



CONTROLS, INC.

46R-5001C

Revised March, 1996

OPERATION AND MAINTENANCE MANUAL

**BYPASS/
ISOLATION
DELAYED
TRANSITION
TRANSFER SWITCH**

**ZBTSDH 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 ZBTSDH 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 ZBTSDH 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 componets. 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

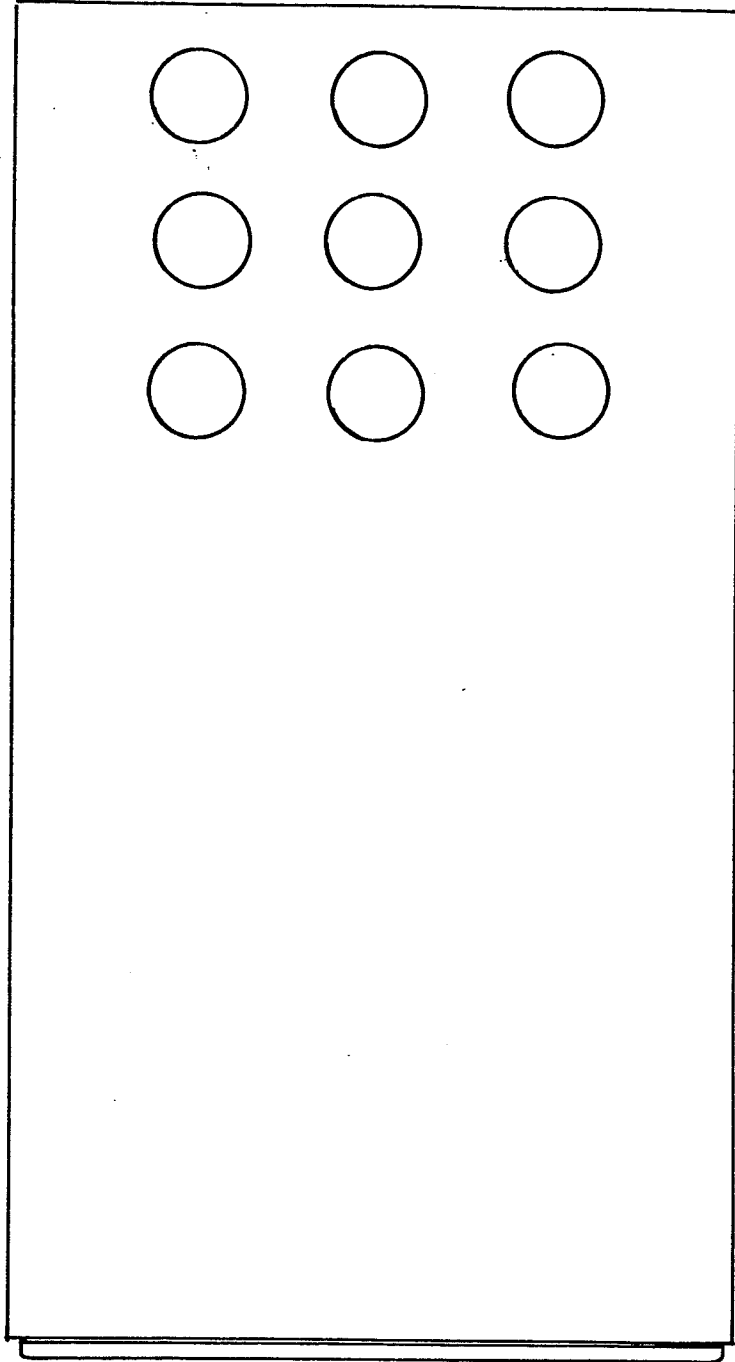
- a) To remove possible oxide, clean cable conductor with a wire brush and apply a contact oxide inhibitor. Insert cables into appropriate lugs.
- b) Connect all auxilliary wires for external electrical operation. Example: E-Start, remote alarm lights or buzzers, motor control contacts, etc. Allow enough 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.

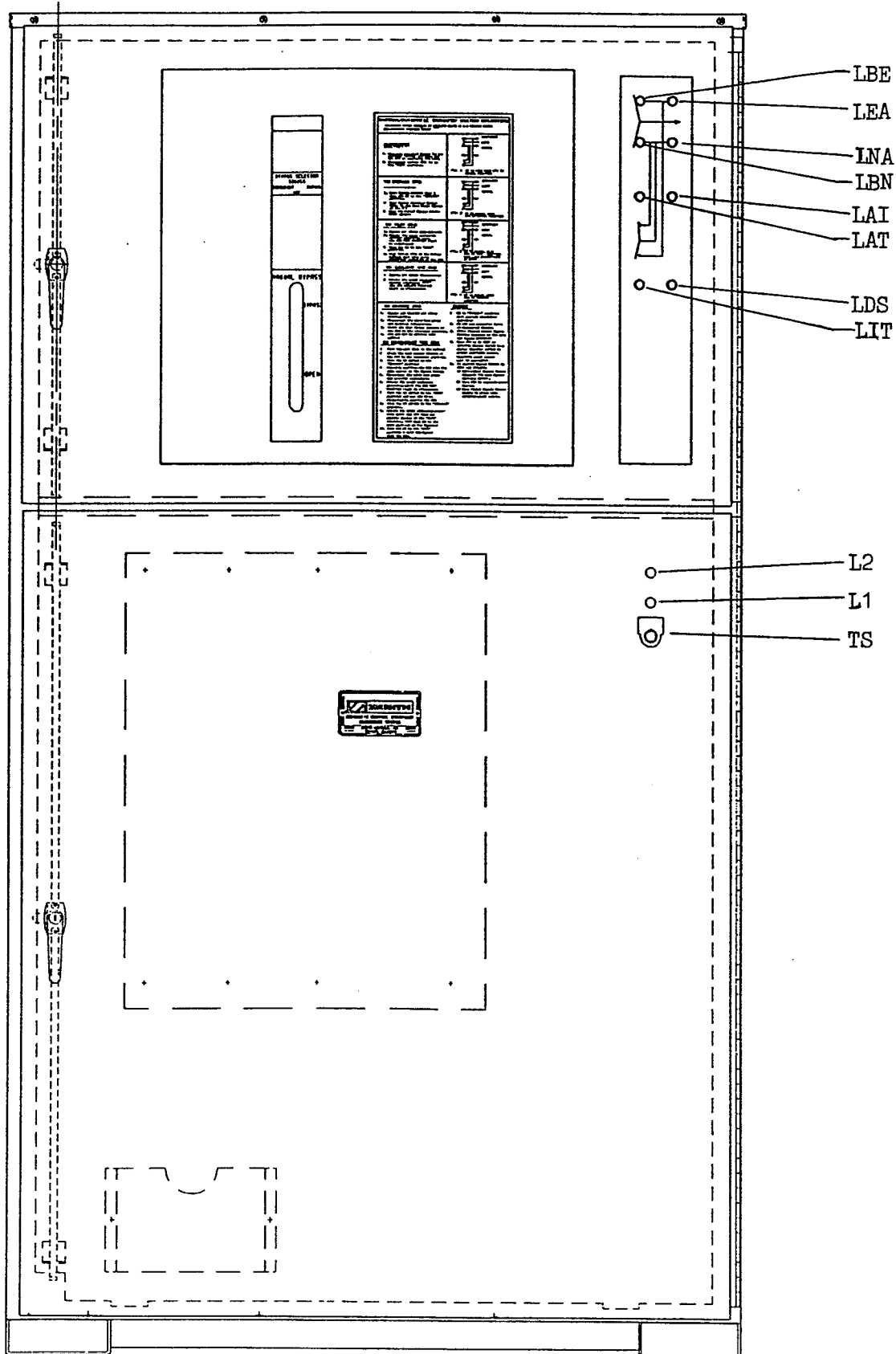
EXAMPLE OF CABLE ENTRIES. TOP VIEW OF CABINET

(BACK)



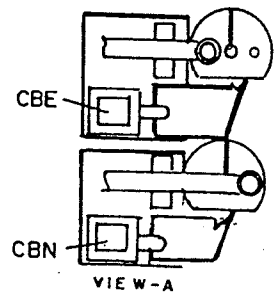
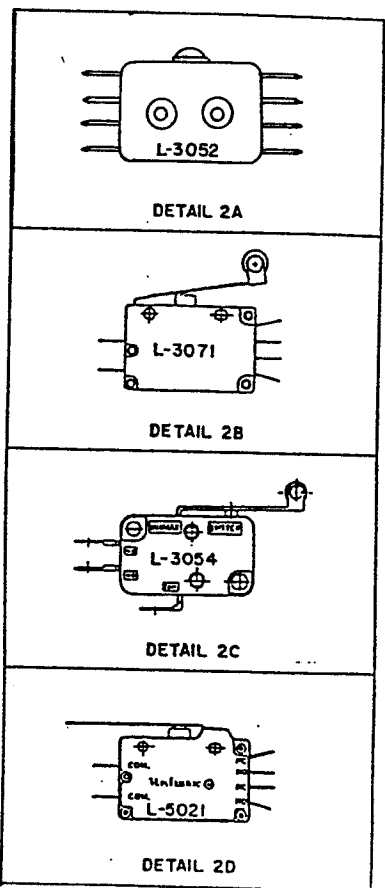
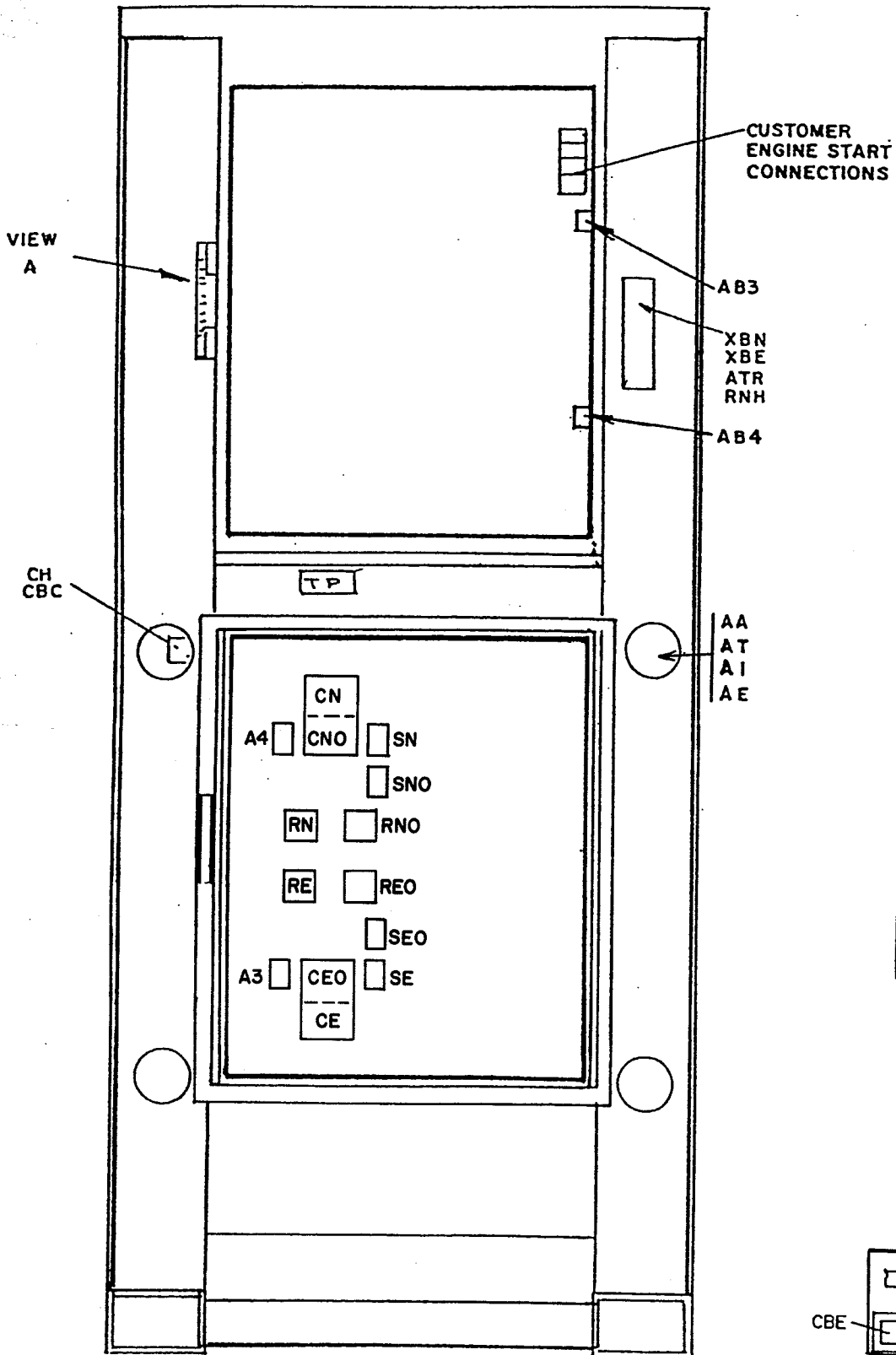
(FRONT)

FIG. 1



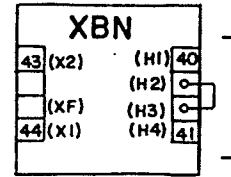
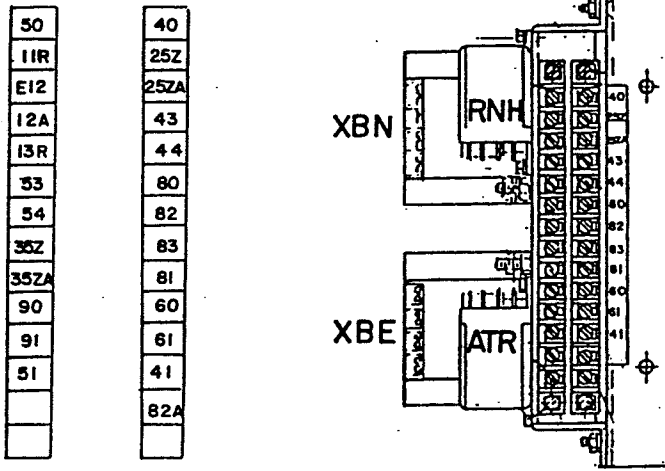
A. CABINET ELECTRICAL PARTS

TAG	DESCRIPTION	PART NUMBER
LNA LEA LBN LBE LAT LAI LIT LOS	Normal Available Indicator (G) Emergency Available Indicator (R) Bypass Normal Location Indicator (G) Bypass Emergency Location Indicator (R) ATS Test Position Indicator (A) ATS Isolate Position Indicator (A) ATS Inhibit Indicator (R) ATS Disconnect Switch "Inhibit" Indicator (R) Flashing Bulb	PS-1272
	COMMON PARTS BYPASS INDICATORS	
	Bulb Socket Red Lens (R) Green Lens (G) Amber Lens (A)	Y500005 PS-5046 PS-5047 PS-5048 PS-5049
L1 L2	ATS Emergency Position Indicator ATS Normal Position Indicator Green Lens (Normal) Red Lens (Emergency) Bulb Socket Normal/ Emergency Nameplate Emergency Bulb Normal Bulb	PS-5048 PS-5047 PS-5046 V-1502 PS-5105 PS-5105
TS	Test Switch Operator, Momentary Contact Block N.C. Name Plate Contact Mounting Base	L-1025 L-1029 V-1503 PS-3473



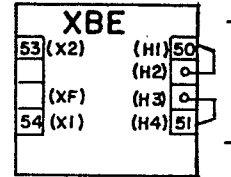
TAG	DESCRIPTION	PART NUMBER						
		STOCK NUMBER BY AMPERAGE						
		1600 A	2000 A	3000 A				
NL1,2,3 EL1,2,3 T1,2,3	Cable Connection at Rear	S-1392F(2) OPTIONAL (8)600MCM-2	S-1392F(2) OPTIONAL (8)600MCM-2	S-1392F(2) OPTIONAL (8)600MCM-2				
STAT(BP)	Stationary Contact Assembly(Bypass)	S-2308	S-2308	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 220/440 volts 240/480 volts 380 volts 575 volts 600 volts		K-3061 K-3063 K-3064 K-3062 K-3067 K-3065 K-3066				
CN/CNO, CE/CEO	Main Operating Coils VOLTAGE SYSTEM							
No.	Volts	Ph	Wire	Coil Volts	Pole	1600A	2000A	3000A
-1	120	1	2	120	2	SPO	SPO	SPO
-2	120/240	1	3	240	2	K-2151	K-2151	K-2151
					3	K-2151	K-2151	K-2151
-3	240	3	3	240	3	K-2151	K-2151	K-2151
-4	120/208	3	4	208	3,4	K-2151	K-2151	K-2151
-5	480	3	3	480	3	K-2160	K-2160	K-2160
-6	575	3	3	575/600	3	SPO	SPO	SPO
-7	277/480	3	4	480	3	K-2160	K-2160	K-2160
					4	K-2160	K-2160	K-2160
-8	120/240	2	4	240	4	K-2151	K-2151	K-2151
-9	240/416	3	4	416	3	SPO	SPO	SPO
SN/SNO	ATS Normal Position Coil Cutout Sw.					26P1250		
SE/SEO	ATS Emerg. Position Coil Cutout Sw.					26P1249		
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)		
AT1,2	ATS Isolate Location Switch							
AT1,2	ATS Test Location Switch					L-3071 (Detail 2b)		
AB3/A	Bypass Emergency Position Switch							
AB4/A	Bypass Normal Position Switch					L-5021 (Detail 2d)		
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 SYSTEMS

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



TYPICAL JUMPERS & WIRING FOR 208 & 240 VOLT SYSTEMS

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

D. ATS CONTROL PANEL

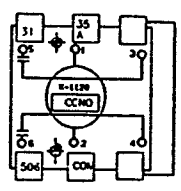
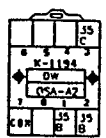
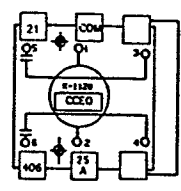
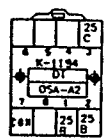
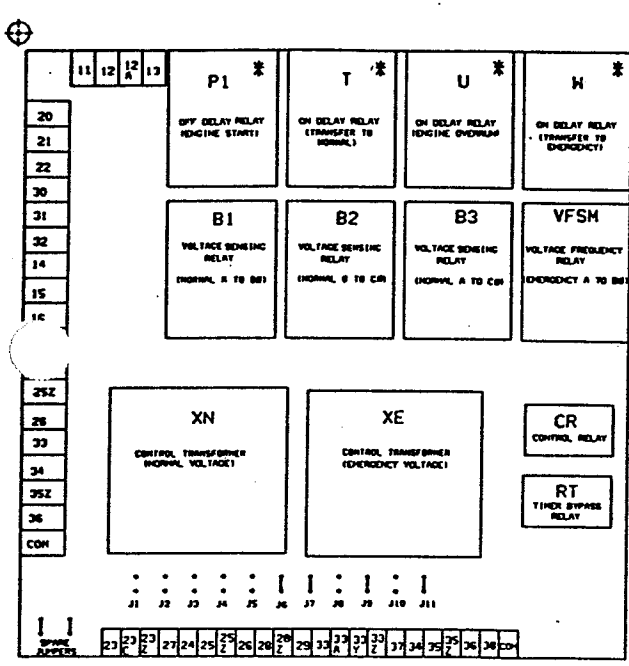
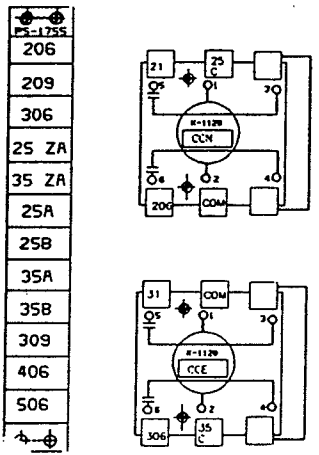


CHART 1

JUMPER	CONNECTS POINTS	REMOVE WHEN ACCESSORIES USED
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 CNO/CEO	CN/CE Transfer Control Relays CNO/CEO Transfer Control Relays	120 Volts	K-1120
DT/DW	Time Delay Neutral to Normal/Emergency	120 Volts	K-1230

(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
PI	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.

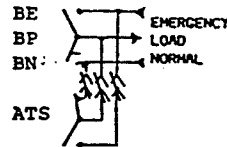


FIG. 1 BP IN OPEN WITH ATS IN NORMAL POSITION.

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.

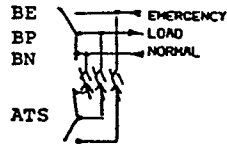


FIG. 2 BP IN NORMAL WITH ATS IN NORMAL POSITION.

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.

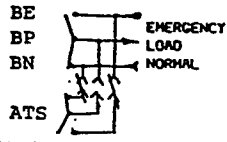


FIG. 3 BP IN NORMAL WITH ATS IN TEST LOCATION (ATS LOAD CONNECTIONS IS OPEN)

TO ISOLATE THE ATS

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

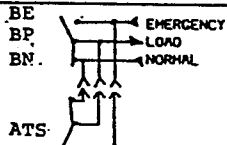


FIG. 4 BP IN NORMAL WITH ATS IN ISOLATE LOCATION

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.

4-1587

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 Normal30 minutes (Factory set)
U	— Engine Cooldown/Stop5 minutes (Factory set)
W	— Engine Warmup5 seconds (Factory set)
P1	— Engine Start3 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)

When the normal line (NL) falls to the preset dropout point, or if any normal phase fails, the phase relay(s) will drop out disconnecting the CR relay. P1 drops out after .5 to 6 seconds (adjustable) and signals generator to start.

When the emergency line (EL) voltage and frequency reach at least 90% of rated value, the VFSM relay is energized. The RT relay is now energized to operate the CCNO relay thru the SE cutout switch causing the main transfer coil CNO to operate. The load is now transferred to the OPEN position. The SNO limit switch operates to disconnect the CCNO relay and CNO transfer coil. The transfer switch is now locked mechanically open. SNO now is activated. This energizes the DW timer. After time setting has lapsed, DW will energize CCE, which will energize main transfer coil CE. The load is now transferred to the emergency line supply. The SE limit switch operates to disconnect the CCE relay and CEO main transfer coil. The transfer switch is now locked mechanically in Emergency position.

When the normal line voltage restores to the preset value, the phase relay(s) (B1,2,3) operate to energize the normal restoration timer T. After the time setting has lapsed, the timer contact closes to energize CR relay. The CCEO relay is now energized thru the SN and SEO limit switches, causing the main transfer coil CEO to operate. The load is now transferred back to the Open position. The SEO limit switch operates to disconnect the CCEO relay and CEO transfer coil. The transfer switch is now locked mechanically open. SEO is now activated, energizing DT timer. After time setting has lapsed, DT will energize CCN which will energize main transfer coil. The load is now transferred to the Normal line supply. The SN limit switch operates to disconnect the CCN relay and CN main transfer coil. The transfer switch is now locked mechanically into Normal position.

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.

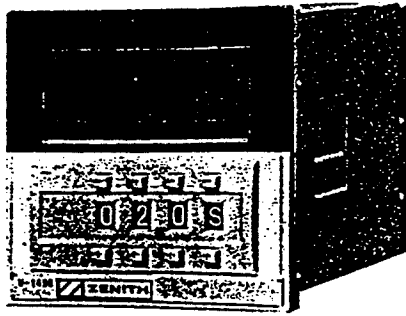
INSPECTION

CONTACTS - The movable and stationary contacts are a vital part of the ZBTSDH 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 ZBTSDH 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.



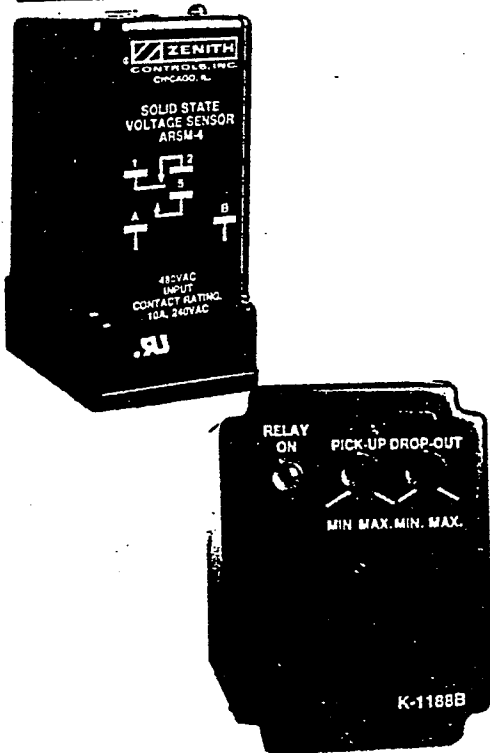
New Solid State Time Delay

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 ZBTSDH 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

NOTICE	
TIGHTENING TORQUES FOR	
FIELD WIRING TERMINALS	
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

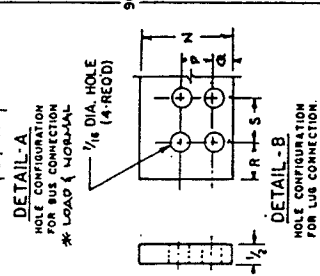
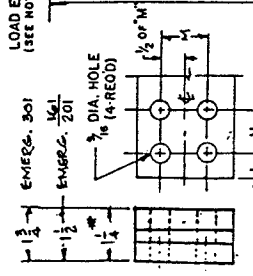
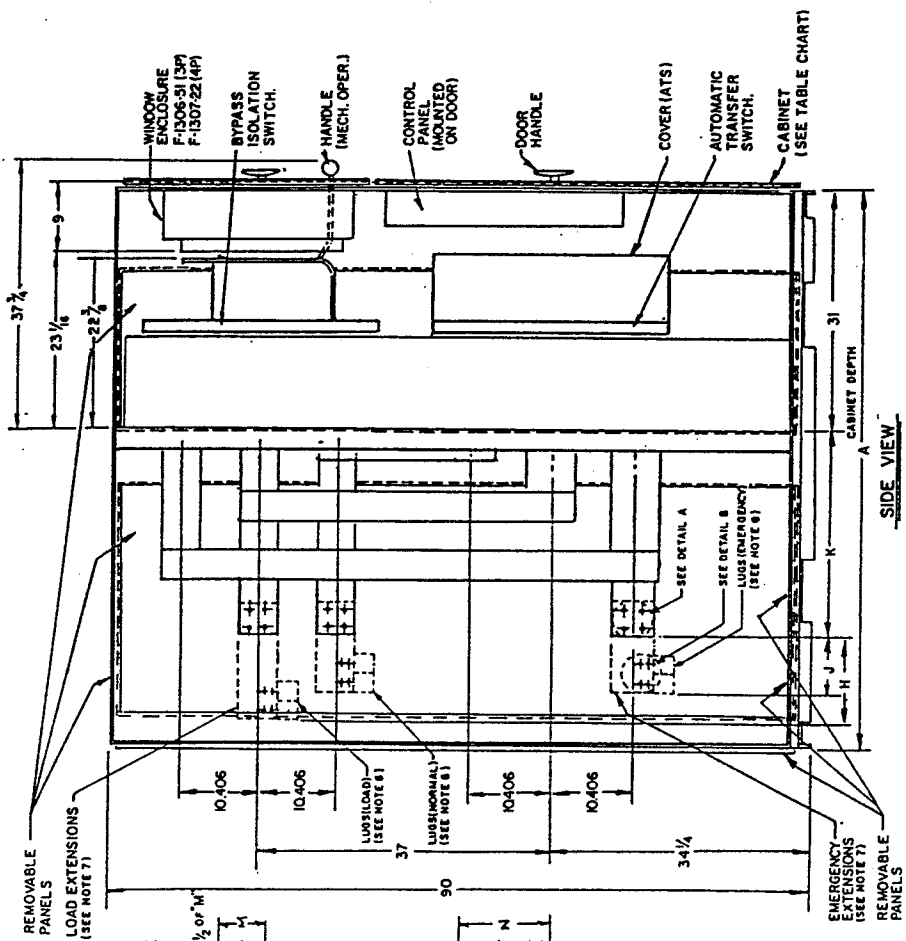
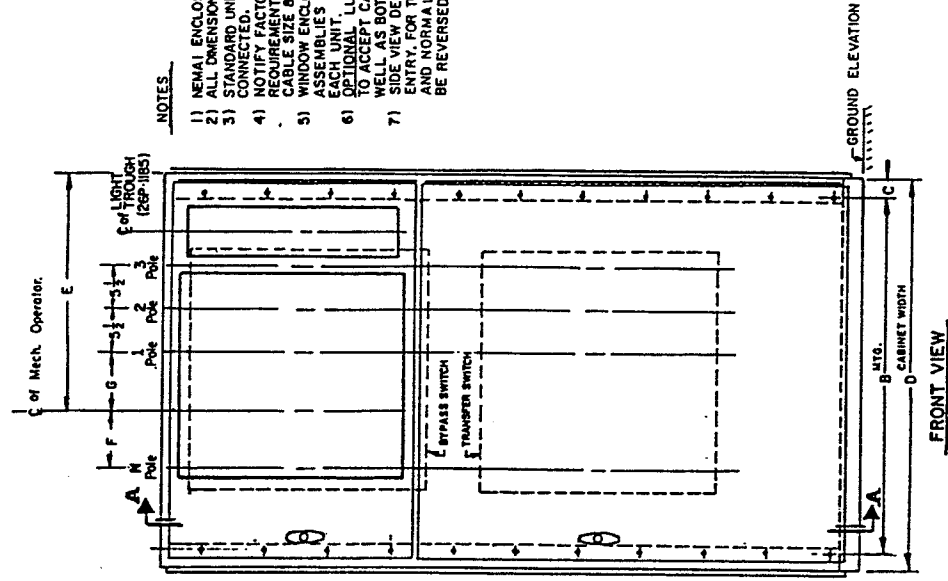
WIRE COND. SIZE AWG or MM	SCREW DRIVER TORQUE (inch - lb.)
18 - 16 AWG	19
14 - 8	19
6 - 4	36

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

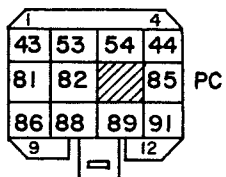
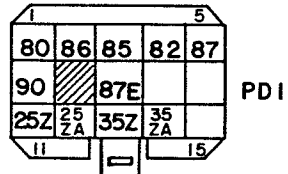
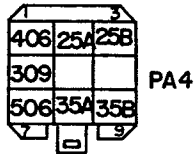
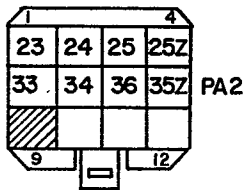
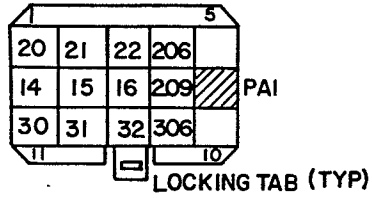
NOTES

- 1) NEMA1 ENCLOSURE,
- 2) ALL DIMENSIONS \pm 1/8.
- 3) STANDARD UNIT SUPPLIED AS BUS NOTIFIED FACTORY OF SPECIFIC JOB.
- 4) NOTIFY FACTORY OF SPECIFIC JOB, CABLE SIZE & LOCATION FOR LOCATION, ASSEMBLIES ARE FURNISHED WITH EACH UNIT.
- 5) WINDOW ENCLOSURE & LIGHT TROUGH OPTIONAL LUGS MAY BE ORIENTED TO ACCEPT CABLING FROM TOP AS WELL AS BOTTOM ENTRY, AS SHOWN. SIDE VIEW DEPICTS BOTTOM CABLE ENTRY. FOR TOP CABLE ENTRY, LOAD AND NORMAL EXTENSION WILL BE REVERSED.

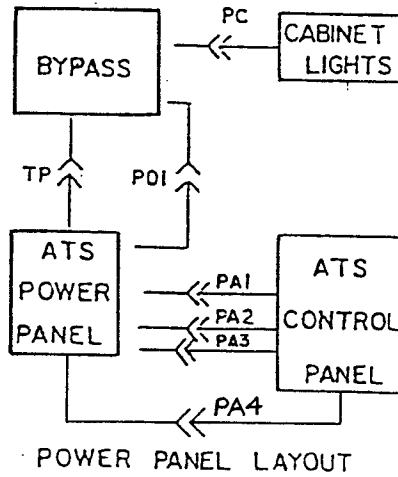
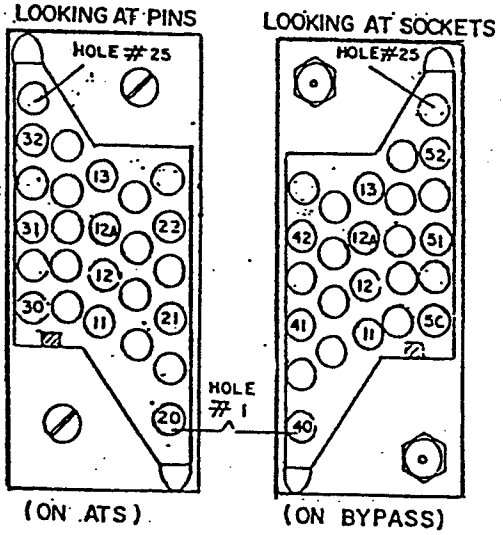


SWITCH, AMP, POLE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	O	R	S
ZBTSDB 160-200A, 3P	60	3 1/2	2 3/8	40	30 3/8	—	5 1/2	7 15/16	5 1/8	17 1/16	3 1/4	1 1/2	3	1 3/8	1/2	1 1/4	2 1/2
ZBTSDB 160-200A, 4P	60	4 1/4	2 7/8	50	30 3/8	7 3/8	7 3/8	7 15/16	5 1/8	17 1/16	3 1/4	1 1/2	3	1 3/8	1/2	1 1/4	2 1/2
ZBTSDB 300A, 3P	72	3 1/2	2 3/4	40	30 3/8	—	5 1/2	9 3/16	5	26 3/8	1 1/8	2 3/4	5	1 3/8	9/16	1 1/4	2 1/2
ZBTSDB 300A, 4P	72	4 1/4	2 7/8	50	30 3/8	7 3/8	7 3/8	9 3/16	5	26 3/8	1 1/8	2 3/4	5	1 3/8	9/16	1 1/4	2 1/2

DISCONNECT PLUGS ZBTSDH 1600-3000 AMPS



TEST PLUG



FIELD NOTES

MODEL NO: _____

SERIAL NO: _____

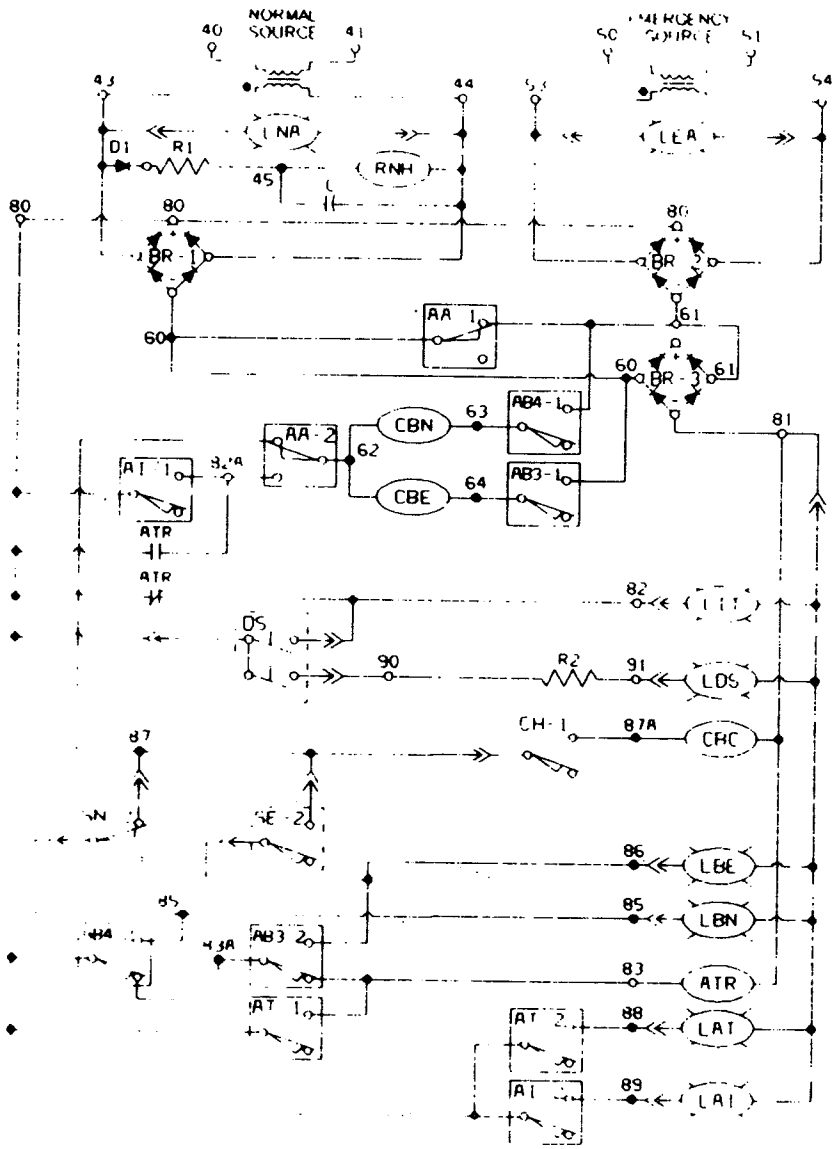
DATE SHIPPED: _____

START-UP DATE: _____

DRAWING SUPPLIED: _____

TEST AND MAINTENANCE NOTES:

DATE	TESTED	OBSERVATIONS	NOTES

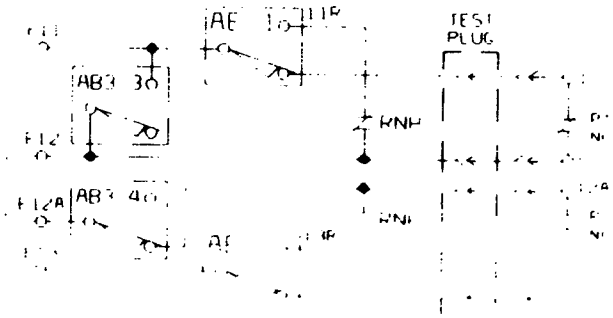


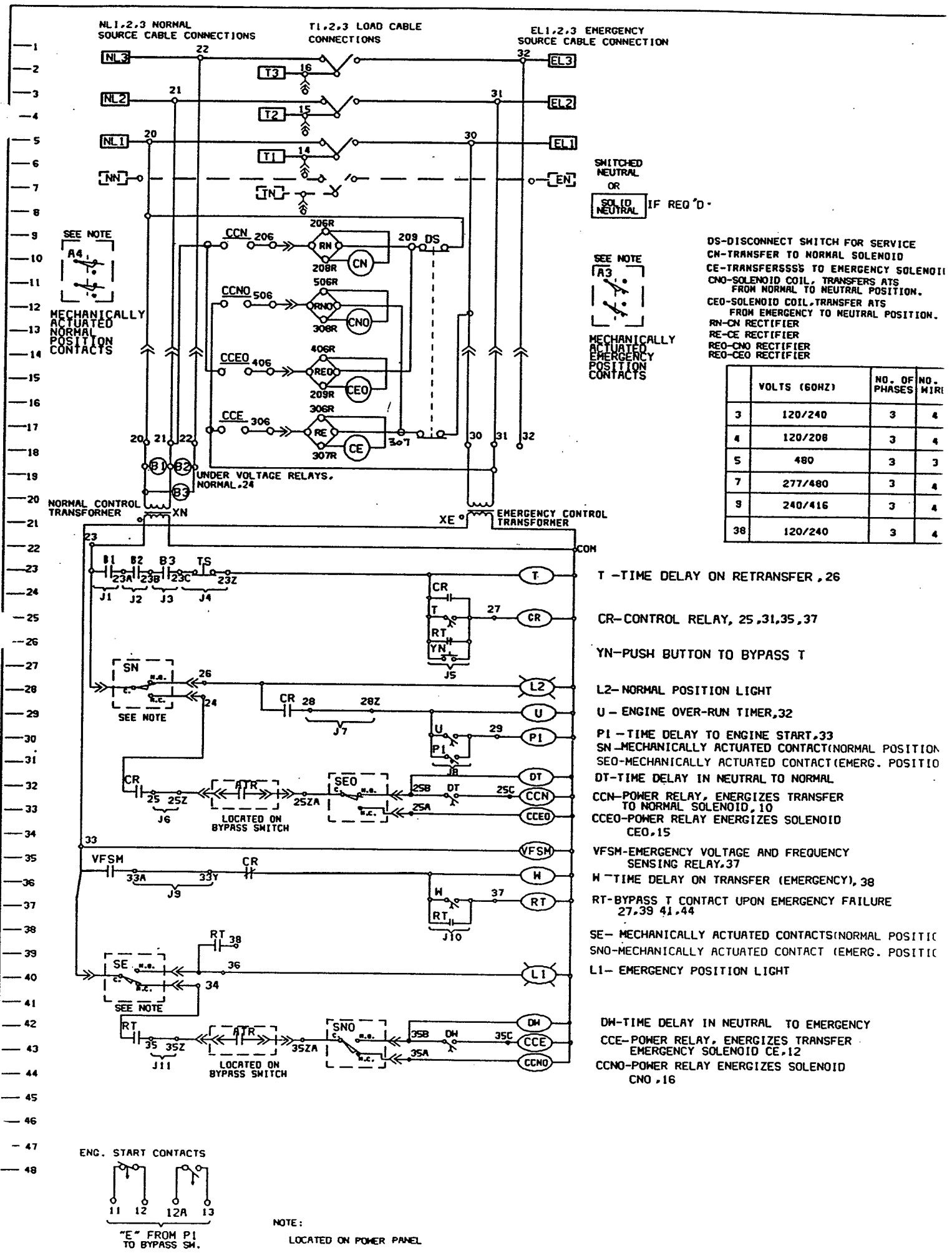
- LNA NORMAL AVAILABLE LIGHT
- LEA EMERGENCY AVAILABLE LIGHT
- RNH RELAY NORMAL HOLD (29, 31)
- BR-1, 2, 3 BRIDGE RECTIFIER
- AA-1, 2 AUTO LIMIT SWITCH (7, 10)
- CBN NORMAL SOLENOID
- CBE EMERGENCY SOLENOID
- AT-1, 2 ISOLATE LIMIT SWITCH (11, 21)
- LIT LAMP INHIBIT TRANSFER
- LDS LAMP DISCONNECT SWITCH INHIBIT POSITION
- CBE CRANE SOLENOID
- CH-1 CRANE HANDLE LIMIT SWITCH
- LBE LAMP BYPASS EMERGENCY
- LBN LAMP BYPASS NORMAL
- ATR AUTOTEST RELAY (12, 13)
- LAT LAMP ATS TEST POSITION
- AT-1, 2 TEST LIMIT SWITCH (14, 22)
- LAI LAMP ATS FOR ATR

AB3-1, 2, 3, 4 HYDRA-EMERGENCY BYPASS
 AB4-1, 2 BYPASS-NORMAL (14, 15)

NOTE:

WIRE NUMBER 112 BECOMES WIRE NUMBER 113 AFTER REWIRING



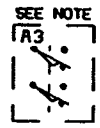
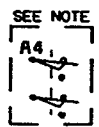


SWITCHED NEUTRAL OR SOLID NEUTRAL IF REQ'D.

DS-DISCONNECT SWITCH FOR SERVICE
 CN-TRANSFER TO NORMAL SOLENOID
 CE-TRANSFER TO EMERGENCY SOLENOID
 CNO-SOLENOID COIL, TRANSFERS ATS FROM NORMAL TO NEUTRAL POSITION.
 CEO-SOLENOID COIL, TRANSFER ATS FROM EMERGENCY TO NEUTRAL POSITION.
 RN-CN RECTIFIER
 RE-CE RECTIFIER
 REO-CNO RECTIFIER
 REO-CEO RECTIFIER

	VOLTS (60HZ)	NO. OF PHASES	NO. WIRES
3	120/240	3	4
4	120/208	3	4
5	480	3	3
7	277/480	3	4
9	240/416	3	4
38	120/240	3	4

T - TIME DELAY ON RETRANSFER, 26
 CR - CONTROL RELAY, 25, 31, 35, 37
 YN - PUSH BUTTON TO BYPASS T
 L2 - NORMAL POSITION LIGHT
 U - ENGINE OVER-RUN TIMER, 32
 PI - TIME DELAY TO ENGINE START, 33
 SN - MECHANICALLY ACTUATED CONTACT (NORMAL POSITION)
 SE - MECHANICALLY ACTUATED CONTACT (EMERG. POSITION)
 DT - TIME DELAY IN NEUTRAL TO NORMAL
 CCN - POWER RELAY, ENERGIZES TRANSFER TO NORMAL SOLENOID, 10
 CCEO - POWER RELAY ENERGIZES SOLENOID CEO, 15
 VFSM - EMERGENCY VOLTAGE AND FREQUENCY SENSING RELAY, 37
 W - TIME DELAY ON TRANSFER (EMERGENCY), 38
 RT - BYPASS T CONTACT UPON EMERGENCY FAILURE 27, 39, 41, 44
 SE - MECHANICALLY ACTUATED CONTACTS (NORMAL POSITION)
 SNO - MECHANICALLY ACTUATED CONTACT (EMERG. POSITION)
 L1 - EMERGENCY POSITION LIGHT
 DW - TIME DELAY IN NEUTRAL TO EMERGENCY
 CCE - POWER RELAY, ENERGIZES TRANSFER EMERGENCY SOLENOID CE, 12
 CCNO - POWER RELAY ENERGIZES SOLENOID CNO, 16

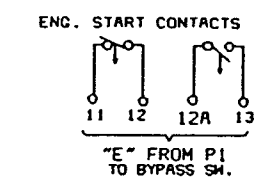


MECHANICALLY ACTUATED NORMAL POSITION CONTACTS

MECHANICALLY ACTUATED EMERGENCY POSITION CONTACTS

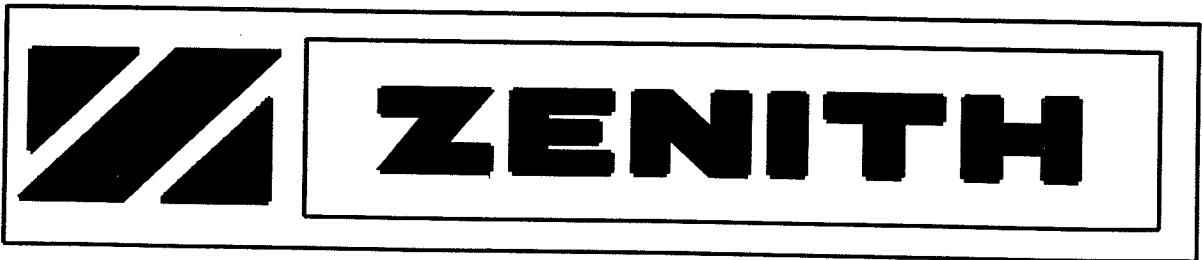
NORMAL CONTROL TRANSFORMER

EMERGENCY CONTROL TRANSFORMER



NOTE: LOCATED ON POWER PANEL

®



CONTROLS INC.

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(312)247-6400