the theory that a system operator really needs an output filter to insure that miscellaneous unwanted products from the upconverter DBM do not find their way into the system via the looping or mixing mode.

This gets us to a +40 dBmV output carrier level. At this point the QB-650 processor offers the user a couple of **options:**

(a) Operation at the **+40 dBmV** level point;

(b) Operation with an optional high level output amplifier at **+60 dBmV** (allowing external channel coupling with external hybrid couplers, directional taps or whatever);

(c) Operation with an optional mid-level looping amplifier at **+50 dBmV** output level (you combine channels by simply looping through one channel to the next via the output looping connectors on the back panel, with +50 dBmV output per channel max).

As lengthy as this basic explanation is, it has but touched the surface of the QB-650 unit. There is an optional phase-lock system for locking a processed channel to a reference signal (local off-air, internal to system generated comb or whatever); test points for direct connection of a garden variety VHF frequency counter to measure the (unmodulated) carrier frequencies in the processor; **optional** use of the helical resonator adjacent channel filter (if you **don't** have strong adjacents—such as UHF input—the cost of the hi-Q adjacent channel filter is eliminated); pre-amplifier powering from the processor and so on.

Both the Triple Crown TSP processor (operating on 8 in, 3 out) and the QB-650 processor (operating 6 in, 6 out) are now undergoing extensive tests at the **CATJ** Lab and this report will continue in the July issue.

COUNTING TO 300. . .

Richey's 300 MHz 'Mini-Freq' Counter Can Be Assembled In Your Spare Time

CATV's "MINI-FREQ" counter developed by Steve Richey and described in text.

Editor's Note:

The reader is referenced to pages 31 to 34 in the April (1977) issue of CATJ for part one of this two-part series. In the April issue Steve Richey describes a very newly developed, state-of-the-art frequency counter for CATV applications. Included in that first installment is a schematic of the unit.

Richey's intent with this unit is to make possible the home or system construction of a counter which is uniquely tailored to serve CATV frequency measurement needs. The unit is described with a parts list in April (see modifications to the parts list here) and certain perhaps hard-to-find-everywhere component parts are sourced in part one.

A complete kit of parts for construction of this frequency counter at this July's CCOS-77 (see separate preview **May**) will be available for CCOS-attendees. Richey advises that in about 2-3 hours time a person should be able to take a complete set of parts and have the counter "up and working"; allowing another hour's time for installing the unit into the metal case and getting the minor adjustments and debugging done.

Modifications To April

Sufficient additional experience with the "Mini-Freq" counter has been achieved since our April CATJ report that the first order of business is to **update** a couple of changes. The changes result in improved performance.

(1) **Input sensitivity**-Reference is made to the schematic diagram on page 34 for April (1977). **Remove** the two 1N914 diodes between the 1K input resistor and the SD-1006 first stage. **Next,** remove the 68 ohm resistor from the B plus to the collector of the SD1006 and replace it with a 6 turn choke on a 4B bead. **Third,** in series with the 68 ohm resistor appearing on the base of the SD-1006 add another 6 turn choke on a 4B bead. **Fourth,** place a 10 ohm resistor in series with the .01 disc cap on the emitter of the SD1006. **Fifth,** place a 22 pF ceramic disc cap from the emitter to ground of the SD1006. **Sixth** and lastly, place a 1K resistor from pin 1 of the 7490 IC (center, near top of diagram) to ground.

By making these modifications, the overall sensitivity of the "Mini-Freq" is improved across the spectrum. To a considerable extent, sensitivity is a function of input frequency with virtually any counter. In real hard numbers, at the 300 MHz upper limit of this particular counter you have just lowered the input sensitivity from approximately 700 mV to around 300 mV. At lower frequencies the sensitivity is considerably lower, such as 100 mV (+40 dBmV).

(2) **Oscillator stability**-Only one change here. Locate the 10K resistor in the oscillator section (just above the 1 MHz crystal) and change it with a 4.7K resistor, **paralleling it** with a 500 pF disc ceramic cap.

(3) **IC-3 change**-Change the output from pin 12 (indicated on schematic) **to** pin 4.

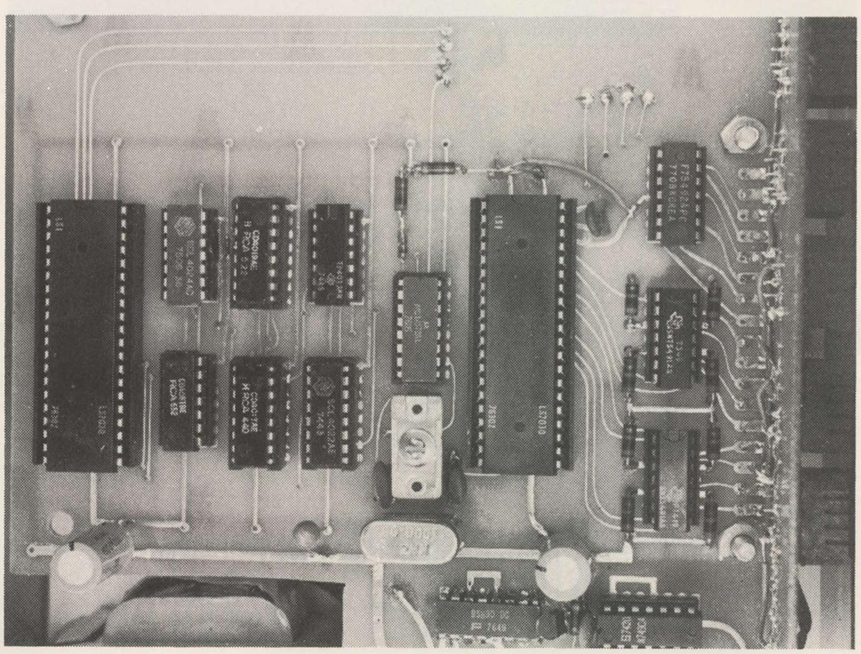
(4) **Sloppy drawing change**-Back to the input circuit, but this time as it relates to the J310/2N3564 stages at the top left of the schematic. The **correct** schematic for this is shown here as **diagram M-1.** Note the changes are the **addition of** a 100 ohm, a 10K and a 100 K resistor (top), a 1 megohm resistor (input to J310) and a .1 disc cap coupling the two gain stages.

(5) **Power supply glitches**-A more stable DC source for the IC's is the result when you do the following: locate the +12 VDC line and **parallel** a **pair** of 100 MFD electrolytics to ground. Then locate the +5 VDC line and **place** a 25 MFD electrolytic to ground.

The parts source referenced for critical parts or hard to find parts in the April report will supply a **corrected schematic** upon request (**enclose** a self addressed, stamped envelope). CCOS-77 "Mini-Freq" kit builders will find an updated schematic in their part bags.

Having updated the schematic, let's charge ahead with the construction. We urge that all IC's **except** the 95H90 be installed **in IC sockets.** Mount the IC sockets and the other parts as outlined in the parts layout shown here and solder all parts into place from the **back of the board only.** Holes (if you obtain the board from the April source given) are "plated through" and you don't need to be messing around with globby solder on the front or top of the board! After all parts (except the IC's-**wait** a while) are mounted, solder the display board to the "mother" (that's respectful) board. Using great care with heat (keep it around 25 watts and keep the soldering tip on the pin only

FND500 LED DISPLAYS mount on right-angle mounted sub-board that attaches to the main "mother board" and places displays directly behind cut out in cabinet.



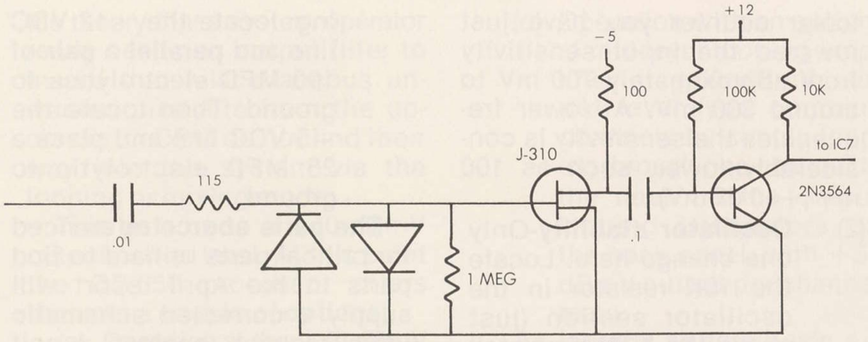
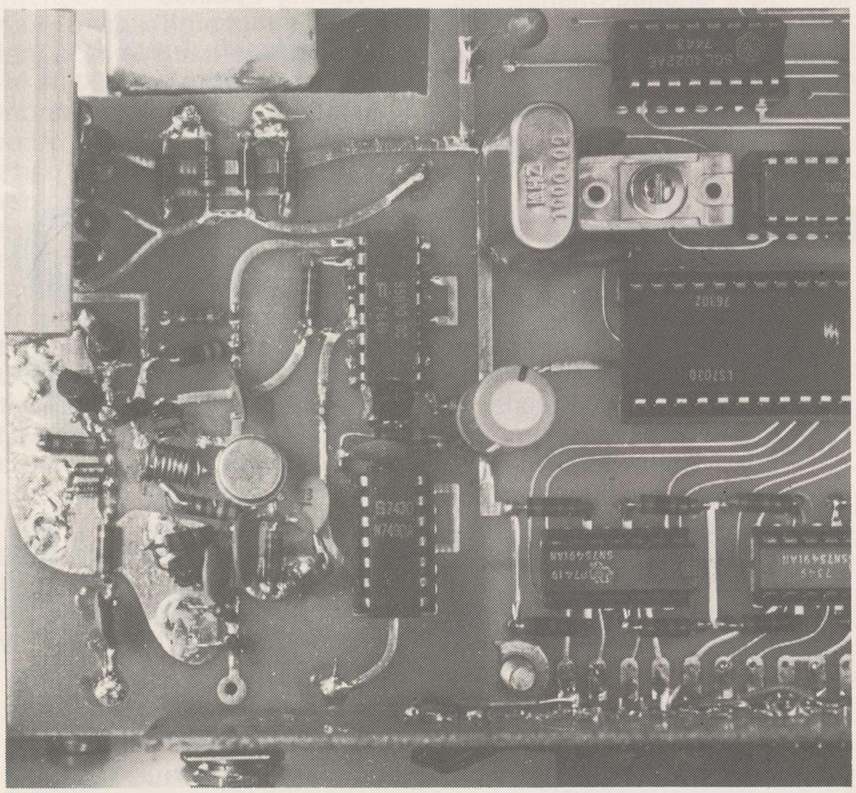


DIAGRAM M-1



long enough to flow-solder) connect up the 95H90. Now put the board into the case (see photos) and connect the input "F" fitting and the 2 pole, 3 position switch. **Note:** Use **very short** leads (as short as practical) in wiring up the switch and the input fitting.

When everything is mounted into place, including the 5 volt regulator mounted on the case itself, turn the unit on and measure the voltage at the 5 and 12 volt regulators. Make sure they are working properly, then **turn off the unit** and insert the 7490 IC. (Note: Never-ever-plug in and take out IC's with the voltage on the unit).

Input with your sweep generator and check the flatness of the input amplifier section. The spec should be flat to within +/- 1 dB from 5 through 300 MHz (pin 12 on the 7490, tieing back to the 2 pole 3 position switch is the output and that's where you sample the sweep after amplification). Now switch your generator to the CW mode and input at 100 MHz or thereabouts. Look at the output with a spectrum analyzer or with a scope (and detector) at TP1 (see lower left, diagram M-2). You should have a square wave output at 1 MHz or 1 cycle per microsecond on your scope. If you do not have these results, back up to your pin 1 input on the 7490 and look for 10 cycles at the input.

When you have completed this step, insert the 4572 (IC6) and hook up your scope to test point 2 (TP2). TP2 is located

POWER SUPPLY

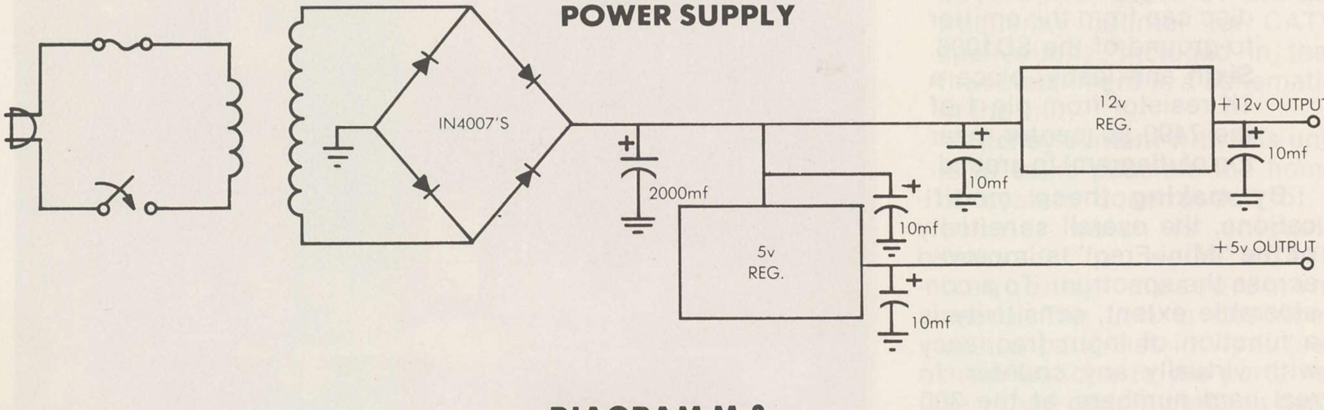


DIAGRAM M-3

just to the left of the 5K resistor at the upper left hand corner of IC1 (7030) near the center of the board (diagram M-2). Adjust your scope for a display of 1 cycle per microsecond or 1 MHz. With power off, insert the balance of the IC's.

When power is re-applied, the display's should light, briefly, and then go to a single zero. By changing the rotary switch (S1A/B) the decimal point location should shift about (from far left to 3 places right of far left).

PARTS LIST ADDENDUM

The following parts have been added, or replace an earlier designated part, or were inadvertently left off the April edition parts list for the "Mini-Freq" counter.

Qty.	Item	Note
1	**4019**	**(IC-5) (a)**
5	10 MFD tantalum caps	
2	100 MFD electrolytic caps	
1	25 MFD electrolytic cap	
1	500 pF disc ceramic	
1	10 ohm resistor	
1	100 ohm resistor	
1	1K resistor	
1	10K resistor	
1	100K resistor	
1	1 Meg-ohm resistor	
1	4.7K resistor	
1	.1 MFD disc ceramic	
1	22 pF disc ceramic	
1	F-61 chassis connector	
1	Radio Shack RS 270-299 enclosure	
3	2" stud spacers, 10-32	
3	10-32 x 2.25" bolts	
3	10-32 nuts	

(**a**-a source for hard to find parts in bold face [including those listed in April] is: **Electronic Research & Development, 5611 NW 37th, Oklahoma City, Ok. 73122.)**

Temporarily remove the jumper from the right hand side of IC1 (diagram M-2) and apply 12 VDC to the "A" point where the jumper came off. All of the digits should turn to "8". If they do, dis-connect the 12 volts and replace the jumper.

Now apply a 100 MHz signal (from signal generator, sweep in CW mode, or some other source of suitable input voltage) and the unit should indicate, in the .01 position, 100.XXX. In the .1 position it should indicate 00.XXXX and in the 1 second division it should read direct.

Trouble?

If there are problems not discussed here, in the alignment procedure and fire-up steps, check the following:

(1) There should be approximately 10 kHz of signal present on pin 39 of IC1. If not, check for a bum solder connection and check the 100 pF capacitor.

(2) Check for signal presence on pins 21 and 22 of IC1. If none is present, IC9 or IC8 may be on the fritz.

(3) Check for signal of one cycle per second or 10 Hz or 100 Hz (varies with position of time-select switch) at pin 6 of IC7. If none is present, go back to pin 3 of IC1. IC-7 or IC-4 can cause this problem.

(4) When all else fails, you might call Mark Miller at (405) 681-5343 and ask for help!

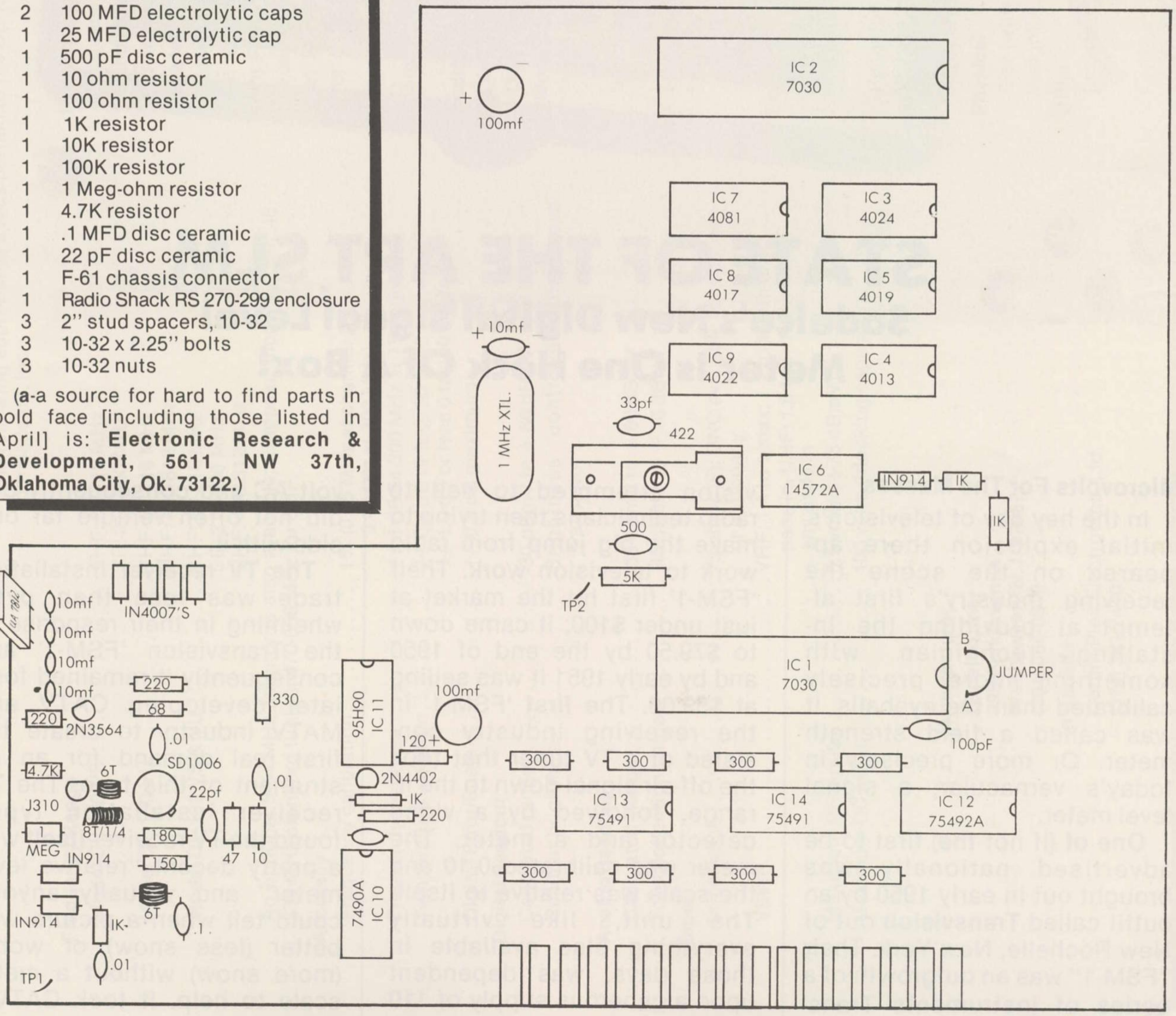
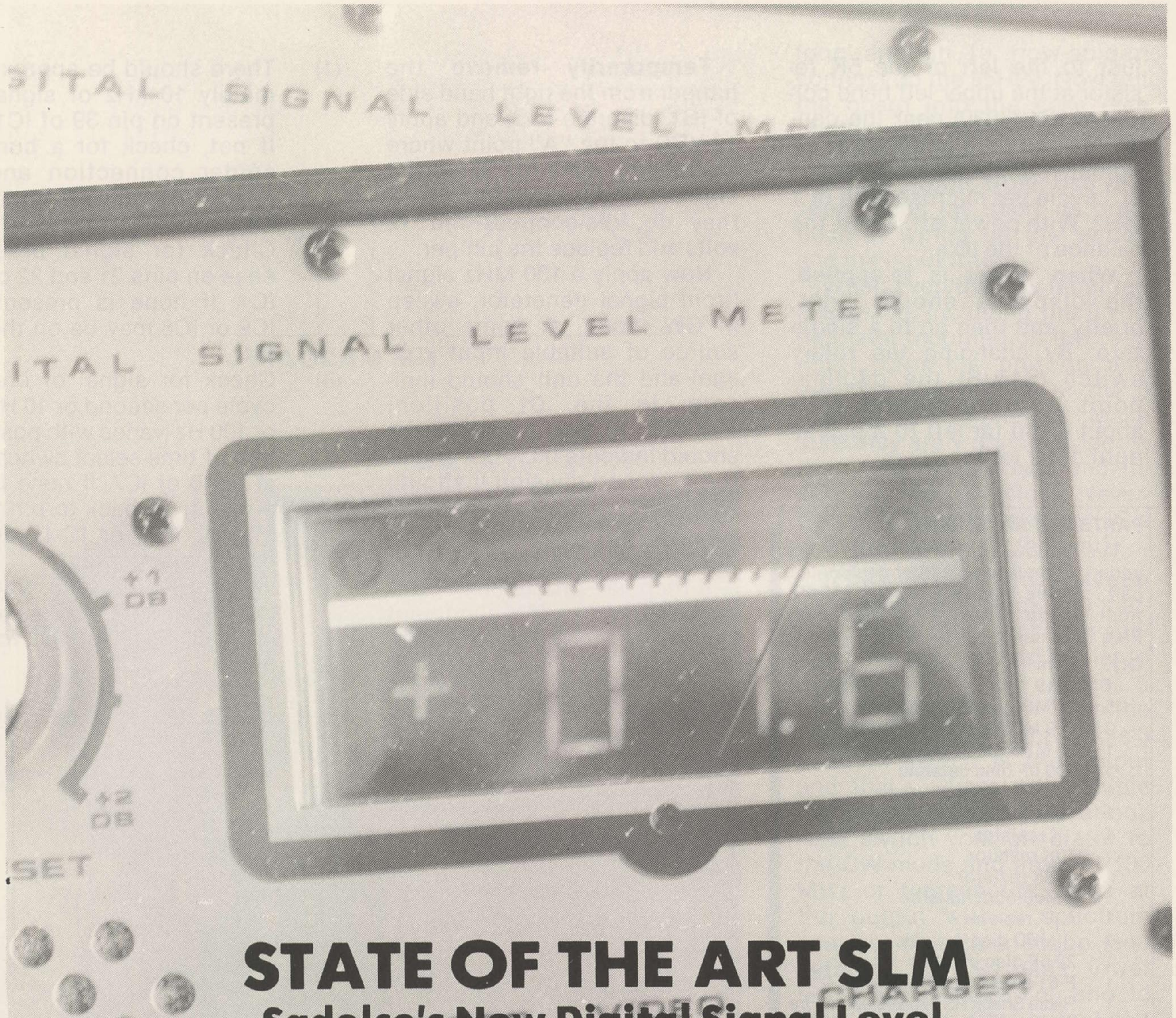


DIAGRAM M-2



STATE OF THE ART SLM

Sadelco's New Digital Signal Level Meter Is One Heck Of A Box!

Microvolts For The Masses

In the hey day of television's initial explosion there appeared on the scene the receiving industry's first attempt at providing the installing technician with something more precisely calibrated than the eyeballs. It was called a field strength meter. Or more precisely in today's vernacular, a signal level meter.

One of (if not **the**) first to be advertised nationally was brought out in early 1950 by an outfit called **Transvision** out of New Rochelle, New York. Their "FSM-1" was an outgrowth of a series of instruments Transvision attempted to sell to radio technicians then trying to make the big jump from radio work to television work. Their 'FSM-1' first hit the market at just under $100; it came down to $79.50 by the end of 1950 and by early 1951 it was selling at $59.00. The **first** 'FSM-1' in the receiving industry consisted of a TV tuner that took the off-air signal down to the IF range, followed by a video detector and a meter. The meter was calibrated 0-10 and the scale was relative to itself. The unit, like virtually everything else available in those days, was dependent upon a generous supply of 110 volt AC and consequently one did not often venture far outside with it.

The TV receiver installation trade was less than overwhelming in their response to the Transvision 'FSM-1' and consequently it remained for a later developing CATV and MATV industry to create the first real demand for an instrument of this type. The TV receiver installation types found the TV receiver **itself** was a pretty decent "relative level meter" and virtually anyone could tell when a picture was better (less snow) or worse (more snow) with**out** a meter scale to help. It took CATV's