

CIRCUIT ANALYSIS WORKSHEET

Example #1

Component ID: **AOV-1 (SOV-1)** Component Type: **AOV**

Component Description: **Power Operated Relief Valve**

BE Code: **AOV-1_TO (PORV AOV-1 TRANSFERS OPEN)**

Required Position: **CLOSED**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **CLOSED**

Failed Air Position: **CLOSED**

High Consequence Component Yes No

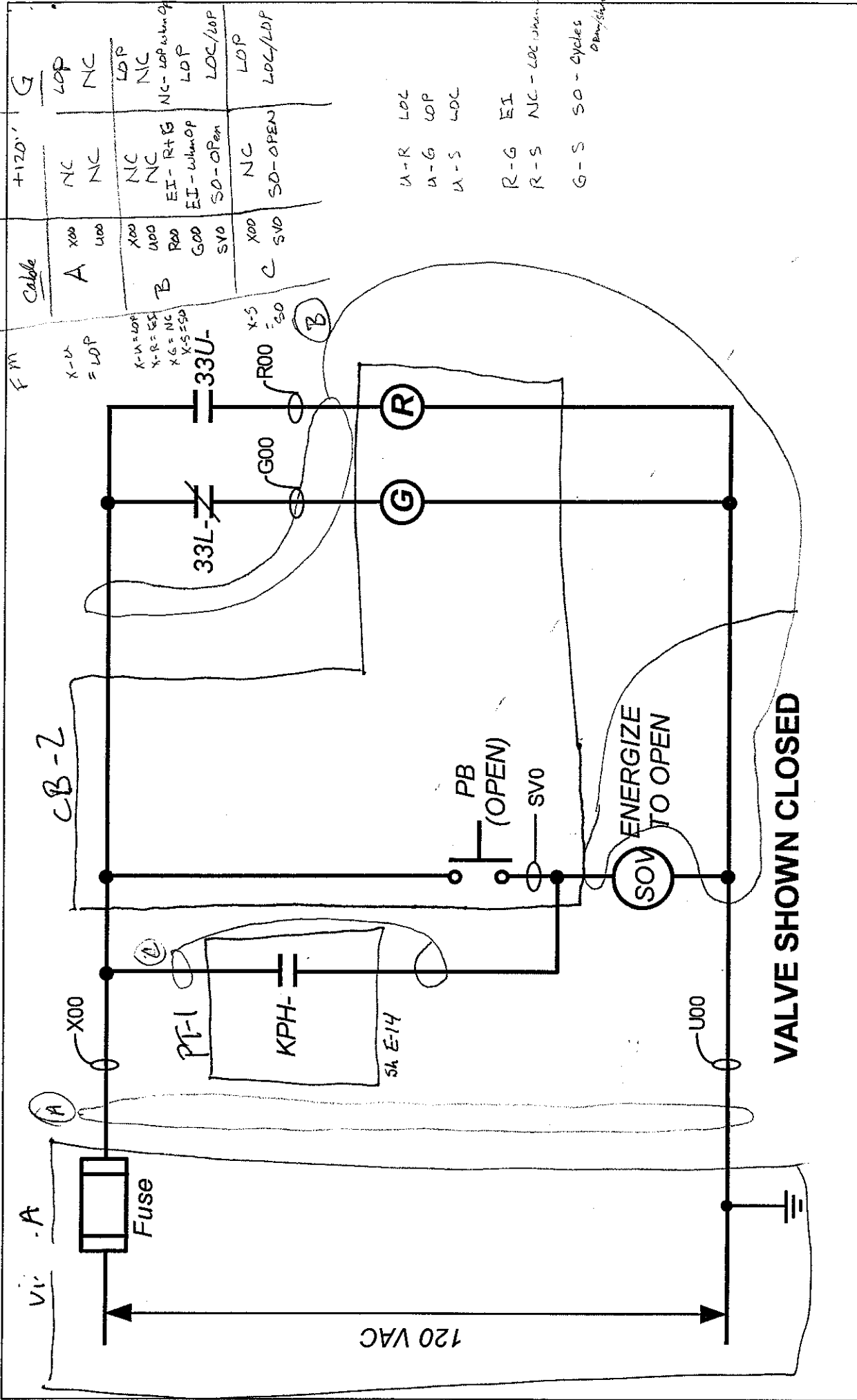
Power Supplies: Vital-A Breaker: 3

Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
VA3A	N	Power	LOP	
VA3B	Y	Control	SO-OPEN	Hot Short between conductors GGO and SVC can cause Valve to cycle open-shut repeatedly
VA3C	Y	Control	SO-OPEN	

<p>Comments: Table 2</p> <p>$P_{(SO,B)} = 0.60 + 0.06 - (0.6 \times 0.06) = 0.62$</p>	<p style="text-align: center;">Formula</p> <p>$P_{(SO,B)} = 0.57 \times 0.42 = 0.24$</p>
<p>$P_{(SO,C)} = 0.60 + 0.06 - (0.6 \times 0.06) = 0.62$ ← Table 2</p>	<p>$P_{(SO,C)} = 0.67 \times 0.63 = 0.42$</p>



Terminal	Cable	Notes
+120V	G	
X00	A	NC
U00	A	NC
X00	B	NC
U00	B	NC
R00	B	EI - R+B
G00	B	EI - when OP
S0	B	SD - OPEN
X00	C	NC
S0	C	SD - OPEN

- X-U = LOP
- X-V = LOP
- X-W = LOP
- X-R = SS
- X-G = NC
- X-S = SD
- X-1 = LOP
- X-2 = LOP
- X-3 = LOP
- X-4 = LOP
- X-5 = SD

- U-R LOP
- U-G LOP
- U-S LOP
- R-G EI
- R-S NC - LOC when F
- G-S SO - Cycles

SNPP
 SCHEMATIC DIAGRAM -
 PRESSURE OPERATED
 RELIEF SOLENOID VALVE
 SOV-1

Drawing No.: E-03
 Date: 05/04/2007
 Revision No.: 1

SCHEME VA3

VALVE SHOWN CLOSED

ENERGIZE TO OPEN

PB (OPEN)

120 VAC

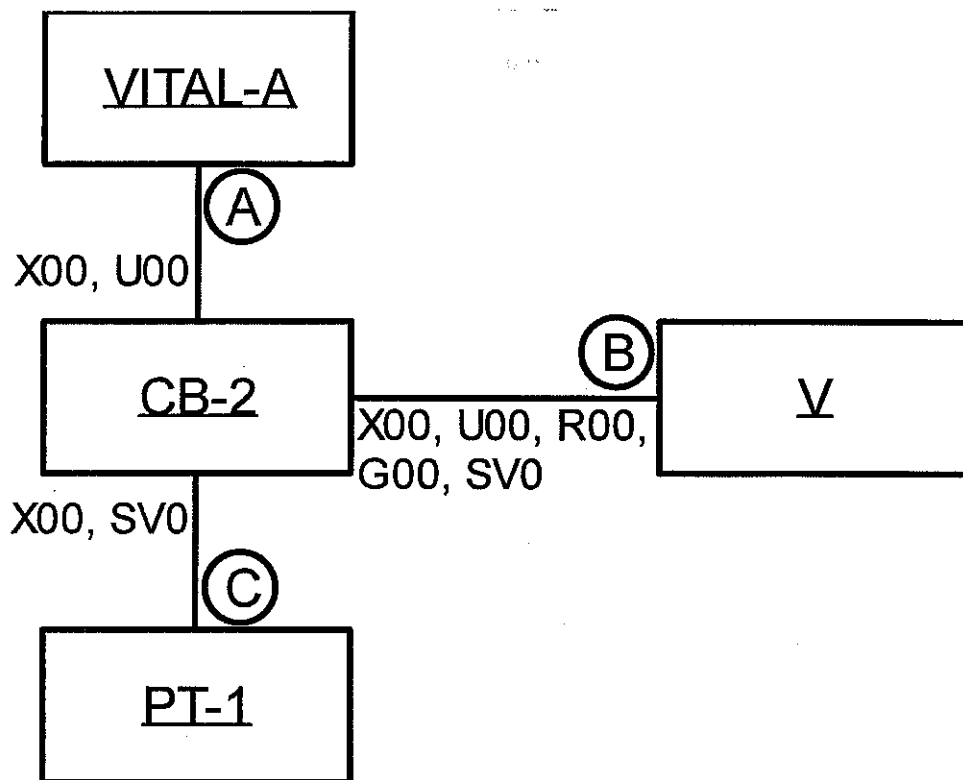
SNPP

TITLE:

AOV-1 BLOCK DIAGRAM

DATE:

4/27/07



SOV-1 SCHEME VA3

CIRCUIT ANALYSIS WORKSHEET

Example #2

Component ID: **AOV-3 (SOV-3)** Component Type: **AOV**

Component Description: **Charging Pump Injection Valve**

BE Code: **AOV-3_FTC (AOV-3 FAILS TO CLOSE)**

Required Position: **CLOSED**
Functional State

Normal Position: **OPEN**

Failed Electrical Position: **CLOSED**

Failed Air Position: **CLOSED**

High Consequence Component Yes No

Power Supplies: Panel B Breaker: 3

Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
PB3A	N	Power	LOP	
PB3B	Y	Control	SD-Open	Energize SVD (ALSO, EI, LOP, LOC)
PB3C	N	Control	LOP	

<p>Comments: <i>Table</i></p> $P_{(SO,B)} = 0.60 + 0.06 - (0.60 \times 0.06) = 0.62$	<p style="text-align: center;"><i>Formula</i></p> $P_{cc} = \frac{(7-1)}{(7-1) + (2 \times 1)} = \frac{6}{6+2} = \frac{6}{8} = 0.75$ $CF = \{1 [3 + \frac{0.5}{1}]\} / 7 = \frac{3.07}{7} = 0.44$ $P_{(SO,B)} = 0.75 \times 0.44 = 0.33$
--	--

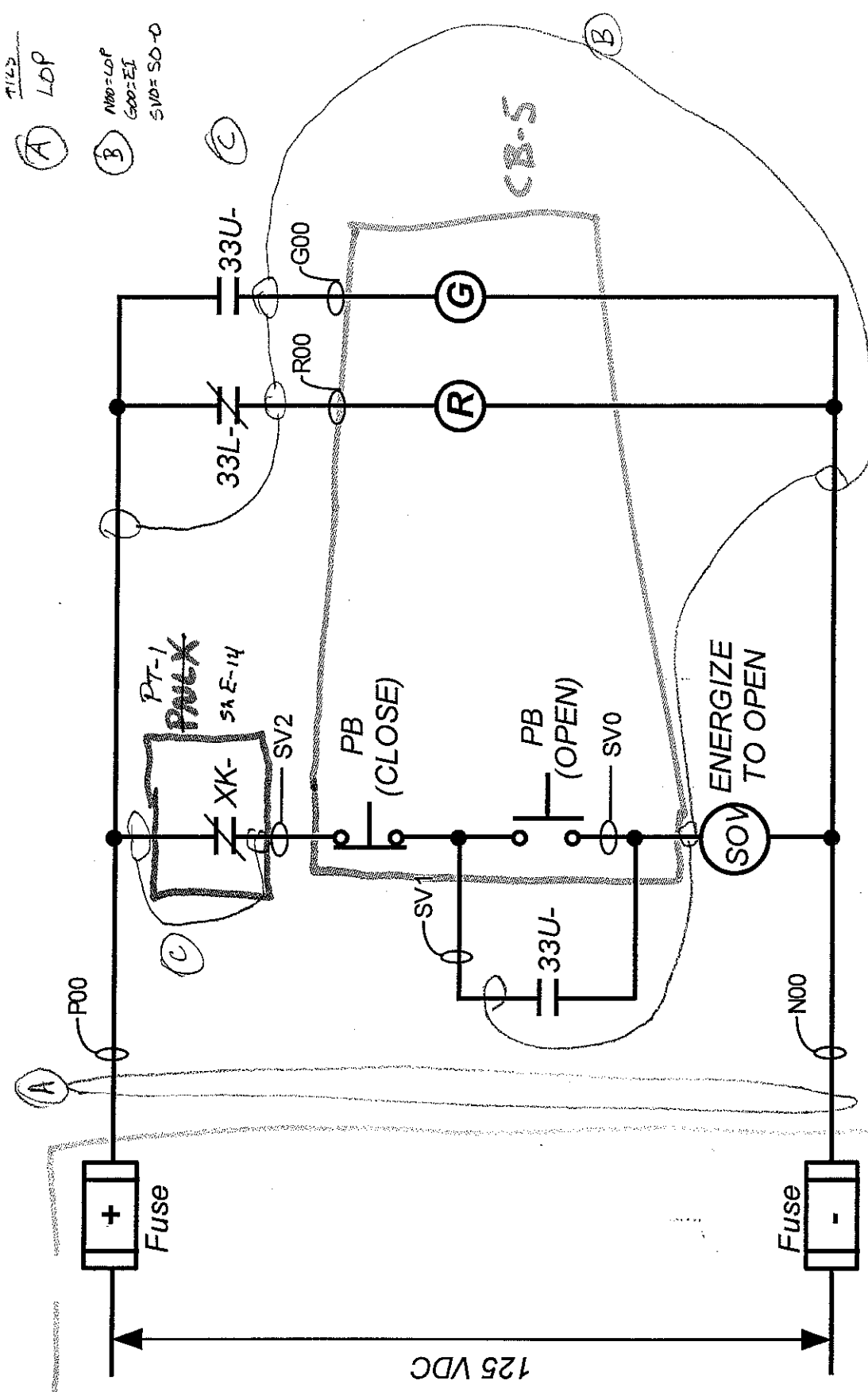
1142
LDP

P00 = LOP
R00 = LOP
SVD = LOP
SVI = LOP

LDP

LDP

N00 = LOP
G00 = EI
SVD = SO-D



VALVE SHOWN CLOSED

VALVE	DESCRIPTION	SCHEME	SWITCH ID
SOV-2	LETDOWN ISOLATION	PB2	AOV-2
SOV-3	CHARGING PUMP INJECTION	PB3	AOV-3

SNPP

SCHEMATIC DIAGRAM --
PRIMARY MAKEUP SYSTEM
SOLENOID VALVES
SOV-2 & SOV-3

Drawing No.:
E-02

Date: 5/4/07
0442772007

Revision No.:
0

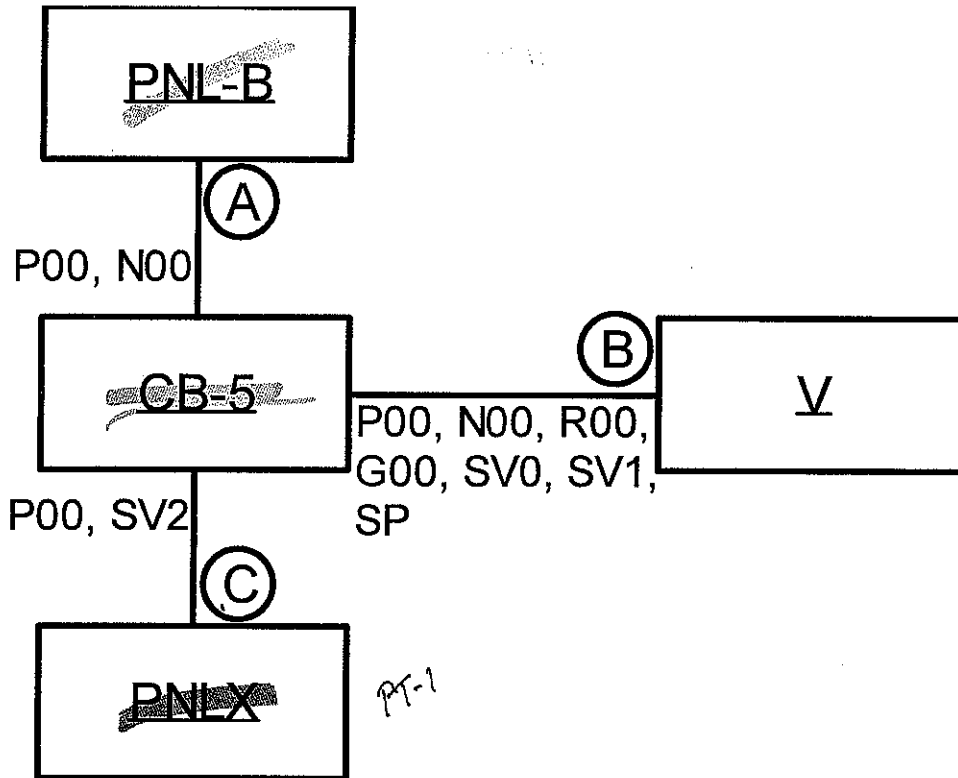
SNPP

TITLE:

AOV-3 BLOCK DIAGRAM

DATE:

4/27/07



50V-3, SCHEME PB3

CIRCUIT ANALYSIS WORKSHEET

Example #3

Component ID: **MOV-9** Component Type: **MOV**

Component Description: **High Pressure Injection Valve**

BE Code: **MOV-9_FTO (MOV-9 FAILS TO OPEN)**

Required Position: **OPEN**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: MCC-B1 Breaker: 45

Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
MB15A	Y	Control	EI, SO-C, SO-O, LDP, LOC	9-C, 1 gnd, 1 target, 2 sources
MB15B	Y	Control	EI, LDP, LOC	
MB15P	Y	Power	LDP	

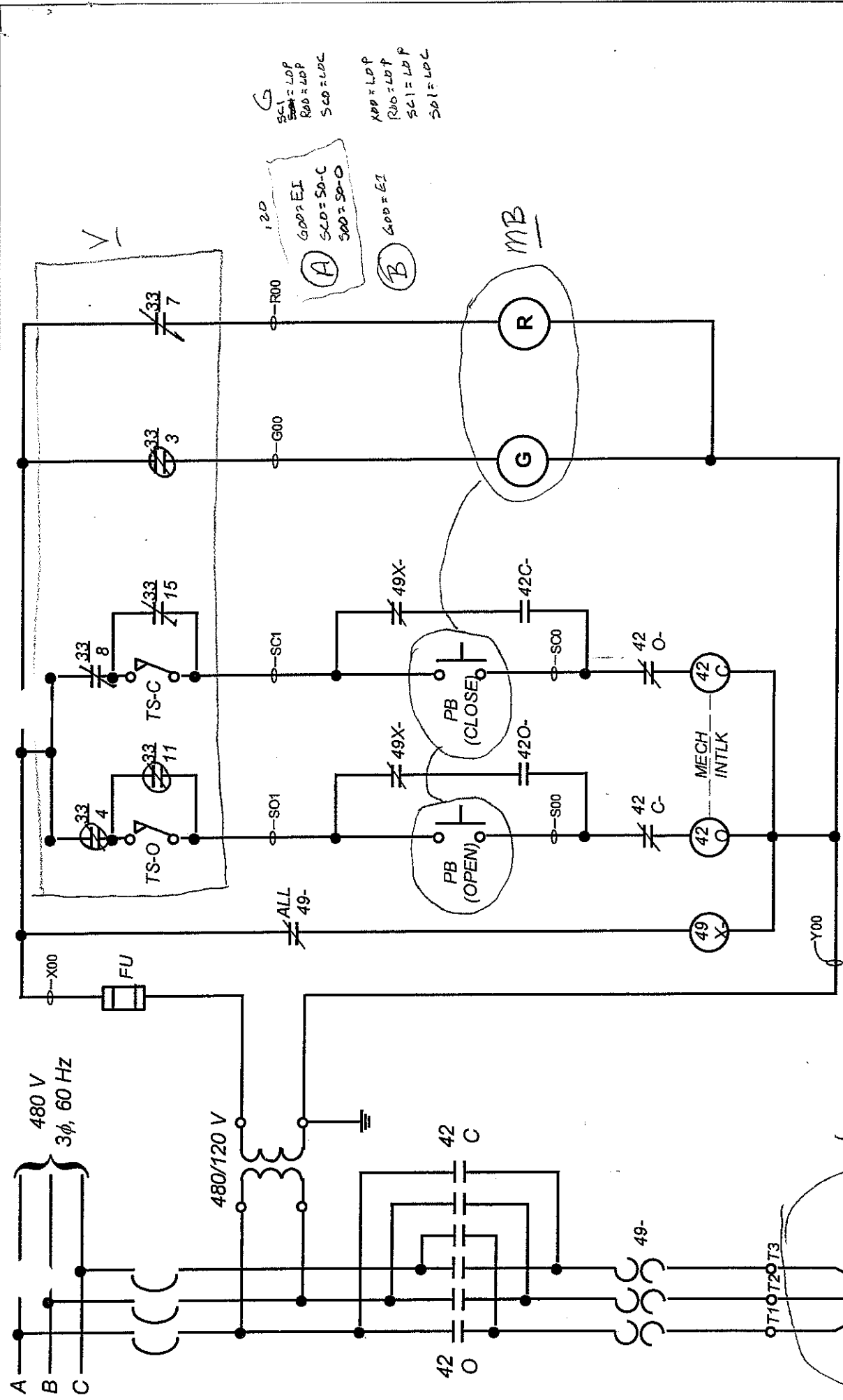
Comments:

$$P_{Table 101} = 0.3 + 0.03 = 0.33$$

$$P_{Calc} = 0.727 \times 0.228 = 0.17$$

$$P_{CC} = \frac{(9-1)}{(9-1) + (2 \times 1) + 1} = 0.727$$

$$CF = 1 \times [2 + \frac{0.5}{9}] / 9 = 0.228$$



SC1 = LOP
 SC2 = LOP
 SC3 = LOP
 SC4 = LOP
 SC5 = LOP
 SC6 = LOP
 SC7 = LOP
 SC8 = LOP
 SC9 = LOP
 SC10 = LOP
 SC11 = LOP
 SC12 = LOP
 SC13 = LOP
 SC14 = LOP
 SC15 = LOP
 SC16 = LOP
 SC17 = LOP
 SC18 = LOP
 SC19 = LOP
 SC20 = LOP
 SC21 = LOP
 SC22 = LOP
 SC23 = LOP
 SC24 = LOP
 SC25 = LOP
 SC26 = LOP
 SC27 = LOP
 SC28 = LOP
 SC29 = LOP
 SC30 = LOP
 SC31 = LOP
 SC32 = LOP
 SC33 = LOP
 SC34 = LOP
 SC35 = LOP
 SC36 = LOP
 SC37 = LOP
 SC38 = LOP
 SC39 = LOP
 SC40 = LOP
 SC41 = LOP
 SC42 = LOP
 SC43 = LOP
 SC44 = LOP
 SC45 = LOP
 SC46 = LOP
 SC47 = LOP
 SC48 = LOP
 SC49 = LOP
 SC50 = LOP
 SC51 = LOP
 SC52 = LOP
 SC53 = LOP
 SC54 = LOP
 SC55 = LOP
 SC56 = LOP
 SC57 = LOP
 SC58 = LOP
 SC59 = LOP
 SC60 = LOP
 SC61 = LOP
 SC62 = LOP
 SC63 = LOP
 SC64 = LOP
 SC65 = LOP
 SC66 = LOP
 SC67 = LOP
 SC68 = LOP
 SC69 = LOP
 SC70 = LOP
 SC71 = LOP
 SC72 = LOP
 SC73 = LOP
 SC74 = LOP
 SC75 = LOP
 SC76 = LOP
 SC77 = LOP
 SC78 = LOP
 SC79 = LOP
 SC80 = LOP
 SC81 = LOP
 SC82 = LOP
 SC83 = LOP
 SC84 = LOP
 SC85 = LOP
 SC86 = LOP
 SC87 = LOP
 SC88 = LOP
 SC89 = LOP
 SC90 = LOP
 SC91 = LOP
 SC92 = LOP
 SC93 = LOP
 SC94 = LOP
 SC95 = LOP
 SC96 = LOP
 SC97 = LOP
 SC98 = LOP
 SC99 = LOP
 SC100 = LOP

G
 SC1 = LOP
 SC2 = LOP
 SC3 = LOP
 SC4 = LOP
 SC5 = LOP
 SC6 = LOP
 SC7 = LOP
 SC8 = LOP
 SC9 = LOP
 SC10 = LOP
 SC11 = LOP
 SC12 = LOP
 SC13 = LOP
 SC14 = LOP
 SC15 = LOP
 SC16 = LOP
 SC17 = LOP
 SC18 = LOP
 SC19 = LOP
 SC20 = LOP
 SC21 = LOP
 SC22 = LOP
 SC23 = LOP
 SC24 = LOP
 SC25 = LOP
 SC26 = LOP
 SC27 = LOP
 SC28 = LOP
 SC29 = LOP
 SC30 = LOP
 SC31 = LOP
 SC32 = LOP
 SC33 = LOP
 SC34 = LOP
 SC35 = LOP
 SC36 = LOP
 SC37 = LOP
 SC38 = LOP
 SC39 = LOP
 SC40 = LOP
 SC41 = LOP
 SC42 = LOP
 SC43 = LOP
 SC44 = LOP
 SC45 = LOP
 SC46 = LOP
 SC47 = LOP
 SC48 = LOP
 SC49 = LOP
 SC50 = LOP
 SC51 = LOP
 SC52 = LOP
 SC53 = LOP
 SC54 = LOP
 SC55 = LOP
 SC56 = LOP
 SC57 = LOP
 SC58 = LOP
 SC59 = LOP
 SC60 = LOP
 SC61 = LOP
 SC62 = LOP
 SC63 = LOP
 SC64 = LOP
 SC65 = LOP
 SC66 = LOP
 SC67 = LOP
 SC68 = LOP
 SC69 = LOP
 SC70 = LOP
 SC71 = LOP
 SC72 = LOP
 SC73 = LOP
 SC74 = LOP
 SC75 = LOP
 SC76 = LOP
 SC77 = LOP
 SC78 = LOP
 SC79 = LOP
 SC80 = LOP
 SC81 = LOP
 SC82 = LOP
 SC83 = LOP
 SC84 = LOP
 SC85 = LOP
 SC86 = LOP
 SC87 = LOP
 SC88 = LOP
 SC89 = LOP
 SC90 = LOP
 SC91 = LOP
 SC92 = LOP
 SC93 = LOP
 SC94 = LOP
 SC95 = LOP
 SC96 = LOP
 SC97 = LOP
 SC98 = LOP
 SC99 = LOP
 SC100 = LOP

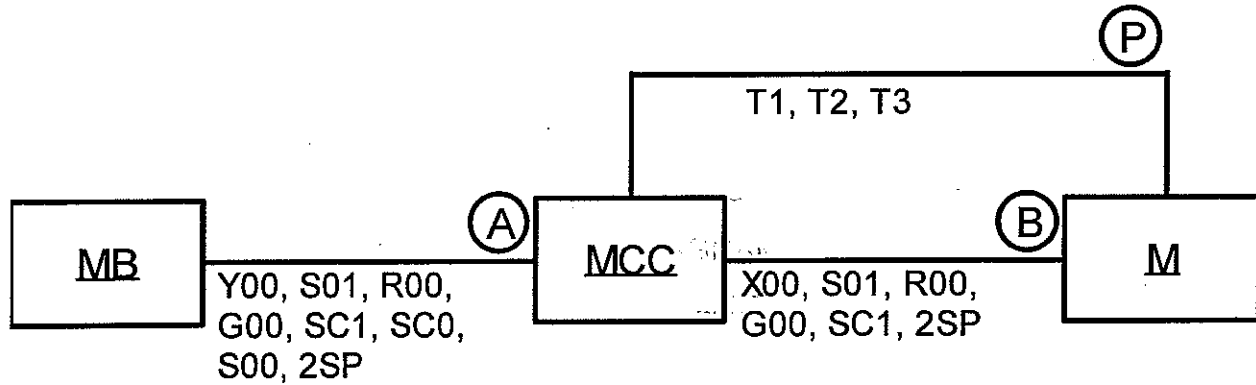
A
 G00 = EI
 SC1 = SO-C
 SC2 = SO-O
 SC3 = SO-O
 G00 = EI
 B
 G00 = EI

Drawing No.: E-04
 Date: 05/01/2007
 Revision No.: 0

SNPP
 SCHEMATIC DIAGRAM - HIGH
 PRESSURE INJECTION
 MOTOR OPERATED VALVES
 MOV-1 & MOV-9

VALVE SHOWN IN CLOSED POSITION
 OPEN

VALVE	DESCRIPTION	SCHEME	SWITCH ID
MOV-1	HIGH PRESS INJECTION-A	MA12	MOV-1
MOV-9	HIGH PRESS INJECTION-B	MB15	MOV-9



<u>M</u>	<u>MCC</u>	<u>CUBICLE</u>	<u>MB</u>	<u>SCHEME</u>
MOV-1	MCC-A1	2	CB-5	MA12
MOV-3	MCC-A1	3	CB-5	MA13
MOV-4	MCC-B1	2	CB-5	MB12
MOV-5	MCC-A1	4	CB-5	MA14
MOV-6	MCC-B1	3	CB-5	MB13
MOV-7	MCC-A1	5	CB-5	MA15
MOV-9	MCC-B1	5	CB-5	MB15
MOV-16	MCC-A1	8	CB-3	MA18
MOV-17	MCC-B1	6	CB-3	MB16

CIRCUIT ANALYSIS WORKSHEET

Example #4

Component ID: **MOV-15** Component Type: **MOV**

Component Description: **AFW Steam Inlet Throttle Valve**

BE Code: **MOV-10_FTO (MOV-10 FAILS TO OPEN)**

Required Position: **THROTTLED**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: **DB DC Bus - B** Breaker: **4**

Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
DB4A	Y	Control	LDP	SD possible only with
DB4B	Y	Control	LDP	dual hot shorts <small>FO1 - FO3 AND NO1 - FO2</small> (FO2) (FO3)

Comments:

Table

$$P_{cc} = 0.60 + 0.06 - (0.60 \times 0.06) = 0.62$$

$$P_{cc} = \frac{5-0}{(5-0)+0} = 1$$

$$CF_1 = (1 \times (1 + \frac{0.5}{5})) / 5 = .22$$

$$CF_2 = (1 \times (1 + \frac{0.5}{3})) / 3 = 0.39$$

$$P_{cc} = P_{cc} \times CF_1 \times CF_2 = 1 \times .22 \times .39 = 0.09$$

(A)

P01 = LOP

ND1 = LOP

P01 - F03
and
ND1 - F02
→ SO-Raise

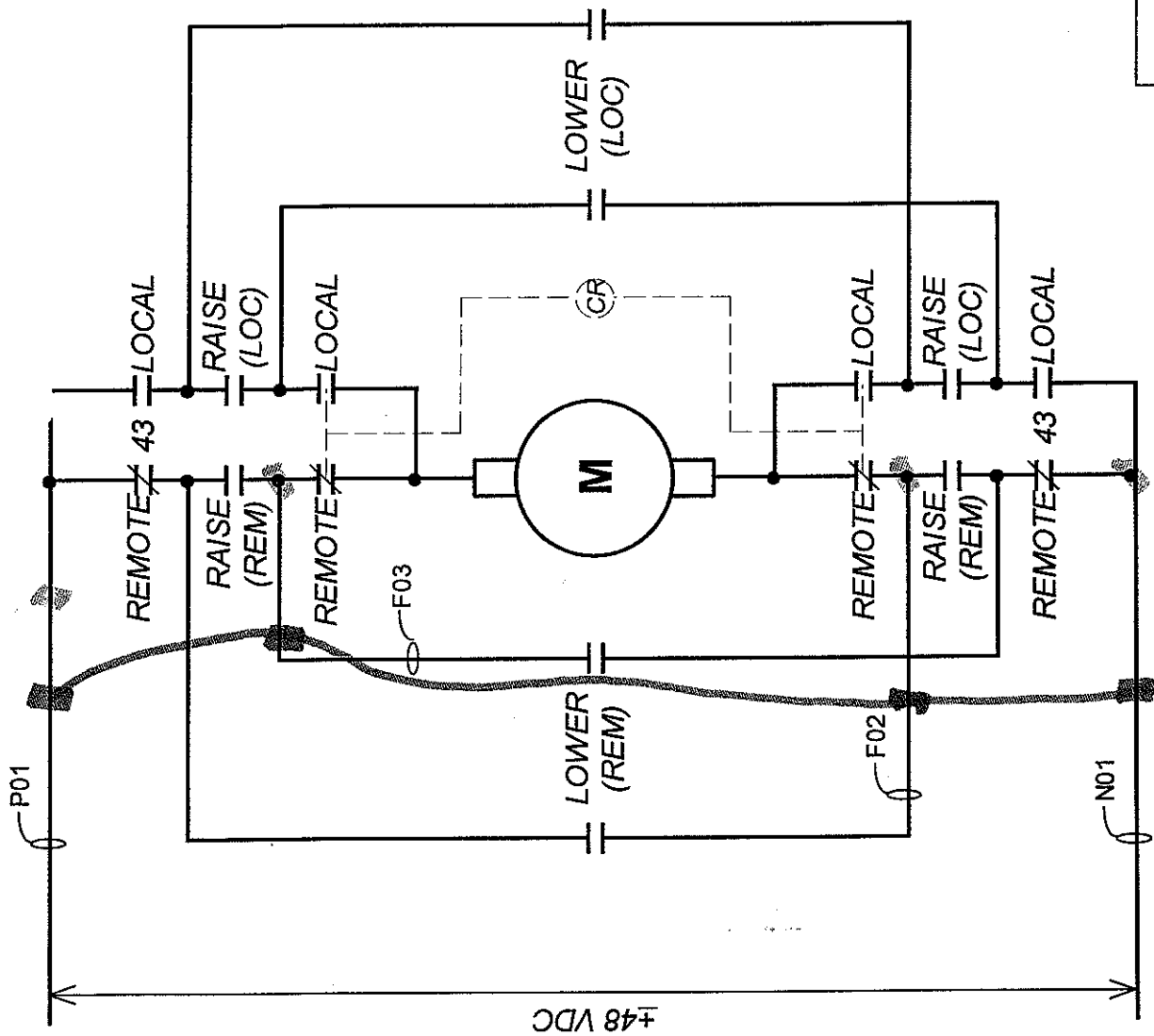
P01 - F02
and
ND1 - F03
→ SO-Lower

(B)

ND1 = LOP

P01 = LOP

±48 VDC

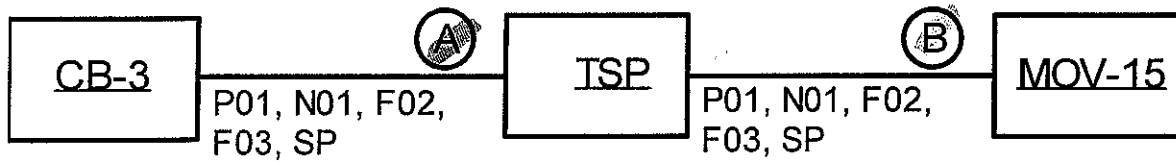


SNPP	Drawing No.: E-09
	Date: 05/01/2007
	Revision No.: 0

SCHEMATIC DIAGRAM -
AFW-B STEAM THROTTLE
MOTOR OPERATED VALVE
MOV-15

Motor Shown in Remote Operating Mode

MOV-15, SCHEME DB4



MOV-15, SCHEME DB4

CIRCUIT ANALYSIS WORKSHEET

Example #5

Component ID: **MOV-13** Component Type: **MOV**

Component Description: **PORV Block Valve**

BE Code: **MOV-13_FTC (MOV-13 FAILS TO CLOSE)**

Required Position: **OPEN / CLOSED**
Functional State

Normal Position: **OPEN**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: MCC-A1 Breaker: 7

Breaker: _____

Cable Analysis:

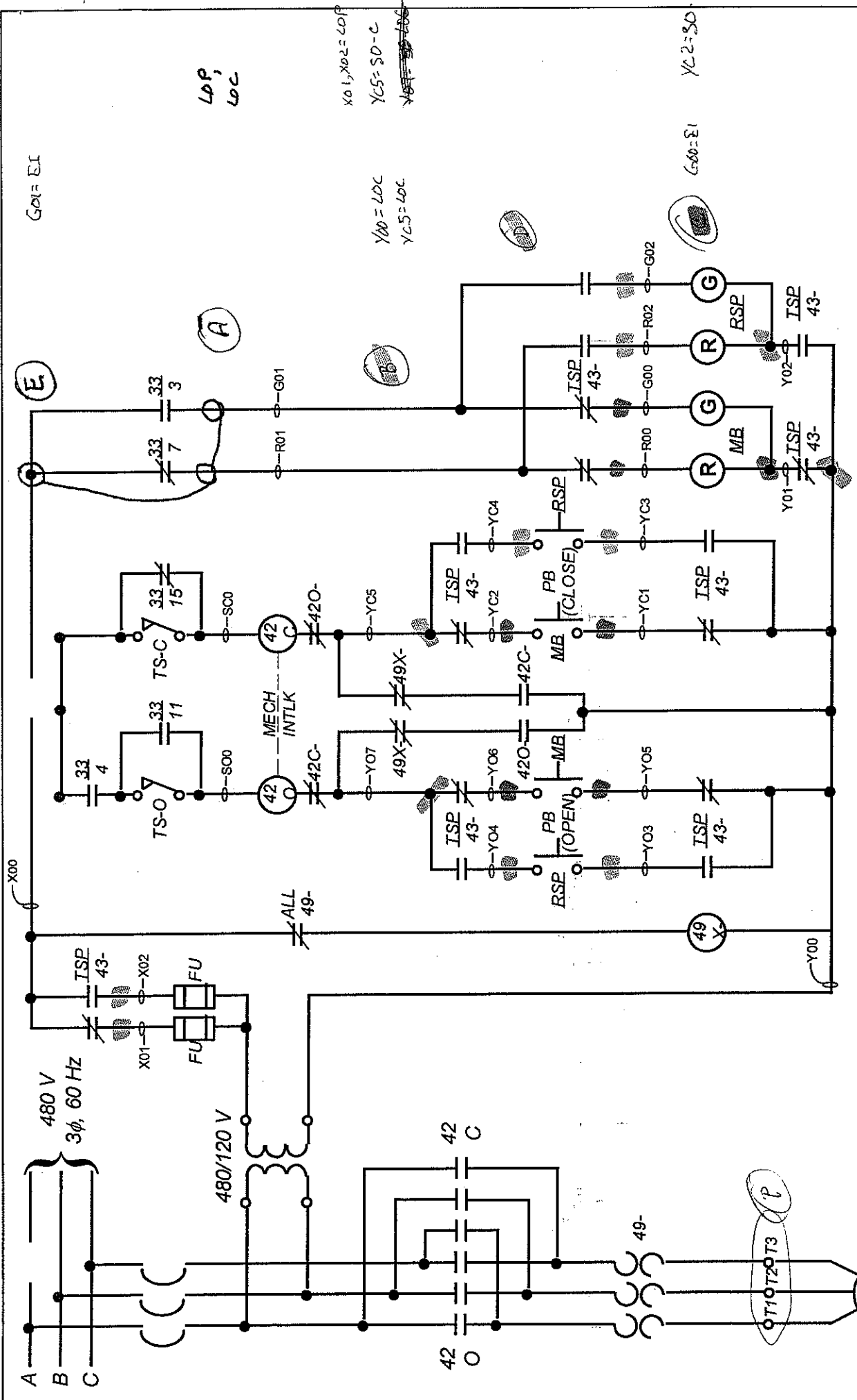
Cable ID	Required?	Function	Fault Consequence	Comments
MA17A	Y	Control	None LDP, LDC	
MA17B	Y	Control	SD-C, LDP, LDC	
MA17C	Y	Control	SD-C, EI, LDC	
MA17D	Y N	Control		RSP
MA17E	Y	Control	EI, LDP	
MA17P	Y	Power	LDP	

Comments:

Table for both BIC = $P_{(50)} = 0.30 + 0.03 - (1.3 \times 0.03) = 0.32$

B: $P_{cc} = \frac{(9-1)}{(9-1)+(2 \times 1)} = \frac{8}{10} = 0.8$ $CF = \frac{\{1[1+1/9]\}}{9} = 0.12$ $P_{(50)} = 0.8 \times 0.12 = 0.10$
(Y00=Source)

C: $P_{cc} = \frac{(9-2)}{(9-2)+(2 \times 2)} = \frac{6}{12} = 0.5$ $CF = \frac{\{1[3+1/9]\}}{9} = 0.34$ $P_{(50)} = 0.5 \times 0.34 = 0.17$



G01 = E1

LDP,
LDC

X01, X02 = LDP
Y05 = SD-C
~~Y06 = SD-C~~

Y00 = LDC
Y05 = LDC

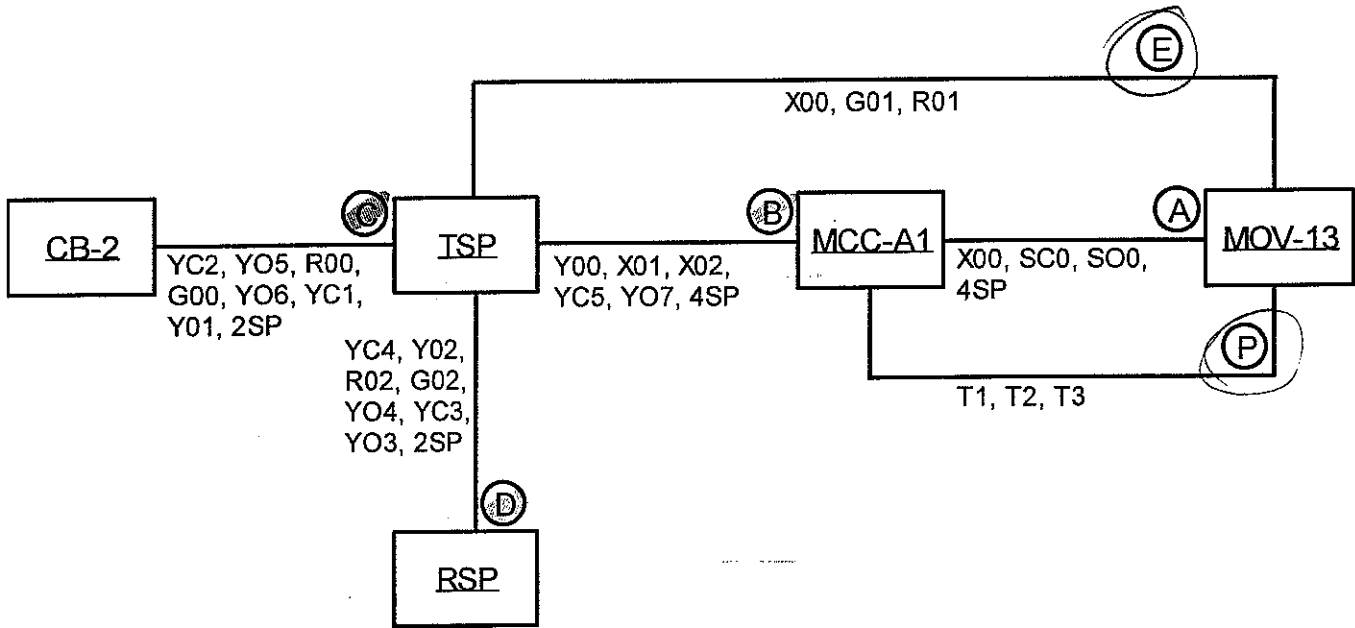
G00 = E1
Y02 = SD

Drawing No.:	E-10
Date:	05/01/2007
Revision No.:	0

SNPP
 SCHEMATIC DIAGRAM - PORV
 BLOCK MOTOR OPERATED
 VALVE
 MOV-13

VALVE SHOWN IN FULL OPEN POSITION

MOV-13, SCHEME MA17



MOV-13, SCHEME MA17

CIRCUIT ANALYSIS WORKSHEET

Example #6

Component ID: **MOV-10**

Component Type: **MOV**

Component Description: **AFW Discharge Isolation Valve**

BE Code: **MOV-10_FTO (MOV-10 FAILS TO OPEN)**

Required Position: **OPEN**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: MCC - A1 Breaker: 6

Breaker: _____

Cable Analysis:

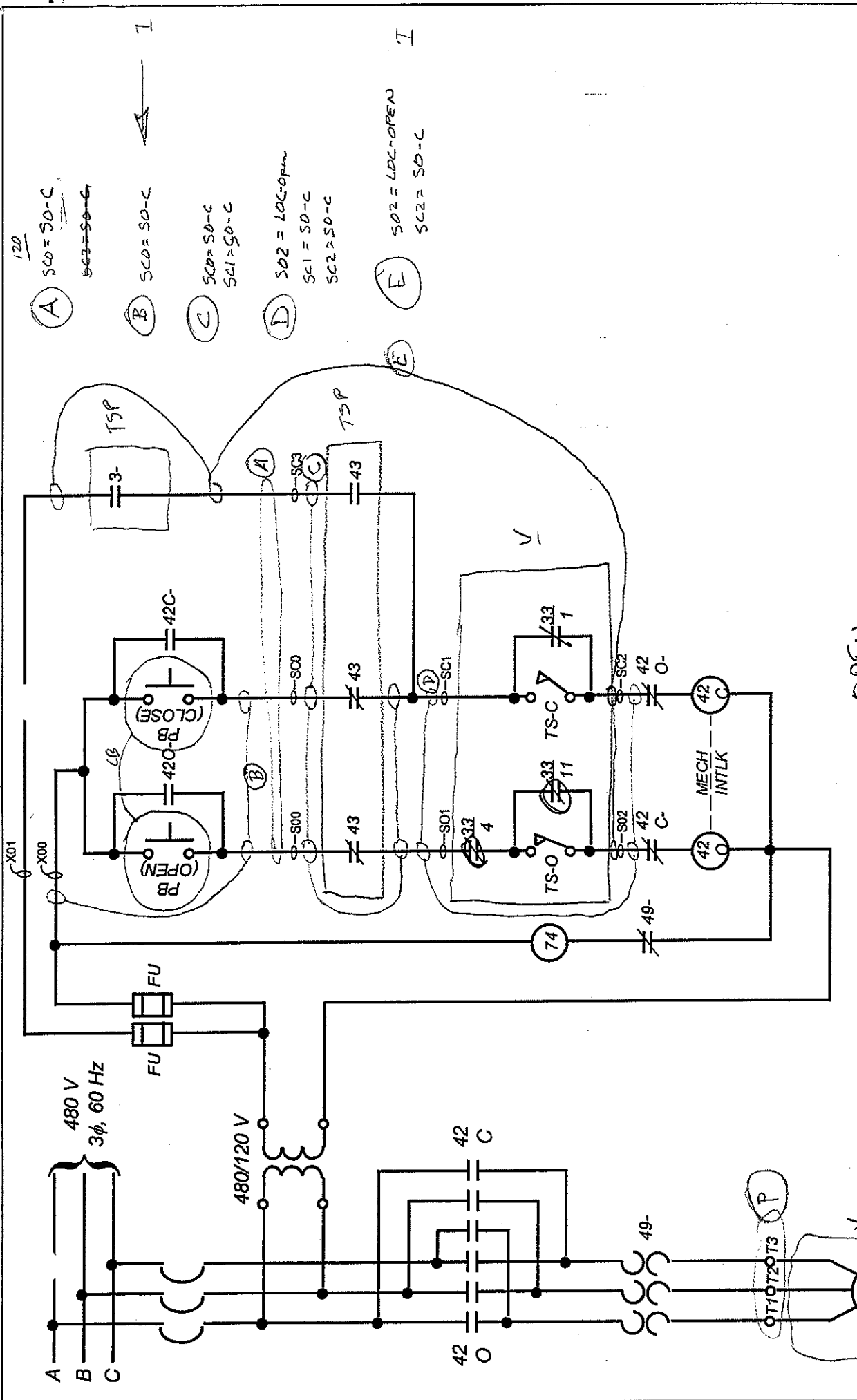
Cable ID	Required?	Function	Fault Consequence	Comments
MA16A	Y	Control	SD-Close	
* MA16B	Y	Control	SD-Close	3-C, 0gnd, 1target, 1source
MA16C	Y	Control	SD-Close	RSP
MA16D	Y	Control	SD-Close, LDC-OPEN	
MA16E	Y	Control	SD-Close, LDC-OPEN	
MA16P	Y	Power	LDP	

Comments: Note - MOV-10 is ungrounded control circuit

$$P_{table} = 0.3 + 0.03 = 0.33 \quad \left| \quad P_{cc} = \frac{(3-0)}{(3-0) + (2 \times 0)} = 1.0 \right.$$

$$P_{calc} = 1.0 \times 0.39 = 0.39 \quad \left| \quad CF = 1 \times \left[1 + \frac{5}{3} \right] / 3 = 0.39 \right.$$

Note: Only cables B and E have energized conductors



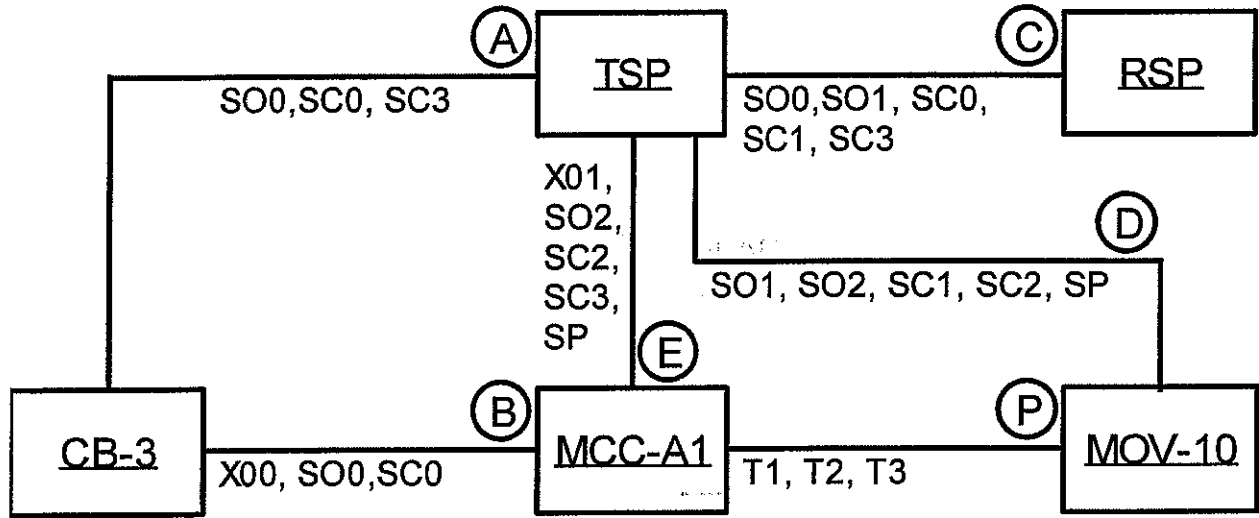
- 120
- A SC0 = SO-C
SC3 = SO-C
- B SC0 = SO-C
- C SC0 = SO-C
SC1 = SO-C
- D S02 = LDC-OPEN
SC1 = SO-C
SC2 = SO-C
- E S02 = LDC-OPEN
SC2 = SO-C

Drawing No.:	E-11
Date:	05/04/2007
Revision No.:	0

SNPP
 SCHEMATIC DIAGRAM -
 AFW-A DISCHARGE MOTOR
 OPERATED VALVE
 MOV-10

OPEN
 VALVE SHOWN IN FULL CLOSED POSITION

MOV-10, SCHEME MA16



MOV-10, SCHEME MA16

CIRCUIT ANALYSIS WORKSHEET

Example #7

Component ID: **MOV-8** Component Type: **MOV**

Component Description: **RHR Outboard Suction Valve**

BE Code: **MOV-8_TO (MOV-8 TRANSFERS OPEN)**

Required Position: **CLOSED**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: MCC-B1 Breaker: 4

Breaker: _____

Cable Analysis:

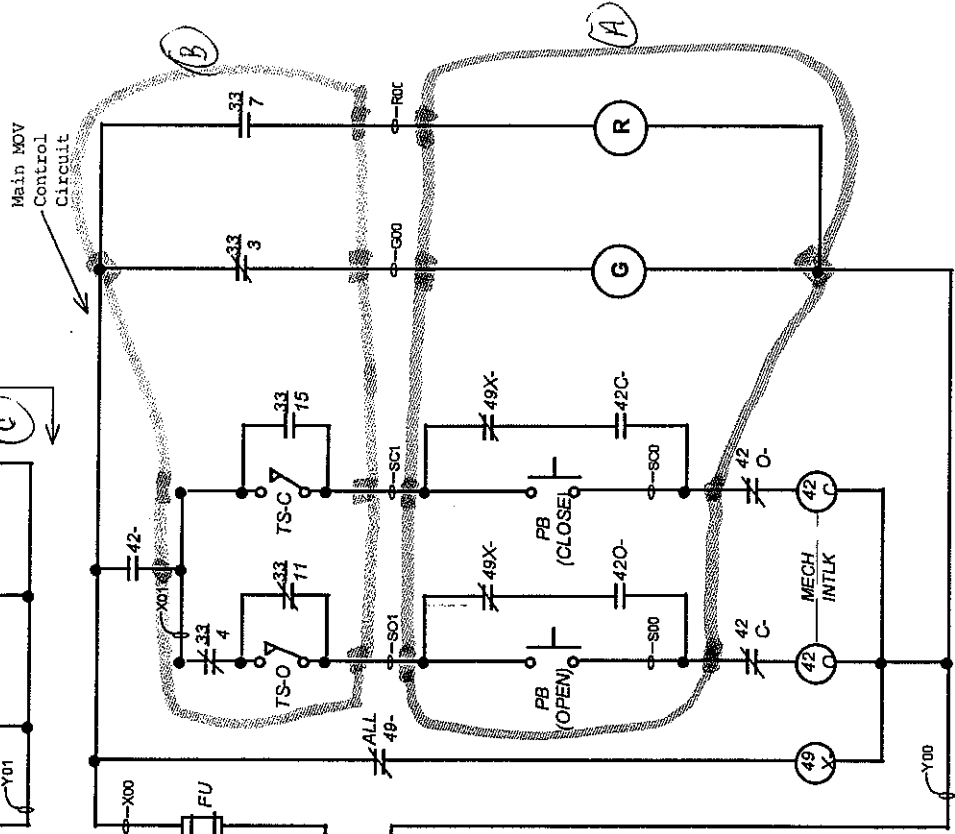
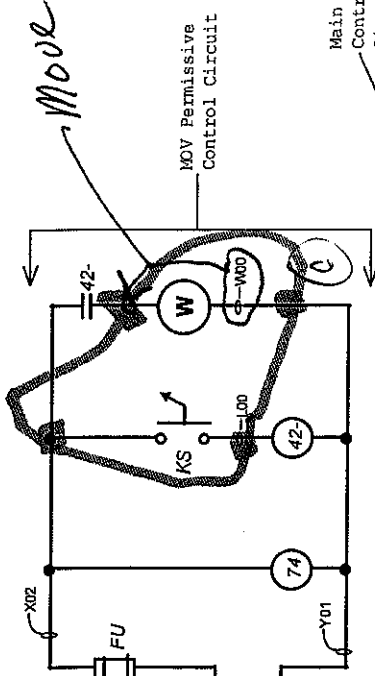
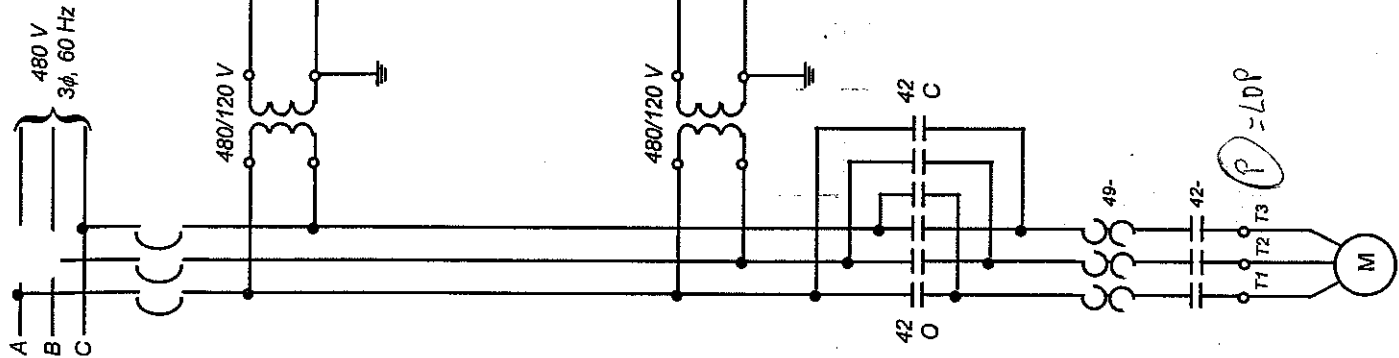
Cable ID	Required?	Function	Fault Consequence	Comments
MB14 A	Y	Control	SO-OPEN	Energize SOD (Also, EI, LDC, LDP)
MB14 B	N	Control	EI, LDC, LDP	
MB14 C	Y	Control	SO-42	Energize LOD (Also, EI, LDC)
MB14 P	Y	Power	SO-OPEN	3Ø "SMART SHORT"

Comments:

Table
 $P_{(SO,A)} = 0.3 + 0.03 = 0.33$

$$P_{cc} = \frac{(9-1)}{(9-1)+(2 \times 1)+1} = \frac{8}{11} = 0.73 \quad CF = \left\{1 \times \left[1 + \frac{5}{9}\right]\right\} / 9 = 0.12$$

$$P_{(SO,A)} = 0.73 \times 0.12 = 0.09$$



Sub
 X02 = LDC
 L00 = LDC
 L000 = LDC

120
~~X02 = LDC~~
~~X01 = LDC~~
 L00 = SD-42
 L000 = EI

X00 = LOP
 S01 = LDC
 G00 = LDP
 X01 = LDC

R00 = EI
 SCD = LDC
 S00 = SD-OPEN

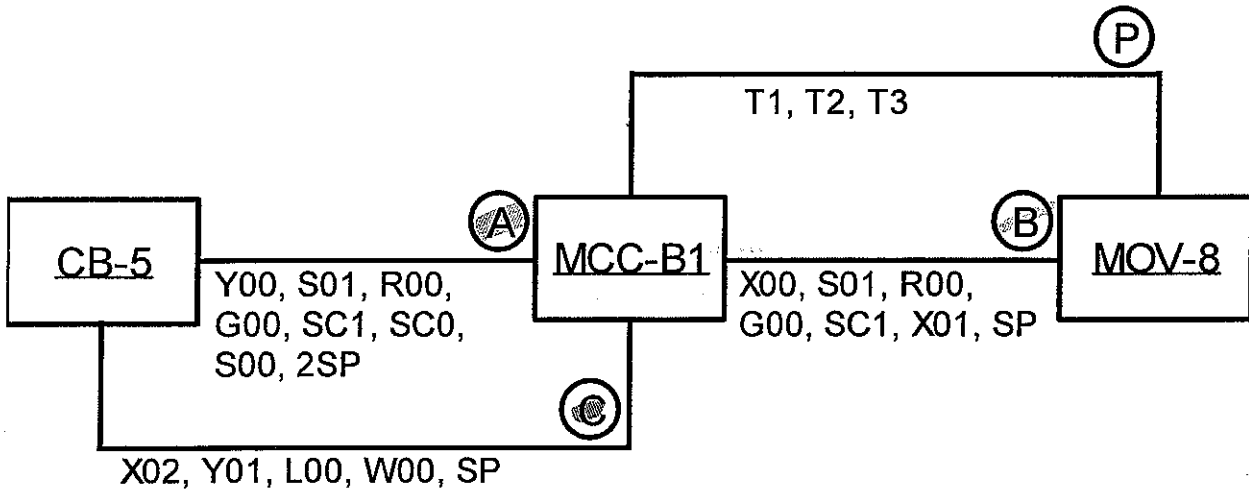
S01 = LDC
 G00 = LDP
 S00 = LDC

R00 = EI
 SCD = LDC
 S00 = SD-OPEN

SNPP	Drawing No.:	E-12
	Date:	05/04/2007
	Revision No.:	0

SCHEMATIC DIAGRAM –
 RHR OUTBOARD SUCTION
 MOTOR OPERATED VALVE
 MOV-8

VALVE SHOWN IN CLOSED POSITION
 MOV-8, SCHEME MB14



MOV-8, SCHEME MB14

CIRCUIT ANALYSIS WORKSHEET

Example #8

Component ID: **MOV-11** Component Type: **MOV**

Component Description: **AFW Discharge Isolation Valve**

BE Code: **MOV-11_FTO (MOV-11 FAILS TO OPEN)**

Required Position: **OPEN**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: DC Bus-B Breaker: 3

Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
DB3A	Y	Control	SO-C, EI, LDC, LOP	YCI
DB3B	Y	Control	LOP	
DB3C	Y	Control	EI, LOP	
DB3P	Y	Power	LDC, LOP	

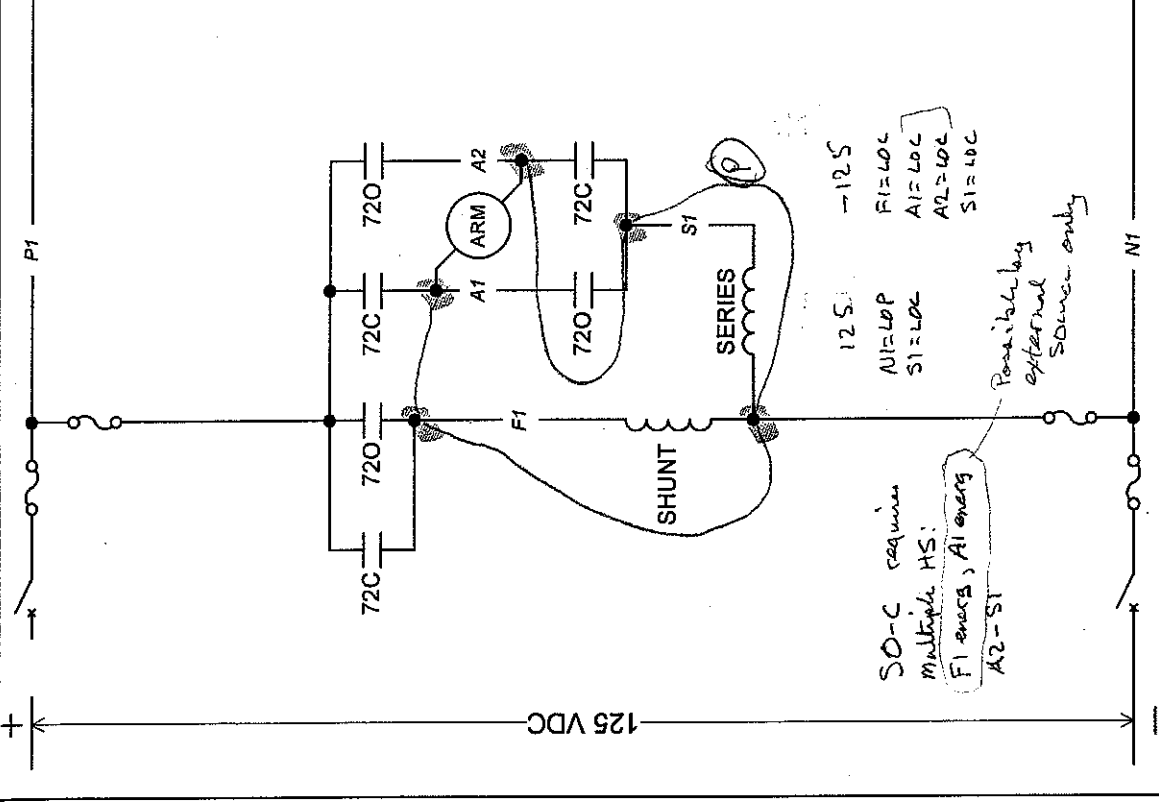
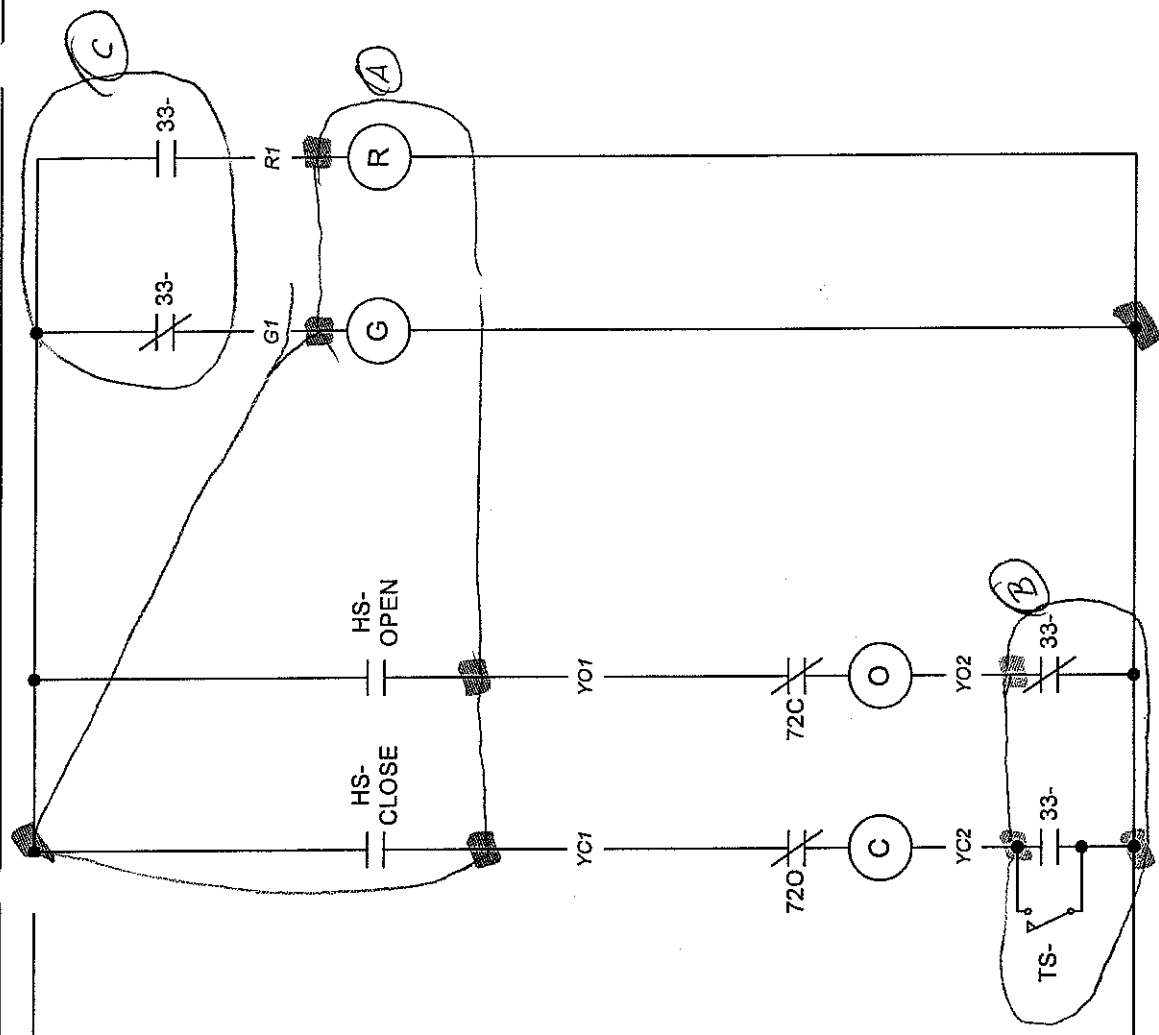
Comments:

Table

$$P_{(SO, A)} = 0.60 + 0.06 - (0.6 \times 0.06) = 0.62$$

$$P_{LL} = \frac{7-1}{(7-1)+(2 \times 1)} = \frac{6}{8} = 0.75 \quad CF = \{1 [2 + \frac{5}{2}]\} / 7 = 0.30$$

$$P_{(SO, A)} = 0.75 \times 0.30 = 0.23$$



SD-C requires multiple HS:
F1 energ, A1 energy
A2-S1

125V -125V
A1=L0P
S1=L0C
F1=L0C
A1=L0C
A2=L0C
S1=L0C

Possible by external source only

VALVE SHOWN IN CLOSED POSITION

Drawing No.:		E-13
Date:		05/09/2007
Revision No.:		0

SNPP
SCHEMATIC DIAGRAM -
AFW-B DISCHARGE MOTOR
OPERATED VALVE
MOV-11

MOV-11, SCHEME DB3

+125 -125
Y01=SD-O
Y02=L0C
Y01=L0P
Y01=L0C
Y01=L0C
G1=L0P
R1=EI

Y02=L0P
N1=L0P

(A)

(B)

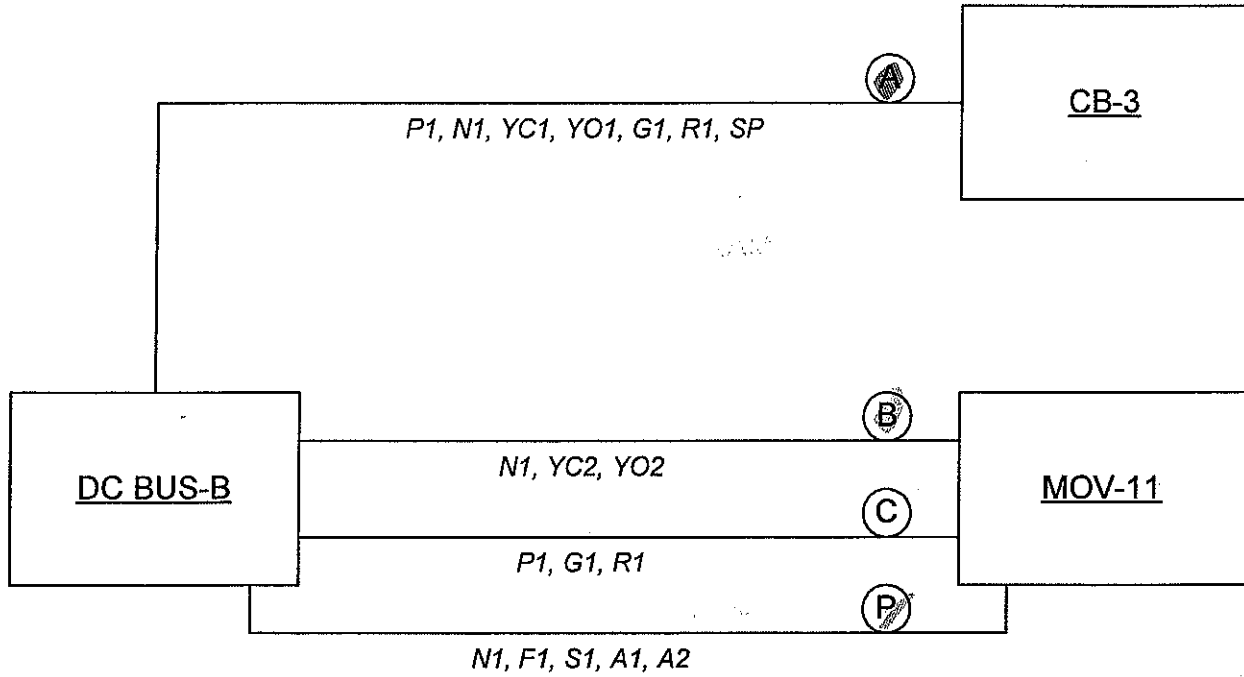
SNPP

TITLE:

MOV BLOCK DIAGRAM - 6

DATE:

5/9/07



MOV-11, SCHEME DB3

CIRCUIT ANALYSIS WORKSHEET

Example #9

Component ID: **MOV-16** Component Type: **MOV**

Component Description: **AFW Test Line Isolation Valve**

BE Code: **MOV-16_TO (MOV-16 TRANSFERS OPEN)**

Required Position: **CLOSED**
Functional State

Normal Position: **CLOSED**

Failed Electrical Position: **AS-IS**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: MCC-A1 Breaker: B
Breaker:

Cable Analysis:

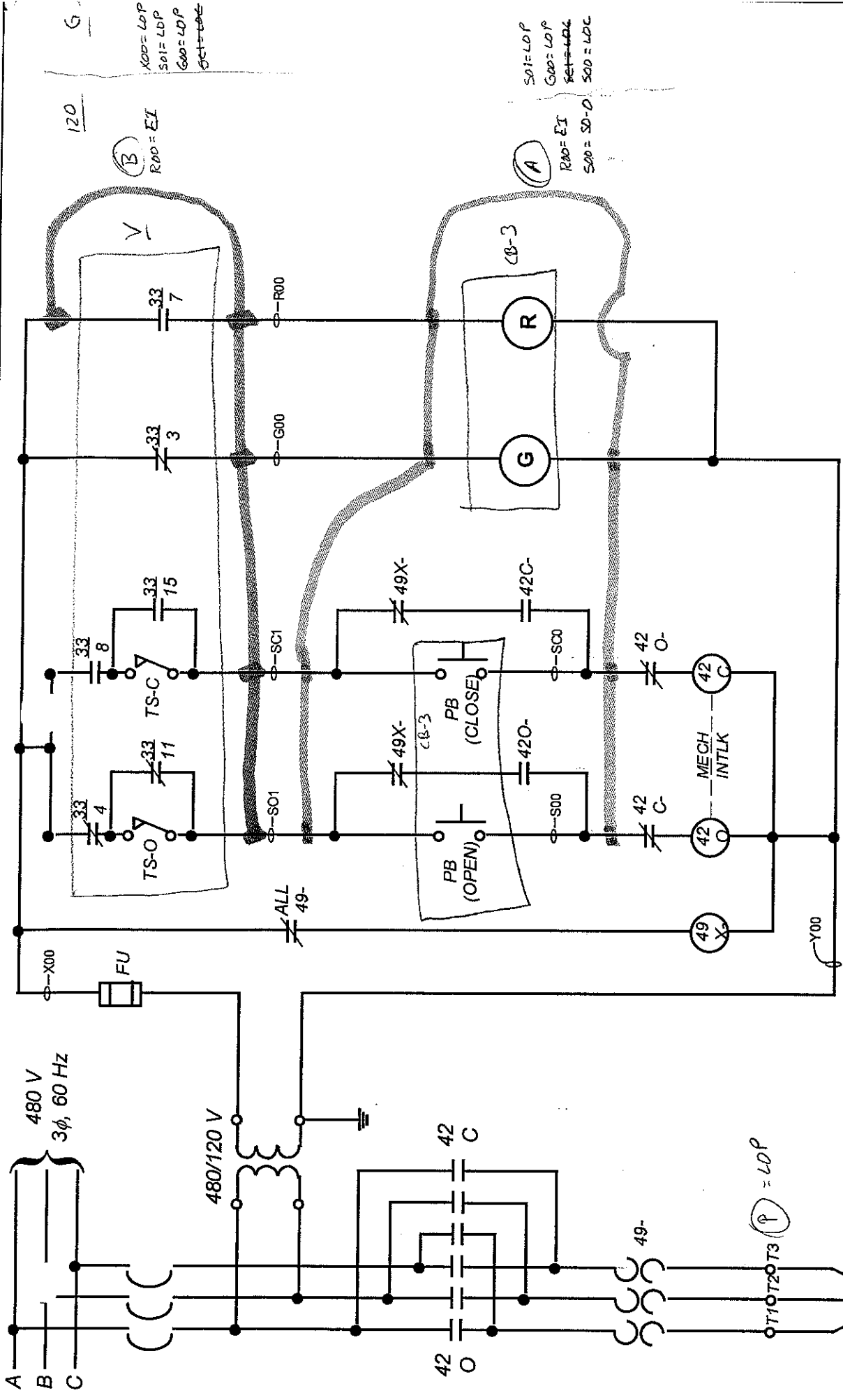
Cable ID	Required?	Function	Fault Consequence	Comments
MA18A	Y	Control	SD-Open	Energize SDD (Also EI, LOP, LDC)
MA18B	N	Control	EI, LOP	
MA18P	N	Power	LOP	

Comments:

$$P_{(SO,A)} = 0.30 + 0.03 = 0.33$$

$$P_{CC} = \frac{q-1}{(q-1)+(2x)+1} = \frac{8}{11} = 0.73 \quad CF = \{1[2+5A]\}/q = 0.23$$

$$P_{(SO,A)} = 0.73 \times 0.23 = 0.17$$



120
 X00 = LOP
 S01 = LOP
 G00 = LOP
 R00 = LOP
 SC1 = LOP

S01 = LOP
 G00 = LOP
 R00 = LOP
 SC1 = LOP
 S00 = LOP

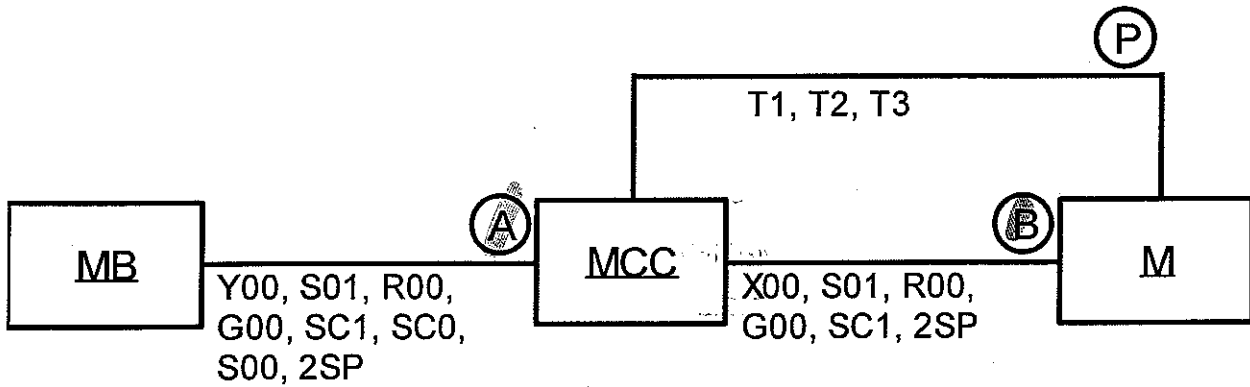
Drawing No.: E-08
 Date: 05/01/2007
 Revision No.: 0

SNPP

SCHEMATIC DIAGRAM - AFW
 TEST LINE ISOLATION MOTOR
 OPERATED VALVES
 MOV-16 & MOV-17

VALVE SHOWN IN CLOSED POSITION

VALVE	DESCRIPTION	SCHEME	SWITCH ID
MOV-16	AFW TEST LINE ISOLATION	MA18	MOV-16
MOV-17	AFW TEST LINE ISOLATION	MB16	MOV-17



<u>M</u>	<u>MCC</u>	<u>CUBICLE</u>	<u>MB</u>	<u>SCHEME</u>
MOV-1	MCC-A1	2	CB-5	MA12
MOV-3	MCC-A1	3	CB-5	MA13
MOV-4	MCC-B1	2	CB-5	MB12
MOV-5	MCC-A1	4	CB-5	MA14
MOV-6	MCC-B1	3	CB-5	MB13
MOV-7	MCC-A1	5	CB-5	MA15
MOV-9	MCC-B1	5	CB-5	MB15
MOV-16	MCC-A1	8	CB-3	MA18
MOV-17	MCC-B1	6	CB-3	MB16

Example 10

CIRCUIT ANALYSIS WORKSHEET

Component ID: PI-1 Component Type: Instrument

Component Description: RCS Pressure

BE Code: PI-1_FL (RCS Pressure Indication Fails High)

Required Position: AVAILABLE
Functional State

Normal Position: AVAILABLE

Failed Electrical Position: ~~HIGH~~ LOW

Failed Air Position: N/A

High Consequence Component Yes No

Power Supplies: VITAL-B Breaker: 8

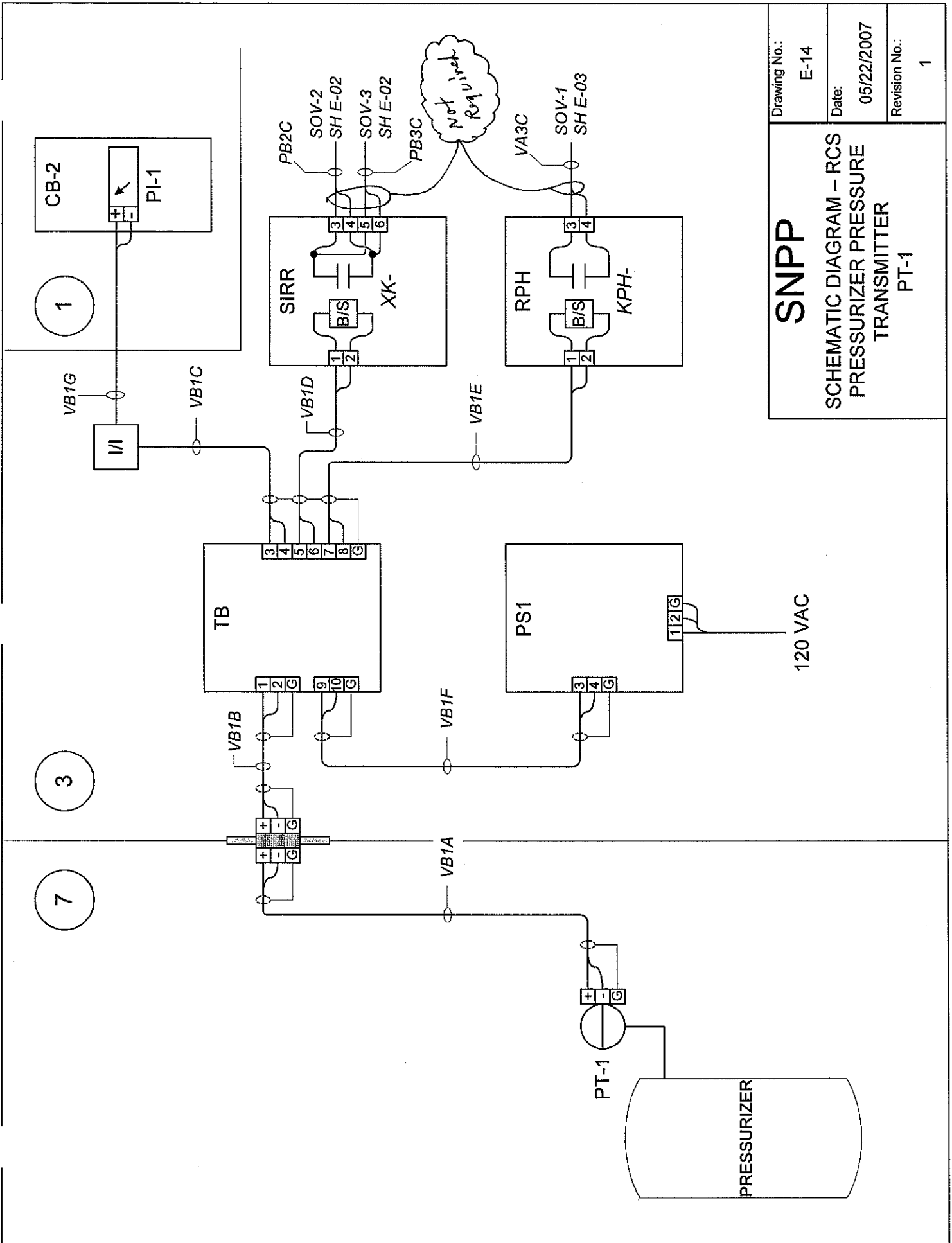
Breaker:

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
VB1A	Y	I	FH, ERROR-H	
VB1B	Y	I	FH, ERROR-H	
VB1C	Y	I	FL, ERROR-L	
VB1D	Y	I	FL, ERROR-L	
VB1E	Y	I	FL, ERROR-L	
VB1F	Y	I	FL, ERROR-L	
VB1G	Y	I	FL, ERROR-L	
VA3C	N	I	NONE	CANNOT AFFECT INDICATION

Comments:

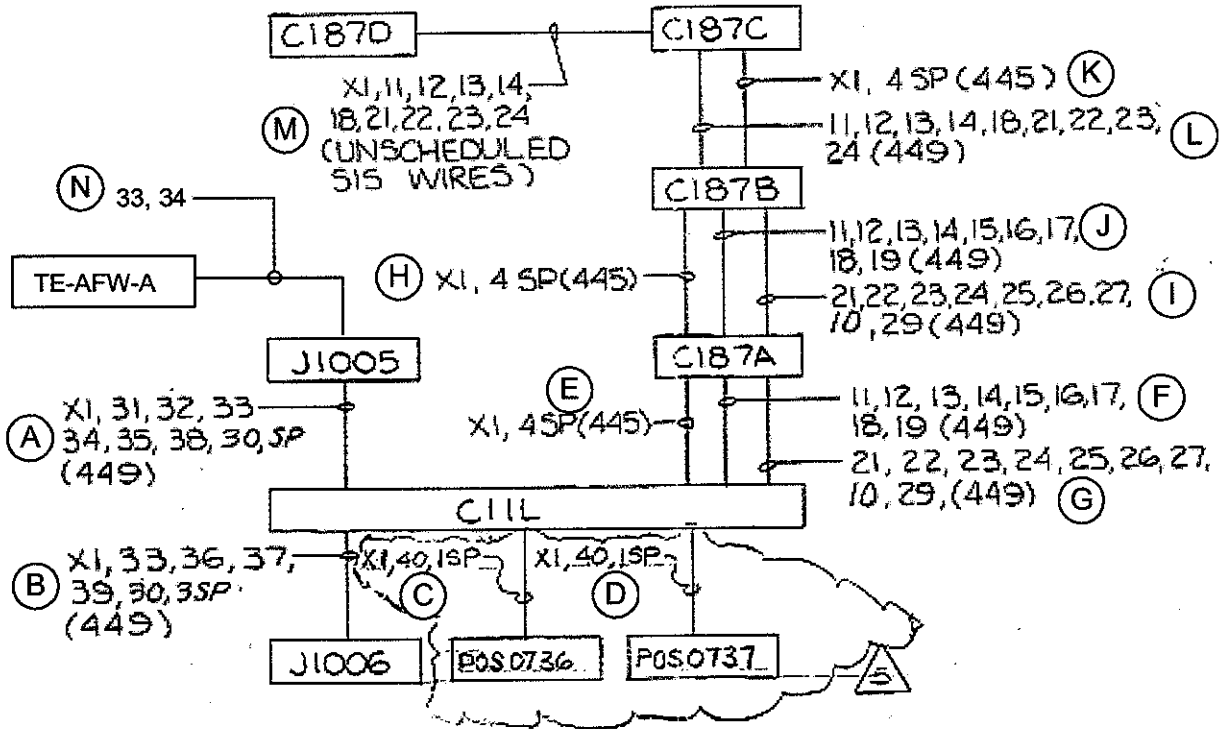
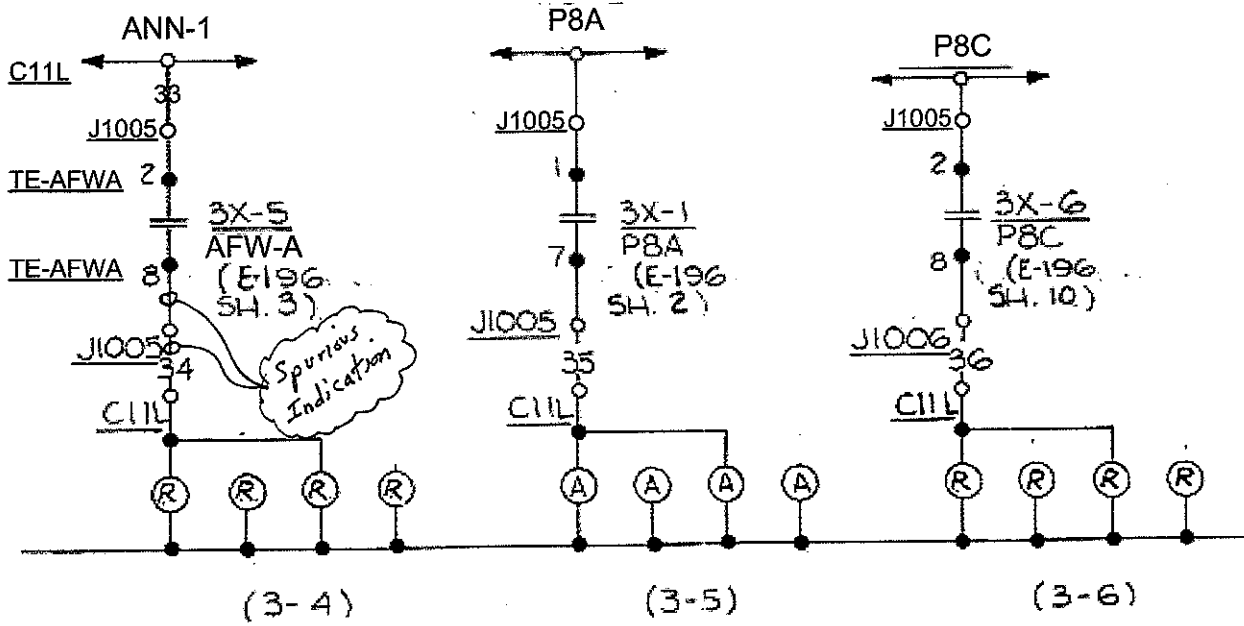
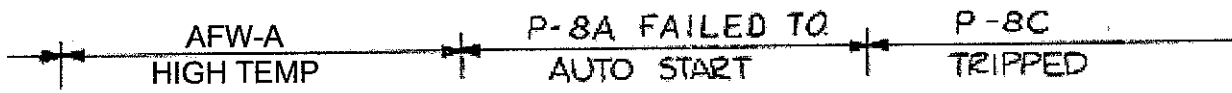
① SHIELDED INSTRUMENT CABLE - EXTERNAL HOT SHORTS NOT CONSIDERED CREDIBLE.



Drawing No.:	E-14
Date:	05/22/2007
Revision No.:	1

SNPP

SCHEMATIC DIAGRAM - RCS
PRESSURIZER PRESSURE
TRANSMITTER
PT-1



BLOCK DIAGRAM
 SCHEME K16

<h1>SNPP</h1> <p>ANNUNCIATOR SCHEME K16</p>	Drawing No.:	ANN-1
	Date:	05/20/2007
	Revision No.:	#8

Example 12

CIRCUIT ANALYSIS WORKSHEET

Component ID: **HPI-B** Component Type: **Pump**

Component Description: **High Pressure Injection Pump B**

BE Code: **HPIA_FTS (HPI-A Fails to Start)**
HPIA_FTR (HPI-A Fails to Run)

Required Position: **ON**
Functional State

Normal Position: **STANDBY / ON**

Failed Electrical Position: **Off**

Failed Air Position: **N/A**

High Consequence Component Yes No

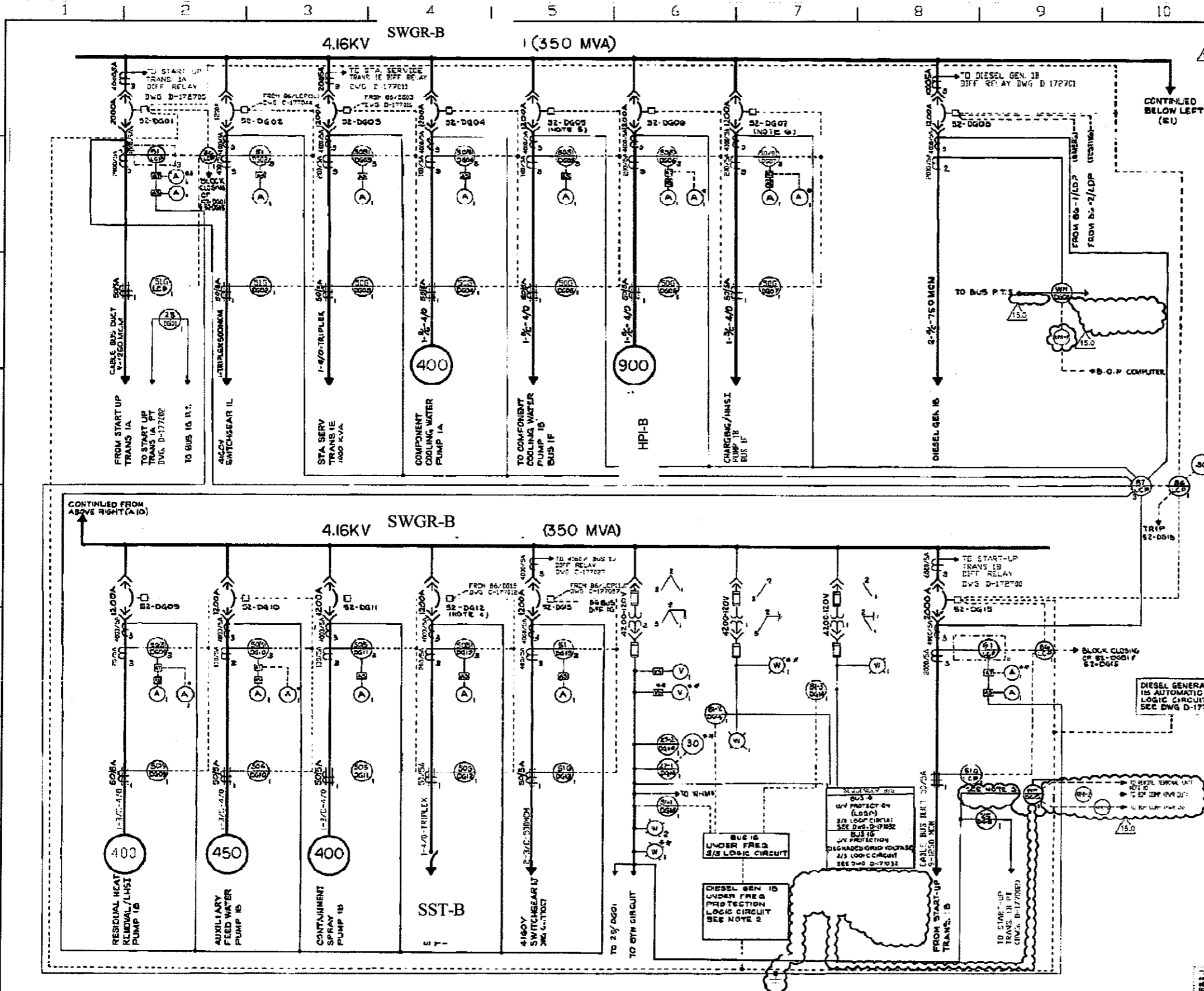
Power Supplies: _____ Breaker: _____

_____ Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
BDG06-P	Y	P	LOP	
BDG06-N	Y	C		
BDG06-D	N	IND	NONE	ISOLATED BY I/I
BDG06-G	N	C	NONE	ISOLATED BY SCB/SS
BDG06-E	Y	C		
BDG06-Z	Y	C		
BDG06-L	Y			DC Control Power

Comments:



DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
B1 LCP	START UP TRANS IA OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG02	DIESEL GEN IB START HOUR METER	JEWSLAR 18520000 85-DIP	
75	BUS 1G SYNCHRONISM CHECK RELAY	GE/13551A	APPLICABLE TO CELLS DG01 & DG15
51 DG02	416KV SWITCHGEAR I OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG03	GROUND SENSOR RELAY	GE/131C14	APPLICABLE TO CELLS DG02 TO DG07, DG09 TO DG12
50/51 DG03	STA SERV TRANS IE OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG04	COMP COOLING WATER PUMP IA OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG05	COMP COOLING WATER PUMP IB OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG06	CHARGING/WASH PUMP IC LEVEL LOCKOUT RELAY	GE/IAJCS38	
50/51 DG07	CHARGING/WASH PUMP IB OVER CURRENT RELAY	GE/IAJCS38	
51 DG07	VERY INVERSE TIME GROUND RELAY	GE/IAJCS38	APPLICABLE TO CELLS DG02 & DG15
50/51 DG09	RHR/LHSE PUMP IA OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG10	AUX FEED WATER PUMP IB OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG11	CONT SPRAY PUMP IB OVER CURRENT RELAY	GE/IAJCS38	
50/51 DG12	STA SERV TRANS IF OVER CURRENT RELAY	GE/IAJCS38	
51 DG13	416KV SWITCHGEAR II OVER CURRENT RELAY	GE/IAJCS38	
51 LCP	BUS DIFFERENTIAL LOCKOUT RELAY	GE/NEA	
57 LCP	BUS 1G DIFF. PROTECTIVE RELAY	GE/PYDHC	
RPR 2	REPEATING PULSE RELAY	GOLDI STATE INSTRUMENT RELAY PNL	LOC IN MAIN CONTROL ROOM
21/2	BUS 1G UNDER VOLTAGE RELAY	GE/13551A	
50/51 DG14	START UP TRANS IB START HOUR METER	JEWSLAR 18520000 85-DIP	
51-12/14 DG14	BUS 1G UNDER FREQUENCY RELAY	GE/13551A	DIESEL GENERATOR IS 2/3 LOGIC CIRCUIT
51 LCP	START UP TRANS ID OVER CURRENT RELAY	GE/IAJCS38	
51 LCP	START UP TRANS IS LOCKOUT RELAY	GE/NEA	
51 LCP	START UP TRANS IA LOCKOUT RELAY	GE/NEA	
51 SIG LCP	VERY INVERSE TIME GROUND RELAY	GE/IAJCS38	APPLICABLE TO CELLS DG01 & DG15

NOTES

- 1 - DENOTES MAIN CONTROL BOARD IN MAIN CONTROL ROOM.
- 2 - DIESEL GENERATOR UNDER FREQUENCY PROTECTION FUNCTIONS ONLY WHEN DIESEL IS OPERATING IN PARALLEL WITH SYSTEM.
- 3 - W METER IS BI-DIRECTIONAL.
- 4 - FOR KEY INTERLOCKING OF BUS 12-001 (SEE DWG. C-177110)
- 5 - FOR KEY INTERLOCKING OF BUS 12-005 (SEE DWG. C-177110)
- 6 - FOR KEY INTERLOCKING OF BUS 12-007 (SEE DWG. C-177110)
- 7 - LCP - DENOTES LOCAL CONTROL PANEL.
- 8 - 44 - DENOTES EMERG. POWER BOARD IN MAIN CONTROL ROOM.
- 9 - LDP - DENOTES LOCAL DIESEL PANEL.
- 10 - REMOTE TERMINAL UNIT IN MAIN CONTROL ROOM.

REFERENCE DRAWINGS

D 177001 SINGLE LINE ELED AUX SYSTEM (EMERG)
416KV & 690V

SNPP

4.16 KV SWGR-B ONE-LINE DIAGRAM

Drawing No.:	SWGR-B-01
Date:	05/20/2007
Revision No.:	#6

BDG06-E

BDG06-Z

BDG06-G

BDG06-P

BDG06-L

BDG06-N

DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
06	LOCKING-OUT RELAY	AGA/ET012PC	24V DC OPER COIL (25V DC RESET COIL)
2	TIME DELAY POWER RELAY (SET AT 10 SEC.)	AGA/ET012PC	125V DC 15-16 SEC.
Z-1	TIME DELAY DROPOUT RELAY (SET AT 1 SEC.)	AGA/ET022PB	125 V DC 0.5-5 SEC.
8&K	AUXILIARY RELAY	G.E. / 12HFA131A2H CODE 4E	125 V DC

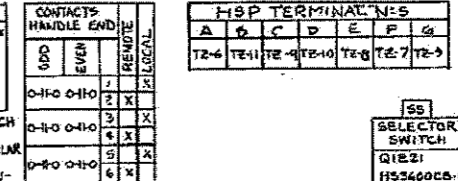
NOTES

1. TEST SWITCH
2. H — TRUCK OPERATED CELL SWITCH SHOWN FOR BREAKER IN TEST POSITION.
3. SEQUENCER LOAD SHEDDING CIRCUIT BIF, DWG D-177688 (SIG, DWG D-177684).
4. ENGINEERED SAFEGUARD SEQUENCER BIF, DWG D-177645 (SIG, DWG D-177646).
5. LOSS OF ORFITE POWER SEQUENCER BIF, DWG D-177649 (SIG, DWG D-177650).
6. THE COMPUTER OPERATOR ADDRESS NUMBERS FOR DFOG 2, DG06 ARE VOIC00 & VOIC02, RESPECTIVELY.
7. CABLES 1VB0606 & 1VB0608 SHOULD BE ROUTED INDEPENDENTLY OF CABLES 1VB0606 & 1VB0608.
8. CABLE 1VB0606 SHOULD BE ROUTED INDEPENDENTLY OF CABLES 1VB0606, F & H.
9. SEE DRAWING A-181981 FOR FUSE RATING & TYPE.

REFERENCE DRAWINGS

- D-177001 - SINGLE LINE ELECAUX SYSTEM (EMERG- 4160V (600V))
- D-177005 - SINGLE LINE PROTECTION & METERING 4160V SWITCH GEAR BUS 1F
- D-177006 - SINGLE LINE PROTECTION & METERING 4160V SWITCH GEAR BUS 1G
- A-177558 - ELEC GENERAL DETAILS & NOTES
- A-181981 - FUSE REPLACEMENT MANUAL FOR SAFETY RELATED EQUIPMENT.

BLOCK DIAGRAM



HSP TERMINALS	
A	B
12-6	TE1 TE2 TE3 TE4 TE5 TE6 TE7 TE8

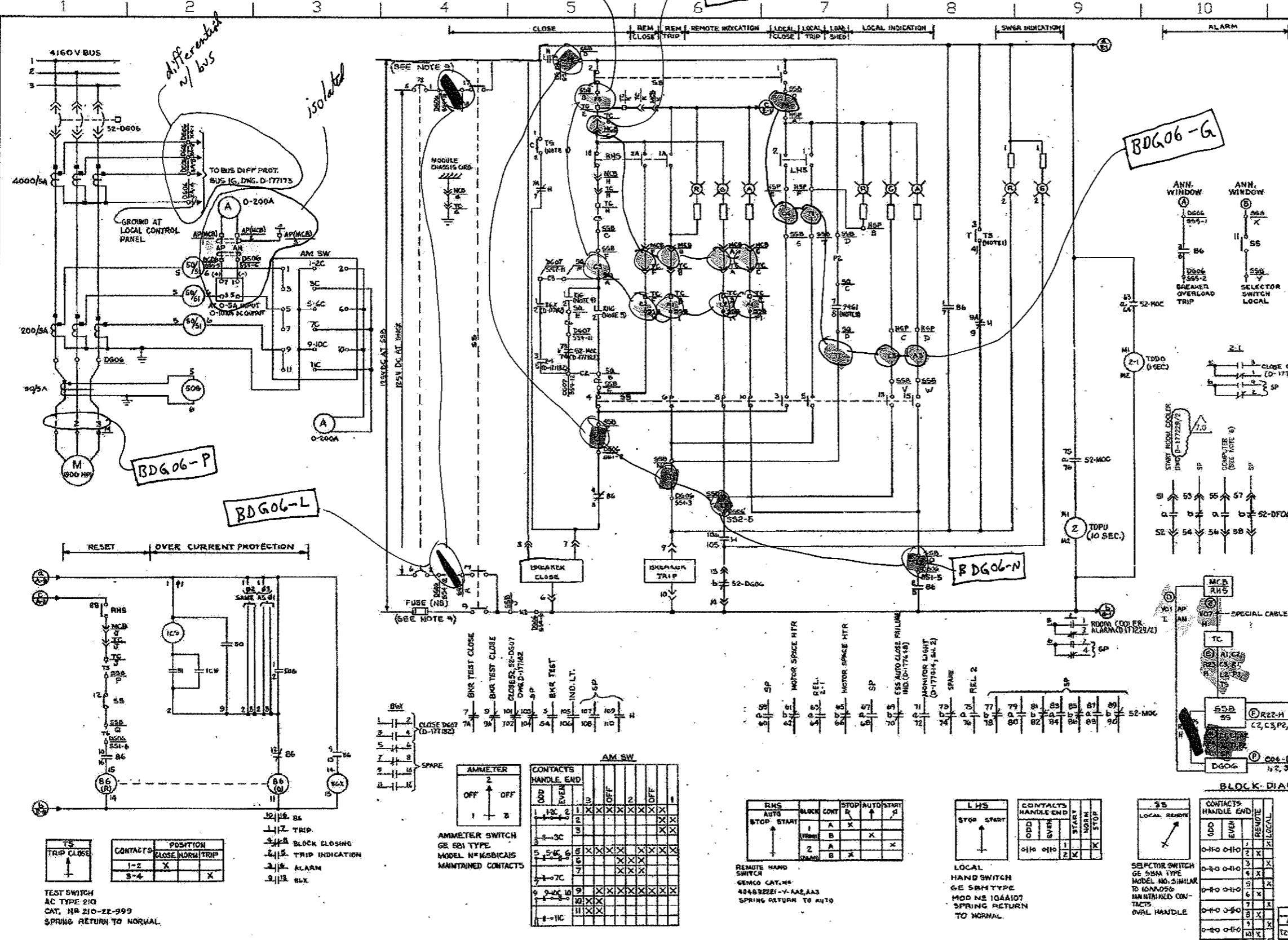
SSB	
LOCAL	REMOTE
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90

SSB	
LOCAL	REMOTE
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90

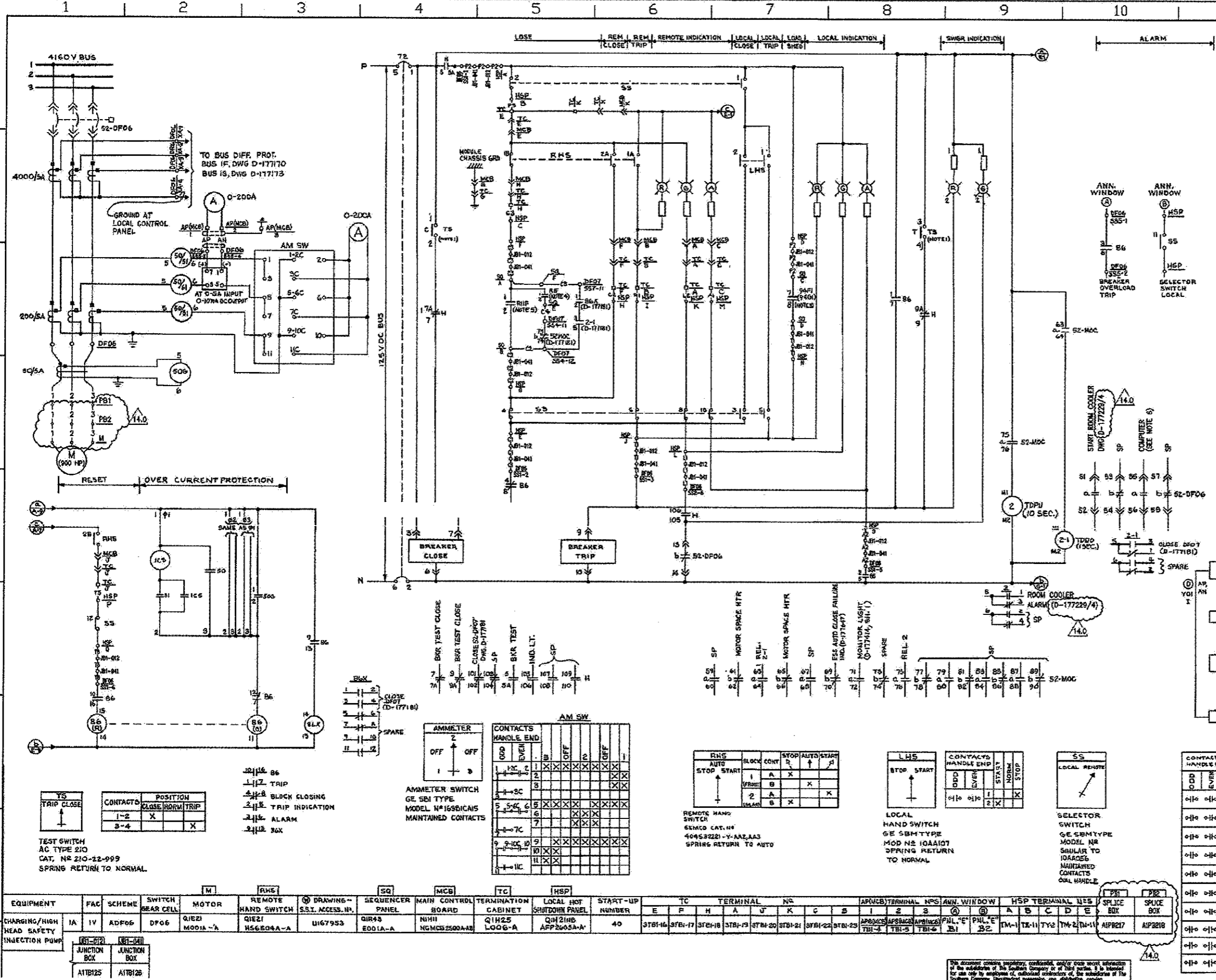
SNPP

HPI-B SCHEMATIC DIAGRAM SHEET 1

Drawing No.: HPI-B-01
 Date: 05/20/2007
 Revision No.: #6



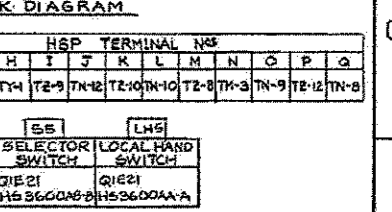
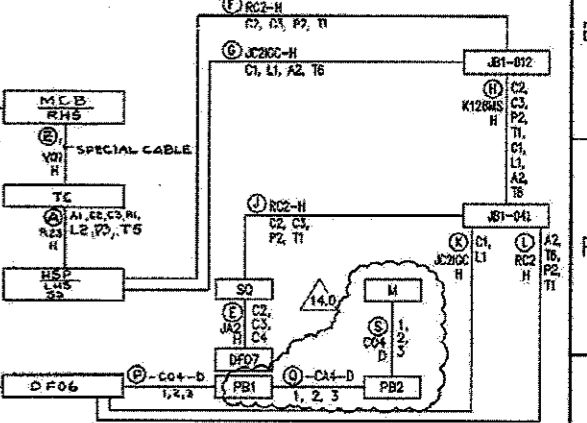
EQUIPMENT	FAC	SCHEME	SWITCH	MOTOR	REMOTE HAND SWITCH	DRAWING- S.S.T. ACCESSORY	SEQUENCER PANEL	MAIN CONTROL BOARD	TERMINATION CABINET	LOCAL HOT SHUTDOWN PANEL	SELECTOR SWITCH BOX	START-UP NUMBER	TC	TERMINAL NO	AP(MCB) TERMINAL NOS	ANN. WINDOW	SSB TERMINAL LINES
CHARGING/HIGH HEAD SAFETY INJECTION PUMP	IC	IV	BDG06	DG06	QIE21 M001C-B	U147934	QIR43 E001B-B	QIR43 N1R1 N5MCR2200A-B	QIR43 Q1H25 Q1H25	QIR21AB APP2405B-B	QIR21AB Q1H21ABR FF2505C-B	40	1TR2-20	1TR2-30 1TR2-31 1TR2-32 1TR2-33 1TR2-34 1TR2-35 1TR2-36 1TR2-37 1TR2-38 1TR2-39 1TR2-40 1TR2-41 1TR2-42 1TR2-43 1TR2-44 1TR2-45 1TR2-46 1TR2-47 1TR2-48 1TR2-49 1TR2-50	1TR2-1 1TR2-2 1TR2-3 1TR2-4 1TR2-5 1TR2-6 1TR2-7 1TR2-8 1TR2-9 1TR2-10 1TR2-11 1TR2-12 1TR2-13 1TR2-14 1TR2-15 1TR2-16 1TR2-17 1TR2-18 1TR2-19 1TR2-20 1TR2-21 1TR2-22 1TR2-23 1TR2-24 1TR2-25 1TR2-26 1TR2-27 1TR2-28 1TR2-29 1TR2-30 1TR2-31 1TR2-32 1TR2-33 1TR2-34 1TR2-35 1TR2-36 1TR2-37 1TR2-38 1TR2-39 1TR2-40 1TR2-41 1TR2-42 1TR2-43 1TR2-44 1TR2-45 1TR2-46 1TR2-47 1TR2-48 1TR2-49 1TR2-50	1TR2-1 1TR2-2 1TR2-3 1TR2-4 1TR2-5 1TR2-6 1TR2-7 1TR2-8 1TR2-9 1TR2-10 1TR2-11 1TR2-12 1TR2-13 1TR2-14 1TR2-15 1TR2-16 1TR2-17 1TR2-18 1TR2-19 1TR2-20 1TR2-21 1TR2-22 1TR2-23 1TR2-24 1TR2-25 1TR2-26 1TR2-27 1TR2-28 1TR2-29 1TR2-30 1TR2-31 1TR2-32 1TR2-33 1TR2-34 1TR2-35 1TR2-36 1TR2-37 1TR2-38 1TR2-39 1TR2-40 1TR2-41 1TR2-42 1TR2-43 1TR2-44 1TR2-45 1TR2-46 1TR2-47 1TR2-48 1TR2-49 1TR2-50	1TR2-1 1TR2-2 1TR2-3 1TR2-4 1TR2-5 1TR2-6 1TR2-7 1TR2-8 1TR2-9 1TR2-10 1TR2-11 1TR2-12 1TR2-13 1TR2-14 1TR2-15 1TR2-16 1TR2-17 1TR2-18 1TR2-19 1TR2-20 1TR2-21 1TR2-22 1TR2-23 1TR2-24 1TR2-25 1TR2-26 1TR2-27 1TR2-28 1TR2-29 1TR2-30 1TR2-31 1TR2-32 1TR2-33 1TR2-34 1TR2-35 1TR2-36 1TR2-37 1TR2-38 1TR2-39 1TR2-40 1TR2-41 1TR2-42 1TR2-43 1TR2-44 1TR2-45 1TR2-46 1TR2-47 1TR2-48 1TR2-49 1TR2-50



DEVICE	DESCRIPTION	MFR/TYPER	REMARKS
06	LOCKING-OUT RELAY	01NG-6 STYLE 2B1B473A22	24V DC OPER COIL 125V DC RESET COIL
2	TIME DELAY PICKUP RELAY (SET AT 10 SEC.)	AQW/E702PC	125 V DC 1.5-15 SEC.
2-1	TIME DELAY DROPOUT RELAY (SET AT 1 SEC.)	AGA/E702PB	125 V DC 0.5-5 SEC.
8G4	AUXILIARY RELAY	GE/ 12 HPA51A4KX C058 42	125 V DC

- NOTES**
1. TS — TEST SWITCH
 2. H — TRUCK OPERATED CELL SWITCH SHOWN FOR BREAKER IN TEST POSITION.
 3. SEQUENCER LOAD SHEDDING CIRCUIT BIF, DWG D-177698(B/S, DWG D-177694).
 4. ENGINEERED SAFEGUARD SEQUENCER BIF, DWG D-177645(B/S, DWG D-177640).
 5. LOSS OF OFFSITE POWER SEQUENCER BIF, DWG D-177649(B/S, DWG D-177650).
 6. THE COMPUTER OPERATOR ADDRESS NUMBERS FOR DFO6 & DFO6 ARE VO1000 & VO1020, RESPECTIVELY.

- REFERENCE DRAWINGS**
- D-177001- SINGLE LINE ELEC AUX SYSTEM (EMERG - 4160V @ 600V)
 - D-177005- SINGLE LINE PROTECTION & METERING 4160V SWITCH GEAR BUS IF
 - D-177006- SINGLE LINE PROTECTION & METERING 4160V SWITCH GEAR BUS I6
 - A-177538- ELEC GENERAL DETAILS & NOTES



CONTACTS	HANDLE END	REMOTE LOCAL
01-01	1	X
01-01	2	X
01-01	3	X
01-01	4	X
01-01	5	X
01-01	6	X
01-01	7	X
01-01	8	X
01-01	9	X
01-01	10	X
01-01	11	X
01-01	12	X
01-01	13	X
01-01	14	X
01-01	15	X
01-01	16	X
01-01	17	X
01-01	18	X
01-01	19	X
01-01	20	X

AMMETER

CONTACTS	HANDLE END	OFF	TRIP	TRIP INDICATION	ALARM	STOP
1-2	X		X			
3-4	X				X	

AMMETER SWITCH

CONTACTS	HANDLE END	OFF	TRIP	TRIP INDICATION	ALARM	STOP
1-2	X		X			
3-4	X				X	

EQUIPMENT	FAC	SCHEME	SWITCH	MOTOR	REMOTE	SS.I. ACCESS. NO.	SEQUENCER	MAIN CONTROL	TERMINATION	START-UP	TC	TERMINAL	NPS	ANN. WINDOW	HSP TERMINAL	SPLICE	SPLICE																					
CHARGING/HIGH HEAD SAFETY INJECTION PUMP	IA	IV	ADF06	DF06	Q1E21	MOD1A-A	Q1E21	H56E04A-A	U167953	Q1R43	E001A-A	N1H1	NGMCS2500A-A8	Q1H25	LO06-A	Q1H21HB	APP2605A-A	40	3TB1-16	3TB1-17	3TB1-18	3TB1-19	3TB1-20	3TB1-21	3TB1-22	3TB1-25	APN05	APN06	APN08	P1LL "E"	P2LL "E"	TM-1	TM-11	TY3	TM-2	TM-11	APR217	APR218

Drawing No.: **HPI-B-02**
 Date: **05/20/2007**
 Revision No.: **#6**

Example 13

CIRCUIT ANALYSIS WORKSHEET

Component ID: **COMP-1** Component Type: **Compressor**

Component Description: **Instrument Air Compressor**

BE Code: **COMP-1_FTR (COMP-1 Fails to Run)**

Required Position: **CYCLE**
Functional State

Normal Position: **CYCLE**

Failed Electrical Position: **Off**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: LC-1 Breaker: LCI-15

Breaker: _____

Cable Analysis:

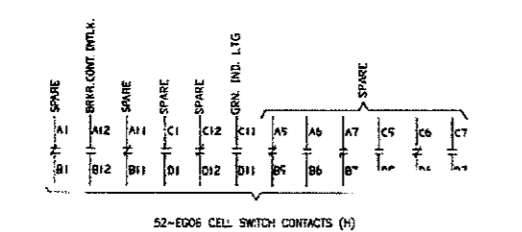
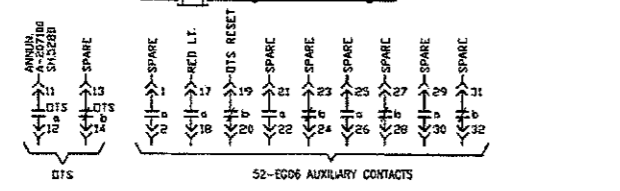
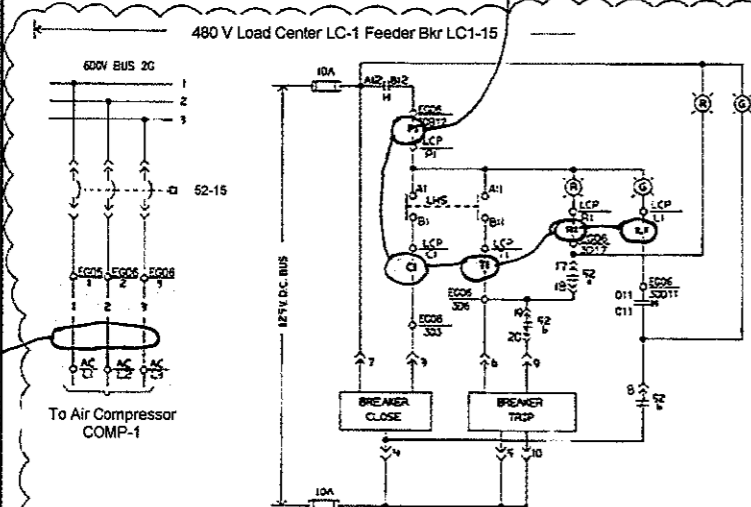
Cable ID	Required?	Function	Fault Consequence	Comments
YEG06-P	Y	P	LOP	
YEG06-A	Y	C	LOP	FAULTS COULD CAUSE LOP TO AIR COMPRESSOR SKID
YEQ17-A	Y	C	Los of Cooling H ₂ O,	LOC
YEQ17-B	Y	C	LOC	
YEQ17-E	Y	C	LOC	
YEQ17-I	Y	C	LOC	
YEQ17-H	Y	C	Fail off	
YEQ17-M	Y	C	LOC, fail off	

Comments:

- ① Air Compressor Sequence Control Mounted on COMP-1 SKID
- ② Motor winding heater not required

YEG06-A

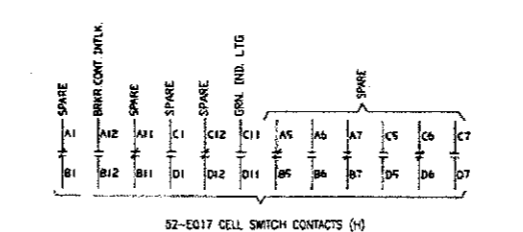
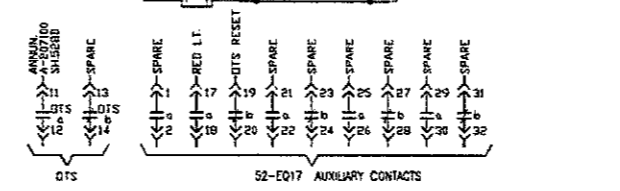
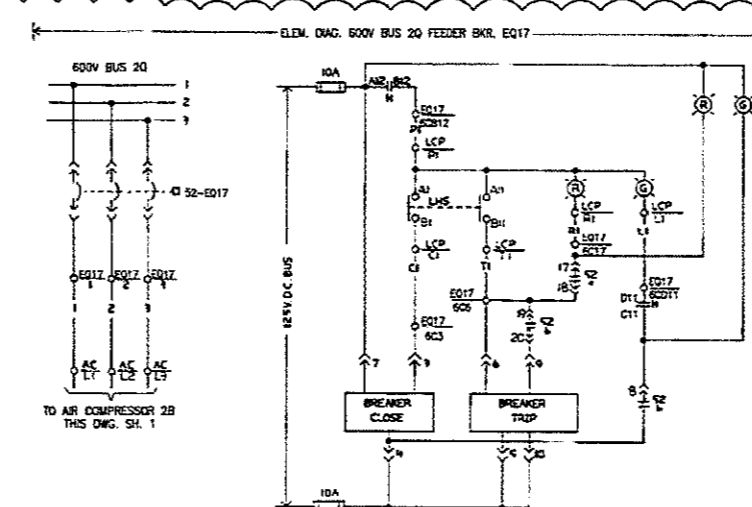
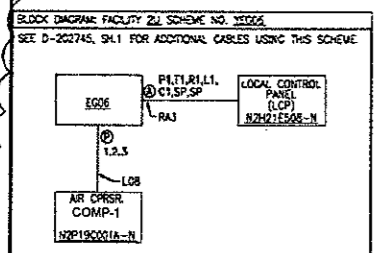
YEG06-P



LOCAL HANDSWITCH (LHS)

BREAKER POSITION	CONTACT	POSITION	FUNCTION
TRIP	A11-B11	X 0 1 0	BREAKER TRIP
CLOSE	A12-B12	0 X 1 0	SPARE
	A1-B1	0 0 1 X	BREAKER CLOSE
WEST. TYPE W2	A5-B5	X 0 1 0	SPARE
	A6-B6	0 X 1 0	
	A7-B7	0 0 1 X	

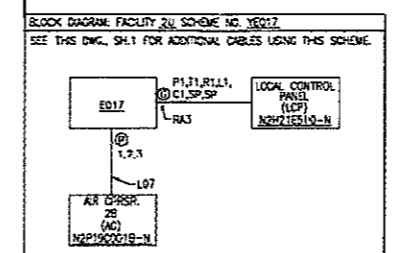
WEST. TYPE W2
NAMEPLATE - 502A054H01
HANDLE - 310C624H02
SWITCH - 505A603G01



LOCAL HANDSWITCH (LHS)

BREAKER POSITION	CONTACT	POSITION	FUNCTION
TRIP	A11-B11	X 0 1 0	BREAKER TRIP
CLOSE	A12-B12	0 X 1 0	SPARE
	A1-B1	0 0 1 X	BREAKER CLOSE
WEST. TYPE W2	A5-B5	X 0 1 0	SPARE
	A6-B6	0 X 1 0	
	A7-B7	0 0 1 X	

WEST. TYPE W2
NAMEPLATE - 492C707H02
HANDLE - 310C624H02
SWITCH - 505A603G01



LEGEND
H - TRUCK OPERATED CELL SWITCH SHOWN WITH BREAKER IN TEST POSITION
OTS - OVERCURRENT TRIP SWITCH

REFERENCES:
D-207013, SH.1 SINGLE LINE PROTECTION & METERING 600V LOAD CTR. 2G
D-207676, SH.1 SINGLE LINE PROTECTION & METERING 600V LOAD CTR. 20

REV. NO.	DATE	BY	CHKD.	APP'D.	DESCRIPTION
1					ISSUED FOR CONSTRUCTION
2					REVISION PER O&P
3					91-2-7267, 001-009

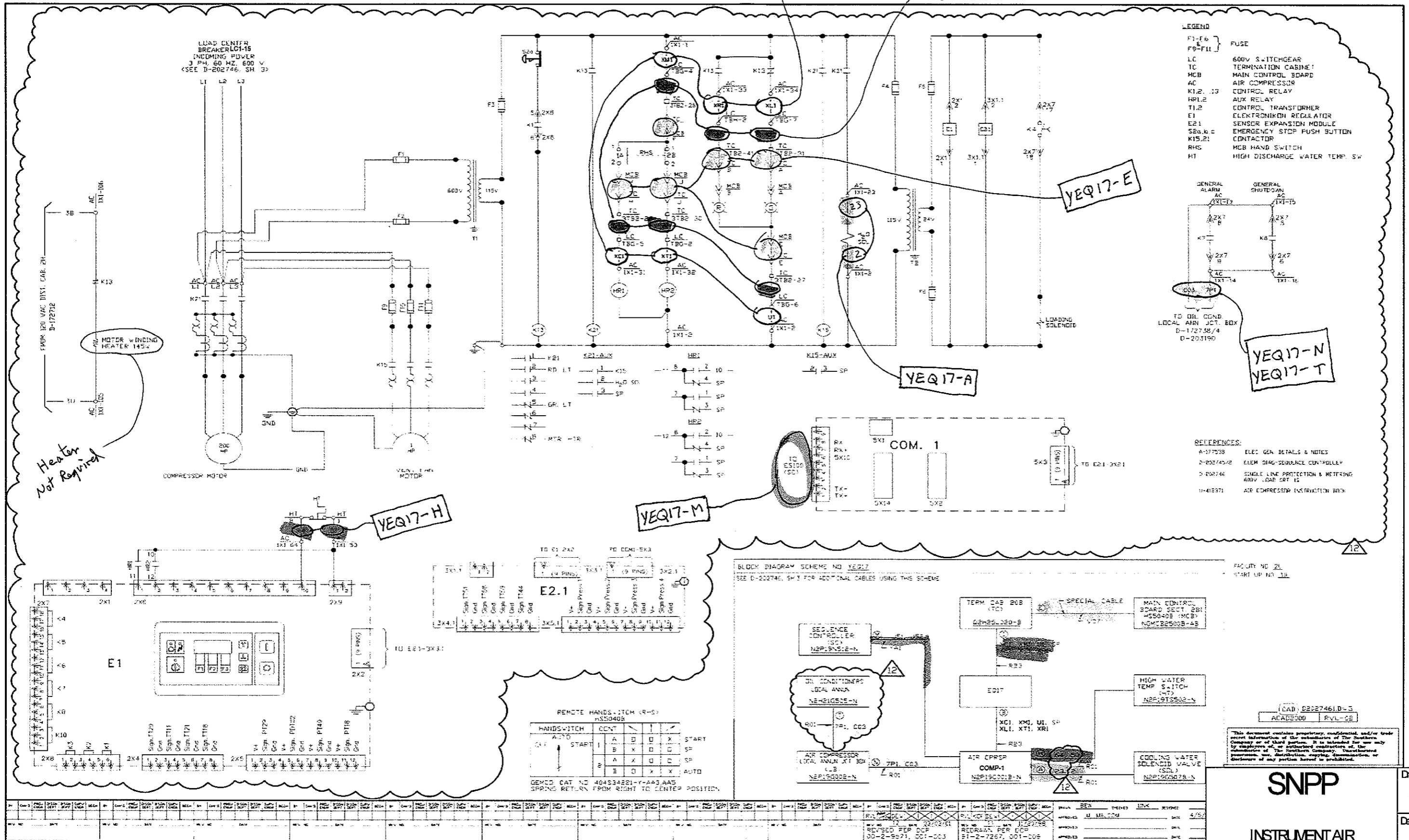
This document contains proprietary, confidential, and/or trade secret information of the manufacturer of the hardware, software, or other equipment shown herein. It is intended for use only by employees of, or authorized contractors of, the manufacturer of the hardware, software, or other equipment shown herein. No reproduction, copying, dissemination, or other use of any part of this document is permitted.

NO.	DATE	BY	CHKD.	APP'D.	DESCRIPTION
1	4/9/85				REVISED
2	4/9/85				REVISED
3	4/9/85				REVISED

SNPP

INSTRUMENT AIR COMPRESSOR COMP-1

Drawing No:	COMP-1-02
Date:	05/20/2007
Revision No:	#6



Heater Not Required

YEQ17-B

YEQ17-I

YEQ17-E

YEQ17-A

YEQ17-N
YEQ17-T

YEQ17-H

YEQ17-M

(LAB) D202746.1.D-3
ACADE300 RVL-02

This document contains proprietary, confidential, and/or trade secret information of the manufacturer of the Southern Company or of third parties. It is intended for use only by employees of, or authorized contractors of, the manufacturer of the Southern Company. Unauthorized possession, use, distribution, copying, transmission, or disclosure of any portion hereof is prohibited.

SNPP

INSTRUMENT AIR COMPRESSOR COMP-1

Drawing No: COMP-1-02
Date: 05/20/2007
Revision No: #6

NO	REV	DATE	BY	CHKD	APP'D	REASON
1	1	05/20/2007
2	2

Example 14

CIRCUIT ANALYSIS WORKSHEET

Component ID: **SWGR-B** Component Type: **Switchgear**

Component Description: **Train B 4160V Switchgear**

BE Code: **PNL-B EPS-4VBUSBF-2 (4KV BUS B FAULT)**

Required Position: **ENERGIZED FROM EDG-B**
Functional State

Normal Position: **ENERGIZED FROM SUT-1**

Failed Electrical Position: **Off**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: _____ Breaker: _____

_____ Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments

Comments:

Example 15

CIRCUIT ANALYSIS WORKSHEET

Component ID: **LC-B** Component Type: **Load Center**

Component Description: **Train B 480 V Load Center**

BE Code: **EPS-480VLCBF (480V LOAD CENTER B FAULT)**

Required Position: **ENERGIZED**
Functional State

Normal Position: **ENERGIZED**

Failed Electrical Position: **Off**

Failed Air Position: **N/A**

High Consequence Component Yes No

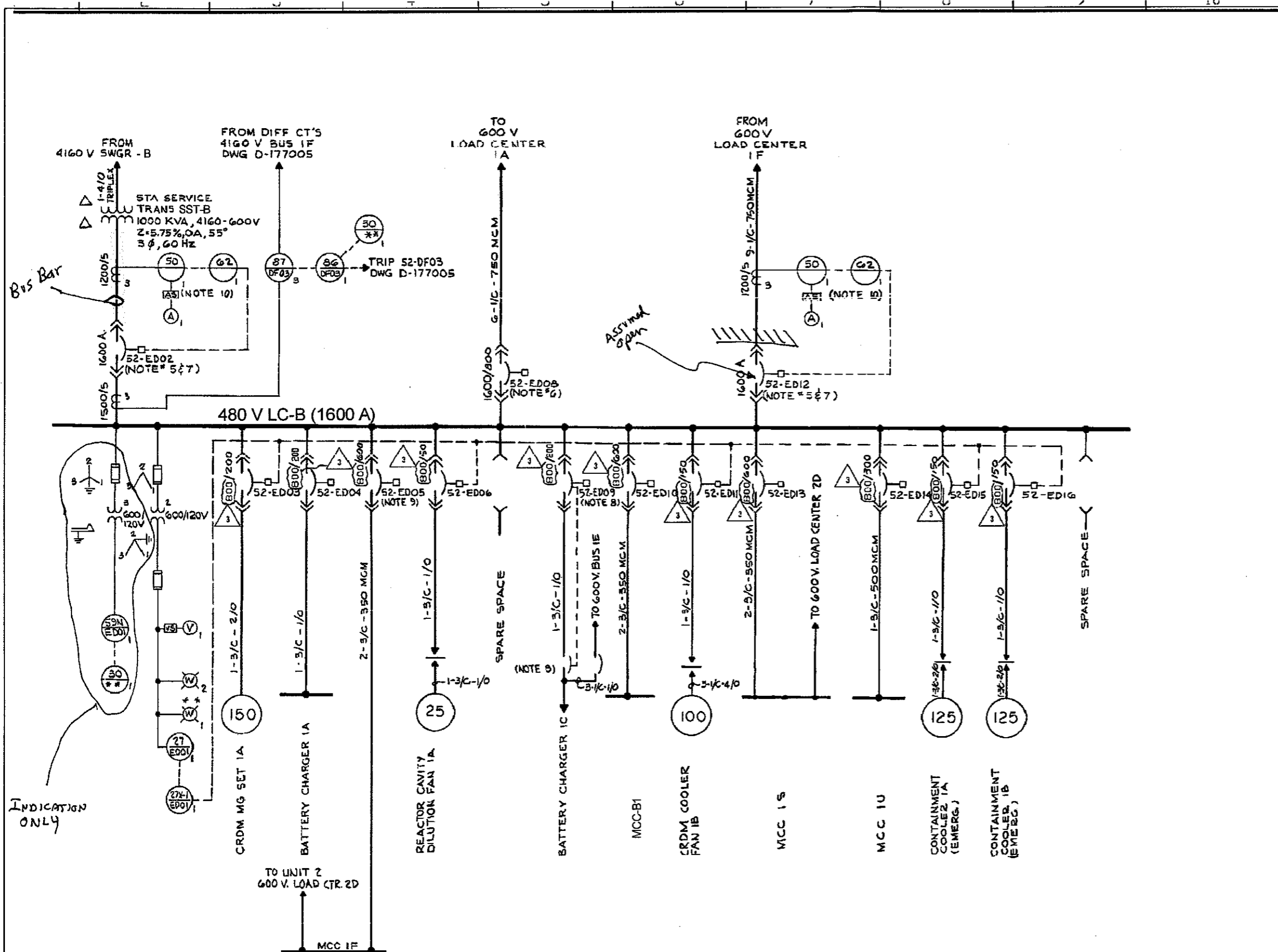
Power Supplies: SST-B Breaker: N/A

PNL-B Breaker: 11

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
AED02-A	Y	C	LOC, Loss-Protection	
AED02-B	Y	C	LOC, Loss-Protection	
AED02-Z	Y	C	LOC, Loss-Protection	
AED12-A	N	C	NONE	KIRK-KEY INTERLOCK
AED12-B	N	C	NONE	KIRK-KEY INTERLOCK
AED12-P	N	P	NONE	LOP FROM LC-1F
AED12-Q	N	P	NONE	LOP FROM LC-1F
AED12-R	N	P	NONE	LOP FROM LC-1F

Comments:



DEVICE	DESCRIPTION	MFR/TYPER	REMARKS
50	STA. SERVICE TRANSF. ID OVER CURRENT RELAY, 3 ϕ	GE/PJC32G	
NOTE 10			
62	TIME DELAY RELAY	AGASTAT/ET012PA	
NOTE 10			
50	OVER CURRENT RELAY, 3 ϕ , FOR INC FDR FROM LOAD CTR 1F	GE/PJC32G	
NOTE 10			
62	TIME DELAY RELAY	AGASTAT/ET012PA	
NOTE 10			
87	STA. SERVICE TRANSF. ID DIFFERENTIAL RELAY	GE/25TD1505A	
86	STA. SERVICE TRANSF. ID LOCKING OUT RELAY	GE/HEA	
59N	BUS ID OVER VOLTAGE RELAY (GROUND DETECTION)	WEST/CV-8	
ED01	BUS ID UNDER VOLTAGE RELAY	WEST/CV-2	
27	BUS ID UNDER VOLTAGE AUXILIARY RELAY.	WEST/MG-6	
ED01			
27X-1			
ED01			

NOTES

1. ** - DENOTES EMERG. POWER BOARD IN MAIN CONT. RM.
2. INTERRUPTING RATING OF ACB'S IS 22,000 AMPS RMS SYMMETRICAL (MIN)
3. BUS SHORT CIRCUIT RATING 22,000 AMPS SYMMETRICAL.
4. STATION SERVICE TRANSFORMER "ASKAREL" TYPE.
5. BREAKERS 52-ED02 AND 52-ED12 ARE KEY INTERLOCKED SO THAT ONLY ONE CAN BE CLOSED AT ANY TIME (DWG. B-177125)
6. BREAKERS 52-ED08 AND 52-ED09 (ON 600V. BUS 1A) ARE OPERATED BY A SINGLE CONTROL SWITCH IN THE MAIN CONTROL ROOM.
7. ALL BKR'S EXCEPT 52-ED02 & 52-ED12 HAVE SOLID STATE TRIP UNITS WITH FOLLOWING DESIGNATIONS (BREAKER FRAME/SENSOR RATING-AMPERES)
8. BREAKERS 52-ED09, 52-ED06 AND MOLDED CASE BKRS. TO BATTERY CHARGER 1C ARE KEY INTERLOCKED SO THAT ONLY ONE BREAKER AND CORRESPONDING MOLDED CASE BKRS CAN BE CLOSED AT ANY TIME (DWG. C-177133).
9. UNIT 1 BREAKER ED05 IS ELECTRICALLY INTERLOCKED WITH UNIT 2 BREAKER ED06 TO PREVENT SIMULTANEOUS CLOSING OF BOTH BREAKERS.
10. LOCATED IN TERMINAL BLOCK COMPARTMENT ABOVE ASSOCIATED BREAKER.
11. THIS DRAWING SUPERSEDES DRAWING C-177010, SHT 1 OF 1 REV. 14, DATED 11-15-90, PER PCN S 93-1-8690, REV 0

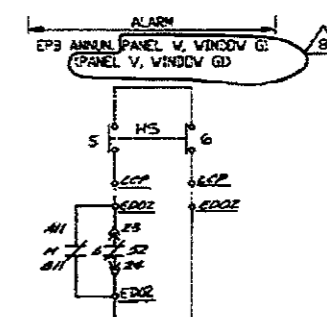
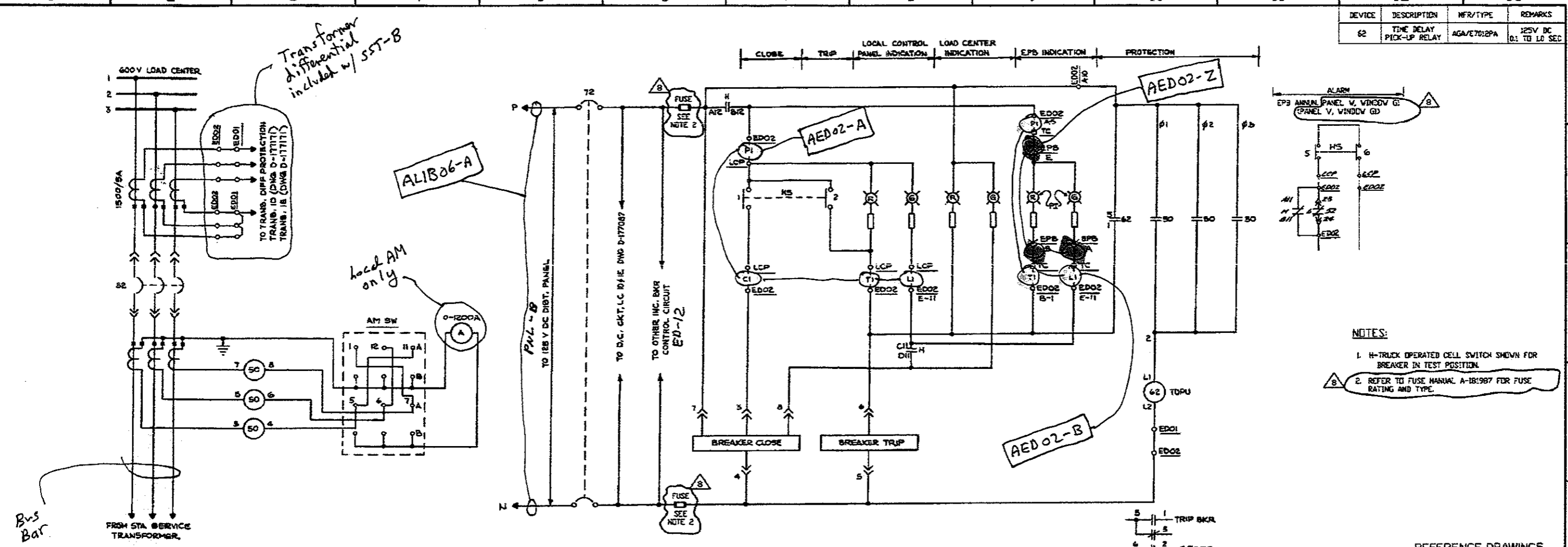
REFERENCE DRAWINGS

A-177538 - ELECTRICAL GENERAL DETAILS & NOTES
 D-177001 - SINGLE LINE ELEC. AUX. SYSTEM (4160/6000)

INDICATION ONLY

<h1>SNPP</h1> <p>LOAD CENTER B (LC-B) ONE-LINE DIAGRAM</p>	Drawing No.:	LC-B-01
	Date:	05/20/2007
	Revision No.:	#6

DEVICE	DESCRIPTION	MFR/TYP	REMARKS
62	TIME DELAY PICK-UP RELAY	AGA/ET02PA	125V DC 0.1 TO 1.0 SEC



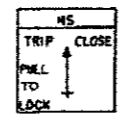
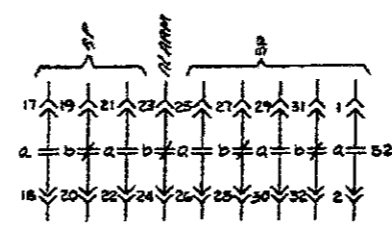
- NOTES:**
1. H-TRUCK OPERATED CELL SWITCH SHOWN FOR BREAKER IN TEST POSITION.
 2. REFER TO FUSE MANUAL A-181987 FOR FUSE RATING AND TYPE.

REFERENCE DRAWINGS

- D-177001 - SINGLE LINE, ELECTRICAL AUXILIARY SYSTEM (EMERG. 4160V @ 600V)
- A-177555 - ELECTRICAL GENERAL DETAILS AND NOTES.
- D-177010 - SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER 1D (EMERGENCY)
- D-177011 - SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER 1E (EMERGENCY)

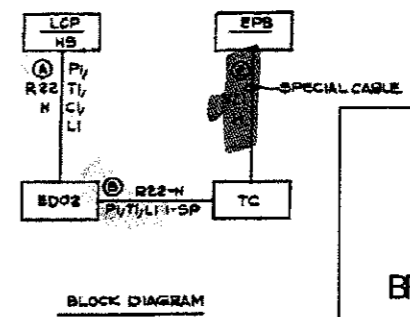
CONTACT	POSITION
0-1	0-1-2-3
A11-B11	X X X X X X X X
A12-B12	X X X X X X X X
A1-B1	X X X X X X X X
A5-B5	X X X X X X X X
A6-B6	X X X X X X X X
A7-B7	X X X X X X X X

AMMETER SWITCH TYPE W-2 SN 787A9N601 ROUND FIXED HANDLE



CONTACTS	HANDLE END	ODD	EVEN	QAN	QAN	MT	TRIP	TRIP	TRIP	TRIP
0-1-0-1-0	1	X								
0-1-0-1-0	2		X	X	X	X	X	X	X	SP
0-1-0-1-0	3	X	X	X	X	X	X	X	X	SP
0-1-0-1-0	4	X	X	X	X	X	X	X	X	ALARM
0-1-0-1-0	5	X	X	X	X	X	X	X	X	ALARM
0-1-0-1-0	6	X	X	X	X	X	X	X	X	ALARM

HANDSWITCH GE SEMI TYPE MODEL NO 10A116 SPRING RETURN TO CENTER PULL TO LOCK IN TRIP POSITION



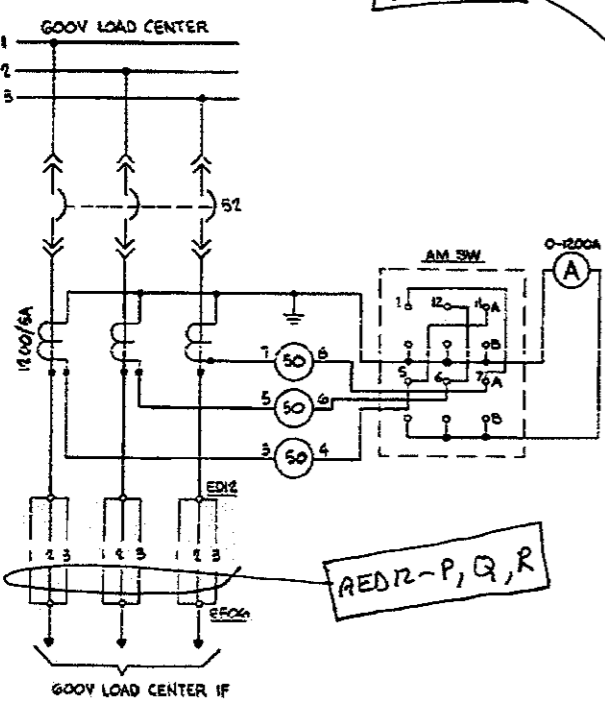
EQUIPMENT	FAC	SCHEME	LOAD CENT. COMPT.	LOCAL CONTROL PANEL	START UP NUMBER	EMERGENCY POWER BOARD	TERMINATION CABINET	POSITION INDICATOR LIGHT
INCOMING BREAKER TO 600V LOAD CENTER	ID	IV	AED02	ED02 QH21 EDO9-A	5	QSHING EP02508-AB	QH25 LOS7-A	QH21 ZL20188A-A
	IE	IV	BEE02	ED02 QH21 EDO10-B	5	QSHING EP02508-AB	QH25 LOS7-B	QH21 ZL20188A-B

SNPP

52-ED-02
BREAKER SCHEMATIC

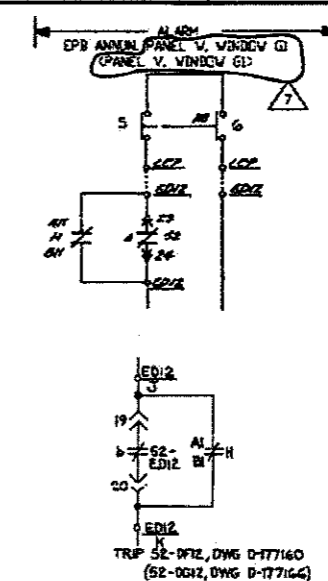
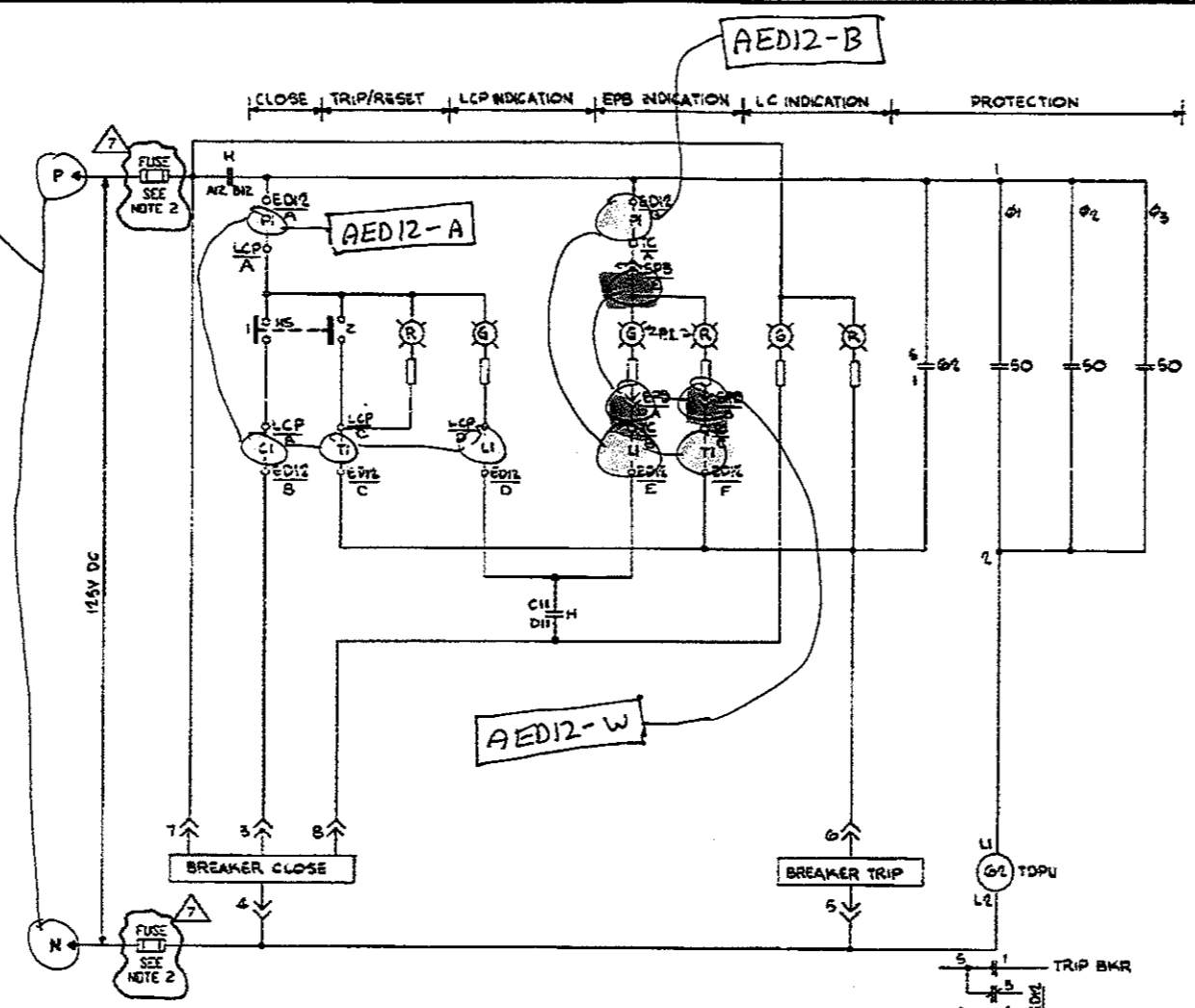
Drawing No:	LCB-02
Date:	05/20/2007
Revision No:	#6

A
B
C
D
E
F
G
H



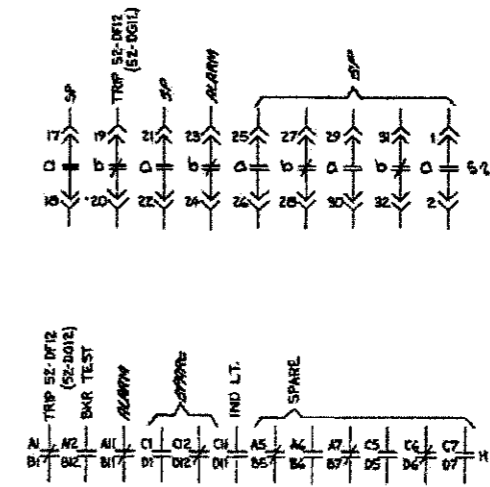
AMMETER	CONTACT	POSITION
OFF	0-11-12-13	
	A1-B1	X X X X X X X X
	A2-B2	X X X X X X X X
	A1-B1	X X X X X X X X
	A5-B5	X X X X
	A6-B6	X X X X
	A7-B7	X X

AMMETER SWITCH
TYPE W-2, S#7874976G01
ROUND FIXED HANDLE



DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
62	TIME DELAY PICK-UP RELAY	AGASTAT E70L2PA	125V DC C1 TO L3 SEC

NOTES:
1. H-TRUCK OPERATED CELL SWITCH SHOWN FOR BREAKER IN TEST POSITION.
2. REFER TO FUSE MANUAL N-181987 FOR FUSE RATING AND TYPE.



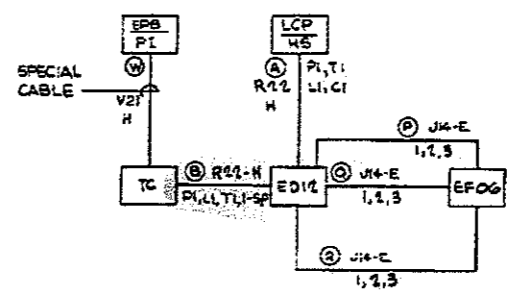
- REFERENCE DRAWINGS
- A-17753B - ELECTRICAL GENERAL DETAILS AND NOTES
 - D-177001 - SINGLE LINE ELECTRICAL AUX SYSTEM (EMERG - 2400V 600V)
 - D-177010 - SINGLE LINE PROTECTION AND METERING 600V L.C. 1D (EMERG)
 - D-177011 - SINGLE LINE PROTECTION AND METERING 600V L.C. 1E (EMERG)
 - C-177012 - SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER IF

EQUIPMENT	FAC	SCHEME	L.C. COMPT.	LCP LOCAL CONTR. PANEL	EPB EMERG POWER BOARD	TC TERMINATION CABINET	PI POSITION IND. LIGHTS	START-UP NUMBER	L.C. COMPT.
INCOMING 600V LOAD CENTER	1D	IV	AED12	ED12	Q1H21	Q1H25	Q1R16	5	EFG6
LOAD CENTER BREAKER	1E	IV	BEE12	EE12	Q1H21	Q1H13	Q1R16	5	EFG8

LOAD CENTER COMPARTMENT	TERMINAL BLOCK NUMBERS	LOCAL CONTROL PNL	TERMINAL BLOCK NUMBERS	TERMINATION CABINET	TERMINAL BLOCK NUMBERS
ED12	A5 A7 B1 E1 E4 B2 A4 B5 B4 C4 C12	ED12	T87-9 T87-11 T87-14 T87-12	Q1H25L037-A	1T82-38 1T82-36 1T82-37
EE12	A5 A7 B1 E1 E4 B2 A4 B5 B4 C4 C12	EE12	T810-9 T810-6 T810-7 T810-8	Q1H25L039-B	3T81-33 3T81-31 3T81-32

CONTACTS HANDLE END	ODD	EVEN	CLOSE	TRIP	TRIP	TRIP	TRIP	TRIP
0-1-0	0-1-0	1	X					
0-1-0	0-1-0	2		X	X	X	X	
0-1-0	0-1-0	3		X	X	X	X	
0-1-0	0-1-0	4	X	X	X	X	X	
0-1-0	0-1-0	5		X	X	X	X	
0-1-0	0-1-0	6	X	X				

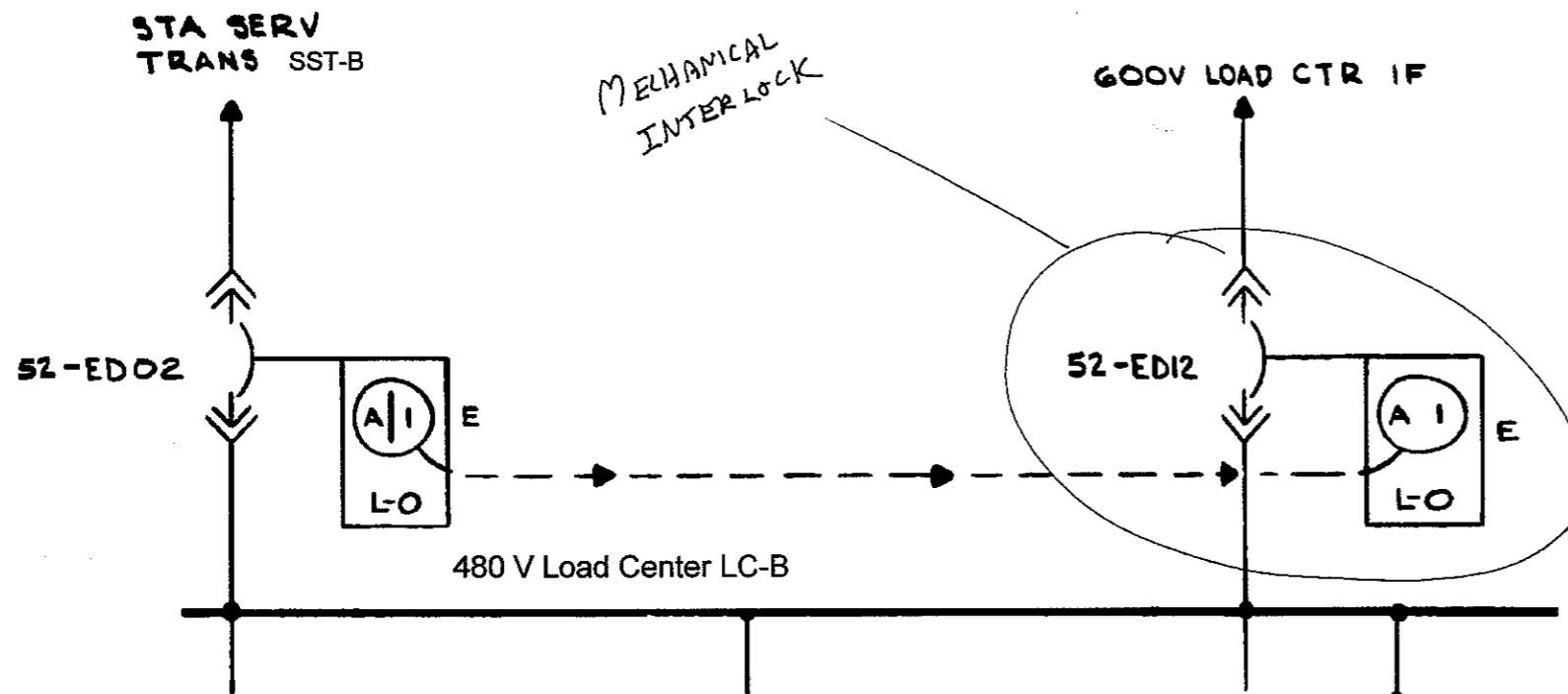
HANDSWITCH
GE 58M TYPE
MODEL NO 10AAN6
SPRING RETURN TO CENTER
PULL TO LOCK IN TRIP POSITION.



SNPP

52-ED-12
SCHEMATIC

Drawing No: LCB-03
Date: 05/20/2007
Revision No: #5



OPERATION SEQUENCE

KEY IS HELD IN CIRCUIT BREAKER 52-ED02 INTERLOCK. TO ESTABLISH SERVICE THROUGH CIRCUIT BREAKER 52-ED12

1. TRIP CIRCUIT BREAKER 52-ED02
2. TURN KEY AI IN L-O INTERLOCK ON CIRCUIT BREAKER 52-ED02 TO LOCK OPEN. KEY AI IS NOW FREE.
3. INSERT KEY AI IN L-O INTERLOCK ON CIRCUIT BREAKER 52-ED12 AND TURN TO UNLOCK. KEY AI IS NOW HELD.
4. CLOSE CIRCUIT BREAKER 52-ED12.

REVERSE SEQUENCE TO RESTORE SERVICE THROUGH CIRCUIT BREAKER 52-ED02.

NOTE: AS AN EXCEPTION FOR MAINTENANCE WORK PER A PLANT PROCEDURE, TWO KEYS MAY BE USED TO OVERRIDE THE NORMAL CIRCUIT BREAKER INTERLOCK FEATURE.

4

NOTES

1. ALL INTERLOCKS ARE KIRK TYPE
2. CIRCUIT BREAKERS 52-ED09, 52-EE06 & MOLDED CASE BREAKERS TO BATTERY CHARGER IC ARE KEY INTERLOCKED SO THAT ONLY ONE BREAKER AND CORRESPONDING BATTERY CHARGER MOLDED CASE BREAKER CAN BE CLOSED AT ANY TIME (SEE DWG C-177133)

LEGEND

- INTERLOCK WITH KEY HELD.
- INTERLOCK WITH KEY REMOVED.
- L-O — (LOCKED OPEN) INDICATES THAT THE KEY IS REMOVABLE WHEN THE CIRCUIT BREAKER IS LOCKED IN THE OPEN POSITION.
- E — INDICATES KEY REMOVABLE ONLY WHEN BOLT EXTENDED.

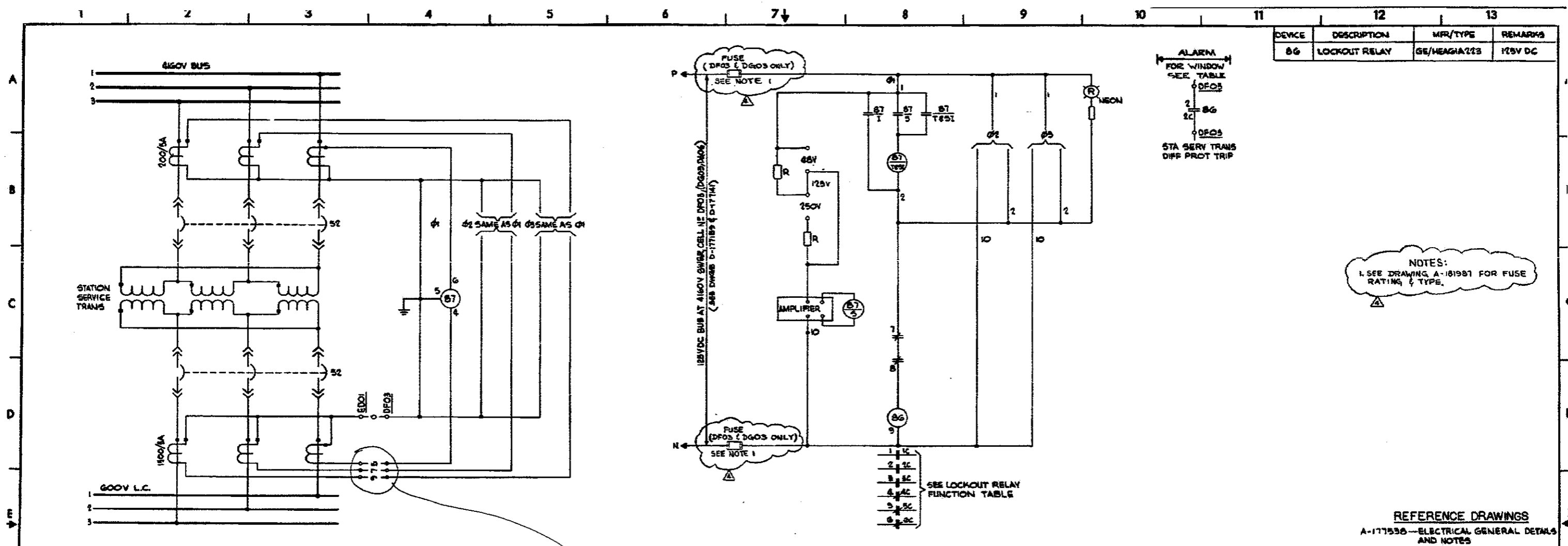
INTERLOCK KEY TABLE

INTERLOCK	KEY NUMBER
AI	RE-14204

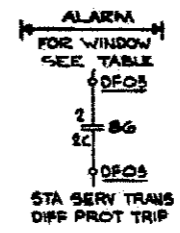
REFERENCE DWG.

- D-177001-SINGLE LINE ELEC AUX SYSTEM (4160V & 600V)
- C-177010-SINGLE LINE PROTECTION & METERING 600V LOAD CENTER ID
- A-177538-ELEC GEN DETAILS & NOTES

<p>SNPP</p> <p>LC-B INCOMING BREAKER INTERLOCKS</p>	<p>Drawing No.: LC-B-04</p>
	<p>Date: 05/20/2007</p>
	<p>Revision No.: #6</p>



DEVICE	DESCRIPTION	MFR/TYPER	REMARKS
B6	LOCKOUT RELAY	GE/HEAGIA223	125V DC

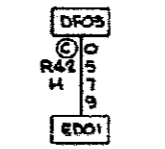


NOTES:
1. SEE DRAWING A-181987 FOR FUSE RATING & TYPE.

LOCKOUT RELAY FUNCTION TABLE

B6 DFO3	FUNCTION	DWG NO	B6 DGO3	FUNCTION	DWG NO	B6 DA06	FUNCTION	DWG NO
1 K	TRIP BAR 52-DFO3	C-17759	1 K	TRIP BAR 52-DGO3	C-17759	1 K	TRIP BAR 52-DA06	D-177141
2 2C	ALARM	TMS DWG	2 2C	ALARM	TMS DWG	2 2C	ALARM	TMS DWG
3 3C	SPARE	---	3 3C	SPARE	---	3 3C	SPARE	---
4 4C	SPARE	---	4 4C	SPARE	---	4 4C	BLOCK CLOSING BKR 52-DA06	D-177141
5 5C	BLOCK CLOSING BKR 52-DFO3	C-17759	5 5C	BLOCK CLOSING BKR 52-DGO3	C-17759	5 5C	SPARE	---
6 6C	SPARE	---	6 6C	SPARE	---	6 6C	SPARE	---

ED01-C



BLOCK DIAGRAM

REFERENCE DRAWINGS

- A-17759—ELECTRICAL GENERAL DETAILS AND NOTES
- D-177001—SINGLE LINE ELECTRICAL AIR SYSTEM (EMERG-480V & 600V)
- D-177002—SINGLE LINE PROTECTION AND METERING 480V SWITCHGEAR, BUS 1A
- D-177005—SINGLE LINE PROTECTION AND METERING 480V SWITCHGEAR, BUS 1F (EMERG)
- D-177006—SINGLE LINE PROTECTION AND METERING 480V SWITCHGEAR, BUS 1G (EMERG)
- C-177010—SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER 1D (EMERG)
- C-177011—SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER 1E (EMERG)
- C-177014—SINGLE LINE PROTECTION AND METERING 600V LOAD CENTER 1I

A-181987—FUSE REPLACEMENT MANUAL FOR SAFETY RELATED EQUIPMENT.

EQUIPMENT	FAC	SCHEME	SWGR CELL	LOAD CENTER COMPARTMENT	BUSWAY-UP NUMBER	ANNUNCIATOR WINDOW NO
DIFFERENTIAL RELAY FOR STATION SERV TRANSFORMER	ID	IV	ADFO3	DFO3	ED01	5
	IE	IV	BOGO3	DGO3	ED01	5
	II	IV	KDA06	DA06	E101	5

SNPP

STATION SERVICE TRANSFORMER DIFFERENTIAL PROTECTION SCHEME

Drawing No.: LC-B-06
Date: 05/20/2007
Revision No.: #6

CIRCUIT ANALYSIS WORKSHEET

Example 16

Component ID: **MCC-1B** Component Type: **MCC**

Component Description: **Train B 480 V Motor Control Center**

BE Code: **EPS-480MCCB1F (480V MCC B1 FAULT)**

Required Position: **ENERGIZED**
Functional State

Normal Position: **ENERGIZED**

Failed Electrical Position: **Off**

Failed Air Position: **N/A**

High Consequence Component Yes No

Power Supplies: LC-B Breaker: ED-10

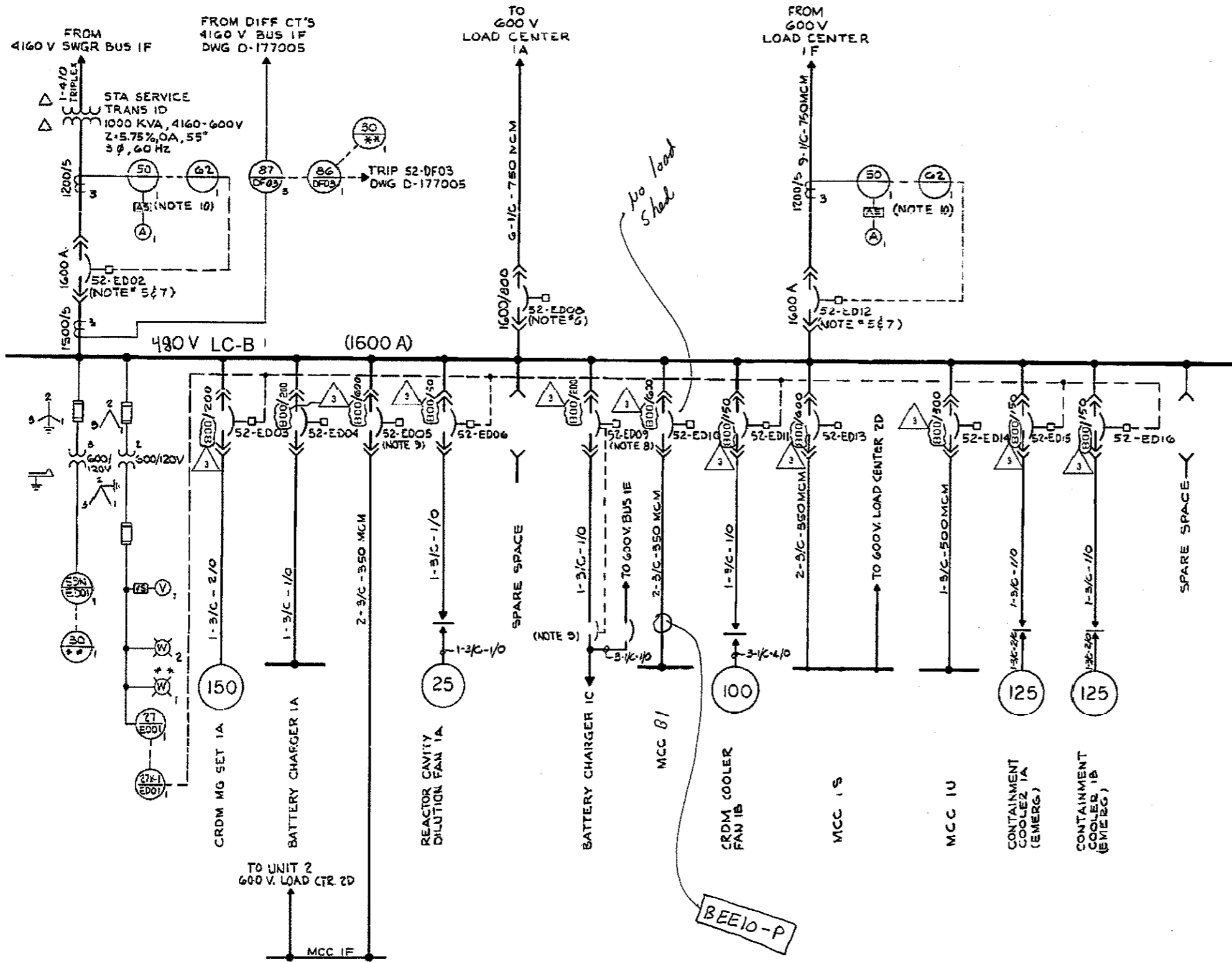
Breaker: _____

Cable Analysis:

Cable ID	Required?	Function	Fault Consequence	Comments
BEE10-P	Y	P	LOP	
BEE10-A	Y	C	LOC, SO	
BEE10-B	Y	C	LOC, SO	
BEE10-Z	Y	C	LOC, SO	

Comments:

- ① Breaker control power included in analysis for LC-B.
- ② MCC-1B has no main breaker. Power cables connected directly to bus.
- ③ Annunciation circuits not required for functionality.



DEVICE	DESCRIPTION	MFR/TYPER	REMARKS
50	STA. SERVICE TRANSF. ID OVER CURRENT RELAY, 3 ϕ	GE/PJCB32G	
NOTE 10			
62	TIME DELAY RELAY	AGASTAT/ET012PA	
NOTE 10			
50	OVER CURRENT RELAY, 3 ϕ , FOR INC FDR FROM LOAD CTR 1F	GE/PJCB32G	
NOTE 10			
62	TIME DELAY RELAY	AGASTAT/ET012PA	
NOTE 10			
87	STA. SERVICE TRANSF ID DIFFERENTIAL RELAY	GE/MSDISUSA	
DF03			
86	STA. SERVICE TRANSF ID LOCKING OUT RELAY	GE/HBA	
DF03			
59N	BUS ID OVER VOLTAGE RELAY (GROUND DETECTION)	WEST/CV-6	
ED01			
27	BUS ID UNDER VOLTAGE RELAY	WEST/CV-2	
ED01			
27Y.1	BUS ID UNDER VOLTAGE AUXILIARY RELAY.	WEST/MG-6	
ED01			

NOTES

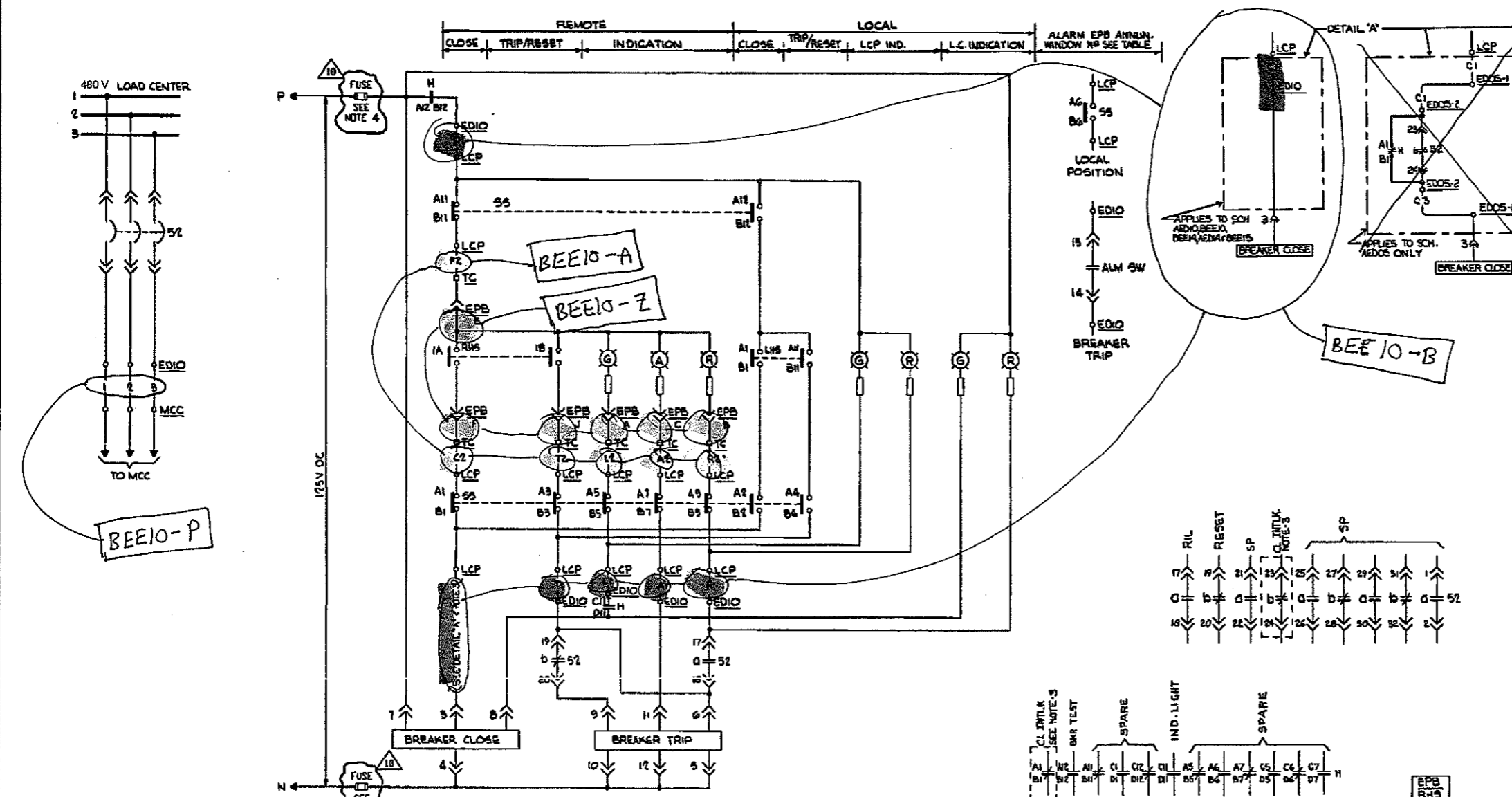
1. ** - DENOTES EMERG POWER BOARD IN MAIN CONTR. RM.
2. INTERRUPTING RATING OF ACB'S IS 22,000 AMPS RMS SYMMETRICAL (MIN)
3. BUS SHORT CIRCUIT RATING 22,000 AMPS SYMMETRICAL.
4. STATION SERVICE TRANSFORMER "ASKAREL" TYPE.
5. BREAKERS 52-ED02 AND 52-ED12 ARE KEY INTERLOCKED SO THAT ONLY ONE CAN BE CLOSED AT ANY TIME (DWG. B-17) 125)
6. BREAKERS 52-ED08 AND 52-ED09 (ON 600V BUS 1A) ARE OPERATED BY A SINGLE CONTROL SWITCH IN THE MAIN CONTROL ROOM.
7. ALL BKR'S EXCEPT 52-ED02 & 52-ED12 HAVE SOLID STATE TRIP UNITS WITH FOLLOWING DESIGNATIONS (BREAKER FRAME/SENSOR RATING-AMPERES)
8. BREAKERS 52-ED09, 52-ED08 AND MOLDED CASE BKRS. TO BATTERY CHARGER IC ARE KEY INTERLOCKED SO THAT ONLY ONE BREAKER AND CORRESPONDING MOLDED CASE BKRS CAN BE CLOSED AT ANY TIME (DWG-C-177153).
9. UNIT 1 BREAKER ED05 IS ELECTRICALLY INTERLOCKED WITH UNIT 2 BREAKER ED05 TO PREVENT SIMULTANEOUS CLOSING OF BOTH BREAKERS.
10. LOCATED IN TERMINAL BLOCK COMPARTMENT ABOVE ASSOCIATED BREAKER.

REFERENCE DRAWINGS
 A-177536 - ELECTRICAL GENERAL DETAILS & NOTES
 D-177001 - SINGLE LINE ELEC. AUX. SYSTEM (4160 & 600V)

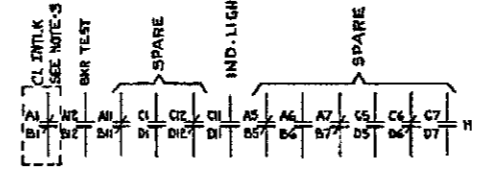
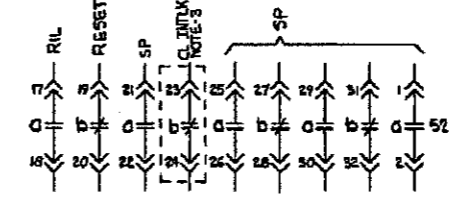
<h1>SNPP</h1> <p>LOAD CENTER B (LC-B) ONE-LINE DIAGRAM</p>	Drawing No.:	LC-B-01
	Date:	05/20/2007
	Revision No.:	#6

A
B
C
D
E
F
G
H

A
B
C
D
E
F
G
H



- NOTES:**
1. H-TRUCK OPERATED CELL SWITCH SHOWN FOR BREAKER IN TEST POSITION.
 2. CONTENTS DELETED.
 3. FOR SCHEMES AED05, AND BEE11 ONLY MCC'S IF #10 ARE FED FROM TWO LOAD CENTERS EACH TO PREVENT SIMULTANEOUS CLOSING, UNIT 1 & UNIT 2 FEEDER BARS TO THESE MCC'S ARE ELECTRICALLY INTERLOCKED. (SEE TABLE FOR BARS)
 4. REFER TO FUSE MANUAL A-181987 FOR FUSE RATING AND TYPE.



LHS TRIP CLOSE

CONTACT	POSITION	TRIP NORM/CLOSE
A11-B11	X	
A12-B12		X
A1-B1		X
A5-B5	X	
A6-B6		X
A7-B7		X

LOCAL HANDSWITCH
TYPE W-2, 5#505AG0301
PISTOL GRIP FIXED HANDLE
SPRING RETURN TO NORMAL

RHS TRIP CLOSE

CONTACT	TRIP	NORM/CLOSE
A		X
B	X	

REMOTE HANDSWITCH
GEMCO CAT NO 404352221-Y-AAS
SPRING RETURN TO NORMAL

SELECTOR SWITCH

CONTACT	W	R	SP
A11-B11	X		
A12-B12		X	
A1-B1		X	
A2-B2	X		
A3-B3		X	
A4-B4	X		
A5-B5		X	
A6-B6	X		
A7-B7		X	
A8-B8	X		
A9-B9		X	
A10-B10	X		

MAINTAINED CONTACTS

EQUIPMENT	FAC	SCHEME	L.C. COMPT.	LOCAL CONTROL PANEL	EMERGENCY POWER BOARD	TERMINATION CABINET	START-UP NUMBER	POWER CABLE CODE	MOTOR CONT CENTER	CONDUCTOR NO	CABLE PICKUP	REMOTE HANDSWITCH	EPB ANNUNCIATOR WINDOW NO	LC COMPT
GOOV LOAD CENTER BARS TO MOTOR CONTROL CENTER	1A	IV	AED10	ED10	Q1H21E009-A	Q1H25L037-A	6	LO9-F	FA-A2	1,1,3	1,1,3	Q1R16H52099A-A	PANEL V, WINDOW G2	PANEL V, WINDOW G1
	1B	IV	BEE10	EE10	Q1H21E010-B	Q1H25L037-B	6	LO9-F	FB-A2	1,1,3	1,1,3	Q1R16H52099A-B	PANEL V, WINDOW G2	PANEL V, WINDOW G1
	1F	IV	AED05	ED05	Q1H21E009-A	Q1H25L037-A	6	LO9-F	FF-A2	1,1,3	1,1,3	Q1R16H52099A-B	PANEL V, WINDOW G2	PANEL V, WINDOW G1
	1G	IV	BEE11	EE11	Q1H21E010-B	Q1H25L037-B	6	LO9-F	FG-A2	1,1,3	1,1,3	Q1R16H52099A-B	PANEL V, WINDOW G2	PANEL V, WINDOW G1
GOOV LOAD CENTER 1E (EMERG)	1T	IV	BEE14	EE14	Q1H21E010-B	Q1H25L037-B	6	LO9-F	FT-A1	1,1,3	1,1,3	Q1R16H52099A-B	PANEL V, WINDOW G2	PANEL V, WINDOW G1
	1U	IV	AED14	ED14	Q1H21E009-A	Q1H25L037-A	6	LO9-F	FU-A1	1,1,3	1,1,3	Q1R16H52099A-A	PANEL V, WINDOW G2	PANEL V, WINDOW G1
	1V	IV	BEE15	EE15	Q1H21E010-B	Q1H25L037-B	6	LO9-F	FV-A1	1,1,3	1,1,3	Q1R16H52099A-B	PANEL V, WINDOW G2	PANEL V, WINDOW G1

SNPP

MOTOR CONTROL CENTER
MCC-1B

Drawing No.: MCC-B1-01
Date: 05/20/2007
Revision No.: #6

