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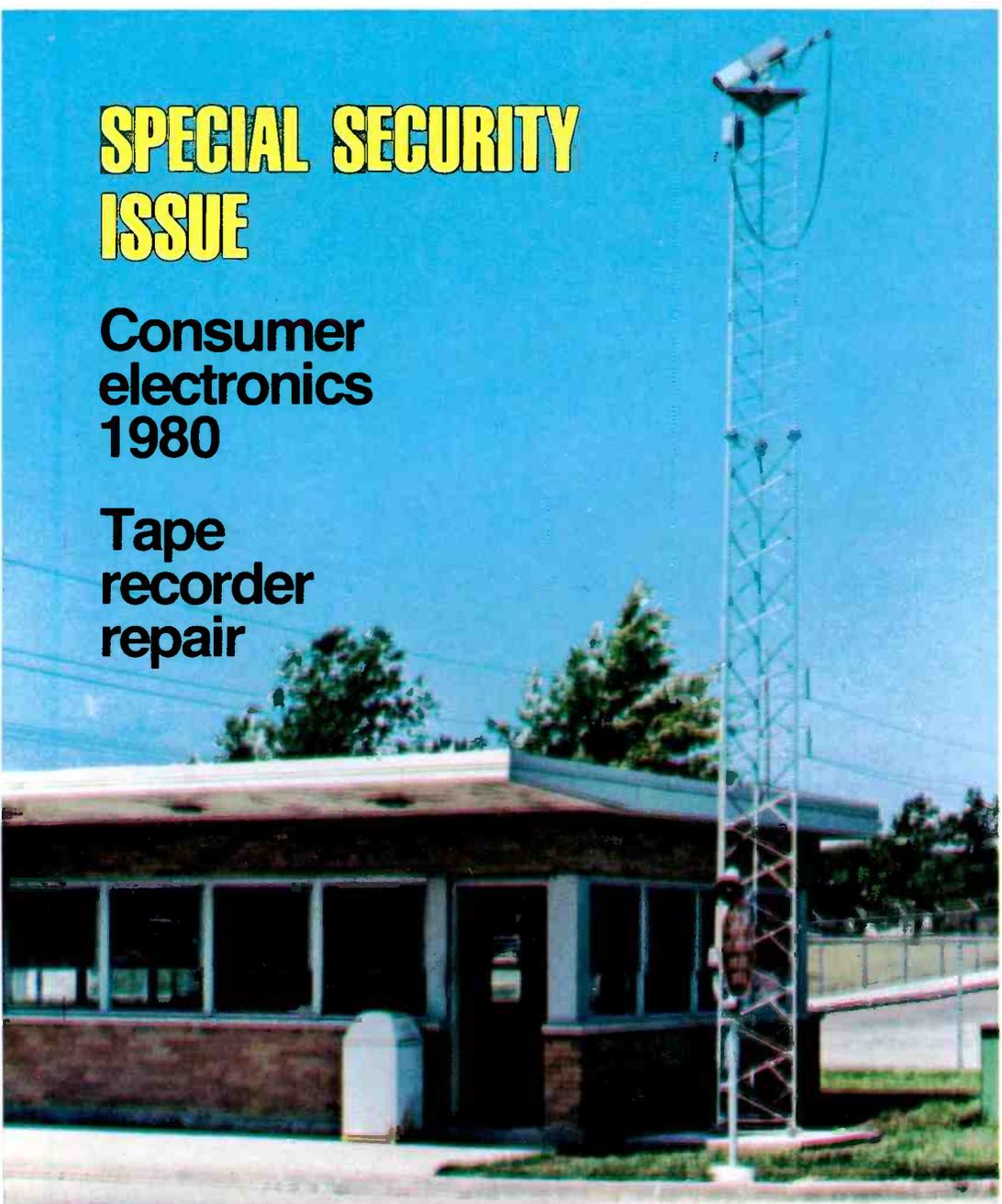
ELECTRONIC TECHNICIAN/DEALER

LEADING THE CONSUMER AND  
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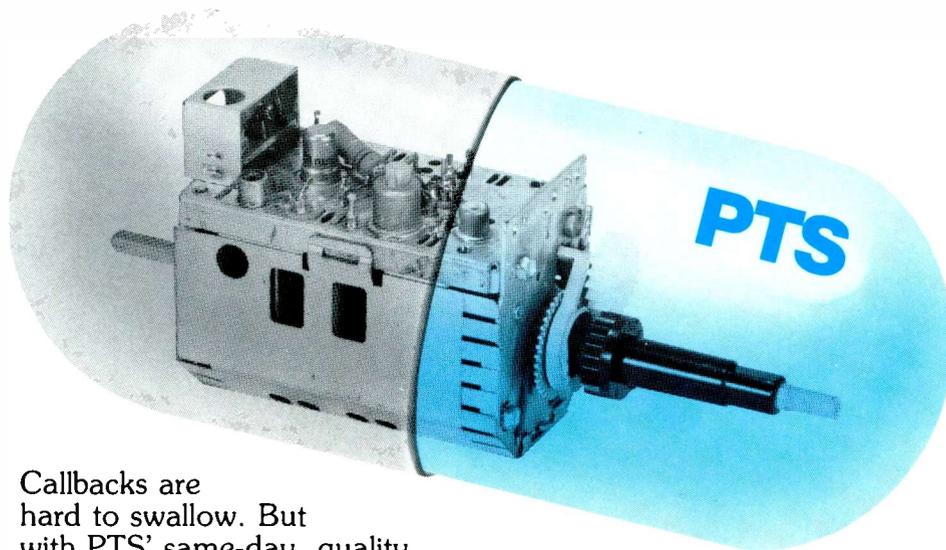


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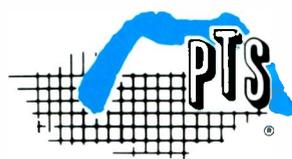
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# INDUSTRY REPORT

## Zenith to Make Teletext Decoders

Zenith Radio Corporation has announced it will supply Satellite Syndicated Systems (SSS) with Zenith Virtex teletext decoders for use at cable TV satellite receiving stations.

The decoders interpret data and graphics in color transmitted during the vertical interval. The unit permits any of 800 pages to be selected while displaying up to 40 characters on 20 lines.

SSS operates the CableText video data system and is currently distributing satellite delivered Reuters and UPI newswire services to its cable TV subscribers.

## Sony Reports New Financial Highs

Sony Corp. says its sales, operating income and net income set new highs in both the second quarter and first six months of the year.

A "favorable exchange rate," Sony said, accounted for about 14 per cent of the 49 per cent increase in net sales during the second quarter and the remaining 35 per cent was due to "large" increases in sales volumes in all major product lines in all major markets.

According to Sony, VCR sales in the second quarter increased 54.1 per cent over the comparable period of a year earlier; for the six months VCR sales were up 66.9 per cent and they accounted for 21 per cent of all sales. Television set sales were up 65.3 per cent during the quarter and 52.7 per cent for the first half.

Sony said that overseas sales were up 71.1 per cent during the half and they comprised 65.7 per cent of all sales.

The operating results were for the period ending April 30.

## Firm to Make AM Stereo Chip

National Semiconductor Corp., reports it is set to supply AM stereo radio manufacturers with an AM radio integrated circuit when production begins on such units.

According to Al Kelsch, co-inventor of the Magnavox AM stereo system and now marketing manager for radio products at National Semiconductor Corp., there is a "sizeable equipment" market developing as many firms are rushing to bring out new AM receivers in time for the January Consumer Electronics Show in Las Vegas.

National's linear circuits marketing manager, Charlie Smaltz, reports "conservative" estimates place the U.S. market for car and home music systems—once production begins—at three to 10

million units in the first three years. National's chip, the LM1981, will separate the signal into left and right channels.

AM stereo, Smaltz said, has "become an important potential to National. We're talking about millions of stereo producing circuits and additional millions more in other improvements we can make in AM tuners," he said.

## RCA Retains Color TV Lead

RCA has maintained its market share lead in color television according to the latest survey by *Television Digest*. According to that publication's tabulations, RCA garnered 21 per cent of the market, compared to Zenith's 20.5 per cent.

According to *Television Digest*, the only significant change in standings was shown by GE, which moved from fifth place last year to gain 7.5 per cent of the color market—the same as Sears and a third place tie. Sears last year, according to the publication, was third.

One word of caution about the survey however, according to the publication, is that the market share survey represents share by brand, not manufacturer and it does not take into account private label output by such major firms as RCA, GE, or Sylvania.

In black and white TV, Zenith maintained its lead, with 16 per cent of the market, over RCA, with 14.85 per cent. GE came in third here too, showing 10 per cent of the market and Sears was fourth, with 9 per cent of the black and white share.

Rounding out the top ten places in color television market share were Magnavox, 7%, Sony, 6.5%, Quasar, 5%, Sylvania, 4%, Montgomery Ward, 2.25%, and Panasonic, 2%.

## Zenith Shows "Surprise" Products

Zenith Radio Corporation has just unveiled its new line of products for 1981 and the introduction really caught some people off guard.

It's not that Zenith introduced anything new to the electronics field, but they did combine some old ideas in communications and security with their television chassis for 1981, to come up with a television set that can be used as a telephone and a black and white set that is designed for both entertainment and security/surveillance purposes.

The first unit is the new remote control system, called Computer Space Command 3500 with Space Phone. Not only does the system control the TV set but it can also be used as an extension telephone. When Space Phone is connected to a telephone jack, an incoming call activates a flashing light. The viewer then simply presses a button on his Space Command 3500 and uses the TV set as he would a speaker phone in his office.

The second innovation is a combo 12-inch black and white TV, plus black



Circle No. 102 on Reader Inquiry Card

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**On the cover:** Industrial and Residential Security are two rapidly expanding service fields in this age of digital electronics. Our cover shows a closed circuit camera high atop a surveillance tower, a part of a complete industrial security system described in more detail in our special report this month starting on page 28.

## FEATURES

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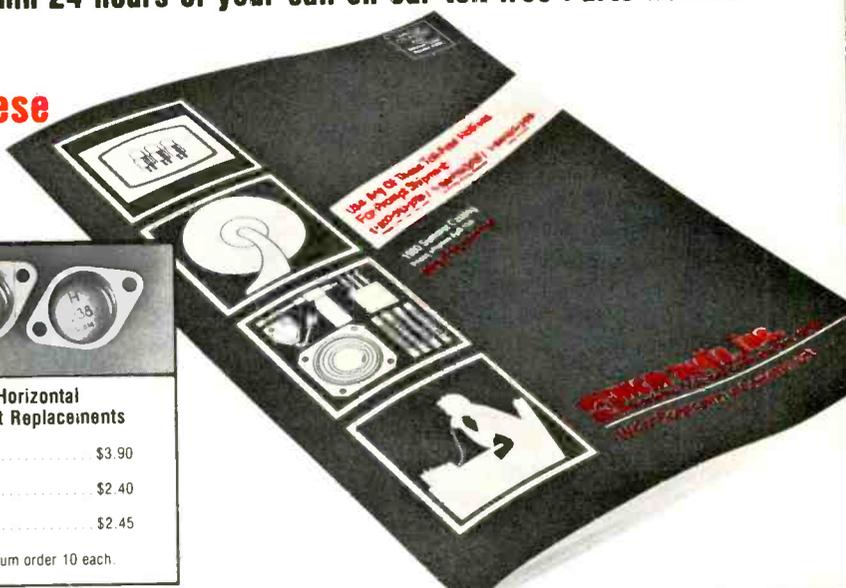
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and white video camera. This combo allows the set owner to monitor the entrance to his home, or any other location he so chooses, through his television set. A special "talk" button also allows the viewer to listen and talk to the door caller.

### Sampo Sets up U.S. Manufacturing Facility

Sampo Corp., headquartered in Taiwan, has announced it is setting up television manufacturing facilities in Georgia.

According to a company spokesman, agreement has been reached for construction of a 110,000 square foot facility on a 23-acre site in the Peachtree In-

dustrial area north of Atlanta. Sampo, according to sales executive Joe DiFiglio, currently has 1.3 per cent of the color television market in the U.S. and 4.3 per cent of black and white. "This new facility means Sampo's growth here in the states need no longer be hampered by quota restrictions from Taiwan."

Initially, he said, the plant will manufacture 19-inch color sets. Plans for the future envision an expansion to include the manufacture of both console TVs and additional portable and table model screen sizes.

Sampo's United States headquarters is located in suburban Chicago at Elk Grove Village. **ET/D**

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2N452	104	2N533	
2N453	104	2N534	
2N454	104	2N535	
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2N458	104	2N539	
2N459	104	2N540	
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2N483B	102	2N573	
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2N485	102	2N573BRN	
2N486	102	2N574	
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2N492	102	2N582	
2N493	102	2N583	
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2N1210	100	2N1886	5544
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2N1216	100	2N1892	5550
2N1217	100	2N1893	5551
2N1218	100	2N1894	5552
2N1219	100	2N1895	5553
2N1220	100	2N1896	5554
2N1221	100	2N1897	5555
2N1222	100	2N1898	5556
2N1223	100	2N1899	5557
2N1224	100	2N1900	5558
2N1225	100	2N1901	5559
2N1226	100	2N1902	5560
2N1227	100	2N1903	5561
2N1228	100	2N1904	5562
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2N1231	100	2N1907	5565
2N1232	100	2N1908	5566
2N1233	100	2N1909	5567
2N1234	100	2N1910	5568
2N1235	100	2N1911	5569
2N1236	100	2N1912	5570
2N1237	100	2N1913	5571
2N1238	100	2N1914	5572
2N1239	100	2N1915	5573
2N1240	100	2N1916	5574
2N1241	100	2N1917	5575
2N1242	100	2N1918	5576
2N1243	100	2N1919	5577
2N1244	100	2N1920	5578
2N1245	100	2N1921	5579
2N1246	100	2N1922	5580
2N1247	100	2N1923	5581
2N1248	100	2N1924	5582
2N1249	100	2N1925	5583
2N1250	100	2N1926	5584
2N1251	100	2N1927	5585
2N1252	100	2N1928	5586
2N1253	100	2N1929	5587
2N1254	100	2N1930	5588
2N1255	100	2N1931	5589
2N1256	100	2N1932	5590
2N1257	100	2N1933	5591
2N1258	100	2N1934	5592
2N1259	100	2N1935	5593
2N1260	100	2N1936	5594
2N1261	100	2N1937	5595
2N1262	100	2N1938	5596
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2N1265	100	2N1941	5599
2N1266	100	2N1942	5600
2N1267	100	2N1943	5601
2N1268	100	2N1944	5602
2N1269	100	2N1945	5603
2N1270	100	2N1946	5604
2N1271	100	2N1947	5605
2N1272	100	2N1948	5606
2N1273	100	2N1949	5607
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2N1277	100	2N1953	5611
2N1278	100	2N1954	5612
2N1279	100	2N1955	5613
2N1280	100	2N1956	5614
2N1281	100	2N1957	5615
2N1282	100	2N1958	5616
2N1283	100	2N1959	5617
2N1284	100	2N1960	5618
2N1285	100	2N1961	5619
2N1286	100	2N1962	5620
2N1287	100	2N1963	5621
2N1288	100	2N1964	5622
2N1289	100	2N1965	5623
2N1290	100	2N1966	5624
2N1291	100	2N1967	5625
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2N1300	100	2N1976	5634
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2N1316	100	2N1992	5650
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2N1318	100	2N1994	5652
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2N1329	100	2N2005	5663
2N1330	100	2N2006	5664
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2N1335	100	2N2011	5669
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2N1340	100	2N2016	5674
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2N1343	100	2N2019	5677
2N1344	100	2N2020	5678
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2N1346	100	2N2022	5680
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2N1349	100	2N2025	5683
2N1350	100	2N2026	5684
2N1351	100	2N2027	5685
2N1352	100	2N2028	5686
2N1353	100	2N2029	5687
2N1354	100	2N2030	5688
2N1355	100	2N2031	5689
2N1356	100	2N2032	5690
2N1357	100	2N2033	5691
2N1358	100	2N2034	5692
2N1359	100	2N2035	5693
2N1360	100	2N2036	5694
2N1361	100	2N2037	5695
2N1362	100	2N2038	5696
2N1363	100	2N2039	5697
2N1364	100</		

# SERVICE SEMINAR

## SYLVANIA

**VTR Stop Solenoid Circuitry Checkout.** There are seven (7) Safety Shut-down circuits in the VTR's—a malfunction in any single circuit may cause function buttons to return to the "Up" position and the unit will not operate. These shut-down circuits are listed below.

1. Take-up Sensor circuitry—connects to the anode side of D623. Counter Memory operation on Rew. when counter comes to 000—also connects to the anode side of D623.
2. Supply Sensor circuitry—connects to anode side of D624.
3. Sensor Lamp Burn out circuitry—connects to anode side of D625.
4. Faulty Loading & Reel stop circuitry—connects to anode side of D626.
5. Dew Detector (dampness in unit) circuitry—connects to anode side of D627.
6. Power Off circuitry—connects to anode side of D629.
7. Timer Switch On circuitry—connects to anode side of D640.

Notice: With the exception of D629, all the cathodes of above diodes are common and are connected to the cathode of D630 (6 volt zener) at TP609.

To simplify—you may refer to D630 (6 volt zener) as an OR GATE, with each of the above diodes as logic inputs. A logic level change on either of the anodes will cause the Stop Solenoid to activate and pull-in, releasing any function button that may be in the down position.

Normal anode DC voltages are listed below to aid in determining which input caused the Stop Solenoid to activate. A higher DC voltage on either anode will activate stop solenoid, and release any button that may be in down position.

## GENERAL ELECTRIC

**"H" Series Chassis. Buzz in sound, slight hum bar in picture.** Possible repair: solder ground tabs of C404 (small can electrolytic at front of power supply assembly).

**Repeated blowing of F400—no trouble can be found.** Possible repair: Replace R404, degaussing thermistor. It does not "open up" fast enough.

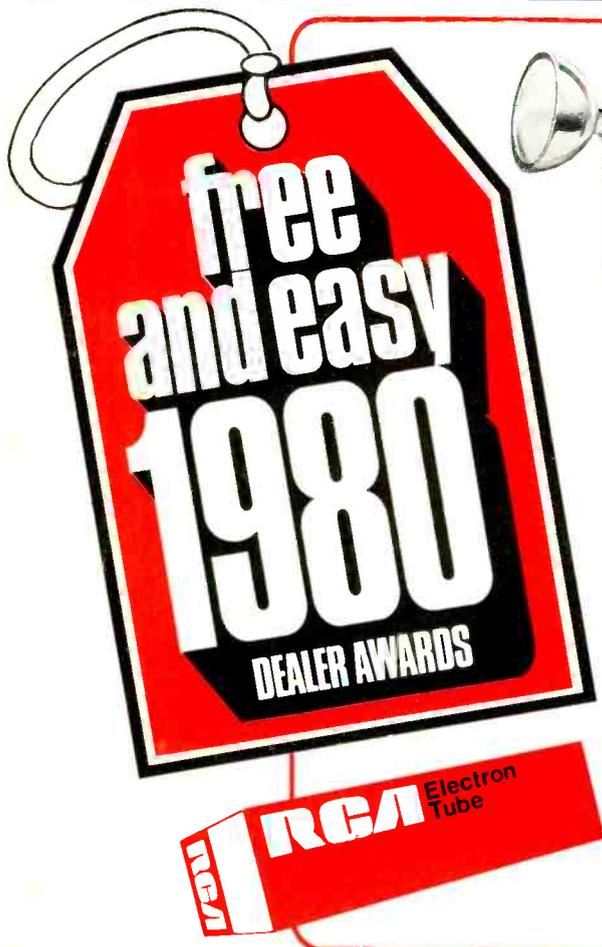
**EC-A Chassis. No raster, no audio.** 13 volts may be down to approx. 5 volts or lower. 47 volts may be down to approx. 20 volts or lower. 120 volts OK. IC501, not starting up could be the problem. When this occurs, Q1550, the horizontal driver, is driven into saturation pulling the start-up 47 volts down. With 47 volts low, the 13 volts will also be down to approx. 5 volts or lower.

To Correct: Change start-up circuit from DC coupling to AC coupling to reduce loading and better assure start up of IC 501.

1. Check R905 (EP14×82), 100 ohms, 2 watt resistor. If the resistance value of R905 has increased, replace R905.

2. Apply power to receiver. Check: Disconnect PG11 on sweep module (EP93×163). Check 13 volts and 47 volts, if both are high, proceed to step three. (If 47 volt is still low, Q1550 and T1550 and their circuitry could be the problem).

3. Cut J2 (jumper) and install a .1 uf at 50 volts (EP25×77) and a 100 ohm ½ watt resistor in series across J2.

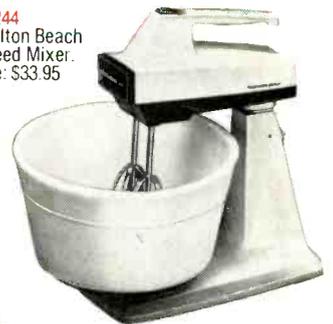


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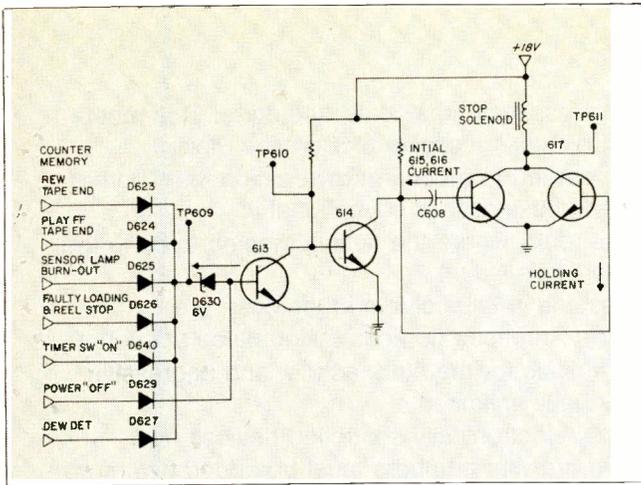
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D623	.5V DC	D627	.5V DC
D624	.5V DC	D629	.05V DC
D625	3.89V DC	D640	.2V DC
D626	.05V DC	D640	4.5V DC

when timer turns unit on.

Before making any measurements: Confirm that the "Sensor Lamp" is lit (it is located in the rear center of cassette compartment)—it can be seen thru the cassette holder cover. Confirm that the malfunction is not caused by Dew Detector (indicated by green light being on—located near the On/Off switch.

The following measurements were made with the power applied to unit—power switch on, but with the cassette out of compartment, and cassette compartment lowered in normal position.

1. Measure DC voltage at TP609—it should be approx. 3.5V DC—this is "no stop" input voltage—if there is a fault in circuitry associated with the input to either of the logic gate diodes, this voltage will be higher, approx. 6-7 volts DC.

2. Measure voltage at TP609 while depressing either—Play, Rew., F.F. button it should be approx. 6-7 volts. Note: none of the buttons will latch in the down position.

3. Measure DC voltage at TP610 with TP609 grounded—it should measure approx. 12-13V DC (this is a unregulated source and may be slightly higher). Note: grounding TP609 defeats all "Stop Logic Inputs" and the Rew., F.F., or Play button should latch.

4. With the ground removed from TP609 measure DC voltage at TP610 with either the Play, Rew., or F.F., button depressed the voltage should decrease to zero (0), and you should hear the Stop Solenoid energize (pull-in).

5. Ground TP610 momentarily—you should again hear the stop solenoid pull-in.

6. Insert a cassette in holder and close holder. Ground TP610—you will hear the Stop Solenoid "pull-in." Then depress either the Play, F.F., Rew., or Rec. button—you will note that the buttons may be depressed, but will not latch, nor will the loading mechanism perform. This simulates a condition of a "turn on" for TR613 by one of the logic inputs, or a possible shorted D630 (6 volt zener), or even a shorted TR613.

This concludes a "check out" procedure for the Stop Solenoid and the Safety Shut-down circuitry. However, an intermittent cause for the stop solenoid to operate may be a little more difficult to locate. **ETD**

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# RCA Receiving Tubes

# FROM THE EDITOR'S DESK



Yet another Consumer Electronics Show has come and gone. This most recent event, staged around Chicago's massive McCormick Place convention complex, has only served to reconfirm my opinion that "home" electronics—be it entertainment, business, or educational in nature—"home" electronics, is really where the action is going to be in the 1980s. (See special CES report, this issue).

I have noted on many occasions in this column in the past, the infiltration of electronics into the American home is taking place at such a rapid pace that service opportunities for the alert, astute, and aggressive electronics shop owner are virtually unlimited.

To the above list of functional electronically controlled devices now found in the American home in growing numbers must be added two more categories—appliances and security/surveillance systems.

That the American home of the future is destined to become an "electronic fortress"—as it were—is not debatable any longer. The question is when, not if.

Already, in the wake of an ever threatening energy crisis, we see evidence that many American businesses are preparing for the day when they will take full advantage of the higher order communications technologies spawned by the microprocessor and its close relative—the computer. By 1985—it is suggested—many of the employees who daily fight the rush hour onslaughts in America's population centers, will be able to work from computer satellite terminals in their own homes (see ET/D, April, 1980). The home in which they work, will be electronically controlled from the standpoint of entertainment, environmental controls, energy management, information storage and retrieval, and security and surveillance devices (ET/D, May, 1980).

This last category, security and surveillance, is indeed an area of great opportunity for those in electronic service. Both residential security and industrial security and surveillance markets are growing at astounding rates.

This is one of the reasons for ET/D's special three part report in this issue on the security installation and service profession. With this series we hope to present to you, the professional technician and serveshop owner, ways you can capitalize on an important and growing industry. The security industry, we have noticed, finds itself the victim of the spread of digital and microprocessor technologies into its realm of operation.

Just as with the appliance and environmental control industries, the security and surveillance business is caught up in the electronics revolution now impacting the American home.

What better opportunity for today's modern serveshop?

Sincerely

*Richard M. Lay*

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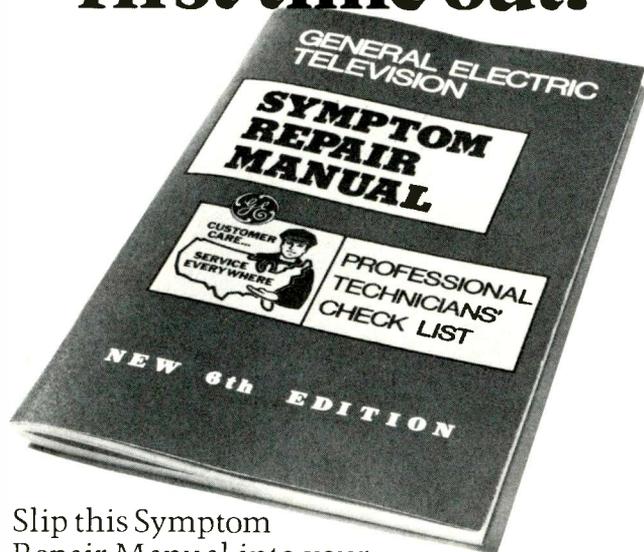


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## LETTERS

### HELP NEEDED:

*Please assist me in finding a source for parts for a Roberts Model 192FT Tape Recorder. Also needed is EVG #1499-27 and EVG G1410-54 Belts. Thank you for your help.*

*Charlie Ryan, Chief Engineer  
 WLTN  
 20 Main St.  
 Littleton, NH 03561*

*Editor: The best source we know of this sort of part is: Audio Video Parts, Inc., 5030 Venice Blvd., Los Angeles, CA 90019. They carry extensive stocks of tape recorder parts. We would like to know of any other such suppliers.*

*Just received my first issue of ET/D and love it. I do have a problem with an E.R.C. (Electra Radio Corp.), Stereo for which I need a schematic. Any help in locating one or a copy of one would be much appreciated.*

*George Campbell  
 Campbell Electronics  
 44445 13th St.  
 East Lancaster, CA 93534*

*I need a schematic and service manual and parts list, if available, for a Concord Model MK-12 AM/FM Stereo receiver. I will copy and return or buy.*

*James E. Higley  
 1460 Cypress Ave.  
 Hanover Park, Ill. 60103*

*I renewed my subscription for two years and have been a reader of your fine magazine for 18 years and look forward to each issue.*

*I would like to see service seminar and all service data on pages that can be removed or an annual index of them. This would sure help.*

*Also I need a 1629 Electron Eye Tube. If anyone has one please state price and condition.*

*I have been servicing electronics for 33 years but now I would like to assemble kits for someone.*

*Clarence England  
 RI Box 135A  
 Rose Hill, VA 24281*

*Editor: Thank you. Service Seminar is indexed yearly in the annual index. TEKFAK of course has its own index. Printing on one side of the sheet to facilitate clipping and filing just isn't economically possible. ET/D*



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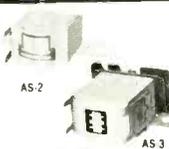
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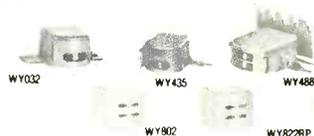
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# NEWSLINE

WARRANTY RATE SUITS SETTLED. Miles Sterling announced at the ETA-1 annual meeting in Ames, Iowa that the lawsuits which he had filed under the anti-trust laws, in 1975, has been settled on a no win basis in early July. The Garden Grove, California, service dealer, whose time has been occupied for the last several years fighting for equitable warranty rates for servicers, stated that after consulting with service industry leaders, it was decided that significant success has been achieved, that both servicers and manufacturers are now aware of warranty service costs and in view of the legal cost of pursuing the matter further, that the matter could be settled. Independent lawsuits by Jim Ballard of California against certain Japanese manufacturers are reportedly continuing.

ELECTRONICS MARKET UP 14.3%. The U.S. market for electronics products in 1979 totaled a record \$80.6 billion at the factory level--according to statistics reported in the latest edition of the Electronic Market Data Book. The publication says the only exception to the expansionist trends in electronics markets was in consumer electronics which remained virtually stable, compiling \$9.27 billion at the factory level.

MAGNAVOX BALKS AT AM STEREO RULING. Magnavox, obviously upset by the FCC's about face in the AM stereo case, says it is concerned that pressure on the FCC staff from other parties could deprive it of a fair hearing. The FCC, which opted for Magnavox's AM stereo system last April 9, now says it wants more information.

SOLAR INTERFERENCE PEAKING? The National Oceanic and Atmospheric Administration's prediction that 1979-80 would be a severe "season" for sun spot interference in the television bands apparently is holding true for those on the eastern seaboard. According to Bob Lynn of Lynn Electronic Services in Somerville, N.J., his shop receives up to 12 calls per day from customers who feel their set has not been properly repaired.

RECEIVES MIAMI: Lynn reports that people in his service area, centered about 45 miles west of New York City have regularly, since late spring, been receiving Channel 2 from Miami--some 1,500 miles away--on New York's Channel 2. Also, Channel 4 of Kansas City has shown up on New York's Channel 4. UHF, Lynn reports, is also affected with Channel 45 from Baltimore and Channel 15 from Norfolk, Va., having been identified. The sun spot activity, which occurs in 11-year cycles, should subside by late Fall.

BURGLAR ALARM MARKET TO EXPAND. The home burglar alarm market--estimated at \$142 million in 1980--will reach \$240 million annually by 1984, according to a marketing study by Frost & Sullivan. Although these alarms have only minimal penetration in the national residential market, according to F & S, "sales should rise to double digit levels as pricing, technological, distribution and marketing problems are overcome."

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ET/D 8/80

# Tape deck service

A practical approach

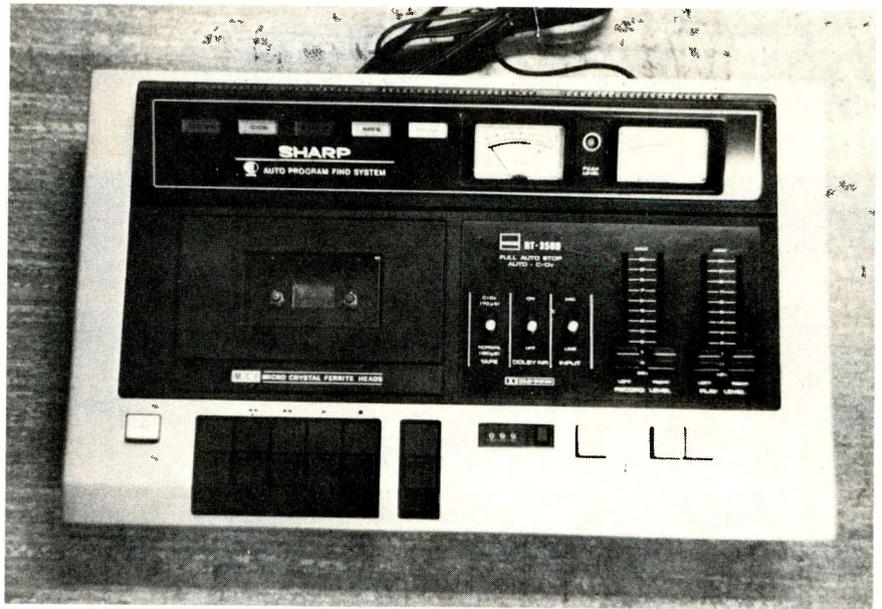
Tape decks, with their marriage of mechanics and electronics, can present unique troubleshooting problems. Breaking each system into logical sections can simplify the job

By James Sims, CET

The modern day tape recorder comes in three basic formats. The first and now probably the most common is the cassette. Here one has the best of both worlds of convenience and reproduction quality. Although the tape itself is narrow and the operating speed slow, 1-7/8 IPS, advances in equalization electronics and exotic forms of recording tape have given cassettes a great deal of versatility.

Another form of recorder is the eight-track. With these machines much is sacrificed for the sake of convenience. Four stereo tracks are placed on a narrow tape with a reasonably slow transport system, which is extremely easy to use. Just push it in and adjust the volume. It even changes tracks all by itself.

The last is the old standby; the open reel type of recorder. Here quality is usually the first and almost only consideration of the designer. Some reel-to-reel machines are difficult to thread, very heavy and quite large. However, this is all justified to the audiophile because of the exceptional specifications, excellent transport systems with speeds up to 15 IPS, frequency responses which far exceed the limits of human hearing, excellent



dynamic range and improved signal to noise figures.

One important thought to keep in mind while servicing any of these machines is that a tape recorder is a complete recording system. Here the mechanical world and the electronic world are blended together and must work in close harmony to form an integrated electro-mechanical system. Breaking system service down into four parts can make your job considerably easier.

They are:

- 1) Tape Transport
- 2) Tape Transport Control
- 3) Electronics; Play & Record
- 4) Cleaning, Lubrication and Alignment

Where required the three individual taping formats will be dealt with separately.

The test equipment required is reasonably common with the exception of a special pre-recorded tape for each format. This tape should have a 400Hz

tone at 0dB on one side and a 10KHz tone at -15dB on the other side. Both sides, or eight-track channel one and four, should be recorded in stereo. Other equipment required is:

- 1) Low distortion audio generator with attenuators
- 2) Oscilloscope
- 3) VTVM or ac volt meter
- 4) Digital volt-meter

## Cassette transport

One of the most important things is to recognize just what the fault or complaint is. This complaint or fault can manifest itself in many different forms throughout the recording system. (Figure #1 front load transport mechanism—Figure #2 is top load transport mechanism.) Drive or transport faults in cassette decks can be quite numerous. First the obvious. Your machine is on and in the play mode but there is no motor or transport drive. It is

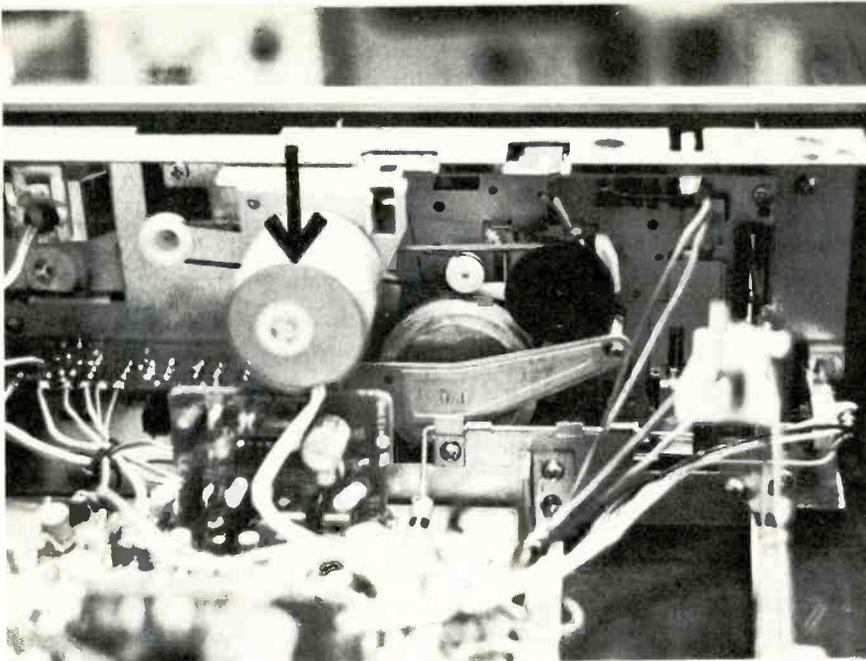


Fig. 1 Front load cassette transport. Motor indicated.

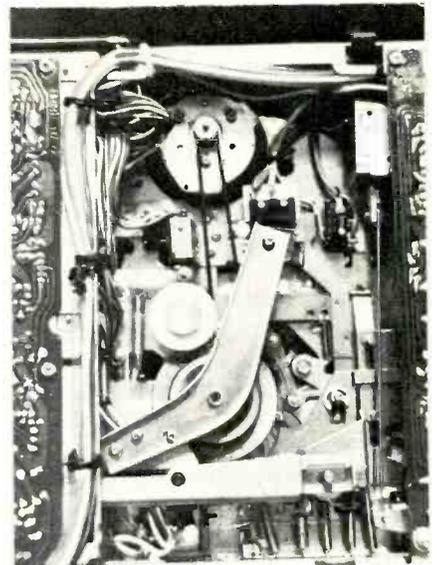


Fig. 2 Top load cassette transport mechanism.

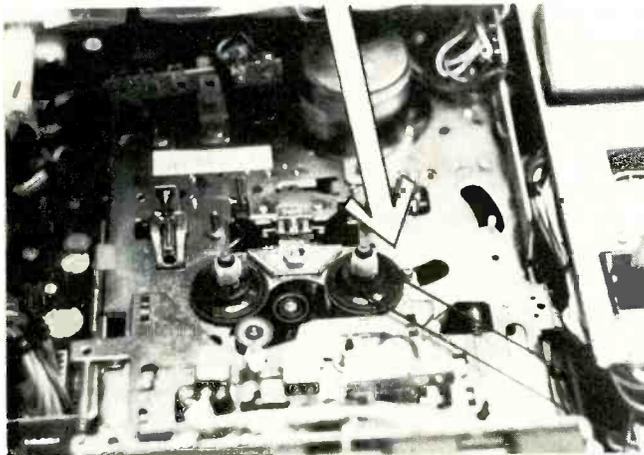


Fig. 3 Clutch and take-up drive, both spindles shown.

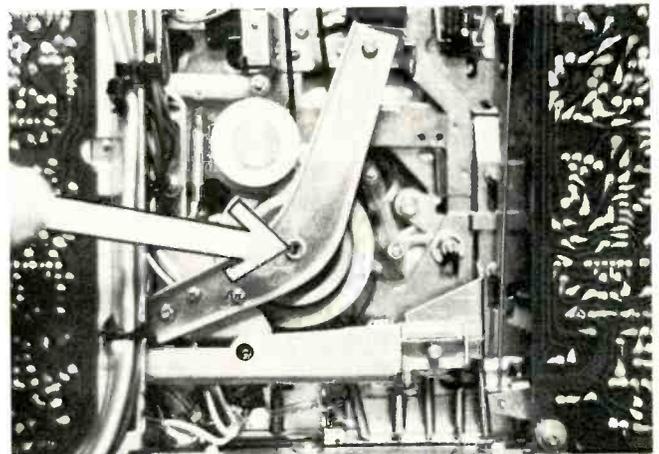


Fig. 4 Flywheel clearance adjustment.

important to identify the different components in the mechanism. Note in Figure #1, the drive motor in the upper left corner. Here a drive belt runs on a large flywheel and capstan assembly. In other types of transports there are three motors and two flywheel and capstan assemblies; one wind motor, one rewind motor and one precision speed capstan motor. In most cases play drive is achieved by a constant and steady capstan drive and a clutch driven idler assembly which supplies play drive take-up. In Figure 3, one can see the take-up spindle with its rim drive and the rewind spindle with its intermediate idler drives. Now, back to our problem which is no tape drive. Check to see what type of motor is used, a synchronous ac type or a dc servo type. In machines with ac type motors, check the motor starting capacitor and any micro or leaf switches responsible for applying current to the motor. Insure that the motor pulley is not

loose and the motor shaft is not slipping in it. This could cause the tape drive to appear stopped. In machines containing dc type motors check to see that the mechanical action of pushing down the play button has caused, by means of a switch of some type, a voltage difference across the motor equal to the motor requirements. Many of these switches are of the leaf type and are misformed resulting in no motor current even when actuated by the play mechanism. Refer to your schematic for this particular switch number and location.

Direct current motors may develop a number of faults which are contained in the motor housing. Most of these dc motors have mechanical or electronic governors on board. Faults which can occur are slowing in speed after playing for awhile, excessive wow and/or flutter, or open contacts resulting in no drive. It is recommended that for reliability you change the defective motor and not

disassemble and repair it. A defective drive or capstan motor will most certainly cause speed variations. Speed variations can also be caused by inconstant or insufficient play take-up torque.

Poor take-up tension on the play spindle will also cause the common fault in cassettes; "eating tapes." If this occurs, check the clutch idler drive on the flywheel side of the mechanism. It may be slipping excessively and need adjustment or replacement. Another trouble spot is the take-up spindle drive. In most cases this spindle has a rubber rim which picks up drive from the clutch mechanism. See figure 3. If this outer rubber rim is worn or contaminated with grease or oil, variations in take-up speed will cause the tape to become entangled in and around the pinch roller and capstan.

Speed changes can also be caused by a worn or tightened bearing. If the

pinch roller has too much side to side travel or the flywheel base is adjusted too tightly, a fault in drive will occur. This flywheel adjustment is on the opposite side of the mechanism and can easily be reset. See figure 4.

In some cassette machines a squeaking or squealing sound can be heard after it has been playing for a short while. This is usually caused by the pick-up spindle's rubber rim becoming polished and hardened by constant drive pressure from the clutch idler drive assembly. Only too often the owner of the cassette hears this squeaking and decides to oil the mechanism. This destroys any hope of the transport functioning at all. To clean the oil out of the drive, you must completely disassemble everything and replace as many rubber parts as you can. Where parts are not available, use a high grade degreaser to clean off the oil. In some cases where this outer rubber drive rim has been indented or worn and where the take-up spindle is similar to the rewind spindle, simply interchange the two. You should find that the rewind spindle is in much better condition than the take-up spindle, as it is usually used far less. Take-up tension adjustments will be located on the clutch, on the reel base, or on a located wire spring which supplies pressure for the clutch drive against the rubber rim of the take-up spindle. Always adjust for constant and adequate take-up torque from 35 to 65 grams/CM. Adjust the flywheel base clearance to approximately 0.2 mm. Insure that the capstan bearing is not worn or dry. If the tape runs through the tape path and becomes noticeably creased check for bent head guides or even a chunk missing from the pinch roller.

Most cassette recorders incorporate some form of auto-shutoff mechanism. Many of these are of a mechanical nature. The simplest one of these is a floating nylon arm which intrudes into the tape path. When the cassette stops at either end, extra tension is created by the continually rotating clutch drive. This extra tension pushes the floating arm forward and actuates auto-shutoff. This is either a micro switch which interrupts motor current or a mechanically operated arm which releases the locking plate and allows the play key to pop up. Keep in mind that the floating arm is only introduced into the tape path in the play mode and therefore there can be no auto-shutoff in the fast forward or rewind positions. A small spring usually insures correct floating arm pressure in the play mode. When this spring becomes dislodged or broken, there will be no

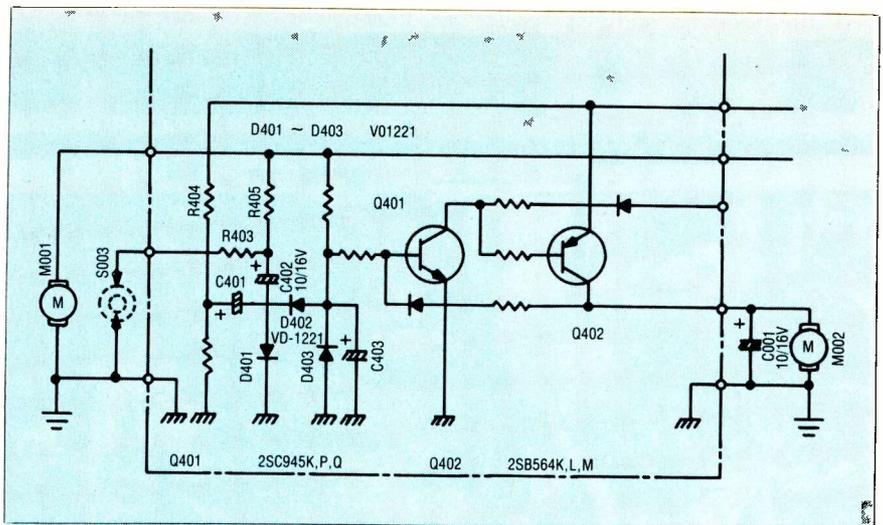


Fig. 5 A typical auto shutoff circuit.

tension sensing and therefore no auto-shutoff. If this same floating arm or associated mechanism becomes dry or binds, continual auto-shutoff will result.

One other common method of mechanical auto-shutoff is the motion sensing push arm and worm gear type. This method allows for auto-shutoff in all drive modes. As both spindles rotate, a slight pressure is applied to a friction arm keeping it to one side of the worm gear. This worm gear is driven from an independent drive source. When motion is stopped, no force is applied to this friction arm and it is set to the center of the worm gear. As the worm gear continues to rotate, a claw catches the arm and forces it upward, releasing the locking plate and the function keys pop up. It is essential to keep all of these parts clean and lubricated.

On all cassette recorders there is a record lock-out system. This system insures that one cannot accidentally erase a valuable recording. Each cassette has two tiny windows on the back of its tape cartridge. These windows correspond to a small metal arm inside the cassette chamber, situated usually at the back, the left hand side. If these cartridge windows are left sealed, insertion of the tape causes the record lock-out arm to be pushed forward and release the record function key. However, if you have made a recording that you wish to keep, punch out these windows and the record lock-out bracket will remain in the locked position. This makes it impossible to push the record button down without damage to the mechanism. Herein lies a very common fault. Some are not aware of this lock-out system and attempt to record on the wrong cassette cartridge. When the record button does not go down easily, excessive force is used which causes bending and binding of the

record key and lock-out mechanism. After this occurs, it is quite likely that none of the function keys will stay down. At this point disassemble the mechanism and repair all bent components. Do not forget to realign the record function key if necessary.

### Eight-track transport

The major difference between eight-track and cassette is that the eight-track machine has a much simpler transport system. Here there is only one point of tape drive; the capstan. Speed variations can develop because of a polished capstan. The capstan becomes highly polished simply because of the recording tape traveling by it. As it becomes smooth it loses its gripping power and the tape is pulled unevenly out of the cartridge. If capstan replacement is not a viable solution, remove the flywheel and capstan and re-etch it with acid or steel wool; some shops have been using sand-blasting successfully. Be careful not to scratch, nick or gouge the capstan and keep it very clean.

Another cause of speed irregularities in eight-track machines is weakened loading springs and guides. These must be checked, and if found defective, replaced. Ironically enough, the biggest single cause of speed irregularities is the eight-track cartridge itself. Have a high quality tape cartridge in your shop to verify this. If that is the case, (the customer has bad tapes), you may never get the machine "fixed" when in fact it has been working all along. Inspect the main drive belt and replace it if you cannot stall the motor by stopping the flywheel. Keep all parts of the tape and the capstan drive clean. Both ac synchronous and dc servo motors can be found in eight-track mechanisms. Watch for motor irregularities that tend

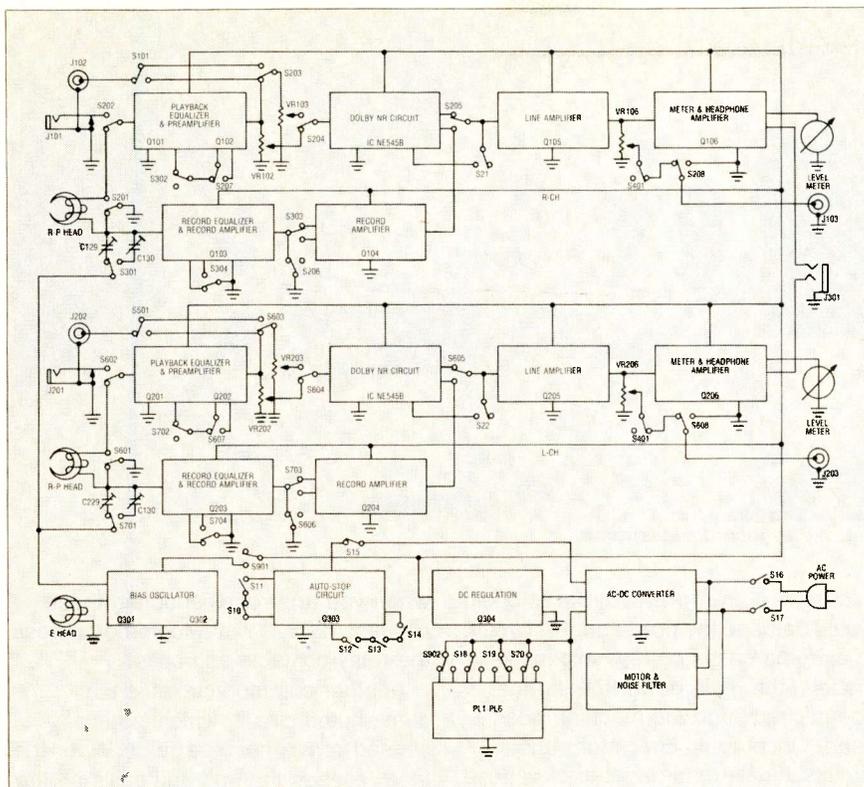


Fig. 6 A block diagram of a typical tape recorder.

to appear as cartridge or transport faults. In many eight-track machines you will find a pause mechanism. If this is actuated, it can fool even the best technician.

### Open-reel transports

The reel-to-reel tape recorder with all of its virtues is a "pig" to service. Most machines are fairly clumsy and were not built with the technician in mind. However I do enjoy repairing them. Their transport mechanisms basically consist of one motor for each function integrated through electronic control. These are high torque wind (fast forward and rewind) motors and one stable hysteresis or servo dc capstan motor. Some of the older machines or new lower priced machines use one synchronous motor for all functions. Here different modes of operation are achieved through idler and belt drives. Again insure that all belts are in reasonable shape and degreased. Clean all tape and counter drives. Remove any built up oxide from the pinch roller and capstan. Both wind and rewind hubs must be clean to insure proper braking when the transport is stopped. Insure that the brake shoes are clean, properly formed and have enough tension to stop each reel without a sudden jerk. If these brakes are set too tight the tape can be wound too tightly, or in extreme cases can snap when you change transport modes. In most cases an open reel machine which still shows

signs of speed variation after a general check out and cleanup will have a defective capstan motor. If it continues to spill tape in the play mode it may have a defective take-up motor, and no rewind or slow rewind points to a defective rewind motor. Sometimes the power harness to each wind motor is a plug which can be interchanged. This can be useful when verifying a suspected bad wind motor. Place the machine into the mode which is not functioning and use the adjacent motor control plug. If the motor does not perform to spec, you can be sure it is not a control or a motor drive fault, in which case a new motor is required.

### Cassette transport control

Transport control could be defined as the electromechanical equipment used to couple an electrical command to a mechanical action. This equipment is most commonly used for auto-shutoff functions. For this purpose many different motion sensing devices are used. First you may encounter some form of rotating magnet on the counter drive or either spindle base. This magnet rotates in close proximity to a reed switch which is opened and closed each time the magnet revolves. This opening and closing of the switch contacts will create a pulse or electronic control signal, which when lost will activate a solenoid and return the function keys to the rest position. Another form of motion sensing rotates a mirrored drum and

uses a LED and a photo transistor. Still another method is to attach a conductive path to ground on the underside of either spindle base. This path is intermittent and has one or more stationary wipers which create a pulse signal for an electronic auto-shutoff circuit. (See figure 5) In this example we have switch S003 on the underside of the play reel base of pickup turntable. As this table revolves, S003 opens and closes in rapid succession providing a discharge path for C402. This capacitor will charge when S003 is open and discharge through R403, C403, and D402 when closed. When C402 discharges, it allows C403 to charge to a negative potential keeping Q401 off. If tape motion is stopped S003 will remain open or closed and the above action will cease. Capacitor 403 will then charge through R405 to a potential great enough to cause Q401 to turn on. This in turn will decrease the potential on the base of Q402 and it will also turn on. Now we can couple this control current to an eject motor or even a solenoid to pop up function keys.

Faults in these circuits usually manifest themselves in two forms; either the machine will eject as soon as the tape is introduced into it or no auto-shutoff will occur at all. If the cassette recorder ejects the tape or halts transport drive when a tape is played, check to see where the auto-eject motion-sensing is taken from. Often it is taken from the counter drive which may be broken or seized. A rotating magnet may have broken away from a spindle or the reed switch may be defective. If all of these components appear to ok, check to see if the pulse signal is getting to the auto-eject sensing circuit. It may be necessary to push the pause button down. This will defeat the auto-eject or stop, and allow you to check for proper auto-shutoff criteria. (See figure 5) When troubleshooting this type of circuit insure that the tape motion causes a pulse signal to be applied to the input circuit.

Check Q401, Q402, and C403. these components appear OK, check to see if the pulse signal is getting to the auto-eject sensing circuit. It may be auto-stop systems function properly only when a cassette is inserted. For example, if the auto-sensing is taken from the tape counter which in turn is driven from the rewind spindle and you push the play key down, it will never stay down because the rewind spindle remains at rest. The auto-stop circuit simply acts as if the tape had reached its end and removes tape drive.

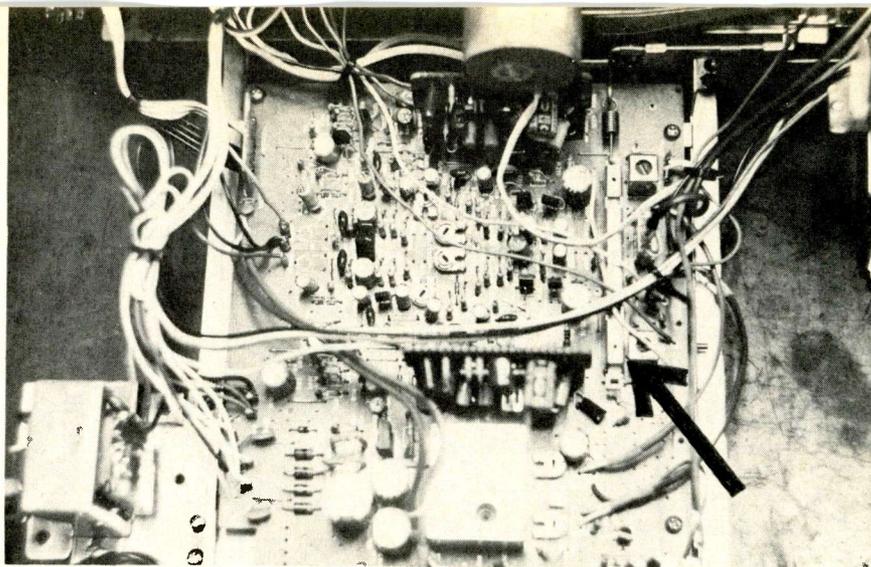
Inspect the transport mechanism

carefully watching for broken or misformed leaf switches. These switches can be used to actuate any electrical transport control. They may also be installed to break a circuit for example, the pause key switch which will override the auto-eject circuit when it is pushed. Without this switch, pausing the machine would also mean halting the tape transport.

On many higher priced cassette decks you will find logic control. This can take the form of transistor and relay logic or even TTL or microprocessor logic. Machines containing exotic forms of transport control can completely do away with mechanical function keys, substituting for them touch solenoid controls. A service manual or schematic is almost a must for these control circuits. Basically, motor functions are controlled by shifting or switching voltages in the logic circuits. For example, a motor may be stopped by opening the return side and restarted by gating the same side back to common. When the play button is touched or pushed, a signal comes from the control section, usually saturating a transistor, which then returns the motor current back to ground. If this function is faulty or incomplete, the motor will have very little torque and may run too slow. Check the logic control before you change the motor. Conversely, the motor could be defective and be drawing excessive current, therefore overdissipating the drive transistor. When these devices show signs of overheating, it is best to take a long hard look at the motor itself before you return the unit.

### **Eight-track control**

Once again the eight-track is much less complex than the cassette. The three common control functions are: 1) Auto stop; 2) Auto track change; and 3) Continuous track repeat. These functions are usually selected by function switches on the front panel. At the back of the cartridge chamber, to the left, is a metal sensing guide, which is in series with the track change solenoid. As the end of the program approaches a metal foil crosses this guide shorting it out and actuating the track change mechanism. The switches on the front panel can either by-pass this function or cause both track change and auto-eject functions to occur simultaneously. The metal foil is located directly on the recording tape inside the cartridge. Insure that parts of this sensing foil have not been deposited inside the mechanism. If it were left across the sensing bracket, it is likely that



*Fig. 7 Play/record slide switch.*

excessive current drawn by the solenoid would damage the power supply circuit. In extreme cases on less expensive models, the main power transformer opens circuit and the machine goes dead. Once again check for pause circuits. Finally many eight-tracks offer a fast forward feature. This feature is also controlled by a switch on the front panel. An extra set of wires is brought out of the motor housing for this purpose. Usually one shield and one hot. When fast forward is switched on, the control lead is shorted to shield or common, greatly increasing motor speed.

Along with this function on the same switch will be audio muting. This insures that the high pitched squealing of a speeded-up recording does not become amplified. Check this switch and cable making sure that the muting contacts are also good. If the tape speed is still too fast, look at the capstan and check it to see if there is recording tape tightly wrapped around it from a previous bad cartridge. It has the effect of increasing the capstan diameter and therefore the tape speed.

### **Open-reel control**

Tape transport control in the reel-to-reel recorder usually takes the form of solenoids and relays. These relay coils are actuated by current from the electronic transport control system. This control system may be full transistor logic, partial transistor logic, or even microprocessor control. Relay contacts carry the actual solenoid current for advancing the head guides and pinch roller and also the drive motor current. When a particular function is selected, the transport control circuit activates the correct sequence of relays and initiates tape drive. If a function is not operative, check the relay involved. In many cases the relay coil will be open. Be careful

when you are troubleshooting these circuits; 120V is not uncommon across the relay contacts and coils.

Another common circuit is the auto-shutoff circuit, which is usually sensed from either tape guide. When the tape reaches the end and spills off the reel, tension is lost and the tape guides relax and swing forward. A micro-switch is attached to this tape guide and it interrupts drive current. If the swinging guide becomes sticky or the micro-switch opens up, auto-shutoff will be lost or the machine will not run at all. One other function of the tape guide is for auto reverse sensing in machines which are so equipped. Here a metallic leader is spliced into the recording tape just before the regular leader. As the tape finishes, this foil shorts across a split tape guide and makes a current path to actuate the auto reverse mechanism. Auto reverse can also be sensed by a tone placed on the tape in any desired location. This tone is then detected and used to actuate auto reverse. On open reel machines which contain auto reverse features, yet do not appear to have a tape guide which has been separated by an insulator, the tape tone method is probably used.

### **Electronics; play & record**

Similarities among all of the three taping formats make it possible to group them together when discussing their electronic functions. (Refer to figure 6) Shown here is a fairly standard play and record system. A block diagram will show these circuits in a much clearer way. The first thing one should establish when confronted with a problem is; in which mode does this problem appear? Is it on play? Record? Just the left channel? Right channel? Or any combination of these functions? It is advisable that you check all the switches

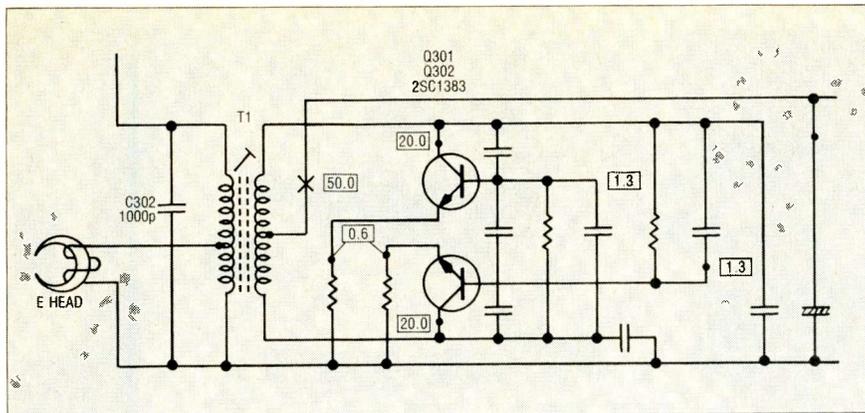


Fig. 8 A typical bias oscillator circuit.

involved in the play and record functions. These will include muting leaf switches, dc actuation switches, leaf type or micro-switches and the main play record slide switch. The play record slide switch is usually a long multi-contact switch mounted on the PCB and actuated by the record function key. Problems with this switch can be numerous. Some examples are, intermittent play, and, or record on either left or right channels, no playback at all, oscillations on playback, and excessive noise on either function. On machines with onboard electric condenser microphones, this switch can cause improper mike disconnection on playback and as a result, squealing through the speakers will be heard. In the block diagram shown, this switch is S2, S6, and S9. Contact cleaner will sometimes cure the problem but switch replacement is advised. Insure that this switch is being fully actuated by the record key and is not left partially between play and record. If the record key has been jammed down, the actuation bracket could be bent or displaced. Figure 7 shows a play record slide switch. Poor frequency response on playback is usually an indication of a dirty or misaligned play/record head. Clean, demagnetize and check the play head alignment before you proceed further. The play/record head will also generate faults such as becoming microphonic, intermittent, or low output in either mode.

Many recent tape recorders contain a signal to noise improving circuit called Dolby.<sup>®</sup> This circuit could be in the form of a single IC for each channel or extra PCB's on the main circuit board as in figure 7. Where integrated circuits are employed, defective or blown chips will cause low, distorted, audio or a dead channel. Inspect the input signal and output signal of the Dolby<sup>®</sup> IC. This will expose any fault immediately. If you have changed the suspected chips and

the problem still persists, check all pertinent coils and capacitors within the Dolby<sup>®</sup> circuit around the IC.

On tape recorders incorporating Dolby<sup>®</sup> PCB's, insure that all board contacts are tight and/or well soldered. (See figure 7) Here both Dolby<sup>®</sup> circuit boards stand on end in the center of the main circuit board. Each of these Dolby<sup>®</sup> PCB's contain one LM1011N IC and its peripheral components.

Other playback faults could include open muting switches, broken play/record head contacts or wiring, open headphone jack shorting contacts, or a fault in the playback equalizer-amplifier circuit.

Record mode problems can be affected by four different circuit areas. These areas include the play/record head, record amplifier and equalizer circuits, the Dolby<sup>®</sup> circuit and the bias oscillator. Most machines, for a clear linear recording, require a specific amount of high frequency current to be passed through the recording head at the same time that the audio signal is applied. This high frequency signal current is usually supplied by a bias current oscillator. (See figure 8) These circuits run from approximately 50KHz to 120KHz and have outputs of 20V to 100V p-p. If the bias oscillator is not running, the recorded signal will be extremely distorted and there will be no erase even though the tape recorder plays back beautifully. Capacitors used in this type of bias circuit are mylar or polystyrene types. These capacitors can short out or leak under operating conditions causing partial or complete loss of bias. Check for blown oscillator transistors, here Q301 or Q302. A defective erase head, shorted coax-cable or an open oscillator transformer T1, will all destroy bias oscillation. Bias oscillator frequency can and should be set by adjusting T1 to manufacturer's specifications.

When checking the machine while

recording, use a mono input signal and be sure that both left and right VU meters are responding within 1dB of each other. Assuming that you have no reason to suspect that someone has tampered with the record amplifier alignment, the VU meters should still remain within 1dB of each other on playback. If this is not the case, use an oscilloscope and look at the amount of audio actually going to the record head while recording. If the audio on one side of the head is not equal and similar to the audio on the other side of the record head, go to the service manual and check the record/playback alignment. Where these audio signals are similar and equal at the head and still will not play back equally, it is safe to assume that you should replace the head involved. In many cases there will be one tape head used for both the record and playback functions. Substitute heads are usually acceptable provided that you check the relationship between the head contacts and both left and right channels. The original part may have the left channel contacts across the top and the right across the bottom, whereas the replacement head may have these contacts on both left and right sides.

### Cassette maintenance

In all three tape formats, it is essential to insure that all rubber drive parts are cleaned and degreased. This includes the capstan and pinch roller. After cleaning and demagnetizing the record/playback head, play the test tape using the 10KHz side. Adjust the head height screw, (see figure 9), for maximum response and equal VU readings on both left and right channels. Some readjusting may be required to optimize this alignment. If a speed adjustment is needed, use the 400Hz test tone tape. The control used for this adjustment, usually a variable resistor, is located under a sticker on the bottom of the motor or on an external speed control PCB. Use a frequency counter and adjust to 400Hz on playback. Only reset motor speed after the general cleaning and lubrication has been done.

On modern day cassette recorders, there are reasonably few points of lubrication. It is always a good idea *not* to lubricate if in doubt. One drop of fine grade machine oil on the pinch roller bearing and on the capstan bearing will do. Intermediate drives are usually composed of nylon and brass parts. Oiling these will sometimes cause the lubricant to migrate on to driving surfaces, in turn creating other drive problems. A small amount of grease

could be applied to any moving or sliding brackets where metal rides on metal. Remember, use grease and oil sparingly.

### Eight-track maintenance

Most of the more recent eight track machines are factory lubricated and do not require any additional lubrication unless moving parts are binding or have been replaced. Wherever lubrication is required, a small amount of lightweight oil should be used. "White Grease, A or B" can be used on any sliding brackets or moving plates. Once again insure that the capstan and drive belt is clean and degreased.

Head adjustments are normally required when the play/record head has been replaced, or for cases of cross-talk and/or poor high frequency response. Use the prerecorded eight track tape or any tape specially recorded for these adjustments. Play/record head adjustments are height and azimuth settings. To set the height or cross-talk screw, insert a tape with a 1KHz tone recorded in the guard bands, and set this screw for minimum output on the left channel. Next insert the cartridge with 10KHz tone and adjust the azimuth screw for maximum output on the right channel. These head adjustments may have to be repeated to achieve optimum head position. Use glyptal or inspectors lacquer to seal the adjusting screws. If the problem of poor high frequency response persists after a head alignment, be sure that the head is perfectly clean.

When a motor speed adjustment is required, insert the 400Hz recording and insure that the played back tone is constant. If it is not, you may have tape drive or motor problems. If it is reasonably steady, but not within 395 to 405Hz, select a different diameter motor pulley. A larger diameter will increase tape speed and a smaller motor pulley will decrease tape speed.

### Open reel maintenance

Reel-to-reel recorders will usually run for years without trouble. This is especially true with machines having a direct motor drive for each function. These direct drive motors eliminate the need for most belts, pulleys and rubber idler drives. On recorders using just one motor, clean and degrease all the intermediate tape drives including the pinch roller, capstan and counter belts. A few drops of lightweight oil can be placed in the pinch roller bearing and on each idler wheel bearing. Clean and demagnetize the play, erase, and record heads. When a

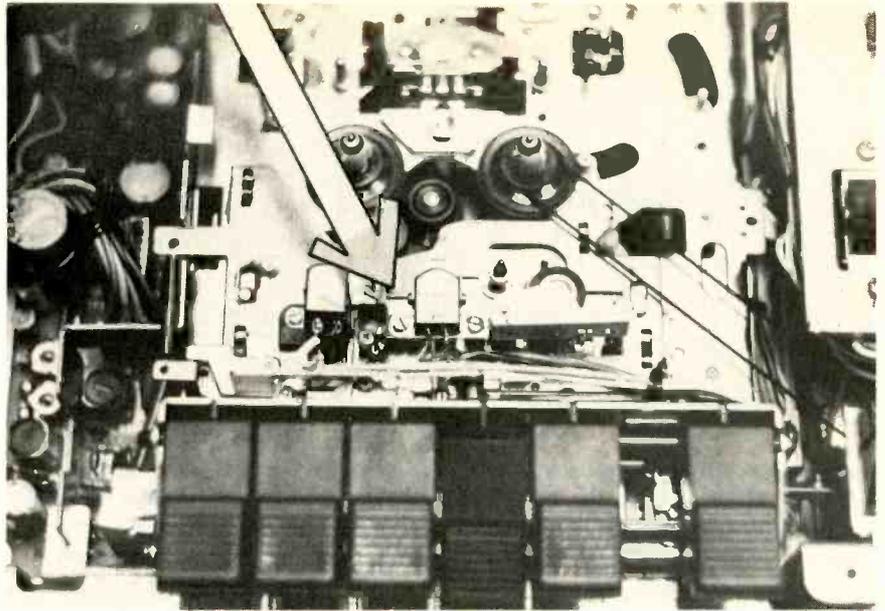


Fig. 9 Play/record head alignment screw.

SWITCH IDENTIFICATION		POSITION
S101, S501	MIC-AUX IN	AUX IN
S201-S208, S901	RECORD-PLAYBACK	PLAYBACK
S601-S608, S902		
S401, S801	MUTING	ON
S301-S304		
S701-S704, S19	Fe <sub>2</sub> O <sub>3</sub> -CrO <sub>2</sub>	CrO <sub>2</sub>
S10	PLAYBACK	
S11	PAUSE	
S12	TAPE COUNTER	
S13	REWIND	
S14, S20	MEMORY	
S15	AUTOSTOP	
S16, S17	POWER	
S18, S21, S22	DOLBY NR	OFF

JACK IDENTIFICATION	
J101, J201	MIC JACK
J102, J202	AUX IN JACK
J103, J203	PRE-AMP OUTPUT JACK
J301	HEADPHONE JACK

LEVEL CONTROL IDENTIFICATION	
VR103, VR203	RECORD LEVEL CONTROL
VR106, VR206	OUTPUT LEVEL CONTROL
VR102, VR202	PLAYBACK LEVEL CONTROL

new tape head is required or you suspect the need for an alignment, a simple yet effective procedure can be used with only the need for one reasonable quality prerecorded tape and one blank tape. First, insure that the tape monitor switch is clean and in the tape position. Next, play your prerecorded tape and adjust the screws affecting the playback head for maximum high frequency response, yet equal output on the right and left channels. This adjustment can be sensitive so take your time and use a set of headphones. After you have achieved this, place the blank reel of tape on the machine, set the monitor switch to the source position and put the tape recorder in the record mode. Apply pink or white noise across each line input and adjust both left and right level controls to cause each VU meter to indicate zero VU. If you do not have a noise generator

at hand, use an FM receiver with no antenna input and select for a constant level of noise on the dial. When this has been set, switch the transport on, and the tape monitor switch back to the tape position. You will probably notice that the recorded signal is low level and uneven. This is due to the misalignment of the record head. Adjust the record head screws for zero VU on both left and right channels. You should also watch for equal and sufficient high end response.

In conclusion, with servicing any one of the three tape formats, remember that the most common fault with these machines will probably be the need of standard cleaning and alignment. Most people are not aware of the importance of a clean playback head. Many try to remedy drive faults with sewing machine oil and still others may be expecting the tape recorder to perform far beyond its designers intent. Before you reach for the test probes and the schematic, clean the machine, check the head alignment and be aware of its limitations. **ET/D**

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# Consumer electronics . . . 1980

A revolution in video

Nothing has impacted the American public in this century as has the development of the television receiver and modern broadcasting techniques. Now some 35 years later, the television set is undergoing another revolutionary change—say the experts—this time as the center of home entertainment/educational systems. It's a phenomenon known as "video" and was highly evident at the summer consumer electronics show in Chicago.

By Richard W. Lay

If one central message emerged from the 14th annual Consumer Electronics Show in Chicago this past June it is that video—a word scarcely associated with consumer electronics just five years ago—is undoubtedly the force that will carry consumer electronics buoyantly into the 1980s.

And the television set, that 35-year-old relic of the past that already has influenced the American public more than any other single medium, is destined to remain—as one source put it—the bedrock foundation of what many are already calling the "video revolution."

The "video revolution," host to the ever increasing array of new and



*The microprocessor controlled PX-2 turntable from Yamaha*

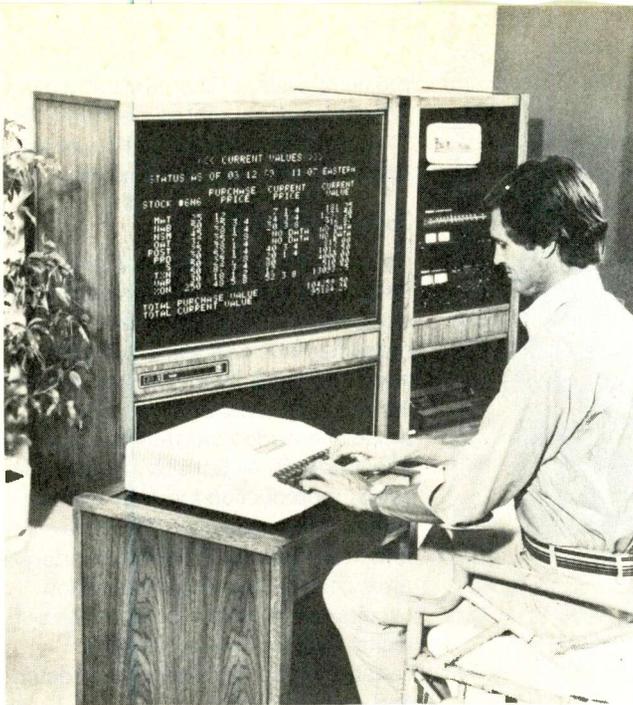
improved VCRs, home TV cameras, video discs, home computers and electronic games, is being spawned by many new technologies, including spreading cable television systems and earth station satellite transmission. Indeed it seems on the verge of even spawning new entertainment networks. One publication of the Electronic Industries Association states an "almost unlimited number of TV channels" will be available even in the most remote areas of the United States once the marriage of cable and satellite is consummated.

Even audio, as ironic as it may seem, seems to be part of the video revolution. Already in Japan television sets with two

channel—and stereo capability—are in operation (ET/D, Feb. 1980, p. 24). Video disc systems with two channel sound which can be played through the television receiver or audio equipment are already a fact of life in the United States. And, of course, we have the convergence of the pulse code modulator and video cassette recording machines that are capable of producing stereo sound of superiority levels 100 times above what is available today through conventional means.

And television, if experts at this year's CES are right, is at the heart of the revolution.

Color television, some 9.8 million units of which were sold in the U.S. last



GE's new Widescreen 3000 rear projection television is shown here with optional furniture coordinates to be used with other home entertainment video products which the manufacturer contends will comprise the home television center of the future. The basic television unit retails for about \$3,500.

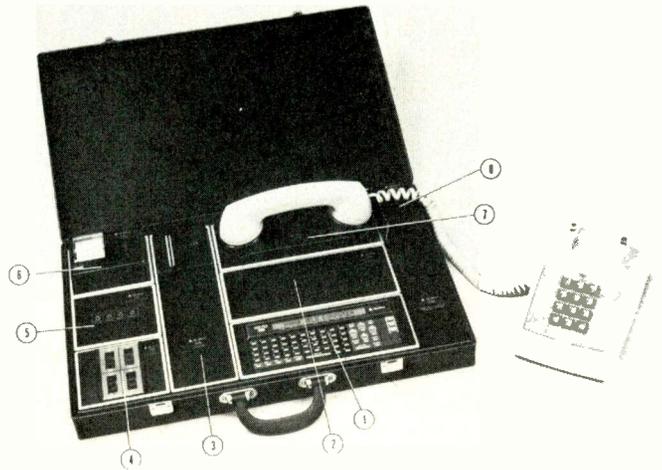
year, will increase to 12 million unit sales by 1985, according to General Electric's Ludwig Huck. Yet the tremendous sophistication of the television set of the future—a set capable of accepting video, audio, and home computer inputs, will raise the retail price of these units to \$5 billion at the retail level. Huck, GE television's marketing manager, told a special CES seminar on video that when you add the VCR, video disc, widescreen TV, satellite TV, and video software to the 1985 forecasts, you come up with a "video industry well over \$12 billion at retail . . . and growing."

"Spawning this video revolution of the 80s" Huck said, "will be the changing structure and economic independence of the American family. Of the 12.8 million families with incomes over \$25,000, almost 40 per cent were carried there on wives' earnings. Wives are likely to account for still a larger share of family income in the 80s," he said, "much of it discretionary income that can and will be spent on high ticket items like new video products."

Eventually, this will lead in the early 1990s to a penetration level of 50 per cent (50 million households) of homes with some sort of "video system" in place—that is, a VCR, video disc, home computer or any combination thereof, according to the EIA's consumer division.

### Trend setters

Embracing this futuristic concept of the American home of the future were the



Quasar's innovative "Micro Information System" is a computer which fits inside your briefcase. It can power optional peripherals including an input/output driver and a video adapter.



The highly compact combination pulse code modulator and Beta format VCR from Toshiba.

displays provided by General Electric and Magnavox.

GE (for the first time) revealed its newest rear projection television system, the Widescreen 3000 powered by the new EC chassis with three five inch picture tubes, its new VHS recorder, and mock up models of its recently announced VHD system (see Newsline, ET/D, July) . . . a third video disc format for the U.S. market.

The new units are part of GE's concept of the "home television center." It features, according to GE, 1,003 square inches of viewing area; dual mode remote control for random access or sequential tuning; four-speakers capable of 10 watts per channel RMS

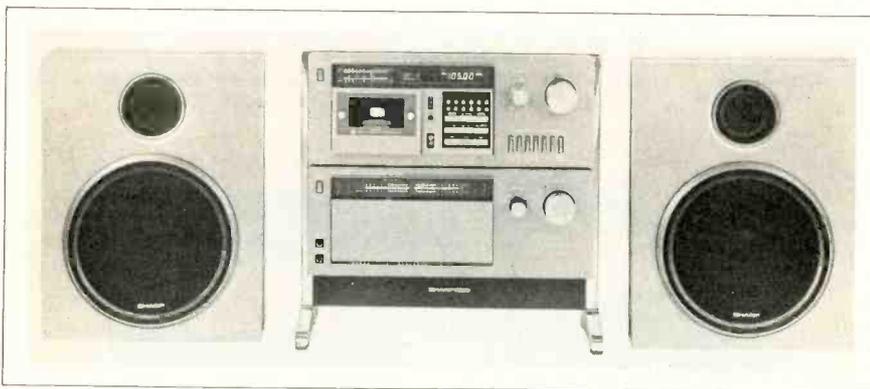
power and frequency response of 50Hz to 15Khz, plus separate bass and treble controls.

The VHD system, which uses JVC's disc technology, will bring a third video disc technology into this country when and if final agreement with the participating parties (Matsushita, JVC, GE, and Thorn) is reached. It is a grooved capacitance pickup system with two channel sound capability.

Magnavox, in similar fashion, introduced at CES its "Performing Arts Center" concept. This center incorporates Magnavox's 50-inch, three-tube projection TV unit with the micro-processor controlled Touch-Tune system. According to Magnavox, the



Magnavox's Performing Arts Center, in addition to the projection TV, a modular audio system, a separate color video TV/monitor and the new Magnavision unit. Overall dimensions are 8 by 5 feet.



Just under four inches in depth, this is Sharp's new ultra thin System 5500. For \$1,000 the system includes AM/FM stereo tuner/metal capable cassette deck, an amplifier and two bookshelf speakers.

unit will include a 19-inch non-remote Touch-Tune color portable, a 6-hour VHS portable video cassette recorder system, the Magnavision Optical Video disc player, a deluxe Magnavox color video camera, the Odyssey 2 electronic home video game system, plus a component audio system, including record changer, 8-track and cassette, and speaker system.

### Computer in a case

Quasar, in addition to coming up with one of the major industry surprises just a few days before the CES with the introduction of an integrated stereo system including cassette, turntable, and AM/FM stereo tuner/amp, took a futuristic approach with its "computer in a briefcase."

Dubbed the "micro information system," this amazing concept includes a hand-held microprocessor/language translator and optional peripheral devices. These peripherals include input/output driver, programmable memory, expandable capsule memory,

tape adapter, telephone modem, hard copy printer and television adapter. Targeted for late 1980 introduction, the retail price has not yet been established, according to Quasar President Alex Stone.

According to Quasar, the system is intended to be compatible with "every major computer." It can also function as a clock and alarm, calculator, memo recorder, reference library, telephone directory and language translator. An acoustical coupler allows the user to enter or access information from computers to other locations via standard telephone.

Quasar's library of memory capsules include 14 languages, a calorie counter, bar/wine guide, and phonetic pronunciation. Additional capsules being readied for introduction include business terms in four languages, Las Vegas games, and a word game capsule.

Quasar also came in with a completely redesigned projection TV unit which requires less space than its

previous system. The new entry has a 45 inch diagonal rear screen projection TV system powered by a 30Kv chassis and three 6 inch projection tubes.

### Audio/Video?

Toshiba, which for the past several shows has concentrated on showing its experimental type high technology products—such as voice activated TV and fixed head LVR, this time came to introduce its combo pulse code modulation/video cassette recorder. The Model PCM-D1 offers high quality sound reproduction together with a compact Beta system VCR. Some of the features of this unit, Toshiba reports, are error correction and compensation circuits which correct for tape drop outs; digital dubbing with analog mix capability; and digital encoded record and mute functions.

Sharp has come out with a super thin stereo system . . . the System 5500. This system, with AM/FM stereo tuner/metal capable cassette deck, an amplifier and two bookshelf speakers, will stand on its own or can be mounted on the wall.

According to Sharp, the cassette deck features auto program locate, microprocessor controlled solenoid cassette functions; digital frequency readout, fluorescent recording level meters; and an independent metal tape selector.

Quasar's first time entry into stereo comes via its Series 7000 audio system. The unique approach of the Quasar system is that it is designed to look like three stacked components—cassette deck, amplifier, and AM/FM stereo tuner—but in reality is a completely integrated system. Beneath a recessed glass dust cover is a record changer obscured from view unless viewed from above.

Yamaha officially introduced its new microprocessor controlled PX-2 turntable which will retail around the \$900 level. This unit is a linear tracking system which also has circuits for eliminating distortion caused by platter inaccuracies. All controls on the PX-2 are located outside the dust cover. The user simply places the disc on the platter, closes the cover, and moves the tonearm electronically to any spot on the record.

As I have said on several occasions in the past when writing about the CES, it is such a huge show that no one person can really fully grasp the significance of all of the electronic productry, gadgetry, and high technology informational and entertainment devices on display.

However, the CES regularly provides  
*continued on page 45*

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# Microprocessors in a factory setting

Keeping the system on track

Microprocessors in the industrial setting have been with us for a long time. Yet, unless one is intimately familiar with a particular system, it is not readily apparent how they function or what they do. The following article attempts to remedy this situation with a first hand description of a microprocessor controlled factory operation.

By Steven K. Roberts\*

The last year or so that I was in business for myself as head of Cybertronics, Inc., I spent in dedication to a product dubbed the IDAC/15, an industrial data collection system I designed for Corning Glass Works. It is, in a nutshell, a collection of microprocessors scattered around a factory with the combined objective of providing a reliable data communications link between plant personnel and the company computer system—be it for inventory, job reporting, quality control, time and attendance, process control, or whatever.

I would like to begin discussing this system, though I can almost guarantee that you will never sit face to face with an IDAC/15 on your bench, it being a rather low-volume operation. I make the choice for two solid reasons:

*\*Mr. Roberts, now a fulltime freelance writer, is also a professional software development engineer and industrial systems designer.*

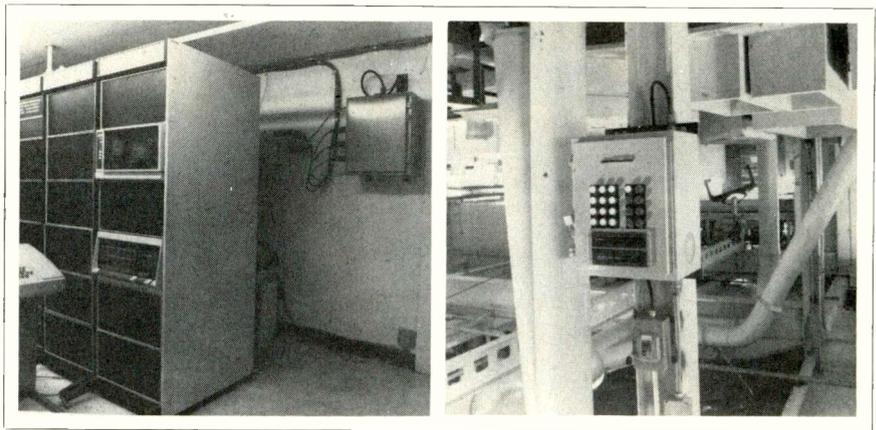


Fig. 1 Overall structure of factory computer system using IDAC/15 system. Typical locations for terminals are suggested by labels; specialized furnace controller and radio-linked terminal on fork lift are shown. A system somewhat like this is in use at Corhart Refractories in Louisville, Ky.

1) Its design is representative of state-of-the-art techniques used widely in commercial and industrial design.

2) I am intimately familiar with it and can discuss it more comfortably than I could a system developed by someone else. This should make it easier for both of us.

So first, let's see what the IDAC/15 is, and how it happened to evolve from Corning's needs.

## The Data Collection Crisis

There is a bit of a problem associated with keeping track of a large manufacturing operation. It is not sufficient to simply issue a job order at the management level and assume that it is done; there must be controls and checkpoints throughout the process which 'close the loop' and enable corrections before something gets out of hand. Things do occasionally get out of hand—in Corning's case, one small part of

the facility is an immersion-arc furnace which, at 1979 prices, consumed about \$206 per minute in energy alone. If it takes management four hours to detect and correct a problem with, say, a ceramic formula, then for four hours the furnace has been processing scrap at a total cost of \$49,440. Add to this the plant overhead.

Why, one may ask, would it take four hours to detect and correct a problem of this severity? Wouldn't the establishment of constant checks on key parameters be high on the corporate priority list?

Sure! But it hasn't always been possible, and still isn't easy. First, assume that the company has a computer system, used for accounting, some plant control, payroll, etc. The classic approach to the data collection problem involves numerous forms, padded on clipboards, which are filled out by various supervisors and QC

personnel during each shift. These make their way to the keypunch department, and, if they are still legible after being smeared with dirty hands and pencil stubs, are converted into punched cards with, hopefully, very few errors. Someone then carts the cards down to the computer room, where they are run to produce a readable listing which communicates effectively to humans (after sitting in an "IN" basket until the human in question has the time to study it).

The problems are obvious. Is the solution?

### Micros to the rescue

Take a look at Figure 1. The typical large computer is at the left, surrounded by the usual collection of CRT terminals, printers, disk and tape drives, and communications lines to a home office or other plants. It works just fine, but it lacks senses which give it real-time, current information about plant activity. It can only operate on information which is fed to it by people.

But when we add the "Multiplexer" and all of its satellites, the picture changes completely. Depending on the cleverness with which we implement the terminals in the plant, the computer is able to make inquiries and receive immediate responses concerning key parameters which may require minute-to-minute monitoring and adjustment, and these responses can come either from employees on the plant floor or directly from the process equipment itself.

We are arriving at a very real application for microprocessors. To make it unnecessary for the host computer to spend a large percentage of its time keeping track of communications, we put a micro into the multiplexer. When the big computer wishes to send a message to a terminal, it just dumps the message, prefixed by a start code and a terminal ID, and then forgets about it. The multiplexer is responsible for shipping the message out on the appropriate channel and ascertaining that it was received correctly.

The terminals, too, contain microprocessors. Not only must they communicate with the multiplexer, but they must be able to control the various input and output devices mounted on the fronts of the boxes. These include a pair of Burroughs Self-Scan Displays (single-line plasma displays which can present a message of 32 characters), a badge reader for employee ID, and an array of lighted pushbuttons to present and accept choices of function and

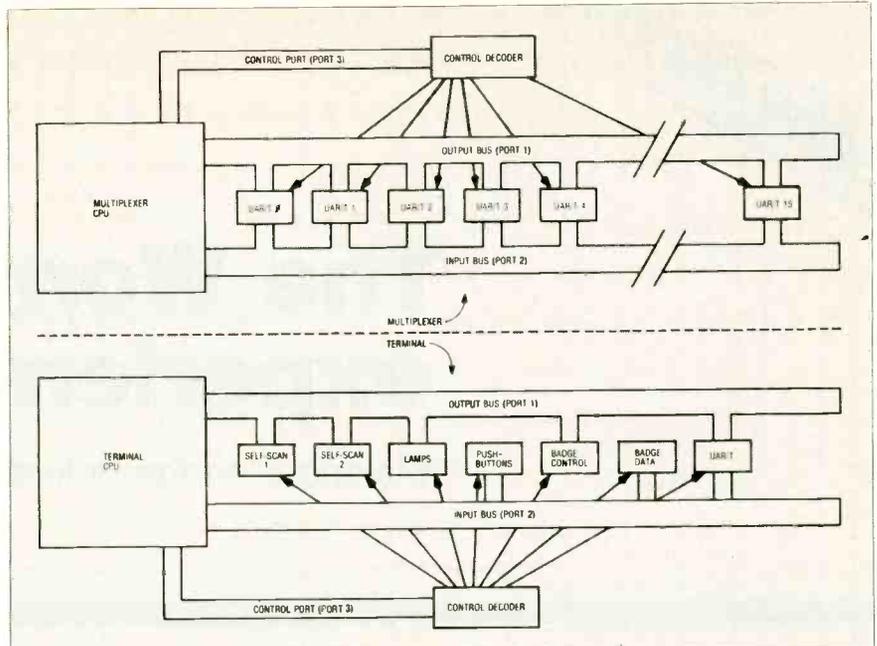


Fig. 2 Internal hardware architecture of IDAC/15 components. Input and output buses are created with I/O ports, and a third port controls device behavior. Interconnection between these two systems is a pair of current loops from UARIT to UARIT.

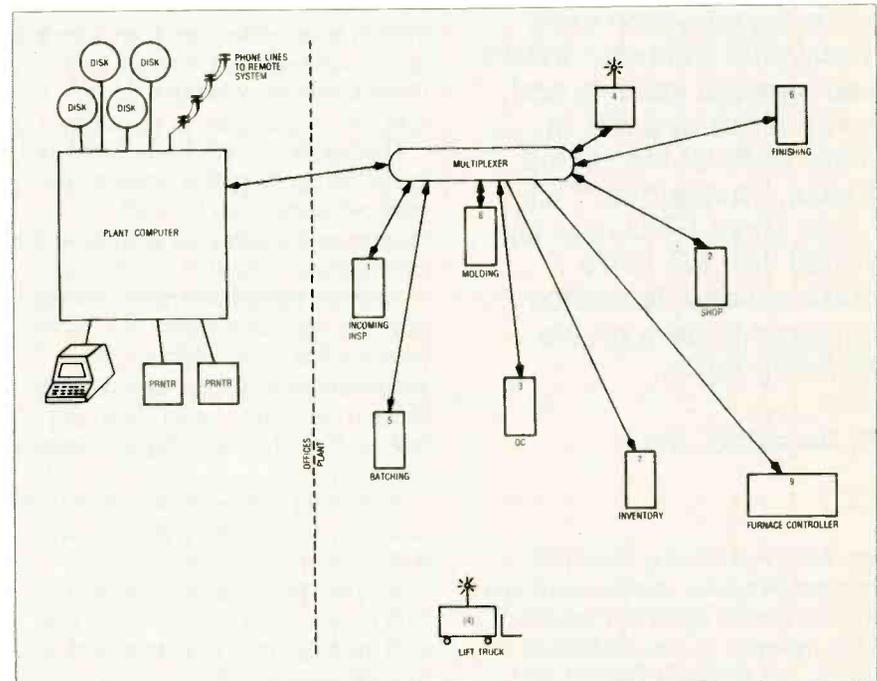


Fig. 3 Multiplexer (left) and Industrial data collection terminal (right), controlled by microprocessors and in use at Corhart Refractories ( a division of Corning Glass).

numeric information. We can use the micro here to 'reduce' the data a little bit by rejecting pushbutton entries if the associated lamp has not been lit by a system command, and by rejecting 'badges' that may actually be putty knives or pieces of paper. Yes, industrial environment offer a fascinating set of design criteria (some of which governed the choice of enclosure: a heavy-gauge steel, padlocked Hoffman box).

The presence of a microprocessor in each terminal also provides us with the opportunity to make the boxes relatively 'smart.' Industrial specifications called

for 200 milliseconds of 'solid down time' on each pushbutton before it can be accepted as real and it must ignore any simultaneous depressions. A built-in self test which can be operated by unskilled personnel makes field support easy. And, interestingly, the communications flexibility allows a terminal to be mounted on a lift truck or a crane and interconnected with the rest of the system via a UHF/FM radio link.

The result of this general design is, more than anything else, flexibility. Because no hardware redesign is necessary when the user requires a

# The Wornall experience

Making it on the industrial side

Wornall TV & Electronics started out 21 years ago as a one man operation servicing television sets. Today this company installs and services security and surveillance systems in many parts of the United States. To see how it all came about ET/D recently visited with the firm's president and its service manager to develop the following report.

By Richard W. Lay

Wornall TV of Kansas City, MO., services television, stereo, black and white and color television cameras, CBs, two way, VCRs, microwave ovens, and the Lee's Summit, MO., fire department.

Fire Department!!!

That's right, I said fire department. And to that list you can add the Western Electric plant at Lee's Summit, the Kansas University Medical Center in Kansas City, KS., and soon—the Tulsa, OK., airport.

Obviously Wornall TV, owned and operated for the past 21 years by President Neil Meltzer, is not your average run of the mill TV shop. Far from it.

"We made a decision a long time ago to tackle any job we felt we could handle if it involved electronics. And that's how we operate," says Meltzer from behind his desk in his new

15,000 square foot headquarters on the southern edge of Kansas City.

Thus it has come to pass that over the years since that 1959 start when Meltzer, a one man operation, opened up for business, that Wornall TV & Electronics has developed into a \$900,000 a year service operation.

The significant fact about that figure is that \$400,000 of that amount, this year, will come from Wornall's involvement in industrial security and surveillance installation and service.

"Wornall will bid on any job we feel safe with no matter where it is, on the east coast to west. We study the specifications and if we (co-managers Richard Baker and Israel Radvinsky) feel we have the capability to handle it we go after it."

Wornall TV & Electronics, obviously, is broken into two separate divisions, consumer and industrial. The consumer division is comprised of nine people, eight technicians and a tech trainee. There are three trucks, two used by service technicians covering the entire Kansas City metro area, and the third by the trainee delivery man for finished product.

## The industrial makeup

Wornall's industrial side is comprised of four technicians, four trucks, three vans, and either Baker or Radvinsky. All vans are equipped with "cherry pickers" for use in CCTV installations which is what comprises most—though not all—of Wornall's industrial business. Wornall does digital board repairs on Motorola decoders located in the western United States. Wornall also has contracted for installation of surveillance and computerized



Fig. 1 "I'm no super technician and I'm no business genius. I'm just a businessman who takes a look around and tries to figure out where I'm going."

information display systems in Iowa, Missouri, Kansas, Nebraska, Arkansas, Oklahoma and Texas. Jobs generally involve the installation and maintenance of closed circuit video systems for industry and business. Typical of a job, Meltzer says, is the surveillance and security system they did for the Western Electric Co. plant at Lee's Summit just outside Kansas City. This job involved eight CCTV camera installations, two way communications systems from entry gates to a central monitoring station, and all of the attendant tasks to be performed when installing camera towers, motorized gate controllers and cable installation.

"Electronics can be fun—and more than just electronics," reports co-manager Rich Baker when talking about problems of installation. These projects involve digging trenches, pouring concrete, and tower construction—then comes the electronics.

The digital board repairs for

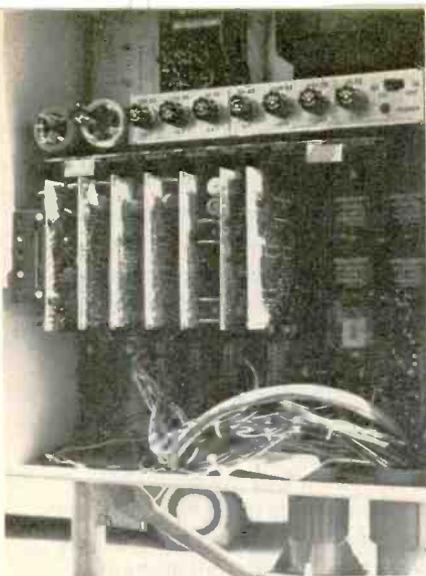


Fig. 2 One of Motorola's digital decoder and power supply units maintained by Wornall TV at the Western Electric Plant in Lee's Summit, Mo.



Fig. 3 The Lee's Summit Fire Department's computerized systems status display system.



Fig. 4 One of Wornall's industrial vans, complete with "cherry picker."



Fig. 5 Motorized gate controllers: Their installation involves excavation and laying underground cable.

Motorola closed circuit surveillance systems involves troubleshooting microprocessor based equipment (see Fig. 2). These digital controllers operate remote CCTV cameras from a control center, including pan left, right, up or down, on or off, and they route two way voice communications from remote microphones at guard and entry points to headquarters on a programmed priority basis.

So how did Wornall TV come to be in industrial security—and how does someone like yourself, perhaps, crack this type of market?

Listen to Meltzer: "Learning industrial security is simply a matter of going to a manufacturers' school to learn a manufacturer's system. I didn't have any special knowledge or skills when I got into this business. I simply

went through all of the manufacturers' catalogs to learn what types of equipment they had and then I went to their schools.

"It's really a simple matter of getting off your duff and doing. We have a policy here that we can do anything—we don't care what field it's in. If it's in electronics, we feel we carry the expertise.

### The future

So far as the future is concerned, security is where it's at, according to Meltzer. The consumer repair business is depreciating very rapidly. We used to run five trucks now we're down to two. That's why I said a long time ago we'd better get into the industrial end of it. In the next five years I wouldn't be surprised if we're

100 per cent industrial/residential security and out of consumer TV altogether.

"We can do this," Meltzer points out, "because we've kept up with the technology. We've been into computers for three years now and we're way ahead of the average shop in this ball game.

Speaking of computers, Wornall installed and maintains the Information Display system used by the Lee's Summit Fire Department (Fig. 3). This particular system provides the dispatcher with the status of each piece of equipment—where located and if in transit or stationary. It also provides the dispatcher with a list of equipment that would reach a fire destination quickest from a given location.

How do Wornall employees learn about computers and keep up with the advancing technologies? By attending school, says Meltzer. Wornall TV's own school—plus all of those provided by manufacturers on their products.

their line to include such systems.

Market reception to these new systems has been judged excellent by their manufacturers and industry spokesmen. The National Burglar and Fire Alarm Association Public Relations Director, William Greer, reports that preliminary soundings by that organization have found market penetration has doubled in the last two to three years and credits much of that growth to the introduction of these systems. Projecting to the future, Greer expects a 20% growth each year for the next ten years in residential installations.

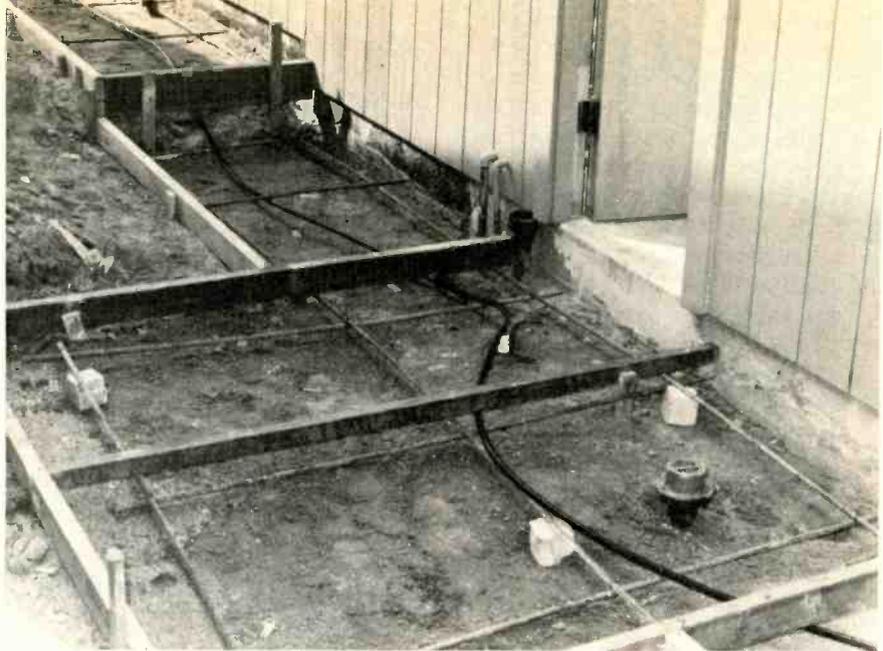
Another significant reason for the sudden and rapid growth in residential market penetration Greer accounts to a growing consumer awareness of the need and value of such systems. The NBFAA itself is investing \$40,000 to \$50,000 per year on consumer education programs in the residential area. This effort is strengthened by the recent commitment of a number of manufacturers buying television time for commercials selling the concept and equipment of burglar alarms, along with a much increased advertising campaign on the part of professional installers in their own local areas.

### Now is the time

With residential security systems now receiving recognition by insurance companies, many of which offer premium discounts to homeowners who have such systems, by crime prevention institutions, and by the homeowners themselves, now is the prime time to actively enter into it.

For the professional electronics technician, grasping the concept and mechanics of the contemporary alarm system should not be a problem. When you choose the equipment you will be installing, most manufacturers will provide you with technical information discussing the equipment and its installation. Major manufacturers provide training seminars for yourself and your installers. In addition, alarm system dealers can generally call manufacturers in the industry for immediate help in the event of a problem installation.

In terms of dollars and cents, an investment will of course be needed. The extent of this investment will vary with the scope of your current operation and, to a slight degree, to the city and state in which you operate. A number of states and



municipalities have instituted licensing laws for alarm installing businesses, attaching a set fee for the procurement of these licenses. To investigate the licensing status of a particular state, consult the local police department and the state consumer protection agency.

Tools will be one capital investment necessary, but it is likely to be a minor one. A telephone head set might be one piece of equipment you will have to purchase since most contemporary systems for effective security automatically report alarm conditions via phone lines from the residence to a remote location such as a police station. If you elect to install hardwired systems, snakes for running wire behind walls and above ceilings would be another necessary purchase. For the most part, all the tools necessary including electric drills, volt ohm meters, screw drivers and soldering guns will already be present on the professional technician's workbench.

Initial investments in inventory will probably be the largest capital investment necessary. As in any other industry, there is considerable range contrasting the prices of various manufacturers' equipment. The decision to install a system with photoelectric intrusion detection as opposed to passive infrared or microwave or ultrasonics detection will affect cost as well the choice of going with a hardwired system rather than one sending alarm signals via radio frequency transmitters.

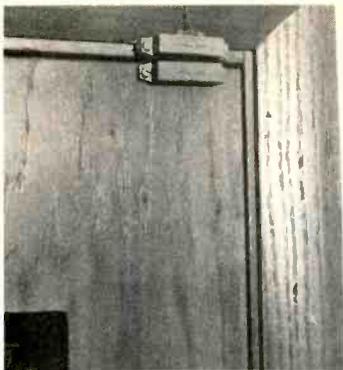
### The basic system

Generally, the basic protection system will feature what is called perimeter protection, a security device on all

openings in the perimeter of the house. To this end, windows are usually protected with foil, vibration detectors, or alarm screens. Foil is a ribbon of metallic material which when broken sends out an alarm signal. Vibration detectors are as their name implies. Alarm screens are window screens which have the appearance and function of standard screens, except when these screens are cut by a would-be intruder, they send out an alarm signal. While alarm screens or vibration detectors might cost more initially than foil, labor time is often less and the possible aesthetics problem of foil is overcome.

Protecting doors can be done with the installation of magnetic contacts which are simple electro-magnetic devices which, when the door is opened, moves a magnet away from a switch and activates an alarm signal. Pressure mats are another technique for protecting doors. These can be placed behind doors, beneath carpet. When someone steps on these mats an alarm signal is triggered.

The effective security system will often include at least one "interior trap," or some means of discreet room protection which an unwitting intruder might trigger simply by his motion or body heat. These systems basically include passive infrared devices, photoelectric devices, ultrasonic devices and microwave devices. According to Dave McElwain of Western Alarm Supply Company, a national distributor of alarm equipment to professional installers, all of these devices will cost in the range of \$100 to \$200. The mechanics and system benefits and drawbacks of these devices are too involved to begin a



Residential security devices can encompass such simple items as magnetic sensors mounted on doors or windows which sound an alarm if a break in occurs to such sophisticated products as the seismic detector system, at left, by Intrusion Detection Systems which is designed for both industrial and upper income home protection.

discussion of them in this article. If you'd like information on them immediately, you should get in touch with the various manufacturers or a distributor of alarm equipment.

### Getting started

There are a number of ways in which an interested party could become involved in the alarm business. The most obvious way is to contact

manufacturers, collect product and manufacturer support information, choose and purchase some initial equipment, take advantage of manufacturer installation training, and go about the business of involving your company in the alarm industry on your own initiative. For many already operating electronics companies, this will be the least expensive and most effective method to employ.

If you are looking for more cautious means of entering the business, a franchise corporation may be your best bet. Rampart Industries, Inc., located in Langhorne, PA, is such a franchise corporation. Its initial training program for participants includes education in industry history, competition, system designs, methods of building a local reputation, methods to develop sales leads, sales techniques, training techniques, and general management methods. In addition, they offer continual back-up support including telephone consultation for application, installation, service, advertising or any other business-related questions. Regional seminars are on-going and in-the-field assistance is available when required. Engineering support is

given for special design/application situations.

The franchise also, of course, entitles its user to corporate name identification and receipt of local leads developed through regional and national promotion programs. For all of this there is a fee charged and with Rampart that fee will range between \$2,000 to \$8,000 depending upon the qualifications of the franchise applicant and the amount of equipment purchased. The minimum \$2,000 fee includes demonstration sales model and all sales forms and aids, along with the aforementioned franchise benefits.

If you enter this market by means of your own effort, or through the help of a franchise corporation, or through some other method, the important thing is that you take the action now. As Rick Stuts, national director of sales and marketing for Mayday Security Devices (one of the manufacturers of equipment exclusively designed for the residential application), says, "It's much harder to catch a train once its got up its momentum." The Residential Security Market Express is building up steam fast. **ETD**

# RCA Permacolor TV Antennas

*Solid Connections  
Solid Pictures  
Solid Profits*

The best possible TV reception in almost any area. That's what your customers will get with RCA's Permacolor Outdoor TV Antennas. One of the reasons is the use of solid, riveted connections of flexible aluminum — from elements to feed line. These permanent connections provide a positive electrical path for the signal to flow. There's no chance of interruption . . . overcoming a major problem found in other antennas. Plus polypropylene insulators and a weather-resistant blue and gold polyester finish contribute to Permacolor's remarkable performance and long life.

With RCA Permacolor, you can offer your customers a complete line of outdoor TV antennas, including 75

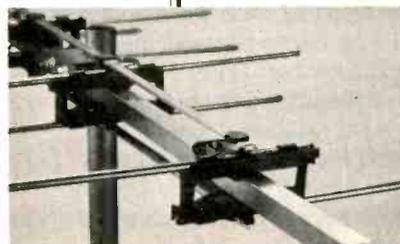
ohm and 300 ohm antenna kits. The RCA name and tradition will assure your customers that the highest quality and performance are built into RCA Permacolor. And they're right. Permacolor brings in a better TV picture for your customers. And a better profit picture for you.

For full information, see your RCA Antenna Distributor or write to: RCA Distributor and Special Products Division, Deptford, N.J. 08096, Attn: Sales Promotion Services.

**RCA**   
**Permacolor**



**4BG20  
SUBURBAN**  
One of many  
RCA Permacolor  
Antenna models  
available.



**SOLID FEED LINE.** Solidly riveted connections of flexible aluminum provide a positive path for the signal to flow from the elements to the receiver with virtually no chance of interruption . . . an RCA exclusive.

# Cracking the residential security market

Operating a one man business

Rex Security, an offshoot of one of Chicago's largest television service companies, has been installing alarm systems in the Chicago area for five years now. In this article you'll learn some of the requirements and opportunities in the expanding field of residential security.

By Richard W. Lay

Doug McKalip, as a one man residential security expert, has all the business he can handle and has the option of expanding his business simply by taking a more aggressive stance in the marketplace. This is something he is about to do when he hires a full time salesman to "scout" for new home security jobs.

Doug has his eye on expanding into nonresidential security areas—primarily small store front jobs in and near his home base, the Chicago suburb of Tinley Park.

"From this store front business will come more residential jobs," Doug told ET/D recently. "So far my business has been primarily word of mouth. Once you get one job in an area, the word spreads fast."

For instance, Doug for the past several months has been doing most of his security installation jobs in the wealthy southern suburb of Prestwick. Word of mouth alone by satisfied customers in this suburb has led to all

the business he can handle by himself.

It all began some five years ago when, at the age of 20, he was working at his father's television shop—Rex Television Service Co.—as an electronic cash register repairman. Realizing the limited potential in such a narrow field, Doug says he placed an ad in the Yellow Pages under the heading "Burglar Alarm," and from that beginning has come his present business.

Rex Security averages about one installation per week, summer being the "busy season" and winter the slack time. An "average job," Doug says will bill between \$1,500 and \$3,000, depending on the customer's own desire for sophistication or simplicity in a system. At the time of ET/D's interview, Doug was involved in an installation involving ten window "bugs" (vibration sensors) and contacts; two smoke detectors; four door contacts; and a passive infrared motion detector. This job, Doug said, would bill around \$2,000.

Besides this, he said, there were five jobs "backed up" and waiting to be completed, most involving installations in Prestwick that grew out of "word of mouth" advertising.

Rex Security, he says, generally has about \$8,000 worth of inventory on average. Some \$3,500 of this will be backup systems. Many customers, especially in business environments, cannot afford to have their security systems out of service for any appreciable amount of time. Thus, if a breakdown occurs, and if repairs would amount to anything more than a

few hours, the dealer must be prepared to supply that customer with a backup unit. Hence the need for a "backup inventory."

Generally, Doug says, he ships all out of service units under warranty back to the factory for service—though there is no reason why a qualified TV service shop could not make some arrangement with the manufacturer to perform warranty work. He also chooses not to service out of warranty work and in such cases charges the customer what he estimates the repair charge for that particular unit would be.

Most of the problems associated with security alarm and detection system installations center around hard wired systems. All such wiring, of course, to be effective must be hidden and this entails laying wire between walls and joists, etc. Most of the failures modes of a perimeter detection system are concerned with open circuits. Generally this involves the movement of a magnetic contact because a door jam moved or some other similar problem, Doug says.

Also, if the system involves a direct dial mode of operation (digital or tape dialer), the unit to be dialed—usually a police or fire department agency—must be contacted and permission received to install the link. Usually such agencies—despite the number of false alarms—are cooperative, Doug says. Licensing is another problem faced by the alarm installer, though this presents no unsurmountable problem.

Each local area, and some entire states, may require licensing

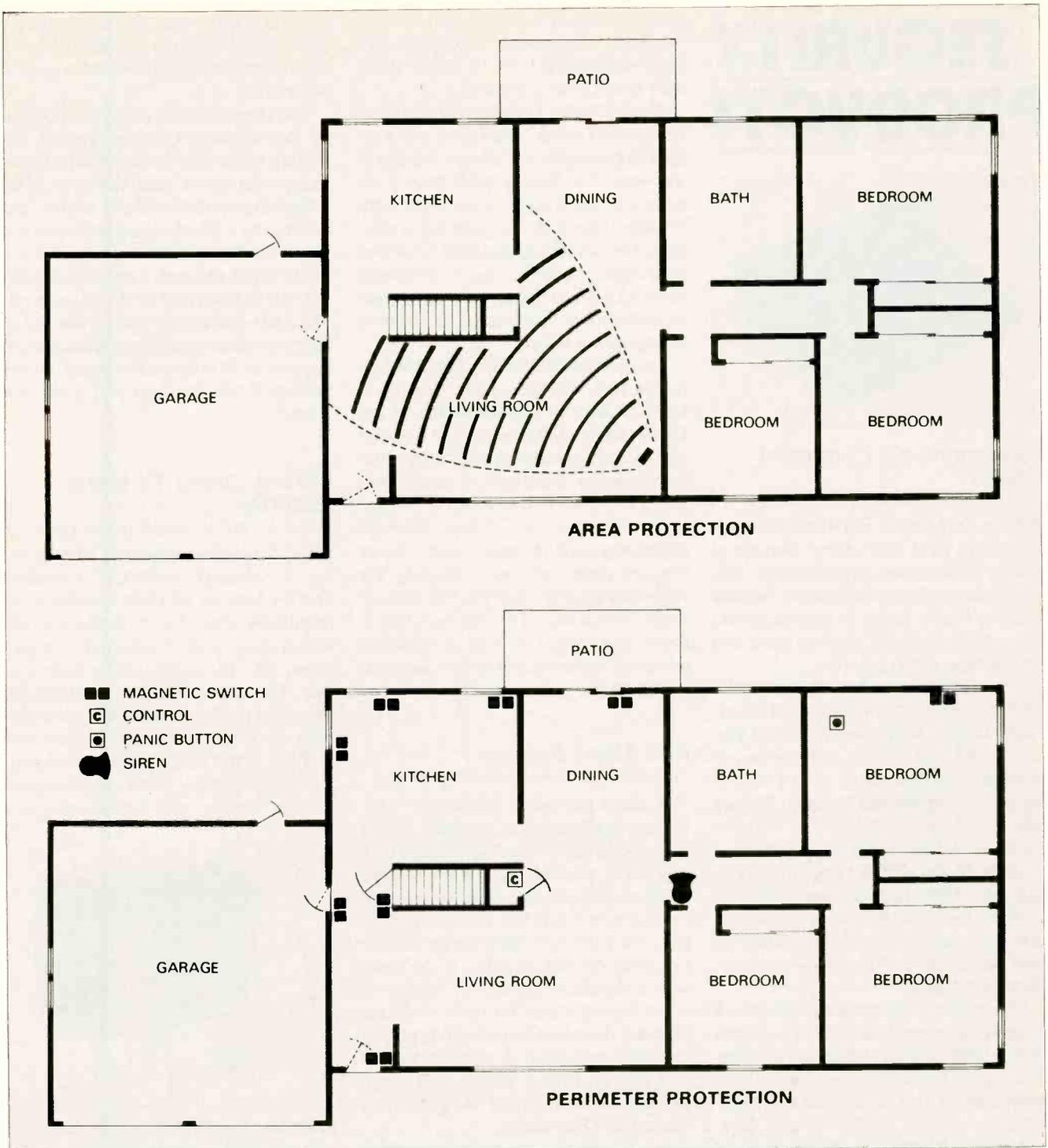


Fig. 1A & 1B The concept of area protection as opposed to perimeter protection is illustrated in this drawing from Master Lock Company. Area protection (1A) is afforded through a motion detector which creates a "trap zone" that intruder must pass through in going from one part of the house to another. Perimeter protection (1B), on the other hand, involves magnetic sensors mounted on exterior doors, door to basement, patio doors and key windows on back of house; "panic" button next to master bed; control unit in centrally located closet. Additional sensors may be added to other windows, or garage doors, at any time.

arrangements for security installers and servicers. Differences between geographic units in the United States are too numerous to list in this article.

One way around the problem of dealing with local police or fire department units, he says, is to involve your customer with one of the 24-hour systems monitoring stations, more and more of which are beginning to spring up around the nation—such

as Silent Watch Corporation's Security Management System. This particular system is designed to connect subscriber locations with a computer center by means of WATS telephone lines through a variety of input devices. These devices range from door locks to passive infrared detectors.

Here's how such a 24-hour monitoring system works. When an

alarm signal is passed to the computer center, the computer flashes a prescribed emergency procedure on a video screen. An on-duty operator then calls police or fire officials, as well as the affected individual's home or the business.

Familiarizing yourself with the industrial or residential security industry is simply a matter of three factors, Doug told ET/D. These are

# SECURITY PRODUCTS



## Programmable Command Center

Circle No. 125 on Reader Inquiry Card  
*Pittway Corporation* will shortly be introducing its First Alert Home Command Center®. Requiring no installation, this microprocessor-based system utilizes existing house wiring to control almost any electrical device, such as lights and appliances, within a home.

The system consists of the Model HC8600 Programmable Home Command Center, which plugs into 120 Vac outlet and can control any number of satellite modules, which in turn control lights and appliances. Initially, Pittway will introduce three types of satellite modules: Model HC8610 lamp/dimmer module; Model HC8611 appliance module; and HC8612 Wall switch/dimmer module, designed to replace an existing standard wall switch. The lamp/dimmer and appliance modules plug into standard wall outlets.

The system reportedly incorporates a number of unique features not available in any other control system on the market. Lights and appliances can be programmed to turn on and off automatically by remote control at any time; either on a specific day of the week, or every day. An Energy Saver feature allows programming of the system to operate lights automatically at a pre-set, energy conserving and money saving level.

The system can at any time confirm whether any system-controlled lamp or appliance is on or off, and will actually acknowledge the execution of each command given to the system. Should completing a command not be possible (if a light doesn't turn on because of a burned out bulb), the system will continue trying, and flash the word "Fail" on its display. Each wall and lamp module functions as a separate dimmer, in addi-

tion to having an On-Off switch to control the lights. Appliances and lamps can also be controlled from the Center using their own On-Off switches.

The HC8600 Programmable Home Command Center is equipped with a digital clock, which also shows the day of the week. The display automatically adjusts to ambient light, darkening at night to reduce glare and brightening in daylight. The Center's keyboard is backlit for easy night operation. The HC8600 also features a 9-volt battery backup system to protect the contents of its memory during power failure.

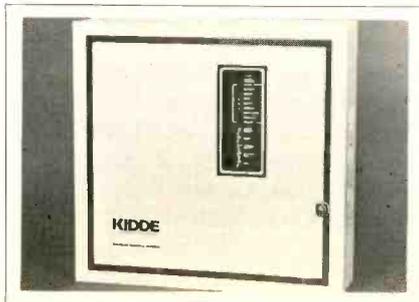
First Alert is also introducing a manual model, the HC8500 Home Command Center. Like the Programmable unit, the Center can at any time confirm whether any light or appliance is on or off and will acknowledge execution of commands given. A Preset Dim key allows the user to turn lights on to a lower-than-full brightness level to save energy. Since the unit does not use a display, the keyboard audibly confirms the entry of each instruction. The Manual Home Command Center is fully compatible with the Programmable system and can work with the same modules.

## Fire Alarm System

Circle No. 126 on Reader Inquiry Card

Fire alarm protection for smaller commercial applications is provided by the new Kidde KDR-400 Alarm System. It reportedly provides a comprehensive range of options and complete signalling functions for one to four zones of protection. The KDR-400 designed by *Kidde's Douglas Randall Division*, to be used with a minimum number of options to avoid having to pay for more functions than are needed while providing proper fire alarm protection, is a self-contained unit with up to four zones, and is designed to meet National Fire Protection Association Standards.

An LED panel, easily read through the cabinet's plexiglass window, provides general alarm and trouble information. It tells if ac power is on, an input zone is in alarm or if an alarm has been silenced. It tells if a switch is in the wrong position or



if wiring is grounded. Standby batteries with a built-in charger provide power for the system should commercial power be interrupted.

With the selection of circuit modules for four input and four output zones, the system reportedly can be tailored to detect smoke, flame, heat, waterflow or an activated pull station. "False alarms" are avoided by a timed investigatory interval which causes a "trouble" warning. If the alarm is not aborted, it sounds after an adjustable interval of 30 to 120 seconds. The KDR-400 system can be tailored to cut off an alarm sounding device after an interval or to change the alarm sound pattern. It can interface with a city box alarm.

## Closed Circuit TV Home Security

Circle No. 127 on Reader Inquiry Card

*Columbia Video Systems* is introducing the "LOOK-OUT" home CCTV system. This TV/Monitor with built in intercom is reportedly ideal for property surveillance, pool side monitoring, nursery room, etc. The most unique feature is that, if watching TV, and the door bell rings, the monitor switches in automatically, on any channel, and you can see and talk to the person at the other end. Up to three cameras can be used and various lenses and accessories are



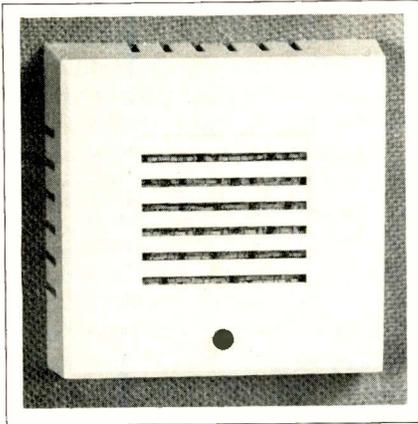
available. The System comes complete with 82 channel solid state TV/Monitor, TV Camera, Camera Mount, 16mm lens, Outside Sound Module, 50' Cable. The net price \$525.00.

## Audio Switch

Circle No. 128 on Reader Inquiry Card

*MRL, Inc.* has a new product for security dealers and installers. MRL's new AUDIO SWITCH operates on 6 or 12 volts ac or dc, externally supplied. Hard wired, it is a sound discriminator unit, to be used in conjunction with most alarm control panels. Two models are available, either flush mount or surface mount. It reportedly has sensitivity ad-

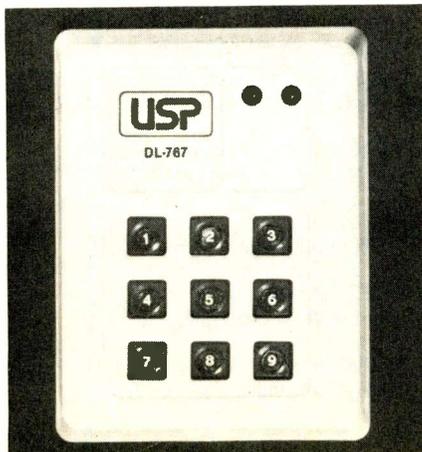
justment, NO and NC dry contacts, automatic reset, lower power consumption and long life. The AUDIO SWITCH is



stated to be a true sound discriminator, detecting sounds of forcible entry while ignoring sounds of normal operations.

### New Digital Lock

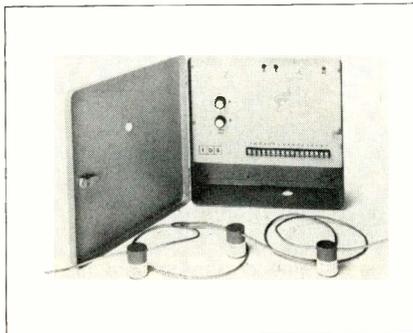
Circle No. 129 on Reader Inquiry Card  
*United Security* has recently announced that it will market a new pushbutton digital lock which can be used to operate an alarm system or an access control system. The USP Digital Lock reportedly employs state-of-the-art electronics to provide a high security combination lock for use with burglar alarms and access control systems. The new lock is available in both Momentary (DL-767) and Latching (DL-767L) models. A key feature is a 9 digit keyboard which incorporates over 3,000 different combination changes. The combination changes can be made in the field, by simply relocating color-coded jumpers. A quick-disconnect plug for external wiring further simplifies field service. The USP Digital Lock is 3½" wide by 4½" high by 15/16" deep. It can be mounted either inside or outside the premises, and when activated by entry of the proper four digit combination on the face plate, it momentarily releases the door strike, allowing entry. The lock can also be



used to arm or disarm a security system, or momentarily shunt a protection system for access. Other features of the new lock include: Wrong Number Lock-out, which delays operation for several seconds if an improper code sequence is entered; Changeable output, and versatile flush/surface mount. The lock is completely self-contained, requiring only low power dc for operation, and contains two LED's which can monitor 6 to 15 Vdc system status, etc.

### System Control Panel

Circle No. 130 on Reader Inquiry Card  
*Adcor Electronics'*, Sentinel System has all alarm functions contained in one central panel, with all features built in, including a power supply, lightning protection, two zones burglary, (delayed and instant), supervised fire alarm, audible or silent personal emergency, relay



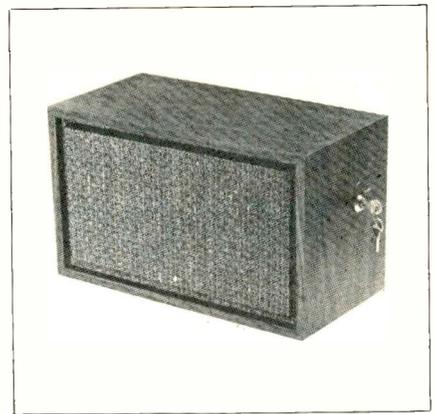
contact or electronic siren driver outputs, entry-exit delay, fire trouble and other features.

With the optional plug-in telephone communicator, the Sentinel System not only rings a bell or sounds a siren in case of fire or attempted break in, but can call for help by telephone.

The system may be armed from the wood-grain finish master remote station which provides visual indication when the system is armed or circuits are closed. Slide switches provide on-off control of interior zones, entry delay and the "sentinel" feature, which converts the system to a door annunciator when not armed. An ac power indicator, personal emergency push button and alert control (audible or light) are also included.

### Sound Discriminator

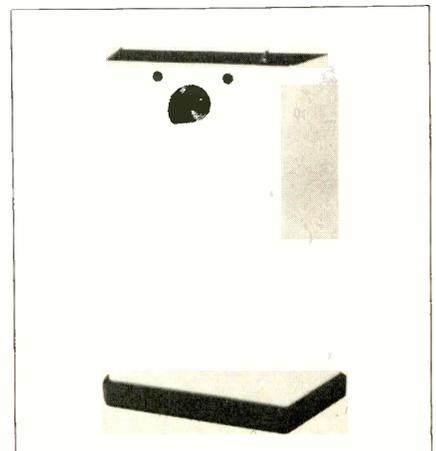
Circle No. 131 on Reader Inquiry Card  
*Controller Systems Corporation* Model 610 is a sound discriminator which reportedly responds only to intense high frequency sounds, those produced by the breaking of glass, splintering of wood, pounding and other break-in sounds, while ignoring normal sounds. It



operates on 120Vac and on its own stand by rechargeable battery (charged by a built in trickle charger) and can turn on lights, sound its alarm siren, or activate a telephone dialer.

### Security Light Control

Circle No. 132 on Reader Inquiry Card  
*Colorado Electro-Optics Inc.* has recently introduced its new Security Light Control (SLC-1). The SLC-1 employs passive infrared to sense an intruding heat source within its 25' x 25' field of view. When a heat source such as a human body is detected, the SKC-1 reportedly reacts instantly and turns on one or more lights. Once a light is activated, it will remain on for a preset period of time (typically four minutes), following the last detected movement. This means that the light will remain on for as long as there is movement within range of the detector. Infrared controlled lights improve security by being a deterrent to would-be intruders. Lighting stairs, porches, driveways and sidewalks automatically can help to prevent many of the kinds of accidents that occur in the dark. In addition to its convenience, the SLC-1 saves energy because it turns on lights only when they are needed. In the day-time, a photo-transistor circuit keeps the SLC-1 inactive. It is reportedly packaged in all-weather housing for indoor or outdoor installation and built in accordance with U.L. standards. **ETD**



# TEST INSTRUMENT REPORT

The Meguro MK-667C is intended to measure wow/flutter and drift of tape equipment and turntables. It can make measurements to NAB, JIS, CCIR and DIN standards, over a wow/flutter range of from 0.003 to 10%. Drift can be measured over a range of  $\pm 10\%$  it has available oscillator output at 3kHz for NAB, JIS and CCIR standard mea-

3-3.15kHz band pass filter and a two stage limiter using LM741's, which clamps the signal to approximately 1.7V rms. At this point a level monitor lights a LED if the amplitude is sufficient for proper operation. Also, the signal from the limiter is routed to a Schmitt trigger discriminator, the time constant of which is switchable to precisely match either the 3 or 3.15kHz signal. The signal from the discriminator, which will be a low frequency at the wow/flutter/drift rate, is amplified by another LM741 and then passes through the wow/flutter range attenuator. This range attenuator is followed by several more LM741 stages of amplification, the characteristics of which are switchable to properly measure wow/flutter to the various NAB, JIS, CCIR, or DIN standards. The percent wow/flutter then is read on an analog meter.

Back just before the wow/flutter range attenuator, the signal is sampled for the drift metering circuit. A drift range switch precedes another LM741 amplifier with proper frequency response to drive the drift meter (a zero center meter to indicate speed variations above and below nominal).

Both the wow/flutter and drift channels have output jacks which allow long term measurements on a strip chart recorder and the wow/flutter channel has a scope monitor output.

There was absolutely no problem using the MK-667C on a tape recorder. Just record the oscillator, play it back and read the meters. For testing turntables a precision 3kHz record would be necessary.

The MK-667C comes with three input/output cable assemblies and an instruction manual and can operate on 100, 117, 200 or 240 Vac, 50/60Hz. The price is \$1145.00. **ET/D**



For more information circle number 150, Reader Service Card this issue

## Meguro's MK-667C

Drift, flutter and wow!

By Walter H. Schwartz

surements and 3.15kHz for DIN measurements.

For those who do not remember, wow is usually defined as speed variations in the range of 0.1 to 10 Hz. Flutter is higher frequencies. (The MK-667C measures wow from 0.5 to 6 Hz and flutter from 6 to 200 Hz.) Drift is long term, slow, speed variation. The method of measurement is to record a precise frequency of 3 or 3.15kHz, with the recorder being tested. Any deviation from the recorded frequency, upon playback, must be due to tape speed variation and will be detected and indicated as percent wow/flutter.

Here's what's in a wow/flutter meter to make such measurements. The MK-667C contains precise oscillators, crystal controlled to an accuracy of 30 parts per million, at 3 and 3.15kHz. Either can be selected to drive a band pass amplifier to provide a 0.2V rms ( $\pm 20\%$  open circuit) output with a 600 ohm impedance. This signal then can easily drive any normal tape amplifier.

To measure the frequency variation imparted to this signal in the recording/playback process the signal is taken from any point of sufficient amplitude via the high impedance input stage of the MK-667C. This stage is followed by a

### Specifications at a Glance.

WOW/FLUTTER RANGE:  
0.003% to 10% at inputs above 30 mV;  
0.1% to 10% above 5 mV.

MEASUREMENT STANDARDS:  
JIS, NAB, CCIR and DIN.

ACCURACY:  
 $\pm 5\%$  of full scale at 4 Hz.

DRIFT RANGE:  
0 to  $\pm 10\%$  in 3 ranges.

ACCURACY:  
 $\pm 5\%$  of full scale.

# BULLETIN BOARD

A new 138 page catalog listing over 3,000 different products from over 100 of the leading **security** manufacturers in the United States is now available. It is stated to be the most comprehensive catalog in the industry. Product categories range from simple residential systems to the most sophisticated commercial and industrial equipment. It also has a newly expanded fire equipment section. For a copy write to the Alarm Supply Company, Inc., 12551-P Globe Rd., Livonia, MI 48150.

*Joseph Electronics Inc.*, recently announced publication of a new **comprehensive Industrial Catalog**. The 344 page Catalog No. 030 features more than 75 product lines providing complete descriptions, technical specifications, and pricing. Special emphasis is placed on test equipment. The first 120 pages of the catalog feature reportedly the finest lines of test instrumentation available through distribution. Also included in this new Catalog is an 32 page Technical Data Handbook. Stated Chuck Annella, Sales Manager of the firm, "It was our intention to make the new Joseph Catalog more valuable and useful than its industry counterparts. We solicited a cross section of engineers in our marketplace and with their assistance compiled 32 pages jam packed with the most frequently needed electronic tables, symbols, and formulas. We hope this new concept results in our finding the Joseph Book on the top of every customer's catalog pile." To obtain a copy of the new Joseph Electronics Industrial Catalog No. 030 contact Chuck Annella, Sales Mgr., 8830 N. Milwaukee Niles, IL 60648.

**Sylvania high voltage components**, are described in a new six page two-color brochure. The components, used as replacements in color television sets are part of the *Sylvania* ECG semiconductor line. The brochure is designed to provide comprehensive product data to electronic parts distributors, service dealers and technicians. It contains sections on high voltage multipliers including a variety of tripler and quadrupler devices, high voltage rectifiers and resistive divider/focus assemblies. Circuit diagrams and package outlines

are also given. Thirty-one Sylvania solid-state devices are cross referenced in the brochure to 615 industry part numbers listed in alphanumeric order. The brochure and information on all ECG semiconductors are available from authorized Sylvania distributors.

A catalog of **closed circuit television** equipment and accessories has recently been issued by *Visual Methods Inc.* This catalog features closed circuit cameras and monitors, lenses, time date equipment, housings, microwave intrusion detectors, and identification card readers. Write: Visual Methods Inc., 35 Charles Street, Westwood, NJ 07675.

**A new 96 page catalog** from *Cornell-Dubilier Electric*, contains complete specifications and selection data on the CDE line of dc capacitors, relays, EMI filters and ac capacitors. Product lines covered in the "CDE Component Selector" include: aluminum electrolytic, film dielectric and mica capacitors; general purpose, miniature, sub-miniature and time-delay relays; all-purpose APF/EMI noise filters; and by-pass, non-PCB and "Soggy Foil" ac capacitors. Also included are product specifications, engineering data and cross-reference and selection tables. For a free copy, write: Leonard Sabal, Marketing Communications, Cornell-Dubilier Electric, 150 Avenue L, Newark, New Jersey 07101.

Digital and analog meters of broad capabilities are featured in a new catalog from *Keithley*. Included in this catalog are a number of models of digital multimeters, a wide selection of electrometers and picoammeters (some capable of to  $10^{-17}$  Ampere sensitivity), nanovoltmeters, milliohm-meters, constant current sources and power supplies. Keithley offers DMM's over a wide range and other instruments for laboratory and industrial use. Keithley Instruments, Inc. 28775 Aurora Road, Cleveland, OH 44139.

**A new Variac®**, variable auto transformer catalog has been recently published by *Technipower*. This 28 page catalog offers applications, features specifications and other data for more than 700 Variac units and more than 1000 possible product variations. Technipower recently acquired exclusive manufacturing and sales rights to all Variac products from General Radio. Write: Technipower, Inc., A Penril Company, PO Box 22, Commerce Park, Danbury, CT 06810.

*Global Specialties Corporation*, formerly known as Continental Specialties Corporation, has published its first catalog since the name change—"Instruments for Testing and Design." The new catalog features the company's line of solderless breadboards, logic probes, electronic test instruments, cases and hardware. Copies of the catalog are now available. Contact Global Specialties Corporation toll-free at 1-800-243-6077 or write them at 70 Fulton Terrace, PO Box 1942, New Haven, CT 06509.

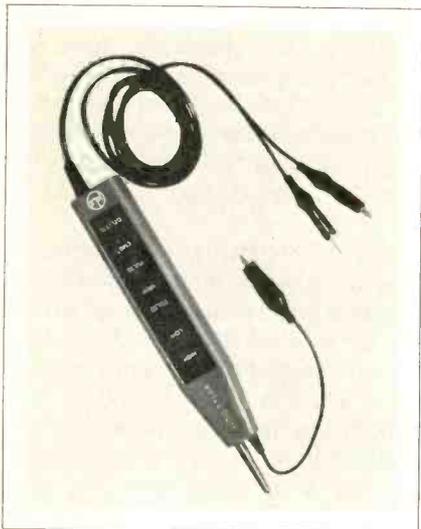
**SHURITE® Meters** has just published a **new condensed catalog** describing all standard-range meters, special options and testers stocked by their distributors. Five different Shurite series include 2½" and 3½" types, and a 1½" edgewise series, available in ac and dc milliammeters, ammeters and voltmeters, and dc microammeters.

The new catalog also lists such standard options as  $\pm 3\%$  accuracy, custom dials and pointers, special ranges, zero suppression, etc., and several additional special options. All series are illustrated, have dimensioned mounting drawings, and customary range and resistance values. The Shurite Meters Catalog is available on request from Shurite Meters, Sigma Instruments, Inc., 170 Pearl St., Braintree, MA 02184.

**A portfolio of soldering, desoldering and resoldering equipment** and supplies has recently been issued by *EDSYN, Inc.* It includes vacuum desoldering systems, manual Soldapull® tools, soldering irons, tips and accessories, low static potential tools and work stations, and system kits. See your local distributor or write: EDSYN, Inc., 15958 Arminta St., Van Nuys, CA 91406.

In its newly published, **2-color 44 page complete line catalog**, several new items have been added to the *Vidaire-Vecor* line. A deluxe 2-channel, noise-free wireless FM intercom system (PLL and IC circuits), UHF/VHF/FM CATV/MATV amplifiers for low TV signal areas, UHF/VHF hybrid splitters, 2-way and 3-way crossover networks, several electret microphones including a mini tie-clasp electret condenser microphone, have been added. The new products add to Vidaire's expanding varied line of electronics products, components and accessories. For more information or a copy of the free catalog write Vidaire Electronics Mfg. Corp., 150 Buffalo Ave., Freeport, NY 11520, or the Vidaire-Vecor rep in your area. **ETD**

# NEW PRODUCTS



## Digital Logic Probe

Circle No. 134 on Reader Inquiry Card

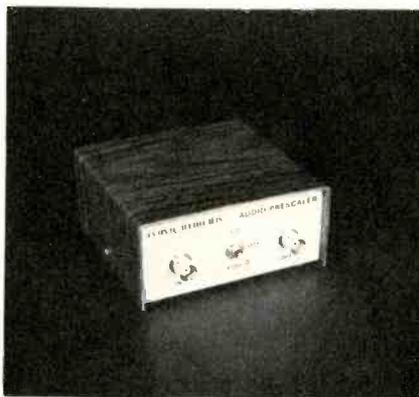
The NLS Model MLB-1 Digital Logic Probe is a small electronic probe with the ability to measure logic states and levels both statically and dynamically and to detect spurious random pulses. Because it is small, its indicators are conveniently grouped so the user can fully focus attention on the circuits under consideration. This, the manufacturer feels, makes the MLB-1 one of the fastest and most utilitarian test instruments for testing and troubleshooting high density digital circuitry. To use the MLB-1, the type of logic is switch selected, TTL, DTL or CMOS. Selectable modes include "pulse" for dynamic testing or "memory" for stored indication—particularly useful in detecting non-repetitive fast pulses which are almost impossible to capture with other ordinary test instruments. High and low LED state indicators are employed for both static and dynamic testing. A pulse indicator flashes during dynamic testing. For static testing the indicators measure high and low states, as well as open circuits. The high and low indicators provide analytical indications in the dynamic testing of pulse trains and rectangular waveforms up to 10 megahertz. Minimum pulse width is 50 nanoseconds. The pattern presented by the flashing lamps gives go-no-go indication to the frequency, duty cycle and level of the waveform being observed. Because patterns can be quickly recognized, the MLB-1 moves quickly from node to node of a circuit providing the fastest signal tracing technique. The

MLB-1 is usually powered from the supply of the circuit under test. An external supply may be used. Threshold voltages for each kind of logic are the go-no-go comparison limits for high and low states. Their values are determined by the supply voltage. The Model MLB-1, in a single unit quantity is priced at \$41.95.

## Audio Prescaler

Circle No. 135 on Reader Inquiry Card

The PS-2 audio prescaler by Ramsey Electronics will multiply any input signal between 10Hz and 1kHz by 100 and any signal between 100Hz and 10kHz by 10, switch selectable, resulting in a measurement resolution of 0.01Hz and 0.1 Hz respectively. This sort of accuracy is useful in measuring the frequencies



involved in tone signaling, tone activated squelch, etc. The PS-2 consists of a voltage controlled oscillator operating at 10 or 100 times the input frequency phase-locked thru divide by 10 or divide by 100 dividers. The unit evaluated by ET/D lived fully up to specifications but noticeably had rather little range beyond them. Its sensitivity is 25 mV and its output is 6V p-p, adequate for, and compatible with, almost any counter. The price of the PS-2 is \$39.95 assembled; \$29.95 as a kit.

## Frequency Standard

Circle No. 136 on Reader Inquiry Card

Global Specialties Corporation (previously known as Continental Specialties Corporation) has announced its new Model 4401 Frequency Standard, a \$225.00 time and frequency reference to be used as an oscilloscope timebase calibrator and in many other applications. The Model 4401 Frequency Standard reportedly incorporates a unique crystal oven oscillator developed by Global Specialties for its recently announced 650MHz Frequency Counter (Model 6001). This oven oscillator is specified as being accurate to within 0.5 parts per million over a 0-50°C temper-



ature range, although the company reports that all units built and tested so far perform within 0.3 ppm. Aging is 1 ppm/year. Twenty-five output frequencies are available. In addition to a full-time output at 10MHz, one of 24 secondary outputs may be selected between 0.1 Hertz and 5 Megahertz through the combined action of a pushbutton 8-decade output scanner and a  $\times 1/\times 2/\times 5$  multiplier selector switch. Both the 10MHz output and the selected output are buffered 50 Ohm TTL-compatible-square waves, are short-circuit-proof, and are available at front panel BNC connectors. The model 4401 is factory calibrated to the National Bureau of Standards via WWVB, and the calibration control inside the case is user accessible. Its major use is expected to be maintaining and calibrating oscilloscopes; however other uses might include timekeeping for microprocessor systems (0.5 ppm is one minute in 3.8 years); chronometry; time-lapse photography; and innumerable applications as frequency counter calibrators, external timebase sources, precision clocking and other time and frequency domain reference use.

## "Make Your Own Case"

Circle No. 137 on Reader Inquiry Card

Platt has designed a line of molded and soft/molded carrying cases to help solve the problem; how to transport safely and display attractively a wide variety of products: mini computers, test equipment, calculators, cameras, microphones, CB's, cassette players, aerosols and other items. These cases all come with three (3) pieces of die-cut, shock absorbent polyfoam that repor-

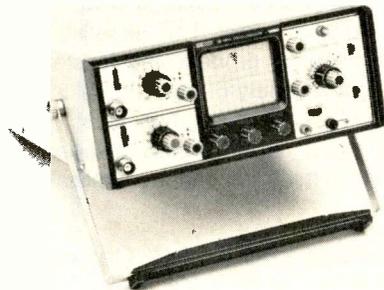


tedly can easily be cut to firmly house and protect any number of products. Five (5) molded sizes and two (2) soft molded sizes.

### 15MHz Mini-Scope

Circle No. 138 on Reader Inquiry Card

*B&K-Precision* Model 1420 portable mini-scope is now available from Dynascan Corp. This compact portable, dual-trace scope reportedly has features that match many lab scopes, yet it measures only 11 × 22 × 30 cm (4.5 × 8.5 × 12 in.). Bandwidth of the triggered sweep scope is rated at 15MHz, with a vertical sensitivity rating of 10 mV per division. The 1420 can be powered by a 117 Vac, 234 Vac, 10-16 Vdc or optional internal battery. Both high- and low-voltage power supplies are fully regulated, to maintain time base and amplitude accuracy over a wide range of input voltages. Eighteen calibrated sweep ranges cover 1 microsecond to



0.5 second per division with ±5% linearity. A 10 × magnifier extends the sweep range to 100 nanoseconds per division. The 1420 automatically selected chopped or alternate mode of display for most efficient operation, and provides automatic selection of video line and frame sync. Other features include automatic stability control and front panel X-Y operation. Since the matched vertical amplifiers are used for both vertical (CH A) and horizontal (CH B) inputs in the X-Y mode, the calibration accuracy of both channels is preserved. This permits the horizontal input signal to be measured in volts/division of horizontal deflection up to specified horizontal amplifier response. By using the matched CH A and CH B inputs, phase and amplitude errors due to unequal impedance loading are eliminated. The rectangular screen CRT has a P31 phosphor for bright waveform display. The display graticule is calibrated in a full 8 × 10 division format. Each division measures 0.5 cm. The 1420 optional battery will fully recharge on one overnight charging. In addition, when operated on external power, the 1420 supplies a continuous trickle charge to the battery pack. An automatic

limiting circuit prevents battery overcharge. Priced at \$825, the 1420 comes complete with two lightweight slim-body 10:1/reference/direct probes (includes accessory tips for each probe), ac power pack and instrument manual. Options include a rechargeable battery, 234 Vac power pack, carrying case, dc power cable and demodulator probes.

### Automatic Distortion Analyzer

Circle No. 139 on Reader Inquiry Card

The new *Tektronix* AA 501 Automatic Distortion Analyzer/SG 505 Oscillator System is stated to lower the cost of measuring signal distortion by reducing measurement time. Total Harmonic Distortion (THD) measurements can be made quickly and without operator assistance because the AA 501's internal circuitry automatically performs level setting, tuning, and nulling functions. Illustrated is the AA 501/SG 505 system packaged in a TM 503 portable mainframe. The 3½ digit LED display reads out distortion in % or dB (autoranging). An option allows measurement of intermodulation distortion on signals conforming to SMTPE, DIN, or CCIF standards. Packaged as plug-ins for the TM 500 family of modular test and measurement instruments, the AA 501/SG 505 can be combined with the user's choice of over 40 plug-in instruments in a single package. Modularity also permits remote testing, especially important in audio field applications.



### Audio Test Set

Circle No. 140 on Reader Inquiry Card

A new multi-purpose instrument, reportedly capable of performing the full range of performance tests on tape recorders, audio amplifiers, preamplifiers, and turntables is available from *Neal Ferrograph*. Recorder test set RTS2 contains a low-distortion audio oscillator, stepped attenuator offering 100dB output range, precision voltmeter, distortion meter, and wow and flutter meter. An advantage claimed for this single test instrument is speed and convenience of testing, as only a single input and output lead need be connected to the equip-



ment under test. Setup for tests is rapid using front panel pushbutton switches. All results are read-out directly in percent or dB without any translation or calculation. Although primarily intended for routine production test and service bench operations, the RTS2 can be used for analysis by attaching an oscilloscope, distortion analyzer, or other equipment to the output provided for this purpose. Among the tests that can be performed by the RTS2 without any other instruments or accessories are: frequency response, signal-to-noise ratio, THD, wow and flutter, drift, input sensitivity, and gain. The RTS2 weighs 14 lbs, contains its own checking circuitry and can be calibrated in the field without reference to auxiliary equipment. The RTS2 is supplied with test leads and a test tape containing both NAB and CCIR test sequences. **ET/D**

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# DEALER'S SHOWCASE



## Audio Credenza

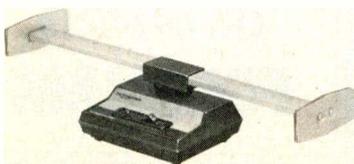
Circle No. 152 on Reader Inquiry Card

*Gusdorf* has recently introduced a credenza with 1-1/2 in. thick sides, divided into two sections. Each section has three shelves behind two bronze tone doors of tempered safety glass. The upper surface, surrounded by a gallery, supports a television set, turntable or VCR. Audio units fit inside. Record dividers come with the credenza and an optional rack mounting kit can be added. The left side is slightly wider than the right to accommodate a TV. Double wheel casters are hooded. Typical of *Gusdorf's* new Status Pro Collection, no fasteners are visible. The Walnut tone finish has the additional protection of a Rendura coating. Approximate retail \$280.

## Indoor Antenna

Circle No. 153 on Reader Inquiry Card

*Winegard Company* has introduced a new indoor FM/Stereo antenna called the Stereo-Cepter Model FM-4400. The FM-4400 has a built-in solid-state amplifier that helps to boost and clean-up weak FM signals, reportedly adding more useful stations in most locations. The unit can sit on a shelf or on top of a stereo receiver, measuring 19 in. wide by 3-1/2 in. deep. The FM-4400 helps eliminate multi-path distortion and improves signal-to-noise. It operates on 110-117VAC. A signal arm on the antenna is bi-directional and turns 90 de-



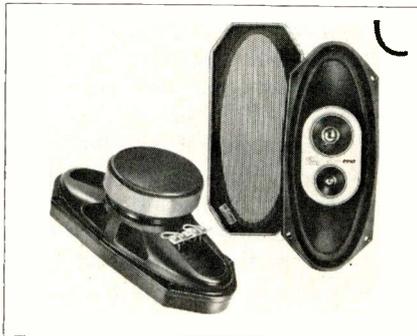
grees to receive FM and FM/Stereo stations in all directions for proper phasing of signals. *Winegard's* FM-4400 has a brown housing with gold tone elements. Coaxial cable and matching transformer are included. List price is \$71.95. Also available is a non-amplified model FM 2400 for \$39.95.

## Automotive Speakers

Circle No. 154 on Reader Inquiry Card

*The Audiovox Corporation* has introduced six new high-end speakers to its Hi-Comp line. The Audiovox Hi-Comp HCS-15 5 inch coaxial speaker system has a 1 inch samarium cobalt horn tweeter, new 1 1/4 inch shallow depth design and built-in crossover network. Other features include 20 watts maximum power input, 12 watts nominal, 8 ohm impedance, frequency response of 120-15,000Hz and a large 1 inch heat-proof voice coil. The list price is \$52.

The Audiovox Hi-Comp HCS-342 4 inch x 10 inch 3-way speaker system



has independent woofer, tweeter and mid-range and a powerful 20 oz. barrium-ferrite magnet. Power rating is 60 watts RMS maximum, 25 watts RMS nominal. Other features include frequency response of 75-17,000Hz, a 1 1/2 inch high-temp aluminum voice coil, and 8 ohm impedance. The list price is \$116.

The Audiovox Hi-Comp HCS-59 5 1/4 inch 3-way speaker system has independent woofer, tweeter and mid-range and a powerful 20 oz. barrium-ferrite magnet. Power rating is 60 watts RMS maximum, 25 watts RMS nominal. Other features include frequency response of 65-17,000Hz, 8 ohm impedance and a 1 3/4 inch high-temp aluminum voice coil. The list price is \$100.

## Coaxial Equipment Product Line

Circle No. 155 on Reader Inquiry Card

*Gemini Industries* recently introduced a line of 75-ohm coaxial TV reception products. The new line consists of splitters, connectors, transformers and cable. All of the products can be used for



UHF/VHF applications. The new coaxial product line completes *Gemini Industries* package of components required for installations with multiple TVs. A typical four outlet, 75-ohm coaxial installation, for example, would consist of an input/output wall plate, low loss cable, indoor/outdoor matching transformers and signal splitter. The versatility of the new coaxial product line is stated to permit a variety of multiple TV installations to fit almost any conceivable application. *Gemini* provides a "Header" card diagramming the various applications.

## Record and Stylus Care Kit

Circle No. 156 on Reader Inquiry Card

A three-piece "Record and Stylus Care Kit," the latest addition to the expanding *Cecil Watts* record care line, is now being offered by *Empire Scientific Corporation*. Designed to introduce the record collector to this basic non-liquid system for record care, the kit includes *Parostatak®* Disc Preener®, *Parostatik®* Anti-Static Fluid and *Watts Stylus Cleaner*. According to *Empire Scientific*: "experts recommend a humid system for record cleaning because the free use

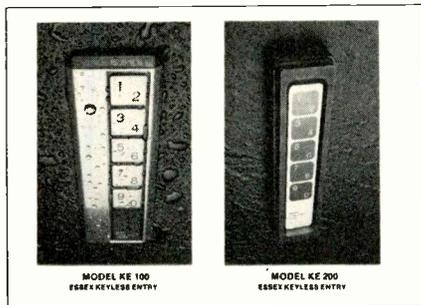


of liquid cleaners can interfere with tracking. Today's sophisticated cartridges, with their ultra light weight tracking, cannot easily push aside or ride through wet or hardened liquids to make intimate contact with the record grooves. The stylus is literally forced to ride over the residue, with the subsequent loss of stylus contact resulting in distortion. The Watts record cleaning devices are used in a semi-dry or slightly moist state and do not leave a film or residue on the record." The new three-piece Cecil Watts "Record and Stylus Care Kit" is priced at \$13.95.

### Keyless Door Lock

Circle No. 157 on Reader Inquiry Card

Keyless locks similar to those used in some automobiles are now available for residential use. *Essex Transducers* offers two models of combination locks, both without moving pushbuttons. The keyboard can be programmed with any five digit combination—a master combi-



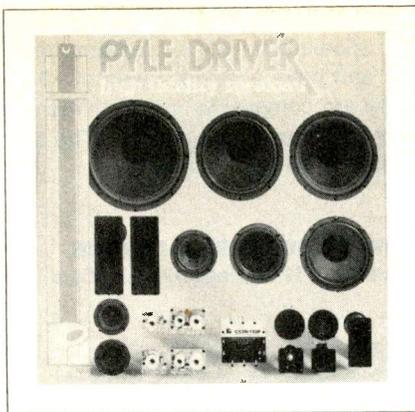
nation can erase the secondary combination and replace it with another. Model KE100 is a do-it-yourself system designed for single family homes. The KE200 is intended for the security industry.

### Plexiglass Speaker Display

Circle No. 158 on Reader Inquiry Card

*Pyle Industries* has introduced three new Plexiglass Displays, one each for High Fidelity speakers, musical Instrument/Disco speakers and High Fidelity Automotive speakers. These plexiglass boards are 4 ft x 4 ft x 1/4 in., 2 color, with rounded corners (hanging hardware included). The displays are pre-drilled for easy mounting of speakers (mounting hardware included). Identification labels are included for the speakers on the board. The display is free with the purchase of a program that is set up to help sell the speakers on the display.

The High Fidelity board features assorted woofers, mid-range, tweeters and crossovers. The Musical



Instrument/Disco board features deluxe 8 in., 10 in., 12 in., and 15 in. speakers with 2 x 6 in., 3 x 9 in. and 3 x 7 in. treble horns and crossovers included. The High Fidelity Automotive board has on display the new Pyle line of auto speakers, featuring bracket-mounted dome radiator or piezoelectric tweeters. Automotive separates are on this board, including woofers, midrange and tweeters for those requiring individual components for car use.

### CATV Wireless Remote Control

Circle No. 159 on Reader Inquiry Card

*Teknika Electronics Corporation* has introduced a new CATV compatible wireless remote control for TV. The Remote Control, model 6301, it is stated, converts any TV set to wireless remote control with just four connections; TV antenna connections and power cords for the Remote Control and the TV set. A small hand-held control allows the TV set to be switched on and off and provides channel selection or up and down scanning of 12 pretuned channels. Any 12 channels from VHF (Ch 2-13), UHF (Ch 14-83) or CATV midband (Ch A-I) can be pretuned. Illuminated Channel indicators show the channel selected. These channel indicators may be



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Model 1476 \$715

B&K-PRECISION oscilloscopes are familiar sights in engineering labs and service organizations, but models are also offered that are within the budgets of hobbyists and experimenters.

The low-cost 3" model 1405 is one of the most affordable scopes available. This recurrent-sweep scope offers a wide range of popular features including high 10mV/div. vertical sensitivity, high-brightness CRT and smoked-glass graticule, internal/external sync and z-axis input.

The 1466 and 1476 are both 10MHz triggered-sweep scopes, featuring 10mV/cm sensitivity, 18 sweep ranges, TTL compatible z-axis and built-in video sync separator. The 1466 is a single-trace scope. The dual-trace 1476 also offers x-y operation and automatic mode selection between chop and alternate.

For immediate delivery on the scope of your choice or for information on the complete line of B&K-PRECISION scopes, contact your local distributor.

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Circle No. 112 on Reader Inquiry Card

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changed to show the correct channel numbers for any viewing area. An ultra-infrared beam is used to transmit control signals from the hand held control to the main unit located near the TV set. This system provides immunity from RF or sound interference while reportedly allowing complete freedom of movement around the room. Suggested Retail Price is \$149.95 with full dealer margins.

### 3½" Auto Speakers

Circle No. 160 on Reader Inquiry Card

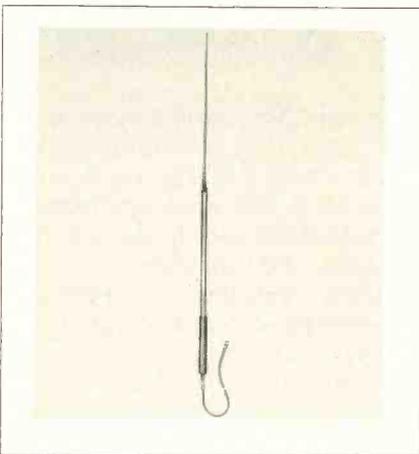
New 3½ in. stereo auto speakers reportedly designed to offer the sound quality of a larger speaker in a smaller size for the new smaller/compact sized cars has been introduced by *BP Electronics*. For in-dash or rear deck installation, the BP 3500 is sold in an attrac-



tive package that includes two speakers. The speakers have a 3 oz ceramic magnet and have a power rating of 10 W. They are compatible with 4 ohm and 8 ohm receivers and tape units. The suggested retail price is \$19.95.

### Low Band Base Antenna

Circle No. 161 on Reader Inquiry Card



The new ASP-710 low band base station antenna recently introduced by the *Antenna Specialists Co.* is reportedly designed to withstand nearly anything that weather and environment can dish out. Featuring a coaxially center-fed radiat-

ing element encapsulated in a rugged fiberglass radome, ASP-710 is stated to be impervious to salt spray and pollution and has a rated wind velocity of 150 mph with a 1.65 safety factor (RS-329). Model ASP-710 handles 500 Watts maximum RF power and has a VSWR of less than 1.5:1 over the specified bandwidth. The vertical beamwidth of the omni-directional antenna is 75°. Termination is type N female and a 2-foot jumper with two Type N male connectors is furnished. Model ASP-710 is designed to operate in the 30-50MHz range; users should specify operating frequency to the nearest 1/10MHz.

### Magnetic Eraser

Circle No. 162 on Reader Inquiry Card

A computer tape eraser is now available from *Robins Industries Corp.* It is reportedly designed to erase virtually all signals from computer cassettes and from floppy disks that do not carry encoded signals. While designed primarily to erase video tapes, it is stated to also erase computer cassettes. The user simply sweeps the unit over the disk or



cassette from which signals are to be removed. The unit's magnetic field wipes clean virtually all recorded signals. Size of the unit is 5 by 3½ inches; weight is 4 pounds. It operates from a power source of 110-120 volts AC and is designed for intermittent duty. Its list price is \$58.50. **ET/D**

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## CONSUMER ELECT.

Continued from page 24

a Design and Engineering Exhibition, a room set aside for special mention of those products which have evolved during the six months since the last CES show. Out of the 109 products selected for inclusion in this year's exhibition, here are just a few that caught my eye:

— an equalizer/analyzer from DBX, Inc., which features digitally controlled graphic equalizers with a built-in, real time spectrum analyzer and sound level meter.

— A massive 72.6 pound turntable from Kenwood Electronics which claims to suppress all resonance in the audio range.

— An AM/FM electronic, digital clock radio from Panasonic that talks and calls out the time at one to sixty minute intervals.

— A new audio amplifier from Sansui said to use the "feedforward" circuitry proposed by H.S. Black, the inventor of negative feedback. Has implications for reducing TIM.

— Zenith's "Space Phone" Systems 3 TV receiver which can be hooked to your telephone system.

— And Panasonic's incredibly expensive AC/DC communications receiver. This 7-day programmable microprocessor, pushbutton unit sells for a mind boggling \$3,800 (suggested retail).

And that sort of wraps it up at Summer CES 1980. **ET/D**

## MICROPROCESSORS

Continued from page 27

different type of terminal, the system becomes something of a general tool for industrial computer I/O.

### The hardware

Take a look at Figure 2, the hardware block diagrams of the terminal and the multiplexer. The architectures of these two systems are virtually identical, and both are shown only to help you visualize the data paths through the network ... from host computer to multiplexer to terminal to device, and back again in the other direction.

The microprocessor systems used here are not set up in a classical 'bus structured' fashion. That type of architecture is typically used in situations where HARDWARE flexibility is needed, and it generally costs a little more.

There is, of course, a system bus as we described it in an earlier article, but it

stops at the edges of the CPU board. What we have done in this case is generate a somewhat fake bus, built from the I/O ports of the system. Port 1, an output port, is defined as the "Output bus," and carries all data out of the CPU, regardless of its destination. Port 2 is configured as the 'Input Bus,' and does just the opposite, with data bound for the processor gated onto it via tri-state logic. Port 3 is the 'Control Port,' and is decoded to produce commands which tell each device how to interact with ports 1 and 2.

It's all very simple: if the CPU wants to write the letter 'X' onto Self-Scan Display #1, it merely places the binary code for 'X' on the output bus and issues a brief code on the control port which, when decoded, results in a strobe command to the display telling it to accept the data currently on its inputs. Likewise, reading data from a device involves delivering a command which causes it to be gated onto the input bus and then simply reading port 2.

In the case of the multiplexer, the devices are all UAR/T's (Universal Asynchronous Receiver/Transmitters) wondrously handy chips which take care of all the details involved in serial data communication. Each one accepts three commands: transmit the data that is on the output bus, place status information (such as 'character received' or 'transmit complete') on the input bus, and place received data on the input bus.

There is no real need for a full schematic of the system to be presented here, as the block structure is very nearly the complete hardware design. Because of the microprocessor's flexibility, all the problems of implementation such as timing and control logic can be defined in software, and changed as necessary to achieve the desired result. I do not mean to imply that software is free (development costs rival those of hardware), but the costs of production and field changes are dramatically reduced by keeping the hardware to an absolute minimum. **ET/D**

## RES. SECURITY MKT.

Continued from page 35

contacting the manufacturers of the security devices, alerting them of your interest and attending their educational seminars when available; and, self educating yourself through books and manufacturers' literature. One such publisher is Butterworth, 10 Tower Office Park, Woburn, MA.

Some of the titles which this publisher carries are: *Industrial Security; Kinks & Hints for the Alarm Installer; Effective Security Management; Successful Retail Security; The Terrorists; Alarm Systems and Theft Prevention*, plus many, many more.

Then, too, there are industry shows, such as the International Security Conference, held twice yearly—the most recent being the three day event held last June at Chicago's O'Hare Expo Center. For information on upcoming shows contact the International Security Conference and Expo, 8687 Melrose Ave., #M-38, Los Angeles, CA 90069.

Once familiar with basic security fundamentals and the design and installation of security systems, it then resolves itself into a problem of "getting the business" ... or, put another way, selling your service to the public.

One such selling tactic used by Doug McKalip when involved with a client is that government statistics show that only one out of 51,000 burglars will stay at a location if a loud noise or light comes on.

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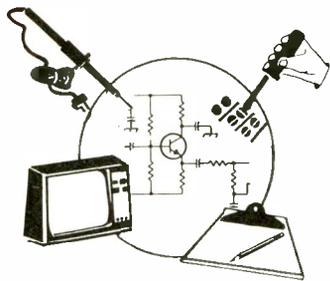
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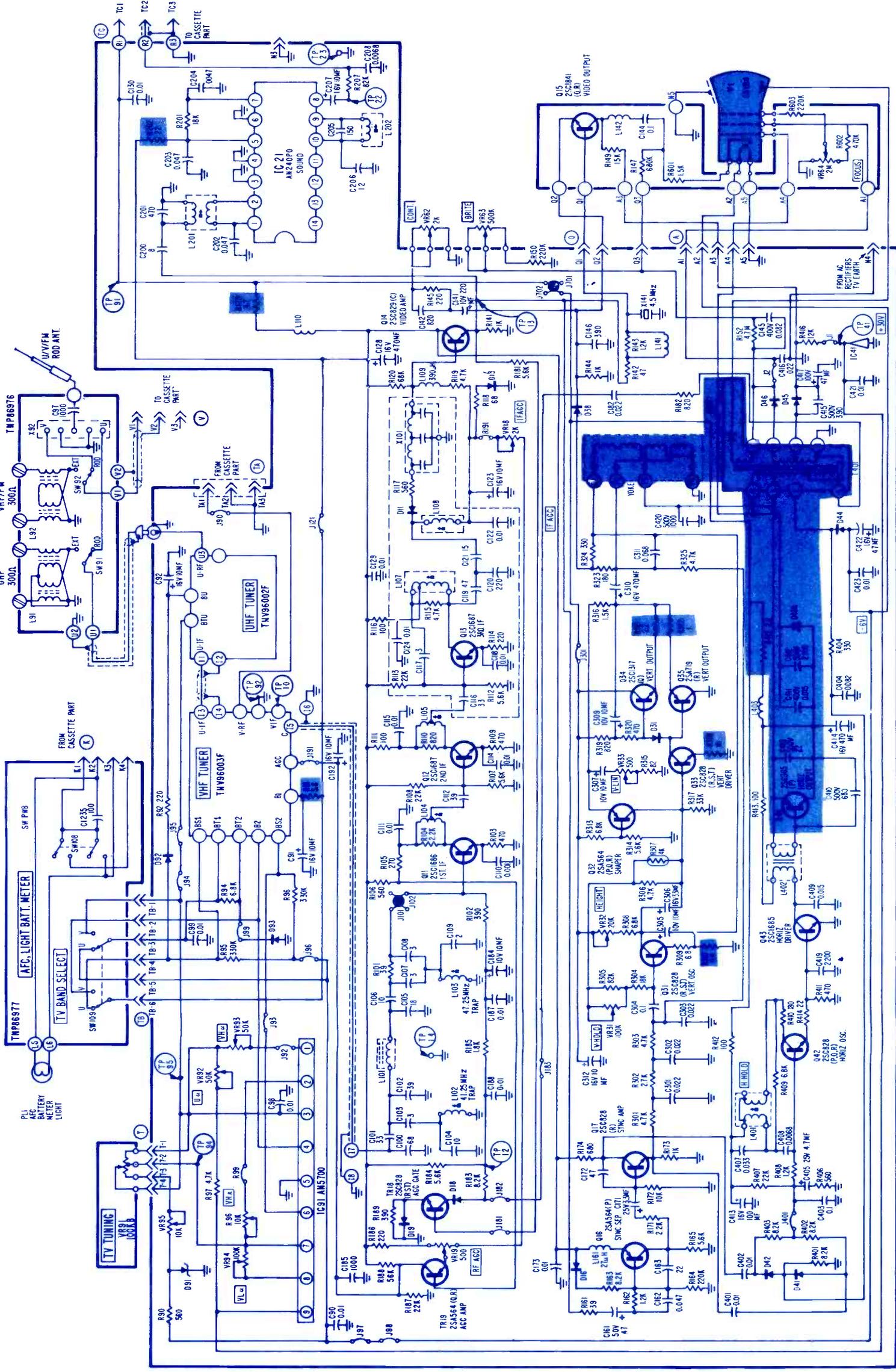
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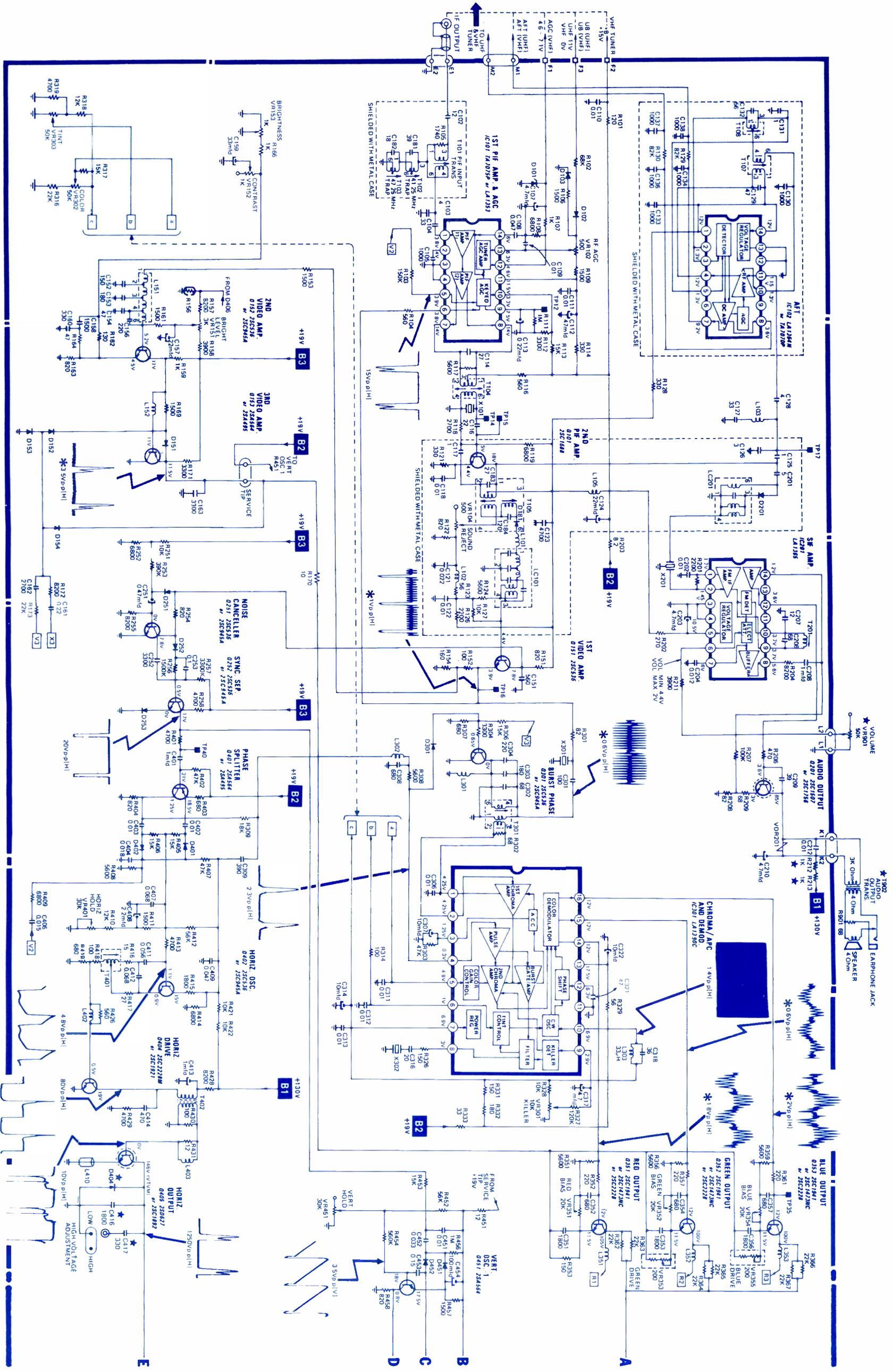
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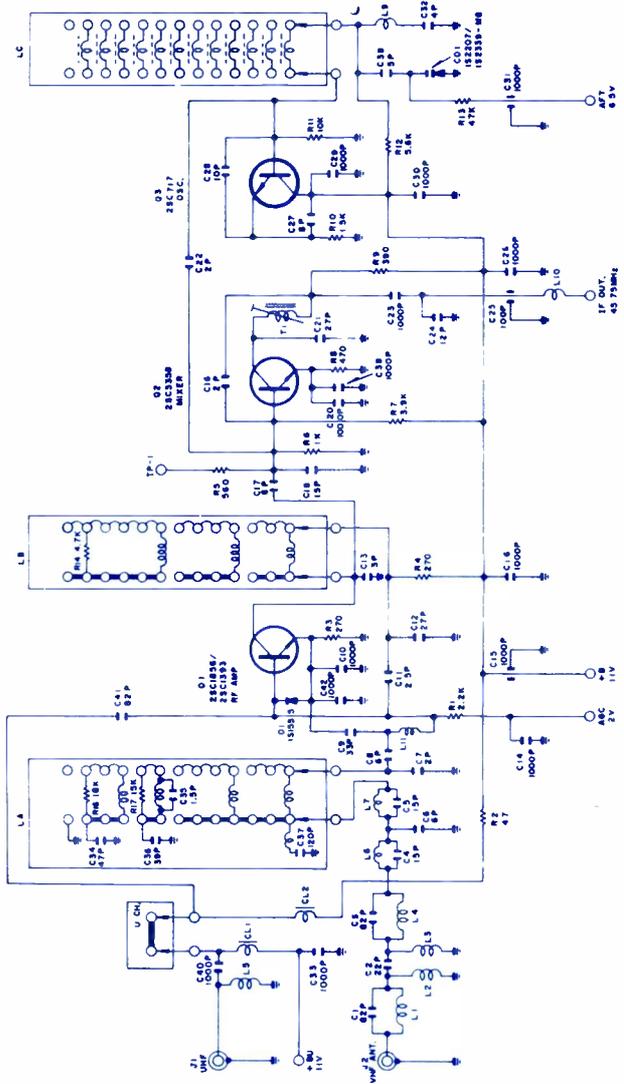




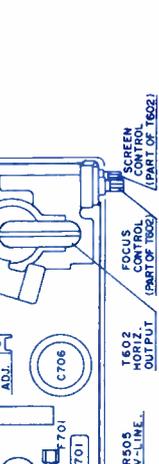
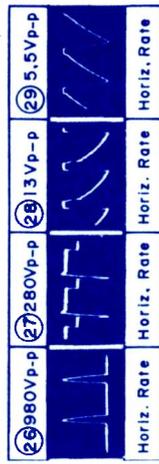
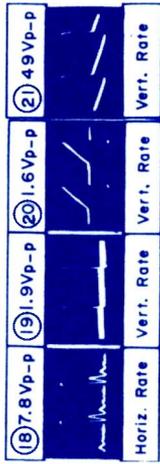
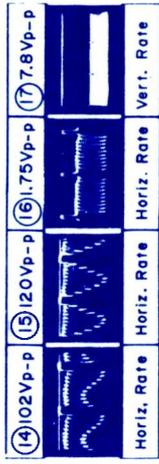
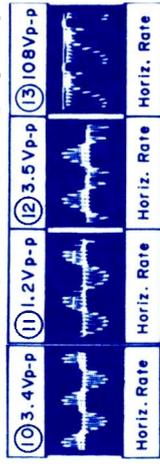
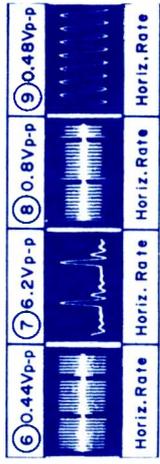
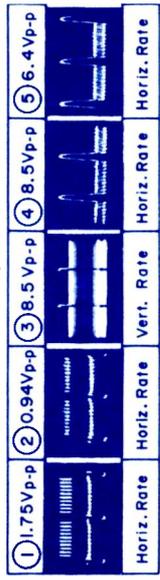
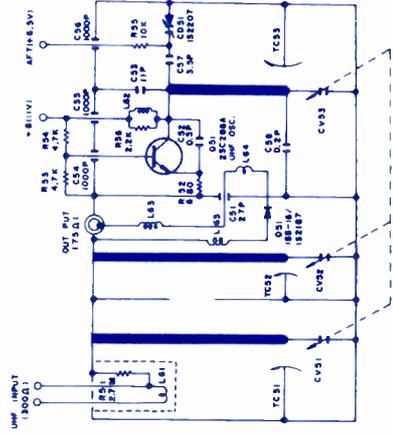


**SHARP**  
Color TV Model  
13D34A

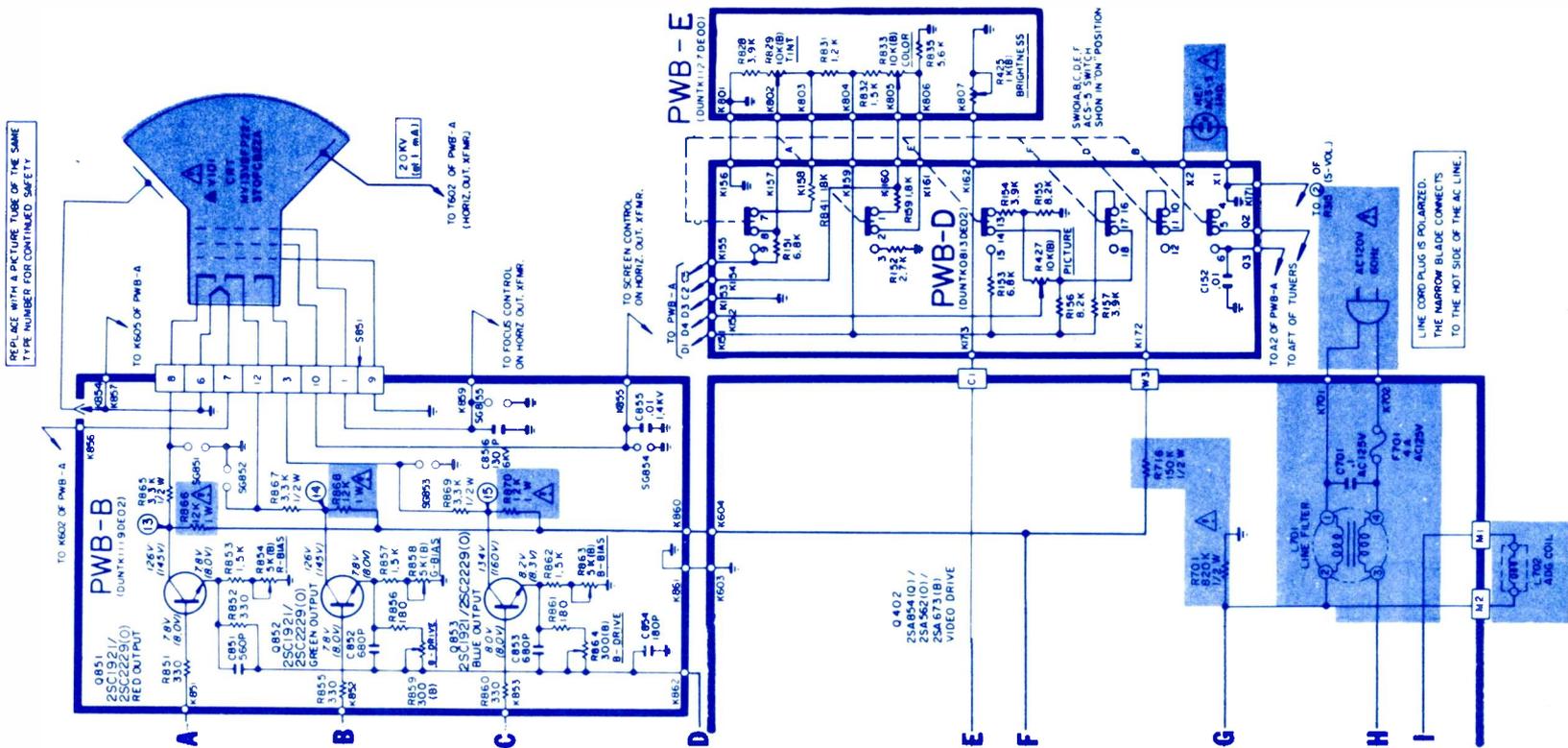
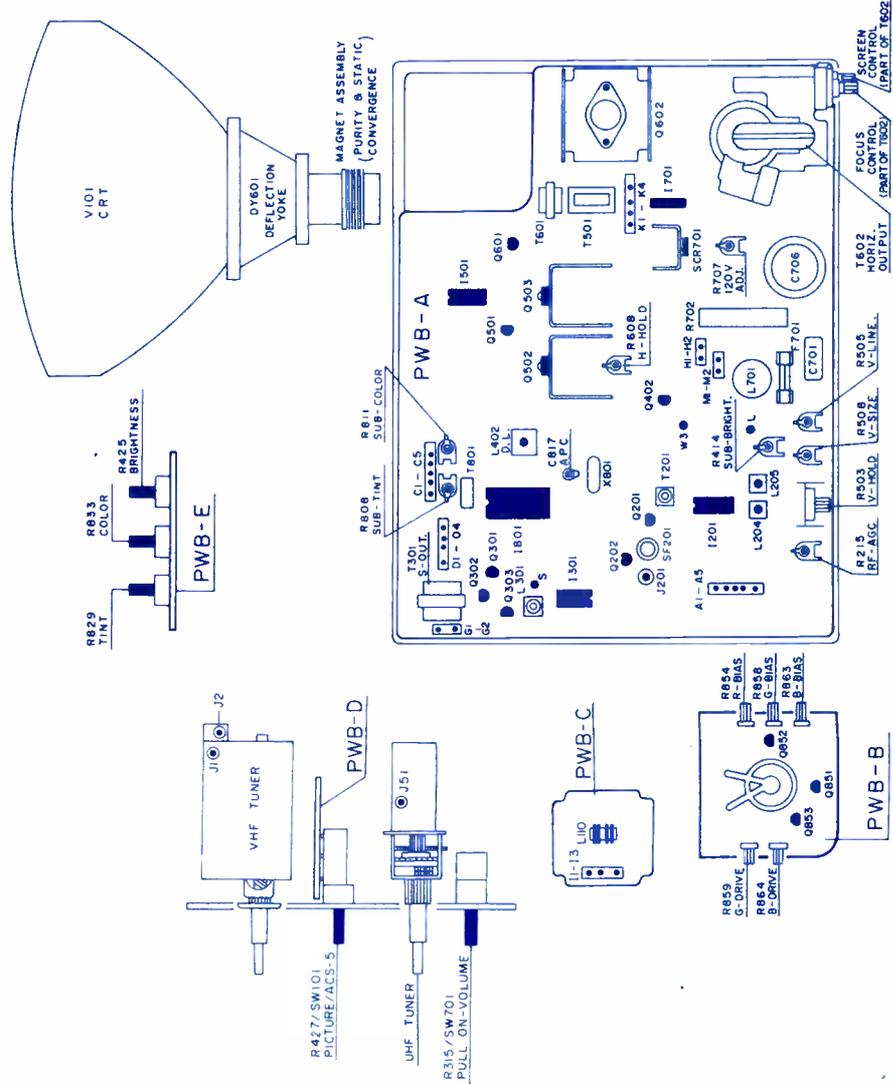
**VHF TUNER**



**UHF TUNER**



**CHASSIS LAYOUT**

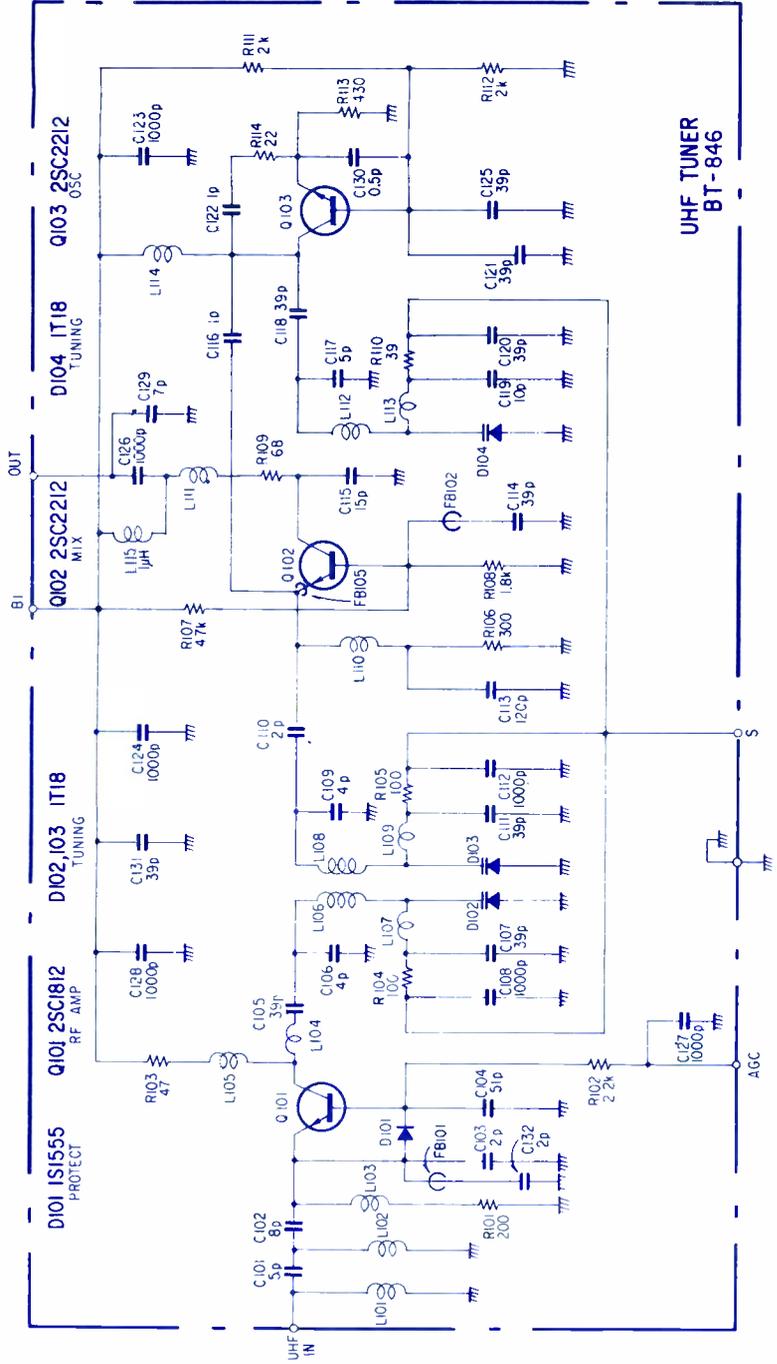


REPLACE WITH A PICTURE TUBE OF THE SAME TYPE NUMBER FOR CONTINUED SAFETY

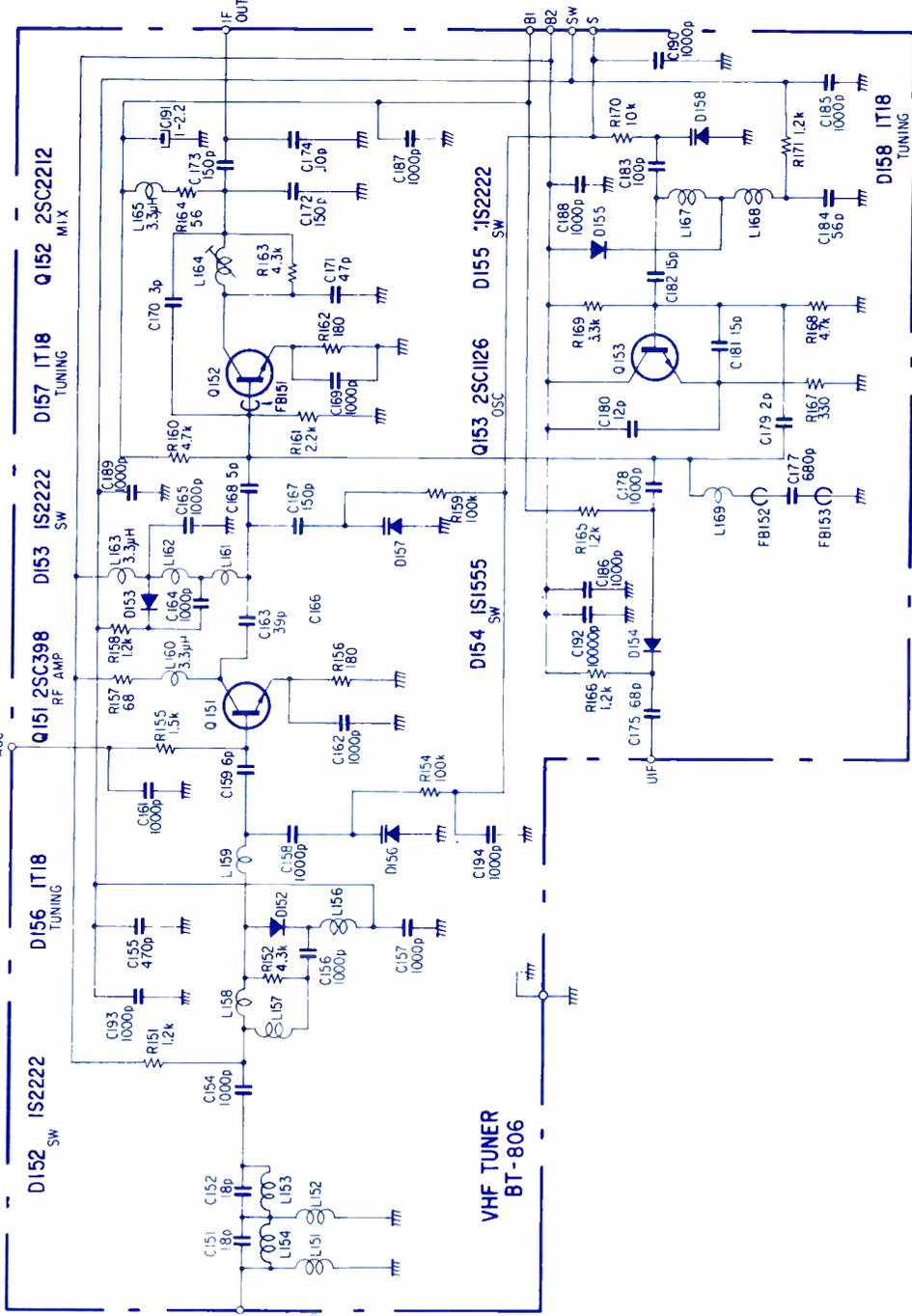
TO K605 OF PWB-A



VHF AND UHF TUNER SCHEMATIC DIAGRAMS



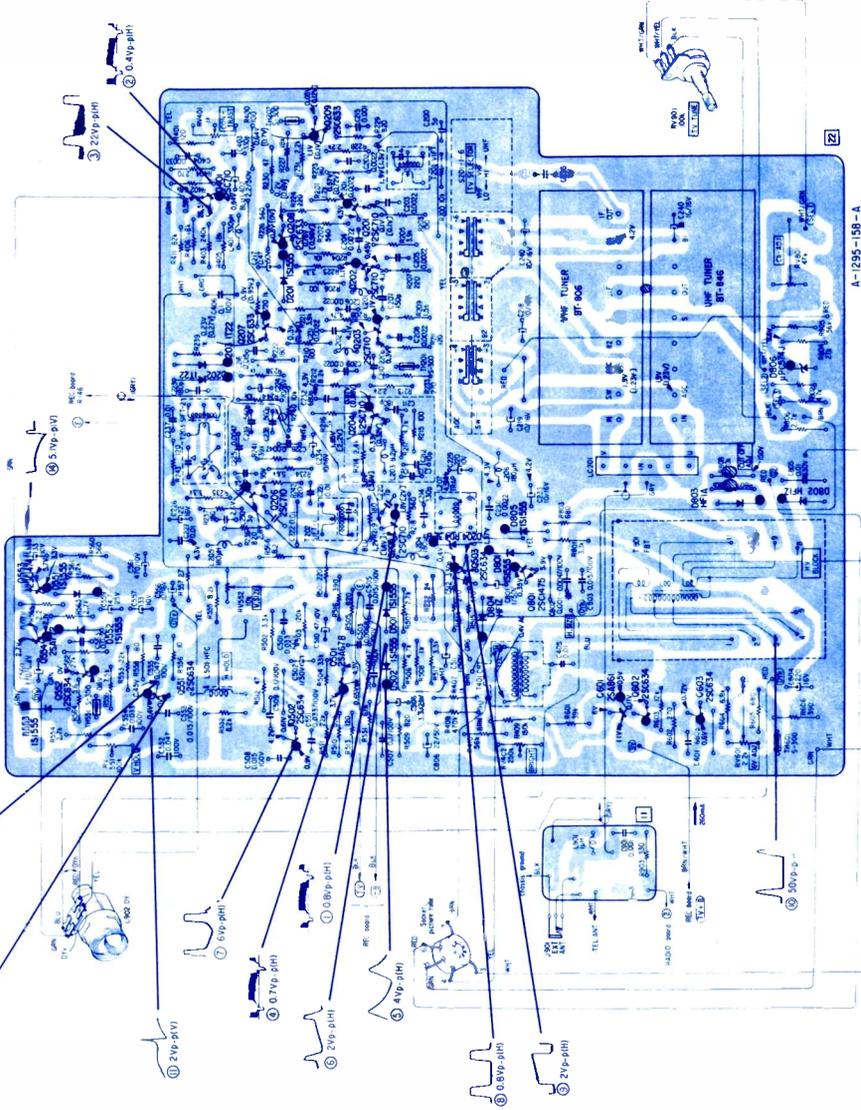
--VHF Tuner --  
(BT-806)



VHF TUNER  
BT-806

SONY  
B&W TV Model  
FX-310

ADJ	RV650	RV632	RV601
0	500	1202	1807
10	502	1204	1809
20	504	1206	1811
30	506	1208	1813
40	508	1210	1815
50	510	1212	1817
60	512	1214	1819
70	514	1216	1821
80	516	1218	1823
90	518	1220	1825
100	520	1222	1827
110	522	1224	1829
120	524	1226	1831
130	526	1228	1833
140	528	1230	1835
150	530	1232	1837
160	532	1234	1839
170	534	1236	1841
180	536	1238	1843
190	538	1240	1845
200	540	1242	1847
210	542	1244	1849
220	544	1246	1851
230	546	1248	1853
240	548	1250	1855
250	550	1252	1857
260	552	1254	1859
270	554	1256	1861
280	556	1258	1863
290	558	1260	1865
300	560	1262	1867
310	562	1264	1869
320	564	1266	1871
330	566	1268	1873
340	568	1270	1875
350	570	1272	1877
360	572	1274	1879
370	574	1276	1881
380	576	1278	1883
390	578	1280	1885
400	580	1282	1887
410	582	1284	1889
420	584	1286	1891
430	586	1288	1893
440	588	1290	1895
450	590	1292	1897
460	592	1294	1899
470	594	1296	1901
480	596	1298	1903
490	598	1300	1905
500	600	1302	1907
510	602	1304	1909
520	604	1306	1911
530	606	1308	1913
540	608	1310	1915
550	610	1312	1917
560	612	1314	1919
570	614	1316	1921
580	616	1318	1923
590	618	1320	1925
600	620	1322	1927
610	622	1324	1929
620	624	1326	1931
630	626	1328	1933
640	628	1330	1935
650	630	1332	1937
660	632	1334	1939
670	634	1336	1941
680	636	1338	1943
690	638	1340	1945
700	640	1342	1947
710	642	1344	1949
720	644	1346	1951
730	646	1348	1953
740	648	1350	1955
750	650	1352	1957
760	652	1354	1959
770	654	1356	1961
780	656	1358	1963
790	658	1360	1965
800	660	1362	1967
810	662	1364	1969
820	664	1366	1971
830	666	1368	1973
840	668	1370	1975
850	670	1372	1977
860	672	1374	1979
870	674	1376	1981
880	676	1378	1983
890	678	1380	1985
900	680	1382	1987
910	682	1384	1989
920	684	1386	1991
930	686	1388	1993
940	688	1390	1995
950	690	1392	1997
960	692	1394	1999
970	694	1396	2001
980	696	1398	2003
990	698	1400	2005
1000	700	1402	2007



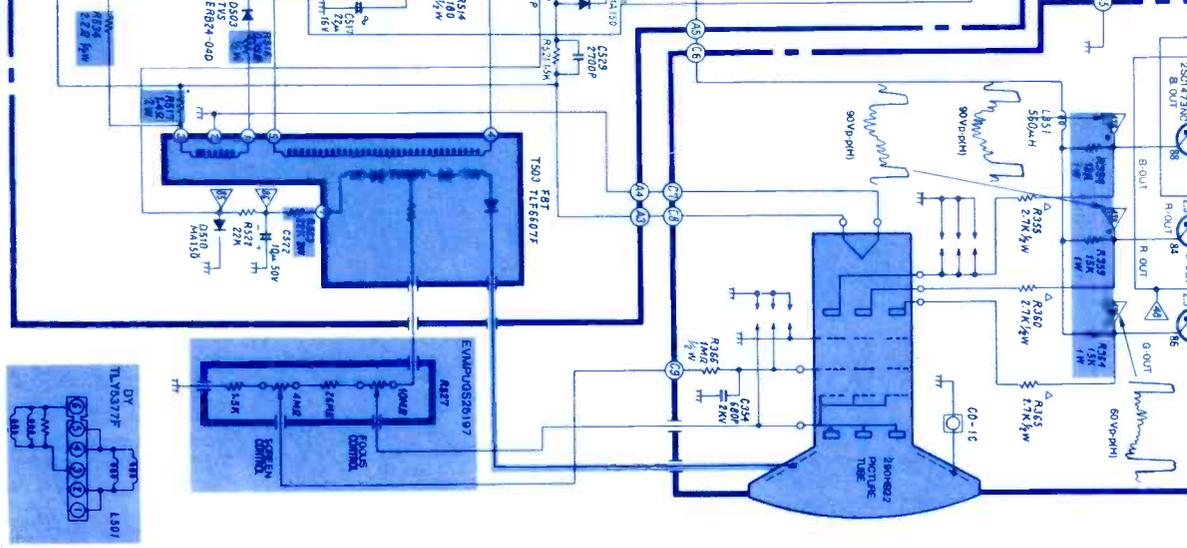
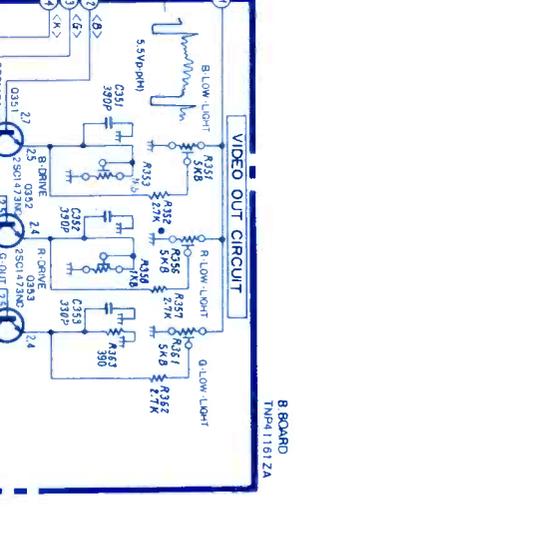
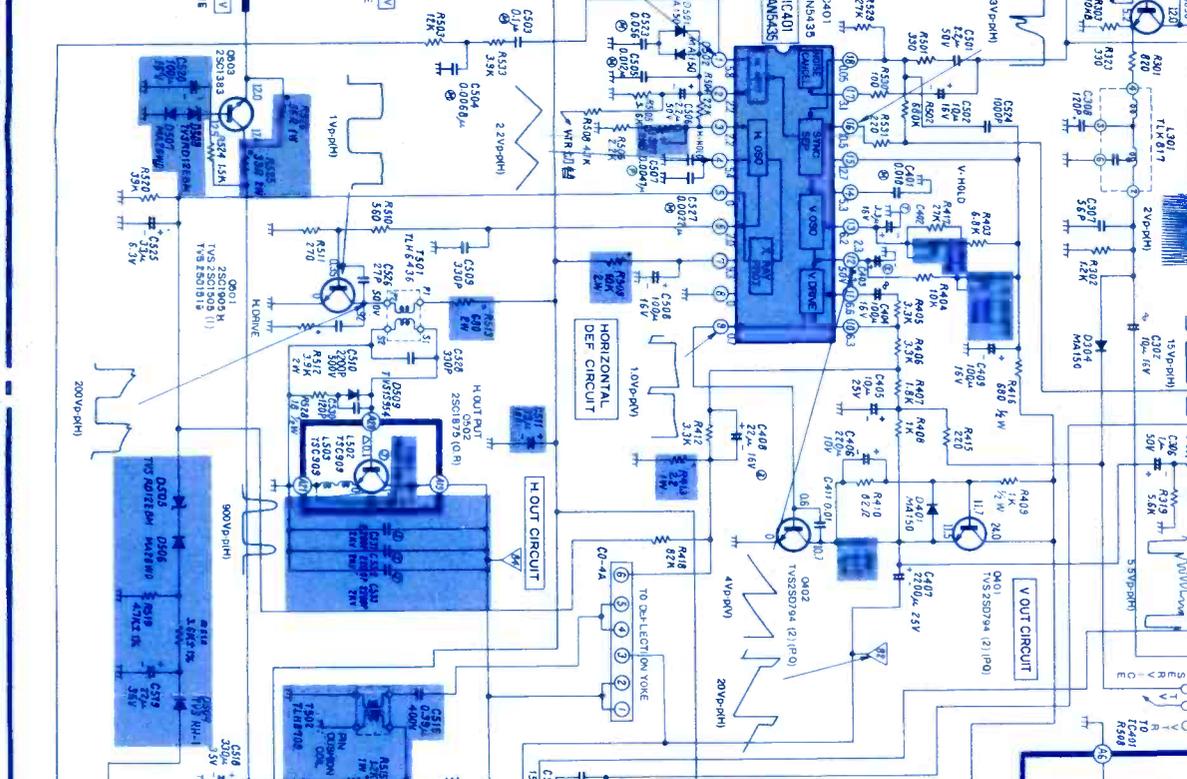
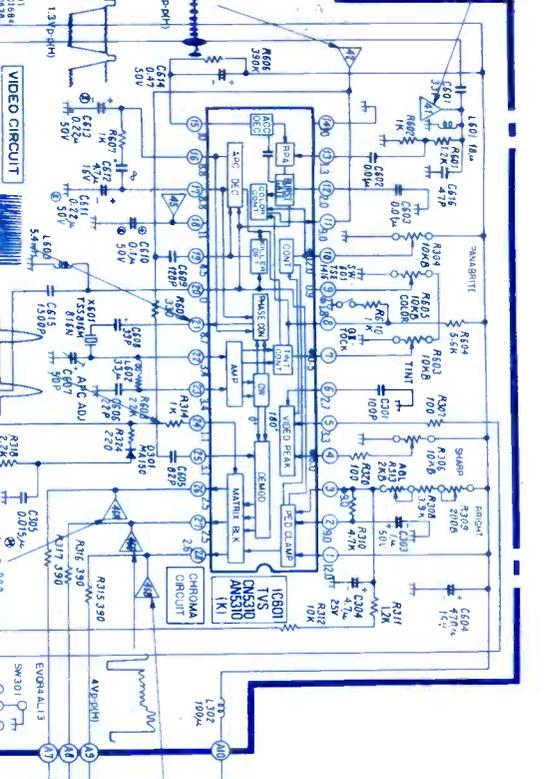
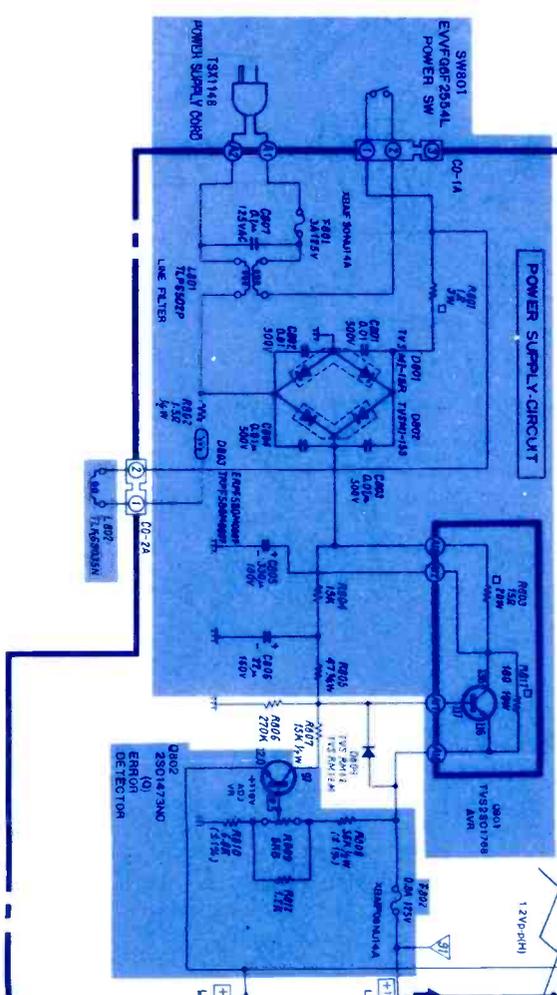
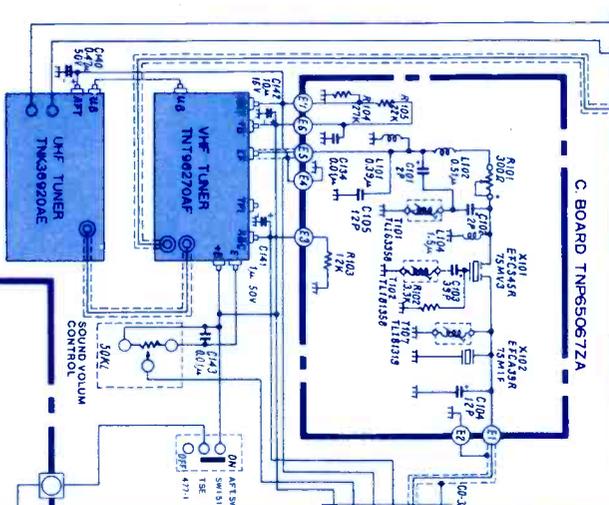
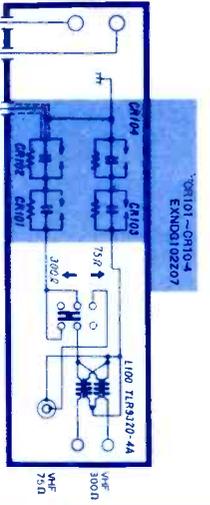
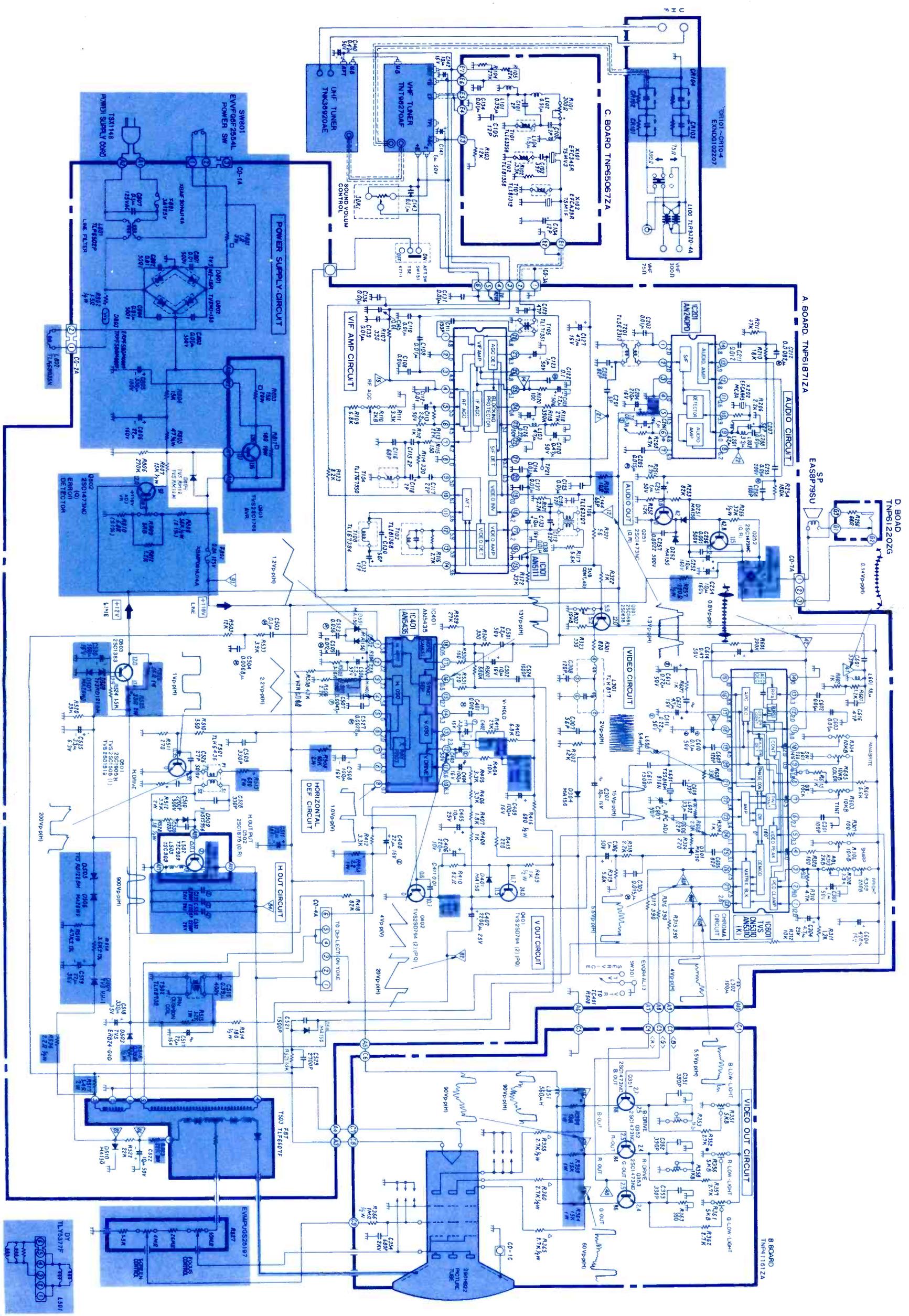
1860

PANASONIC  
B&W TV Model  
CT-119

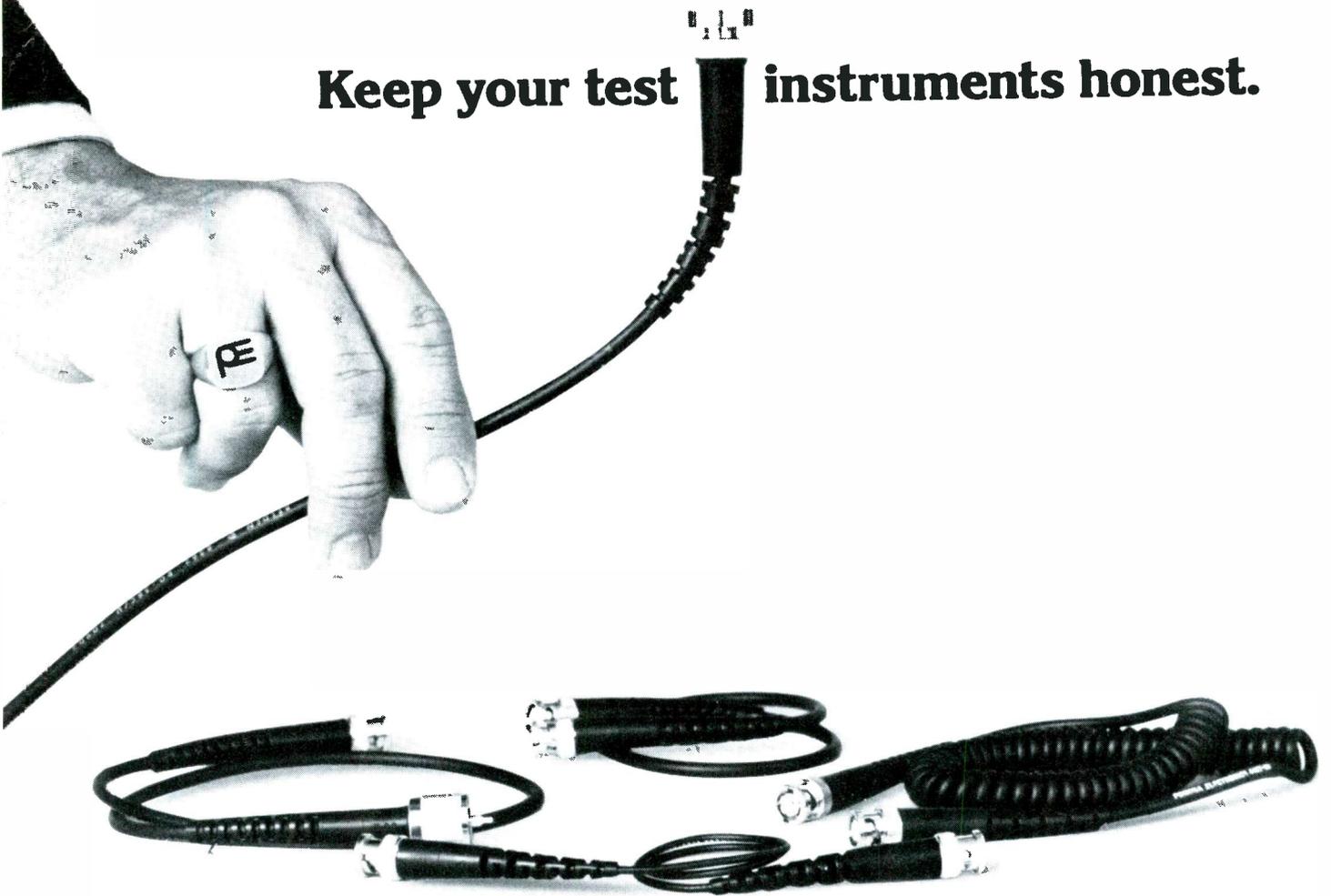
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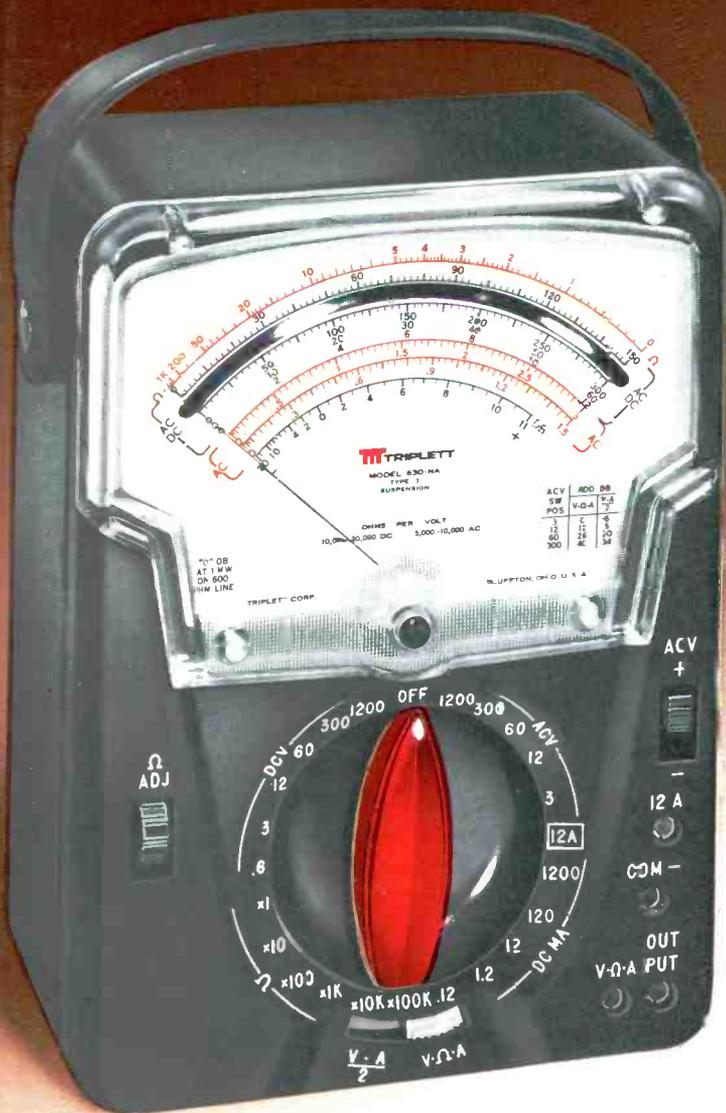


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