 37		False
R1	SITM38	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM38 SER Points and Aliases, Point 38		False
R1	SITM39	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM39 SER Points and Aliases, Point 39		False
R1	SITM40	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM40 SER Points and Aliases, Point 40		False
R1	SITM41	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM41 SER Points and Aliases, Point 41		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)

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Group	Setting	Range	Default Value	Value	Delta	Description	Comments	Hidden
R1	SITM237	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM237 SER Points and Aliases, Point 237		False
R1	SITM238	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM238 SER Points and Aliases, Point 238		False
R1	SITM239	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM239 SER Points and Aliases, Point 239		False
R1	SITM240	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM240 SER Points and Aliases, Point 240		False
R1	SITM241	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM241 SER Points and Aliases, Point 241		False
R1	SITM242	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM242 SER Points and Aliases, Point 242		False
R1	SITM243	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM243 SER Points and Aliases, Point 243		False
R1	SITM244	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM244 SER Points and Aliases, Point 244		False
R1	SITM245	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM245 SER Points and Aliases, Point 245		False
R1	SITM246	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM246 SER Points and Aliases, Point 246		False
R1	SITM247	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM247 SER Points and Aliases, Point 247		False
R1	SITM248	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM248 SER Points and Aliases, Point 248		False
R1	SITM249	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM249 SER Points and Aliases, Point 249		False
R1	SITM250	DeviceWord Element, AliasName, AssertedText, DeAssertedText			False	SITM250 SER Points and Aliases, Point 250		False

((Group = G1) or (Group = L1) or (Group = O1) or (Group = R1) or (Group = S1)) and (Hidden = False)