Trouble-shooting Manual
MODEL 259
VOLTAGE TO
FREQUENCY CONVERTER
(PRECISION OSCILLATOR)
PART NUMBER 12M03-00146-01

BENCH TEST

TEST MATERIAL REQUIRED:

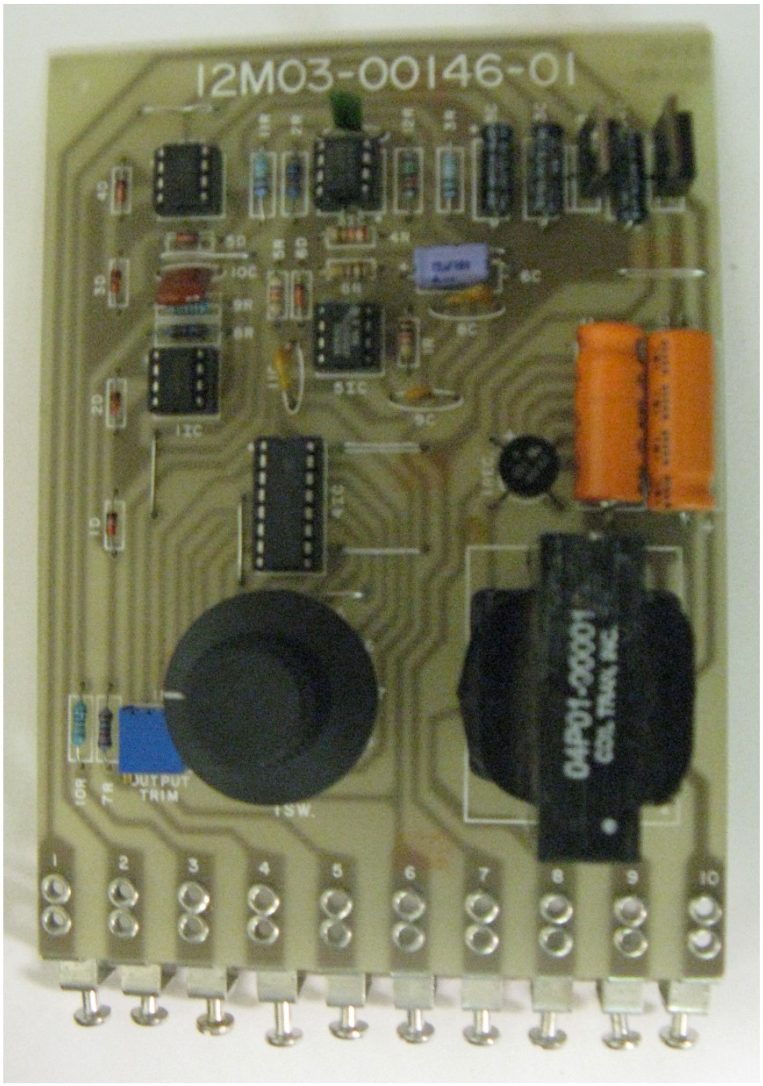
- 1 - 0 to 10V DC Precise Voltage Reference (Use REFLEX® P/N 12M03-00102)
- 1 - DVM (Fluke 8020A or Equivalent)
- 1 - Oscilloscope
- 1 - Frequency Counter
- 1 - 120V AC Source

NOTE: ALL MEASUREMENT AND INPUTS MADE WITH COMMON ON TERMINAL 8.

PROCEDURE:

1. Turn 1SW to position 1; apply +10.0V to terminal 4 with common on terminal 8 and connect a frequency counter and oscilloscope to terminal 5, with commons on terminal 8.
2. Apply 120V AC to terminals 9 and 10.
3. Vary 1P from full CCW to full CW. Observe a frequency of 25 KHz or less in full CCW position and 60 HKz or more in full CW position.
4. Adjust 1P for 50.0 KHz and observe the output on terminal 5 with the oscilloscope. It should be a positive pulse 15V P-P, 4 to 7 microseconds long.
5. Compare the following nominal output frequencies with the switch position:

1SW	Frequency
1	50.0 KHz
2	25.0 KHz
3	12.5 KHz
4	6.25 KHz
5	3.12 KHz
6	1.56 KHz
7	781 Hz
8	391 Hz
9	196 Hz
10	97.6 Hz
11	48.8 Hz
12	24.4 Hz



VOLTAGE CHECKS (with common on terminal 8)

Terminal	Nominal Voltage
1	-6V
2	+6V
6	+15V
7	-15V

REFLEX® MODEL 259 VOLTAGE TO FREQUENCY CONVERTER (PRECISION OSCILLATOR)

PART NUMBER 12M03-00146-01
SCHEMATIC DIAGRAM 12M03-00146-01

I. SPECIFICATIONS

SUPPLY:

- 120 volts AC ± 10% 50/60 Hz, Single Phase

AMBIENT TEMPERATURE:

- 0º to 40ºC (32º to 104ºF)
- 50ºC in cabinet

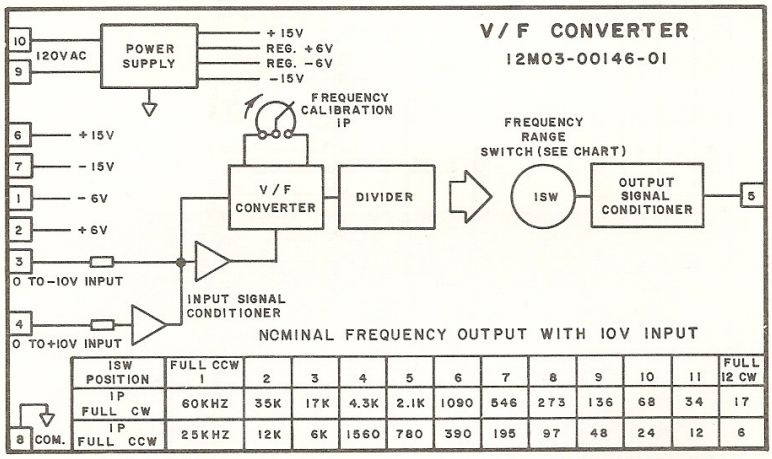
INPUT:

- 0 to 10 volts DC positive or negative

OUTPUT:

- Pulses of 15V magnitude 4 to 7 microseconds long, maximum load of 150 mA source, 50 mA sink.

  Frequencies corresponding to 10V DC input: 6 Hz to 60 KHz with 12 ranges selected by a 12 position switch. Any given range has approximately 3 to 1 adjustment with the OUTPUT TRIM potentiometer.



NOMINAL FREQUENCY OUTPUT WITH 10V INPUT

ISW POSITION	FULL CCW 1	2	3	4	5	6	7	8	9	10	11	FULL 12 CW
IP FULL CW	60KHZ	35K	17K	4.3K	2.1K	1090	546	273	136	68	34	17
IP FULL CCW	25KHZ	12K	6K	1560	780	390	195	97	48	24	12	6

FIGURE 1. SIMPLIFIED SCHEMATIC

LINEARITY: Within 0.1% of full scale.

DRIFT: 100 PPM per degree C maximum from 0º to 50ºC.

MOUNTING: Standard Reflex® 10 terminal chassis (P/N 12M04-00011).

II. THEORY OF OPERATION

The REFLEX® Model 259 Voltage to Frequency Converter is a circuit that converts a DC input to a train of pulses whose frequency is determined by the magnitude of the input voltage and the position of an on-board selector switch.

The circuit consists of the following sections as shown on the Simplified Schematic, Figure 1.

1. Power Supply
2. Input Signal Conditioner
3. Voltage to Frequency Converter
4. Divider
5. Output Signal Conditioner

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 regulated positive and negative 6 volts is obtained from the positive and negative 15 volt supplies using regulators 1VR and 2VR each with a 10 MF filter capacitor.

2. **Signal Conditioner** — This section consists of two precision op-amps, 1IC and 2IC. 1IC serves as an inverter to change the polarity of the signal at input terminal 4 from positive to negative.

   The negative signal from 1IC or from input terminal 3 becomes the input signal to op-amp 2IC. Op-amp 2IC receives its feedback from a single chip Voltage-to-Frequency Converter, 3IC.

3. **Voltage to Frequency Converter** — This section takes the output of 2IC and converts it to pulses with a frequency adjustable over an approximate 3 to 1 range by the "OUTPUT TRIM" potentiometer 1P. For a 10 volt input the output frequency ranges from approximately 25KHz to 60KHz depending on the setting of 1P.

4. **Divider** — A 12-stage binary counter, 4IC is used as a divider to select lower frequencies on a binary progression. The divider ratio is selected by a rotary 12-position switch.

   All binary divider numbers representing decimal divisions of 2 to 4096 except 8 are available. If division by 8 is required, division by 4 can be selected with an input of zero to 5 volts instead of zero to 10 volts.

5. **Output Signal Conditioner** — This section takes the pulses from the selector switch and acts as a one-shot multivibrator to provide a standard, buffered output pulse of 15 volts, 5 *u* sec and up to 150 mA driving capability. For driving TTL Circuits, the sink capability is a minimum of 50 mA.

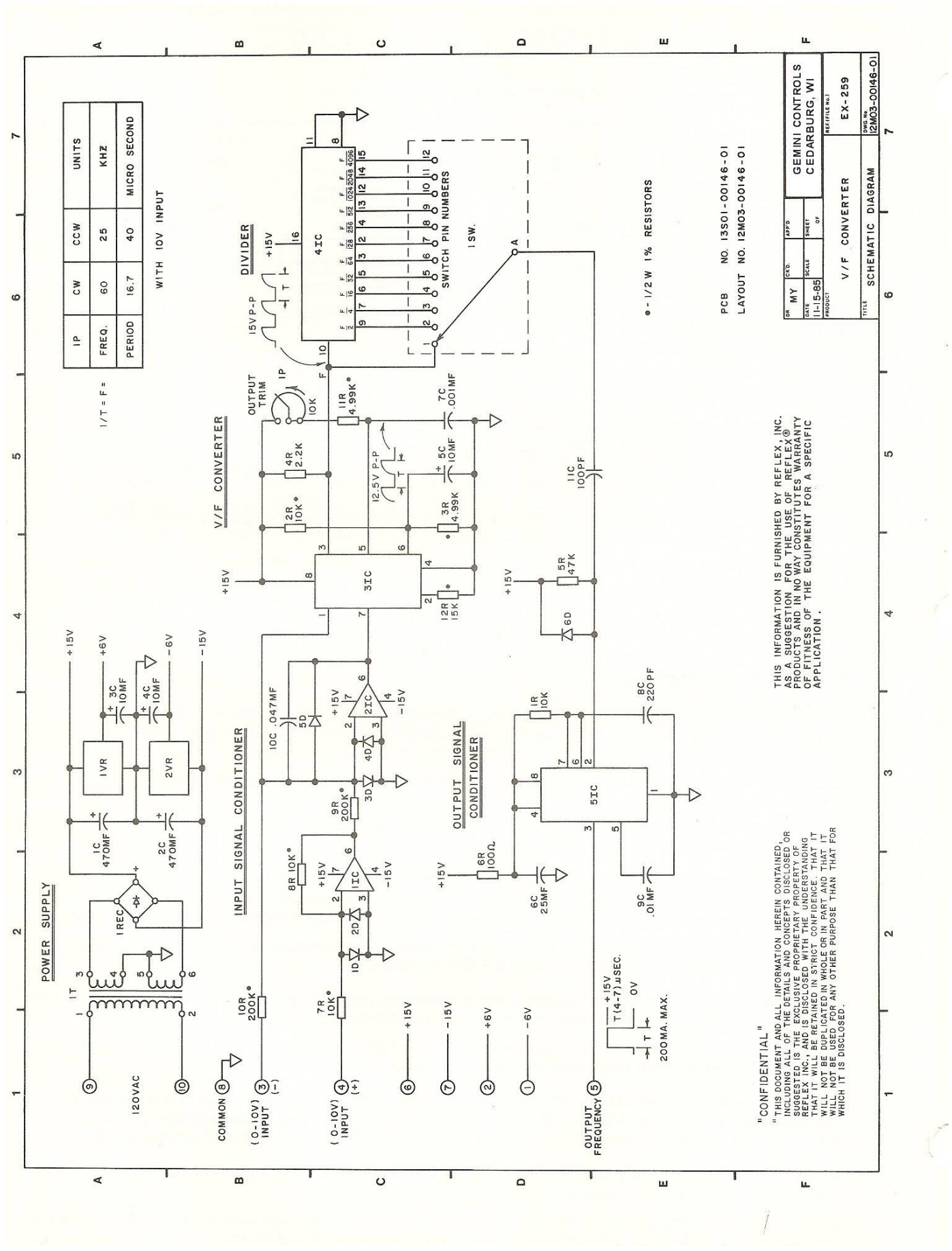
COMPONENT LIST — ASSEMBLY #12M03-00146-01

Symbol	Part #	Description (Acceptable Substitute) *	Symbol	Part #	Description (Acceptable Substitute) *
1T	04P01-00001	Transformer - 120V AC PRI, two 10V AC SEC @ 220 mA (Signal - PC20-220)	3-5C	03P01-10001-00	Capacitor - 10MF, 16V, Electrolytic
			6C	03P01-25001-00	Capacitor - 25MF, 16V, Electrolytic
1REC	05P01-00003	Rectifier Bridge - 50V, 1A (EDI-PF50)	7C	03P07-10210-00	Capacitor - .001MF, 50V, Film
1-6D	05P02-00001	Diode - Signal, 50mA, 200 PIV (1N4148)	8C	03P06-22105-00	Capacitor - 220PF, 50V, Ceramic
			9C	03P06-10305-00	Capacitor - .01MF, 50V, Ceramic
1VR	05P08-00006	+6V Regulator (7806)	10C	03P07-47310-00	Capacitor - .047MF, 100V, Film
2VR	05P08-00007	–6V Regulator (7906)	11C	03P06-10105-00	Capacitor - 100PF, 50V, Ceramic
1, 2IC	05P08-00005	Precision Op-Amp (Fairchild 714HC)	1R	01P01-10300-02	Resistor - 10K, ¼W 5%
3IC	05P10-00003	V/F Converter (4151)	2,7,8R	01P02-10021-01	Resistor - 10.0K, ½W, 1%
4IC	05P09-00004	Counter (4040)	3,11R	01P02-49911-01	Resistor - 4.99K, ½W, 1%
5IC	05P08-00003	Timer (LM555)	4R	01P01-22200-02	Resistor - 2.2K, ¼W, 5%
1SW	09P01-00008	Switch, 12 Pos. Rotary (Power Dynamics JPB-100-PC-Q)	5R	01P01-47300-02	Resistor - 47K, ¼W, 5%
			6R	01P01-10100-02	Resistor - 100 Ohm, ¼W, 5%
1P	02P05-10301-02	Potentiometer - 10K, ¼W, 5%, 25T (Bournes-3299P-1-103)	9,10R	01P02-20031-01	Resistor - 200K, ½W, 1%
1,2C	03P01-47102-01	Capacitor - 470MF, 25V, Electrolytic	12R	01P02-15021-01	Resistor - 15.0K, ½W, 1%

* OR EQUAL

GEMINI CONTROLS LLC
W61 N14280 TAUNTON AVE.
PO BOX 380
CEDARBURG, WI 53012
www.geminicontrols.com

PHONE: (262)-377-8585
FAX: (262-377-4920
email:sales@geminicontrols.com


POWER SUPPLY
INPUT SIGNAL CONDITIONER
V/F CONVERTER
DIVIDER
OUTPUT SIGNAL CONDITIONER
SWITCH PIN NUMBERS
1 SW.
WITH 10V INPUT
I/T = F =
IP | FREQ. | PERIOD
CW | 60 | 16.7
CCW | 25 | 40
UNITS | KHZ | MICRO SECOND
120VAC
COMMON
(0-10V) INPUT (-)
(0-10V) INPUT (+)
OUTPUT FREQUENCY
+15V
-15V
+6V
-6V
200MA. MAX.
• - 1/2 W 1% RESISTORS
PCB NO. 13S01-00146-01
LAYOUT NO. 12M03-00146-01
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GEMINI CONTROLS CEDARBURG, WI
V/F CONVERTER
EX-259
TITLE SCHEMATIC DIAGRAM
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