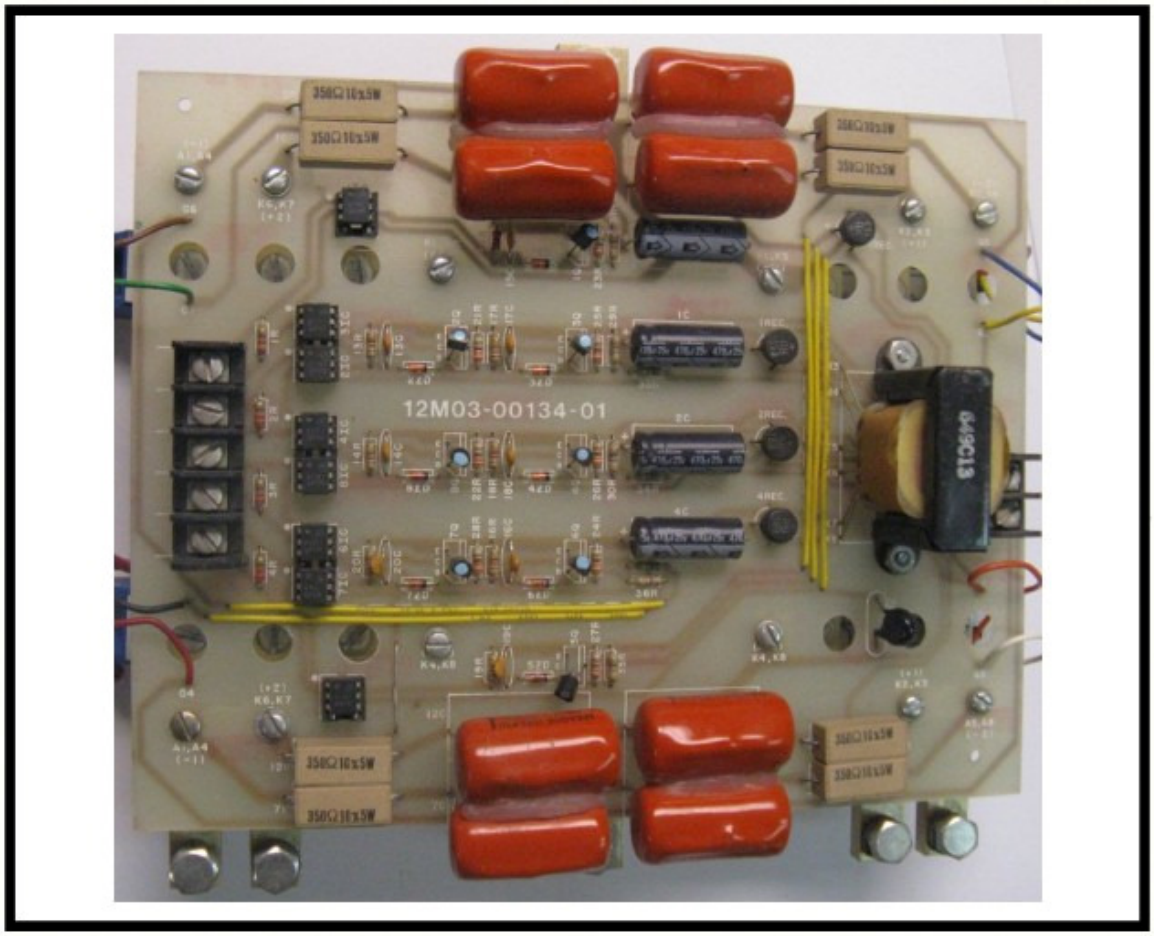
Trouble-shooting Manual
MODEL 244 DUAL BRIDGE PULSE AMPLIFIER
PART NUMBER 12M03-00134-01



BENCH TEST

MATERIALS REQUIRED:

- 1 – Oscilloscope (Tektronix 2213 or equal)
- 1 – VOM (Simpson 260 or equal)
- 2 – 1K OHM ¼ watt resistor
- 6 – Clip leads
- 1 – 115V AC line cord with spade lugs one end
- 1 – 6V DC source capable 50 mA output
- 1 – 68 OHM, ¼ watt resistor

1. Connect a 1K resistor from the negative end of 1C and G3 (white lead). Connect the other resistor from the negative end of 3C and G1 (green lead.)
2. Apply 115V AC between L1 and L2.
3. Apply +6V DC through 68 ohms to terminal 1 with common on terminal 5. If a +6V power supply is not available, a +15V power supply can be used by changing the 68 ohm resistor to a 270 ohm resistor.
4. With an oscilloscope observe the outputs across the two 1K ohm resistors. There should be approximately 12V DC when the 6V signal is applied to the input, and OVDC when the 6V DC is removed from the input.
5. Repeat steps 1 through 4 for the following 3 conditions:

INPUT PULSES	1K RESISTORS
Terminals 2 and 5	Neg 1C and G2 (yellow lead) Neg 2C and G4 (red lead)
Terminals 3 and 5	Neg 2C and G8 (orange lead) Neg 4C and G6 (brown lead)
Terminals 4 and 5	Neg 3C and G5 (blue lead) Neg 4C and G7 (black lead)

GEMINI MODEL 244 DUAL BRIDGE PULSE AMPLIFIER

PART NUMBER 12M03-00134-01
SCHEMATIC DIAGRAM 12M03-00134-01

I. SPECIFICATIONS

SUPPLY:
- 120 Volts AC ± 10%
- 50/60 Hz, single phase

AMBIENT TEMPERATURE:
- 0º to 40ºC (32º to 104ºF)
- 50ºC in enclosure

INPUT:
- 50 mA into parallel load of 220 ohms and light emitting diodes of two opto-couplers in series.

OUTPUT:
- 0.5 Ampere pulses into a short circuit load; approximately 12 volts open circuited. Pulse duty cycle not to exceed 5% and a maximum of 150 *us* with a short circuit load. Rise time typically less than 500 nanoseconds.

  Primarily designed for use with a single phase, eight thyristor, dual bridge power converter to 480V RMS. Can be adapted for use with other configurations if circuit common requirements are compatible.

MOUNTING:
- Mounts on conducting stand-offs to the AC and DC buss bars of a dual eight-thyristor bridge.

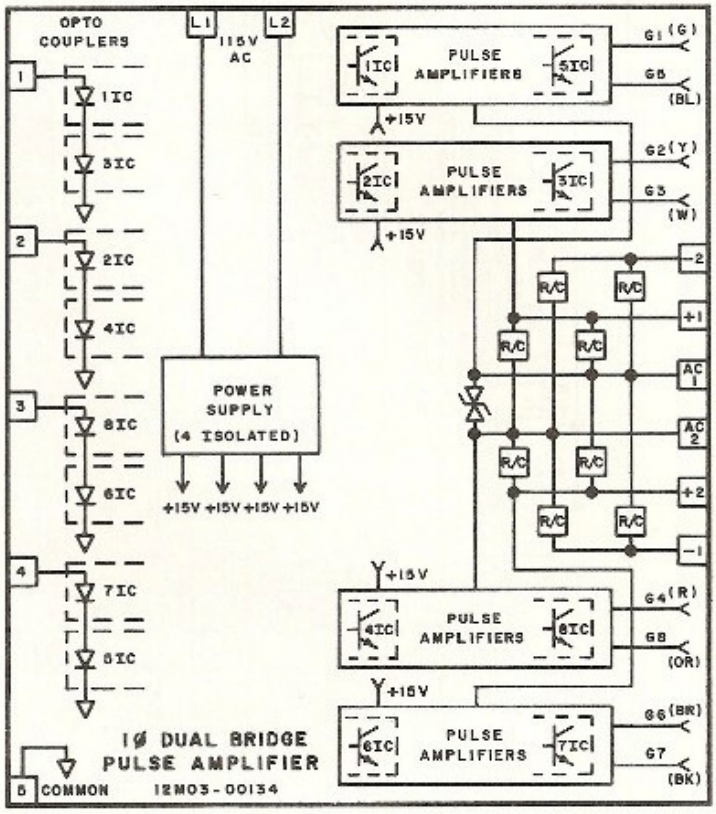


FIGURE 1. SIMPLIFIED SCHEMATIC

II. THEORY OF OPERATION

The REFLEX® Model 244 Pulse Amplifier is used in the REFLEX® Model 253 Power Converter to provide eight isolated outputs (four pairs with common cathode connections) with high noise immunity to the gates of a single phase, eight-thyristor, dual bridge power converter. It consists of the following elements as shown in the simplified schematic diagram (Figure 1).

1. Power Supply
2. Isolators
3. Gate Drives
4. DV/DT Networks

1. **Power Supply** — The power supply uses a transformer with four identical 10 volt secondary windings. A bridge rectifier with a 470 MF filter capacitor on each winding supplies a nominal 15 volts DC to a pair of opto-couplers and gate drive transistors.

2. **Isolators** — Electrical isolation for each of eight outputs is furnished by an opto-coupler whose input is driven by the Reflex® Model 245 Single Phase Four Quadrant, Regenerative Firing Circuit, or other suitable source.

   Each opto-coupler output drives an amplifier which provides the gate drive to a thyristor.

3. **Gate Drives** — Each of eight outputs is supplied by a Darlington Power Transistor. The outputs are connected in pairs to utilize the common cathode connections in a dual bridge, four quadrant thyristor converter.

   A high level of noise immunity is achieved by biasing the output transistors so that a significant output current from the opto-coupler is required before an output pulse is generated. Unwanted signals, which may be caused by high dv/dt acting on the input-output capacitance of the opto-coupler are effectively by-passed without triggering an output.

   Although the opto-coupler itself has an unacceptably slow rise time, only a small portion of the rising waveform is needed for full output, and the output pulse has a rise time of less than 0.5 microseconds. Output pulses, therefore, qualify as "hard firing."

4. **DV/DT Networks** — Protection from potentially destructive line voltage transients is provided by an R-C network across each thyristor and a metal oxide varistor across the incoming AC line. An AC line impedance of not less than 200 *u* Hy is necessary. If not present, add external reactance.

VOLTAGE CHECK

1. The primary voltage of transformer 1T, leads 1 and 2 (terminals L1 and L2) should be 115V AC.
2. The secondary voltage of 1T should be 10V AC nominal on each of four windings. Voltage can be read at the AC input to each bridge rectifier, 1REC through 4REC.
3. Voltage across 1C through 4C should be 15 volts DC nominal.
4. Voltage across 1ZD through 8ZD should be 4.3 volts nominal (±5%) when an output pulse is present.
5. Use an oscilloscope to verify that waveforms are as shown on the schematic diagram.

COMPONENT LIST — ASSEMBLY #12M03-00134-01

Symbol	Part #	Description (Acceptable Substitute)*
1T	04P01-00004	Transformer - 120V AC PRI, four 10V SEC @ 50mA (COIL TRANS-120-4-10)
1SU	05P07-00002	MOV, 480V (GE-V480LA20A)
1-4REC	05P01-00003	Rectifier Bridge - 50V, 1A (EDI-PF50)
1-8ZD	05P03-00002	Zener Diode, 4.3V, 500 mW, 5%
1-8Q	05P04-00009	Transistor, Darlington PNP (GE-D41K1)
1-8IC	05P10-00001	Opto-Isolator (GE-H11A1)
1-4C	03P01-47102-01	Capacitor, 470MF, 25V
5-12C	03P07-47399-00	Capacitor, 0.047MF, 1000V
13-20C	03P06-01305-00	Capacitor, 0.01MF, Ceramic
1-4R	01P01-22100-02	Resistor, 220 Ohm, ¼W, 5%
5-12R	01P01-39105-03	Resistor, 390 Ohm, 5W, 10%
13-20R	01P01-10200-02	Resistor, 1.0K, ¼W, 5%
21-28R	01P01-33100-02	Resistor, 330 Ohm, ¼W, 5%
29-36R	01P01-47000-02	Resistor, 47 Ohm, ¼W, 5%

* OR EQUAL

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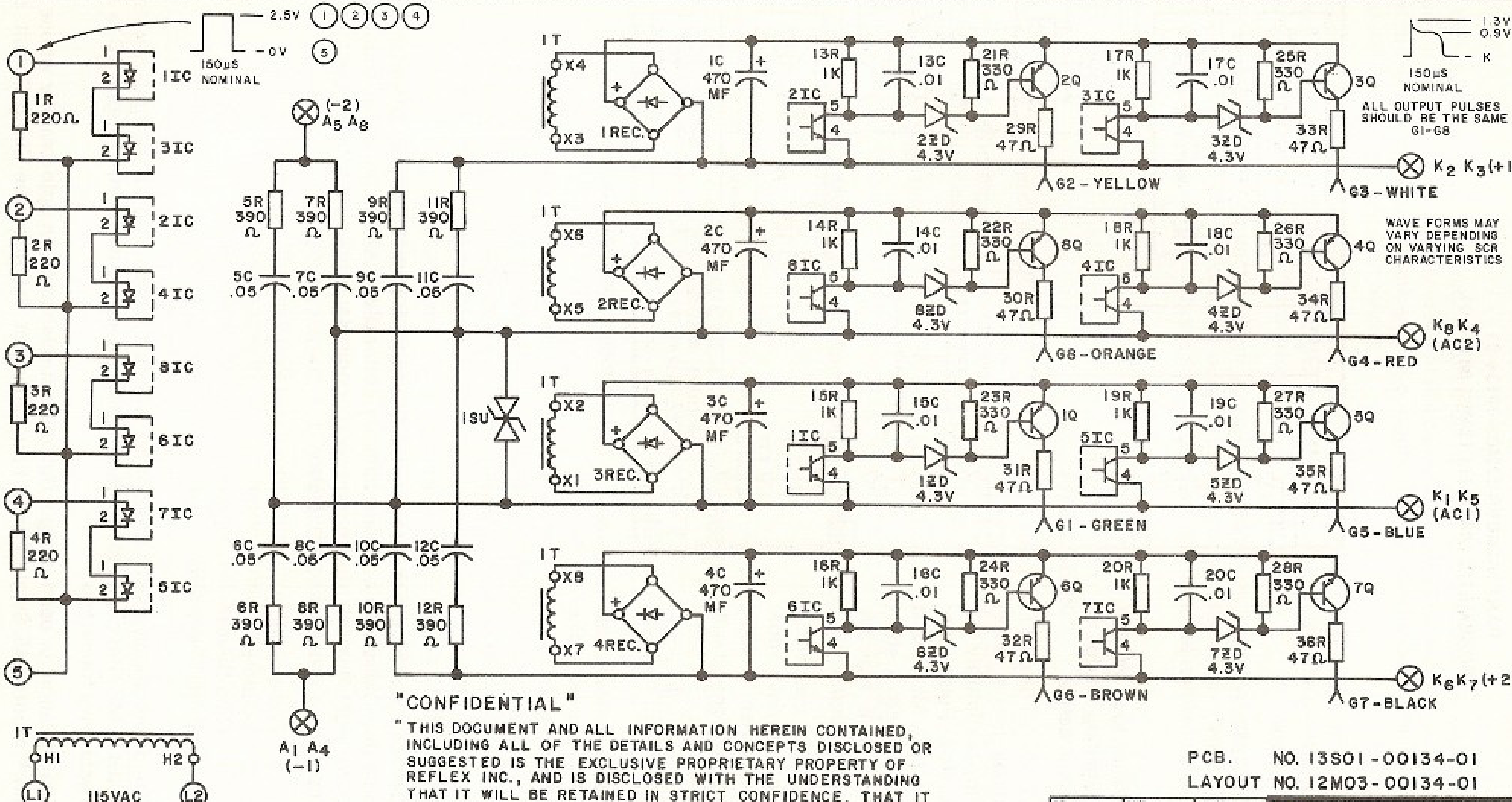

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◯ - TERMINALS.

⊗ - CONNECTIONS TO POWER BUSS.

⅄ - WIRE WITH CONNECTOR.

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PCB. NO. 13S01-00134-01

LAYOUT NO. 12M03-00134-01

DR	CK'D.	APP'D	
MY			GEMINI CONTROLS
DATE 3-22-84	SCALE	SHEET OF	
PRODUCT 1 PHASE DUAL BRIDGE PULSE AMP.			REF FILE No. EX-224
CUSTOMER			JOB No
TITLE SCHEMATIC DIAGRAM			DWG No 12M03-00134-01