



CONTROLS, INC.

46R-3000A

Revised March, 1996

# OPERATION AND MAINTENANCE MANUAL

**BYPASS/  
ISOLATION  
TRANSFER  
SWITCH**

**ZBTSH SERIES  
1600 THRU 3000 AMPS**

MODEL NUMBER

SERIAL NUMBER

ZENITH CONTROLS, INC., 830 W. 40th St., Chicago, IL 60609  
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## STORAGE

The ZBTSH should be stored in a clean dry area. AVOID STORAGE BENEATH STEAM OR WATER PIPES. Excessive moisture may damage the unit. The switch should only be stored on a level (horizontal) surface.

## INSTALLATION

### 1. HANDLING

CAUTION: Depending upon the model, a ZBTSH weighs between 3000-5000 pounds. Use adequate machinery and cables to handle the load.

### 2. EQUIPMENT PREPARATION

- a) Check nameplate to assure switch system voltage and amperage is correct. Any discrepancy should be immediately reported to a Zenith representative.
- b) Lock open breakers to Normal and Emergency lines.

### 3. CABINET PREPARATION

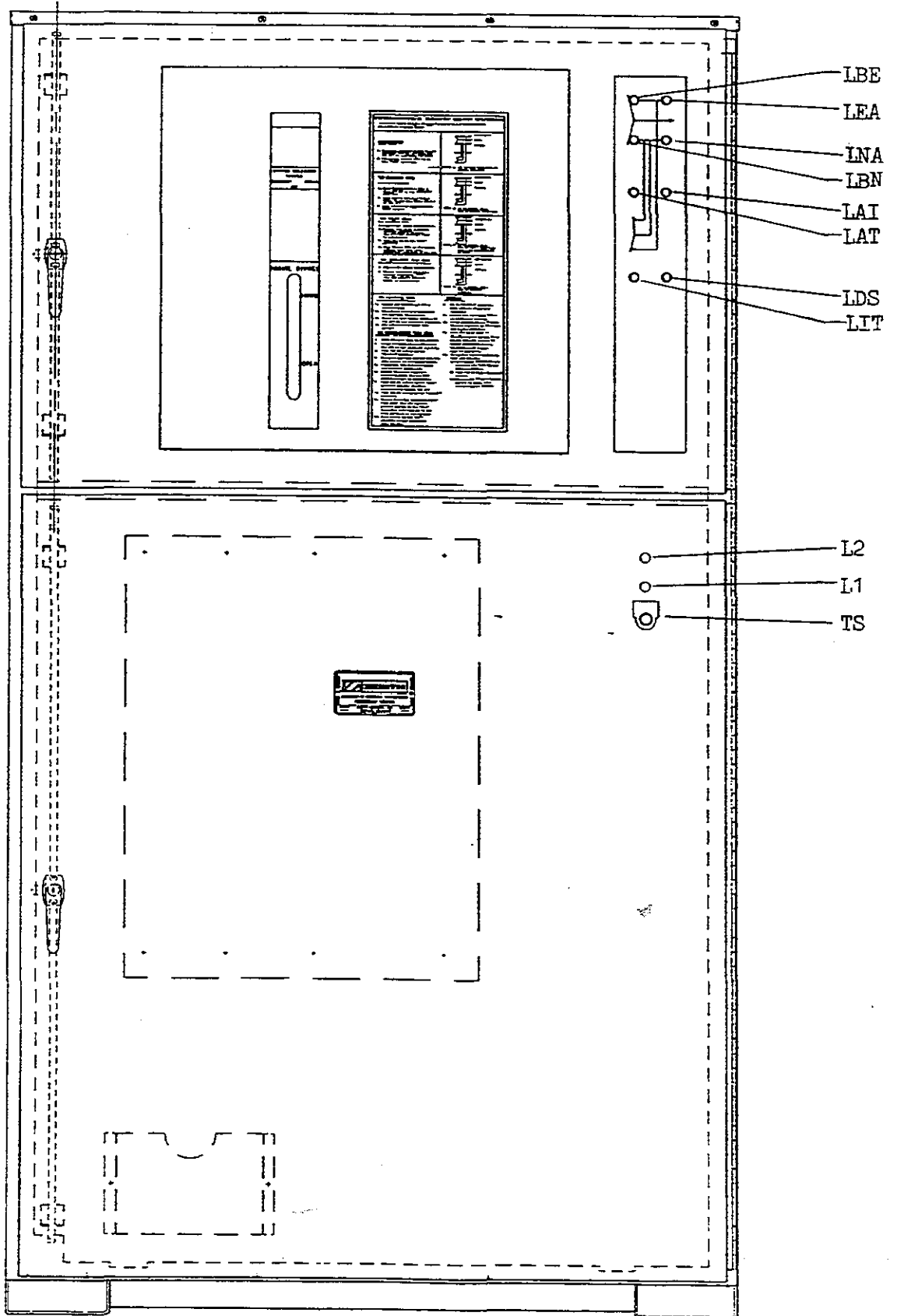
- a) A small amount of cabinet work is required before the cables are connected. Cover the switch and the controls to avoid metal fragments from entering mechanical and electrical components. Visually verify that metal filings are removed from bus support. (Use vacuum if necessary).
- b) Standard cable entry is through the top or bottom of cabinet. Fig. 1 shows one suggested knockout. For a guide to assist in the hole layout, refer to Appendix A for determining appropriate knockout arrangement.

### 4. CABLE AND WIRE CONNECTIONS

- a) To remove possible oxide, clean cable conductor with a wire brush and apply a contact oxide inhibitor. Insert cables into appropriate lugs.
- b) Connect all auxiliary wires for external electrical operation. Example: E-Start, remote alarm lights or buzzers, motor control contacts, etc. Allow enough slack in wires to allow movement of the ATS to Isolate Position.

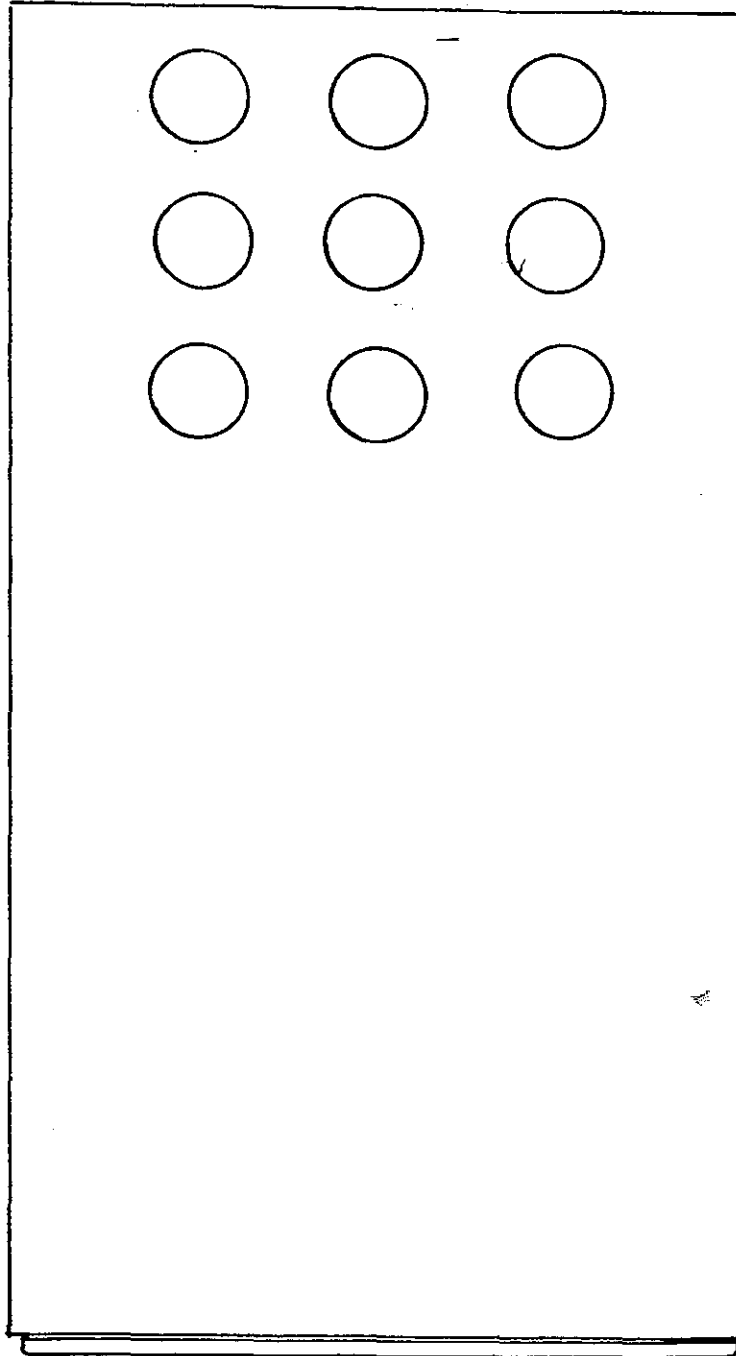
### 5. PRIOR TO THE UNIT'S ENERGIZATION

- a) Remove any debris incurred due to installation (cut cable strands, metal filings, etc.)
- b) Inspect the unit and verify torque of cable and wire connections.



EXAMPLE OF CABLE ENTRIES. TOP VIEW OF CABINET

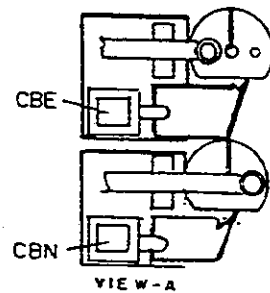
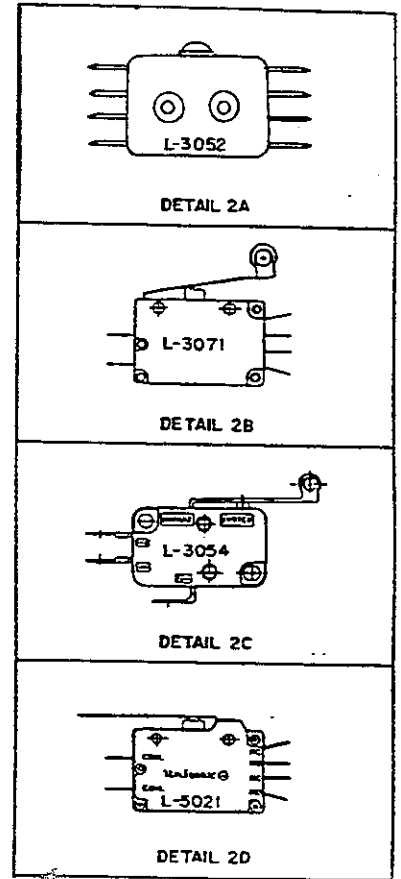
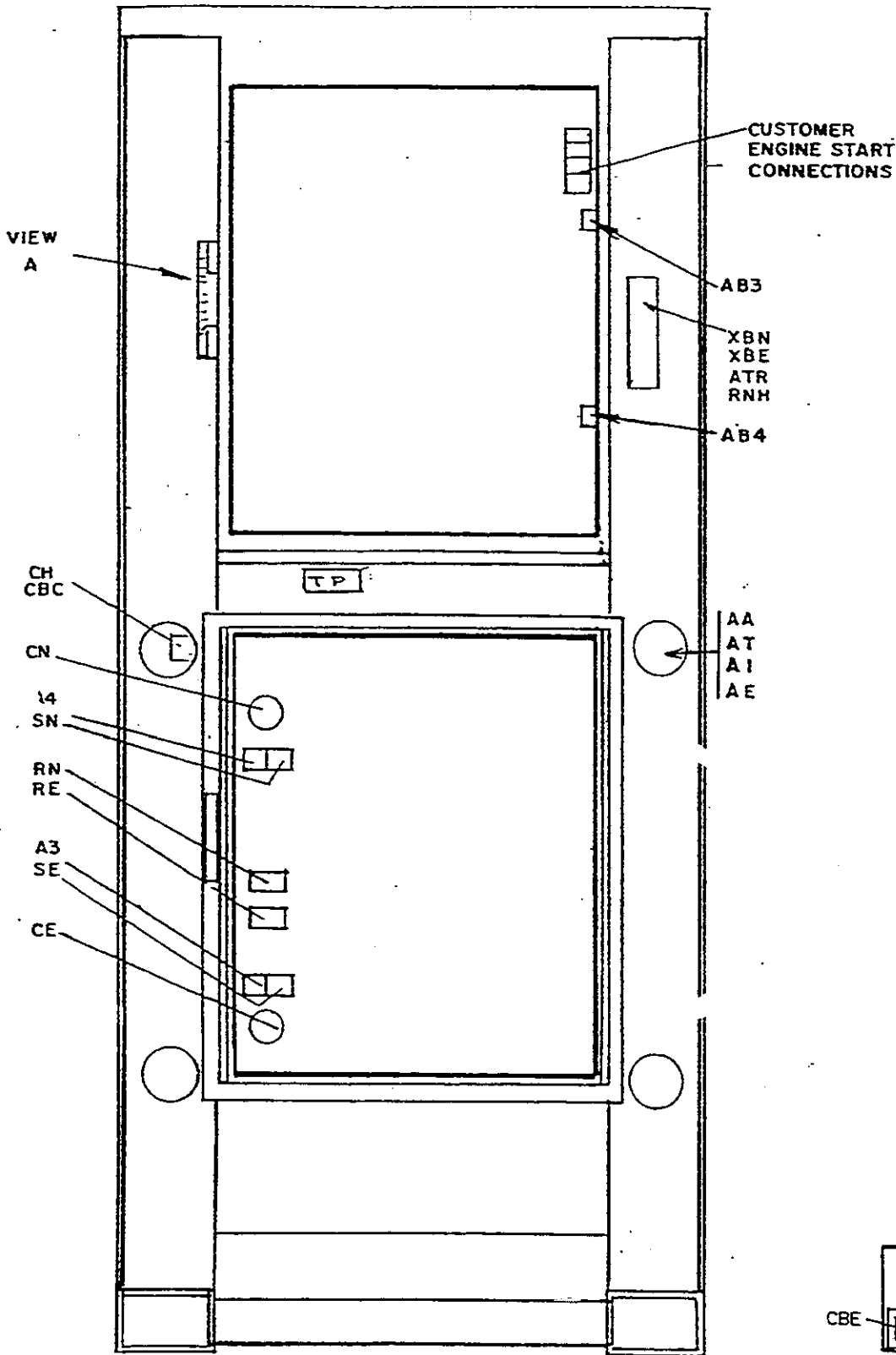
(BACK)



(FRONT)

FIG. 1

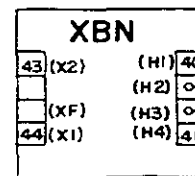
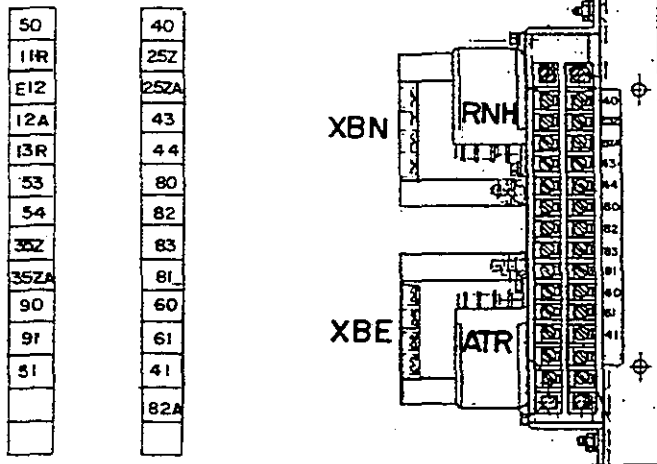




TAG	DESCRIPTION	PART NUMBER						
		STOCK NUMBER BY AMPERAGE						
		1600 A	2000 A	3000 A				
NL1,2,3 EL1,2,3 T1,2,3	Cable Connection at Rear	S-1392F(2) OPTIONAL (8)600MCM-2	S-1392F(2) OPTIONAL (8)600MCM-2	S-1392F(2) OPTIONAL (8)600MCM-2				
STAT(BP)	Stationary Contact Assembly(Bypass)	S-2308	S-2308	S-2343				
STAT(ATS)	Stationary Contact Assembly (ATS)	S-2308	S-2308	S-2343				
ARC	Arc Grid Assembly	23P-1171	23P-1171	23P-1171				
MOV	Movable Contact Assembly	23P-1400	23P-1400	23P-1344				
XBE, XBN	Bypass Step-Down Transformer 25VA Secondary 24V	VOLTAGE		PART NUMBER				
		120/240 volts	208/416 volts	K-3061				
		220/440 volts	240/480 volts	K-3063				
		380 volts	575 volts	K-3064				
		600 volts		K-3062				
				K-3067				
				K-3065				
				K-3066				
CN; CE	Main Operating Coils VOLTAGE SYSTEM							
No.	Volts	Ph	Wire	Coil Volts	Pole	1600A	2000A	3000A
-2	120/240	1	3	240	3	K-2123	K-2123	K-2123
-3	240	3	3	240	3	K-2123	K-2123	K-2123
			4		4	K-2127	K-2127	K-2127
-4	120/208	3	4	208	3	K-2125	K-2125	K-2125
					4	K-2128	K-2128	K-2128
-5	480	3	3	480	3	K-2120	K-2120	K-2120
-7	277/480	3	4	480	3	K-2120	K-2120	K-2120
					4	K-2130	K-2130	K-2130
-9	240/416	3	4	416	3	K-2126	K-2126	K-2126
SN	ATS Normal Position Coil Cutout Sw.				26P-1311			
SE	ATS Emerg. Position Coil Cutout Sw.				26P-1312			
A3	ATS Emergency Position Switch				23P-1352,1353,1354,1355			
A4	ATS Normal Position Switch				23P-1356,1357,1358,1359			
CH	Crank Handle Limit Switch				L-3052 (Detail 2A)			
AA1,2,3,4	ATS Auto Location Switch				L-3071 (Detail 2b)			
AE1,2	ATS Isolate/Remove Location Switch				L-3052 (Detail 2A)			
AI1,2	ATS Isolate Location Switch				L-3071 (Detail 2b)			
AT1,2	ATS Test Location Switch							
AB3/A	Bypass Emergency Position Switch							
AB4/A	Bypass Normal Position Switch				L-5021 (Detail 2a)			
AL-1,2,3,4	ATS Latched Limit Switch				L-3054 (Detail 2c)			
DS	ATS Solenoid Disconnect Switch				L-4018			
	Operator 2-Position Maintain				L-1029			
	Contact Block N.C. (1)				L-1028			
	Contact Block N.O. (2)				PS-3473			
CBN, CBE	Bypass Interlock Solenoid				K-2192			
CBC	Crank Enable Solenoid				K-2159R			

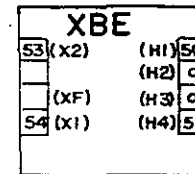


### C. BYPASS CONTROL PANEL



TYPICAL JUMPER WIRING FOR 416 480 VOLT SYSTEM

NOTE: IF SYSTEM IS 416 OR 480 VOL WIRE TRANSFORMERS AS SHOWN ABOVE; SYSTEM IS 208 OR 240 VOLTS, WIRE TRANSFORMERS AS SHOWN BELOW.



TYPICAL JUMPER WIRING FOR 208 240 VOLT SYSTEM

USE K-3062 FOR 240 & 480V SYSTEMS. USE K-3063 FOR 208 & 240V SYSTEMS

### D. ATS CONTROL PANEL

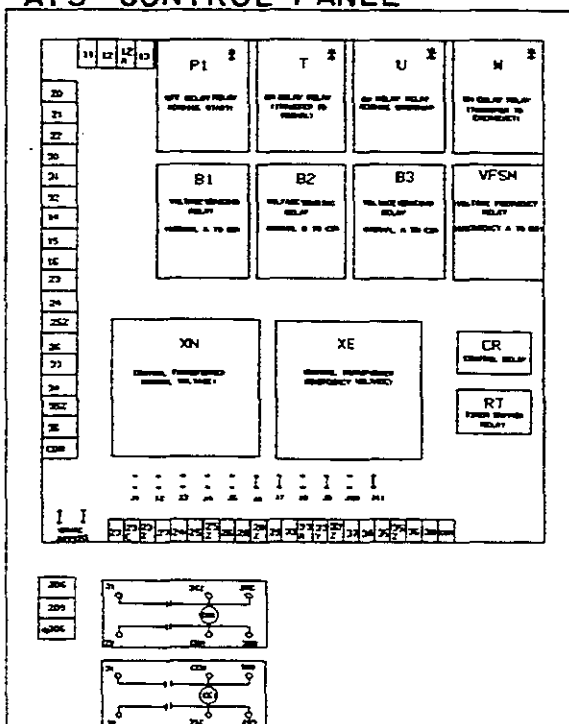


CHART 1

JUMPER	CONNECTS POINTS	REMOVE WHEN ACCESSORIES USE
J1	23, 23A	B1
J2	23A, 23B	B2
J3	23B, 23C	B3
J4	23C, 23Z	J1N, TS, C/D
J5	23Z, 27	T, YN
J6	25, 25Z	T3, R4
J7	28, 28Z	S1, C, C/D
J8	28Z, 29	P1 & U
J9	33A, 33Y	ER1, 2, 3, J1E
J10	33Z, 37	W
J11	35, 35Z	R4, W3

C. BYPASS CONTROL PANEL (46P-1079) INCLUDES PARTS BELOW

TAG	DESCRIPTION	PART NUMBER
BR,1,2,3	Bridge Rectifier	PS-5076
RNH	Normal Voltage Relay	K-1218
R1	Resistor RNH, 30 ohm	PS-4056
R2	Resistor LDS, 120-ohm	PS-4057
D1	Diode	PS-4812
CA	Capacitor RNH	PS-4058
ATR	Auxiliary Test Relay	K-1218

D. ATS CONTROL PANEL (SSRCP) STANDARD ITEMS

TAG	DESCRIPTION	VOLTAGE 50/60 HZ	PART NUMBER
XN,XE	Control Transformers (see Note 1)	120 Volts	K-3076
		208 Volts	K-3070
		240 or 480 Volts	K-3071
		416 Volts	K-3089
B1,2,3	Phase Relays, Solid State (See Note 1)	120 Volts	K-1185
		208 or 240 Volts	K-1186
		480 Volts	K-1188
VFSM	Voltage Frequency Sensor	120VVolts	K-1192
CR	Control Relay	120 Volts	K-1204
RT	Bypass T Relay	120 Volts	K-1204
J1-J11	Jumpers		PS-5067
CCN/CCE	CN/CE Transfer Control Relays	120 Volts	K-1120

(OPTIONAL ITEMS)

TAG	DESCRIPTION	VOLTAGE	PART NUMBER	REPLACED BY
T	Time Delay to Normal, Timer Solid State	120V .1 Sec. to 9990 Hrs. (Adj.)	OSA-A-T	OSA-A2-T
U	Engine Cool Down, Timer Solid State	120V .1 Sec. to 9990 Hrs. (Adj.)	OSA-A-U	OSA-A2-U
W	Time Delay Emergency, Timer Solid State	120V .1 Sec to 9990 Hrs. (Adj.)	OSA-A-W	OSA-A2-W
P1	Time Delay Engine Start, Timer	120V (.5 to 6 sec. Adjustable)	K-1201	
P2	Optional (Mounted below SSRCP)	120V (300 Sec. Adjustable)	K-1061	

Notes:

1. If -6 voltage system (575/600V) is supplied, then XN, XE is K-3087 and B1,2, 3 is K-1185 (120V) supplied with XB (575:600V/120V) 3 phase transformer assembly. B1, 2, 3 mounted below SSRCP.

## BYPASS/AUTOMATIC TRANSFER SWITCH OPERATION

BP-BYPASS SWITCH INDICATED BY CONTACTS BN/BE IS A 3 POSITION SWITCH  
 ATS-AUTOMATIC TRANSFER SWITCH

### AUTOMATIC

1. Manually operated Bypass Switch contacts (BN/BE) are open and the ATS is supplying the Load.
2. Disconnect switch (DS) is in the "AUTO" position.

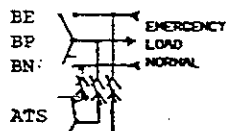


FIG. 1 BP IN OPEN WITH ATS IN NORMAL POSITION.

### TO BYPASS ATS

1. Open bottom cabinet door & turn ATS DS to the "INHIBIT" position.
2. Turn Bypass Selector Switch (BSS) to the same Power Source as the ATS.
3. Move the Manual Bypass Handle (MBH) upward.

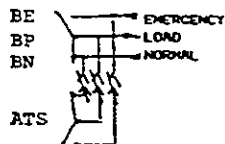


FIG. 2 BP IN NORMAL WITH ATS IN NORMAL POSITION.

### TO TEST ATS

1. Bypass per above instructions.
2. Rotate the crank mechanism counter clockwise until the ATS TEST POSITION light is illuminated.
3. Turn the DS to the "AUTO" position.
4. Test Switch (TS) on the bottom cabinet door will allow electrical operation of the ATS.

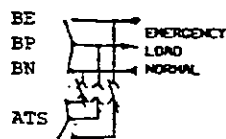


FIG. 3 BP IN NORMAL WITH ATS IN TEST LOCATION (ATS LOAD CONNECTIONS IS OPEN)

### TO ISOLATE THE ATS

1. Bypass per above instructions.
2. Rotate the crank mechanism counter clockwise until the ATS ISOLATE POSITION light is illuminated.

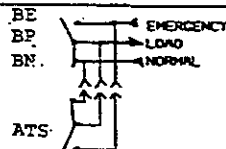


FIG. 4 BP IN NORMAL WITH ATS IN ISOLATE LOCATION

### TO REMOVE ATS

1. Bypass and isolate per above instructions.
2. Disconnect the multi-pin plugs and external connections.
3. Slide the four corner latches of the ATS to the innermost position.
4. ATS can now be removed from cabinet.

### TO RECONNECT THE ATS

1. Roll the cart back in the cabinet.
2. Slide the four corner latches of the ATS to the outermost position.
3. Turn the DS switch to the "INHIBIT" position.
4. Manually position the ATS into the same source as the Bypass Switch.
5. Re-connect the multi-pin plugs and external connections.
6. Rotate the crank mechanism clockwise until the ATS TEST POSITION light is illuminated.
7. Turn the DS switch to the "AUTO" position and use the TS to electrically operate the ATS.
8. Turn the DS switch to the "INHIBIT" position.
9. Rotate the crank mechanism clockwise until the ATS location pointer points to the "AUTO" location. (ATS must be in the same position as the Bypass.)
10. Turn the DS to the "AUTO" position & open the Bypass with the MBH.

### NOTES:

1. DS in "INHIBIT" position will prevent electrical operation.
2. Do not use excessive force on mechanical handles.
3. Above figures depict Bypass NORMAL; Sequence is the same for Bypass EMERGENCY.
4. When ATS is in TEST or ISOLATE, Bypass Switch is a manual transfer switch to either available source (opposite power source must be available).
5. To operate Bypass Switch in TEST and ISOLATE.
  - a) Move manual Bypass Handle downward (to open Bypass contacts BN/BE).
  - b) Turn BSS to opposite power source.
  - c) Move Manual Bypass Handle upward to close into selected power source.

V-1587

DEFINITIONS:

BP - Bypass/Isolation Switch

It is a manually operated device used in conjunction with an Automatic Transfer Switch (ATS) to provide a means of directly connecting load conductors to a power source, and of disconnecting the Automatic Transfer Switch.

The BP can also be used as a Manual Transfer Switch in the event of power failure while the ATS is in the TEST or ISOLATE positions.

ATS -- Automatic Transfer Switch

Is a self-acting equipment for transferring one or more load conductor connections from one power source to another.

DS - Disconnect Switch

Inhibits operation of ATS Main Coils (CN-CE). In the "AUTO" position, the ATS operates normally. In the "INHIBIT" position the main coils (CN-CE) cannot be energized, and automatic transfer in either direction cannot take place.

BSS - Bypass Selector Switch

Selects position to bypass.

MBH - Manual Bypass Handle

Actuates the Bypass Operator

Down for Bypass Open

UP for bypass Normal and Bypass Emergency

TS - Test Switch

Simulates Normal Line failure when open.

OPERATION NOTES:

1. The ATS will not operate if:
  - a) Harness plugs are not connected.
  - b) DS is in the "INHIBIT" position.
  - c) ATS is not in "AUTO" location with bypass switch open or ATS is not in "TEST".
  - d) ATS is in "AUTO" location and BYPASS SWITCH is not open.
2. The MBH will not close the Bypass if:
  - a) The BSS is turned to the opposite source that the ATS is in.
3. The MBH will not open the Bypass if:
  - a) ATS is not engaged in one of the following; AUTO - TEST- ISOLATE.
  - b) ATS is in "TEST" or "ISOLATE" location and the opposite source is not available.
4. The CH (CRANK HANDLE) will not operate if:
  - a) BP and ATS are not positioned to same source.
  - b) Power is not available.
  - c) Harness Plugs are not connected.
  - d) ATS has reached limit of travel to "AUTO" or "ISOLATE" (Clutch device on the crank mechanism slips.)

**READ THE FOLLOWING PARAGRAPHS BEFORE PROCEEDING TO "TEST PROCEDURE".  
(THIS PROCEDURE IS ONLY TO BE PERFORMED BY AUTHORIZED PERSONNEL)**

**CAUTION:**

Loads controlled by Bypass/Isolation Transfer Switch may cause PERSONAL INJURY by UNAUTHORIZED PERSONNEL operating or testing this equipment.

Check all wiring diagrams that have been supplied for added options that may affect external equipment: For example; Starting and Stopping of Elevators and Motors.

A 'Control Panel Test' or a test with the ATS in the TEST LOCATION runs the EMERGENCY SOURCE with no load. A no load operation may be detrimental to the engine, and the Engine/Generator Manufacturer should be consulted.

Allow sufficient time on the U timer for engine to safely cool down.

**RECOMMENDED TIMER SETTINGS:**

- T — Restoration to Normal . . . . . 30 minutes (Factory set)
- U — Engine Cooldown/Stop . . . . . 5 minutes (Factory set)
- W — Engine Warmup . . . . . 5 seconds (Factory set)
- P1 — Engine Start . . . . . 3 seconds (Factory set)

**TEST PROCEDURE**

The ATS can be tested in either of two locations:

- 1). AUTO LOCATION
- 2). TEST LOCATION

1). "AUTO LOCATION":

Full Transfer Test — This test checks the complete operation of the ATS by transferring and interrupting the load's power source from 'Normal' to 'Emergency'.

Depress TS (Test Switch) until Generator starts and the 'W' timer times out (timer will indicate ON). ATS will transfer to Emergency.

Release TS (this resets TS to AUTO). Normal restoration timer 'T' will time out (will indicate ON) which will energize the CR relay causing ATS to retransfer back to Normal.

Engine/Generator will shut down after timer U times out. Full Transfer Test is now complete.

2). "TEST LOCATION":

This procedure is recommended for Preventive Maintenance (PM) of ATS without interrupting the Load thru the BYPASS/ISOLATION SWITCH.

NOTE: TEST LOCATION is recommended after maintenance of ATS.

## OPERATION OF AUTOMATIC TRANSFER SWITCH (ATS)

### OPERATION OF ZENITH ACCESSORY MODULE 9

When the Normal Line (NL) voltage falls to the preset dropout point, or if any phase fails, the phase relays (B1,B2,B3) will dropout disconnecting the CR relay. This will de-energize the P1 timer. The P1 timer signals the generator to start.

When the Emergency Line (EL) voltage and frequency reach at least 90% of rated value, the VFMS relay will energize. The W timer then energizes. After the W timer times out the RT relay will now energize to operate the CCE relay thru the SE limit switch. The CCE then energizes the CE solenoids. The load is now transferred to the EL supply. The SE limit switch operates to disconnect the CCE relay and the CE solenoid. The ATS is now locked mechanically only. Limit switch SN operates to enable the next transfer back to Normal when NL returns. When NL returns B1, B2 and B3 pick-up to energize the T timer. After the set time delay the T timer contact closes to energize the CR relay. The CR relay will now operate the CCN relay thru the SN limit switch. The CCN energizes the CN solenoid. The load is now transferred to NL supply. The SN limit switch operates to disconnect the CCN relay and the CN solenoid. The ATS is now locked mechanically only. Limit Switch SE operates to enable the next transfer back to Emergency when NL fails.

## MAINTENANCE

### ELECTRICAL TEST:

The ATS may be electrically tested for preventative maintenance (refer to page 10, "Test Procedure"). After completion of an electrical test, the ATS should be returned to the Auto Operation Mode. If the ATS malfunctions, troubleshoot the switch, referring to page 12, and replace any faulty part(s) immediately.

### INSPECTION

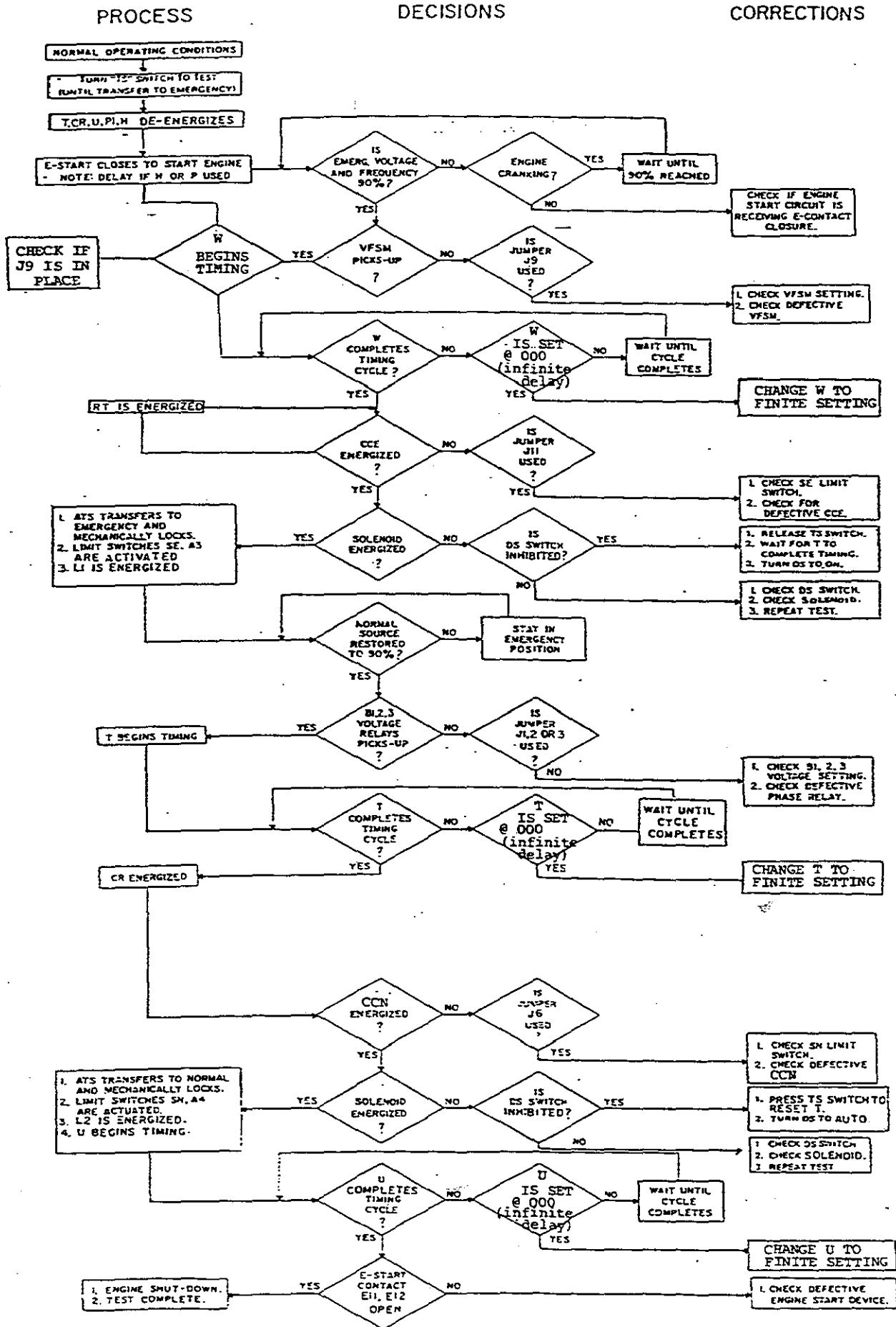
**CONTACTS** - The movable and stationary contacts are a vital part of the ZBTSH and must be kept clean. To inspect the ATS contacts, place ATS in Isolate location (see page 8). Examine the contacts.

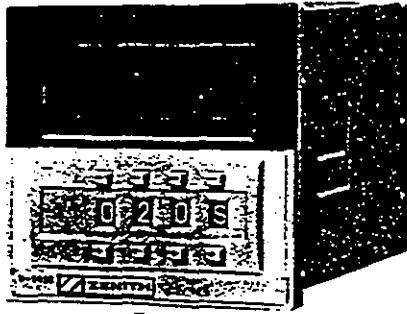
Any surface deposits must be removed with a clean cloth (DO NOT USE EMERY CLOTH OR A FILE).

After the movable and stationary contacts are wiped clean (no discoloration or deposits) return the ZBTSH to Auto Mode.

**CURRENT CARRYING PARTS** - An easily detected but abnormal condition is the discoloration of current carrying parts (particularly copper). Discoloration appears as darkened materials or finishes. Any discolored parts should be cleaned. **WARNING: ANY MAINTENANCE SHOULD ONLY BE DONE WHILE THE POWER IS OFF!** If the discoloration persists, consult the factory.

TABLE 3 "TROUBLE SHOOTING"





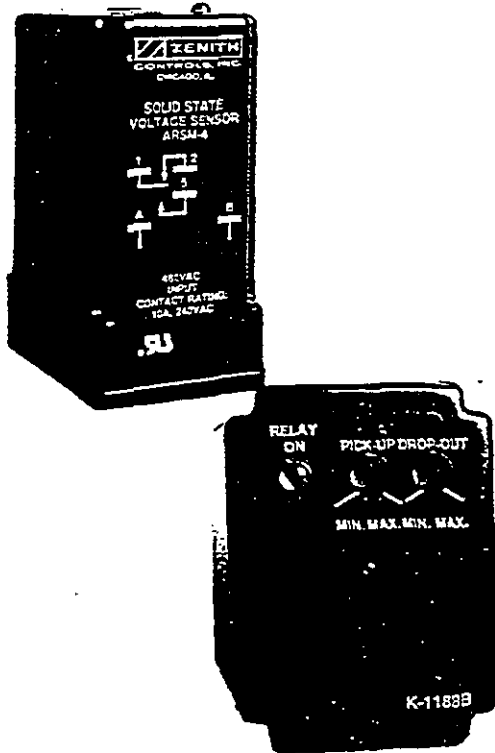
New Solid State Time Delay

Accessories T, U, W Solid State Timers Adjustable in Seconds, Minutes and Hours (Plug-In Style).

To select a time unit, operate the pushbuttons of the rightmost thumbwheel switch until the desired time unit is shown in window. The time unit can be selected by pushing the plus (+) bottom button or the minus (-) top button. The desired time is specified by operating the three thumbwheel switches in the middle of the front panel.

Setting of the timer at 000 will result in an infinite delay. The min. setting for OSA-A timers is  $\frac{1}{10}$  of 1 second as shown. See instructions.

0	0	1	0.1 Sec.
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### Close Differential (ARSM) Relay Adjustment

The voltage points at which the relay operates are adjustable. When the relay pulls in, an audible click is heard, and the LED will come on.

### Setting the Relay:

If the relay should be set with a variable voltage supply (Variac):

1. Turn pick-up control fully clockwise.
2. Turn drop-out control fully counterclockwise.
3. Set Variac pick-up voltage to desired level.
4. Very slowly rotate pick-up adjustment counterclockwise until relay picks up. (LED will energize).
5. Set Variac drop-out voltage to desired level.
6. Very slowly rotate drop-out adjustment clockwise until relay drops out (LED de-energizes).

Verify settings by raising voltage until relay picks up, then lower voltage until relay drops out, making sure that relay operates at desired voltage levels.

## LUBRICATION

The cams and gears of the ZBTSH are lubricated with Dow Chemicals "Molykote" (321R or GN paste). These lubricants provide adequate lubrication for a clean and properly maintained switch's lifetime. Should debris contaminate the mechanism, clean and apply additional lubricants. Mobiltemp SHC-32 is used on isolating contacts.

### LUBRICATION MAINTENANCE CHART

Date Inspected	Date Lubricated	Lubricant Used (Cams) (Gears)	Notes



## TORQUE REQUIREMENTS FOR FIELD CONNECTIONS

<b>NOTICE</b>	
<b>TIGHTENING TORQUES FOR FIELD WIRING TERMINALS</b>	
Socket Size Across Flats, Inch	Tightening Torque Pound-Inches
1/8	45
5/32	100
3/16	120
7/32	150
1/4	200
5/16	275
3/8	375
1/2	500
9/16	600

### TORQUE REQUIREMENTS FOR ELECTRICAL CONNECTIONS

All current carrying parts use compression washers and should be torqued to the values presented below.  
 Caution: DO NOT OVERTORQUE WASHERS; follow the given torque values.

#### TORQUE REQUIREMENTS (inch - lb. except denoted by + are ft. - lb.)

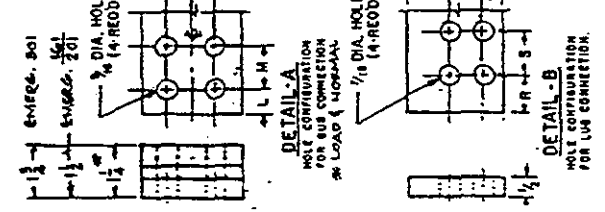
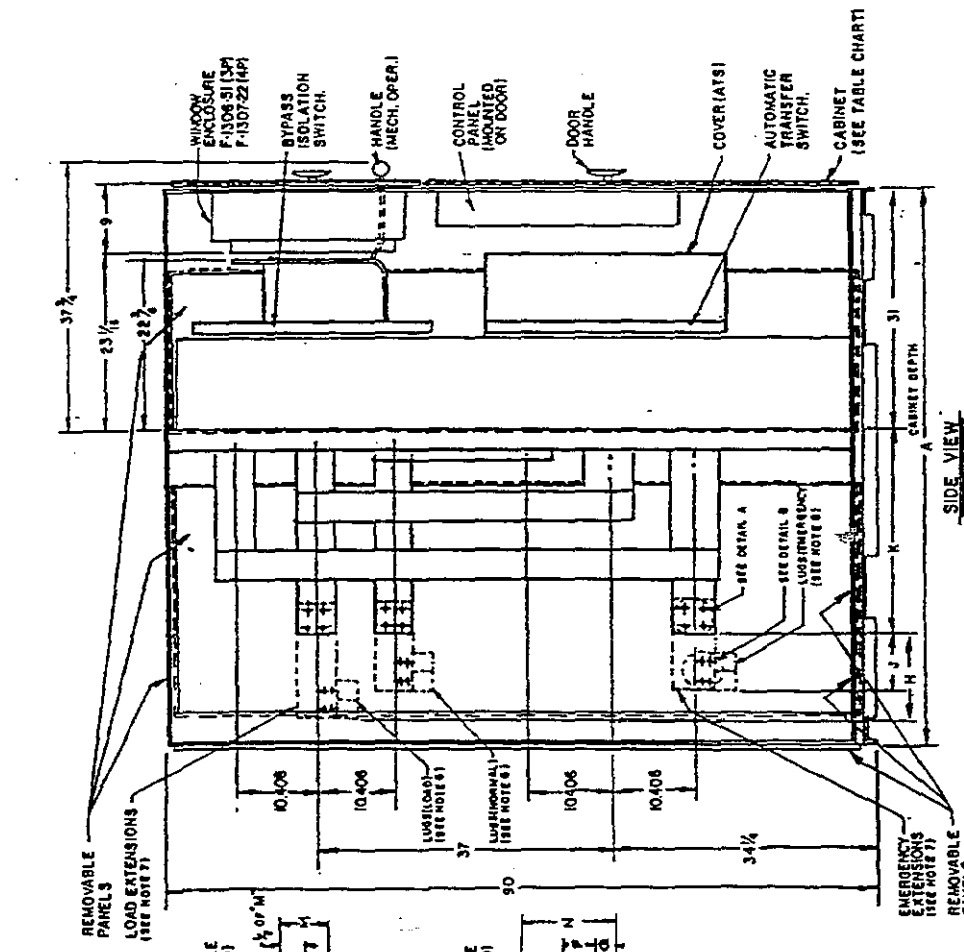
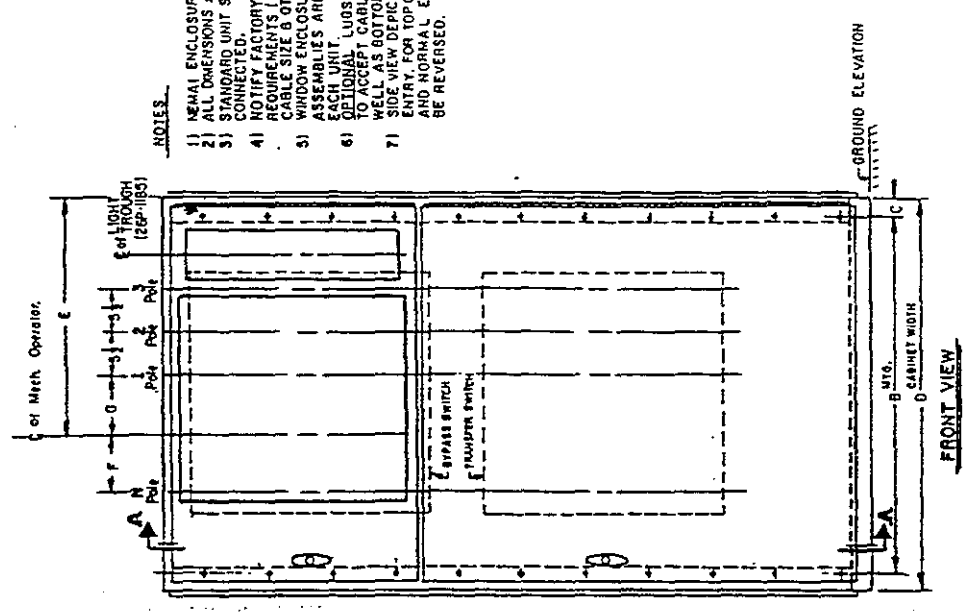
BOLT SIZE	GRADE 5	SOCKET HEAD	SET SCREW	COMPRESSION WASHERS	
				1	2
1/4 - 20	75	120	52	80	87
5/16 - 18	157	225	105	159	170
3/8 - 16	+23	412	165	+23	+26
1/2 - 13	+57	1030	386	+56	+59

#### WIRE CONNECTION TIGHTENING TORQUE

WIRE COND. SIZE AWG or MM	SCREW DRIVER TORQUE (inch - lb.)
18 - 16 AWG	19
14 - 8	19
6 - 4	36

#### LUG BOLTING TORQUE

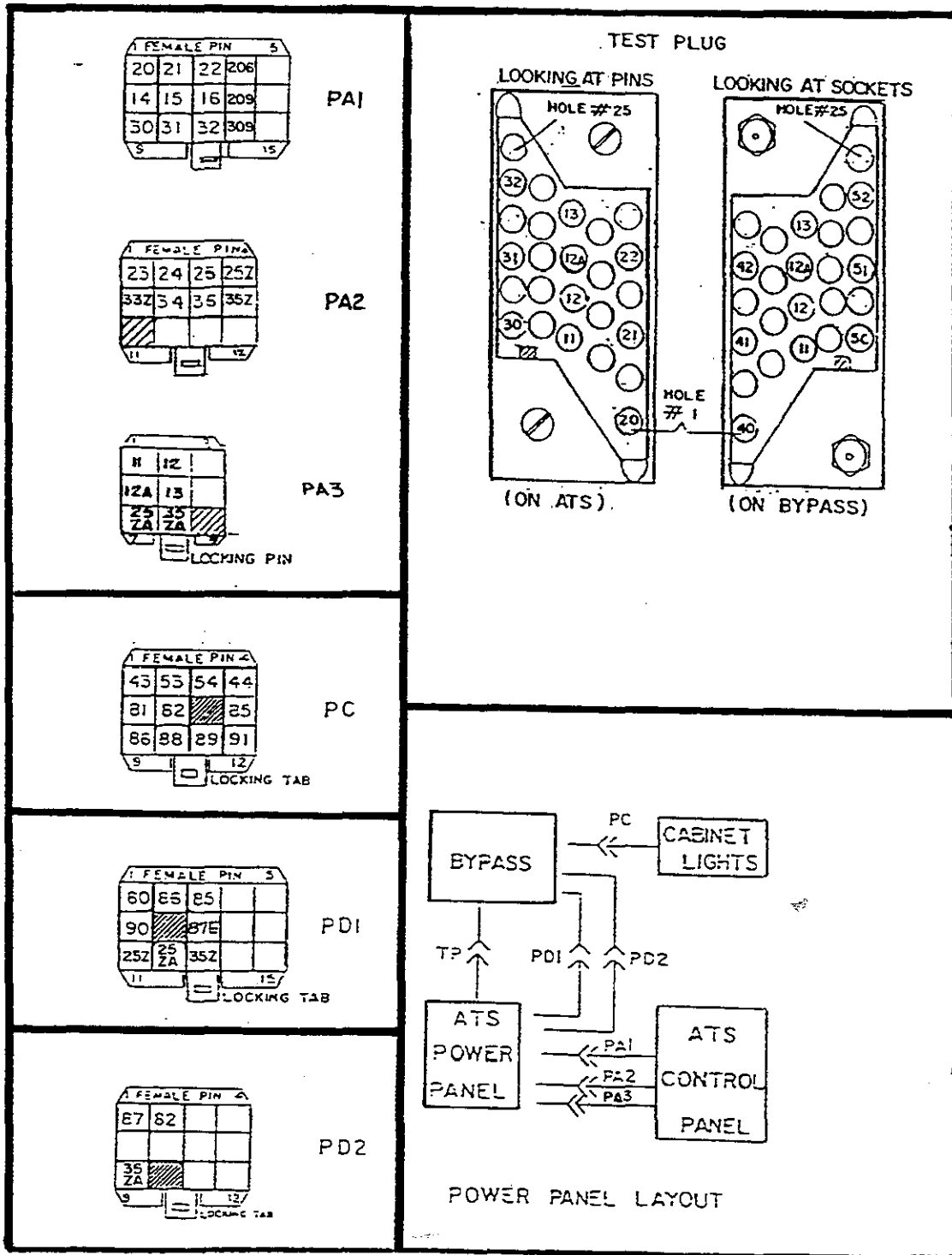
BOLT DIA. (inch)	TORQUE (ft. - lb.)
1/4 OR LESS	6
5/16	11
3/8	19
7/16	30
1/2	40
5/8 OR MORE	55



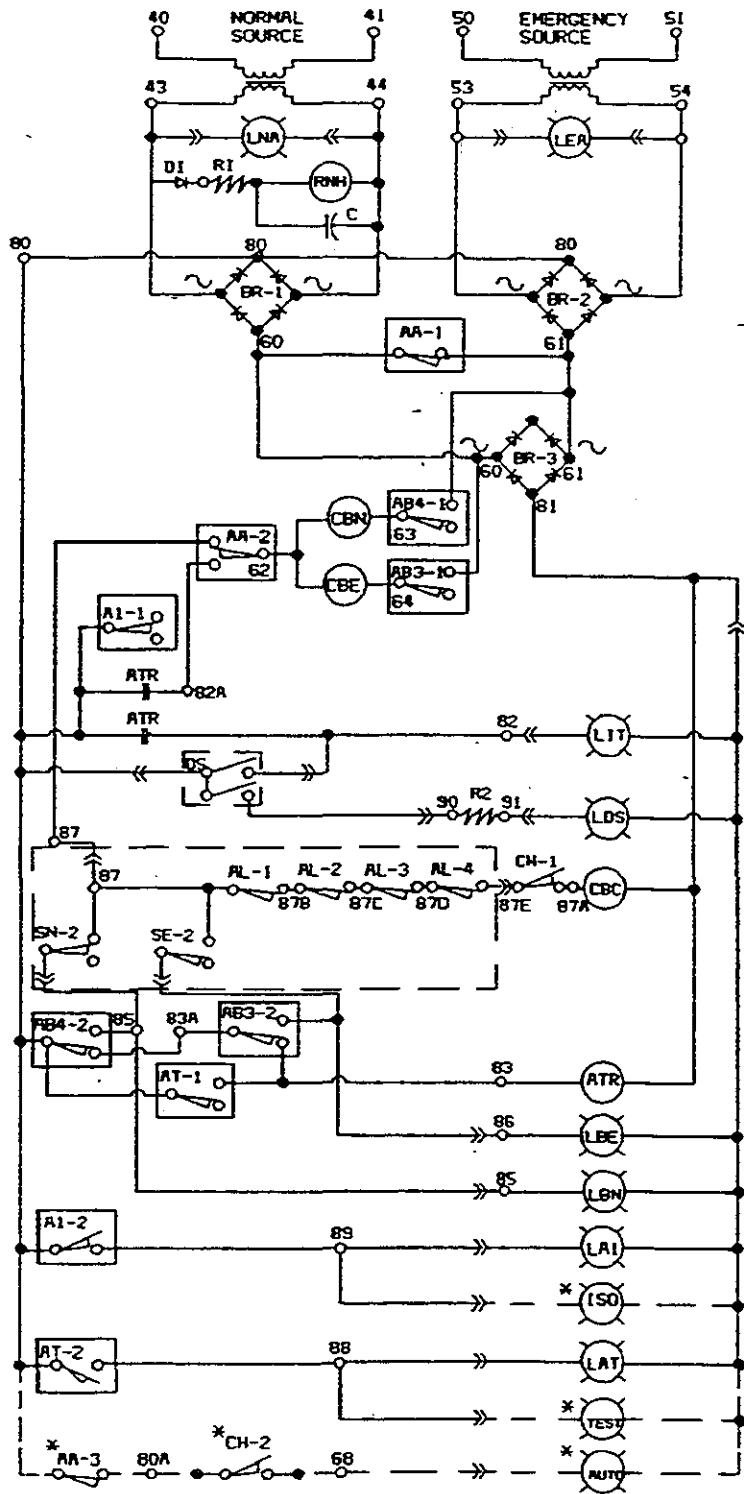
- NOTES**
- 1) METAL ENCLOSURE.
  - 2) ALL DIMENSIONS  $\pm 1/4$ .
  - 3) STANDARD UNIT SUPPLIED AS BUS CONNECTED.
  - 4) NOTIFY FACTORY OF SPECIFIC JOB REQUIREMENTS (ENTRY LOCATION, CABLE SIZE & QTY, FOR LOGS).
  - 5) WINDOW ENCLOSURE & LIGHT THROUGH EACH UNIT LOGS MAY BE ORIENTED VERTICALLY OR HORIZONTALLY.
  - 6) UNIT LOGS MAY BE ORIENTED VERTICALLY OR HORIZONTALLY.
  - 7) SIDE VIEW DEPICTS BOTTOM CABLE ENTRY, FOR TOP CABLE ENTRY, LOAD AND NORMAL EXTENSION WILL BE REVERSED.

SWITCH, AMP. POLE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
ZBTSH 80-200A 3P	80	34 1/2	2 1/4	40	30 3/8	—	3 1/2	7 9/16	5 1/8	17 1/16	9/4	1 1/8	3	1 1/8	1/2	1 1/4	2 1/2
ZBTSH 80-200A 4P	80	44 1/4	2 1/8	50	30 3/8	7 3/8	7 3/8	7 15/16	5 1/8	17 1/16	9/4	1 1/8	3	1 1/8	1/2	1 1/4	2 1/2
ZBTSH 300A	72	34 1/2	2 1/4	40	30 3/8	—	3 1/2	9 3/16	5	26 1/4	1 1/8	2 1/4	5	1 1/8	9/16	1 1/4	2 1/2
ZBTSH 300A	72	44 1/4	2 1/8	50	30 3/8	7 3/8	7 3/8	9 3/16	5	26 1/4	1 1/8	2 1/4	5	1 1/8	9/16	1 1/4	2 1/2

# DISCONNECT PLUGS ZBTSH 1600-3000 AMPS

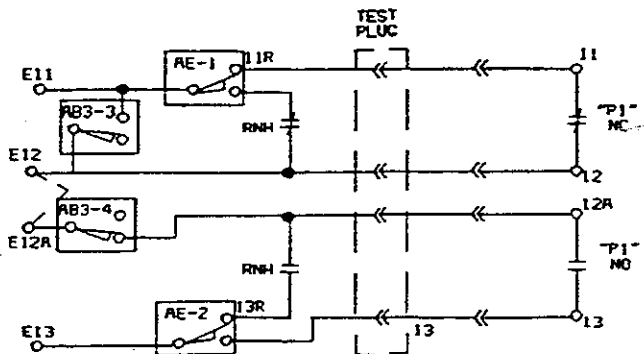


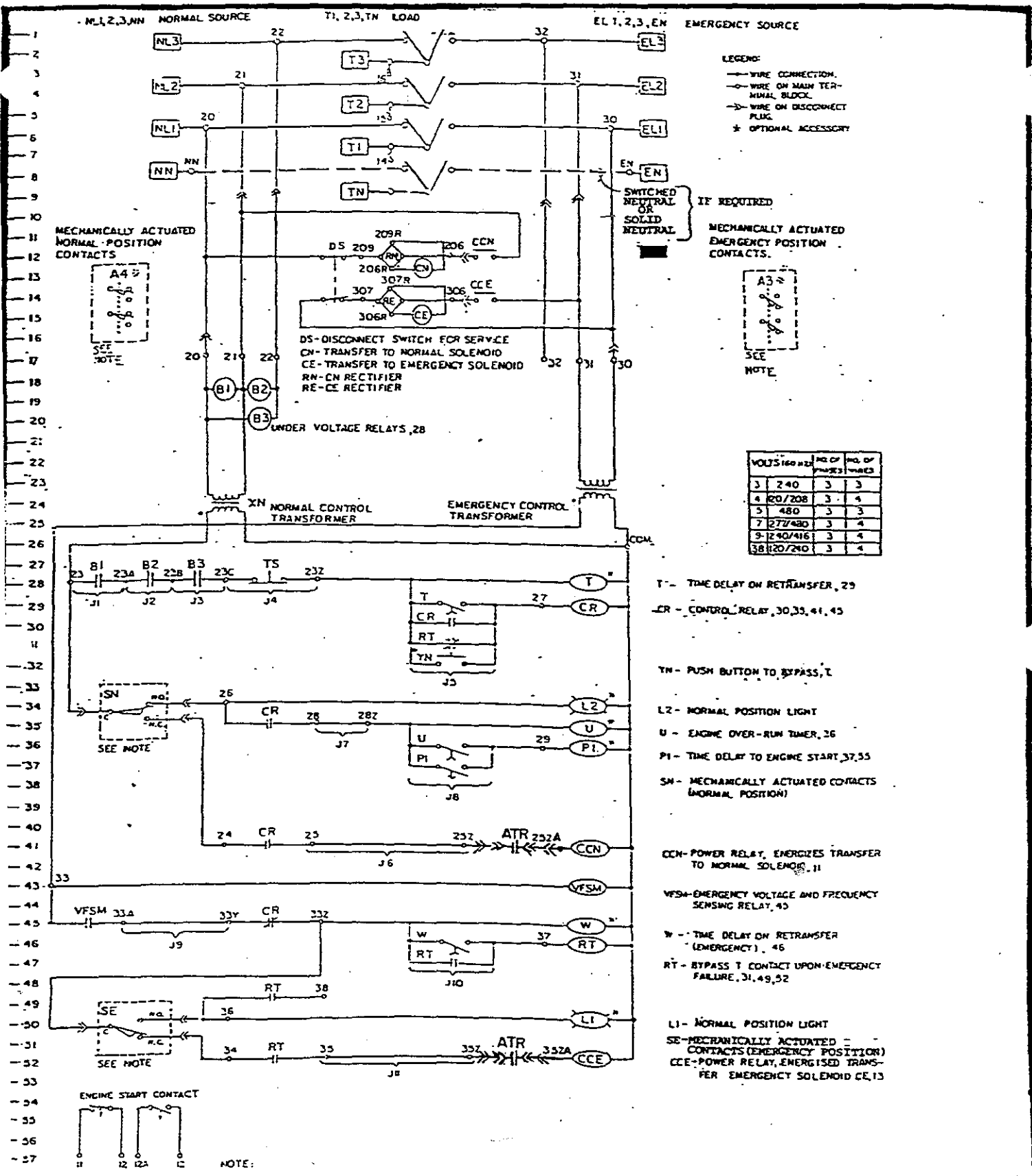




- LNA-NORMAL LIGHT AVAILABLE
- LEA- EMERGENCY LAMP AVAILABLE
- RNH- RELAY NORMAL HOLD. 4,28,30
- AA-1,2,3-AUTO LIMIT SWITCH. 7,10,26
- BR-1,2,3- BRIDGE RECTIFIER
- CBN- NORMAL SOLENOID. 10
- CBE- EMERGENCY SOLENOID. 11
- A1-1,2- ISOLATE LIMIT SWITCH. 11,22
- ATR- AUTO TEST RELAY. 13,19
- LIT- LAMP INHIBIT TRANSFER. 13
- LDS- LAMP DISCONNECT SWITCH "INHIBIT" POSITION. 15
- CBC- CRANK SOLENOID. 16
- AT-1,2- TEST LIMIT SWITCH. 19,23
- CH-1,2- CRANK HANDLE LIMIT SWITCHES
- LBE- LAMP BYPASS EMERGENCY. 19
- LBN- LAMP BYPASS NORMAL. 20
- LAI/ISO- LAMP ATS ISOLATE. 22
- LAT/TEST- LAMP ATS TEST POS. 24
- AUTO- LAMP ATS AUTO POS. 26
- AB4-1,2- BYPASS NORMAL. 9,18
- AB3-1,2,3,4- BYPASS EMERGENCY 10, 18, 28, 30
- AL- 1,2,3,4- ATS LATCHED. 15

NOTES:  
 WIRE NUMBER E12 BECOMES WIRE NUMBER 12 AFTER THE TEST PLUG (TP).  
 LOCATED ON ATS POWER PANEL.  
 \* OPTIONAL





LEGEND:  
 — WIRE CONNECTION  
 ○ WIRE ON MAIN TERMINAL BLOCK  
 ⊳ WIRE ON DISCONNECT PLUG  
 \* OPTIONAL ACCESSORY

MECHANICALLY ACTUATED NORMAL POSITION CONTACTS

MECHANICALLY ACTUATED EMERGENCY POSITION CONTACTS

DS-DISCONNECT SWITCH FOR SERVICE  
 CN-TRANSFER TO NORMAL SOLENOID  
 CE-TRANSFER TO EMERGENCY SOLENOID  
 RN-CN RECTIFIER  
 RE-CE RECTIFIER

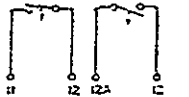
B1 B2 B3 UNDER VOLTAGE RELAYS, 28

XN NORMAL CONTROL TRANSFORMER  
 EMERGENCY CONTROL TRANSFORMER

VOLTS 160 #12	NO. OF PHASES	NO. OF WIRES
3	240	3 3
4	20/208	3 4
5	480	3 3
7	27/480	3 4
9	12/4/16	3 4
38	20/240	3 4

- T - TIME DELAY ON RETRANSFER, 29
- CR - CONTROL RELAY, 30, 33, 41, 43
- YN - PUSH BUTTON TO BYPASS, T
- L2 - NORMAL POSITION LIGHT
- U - ENGINE OVER-RUN TIMER, 26
- PI - TIME DELAY TO ENGINE START, 37, 35
- SN - MECHANICALLY ACTUATED CONTACTS (NORMAL POSITION)
- CCN - POWER RELAY, ENERGIZES TRANSFER TO NORMAL SOLENOID, 11
- VFSM - EMERGENCY VOLTAGE AND FREQUENCY SENSING RELAY, 40
- W - TIME DELAY ON RETRANSFER (EMERGENCY), 46
- RT - BYPASS T CONTACT UPON EMERGENCY FAILURE, 31, 49, 32
- L1 - NORMAL POSITION LIGHT
- SE - MECHANICALLY ACTUATED CONTACTS (EMERGENCY POSITION)
- CCE - POWER RELAY, ENERGISED TRANSFER EMERGENCY SOLENOID CE, 13

ENGINE START CONTACT



NOTE:  
 LOCATED ON POWER PANEL

®



**ZENITH**

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