

```

*****
**                                     **
**           D I G I M A X           **
**                                     **
**       I N S T R U M E N T S       **
**                                     **
**           C O R P .               **
**                                     **
*****
**                                     **
**           M O D E L   D612         **
**                                     **
**       I N S T R U C T I O N       **
**                                     **
**           M A N U A L              **
**                                     **
*****

```

DIGIMAX INSTRUMENTS CORP.  
 5625 KEARNY VILLA RD.  
 SAN DIEGO, CALIFORNIA 92123  
 714-569-6582

\* \* \* \* \*   T A B L E   O F   C O N T E N T S   \* \* \* \* \*

SECTION 1	INTRODUCTION.....	2
SECTION 2	SPECIFICATIONS.....	3
SECTION 3	UNPACKING AND SETTING UP.....	4
SECTION 4	OPERATING INSTRUCTIONS.....	5
	A. GENERAL USE.....	5
	B. USING THE AUDIO SCALER.....	9
	C. USE AND CARE OF NI-CAD BATTERY PACK.....	10
SECTION 5	THEORY OF OPERATION.....	12
SECTION 6	CALIBRATION.....	13
SECTION 7	BLOCK DIAGRAM.....	14
SECTION 8	PARTS LIST.....	15
SECTION 9	RF SAMPLER.....	16
SECTION 10	SCHEMATICS.....	17

\* \* \* \* S E C T I O N 1 I N T R O D U C T I O N \* \* \* \*

YOU ARE THE PROUD OWNER OF A DIGIMAX MODEL D612 FREQUENCY COUNTER WHICH HAS BEEN DESIGNED AND MANUFACTURED TO THE STRICTEST STANDARDS. ADVANCED MOS/LSI CIRCUITRY HAS BEEN INCORPORATED TO GUARANTEE YEARS OF RELIABLE OPERATION AS WELL AS PROVIDE THE EXCEPTIONAL ELECTRICAL PERFORMANCE INHERENT IN THESE UNITS.

THE D612 FEATURES A 1/2 INCH LARGE RED LED DIGITAL DISPLAY, DIRECT FREQUENCY READINGS FROM 50 HZ TO 1.2 GHZ, SELECTABLE RESOLUTION, AND DIRECT AND PRESCALED INPUTS. THE COUNTER MAY BE USED TO MEASURE THE FREQUENCY OF MOST CONTINUOUS SOURCES OF RF OR AUDIO.

THE D612 ALSO FEATURES A STANDARD 10 MHZ CRYSTAL TIMEBASE ENCLOSED IN A PROPORTIONAL OVEN WITH + OR - .1 PPM ACCURACY. ALL TIME BASES ARE SET WITH STANDARDS WHICH ARE TRACEABLE TO NATIONAL BUREAU OF STANDARDS.

# \*\*\* SECTION 2      SPECIFICATIONS \*\*\*

## DMI MODEL D612 FREQUENCY COUNTER

### PERFORMANCE.....

FREQUENCY RANGE	NON-PRESCALED PRESCALED	50 HZ TO 50 MHZ 30 MHZ TO 1.2 GHZ
SENSITIVITY	10-25 MV TYP 25-50 MV TYP 10-50 MV TYP 15-50 MV TYP	100 HZ TO 25 MHZ NON-PRESCALED 25 MHZ TO 50 MHZ NON- PRESCALED 30 MHZ TO 450 MHZ PRESCALED 450 TO 1.2 GHZ PRESCALED
RESOLUTION	NON-PRESCALED PRESCALED	10 HZ / 1 HZ / 0.1 HZ 1 KHZ / 100 HZ / 10 HZ
TIMEBASE	10 MHZ	PROPORTIONAL GAIN CONTROL, PROVISION FOR EXTERNAL INPUT AND OUTPUT
ACCURACY	+ OR - .1 PPM + OR - 1 PPM BEST ACCURACY	20 TO 40 DEGREES CELSIUS 10 TO 40 DEGREES CELSIUS AFTER MINIMUM 1 HOUR WARMUP.
AGING	.08 PPM	PER MONTH TYPICAL
INPUT IMPEDANCE	NON-PRESCALED PRESCALED	1 MEGOHM / 30 PF 50 OHMS / 25 PF

### GENERAL.....

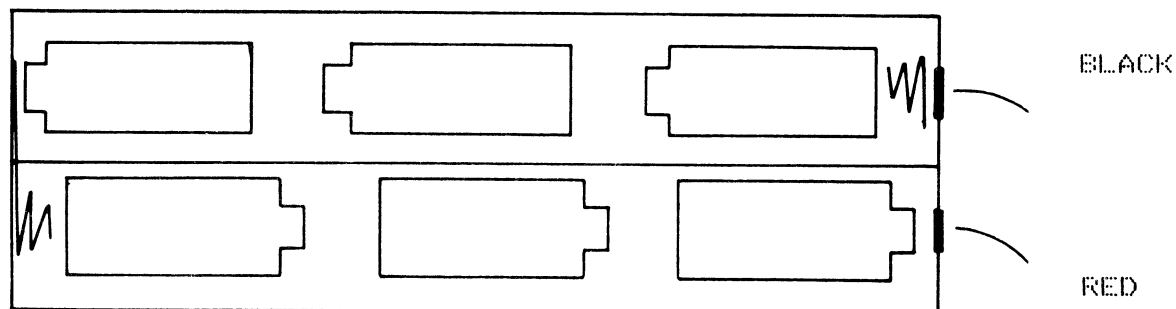
DISPLAY	9 DIGIT RED LED (8 FULL DIGITS PLUS 1 DIGIT OF OVERFLOW INFORMATION), 1/2 INCH SEVEN SEGMENT DISPLAYS, LEADING ZERO SUPPRESSION NOTE: 9TH DIGIT ONLY DISPLAYS A "1" WITH .1 HZ RESOLUTION, DIRECT, FROM 10-50 MHZ.
INPUT CONNECTORS	TWO BNC, PRESCALED AND NON-PRESCALED
POWER REQUIRED	9 TO 14 VOLTS DC, CENTER PIN POSITIVE 115 VOLTS AC WITH OPTIONAL AC ADAPTER BATTERY PACK: 6 "C" CELLS ALKALINE BATTERIES RECOMMENDED OR BAC12 NI-CAD RECHARGEABLE BATTERIES CURRENT REQUIREMENTS: 120 MA STANDBY, 400 MA MAXIMUM
PHYSICAL SPEC.	HEIGHT: 3 1/4 INCHES    WIDTH: 9 INCHES DEPTH: 9 INCHES WEIGHT: WITHOUT BATTERIES, 1 LB. INCLUDING BATTERIES, 3 LB.
OPTIONS	AUDIO SCALER, RECHARGEABLE BATTERY PACK

\* \* \* \* \* SECTION 3 UNPACKING AND SETTING UP \* \* \* \* \*

THE D612 IS PACKAGED AND SHIPPED IN A CUSTOM MOLDED FORM BLOCK CONTAINING CUTOUTS FOR THE INSTRUMENT AND BATTERY ELIMINATOR. THIS PACKAGING PROVIDES PROTECTION WHICH MINIMIZES THE POSSIBILITY OF DAMAGE IN SHIPMENT. WE RECOMMEND THAT ALL PACKAGING BE SAVED IN THE EVENT THE INSTRUMENT MUST BE STORED OR SHIPPED AT SOME FUTURE DATE.

INSTALLATION OF BATTERIES..... !! OPTION B-12 ONLY !! .....

1. REMOVE THE FOUR SCREWS SECURING THE TOP AND BOTTOM OF THE CASE.
2. REMOVE THE CASE TOP.
3. INSTALL SIX "C" CELL BATTERIES AS SHOWN IN THE SKETCH BELOW. BE SURE TO OBSERVE POLARITY MARKINGS MOLDED INTO THE BATTERY BOX.
4. REASSEMBLE CASE.



BATTERY LIFE.....

DMI RECOMMENDS THE USE OF ALKALINE BATTERIES. BECAUSE BATTERY LIFE IS AFFECTED BY DISCHARGE RATES, THE FOLLOWING INFORMATION IS SUPPLIED AS A ROUGH GUIDE ONLY.

1. CONTINUOUS OPERATION (NON-STANDBY), 8 HOURS
2. INTERMITTENT OPERATION (APPROX 1/2 HOUR PER DAY), 1 MONTH

- - - C A U T I O N - - -

IF THE COUNTER IS TO BE STORED FOR AN APPRECIABLE PERIOD OF TIME, THE BATTERIES SHOULD BE REMOVED TO PREVENT DAMAGE TO THE INSIDE OF THE INSTRUMENT.

BATTERY ELIMINATOR (OPTIONAL ACCESSORY).....

THE DMI BATTERY ELIMINATOR IS A SELF-CONTAINED DC POWER SUPPLY WHICH PLUGS INTO ANY 50/60 HZ 110 VAC OUTLET AND PROVIDES APPROXIMATELY 9.0 VOLTS DC TO THE COUNTER THROUGH THE JACK ON THE REAR OF THE INSTRUMENT. IT MAY BE USED EVEN WITH BATTERIES INSTALLED IN THE COUNTER BECAUSE THE JACK IS PROVIDED WITH A SWITCH WHICH AUTOMATICALLY DISCONNECTS THE INTERNAL BATTERY PACK. NOTE: THE OPEN CIRCUIT VOLTAGE OF THE BATTERY ELIMINATOR IS 15 - 18 VDC.

USER FURNISHED POWER SUPPLY.....

ANY RIPPLE FREE SUPPLY OF 9 VDC TO 13 VDC CAPABLE OF SUPPLYING 400 MA MAY BE USED. USE A 2.5 MM POWER PLUG WIRED WITH POSITIVE CENTER.

\* \* \* \* \* SECTION 4 OPERATING INSTRUCTIONS \* \* \* \* \*

- W - A - R - N - I - N - G -

\* DO NOT FEED MORE THAN 10 VOLTS RMS DIRECTLY TO INPUT CONNECTORS \*

THE D612 FREQUENCY COUNTER CAN BE USED IN SEVERAL DIFFERENT MODES:

ANTENNA	1 MHZ - 50 MHZ	FOR MORE DETAILS,
	30 MHZ - 1.2 GHZ	SEE NEXT PAGE
THROUGH T-TAP	3 MHZ - 500 MHZ	
DIRECT FROM RF OR	50 HZ - 50 MHZ	NON-PRESCALED
OSCILLATOR	30 MHZ - 1.2 GHZ	PRESCALED
SNIFFER OR DIRECT	3 MHZ - 50 MHZ	NON-PRESCALED
PROBE	30 MHZ TO 1.2GHZ	PRESCALED

A SIMPLE SNIFFER PROBE MAY BE CONSTRUCTED AS FOLLOWS:

MATERIALS REQUIRED: 1 BNC CONNECTOR  
3 FT. RG-58 COAX CABLE  
5" HEAT SHRINKABLE TUBING

TO MAKE THE PROBE, FIRST ATTACH A FEMALE BNC CONNECTOR TO ONE END OF THE COAXIAL CABLE FOLLOWING THE CONNECTOR MANUFACTURER'S INSTRUCTIONS. THE OTHER END OF THE COAX IS PREPARED AS FOLLOWS:

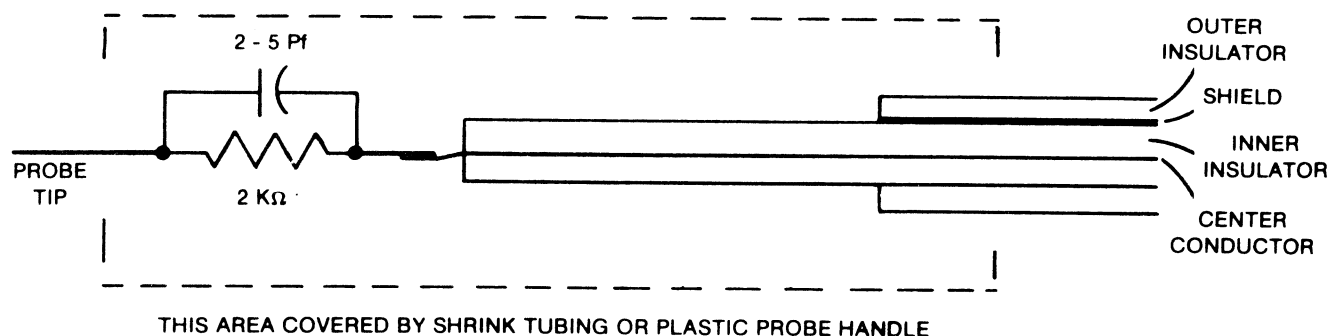
1. MAKE A CLEAN FLUSH CUT AT THE END OF THE CABLE SO THAT A MINIMUM OF INNER CONDUCTOR SHOWS.
2. REMOVE THE OUTER INSULATION AND BRAIDED SHIELD FOR A DISTANCE OF THREE INCHES BACK FROM THE END OF THE WIRE. LEAVE INNER INSULATION INTACT.
3. USE A PIECE OF HEAT SHRINKABLE TUBING TO COVER THE ENTIRE END, INCLUDING THE EXPOSED ENDS OF THE SHIELD. MAKE SURE THAT THE INNER CONDUCTOR IS ALSO COVERED BY THE HEAT SHRINKABLE TUBING. THIS LAST STEP IS NECESSARY TO PREVENT EITHER THE CONDUCTOR OR THE SHIELD FROM MAKING ELECTRICAL CONTACT WITH ANY ENERGIZED SECTION OF THE TRANSMITTER UNDER TEST.

IN USE, THE CONNECTOR END OF THE SNIFFER PROBE IS ATTACHED TO THE APPROPRIATE INPUT CONNECTOR. THE OTHER END OF THE PROBE IS PLACED IN AN AREA CONTAINING 1/2 WATT MINIMUM OF RF ENERGY, SUCH AS NEAR THE OUTPUT STAGE OF THE TRANSMITTER UNDER TEST.

A DIRECT CONTACT PROBE CAN BE MADE BY ADDING AN RC NETWORK TO THE END OF THE COAX CENTER CONDUCTOR AS SHOWN IN THE SKETCH ON THE NEXT PAGE. HEAT SHRINKABLE TUBING SHOULD BE USED OVER THE CAPACITOR AND RESISTOR OR THE NETWORK SHOULD BE MOUNTED IN A PLASTIC PROBE HANDLE.

NOTE: THAT ALL THE ABOVE APPLICATIONS INVOLVE TRANSMIT OR SIGNAL GENERATOR SOURCES THERE IS NO SIMPLE, CONVENIENT WAY TO READ RECEIVE FREQUENCIES WITH ANY FREQUENCY COUNTER.

# SNIFFER PROBE DETAIL....



INPUT		RESOLUTION SELECTED			DISPLAYED READING
INPUT FREQUENCY	DIR PRE	.1 HZ 10 HZ	1 HZ 100 HZ	10 HZ 1 KHZ	
10. 0000000	X	X			10. 0000000
10. 0000000	X		X		10. 0000000
10. 0000000	X			X	10. 000000
14. 2500000	X	X			14. 2500000
14. 2500000	X		X		14. 2500000
14. 2500000	X			X	14. 250000
27. 0850000	X	X			17. 0850000
27. 0850000	X		X		27. 0850000
27. 0850000	X			X	27. 085000
2125. 0 HZ	X	X			21250
2125. 0 HZ	X		X		2125
2125. 0 HZ	X			X	212
146. 940000	X	X			146. 940000
146. 940000	X		X		146. 9400
146. 940000	X			X	146. 940
1200. 250000	X	X			1200. 250000
1200. 250000	X		X		1200. 2500
1200. 250000	X			X	1200. 250

NOTE: 9TH DIGIT READS 1 ONLY ABOVE 1GHZ. 8 FULL DIGITS BELOW 1GHZ.

## OPERATING THE COUNTER.....

1. MAKE SURE BATTERIES ARE INSTALLED OR CONNECT UNIT TO AC ADAPTER OR DC POWER SUPPLY.
2. TURN POWER ON (PUSH BUTTON SWITCH AT RIGHT REAR OF CABINET). WHEN THE FRONT PANEL POWER SWITCH IS IN THE STANDBY POSITION, ONLY THE OVEN IS ENERGIZED. THIS FEATURE IS PROVIDED TO MINIMIZE BATTERY DRAIN AND STILL ALLOW THE OSCILLATOR TO REMAIN WARMED, STABILIZED, AND READY FOR OPERATION. WHEN THE OVEN HAS REACHED OPERATING TEMPERATURE, THE OVEN INDICATOR ON THE FRONT PANEL WILL COME ON. NOTE: IT IS NORMAL FOR THE OVEN INDICATOR TO TURN OFF AND ON OCCASIONALLY. IN ADDITION, WHEN THE AMBIENT TEMPERATURE IS LESS THAN 50 DEGREES FAHRENHEIT, THE OVEN LIGHT MAY NOT COME ON AT ALL. THIS DOES NOT MEAN THE OVEN IS NOT READY, MERELY THAT IT IS HAVING DIFFICULTY COMING UP TO TEMPERATURE. THE TIMEBASE WILL STABILIZE TO WITHIN  $\pm 0.5$  PPM WITHIN ABOUT AN HOUR AS LONG AS THE AMBIENT TEMPERATURE IS WITHIN 0 TO 40 DEGREES CENTIGRADE.
3. TURN ON FRONT PANEL POWER SWITCH.
4. SELECT CORRECT INPUT MODE, I. E. DIRECT 512 OR 1.2 GHZ PRESCALED.
5. SELECT RESOLUTION DESIRED. THIS IS ACHIEVED WITH THREE RIGHT-HAND INTERLOCKED PUSH-BUTTON SWITCHES. THE LEGEND ABOVE THE SWITCHES INDICATES THE VALUE OF THE LEAST SIGNIFICANT DIGIT DISPLAYED.  
FOR EXAMPLE:
  - A. DIRECT INPUT, .1HZ RESOLUTION DEPRESSED. THE LAST DIGIT DISPLAYED WILL BE .1'S OF HZ.
  - B. PRESCALED INPUT, 1KHZ RESOLUTION DEPRESSED. THE LAST DIGIT DISPLAYED WILL BE 1000'S OF HZ.

ALL LEADING ZEROS ARE SUPPRESSED TO AVOID CONFUSION.

PLEASE REFER TO THE CHART ON PAGE 6 FOR DETAILS ON RESOLUTION AND INPUT SELECTION.

-----  
NOTE: LOOK AT THE 7TH LINE ON THE CHART ON PAGE 6. (27.0850000 / DIR / .1 HZ). OBSERVE THE DISPLAYED READING IS 17.0850000. THIS IS NORMAL. THE NINTH DIGIT (THE LEFTMOST DIGIT) IS AN OVERFLOW DIGIT CAPABLE OF DISPLAYING ONLY A "1". IF THE INPUT FREQUENCY IS LESS THAN OR EQUAL TO 19.9999999 MHZ THE READING WILL BE CORRECT. IF THE INPUT FREQUENCY IS GREATER THAN 19.9999999 MHZ, THE READING WILL BE INCORRECT. IMPORTANT: THE RIGHTMOST 8 DIGITS WILL STILL BE CORRECT.  
-----

THE MODEL D612 FREQUENCY COUNTER CAN BE USED WITH AN ANTENNA, RF TAPOFF, OR PICKUP LOOP TO MONITOR TRANSMITTER FREQUENCY.....

IT IS SOMETIMES DIFFICULT TO MONITOR LOW BAND (1.8 TO 30 MHZ) TRANSMITTERS. THE COAX TRANSMISSION LINES DO NOT LEAK ENOUGH RF TO GIVE A STABLE READING ON THE COUNTER. WE SUGGEST BUILDING AN RF TAPOFF (REFER TO INSIDE FRONT COVER) AND INSERTING IT IN THE TRANSMISSION LINE. AS AN ALTERNATIVE, TRY WINDING A FEW TURNS OF TEST LEAD WIRE AROUND THE TRANSMISSION LINE AND CONNECTING IT TO THE COUNTER.

CONCERNING SSB SIGNALS ... THE NATURE OF SSB IS SUCH THAT THERE IS NO CARRIER PRESENT DURING TIMES OF NO MODULATION. IN ORDER TO READ THE FREQUENCY OF AN SSB SIGNAL, IT WILL BE NECESSARY TO MODULATE THE 'CARRIER'. YOU MAY FIND IT EASIER TO SWITCH YOUR TRANSMITTER TO AM OR CW TO PERFORM A FREQUENCY CHECK. THIS WILL ALSO GIVE A MORE STABLE READING. IF YOU ARE TECHNICALLY MINDED AND KNOW YOUR TRANSMITTER, YOU MAY BE ABLE TO CONNECT THE COUNTER TO A POINT INSIDE THE TRANSMITTER BEFORE THE CARRIER IS SUPPRESSED.

DUE TO THE WIDE VARIETY OF TRANSMITTER DESIGNS, WE CAN NOT RECOMMEND ANY SPECIFIC CONNECTION POINT IN ANY TRANSMITTER. PLEASE DO NOT PHONE OR WRITE FOR THIS KIND OF TECHNICAL ADVICE. DMI WILL ASSUME NO RESPONSIBILITY FOR DAMAGE TO EQUIPMENT CAUSED BY CONNECTIONS TO OUR PRODUCTS.

MONITORING VHF SIGNALS IS USUALLY EASIER. IN MOST CASES, USING A PICKUP ANTENNA SUCH AS OUR T1200 BNC ANTENNA IS ALL THAT IS NECESSARY. CONNECT THE ANTENNA TO THE PRESCALED INPUT AND PLACE THE COUNTER WITHIN A FEW FEET OF THE TRANSMITTER. THERE IS USUALLY ENOUGH LEAKAGE FROM VHF TRANSMITTERS TO ALLOW THE D612 TO STABILIZE EASILY. IT MAY BE NECESSARY TO WIND A TURN OR TWO OF TEST LEAD WIRE AROUND THE TRANSMISSION LINE AS A PICKUP IN CASES WHERE LOW POWER OR WELL SHIELDED TRANSMITTERS ARE INVOLVED.

ANOTHER POSSIBLE METHOD FOR PICKING UP VHF SIGNALS IS TO CONSTRUCT A PICKUP LOOP. THIS CAN BE DONE BY BUILDING THE SNIFFER AS OUTLINED ON PAGE 6 EXCEPT THAT THE CENTER CONDUCTOR OF THE COAX IS FORMED INTO A LOOP ABOUT 1 1/2" IN DIAMETER AND CONNECTED BACK TO THE BRAID. THIS IS IN ESSENCE FORMING A ONE TURN TRANSFORMER THAT PICKS UP VHF AND UHF SIGNALS VERY WELL. IT MAY BE NECESSARY TO HOLD THIS LOOP VERY CLOSE TO THE SOURCE OF RF TO GET A STABLE READING.

\* \* \* D M I    A M - 612    A U D I O    M U L T I P L I E R    \* \* \*

THE DMI AM12 AUDIO MULTIPLIER IS DESIGNED TO BE INSTALLED INSIDE THE MODEL D612 COUNTER. THE AM12 WILL ALLOW FREQUENCIES FROM 20 HZ TO 10 KHZ TO BE DISPLAYED ON THE COUNTER WITH INCREASED RESOLUTION. THE AM12 EMPLOYS ADVANCED PHASE LOCKED LOOP (PLL) CIRCUITRY WHICH MULTIPLIES INCOMING AUDIO FREQUENCIES WITH DIGITAL PRECISION. THE AM12 AUTOMATICALLY POSITIONS THE DECIMAL POINT FOR READOUT DIRECTLY IN HZ (CYCLES PER SECOND).

-----  
SPECIFICATIONS ...

FREQUENCY RANGE	X10	20 HZ TO 10 KHZ
	X100	20 HZ TO 1 KHZ
SENSITIVITY		50 MV RMS TYPICAL 20 HZ - 10 KHZ
		THE AM612 WILL SAFELY ACCEPT UP TO 20 VOLTS RMS.
RESOLUTION	X10	.1 SEC GATE / 1 HZ
	X10	1 SEC GATE / .1 HZ
	X10	10 SEC GATE / .01 HZ
	X100	.1 SEC GATE / .1 HZ
	X100	1 SEC GATE / .01 HZ
	X100	10 SEC GATE / .001 HZ
PLL LOCK TIME		LESS THAN .5 SECOND

-----

OPERATING INSTRUCTIONS ...

THE D612 WITH AN AM12 INSTALLED WILL MEASURE AUDIO FREQUENCIES FROM 20 HZ TO OVER 10 KHZ. THE AM12 WILL ACCEPT SINE, SQUARE, TRIANGULAR OR PULSE WAVE FORMS WITHIN THIS RANGE.

SOME OF THE SIGNALS YOU CAN MEASURE:

- \* TOUCH TONES (ONE TONE AT A TIME)    \* TELETYPE FREQUENCY SHIFTS
- \* PRIVATE LINE TONES                    \* AUDIO SIGNALS FROM AN AUDIO GENERATOR

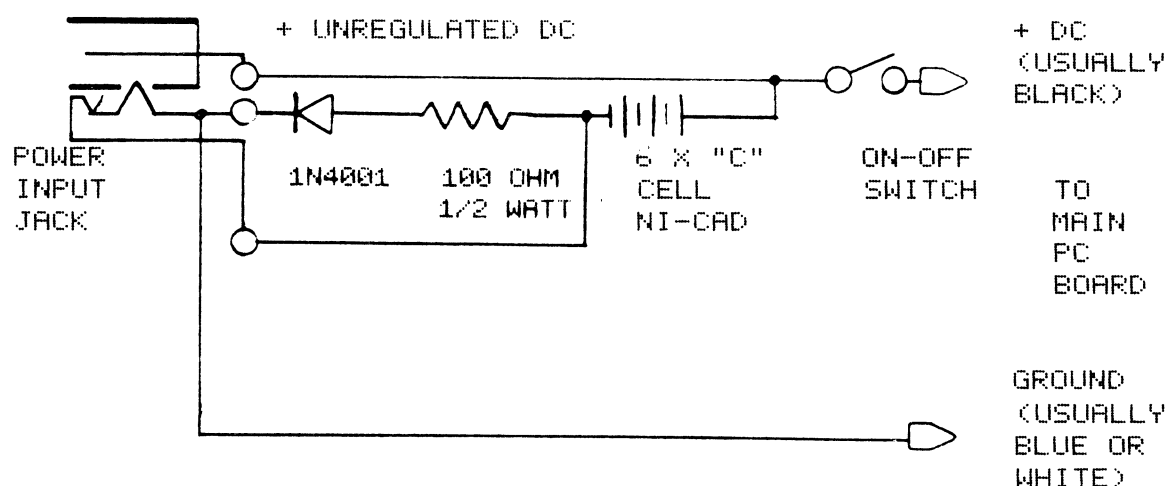
THE AM12 IS EASY TO USE ... JUST CONNECT THE SIGNAL TO BE MEASURED TO THE NON-PRESCALED INPUT, THEN SELECT THE MULTIPLICATION FACTOR USING THE SWITCH ON THE BACK PANEL. THE FREQUENCY SHOULD BE DISPLAYED ON THE FRONT PANEL. PER FIG. BELOW.

INPUT FREQUENCY	MULT. FACTOR		RESOLUTION SELECT			DISPLAYED READING
	X10	X100	.1 HZ	1 HZ	10 HZ	
2125.000 HZ	X .....		X .....			2125.00
2125.000 HZ	X .....			X .....		2125.0
2125.000 HZ	X .....				X .....	2125.
122.500 HZ		X .....	X .....			122.500
122.500 HZ		X .....		X .....		122.50
122.500 HZ		X .....			X .....	122.5

-----

## USE AND CARE OF NI-CAD BATTERY PACK (OPTIONAL ACCESSORY)...

THE DMI BAC12 RECHARGEABLE BATTERY PACK IS A COMPLETE ASSEMBLY CONSISTING OF A BACKPLATE, BATTERY CASE, ON-OFF SWITCH, POWER INPUT JACK AND SIX "C" CELL NI-CAD RECHARGEABLE BATTERIES. IF YOU ARE INSTALLING THE BAC12 YOURSELF, YOU WILL HAVE TO DISASSEMBLE THE COUNTER. REMOVE THE OLD BACKPLATE/BATTERY ASSEMBLY THEN INSTALL THE NEW BAC12 ASSEMBLY. BE SURE TO WIRE THE BAC12 ASSEMBLY IN THE SAME WAY THE 'OLD' ASSEMBLY WAS WIRED. IF IN DOUBT, DOUBLE CHECK THE WIRING BY REFERRING TO THE SCHEMATIC AND/OR THE PICTURES IN THIS MANUAL.



USING YOUR D612 WITH RECHARGEABLE BATTERIES IS USUALLY JUST AS SIMPLE AS USING THE COUNTER WITH REGULAR BATTERIES OR THE AC ADAPTER. THERE ARE A FEW THINGS YOU SHOULD KNOW ABOUT NI-CAD BATTERIES AND ABOUT OUR BAC12 IN PARTICULAR.

### CHARGING.....

THE BATTERY PACK IS WIRED FOR AUTOMATIC TRICKLE CHARGING FROM THE DMI AC12 AC ADAPTER. THIS ADAPTER IS WELL SUITED FOR MAINTAINING THE NI-CADS AT CONSTANT FULL CHARGE OR FOR RECHARGING THEM OVERNIGHT.

THE OUTPUT VOLTAGE FROM THE AC ADAPTER IS NOT 'REGULATED' VERY WELL; UNDER NO LOAD OR LIGHT LOAD (0-100 MA), THE VOLTAGE IS USUALLY AROUND 14-18 VOLTS. THE D612, WHEN TURNED <OFF> OR IN <STANDBY> DRAWS LESS THAN 100 MA. THIS VOLTAGE, SUPPLIED TO THE BATTERIES THROUGH A 100 OHM CURRENT LIMITING RESISTOR IS PERFECT FOR A REASONABLY 'FAST' CHARGE (16-24 HOURS). WHEN THE COUNTER IS TURNED <ON>, OUTPUT FROM THE ADAPTER IS LOADED DOWN TO AROUND 9-11 VOLTS. THIS VOLTAGE, SUPPLIED TO THE BATTERIES THROUGH THE 100 OHM RESISTOR IS SUFFICIENT TO MAINTAIN A 'FLOAT' CONDITION ON THE NI-CADS (CHARGE CURRENT APPROX. 10-30 MA).

**\*\* NOTE \*\*** IF YOU ARE RUNNING THE COUNTER FROM A WELL-REGULATED 12 VOLT DC SOURCE, THE BATTERIES MAY TAKE LONGER TO RECHARGE (24-48 HOURS). THIS IS BECAUSE THE CHARGE CURRENT IS ONLY APPROX. 50 MA.

NI-CAD BATTERY INSTRUCTIONS CONTINUED.....

DISCHARGE.....

THE NI-CAD CELLS IN THE BAC12 HAVE 1200 MILLIAMPERE-HOURS OF CAPACITY. THIS GIVES THEM ABOUT 3 TO 10 HOURS OF USE DEPENDING ON AMBIENT TEMPERATURE, NUMBER OF DIGITS DISPLAYED AND WHETHER NON-PRESCALED OR PRESCALED INPUTS ARE USED.

IT IS A GOOD IDEA TO RECHARGE THE BATTERIES AS SOON AS POSSIBLE AFTER USE. ALSO, TRY NOT TO LEAVE THE COUNTER TURNED <ON> WITH 'DEAD' NI-CADS AS THIS MAY LEAD TO REVERSE CHARGING OF THE CELLS. UNDER MOST CIRCUMSTANCES, REVERSED CELLS MAY BE RESTORED TO NORMAL SIMPLY BY RECHARGING FOR AN EXTRA FEW HOURS.

ON BATTERY LIFE.....

NI-CAD CELLS NORMALLY CAN BE RECHARGED 100 TO 500 TIMES. NORMAL LIFE OF THE CELLS IS ABOUT 1 TO 3 YEARS. OUR WARRANTY COVERS THE PACK FOR 90 DAYS ONLY, USUALLY ENOUGH TIME FOR DEFECTIVE CELLS TO SHOW UP. IF YOUR BATTERY PACK WILL NOT ACCEPT A CHARGE, THERE ARE A FEW THINGS YOU CAN DO BEFORE RETURNING THE ASSEMBLY TO THE FACTORY. OPEN THE COUNTER, INSPECT THE BATTERY PACK ASSEMBLY FOR LOOSE CONNECTIONS. LOOK CLOSELY AT THE CELLS. IF ANY OF THEM ARE LEAKING AROUND THE SEAMS, REMOVE THE CELL(S).

IF YOU ARE CONVINCED THE BATTERY ASSEMBLY IS DEFECTIVE, AND IT IS WITHIN THE WARRANTY, CALL THE FACTORY FOR A RETURN AUTHORIZATION. IF YOU HAVE TO DEPEND ON THE COUNTER TO OPERATE ON NI-CADS, YOU MIGHT CONSIDER PURCHASING A SPARE BAC12 ASSEMBLY JUST FOR A BACKUP.

A FEW WORDS OF CAUTION.....

**\*\* DO NOT \*\*** UNDER ANY CIRCUMSTANCES, DISPOSE OF NI-CAD BATTERIES IN A FIRE. THEY MAY EXPLODE. DO NOT MIX ALKALINE BATTERIES WITH NI-CAD CELLS IN THE BAC12 ASSEMBLY. DO NOT INSTALL ALKALINE BATTERIES IN THIS ASSEMBLY WITHOUT REMOVING THE RECHARGING CIRCUIT (THE 1N4001 AND THE 100 OHM RESISTOR). ALKALINE BATTERIES ARE NOT DESIGNED FOR RECHARGING AND MAY EXPLODE IF CURRENT IS FORCED INTO THEM.

\* \* \* \* \* SECTION 5 - THEORY OF OPERATION \* \* \* \* \*

THE D612 MAY BE DIVIDED INTO SEVEN SECTIONS BY FUNCTION AS FOLLOWS:

1. TIMING AND CONTROL
2. INPUT SIGNAL CONDITIONING AND AMPLIFICATION
3. SIGNAL GATE
4. COUNTER
5. DISPLAY LATCHES AND DRIVERS
6. DISPLAY
7. POWER SUPPLY / BATTERY PACK

A PRECISE CLOCK FREQUENCY IS PROVIDED BY THE OVENIZED OSCILLATOR PORTION OF THE TIMING/CONTROL SECTION. THE OSCILLATOR FREQUENCY IS DIVIDED DOWN FURTHER BY THE DIVIDERS TO PROVIDE VERY PRECISE GATE TIMES.

THE GATE DRIVE IS USED TO OPEN AND CLOSE A GATE WHICH CONTROLS THE INPUT FROM THE SIGNAL CONDITIONING SECTION TO THE COUNTER SECTION. IT ALSO PROVIDES STROBE AND RESET SIGNALS TO THE COUNTER SECTION.

THE SIGNAL CONDITIONING SECTION AMPLIFIES AND THEN SQUARES UP THE INPUT SIGNAL. IT ALSO DIVIDES THE VHF INPUT SIGNAL DOWN TO A LOWER FREQUENCY WHICH CAN BE COUNTED BY LSTTL COUNTERS.

THE SEQUENCE OF EVENTS IN THE FUNCTION OF THE COUNTER IS AS FOLLOWS:

STARTING AT TIME ZERO THE TIMING AND CONTROL SECTION DELIVERS A SIGNAL TO THE CONTROL GATE WHICH OPENS IT FOR THE TIME DURATION OF THE GATE PERIOD. DURING THE TIME THE GATE IS OPEN A PULSE TRAIN FROM THE SIGNAL CONDITIONING SECTION IS FED DIRECTLY INTO THE COUNTER.

THE COUNTER ACCUMULATES AND STORES THE NUMBER OF PULSES RECEIVED DURING THE GATE PERIOD. WHEN THE GATE CLOSES THE PULSE TRAIN IS SHUT OFF AND THE COUNTER TRANSFERS THE ACCUMULATED DATA TO THE LATCH AND DRIVER SECTION WHICH CAUSES THE LED'S TO DISPLAY THE DATA STORED IN THE LATCH.

WHILE THIS DATA IS BEING DISPLAYED THE GATE OPENS AGAIN AND A NEW PULSE TRAIN IS ACCUMULATED AND STORED IN THE COUNTER.

WHEN THE GATE CLOSES, THE DATA IS TRANSFERRED FROM THE COUNTER SECTION TO THE LATCH AND DRIVER SECTION AND THE INFORMATION IN THE DISPLAY IS INSTANTLY UPDATED.

THE BATTERY PACK OR EXTERNAL POWER SUPPLY PROVIDES POWER TO A 5 VOLT REGULATOR ON THE MAIN PC BOARD WHICH IN TURN PROVIDES ALL THE POWER TO THE FREQUENCY COUNTER.

REFER TO BLOCK DIAGRAM AND SCHEMATIC FOR MORE INFORMATION.

\* \* \* \* \* S E C T I O N   6            C A L I B R A T I O N   \* \* \* \* \*

GENERAL CONSIDERATIONS.....

UNITS TO BE CALIBRATED SHOULD ALWAYS BE TEMPERATURE STABILIZED BY WARMING UP FOR A MINIMUM OF 30 MINUTES (1 HOUR PREFERABLE). IF THE COUNTER IS OPERATING FROM INTERNAL BATTERIES, BE SURE TO USE FRESH BATTERIES.

FOR MAXIMUM ACCURACY, CALIBRATION FREQUENCY SHOULD BE 10 MHZ TO 30 MHZ ON NON-PRESCALED INPUT OR 100 MHZ TO 300 MHZ ON PRESCALED INPUT. YOU'LL NEED A SMALL SCREWDRIVER FOR ANY OF THE FOLLOWING METHODS:

METHOD 1.....

EQUIPMENT REQUIRED:

1. CALIBRATED FREQUENCY COUNTER
2. RF TRANSMITTER, CRYSTAL CONTROLLED, EITHER LO-BAND (10 MHZ - 30 MHZ) OR VHF (140 MHZ - 450 MHZ)

TURN ON BOTH FREQUENCY COUNTERS AND TRANSMITTER. ALLOW TIME ENOUGH FOR BOTH COUNTERS TO COME TO TEMPERATURE EQUILIBRIUM. SELECT 1 HZ NON-PRESCALED OR 10 HZ PRESCALED RESOLUTION DEPENDING ON FREQUENCY OF TRANSMITTER. PLACE BOTH COUNTERS CLOSE TOGETHER ON BENCH. USING ANTENNA INPUTS OR SNIFFER PROBES ON BOTH COUNTERS, TRANSMIT TO BOTH COUNTERS SIMULTANEOUSLY. ADJUST TIMEBASE TRIMMER CAPACITOR ON THE D612 UNTIL THE COUNT MATCHES THAT ON THE CALIBRATED UNIT. ACCESS TO THE TRIMMER CAPACITOR IS THROUGH A SMALL HOLE ON THE BOTTOM LEFT SIDE OF THE CASE. THE HOLE MAY BE COVERED WITH AN ADHESIVE SEAL WHICH SHOULD BE REPLACED AFTER CALIBRATION. USE EXTREME CARE WHEN ADJUSTING THE TRIMMER. ONLY A FEW DEGREES OF ROTATION ARE REQUIRED FOR MOST CALIBRATION ADJUSTMENTS.

NOTE: IF THE INSTRUMENT IS GROSSLY OUT OF CALIBRATION, A PRELIMINARY ADJUSTMENT CAN BE MADE AT A LOWER RESOLUTION FIRST. BE SURE TO MAKE THE FINAL ADJUSTMENT AT THE HIGHEST RESOLUTION POSSIBLE.

METHOD 2.....

EQUIPMENT REQUIRED:

1. RF SIGNAL SOURCE OF KNOWN ACCURACY - 10 MHZ OR 1 MHZ  
LABORATORY STANDARD PREFERRED.

THE SOURCE OF RF MUST HAVE OUTPUT AT LEAST AS ACCURATE AS THE DESIRED ACCURACY OF THE D612. CONNECT THE KNOWN FREQUENCY INTO THE D612 AND ADJUST THE TRIMMER UNTIL THE D612 DISPLAYS THE FREQUENCY CORRECTLY.

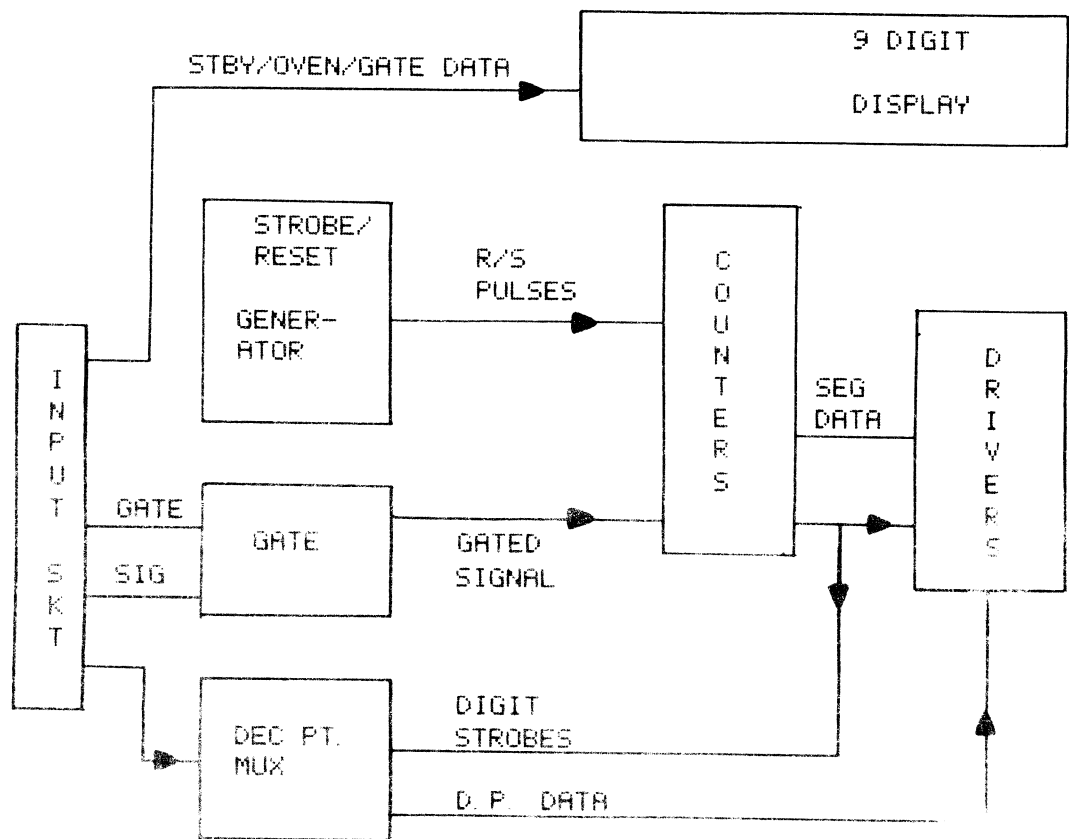
METHOD 3.....

NOTE: YOU MUST DISASSEMBLE THE COUNTER USING THIS METHOD.

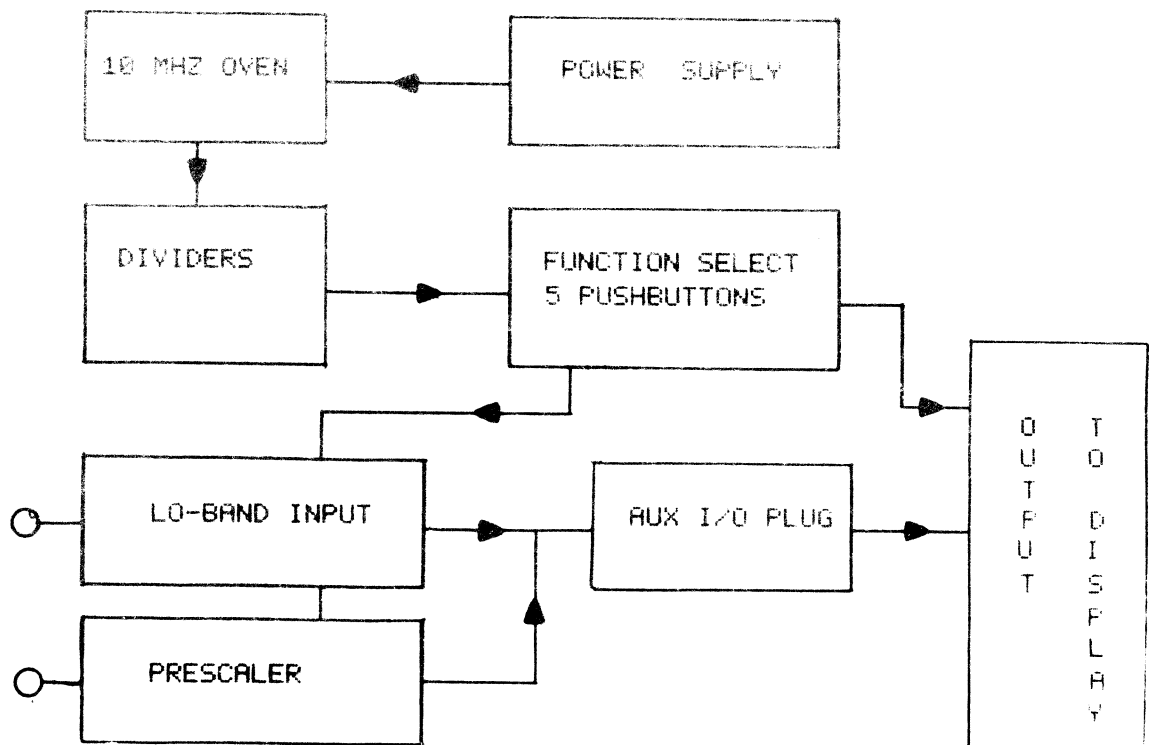
EQUIPMENT REQUIRED:

1. CALIBRATED FREQUENCY COUNTER ABLE TO READ 10MHZ  
REMOVE THE TOP COVER OF YOUR D612 COUNTER BY REMOVING THE FOUR SCREWS SECURING THE FEET. LOCATE THE TWO RCA PHONE JACKS LOCATED BEHIND THE OVEN COVER (NOTE DO NOT REMOVE THE OVEN COVER FOR ANY REASON ). CONNECT A LEAD FROM THE 10 MHZ OUTPUT JACK TO THE FREQUENCY COUNTER TO BE USED FOR CALIBRATION. ADJUST YOUR D612 COUNTER TO READ 10 MHZ. BE SURE THE COUNTER BEING USED IS AT LEAST ACCURATE TO WITH IN 1X10 TO 8TH POWER.

BLOCK DIAGRAM:  
DISPLAY BOARD.....



MAIN PC BOARD.....



INTEGRATED CIRCUITS....

1 - 7805 REGULATOR  
 2 - 75492 DIGIT DRIVER  
 4 - 74LS196 COUNTER  
 1 - 74196 COUNTER  
 2 - 74LS00 QUAD NAND  
 2 - 4011 CMOS QUAD NAND  
 2 - 4013 CMOS DUAL D FF  
 1 - 4051 8 INPUT MUX  
 4 - 4518 COUNTER  
 1 - 4511 BCD - 7 SEG DRIVER  
 1 - 4520 BINARY COUNTER  
 1 - LM3911 TEMP CONTROLLER  
 1 - DM1020 PRESCALER  
 1 - LS7031 LSI COUNTER

TRANSISTORS....

6 - 2N2222A NPN  
 2 - 2N2907 PNP  
 2 - 2N5179 NPN  
 1 - SC700 OR MPF102A FET

DIODES.....

12 - 1N914  
 1 - 1N4002

LEDs.....

10 - DL-500 OR TIL322A

RESISTORS.....

7 - 27 OHM	3 - 10 MEG	1 - 5.6 K OHM
4 - 470 OHM	3 - 100 K OHM	1 - 33 OHM
1 - 2200 OHM	1 - 4.7 K OHM	1 - 270 K OHM
2 - 47 OHM	1 - 2.0 K OHM	4 - 1 K OHM
3 - 150 OHM METAL FILM	3 - 10 K OHM	4 - 390 OHM
3 - 1 MEG	4 - 11 K OHM	2 - 330 OHM
1 - 820 OHM	1 - 100 OHM	2 - 22 K OHM
3 - 680 OHM	1 - 330 K OHM	

CAPACITORS.....

3 - .001 UF DISC	9 - .01 UF DISC	1 - .005 UF
2 - .1 UF DISC	3 - .02 UF DISC	1 - 22 PF
1 - 47 PF	4 - 22 UF ELECT.	2 - 47 UF ELECT
1 - 100 PF NPO DISC	1 - 3-25 PF TRIMMER	

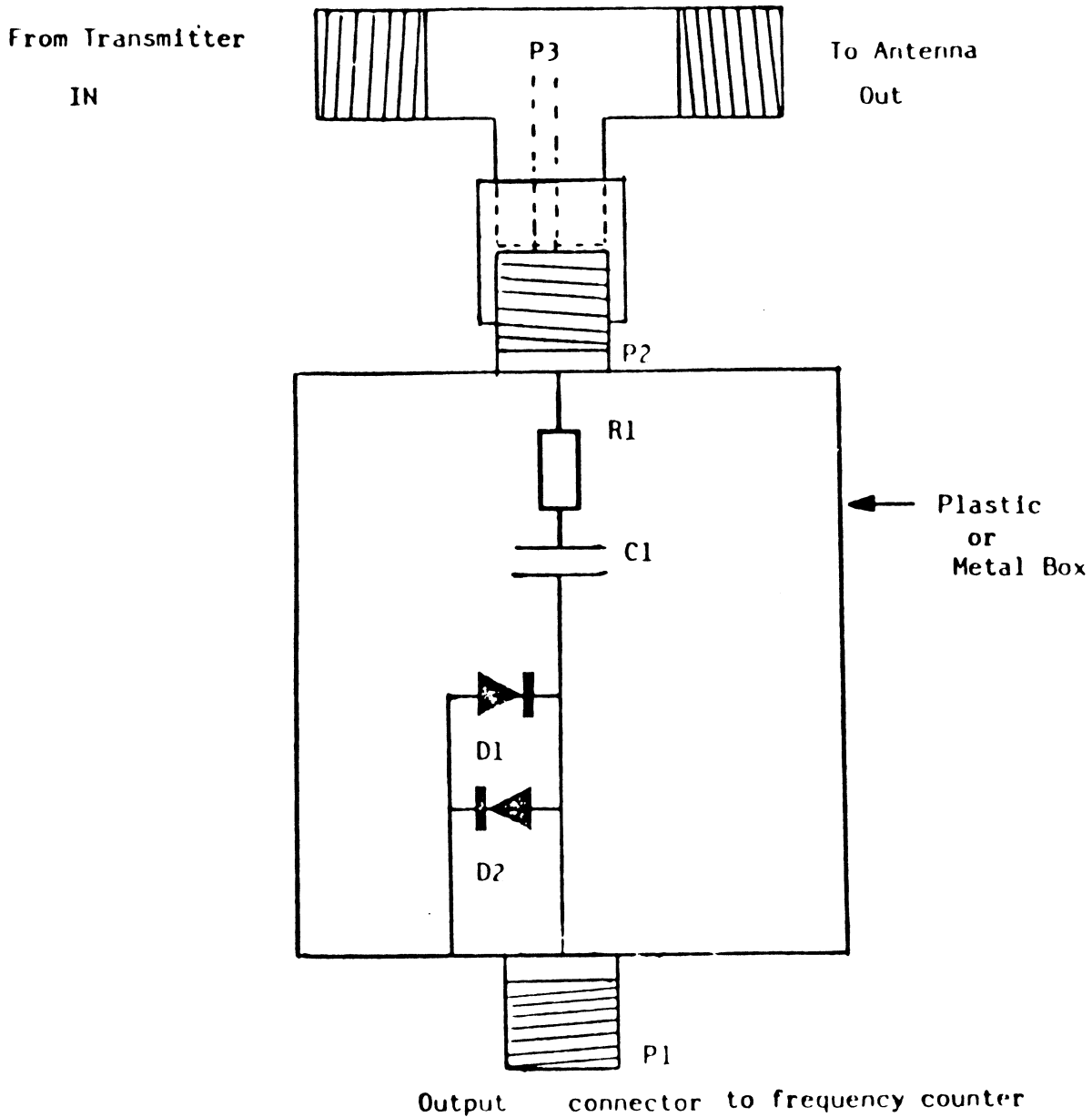
MECHANICAL.....

1 - PRINTED CIRCUIT MAIN BOARD	CASE CONSISTING OF:
1 - PRINTED CIRCUIT DISPLAY BOARD	1 - CASE TOP
2 - BNC CONNECTORS FEMALE	1 - CASE BOTTOM
2 - RCA CONNECTORS PC MOUNT	2 - SIDE RAILS
1 - 14 CONDUCTOR HARNESS ASS'Y	1 - BACK PANEL
1 - 6 GANG SWITCH ASSEMBLY	1 - FRONT PANEL
5 - SWITCH BUTTONS	1 - FRONT FACE PLATE
1 - POWER INPUT JACK	8 - SIDE RAIL SPACERS

# RF SAMPLER

160 Meters to 450 MHz

1 Watt to 250 Watts



R1 1 K Ohms  $\frac{1}{4}$  Watt

C1 5 pf 1KV

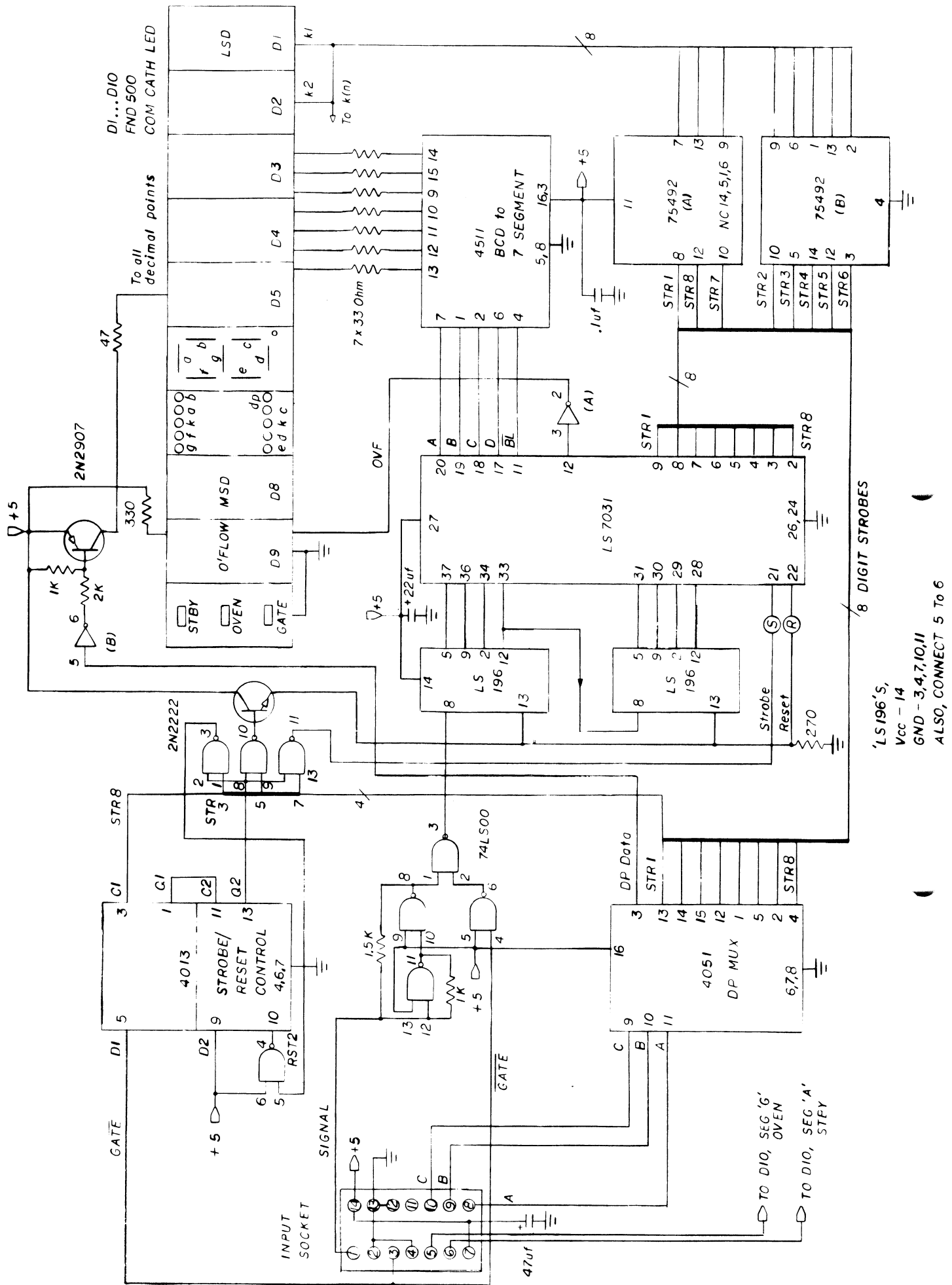
D1 D2 1N914

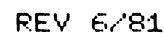
P1 P2 S0239 Flange Connector

P3 PL259 T connector

Note: Diodes to ground

Note: Do not exceed 250 watts input





\*\*\*\*\* C E R T I F I C A T I O N \*\*\*\*\*

DIGIMAX INSTRUMENTS CORP. CERTIFIES THAT THIS INSTRUMENT WAS TESTED AND FOUND TO MEET ALL PUBLISHED SPECIFICATIONS WHEN IT WAS SHIPPED FROM THE FACTORY. DIGIMAX INSTRUMENTS FURTHER CERTIFIES THAT ITS CALIBRATION MEASUREMENTS ARE TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS TO THE EXTENT ALLOWED BY NB'S CALIBRATION FACILITY.

\*\*\*\*\* W A R R A N T Y \*\*\*\*\*

DIGIMAX INSTRUMENTS CORP. WARRANTS THIS INSTRUMENT AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR ONE YEAR FROM DATE OF SHIPMENT. WE WILL REPAIR OR REPLACE THE INSTRUMENT DURING THE WARRANTY PERIOD PROVIDED IT IS RETURNED TO DIGIMAX INSTRUMENTS CORP. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. WE ARE NOT LIABLE FOR CONSEQUENTIAL DAMAGES. PERMISSION MUST BE OBTAINED DIRECTLY FROM THE FACTORY FOR WARRANTY REPAIR RETURNS. NO LIABILITY WILL BE ACCEPTED IF RETURNED WITHOUT SUCH PERMISSION.