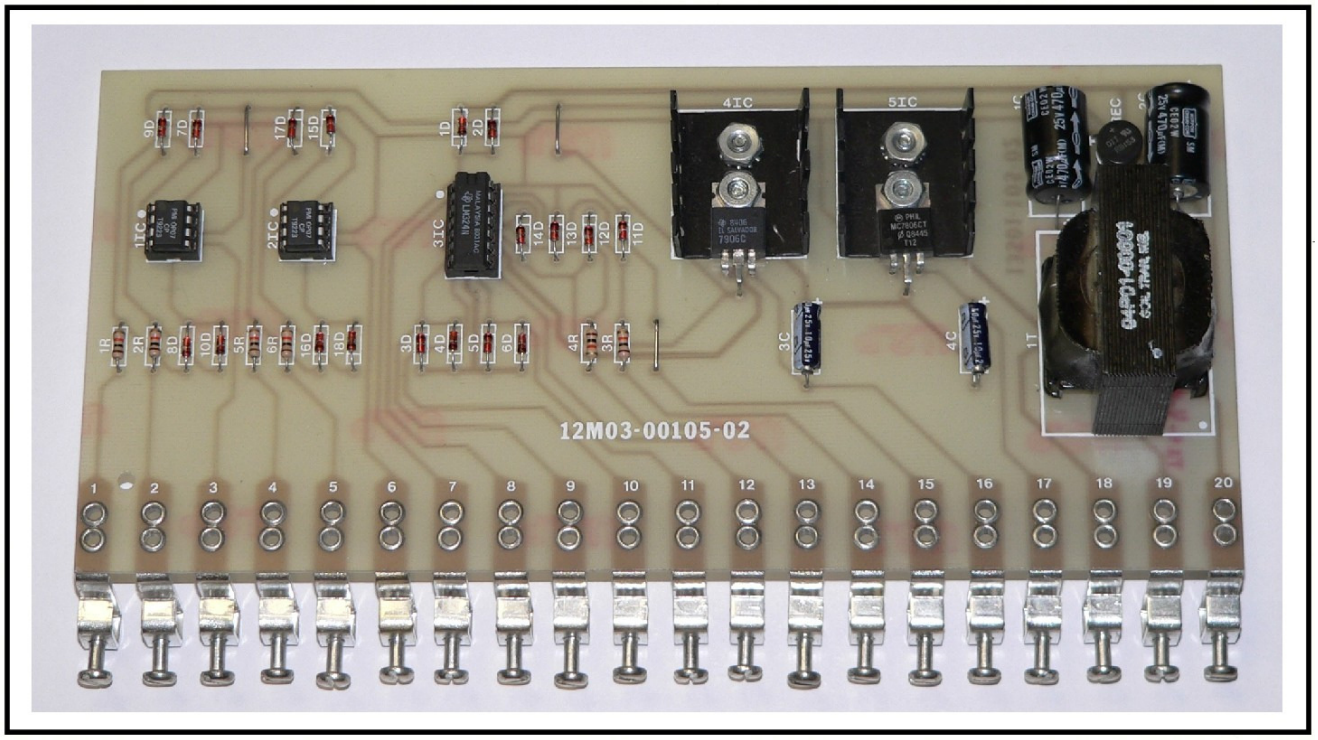
Trouble-shooting Manual
MODEL 207
MULTIPLE OPERATIONAL AMPLIFIER ASSEMBLY
PART NUMBER 12M03-00105-02



BENCH TEST

1. Connect a 49.9K precision resistor (1%) between each of the following terminals (tests may be performed one at a time with a single resistor and capacitor):

   1 & 3 (with 10 pf in parallel)
   4 & 6 (with 10 pf in parallel)
   7 & 8
   9 & 10
   11 & 12
   14 & 15

2. Connect a 5K potentiometer with the end terminals connected to terminals 16 (CW) and 17 (CCW), and the wiper to a 49.9K resistor. This potentiometer will provide signals to the op-amp under test.

3. Jumper terminals 2, 5 and 13 to terminal 18. Apply 120V AC to terminals 19 and 20. Measure the voltage from 18 to 17. It should be +6 volts nominal. Similarly the voltage from 18 to 16 should be -6 volts nominal.

4. Temporarily connect the free end of the 49.9K resistor on the signal potentiometer to each input terminal. The output should follow the potentiometer signal smoothly through its range, with reverse polarity output according to the following chart:

Input Terminal (free end of resistor)	Output Terminal
1	3
4	6
7	8
9	10
11	12
14	15

Max. output on all steps should be approximately ±6 volts.

5. Remove the input signal, and connect a 100 Ohm resistor between terminals 1 and 18, and between 4 and 18. Max. voltage at the following terminals are shown in the chart below.

Terminal	Max. Voltage
3	± 5 mV
6	± 5 mV
8	± 10 mV
10	± 10 mV
12	± 10 mV
15	± 10 mV

6. Remove jumpers from terminals 2, 5 and 13 to 18. Apply the signal from the wiper of the 5K potentiometer directly to terminals 2, 5 and 13. As the potentiometer is moved through its range, the output at terminals 3, 6 and 15 should follow the input, with polarity the same.

GEMINI MODEL 207
MULTIPLE OPERATIONAL AMPLIFIER ASSEMBLY

PART NUMBER 12M03-00105-02
SCHEMATIC DIAGRAM 12M03-00105-02

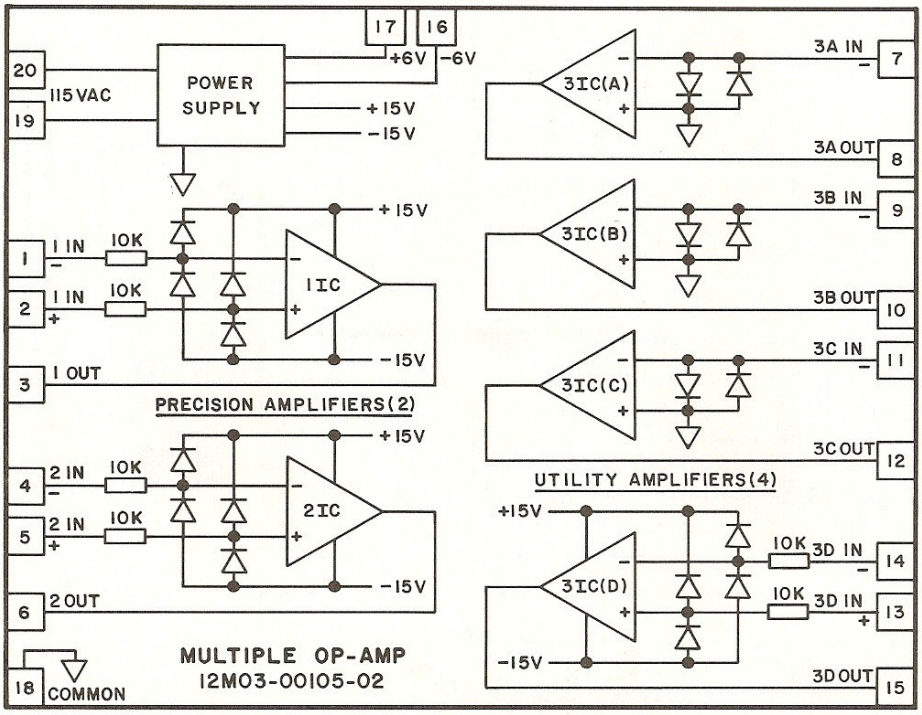


FIGURE 1 SIMPLIFIED SCHEMATIC

I. SPECIFICATIONS

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

AMBIENT TEMPERATURE
- 0° to 40°C (32° to 104°F)
- 50°C in cabinet

CHARACTERISTICS

	Quad OP-AMP (1)		Precision (OP-AMP) (2)	
	Typical	Maximum	Typical	Maximum
Input Offset Voltage	± 2mV	± 7mV	60 uV	150 uV
Input Bias Current	45 nA	250 nA	1.8 nA	7 nA
Common Mode Range (OP-AMPS 1, 2, & 3D)	-15 to +13.5 volts	-----	± 13V	-----
Slewing Rate	0.5V/u sec	-----	0.17V/u sec	-----
Gain	100,000	-----	400,000	-----

NOTES: (1) 324 or equal
NOTES: (2) 714 or equal

POWER SUPPLY
- ± 6 volts DC at 20 mA, regulated

II. THEORY OF OPERATION

The Model 207 Multiple Operational Amplifier is a versatile assembly for use wherever signal Amplification, Inversion, Limiting, Differential Impedance Isolation or Analog Computation such as adding, subtracting, integrating or active filtering is required.

It consists of the following elements as shown in the Simplified Schematic Diagram (Figure 1).

1. Power Supply
2. Utility Quad OP-AMP (4)
3. Precision OP-AMP (2)

1. **Power Supply.** The power supply uses a center-tapped transformer with 10 volts on each side of center together with a bridge rectifier and two 470 MF filter capacitors to provide a nominal positive and negative unregulated 15 volts DC with respect to the transformer center-tap, which is connected to circuit common.

   Additionally, a positive and negative 6 volt regulated voltage is obtained from the positive and negative 15 volt supplies, using regulators 5IC and 4IC each with a 10 MF filter capacitor.

2. **Utility Quad Op-Amp.** Op-Amp 3IC includes four utility grade amplifiers (A, B, C and D).

   A, B and C are configured for use as inverting amplifiers. The input is diode clamped to circuit common and external input impedance must be used to limit input current to 2 mA maximum.

   The fourth utility amplifier (D) is arranged for use as an Inverting, Non-inverting or Differential Amplifier. Input voltages should be limited to ± 15 volts or damage to the circuit may result.

3. **Precision Op-Amp.** Op-Amps 1IC and 2IC are arranged for use as Inverting, Non-inverting or Differential Amplifiers the same as 3IC (D). Input voltages should be limited to ± 15 volts or damage to the circuit may result.

VOLTAGE CHECKS

1. The primary voltage of 1T, leads 1 and 2 (terminals 20 and 19) should be 120V AC.
2. The secondary voltage of 1T, leads 3 to 4 and leads 5 to 6 should be 10V AC. These can be measured between circuit common, terminal 8 (leads 4 and 5), and each AC input to the bridge rectifier 1 REC (leads 3 and 6). Voltage at the AC input to the bridge rectifier (leads 3 to 6) should be 20V AC.
3. +15V DC nominal between the positive end of capacitor 1C and terminal 18 (common).
4. –15V DC nominal between the negative end of capacitor 2C and terminal 18 (common).
5. +6V DC nominal between terminals 17 and 18 (common).
6. –6V DC nominal between terminals 16 and 18 (common).

COMPONENT LIST - ASSEMBLY #12MO3-00105-02

Symbol	Part #	Description (Acceptable Substitute)*
1T	04P01-00001	Transformer – 120V AC PRI, two 10V AC SEC. @ 220 mA (Signal–PC 20-220)
1REC	05P01-00003	Rectifier Bridge – 50V, 1A (EDI-PF50)
1-18D	05P02-00001	Diode–Signal 50mA, 200PIV (1N4148)
1, 2IC	05P08-00005	Precision Op-Amp (Fairchild 714)
3IC	05P08-00001	Quad Op-Amp (National–LM324)
4IC	05P08-00007	–6 Volt Regulator (7906)
5IC	05P08-00006	+6 Volt Regulator (7806)
1C, 2C	03P01-47102-01	Capacitor – 470MF, 25V, Electrolytic
3C, 4C	03P01-10001-00	Capacitor – 10MF, 15V, Electrolytic
1-6R	01P01-10300-02	Resistor 10K, ¼W, 5%

*OR EQUAL

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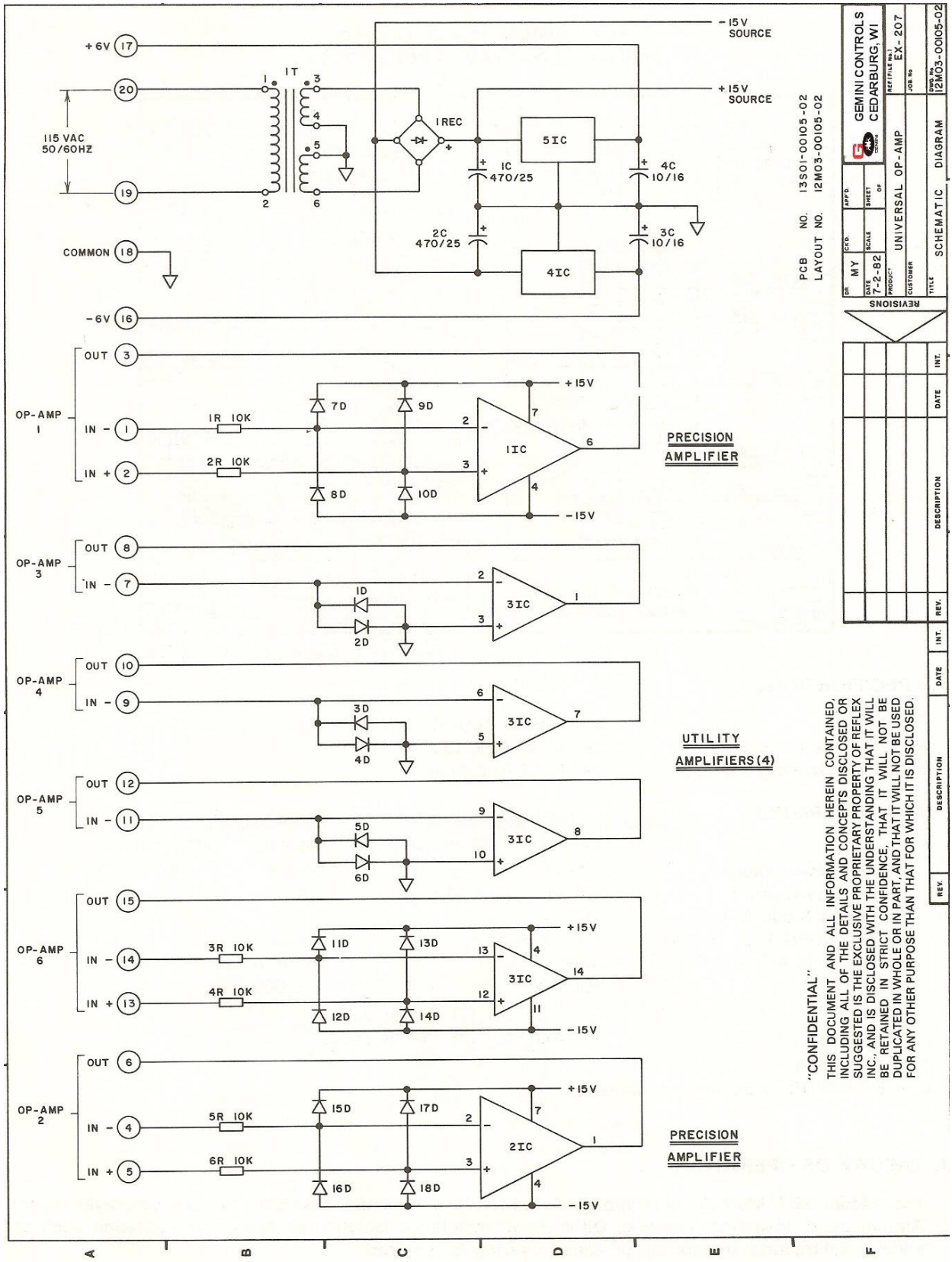
+6V
20
19
115 VAC
50/60HZ
COMMON
18
-6V
16
1T
1REC
5IC
1C
470/25
2C
470/25
4C
10/16
3C
10/16
4IC
-15V SOURCE
+15V SOURCE
OUT
IN -
IN +
OP-AMP 1
1R 10K
2R 10K
7D
8D
9D
10D
1IC
PRECISION AMPLIFIER
OP-AMP 3
1D
2D
3IC
OP-AMP 4
3D
4D
OP-AMP 5
5D
6D
UTILITY AMPLIFIERS (4)
OP-AMP 6
3R 10K
4R 10K
11D
12D
13D
14D
OP-AMP 2
5R 10K
6R 10K
15D
16D
17D
18D
2IC
PRECISION AMPLIFIER
+15V
-15V
PCB NO. 13501-00105-02
LAYOUT NO. 12M03-00105-02
GEMINI CONTROLS
CEDARBURG, WI
UNIVERSAL OP-AMP
EX-207
SCHEMATIC DIAGRAM
12M03-00105-02
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