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SOLUÇÕES EM ENERGIA

Estudo de Curto – Circuito e Seletividade da UTE IACANGA Conexão e Parte Interna em 13. 8 kV.

Pedido de Compra – SINER – 20101099 de 11/02/2010

São Paulo / Junho de 2010 – Revisão 2A

Nota 1 : Alterações em Vermelho conforme últimas atualizações em campo efetuadas em abril de 2010 / Alterações em Magenta em junho de 2010

Relatório Técnico FARFILHO – 007/2010

1 - Introdução.

O presente trabalho tem por objetivo apresentar os ajustes para as proteções da planta da UTE IACANGA em 13.8 KV, tomando como referência os desenhos DE-EL-0608-00-01(Diagrama Unifilar 34.5/13.8 kV), Diagrama Unifilar – UIA – 06.001.00.02 e o Memorial ROVEL de 07/12/2009. O escopo de estudo visa apresentar os ajustes das proteções SEL 300G dos geradores TG01 e TG02, dos alimentadores em 13.8 KV feitas pelo relé SEL 351A dos cubículos C1B da entrada da CPFL e da Usina e dos cubículos internos de 02 a 11 sendo todos os relés de fabricação Schweitzer. Para tal o presente relatório está dividido nas seguintes partes descritas a seguir :

1.1.1 - Proteção dos Cubículos de 13.8 KV – Relés SEL 351.

1.1.2 - Proteção do Gerador TG01(5 MVA) - Relé SEL 300 G.

1.1.3 - Proteção do Gerador TG02(18.75 MVA) - Relé SEL 300 G.

1.1.4 – Proteção da Conexão – Relé SEL 351.

1.1.5 – Curvas de Ajustes.

1.1.6 – Tabelas de Ajustes.

1.1.7 - Comentários e Conclusões.

1.1.8 – Anexo 1 : Planilhas e Estudos de Curto – Circuito.

Para tal será considerada a principal condição operativa a seguir :

Grupo 1 : Operação de 02 geradores (TG01 e TG2) em paralelo com a concessionária e exportando um total de 12 MW.

1.1.1– Relés SEL 351 (Cubículos K02 a K12) – Cubículos de 13.8 KV.

- **Unidade 51P1 – Enxergar defeitos 3F no final dos cabos e na baixa tensão.**
- **Unidade 51G1 – Enxergar defeitos 1F no final dos cabos e na baixa tensão.**
- **Unidade 50P1 – Enxergar defeitos 3F na saída dos cabos.**
- **Unidade 50G1 – Enxergar defeitos 1F na saída dos cabos.**

Os defeitos apresentam quase os mesmos valores de corrente para os cabos de média tensão, portanto adota-se como referência o menor valor encontrado que é na barra(12):

Nota 1: Busca-se aqui o menor valor de defeito que se dá para a Usina alimentada pela concessionária.

Defeitos 2F : 1704 A.
Defeitos 1F : 363A(3Io) – Toma-se como referência a menor corrente limitada pela resistência de neutro do gerador.

Como valores de partida das unidades 51P e 51G adota-se como referência a corrente máxima de carga do Transformadores de média Tensão do circuito dos cubículos circuito acrescidos de 15 % calculados conforme a equação 01 abaixo. A seguir na tabela 01 são mostrados esse valores :

Logo :

Toma-se como exemplo a carga do Cubículo C09 :

$$I_p = \frac{500 \quad KVA}{\sqrt{3} \quad x \quad 13.8 \quad KV} \quad x \quad 1.15 \quad = \quad 24.05 \quad A \qquad (01)$$

Para Defeitos à Terra :

Adota-se o valor de 10 % do valor obtido para os defeitos fase-fase, pois o sistema de aterramento é feito através de resistores o que limita sua sensibilidade.

Logo :

Ip (Defeitos à terra) = 2.405 A.

Tabela 01 – Partidas das Unidades 51P e 51G

		Partida para os Defeitos entre Fases	Partida para os Defeitos à Terra	RTC (Relação dos Tc´s)	
Cub.	Transformador (KVA)	Ip(A) - Primário	Ip(A)-Primário	TC - Fase	TC - Neutro
C03 - Moenda	2000 KVA	96 A	9.6 A	40/1	20/1
C4 - Caldeira	2500 KVA	120 A	12 A	40/1	20/1
C5 – Tratamento Caldo	1500 KVA	72 A	7.2 A	40/1	20/1
C7 - Destilaria	1500 KVA	72 A	7.2 A	40/1	20/1
C8 - Vinhaça	1500 KVA	72 A	7.2 A	40/1	20/1
C9 – Serviço Auxiliar	500 KVA	24 A	2.4 A	40/1	20/1
C10 - Administrativo	450 kVA	21.65 A	2.16 A	40/1	20/1
C11 – Torre de Resfriamento	2000 KVA	96 A	9.6 A	40/1	20/1
C12 – Ternos de Moenda	4000 KVA	192 A	19.2 A	40/1	20/1
C1 – Entrada da Concessionária	15 MVA	722 A	72.2 A	200/1	20/1
C2 – Gerador 1	5 MVA	241 A	24.1 A	60/1	20/1
C13 – Gerador 2	18,75 MVA	903 A	90.3 A	160/1	20/1
Secundário - Transformador	15 MVA	753 A	60 A	200/1	200/1

Para todo o desenvolvimento de todo o estudo vai-se adotar para as respectivas coordenações os tipos de curva **IEC – Normal Inverse** tanto para os defeitos entre fases como para defeitos à terra.

Defeitos nas saídas dos alimentadores de 13.8 KV :

Para as unidades 50P1 e 50G1 supõe-se que o defeito na barra se desloque logo para a saída de um dos ramais dos cubículos. Novamente aqui adota-se a corrente total de defeito entre fases e à terra na barra de 13.8 KV. Os ajustes de tempo serão os menores possíveis para se eliminar esse defeitos.

Para essa condição adota-se a menor corrente de defeitos na barra de 13.8 KV. Do estudo de curto – circuito têm-se as seguintes correntes :

Defeitos 2F : 1704 A.
Defeitos 1F : 363 A(3Io).

Logo os ajustes das unidades 50P1 e 50G1 serão :

50P1 (Alimentadores C3,C9 e C10) = 1704(1500) / 40 = 37.5 A
50P1 (Alimentadores C4,C5,C6,C7,C8,C11 e C12)= 1704(1500) / 40 = 37.5 A
50G1 (Alimentadores C3 a C12) = 363(254 A) / 20 = 12.7 A

As funções 51P e 51G dos relés do transformador e da conexão da entrada deverão enxergar sempre que possível os defeitos nos ramais de 13.8 KV com uma temporização adequada. No item 1.1.4 são apresentadas as curvas de coordenação típica para os defeitos 3F e 1F tomando-se a barra de 13.8 kV como referência. Como partida das unidades 51P e 51G das proteções citadas tomam-se os valores de corrente nominais do Gerador TG01 acrescidos de 15 % e das correntes apresentadas na tabela 01 acima.

Unidade 51P do relé SEL 300 G :

$$I_p = \frac{18750 \text{ KVA}}{\sqrt{3} \times 13.8 \text{ KV}} \times 1.15 = 902.01 \text{ A}$$

Unidade 51G do relé SEL 300G :(Para Defeitos à Terra) :

Adota-se o valor de 10 % do valor obtido para os defeitos fase-fase.

Logo :

Ip (Defeitos à terra) = 90.01 A

Na tabela 02 a seguir são apresentados os valores de partida para os relés que deverão enxergar defeitos 3F e 1F no final dos alimentadores de 13.8 KV com a devida coordenação e tentando sempre que possível enxergar defeitos no setor de 480 V também. A menor contribuição ocorre para um defeito na barra C12.

Tabela 02 – Partidas e Relações para Defeitos nos cabos de 13.8 KV (Mais Longo)

	Partida Fase (A)	Partida à Terra(A)	Icc - Fase	Icc-Terra	M	M	TD-F	TD-T
Relé	Ip – C. Primária	Ip – C. Primária			Fase	Terra		
C1 – Entrada da Concessionária	722 A	72.2 A	1500 A	100 A	2.07	1.38	0.07	0.05
C03 - Moenda	96 A	9.6 A	1500 A	30 A	15.62	3.12	0.14	0.09
C4 - Caldeira	120 A	12 A	1500 A	30 A	12.5	2.5	0.13	0.06
C5 – Tratamento Caldo	72 A	7.2 A	1500 A	30 A	20.8	4.16	0.16	0.1
C7 - Destilaria	72 A	7.2 A	1500 A	30 A	20.8	4.16	0.16	0.1
C8 - Vinhaça	72 A	7.2 A	1500 A	30 A	20.8	4.16	0.16	0.1
C9 – Serviço Auxiliar	24 A	2.4 A	1500 A	30 A	62.5	12.5	0.22	0.37
C10 - Administrativo	21.65 A	2.16 A	1500 A	30 A	69.28	13.88	0.22	0.19
C11 – Torre de Resfriamento	96 A	9.6 A	1500 A	30 A	15.62	3.12	0.14	0.09
C12 – Ternos de Moenda	192 A	19.2 A	1500 A	30 A	7.81	1.56	0.05	0.03
C2 – Gerador 1	241 A	24.1 A	1500 A	30 A	6.22	1.24	0.25	0.4
C13 – Gerador 2	903 A	90.3 A	1500 A	100 A	1.66	1.1	0.25	0.4

Onde :

Icc – Corrente de Defeito Primário tirado do estudo de Curto – Circuito.

M – Relação entre Icc/Ip para uso nas fórmulas definidas em catálogo.

TD-F – Time dial dos relés mantendo um tempo de 80 ms para um defeito entre fases no final dos Cabos e um acréscimo de 40 ms para o relé do gerador.

TD- T – Time dial dos relés mantendo um tempo de 350 ms para um defeito à terra no final dos Cabos e um acréscimo de 200 ms para o relé do gerador.

Nota 2 : Do relatório tomado como referência(Memorial ROVEL) para o ajuste dos transformadores e do cabo de conexão em 13.8 kV têm-se :

Tabela 03 – Ajustes da Proteção de Sobrecorrente do Transformador

Proteção do Transformador	Unidade 51	Unidade 51 N	Unidade 50	Unidade 50 N
Lado da Baixa – 13.8 kV	51P2P = 5,0 51P2C = C1 51P2TD = 0,5	51P3P = 1,5 51P3C = C1 51P3TD = 0,5	50P21P = 8 50P21D = 0,3 s	50P31P = 3,8 50P31D = 0,3 s
Lado da Alta – 34.5 kV	51P1P = 5,0 51P1C = C1 51P1TD = 0,45	51N1P = 0,5 51N1C = C1 51N1TD = 0,05	50P11P = 15 50P11D = 0,3 s	50N11P = 2,5 50N11D = 0

Nas figuras 1 e 2 do item 1.1.4 são apresentados os coordenogramas para os defeitos 3F e 1F usando os valores apresentados nas tabelas 01, 02 e 03.

1.1.3 – Proteções dos Geradores TG01(5 MVA) e TG02(18.75 MVA).

Esse geradores estão conectados a barra 3 da figura 6. A seguir é apresentada a lista de funções de proteção a serem ajustadas.

- **Função 27 :** Enxergar defeitos 1F no sistema em forma de retaguarda.
- **Função 59 :** Enxergar degrau de Energia como retaguarda da proteção da conexão.
- **Função 51P :** Enxergar defeitos 3F/2F no setor de 13.8 KV da Usina na forma de retaguarda e coordenada com as demais proteções da mesma.
- **Função 50Q1 :** Enxergar defeitos 1F no setor de 13.8 KV da Usina e no setor de 34.5 kV na forma de retaguarda e coordenada com as demais proteções da mesma.
- **Função 46 :** Detectar defeitos de alta – impedância externos ao gerador.
- **Função 21 :** Enxergar defeitos entre fases no setor de 13.8/34.5 kV em forma de retaguarda das demais proteções do sistema.
- **Função 32 :** Motorização do gerador.
- **Função 40 :** Perda de Excitação do Gerador.
- **Função 87 :** Proteção Diferencial do Gerador.
- **Função 50/51 GN :** Falha à terra no Estator e retaguarda de falta à terra no setor de 13.8 KV.
- **Função 81 :** Enxergar degrau de Energia como retaguarda da proteção da conexão.

Gerador TG 01 :

RTC – Fase /Lado Gerador = 300 / 5A = 60/1.

RTC – Fase / Lado do Neutro = 300 / 5A = 60/1.

RTC-Neutro = 100/5 A = 20/1.

RTP = 13800/115 = 120/1.

- **Função 27 :**

Do estudo de curto – circuito têm-se a menor tensão para um defeito 1F com Rf = 30 Ω na barra 1 de 34.5 kV. A temporização deverá ser maior do que a zona 3 do relé de distância da linha para defeitos à terra.

V (alarme) = 7523 V ou 94 % de Un.

V (trip)- Defeitos 1F francos na barra 1 de 34.5 kV → 5791 V – Trip.

Undervoltage Alarm PickUp V < = 7523/120 = 62.7 V

Undevoltage Alarm Delay : **1,3 s.**

Undervoltage Trip PickUp : V<< = 5791/120 = 48.25 V

Undevoltage Trip Delay : **1,1 s.**

Nota 4 : As respectivas temporizações das funções 27 acima deverão ser implementadas via lógica adicional no relé.

● **Função 51N - 2 :**

Do estudo de curto – circuito têm-se a seguinte contribuição para os defeitos à terra na barra 12 de 13.8 kV :

Icc1F = 174 A(3Io) – A máxima corrente circulando no neutro do gerador é 400 A.

PickUP(51P-2) = 30 / 20 = 1.5 A
Time Dial - Ajuste de tempo(51N-2) = 0.08
Curva de Tempo IEC Normal Inverse – C1

A temporização aqui será coordenada com os gráficos apresentados no item 1.1.5

Função 50Q1P será ajustada para um valor de 81 A (I_2) para um defeito 1F na barra 12 com uma temporização de .

● **Função 46 :**

Essa função irá enxergar a menor contribuição para defeitos assimétricos no sistema na qual o gerador poderá contribuir. A respectiva temporização deverá se alta o suficiente para a posterior coordenação com as demais proteções. De todas as barras simuladas no estudo de curto-circuito a menor contribuição de seqüência negativa se dá para um defeito 1F(Rf= 30 Ω) na barra 1 de 34.5 kV e na barra 12 de 13.8 kV interna na Usina com um deflator de 30 %.

PickUP (I_2 Nivel 1) = 148 A. ou 62 % de In.
A temporização será maior de que a zona 3 do relé de distância da linha.

● **Função 32 :**

Esta função deverá enxergar a motorização do gerador em caso de perda de sua máquina motriz. Para geradores desse porte e tipo, a Norma IEEE C37.102 – 1987 indica que para turbinas a vapor se use uma faixa de 0,5 a 3,0 % da potência nominal da máquina. Para um ajuste típico de 2 % (alarme) e 5 % (trip) adotam-se os seguintes parâmetros:

Fator de potência = 0,8
P = 0,8 x 5000 kVA = 4000 kW
Ajuste de Alarme = 0,02 x 4000 = 0,08 MW
Ajuste de Trip = 0,05 x 4000 = 0,2 MW

Logo o ajuste será:

Reverse Power Alarm Level → **0,02 x Rated MW**
Reverse Power Alarm Delay → **3,0 s**
Reverse Power Trip Level → **0,05 x Rated MW**
Reverse Power Trip Delay → **1,5 s**

● Função 40 :

Esses ajustes estão apresentados na tabela.

● Função 87 :

Os ajustes dessa função estão apresentados na tabela.

● **Função 50 GN :**

Para a função 50GN enxergar um defeito interno no gerador toma-se um defeito à terra na barra 3 do estudo de curto-circuito.

Ground Overcurrent Trip PickUp/Unidade 1 : 198 A(3Io) /20 = 9.9 A
Curve Shape : Definite Time
Overcurrent Curve Multiplier : 10 ciclos ou 180 ms.

Ground Overcurrent Trip PickUp/Unidade 2 : 40 A(3Io) /20 = 2 A
Curve Shape : Definite Time
Overcurrent Curve Multiplier : 20 ciclos ou 360 ms.

Na condição de alarme adota-se o valor de 70% do valor acima com uma temporização de 0.65s.

●● **Defeitos entre Fases na Barra de 13.8 KV da UTE Iacanga :**

Para esse tipo de defeito vamos ajustar a unidade 1 da função 50P do gerador e a unidade 2 para enxergar um defeito na barra de 34.5 kV em forma de retaguarda das demais proteções.

Unidade 1 :
Idefeito(2F) = 1956 A.
Ajuste (50P) = 1956 / 60 = 32.6 A
Ajuste de Tempo = 450 ms.
Unidade 2 :
Idefeito(2F) = 1512 A.
Ajuste (50P) = 1512 / 60 = 25.2 A
Ajuste de Tempo = 550 ms.

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● **Função 21 :**

Esta função deverá enxergar defeitos entre fases em forma de retaguarda :

1 – Zona : Enxergar até a barra de entrada da CPFL em 13.8 kV :
(Cabo entre as barras 2 → 3)

R1 + jX1 = (0.0185 + j0.0195) Ω x 60 / 120 = (0.00925 + j.0.00975)Ω/secundários
Timer = 0.25 s

2 – Zona : Enxergar até a barra de alta do transformador de 34.5/13.8 kV:
(Cabo e transformador entre as barras 1 →2 → 3)

R1+jX1=(0.0185+j0.0195+j1.016) Ω x 60 / 120 =(0.00925+j0.517)Ω/secundários
Timer = 0.35 s

Obs : Será usado o off-set igual a impedância do gerador para servir de back-up para a proteção diferencial do mesmo.

Temporizações a serem ajustadas via lógica no relé SEL – 300 G:

59PP1D = 1s
59PP2D = 0.8 s
27PP1D = 1.3 s
27PP2D = 1.1 s
59QP = 1s
59G1P = 1s

Gerador TG 02 :

RTC – Fase /Lado Gerador = 800 / 5A = 160/1.

RTC – Fase / Lado do Neutro = 800 / 5A = 160/1.

RTC-Neutro = 100/5 A = 20/1.

RTP = 13800/115 = 120/1.

- **Função 27 :**

Do estudo de curto – circuito têm-se a menor tensão para um defeito 1F com Rf = 30 Ω na barra 1 de 34.5 kV. A temporização deverá ser maior do que a zona 3 do relé de distância da linha para defeitos à terra.

V (alarme) = 7523 V ou 94 % de Un.

V (trip)- Defeitos 1F francos na barra 1 de 34.5 kV → 5791 V – Trip.

Undervoltage Alarm PickUp V < = 7523/120 = 62.7 V

Undevoltage Alarm Delay : **1,3 s.**

Undervoltage Trip PickUp : V<< = 5791/120 = 48.25 V

Undevoltage Trip Delay : **1,1 s.**

Nota 4 : As respectivas temporizações das funções 27 acima deverão ser implementadas via lógica adicional no relé.

● **Função 51N - 2 :**

Do estudo de curto – circuito têm-se a seguinte contribuição para os defeitos à terra na barra 12 de 13.8 kV :

Icc1F = 174 A(3Io) – A máxima corrente circulando no neutro do gerador é 400 A.

PickUP(51P-2) = 30 / 20 = 1.5 A
Time Dial - Ajuste de tempo(51N-2) = 0.28
Curva de Tempo IEC Normal Inverse – C1

A temporização aqui será coordenada com os gráficos apresentados no item 1.1.5

Função 50Q1P será ajustada para um valor de 81 A (I_2) para um defeito 1F na barra 12 com uma temporização indicada na tabela de ajustes.

● **Função 46 :**

Essa função irá enxergar a menor contribuição para defeitos assimétricos no sistema na qual o gerador poderá contribuir. A respectiva temporização deverá se alta o suficiente para a posterior coordenação com as demais proteções. De todas as barras simuladas no estudo de curto-circuito a menor contribuição de seqüência negativa se dá para um defeito 1F(Rf= 30 Ω) na barra 1 de 34.5 kV e na barra 12 de 13.8 kV interna na Usina com um deflator de 30 %.

PickUP (I_2 Nivel 1) = 148 A. ou 62 % de In.
A temporização será maior de que a zona 3 do relé de distância da linha.

● **Função 32 :**

Esta função deverá enxergar a motorização do gerador em caso de perda de sua máquina motriz. Para geradores desse porte e tipo, a Norma IEEE C37.102 – 1987 indica que para turbinas a vapor se use uma faixa de 0,5 a 3,0 % da potência nominal da máquina. Para um ajuste típico de 2 % (alarme) e 5 % (trip) adotam-se os seguintes parâmetros:

Fator de potência = 0,8
P = 0,8 x 18750 kVA = 15000 kW
Ajuste de Alarme = 0,02 x 15000 = 0,3 MW
Ajuste de Trip = 0,05 x 15000 = 0,75 MW

Logo o ajuste será:

Reverse Power Alarm Level → **0,02 x Rated MW**
Reverse Power Alarm Delay → **3,0 s**
Reverse Power Trip Level → **0,05 x Rated MW**
Reverse Power Trip Delay → **1,5 s**

● Função 40 :

Esses ajustes estão apresentados na tabela.

● Função 87 :

Os ajustes dessa função estão apresentados na tabela.

● **Função 50 GN :**

Para a função 50GN enxergar um defeito interno no gerador toma-se um defeito à terra na barra 3 do estudo de curto-circuito.

Ground Overcurrent Trip PickUp/Unidade 1 : 198 A(3Io) /20 = 9.9 A
Curve Shape : Definite Time
Overcurrent Curve Multiplier : 10 ciclos ou 180 ms.

Ground Overcurrent Trip PickUp/Unidade 2 : 40 A(3Io) /20 = 2 A
Curve Shape : Definite Time
Overcurrent Curve Multiplier : 20 ciclos ou 360 ms.

Na condição de alarme adota-se o valor de 70% do valor acima com uma temporização de 0.65s.

●● **Defeitos entre Fases(2F) na Barra de 13.8 KV da UTE Iacanga :**

Para esse tipo de defeito vamos ajustar a unidade 1 da função 50P do gerador e a unidade 2 para enxergar um defeito na barra de 34.5 kV em forma de retaguarda das demais proteções.

Unidade 1 :
Idefeito(2F) = 3273 A.
Ajuste (50P1P) = 3273 / 160 = 20.45 A
Ajuste de Tempo = 450 ms.
Unidade 2 :
Idefeito(2F) = 1512 A.
Ajuste (50P2P) = 1512 / 160 = 9.45 A
Ajuste de Tempo = 550 ms.

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● **Função 21 :**

Esta função deverá enxergar defeitos entre fases em forma de retaguarda :

1 – Zona : Enxergar até a barra de entrada da CPFL em 13.8 kV :
(Cabo entre as barras 2 → 3)

R1 + jX1 = (0.0185 + j0.0195) Ω x 160 / 120 = (0.0246 + j0.026)Ω/secundários
Timer = 0.25 s

2 – Zona : Enxergar até a barra de alta do transformador de 34.5/13.8 kV:
(Cabo e transformador entre as barras 1 →2 → 3)

R1+jX1=(0.0185+j0.0195+j1.016) Ω x 160 / 120 =(0.0246+j1.35)Ω/secundários
Timer = 0.35 s

Obs : Será usado o off-set igual a impedância do gerador para servir de back-up para a proteção diferencial do mesmo.

Temporizações a serem ajustadas via lógica no relé :

59PP1D = 1s
59PP2D = 0.8 s
27PP1D = 1.3 s
27PP2D = 1.1 s
59QP = 1s
59G1P = 1s

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1.1.4– Relés SEL 351 - Proteção da Conexão – Cubículos C1.

● Cubículo C1 (Entrada da Usina).

Função 81 : Proteção contra degrau de energia(Exportação de 12 MW)(Figuras 3 e 4).

Função 27 : Proteção de Retaguarda do sistema para um defeito na barra de 34.5 kV com Rf = 30 Ω.

Função 67/67_2 : Proteção de Retaguarda para defeitos na CPFL com uma temporização igual ou maior do que a zona 3 do relé de distância da linha de entrada(34.5 kV)(Rf = 30 Ω).

Função 59N : Enxergar defeitos 1F na CPFL após a abertura do seu terminal.

Função 50/51 P : Enxergar defeitos entre fases em forma de retaguarda dos cabos de 13.8 kV.

Função 50/51 N : Enxergar defeitos à terra em forma de retaguarda dos cabos de 13.8 kV.

1.1.5 - Curvas de Ajustes.

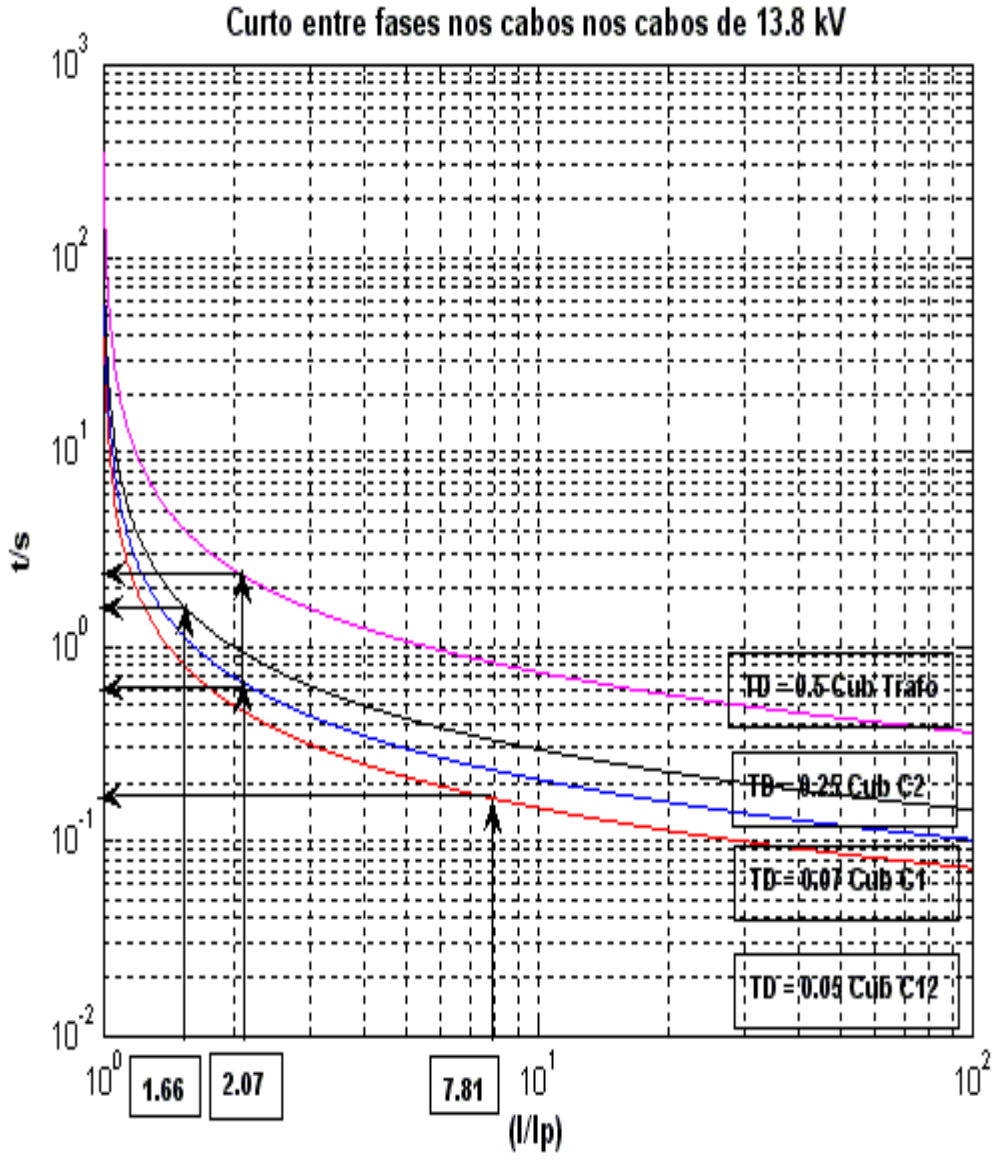

Figura 1 – Defeitos entre Fases nos Cabos de 13.8 kV

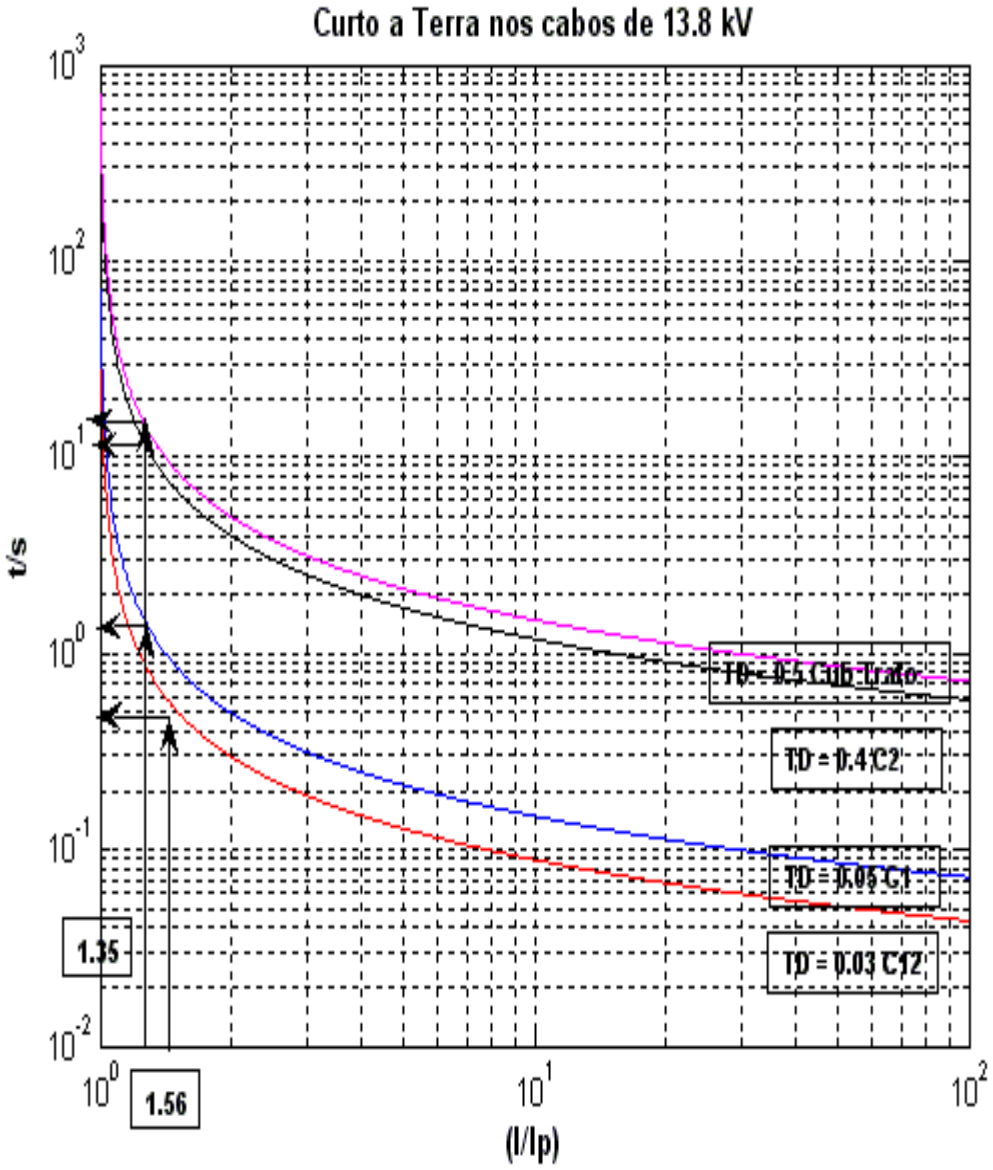

Figura 2 – Defeitos a terra nos Cabos de 13.8 kV

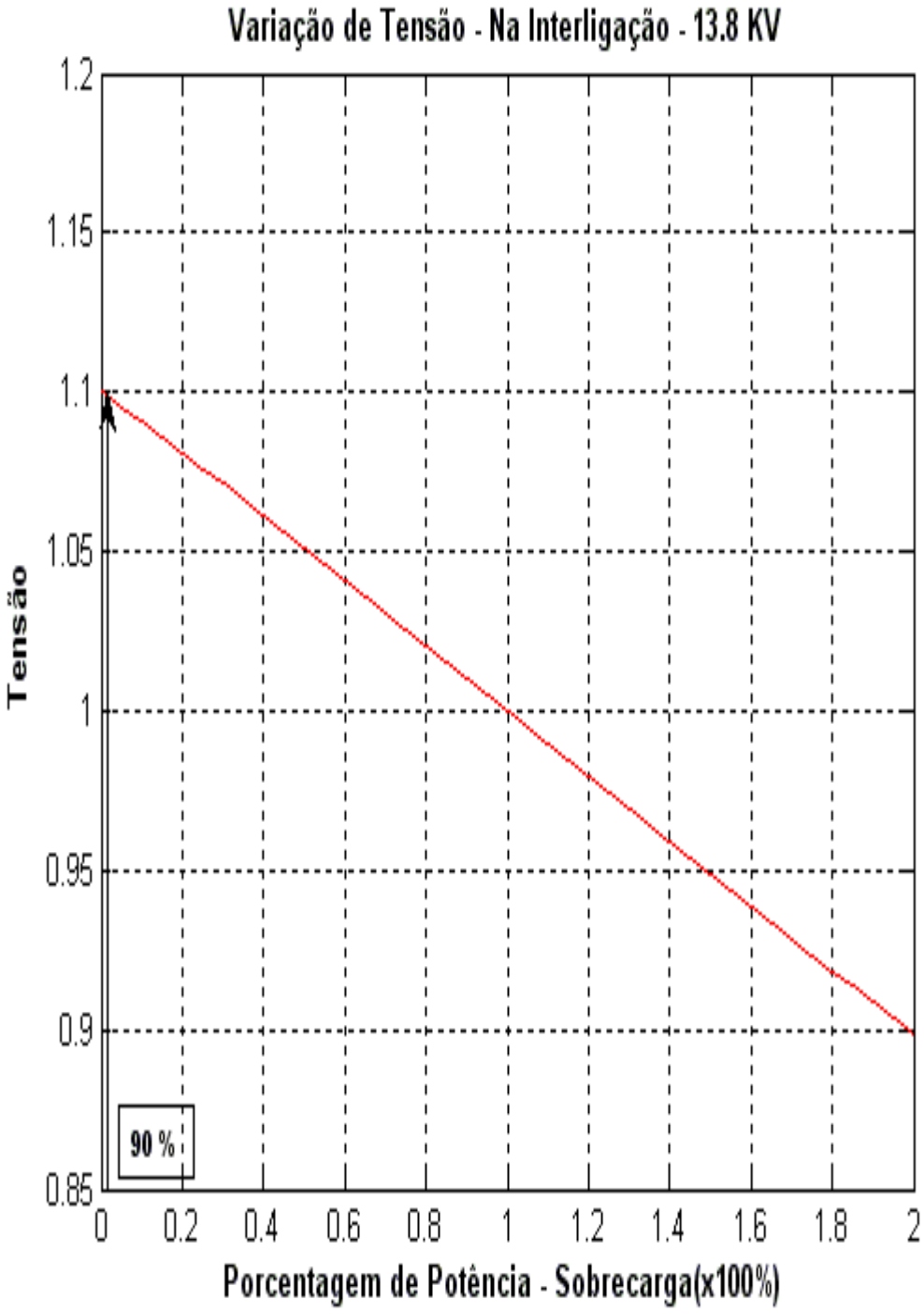

Figura 3 – Variação da Tensão na Interligação

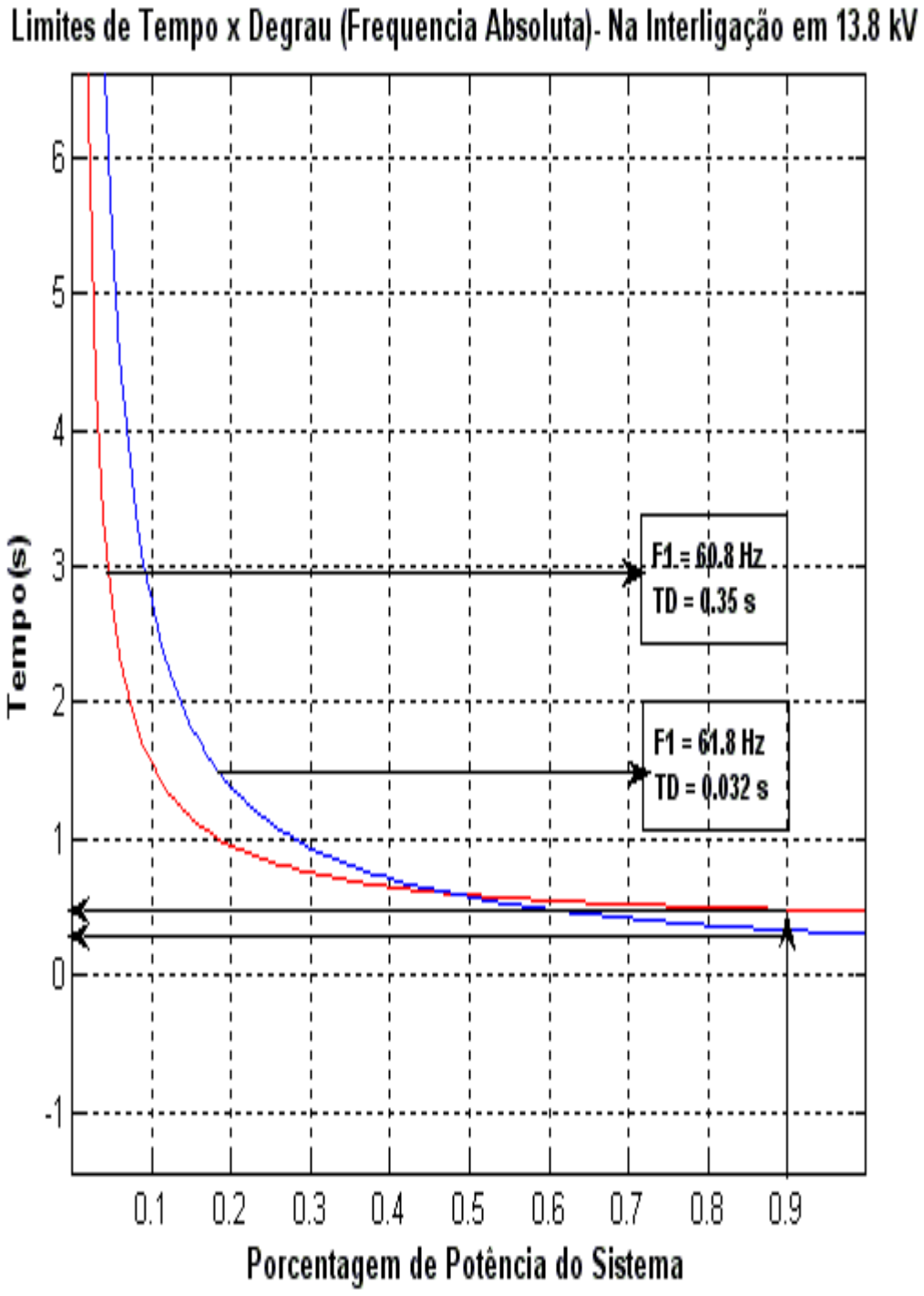

Figura 4 – Variação da frequencia na Interligação

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1.1.6 – Tabelas de Ajustes .

Ajustes dos relés SEL 351 A – Cubículos de 13.8 kV – Tabela 1

SEL - 351	TC		Unidade 51P			Unidade 51G			Unidade 50P1		Unidade 50G1	
	FA	G										
Cub.			PU	CT	TD	PU	CT	TD	I>	TD	Ie>	TD
C1	200/1	20/1	3.61 A	C1	0.25	3.61 A	C1	0.4	7.5 A	10 ciclos	12.7 A	15 ciclos
C3	40/1	20/1	2.4 A	C1	0.14	0.5 A	C1	0.09	37.5 A	1 ciclos	12.7 A	2 ciclos
C4	40/1	20/1	3,0 A	C1	0.13	0.6 A	C1	0.06	37.5 A	1 ciclos	12.7 A	2 ciclos
C5	40/1	20/1	1.8 A	C1	0.16	0.50 A	C1	0.1	37.5 A	1 ciclos	12.7 A	2 ciclos
C7	40/1	20/1	1.8 A	C1	0.16	0.50 A	C1	0.1	37.5 A	1 ciclos	12.7 A	2 ciclos
C8	40/1	20/1	1.8 A	C1	0.16	0.50 A	C1	0.1	37.5 A	1 ciclos	12.7 A	2 ciclos
C9	40/1	20/1	0.6 A	C1	0.22	0,50 A	C1	0.37	37.5 A	1 ciclos	12.7 A	2 ciclos
C10	40/1	20/1	0.54 A	C1	0.22	0,50 A	C1	0.19	37.5 A	1 ciclos	12.7 A	2 ciclos
C11	40/1	20/1	2.4 A	C1	0.14	0,50 A	C1	0.09	37.5 A	1 ciclos	12.7 A	2 ciclos
C12	40/1	20/1	4.8 A	C1	0.05	4.51 A	C1	0.03	37.5 A	1 ciclos	12.7 A	2 ciclos

Unidade 50Q1P – Relés dos cubículos de 13.8 kV

SEL - 351	TC		
	FA		
Cub.		PU	TD
C03 - Moenda	40/1	1.75 A	30 ciclos
C4 - Caldeira	40/1	1.75 A	30 ciclos
C5 – Tratamento Caldo	40/1	1.75 A	30 ciclos
C7 - Destilaria	40/1	1.75 A	30 ciclos
C8 - Vinhaça	40/1	1.75 A	30 ciclos
C9 – Serviço Auxiliar	40/1	1.75 A	30 ciclos
C10 - Administrativo	40/1	1.75 A	30 ciclos
C11 – Torre de Resfriamento	40/1	1.75 A	30 ciclos
C12 – Ternos de Moenda	40/1	1.75 A	30 ciclos

Direção Forward → Sentido Concessionária .
Direção Backward → Sentido Usina.

SEL – 351A		
Proteção da Conexão em 13.8 kV(Cubículo C1) - Usina		
Unidade	**Simbolo**	**Valor**
Phase Undervoltage Block	**27B81P**	**70 V**
Level 1 Pick - UP	**81D1P**	**62 Hz**
Level 1 Time Delay	**81D1D**	**60 cycles**
Level 2 Pick - UP	**81D2P**	**61 Hz**
Level 2 Time Delay	**81D2D**	**120 cycles**
Level 3 Pick - UP	**81D3P**	**59 Hz**
Level 3 Time Delay	**81D3D**	**120 cycles**
Level 4 Pick - UP	**81D4P**	**58 Hz**
Level 4 Time Delay	**81D4D**	**60 cycles**
Level 1 Pick - UP	**59P1P**	**127 V**
Level 1 Time Delay	**59PID**	**20 cycles**
Level 2 Pick - UP	**59P2P**	**120 V**
Level 2 Time Delay	**59P2D**	**25 cycles**
Level 1 Pick - UP	**27P1P**	**98 V**
Level 1 Time Delay	**27PID**	**80 cycles**
Phase Inst.Overc – L1	**50P1P**	**8.73 A + Dir 1(Forward)**
Phase Inst.Overc – Timer	**67P1D**	**65 ciclos**
Phase Inst.Overc – L2	**50P2P**	**11.48 A + Dir 2(Forward)**
Phase Inst.Overc – Timer	**67P2D**	**35 ciclos**
Phase Inst.Overc – L3	**50P3P**	**13 A + Dir 2(Backward)**
Phase Inst.Overc – Timer	**67P3D**	**14 ciclos**
Phase Inst.Overc – L3	**50P4P**	**15 A + Dir 2(Forward)**
Phase Inst.Overc – Timer	**67P4D**	**06 ciclos**
Negative Seq. Inst-L1	**50Q1P**	**1.23 A + Dir1(Forward)**
Negative Seq. (Timer)	**67Q1D**	**65 ciclos**
Negative Seq. Inst-L2	**50Q2P**	**1.41 A + Dir2(Backward)**
Negative Seq. (Timer)	**67Q2D**	**45 ciclos**
Voltage Elements(3Vo)	**59N1P**	**160 V**
Voltage Elem -(Timer)	**Nota 3**	**24 ciclos**
Neutral Inst.Overc – L1	**50G1N**	**8.7 A**
Neutral.Overc – Timer	**67G1ND**	**50 ciclos**
Neutral Inst.Overc – L2	**50G2N**	**15 A**
Neutral.Overc – Timer	**67G2ND**	**40 ciclos**
Phase Time Overc – L1	**51P1P**	**3.61 A**
IEC Curve	**-**	**C1**
Phase Inst.Overc – Timer	**67P2P**	**0.25 s**
NeutralTime Overc – L1	**51P1N**	**3.61 A**
IEC Curve	**-**	**C1**
Phase Inst.Overc – Timer	**67P2N**	**0.4 s**

Nota 3 : As respectivas temporizações das funções 27, 59N1P e 59P deverão ser implementadas via lógica adicional no relé.

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SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Identifier Labels

Relay Identifier (39 characters)	RID =	Proteção do Gerador TG01
Terminal Identifier (59 characters)	TID =	Painel C2

Current and Potential Transformer Configuration

Phase (IA, IB, IC) Current Transformer Ratio (1–10000 {5 A model}; 1–50000 {1 A model})	CTR =	60
Differential (IA87, IB87, IC87) Current Transformer Ratio (1–10000 {5 A model}; 1–50000 {1 A model}) (hidden if relay is not equipped with differential current inputs)	CTRD =	60
Neutral (IN) Current Transformer Ratio (1–10000)	CTRN =	20
Phase (VA, VB, VC) Potential Transformer Ratio (1.00–10000.00)	PTR =	120
Neutral (VN) Potential Transformer Ratio (1.00–10000.00)	PTRN =	-
Synch Voltage (VS) Potential Transformer Ratio (1.00–10000.00) (hidden if relay is not equipped with synch-check function)	PTRS =	120
Nominal Voltage (80.0–140.0 V {DELTA_Y = D}; 80.0–208.0 V {DELTA_Y = Y} line-to-line)	VNOM =	115 V
Nominal Current (1.0–10.0 A {5 A model}; 0.2–2.0 A {1 A model})	INOM =	3.48 A
Phase Rotation (ABC, ACB)	PHROT =	ABC

Protection Element Enables

Enable Backup System Protection (N, D, DC, V, C {firmware R320 and higher}; N, D, V, C {firmware < R320})	EBUP =	N
Enable Load Encroachment (Y, N) [Applies to firmware R320 and higher] (hidden when EBUP = N, V, or C)	ELE =	N
Enable Volts/Hertz Protection (Y, N)	E24 =	N
Enable Synchronism Checking (Y, N) [Model 300G2, 300G3]	E25 =	Y
Enable Undervoltage (U/V) Protection (Y, N)	E27 =	Y
Enable Reverse/Low-Forward Power Protection (Y, N)	E32 =	Y
Enable Loss-of-Field Protection (Y, N)	E40 =	Y
Enable Negative-Sequence Overcurrent (O/C) Protection (Y, N)	E46 =	Y
Enable O/C Protection (Y, N)	E50 =	Y
Enable 87-Input O/C Protection (Y, N) [Model 300G1, 300G3]	E50_87 =	Y
Enable Time-O/C Protection (Y, N)	E51 =	Y
Enable Overvoltage (O/V) Protection (Y, N)	E59 =	Y
Enable 100% Stator Ground Protection (Y, N)	E64 =	Y
Enable Out-of-Step Protection (1B, 2B, N)	E78 =	N
Enable Frequency Protection (N, 1–6)	E81 =	Y
Enable Abnormal Frequency Scheme (N, 1–6)	E81AC =	N
Enable Differential Protection (G, T, N) [Model 300G1, 300G3]	E87 =	G
Enable Ground Differential Protection (Y, N) [Model 300G0, 300G2]	E87N =	N
Enable SELOGIC® Control Equation Variables (0–16)	ESV =	

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Enable Set/Reset Latch Variables (0–16) ESL = _____

Enable Demand Metering (THM, ROL) EDEM = _____

21 MHO Elements (hidden when EBUP ≠ D)

Zone 1 Phase Distance Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z1R = 0.1

Zone 1 Phase Distance Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z1R = OFF) Z1O = 3.17

Zone 1 Maximum Torque Angle (90–45 degrees)
(hidden when Z1R = OFF) MTA1 = 50

Zone 1 Transformer Compensation (0, –30, 30 degrees)
(hidden when Z1R = OFF) Z1CMP = OFF

Zone 1 Phase Distance Time Delay (0.00 to 400.00 seconds)
(hidden when Z1R = OFF) Z1D = 0.25

Zone 2 Phase Distance Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z2R = 0.517

Zone 2 Phase Distance Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z2R = OFF) Z2O = 3.17

Zone 2 Maximum Torque Angle (90–45 degrees)
(hidden when Z2R = OFF) MTA2 = 88

Zone 2 Transformer Compensation (0, –30, 30 degrees)
(hidden when Z2R = OFF) Z2CMP = 30

Zone 2 Phase Distance Time-Delay (0.00 to 400.00 seconds)
(hidden when Z2R = OFF) Z2D = 0.35

Minimum Power Factor (OFF, 0.98–0.50) [Applies to firmware < R320] MPF = OFF

Maximum Generator Load (0.5–3.0 per unit) [Applies to firmware < R320]
(hidden when MPF = OFF) MXLD = OFF

21P Element Torque Control (SELOGIC control equation)

21PTC = _____

21 Compensator Elements (hidden when EBUP ≠ DC) [Requires firmware R320 or higher]

Zone 1 Compensator Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z1C = _____

Zone 1 Compensator Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z1C = OFF) Z1CO = _____

Zone 1 Compensator Time Delay (0.00 to 400.00 seconds)
(hidden when Z1C = OFF) Z1CD = _____

Zone 1 Phase-Phase Current FD (0.5–170.0 A)
(hidden when Z1C = OFF) 50PP1 = _____

Zone 1 Pos-Seq Impedance Angle (90–45 degrees)
(hidden when Z1C = OFF) ZANG1 = _____

Zone 2 Compensator Reach _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z2C = _____

Zone 2 Compensator Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z2C = OFF) Z2CO = _____

Zone 2 Compensator Time Delay (0.00 to 400.00 seconds)
(hidden when Z2C = OFF) Z2CD = _____

Zone 2 Phase-Phase Current FD (0.5–170.0 A)
(hidden when Z2C = OFF) 50PP2 = _____

Zone 2 Pos-Seq Impedance Angle (90–45 degrees)
(hidden when Z2C = OFF) ZANG2 = _____

21C Element Torque Control (SELOGIC control equation)
21CTC = _____

Load Encroachment (hidden when ELE = N) [Applies to firmware R320 and higher]

Minimum Power Factor (OFF, 0.98–0.50) MPF = _____

Maximum Generator Load (0.5–3.0 per unit)
(hidden when MPF = OFF) MXLD = _____

24 Elements (hidden when E24 = N)

Level 1 Volts/Hertz Pickup (100–200%) 24D1P = _____

Level 1 Time Delay (0.00–400.00 s) 24D1D = _____

Level 2 Composite Curve Shape (OFF, DD, ID, I) 24CCS = _____

Level 2 Inverse-Time Pickup (100–200%)
(hidden when 24CCS = OFF, DD) 24IP = _____

Level 2 Inverse-Time Curve (0.5, 1, 2)
(hidden when 24CCS = OFF, DD) 24IC = _____

Level 2 Inverse-Time Factor (0.1–10.0 s)
(hidden when 24CCS = OFF, DD) 24ITD = _____

Level 2 Pickup One (100–200%)
(hidden when 24CCS = OFF, ID, I) 24D2P1 = _____

Level 2 Time-Delay One (0.00–400.00 s)
(hidden when 24CCS = OFF, ID, I) 24D2D1 = _____

Level 2 Pickup Two (101–200%)
(hidden when 24CCS = OFF, I) 24D2P2 = _____

Level 2 Time-Delay Two (0.00–400.00 s)
(hidden when 24CCS = OFF, I) 24D2D2 = _____

Level 2 Reset Time (0.00–400.00 s) (hidden when 24CCS = OFF) 24CR = _____

24 Element Torque Control (SELOGIC control equation)
24TC = _____

25 Elements for Model 300G2, 300G3 (hidden when E25 = N)

Synch-Check Phase (VA, VB, VC, VAB, VBC) SYNCP = **VAB**

Voltage Window, Low Threshold (20.0–200.0 V) 25VLO = **103.5**

Voltage Window, High Threshold (20.0–200.0 V) 25VHI = **126.5**

Maximum Voltage Difference (OFF, 1.0–15.0%) 25VDIF = **5%**

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Voltage Ratio Correction Factor (0.500–2.000)	25RCF =	0.5
Generator Voltage High Required (Y, N) (hidden when 25VDIF = OFF)	GENV+ =	N
Minimum Slip Frequency (–1.00 to 0.99 Hz)	25SLO =	- 0.1
Maximum Slip Frequency (–0.99 to 1.00 Hz)	25SHI =	0.1
Transformer Compensation Angle (0, 30, –30 degrees)	COMPA =	0
Maximum Angle 1 (0–80 degrees)	25ANG1 =	5
Maximum Angle 2 (0–80 degrees)	25ANG2 =	0
Target Close Angle (–15 to 15 degrees)	CANGLE =	10
Breaker Close Time (0.000 to 1.000 s)	TCLOSD =	0.08
Close Fail Angle (OFF, 3–120 degrees)	CFANGL =	OFF
Dead-Bus Undervoltage (OFF, 0.1–200.0 V)	27VSP =	OFF
Block Synch-Check (SELOGIC control equation)		
BSYNCH =		
27 Elements (hidden when E27 = N)		
Level 1 Phase U/V Pickup (OFF, 0.1–200.0 V) (hidden when DELTA_Y = D)	27P1P =	
Level 2 Phase U/V Pickup (OFF, 0.1–200.0 V) (hidden when DELTA_Y = D)	27P2P =	
Positive-Sequence U/V Pickup (OFF, 0.1–200.0 V)	27V1P =	
Level 1 Phase-to-Phase U/V Pickup (OFF, 0.1–200.0 V)	27PP1 =	62.7 V
Level 2 Phase-to-Phase U/V Pickup (OFF, 0.1–200.0 V)	27PP2 =	48.25 V
32 Elements (hidden when E32 = N)		
Level 1 Power Threshold (±0.0015 to ±3.0000 pu)	32P1P =	- 0.02
Level 1 Power Time Delay (0.01–400.00 s)	32P1D =	3 s
Level 2 Power Threshold (OFF, ±0.0015 to ±3.0000 pu)	32P2P =	- 0.05
Level 2 Power Time Delay (0.01–400.00 s) (hidden when 32P2P = OFF)	32P2D =	1.5 s
32 Element Torque Control (SELOGIC control equation)		
32PTC =		OFF
40 Elements (hidden when E40 = N)		
Zone 1 Mho Diameter (OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model})		31.26
Zone 1 Offset Reactance (-50.0–0.0 Ohms {5 A model}; –250.0–0.0 Ohms {1 A model})	40XD1 =	1.58
Zone 1 Pickup Time Delay (0.00–400.00 s)	40Z1D =	0.25
Zone 2 Mho Diameter (OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model})	40Z2P =	34.29
Zone 2 Offset Reactance (–50.0–50.0 Ohms {5 A model}; –250.0–250.0 Ohms {1 A model} (hidden when 40Z2P = OFF)	40XD2 =	2.9
Zone 2 Pickup Time Delay (0.00–400.00 s) (hidden when 40Z2P = OFF)	40Z2D =	1

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Zone 2 Directional Superv. Angle (–20.0°–0.0°) (hidden when 40Z2P = OFF or 40XD2 < 0) 40DIR = **-40**

40 Element Torque Control (SELOGIC control equation)

40ZTC =

46 Elements (hidden when E46 = N)

Level 1 Negative-Sequence O/C Pickup (OFF, 2–100%) 46Q1P = **62 %**

Level 1 Negative-Sequence O/C Time Delay (0.02–999.90 s)
(hidden when 46Q1P = OFF) 46Q1D = **1.3 s**

Level 2 Negative-Sequence Time-O/C Pickup (OFF, 2–100%) 46Q2P = **OFF**

Level 2 Negative-Sequence Time-O/C Time Dial (1–100 s)
(hidden when 46Q2P = OFF) 46Q2K = **OFF**

46Q Element Torque Control (SELOGIC control equation)

46QTC = **OFF**

50 Elements (hidden when E50 = N)

Level 1 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50P1P = **32.6 A**

Level 1 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50P1P = OFF) 50P1D = **0.45 s**

Level 2 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50P2P = **17.63 A**

Level 2 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50P2P = OFF) 50P2D = **0.55 s**

Level 1 Neutral O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50N1P = **9.9 A**

Level 1 Neutral O/C Time Delay (0.00–400.00 s)
(hidden when 50N1P = OFF) 50N1D = **0.18 s**

Level 2 Neutral O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50N2P = **2 A**

Level 2 Neutral O/C Time Delay (0.00–400.00 s)
(hidden when 50N2P = OFF) 50N2D = **0.36 s**

Level 1 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50G1P = **5.94 A**

Level 1 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50G1P = OFF) 50G1D = **0.65 s**

Level 2 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50G2P =

Level 2 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50G2P = OFF) 50G2D =

50_87 Elements for Models 300G1 and 300G3 (hidden when E50_87 = N)

Level 1 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50H1P =

Level 1 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50H1P = OFF) 50H1D =

Level 2 A-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50H2PA =

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Level 2 B-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model})
(hidden when 50H2PA = OFF) 50H2PB = _____

Level 2 C-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model})
(hidden when 50H2PA = OFF) 50H2PC = _____

Level 2 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50H2PA = OFF) 50H2D = _____

Level 1 Negative-Sequence O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50Q1P = _____

Level 1 Negative-Sequence O/C Time Delay (0.00–400.00 s)
(hidden when 50Q1P = OFF) 50Q1D = _____

Level 2 Negative-Sequence O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50Q2P = _____

Level 2 Negative-Sequence O/C Time Delay (0.00–400.00 s)
(hidden when 50Q2P = OFF) 50Q2D = _____

Level 1 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50R1P = _____

Level 1 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50R1P = OFF) 50R1D = _____

Level 2 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50R2P = _____

Level 2 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50R2P = OFF) 50R2D = _____

51N Element (hidden when E51 = N)

Neutral Time-O/C Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) 51NP = **1.5 A**

Neutral Time-O/C Curve (U1–U5, C1–C5)
(hidden when 51NP = OFF) 51NC = **C1**

Neutral Time-O/C Time Dial (0.50–15.00, U curves; 0.05–1.00, C curves)
(hidden when 51NP = OFF) 51NTD = **0.08**

Neutral Time-O/C EM Reset (Y, N)
(hidden when 51NP = OFF) 51NRS = **OFF**

51N Element Torque Control (SELOGIC control equation)
(hidden when 51NP = OFF) **OFF**

51NTC = _____

51G Element (hidden when E51 = N)

Residual Time-O/C Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) 51GP = _____

Residual Time-O/C Curve (U1–U5, C1–C5)
(hidden when 51GP = OFF) 51GC = _____

Residual Time-O/C Time Dial (0.50–15.00, U curves; 0.05–1.00, C curves)
(hidden when 51GP = OFF) 51GTD = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Residual Time-O/C EM Reset (Y, N)
(hidden when 51GP = OFF) 51GRS = _____

51G Element Torque Control (SELOGIC control equation) (hidden when 51GP = OFF)
51GTC = _____

51C Element (hidden when EBUP ≠ C)

Volt Controlled Time-O/C Pickup
(0.50–16.00 A {5 A model}; 0.10–3.20 A {1 A model}) 51CP = _____

Volt Controlled Time-O/C Curve (U1–U5, C1–C5) 51CC = _____

Volt Controlled Time-O/C Time Dial
(0.50–15.00, U curves; 0.05–1.00, C curves) 51CTD = _____

Volt Controlled Time-O/C EM Reset (Y, N) 51CRS = _____

51C Element Torque Control (SELOGIC control equation)
51CTC = _____

51V Element (hidden when EBUP ≠ V)

Compensation Angle (0, –30, +30 deg) 51VCA = _____

Volt Restrained Time-O/C Pickup
(2.00–16.00 A {5 A model}; 0.40–3.20 A {1 A model}) 51VP = _____

Volt Restrained Time-O/C Curve (U1–U5, C1–C5) 51VC = _____

Volt Restrained Time-O/C Time Dial
(0.50–15.00, U curves; 0.05–1.00, C curves) 51VTD = _____

Volt Restrained Time-O/C EM Reset (Y, N) 51VRS = _____

51V Element Torque Control (SELOGIC control equation)
51VTC = _____

Open Pole Element

Three-Pole Open Time Delay (0.00–1.00 s) 3POD = _____

Load Detection Phase Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50LP = _____

Generator Breaker Auxiliary (SELOGIC control equation)
52A = _____

59 Elements (hidden when E59 = N)

Level 1 Phase O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59P1P = _____

Level 2 Phase O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59P2P = _____

Level 1 Residual O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59G1P = **72.65 V**

Level 2 Residual O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59G2P = _____

Negative-Sequence (V2) O/V Pickup (OFF, 0.0–200.0 V) 59QP = **1.65 V**

Positive-Sequence (V1) O/V Pickup (OFF, 0.0–200.0 V) 59V1P = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Level 1 Phase-to-Phase O/V Pickup
(OFF, 0.0–200.0 V {DELTA_Y = D};
OFF, 0.0–300.0 V {DELTA_Y = Y} line-to-line) 59PP1 = 127

Level 2 Phase-to-Phase O/V Pickup
(OFF, 0.0–200.0 V {DELTA_Y = D};
OFF, 0.0–300.0 V {DELTA_Y = Y} line-to-line) 59PP2 = 124

64G Elements (hidden when E64 = N)

Zone 1 Neutral O/V Pickup (OFF, 0.1–150.0 V) 64G1P = _____

Zone 1 Time Delay (0.00–400.00 s) (hidden when 64G1P = OFF) 64G1D = _____

Zone 2 Differential Voltage (OFF, 0.1–20.0 V) 64G2P = _____

Zone 2 Ratio Setting (0.0–5.0) (hidden when 64G2P = OFF or when DELTA_Y = D) 64RAT = _____

Zone 2 Time Delay (0.00–400.00 s) (hidden when 64G2P = OFF) 64G2D = _____

64G Element Torque Control (SELOGIC control equation)

64GTC = _____

64F Elements (requires the SEL-2664 to provide Insulation Resistance Measurement)

64F Input Option (EXT, NONE) 64FOPT = _____

Level 1 Pickup (OFF, 0.5–200.0 kOhms) (hidden when 64FOPT = NONE) 64F1P = _____

Level 1 Delay (0.0–99.0 s) (hidden when 64FOPT = NONE or when 64F1P = OFF) 64F1D = _____

Level 2 Pickup (OFF, 0.5–200.0 kOhms) (hidden when 64FOPT = NONE) 64F2P = _____

Level 2 Delay (0.0–99.0 s) (hidden when 64FOPT = NONE or when 64F2P = OFF) 64F2D = _____

64F Element Torque Control (SELOGIC control equation) (hidden when 64FOPT = NONE)

64FTC = _____

78 Elements (hidden when E78 = N)

If E78 = 1B, the following settings will apply:

Forward Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78FWD = _____

Reverse Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78REV = _____

Right-Hand Blinder
(0.1–50.0 Ohms {5 A model}; 0.5–250.0 Ohms {1 A model}) 78R1 = _____

Left-Hand Blinder
(0.1–50.0 Ohms {5 A model}; 0.5–250.0 Ohms {1 A model}) 78R2 = _____

Out-of-Step Trip Delay (0.00–1.00 s) 78TD = _____

Out-of-Step Trip Duration (0.00–5.00 s) 78TDURD = _____

Positive-Sequence Current Supervision
(0.25–30.00 A {5 A model}; 0.05–6.00 A {1 A model}) 50ABC = _____

78 Element Torque Control (SELOGIC control equation)

OOSTC = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

If E78 = 2B, the following settings will apply:

Forward Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78FWD = _____

Reverse Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78REV = _____

Outer Resistance Blinder
(0.2–100.0 Ohms {5 A model}; 1.0–500.0 Ohms {1 A model}) 78R1 = _____

Inner Resistance Blinder
(0.1–50 Ohms {5 A model}; 0.5–250 Ohms {1 A model}) 78R2 = _____

Out-of-Step Delay (0.00–1.00 s) 78D = _____

Out-of-Step Trip Delay (0.00–1.00 s) 78TD = _____

Out-of-Step Trip Duration (0.00–5.00 s) 78TDURD = _____

Positive-Sequence Current Supervision
(0.25–30.00 A {5 A model}; 0.05–6.00 A {1 A model}) 50ABC = _____

78 Element Torque Control (SELOGIC control equation)

OOSTC = _____

81 Elements (hidden when E81 = N)

Undervoltage Block (20.0–150.0 V) 27B81P = **50 V**

Level 1 Pickup (OFF, 20.00–70.00 Hz) 81D1P = **60.8 Hz**

Level 1 Time Delay (0.03–400.00 s) (hidden when 81D1P = OFF) 81D1D = **1.5 s**

Level 2 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 2) 81D2P = **61.8 Hz**

Level 2 Time Delay (0.03–400.00 s)
(hidden when E81 < 2 or 81D2P = OFF) 81D2D = **1 s**

Level 3 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 3) 81D3P = **59.2 Hz**

Level 3 Time Delay (0.03–400.00 s)
(hidden when E81 < 3 or 81D3P = OFF) 81D3D = **1.5 s**

Level 4 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 4) 81D4P = **57.7 Hz**

Level 4 Time Delay (0.03–400.00 s)
(hidden when E81 < 4 or 81D4P = OFF) 81D4D = **1 s**

Level 5 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 5) 81D5P = **-**

Level 5 Time Delay (0.03–400.00 s)
(hidden when E81 < 5 or 81D5P = OFF) 81D5D = **-**

Level 6 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 6) 81D6P = **-**

Level 6 Time Delay (0.03–400.00 s)
(hidden when E81 < 6 or 81D6P = OFF) 81D6D = **-**

81AC Elements (hidden when E81AC = N)

Upper Frequency Limit of Band 1 (20.0–70.0 Hz) UBND1 = _____

Lower Frequency Limit of Band 1 (20.0–70.0 Hz) LBND1 = _____

Band 1 Accumulator Limit Time (0.01–6000.00 s) TBND1 = _____

Lower Frequency Limit of Band 2 (20.0–70.0 Hz)
(hidden when E81AC < 2) LBND2 = _____

Band 2 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 2) TBND2 = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Lower Frequency Limit of Band 3 (20.0–70.0 Hz)
(hidden when E81AC < 3) LBND3 = _____

Band 3 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 3) TBND3 = _____

Lower Frequency Limit of Band 4 (20.0–70.0 Hz)
(hidden when E81AC < 4) LBND4 = _____

Band 4 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 4) TBND4 = _____

Lower Frequency Limit of Band 5 (20.0–70.0 Hz)
(hidden when E81AC < 5) LBND5 = _____

Band 5 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 5) TBND5 = _____

Lower Frequency Limit of Band 6 (20.0–70.0 Hz)
(hidden when E81AC < 6) LBND6 = _____

Band 6 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 6) TBND6 = _____

Accumulator Time-Delayed Pickup (0.00–400.00 s) 62ACC = _____

Abnormal Frequency Element Control (SELOGIC control equation)

ONLINE = _____

87N Elements for Model 0300G0, 0300G2 (hidden when E87N = N)

Level 1 Ground Differential Pickup
(0.1 • CTR/CTRN to 15.0 A {5 A model};
0.02 • CTR/CTRN to 3.00 A {1 A model}) 87N1P = _____

Level 1 Ground Differential Time Delay (0.00 to 400.00 s) 87N1D = _____

Level 2 Ground Differential Pickup
(OFF, 0.1*CTR/CTRN to 15.0 A {5 A model};
OFF, 0.02*CTR/CTRN to 3.00 A {1 A model}) 87N2P = _____

Level 2 Ground Differential Time Delay (0.00 to 400.00 s)
(hidden when 87N2P = OFF) 87N2D = _____

87N Element Torque Control (SELOGIC control equation)

87NTC = _____

87 Elements for Model 0300G1, 0300G3 (hidden when E87 = N)

XFMR High-Side Winding L-L Voltage (OFF, 1.0–1000.0 kV)
(hidden when E87 = G) VWDGD = _____

XFMR (GEN, YY, YDAC, YDAB, DACDAC, DABDAB, DABY, DACY)
(hidden when E87 = G) TRCON = _____

87-Input CT Connection (Y, DAB, DAC) (hidden when E87 = G)
(Range depends on TRCON Setting) CTCON = _____

Phase Input TAP Value
(0.50–160.00 A {5 A model}; 0.10–32.00 A{1 A model}) TAP1 = _____

87-Input TAP Value
(0.50–160.00 A {5 A model}; 0.10–32.00 A{1 A model})

Note: Relay calculates TAP values when E87= G, or when E87 = T and VWDGD ≠ OFF. You must enter TAP settings if E87 = T and VWDGD = OFF. TAP_{MAX}/TAP_{MIN} must be less than or equal to 7.5 TAPD = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Unrestrained Element Pickup, multiple of TAP (1.0–20.0)
Note: TAPMAX · U87P ≤ 160.0 A {5 A model}
TAPMAX · U87P ≤ 32.0 A {1 A model}
U87P = **29.21**

Restrained Element Pickup, multiple of TAP (0.04–1.00)
Note: TAP_{MIN} · O87P ≥ 0.2 A {5 A model}
TAP_{MIN} · O87P ≥ 0.04 A {1 A model}
0.3
O87P =

Restraint Slope 1 Percentage (5–100%)
SLP1 = **25 %**

Restraint Slope 2 Percentage (OFF, 50–200%)
(hidden and set equal to 100% when E87 = G)
SLP2 = **100 %**

Restraint Slope 1 Limit, multiple of TAP (1.0–16.0)
(hidden and set equal to 3 when E87 = G)
Note: TAPMAX • IRS1 ≤ 160.0 A {5 A model}
TAPMAX • IRS1 ≤ 32.0 A {1 A model}
IRS1 = **3**

Second-Harmonic Blocking Percent (OFF, 5–100%)
(hidden and set equal to OFF when E87 = G)
PCT2 = **OFF**

Independent Harmonic Blocking (Y, N)
(hidden when E87 = G or when PCT2 = OFF)
IHBL = **OFF**

Restrained Element Block (SELOGIC control equation)
87B =

RTD Based Protection for Models Compatible With the SEL-2600 Series Module

RTD Input Option (EXT, NONE) RTDOPT =
(Following Settings are hidden when RTDOPT=NONE)
Temperature Preference Setting (C, F) TMPREF =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD1LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD2LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD3LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD4LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD5LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD6LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD7LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD8LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD9LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD10LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD11LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD12LOC =
RTD Type (PT100, NI100, NI120, CU10) RTD1TY =
RTD Type (PT100, NI100, NI120, CU10) RTD2TY =
RTD Type (PT100, NI100, NI120, CU10) RTD3TY =
RTD Type (PT100, NI100, NI120, CU10) RTD4TY =
RTD Type (PT100, NI100, NI120, CU10) RTD5TY =
RTD Type (PT100, NI100, NI120, CU10) RTD6TY =
RTD Type (PT100, NI100, NI120, CU10) RTD7TY =

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

RTD Type (PT100, NI100, NI120, CU10)	RTD8TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD9TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD10TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD11TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD12TY = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP1 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP1 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP2 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP2 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP3 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP3 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP4 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP4 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP5 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP5 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP6 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP6 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP7 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP7 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP8 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP8 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP9 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP9 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP10 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP10 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP11 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP11 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP12 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP12 = _____
Enable Winding Trip Voting (Y, N)	EWDGV = _____
Enable Bearing Trip Voting (Y, N)	EBRGV = _____
RTD Biasing (AMB, LOAD, NONE) (RTDBIAS=AMB requires one RTDnLOC=AMB)	RTDBIAS = _____
RTD Bias Differential Temperature (0° to 45°F or 0° to 25°C)	TMPK = _____
Overload Bias Limit (1.00–2.00 per unit Amps) (Settings TMPK and BLMT are hidden when RTDBIAS ≠ LOAD)	BLMT = _____

<u>Demand Ammeter</u>

Demand Meter Time Constant (5, 10, 15, 30, 60 min)	DMTC = _____
Phase Pickup (OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model})	PDEMP = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Neutral Ground Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) NDEMP = _____

Residual Ground Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) GDEMP = _____

Negative-Sequence Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) QDEMP = _____

Inadvertent Energization Logic

Inadvertent Energization (SELOGIC control equation)

INAD = _____

Inadvertent Energization PU Time (0.00–400.00 s) INADPU = _____

Inadvertent Energization DO Time (0.00–400.00 s) INADDO = _____

SELOGIC Control Equation Variable Timers
(only set those variables and timers enabled by ESV)

SELOGIC Control Equation Variable SV1

SV1 = _____

SV1 Pickup Time (0.00–3000.00 s) SV1PU = _____

SV1 Dropout Time (0.00–3000.00 s) SV1DO = _____

SELOGIC Control Equation Variable SV2

SV2 = _____

SV2 Pickup Time (0.00–3000.00 s) SV2PU = _____

SV2 Dropout Time (0.00–3000.00 s) SV2DO = _____

SELOGIC Control Equation Variable SV3

SV3 = _____

SV3 Pickup Time (0.00–3000.00 s) SV3PU = _____

SV3 Dropout Time (0.00–3000.00 s) SV3DO = _____

SELOGIC Control Equation Variable SV4

SV4 = _____

SV4 Pickup Time (0.00–3000.00 s) SV4PU = _____

SV4 Dropout Time (0.00–3000.00 s) SV4DO = _____

SELOGIC Control Equation Variable SV5

SV5 = _____

SV5 Pickup Time (0.00–3000.00 s) SV5PU = _____

SV5 Dropout Time (0.00–3000.00 s) SV5DO = _____

SELOGIC Control Equation Variable SV6

SV6 = _____

SV6 Pickup Time (0.00–3000.00 s) SV6PU = _____

SV6 Dropout Time (0.00–3000.00 s) SV6DO = _____

SELOGIC Control Equation Variable SV7

SV7 = _____

SV7 Pickup Time (0.00–3000.00 s) SV7PU = _____

SV7 Dropout Time (0.00–3000.00 s) SV7DO = _____

SELOGIC Control Equation Variable SV8

SV8 = _____

SV8 Pickup Time (0.00–3000.00 s) SV8PU = _____

SV8 Dropout Time (0.00–3000.00 s) SV8DO = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

SELOGIC Control Equation Variable SV9
SV9 = _____
SV9 Pickup Time (0.00–3000.00 s) SV9PU = _____
SV9 Dropout Time (0.00–3000.00 s) SV9DO = _____
SELOGIC Control Equation Variable SV10
SV10 = _____
SV10 Pickup Time (0.00–3000.00 s) SV10PU = _____
SV10 Dropout Time (0.00–3000.00 s) SV10DO = _____
SELOGIC Control Equation Variable SV11
SV11 = _____
SV11 Pickup Time (0.00–3000.00 s) SV11PU = _____
SV11 Dropout Time (0.00–3000.00 s) SV11DO = _____
SELOGIC Control Equation Variable SV12
SV12 = _____
SV12 Pickup Time (0.00–3000.00 s) SV12PU = _____
SV12 Dropout Time (0.00–3000.00 s) SV12DO = _____
SELOGIC Control Equation Variable SV13
SV13 = _____
SV13 Pickup Time (0.00–3000.00 s) SV13PU = _____
SV13 Dropout Time (0.00–3000.00 s) SV13DO = _____
SELOGIC Control Equation Variable SV14
SV14 = _____
SV14 Pickup Time (0.00–3000.00 s) SV14PU = _____
SV14 Dropout Time (0.00–3000.00 s) SV14DO = _____
SELOGIC Control Equation Variable SV15
SV15 = _____
SV15 Pickup Time (0.00–3000.00 s) SV15PU = _____
SV15 Dropout Time (0.00–3000.00 s) SV15DO = _____
SELOGIC Control Equation Variable SV16
SV16 = _____
SV16 Pickup Time (0.00–3000.00 s) SV16PU = _____
SV16 Dropout Time (0.00–3000.00 s) SV16DO = _____

Latch Bits Set/Reset Equations **(only set those variables enabled by ESL)**

Set Latch Bit LT1 (SELOGIC control equation)
SET1 = _____
Reset Latch Bit LT1 (SELOGIC control equation)
RST1 = _____
Set Latch Bit LT2 (SELOGIC control equation)
SET2 = _____
Reset Latch Bit LT2 (SELOGIC control equation)

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

RST2 = _____
Set Latch Bit LT3 (SELOGIC control equation)
SET3 = _____
Reset Latch Bit LT3 (SELOGIC control equation)
RST3 = _____
Set Latch Bit LT4 (SELOGIC control equation)
SET4 = _____
Reset Latch Bit LT4 (SELOGIC control equation)
RST4 = _____
Set Latch Bit LT5 (SELOGIC control equation)
SET5 = _____
Reset Latch Bit LT5 (SELOGIC control equation)
RST5 = _____
Set Latch Bit LT6 (SELOGIC control equation)
SET6 = _____
Reset Latch Bit LT6 (SELOGIC control equation)
RST6 = _____
Set Latch Bit LT7 (SELOGIC control equation)
SET7 = _____
Reset Latch Bit LT7 (SELOGIC control equation)
RST7 = _____
Set Latch Bit LT8 (SELOGIC control equation)
SET8 = _____
Reset Latch Bit LT8 (SELOGIC control equation)
RST8 = _____
Set Latch Bit LT9 (SELOGIC control equation)
SET9 = _____
Reset Latch Bit LT9 (SELOGIC control equation)
RST9 = _____
Set Latch Bit LT10 (SELOGIC control equation)
SET10 = _____
Reset Latch Bit LT10 (SELOGIC control equation)
RST10 = _____
Set Latch Bit LT11 (SELOGIC control equation)
SET11 = _____
Reset Latch Bit LT11 (SELOGIC control equation)
RST11 = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Set Latch Bit LT12 (SELOGIC control equation)
SET12 = _____
Reset Latch Bit LT12 (SELOGIC control equation)
RST12 = _____
Set Latch Bit LT13 (SELOGIC control equation)
SET13 = _____
Reset Latch Bit LT13 (SELOGIC control equation)
RST13 = _____
Set Latch Bit LT14 (SELOGIC control equation)
SET14 = _____
Reset Latch Bit LT14 (SELOGIC control equation)
RST14 = _____
Set Latch Bit LT15 (SELOGIC control equation)
SET15 = _____
Reset Latch Bit LT15 (SELOGIC control equation)
RST15 = _____
Set Latch Bit LT16 (SELOGIC control equation)
SET16 = _____
Reset Latch Bit LT16 (SELOGIC control equation)
RST16 = _____

TRIP, CLOSE, ER, OUTPUT Elements

Minimum Trip Duration Time (0.00–400.00 s) TDURD = _____
Trip Equation 1 (SELOGIC control equation)
TR1 = _____
Unlatch Trip Equation 1 (SELOGIC control equation)
ULTR1 = _____
Trip Equation 2 (SELOGIC control equation)
TR2 = _____
Unlatch Trip Equation 2 (SELOGIC control equation)
ULTR2 = _____
Trip Equation 3 (SELOGIC control equation)
TR3 = _____
Unlatch Trip Equation 3 (SELOGIC control equation)
ULTR3 = _____
Trip Equation 4 (SELOGIC control equation)
TR4 = _____
Unlatch Trip Equation 4 (SELOGIC control equation)
ULTR4 = _____
Close Enable Equation (SELOGIC control equation)
CLEN = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Close Initiate Equation (SELOGIC control equation)
CL = _____

Unlatch Close Equation
ULCL = _____

Close Dwell Timer (0.00–1.00 s)
CLSD = _____

Event Trigger Equation
ER = _____

Output Contact Equations

Output Contact OUT101 (SELOGIC control equation)
OUT101 = _____

Output Contact OUT102 (SELOGIC control equation)
OUT102 = _____

Output Contact OUT103 (SELOGIC control equation)
OUT103 = _____

Output Contact OUT104 (SELOGIC control equation)
OUT104 = _____

Output Contact OUT105 (SELOGIC control equation)
OUT105 = _____

Output Contact OUT106 (SELOGIC control equation)
OUT106 = _____

Output Contact OUT107 (SELOGIC control equation)
OUT107 = _____

Output Contact Equations for Model 0300G_1-extra I/O board

Output Contact OUT201 (SELOGIC control equation)
OUT201 = _____

Output Contact OUT202 (SELOGIC control equation)
OUT202 = _____

Output Contact OUT203 (SELOGIC control equation)
OUT203 = _____

Output Contact OUT204 (SELOGIC control equation)
OUT204 = _____

Output Contact OUT205 (SELOGIC control equation)
OUT205 = _____

Output Contact OUT206 (SELOGIC control equation)
OUT206 = _____

Output Contact OUT207 (SELOGIC control equation)
OUT207 = _____

Output Contact OUT208 (SELOGIC control equation)
OUT208 = _____

Output Contact OUT209 (SELOGIC control equation)
OUT209 = _____

SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Output Contact OUT210 (SELOGIC control equation)
OUT210 = _____

Output Contact OUT211 (SELOGIC control equation)
OUT211 = _____

Output Contact OUT212 (SELOGIC control equation)
OUT212 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Event Report Parameters

Length of Event Report (15, 30, 60, 180 cycles {firmware R320 and higher}; 15, 30 cycles {firmware <R320}) LER = _____

Length of Prefault in Event Report (1 through LER-1 cycles) PRE = _____

Front-Panel Display Time-Out

Front-Panel Display Time-Out (OFF, 0–30 min) FP_TO = _____

Date Format

Date Format (MDY, YMD) DATE_F = _____

Station DC Battery Monitor

DC Battery Instantaneous Undervoltage Pickup (OFF, 20–300 Vdc) DCLOP = _____

DC Battery Instantaneous Overvoltage Pickup (OFF, 20–300 Vdc) DCHIP = _____

Power System Configuration

Nominal Frequency (50 Hz, 60 Hz) FNOM = _____

Phase Potential Transformer Connection (D, Y) DELTA_Y = _____

Settings Group Change Delay

Group Change Delay (0–400 s) TGR = _____

Group 1 Select Input (SELOGIC control equation)

SS1 = _____

Group 2 Select Input (SELOGIC control equation)

SS2 = _____

Breaker Monitor Settings

Breaker Monitor Input (SELOGIC control equation)

BKMON = _____

Close/Open Set Point 1–max. (1–65000 operations) COSP1 = _____

Close/Open Set Point 2–mid. (1–65000 operations) COSP2 = _____

Close/Open Set Point 3–min. (1–65000 operations) COSP3 = _____

kA Interrupted Set Point 1–min. (0.1–999.0 kA primary) KASP1 = _____

kA Interrupted Set Point 2–mid. (0.1–999.0 kA primary) KASP2 = _____

kA Interrupted Set Point 3–max. (0.1–999.0 kA primary) KASP3 = _____

Optoisolated Input Timers

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN101D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN102D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN103D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN104D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN105D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN106D = _____

Optoisolated Input Timers for Model 0300G_1

Input IN201 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN201D = _____
Input IN202 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN202D = _____
Input IN203 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN203D = _____
Input IN204 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN204D = _____
Input IN205 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN205D = _____
Input IN206 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN206D = _____
Input IN207 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN207D = _____
Input IN208 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN208D = _____

Local Bit Labels

Enter the following characters:0–9, A–Z, -, /, ., space
for each text label setting, subject to the specified character limit. Enter NA to null a label.

Local Bit LB1 Name (14 characters) NLB1 = _____
Clear Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) CLB1 = _____
Set Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) SLB1 = _____
Pulse Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) PLB1 = _____
Local Bit LB2 Name (14 characters) NLB2 = _____
Clear Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) CLB2 = _____
Set Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) SLB2 = _____
Pulse Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) PLB2 = _____
Local Bit LB3 Name (14 characters) NLB3 = _____
Clear Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) CLB3 = _____
Set Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) SLB3 = _____
Pulse Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) PLB3 = _____
Local Bit LB4 Name (14 characters) NLB4 = _____
Clear Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) CLB4 = _____
Set Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) SLB4 = _____
Pulse Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) PLB4 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Local Bit LB5 Name (14 characters) NLB5 = _____

Clear Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) CLB5 = _____

Set Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) SLB5 = _____

Pulse Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) PLB5 = _____

Local Bit LB6 Name (14 characters) NLB6 = _____

Clear Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) CLB6 = _____

Set Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) SLB6 = _____

Pulse Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) PLB6 = _____

Local Bit LB7 Name (14 characters) NLB7 = _____

Clear Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) CLB7 = _____

Set Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) SLB7 = _____

Pulse Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) PLB7 = _____

Local Bit LB8 Name (14 characters) NLB8 = _____

Clear Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) CLB8 = _____

Set Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) SLB8 = _____

Pulse Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) PLB8 = _____

Local Bit LB9 Name (14 characters) NLB9 = _____

Clear Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) CLB9 = _____

Set Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) SLB9 = _____

Pulse Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) PLB9 = _____

Local Bit LB10 Name (14 characters) NLB10 = _____

Clear Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) CLB10 = _____

Set Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) SLB10 = _____

Pulse Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) PLB10 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Local Bit LB11 Name (14 characters) NLB11 = _____

Clear Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) CLB11 = _____

Set Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) SLB11 = _____

Pulse Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) PLB11 = _____

Local Bit LB12 Name (14 characters) NLB12 = _____

Clear Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) CLB12 = _____

Set Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) SLB12 = _____

Pulse Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) PLB12 = _____

Local Bit LB13 Name (14 characters) NLB13 = _____

Clear Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) CLB13 = _____

Set Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) SLB13 = _____

Pulse Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) PLB13 = _____

Local Bit LB14 Name (14 characters) NLB14 = _____

Clear Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) CLB14 = _____

Set Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) SLB14 = _____

Pulse Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) PLB14 = _____

Local Bit LB15 Name (14 characters) NLB15 = _____

Clear Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) CLB15 = _____

Set Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) SLB15 = _____

Pulse Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) PLB15 = _____

Local Bit LB16 Name (14 characters) NLB16 = _____

Clear Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) CLB16 = _____

Set Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) SLB16 = _____

Pulse Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) PLB16 = _____

Front-Panel Display

Front-Panel Current Display (Y, N) FP_I = _____
Front-Panel Phase-to-Phase Voltage Display (Y, N) FP_VPP = _____
Front-Panel Phase Voltage Display (Y, N)
(hidden when DELTA_Y = D) FP_VP = _____
Front-Panel Power Display (Y, N) FP_MW = _____
Front-Panel Frequency Display (Y, N) FP_FR = _____
Front-Panel Current Differential Display (Y, N) FP_87 = _____
Front-Panel Field Insulation Rf Display (Y, N) FP_RF = _____
Front-Panel RTD Temperature Display (Y, N) FP_RTD = _____

Display Points

Display Point DP1 (SELOGIC control equation)
DP1 = _____
Display if DP1 = logical 1 (16 characters) DP1_1 = _____
Display if DP1 = logical 0 (16 characters) DP1_0 = _____
Display Point DP2 (SELOGIC control equation)
DP2 = _____
Display if DP2 = logical 1 (16 characters) DP2_1 = _____
Display if DP2 = logical 0 (16 characters) DP2_0 = _____
Display Point DP3 (SELOGIC control equation)
DP3 = _____
Display if DP3 = logical 1 (16 characters) DP3_1 = _____
Display if DP3 = logical 0 (16 characters) DP3_0 = _____
Display Point DP4 (SELOGIC control equation)
DP4 = _____
Display if DP4 = logical 1 (16 characters) DP4_1 = _____
Display if DP4 = logical 0 (16 characters) DP4_0 = _____
Display Point DP5 (SELOGIC control equation)
DP5 = _____
Display if DP5 = logical 1 (16 characters) DP5_1 = _____
Display if DP5 = logical 0 (16 characters) DP5_0 = _____
Display Point DP6 (SELOGIC control equation)
DP6 = _____
Display if DP6 = logical 1 (16 characters) DP6_1 = _____
Display if DP6 = logical 0 (16 characters) DP6_0 = _____
Display Point DP7 (SELOGIC control equation)
DP7 = _____
Display if DP7 = logical 1 (16 characters) DP7_1 = _____
Display if DP7 = logical 0 (16 characters) DP7_0 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Display Point DP8 (SELOGIC control equation)

DP8 = _____

Display if DP8 = logical 1 (16 characters) DP8_1 = _____

Display if DP8 = logical 0 (16 characters) DP8_0 = _____

Display Point DP9 (SELOGIC control equation)

DP9 = _____

Display if DP9 = logical 1 (16 characters) DP9_1 = _____

Display if DP9 = logical 0 (16 characters) DP9_0 = _____

Display Point DP10 (SELOGIC control equation)

DP10 = _____

Display if DP10 = logical 1 (16 characters) DP10_1 = _____

Display if DP10 = logical 0 (16 characters) DP10_0 = _____

Display Point DP11 (SELOGIC control equation)

DP11 =

Display if DP11 = logical 1 (16 characters) DP11_1 = _____

Display if DP11 = logical 0 (16 characters) DP11_0 = _____

Display Point DP12 (SELOGIC control equation)

DP12 = _____

Display if DP12 = logical 1 (16 characters) DP12_1 = _____

Display if DP12 = logical 0 (16 characters) DP12_0 = _____

Display Point DP13 (SELOGIC control equation)

DP13 = _____

Display if DP13 = logical 1 (16 characters) DP13_1 = _____

Display if DP13 = logical 0 (16 characters) DP13_0 = _____

Display Point DP14 (SELOGIC control equation)

DP14 = _____

Display if DP14 = logical 1 (16 characters) DP14_1 = _____

Display if DP14 = logical 0 (16 characters) DP14_0 = _____

Display Point DP15 (SELOGIC control equation)

DP15 = _____

Display if DP15 = logical 1 (16 characters) DP15_1 = _____

Display if DP15 = logical 0 (16 characters) DP15_0 = _____

Display Point DP16 (SELOGIC control equation)

DP16 = _____

Display if DP16 = logical 1 (16 characters) DP16_1 = _____

Display if DP16 = logical 0 (16 characters) DP16_0 = _____

SEQUENTIAL EVENTS RECORDER SETTINGS (SERIAL PORT COMMAND SET R)

Sequential Events Recorder settings are comprised of three trigger lists. Each trigger list can include up to 24 Relay Word bits delimited by spaces or commas. See *Sequential Events Recorder (SER) Report* in *Section 11: Event Reports and SER Functions*.

SER Trigger List 1 SER1 = _____

SER Trigger List 2 SER2 = _____

SER Trigger List 3 SER3 = _____

SER Trigger List 4 SER4 = _____

Relay Word Bit Aliases (ALIAS# > EALIAS setting are hidden)

(See ***Alias Settings*** in ***Section 3: Auxiliary Function Settings***.)

Enable ALIAS Settings (0, 10, 20, 30, 40) EALIAS = _____

ALIAS1 = _____

ALIAS2 = _____

ALIAS3 = _____

ALIAS4 = _____

ALIAS5 = _____

ALIAS6 = _____

ALIAS7 = _____

ALIAS8 = _____

ALIAS9 = _____

ALIAS10 = _____

ALIAS11 = _____

ALIAS12 = _____

ALIAS13 = _____

ALIAS14 = _____

ALIAS15 = _____

ALIAS16 = _____

ALIAS17 = _____

ALIAS18 = _____

ALIAS19 = _____

SEQUENTIAL EVENTS RECORDER SETTINGS (SERIAL PORT COMMAND SET R)

ALIAS20 = _____

ALIAS21 = _____

ALIAS22 = _____

ALIAS23 = _____

ALIAS24 = _____

ALIAS25 = _____

ALIAS26 = _____

ALIAS27 = _____

ALIAS28 = _____

ALIAS29 = _____

ALIAS30 = _____

ALIAS31 = _____

ALIAS32 = _____

ALIAS33 = _____

ALIAS34 = _____

ALIAS35 = _____

ALIAS36 = _____

ALIAS37 = _____

ALIAS38 = _____

ALIAS39 = _____

ALIAS40 = _____

PORT SETTINGS (SERIAL PORT COMMAND SET P AND FRONT PANEL)

Protocol Settings

Protocol (SEL, LMD, MOD {Standard plus Modbus® Models}; SEL, LMD {Standard Models})	PROTO = _____
LMD Prefix (@, #, $, %, &) (hidden when PROTO ≠ LMD)	PREFIX = _____
LMD Address (01–99) (hidden when PROTO ≠ LMD)	ADDR = _____
LMD Settling Time (0–30 seconds) (hidden when PROTO ≠ LMD)	SETTLE = _____
Enable Hardware Handshaking[1] (Y, N, H {when PROTO = MOD}; Y, N {when PROTO = SEL}) (hidden when PROTO = LMD)	RTSCTS = _____
Modbus Slave ID (1–247) (hidden when PROTO ≠ MOD)	SLAVEID = _____

Protocol Settings: Refer to ***Section 10: Serial Port Communications and Commands*** for details.

Communications Settings

Baud Rate (300, 1200, 2400, 4800, 9600, 19200, 38400)	SPEED = _____

Note: The highest baud rate for Modbus RTU protocol is 19200.

Data Bits (7, 8)	BITS = _____
Parity (0, E, N) {Odd, Even, None}	PARITY = _____
Stop Bits (1, 2)	STOP = _____

Other Port Settings

Time-Out (0–30 minutes)	T_OUT = _____
Send Auto Messages to Port (Y, N)	AUTO = _____
Fast Operate Enable (Y, N)	FASTOP = _____

Other Port Settings. Set T_OUT to the number of minutes of serial port inactivity for an automatic log out. Set T_OUT = 0 for no port time-out. If the event report length setting LER = 180 cycles, set the port time-out setting T_OUT > 2 minutes.

Set AUTO = Y to allow automatic messages at the serial port. Set RTSCTS = Y to enable hardware handshaking. With RTSCTS = Y, the relay will not send characters until the CTS input is asserted. Also, if the relay is unable to receive characters, it deasserts the RTS line.

Set FASTOP = Y to enable binary *Fast Operate* messages at the serial port. Set FASTOP = N to block binary *Fast Operate* messages. Refer to ***Appendix D: Configuration, Fast Meter, and Fast Operate Commands*** for the description of the SEL-300G Relay *Fast Operate* commands.

[1] RTSCTS setting is hidden for Port 1 (EIA-485) and the default value is N.

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RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Identifier Labels

Relay Identifier (39 characters)	RID =	Proteção do Gerador TG02
Terminal Identifier (59 characters)	TID =	Painel C13

Current and Potential Transformer Configuration

Phase (IA, IB, IC) Current Transformer Ratio (1–10000 {5 A model}; 1–50000 {1 A model})	CTR =	160
Differential (IA87, IB87, IC87) Current Transformer Ratio (1–10000 {5 A model}; 1–50000 {1 A model}) (hidden if relay is not equipped with differential current inputs)	CTRD =	160
Neutral (IN) Current Transformer Ratio (1–10000)	CTRN =	20
Phase (VA, VB, VC) Potential Transformer Ratio (1.00–10000.00)	PTR =	120
Neutral (VN) Potential Transformer Ratio (1.00–10000.00)	PTRN =	-
Synch Voltage (VS) Potential Transformer Ratio (1.00–10000.00) (hidden if relay is not equipped with synch-check function)	PTRS =	120
Nominal Voltage (80.0–140.0 V {DELTA_Y = D}; 80.0–208.0 V {DELTA_Y = Y} line-to-line)	VNOM =	115 V
Nominal Current (1.0–10.0 A {5 A model}; 0.2–2.0 A {1 A model})	INOM =	4.9 A
Phase Rotation (ABC, ACB)	PHROT =	ABC

Protection Element Enables

Enable Backup System Protection (N, D, DC, V, C {firmware R320 and higher}; N, D, V, C {firmware < R320})	EBUP =	N
Enable Load Encroachment (Y, N) [Applies to firmware R320 and higher] (hidden when EBUP = N, V, or C)	ELE =	N
Enable Volts/Hertz Protection (Y, N)	E24 =	N
Enable Synchronism Checking (Y, N) [Model 300G2, 300G3]	E25 =	Y
Enable Undervoltage (U/V) Protection (Y, N)	E27 =	Y
Enable Reverse/Low-Forward Power Protection (Y, N)	E32 =	Y
Enable Loss-of-Field Protection (Y, N)	E40 =	Y
Enable Negative-Sequence Overcurrent (O/C) Protection (Y, N)	E46 =	Y
Enable O/C Protection (Y, N)	E50 =	Y
Enable 87-Input O/C Protection (Y, N) [Model 300G1, 300G3]	E50_87 =	Y
Enable Time-O/C Protection (Y, N)	E51 =	Y
Enable Overvoltage (O/V) Protection (Y, N)	E59 =	Y
Enable 100% Stator Ground Protection (Y, N)	E64 =	N
Enable Out-of-Step Protection (1B, 2B, N)	E78 =	N
Enable Frequency Protection (N, 1–6)	E81 =	Y
Enable Abnormal Frequency Scheme (N, 1–6)	E81AC =	N
Enable Differential Protection (G, T, N) [Model 300G1, 300G3]	E87 =	G
Enable Ground Differential Protection (Y, N) [Model 300G0, 300G2]	E87N =	N
Enable SELOGIC® Control Equation Variables (0–16)	ESV =	

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Enable Set/Reset Latch Variables (0–16) ESL = _____

Enable Demand Metering (THM, ROL) EDEM = _____

21 MHO Elements (hidden when EBUP ≠ D)

Zone 1 Phase Distance Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z1R = 0.035

Zone 1 Phase Distance Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z1R = OFF) Z1O = 2.94

Zone 1 Maximum Torque Angle (90–45 degrees)
(hidden when Z1R = OFF) MTA1 = 50

Zone 1 Transformer Compensation (0, –30, 30 degrees)
(hidden when Z1R = OFF) Z1CMP = OFF

Zone 1 Phase Distance Time Delay (0.00 to 400.00 seconds)
(hidden when Z1R = OFF) Z1D = 0.25

Zone 2 Phase Distance Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z2R = 1.35

Zone 2 Phase Distance Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z2R = OFF) Z2O = 2.94

Zone 2 Maximum Torque Angle (90–45 degrees)
(hidden when Z2R = OFF) MTA2 = 88

Zone 2 Transformer Compensation (0, –30, 30 degrees)
(hidden when Z2R = OFF) Z2CMP = 30

Zone 2 Phase Distance Time-Delay (0.00 to 400.00 seconds)
(hidden when Z2R = OFF) Z2D = 0.35

Minimum Power Factor (OFF, 0.98–0.50) [Applies to firmware < R320] MPF = OFF

Maximum Generator Load (0.5–3.0 per unit) [Applies to firmware < R320]
(hidden when MPF = OFF) MXLD = OFF

21P Element Torque Control (SELOGIC control equation)

21PTC = _____

21 Compensator Elements (hidden when EBUP ≠ DC) [Requires firmware R320 or higher]

Zone 1 Compensator Reach
(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z1C = _____

Zone 1 Compensator Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z1C = OFF) Z1CO = _____

Zone 1 Compensator Time Delay (0.00 to 400.00 seconds)
(hidden when Z1C = OFF) Z1CD = _____

Zone 1 Phase-Phase Current FD (0.5–170.0 A)
(hidden when Z1C = OFF) 50PP1 = _____

Zone 1 Pos-Seq Impedance Angle (90–45 degrees)
(hidden when Z1C = OFF) ZANG1 = _____

Zone 2 Compensator Reach _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

(OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model}) Z2C = _____

Zone 2 Compensator Offset
(0.0–10.0 Ohms {5 A model}; 0.0–50.0 Ohms {1 A model})
(hidden when Z2C = OFF) Z2CO = _____

Zone 2 Compensator Time Delay (0.00 to 400.00 seconds)
(hidden when Z2C = OFF) Z2CD = _____

Zone 2 Phase-Phase Current FD (0.5–170.0 A)
(hidden when Z2C = OFF) 50PP2 = _____

Zone 2 Pos-Seq Impedance Angle (90–45 degrees)
(hidden when Z2C = OFF) ZANG2 = _____

21C Element Torque Control (SELOGIC control equation)
21CTC = _____

Load Encroachment (hidden when ELE = N) [Applies to firmware R320 and higher]

Minimum Power Factor (OFF, 0.98–0.50) MPF = _____

Maximum Generator Load (0.5–3.0 per unit)
(hidden when MPF = OFF) MXLD = _____

24 Elements (hidden when E24 = N)

Level 1 Volts/Hertz Pickup (100–200%) 24D1P = _____

Level 1 Time Delay (0.00–400.00 s) 24D1D = _____

Level 2 Composite Curve Shape (OFF, DD, ID, I) 24CCS = _____

Level 2 Inverse-Time Pickup (100–200%)
(hidden when 24CCS = OFF, DD) 24IP = _____

Level 2 Inverse-Time Curve (0.5, 1, 2)
(hidden when 24CCS = OFF, DD) 24IC = _____

Level 2 Inverse-Time Factor (0.1–10.0 s)
(hidden when 24CCS = OFF, DD) 24ITD = _____

Level 2 Pickup One (100–200%)
(hidden when 24CCS = OFF, ID, I) 24D2P1 = _____

Level 2 Time-Delay One (0.00–400.00 s)
(hidden when 24CCS = OFF, ID, I) 24D2D1 = _____

Level 2 Pickup Two (101–200%)
(hidden when 24CCS = OFF, I) 24D2P2 = _____

Level 2 Time-Delay Two (0.00–400.00 s)
(hidden when 24CCS = OFF, I) 24D2D2 = _____

Level 2 Reset Time (0.00–400.00 s) (hidden when 24CCS = OFF) 24CR = _____

24 Element Torque Control (SELOGIC control equation)
24TC = _____

25 Elements for Model 300G2, 300G3 (hidden when E25 = N)

Synch-Check Phase (VA, VB, VC, VAB, VBC) SYNCP = **VAB**

Voltage Window, Low Threshold (20.0–200.0 V) 25VLO = **103.5**

Voltage Window, High Threshold (20.0–200.0 V) 25VHI = **126.5**

Maximum Voltage Difference (OFF, 1.0–15.0%) 25VDIF = **5%**

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Voltage Ratio Correction Factor (0.500–2.000)	25RCF =	0.5
Generator Voltage High Required (Y, N) (hidden when 25VDIF = OFF)	GENV+ =	N
Minimum Slip Frequency (–1.00 to 0.99 Hz)	25SLO =	- 0.1
Maximum Slip Frequency (–0.99 to 1.00 Hz)	25SHI =	0.1
Transformer Compensation Angle (0, 30, –30 degrees)	COMPA =	0
Maximum Angle 1 (0–80 degrees)	25ANG1 =	5
Maximum Angle 2 (0–80 degrees)	25ANG2 =	0
Target Close Angle (–15 to 15 degrees)	CANGLE =	10
Breaker Close Time (0.000 to 1.000 s)	TCLOSD =	0.08
Close Fail Angle (OFF, 3–120 degrees)	CFANGL =	OFF
Dead-Bus Undervoltage (OFF, 0.1–200.0 V)	27VSP =	OFF
Block Synch-Check (SELOGIC control equation)		
BSYNCH =		
27 Elements (hidden when E27 = N)		
Level 1 Phase U/V Pickup (OFF, 0.1–200.0 V) (hidden when DELTA_Y = D)	27P1P =	
Level 2 Phase U/V Pickup (OFF, 0.1–200.0 V) (hidden when DELTA_Y = D)	27P2P =	
Positive-Sequence U/V Pickup (OFF, 0.1–200.0 V)	27V1P =	
Level 1 Phase-to-Phase U/V Pickup (OFF, 0.1–200.0 V)	27PP1 =	62.7 V
Level 2 Phase-to-Phase U/V Pickup (OFF, 0.1–200.0 V)	27PP2 =	48.25 V
32 Elements (hidden when E32 = N)		
Level 1 Power Threshold (±0.0015 to ±3.0000 pu)	32P1P =	- 0.02
Level 1 Power Time Delay (0.01–400.00 s)	32P1D =	3 s
Level 2 Power Threshold (OFF, ±0.0015 to ±3.0000 pu)	32P2P =	- 0.05
Level 2 Power Time Delay (0.01–400.00 s) (hidden when 32P2P = OFF)	32P2D =	1.5 s
32 Element Torque Control (SELOGIC control equation)		
32PTC =		OFF
40 Elements (hidden when E40 = N)		
Zone 1 Mho Diameter (OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model})		17.62
Zone 1 Offset Reactance (-50.0–0.0 Ohms {5 A model}; –250.0–0.0 Ohms {1 A model})	40XD1 =	1.47
Zone 1 Pickup Time Delay (0.00–400.00 s)	40Z1D =	0.25
Zone 2 Mho Diameter (OFF, 0.1–100.0 Ohms {5 A model}; OFF, 0.5–500.0 Ohms {1 A model})	40Z2P =	19.59
Zone 2 Offset Reactance (–50.0–50.0 Ohms {5 A model}; –250.0–250.0 Ohms {1 A model} (hidden when 40Z2P = OFF)	40XD2 =	0.507
Zone 2 Pickup Time Delay (0.00–400.00 s) (hidden when 40Z2P = OFF)	40Z2D =	1

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Zone 2 Directional Superv. Angle (–20.0°–0.0°) (hidden when 40Z2P = OFF or 40XD2 < 0) 40DIR = **-40**

40 Element Torque Control (SELOGIC control equation)

40ZTC =

46 Elements (hidden when E46 = N)

Level 1 Negative-Sequence O/C Pickup (OFF, 2–100%) 46Q1P = **62 %**

Level 1 Negative-Sequence O/C Time Delay (0.02–999.90 s)
(hidden when 46Q1P = OFF) 46Q1D = **1.3 s**

Level 2 Negative-Sequence Time-O/C Pickup (OFF, 2–100%) 46Q2P = **OFF**

Level 2 Negative-Sequence Time-O/C Time Dial (1–100 s)
(hidden when 46Q2P = OFF) 46Q2K = **OFF**

46Q Element Torque Control (SELOGIC control equation)

46QTC = **OFF**

50 Elements (hidden when E50 = N)

Level 1 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50P1P = **20.45 A**

Level 1 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50P1P = OFF) 50P1D = **0.45 s**

Level 2 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50P2P = **9.45 A**

Level 2 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50P2P = OFF) 50P2D = **0.55 s**

Level 1 Neutral O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50N1P = **9.9 A**

Level 1 Neutral O/C Time Delay (0.00–400.00 s)
(hidden when 50N1P = OFF) 50N1D = **0.18 s**

Level 2 Neutral O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50N2P = **2 A**

Level 2 Neutral O/C Time Delay (0.00–400.00 s)
(hidden when 50N2P = OFF) 50N2D = **0.36 s**

Level 1 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50G1P = **5.94 A**

Level 1 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50G1P = OFF) 50G1D = **0.65 s**

Level 2 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50G2P =

Level 2 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50G2P = OFF) 50G2D =

50_87 Elements for Models 300G1 and 300G3 (hidden when E50_87 = N)

Level 1 Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50H1P =

Level 1 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50H1P = OFF) 50H1D =

Level 2 A-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50H2PA =

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Level 2 B-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model})
(hidden when 50H2PA = OFF) 50H2PB = _____

Level 2 C-Phase O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model})
(hidden when 50H2PA = OFF) 50H2PC = _____

Level 2 Phase O/C Time Delay (0.00–400.00 s)
(hidden when 50H2PA = OFF) 50H2D = _____

Level 1 Negative-Sequence O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50Q1P = _____

Level 1 Negative-Sequence O/C Time Delay (0.00–400.00 s)
(hidden when 50Q1P = OFF) 50Q1D = _____

Level 2 Negative-Sequence O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50Q2P = _____

Level 2 Negative-Sequence O/C Time Delay (0.00–400.00 s)
(hidden when 50Q2P = OFF) 50Q2D = _____

Level 1 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50R1P = _____

Level 1 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50R1P = OFF) 50R1D = _____

Level 2 Residual O/C Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50R2P = _____

Level 2 Residual O/C Time Delay (0.00–400.00 s)
(hidden when 50R2P = OFF) 50R2D = _____

51N Element (hidden when E51 = N)

Neutral Time-O/C Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) 51NP = **1.5 A**

Neutral Time-O/C Curve (U1–U5, C1–C5)
(hidden when 51NP = OFF) 51NC = **C1**

Neutral Time-O/C Time Dial (0.50–15.00, U curves; 0.05–1.00, C curves)
(hidden when 51NP = OFF) 51NTD = **0.08**

Neutral Time-O/C EM Reset (Y, N)
(hidden when 51NP = OFF) 51NRS = **OFF**

51N Element Torque Control (SELOGIC control equation)
(hidden when 51NP = OFF) **OFF**

51NTC = _____

51G Element (hidden when E51 = N)

Residual Time-O/C Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) 51GP = _____

Residual Time-O/C Curve (U1–U5, C1–C5)
(hidden when 51GP = OFF) 51GC = _____

Residual Time-O/C Time Dial (0.50–15.00, U curves; 0.05–1.00, C curves)
(hidden when 51GP = OFF) 51GTD = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Residual Time-O/C EM Reset (Y, N)
(hidden when 51GP = OFF) 51GRS = _____

51G Element Torque Control (SELOGIC control equation) (hidden when 51GP = OFF)
51GTC = _____

51C Element (hidden when EBUP ≠ C)

Volt Controlled Time-O/C Pickup
(0.50–16.00 A {5 A model}; 0.10–3.20 A {1 A model}) 51CP = _____

Volt Controlled Time-O/C Curve (U1–U5, C1–C5) 51CC = _____

Volt Controlled Time-O/C Time Dial
(0.50–15.00, U curves; 0.05–1.00, C curves) 51CTD = _____

Volt Controlled Time-O/C EM Reset (Y, N) 51CRS = _____

51C Element Torque Control (SELOGIC control equation)
51CTC = _____

51V Element (hidden when EBUP ≠ V)

Compensation Angle (0, –30, +30 deg) 51VCA = _____

Volt Restrained Time-O/C Pickup
(2.00–16.00 A {5 A model}; 0.40–3.20 A {1 A model}) 51VP = _____

Volt Restrained Time-O/C Curve (U1–U5, C1–C5) 51VC = _____

Volt Restrained Time-O/C Time Dial
(0.50–15.00, U curves; 0.05–1.00, C curves) 51VTD = _____

Volt Restrained Time-O/C EM Reset (Y, N) 51VRS = _____

51V Element Torque Control (SELOGIC control equation)
51VTC = _____

Open Pole Element

Three-Pole Open Time Delay (0.00–1.00 s) 3POD = _____

Load Detection Phase Pickup
(OFF, 0.25–100.00 A {5 A model}; OFF, 0.05–20.00 A {1 A model}) 50LP = _____

Generator Breaker Auxiliary (SELOGIC control equation)
52A = _____

59 Elements (hidden when E59 = N)

Level 1 Phase O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59P1P = _____

Level 2 Phase O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59P2P = _____

Level 1 Residual O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59G1P = **72.65 V**

Level 2 Residual O/V Pickup (OFF, 0.0–200.0 V)
(hidden when DELTA_Y = D) 59G2P = _____

Negative-Sequence (V2) O/V Pickup (OFF, 0.0–200.0 V) 59QP = **1.65 V**

Positive-Sequence (V1) O/V Pickup (OFF, 0.0–200.0 V) 59V1P = _____

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RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Level 1 Phase-to-Phase O/V Pickup
(OFF, 0.0–200.0 V {DELTA_Y = D};
OFF, 0.0–300.0 V {DELTA_Y = Y} line-to-line) 59PP1 = 127

Level 2 Phase-to-Phase O/V Pickup
(OFF, 0.0–200.0 V {DELTA_Y = D};
OFF, 0.0–300.0 V {DELTA_Y = Y} line-to-line) 59PP2 = 124

64G Elements (hidden when E64 = N)

Zone 1 Neutral O/V Pickup (OFF, 0.1–150.0 V) 64G1P = _____

Zone 1 Time Delay (0.00–400.00 s) (hidden when 64G1P = OFF) 64G1D = _____

Zone 2 Differential Voltage (OFF, 0.1–20.0 V) 64G2P = _____

Zone 2 Ratio Setting (0.0–5.0) (hidden when 64G2P = OFF or when DELTA_Y = D) 64RAT = _____

Zone 2 Time Delay (0.00–400.00 s) (hidden when 64G2P = OFF) 64G2D = _____

64G Element Torque Control (SELOGIC control equation)

64GTC = _____

64F Elements (requires the SEL-2664 to provide Insulation Resistance Measurement)

64F Input Option (EXT, NONE) 64FOPT = _____

Level 1 Pickup (OFF, 0.5–200.0 kOhms) (hidden when 64FOPT = NONE) 64F1P = _____

Level 1 Delay (0.0–99.0 s) (hidden when 64FOPT = NONE or when 64F1P = OFF) 64F1D = _____

Level 2 Pickup (OFF, 0.5–200.0 kOhms) (hidden when 64FOPT = NONE) 64F2P = _____

Level 2 Delay (0.0–99.0 s) (hidden when 64FOPT = NONE or when 64F2P = OFF) 64F2D = _____

64F Element Torque Control (SELOGIC control equation) (hidden when 64FOPT = NONE)

64FTC = _____

78 Elements (hidden when E78 = N)

If E78 = 1B, the following settings will apply:

Forward Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78FWD = _____

Reverse Reach Reactance
(0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model}) 78REV = _____

Right-Hand Blinder
(0.1–50.0 Ohms {5 A model}; 0.5–250.0 Ohms {1 A model}) 78R1 = _____

Left-Hand Blinder
(0.1–50.0 Ohms {5 A model}; 0.5–250.0 Ohms {1 A model}) 78R2 = _____

Out-of-Step Trip Delay (0.00–1.00 s) 78TD = _____

Out-of-Step Trip Duration (0.00–5.00 s) 78TDURD = _____

Positive-Sequence Current Supervision
(0.25–30.00 A {5 A model}; 0.05–6.00 A {1 A model}) 50ABC = _____

78 Element Torque Control (SELOGIC control equation)

OOSTC = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

If E78 = 2B, the following settings will apply:

Forward Reach Reactance (0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model})	78FWD =	
Reverse Reach Reactance (0.1–100.0 Ohms {5 A model}; 0.5–500.0 Ohms {1 A model})	78REV =	
Outer Resistance Blinder (0.2–100.0 Ohms {5 A model}; 1.0–500.0 Ohms {1 A model})	78R1 =	
Inner Resistance Blinder (0.1–50 Ohms {5 A model}; 0.5–250 Ohms {1 A model})	78R2 =	
Out-of-Step Delay (0.00–1.00 s)	78D =	
Out-of-Step Trip Delay (0.00–1.00 s)	78TD =	
Out-of-Step Trip Duration (0.00–5.00 s)	78TDURD =	
Positive-Sequence Current Supervision (0.25–30.00 A {5 A model}; 0.05–6.00 A {1 A model})	50ABC =	

78 Element Torque Control (SELOGIC control equation)

OOSTC =

81 Elements (hidden when E81 = N)

Undervoltage Block (20.0–150.0 V)	27B81P =	50 V
Level 1 Pickup (OFF, 20.00–70.00 Hz)	81D1P =	63 Hz
Level 1 Time Delay (0.03–400.00 s) (hidden when 81D1P = OFF)	81D1D =	2 s
Level 2 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 2)	81D2P =	62 Hz
Level 2 Time Delay (0.03–400.00 s) (hidden when E81 < 2 or 81D2P = OFF)	81D2D =	3 s
Level 3 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 3)	81D3P =	58 Hz
Level 3 Time Delay (0.03–400.00 s) (hidden when E81 < 3 or 81D3P = OFF)	81D3D =	3 s
Level 4 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 4)	81D4P =	57 Hz
Level 4 Time Delay (0.03–400.00 s) (hidden when E81 < 4 or 81D4P = OFF)	81D4D =	2 s
Level 5 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 5)	81D5P =	-
Level 5 Time Delay (0.03–400.00 s) (hidden when E81 < 5 or 81D5P = OFF)	81D5D =	-
Level 6 Pickup (OFF, 20.00–70.00 Hz) (hidden when E81 < 6)	81D6P =	-
Level 6 Time Delay (0.03–400.00 s) (hidden when E81 < 6 or 81D6P = OFF)	81D6D =	-

81AC Elements (hidden when E81AC = N)

Upper Frequency Limit of Band 1 (20.0–70.0 Hz)	UBND1 =	
Lower Frequency Limit of Band 1 (20.0–70.0 Hz)	LBND1 =	
Band 1 Accumulator Limit Time (0.01–6000.00 s)	TBND1 =	
Lower Frequency Limit of Band 2 (20.0–70.0 Hz) (hidden when E81AC < 2)	LBND2 =	
Band 2 Accumulator Limit Time (0.01–6000.00 s) (hidden when E81AC < 2)	TBND2 =	

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Lower Frequency Limit of Band 3 (20.0–70.0 Hz)
(hidden when E81AC < 3) LBND3 = _____

Band 3 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 3) TBND3 = _____

Lower Frequency Limit of Band 4 (20.0–70.0 Hz)
(hidden when E81AC < 4) LBND4 = _____

Band 4 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 4) TBND4 = _____

Lower Frequency Limit of Band 5 (20.0–70.0 Hz)
(hidden when E81AC < 5) LBND5 = _____

Band 5 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 5) TBND5 = _____

Lower Frequency Limit of Band 6 (20.0–70.0 Hz)
(hidden when E81AC < 6) LBND6 = _____

Band 6 Accumulator Limit Time (0.01–6000.00 s)
(hidden when E81AC < 6) TBND6 = _____

Accumulator Time-Delayed Pickup (0.00–400.00 s) 62ACC = _____

Abnormal Frequency Element Control (SELOGIC control equation)

ONLINE = _____

87N Elements for Model 0300G0, 0300G2 (hidden when E87N = N)

Level 1 Ground Differential Pickup
(0.1 • CTR/CTRN to 15.0 A {5 A model};
0.02 • CTR/CTRN to 3.00 A {1 A model}) 87N1P = _____

Level 1 Ground Differential Time Delay (0.00 to 400.00 s) 87N1D = _____

Level 2 Ground Differential Pickup
(OFF, 0.1*CTR/CTRN to 15.0 A {5 A model};
OFF, 0.02*CTR/CTRN to 3.00 A {1 A model}) 87N2P = _____

Level 2 Ground Differential Time Delay (0.00 to 400.00 s)
(hidden when 87N2P = OFF) 87N2D = _____

87N Element Torque Control (SELOGIC control equation)

87NTC = _____

87 Elements for Model 0300G1, 0300G3 (hidden when E87 = N)

XFMR High-Side Winding L-L Voltage (OFF, 1.0–1000.0 kV)
(hidden when E87 = G) VWDGD = _____

XFMR (GEN, YY, YDAC, YDAB, DACDAC, DABDAB, DABY, DACY)
(hidden when E87 = G) TRCON = _____

87-Input CT Connection (Y, DAB, DAC) (hidden when E87 = G)
(Range depends on TRCON Setting) CTCON = _____

Phase Input TAP Value
(0.50–160.00 A {5 A model}; 0.10–32.00 A{1 A model}) TAP1 = _____

87-Input TAP Value
(0.50–160.00 A {5 A model}; 0.10–32.00 A{1 A model})

Note: Relay calculates TAP values when E87= G, or when E87 = T and VWDGD ≠ OFF. You must enter TAP settings if E87 = T and VWDGD = OFF. TAP_{MAX}/TAP_{MIN} must be less than or equal to 7.5 TAPD = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Unrestrained Element Pickup, multiple of TAP (1.0–20.0)
Note: TAPMAX · U87P ≤ 160.0 A {5 A model}
TAPMAX · U87P ≤ 32.0 A {1 A model}
U87P = **37.6**

Restrained Element Pickup, multiple of TAP (0.04–1.00)
Note: TAP_{MIN} · O87P ≥ 0.2 A {5 A model}
TAP_{MIN} · O87P ≥ 0.04 A {1 A model}
O87P = **0.3**

Restraint Slope 1 Percentage (5–100%)
SLP1 = **25 %**

Restraint Slope 2 Percentage (OFF, 50–200%)
(hidden and set equal to 100% when E87 = G)
SLP2 = **100 %**

Restraint Slope 1 Limit, multiple of TAP (1.0–16.0)
(hidden and set equal to 3 when E87 = G)
Note: TAPMAX • IRS1 ≤ 160.0 A {5 A model}
TAPMAX • IRS1 ≤ 32.0 A {1 A model}
IRS1 = **3**

Second-Harmonic Blocking Percent (OFF, 5–100%)
(hidden and set equal to OFF when E87 = G)
PCT2 = **OFF**

Independent Harmonic Blocking (Y, N)
(hidden when E87 = G or when PCT2 = OFF)
IHBL =

Restrained Element Block (SELOGIC control equation)
87B =

RTD Based Protection for Models Compatible With the SEL-2600 Series Module

RTD Input Option (EXT, NONE) RTDOPT =
(Following Settings are hidden when RTDOPT=NONE)
Temperature Preference Setting (C, F) TMPREF =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD1LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD2LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD3LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD4LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD5LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD6LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD7LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD8LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD9LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD10LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD11LOC =
RTD Location (WDG, BRG, AMB, OTH, NONE) RTD12LOC =
RTD Type (PT100, NI100, NI120, CU10) RTD1TY =
RTD Type (PT100, NI100, NI120, CU10) RTD2TY =
RTD Type (PT100, NI100, NI120, CU10) RTD3TY =
RTD Type (PT100, NI100, NI120, CU10) RTD4TY =
RTD Type (PT100, NI100, NI120, CU10) RTD5TY =
RTD Type (PT100, NI100, NI120, CU10) RTD6TY =
RTD Type (PT100, NI100, NI120, CU10) RTD7TY =

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

RTD Type (PT100, NI100, NI120, CU10)	RTD8TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD9TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD10TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD11TY = _____
RTD Type (PT100, NI100, NI120, CU10)	RTD12TY = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP1 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP1 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP2 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP2 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP3 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP3 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP4 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP4 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP5 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP5 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP6 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP6 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP7 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP7 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP8 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP8 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP9 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP9 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP10 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP10 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP11 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP11 = _____
RTD Trip Temperature (OFF, 32° to 482°F or 0° to 250°C)	TRTMP12 = _____
RTD Alarm Temperature (OFF, 32° to 482°F or 0° to 250°C)	ALTMP12 = _____
Enable Winding Trip Voting (Y, N)	EWDGV = _____
Enable Bearing Trip Voting (Y, N)	EBRGV = _____
RTD Biasing (AMB, LOAD, NONE) (RTDBIAS=AMB requires one RTDnLOC=AMB)	RTDBIAS = _____
RTD Bias Differential Temperature (0° to 45°F or 0° to 25°C)	TMPK = _____
Overload Bias Limit (1.00–2.00 per unit Amps) (Settings TMPK and BLMT are hidden when RTDBIAS ≠ LOAD)	BLMT = _____

<u>Demand Ammeter</u>

Demand Meter Time Constant (5, 10, 15, 30, 60 min)	DMTC = _____
Phase Pickup (OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model})	PDEMP = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Neutral Ground Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) NDEMP = _____

Residual Ground Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) GDEMP = _____

Negative-Sequence Pickup
(OFF, 0.50–16.00 A {5 A model}; OFF, 0.10–3.20 A {1 A model}) QDEMP = _____

Inadvertent Energization Logic

Inadvertent Energization (SELOGIC control equation)

INAD = _____

Inadvertent Energization PU Time (0.00–400.00 s) INADPU = _____

Inadvertent Energization DO Time (0.00–400.00 s) INADDO = _____

SELOGIC Control Equation Variable Timers
(only set those variables and timers enabled by ESV)

SELOGIC Control Equation Variable SV1

SV1 = _____

SV1 Pickup Time (0.00–3000.00 s) SV1PU = _____

SV1 Dropout Time (0.00–3000.00 s) SV1DO = _____

SELOGIC Control Equation Variable SV2

SV2 = _____

SV2 Pickup Time (0.00–3000.00 s) SV2PU = _____

SV2 Dropout Time (0.00–3000.00 s) SV2DO = _____

SELOGIC Control Equation Variable SV3

SV3 = _____

SV3 Pickup Time (0.00–3000.00 s) SV3PU = _____

SV3 Dropout Time (0.00–3000.00 s) SV3DO = _____

SELOGIC Control Equation Variable SV4

SV4 = _____

SV4 Pickup Time (0.00–3000.00 s) SV4PU = _____

SV4 Dropout Time (0.00–3000.00 s) SV4DO = _____

SELOGIC Control Equation Variable SV5

SV5 = _____

SV5 Pickup Time (0.00–3000.00 s) SV5PU = _____

SV5 Dropout Time (0.00–3000.00 s) SV5DO = _____

SELOGIC Control Equation Variable SV6

SV6 = _____

SV6 Pickup Time (0.00–3000.00 s) SV6PU = _____

SV6 Dropout Time (0.00–3000.00 s) SV6DO = _____

SELOGIC Control Equation Variable SV7

SV7 = _____

SV7 Pickup Time (0.00–3000.00 s) SV7PU = _____

SV7 Dropout Time (0.00–3000.00 s) SV7DO = _____

SELOGIC Control Equation Variable SV8

SV8 = _____

SV8 Pickup Time (0.00–3000.00 s) SV8PU = _____

SV8 Dropout Time (0.00–3000.00 s) SV8DO = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

SELOGIC Control Equation Variable SV9
SV9 = _____
SV9 Pickup Time (0.00–3000.00 s) SV9PU = _____
SV9 Dropout Time (0.00–3000.00 s) SV9DO = _____
SELOGIC Control Equation Variable SV10
SV10 = _____
SV10 Pickup Time (0.00–3000.00 s) SV10PU = _____
SV10 Dropout Time (0.00–3000.00 s) SV10DO = _____
SELOGIC Control Equation Variable SV11
SV11 = _____
SV11 Pickup Time (0.00–3000.00 s) SV11PU = _____
SV11 Dropout Time (0.00–3000.00 s) SV11DO = _____
SELOGIC Control Equation Variable SV12
SV12 = _____
SV12 Pickup Time (0.00–3000.00 s) SV12PU = _____
SV12 Dropout Time (0.00–3000.00 s) SV12DO = _____
SELOGIC Control Equation Variable SV13
SV13 = _____
SV13 Pickup Time (0.00–3000.00 s) SV13PU = _____
SV13 Dropout Time (0.00–3000.00 s) SV13DO = _____
SELOGIC Control Equation Variable SV14
SV14 = _____
SV14 Pickup Time (0.00–3000.00 s) SV14PU = _____
SV14 Dropout Time (0.00–3000.00 s) SV14DO = _____
SELOGIC Control Equation Variable SV15
SV15 = _____
SV15 Pickup Time (0.00–3000.00 s) SV15PU = _____
SV15 Dropout Time (0.00–3000.00 s) SV15DO = _____
SELOGIC Control Equation Variable SV16
SV16 = _____
SV16 Pickup Time (0.00–3000.00 s) SV16PU = _____
SV16 Dropout Time (0.00–3000.00 s) SV16DO = _____

Latch Bits Set/Reset Equations **(only set those variables enabled by ESL)**

Set Latch Bit LT1 (SELOGIC control equation)
SET1 = _____
Reset Latch Bit LT1 (SELOGIC control equation)
RST1 = _____
Set Latch Bit LT2 (SELOGIC control equation)
SET2 = _____
Reset Latch Bit LT2 (SELOGIC control equation)

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

RST2 = _____

Set Latch Bit LT3 (SELOGIC control equation)

SET3 = _____

Reset Latch Bit LT3 (SELOGIC control equation)

RST3 = _____

Set Latch Bit LT4 (SELOGIC control equation)

SET4 = _____

Reset Latch Bit LT4 (SELOGIC control equation)

RST4 = _____

Set Latch Bit LT5 (SELOGIC control equation)

SET5 = _____

Reset Latch Bit LT5 (SELOGIC control equation)

RST5 = _____

Set Latch Bit LT6 (SELOGIC control equation)

SET6 = _____

Reset Latch Bit LT6 (SELOGIC control equation)

RST6 = _____

Set Latch Bit LT7 (SELOGIC control equation)

SET7 = _____

Reset Latch Bit LT7 (SELOGIC control equation)

RST7 = _____

Set Latch Bit LT8 (SELOGIC control equation)

SET8 = _____

Reset Latch Bit LT8 (SELOGIC control equation)

RST8 = _____

Set Latch Bit LT9 (SELOGIC control equation)

SET9 = _____

Reset Latch Bit LT9 (SELOGIC control equation)

RST9 = _____

Set Latch Bit LT10 (SELOGIC control equation)

SET10 = _____

Reset Latch Bit LT10 (SELOGIC control equation)

RST10 = _____

Set Latch Bit LT11 (SELOGIC control equation)

SET11 = _____

Reset Latch Bit LT11 (SELOGIC control equation)

RST11 = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Set Latch Bit LT12 (SELOGIC control equation)
SET12 = _____
Reset Latch Bit LT12 (SELOGIC control equation)
RST12 = _____
Set Latch Bit LT13 (SELOGIC control equation)
SET13 = _____
Reset Latch Bit LT13 (SELOGIC control equation)
RST13 = _____
Set Latch Bit LT14 (SELOGIC control equation)
SET14 = _____
Reset Latch Bit LT14 (SELOGIC control equation)
RST14 = _____
Set Latch Bit LT15 (SELOGIC control equation)
SET15 = _____
Reset Latch Bit LT15 (SELOGIC control equation)
RST15 = _____
Set Latch Bit LT16 (SELOGIC control equation)
SET16 = _____
Reset Latch Bit LT16 (SELOGIC control equation)
RST16 = _____

TRIP, CLOSE, ER, OUTPUT Elements

Minimum Trip Duration Time (0.00–400.00 s) TDURD = _____
Trip Equation 1 (SELOGIC control equation)
TR1 = _____
Unlatch Trip Equation 1 (SELOGIC control equation)
ULTR1 = _____
Trip Equation 2 (SELOGIC control equation)
TR2 = _____
Unlatch Trip Equation 2 (SELOGIC control equation)
ULTR2 = _____
Trip Equation 3 (SELOGIC control equation)
TR3 = _____
Unlatch Trip Equation 3 (SELOGIC control equation)
ULTR3 = _____
Trip Equation 4 (SELOGIC control equation)
TR4 = _____
Unlatch Trip Equation 4 (SELOGIC control equation)
ULTR4 = _____
Close Enable Equation (SELOGIC control equation)
CLEN = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Close Initiate Equation (SELOGIC control equation)
CL = _____

Unlatch Close Equation
ULCL = _____

Close Dwell Timer (0.00–1.00 s)
CLSD = _____

Event Trigger Equation
ER = _____

Output Contact Equations

Output Contact OUT101 (SELOGIC control equation)
OUT101 = _____

Output Contact OUT102 (SELOGIC control equation)
OUT102 = _____

Output Contact OUT103 (SELOGIC control equation)
OUT103 = _____

Output Contact OUT104 (SELOGIC control equation)
OUT104 = _____

Output Contact OUT105 (SELOGIC control equation)
OUT105 = _____

Output Contact OUT106 (SELOGIC control equation)
OUT106 = _____

Output Contact OUT107 (SELOGIC control equation)
OUT107 = _____

Output Contact Equations for Model 0300G_1-extra I/O board

Output Contact OUT201 (SELOGIC control equation)
OUT201 = _____

Output Contact OUT202 (SELOGIC control equation)
OUT202 = _____

Output Contact OUT203 (SELOGIC control equation)
OUT203 = _____

Output Contact OUT204 (SELOGIC control equation)
OUT204 = _____

Output Contact OUT205 (SELOGIC control equation)
OUT205 = _____

Output Contact OUT206 (SELOGIC control equation)
OUT206 = _____

Output Contact OUT207 (SELOGIC control equation)
OUT207 = _____

Output Contact OUT208 (SELOGIC control equation)
OUT208 = _____

Output Contact OUT209 (SELOGIC control equation)
OUT209 = _____

RELAY SETTINGS (SERIAL PORT COMMAND SET AND FRONT PANEL)

Output Contact OUT210 (SELOGIC control equation)
OUT210 = _____

Output Contact OUT211 (SELOGIC control equation)
OUT211 = _____

Output Contact OUT212 (SELOGIC control equation)
OUT212 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Event Report Parameters

Length of Event Report (15, 30, 60, 180 cycles {firmware R320 and higher}; 15, 30 cycles {firmware <R320}) LER = _____

Length of Prefault in Event Report (1 through LER-1 cycles) PRE = _____

Front-Panel Display Time-Out

Front-Panel Display Time-Out (OFF, 0–30 min) FP_TO = _____

Date Format

Date Format (MDY, YMD) DATE_F = _____

Station DC Battery Monitor

DC Battery Instantaneous Undervoltage Pickup (OFF, 20–300 Vdc) DCLOP = _____

DC Battery Instantaneous Overvoltage Pickup (OFF, 20–300 Vdc) DCHIP = _____

Power System Configuration

Nominal Frequency (50 Hz, 60 Hz) FNOM = _____

Phase Potential Transformer Connection (D, Y) DELTA_Y = _____

Settings Group Change Delay

Group Change Delay (0–400 s) TGR = _____

Group 1 Select Input (SELOGIC control equation)

SS1 = _____

Group 2 Select Input (SELOGIC control equation)

SS2 = _____

Breaker Monitor Settings

Breaker Monitor Input (SELOGIC control equation)

BKMON = _____

Close/Open Set Point 1–max. (1–65000 operations) COSP1 = _____

Close/Open Set Point 2–mid. (1–65000 operations) COSP2 = _____

Close/Open Set Point 3–min. (1–65000 operations) COSP3 = _____

kA Interrupted Set Point 1–min. (0.1–999.0 kA primary) KASP1 = _____

kA Interrupted Set Point 2–mid. (0.1–999.0 kA primary) KASP2 = _____

kA Interrupted Set Point 3–max. (0.1–999.0 kA primary) KASP3 = _____

Optoisolated Input Timers

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN101D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN102D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN103D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN104D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN105D = _____

Input Debounce Time (0.00–1.00 cycle in 0.25-cycle steps) IN106D = _____

Optoisolated Input Timers for Model 0300G_1

Input IN201 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN201D = _____
Input IN202 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN202D = _____
Input IN203 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN203D = _____
Input IN204 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN204D = _____
Input IN205 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN205D = _____
Input IN206 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN206D = _____
Input IN207 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN207D = _____
Input IN208 Debounce Time (0.00–1.00 cycles in 0.25-cycle steps) IN208D = _____

Local Bit Labels

Enter the following characters:0–9, A–Z, -, /, ., space
for each text label setting, subject to the specified character limit. Enter NA to null a label.

Local Bit LB1 Name (14 characters) NLB1 = _____
Clear Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) CLB1 = _____
Set Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) SLB1 = _____
Pulse Local Bit LB1 Label (7 characters)
(setting hidden if NLB1 = NA) PLB1 = _____
Local Bit LB2 Name (14 characters) NLB2 = _____
Clear Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) CLB2 = _____
Set Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) SLB2 = _____
Pulse Local Bit LB2 Label (7 characters)
(setting hidden if NLB2 = NA) PLB2 = _____
Local Bit LB3 Name (14 characters) NLB3 = _____
Clear Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) CLB3 = _____
Set Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) SLB3 = _____
Pulse Local Bit LB3 Label (7 characters)
(setting hidden if NLB3 = NA) PLB3 = _____
Local Bit LB4 Name (14 characters) NLB4 = _____
Clear Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) CLB4 = _____
Set Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) SLB4 = _____
Pulse Local Bit LB4 Label (7 characters)
(setting hidden if NLB4 = NA) PLB4 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Local Bit LB5 Name (14 characters) NLB5 = _____

Clear Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) CLB5 = _____

Set Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) SLB5 = _____

Pulse Local Bit LB5 Label (7 characters)
(setting hidden if NLB5 = NA) PLB5 = _____

Local Bit LB6 Name (14 characters) NLB6 = _____

Clear Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) CLB6 = _____

Set Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) SLB6 = _____

Pulse Local Bit LB6 Label (7 characters)
(setting hidden if NLB6 = NA) PLB6 = _____

Local Bit LB7 Name (14 characters) NLB7 = _____

Clear Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) CLB7 = _____

Set Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) SLB7 = _____

Pulse Local Bit LB7 Label (7 characters)
(setting hidden if NLB7 = NA) PLB7 = _____

Local Bit LB8 Name (14 characters) NLB8 = _____

Clear Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) CLB8 = _____

Set Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) SLB8 = _____

Pulse Local Bit LB8 Label (7 characters)
(setting hidden if NLB8 = NA) PLB8 = _____

Local Bit LB9 Name (14 characters) NLB9 = _____

Clear Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) CLB9 = _____

Set Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) SLB9 = _____

Pulse Local Bit LB9 Label (7 characters)
(setting hidden if NLB9 = NA) PLB9 = _____

Local Bit LB10 Name (14 characters) NLB10 = _____

Clear Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) CLB10 = _____

Set Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) SLB10 = _____

Pulse Local Bit LB10 Label (7 characters)
(setting hidden if NLB10 = NA) PLB10 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Local Bit LB11 Name (14 characters) NLB11 = _____

Clear Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) CLB11 = _____

Set Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) SLB11 = _____

Pulse Local Bit LB11 Label (7 characters)
(setting hidden if NLB11 = NA) PLB11 = _____

Local Bit LB12 Name (14 characters) NLB12 = _____

Clear Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) CLB12 = _____

Set Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) SLB12 = _____

Pulse Local Bit LB12 Label (7 characters)
(setting hidden if NLB12 = NA) PLB12 = _____

Local Bit LB13 Name (14 characters) NLB13 = _____

Clear Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) CLB13 = _____

Set Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) SLB13 = _____

Pulse Local Bit LB13 Label (7 characters)
(setting hidden if NLB13 = NA) PLB13 = _____

Local Bit LB14 Name (14 characters) NLB14 = _____

Clear Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) CLB14 = _____

Set Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) SLB14 = _____

Pulse Local Bit LB14 Label (7 characters)
(setting hidden if NLB14 = NA) PLB14 = _____

Local Bit LB15 Name (14 characters) NLB15 = _____

Clear Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) CLB15 = _____

Set Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) SLB15 = _____

Pulse Local Bit LB15 Label (7 characters)
(setting hidden if NLB15 = NA) PLB15 = _____

Local Bit LB16 Name (14 characters) NLB16 = _____

Clear Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) CLB16 = _____

Set Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) SLB16 = _____

Pulse Local Bit LB16 Label (7 characters)
(setting hidden if NLB16 = NA) PLB16 = _____

Front-Panel Display

Front-Panel Current Display (Y, N) FP_I = _____
Front-Panel Phase-to-Phase Voltage Display (Y, N) FP_VPP = _____
Front-Panel Phase Voltage Display (Y, N)
(hidden when DELTA_Y = D) FP_VP = _____
Front-Panel Power Display (Y, N) FP_MW = _____
Front-Panel Frequency Display (Y, N) FP_FR = _____
Front-Panel Current Differential Display (Y, N) FP_87 = _____
Front-Panel Field Insulation Rf Display (Y, N) FP_RF = _____
Front-Panel RTD Temperature Display (Y, N) FP_RTD = _____

Display Points

Display Point DP1 (SELOGIC control equation)
DP1 = _____
Display if DP1 = logical 1 (16 characters) DP1_1 = _____
Display if DP1 = logical 0 (16 characters) DP1_0 = _____
Display Point DP2 (SELOGIC control equation)
DP2 = _____
Display if DP2 = logical 1 (16 characters) DP2_1 = _____
Display if DP2 = logical 0 (16 characters) DP2_0 = _____
Display Point DP3 (SELOGIC control equation)
DP3 = _____
Display if DP3 = logical 1 (16 characters) DP3_1 = _____
Display if DP3 = logical 0 (16 characters) DP3_0 = _____
Display Point DP4 (SELOGIC control equation)
DP4 = _____
Display if DP4 = logical 1 (16 characters) DP4_1 = _____
Display if DP4 = logical 0 (16 characters) DP4_0 = _____
Display Point DP5 (SELOGIC control equation)
DP5 = _____
Display if DP5 = logical 1 (16 characters) DP5_1 = _____
Display if DP5 = logical 0 (16 characters) DP5_0 = _____
Display Point DP6 (SELOGIC control equation)
DP6 = _____
Display if DP6 = logical 1 (16 characters) DP6_1 = _____
Display if DP6 = logical 0 (16 characters) DP6_0 = _____
Display Point DP7 (SELOGIC control equation)
DP7 = _____
Display if DP7 = logical 1 (16 characters) DP7_1 = _____
Display if DP7 = logical 0 (16 characters) DP7_0 = _____

GLOBAL SETTINGS (SERIAL PORT COMMAND SET G AND FRONT PANEL)

Display Point DP8 (SELOGIC control equation)
DP8 = _____
Display if DP8 = logical 1 (16 characters) DP8_1 = _____
Display if DP8 = logical 0 (16 characters) DP8_0 = _____
Display Point DP9 (SELOGIC control equation)
DP9 = _____
Display if DP9 = logical 1 (16 characters) DP9_1 = _____
Display if DP9 = logical 0 (16 characters) DP9_0 = _____
Display Point DP10 (SELOGIC control equation)
DP10 = _____
Display if DP10 = logical 1 (16 characters) DP10_1 = _____
Display if DP10 = logical 0 (16 characters) DP10_0 = _____
Display Point DP11 (SELOGIC control equation)
DP11 =
Display if DP11 = logical 1 (16 characters) DP11_1 = _____
Display if DP11 = logical 0 (16 characters) DP11_0 = _____
Display Point DP12 (SELOGIC control equation)
DP12 = _____
Display if DP12 = logical 1 (16 characters) DP12_1 = _____
Display if DP12 = logical 0 (16 characters) DP12_0 = _____
Display Point DP13 (SELOGIC control equation)
DP13 = _____
Display if DP13 = logical 1 (16 characters) DP13_1 = _____
Display if DP13 = logical 0 (16 characters) DP13_0 = _____
Display Point DP14 (SELOGIC control equation)
DP14 = _____
Display if DP14 = logical 1 (16 characters) DP14_1 = _____
Display if DP14 = logical 0 (16 characters) DP14_0 = _____
Display Point DP15 (SELOGIC control equation)
DP15 = _____
Display if DP15 = logical 1 (16 characters) DP15_1 = _____
Display if DP15 = logical 0 (16 characters) DP15_0 = _____
Display Point DP16 (SELOGIC control equation)
DP16 = _____
Display if DP16 = logical 1 (16 characters) DP16_1 = _____
Display if DP16 = logical 0 (16 characters) DP16_0 = _____

SEQUENTIAL EVENTS RECORDER SETTINGS (SERIAL PORT COMMAND SET R)

Sequential Events Recorder settings are comprised of three trigger lists. Each trigger list can include up to 24 Relay Word bits delimited by spaces or commas. See *Sequential Events Recorder (SER) Report* in *Section 11: Event Reports and SER Functions*.

SER Trigger List 1 SER1 = _____

SER Trigger List 2 SER2 = _____

SER Trigger List 3 SER3 = _____

SER Trigger List 4 SER4 = _____

Relay Word Bit Aliases (ALIAS# > EALIAS setting are hidden)

(See ***Alias Settings*** in ***Section 3: Auxiliary Function Settings***.)

Enable ALIAS Settings (0, 10, 20, 30, 40) EALIAS = _____

ALIAS1 = _____

ALIAS2 = _____

ALIAS3 = _____

ALIAS4 = _____

ALIAS5 = _____

ALIAS6 = _____

ALIAS7 = _____

ALIAS8 = _____

ALIAS9 = _____

ALIAS10 = _____

ALIAS11 = _____

ALIAS12 = _____

ALIAS13 = _____

ALIAS14 = _____

ALIAS15 = _____

ALIAS16 = _____

ALIAS17 = _____

ALIAS18 = _____

ALIAS19 = _____

SEQUENTIAL EVENTS RECORDER SETTINGS (SERIAL PORT COMMAND SET R)

ALIAS20 = _____

ALIAS21 = _____

ALIAS22 = _____

ALIAS23 = _____

ALIAS24 = _____

ALIAS25 = _____

ALIAS26 = _____

ALIAS27 = _____

ALIAS28 = _____

ALIAS29 = _____

ALIAS30 = _____

ALIAS31 = _____

ALIAS32 = _____

ALIAS33 = _____

ALIAS34 = _____

ALIAS35 = _____

ALIAS36 = _____

ALIAS37 = _____

ALIAS38 = _____

ALIAS39 = _____

ALIAS40 = _____

PORT SETTINGS (SERIAL PORT COMMAND SET P AND FRONT PANEL)

Protocol Settings

Protocol (SEL, LMD, MOD {Standard plus Modbus® Models}; SEL, LMD {Standard Models})	PROTO = _____
LMD Prefix (@, #, $, %, &) (hidden when PROTO ≠ LMD)	PREFIX = _____
LMD Address (01–99) (hidden when PROTO ≠ LMD)	ADDR = _____
LMD Settling Time (0–30 seconds) (hidden when PROTO ≠ LMD)	SETTLE = _____
Enable Hardware Handshaking[2] (Y, N, H {when PROTO = MOD}; Y, N {when PROTO = SEL}) (hidden when PROTO = LMD)	RTSCTS = _____
Modbus Slave ID (1–247) (hidden when PROTO ≠ MOD)	SLAVEID = _____

Protocol Settings: Refer to ***Section 10: Serial Port Communications and Commands*** for details.

Communications Settings

Baud Rate (300, 1200, 2400, 4800, 9600, 19200, 38400)	SPEED = _____

Note: The highest baud rate for Modbus RTU protocol is 19200.

Data Bits (7, 8)	BITS = _____
Parity (0, E, N) {Odd, Even, None}	PARITY = _____
Stop Bits (1, 2)	STOP = _____

Other Port Settings

Time-Out (0–30 minutes)	T_OUT = _____
Send Auto Messages to Port (Y, N)	AUTO = _____
Fast Operate Enable (Y, N)	FASTOP = _____

Other Port Settings. Set T_OUT to the number of minutes of serial port inactivity for an automatic log out. Set T_OUT = 0 for no port time-out. If the event report length setting LER = 180 cycles, set the port time-out setting T_OUT > 2 minutes.

Set AUTO = Y to allow automatic messages at the serial port. Set RTSCTS = Y to enable hardware handshaking. With RTSCTS = Y, the relay will not send characters until the CTS input is asserted. Also, if the relay is unable to receive characters, it deasserts the RTS line.

Set FASTOP = Y to enable binary *Fast Operate* messages at the serial port. Set FASTOP = N to block binary *Fast Operate* messages. Refer to ***Appendix D: Configuration, Fast Meter, and Fast Operate Commands*** for the description of the SEL-300G Relay *Fast Operate* commands.

[2] RTSCTS setting is hidden for Port 1 (EIA-485) and the default value is N.

1.1.6 - Comentários e Conclusões.

● O estudo está literalmente desenvolvido nas proteções de fabricação Schweitzer que fazem parte do novo arranjo da planta. Não foram feitas portanto nenhuma análise das curvas e ajustes da parte existente da mesma.

● Os respectivos ajustes das funções térmicas do gerador e dos motores foi feita de forma padrão pela falta de informações obtidas no catálogo do fabricante onde não se disponibilizam as constantes de aquecimento e resfriamento.

● Não foram feitos os estudos de load-flow da planta que pudessem garantir a correta partida dos motores de 13.8 KV frente a operação dos geradores TG1 e TG2 na condição ilhada da planta.

1.1.8 - Anexo 1 : Planilhas e Estudos de Curto – Circuito.

Para o estudo de curto optou-se por modelar a Usina alimentada somente pela Concessionária(01 condição) e pela concessionária e o gerador de 5 MVA(02 condição) objetivando-se as menores correntes de defeito.(Esses diagramas são apresentados nas figuras abaixo obedecendo a numeração apresentada no diagrama Unifilar tomado como referência).

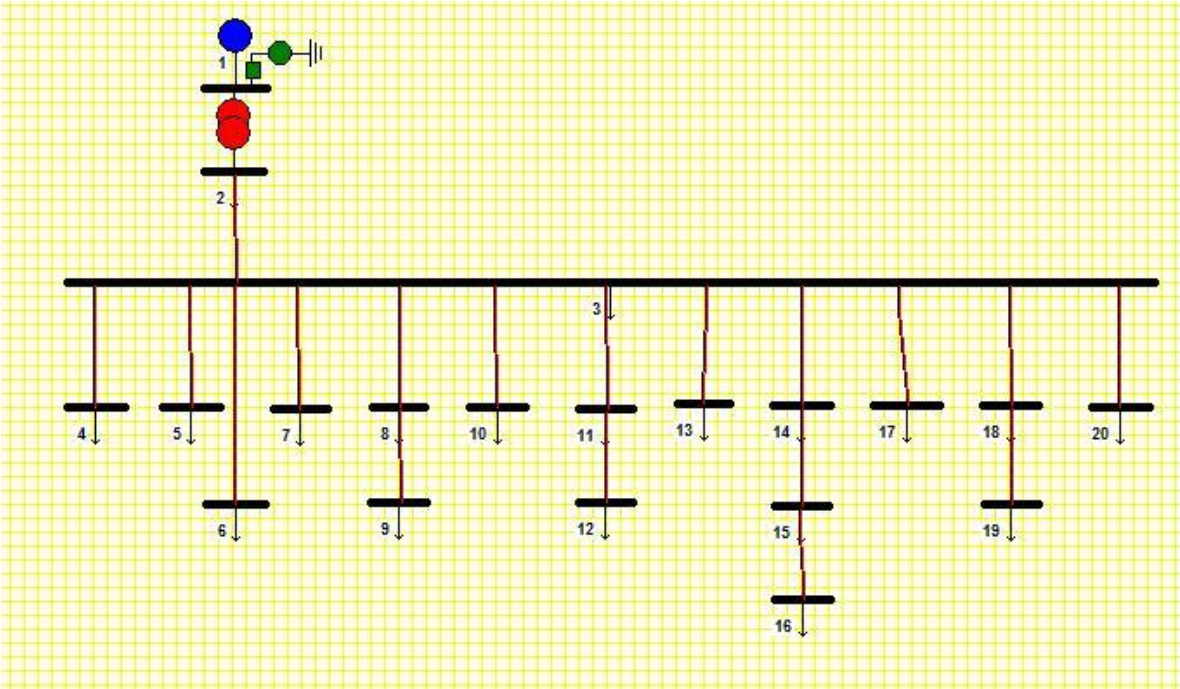

Figura 5 – Diagrama Unifilar – Caso 1

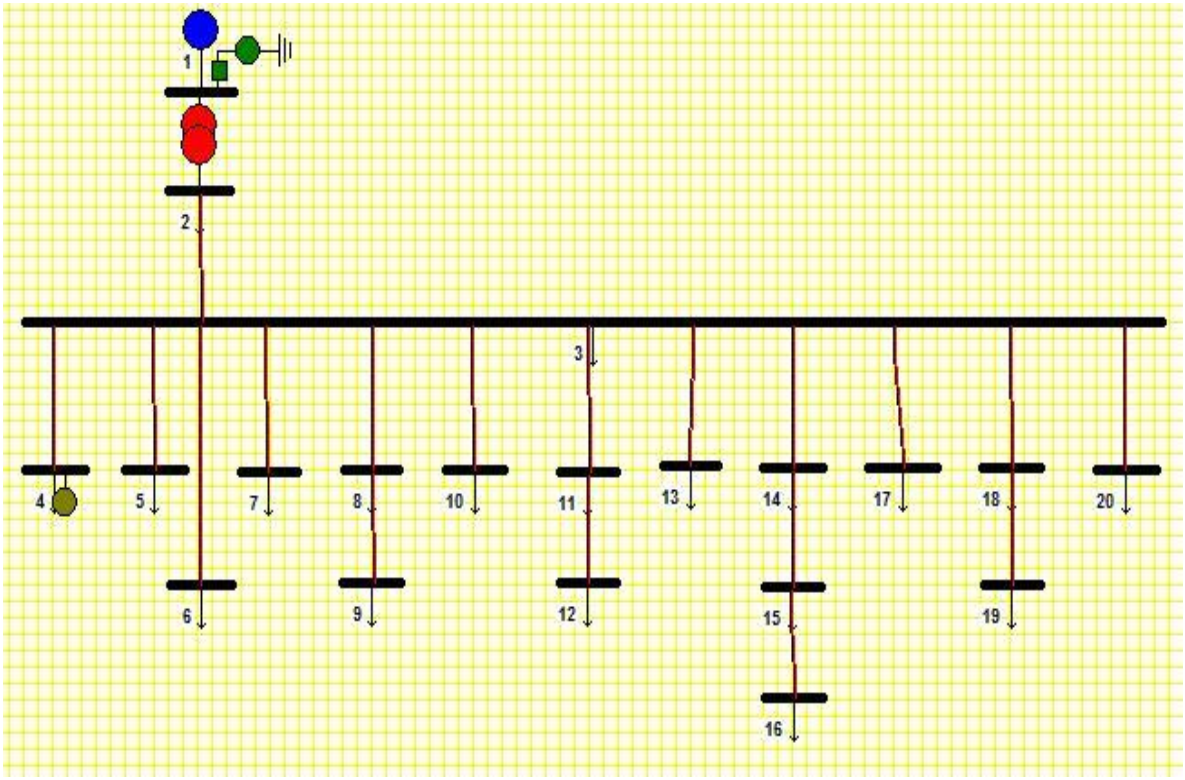

Figura 6 – Diagrama Unifilar – Caso 2

Nos dois arquivos anexados em EXCEL são apresentados os defeitos 3F,2F e 1F em todas as barras com suas contribuições e valores primários de corrente e tensão usados no estudo em pauta.

Arquivo 1 : Iacanga_Curtos.zip

Arquivo 2 : Curtos_Restantes_Caso_2.zip

Arquivo 3 : dados das Impedâncias Usadas no estudo de curto-circuito.doc