

Effective: April 1994  
NEW INFORMATION

## TYPE ALS-1 AND DLS-1 POWER SUPPLIES



**Before putting this equipment into service, it is recommended that the user of this equipment become acquainted with the information in these instructions. This supply module should not be removed or inserted while the cabinet is energized with dc quantities. Failure to observe this precaution can result in undesired operation or component damage.**

**Some components used on this module are sensitive to and can be damaged by the discharge of static electricity. Electro-static discharge precautions should be observed when handling modules or individual components.**

### 1. APPLICATION

The ALS-1 and DLS-1 power supply modules are used as direct replacement for the ALS and DLS power supplies and isolate the relay system logic and sensing circuits from the station battery. The ALS-1 module provides a source of plus and minus 15 Vdc needed by the analog operational amplifiers and digital logic circuits, while the DLS-1 module provides the additional +15 Vdc capacity for driving large amounts of digital logic circuits and for extra trip outputs.

The ALS-1 and DLS-1 modules (with the AMP connector or the DIN connector), are grouped for ordering purposes as follows:

- G01 (48 Vdc) ALS-1 for Uniflex, LDAR and LCB
- G02 (125 Vdc) ALS-1 for Uniflex, LDAR and LCB
- G03 (250 Vdc) ALS-1 for Uniflex, LDAR and LCB
- G04 (48 Vdc) DLS-1 for UIO and LDAR Option Pkg.
- G05 (125 Vdc) DLS-1 for UIO and LDAR Option Pkg.
- G06 (250 Vdc) DLS-1 for UIO and LDAR Option Pkg.

Parts List 1615C54 (for ALS-1/DLS-1 with AMP connector) shows PC Board 1615C53H01. Parts List 1615C51 (for ALS-1/DLS-1 with DIN connector) shows PC Board 1615C50H01. Both PC Boards are used for all six applications.

### 2. CONSTRUCTION

The ALS-1 and DLS-1 modules are self-contained power supplies with isolated outputs. The ALS-1 consists of two dc/dc converters and the DLS-1 consists of only one converter. A large heat-sink is assembled on the top of the converters in order to dissipate heat evenly. A fuse and all of the circuitry are mounted on a pc board approximately 4.875" x 10". A 2" panel on which are mounted a power ON/OFF switch and test

*All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB representative should be contacted.*

jacks is attached to the pc module. Two LED's, one for input (red) and one for output (yellow) are also visible from front panel. The ALS-1/DLS-1 power supply requires two module spaces in a standard 3 rack unit chassis and is designed to fit in any position in the chassis

### 3. SPECIFICATIONS

#### DC Input

48V(nom)	38 to 66	Vdc @ 1.6 Amps
125V(nom)	88 to 145	Vdc @ 0.62 Amps
250V (nom)	176 to 290	Vdc @ 0.31 Amps

#### DC Output

ALS-1 Supply	+15 volts @ 3 Amps (Max.)
	-15 volts @ 1 Amp (Max.)
DLS-1 Supply	+15 volts @ 4 Amps (Max.)

Regulation on the +15 Vdc and -15 Vdc supplies is  $\pm 100$  mV; All ratings are at the rated input voltages and output loads.

#### 3.1 Isolation

Primary to Secondary	3 kVdc/sec
Primary to Case Gnd	3 kVdc/sec
Secondary to Case Gnd	700 Vdc/sec

#### 3.2 Environmental Data

- a) Ambient Temperature Range
  - For Operation -20°C to +60°C
  - For Storage -40°C to +80°C
- b) Impulse Withstand Level  
5 kV peak, 1.2/50  $\mu$ sec, 0.5 joule (IEC 255-5).
- c) Fast Transient Surge Withstand Capability  
4 kV, 5/50 nsec (IEC 801-4); 5 kV, 10/150 nsec (ANSI C37.90.1).
- d) Oscillatory Surge Withstand Capability  
2.5 kV, 1 MHz (ANSI C37.90.1, IEC 255-6).

### 4. OPERATION

Two compact mini-module dc/dc converters are used for ALS-1 dual output power supply. For DLS-1 single output power supply, only one converter is used. Although each mini-module converter is capable to deliver 100 watts of power it is recommended that a maximum of 60 Watts should be used due to the heat dissipating limitation.

A voltage level detector is designed for monitoring the output voltage(s) and generates a Power Supply Monitor Enable (PSME) signal. The dc output LED (yellow) is illuminated and an alarm relay (RRI) is picked up for the normal operation condition. If any abnormal condition at the secondary is detected, the PSME signal will change state from "High" to "Low" immediately and block any trip action. At the same time, the yellow LED will be turned off and the alarm relay will be dropped out.

The level detector's dc power is supplied by the dc/dc converter and/or from the input PSMP terminal; therefore, even if the local power supply failure occurs, the detector should still work normally. In general, if several ALS-1 and DLS-1 are used in a system, all PSMP terminals should be connected together in parallel and all PSME terminals should be connected in parallel.

The PSMP and PSME (separately) paralleled terminals are required in order to prevent a false trip due to a power supply failure.

### 5. ACCEPTANCE TEST

The following equipment is required:

- Digital voltmeter (DVM)
  - Loads for ALS-1 and DLS-1 supplies  
ALS-1 supply (5 and 15 ohms, 100 W)  
DLS-1 supply (3.75 ohms, 100 W)
  - Dual adjustable dc voltage supply for +15 Vdc and -15 Vdc
  - Rated battery dc power source
- a) Apply a rated dc voltage to the input terminals 33 (bat+) and 35 (bat-) for a power supply with the AMP connector; apply to terminals 30 a/c (Bat+) and 32 a/c (bat-) for a power supply with the DIN connector.
  - b) Turn on the power supply switch.
  - c) Use a digital voltmeter and measure the open circuit voltage between terminals 21(+) & 31 (Com) for +15 volts and 25 (+) & 31 (Com) for -15 volts for a power supply with AMP connector. The -15 V is for ALS-1 only. For a power supply with DIN connector, the following terminals should be used — 18 a/c (+) & 28 a/c (Com) for +15 V and 20 a/c (+) & 28 a/c (Com) for -15 V.

The error of +15 and -15 V should be within 0.1 volts.

- d) Load the outputs of the supplies per the following table.

ALS-1 Supplies	
+15 Vdc Output	(5 ohms, 100 W) 3A
-15 Vdc Output	(15 ohms, 100 W) 1 A
DLS-1 Supplies	
+15 Vdc Output	(3.75 ohms, 100 W) 4 A

The output voltages should not change by 1% of the rated output values. No alarm should occur and the dc output LED should remain lit as the load is changed from full to no load.

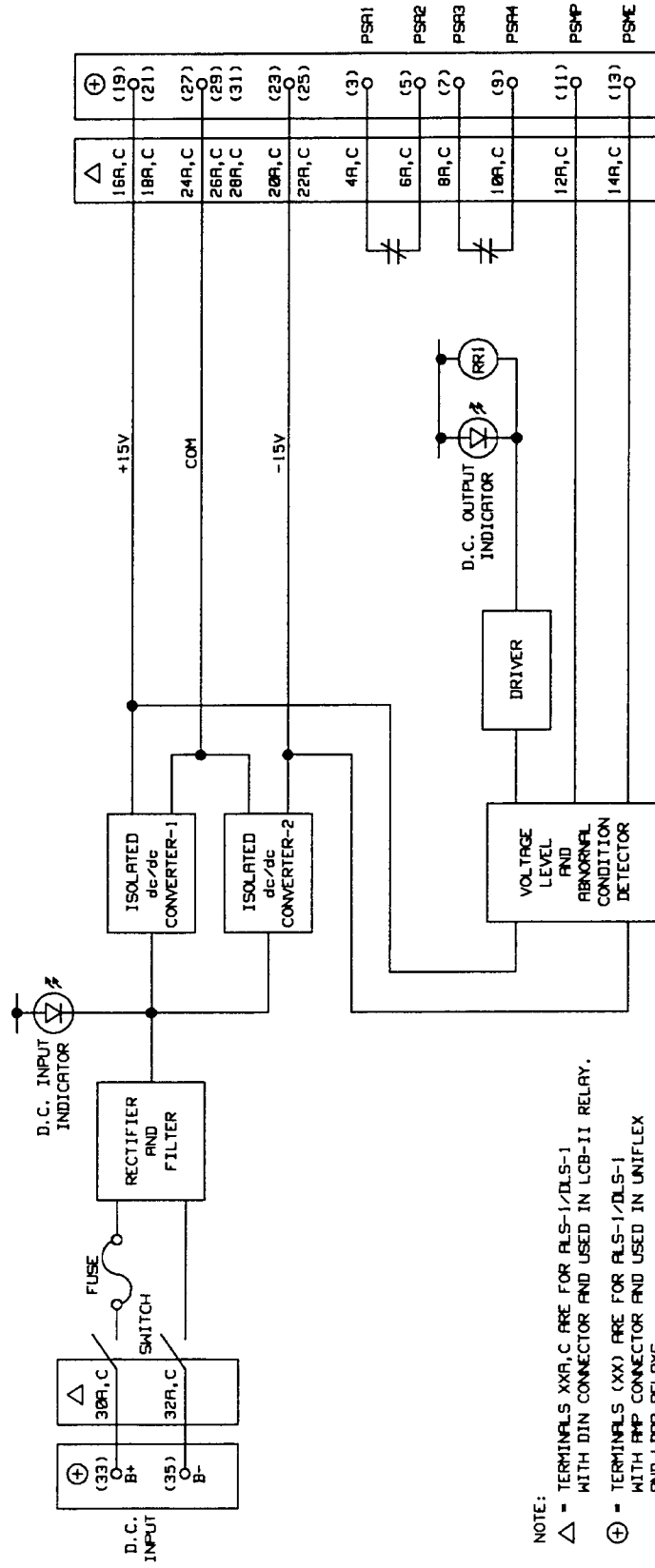
- e) PSMP Test  
With the rated battery voltage applied, measure the output PSMP voltage between terminals 11(+) & 31 (Com) for the AMP connector P/S or terminals 12 a/c(+) & 28 a/c (Com) for DIN connector P/S. The voltage should be between 13.5 V and 14.7 V.
- f) PSME and Output Relay (RRI)
- (1) Disconnect the dc input battery voltage.
  - (2) Refer to the output terminals shown in step (c) and connect an external dual dc supply

to +15 V and -15 V. (The -15 V is for ALS-1 only).

- (3) Turn on the external  $\pm 15$  V source. The Yellow LED should be on and the contact output terminals 3 & 5 and 7 & 9 (for AMP connector) or 4 a/c & 6 a/c and 8a/c & 10 a/c (for DIN connector) should be open Monitor output terminal PSME to common. The voltage should be 8.5 Vdc or greater.
- (4) Increase +15 Vdc to +16.0 V or reduce +15 Vdc to +13.5 V. The yellow LED will turn off and the output contacts will close. The signal of PSME will drop to 1 Vdc or less. Return the +15 Vdc to +15.00 volts.
- (5) Repeat step (4) by changing -15 Vdc to -16.0 Vdc or -13.5 Vdc. The yellow LED, output contacts and PSME should change states. Step (5) is for ALS-1 only.

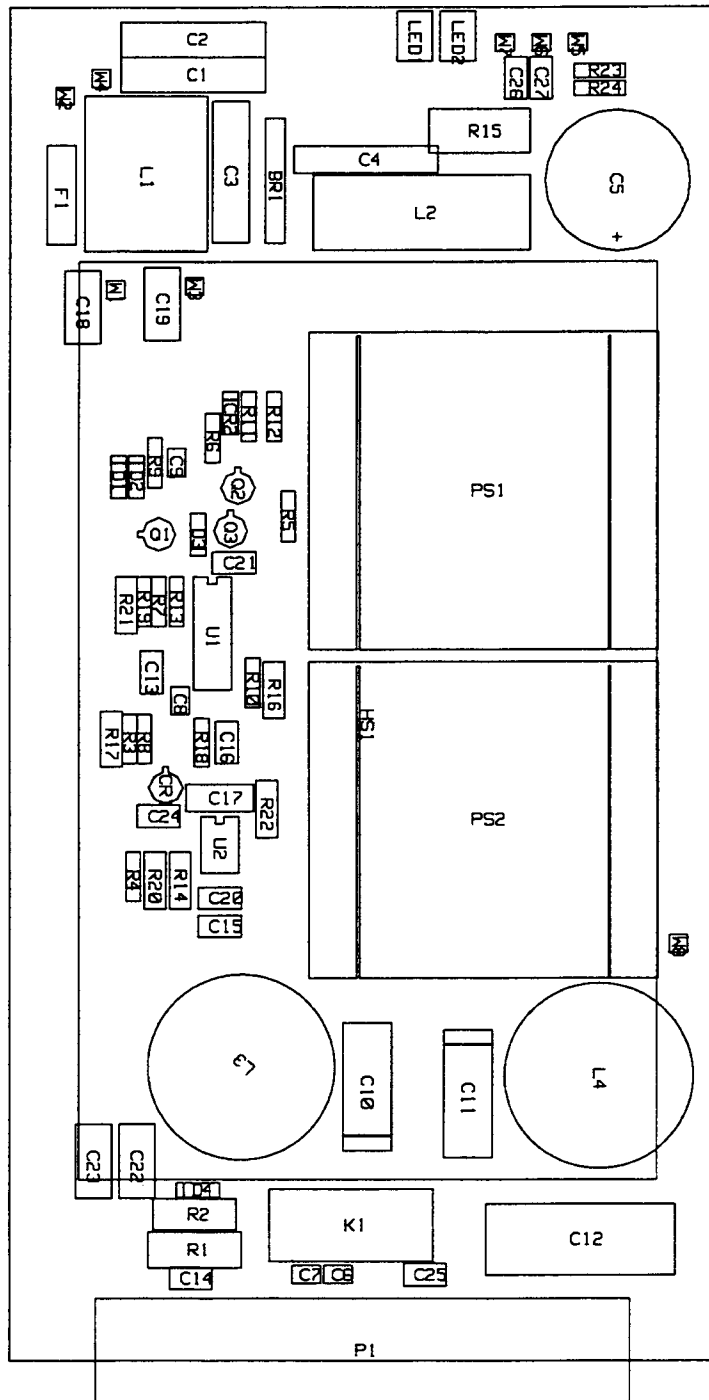
## 6. RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data and appropriate factory style number.



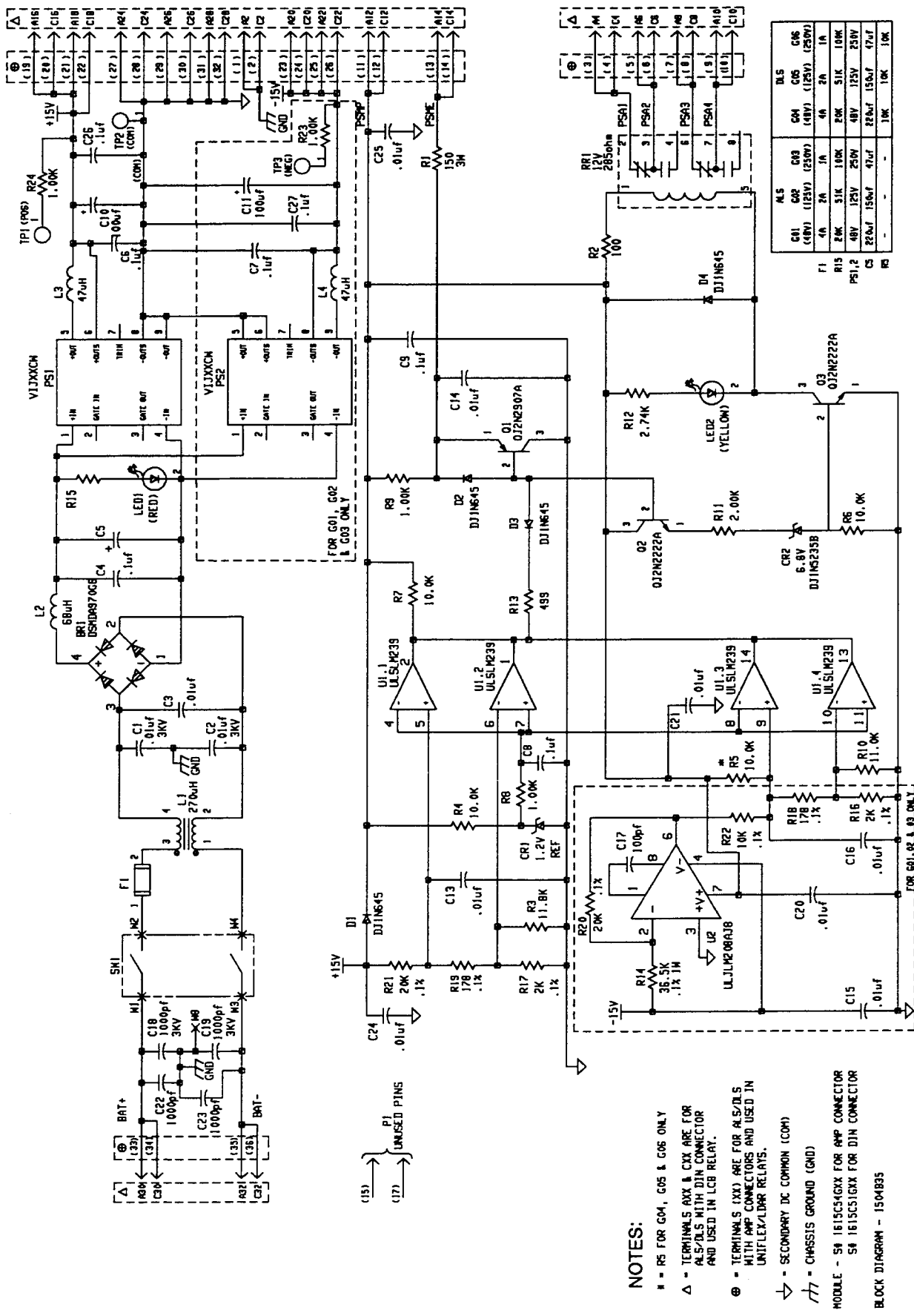
Sub 2  
1504B35

Figure 1. ALS-1/DLS-1 Block Diagram



Sub 1  
1615C51

Figure 2. Component Location



Sub 1  
1615C55

Figure 3. Internal Schematic

- NOTES:**
- \* = RS FOR G04, G05 & G06 ONLY
  - Δ = TERMINALS AXK & CXX ARE FOR ALS/DLS WITH DIN CONNECTOR AND USED IN LCB RELAY.
  - ⊕ = TERMINALS (XXX) ARE FOR ALS/DLS WITH AMP CONNECTORS AND USED IN UNIT/EX/LDR RELAYS.
  - ↔ = SECONDARY DC COMMON (COM)
  - ⌋ = CHASSIS GROUND (GND)
  - MODULE - 58 1615C54GX FOR AMP CONNECTOR  
58 1615C51GX FOR DIN CONNECTOR
  - BLOCK DIAGRAM - 1504835

**PART LIST**

1615C51 ALS-1/DLS-1 Power Supply with DIN Connector

1615C54 ALS-1/DLS-1 Power Supply with AMP Connector

ALS-1	G01	48V	DLS-1	G04	48V
	G02	125V		G05	125V
	G03	250V		G06	250V

COMP	DESCRIPTION	STYLE	GROUP #
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**CAPACITORS**

C1	0.1 UF 20% 3000V Z5U Ceramic Disc	CQ1002M380	01 thru 06
C2	0.1 UF 20% 3000V Z5U Ceramic Disc	CQ1002M380	01 thru 06
C3	0.1 UF 20% 3000V Z5U Ceramic Disc	CQ1002M380	01 thru 06
C4	0.1 UF 20% 500V Ceramic Disc	CQ1003MV08	01 thru 06
C5	150 UF 20% 200V Aluminum	CN1506MPE1	02, 05
C5	220 UF 20% 160V Aluminum	CN2206MNE1	01, 04
C5	47 UF 20% 400V Aluminum	CN4705MUE1	03, 06
C6	0.1 UF 20% 50V X7R Mono Ceramic	CP1003MH65	01 thru 06
C7	0.1 UF 20% 50V X7R Mono Ceramic	CP1003MH65	01, 02, 03
C8	0.1 UF 20% 50V X7R Mono Ceramic	CP1003MH65	01 thru 06
C9	0.1 UF 20% 50V X7R Mono Ceramic	CP1003MH65	01 thru 06
C10	100 UF 20% 35V Tantalum	CJ1006MGC4	01 thru 06
C11	100 UF 20% 35V Tantalum	CJ1006MGC4	01, 02, 03
C13	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01 thru 06
C14	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01 thru 06
C15	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01, 02, 03
C16	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01, 02, 03
C17	100 PF 2% 500V Dipped MICA	CR1000GV91	01, 02, 03
C18	1000 PF 20% 3000V Z5U Ceramic Disc	CQ1001M380	01 thru 06
C19	1000 PF 20% 3000V Z5U Ceramic Disc	CQ1001M380	01 thru 06
C20	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01, 02, 03
C21	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01 thru 06
C22	1000 PF 20% 3000V Z5U Ceramic Disc	CQ1001M380	01 thru 06
C23	1000 PF 20% 3000V Z5U Ceramic Disc	CQ1001M380	01 thru 06
C24	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01 thru 06
C25	0.01 UF 20% 100V Ceramic Disc	CQ1002ML08	01 thru 06
C26	0.1 UF 20% 50V x7R Mono Ceramic	CQ1003MH65	01 thru 06
C27	0.1 UF 20% x7R Mono Ceramic	CQ1003MH65	01, 02, 03

**RESISTORS**

R1	150 Ohms 5% 3W Wirewound	RW1500J3F9	01 thru 06
R2	100 Ohms 5% 1W Carbon Comp	RC1000J167	01 thru 06
R3	11.8 Kilohms 1% 0.25W Metal Film	RM1182FQA9	01 thru 06
R4	10.0 Kilohms 1% 0.25W Metal Film	RM1002FQA9	01 thru 06
R5	10.0 Kilohms 1% 0.25W Metal Film	RM1002FQA9	04, 05, 06
R6	10.0 Kilohms 1% 0.25W Metal Film	RM1002FQA9	01 thru 06
R7	10.0 Kilohms 1% 0.25W Metal Film	RM1002FQA9	01 thru 06

R8	1.00 Kilohms 1% 0.25W Metal Film	RM1001FQB0	01 thru 06
R9	1.00 Kilohms 1% 0.25W Metal Film	RM1001FQB0	01 thru 06
R10	11.0 Kilohms 1% 0.25W Metal Film	RM1102FQA9	01 thru 06
R11	2.00 Kilohms 1% 0.25W Metal Film	RM2001FQB0	01 thru 06
R12	2.74 Kilohms 1% 0.25W Metal Film	RM2741FQB0	01 thru 06
R13	499 Ohms 1% 0.25W Metal Film	RM499FQB1	01 thru 06
R14	36.5 Kilohms 0.1% 1W Metal Film	RM2652C1A7	01, 02, 03
R15	51 Kilohms 5% 2W Carbon Comp	RC5102J249	02, 05
R15	20 Kilohms 5% 2W Carbon Comp	RC2002J249	01, 04
R15	100 Kilohms 5% 2W Carbon Comp	RC1003J249	03, 06
R16	2.00 Kilohms 0.1% 1W Metal Film	3534A73H12	01, 02, 03
R17	2.00 Kilohms 0.1% 1W Metal Film	3534A73H12	01 thru 06
R18	178 ohms 0.1% 0.125W Metal Film	RM1780CE63	01, 02, 03
R19	178 ohms 0.1% 0.125W Metal Film	RM1780CE63	01, thru 06
R20	20.0 Kilohms 0.1% 1W Metal Film	RM2002C1A7	01, 02, 03
R21	20.0 Kilohms 0.1% 1W Metal Film	RM2002C1A7	01 thru 06
R22	10.0 Kilohms 0.1% 1W Metal Film	RM1002C1A7	01, 02, 03
R23	1.00 Kilohms 1% 0.25W Metal Film	RM1001FQB0	01, 02, 03
R24	1.00 Kilohms 1% 0.25W Metal Film	RM1001FQB0	01 thru 06

**CHOKES**

L1	270 UH 5%	3535A73H01	01 thru 06
L2	68 UH	3516A94H01	01 thru 06
L3	1.28 UH Toroidal Coil	3535A63G01	01 thru 06
L4	1.28 UH Toroidal Coil	3535A63G01	01, 02, 03

**TRANSISTORS**

Q1	2N2907A 60V 0.6A 0.4W PNP	762A672H17	01 thru 06
Q2	2N2222A 40V 0.8A 0.4W NPN	762A672H15	01 thru 06
Q3	2N2222A 40V 0.8A 0.4W NPN	762A672H15	01 thru 06

**INT CKTS**

U1	LM239AF Quad Comparator	3524A65H01	01 thru 06
U2	Linear 1C LM208J-8 single OP-AMP	9649A09H01	01, 02, 03

**DIODES**

D1	1N645A 225V 0.4A	837A692H03	01 thru 06
D2	1N645A 225V 0.4A	837A692H03	01 thru 06
D3	1N645A 225V 0.4A	837A692H03	01 thru 06
D4	1N645A 225V 0.4A	837A692H03	01 thru 06

**ZENER DIODES**

CR1	1CL8069 1.2V Reference	9649A34H01	01 thru 06
CR2	1N756A 8.2V 5% 0.4W	862A606H13	01 thru 06



**RELAY**

RR1	2FORMC 2 Pole 12V 285 Ohms	9645A10H04	01 thru 06
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**TEST POINT**

TP1	Red Terminal	187A332H01	01 thru 06
TP2	Black Terminal	187A332H02	01 thru 06
TP3	White Terminal	187A332H03	01, 02, 03

**FUSES**

F1	1A 250V 2AG Fuse	837A964H20	03, 06
F1	2A 250V 2AG Fuse	837A964H21	02, 05
F1	4A 250V 2AG Fuse	837A964H23	01, 04

**DC/DC CONVERTORS**

PS1	VIJ32CW, 48V	9658A45H06	01, 04
PS1	VIJ52CW, 125V	9658A45H07	02, 05
PS1	VIJ62CW, 250V	9658A45H08	03, 06
PS2	VIJ32CW, 48V	9658A45H06	01
PS2	VIJ52CW, 125V	9658A45H07	02
PS2	VIJ62CW, 250V	9658A45H08	03

**LED**

LED1	Red Led (Edge Mount) 550-0406	3508A22H01	01 thru 06
LED2	Yellow LED (Edge Mount) 550-0306	3508A22H02	01 thru 06

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