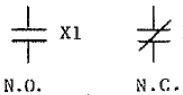
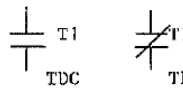
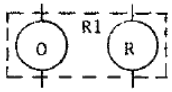
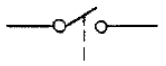
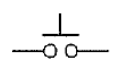
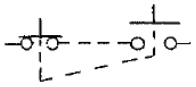
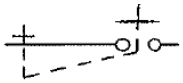
TYPICAL ELECTRICAL DRAWING SYMBOLS AND CONVENTIONS

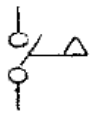
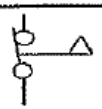
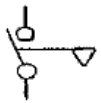
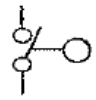
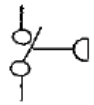
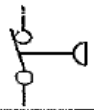
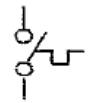
ELECTRICAL SYMBOLS

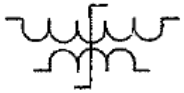
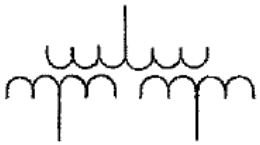
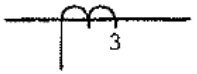
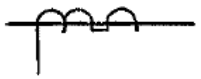
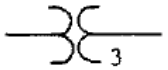
CONTACTS, SWITCHES, CONTACTORS AND RELAYS

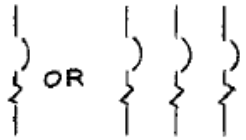
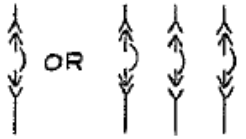
SYMBOL	DESCRIPTION
	Relay contact - Shown with relay in de-energized or in reset position. (Show relay coil designation near contact.)
	Timing Relay Contact - TDC indicates contact closes at end of timing period. TDO contact opens at end of timing period.
	Coil - Relay, contactors, circuit breaker, solenoid etc. (Show device designation, X1)
	Coil - Timing Relay - TDPU indicates timing period starts when coil is energized. TDDO indicates timing period starts when coil is de-energized.
	Latching Relay or Mechanically-Held Contactor O=operate; R=reset; TC=trip coil; CC=closing coil. (Coils may be separated on diagram)
	Knife Switch, general. (If shown closed, terminals must be added.)
	Switch - General, single pole, single throw.
	Switch - One pole of multi-pole switch shown. Other poles shown elsewhere.
	Pushbutton - Momentary or spring return. Single Circuit (make)
	Pushbutton - Momentary or spring return. Single Circuit (break)
	Pushbutton - Momentary or spring return. Two Circuit
	Pushbutton - Maintained, two circuit
	Pushbutton - Maintained, single circuit
	Selector Switch - Two position, maintained (designate position shown; i.e. A=Auto; H=Hand)
	Selector Switch - Three position, SR indicates spring return from position so labeled. ("TRIP-(NORMAL)-CLOSE" position shown)
	Limit Switch - Normally open - Not applicable for Motor Operated Valves and Solenoid Valves.
	Limit Switch - Normally closed - Not applicable for Motor Operated Valves and Solenoid Valves.

	Used with other symbols to indicate device is adjustable
+ (Positive) — (Negative)	Polarity markings - Direct current.
	Instantaneous Polarity Markings
	3-phase, 3-wire, delta
	3-phase, 3-wire, open delta grounded
	3-phase, 3-wire, wye
	3-phase, 3-wire, wye grounded neutral
	3-phase, 3-wire, zigzag

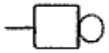
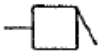
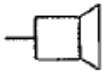
	3-phase, 3 wire zigzag, grounded neutral
	Connection to earth ground (may be plant grounding system)
	Connection to chassis or frame
	Terminal - may be added to any of the following symbols at connection points.
	Short circuit (not a fault)
	Terminal - Designates termination point of field run cables to main control board, emergency power board, main control board termination cabinet or emergency power board termination cabinet.

	Flow Switch - Closes on increase in flow at value shown
	Flow Switch - Opens on increase in flow at value shown
	Flow Switch - Closes on decrease in flow at value shown.
	Flow Switch - Opens on decrease in flow at value shown.
	Liquid Level Switch - Opens on rising level (Closes on low level)
	Liquid Level Switch - Closes on rising level (Opens on low level)
	Pressure or Vacuum Switch - Closes on rising pressure
	Pressure or Vacuum Switch - Opens on rising pressure (Closes on increase in vacuum)
	Temperature Switch - Closes on increasing temp.
	Torque Switch - Opens on high torque

	Transductor - Control winding shown with 5 loops. Power winding shown with 3 loops.
	Transformer - General, two winding
	Autotransformer - General
	Transformer - General, three winding
	Current Transformer - number represents quantity (Add instantaneous polarity marks and ratio)
	Bushing Type Current Transformer
	Potential Transformer - number represents quantity (Show instantaneous polarity marks, voltage rating, vectors, etc.)

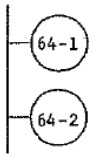
	Fuse - General
	High Voltage Primary Fuse Cutout
	Lightning Arrester - General Gap Type
	Lightning Arrester - Valve or film type
	Circuit Breaker - General
	Power Circuit Breaker - (Show location of operating mechanism)
	Circuit Breaker, 3-pole with magnetic - overload device in each pole. (Show rating)
	Circuit Breaker, 3-pole, drawout type (Used in metal clad switchgear groups) 

INDICATORS & ALARMS

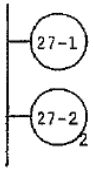
	Bell, electric
	Buzzer
	Horn - General
	Annunciator - General
	Indicating Light - General Use the following to specify color: A - Amber B - Blue C - Clear G - Green NE - Neon O - Orange OP - Opalescent P - Purple R - Red W - White Y - Yellow

RELAYS

The following methods are used on drawings to identify relays:

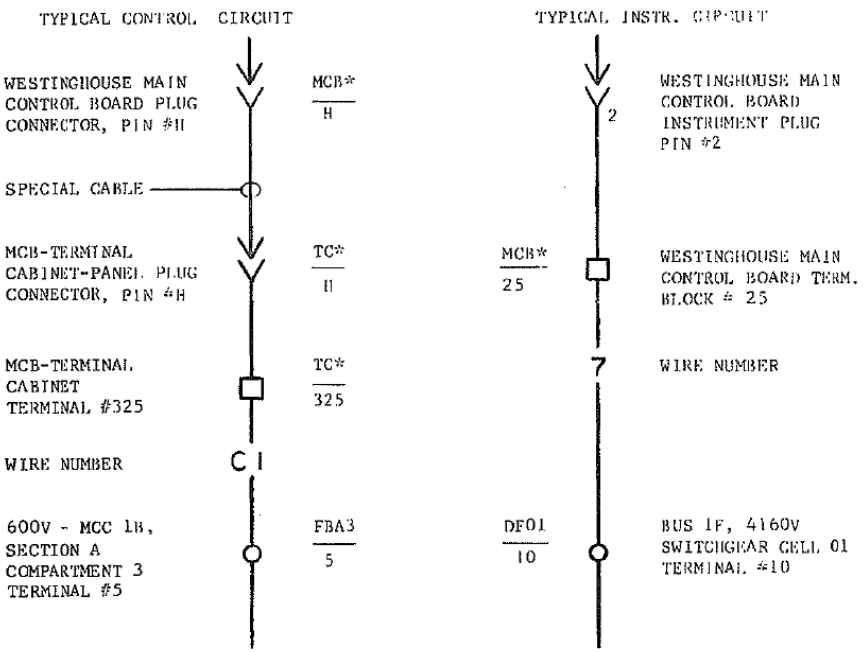
1) 

Two (2) 64 devices 64-1 and 64-2 in same cell.

2) 

Three (3) 27 devices 27-1, 27-2 and 27-3. The two (2) below the 27-2 device indicates there are two (2) 27 devices and their sequence numbers are in numerical order starting with -2.

ELEMENTARY DIAGRAM CONNECTIONS



*Abbreviation for equipment - The corresponding equipment number will appear in a table on the elementary diagram (e.g. MCB = Q1H12C005)

WIRE NUMBERING

WIRE NUMBERING SYSTEM

1. The following standard interconnecting wire numbers shall be used wherever applicable (for computer - schedule programming).

Wire Number	Purpose	Wire Number	Purpose
1	A - Phase Power	4	A - Phase Potential (See Notes 3 & 5)
2	B - Phase Power	5	A - Phase Current (See Notes 3 & 5)
3	C - Phase Power	6	B - Phase Potential (See Notes 3 & 5)
(Note 1)	Annunciator	7	B Phase Current (see Notes 3 & 5)
N	D. C. Negative (See Note 2)	8	C - Phase Potential (See Notes 3 & 5)
P	D. C. Positive (See Note 2)	9	C - Phase Current (See Notes 3 & 5)
U	115 volt A. C.-Ground Return (see Note 2)	0	Potential (or Current) Neutral (See Notes 4 & 5)
X	115 volt A. C. (See Note 2)		
C	Closing (See Note 2)		
T	Tripping (See Note. 2).		
O	Opening, MOV Only (See Note 2)		
F	Instrumentation (e.g. indicator, recorder, etc; See Note 2)		
H	Computer (See Note 2)		
M	General Control (Neither tripping nor closing; See Note 2)		
A	Amber Lamp (See Note 2)		
B	Blue Lamp (See Note 2)		
L	Green Lamp (See Note 2)		
R	Red Lamp (See Note 2)		
W	White Lamp (See Note 2)		

	Basic, Generator or Motor
	Field, Compensating, Generator or Motor
	Field, Series, Generator or Motor
	Field, Short or Separately Excited, Generator or Motor
	Field, Permanent Magnet, Generator or Motor
	1-phase
	2-phase
	3-phase, wye

	3-phase wye, grounded
	3-phase delta

ABBREVIATIONS

A	Ammeter
AH	Ampere-hour
C	Coulombmeter
CMA	Contact-making (or breaking) ammeter
CMC	Contact-making (or breaking) clock
CMV	Contact-making (or breaking) voltmeter
CRO	Oscilloscope or cathoderay oscillograph
DB	DB (decibel) meter: Audio level/meter
DBM	DBM (decibels referred to 1 milliwatt (meter)
DM	Demand meter
DTR	Demand-totalizing relay
F	Frequency meter
G	Galvanometer
GD	Ground detector
I	Indicating
INT	Integrating
UA	Microammeter
MA	Milliammeter
NM	Noise meter
OHM	Ohmmeter
OP	Oil pressure
OSCG	Oscillograph, string
PF	Power factor
PH	Phasemeter
PI	Position indicator
RD	Recording demand meter
REC	Recording
RF	Reactive factor
SY	Synchroscope
t^{O}	Temperature meter
THC	Thermal converter
TLM	Telemeter
TT	Total time: Elapsed time
V	Voltmeter
VA	Volt-ammeter
VAR	Varmeter
VARH	Varhour meter
VI	Volume indicator: Meter, audio level
VU	Standard volume indicator Meter, audio level
W	Wattmeter
WH	Watthour meter

ANSI/IEEE Standard Device Numbers

1 - Master Element
2 - Time Delay Starting or Closing Relay
3 - Checking or Interlocking Relay
4 - Master Contactor
5 - Stopping Device
6 - Starting Circuit Breaker
7 – Rate of Change Relay
8 - Control Power Disconnecting Device
9 - Reversing Device
10 - Unit Sequence Switch
11 – Multifunction Device
12 - Overspeed Device
13 - Synchronous-speed Device
14 - Underspeed Device
15 - Speed - or Frequency-Matching Device
20 - Elect. operated valve (solenoid valve)
21 - Distance Relay
23 - Temperature Control Device
24 – Volts per Hertz Relay
25 - Synchronizing or Synchronism-Check Device
26 - Apparatus Thermal Device
27 - Undervoltage Relay
29 - Isolating Contactor
30 - Annunciator Relay
32 - Directional Power Relay
36 - Polarity or Polarizing Voltage Devices
37 - Undercurrent or Underpower Relay
38 - Bearing Protective Device
39 - Mechanical Conduction Monitor
40 – Loss of Field Relay
41 - Field Circuit Breaker
42 - Running Circuit Breaker
43 - Manual Transfer or Selector Device
46 - Reverse-phase or Phase-Balance Relay
47 - Phase-Sequence Voltage Relay
48 - Incomplete-Sequence Relay
49 - Machine or Transformer Thermal Relay
50 - Instantaneous Overcurrent
51 - AC Time Overcurrent Relay
52 - AC Circuit Breaker
53 - Exciter or DC Generator Relay
54 - High-Speed DC Circuit Breaker
55 - Power Factor Relay
56 - Field Application Relay
59 - Overvoltage Relay
60 - Voltage or Current Balance Relay
62 - Time-Delay Stopping or Opening Relay
63 - Pressure Switch
64 - Ground Detector Relay
65 - Governor
66 – Notching or jogging device
67 - AC Directional Overcurrent Relay
68 - Blocking or “out of step” Relay
69 - Permissive Control Device
71 - Level Switch
72 - DC Circuit Breaker
74 - Alarm Relay
75 - Position Changing Mechanism
76 - DC Overcurrent Relay
78 - Phase-Angle Measuring or Out-of-Step Relay
79 - AC-Reclosing Relay
81 - Frequency Relay
83 - Automatic Selective Control or Transfer Relay
84 - Operating Mechanism
85 - Carrier or Pilot-Wire Receiver Relay
86 - Lockout Relay
87 - Differential Protective Relay
89 - Line Switch
90 - Regulating Device
91 - Voltage Directional Relay
92 - Voltage and Power Directional Relay
94 - Tripping or Trip-Free Relay

B – Bus
F – Field
G – Ground or generator
N – Neutral
T – Transformer

Electrical Basics
Sample Drawing Index

230 KV BUS #1

230 KV BUS #3

PARR HYDRO 13.8KV LINE

115 KV PARR ESF LINE

XES 5 DISPATCH *1838

XES 4 DISPATCH *1826

CIRCUIT SWITCHER

XES 8

XTF5052-ES

XTF 1 MAIN PWR TRANS. 242-22KV

XTF 2 UNIT AUX. TRANSF. 22-7.2KV

XTF 32 EMER. AUX. TRANS. 230-7.2KV

XTF 31 EMER. AUX. TRANS. 230-7.2KV

XTF 5 UNIT 2 ESF. TRANS. 115-7.2KV

XTF 4 UNIT 1 ESF. TRANS. 115-7.2KV

XTF 6 VOLTAGE REGULATOR

XGN 1 GENERATOR TB 463

XSW 1DX 7.2KV TB 463

XSW 1A 7.2 KV TB 436

XSW 1B 7.2 KV TB 412

XSW 1C 7.2 KV TB 412

XSW 1DA 7.2 KV IB 463

XSW 1DB 7.2 KV IB 436

XSW 1EB 7.2 KV SW 440

XSW 1EA 7.2 KV SW 425

XSW 1A1 480 V TB 436

XSW 1A5 480 V SB 436

XSW 1A3 480 V AB 436

XSW 1B1 480 V TB 436

XSW 1B3 480 V AB 436

XSW1C2 480 V CW 436

XSW1C4 480 V CB 482

XSW 1A2 480 V AB 485

XSW 1C1 480 V TB 412

XSW 1A4 480 V WT 436

XSW 1B2 480 V AB 485

XSW 1B5 480 V YD-WEST

XSW 1B4 480 V CB 482

XSW 1C3 480 V AB 436

XSW 1C5 480 V TB 412

XSW 1DA2 480 V IB 463

XSW 1DB2 480 V IB 436

XSW 1EB1 480 V SW 440

XSW 1EA1 480 V SW 425

XSW 1B6 480 V CT-PH

XMC 1A1X

XMC 1A5X

XMC 1A3Y

XMC 1B1X

XMC 1B1Y

XMC 1B3X

XMC 1B3Y

XMC 1C2X

XMC 1C4X

XMC 1A2X

XMC 1C1X

XMC 1A4X

XMC 1A4Y

XMC 1B2X

XMC 1B4X

XMC 1C3X

XMC 1C3Y

XMC 1DA2Z

XMC 1DA2X

XMC 1DA2Y

XMC 1DB2Y

XMC 1DB2X

XMC 1DB2Z

XMC 1EB1X

XMC 1EA1X

XMC 1B6X

APN 1M

APN 4104

APN 4105

APN 4106

XET 2002C

XET 2003C

XET 2001C

XET 4001

XET 4002

XET 4003

XPP43C

XPP39C

XPP1C

XHX 1C

XPP48C

XPN40

XET 4004

XET 4006

XBA 0004

XDS 0095

XDS 0096

XIT 5936

XIT 5937

APN 5936

APN 5937

APN 5940

XTF 5014

XTF 5909

XTF 5910

APN 5909

APN 5910

XBA 1X

XBA 1A

XBA 1B

XBC 1X -2X

XBC 1A -1B

XBC 1A

XBC 1B

XET4003

XBC 1A -1B KEY INTLK

DPN 1X

DPN 2X

DPN 1HX

DPN 1HA

DPN 1HB

DPN 1HX3

DPN 1HX1

DPN 1HX2

DPN 1S

DPN 1HA3

DPN 1HA2

DPN 1HA1

DPN 1HB1

DPN 1HB2

DPN 1HB3

XIT 5906

XIT 5905

XIT 5901

XIT 5902

XIT 5903

XIT 5904

APN 1FX

APN 1FA

APN 1FB

APN 1FX1

APN 5906

APN 1FC1

APN 5901

APN 5902

APN 5903

APN 5904

APN 5905

APN 5920

APN 5921

APN 5907

APN 5908

XPN 5259

XPN 5260

XTF4181

XTF4182

XTF4183

SCR CONTROLLER

XOS8149

NNS NSR

NOTES:

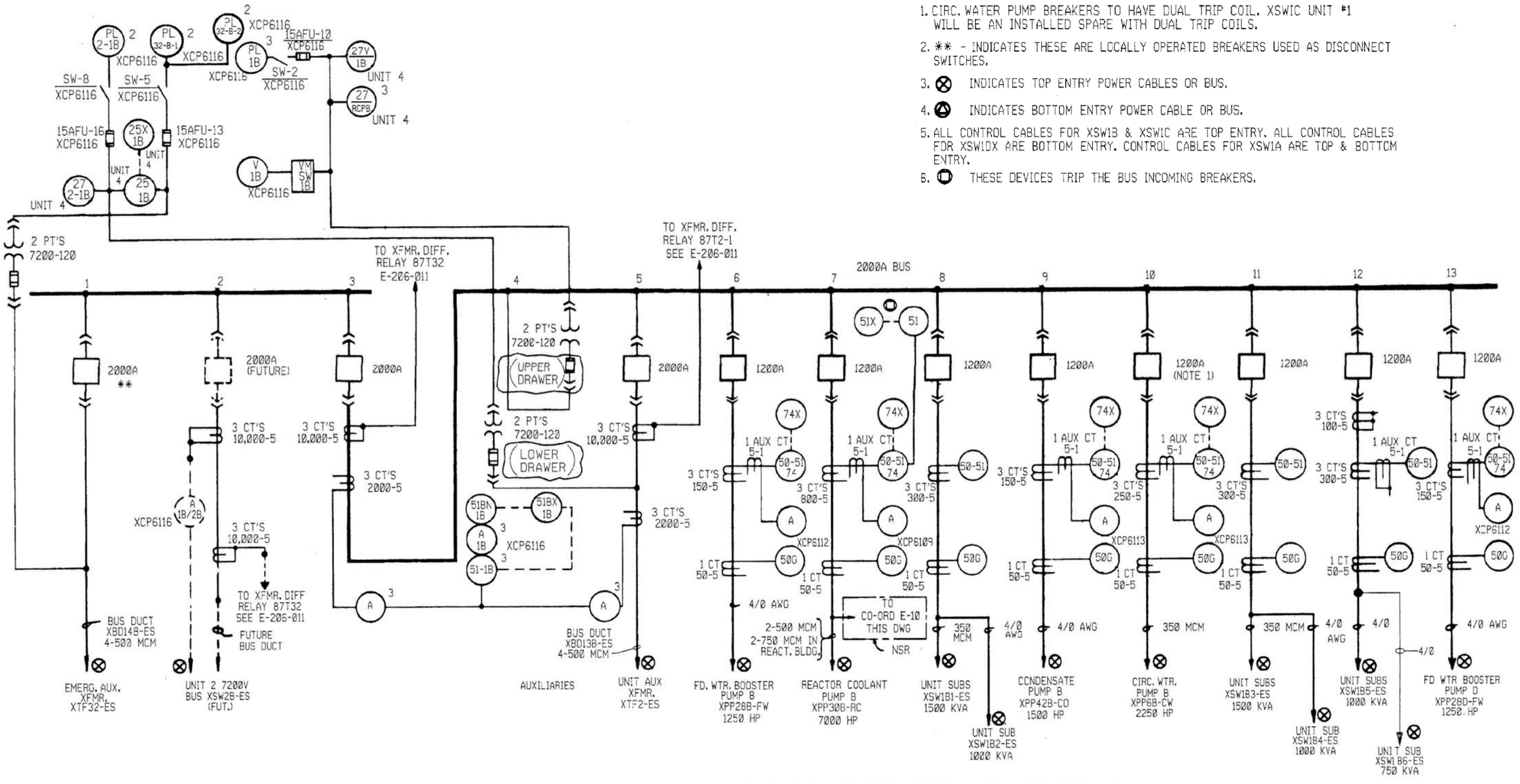
1. R - CIRCUIT BREAKER CONTROLLED REMOTELY FROM MAIN CONTROL BOARD
2. 9 - CIRCUIT BREAKER CONTROLLED REMOTELY FROM PANEL 9 ON MAIN CONTROL BOARD
3. R/E9 - CIRCUIT BREAKER CONTROLLED REMOTELY FROM PANEL 9 ON MAIN CONTROL BOARD OR PANEL XPN7200.
4. R - 480V BREAKER REMOTELY CONTROLLED FROM MAIN CONTROL BOARD
5. - LOCALLY CONTROLLED BREAKER
6. R - SWITCH CONTROLLED FROM MAIN CONTROL BOARD
7. XET 4004 IS NORMALLY CONNECTED TO XSW 1DA2
8. THIS DRAWING SUPERSEDES SCE&G DRAWING C-20226
9. - CIRCUIT BREAKER LOCALLY CONTROLLED
10. SS - CIRCUIT BREAKER CONTROLLED FROM SUBSTATION CONTROL HOUSE AND VIA SUPERVISORY CONTROL FROM SYSTEM DISPATCHER.
11.
12. XTF6-ES IS NORMALLY IN SERVICE

Basics 1

Overall Plant One-Line

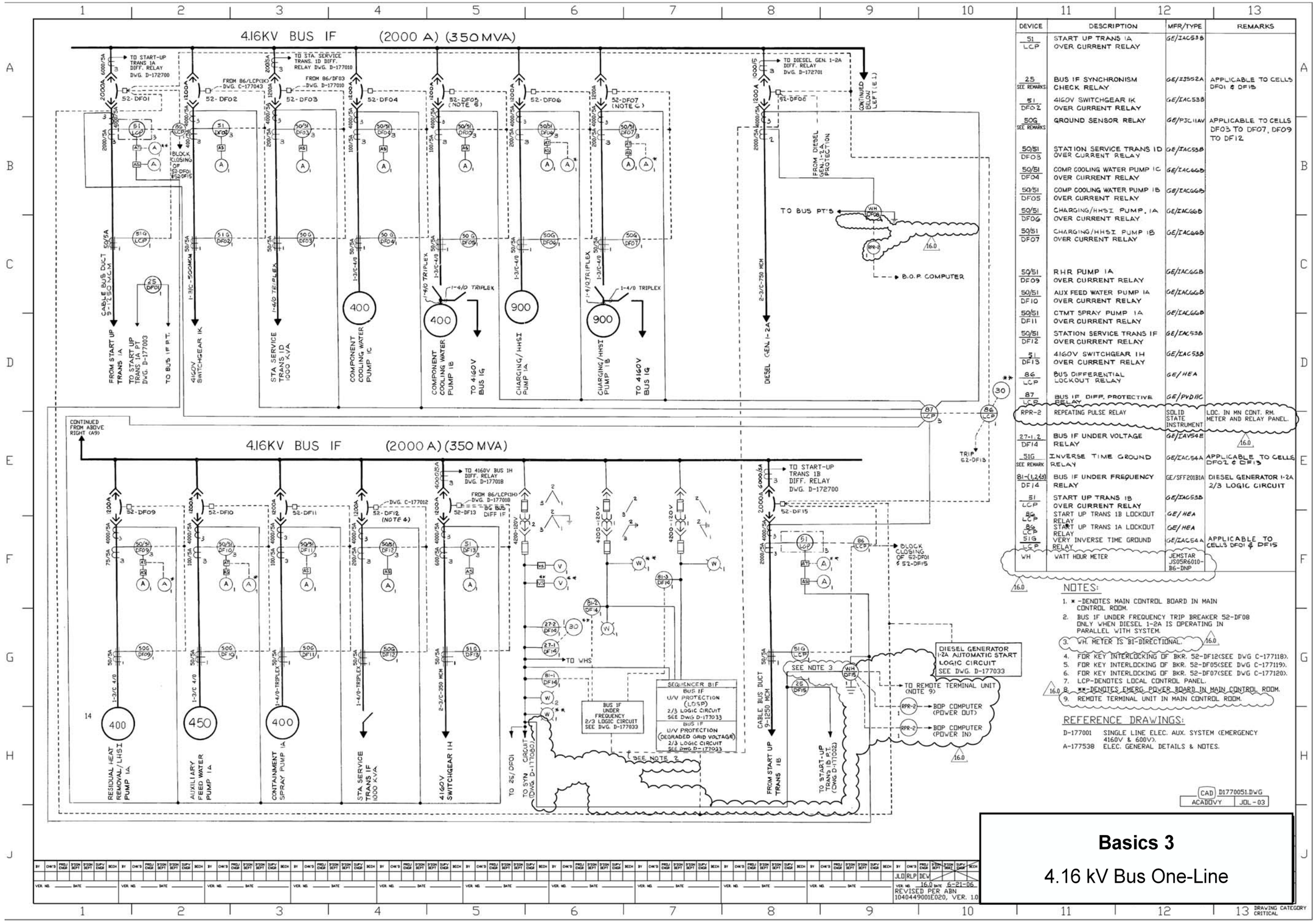
NOTES:

1. CIRC. WATER PUMP BREAKERS TO HAVE DUAL TRIP COIL. XSWIC UNIT #1 WILL BE AN INSTALLED SPARE WITH DUAL TRIP COILS.
2. ** - INDICATES THESE ARE LOCALLY OPERATED BREAKERS USED AS DISCONNECT SWITCHES.
3. ⊗ INDICATES TOP ENTRY POWER CABLES OR BUS.
4. ⊗ INDICATES BOTTOM ENTRY POWER CABLE OR BUS.
5. ALL CONTROL CABLES FOR XSW1B & XSWIC ARE TOP ENTRY. ALL CONTROL CABLES FOR XSW1DX ARE BOTTOM ENTRY. CONTROL CABLES FOR XSW1A ARE TOP & BOTTOM ENTRY.
6. ⊖ THESE DEVICES TRIP THE BUS INCOMING BREAKERS.



Basics 2

7.2 kV Bus One-Line



DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
51 LCP	START UP TRANS 1A OVER CURRENT RELAY	GE/IAC53B	
25 SEE REMARKS	BUS 1F SYNCHRONISM CHECK RELAY	GE/IJS52A	APPLICABLE TO CELLS DF01 & DF15
51 DF02	4160V SWITCHGEAR 1K OVER CURRENT RELAY	GE/IAC53B	
50G SEE REMARKS	GROUND SENSOR RELAY	GE/PJC11AV	APPLICABLE TO CELLS DF03 TO DF07, DF09 TO DF12
50/51 DF03	STATION SERVICE TRANS 1D OVER CURRENT RELAY	GE/IAC53B	
50/51 DF04	COMP COOLING WATER PUMP 1C OVER CURRENT RELAY	GE/IAC66B	
50/51 DF05	COMP COOLING WATER PUMP 1B OVER CURRENT RELAY	GE/IAC66B	
50/51 DF06	CHARGING/HHSI PUMP, 1A OVER CURRENT RELAY	GE/IAC66B	
50/51 DF07	CHARGING/HHSI PUMP 1B OVER CURRENT RELAY	GE/IAC66B	
50/51 DF09	RHR PUMP 1A OVER CURRENT RELAY	GE/IAC66B	
50/51 DF10	AUX FEED WATER PUMP 1A OVER CURRENT RELAY	GE/IAC66B	
50/51 DF11	CTMT SPRAY PUMP 1A OVER CURRENT RELAY	GE/IAC66B	
50/51 DF12	STATION SERVICE TRANS 1F OVER CURRENT RELAY	GE/IAC53B	
51 DF13	4160V SWITCHGEAR 1H OVER CURRENT RELAY	GE/IAC53B	
86 LCP	BUS DIFFERENTIAL LOCKOUT RELAY	GE/HEA	
87 LCP	BUS 1F DIFF. PROTECTIVE RELAY	GE/PVD11C	
RPR-2	REPEATING PULSE RELAY	SOLID STATE INSTRUMENT	LOC. IN MN CONT. RM. METER AND RELAY PANEL.
27-1,2 DF14	BUS 1F UNDER VOLTAGE RELAY	GE/IAV54E	16.0
51G SEE REMARK	INVERSE TIME GROUND RELAY	GE/IAC54A	APPLICABLE TO CELLS DF02 & DF13
81-(1,2&3) DF14	BUS 1F UNDER FREQUENCY RELAY	GE/SFF201B1A	DIESEL GENERATOR 1-2A 2/3 LOGIC CIRCUIT
51 LCP	START UP TRANS 1B OVER CURRENT RELAY	GE/IAC53B	
86 LCP	START UP TRANS 1B LOCKOUT RELAY	GE/HEA	
86 LCP	START UP TRANS 1A LOCKOUT RELAY	GE/HEA	
51G LCP	VERY INVERSE TIME GROUND RELAY	GE/IAC54A	APPLICABLE TO CELLS DF01 & DF15
WH	WATT HOUR METER	JEMSTAR JS05R6010-B6-DNP	16.0

NOTES:

1. * -DENOTES MAIN CONTROL BOARD IN MAIN CONTROL ROOM.
2. BUS 1F UNDER FREQUENCY TRIP BREAKER 52-DF08 ONLY WHEN DIESEL 1-2A IS OPERATING IN PARALLEL WITH SYSTEM.
3. WH METER IS BI-DIRECTIONAL. 16.0
4. FOR KEY INTERLOCKING OF BKR. 52-DF12(SEE DWG C-177118).
5. FOR KEY INTERLOCKING OF BKR. 52-DF05(SEE DWG C-177119).
6. FOR KEY INTERLOCKING OF BKR. 52-DF07(SEE DWG C-177120).
7. LCP-DENOTES LOCAL CONTROL PANEL.
8. ** -DENOTES EMERG POWER BOARD IN MAIN CONTROL ROOM. 16.0
9. REMOTE TERMINAL UNIT IN MAIN CONTROL ROOM.

REFERENCE DRAWINGS:

D-177001 SINGLE LINE ELEC. AUX. SYSTEM (EMERGENCY 4160V & 600V).
A-177538 ELEC. GENERAL DETAILS & NOTES.

CAD D1770051.DWG
ACADOVY | JDL-03

VER. NO. 16.0 DATE 5-21-06
REVISED PER ABN 1040449001E020, VER. 1.0

Basics 3

4.16 kV Bus One-Line

DRAWING CATEGORY CRITICAL

D-177009

DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
50 NOTE 9	STA. SERVICE TRANS. IC OVER CURRENT RELAY, 3Ø	GE/PJC 32G	
62 NOTE 9	TIME DELAY RELAY	AGASTAT/ 7012 PA	
50 NOTE 9	OVER CURRENT RELAY 3Ø, FOR INCOMING FEEDER FROM LOAD CENTER IF.	GE/PJC 32G	
62 NOTE 9	TIME DELAY RELAY	AGASTAT/ 7012 PA	
87 DE07	STA. SERVICE TRANS. IC DIFFERENTIAL RELAY	GE/12STDI5C5A	
86 DE07	STA. SERVICE TRANS. IC LOCKING-OUT RELAY	GE/HEA	
59N EC17	BUS IC OVER VOLTAGE RELAY (GRD. DETECTION)	WEST./CV-8	
27 EC17	BUS IC UNDER VOLTAGE RELAY	WEST/CV-2	
27X-1 EC17	BUS IC UNDER VOLTAGE AUXILIARY RELAY	WEST./MG-G	

NOTES

1. ALL BKRS. EXCEPT 52-EC02, 52-EC10 & 52-EC07 HAVE SOLID STATE TRIP UNITS WITH THE FOLLOWING DESIGNATIONS: (BREAKER FRAME/SENSOR RATING - AMPERES).
2. * - DENOTES MAIN CONTROL BOARD IN MAIN CONTROL RM.
3. INTERRUPTING RATING OF ACB'S IS 22,000 AMPS RMS SYMMETRICAL (MIN).
4. BUS SHORT CIRCUIT RATING 22,000 AMPS. SYMMETRICAL.
5. STA. SERVICE TRANSFORMER "ASKAREL" TYPE.
6. BREAKERS 52-EC02 AND 52-EC07 ARE KEY INTERLOCKED SO THAT ONLY ONE CAN BE CLOSED AT ANY TIME (DWG. D-177124).
7. BREAKERS 52-EC08 AND 52-EC10 ARE ELECTRICALLY INTERLOCKED SO THAT ONLY ONE CAN BE CLOSED AT ANY TIME.
8. BREAKER 52-EC10 AND 52-EE07 ARE ELECTRICALLY OPERATED FROM A SINGLE CONTROL SWITCH IN THE MAIN CONTROL ROOM.
9. LOCATED IN TERMINAL BLOCK COMPARTMENT ABOVE ASSOCIATED BREAKER
10. ** - DENOTES EMERGENCY POWER BOARD IN MAIN CONTROL ROOM.
11. NEW SENSOR, REVISED TO AGREE WITH FIELD CHANGES TO BE MADE.
12. THIS DRAWING SUPERSEDES DRAWING NO. C-177009 SH. 1, REVISION 13.
13. FOR CONNECTED AND RUNNING LOADS, CONTACT SCS ENG. - FARLEY PROJECT.

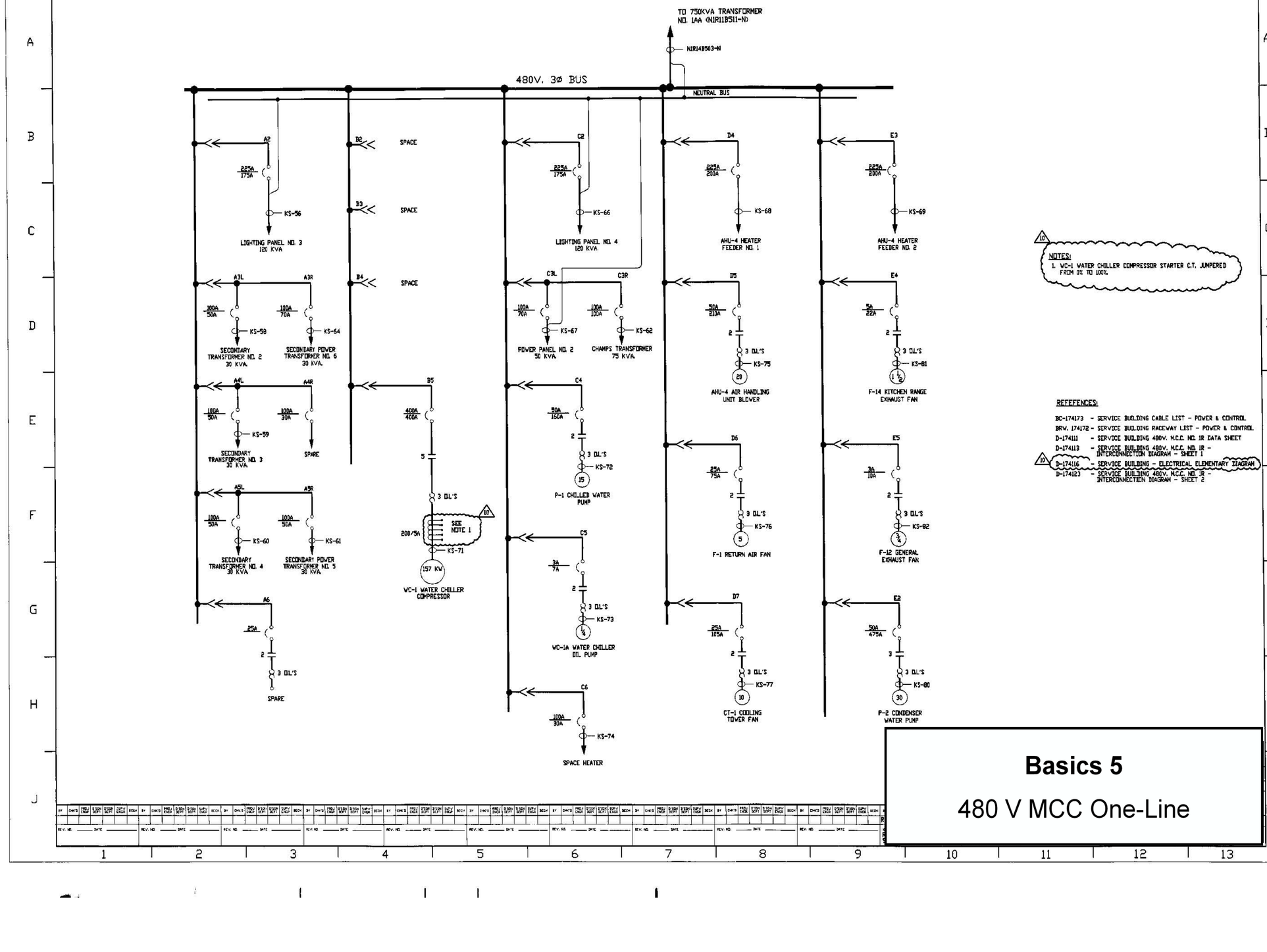
REFERENCE DWGS

D-177001-SINGLE LINE ELEC AUX SYSTEM (4160V & 600V)

A-177538-ELEC GENERAL DETAILS & NOTES

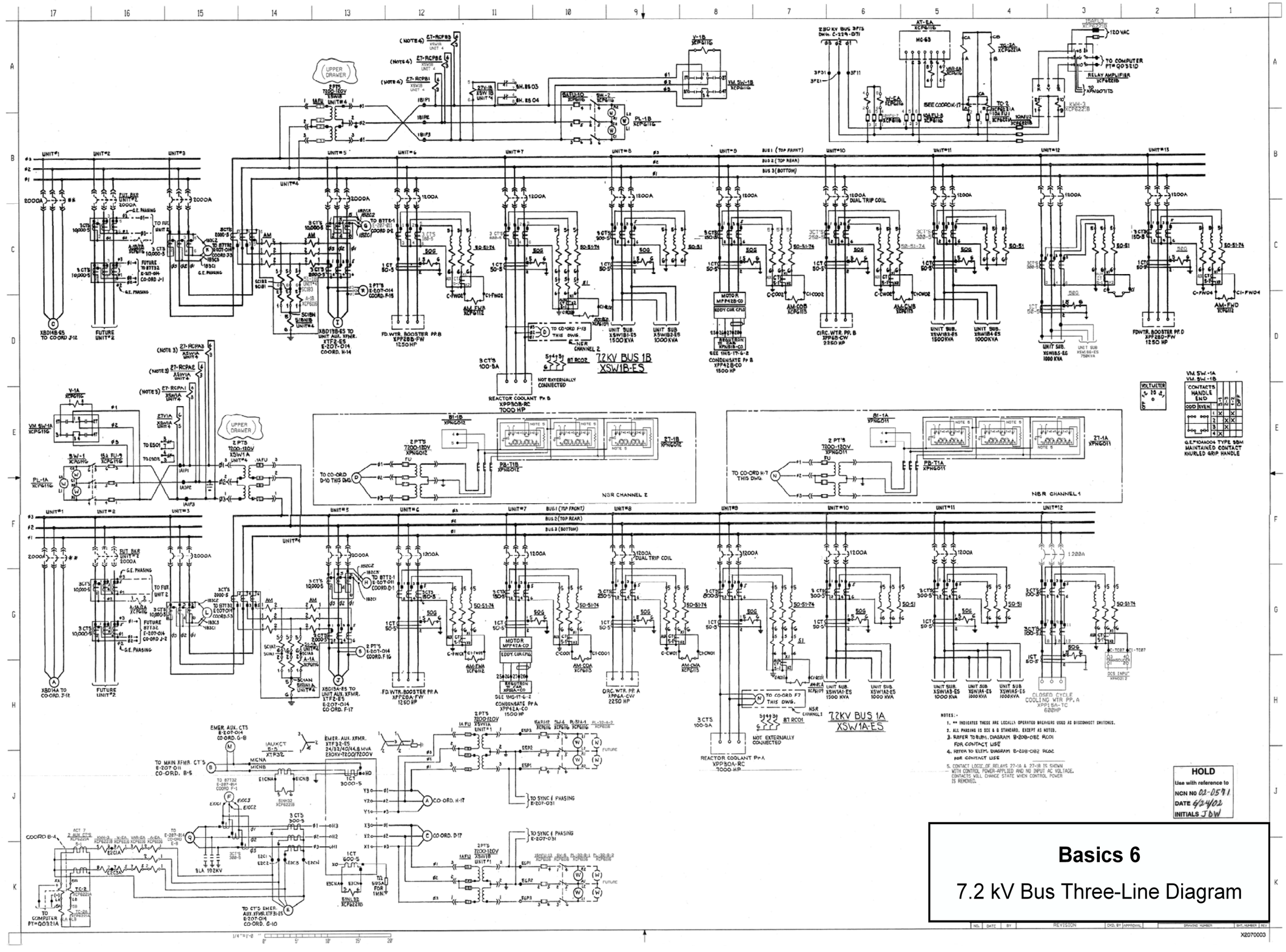
Basics 4

600 V Bus One-Line



Basics 5

480 V MCC One-Line


72KV BUS 1B
XSW1B-ES
72KV BUS 1A
XSW1A-ES
BUS 1 (TOP FRONT)
BUS 2 (TOP REAR)
BUS 3 (BOTTOM)
UNIT#1
UNIT#2
UNIT#3
UNIT#4
UNIT#5
UNIT#6
UNIT#7
UNIT#8
UNIT#9
UNIT#10
UNIT#11
UNIT#12
UNIT#13
UPPER DRAWER
2 PT'S 7200-120V XSW1B UNIT#4
2 PT'S 7200-120V XSW1A UNIT#4
2 PT'S 7200-120V XSW1A UNIT#1
2 PT'S 7200-120V XSW1B UNIT#1
2 PT'S 7200-120V XPNG012
2 PT'S 7200-120V XPNG011
120 VAC
TO COMPUTER PT=Q0321D
RELAY AMPLIFIER XCP6221B
TO XPNG011TS
SEE COORD K-17
NBR CHANNEL 2
NBR CHANNEL 1
REACTOR COOLANT Pr B XPP36B-RC 7000 HP
REACTOR COOLANT Pr A XPP36A-RC 3000 HP
CONDENSATE Pr B XPP42B-CO 1500 HP
CONDENSATE Pr A XPP42A-CO 1500 HP
CIRC. WTR. PP. B XPP62B-CW 2250 HP
CIRC. WTR. PP. A XPP62A-CW 2250 HP
FD.WTR. BOOSTER PP.B XPP28B-FW 1250 HP
FD.WTR. BOOSTER PP.A XPP28A-FW 1250 HP
FDWTR. BOOSTER PP.D XPP28D-FW 1250 HP
CLOSED CYCLE COOLING WTR PP. A XPP15A-TC 600HP
UNIT SUB. XSW1B5-ES 1000 KVA
UNIT SUB XSW1B6-ES 750KVA
UNIT SUB. XSW1B3-ES 1500KVA
UNIT SUB. XSW1B4-ES 1000KVA
UNIT SUB XSW1A1-ES 1500 KVA
UNIT SUB XSW1A2-ES 1000 KVA
UNIT SUB. XSW1A3-ES 1000 KVA
UNIT SUB XSW1A4-ES 1000 KVA
UNIT SUB XSW1A5-ES 1000 KVA
EMER. AUX. XFMR. XTF32-ES 24/32/40/44.8 MVA 230KV-7200/7200V
EMER. AUX. CT'S E-207-014 CO-ORD. G-8
TO MAIN XFMR. CT'S E-207-011 CO-ORD. B-5
TO CT'S EMER. AUX. XFMR. XTF32-ES E-207-014 CO-ORD. G-10
TO SYNC & PHASING E-207-031
TO COMPUTER PT=Q0321A
NOT EXTERNALLY CONNECTED
VOLTMETER
VM SW-1A
VM SW-1B
CONTACTS HANDLE END.
ODD
EVEN
OFF
G.E.*104004 TYPE SBM MAINTAINED CONTACT KNURLED GRIP HANDLE
HOLD
Use with reference to
NCN NO 02-0591
DATE 6/24/02
INITIALS JDW
Basics 6
7.2 kV Bus Three-Line Diagram
X2070003
207013_0001.m Printed by TS12557 Friday June 14 2002 12:50:53 PM EDT

DEVICE	DESCRIPTION	MFR/TYPE	REMARKS
25 / 1A101	BUS 1A SYNCHRONISM CHECK RELAY	GE/IJS51	
27A / 1A101	UNIT AUX TRANS 1B UNDER VOLTAGE RELAY	GE/HGA11	
51 / 1A101	UNIT AUX TRANS 1B OVER CURRENT RELAY	GE/IAC	
51N / 1A101	UNIT AUX TRANS 1B OVER CURRENT GROUND RELAY	GE/IAC	
27-1 / 1A102	BUS 1A UNDER VOLTAGE RELAY REACTOR PROTECTION SYS LOGIC	GE/NGV13	
27-2 / 1A102	BUS 1A UNDER VOLTAGE RELAY	GE/IAV54	
27-3 / 1A102	BUS 1A UNDER VOLTAGE RELAY REACTOR PROTECTION SYS LOGIC	GE/NGV13	
81-1 / 1A102	BUS 1A UNDER FREQUENCY RELAY - RCP TRIP LOGIC	GE/CFF12	
81-2 / 1A102	BUS 1A UNDER FREQUENCY RELAY - RCP TRIP LOGIC	GE/CFF12	
51 / 1A106	START UP TRANS 1C OVER CURRENT RELAY	GE/IAC	
51N / 1A106	START UP TRANS 1C OVER CURRENT GROUND RELAY	GE/IAC	
27A / 1A106	START UP TRANS 1C UNDER VOLTAGE RELAY	GE/HGA11	

NOTE

*-DENOTES REMOTE LOCATION

REFERENCE DWG

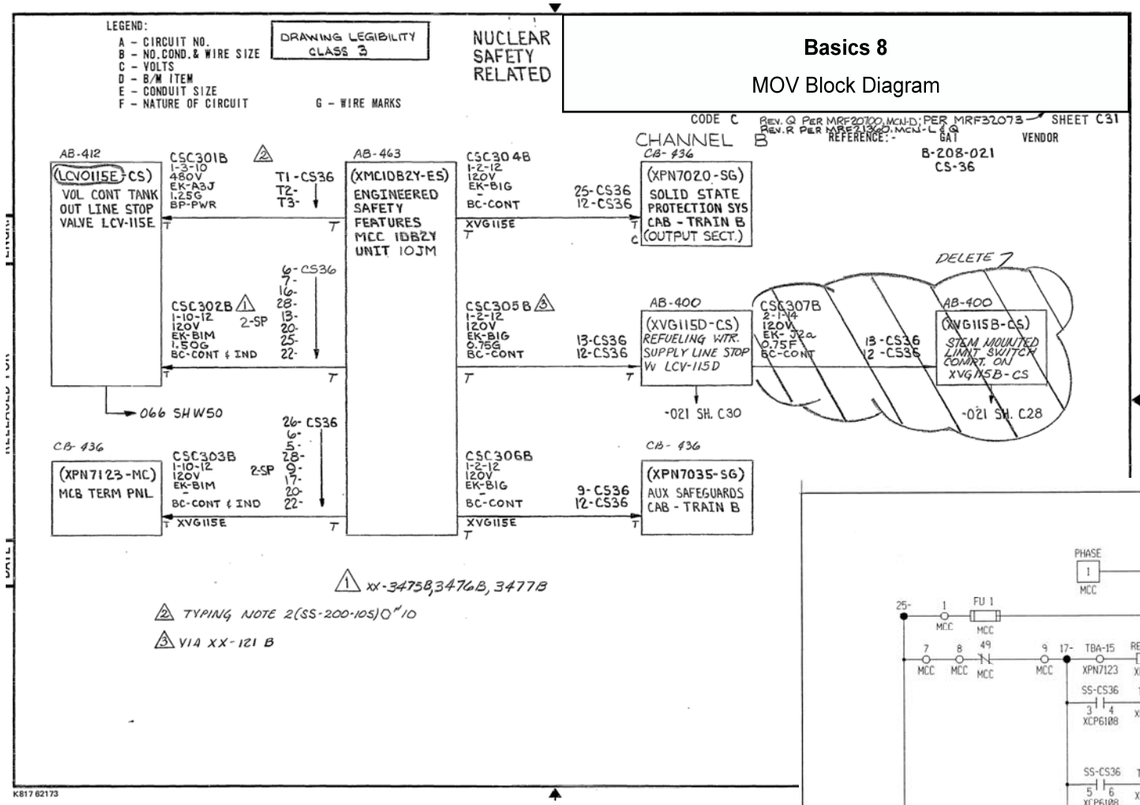
D-177001 SINGLE LINE ELECT AUX SYS (4160V & 600V)
C-177002 SINGLE LINE PROTECTION & METERING 4160V SWITCHGEAR BUS 1A
B-177199 CONTROL SCHEM REACTOR COOLANT PUMP #1
B-177202 CONTROL SCHEM CIRC WATER PUMP #1

REV 1 VOID 7-19-78

REV 0 9-4-70 ISSUED FOR APPROVAL & CONSTRUCTION

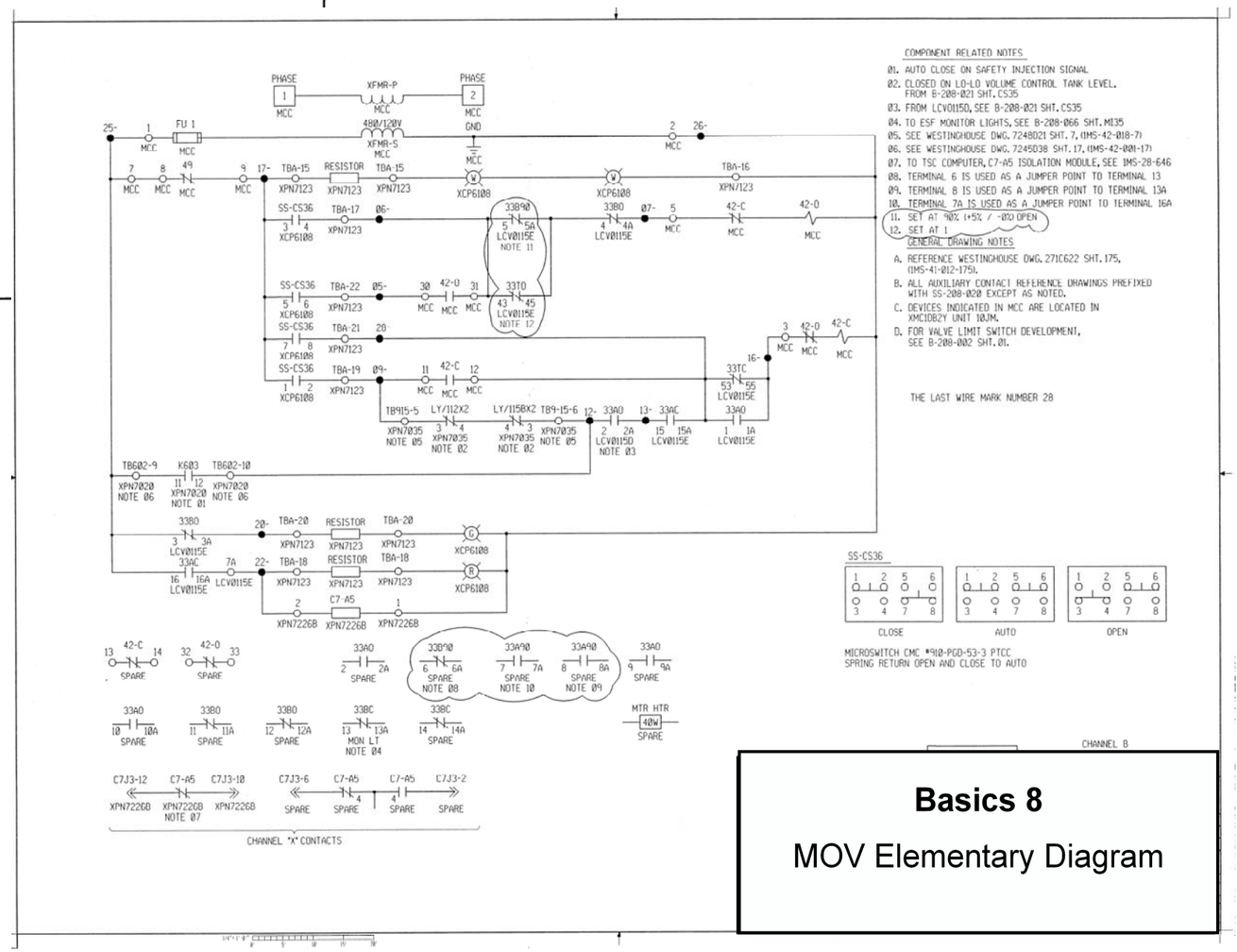
Basics 7

4.16 kV Bus Three-Line Diagram



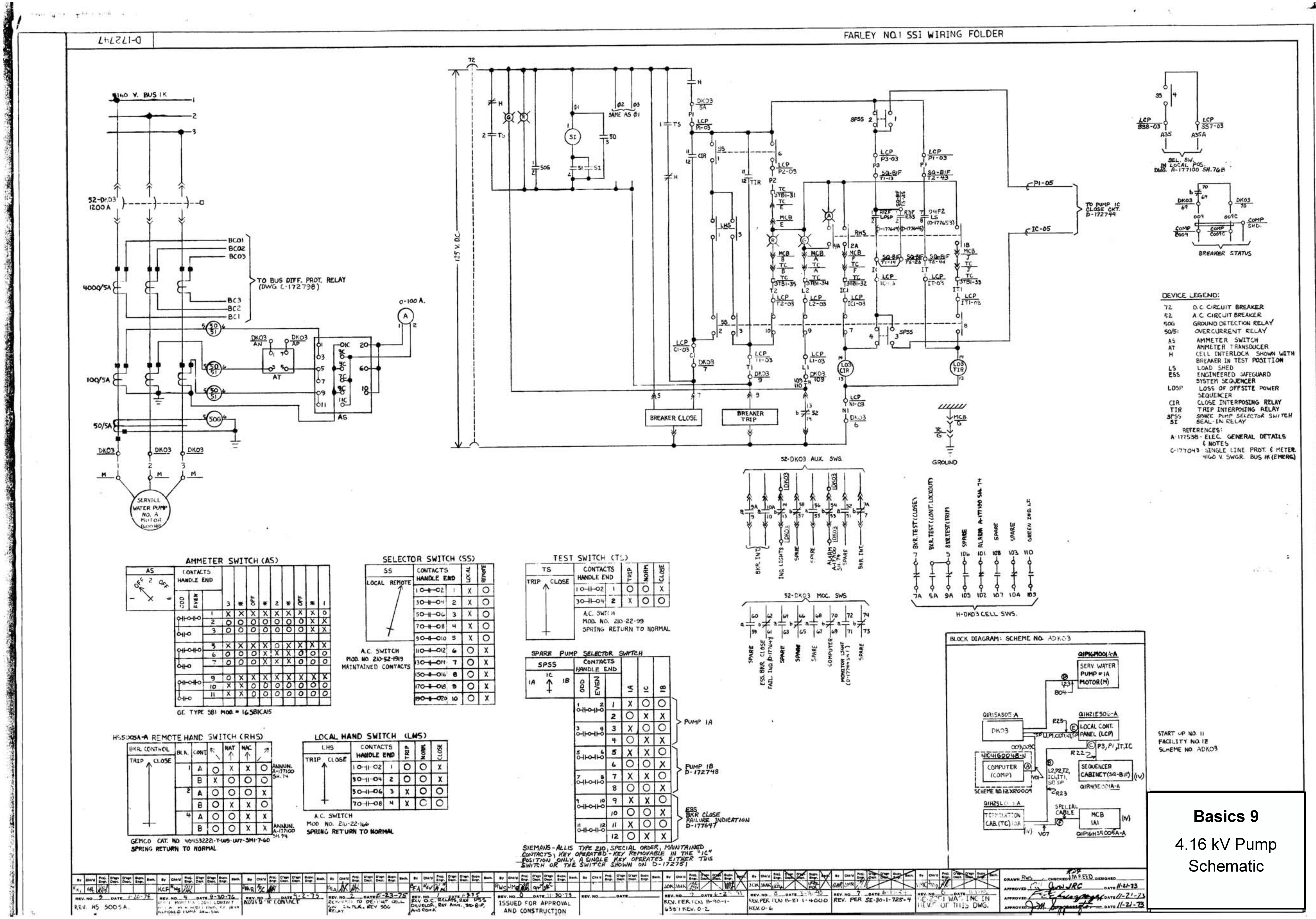
Basics 8

MOV Block Diagram



Basics 8

MOV Elementary Diagram

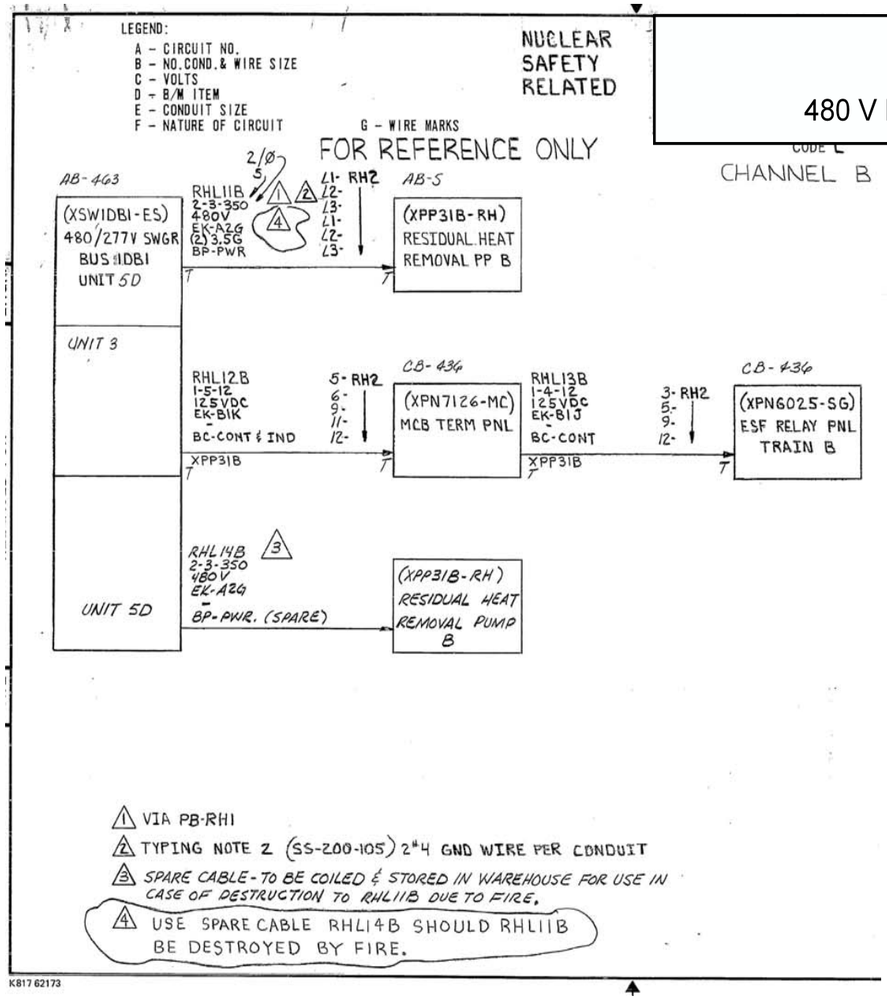


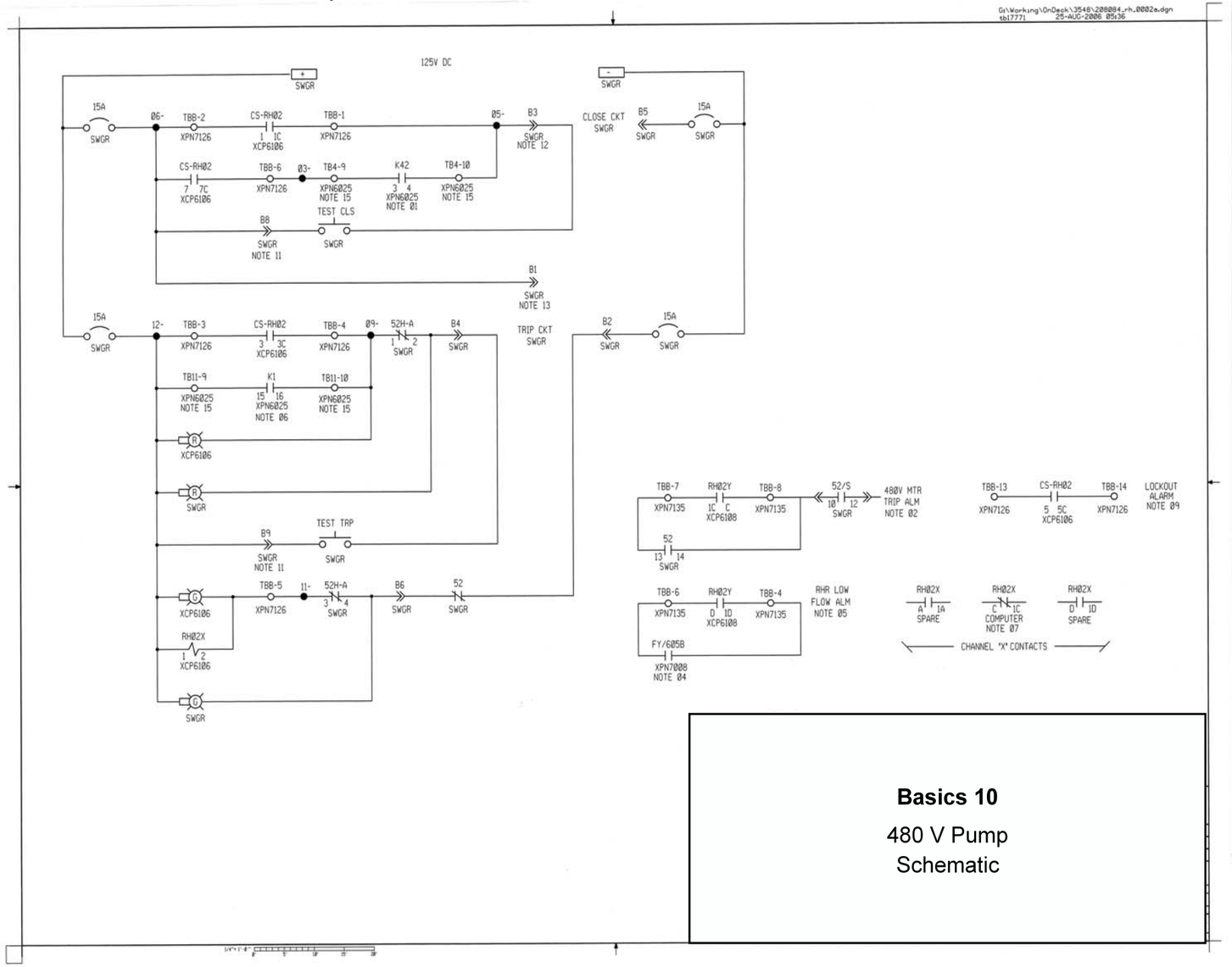
Basics 9

4.16 kV Pump Schematic

Basics 10

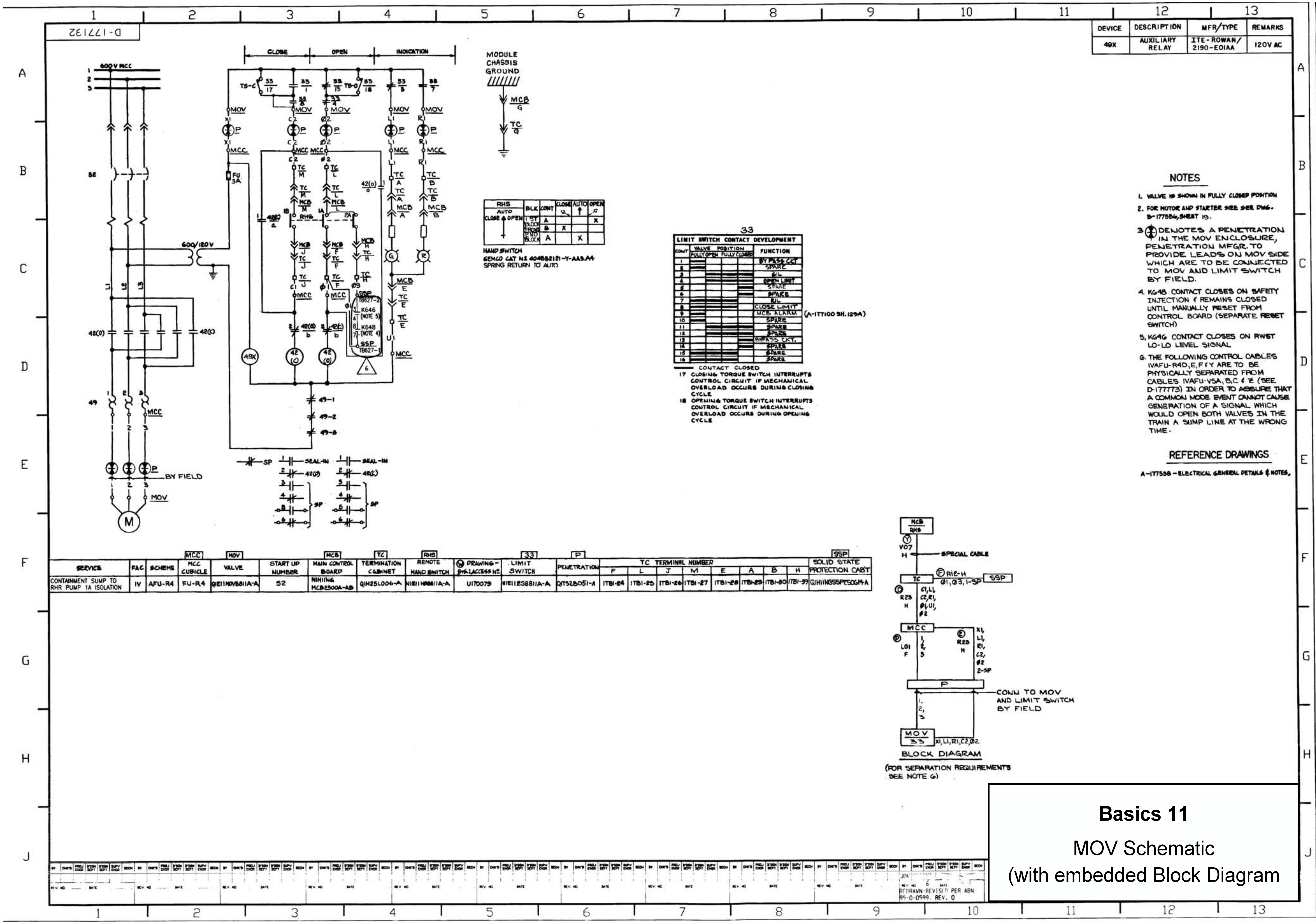
480 V Pump Block Diagram





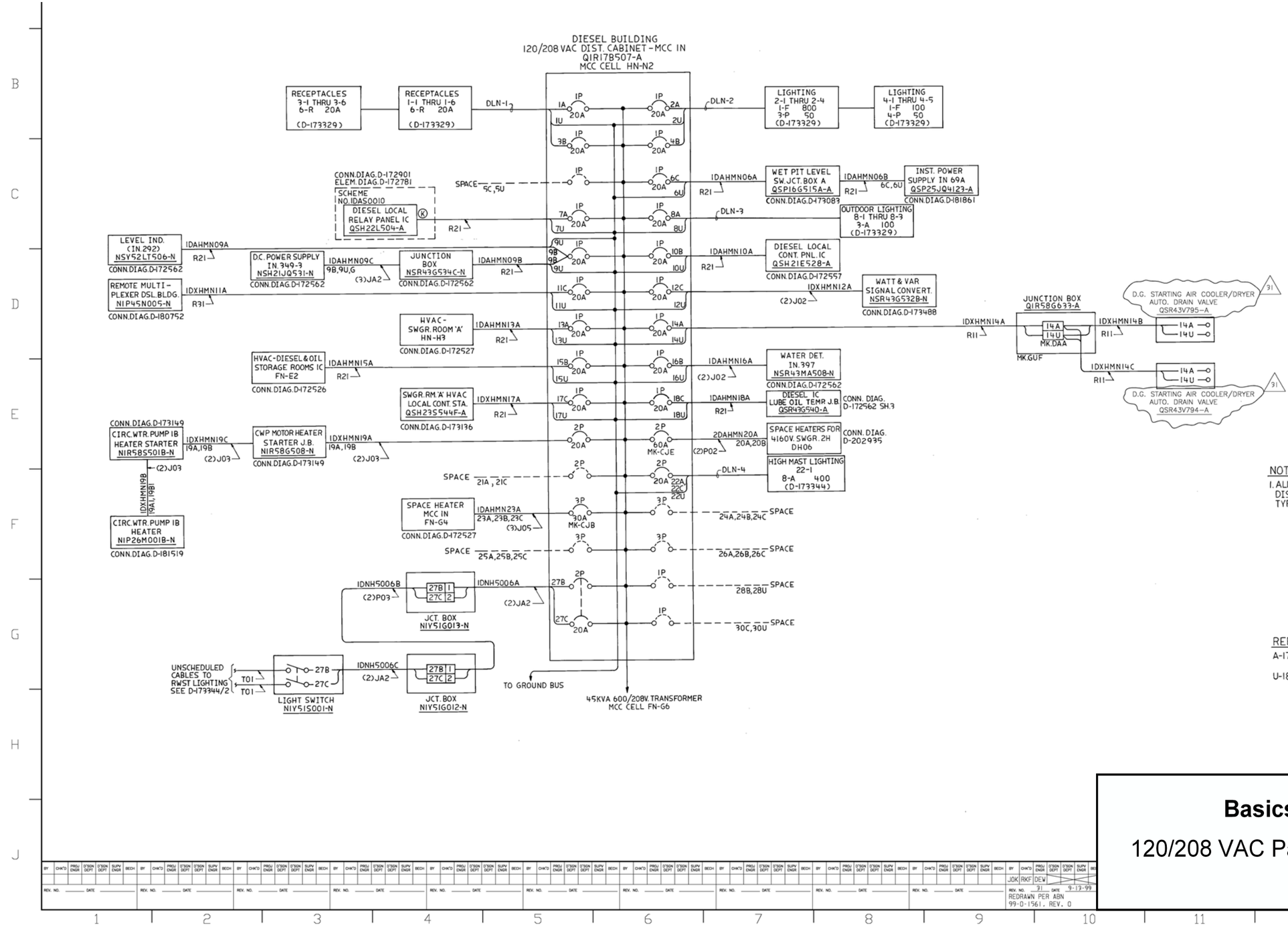
Basics 10

480 V Pump Schematic



Basics 11

MOV Schematic
(with embedded Block Diagram



NOTES:

1. ALL BREAKERS IN THESE 208V. DISTRIBUTION PANELS ARE ITE TYPE EQ-B OR BQ.

REFERENCES:

A-177538	ELECT. GEN. DETAILS & NOTES
U-184788	WIRING DIAG. 45KVA TRANSF. 208V 3ϕ SUPPLY & 42 CIR. LTG. PNL.

REV. NO. 91 DATE 9-13-99
REDRAWN PER ABN 99-0-1561, REV. 0

Basics 12

120/208 VAC Panel Diagram

OPERATIONS CRITICAL

NOTES:

1. BREAKERS SHOWN IN THE "OPEN" POSITION
2. COILS SHOWN IN THE "DE-ENERGIZED" STATE.
3. PRESSURE SWITCHES, FLOW SWITCHES, ETC. SHOWN IN THE "OFF-SHELF" POSITION.
4. THE COMPLETE WIRE MARK IS THE WIRE MARK SHOWN PLUS THE SYSTEM SHEET NUMBER (e.g. 1-ES09, 2-ES09, ETC.)
5. VALVES SHOWN IN THE "CLOSED" POSITION (EXCEPT AS NOTED).
6. GAI-ERAC NO.'S WILL BE USED TO IDENTIFY EQUIPMENT LOCATION WHERE APPLICABLE. SEE EQUIPMENT LIST FOR GAI-ERAC DESIGNATION
7. ALL AUX. RELAYS WILL BE "CUTLER-HAMMER" TYPE M-600V AS SHOWN ON B-208-002 SHT. 19. EXCEPT AS NOTED ON ELEM. DIAGRAM'S
8. DROPPING RESISTORS FOR "CMC" LIGHT MODULES ON MCB SHALL BE AS FOLLOWS:
   a) 125VDC CIRCUITS - 1950 OHMS FOR SINGLE LAMP; 1600 OHMS FOR TWO LAMPS IN SERIES
   b) 120VAC CIRCUITS - 1750 OHMS FOR SINGLE LAMP; 1400 OHMS FOR TWO LAMPS IN SERIES
9. INSTRUMENTATION SETPOINTS SHOWN ON THIS SERIES DRAWINGS ARE FOR INFORMATION ONLY. THE SETPOINT DATABASE/LIST SHALL BE CHECKED TO VERIFY INSTRUMENT SETPOINTS LISTED ON THESE DRAWINGS.

ABBREVIATIONS

ABBREVIATIONS	DEFINITIONS
AL	ALARM
BLU	BLUE
B.O.	BLACK OUT
COMPT	COMPUTER
CONT	CONTROL
DFTD	DEFEATED
GRN	GREEN
INTERLK	INTERLOCK
MON AL 2	MONITOR LIGHT ALARM GROUP 2
MON LT 2	MONITOR LIGHT GROUP 2
REM	REMOTE
T.C.	TORQUE SWITCH TO STOP VALVE CLOSING
T.O.	TORQUE SWITCH TO STOP VALVE OPENING
WH	WESTINGHOUSE
WHT	WHITE
YEL	YELLOW

LIMIT SWITCH DEVELOPMENT - ROTORK OPERATOR

SWITCH	CONTACT	OPEN	INTERMEDIATE	CLOSED
OT/LS	24-25			
CT/LS	26-27			
OAS1	15-16			
CAS1	6-7			
OAS2	17-18			
CAS2	8-9			

ADD-ON-PAK 1 SWITCH OPERATION

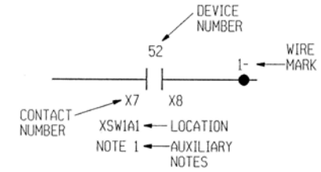
SWITCH	CONTACT	OPEN	INTERMEDIATE	CLOSED
IAS1	10-11			
IAS2	12-13			
IAS3	19-20			
IAS4	21-22			
IAS5	28-29			
IAS6	30-31			

ADD-ON-PAK SWITCHES CAN BE SET AT VALVE FULL OPEN, FULL CLOSED, OR ANY POSITION IN BETWEEN

LEGEND (FOR COMPUTER GENERATED DRAWINGS)

- INDICATING LIGHT
- INDICATING LIGHT WITH RESISTOR
- COIL/SOLENOID VALVE
- BREAKER
- BREAK IN CIRCUIT SHOWING CONTINUATION ON ANOTHER LINE
- EQUIPMENT TERMINAL [TERMINAL NUMBER ABOVE / LOCATION BELOW]
- INDICATES NO CONNECTION
- OR — INDICATES CONNECTION

DEVICE IDENTIFICATION (COMPUTER DRAWINGS)



LIMIT SWITCH DEVELOPMENT FOR AIR OPERATED VALVES AND DAMPERS

	LIMIT SWITCH	DEVICE POSITION FULL CLOSE		FULL OPEN
SWITCH ACTUATED DEVICE CLOSED	33bc			
	33bc			
	33ac			
	33ac			
SWITCH ACTUATED DEVICE OPEN	33ao			
	33ao			
	33bo			
	33bo			

NOTE: 33 CONTACTS SHOWN FOR DEVICE FULL CLOSED

LIMIT SWITCH DEVELOPMENT - LIMITORQUE OPER.

ROTOR	POSITION SWITCH	CONT	VALVE POSITION FULL CLOSE		FULL OPEN
1	33AO	1			
	33AO	2			
	33BO	3			
	33BO	4			
2	33BC	5			
	33BC	6			
	33AC	7			
	33AC	8			
3	33AO	9			
	33AO	10			
	33BO	11			
	33BO	12			
4	33BC	13			
	33BC	14			
	33AC	15			
	33AC	16			

17 CLOSING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING CLOSING CYCLE OR FULLY CLOSED VALVE

18 OPENING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING OPENING CYCLE OR FULLY OPENED VALVE

NOTES: LIMIT SWITCH DEVELOPMENT- LIMITORQUE OPER.

1. INTERMEDIATE POSITIONS ARE EXPRESSED IN PERCENTAGE OF FULL OPEN. EX. 33A05 CONTACT ACTUATES WHEN THE VALVE IS 5% OPEN.
2. THE TOLERANCE FOR ROTOR 2 CONTACTS SET AT 25% OPEN IS ± 2.5%.
3. LIMITORQUE VALVES STROKED OPEN TO A POSITION OF ≥90% ARE CONSIDERED "FULLY OPEN" WITH THE EXCEPTION OF XVG2802A & B-MS, WHICH MUST BE STROKED OPEN TO 95%. THE BASIS FOR THIS STATEMENT IS NUCLEAR ENGINEERING LETTER CGSS-20371, DATED 11/9/87.

ESSENTIAL

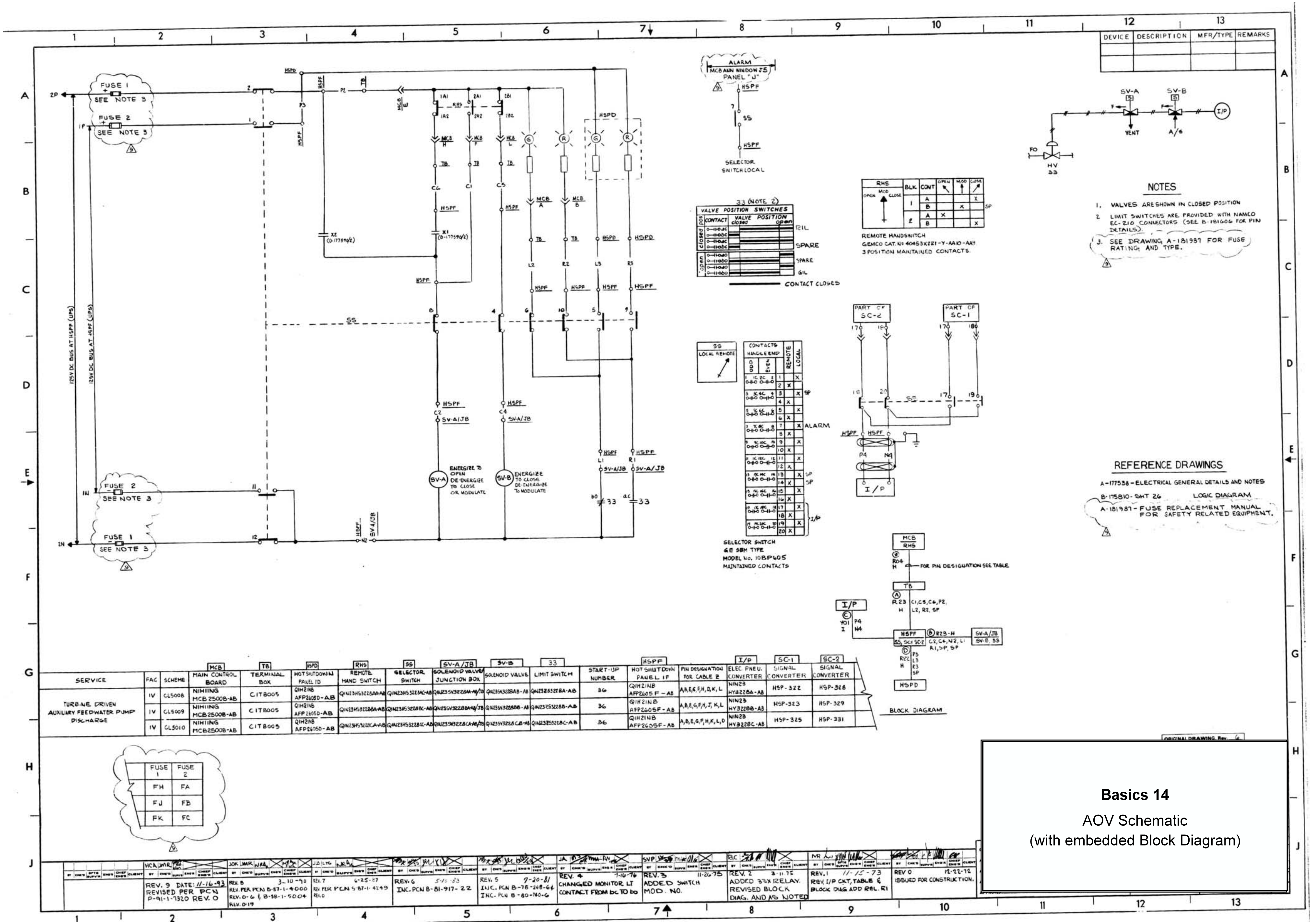
DRAWING LEGIBILITY

Basics 13

Valve Limit Switch Legend

1/4"=1'-0" 0" 5" 10" 15" 20"

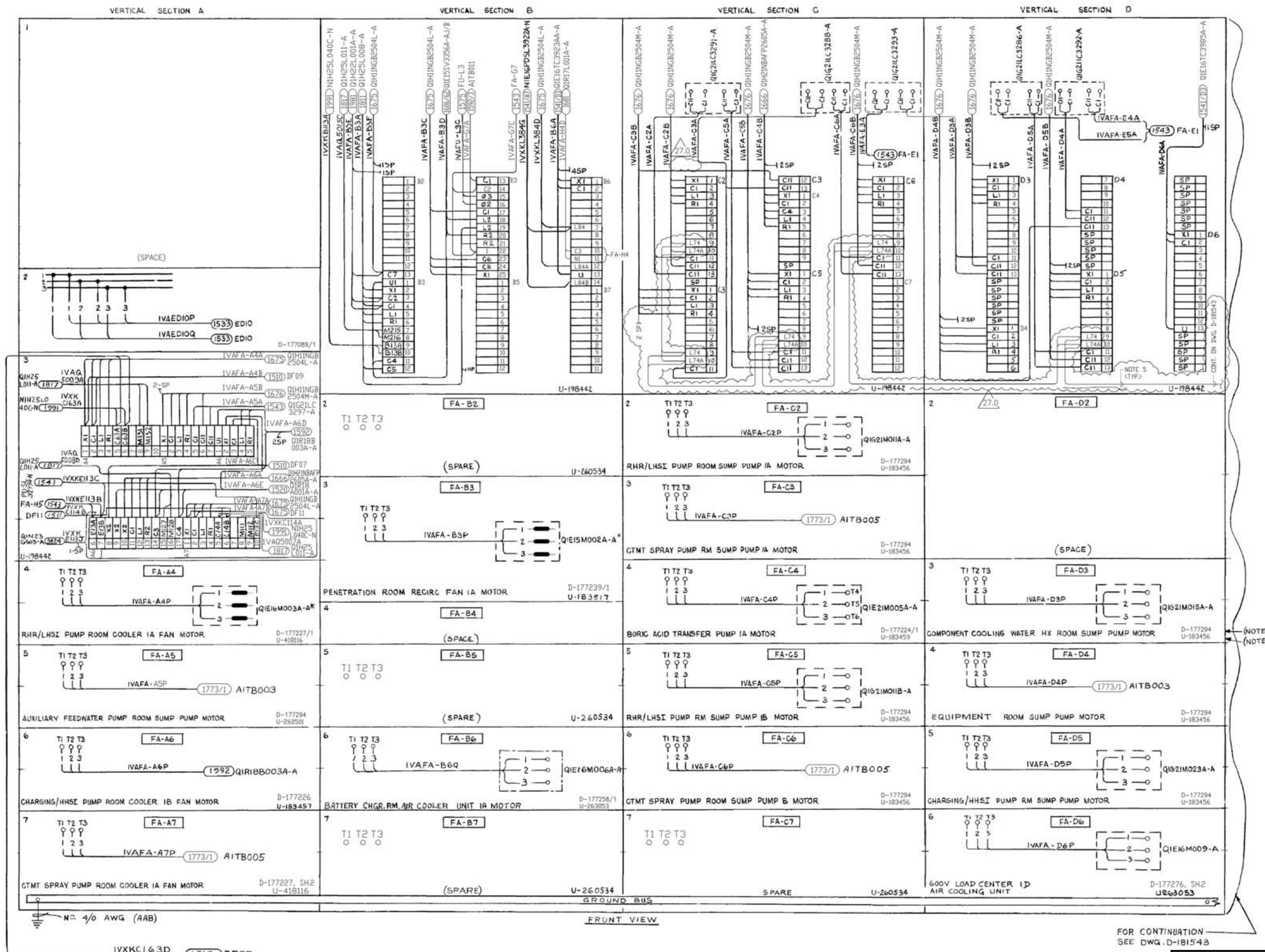
208002_xx_0001



Basics 14

AOV Schematic

(with embedded Block Diagram)



LEGEND:

▬ INDICATES CABLE SPLICE

NOTES

1. NUMBER REFERS TO THE ELEMENTARY PERTAINING TO THAT COMPARTMENT. TYPICAL FOR ALL COMPARTMENTS.
2. NUMBER REFERS TO VENDOR DRAWING PERTAINING TO THAT COMPARTMENT. TYPICAL FOR ALL COMPARTMENTS.
3. PHASE SEQUENCE IS 3-2-1.
4. COMPONENTS MARKED WITH AN "*" ARE WITHIN E.Q. SCOPE. FOR INSTALLATION DETAILS, SEE E.Q. REFERENCE DRAWINGS LISTED BELOW.
5. #12 SIS JUMPERS, P/N XP123165-162.

27.0

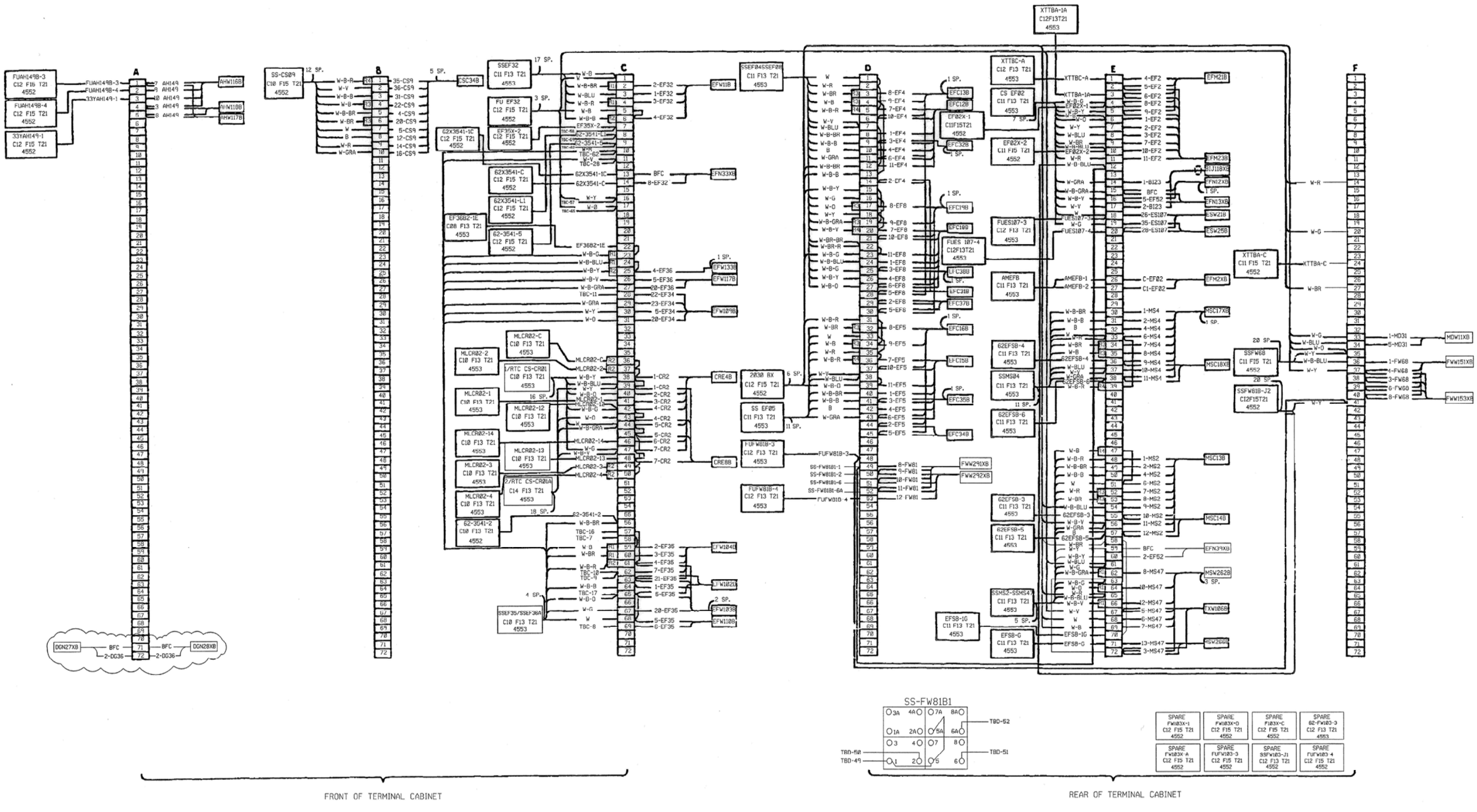
REFERENCE DRAWINGS:

A-177538	-	ELECTRICAL GENERAL DETAILS & NOTES
B-177556	-	MCC SCHEDULES MCC-1A
D-181900, SH.15	-	INSTALLATION DETAILS FOR E.Q. 550V G.E. ROOM COOLER MOTORS
D-181900, SH.17	-	INSTALLATION DETAILS FOR E.Q. 208V AND 550V RELIANCE FAN MOTORS

JLD RKF DEW
VER. NO. 27.0 DATE 9-6-06
REVISED PER ABN 1989944801E012, VER. 1

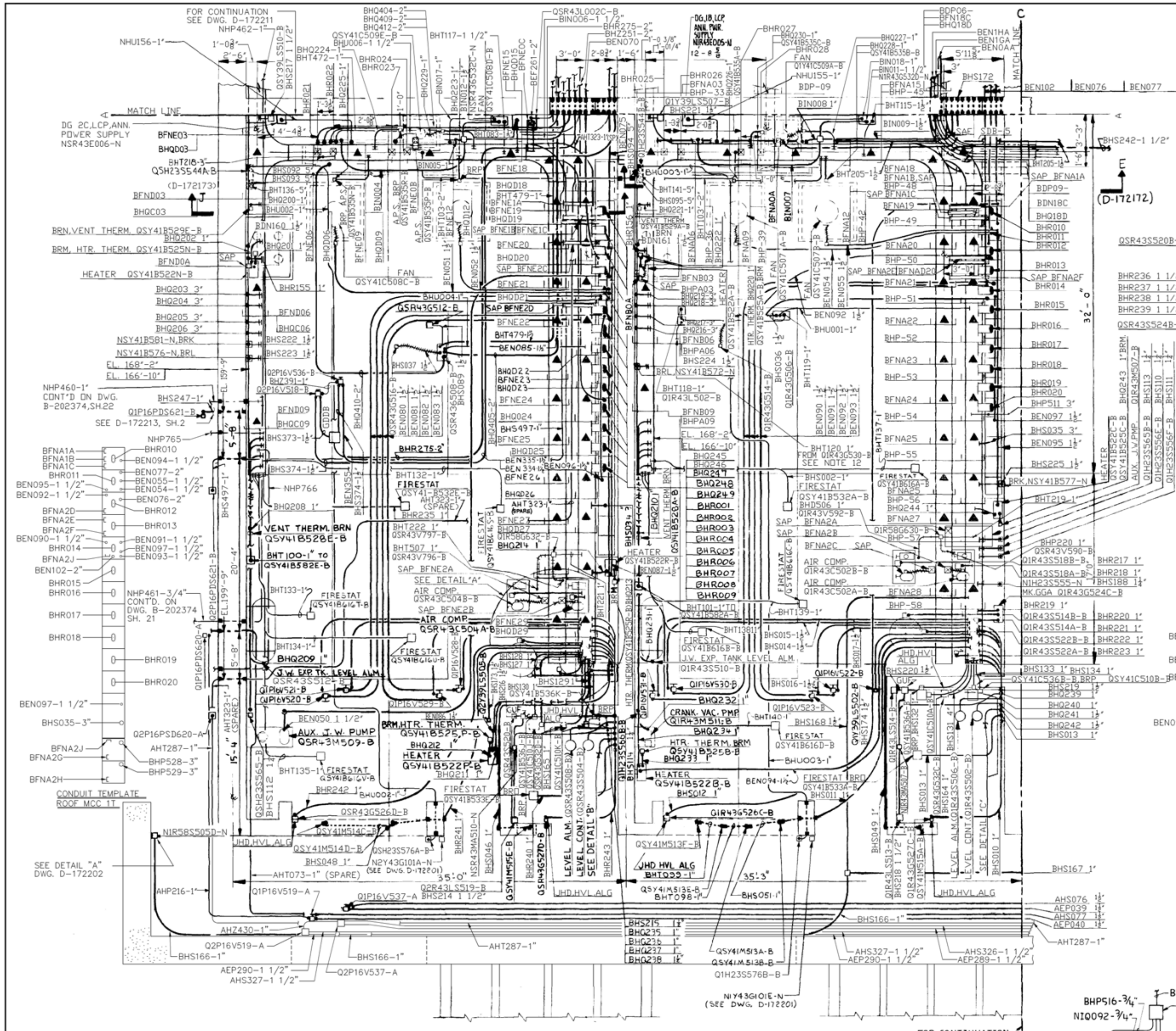
Basics 15

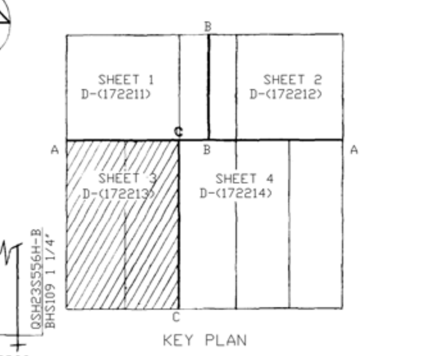
MCC Wiring (or Connection) Diagram

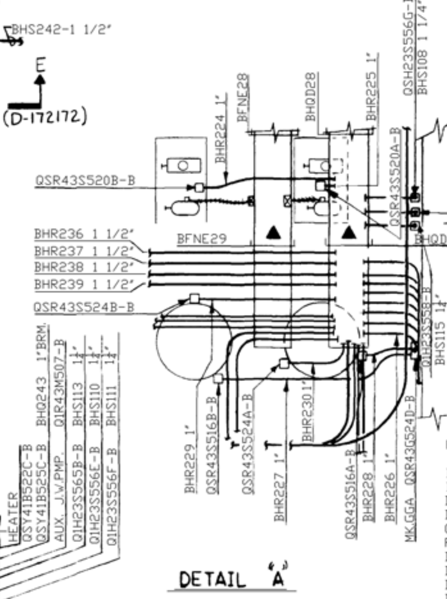


Basics 16

Terminal Cabinet Wiring (or Connection) Diagram



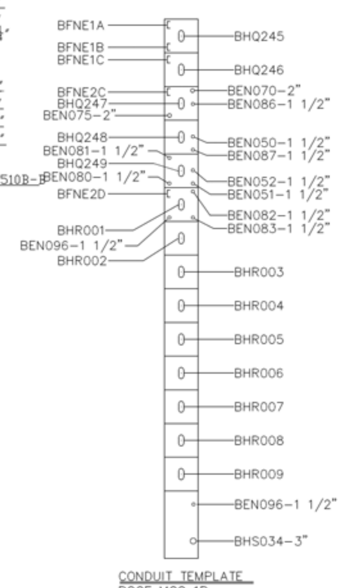




REFERENCES

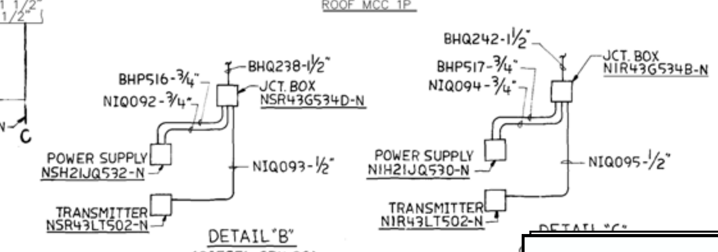
D-172203 DIESEL BUILDING - CABLE TRAY AND SUPPORT PLAN
D-172211 CABLE TRAY LAYOUT - DIESEL BUILDING, SH. 1
D-172212 CABLE TRAY LAYOUT - DIESEL BUILDING, SH. 2
D-172214 CABLE TRAY LAYOUT - DIESEL BUILDING, SH. 4
C-172285 CLASS 1 CABLE TRAY SUPPORT POST.
F-172292 CLASS 1 CABLE TRAY SUPPORT BRACKET
D-172171 ELECTRICAL EQUIPMENT PLAN - DIESEL BUILDING
D-172195 CONDUIT PLAN DIESEL BLDG. SLAB
D-172197 EMBEDDED SUPPORTS AND CONDUIT IN WALLS.
D-172182 ELECTRICAL SECTIONS & DETAILS - DIESEL BLDG. - SH. 5
D-172202 ELECTRICAL SECTIONS & DETAILS - PLANT SECURITY
D-172201 ELECTRICAL EQUIPMENT & CONDUIT PLAN-FIRE PROTECTION DIESEL BUILDING

U-260651 DIESEL CONTROL BREAKER INTERLOCKS



NOTES:

1. ALL ELEVATIONS ARE BOTTOM ELEVATIONS UNLESS NOTED.
2. ALL 90° HORIZONTAL BENDS SDB-4 UNLESS NOTED.
3. ALL STRAIGHT SECTIONS SAD UNLESS NOTED.
4. ALL HORIZONTAL TEES SEB-4 UNLESS NOTED.
5. ALL HORIZONTAL CROSSES SEL-4 UNLESS NOTED.
6. ALL CABLE TRAY SUPPORT POST MARK NOS. ARE PRE-FIXED REU-
7. ALL CABLE TRAY SUPPORT POST MK. REU-31 UNLESS NOTED.
8. ALL EXPOSED CONDUIT 2" ALUMINUM UNLESS NOTED.
9. ALL EXPOSED CONDUIT TO BE RUN EITHER PARALLEL OR PERPENDICULAR WITH BOTH ROOF AND WALLS.
10. CONDUIT SEAL-OFFS MK. HUC SHALL BE USED AT FUEL ROOM PENETRATIONS.
11. WHERE SEPARATION OF 5' VERTICAL AND 3' HORIZONTAL IS NOT MAINTAINED BETWEEN UNIT 1 & UNIT 2 TRAYS, REGARDLESS OF TRAIN, A FIRE BARRIER OF MARINITE IS REQUIRED.
12. RUN RACEWAY BHT120-1" TO PUMP Q1R43P509-B; RACEWAY AHT147-1" TO PUMP QSR43P525-A; RACEWAY BHT370-1" TO PUMP Q2R43P509-B WHEN LOCATED AND MOUNTED.
13. CHANNELS BFN0DC & BFN1FC ARE FOR TEMPORARY POWER FEEDER FOR MCC 2T & SHOULD BE REMOVED WHEN FEEDER IS ENERGIZED.
14. FOR ADDITIONAL EQUIPMENT AND RACEWAYS IN THIS AREA SEE DRAWING D-172213 SH. 2.



32 THIS DRAWING WILL NO LONGER BE REVISED TO INCORPORATE CONDUIT ADDITIONS, DELETIONS, OR CHANGES. REFER TO THE RACEWAY SCHEDULE FOR CURRENT CONDUIT INFORMATION. CABLE TRAY ADDITIONS, DELETIONS, AND CHANGES WILL BE INCORPORATED.

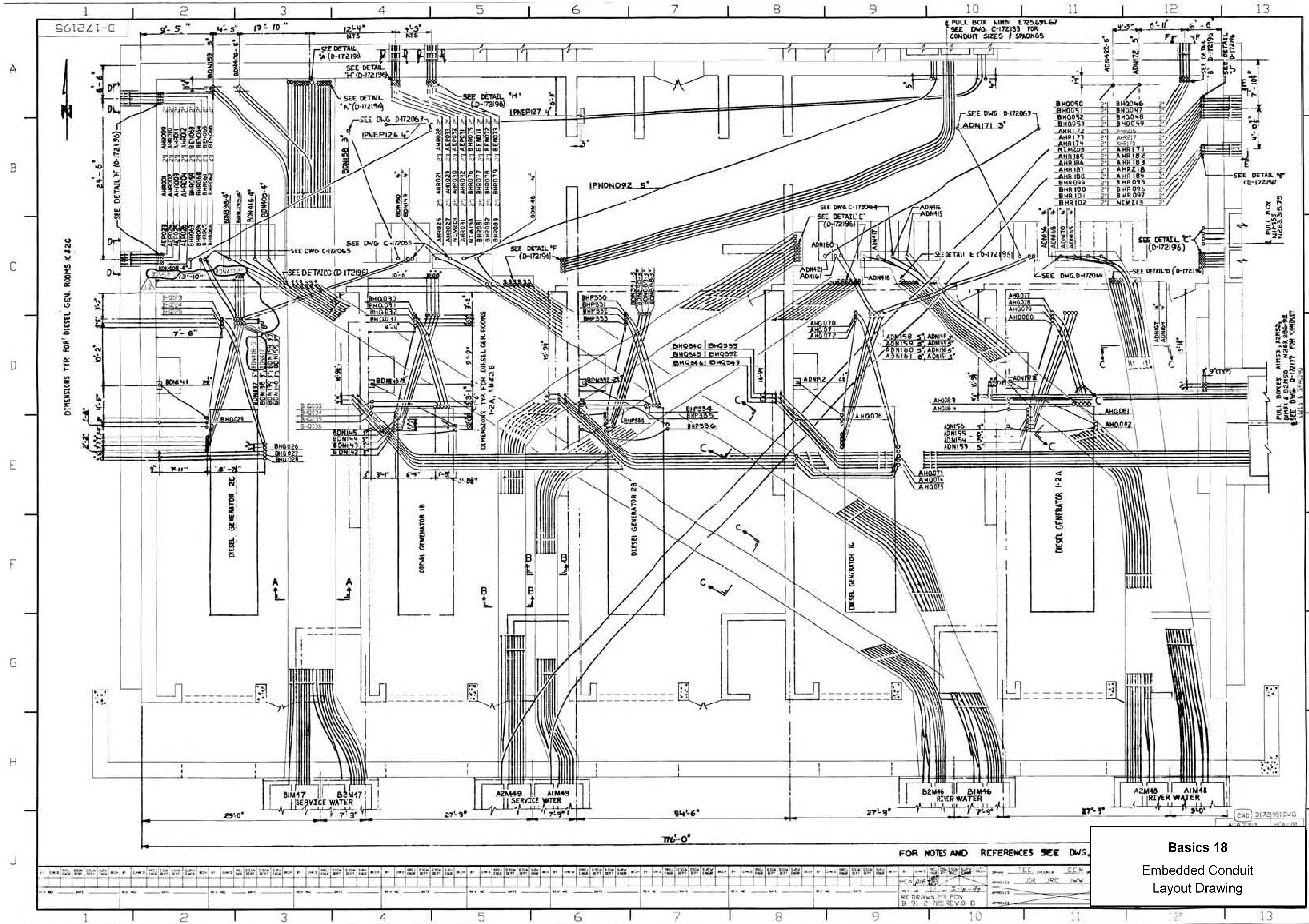
CAD D1722131.DWG
DVY2000 TRM-04

REV. NO.	DATE	DESCRIPTION
32	9-24-02	REVISED PER DCP 00-0-9595, 001-007
31	2-16-94	REVISED PER PCN B-91-2-7851 REV. 0-8
30	02-04-93	REDRAWN TO INCORPORATE PCN B-90-0-7068, REV. 0 THRU 12.
0	10/31/73	ISSUED FOR APPROVAL AND CONSTRUCTION.

DRAWN R. H. CHAPMAN
APPROVED JBK
APPROVED F.E.
APPROVED J.M.

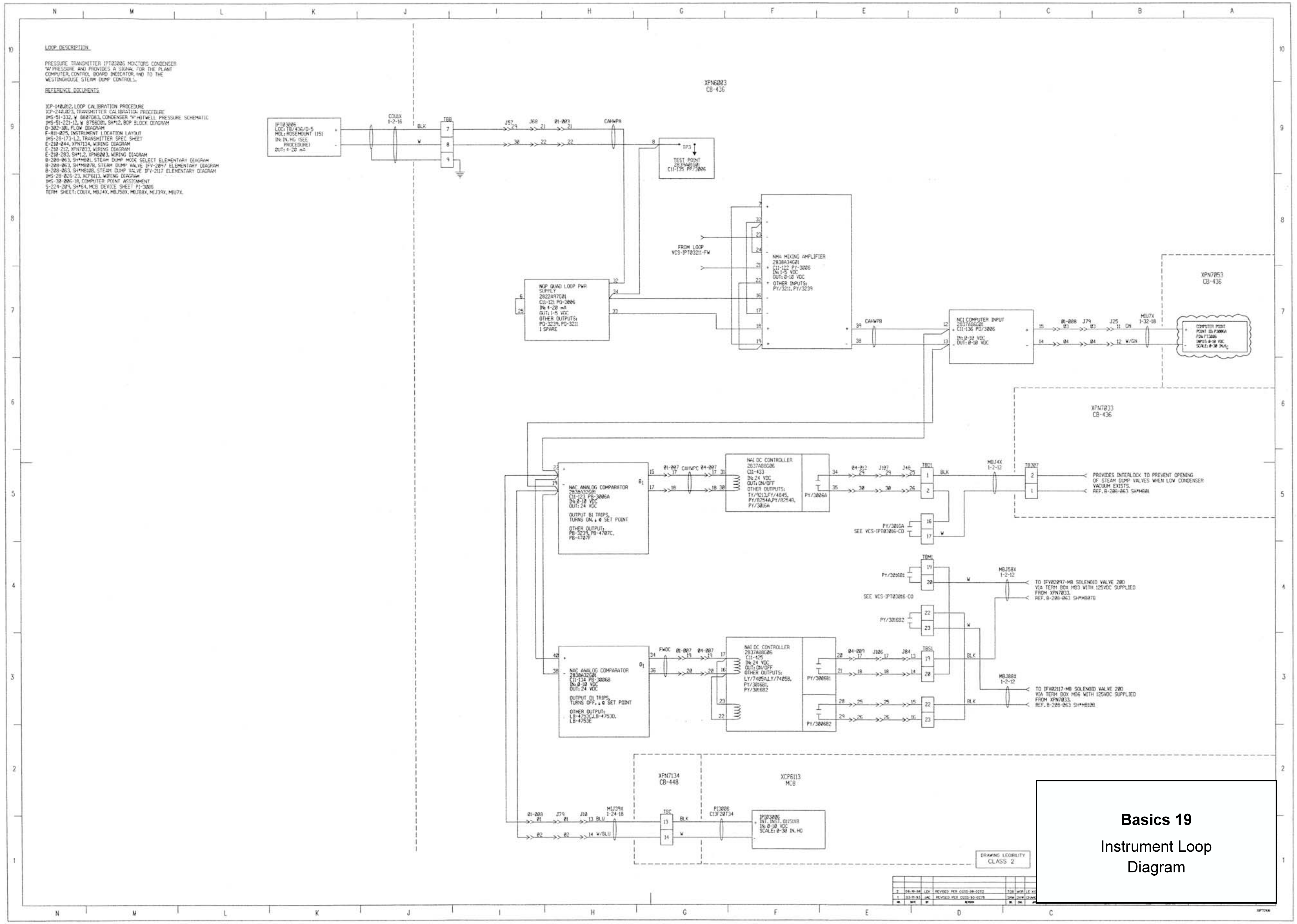
Basics 17

Tray & Conduit Layout Drawing



Basics 18

Embedded Conduit Layout Drawing



Basics 19

Instrument Loop Diagram