# Electrical Coordination Study

Performed for the New Electrical System at

[redacted]

Located in [redacted]

Prepared for

[redacted]

Project: [redacted]

**Attn:** [redacted]

[redacted]

**Subject:** Electrical Coordination Study, [redacted]

**Project Address:** [redacted]

The electrical system being installed at the above address is designed to provide power to the site through a new medium-voltage service and switchgear. The system will also interface with a new 39.52 kWstc PV system to be installed on the site. The following report will take into consideration the coordination and safety of all devices in the sysetm, pursuant to the following scope:

1. Arc Flash Hazard Report and labels for all DC and AC equipment in the PV system above 50 volts
2. Coordination Study for PV equipment, any customer equipment that was modified, and coordination between PV system and the existing electrical system

Please reference the attached reports as provided:

Appendix A: DC Incident Energy Study

Appendix B: AC Fault and Incident Energy Study

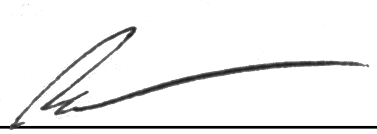
Appendix C: AC & DC Arc Flash Values and Placards

Appendix D: Coordination Study

Appendix E: Summary

We hope this provides the information you require. If you have any questions regarding the contents of our report, or if we can be of further assistance, please contact us.

Respectfully submitted,



Richard Dobbins, PE

**Appendix A: DC Incident Energy Study**

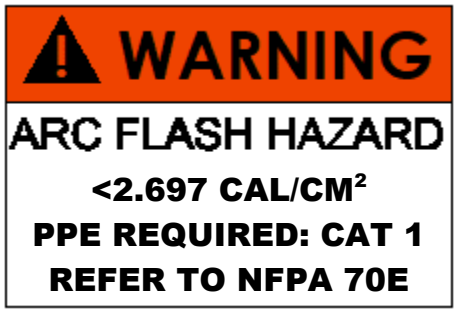
The total combined DC energy present at the inverter is found to be 39.52 kW DC. Using this value, we can calculate the maximum incident energy at the inverter using the following equation:

$$Incident\ Energy = P\ x\ \frac{1.25\ x\ T_{exp}\ x\ 3000}{4\pi\ x\ (D\ x\ 2.54)^2}\ x\ 0.239$$

where P is the kW DC power at the inverter, $T_{exp}$ is the exposure time (in seconds), and D is the working distance (in inches). We have assumed $T_{exp}$ to be 2 seconds (typical for DC systems), and D to be 18 inches. In the case of the above inverter, the Incident Energy in the event of an arc was found to be:

$$Incident\ Energy = 39.52\ x\ \frac{1.25\ x\ 2\ x\ 3000}{4\pi\ x\ (18\ x\ 2.54)^2}\ x\ 0.239 = 2.697\ cal/cm^2$$

Based on the PPE tables provided in NFPA 70E, the minimum arc flash PPE category required for servicing a live PV inverter on this system is category 1.




The above placard shall be affixed to the PV inverter.

**Appendix B: AC Fault and Incident Energy Study**

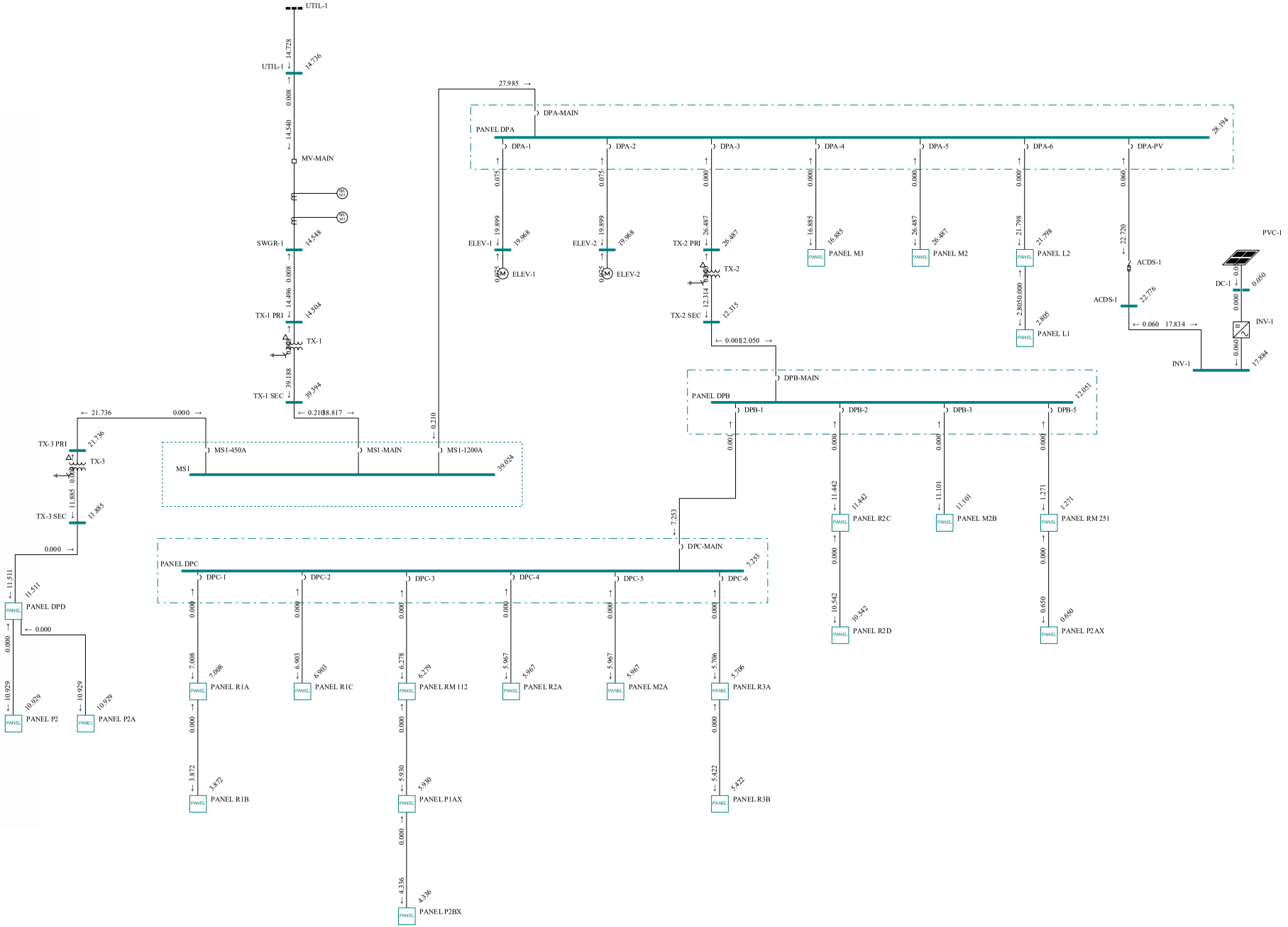
The total available fault current supplied by the utility, combined with the new fault current contribution from the PV system, must not exceed the fault rating of the main service panel. We will determine the available fault current at each piece of equipment using the following equations:

$$Fault\ Current\ (I_{AIC}) = \frac{kVA\ x\ 100000}{V\ x\ \sqrt{3}\ x\ \%Z}$$

$$f = \frac{\sqrt{3}\ x\ L\ x\ I_{AIC}}{N\ x\ C\ x\ V} \qquad\qquad I_{AIC'} = I_{AIC}\ x\ \frac{1}{1+f}$$

Where kVA is the transformer rating (in kVA), V is the service voltage (in volts), %Z is the transformer impedance, and L, N, and C are respectively the length (in feet), parallel number, and C constant of conductors between the equipment we are measuring the fault current at and the equipment the fault current is being sourced from.

The estimated utility fault current (using the infinite bus method) at the main service equipment is 14.728 kAIC. We will use the point-to-point calculation method to determine the available fault current at the other equipment in the system, as shown on the following page:


UTIL-1
14.728
14.736
0.008
14.540
MV-MAIN
SWGR-1
14.548
0.008
14.496
14.504
TX-1 PRI
TX-1
39.188
39.394
TX-1 SEC
27.985
DPA-MAIN
PANEL DPA
28.194
DPA-1
DPA-2
DPA-3
DPA-4
DPA-5
DPA-6
DPA-PV
0.075
0.075
0.000
0.000
0.000
0.000
0.060
ELEV-1
ELEV-2
19.899
19.968
0.075
ELEV-1
ELEV-2
TX-2 PRI
26.487
TX-2
12.314
12.315
TX-2 SEC
16.885
PANEL M3
26.487
PANEL M2
21.798
PANEL L2
2.805
PANEL L1
22.720
ACDS-1
22.776
0.060
17.834
INV-1
17.884
PVC-1
DC-1
0.050
0.000
0.050
INV-1
0.050
0.210
0.210
38.817
21.736
0.000
21.736
TX-3 PRI
TX-3
11.885
11.885
TX-3 SEC
MS1-450A
MS1-MAIN
MS1-1200A
MS1
39.024
12.050
DPB-MAIN
PANEL DPB
12.051
DPB-1
DPB-2
DPB-3
DPB-5
0.001
0.000
0.000
0.000
11.442
11.442
PANEL R2C
11.101
11.101
PANEL M2B
1.271
1.271
PANEL RM 251
10.542
10.542
PANEL R2D
0.650
0.650
PANEL P2AX
7.253
7.253
DPC-MAIN
PANEL DPC
DPC-1
DPC-2
DPC-3
DPC-4
DPC-5
DPC-6
0.000
0.000
0.000
0.000
0.000
0.000
7.008
7.008
PANEL R1A
6.903
6.903
PANEL R1C
6.278
6.279
PANEL RM 112
5.967
5.967
PANEL R2A
5.967
5.967
PANEL M2A
5.706
5.706
PANEL R3A
3.872
3.872
PANEL R1B
5.930
5.930
PANEL P1AX
5.422
5.422
PANEL R3B
4.336
4.336
PANEL P2BX
11.511
11.511
PANEL DPD
0.000
0.000
10.929
10.929
PANEL P2
10.929
10.929
PANEL P2A

The available utility fault current at the point of service will drop off from the main switchgear, changing as it passes through the MV transformers that are providing power to the site. The PV inverter will also contribute fault current to the system, albeit at a much lower value than that of the utility. Based on manufacturer specifications, each inverter can contribute a maximum of 150% of its rated maximum operational current. For a 33.3kW inverter, this comes out to approximately 60 AIC. Therefore, the maximum potential fault current contribution from the PV inverter at the panel DPA will be 0.060 kAIC, in addition to that seen by the utility.

Using the calculated values for fault current at each piece of equipment in the system, the incident energy and minimum PPE category can be determined.

Using similar values to the ones used to determine the system's DC incident energy, we will use the following equations to determine the incident energy at a piece of equipment:

$$Arcing\ Fault\ Current\ (log(I_A)) = K_3 + 0.662\log(I_{BF}) + 0.0966V + 0.000526G + 0.5588V\log(I_{BF}) - 0.00304G\log(I_{BF})$$

$$Normalized\ Incident\ Energy\ (E_{in}) = 10\text{^}(K_1 + K_2 + 1.081\log(I_A) + 0.0011G$$

$$Adjusted\ Incident\ Energy\ (E_i) = 1.5\ x\ E_{in}\ x\ \left(\frac{T_{exp}}{0.2}\right)\ x\ \left(\frac{610}{D}\right)^X$$

Where $I_{bf}$ is the available bolted fault current at the equipment, $I_A$ is the available arcing fault current at the equipment, $K_1$ is the configuration constant (assumed to be -0.555 for enclosures), $K_2$ is the ground constant (assumed to be -0.113 for grounded systems), $K_3$ is the arc constant (at -0.097), X is the distance exponent (assumed to be approximately 1.5 for enclosures), G is the conductor gap (as defined by the enclosure type), $T_{exp}$ is the exposure time (in seconds), and D is the working distance (in inches). We assumed the $T_{exp}$ for all inverters to be 0.2 seconds (typical for AC systems), and D to be 18 inches. Where $T_{exp}$ is a value other than 0.2 seconds, it is due to the equipment's OCPD providing a different clearing time according to their coordination settings (reference the values under the Coordination Study section at the end of this report).

The difference in bus bolted fault current and bus arc fault current is that the former is the maximum fault current present on the bus and conductors, while the latter is a percentage of that bolted fault current reduced as a function of the resistance of air through which the current flows in the event of an arc flash.

**Appendix C: AC & DC Arc Flash Values and Placards**

The following table displays the total bolted and arc fault currents available (as the sum of contributions from the utility and PV inverter) at each piece of equipment in the system, as well as the incident energy and arc flash boundary for each.

| Arc Fault Bus Name | Arc Fault Bus kV | Equip Type | Gnd | Electrode Gap (mm) | Bus Bolted Fault (kA)* | Bus Arc Fault (kA) | Trip Time (sec) | Arc Time (sec) | Est Arc Flash Boundary (inches) | Working Distance (inches) | Incident Energy (cal/cm2)** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ACDS-1 | 0.48 | Int Switch | X | 32 | 22.776 | 16.849 | 0.2 | 0.2 | 46.6 | 18 | 5.5 |
| ELEV-1 | 0.48 | Other | X | 32 | 19.968 | 14.893 | 0.01 | 0.01 | 8.8 | 18 | 0.4 |
| ELEV-2 | 0.48 | Other | X | 32 | 19.968 | 14.893 | 0.01 | 0.01 | 8.8 | 18 | 0.4 |
| INV-1 | 0.48 | Other | X | 32 | 17.884 | 13.391 | 0.2 | 0.2 | 53.1 | 18 | 6.8 |
| MS1 | 0.48 | Switchboard | X | 32 | 39.024 | 26.235 | 1.954 | 2 | 353.4 | 18 | 139.8 |
| PANEL DPA | 0.48 | Panelboard | X | 25 | 28.194 | 20.916 | 0.2 | 0.2 | 68.1 | 18 | 10.1 |
| PANEL DPB | 0.208 | Panelboard | X | 25 | 12.051 | 5.565 | 8.096 | 2 | 122.9 | 18 | 25.9 |
| PANEL DPC | 0.208 | Panelboard | X | 25 | 7.253 | 3.229 | 0.027 | 0.027 | 5.7 | 18 | 0.2 |
| SWGR-1 | 12.47 | Switchgear | X | 152 | 14.548 | 13.262 |  | 1.47 | 242.8 | 18 | 71.0 |
| TX-1 PRI | 12.47 | Transformer Terminal | X | 152 | 14.504 | 13.222 | 1.447 | 1.531 | 248.7 | 18 | 73.7 |
| TX-1 SEC | 0.48 | Transformer Terminal | X | 32 | 39.394 | 26.407 | 1.948 | 2 | 355 | 18 | 140.8 |
| TX-2 PRI | 0.48 | Transformer Terminal | X | 32 | 26.487 | 19.297 | 0.03 | 0.03 | 20.7 | 18 | 1.5 |
| TX-2 SEC | 0.208 | Transformer Terminal | X | 32 | 12.315 | 5.41 | 8.567 | 2 | 127.1 | 18 | 27.3 |
| TX-3 PRI | 0.48 | Transformer Terminal | X | 32 | 21.736 | 16.134 | 0.018 | 0.018 | 13.1 | 18 | 0.7 |
| TX-3 SEC | 0.208 | Transformer Terminal | X | 32 | 11.885 | 5.212 | 0.018 | 0.018 | 6.4 | 18 | 0.2 |
| PANEL L1 | 0.48 | Panel | X | 25 | 2.805 | 2.015 | 0.03 | 0.03 | 3.4 | 18 | 0.08 |
| PANEL L2 | 0.48 | Panel | X | 25 | 21.798 | 16.621 | 0.01 | 0.01 | 7 | 18 | 0.3 |
| PANEL M2 | 0.48 | Panel | X | 25 | 26.487 | 19.821 | 0.03 | 0.03 | 15.5 | 18 | 0.9 |
| PANEL M2A | 0.208 | Panel | X | 25 | 5.967 | 2.61 | 0.025 | 0.025 | 3.7 | 18 | 0.1 |
| PANEL M2B | 0.208 | Panel | X | 25 | 11.101 | 5.104 | 0.025 | 0.025 | 5.8 | 18 | 0.2 |
| PANEL M3 | 0.48 | Panel | X | 25 | 16.885 | 13.006 | 0.04 | 0.04 | 14 | 18 | 0.8 |
| PANEL P1AX | 0.208 | Panel | X | 25 | 5.930 | 2.593 | 0.025 | 0.025 | 3.7 | 18 | 0.1 |
| PANEL P2 | 0.208 | Panel | X | 25 | 10.929 | 5.021 | 0.025 | 0.025 | 4.6 | 18 | 0.1 |
| PANEL P2A | 0.208 | Panel | X | 25 | 10.929 | 5.021 | 0.025 | 0.025 | 4.6 | 18 | 0.1 |
| PANEL P2AX | 0.208 | Panel | X | 25 | 0.650 | 0.236 | 0.025 | 0.025 | 0.8 | 18 | 0.008 |
| PANEL P2BX | 0.208 | Panel | X | 25 | 4.336 | 1.842 | 0.025 | 0.025 | 3 | 18 | 0.07 |
| PANEL R1A | 0.208 | Panel | X | 25 | 7.008 | 3.111 | 0.025 | 0.025 | 4.2 | 18 | 0.1 |
| PANEL R1B | 0.208 | Panel | X | 25 | 3.872 | 1.627 | 0.025 | 0.025 | 2.7 | 18 | 0.06 |
| PANEL R1C | 0.208 | Panel | X | 25 | 6.903 | 3.06 | 0.025 | 0.025 | 4.1 | 18 | 0.1 |
| PANEL R2A | 0.208 | Panel | X | 25 | 5.967 | 2.61 | 0.025 | 0.025 | 3.7 | 18 | 0.1 |
| PANEL R2C | 0.208 | Panel | X | 25 | 11.442 | 5.27 | 0.025 | 0.025 | 5.9 | 18 | 0.2 |
| PANEL R2D | 0.208 | Panel | X | 25 | 10.542 | 4.832 | 0.025 | 0.025 | 5.6 | 18 | 0.2 |
| PANEL R3A | 0.208 | Panel | X | 25 | 5.706 | 2.486 | 0.025 | 0.025 | 3.6 | 18 | 0.09 |
| PANEL R3B | 0.208 | Panel | X | 25 | 5.422 | 2.351 | 0.025 | 0.025 | 3.5 | 18 | 0.09 |
| PANEL DPD | 0.208 | Panel | X | 25 | 11.511 | 5.303 | 0.018 | 0.018 | 4.8 | 18 | 0.1 |
| PANEL RM 251 | 0.208 | Panel | X | 25 | 1.271 | 0.486 | 0.025 | 0.025 | 1.2 | 18 | 0.02 |
| PANEL RM 112 | 0.208 | Panel | X | 25 | 6.279 | 2.759 | 0.025 | 0.025 | 3.9 | 18 | 0.1 |
| *Values are including fault contributions from utility and all generation sources - please reference SLD for breakdown of individual contributions | | | | | | | | | | | |
| **Refer to NFPA 70E-2018 Table 130.5(G) for PPE requirements | | | | | | | | | | | |

The following labels shall be affixed to the designated equipment (displaying the incident energy, arc flash boundary, and limited and restricted approach boundaries):

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 3' - 11" | Arc Flash Boundary |
| 5.5 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: ACDS-1


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 9" | Arc Flash Boundary |
| 0.4 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: ELEV-1


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 9" | Arc Flash Boundary |
| 0.4 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: ELEV-2


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 4' - 5" | Arc Flash Boundary |
| 6.8 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: INV-1


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 7' - 0" | Arc Flash Boundary |
| 14.0 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: MS1


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 5' - 8" | Arc Flash Boundary |
| 10.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL DPA

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 10' - 3" | Arc Flash Boundary |
| 25.9 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL DPB


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 6" | Arc Flash Boundary |
| 0.2 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL DPC


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 20' - 3" | Arc Flash Boundary |
| 71.0 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| Extreme Danger | Do not Work on Energized Equipment! |
| 12.47 | kV Shock Hazard when cover is removed |
| 5' - 0" | Limited Approach |
| 2' - 2" | Restricted Approach - Class 2 Voltage Gloves |

Equipment Name: SWGR-1


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 5' - 8" | Arc Flash Boundary |
| 9.6 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 12.47 | kV Shock Hazard when cover is removed |
| 5' - 0" | Limited Approach |
| 2' - 2" | Restricted Approach - Class 2 Voltage Gloves |

Equipment Name: TX-1 PRI


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 7' - 0" | Arc Flash Boundary |
| 14.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: TX-1 SEC


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 1' - 9" | Arc Flash Boundary |
| 1.5 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: TX-2 PRI

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 10' - 7" | Arc Flash Boundary |
| 27.3 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: TX-2 SEC

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 1' - 1" | Arc Flash Boundary |
| 0.7 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: TX-3 PRI

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 6" | Arc Flash Boundary |
| 0.2 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: TX-3 SEC

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 5" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL DPD

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 3" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL L1

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 7" | Arc Flash Boundary |
| 0.3 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL L2

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 1' - 4" | Arc Flash Boundary |
| 0.9 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL M2

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL M2A

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 6" | Arc Flash Boundary |
| 0.2 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL M2B

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 1' - 2" | Arc Flash Boundary |
| 0.8 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.48 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL M3

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL P1AX

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 5" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL P2

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 5" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL P2A

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 1" | Arc Flash Boundary |
| 0.0 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL P2AX

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 3" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL P2BX

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R1A

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 3" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R1B

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R1C

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R2A


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 6" | Arc Flash Boundary |
| 0.2 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R2C


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 6" | Arc Flash Boundary |
| 0.2 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R2D


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R3A


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 3" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL R3B


# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required


| | |
|---|---|
| 0' - 4" | Arc Flash Boundary |
| 0.1 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

Equipment Name: PANEL RM 112

# WARNING

## Arc Flash and Shock Risk Assessment
## Appropriate PPE Required

| | |
|---|---|
| 0' - 1" | Arc Flash Boundary |
| 0.0 | cal/cm2 at 18.0 Inches - Arc Flash Incident Energy |
| | Refer to NFPA 70E-2018 Table 130.5(G) |
| 0.208 | kV Shock Hazard when cover is removed |
| 3' - 6" | Limited Approach |
| 1' - 0" | Restricted Approach - Class 00 Voltage Gloves |

**Equipment Name: PANEL RM 251**

**Appendix D: Coordination Study**

All new overcurrent devices that are being installed as a part of the new system have been coordinated to improve their efficacy and response to a short-circuit in the system.

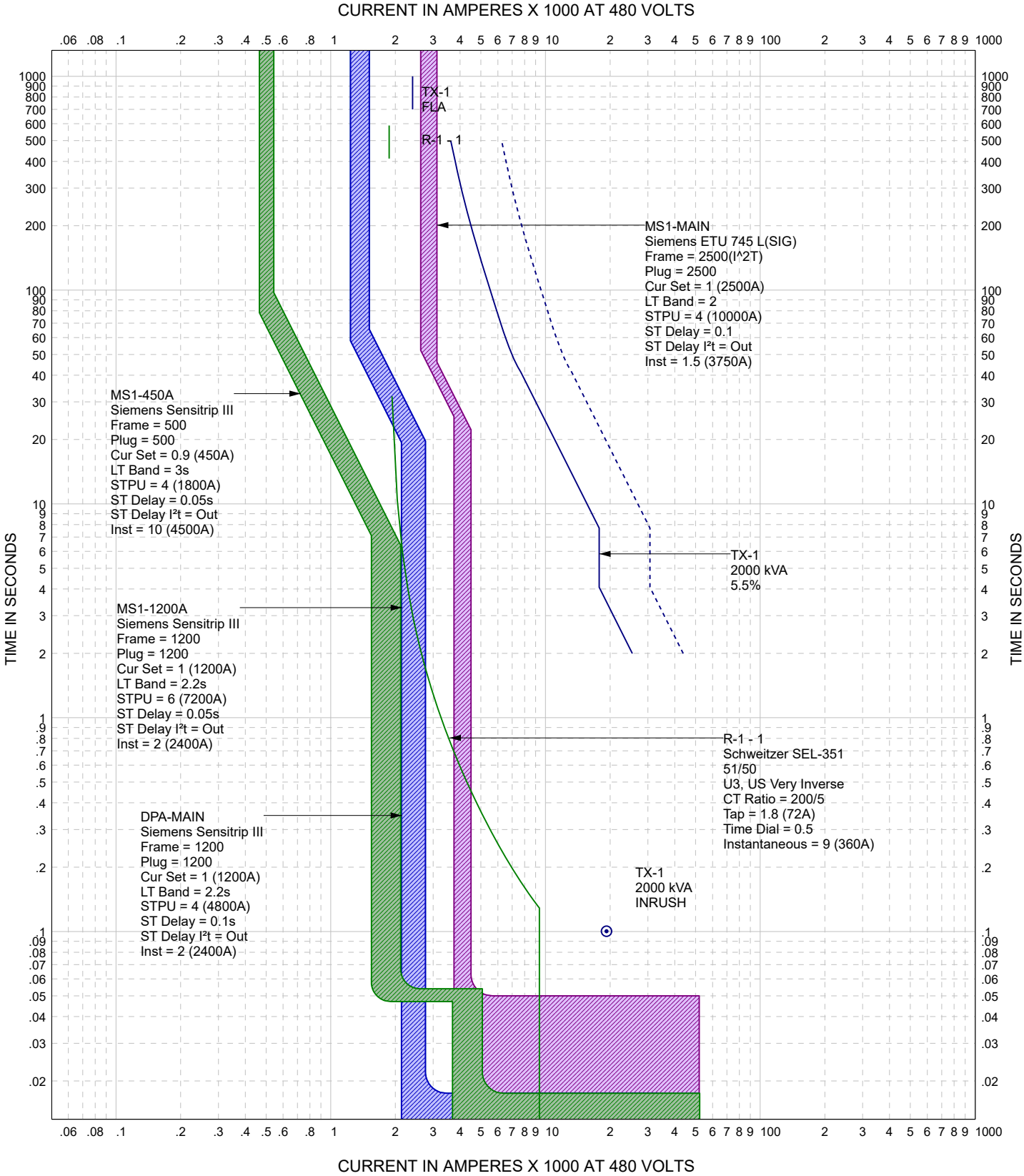
Based on the coordination graphs below (horizontal axis is fault AIC x 100, and vertical axis is time in seconds), all main breakers feeding each subcombiner panel or load panel are coordinated with the breakers in their respective feeder panels to reduce the amount of fault current seen

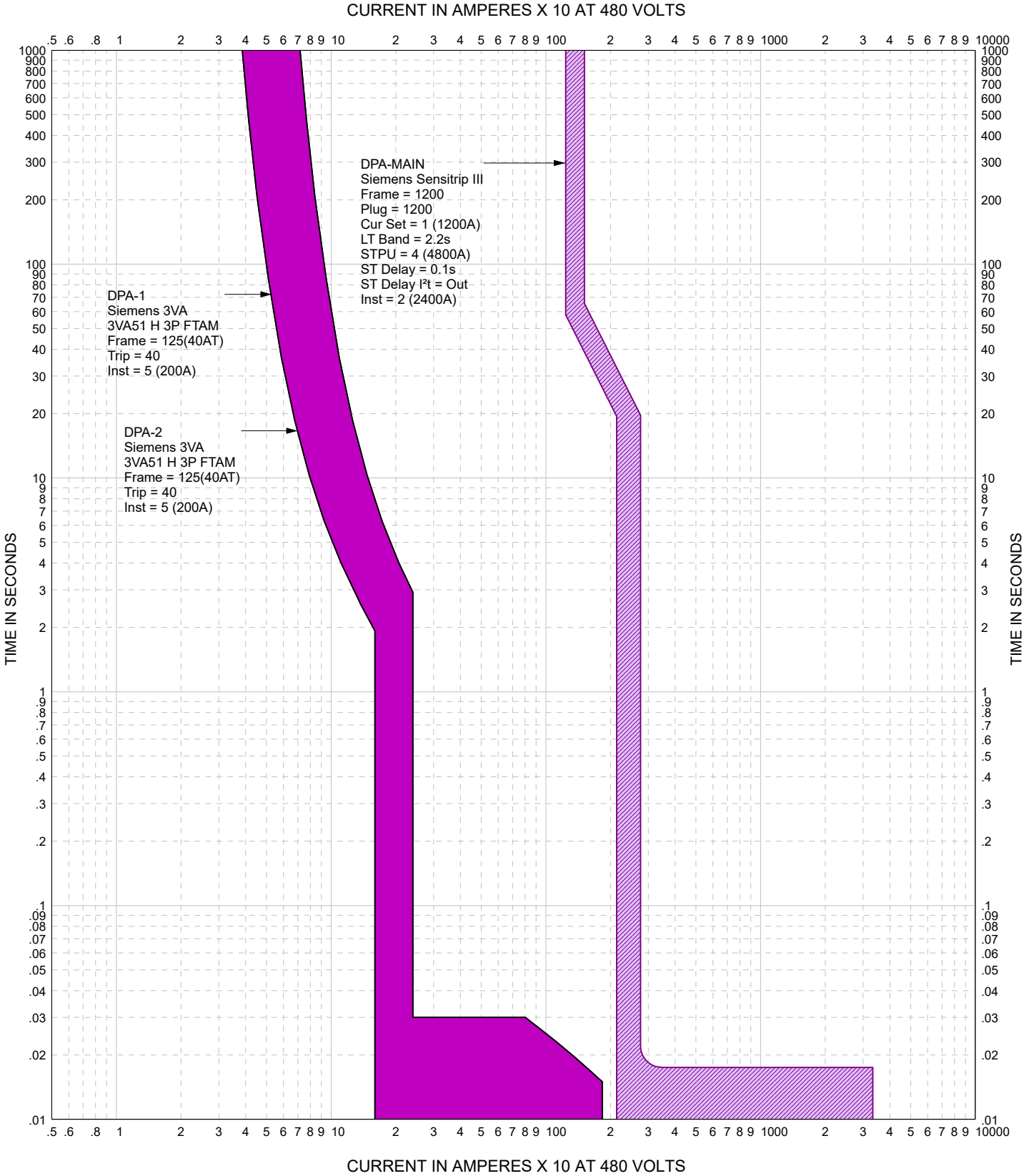
**Coordination Report - Trip Settings**

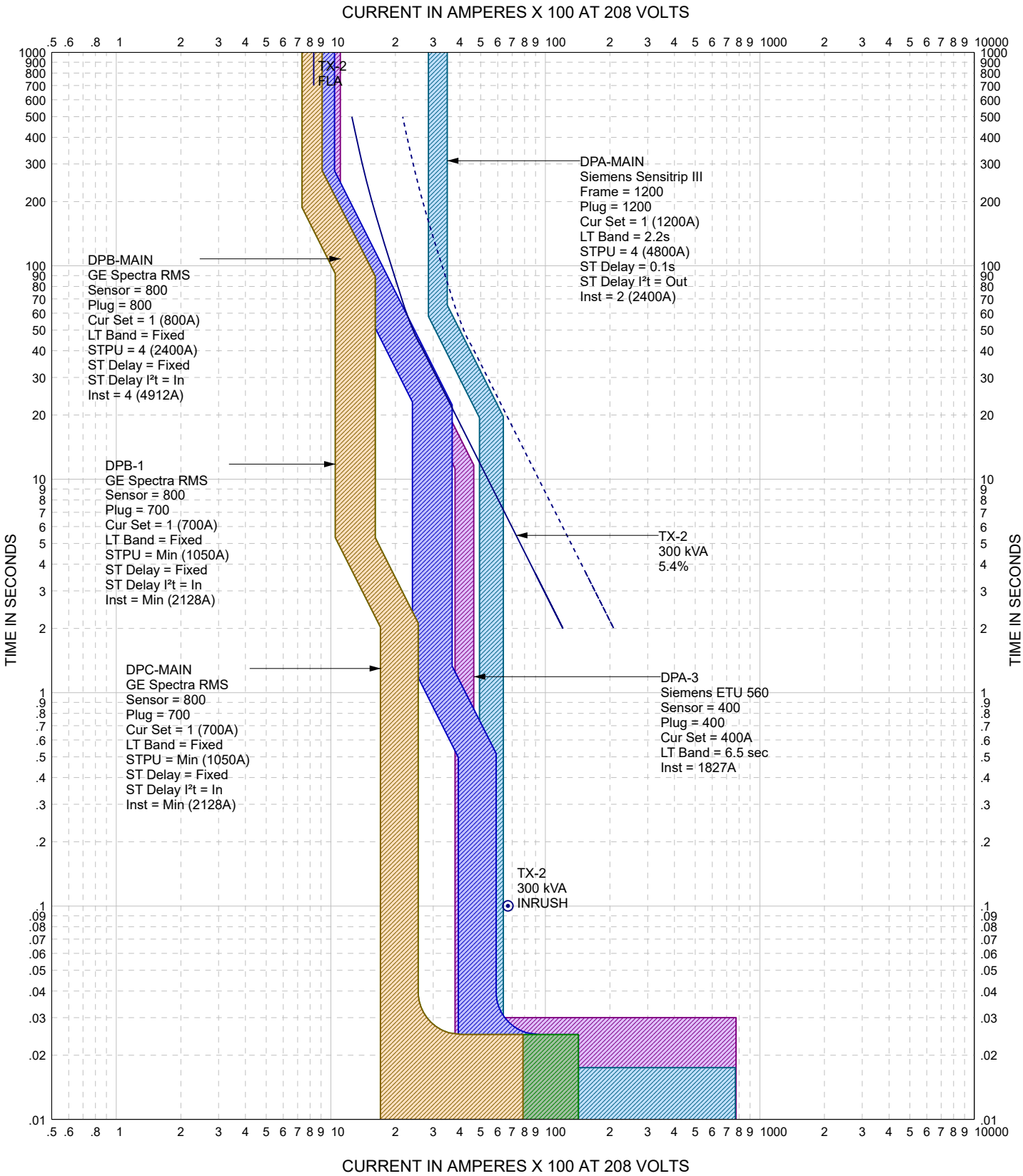
| Relay | | | | | Tap | | | | | | | | Instantaneous | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Manufacturer | Type | Device Function | CT Ratio | Name | Range | Setting | PA | Name | Curve | Range | Setting | Name | Range | Setting | PA |
| R-1 | Schweitzer | SEL-351 | 51/50 | 200/5 | Tap | 0.1 - 3.2 | 1.8 | 72 | Time Dial | U3, US Very Inverse | 0.5 - 15 | 0.5 | Inst | 0.25-100 | 9 | 360 |
| | Schweitzer | SEL-351 | 51G/50G | 200/5 | Tap | 0.1 - 3.2 | 0.5 | 20 | Time Dial | U3, US Very Inverse | 0.5 - 15 | 1 | Inst | 0.25-100 | 6 | 240 |
| R-UTIL | Schweitzer | SEL-551 | 51/50 IEEE | 600/5 | Tap | 0.1 - 3.2 | 0.8 | 96 | Time Dial | U3, US Very Inverse | 0.5 - 15 | 1 | Inst | 0.5-80 | 15 | 1800 |
| | Schweitzer | SEL-551 | 51/50N IEEE | 600/5 | Tap | 0.1 - 3.2 | 0.5 | 60 | Time Dial | U3, US Very Inverse | 0.5 - 15 | 1 | Inst | 0.5-80 | 10 | 1200 |

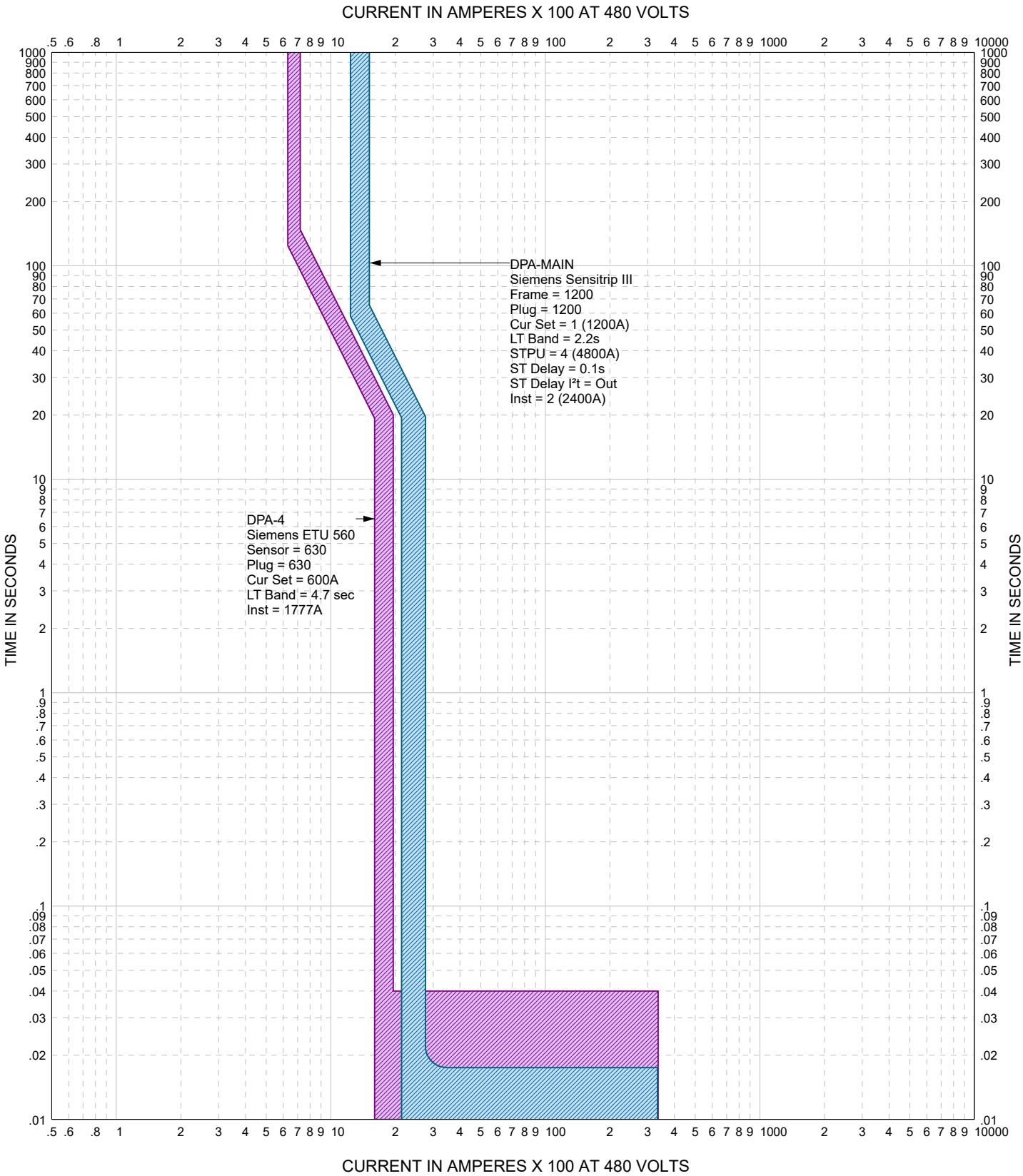
| Solid State Trip Breaker Specifications | | | | | | LTPU | | LT Delay | | STPU | | | | | Instantaneous | | | Ground Trip | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Manufacturer | Type | Style | Frame/Sensor | tap/plug | Name | Trip (A) | Name | Band | Name | Setting | Trip (A) | Band | I2t | Setting | Override | Trip (A) | Pickup | Trip (A) | Delay |
| DPA-3 | Siemens | ETU 560 | 3VA 400A-LSIG | 400 | 400 | LT Pickup | 400 | tr | 6.5 | ST Pickup | - | - | - | - | 1827 | Pickup | 1827 | 80 | 80 | 0.05 |
| DPA-4 | Siemens | ETU 560 | 3VA 630A-LSIG | 630 | 630 | LT Pickup | 600 | tr | 4.7 | ST Pickup | - | - | - | - | 1777 | Pickup | 1777 | 126 | 126 | 0.05 |
| DPA-5 | Siemens | ETU 560 | 3VA 400A-LSIG | 400 | 400 | LT Pickup | 400 | tr | 10.5 | ST Pickup | - | - | - | - | 1833 | Pickup | 1833 | 80 | 80 | 0.05 |
| DPA-MAIN | Siemens | Sensitrip III | ND | 1200 | 1200 | LT Pickup | 1200 | LT Delay | 2.2 | ST Pickup | 4 | 4800 | 0.1 | Out | 4 | Pickup | 4800 | 0.4 | 480 | 0.1 |
| DPB-1 | GE | Spectra RMS | MCCB SK | 800 | 700 | LT Pickup | 700 | LT Delay | Fixed | ST Pickup | Min | 1050 | Fixed | In | Min | Pickup | 2128 | - | - | - |
| DPB-2 | GE | Spectra RMS | MCCB SF | 250AF(225) | 225 | LT Pickup | 225 | LT Delay | Fixed | ST Pickup | Min | 337.5 | Fixed | In | Min | Pickup | 665 | - | - | - |
| DPB-3 | GE | Spectra RMS | MCCB SE | 100A (100AT) | 100 | LT Pickup | 100 | LT Delay | Fixed | ST Pickup | Min | 150 | Fixed | In | Min | Pickup | 297 | - | - | - |
| | | | | | | | | | | | | | | | | | | | | |
| DPB-5 | GE | Spectra RMS | MCCB SE | 60A (50AT) | 50 | LT Pickup | 50 | LT Delay | Fixed | ST Pickup | Min | 75 | Fixed | In | Min | Pickup | 148 | - | - | - |
| DPB-MAIN | GE | Spectra RMS | MCCB SK | 800 | 800 | LT Pickup | 800 | LT Delay | Fixed | ST Pickup | 4 | 2400 | Fixed | In | 4 | Pickup | 4912 | - | - | - |
| DPC-1 | GE | Spectra RMS | MCCB SF | 250AF(225) | 225 | LT Pickup | 225 | LT Delay | Fixed | ST Pickup | Min | 337.5 | Fixed | In | Min | Pickup | 665 | - | - | - |
| DPC-2 | GE | Spectra RMS | MCCB SE | 150A (150AT) | 150 | LT Pickup | 150 | LT Delay | Fixed | ST Pickup | Min | 225 | Fixed | In | Min | Pickup | 450 | - | - | - |
| DPC-3 | GE | Spectra RMS | MCCB SE | 100A (70AT) | 70 | LT Pickup | 70 | LT Delay | Fixed | ST Pickup | Min | 105 | Fixed | In | Min | Pickup | 206 | - | - | - |
| DPC-4 | GE | Spectra RMS | MCCB SF | 250AF(225) | 225 | LT Pickup | 225 | LT Delay | Fixed | ST Pickup | Min | 337.5 | Fixed | In | Min | Pickup | 665 | - | - | - |
| DPC-5 | GE | Spectra RMS | MCCB SF | 250AF(225) | 225 | LT Pickup | 225 | LT Delay | Fixed | ST Pickup | Min | 337.5 | Fixed | In | Min | Pickup | 665 | - | - | - |
| DPC-6 | GE | Spectra RMS | MCCB SF | 250AF(225) | 225 | LT Pickup | 225 | LT Delay | Fixed | ST Pickup | Min | 337.5 | Fixed | In | Min | Pickup | 665 | - | - | - |
| DPC-MAIN | GE | Spectra RMS | MCCB SK | 800 | 700 | LT Pickup | 700 | LT Delay | Fixed | ST Pickup | Min | 1050 | Fixed | In | Min | Pickup | 2128 | - | - | - |
| MS1-1200A | Siemens | Sensitrip III | ND | 1200 | 1200 | LT Pickup | 1200 | LT Delay | 2.2 | ST Pickup | 6 | 7200 | 0.05 | Out | 2 | Pickup | 2400 | 0.7 | 840 | 0.2 |
| MS1-450A | Siemens | Sensitrip III | LD | 500 | 500 | LT Pickup | 450 | LT Delay | 3 | ST Pickup | 4 | 1800 | 0.05 | Out | 10 | Pickup | 4500 | 0.55 | 275 | 0.1 |
| MS1-MAIN | Siemens | ETU 745 L(SIG) | ICCB WL FS II-L | 2500(I^2T) | 2500 | LT Pickup | 2500 | LT Delay | 2 | ST Pickup | 4 | 10000 | 0.1 | Out | 1.5 | Pickup | 3750 | 1200 | 1200 | 0.2 |

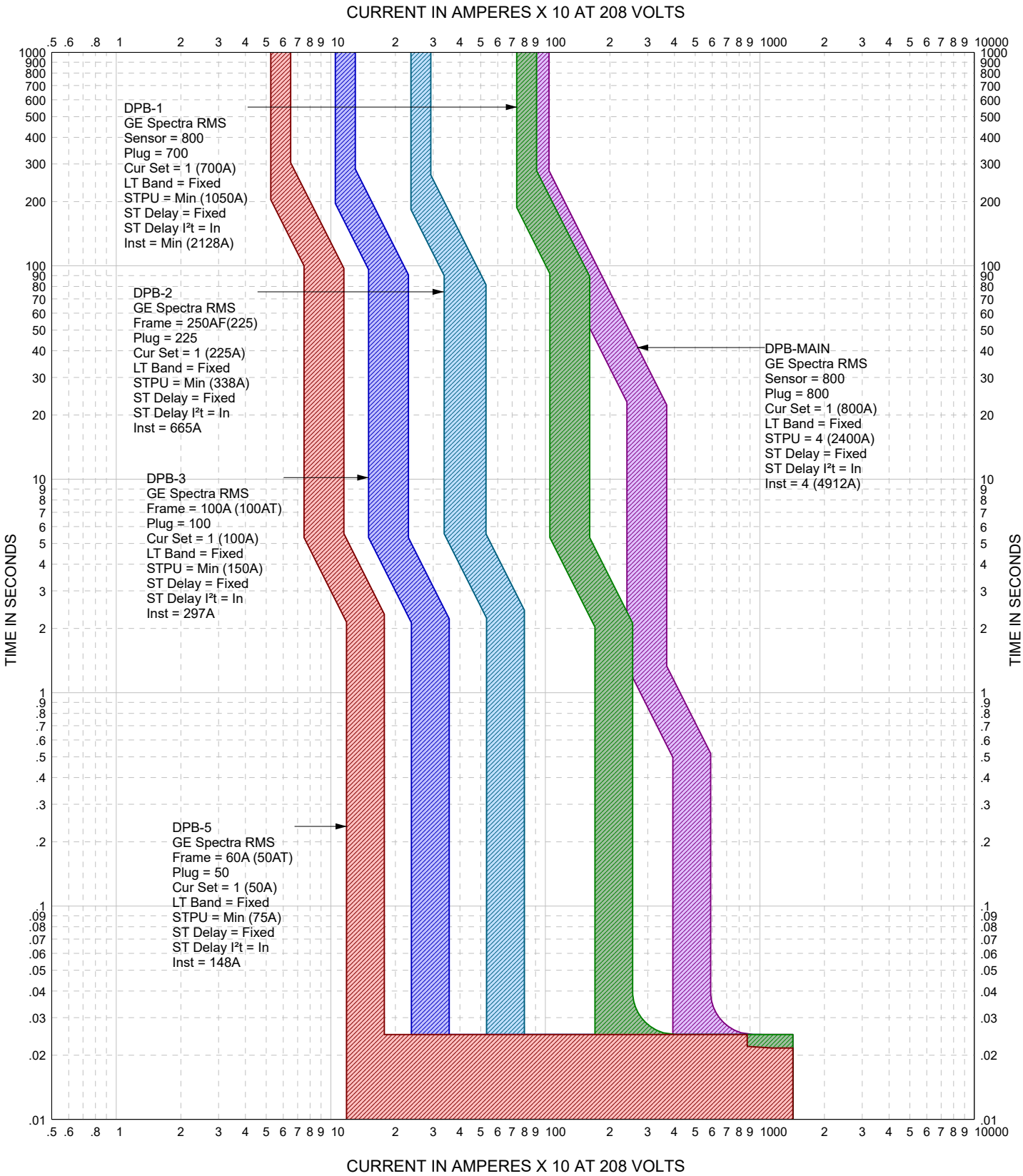
| Thermal Magnetic Breaker Specifications | | | | | | Instantaneous | |
|---|---|---|---|---|---|---|---|
| ID | Manufacturer | Type | Style | Frame | Trip | Setting | Trip (A) |
| DPA-1 | Siemens | 3VA | 3VA51 H 3P FTAM | 125(40AT) | 40 | 5 | 200 |
| DPA-2 | Siemens | 3VA | 3VA51 H 3P FTAM | 125(40AT) | 40 | 5 | 200 |
| DPA-6 | Siemens | 3VA | 3VA51 H 3P FTAM | 125(100AT) | 100 | 5 | 500 |
| DPA-PV | Siemens | 3VA | 3VA51 H 3P FTAM | 125(50AT) | 50 | 5 | 250 |

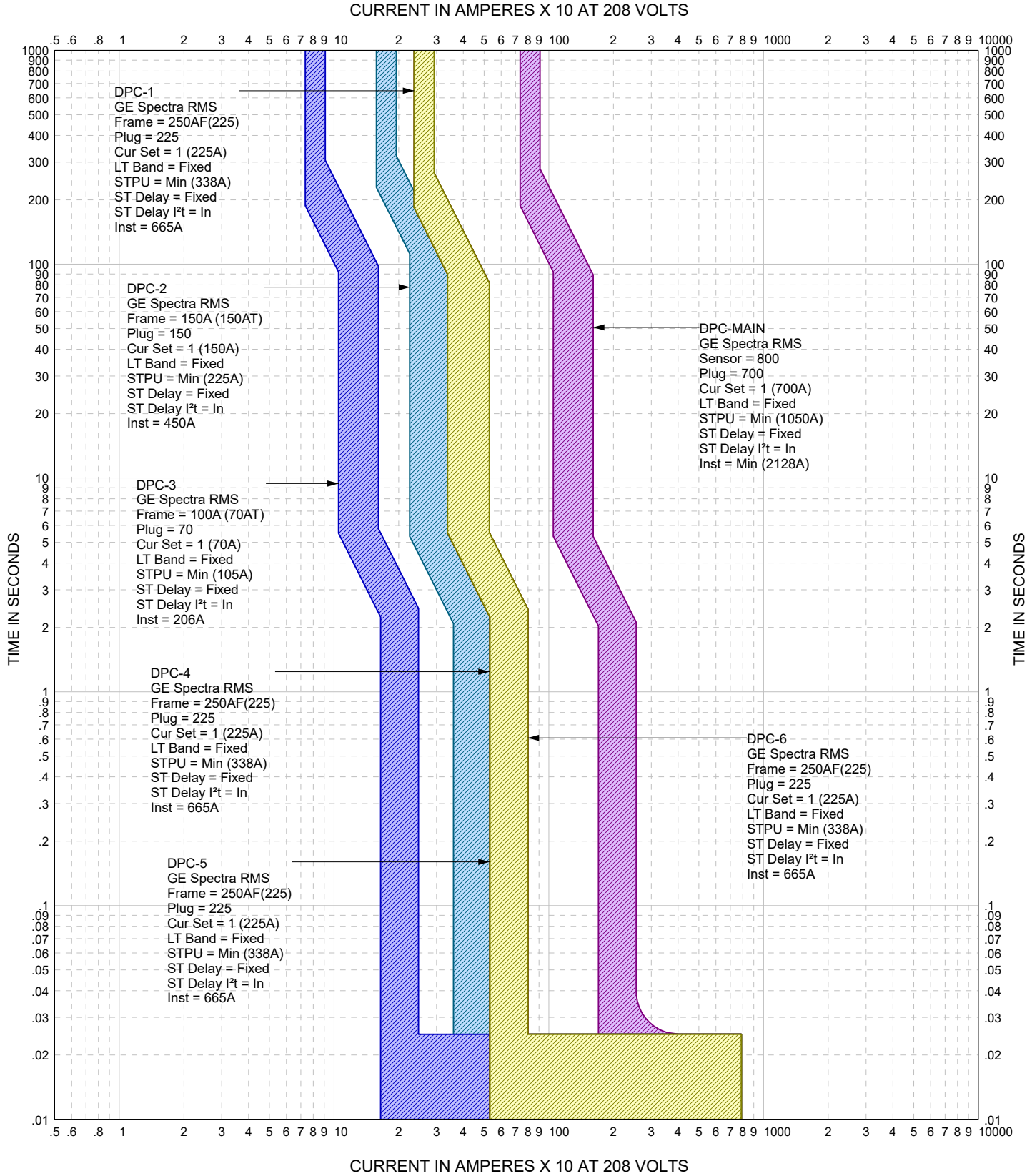

CURRENT IN AMPERES X 1000 AT 480 VOLTS
TIME IN SECONDS
TX-1
FLA
R-1 - 1
MS1-MAIN
Siemens ETU 745 L(SIG)
Frame = 2500(I^2T)
Plug = 2500
Cur Set = 1 (2500A)
LT Band = 2
STPU = 4 (10000A)
ST Delay = 0.1
ST Delay I²t = Out
Inst = 1.5 (3750A)
MS1-450A
Siemens Sensitrip III
Frame = 500
Plug = 500
Cur Set = 0.9 (450A)
LT Band = 3s
STPU = 4 (1800A)
ST Delay = 0.05s
ST Delay I²t = Out
Inst = 10 (4500A)
TX-1
2000 kVA
5.5%
MS1-1200A
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 6 (7200A)
ST Delay = 0.05s
ST Delay I²t = Out
Inst = 2 (2400A)
R-1 - 1
Schweitzer SEL-351
51/50
U3, US Very Inverse
CT Ratio = 200/5
Tap = 1.8 (72A)
Time Dial = 0.5
Instantaneous = 9 (360A)
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
TX-1
2000 kVA
INRUSH

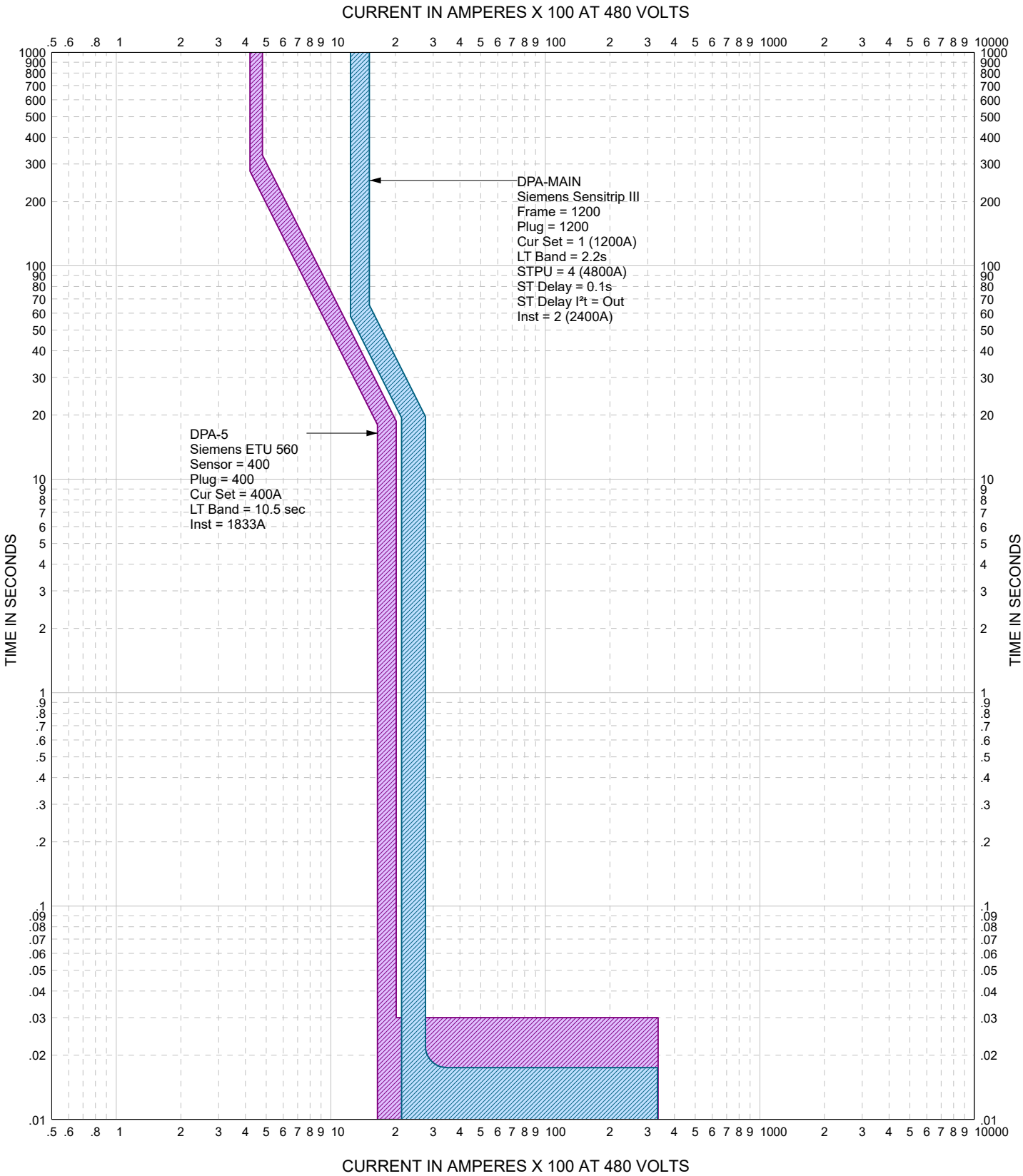

CURRENT IN AMPERES X 10 AT 480 VOLTS
TIME IN SECONDS
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
DPA-1
Siemens 3VA
3VA51 H 3P FTAM
Frame = 125(40AT)
Trip = 40
Inst = 5 (200A)
DPA-2
Siemens 3VA
3VA51 H 3P FTAM
Frame = 125(40AT)
Trip = 40
Inst = 5 (200A)

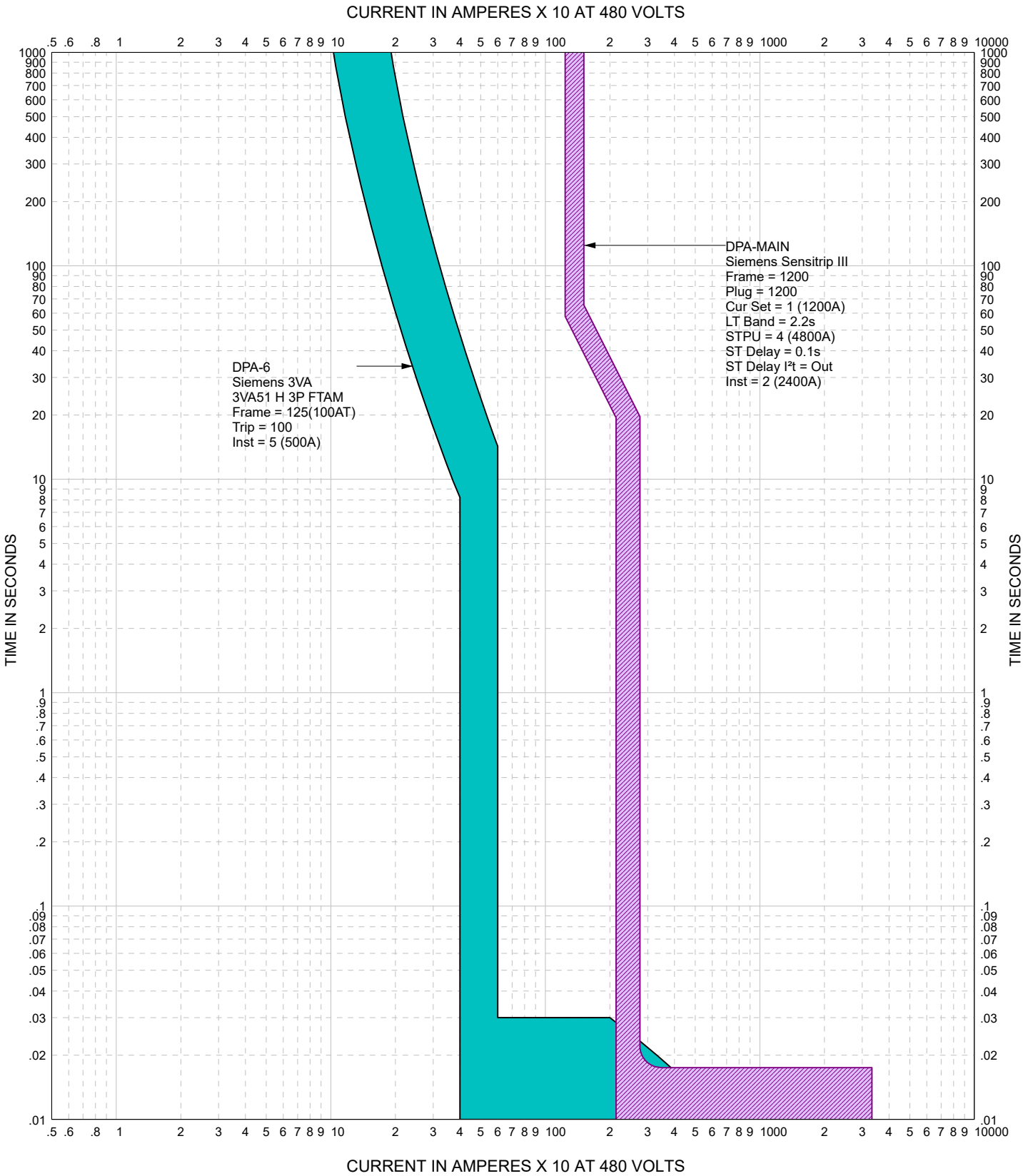

CURRENT IN AMPERES X 100 AT 208 VOLTS
TIME IN SECONDS
TX-2
FLA
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
DPB-MAIN
GE Spectra RMS
Sensor = 800
Plug = 800
Cur Set = 1 (800A)
LT Band = Fixed
STPU = 4 (2400A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 4 (4912A)
DPB-1
GE Spectra RMS
Sensor = 800
Plug = 700
Cur Set = 1 (700A)
LT Band = Fixed
STPU = Min (1050A)
ST Delay = Fixed
ST Delay I²t = In
Inst = Min (2128A)
TX-2
300 kVA
5.4%
DPC-MAIN
GE Spectra RMS
Sensor = 800
Plug = 700
Cur Set = 1 (700A)
LT Band = Fixed
STPU = Min (1050A)
ST Delay = Fixed
ST Delay I²t = In
Inst = Min (2128A)
DPA-3
Siemens ETU 560
Sensor = 400
Plug = 400
Cur Set = 400A
LT Band = 6.5 sec
Inst = 1827A
TX-2
300 kVA
INRUSH

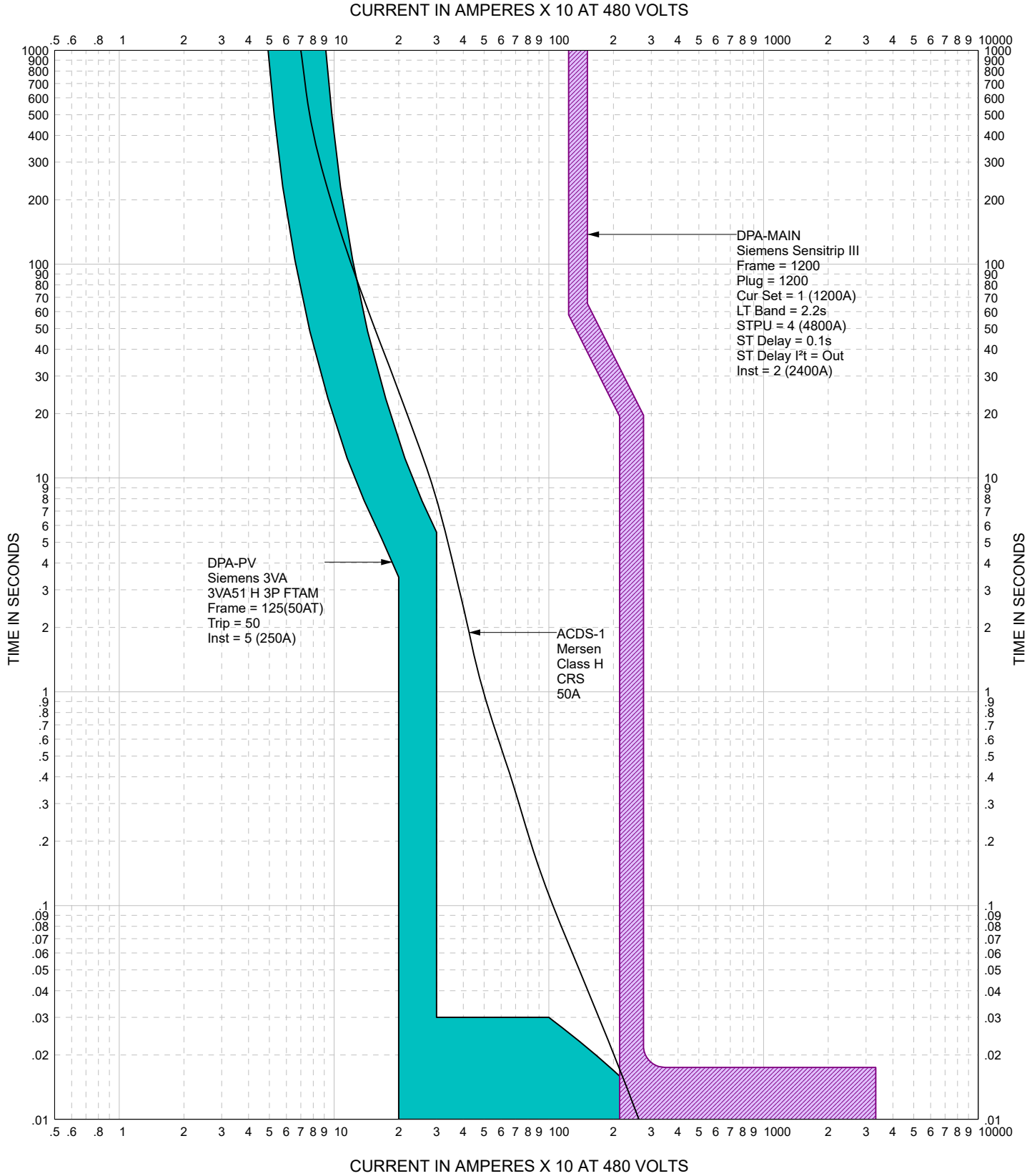

CURRENT IN AMPERES X 100 AT 480 VOLTS
TIME IN SECONDS
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
DPA-4
Siemens ETU 560
Sensor = 630
Plug = 630
Cur Set = 600A
LT Band = 4.7 sec
Inst = 1777A

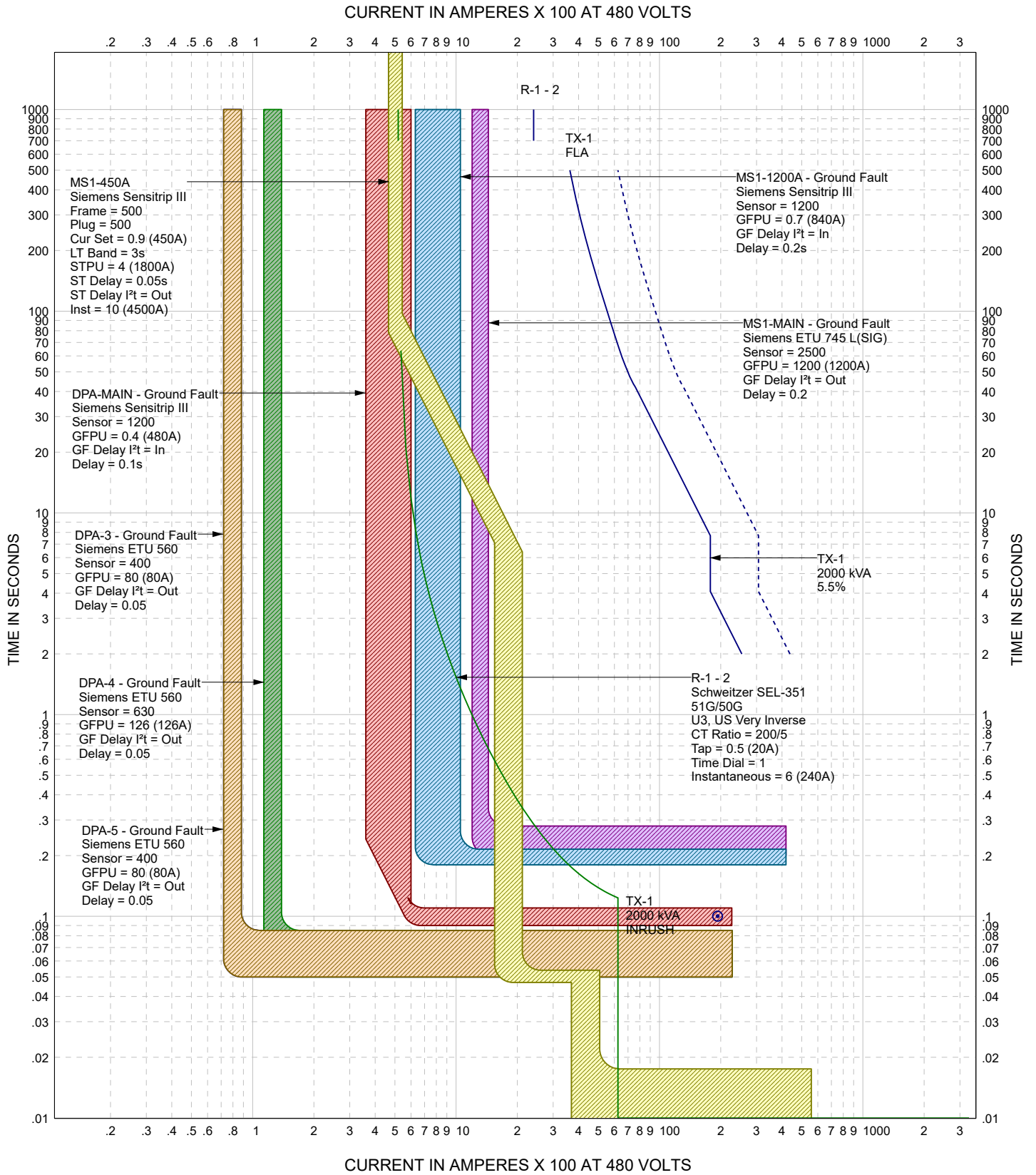

CURRENT IN AMPERES X 10 AT 208 VOLTS
TIME IN SECONDS
DPB-1
GE Spectra RMS
Sensor = 800
Plug = 700
Cur Set = 1 (700A)
LT Band = Fixed
STPU = Min (1050A)
ST Delay = Fixed
ST Delay I²t = In
Inst = Min (2128A)
DPB-2
GE Spectra RMS
Frame = 250AF(225)
Plug = 225
Cur Set = 1 (225A)
LT Band = Fixed
STPU = Min (338A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 665A
DPB-3
GE Spectra RMS
Frame = 100A (100AT)
Plug = 100
Cur Set = 1 (100A)
LT Band = Fixed
STPU = Min (150A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 297A
DPB-5
GE Spectra RMS
Frame = 60A (50AT)
Plug = 50
Cur Set = 1 (50A)
LT Band = Fixed
STPU = Min (75A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 148A
DPB-MAIN
GE Spectra RMS
Sensor = 800
Plug = 800
Cur Set = 1 (800A)
LT Band = Fixed
STPU = 4 (2400A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 4 (4912A)

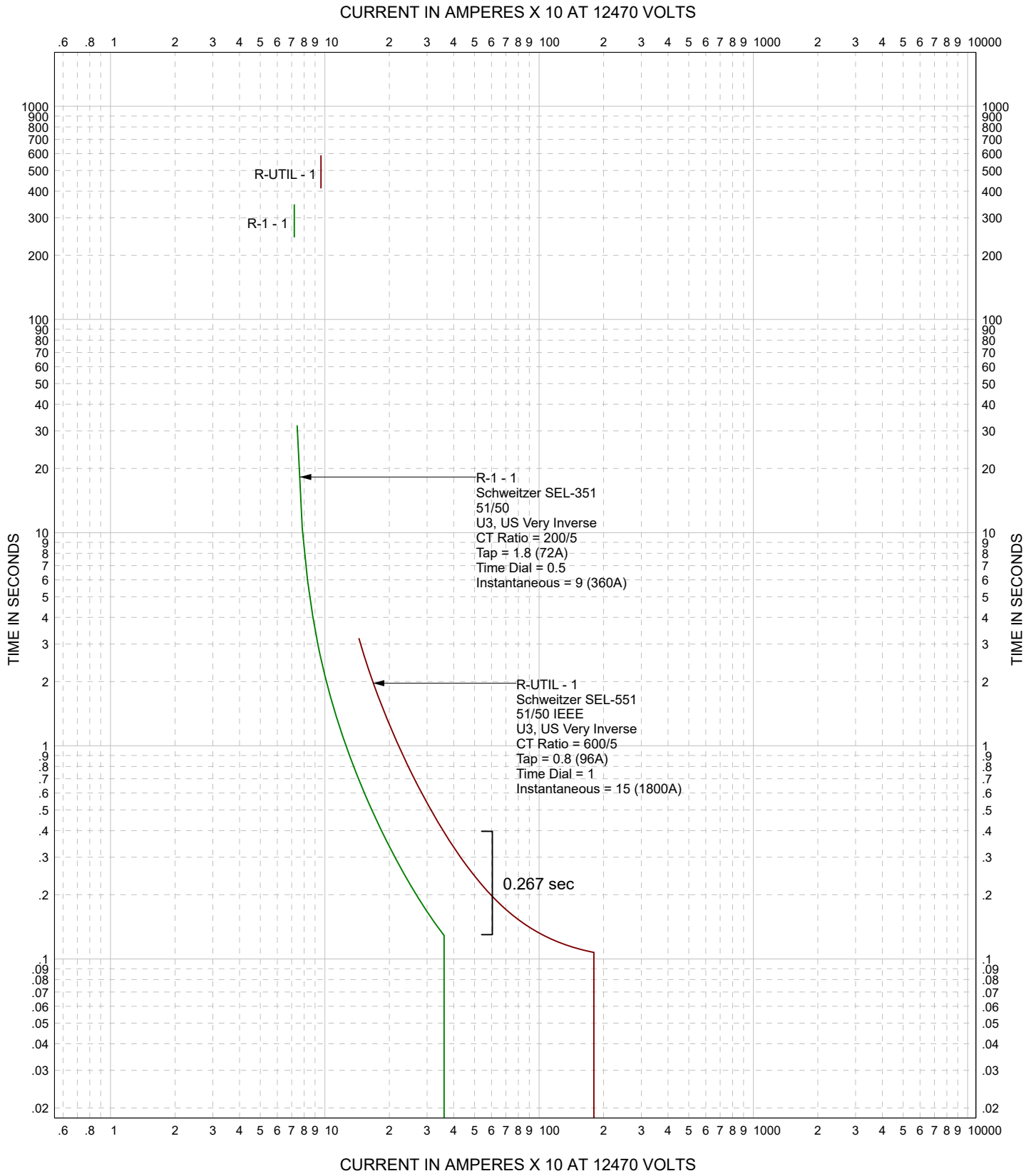

CURRENT IN AMPERES X 10 AT 208 VOLTS
TIME IN SECONDS
DPC-1
GE Spectra RMS
Frame = 250AF(225)
Plug = 225
Cur Set = 1 (225A)
LT Band = Fixed
STPU = Min (338A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 665A
DPC-2
GE Spectra RMS
Frame = 150A (150AT)
Plug = 150
Cur Set = 1 (150A)
LT Band = Fixed
STPU = Min (225A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 450A
DPC-3
GE Spectra RMS
Frame = 100A (70AT)
Plug = 70
Cur Set = 1 (70A)
LT Band = Fixed
STPU = Min (105A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 206A
DPC-4
GE Spectra RMS
Frame = 250AF(225)
Plug = 225
Cur Set = 1 (225A)
LT Band = Fixed
STPU = Min (338A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 665A
DPC-5
GE Spectra RMS
Frame = 250AF(225)
Plug = 225
Cur Set = 1 (225A)
LT Band = Fixed
STPU = Min (338A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 665A
DPC-MAIN
GE Spectra RMS
Sensor = 800
Plug = 700
Cur Set = 1 (700A)
LT Band = Fixed
STPU = Min (1050A)
ST Delay = Fixed
ST Delay I²t = In
Inst = Min (2128A)
DPC-6
GE Spectra RMS
Frame = 250AF(225)
Plug = 225
Cur Set = 1 (225A)
LT Band = Fixed
STPU = Min (338A)
ST Delay = Fixed
ST Delay I²t = In
Inst = 665A
CURRENT IN AMPERES X 10 AT 208 VOLTS


CURRENT IN AMPERES X 100 AT 480 VOLTS
TIME IN SECONDS
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
DPA-5
Siemens ETU 560
Sensor = 400
Plug = 400
Cur Set = 400A
LT Band = 10.5 sec
Inst = 1833A

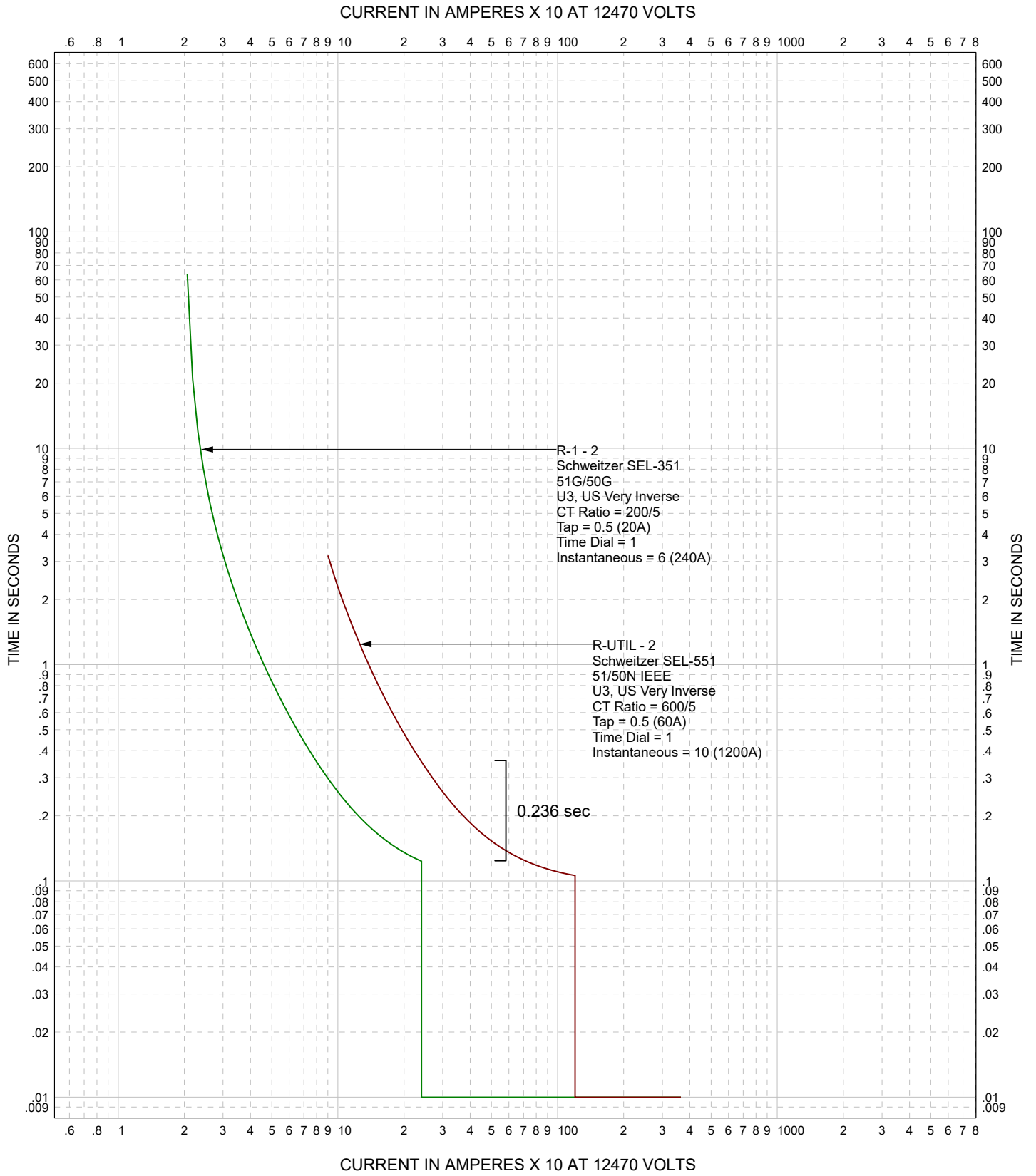

CURRENT IN AMPERES X 10 AT 480 VOLTS
TIME IN SECONDS
DPA-6
Siemens 3VA
3VA51 H 3P FTAM
Frame = 125(100AT)
Trip = 100
Inst = 5 (500A)
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
CURRENT IN AMPERES X 10 AT 480 VOLTS
TIME IN SECONDS


CURRENT IN AMPERES X 10 AT 480 VOLTS
TIME IN SECONDS
DPA-MAIN
Siemens Sensitrip III
Frame = 1200
Plug = 1200
Cur Set = 1 (1200A)
LT Band = 2.2s
STPU = 4 (4800A)
ST Delay = 0.1s
ST Delay I²t = Out
Inst = 2 (2400A)
DPA-PV
Siemens 3VA
3VA51 H 3P FTAM
Frame = 125(50AT)
Trip = 50
Inst = 5 (250A)
ACDS-1
Mersen
Class H
CRS
50A


CURRENT IN AMPERES X 100 AT 480 VOLTS
TIME IN SECONDS
R-1 - 2
TX-1
FLA
MS1-450A
Siemens Sensitrip III
Frame = 500
Plug = 500
Cur Set = 0.9 (450A)
LT Band = 3s
STPU = 4 (1800A)
ST Delay = 0.05s
ST Delay I²t = Out
Inst = 10 (4500A)
MS1-1200A - Ground Fault
Siemens Sensitrip III
Sensor = 1200
GFPU = 0.7 (840A)
GF Delay I²t = In
Delay = 0.2s
MS1-MAIN - Ground Fault
Siemens ETU 745 L(SIG)
Sensor = 2500
GFPU = 1200 (1200A)
GF Delay I²t = Out
Delay = 0.2
DPA-MAIN - Ground Fault
Siemens Sensitrip III
Sensor = 1200
GFPU = 0.4 (480A)
GF Delay I²t = In
Delay = 0.1s
DPA-3 - Ground Fault
Siemens ETU 560
Sensor = 400
GFPU = 80 (80A)
GF Delay I²t = Out
Delay = 0.05
TX-1
2000 kVA
5.5%
DPA-4 - Ground Fault
Siemens ETU 560
Sensor = 630
GFPU = 126 (126A)
GF Delay I²t = Out
Delay = 0.05
R-1 - 2
Schweitzer SEL-351
51G/50G
U3, US Very Inverse
CT Ratio = 200/5
Tap = 0.5 (20A)
Time Dial = 1
Instantaneous = 6 (240A)
DPA-5 - Ground Fault
Siemens ETU 560
Sensor = 400
GFPU = 80 (80A)
GF Delay I²t = Out
Delay = 0.05
TX-1
2000 kVA
INRUSH
CURRENT IN AMPERES X 100 AT 480 VOLTS




**Utility and Customer Relays - Phase**




**Utility and Customer Relays - Ground**

Note: SEL-351 shall be programmed using 50G residual-ground overcurrent device function, $I_G = 3I_0 = I_A + I_B + I_C$

**Appendix E: Summary**

Based on our review of the system's design documents, the provided analysis of the DC and AC arc flash, and the coordination study and accompanying values and settings for all trip devices, the system shall operate as intended and within safety parameters defined by NFPA 70E and the National Electrical Code. It is the responsibility of the electrical contractor to properly install all trip devices, ensure they are programmed according to this report, and that all appropriate labels (or their equivalents) are affixed to all applicable equipment, in accordance with local jurisdictional requirements.

No element of PV system output performance and efficiency was taken into consideration in this report.