October, 1972 ☐ 75 cents

A HOWARD W. SAMS PUBLICATION

Electronic Servicing®

NEA and NATESA to merge!

page 14

Horizontal Phase Detector page 26

Save On Depreciation page 46

A Look At 4-Channel Sound page 20


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Circle 4 on literature card

October 1972 • Volume 22, No. 10

Electronic Servicing®

in this issue...

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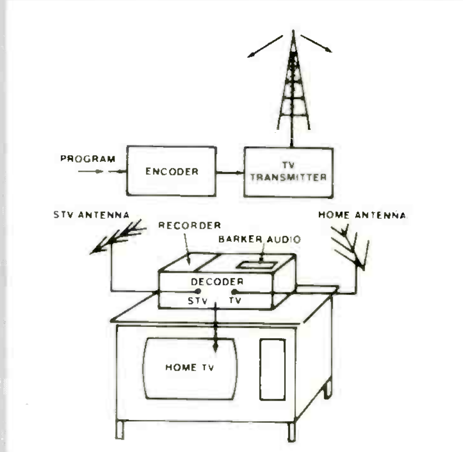
Circle 5 on literature card

electronic scanner

news of the industry

The FCC approves subscription-TV broadcasting by the Blonder-Tongue Broadcasting Company. Mr. Isaac S. Blonder, president of the company, recently announced that a construction permit for their UHF TV station on Channel 68 in the New York/New Jersey area has been issued by the FCC. This is the **first** subscription-TV station licensed by the FCC.

The BTVision system, designed by Blonder-Tongue Laboratories, Inc., alters the vertical-sync pulses during broadcasts which causes the picture on a non-subscriber's TV to roll uncontrollably. Subscribers to the service will have a rented decoder unit attached to their TV receivers. This decoder changes the STV signal to restore the vertical locking, records (for billing purposes) which programs were selected for viewing, and also provides "barker" audio so the station can give details about the programming.



Courtesy of Blonder-Tongue Laboratories, Inc.

No wiring change to the receiver is necessary. The regular antenna is connected to the STV decoder unit which, in turn, is connnected to the antenna terminals of the receiver. Two separate antennas can be used. Or, a single antenna plus either a signal-splitter or an antenna-switch supplies both the decoder and the TV receiver.

Not all programs from this station will be of the STV type (for which a charge is to be made). One of the FCC rules specifies that 28 hours a week must be "free" programming.

A spokesman for the Blonder-Tongue Laboratories speculates that **broadcast** subscription TV of the BTVision type will prove profitable to independent TV technicians. Because the system doesn't require modifications or special adjustments of the receivers, and doesn't interfere with normal reception of other stations, there will be no reason for the BTVision organization to infringe on any servicing activities. In addition, the set owners will be *paying* for superior TV programs, and probably will want their receivers maintained in top-notch condition.

NATESA and NEA members vote to merge their organizations. Elsewhere in this issue is the story of the joint convention in New Orleans, and the details of the monumental merger decision. The editors and staff of ELECTRONIC SERVICING heartily applaud this important step, and we believe it eventually will prove of immense value to all electronic technicians everywhere.

(Continued on page 6)

TO A PRO,
TIME IS MONEY

So take time to read about the BUSS® Kolor Kit of replacement fuses

The mark of a professional Certified Electronic Technician is efficiency. He's got the ability to locate a problem quickly, repair it quickly, and get on to the next job.

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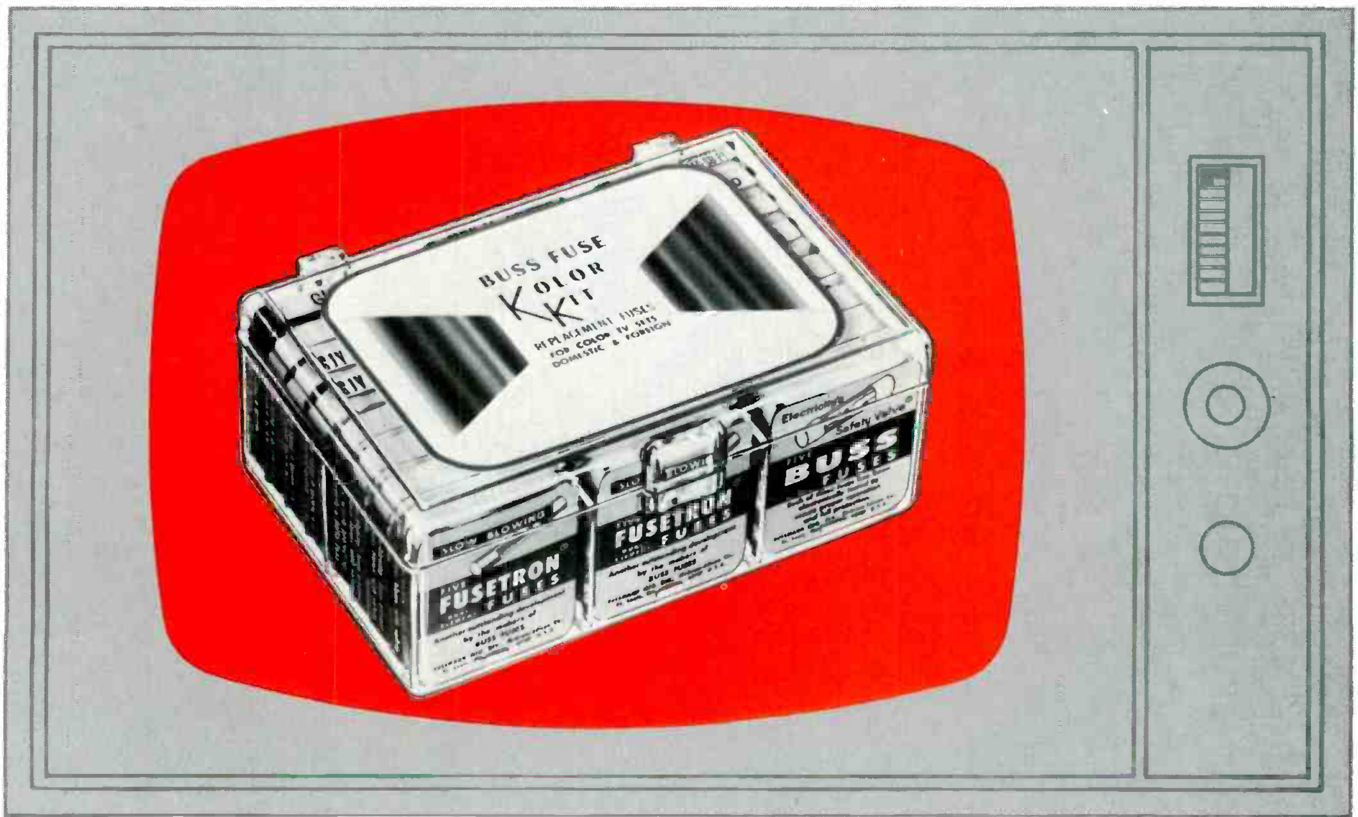
BUSS Kolor Kits are available from your local BUSS Distributor.



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SUPPLIED THE ECONOMICAL WAY ...THRU DISTRIBUTORS
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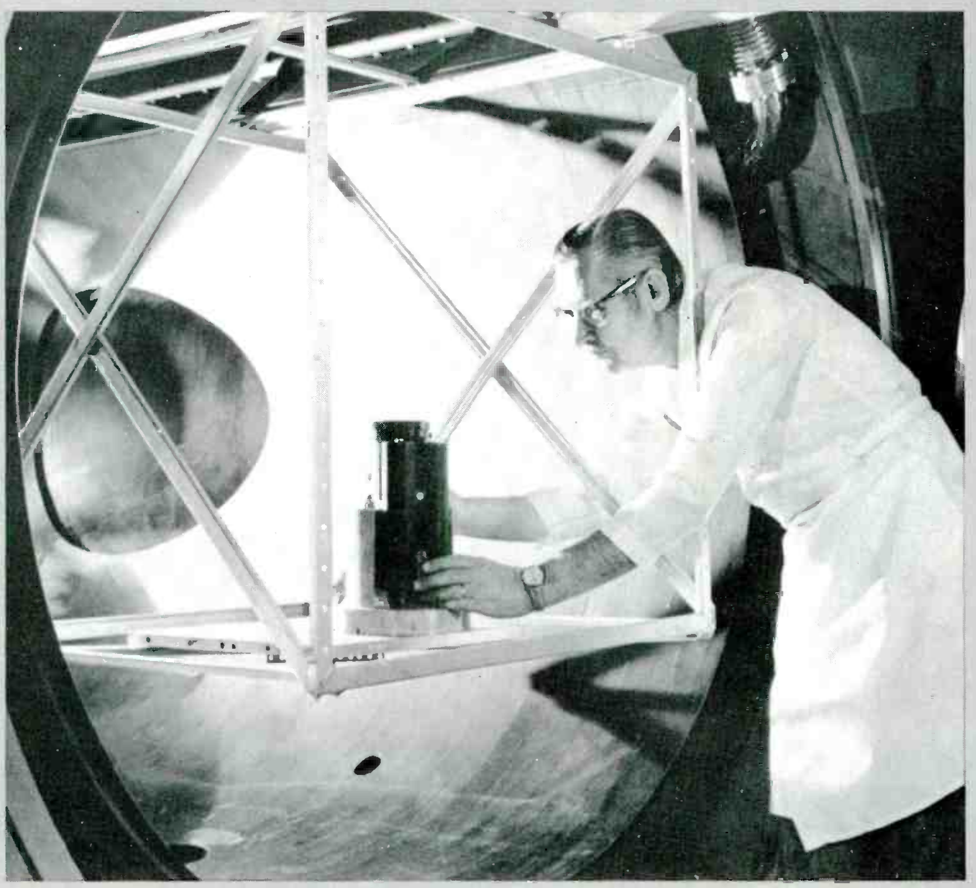
Officials of Cartrivision video-tape recorders revealed at the NEA/NATESA convention details of the world's first video tape service school. More than 300 television technicians from 25 organizations, they stated, have completed a training school for the maintenance of home-type video-tape recorders. According to S. Carl Huber, director of parts and service for Cartrivision, this seven-day course is the first consumer-oriented video-tape recorder service course ever offered in the United States. According to Huber, "The school uses a hands-on approach, accompanied by training aids and makes extensive use of the abilities of the video-tape recorder as a training tool. One aid is a training tape which serves as a lesson in the course." The school directed by Mark Sheldon, takes seven working days, and is held in the San Francisco area.

The Star Sighter, used to navigate NASA spacecraft, is shown being tested by ITT Gilfillan, a division of IT&T Corporation. The test chamber, at Van Nuys, California, simulates the vacuum and temperature conditions of outer space. □



Courtesy of IT&T

Who said B & K couldn't improve the only complete Television Analyst?

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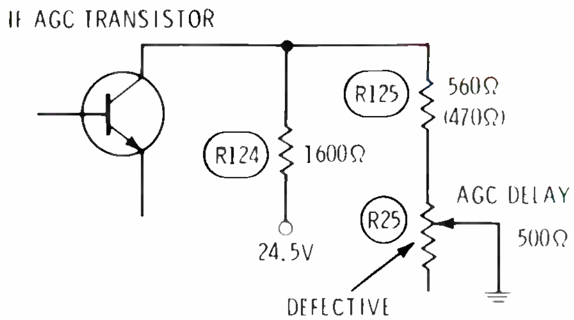
Circle 7 on literature card

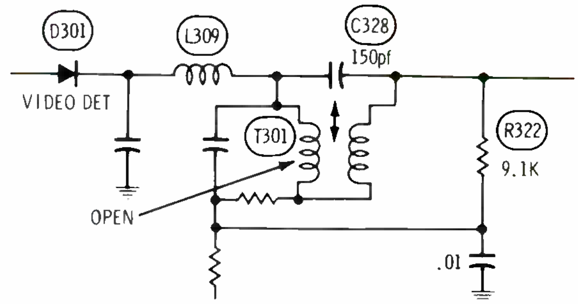
symcure Symptoms and cures compiled from field reports of recurring troubles

Chassis—Zenith 12A12C52, 12A13C52
PHOTOFACT—1120-3



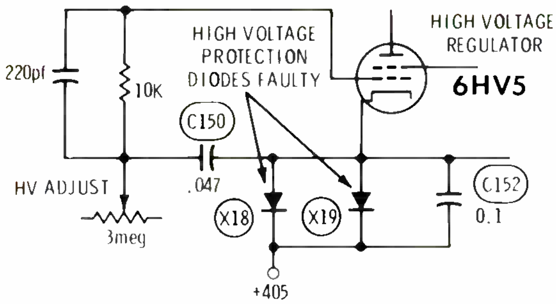
Symptom—Brightness increases intermittently; might exhibit vertical lines during this condition
Cure—Replace defective AGC delay control, R25

Chassis—Admiral 1K2084-2
PHOTOFACT—Not yet available



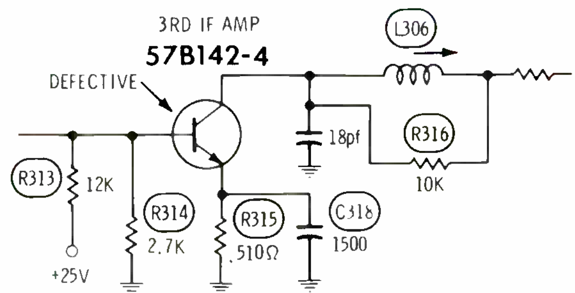
Symptom—Ghosty, faint "negative" appearing picture. Sound normal
Cure—Check for open winding in T301

Chassis—Zenith 12A12C52, 12A13C52
PHOTOFACT—1120-3



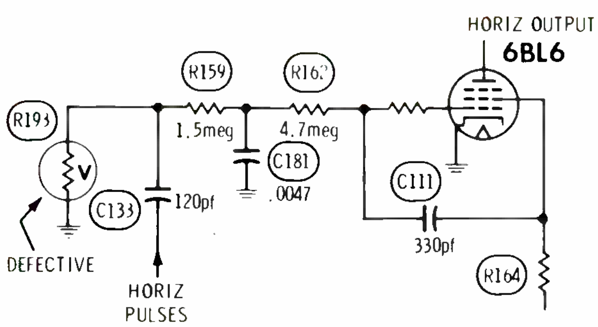
Symptom—Picture gets narrow at bottom when brightness control is turned down to produce low level. High-voltage adjustment does not change high voltage, or does so erratically
Cure—Replace both high-voltage protection diodes, X18 and X19

Chassis—Admiral 1K2084-2
PHOTOFACT—Not yet available



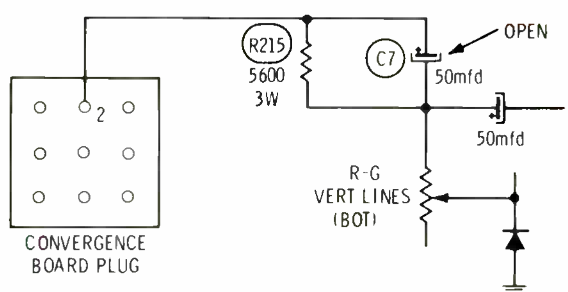
Symptom—Intermittent loss of picture and sound; raster okay. Might become a steady condition after set operates for several minutes
Cure—Check 3rd IF transistor, 57B142-4, and replace, if defective

Chassis—Zenith 14A10C19
PHOTOFACT—1108-3

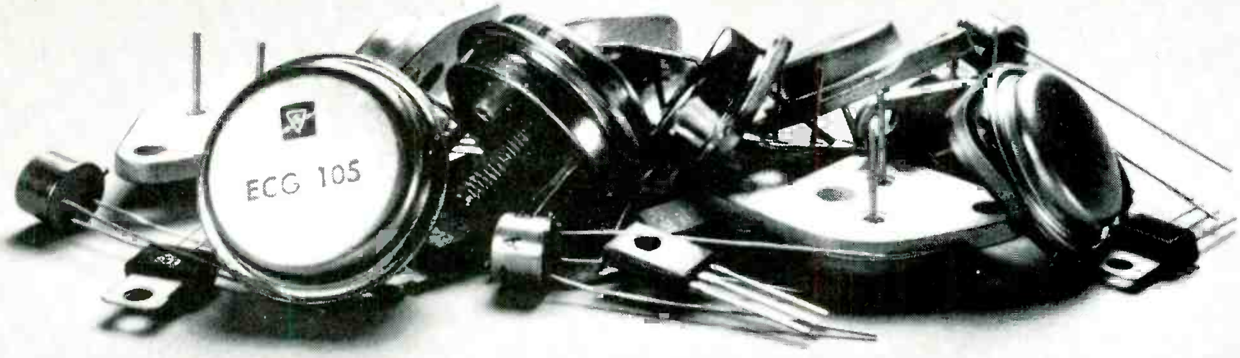


Symptom—"Cog wheel" or "Pie crust" effect in vertical lines of picture. Also picture "shimmy".
Cure—Replace defective VDR (R193), in horizontal-output circuit (Also check for defective 1K resistor, between Pin 3 or 6HV5 HV regulator tube and ground)

Chassis—Admiral 11H12 and similar chassis
PHOTOFACT—1116



Symptom—Insufficient height; raster pulled up at bottom; no foldover
Cure—Replace 50-mfd, 150-volt (100 volt in some chassis) capacitor, C7, mounted on convergence board □



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AD138/50	121	QP 2	179
AD139	104	QP 3	179
AD140	121	QP 4	179
AD142	179	QP 5	179
AD143	179	QP 6	179
AD143B	179	QP-7	179
AD148	131	QP 8	130
AD149	104	QP 8-1	130
AD149-01	121	QP-8 P	130
AD149-02	121	QP-10	179
AD149B	121	QP-11	130
AD150	121	QP-12	130
AD152	131	QP-13	185
AD155	131	QP-14	184
AD156	131	QP8-6623N	105
AD157	131	QP-13	153
AD159	121	QP-14	152
AD160	175	QQC61209	158
AD161	155	QQC61210	102A

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GTE SYLVANIA

readers exchange

Need a not-available schematic? Need an obsolete part? Have an unusual service problem and want help? Send information and full mailing address to ELECTRONIC SERVICING. Other ES readers should send replies with their offer of help direct to the writer. We reserve the right to edit and print all letters sent to this column. **Let us help one another.**

Needed: *Schematic and operating instructions for an RCA scope, type WO-79A (3-inch CRT).*

Gerard Kersting
2463 Tiebout Ave.
Bronx, New York 10458

Needed: *Schematic, voltage readings, etc., for a Lincoln transistor tape recorder, Model L-4320.*

S.R. Creacey
308 Bond St.
Redlands, California 92373

Needed: *Schematic and service data for a CANDLE (Valiant) Micro TV, Model MT-510.*

Jerry Malewicz
361 92nd St.
Brooklyn, New York 11209

Circle 9 on literature card

Needed: *Schematic and operating instructions for Atwater Kent, Model 286 radio. Restoring, may need parts.*

R.E. Shaver
218 Kolbe St.
Napoleon, Ohio 43545

Needed: *Schematic and service data for a PACO, Model S-55 scope.*

J. Bautista
J-B Radio-TV Servicing
140 W. Orangethorpe No. 76
Placentia, California 92670

Needed: *Schematic and service data for a Webcor, Model TV208. This is a solid-state type and has no chassis number.*

S. Comeaux
1616 Thomas Ave.
San Francisco, California 94124

Wanted: *The schematic for a Curtis Mathes color TV, Model FF500W.*

Forrest Wilkinson
5817 No. Kauffman Ave.
Temple City, California 91780

Wanted: *The U.S. distributor for Monacor. The home manufacturing center is in Japan.*

Belford A. Belles
117 Andover Dr.
Exton, Pennsylvania 19341

Editor's Note: The address of the U.S. distributor for Monacor products is: Monarch Electronics Corp., 7035 Laurel Canyon Blvd., N. Hollywood, California 91605.

Wanted: *We are looking for a repair capability for Touch Tone generators such as the ones used in Touch Tone telephones. One rumor has it that one of the TV tuner firms who repair or supply replacement tuners also repair the Touch Tone single transistor pads that are so common now in telephones.*

R. E. Hightower
9224 Woodland Dr.
Silver Spring, Maryland 20910

Wanted: *Information about the new Panaplex readout system.*

Jimmy Whitley
Route 1
Marshville, North Carolina 28103 ☐

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Circle 8 on literature card

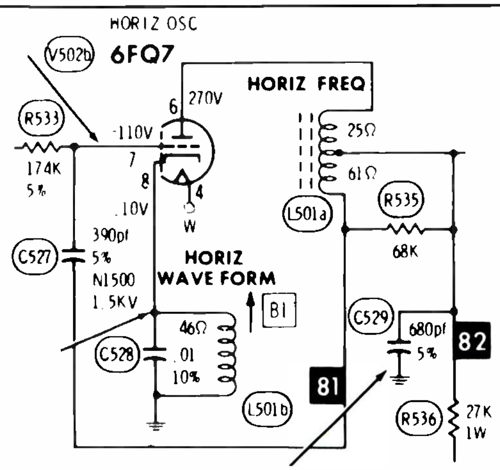
service bulletin

a digest of info from manufacturers

Failure of oscillator capacitor

Magnavox T958 and T962 color TV chassis

Loss of high voltage in these models has been traced in some cases to a shorted C529 in the horizontal oscillator circuit.

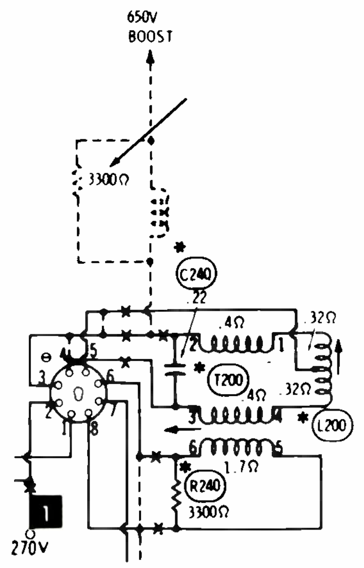


The Magnavox part number is 250364-350 for this 680-Pf 500-volt silver-mica capacitor. Use **only** a silver-mica type for replacement.

Vertical bars in picture

General Electric C2/L2 color TV chassis

Four or five vertical bars in the picture of 18", 19" or 20" receivers might be caused by an open in R270 (3300 ohms) which is a damping resistor in parallel with L260. (These are GE numbers.)



These components are mounted on a terminal strip in front of the 26HU5 horizontal-output tube. Replace the resistor only with a flame-proof type, such as GE EP14X38.

C529 was erroneously listed as a 200-volt type on the Magnavox schematic.

New location for yoke capacitors

Magnavox T958 and T974 color TV chassis

Deflection yokes used in the new T974 and the late-production T958 chassis have been designed and manufactured without the capacitors which usually are included inside the cover of the yoke.

On those chassis, the capacitors are mounted on a terminal board at the top rear of the high-voltage cage.

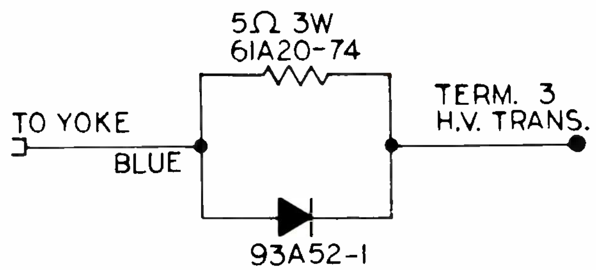
When you connect one of these chassis to a test jig containing capacitors inside the yoke, the width will be overscanned and the high voltage will be slightly reduced.

Tip for horizontal centering

Admiral G11 color TV chassis

After you have installed an Admiral number 79A148-1 high-voltage transformer in a G11 chassis, you might find that horizontal centering is needed.

Wire a 5-ohm 3-watt resistor and a power-supply diode in parallel, and connnect this assembly between the blue yoke wire and terminal #3 of the HV transformer.



Courtesy of Admiral Corporation

Polarity of the diode determines the direction of centering. Diode polarity, as shown, shifts the picture to the left about one inch. Reverse the polarity, if centering to the right is needed.

Loss of sound

Admiral K20 color TV chassis

If you check one of these chassis for a complaint of "no sound" and find the audio IC is defective, check the grounding point of the .022-mfd tone control capacitor, C134. This capacitor **must** be grounded to the shield braid at the volume control. If it is connected to the tuner-cluster bracket, change this ground before you install a new IC.

One Color Missing

General Electric C2/L2 color TV chassis

When one color is missing from the raster and also from the color picture, remove the picture-tube socket and measure the DC voltages there.

Measure the control-grid voltages at pins 3, 7 and 12, and the screen-grid voltages at pins 4, 5 and 13. If one voltage is appreciably lower than the other two, suspect leakage of the spark gap inside the socket. Measure the resistance to pin 8 (ground), and replace the socket if leakage is indicated. □

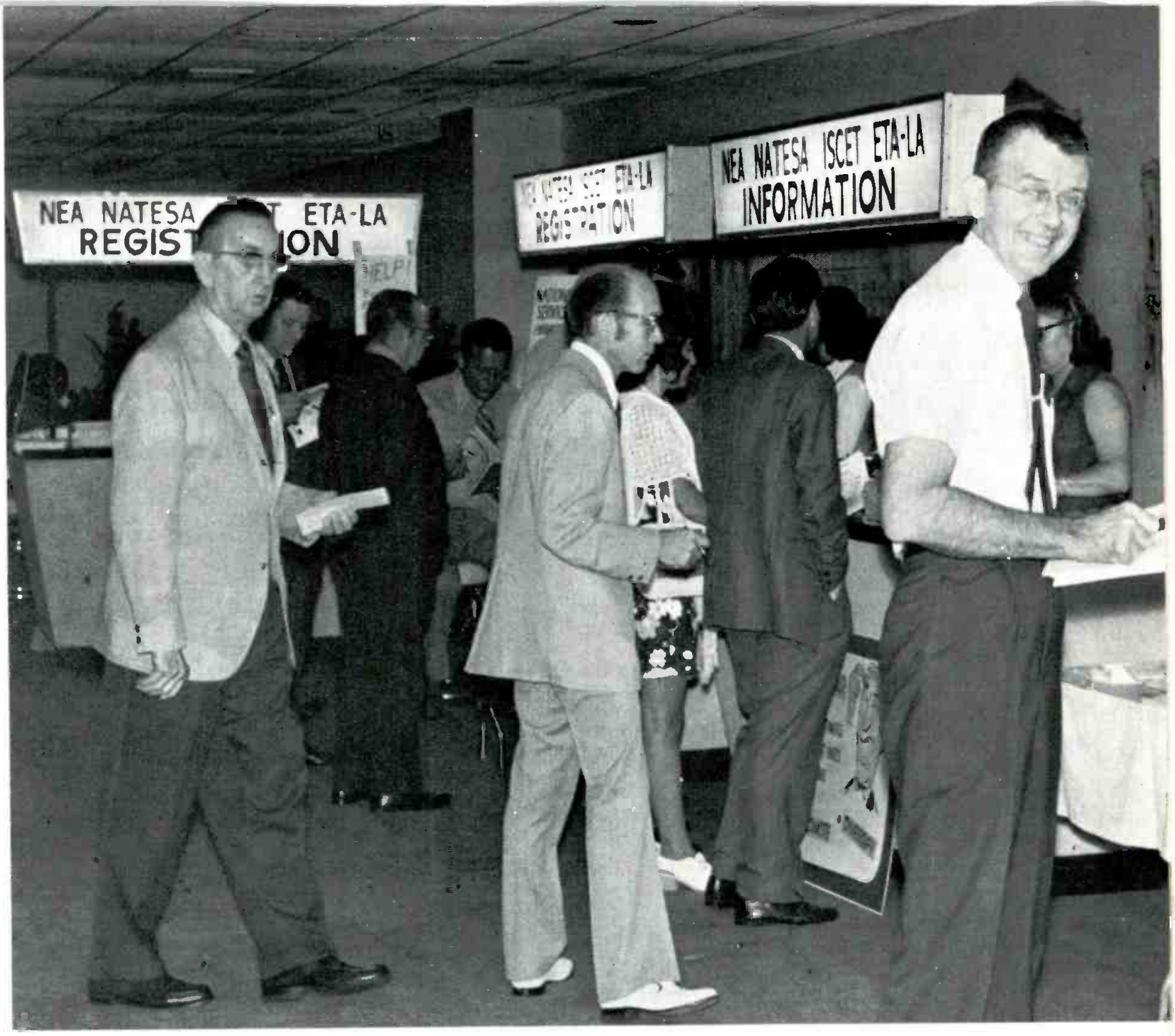


Fig. 1 The registration and information booths on the sixth floor of the Jung Hotel were the center of activity.

At the convention . . . .

NEA-NATESA announce historic merger

by Carl Babcoke

Highlights of the recent NATESA, NEA, ETA of Louisiana and ISCET conventions held August 9-13 in New Orleans.

PEACE, IT'S WONDERFUL! This well might have been the theme recently of the combined convention in New Orleans of NATESA, NEA, ETA of Louisiana (host organization) and ISCET. Not only was there peace between the National Alliance of Television & Electronic Service Associations (NATESA) and the National Electronics Associations (NEA), whose memberships voted to merge, but good feeling also was evident between the assembled technicians and the visiting manufacturer's representatives who made speeches, conducted seminars, and presented displays in the Trade Show.

A full crew of reporters would have been required to cover all the action in the Jung Hotel; often several important meetings or seminars were scheduled simultaneously. Any omissions in our coverage are strictly accidental, and do not reflect our opinion of their importance.

The registration and information booths on the sixth floor of the Jung Hotel were a beehive of activity as latecomers registered. Some conventioneers wanted to know the room number of a friend or a hospitality suite, and others asked about the correct meeting room, often changed at the last minute.

After a welcome by Roger Drost, of the host organization ETA of Louisiana, the convention was officially opened with keynote speeches by presidents Leo Shumavon of NATESA and Norris Browne of NEA.

Shortly afterwards, Morris L. Finneburgh made an impassioned plea for merger of the two organizations and retention of the leaders, including both Dick Glass (NEA) and Frank Moch (NATESA). Mr. Finneburgh offered to take a year's leave of absence from his company and help if the merger was approved. The thunderous applause and the joking reference by one of the speakers that Mrs. Finneburgh (often affectionately called "Babe") should be renamed

Fig. 2 Henry Smith, ETA of Louisiana President, welcomes those attending the convention, while Roger Drost, of ETA of Louisiana, and Norris R. Browne, President of NATESA, wait their turn at the podium.

Fig. 3 Lee Shumavon, NATESA President, at the microphone making one of the keynote addresses.

Fig. 4 A full house was the rule at every Business Management School session. Bob Bond lectured at this one.

Fig. 5 Lew Edwards presents a Serviceability Design Award (SDA) to **John Kelly,** vice-president of Magnavox.

"SIS" (for Superior Independent Service) all testified to his popularity.

Many of the meals were sponsored by various electronics companies who often supplied after-dinner speakers.

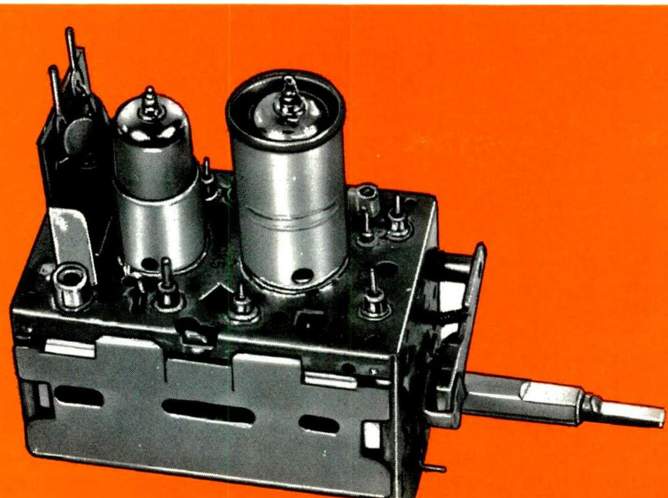
An official spokesman from Zenith presented some interesting speculations about the electronic devices that might be used in future homes. Dr. Robert Adler, Vice-President and Director of Research for the Zenith Radio Corporation, prophesized that television would gain in importance during the next decade with applications far beyond mere entertainment.

Dr. Adler said that color TV would continue to be the most important consumer electronic product even in 1985 because vision is the most important of man's senses. Also, he predicted the development of flat-panel TV screens and low-cost video recording and playback equipment.

"By 1985," Dr. Adler said, "a component failure of any part of a color television set, or a consumer device of similar complexity, should be a rare event, indeed. On the other hand, the addition of new devices such as those for video recording and playback, and various automatic features to replace manual adjustments, will increase complexity. Highly-trained service people will clearly be needed to maintain such sophisticated equipment."

At another banquet, Ed Stehle, Vice-President of General Electric, also spoke about the future of the electronic servicing business. "By 1985, three-out-of-four in the work force will be engaged in supply and services," he told the assembled conventioneers. "And those who understand the consumer are the ones who are going to be successful as the service business grows." Good reliable service, he declared, is a joint responsibility, and "good, bad or indifferent, we the manufacturer, and you the servicer, are in this business together." Continued cooperation to gain public confidence, according to Stehle, is not only necessary for success, but for **survival.** "In today's consumerism market, public confidence is granted only if the service is the best attainable," and he termed this the joint goal

(Continued on page 18)



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WATCH US GROW

Circle 12 on literature card

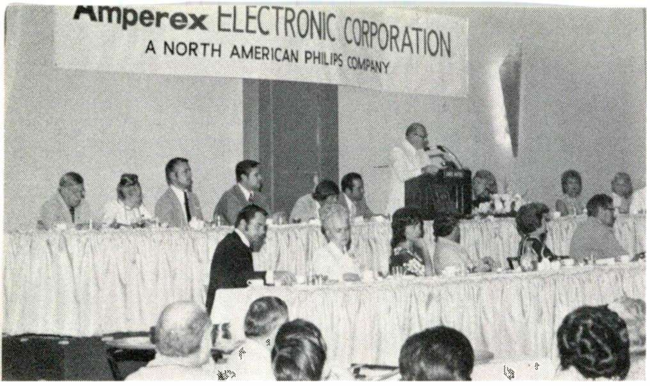


Fig. 6 An overflow crowd listens intently as John F. Rider tells of his experiences in the electronics field. Mr. Rider had just been inducted into the Electronics Hall of Fame.

Fig. 7 Emmett Mefford presents the plaque of the Electronics Hall of Fame to John F. Rider.

Fig. 9 Dick Glass and **Frank Moch** are inspired by **Morris Finneburgh** to show the enthusiasm felt by most members when the merger was official.

Fig. 8 For the first time, the new NEA and NATESA officers were installed together. Back row, left to right: J. Leach; E. Pershing; C. Cave; A. Powers; W. Carden; W. Cooke and M. L. Finneburgh (installer). Front row, left to right: J. Rolison; T. Cooper; V. Gaither; C. Couch; Leo Shumavon, C. Barvle, E. Gove and Phil Holt.

and challenge in the new era of solid-state TV.

Commenting on the serviceability ratings given GE receivers by the independent servicer panel, Stehle said GE was pleased by this, because it verified that GE had taken steps to design products so they are easy to service. As an example, he stated that GE is using the same signal-processing board in the company's 10-inch, 16-inch and 19-inch solid-state color TV's. This approach eliminates the need for technicians to become familiar with three different layouts, and it also minimizes the parts procurement problems.

Magnavox received a Serviceability Design Award plaque, which was presented by Lew Edwards and received by John Kelly, Vice-President of Magnavox. Zenith also received a similar award for their Model C4030 color receiver. This award was presented by John MacPherson (President of the Virginia Electronics Association) and accepted by Brian Marohnic, national service manager for Zenith.

Another highlight was the installation of John F. Rider into the Electronics Hall of Fame. Mr. Rider is a veteran of the electronics field, including a hitch in the Army Signal Corps, from which he retired in 1945 with the rank of Lt. Colonel. But, perhaps he is best remembered by oldtimers as publisher of the well-known Rider's Manuals.

Business-Management and technical seminars were well attended, as was the Trade Show, which consisted of several dozen attractive booths by various manufacturers.

Extra-curricular activities weren't overlooked either. Many conventioneers also entered the golfing and bowling tournaments, or played hooky long enough to investigate (and photograph) the interesting and historic old French Section of New Orleans.

Business meetings and elections by both major organizations concluded the convention.

The new officers of NEA are: president, Charles Couch; executive vice-president, Dick Glass; treasurer, Tom Cooper; and secretary, Virgil Gaither.

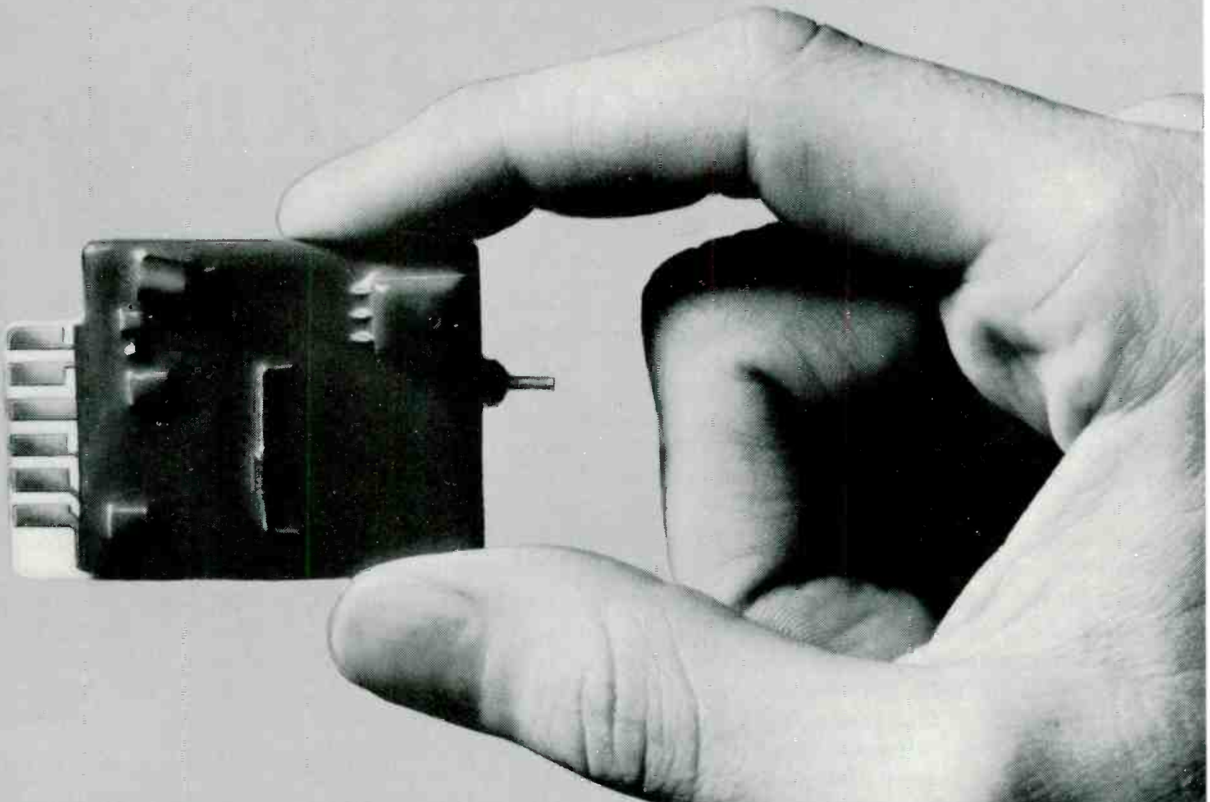
New NATESA officers are: president, Leo Shumavon; vice-president, Charles Barvle; secretary-general, Earl Gove, Jr.; and treasurer, Phil Holt.

The International Society of Certified Electronic Technicians (ISCET) also elected these new officers: chairman, Phillip Dahlen: vice-chairman, Jim Boyd; secretary, Valerie Miller; and treasurer, Bob Cook.

Last, and most important was the decision of both NEA and NATESA to merge. One meeting about implementing the merger was held in New Orleans before the participants left the city. A second meeting was held in Memphis, Tennessee this last September.

The editor and staff of ELECTRONIC SERVICING sincerely wish both organizations the best of luck and a minimum of problems as they undertake this historic merger. And we believe that all electronic technicians should join and support the new organization that will result. □

Why RCA XL-100's can be a quick fix:



RCA XL-100's are 100% solid state, with 12 plug-in, solid state AccuCircuit modules—like the ceramic kine drive amplifier you see above.

Since each of the 12 modules performs specific functions, diagnosis of the trouble is usually quick and easy. Most malfunctions can be fixed right in the home. That's bound to please your customer.

So when it comes to servicing RCA solid state color, XL-100's let you make more house calls—in a lot less time!

And you won't waste so much time hauling sets back and forth to the shop.

Something else: Whether you're servicing an XL-100 console, table model or portable, most modules are interchangeable, function for function. That will make your life easier, and you won't have to worry about stocking a large parts inventory.

RCA XL-100. It's already got a great reputation.
It could even add to yours.

RCA XL-100
100% Solid State AccuColor

Circle 13 on literature card

4-CHANNEL SOUND...A Profusion Of

By Wayne Lemons

Confusion, claims and counter-claims of the rival systems often obscure the basic issues of the new 4-channel sound. This interim report should answer most of the questions occuring either to you or your customers. After the situation has stabilized, we will cover the circuitry and servicing techniques for 4-channel equipment.

Some wit has said that if Nature had intended for people to listen to 4-channel stereo sound, she would have provided us with four ears! Perhaps this jibe isn't screamingly funny. But it does illustrate the feeling shared by many that 4-channel sound is not very practical. At least, not at this time.

To place the problems in perspective, we'll review briefly what 4-channel sound is, and why it is desirable.

4-Channel Sound Adds Depth To The Width

Conventional 2-channel stereo gives the illusion of directivity. Often, we can hear the locations of the instruments that are playing the music. However, the instruments seem to be arranged in a straight line from side to side in front of us.

This same lateral directional effect also is reproduced by 4-channel stereo, but with added reverberation and auditorium noises, or the sounds of unconventionally-located musical instruments, coming from the sides or from behind the listener. When you listen, the sounds surround you.

At its best, such spacious musical reproduction closely approaches the beauty of "live" sound.

Which System Of 4-Channel Sound Is Best?

Unfortunately, into this paradise of aural perfection intrudes the noise of a huge technological and merchandising war. Both major methods of reproducing 4-channel sound are championed by companies who have been antagonists in similar battles for many decades. These giants are RCA and CBS. We all know of the bitter fights over 45-RPM and 33-RPM records, and electronic-scanning of color television versus mechanical scanning. Luckily, our industry was spared such costly fights over 2-channel stereo records.

But now the same battlers, and their allies, are marshalling their strongest arguments to prove their system of 4-channel sound is best. Neither side wants such a battle, but both want the **other** to give in.

Discrete 4-Channel Sound

Most experts agree that the ideal method for reproducing natural-sounding 4-channel music is to have four separate (discrete) channels all the way from the recording studio to four separate speaker systems in the listening room.

However, this is not always possible. FM stations cannot broadcast discrete 4-channel sound until

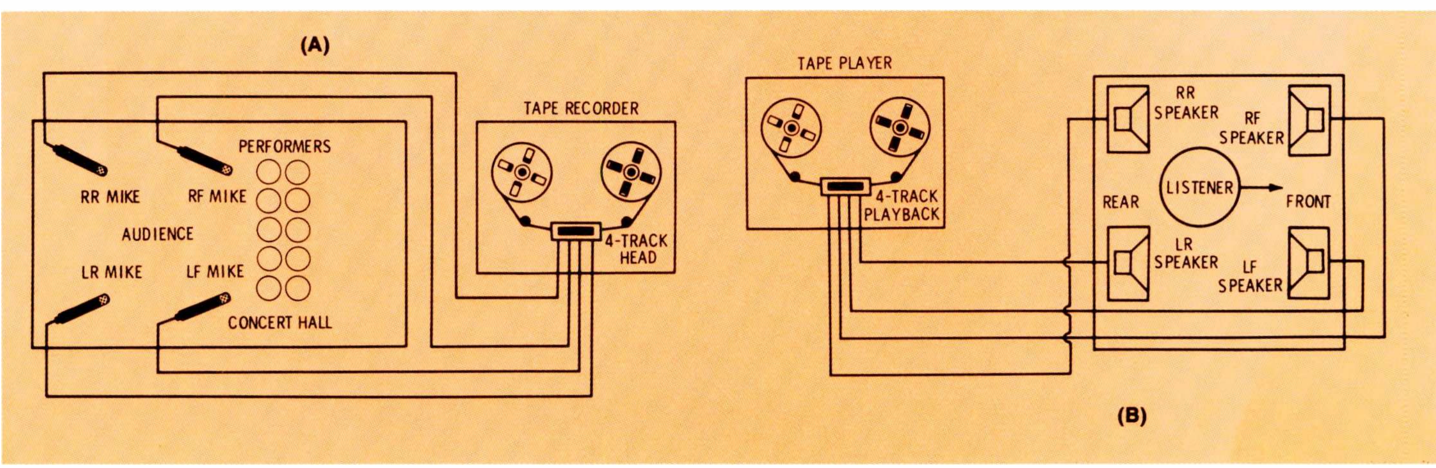


Fig. 1 This arrangement of microphones and playback speakers gives natural sound from symphony orchestras playing in large auditoriums.

Confusion

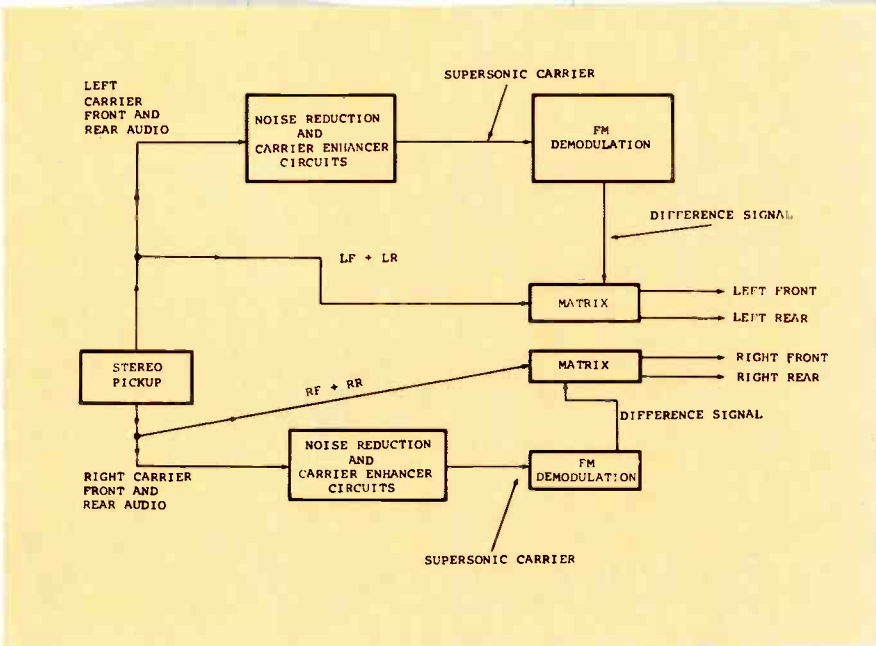


Fig. 2 A simplified diagram of the circuits used in playing JVC-system 4-channel discrete-stereo records made by RCA. Each channel during recording has an added 30-KHz carrier that is frequency-modulated by the stereo-difference signal. During playback, audio signals of the two normal stereo channels are mixed with the signals recovered from the carriers to provide four discrete stereo signals which are amplified and supplied to four speaker systems.

the FCC rules are changed. Discs with 4 discrete channels are promised, but are not generally available as yet.

Audio tape is the easiest source of four discrete channels. Cassette 4-channel tapes should be available shortly. And, 4-channel stereo-8 tapes are here now in limited quantities for those having a tape machine capable of playing them.

One method of arranging the microphones and playback speakers for discrete 4-channel stereo on tape is shown in Fig. 1. Other placements also can be used, but this one is very effective for reproducing the music of symphony orchestras.

But the tape method, although ideal from the electronic standpoint, suffers from economic problems. Twice the number of separate tracks are required for 4-channel compared to conventional stereo. This cuts in half the number of minutes of music from each tape of the same length. Also, tapes cost more than discs which play the same amount of music.

Discrete 4-Channel Records

Disc records playing four discrete channels appear to be the most practical answer to the needs of the mass market. Especially if the records would produce conventional 2-channel stereo when played on present stereo machines. Such compatibility is highly desirable.

The Japan Victor Company (JVC) has announced their new version of an old idea (once proposed for the original stereo records). In this system, a frequency-modulated supersonic carrier is

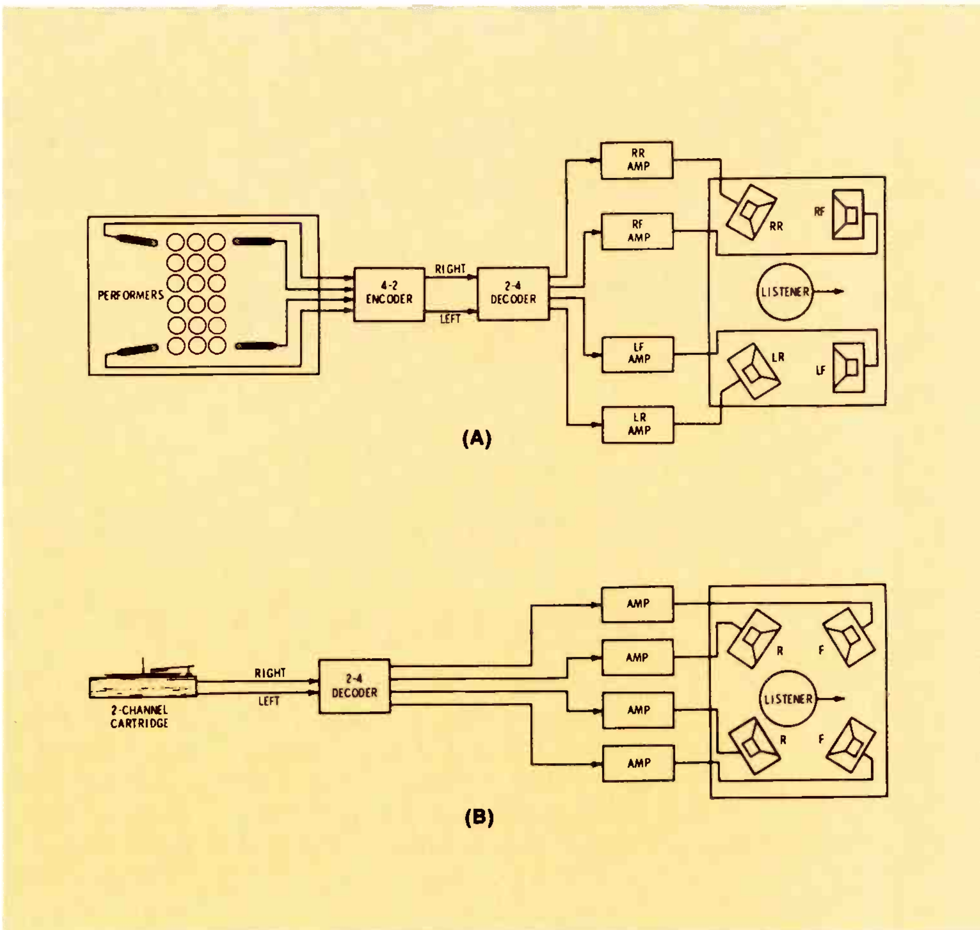


Fig. 3 Encoders and decoders are used in matrixing systems to permit transmission of 4-channel information with 2-channel equipment.

(A). This arrangement is used in 4-2-4 systems for stereo FM or stereo tapes.

(B) Matrix-encoded records require a complementary decoder during playback to provide the four channels.

added to each channel of the conventional 45°/45° stereo record. The normal left/right stereo channels carry the "sum" of the front and rear sounds, and they reproduce the usual stereo effect when played on present-day machines. The carriers are modulated by the "difference" signals which, after demodulation and mixing with the right and left channel signals, produce four separate discrete channels of stereo sound.

Although the basic idea of such a system is simple and straightforward, two severe problems must be solved. Because each FM carrier has a center frequency of about 30 KHz, separation of the channels during both recording and playback must be very good up to nearly 50 KHz. That's very difficult! Also the durability of the record material and the compliance of the playback stylus must permit many playings without shearing off the tiny undulations of the carriers.

For their contribution to the new disc system, RCA has produced a record material mix which they claim is about five times more resistant to wear than is the conventional vinyl, and should allow more than 100 playings without loss of the carriers.

Figure 2 shows the routing of the signals from the special stereo cartridge through the carrier-enhancer and noise-reduction circuits, the FM demodulators, and the matrixing circuits.

The JVC playback system (called CD4) also features the Shibata stylus, which has an elliptical tip plus a special shape of the rear side designed to improve contact with the record groove, and also to reduce wear of the record.

Records cut for use with this type of playback equipment give four discrete channels when used with JVC or Panasonic machines. When played on conventional machines, these records produce 2-channel stereo, because the cartridges and amplifiers ignore the carriers.

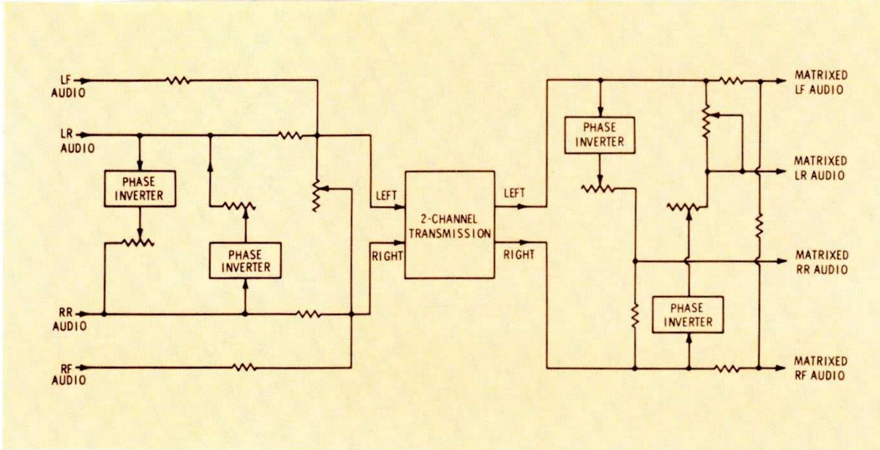


Fig. 4 Some encoder/decoder systems are based on this diagram which uses 180° phase shifts. One drawback is the cancellation in certain listening areas of some portions of the music.

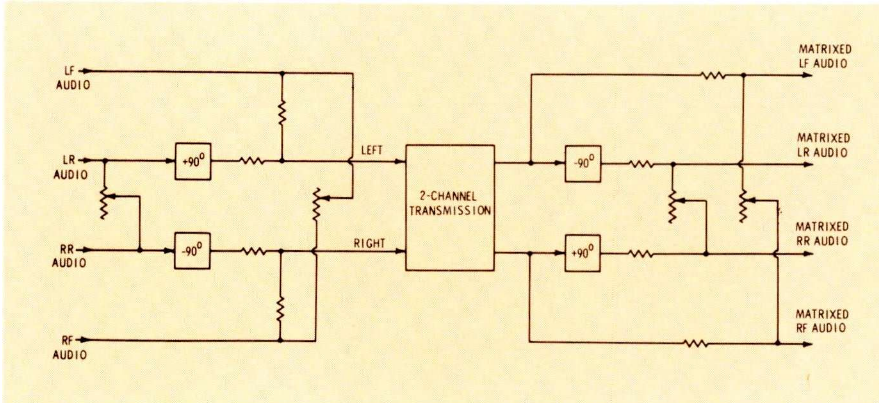


Fig. 5 The Sansui QS system avoids any complete cancellation by shifting the phases by +90° and −90°.

Only time and extensive field-testing will reveal whether or not this system is satisfactory for adoption industrywide.

Matrixed 4-Channel Sound

The sky is the limit in this wild and unpredictable field of matrixed 4-channel sound. For one thing, there are several basic ways of matrixing.

Some pioneers couldn't wait for the encoded records and they tried conventional stereo through three- or four-speaker arrays with various electrical phasings of the voice coils, and experimental locations of the speakers in the rooms. Many such hookups used only one 2-channel amplifier. Page 37 of the October, 1971 ELECTRONIC SERVICING gave some information about one such method. Some recordings were reported to give a beautiful effect when played over these far-out systems, while others gave some weird sounds.

A more scientific approach is the use of encoders during recording, and complementary decoders during playback. One such system is illustrated in Fig. 3.

The schematic of many encoder/decoder circuits are similar to those of Fig. 4, which require 180° phase shifts. However, this 180° phase sometimes results in cancellation of portions of the music.

Another method, said to eliminate the unwanted phase-cancellations, is the Sansui QS system which uses plus and minus 90° phases (Fig. 5).

Other matrixing circuits are recommended by Electro-Voice and Columbia Records who recently agreed to an exchange of patent rights covering 4-channel sound.

The situation is changing so rapidly that it is useless to list any more variations of the matrixing principle.

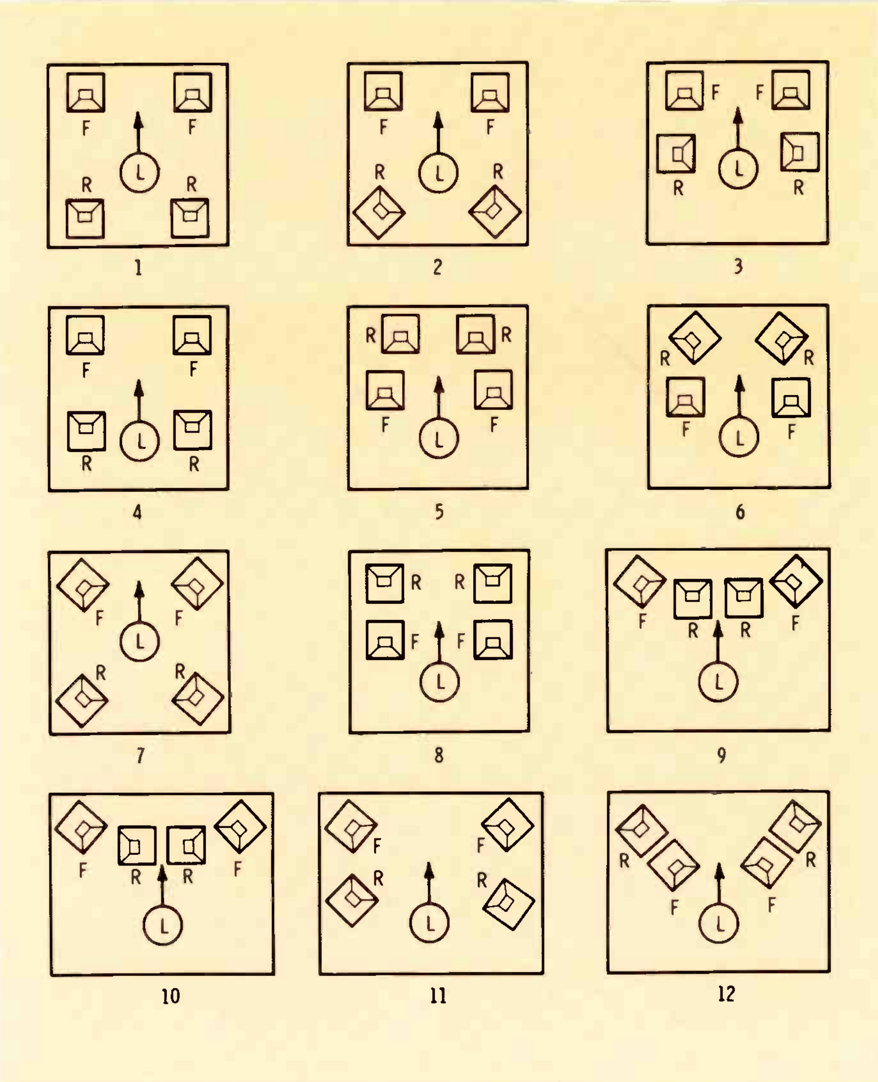


Fig. 6 Here are some of the speaker arrangements you can try either with matrixed-stereo records, or with simulated-4-channel hookups made by the phasing of speakers.

The Debate Rages On

Adherents of the discrete systems insist that only their method can give the excellent channel separation necessary for life-like sound.

Partisans of the matrixing methods reply that the early "ping-pong" type of exaggerated stereo effect was unsatisfactory and later was replaced by mixed (matrixed) sound which gave more blend and less separation. They accuse the discrete boosters of insisting on "ping-pong-pang-pung" 4-channel effects.

The matrix system does have several good talking points. One is compatibility; that is, 4-channel matrixed records play okay on 2-channel stereo machines. However, the discrete reply is that the musical sound is not very natural.

Also, when played through a 4-channel matrixed system, 2-channel records produce a synthetic diffused-stereo effect which many people find quite pleasant. On the other hand, critics say the sound is not natural.

Speaker Locations

Speaker placements for 4-channel matrixed sound give results ranging from a "It seats you right in the center of the orchestra" effect to "I want to listen from the 20th row center."

There are no right or wrong ways of connecting or locating the four speaker systems; only your ear can be the judge. Some possible speaker locations are diagrammed in Fig. 6. Try them for yourself; some of the results will be very pleasant.

Selling Methods For 4-Channel Sound

While researching for this article, I visited a number of "big name" hi-fi stores in a city of about 125,000 people. I wanted to hear different brands and systems, and to find out how a salesman would try to "sell" a potential customer.

When I asked a salesman whether or not I should buy 4-channel equipment now, invariably the answer was, "Sure, it's great! It's the coming thing, just like being at the performance", and so on.

"But", I said, "I have heard there is now no standardization. If I buy today, will my equipment be obsolete right away?" The best answer I got was. "Oh, it won't become obsolete; they've got all that worked out." But, when I innocently asked who "they" were and what they were doing about it, the salesman handed me a brochure and escaped to wait on someone else.

Such ignorance of the product certainly doesn't help to sell 4-channel merchandise.

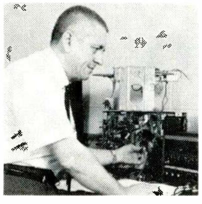
And none of the demonstration setups were adequate. Connections were haywired, with speakers placed just anywhere, or perhaps stacked among other components. Not once did I hear a demonstration of the "overwhelming difference" between "old-fashioned" stereo and the new 4-channel sound.

If you sell 4-channel equipment, this is my advice:

- Learn enough about 4-channel systems to be able to explain or defend the brand and type you sell; and

- provide a realistic demonstration of good sound quality by having the equipment placed for optimum listening.

Or, if you are thinking about buying a 4-channel stereo system for your own use, try to listen to a demonstration which does justice to the music. If it pleases you, buy it; there is never a time when progress ceases and it is "safe" to purchase anything. □



The inside story of horizontal phase detectors

By Carl Babcoke

Continuing our series of in-depth analysis of the basic television circuits, we take a searching look at duo-diode horizontal phase detectors and give troubleshooting tips for better servicing.

Any horizontal phase detector using a duo-diode appears to be very simple. The one we're using as an example has only 12 components. And yet, some of the electronic actions in this circuits are so complex that we often take the theory on faith without really understanding it.

Because we believe that all technicians can service more accurately and more rapidly when they understand the operation of the circuit in question, we are combining the theory of horizontal phase detectors with troubleshooting tips.

Further, we are attempting to explain **all** horizontal phase detectors by analyzing thoroughly just **one** specific example.

The schematic in Fig. 1 includes the normal DC voltages and waveforms of the horizontal phase detector in an Admiral 25D6 color chassis, which is covered in PHOTOFACT 540-1. This chassis is nearly identical with the RCA CTC10, and others.

Requirements Of Phase Detectors

For any horizontal phase detector to give the best results, it must fulfill these conditions:

- A DC error-correcting voltage must be produced by leading or lagging phases between the horizontal sync and the reference signal from the sweep circuit. This control voltage is used to maintain horizontal locking and also the desired phase.
- Reasonable variations in the amplitude of the sync should not cause locking problems, or bending of the picture.
- The frequency of the horizontal oscillator, which is determined by the action of the phase detector, should be nearly the same either with or without a sync signal. This helps eliminate "hooking" at the top of the picture. Also, the high voltage and the width of the picture are the same whether or not a station is tuned in.
- Correction of wrong phase should be very rapid, but without "hunting" or "piecrusting".

A Preview Of Operation

Many phase detectors, such as those for color locking, or horizontal phase detectors in older TV receivers, compare the phases of a push-pull sync signal to a single-ended sweep waveform. These are simple circuits that are easy to analyze.

Not so with the duo-diode type of horizontal phase detector. Although it's true the action of the circuit has the same **effect** as a push-pull sweep signal and single-ended sync pulses. It's interesting to see how this unlikely situation occurs.

Two Peak-Reading Series Rectifiers

Both diodes simultaneously rectify (Fig. 1) the sweep and sync signals. But a different type of rectification is used for each signal.

When they rectify the sweep waveform (W4 waveform, nearly a sawtooth), both diodes act as series-type peak-reading rectifiers. Now someone is sure to question that statement, because the signal enters through C72 and C71. Shunt-rectifier circuits normally bring the AC in through a capacitor, while series circuits usually have a DC path through an input transformer. This circuit is an exception to those general rules.

The simplified schematics in Fig. 2 show the electron current flow during both the positive and negative peaks of the sweep sawtooth. Notice this: either diode **alone** (the other diode removed) rectifies in the shunt mode, and the DC voltages obtained are opposite in polarity from those shown in Fig. 2. But when the actions of Figs. 2A and 2B proceed alternately, C72 (and also C71, less importantly) discharges each time either diode conducts. This prevents C72 from becoming the peak-reading input capacitor of a shunt-type rectifier circuit. The action is the same for AC as though the input waveform entered via the secondary winding of a transformer connected where C73 is now.

To make the rectifier action clear, we have shown the sync-coupling capacitor, C69 returning to ground. In the actual circuit (Fig. 1), the resistance of the sync circuit is between C69 and ground.

However, proof that this method of illustration is valid is found in the DC voltages obtained from the actual chassis. Without a sync signal (off-channel operation), rectifications by X1 and X2 of the sweep sawtooth produce nearly equal DC voltages which combined at the output measure within a few tenths of a volt of zero.

Also, peak rectification is proven by the narrow pulses of diode current shown in Fig. 3.

Looking at the separate paths of rectification in Figs. 2A and 2B, it is easy to see that R102 is the load resistor, and C69 is the peak-reading filter capacitor for X1, which supplies the positive part of the

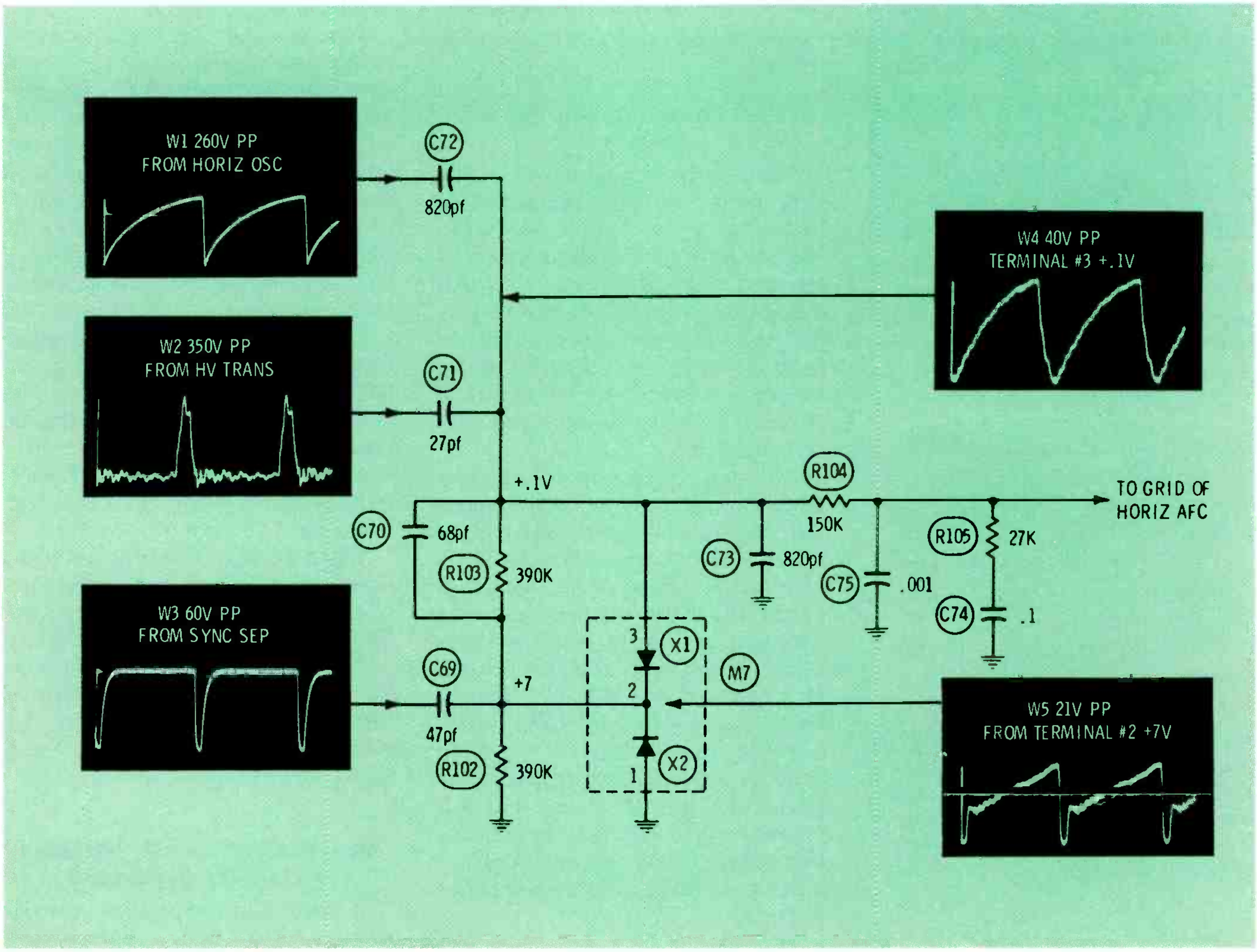


Fig. 1 Complete schematic of the horizontal phase detector circuit in an Admiral 25D6 color chassis. DC voltages and waveforms shown are those obtained from this one chassis, but they are nearly typical of many similar circuits.

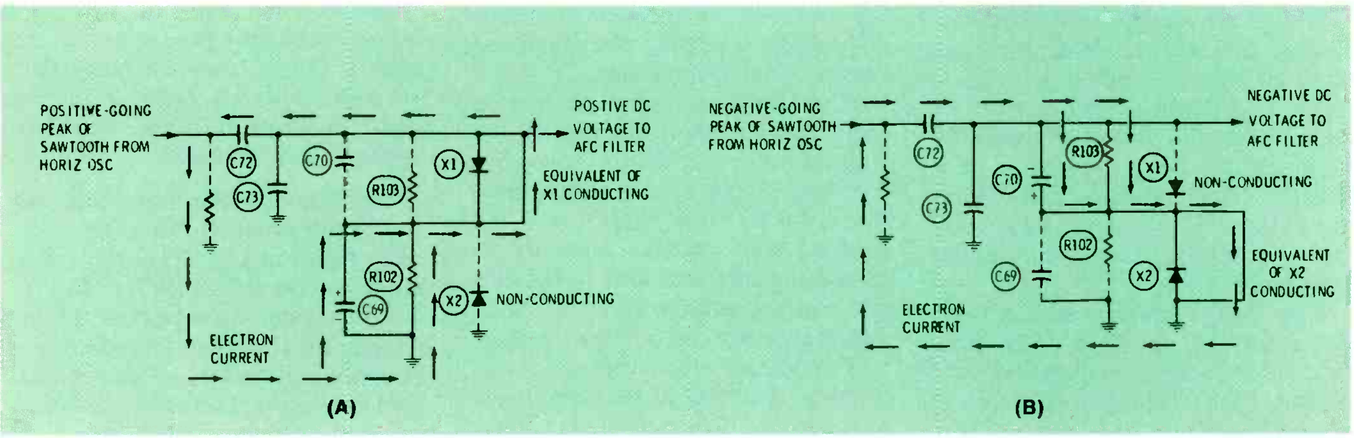


Fig. 2 The diodes alternately rectify the positive and negative peaks of the sawteeth coming from the sweep circuit. There is no sync at this time. **(A)** Paths of the electron flow show that rectification is in a series-type peak-reading circuit, which produces a positive voltage at the output from rectification of the positive peaks of the sawteeth. **(B)** Paths of the electron flow during rectification of the negative peaks of the sawteeth also show that the circuit is a series-type of peak-reading circuit. Negative voltage is produced.

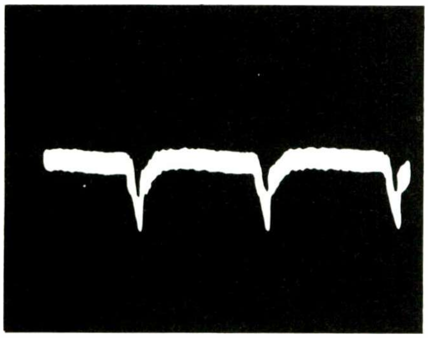


Fig. 3 Narrow, negative-going pulses of X2 diode current prove the rectification is peak reading, and that rectification occurs during the negative peak.

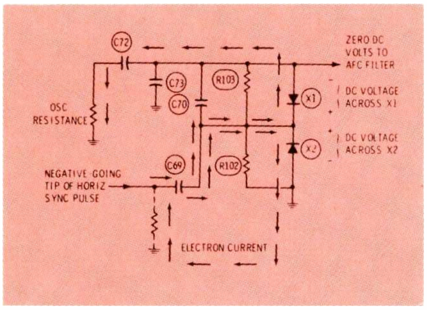


Fig. 4 Rectification of the negative-going sync signal is by shunt-type peak-reading action. This back-to-back series connection produces both positive and negative voltages which cancel to give an output voltage of nearly zero.

error-correcting voltage. Also, R103 is the load resistor, and C70 is the peak-reading filter capacitor for X2, and it supplies the negative part of the control voltage.

When these components, and the diodes, are all matched, the two rectified voltages are equal to each other, and opposite in polarity, so the output voltage is nearly zero. If a capacitor is open or leaking, or a resistor value too high or too low, the balance between the two voltages is upset and the output voltage is no longer zero.

This makes possible a very fast, yet accurate, method of testing those four components and the two diodes. Tune the receiver to a channel without any signal, and measure the DC voltage at the anode of X1 (output voltage). If the voltage is zero, or within a few tenths of a volt of zero, and the voltage at the common-cathode connection is between +6 and +9 volts (showing rectification of the sawtooth of sweep), it is virtually a certainty that all those components are normal.

Two Peak-Reading Shunt Rectifiers

The negative-going pulses of the sync signal are shunt rectified also by the same two diodes. Arrows in Fig. 4 show the resulting electron current. Rectification by both diodes occurs simultaneously at the tip of the sync pulses. This is opposite to the rectification of the sweep sawtooth, which occured alternately on the positive and negative peaks.

Although operation of the two shunt-rectifiers with sync pulses but without sweep sawteeth produces a DC output voltage that is only about .6 positive, the two shunt rectifier circuits are not identical, and the positive and negative voltages are not quite equal. In a practical way this is of no consequence, because operation without the sweep signal, but with sync, is nearly impossible in practice. The slight unbalance makes it impractical to use the shunt-rectifier mode to test the components, as was urged for the series-rectifier circuits.

Combining The Four Rectifying Actions

In actual operation, all four rectifying actions occur together. Perhaps it is more accurate to say that the mode of rectification is determined by whether the sync or sweep signal is dominant.

When the phase between the two input signals is correct and all the components are within tolerance for values, the sync voltage adds the same to both diodes, and the positive and negative voltages increase the same amount so the output control voltage is zero. Also, you remember, zero output voltage was obtained when the sync was missing. This fulfills the third basic requirement for duo-diode phase detectors, that the control voltage should be the same both on and off channel.

This situation also gives us another fast test. Suppose the horizontal oscillator is off frequency. Is the trouble in the oscillator, or in the phase detector?

Just ground the error-control voltage at the output of the phase detector (the anode of X1 is a good spot), and attempt to bring the oscillator to frequency by using the hold control. If the phase detector is at fault, you will be able to adjust to the frequency (the picture upright), and also to obtain the diagonal bars with adjustments to either side.

If you can't obtain the normal frequency, the defect is in the oscillator circuit.

Of course, there are a few similar circuits designed so the error-correction voltage is always positive. Naturally, this quick test will not work with those few circuits.

When both the sweep and sync signals are present, any difference of phase between them causes the DC output voltage to swing slightly positive or negative, and this control voltage forces the oscillator to run slower or faster to bring the sweep signal to the phase of the sync.

How The Positive Or Negative Voltage Is Developed

It is difficult to visualize how the phase difference between the sweep sawteeth and the sync pulses can upset the balance of the two rectifier systems and produce the required positive or negative error-correction voltage. One problem is that the vital waveform across X1 can't be seen with any clarity. Our solution to this difficulty will be given later. First, we need to know how the waveform across X2 is produced.

The top waveform of Fig. 5A shows the sawteeth from the sweep circuit (W4 in Fig. 1), in the center are the sync pulses (W3 in Fig. 1), and the lower waveform is a composite of the two found at the common cathodes of the diodes (W5 in Fig. 1). The sync pulses are coupled through C69 to the common cathodes, and the sawteeth arrive through R103 and C70. This triple exposure was arranged to show the correct phase between the waveforms. The lower waveform here is the same as the lower one in Fig. 5B.

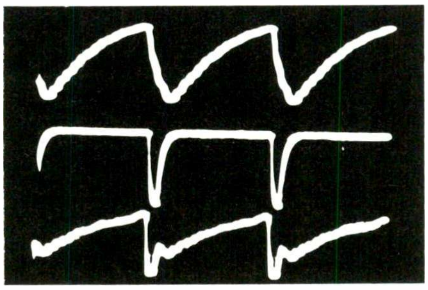
From the complete schematic, there doesn't appear to be any way for the sync pulse to affect X1. However, it is the voltage **across** X1 (not measured to ground) that is important. And the voltage across X1 is the waveform at the common cathode minus the waveform at the anode of X1. To obtain this waveform, it should only be necessary to connect the ground wire of the scope to the anode, and the low-capacitance probe to the common cathode. Unfortunately, the floating case and ground wiring of the scope applied to this ungrounded point introduces more hum than waveform. But, enough of the waveform could be seen so we could be certain of the shape, and then simulate a good waveform photographically, as shown in the top waveform of Fig. 5B. Figure 5 shows the waveforms across both X1 and X2; they are mirror views of each other.

When the horizontal oscillator starts running too slow so the sweep waveform moves to the left of the sync pulse, the pulse protrudes less from the X1 (top) waveform. At the same time, the pulse of the X2 waveform protrudes more from the X2 (bottom) waveform. Therefore, X2 is supplied with more voltage, and produces more positive voltage. (This rectification is in the shunt mode, because the pulse has more amplitude than the sawtooth.) On the other hand, X1 has less voltage, and by shunt rectification produces less negative voltage. The two voltage supplies are no longer in balance, and the output voltage is positive, which speeds up the oscillator until the phase error is nearly eliminated.

Of course, if the oscillator begins to run too fast, and the sweep sawtooth moves to the right relative to the sync pulses, opposite reactions take place, and the output voltage becomes negative to decrease the frequency of the oscillator.

Limits Of Locking

Once locked, the oscillator often remains locked, even though the phase (which affects the centering and the possible loss of burst) might be slightly wrong. At such times, the control voltage from the phase detector will **not** be zero. To learn more about horizontal locking, follow the adjustments and the normal results given next.



(A)

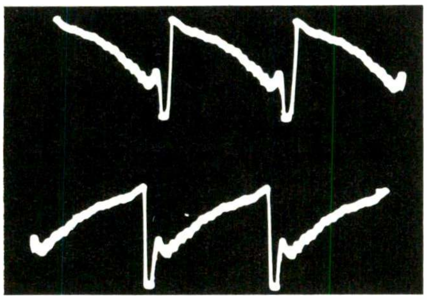
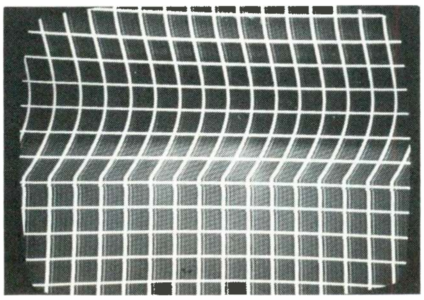


Fig. 5 Both sweep and sync waveforms are found at both diodes.

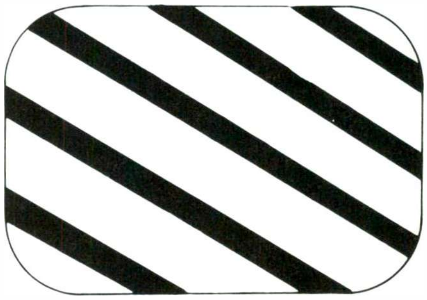
(A) Sweep sawteeth (top) added to sync pulses (center) produce the composite waveform (bottom) which is across X2 diode.

(B) The X2 waveform is shown at the bottom. At the top is the simulated X1 waveform, which is a mirror image of that at X2. When a phase change moves the sawteeth right or left, the pulses retract or protrude and this moves the zero-voltage point up on one waveform and down on the other. This action represents a voltage change to the diodes.

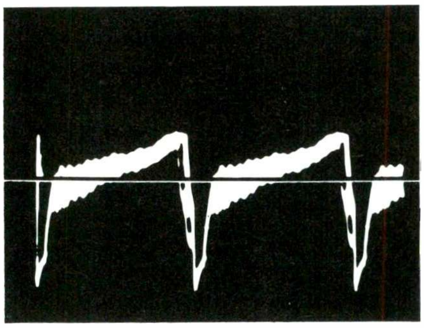


PICTURE MOVES
TO RIGHT
—LOSES COLOR

THEN



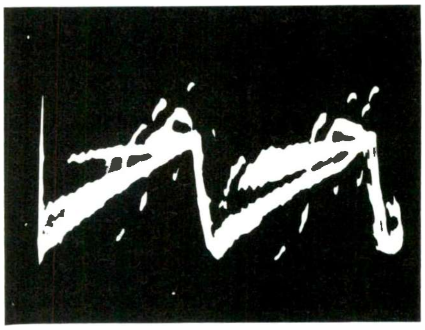
STRIPES SLANT DOWN
TO THE RIGHT
(LOWER FREQUENCY)



SWEEP LAGS THE
SYNC AT COMMON CATHODE

ANODE OF X1 +2V
COMMON CATHODES +9V

(A)



OUT OF LOCK
AT COMMON CATHODE

ANODE OF X1 0V
COMMON CATHODES +7

(B)

Fig. 6 These pictures, waveforms and DC voltages were obtained when the horizontal locking was almost lost; and after the oscillator was forced out of lock.

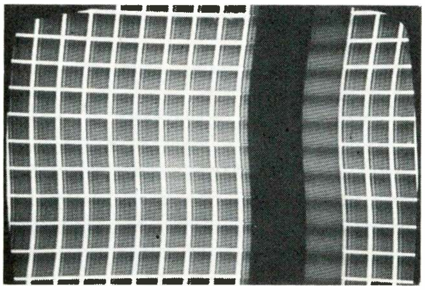
(A) The horizontal hold control has been adjusted to move the picture to the right as far as possible without loss of locking.

(B) An additional adjustment of the hold control has forced the oscillator out of lock. Notice that the DC voltages are nearly the same as those measured when the oscillator was locked correctly.

Starting with locking that gives zero output voltage from the phase detector:

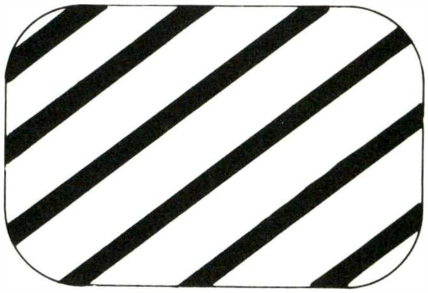
- Adjust the horizontal hold control so the picture moves slightly to the right. Go as far as possible without losing the locking.
- Voltages and waveforms of our test chassis are shown in Fig. 6A.
- Adjust the hold control more in the same direction until locking is lost.
- The new voltages and waveforms are in Fig. 6B.

Now, repeat the same adjustments, but move the picture to the left. Those results are given in Fig. 7. Notice that when the oscillator is not locked, the DC voltages are the same as for correct locking; but the waveform at the common cathode tells the story.

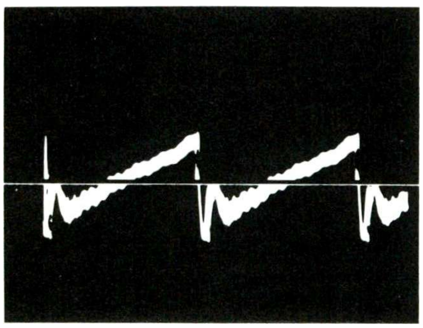


PICTURE MOVES TO LEFT—LOSES COLOR

THEN



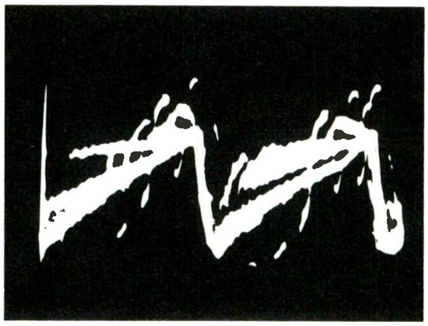
STRIPES SLANT DOWN TO LEFT *(HIGHER FREQUENCY)*



SWEEP LEADS THE SYNC AT COMMON CATHODE

ANODE OF X1 -5V
COMMON CATHODES +3

(A)



OUT OF LOCK AT COMMON CATHODE

ANODE OF X1 OV
COMMON CATHODES +7V

(B)

Fig. 7 These pictures, waveforms and DC voltages were obtained when the horizontal locking was nearly lost; and after the oscillator was forced out of lock.
(A) The horizontal hold control had been adjusted to move the picture to the left as far as possible without loss of locking.
(B) An additional adjustment of the hold control now has forced the oscillator out of lock. The DC voltages are the same as when locked.

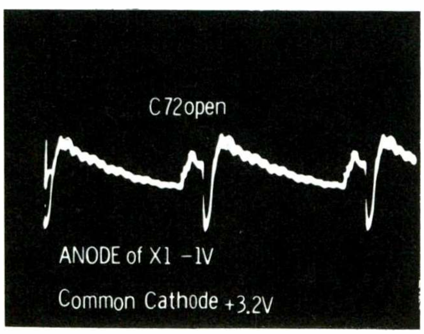


Fig. 8 An open C72 inverted and weakened the sawtooth at the common cathode terminal, and decreased the positive voltage supply. Slight leakage of C72 forced the horizontal oscillator far out of frequency.

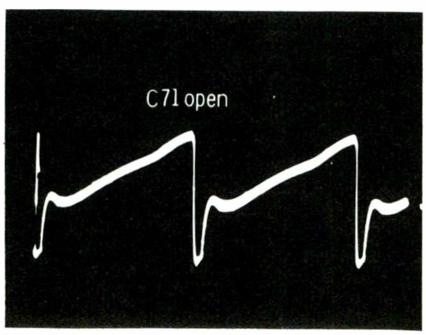


Fig. 9 When C71 was open, the picture moved about 1/2 inch to the left; but the locking and DC voltages were unchanged. The waveform at the common cathode lost the ringing that came from the flyback transformer.

Waveforms At The Common Cathode

The composite waveform at the common cathode connection of the duo-diode will be, in many cases, the only one you need to analyze. Samples of both the sync and sweep waveforms appear there, and the waveform is given in many schematics. For this reason, the common-cathode waveform is often the only one given in the following section of theory and troubleshooting tips.

C72

C72 brings the sawteeth from the horizontal oscillator to the diodes of the phase detector. An open C72 removed most of the sweep portion of the waveform at the anode of X1 and inverted (Fig. 8) the sawtooth there. The small remaining sweep was brought in by C71; therefore, the locking was touchy and the color tint sometimes was wrong.

Even a slight leakage of C72 effects the horizontal frequency. For example, leakage of only 5.6M forced the oscillator far out of frequency and caused a reading of +6.5 volts at the anode of X1.

C71

Apparently C71 brings in a small amount of pulse from the horizontal sweep system to make the oscillator lock at the point giving best centering of the picture on the raster, and also best burst keyer action. An open C71 removed the wrinkles from the waveform at the common cathode of the diodes (Fig. 9), and moved the picture about one-half inch to the left. Locking was not affected.

Leakage was not a critical factor, but leakage of 100K or less in ohms narrowed the range of locking.

C73

C73 reduces the oscillator sawtooth at the anode of X1. When C73 was open, horizontal locking became critical, and often the color was lost. AC voltages increased to 86 volts p-p at the anode of X1 and 37 volts p-p at the common cathode (Fig. 10).

(Continued on page 32)

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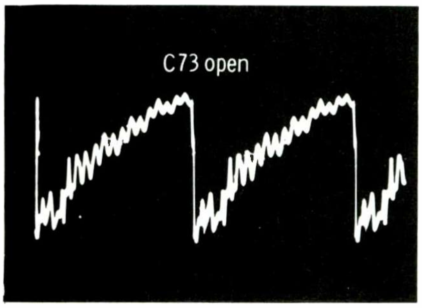


Fig. 10 An open C73 greatly increased the amplitude of the sawteeth at the anode of X1, and gave poor locking. Also, this permitted more ringing to come through C71 from the flyback transformer.

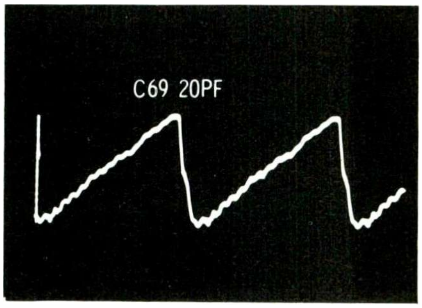


Fig. 11 Weak, critical locking was the symptom when C69 was reduced to 20 Pf. When it was open, no locking was possible. Slight leakage forced the oscillator far off frequency.

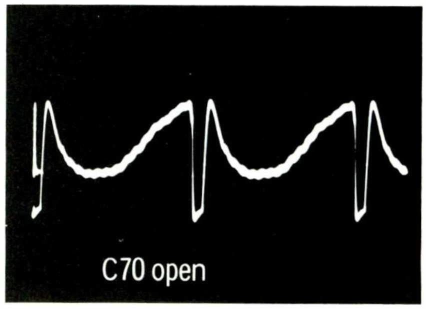


Fig. 12 More amplitude of sync pulses and less of sawteeth were obtained at the common cathodes when C70 was open. Locking range was unbalanced, with better locking in one direction and poor locking in the other rotation of the hold control.

Larger values than the normal 820 Pf reduced the amplitude of the sawtooth waveform and made the locking very critical.

Leakages of 100K or less in ohms caused touchy locking.

C69

C69 couples the sync to the common cathode of the diodes, and also acts as the input filter capacitor for X1. Therefore, defects of C69 affect the DC voltages at the diodes even when there is no sync.

An open C69 prevented all horizontal locking. A DC voltage of +4.6 was measured at the common cathode. A value of only 9 Pf barely permitted locking. Notice the waveform in Fig. 11.

Even a slight leakage of C69 affects the horizontal frequency. For example, a 1M resistor paralleled across C69 forced the oscillator far out of frequency. At that time, the common cathode connection measured +14 volts DC, and the anode of X1 was +4 volts.

C70

C70 is the peak-reading filter capacitor for X2. The exact value determines, to a large degree, the equal balancing of the two voltages.

An open C70 (waveform shown in Fig. 12) caused tighter locking in one direction of the hold control, and poorer locking in the other rotation. The anode of X1 measured −1.5 volts, and +4.8 volts was measured at the common cathode connection. As you can see, the positive voltage supply was decreased.

Moderate leakage didn't change the locking, although leakages worse than 180K reduced the positive voltage at the common cathodes.

R103

R103 is the DC load for the series voltage from X2 or the shunt voltage from X1, therefore the exact value affected the DC voltages both on and off station.

When R103 was open, there was no horizontal locking, and the DC voltage at the common cathodes increased to +9 volts. Lower values of R103 moved the point of locking, and decreased the positive voltage at the common cathodes.

R102

Because R102 is the DC load for the shunt voltage from X1, and the series voltage from X2, we might expect its values to give results just the reverse of that of R103. Not quite true. An open R102 moved the point of best locking to one side of the hold control, and also increased the positive voltage at the common cathodes to +8 volts. Lower values of R102 caused ineffective, critical locking.

R104

R104 is a filter resistor which, in conjunction with C75 and C74, slows down the speed with which the oscillator frequency is changed. It helps prevent "piecrust".

Values below 51K ohms made the locking more critical, and less than 4.7K ohms caused bending of the picture. Values above 680K caused large bends of the picture.

C75

C75 acts with R104 to slow down the change of oscillator frequency. An open C75 made tighter locking on one side of the adjustment, but the oscillator had a parasitic oscillation when locking was lost on the high-frequency side.

Slight leakage has no noticeable effect, but leakage more serious than 100K should be avoided.

C74 and R105

These two components wired in series are a storage device to prevent the DC control voltage to the oscillator-control tube from changing too rapidly. When either was open, there was "piecrusting" of the vertical lines of the picture, as shown in Fig. 13.

Slight leakage of C74 made no difference in the locking.

A value of less than 10K ohms for R105 produced some bowing of the vertical lines in the picture. When the value was zero, the picture bending was tremendous, sometimes moving nearly the width of the screen.

Loss of Sync

Loss of sync pulses from the sync separator made locking impossible. As shown in Fig. 14, no sync pulses appeared at the common cathode connection of the diodes, but the DC voltages were nearly normal.

Defects Of The Diodes

Defects of the duo-diode are likely to cause most of the trouble

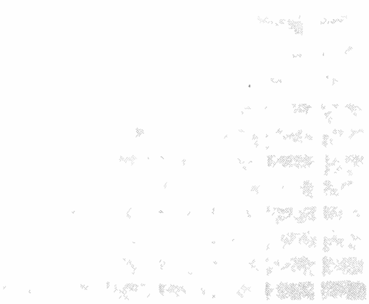


Fig. 13 This "piecrusting" was caused by an open in either C74 or R105.

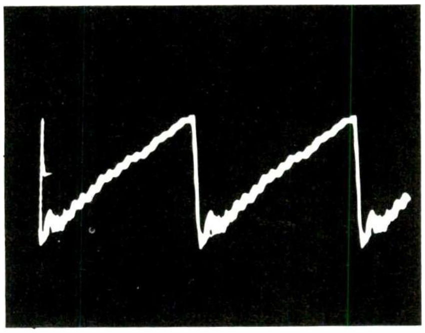


Fig. 14 When the sync separator stage was dead, no sync pulses were present at the common cathode.

in this circuit. Many of these diodes are selenium type, and they are difficult to test accurately with an ohmmeter. For example, even with new units, forward or reverse readings of the two sections seldom are matched.

When X1 is open, X2 functions as a shunt rectifier, and the output measures several volts positive. And when X2 is open, X1 functions as a shunt rectifier, and the output is several volts negative.

Horizontal locking is not possible if either diode is open or has serious leakage.

Summary

Because some defects affect the DC voltages but change the waveforms very little, and others operate just the opposite, it is recommended that you check **both** DC voltages and waveforms. Then analyze the defect using the method which is most useful in that particular case.

You should find it much easier to troubleshoot duo-diode horizontal phase detectors after you know the function of all components in the circuit. ☐

The most common car radio defects

By Joseph J. Carr

Use this checklist to save time when you repair recurrent defects in late-model car radios. For the beginner, it can be a guide to typical problems. If you are an old-timer, use it as a reminder.

Don't be surprised if my list of the most common defects doesn't agree with your experience. Local climatic conditions change the types of failures. For example, most of my work has been in humid areas near the Atlantic Ocean where leaking and noisy trimmer capacitors are a constant problem. But, a tech in Arizona might never find one.

Weak Volume

When the 1000-mfd 4-volt electrolytic capacitor of Fig. 1 opens, audio degeneration causes weak volume in Bendix radios.

Because the open capacitor doesn't change the DC voltages, you must use other tests to locate it. Perhaps the easiest and most positive check is to parallel the suspected one with a new capacitor of the same rating. A sudden return to full volume proves that the old capacitor is open.

A defective output transistor produces similar audible symptoms; both defects cause weak volume. However, the sound will be weak and undistorted with an open capacitor, but weak and distorted when the transistor is bad. After experiencing both troubles, you should begin to develop a "feeling" for the subtle differences of sound quality that will enable you to diagnose by listening.

In some instances, the Bendix distributor might fill your order with a capacitor having a different suffix number. Usually this substitution is satisfactory. Except for use in the radios from some imported cars. When working with these few types, use a replacement which is no larger than the original. Otherwise, you will find it impossible to replace the back cover.

No Sound, And Low Current

No audio and abnormally-low "A" current are the first symptoms you are likely to notice when the silicon NPN output transistor (Fig. 2) is defective in Bendix radios manufactured after 1967.

Typically, the base-emitter junction opens. When you measure the DC voltages, the base-to-ground voltage (normally about 2 volts) probably is higher than 8 volts. Such a high base voltage applied to a non-defective transistor would saturate it. Because the collector current actually is less than normal, this indicates on open base circuit. Verify the defect by using an ohmmeter or an in-circuit transistor tester.

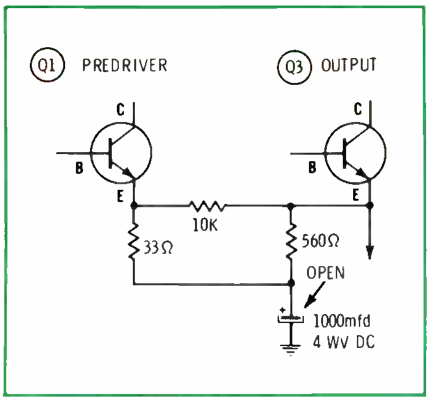


Fig. 1 Low volume without distortion often is caused by an open 1000 mfd capacitor which allows audio degeneration in Bendix car radios.

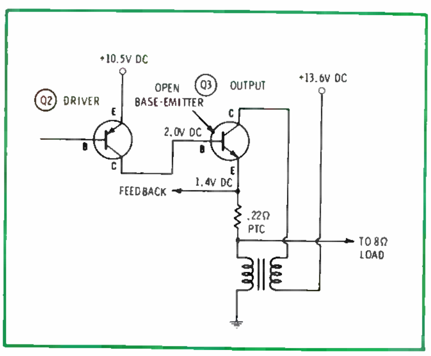


Fig. 2 No audio and insufficient "A" current often are produced by an open base-emitter junction in the output transistor in Bendix radios supplied after 1967. Excessive voltage at the base of the transistor Q3 is a good clue.

Early-production transistors were made on an exposed metal base of the TO-3 type. The transistor was molded into a pellet of blue epoxy, and welded to the base plate. Later versions were in P-66 style plastic cases similar to some RCA's. This type was mounted with a metal end-tab to the heat sink. Plastic transistors of the Motorola style were mounted to the heat sink by a machine screw through a hole in the plastic body of the transistor.

After you have determined that the transistor is bad, there are three ways of handling the repair. One is merely to replace the transistor with a Bendix of the same part number.

Or you might want to increase the safety factor by reducing the current and heat of the replacement transistor. A change recommended by Bendix for certain models used in Fords is to add a 15OK 1/4-watt resistor in parallel with the 68K base-bias resistor in the first audio-preamp circuit.

Probably the best solution is to replace the output transistor (or both, if the unit is stereo) with one having a larger wattage rating. One suitable replacement is the type 2N3055, which is popular in home-type hi-fi machines. Because the power requirements of car radios are low, the selection of a higher-rated replacement is not critical.

You can buy at the local distributor of Bendix car-radio parts a modification kit containing two TO-3 silicon NPN power transistors and all the hardware needed for mounting them.

Also available are TO-66 NPN silicon transistors for use in any radios having holes in the chassis for this style. Some Bendix radios, such as those made for Chryslers, used this type as original equipment. And Philco-Ford radios have mounting holes pre-cut for the TO-66 type. Mounting is easier, however, if you use a socket from some pre-69 Philco model.

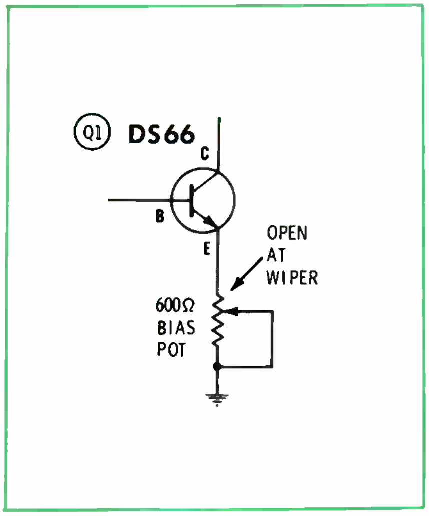


Fig. 3 In cases of intermittent volume or distortion in Delco radios built since 1966, look for an open bias potentiometer in the emitter circuit of Q1.

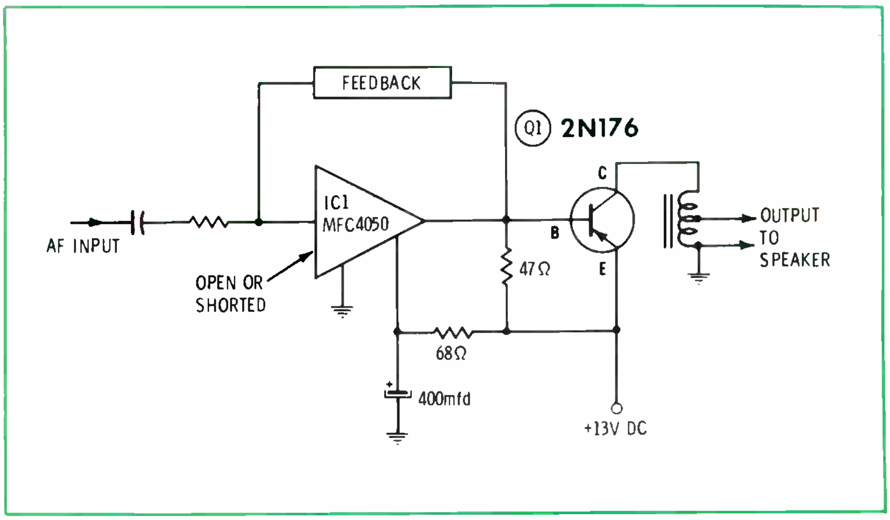


Fig. 4 No audio, and excessive collector current which makes the output autoformer smoke or burn might be caused by a defective IC used as audio driver in Motorola radios built for Chrysler and Volkswagen.

Many Bendix radios which already use the P-66 type transistors are pre-cut for one or two TO-3 types. In most cases, the cut-outs are on the front section of the radio on each side of the dial bezel. Unfortunately, in the '69 and '70 Galaxy/LTD series, you must drill the four holes needed for each transistor.

A molded socket is preferred whenever the holes are drilled, because the wafer type might permit the collector to touch ground. Also, covers for TO-3 type transistors are available, if you want to be extra certain there will be no shorts.

No Sound, But Transistor Is Normal

Not all dead audio channels in post-'67 Bendix radios are the result of open output transistors. Open windings of the audio-output transformer can also kill the audio.

In many Ford radios, the output transformer is soldered to the circuit board. Vibration can loosen a soldered joint, or a wire of the winding might break where it is soldered to the lug of the transformer. Give that area a good visual inspection to save time. Most of these defects can be repaired by careful soldering.

Intermittent Distortion

Intermittent volume or distortion often can be traced in post-'66 Delco radios to the bias potentiometer (Fig. 3). Older types of pots tend to open at the wiper contacts.

Opening the emitter circuit of the pre-driver causes the output transistor to saturate and draw excessive current. One tell-tale sign is discoloration of the fuse-resistor protecting the emitter circuit of the output transistor.

Check the pot this way: Lightly tap the lugs of the bias pot while you monitor the current drawn by the entire radio, or the collector voltage of the power transistor. Any radical change of meter reading indicates a defective pot. Replacement is the best and most permanent cure.

No Sound, Might Smoke

When there is no volume, late-model Motorola radios made for Chrysler and Volkswagen might have a defective Integrated Circuit (IC) which is used as audio preamp and driver. This IC is number MFC4050, and has only four terminals.

Because the IC is direct-coupled to the 2N176 output transistor, bias voltage and collector current of the output transistor are affected drastically by conditions in the IC. These IC's either open or short (as do most solid-state components) when they fail.

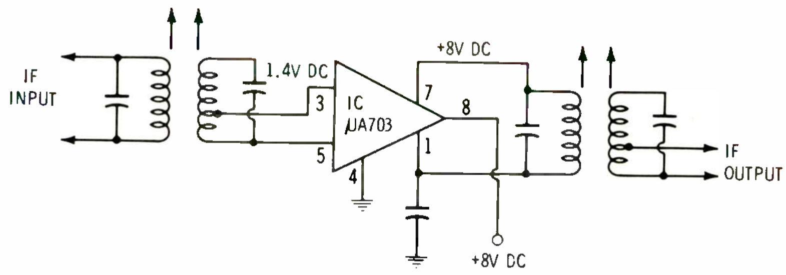
A shorted IC reduces the base voltage of the PNP-polarity 2N176. This increases the forward bias, and the collector current approaches saturation. In fact, the choke which serves as output transformer can be cooked and ruined by the excessive current, if the radio is operated too long in this condition. The burned choke is the source of the smoke which arises in some cases.

Test for the possibility of excessive forward bias by connecting together the base and emitter terminals of the 2N176. If the collector voltage drops to zero, or if the drain of the receiver decreases sharply, we must assume the IC is shorted and increasing the bias. But if the excessive current continues, the 2N176 probably is shorted. Conversely, an open IC biases the 2N176 to cutoff, eliminating the collector current.

To test for an open IC, connect a 100-ohm resistor from the base of the 2N176 to ground. If this causes a collector voltage, or if the "A" current to the receiver increases, it is a good bet the IC is open. However, if these results are not obtained, the output transistor probably is open.

Next, test the IC by connecting

Fig. 5 Weak sensitivity on FM or loss of stereo in Motorola car radios often is caused by a defective IC used as the IF amplifier.



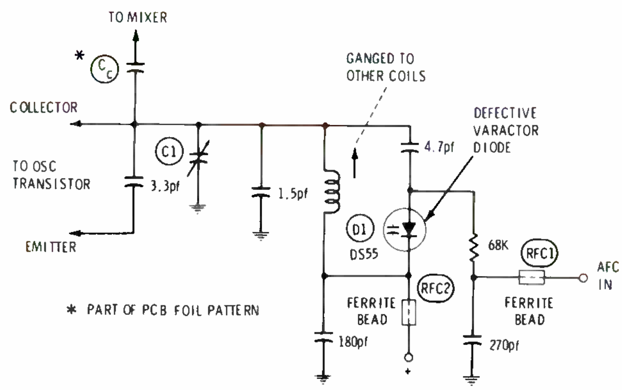


Fig. 6 Sudden shifts of tuning are most likely to be produced by defective varactor diodes used in the AFC circuit of almost any car radio with FM.

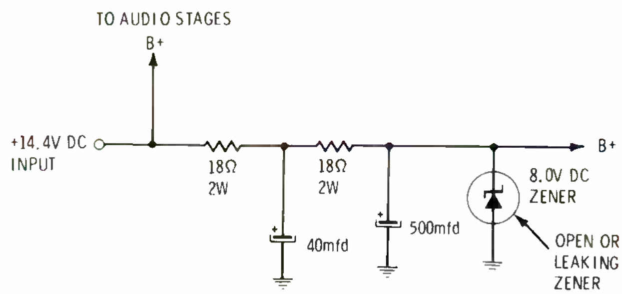


Fig. 7 Leakage in the zener voltage-regulator diode gives the same symptoms as a dead IF stage. A shorted zener kills all reception, and an open zener causes erratic tuning which varies with the motor speed.

a high-value resistor (around 470K) between the +12 volt supply and the input terminal of the IC. If the IC is good, this should increase the forward bias of the output transistor so it draws more collector current. No change output current indicates an open IC.

It is advisable to use a Motorola Semiconductor Products MFC 4050, or the equivalent in the Motorola HEP line for replacement.

Weak FM Reception

Loss of stereo effect and weak sensitivity of the FM band often are caused in Motorola receivers by a bad IC used as the IF amplifier on FM (see Fig. 5).

This IC, a version of the popular Fairchild μA703, is basically a differential amplifier, internally stabilized by diodes. Some newer replacements are packaged in a metal housing similar to the TO-5 transistor. These are regarded generally as being more reliable than the older plastic ones. Replacements are available from MAPI or Motorola Consumer Products distributors, and other sources. Carefully check the HEP substitute, because it's different mechanically.

Most defective IC's change the DC voltages at the terminals. But, other failures leave the DC voltages undisturbed, and such cases require signal tracing to locate the dead stage.

Drift Or Shift Of Tuning

Defective AFC varactor diodes, such as the one shown in Fig. 6, can cause a slow drift or a fast shift in tuning. Or certain defects might stop all FM reception. A shorted or open diode can stop the oscillation, or change the frequency so much that no stations can be tuned in.

Drift is caused by heat changing the junction capacitance of the AFC diode or the oscillator transistor. In either case, any slight normal drift should be cancelled by the AFC action. On the other hand, loss of the error-correcting DC voltage at the diode permits the normal drift to become noticeable. Cases of drift originating in the oscillator circuit are quite rare.

The varactor diode is the prime suspect in a radio that has sudden large frequency shifts. Replacement of the diode is the only sure cure. Because most diode frequency shifts are triggered by heat cycles, spraying the diode with coolant often causes the shift to occur

(Continued on page 38)

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Circle 18 on literature card

(Continued from page 36)

under controlled conditions which helps prove the diode is defective.

Be careful to check for other causes of shift. Loose or cracked trimmer capacitors, cracked circuit boards, and loose screws holding the boards all have been mistaken for defective AFC diodes.

Weak Reception, Or Drifting Tuning

Weak reception without noise between stations, or a drift of tuning which changes with speed of the car engine, can be caused by opposite defects of the zener diode which regulates the voltage to some stages (Fig. 7).

When leakage of the zener drops the voltage as low as 2 to 4 volts, the effect is similar to that of a dead IF stage: strong signals come through okay, but the sensitivity to distant stations is low. Test for this possibility by disconnecting the zener. If the supply voltage shoots up above normal and the sensitivity returns, the zener definitely is bad. A shorted zener kills reception.

When the stations are tuned out by accelerating the car, and drift back when the engine idles, suspect an open zener diode. This effect is more noticeable when the car battery is weak or nearly discharged.

One Stereo Channel Intermittent

Intermittent operation of one stereo channel in Bendix FM car radios often can be traced to the separation control. This control is in the emitter circuit of the buffer amplifiers in the multiplex section, as shown in Fig. 8.

A light touch on the terminals of the pot usually triggers the intermittent. If you are tempted to take the easy way out and merely reset the pot, remember that this gives only a temporary "cure" which decreases the stereo separation. Replacement of the pot is recommended.

Loss Of Stereo, Or Loss Of Sound

A loss of stereo effect (both channels playing the same audio) occurs when the sub-carrier is killed by a defect in the IC used as a stereo-decoder (Fig. 9) in Motorola radios. Test for the sub-carrier by using your scope at the 19-KHz coils which are outside the IC.

Other defects inside the IC can kill both channels of audio. Use DC voltage analysis and signal tracing to find where the signal is lost.

Three different IC's, MC1304, MC1305 and MC1307, have been used in various models of Motorola radios. Check the service data before replacing an IC.

Usually, these IC's are lower in price when purchased from the distributors of Motorola Semiconductor Products than when bought from most other sources. □

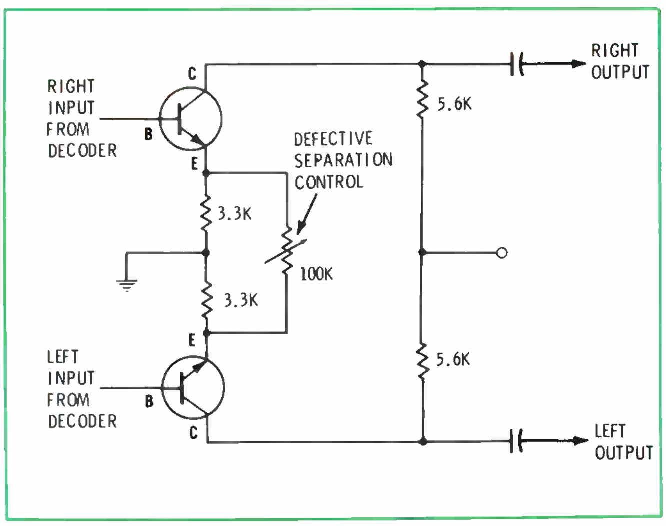

Fig. 8 A defective separation control often causes intermittent operation of one stereo channel in Bendix FM-stereo car radios.

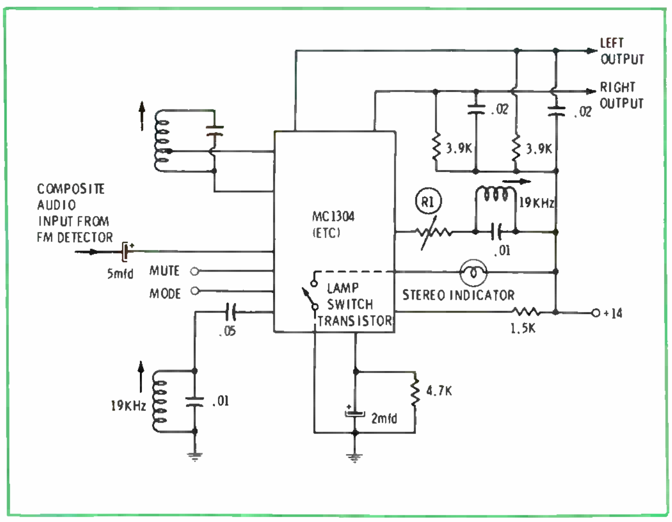

Fig. 9 Loss of the stereo effect is produced by defects of the IC used as the stereo-decoder in Motorola FM-stereo radios. Usually this is caused by loss of the 19-KHz carrier, and can be verified by use of a scope.

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Circle 20 on literature card

Both Serv-A-Set shops are in attractive shopping centers. This provides adequate parking and encourages carry-in service.

Serv-A-Set builds success on planning and promotion

"We have to search constantly for new ideas, break old habits that are no longer useful, and keep upgrading our business."

by John Stapp

Only three years ago, Jim Ballard opened the first branch of Serv-A-Set, Inc. Today this San Francisco area company is the fastest growing television service business on the West Coast, and Ballard, the firm's president, sees continued rapid growth ahead. A second shop has been opened, and two others are planned. In one year, the two shops serviced over 7,000 TV sets.

This phenomenal growth didn't happen by accident, but resulted from long and thorough planning of every aspect of the business.

Jim explains it this way: "Before opening Serv-A-Set, I traveled the country for three months, looking at service shops and gathering information on what procedures they used and what their problems were. The service order form seemed to be a major problem. Consequently, I worked with a marketing company in designing a service order that overcomes the problems of misunderstandings between the shop and its customers."

Service Order Forms

It seems strange for a shop manager to be so concerned about service orders. They usually get a low priority. **"Our complaints are nearly zero, and this is largely because we use our service order form to establish the first line of communication with the customer.** Our service orders are complete in every detail. There's no room for misunderstandings. Basically, we consider the service order the prime tool for reeducating the public on honesty in service. Everything pertinent to the repair goes on our service order—what **needs** to be done, what **is** done, and what the work is

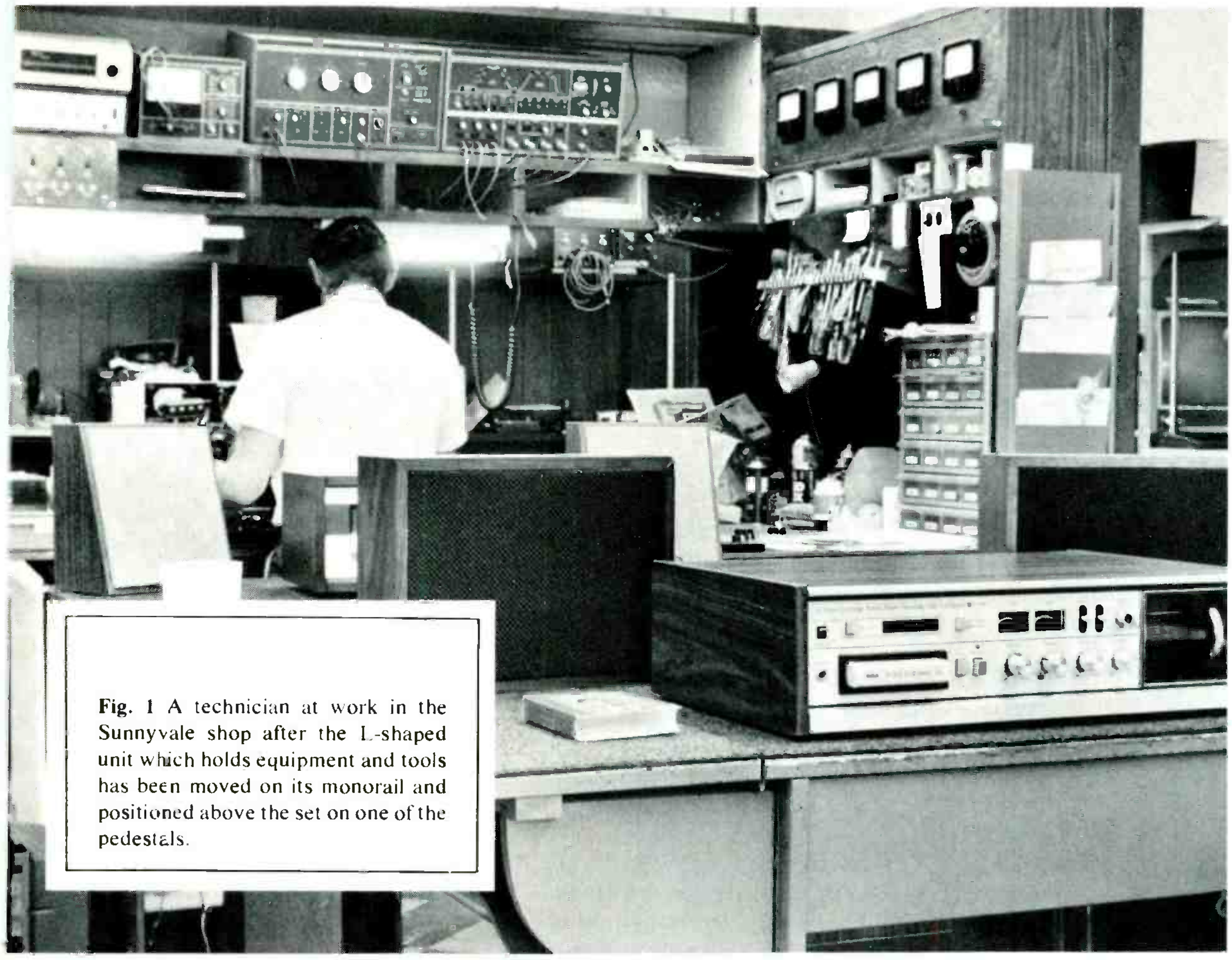

Fig. 1 A technician at work in the Sunnyvale shop after the L-shaped unit which holds equipment and tools has been moved on its monorail and positioned above the set on one of the pedestals.

going to **cost**—and it's signed by the customer who gets a copy for his own records."

Ballard goes on to say that some TV servicemen resort to near-fraudulent practices in order to make ends meet. He believes they do this because they charge 1949 prices in 1972. "Our service order tells it like it is, so the customer knows just what he's paying for, and knows he's not getting jabbed by the service technician."

After the serviceman inspects the set, usually in the presence of the customer, he places a check mark in front of the items or circuits that **should** be repaired for optimum performance. If the customer decides to have only a part of this work done, this also is marked on the service order.

All parts are individually itemized and priced, separate charges are listed for technical shop labor, field service, and removal-and-reinstallation.

Unique Shop Layouts

Following this nationwide inspection of service shops, Ballard designed his own unique shop layout.

Serv-A-Set's shop layout is unusual, in that it eliminates the bench-type operation, substituting a

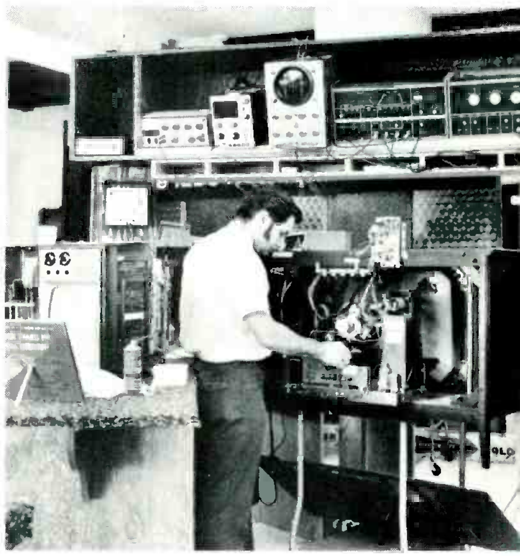

Fig. 2 In the Campbell shop, a "carousel" holding the test equipment circles above the work pedestals, which are arranged in a semi-circle. This system was designed for use in a shop that's wider than it is long.

Fig. 3 A carry-in service counter has all the equipment necessary for most repairs. Minor repairs are made as the customer waits. Notice the low lift-through section of the counter which is carpeted to avoid scratching portable television sets.

"continuous flow" system which moves the shop service man and his equipment to the set, rather than moving the set to the bench.

Ballard declares this continuous-flow system, which makes use of all the latest test equipment, is **seven times more efficient** than the usual bench-type shop system. His statistics show that a single shop man can repair as many as 140 TV sets a month.

While the two Serv-A-Set shops are both organized on the continuous-flow system, there is some variation in design and layout.

At the Sunnyvale shop, which is long and narrow, five pedestals were built instead of benches (Fig. 1). These extend in a straight line from front to rear of the narrow shop.

Test equipment and tools are carried on an L-shaped cabinet which moves on a monorail alongside the pedestals, with the top of the "L" extending out over the pedestals (Fig. 1).

With this monorail system, the service man can have five sets in various stages of repair or cooking without having to remove the sets from the pedestals. He easily pushes the L-shaped unit holding his equipment and tools along the monorail until it is centered at the pedestal where he plans to work next.

At the Campbell shop (Fig. 2), which is wider than long, the same system is used, except that the pedestals are built in a semi-circle, and the equipment and tools ride on a "carousel" which turns in a circle.

Both systems are equally efficient, Ballard emphasizes, making possible the application of "assembly line" procedures in the shop operation. Normally, one service man and an apprentice handle the shop work at Sunnyvale, and one service man handles the Campbell shop.

"Of course, we're also constantly buying the latest equipment, when it proves out," Ballard continues. "Cost of equipment is a small factor in overall costs, and it certainly makes a big difference in the time a man spends on the job."

Coping With Changing Technology

While Ballard is optimistic about the service business, predicting an increase of more than $1 million a year in his TV service operations during the next five years, he believes the small owner-operated service shops will have to develop more efficient operations or an increasing number will fail.

"Too many shop owners do not have time to keep up with changing technology while also handling the management aspects of their businesses," Ballard points out.

"Just three weeks ago, for example, we bought the business of a service shop at an IRS sale. In the three weeks since buying this business, we've done four thousand dollars in work for this shop's customer accounts. What was the matter? Why did a shop with a volume of more than $1,000 a week go broke? The answer is lack of efficiency."

Making The Work Profitable

Shop design and up-to-the-minute procedures are only part of Ballard's program for developing the highest possible efficiency.

Concentration on work that is definitely profitable plays a part. Serv-A-Set services 17 makes of TV sets, but politely declines the oddballs. The main problem with the latter is not isolating the trouble, but finding the replacement parts.

To maintain profitability at all times, Ballard periodically analyzes every shop ticket.

"We can't lose money on one service job and hope to make it up on the next one," Ballard declares. "Every six months, I find the time to sit down and go through all the

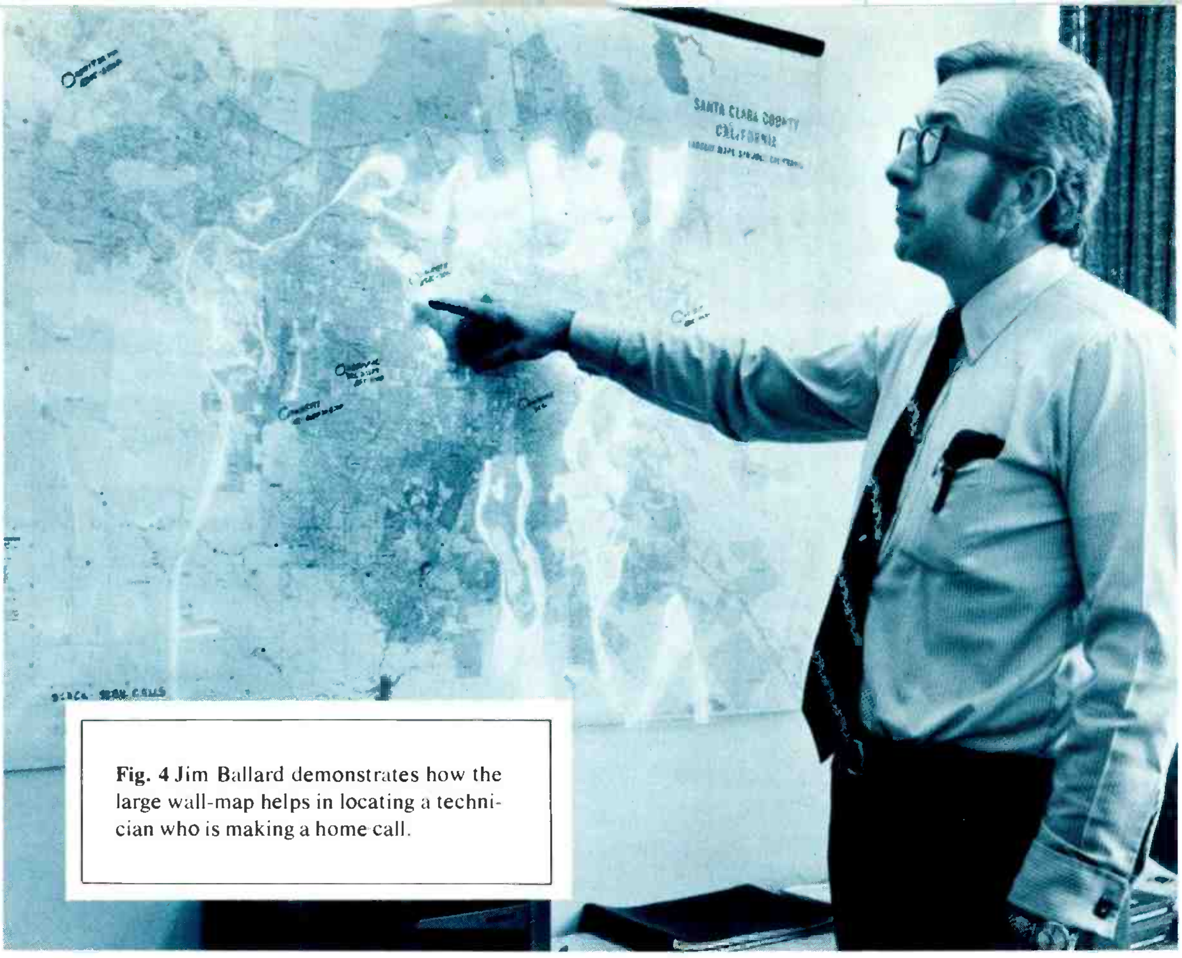

Fig. 4 Jim Ballard demonstrates how the large wall-map helps in locating a technician who is making a home call.

tickets to see if we have to tighten up anywhere along the line. I add up, by brands, the total labor time spent on each repair. Therefore, we know what it costs us to service each brand. **And believe me, there are significant differences which, if not taken into consideration, eventually will lead to losing money on certain brands.''**

All Labor Is Listed By Time

All labor time is recorded on the service orders in one-tenth of an hour segments (six minutes per tenth).

Ballard explains, ''If, for example, I see .4 of an hour on several tickets covering a repair of a particular make, but the price we're getting covers only .3 of an hour, then we have to raise our price on that repair.

''The only alternative would be to cut down on the components or on the quality of the work, and that would mean a loss of customer satisfaction. On the other hand, we've found there is absolutely no complaint when we have to raise prices.''

All antenna work is subbed out. It's a different ball game that doesn't fit into the operation. For the same reason, there are no retail sales except for a small traffic-building display of items for easy-to-fix, do-it-yourself repairs. This is self-selection. Shop men don't ''wait on trade.''

Carry-In Service Is Encouraged

Serv-A-Set's business is now 60 percent in-home service and 40 percent carry-in, but a program is under way to increase carry-in service to 50 percent of the dollar volume by the end of 1972.

Anyone telephoning for in-home service is told he can save money by bringing the set into the shop: at least $18.50 (the charge for a house call) and possibly an additional $15.00 for pickup and delivery, in the event the set must be brought into the shop for service.

The campaign is getting results and more people are now bringing in sets, including even a few consoles. Ballard considers it well worth the effort, because shop service is more profitable than in-home service.

Customers Watch The Repairs

The customer-service area at th front of the shop is designed to encourage carry-in service.

Test equipment is built into the counter (Fig. 3) and the customer is encouraged to stay and watch the service man make a thorough checkout to pinpoint any malfunction of the set. This check-out procedure is called ''preventative service''—and it's **not** free. A $9.50 charge is made if the repair is refused.

Carry-in repair service (b-w or color) is $15.50 minimum plus parts. The average time required for carry-in repairs is approximately 22 minutes. Approximately 70 percent of the sets are repaired while customers wait.

''We have very, very few objections to our policy of not giving free estimates,'' Ballard says. ''Less than one person out of a hundred picks up his set and walks out when we explain we charge $9.50 for checking out the set, if he decides not to get it repaired.''

Outside Service Improves The Image

The Serv-A-Set technician making house calls has to be more than a skilled service man; he must be pleasant and diplomatic as well. He wears a navy-blue tie with the CSEA emblem on it, a blazer with coordinated dress slacks, and a white shirt. He carries his tools in an attache case.

"Look like a pro and you feel like a pro," Ballard says. "If you look efficient, you feel efficient, and you **are** efficient. Yes, to many consumers, service costs seem high. But, they recognize that the man who looks like a pro and acts like a pro is probably worth the money they have to pay for service."

It costs Serv-A-Set $14.07 to ring a door bell when the service man averages eight calls a day. Serv-A-Set charges $18.50 for a house call in a trading area where quite a few others are getting only $10.95—and, Ballard adds grimly, probably facing bankruptcy, or being forced to cut corners to make up the difference.

Technicians Get Top Pay

Serv-A-Set pays the top dollar in technicians' wages and fringe benefits, puts the right man on the right job, then expects a lot.

There are now four outside technicians, and Ballard plans to add three more by the end of the year. He prefers graduates of the Philco-Ford technical schools.

Procedures For Outside Calls

A new outside man is given a standard truck inventory and has one day to check it out before going on a route. He signs the itemized list of his truck inventory which then becomes a perpetual inventory, checked every six months by management for possible shortages.

The truck inventory was set up after a study was made of the components most needed for in-home repair service. An 89 percent completed-in-home record is now being achieved.

Daily route sheets are made up by an "early man" who lines up house calls on each route in order, and lines up the sets in the order of return. He also sets out the parts and components to bring the truck inventory up to the perpetual inventory list.

Stops for the day then are flagged on a large wall map which is covered with plastic (Fig. 4). Grease crayons are used to make a black mark for a service call, yellow for a pickup, and red for a delivery. Everything is ready to go by 9 a.m., so there's no reason why outside men can't start rolling at 9:10 a.m.

Route areas are closely plotted for efficient operation and the service charges are based on the same one-tenth of an hour system that prevails in the shop.

Checking Performance Of Outside Techs

Outside service technicians are completely aware that management is not only going to check out their work orders for accuracy, but also is going to spot-check their in-home performance. Once a week, Ballard or the shop foreman selects three calls at random from each route. There is no set day for this and service men never know the day when the spot-check is to be made.

"We follow right up behind the technicians before the calls get cold," Ballard explains. "We have a checkout list for each set—the same as that appearing on the service order. After checking over the set to verify that it's working properly, we'll ask the customer a few questions: What time did our service technician get here? What time did he leave? Was he neatly in uniform? Do you have any complaints about him?

"After thanking the customer, we give him or her a certificate entitling the customer to a dinner for two at one of our better restaurants. This makes quite a hit and gets us talked about favorably in the neighborhood—along the line of 'Look how careful they are. They came back and went over the set again and then gave us two dinners just for telling them what the man had done.' This pays off tremendously for us, we find."

The "Gig Sheet"

A monthly "gig sheet" is prepared from information collected on these random surveys, and from any other customer complaints. At the regular monthly meeting, the technician who drew the fewest complaints is awarded at least $20, and sometimes as high as $50, the exact amount being determined by throwing darts.

During the course of the monthly meeting, Ballard discusses any necessary changes in procedures. This information also is posted on a bulletin board. In addition, each technician gets a Xerox copy of the service problems discussed.

"All our service men carry a monthly 'burden,' based on office and overhead expenses," Ballard says. "The burden is set as a quota and expressed in dollars. What we shoot for is three times wages, although we average two-and-one-half times. It's important not to put the burden too high because we might lose control over quality."

Any repeats because of unsatisfactory in-home repair work are added at retail price to the outside technician's next month's burden. Technicians understand, according to Ballard, that this is essential to running a profitable operation, and he's had no beefs about the policy.

Parts Inventory Control

Parts inventory control admittedly is something of a thorn in the side for Serv-A-Set. With a $10,000-$15,000 inventory, Ballard aims for a 90-day turn but is not getting it.

The main problem, he adds, is model changes. Serv-A-Set is now in the process of setting up a model stock in an effort to establish better turnover.

"Our practice, at this point, is not to keep anything in stock over three years," Ballard says. "When it gets that old, we donate it to the schools. We'd have to sell it at two-hundred percent more than list price to come out on it, so we're better off getting rid of it."

Advertising

Serv-A-Set's advertising program is directed, first, to holding old customers and, second, to winning new ones. Every service customer costs $11 to find, Ballard declares, but the problem is: how to hang onto them?

"Here's a good test of your standing with your customers," he says. "Go through your file and pick out at random the names of ten customers. Telephone each one and ask them what service company they call when they need service. I did this about a year after starting and found out that three out of ten of my customers didn't know the name Serv-A-Set. That really gave me something to think about!"

Thinking about it, Ballard decided it was necessary to remind customers about Serv-A-Set at least twice yearly.

Therefore, during the Christmas season, Serv-A-Set sends out a small gift—a potholder or perhaps a calendar, always with the shop name, address, phone number, and an advertising message imprinted on it—and always something the customer will keep and use. Then during the summer, a pre-Fall check-up special is offered at $3.00 off (this is the only special Serv-A-Set ever offers).

Two means are used to reach new customers. Everyone moving into the suburban communities covered by Serv-A-Set receives a welcoming letter and a sticker to go on the set. Newcomers are likely prospects since they'll sooner or later be looking for a service shop.

To reach the general trading area, advertising folders are placed under windshield wipers of automobiles parked at nearby shopping centers. Their present folder, printed on a good grade of heavy paper, costs nine cents each in lots of 10,000.

"We learned our lesson early about not wasting money on cheap-looking fliers," Ballard says. "After we put out one such flier, we got calls from two shopping centers to come out and pick up our trash off their property. This taught us that unless it's quality, it's money thrown away. Now we put out a good-looking folder and it gets results."

New Ideas

Ballard is always devising new ways to sell service. Three months ago, he introduced a 6-year warranty on color TV tubes. The warranty runs from $20 minimum to $27.75 maximum, depending on the make. This is getting lots of attention.

He has also introduced, with good results, a maximum labor charge of $56.50 for in-shop service. Logging shop-service costs over a six-month period, Ballard found the labor charge on any repair job seldom exceeded that amount. He is widely advertising the $56.50 maximum labor charge and finds it creates a favorable identity for the progressive young company.

"We have to search constantly for new ideas, break old habits that are no longer useful, and keep upgrading our business," Ballard concludes.

"As we see it, there's going to be a wide-open future for electronic servicing—such things as video tapes, computerized TV sets, instant replays that will record a program when you're out of the house and play it back to you when you get home.

"At the same time, there will be changes that seem to be for the worse. The modular portable is one example. The man who's now changing his own tubes is just going to start changing boards. We're already planning for this new situation, and we're setting up test-board jigs and a module exchange system to take care of this new development when it hits.

"The service business is a very good business—if we stay on top of it." □

Cut your depreciation losses

Losses by depreciation are inevitable. Use these suggestions to minimize this part of your expense.

by Robert G. Amick

Depreciation Is Normal

There's a bit of doggerel that goes: "Use it up, wear it out, make it do, or do without."

The pressure of modern-day business doesn't often allow us to follow that suggestion. But the little verse does point up a natural aspect of owning something. Through the action of time—either as wear, erosion, corrosion, consumption or obsolescence—almost everything you own loses value.

This loss is called **depreciation.**

In your business, this loss of value is an expense. It's part of your cost of doing business. (Remember, from our earlier discussions, we defined an expense as an outlay that reduces capital.)

The furniture, equipment, tools and trucks you use in your business begin a constant march from the dealer's shelves to the junkyard the minute you acquire them. When you bought them, their value was what they cost; a month later, a part of this value already is lost. Your truck is "like new", but it's still a used truck, and you couldn't get your purchase price out of it if you were forced to liquidate. Ten years after you bought it, it might have practically no value at all, except as junk.

So, over ten years, that truck depreciates from a $3,000 item to one worth $100. The difference between what it cost and its salvage value is $2,900, and that's its depreciation. If you figure it over ten years, that averages $290 per year.

Depreciation and Bookkeeping

Accounting for depreciation in your bookkeeping system is essential. If you remember our early discussions of the Balance Sheet, or Financial Statement, you'll see why. The Balance Sheet shows the value of your business at the close of an accounting period. If your Balance Sheet still carries your equipment at its new value, it **overstates** the value of your business.

Likewise, if your system doesn't account for depreciation, then your Operating Statement (or Income and Expense Summary) will **understate** your expenses, making your profit picture look better than it really is.

Your Income and Expense Summary thereby fails to show the true cost of operating your business.

There's another strong reason for maintaining an accurate depreciation system: Taxes. Income taxes, obviously, but probably for property taxes on the personal property of your business as well.

Depreciation is handled much the same on your tax return as it is on your books. The reasoning is the same; it's an expense of the business. Methods do vary, however.

On your books, depreciation begins with a card form like the one shown in Fig. 1. All essential data about the item is listed, and the record of period-by-

ITEM *SIGNAL GENERATOR* **GEN. LEDGER ACCOUNT** *EQUIPMENT*
SER. NO. *6-811060* **DESCRIPTION** *MAJESTIC MODEL SG-10*
FROM WHOM PURCHASED *MAJESTIC MFG. CO., PASSAIC, SO. VA.*
ESTIMATED LIFE *7 YEARS* **DEPRECIATION PER YEAR** *14%*

Date			Remarks	Asset Account			Depreciation Allow.			Book
Mo.	Day	Yr.		DR	CR	BAL	DR	CR	BAL	Value
7	2	69	←INITIAL PURCHASE→	200 00		200 00				200 00
12	31	69	←CLOSE OF BOOKS FOR '69				(1)→	14 00	14 00	186 00
12	31	70						28 00	42 00	158 00
12	31	71						28 00	70 00	130 00
								(2)	(3)	(4)

period depreciation is kept, so that the card is a complete record of the item. It records essential data—brand, model number, and serial number—which are helpful for many purposes. It's an inventory, it's an identification record in case of theft or other loss, and it's a definition of the item's depreciation status. Also, in my own office, I use the reverse side of each card to record important data on maintenance, repair or modification of the equipment.

The initial purchase is entered on the first line, as noted. The second line deserves an explanation. Only half a year's depreciation is charged off, since the signal generator was bought on July 1. Thereafter each year's entry is for the full annual amount.

For that group of items called Fixed Assets (those having a fairly extended useful life, and a fairly substantial value), the card system forms a permanent inventory record, as well as a running record of depreciation claimed and value remaining.

Incidentally, we might clear up one point of theory: Only fixed assets depreciate, those which are consumed rapidly don't. Likewise, land doesn't depreciate, although the building standing on it does.

That card system, and its depreciation accounting takes care of things like your truck, furniture, test equipment and the like. But, take a three-dollar waste basket, or a five-dollar pair of pliers. It's foolish to set up a card and keep a running record of 25 or 30 cents in depreciation a year. And yet, you might have a large number of small items around the shop. Ordinarily, these are set up on a card labeled "Miscellaneous Small Tools." Their value is totaled, and a fairly long average life is established. Then the total value is depreciated as in the case of a single item. (Again, I list the items covered on the back of the card, just by way of having a record. I started this when I found that the number of small items came to a value greater than that of my typewriter when new.)

Depreciation And Taxes

As a tax matter, depreciation depends on the bookkeeping you've done. As you know, the Internal Revenue Service does call on taxpayers from time to time to prove their claims. It's comforting to face an IRS audit with the records to back up whatever your return has claimed. And, you'll never win that argument without them. I'm all for shouldering my fair load, but I hate the idea of paying too much as a penalty for not keeping records.

When it comes to depreciation guidelines for taxpayers, the IRS is less generous than your accountant. That is, useful life definitions for certain classes of equipment, as suggested by the tax people are a bit longer than you and your accountant might agree to. Recent efforts to encourage businessmen to invest in modernization and expansion have improved this situation a little. But, you might have to settle for a ten-year life on some test equipment you know you'll junk, or sell for salvage value in six or seven.

The reason for this is **obsolescence.** It's hard to de-

(Continued on page 48)

(Continued from page 47)

fine for tax purposes. Technical advances make a three-year-old item inefficient, although it's still usable. How much value has it lost? The tax collector doesn't know, you don't know, nobody else can say. The only way you can settle that question is to sell the item. That will establish its value fairly quickly, if there's a market for it at all.

So, the tax guidelines hold the line against over-rapid depreciation, simply to keep it from becoming another loophole.

Methods Of Depreciation

There are three main methods of depreciating equipment which are recognized by the IRS. There's the straight-line method; in which the unit is depreciated by a fixed percentage each year of its useful life. There's the declining-balance method which speeds up the depreciation during early years. And there's the "sum-of-the-year-digits" method which helps with the middle- and late-years depreciation.

A comparison of the rates of all three methods is shown in Fig. 2. The straight-line method depreciates a constant amount each year. The declining balance gives a fast start, with higher depreciation in the early years, and slows down in the middle and late years. The sum-of-the-year-digits method gives you almost as fast a start, but a better break in the middle and late years.

The graphs are based on an example of a $1,000 item of equipment with a useful life of 10 years. The table in Fig. 3 shows the amount of depreciation by each of the three methods for each of the ten years.

If you plan to keep the equipment until the end of its useful life, and can afford to yield a little of the early-year break, the straight-line method will give you the best late-year deduction. It's also useful when the tax rates are not expected to change, and are not particularly high at the beginning of the equipment's life span.

In a high-tax year, one of the other two methods probably would be more advantageous. It also depends on how long you plan to keep the equipment being depreciated. A truck you plan to keep for only four years might best be depreciated by one of these methods.

Selecting a method involves those factors and several others. If you're having a better-than-average year, and need to do all you can to cut your taxes, you'll want the high-early-years methods. If business is off, but you expect it to improve, you may want the mid- and late-year protection of straight-line. A small item—say $150—doesn't matter much. A few dollars in depreciation, and less in taxes, is all that's at stake. But, a piece of equipment that costs $1,500 or $2,000 does make a difference. There's substantial money riding on your choice.

Understand, if your truck cost $3,000 and you use it until it's junked, you'll depreciate it all the way by any of the three methods. You can only depreciate it by $2,900 or so (new cost minus salvage value), in any event. The three methods only help you by giving you a choice of **when** you'll take it. With taxes fairly high now, not expected to drop much, and technological obsolescence a problem in your field, the early break might generally be most favorable.

Figuring depreciation isn't really difficult. What is tough is making sure that the method you choose is acceptable to IRS—and boning up on the data in their applicable publications is necessary. But, understand one thing: IRS likes consistency, and dislikes changes in methods. So, you should go on depreciating old equipment by whatever method you started with, even though you choose a different method for newly-acquired equipment.

Straight-Line Depreciation

Figuring straight-line depreciation is just a matter of fixing the useful life in years, dividing that life-span into 100 (percent) to get the yearly percentage rate.

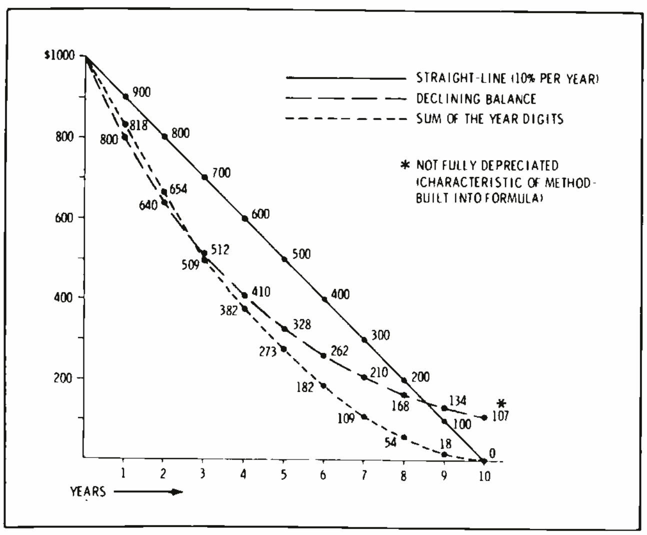

Fig. 2 Comparison of the rate of depreciation obtained by the three common methods. The figures beside each curve shows the remaining balance to be depreciated.

Year	Straight Line	Declining Balance	Sum-of-year-digits
1st	$100	$200	$182
2nd	100	160	164
3rd	100	128	145
4th	100	102	127
5th	100	82	109
6th	100	66	91
7th	100	52	73
8th	100	42	55
9th	100	34	36
10th	100	27	18

Fig. 3 This table shows the comparative depreciation on an item costing $1000 taken by three methods for calculating losses of value for tax purposes.

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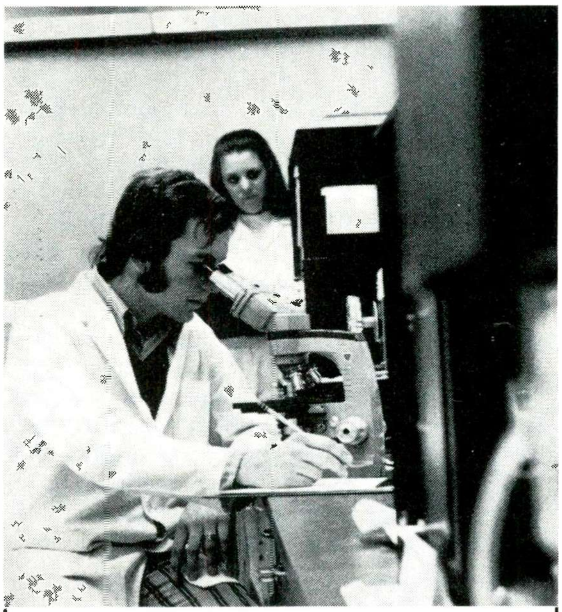

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Then, every year, depreciate the item by that amount.

Declining-Balance Depreciation

Figuring declining balance isn't much harder. Some assets may be depreciated at twice the straight-line rate; for certain others it's limited to 1 1/2 or even 1 1/4 times the straight-line rate. Let's assume it's twice the straight-line rate. In the previous example, we used 10 percent as the straight line depreciation per year. By the declining balance method it becomes 20 percent, but now it's applied against the preceding year's balance instead of the initial price.

The first year you deduct 20 percent of the purchase price. The second, 20 percent of the remaining blance (book value).

Digit-Sum Depreciation

The digit-sum method is more complicated yet, but not so much so that you can't grasp it and figure depreciation with it. The "year-digits" referred to, mean the total of the number of years—10 in our example. So, you develop a series of fractions based on this 10-year useful life. To get the denominator of the fraction, you add 10 + 9 + 8 + 7 + 6 + and so on, down through 1. That's the sum of the year-digits. It totals 55. The fractions are formed with the same digits, thus:

1st year (10 years to go) 10/55 18.1%
2nd year (9 years to go) 9/55 16.4%
3rd year (8 years to go) 8/55 14.5%
and so on.

As mentioned earlier, most bookkeeping systems use straight-line depreciation. The other two methods are primarily tax-figuring methods.

The Reality Of Depreciation

Up to now, we've been talking about bookkeeping and taxpaying situations. Both place about as much emphasis on consistency as on logic. Reality enters the picture when your theoretical value—on the books or on your tax retnrn—is put to the test by disposal or conversion of the asset in question. You've used up the equipment, or it's outmoded, or broken down and not worth the cost of repair. So you sell it. Perhaps for junk, or to a young fellow just starting out, who's glad to find a bargain even if he does have to fix it. Or, you trade it in on a newer model.

Outright sale will show you what the item's real value is. If it's above book value, that's a gain. If below, you have a loss. You can take the loss on this conversion, both on the books and in your tax return. You also must show a gain in both places, if that turns out to be the case.

But, if you trade in the item, you have neither a gain nor a loss, either on the books, or for the tax return. Remember that truck we were talking about? It cost $3,000, you kept it four years and depreciated it to $1,640 (book value) by the declining-balance method. At trade-in, you pay $1,800 cash along with your old one for a new truck. Your new truck shows a cost on the books of $1,800 + $1,640 or $3,440. You begin depreciating the new one on the basis of that cost. The apparent loss can't be taken off your tax return, but you get to make it up in depreciating the new truck.

Notice what has happened. Knowing that you'd trade in early, you took your depreciation in the early years. Looking at the table of Fig. 3, you can see the relative value of each method in this example. Using straight-line you'd have a truck with $1,200 in depreciation deductions. This would be a certain loss at trade-in time; a loss you couldn't use. There is an advantage at four years under the sum-of-the-year-digits method: you'd have claimed $1,850 in depreciation. Selecting a method, in the light of your plans and your own circumstances, as well as the tax situation, is very important, as you can see.

Depreciation Of Buildings

Earlier, I mentioned buildings depreciating. Useful life on these is standardized by the tax guidelines: 30 years on dwellings, and as much as 50 years on factories. Usually, these are depreciated by straight-line. If you own the building your shop occupies, and you remodel, the gain in value added by remodeling becomes part of the building's value for depreciation. Repairs can be fully deductible in the year they're made (and paid for), or they might become depreciation items because they extend the building's useful life. Which claim you make depends on IRS regulations. Replacing a roof is depreciated. Repairing one that has burned might be a deductible repair. A major criterion is whether the change is an improvement or a restoration of the normal condition of the property.

Tax Advice

As an early scholar once remarked, "The art of plucking a goose is to get the most feathers with the least hissing." Well, the art of being a taxpayer is to yield gracefully to your fate (being plucked) but to keep all the feathers you can (legitimately). □

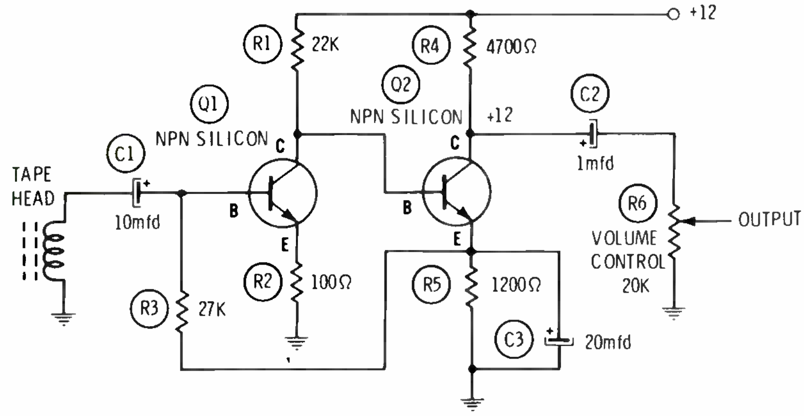
DEMODULATOR OMISSION

Chart 1 referred to on page 27 of the September, 1972 issue of ELECTRONIC SERVICING accidentally was omitted. It is printed here for your convenience.

CHART 1

Relative phase of "C" and "E"	3.58M-Hz at "A" and "B"	Chroma at "C"	PP volts at "D" and "E"	DC volts at "D"	DC volts at "E"	DC volts at "F"
no chroma	12 V PP	0 V PP	10.4 V PP	-4.1	+4.1	+.01
in-phase	12 V PP	4 V PP	10.7 10.4 V PP	-5.9	+3.3	-1.4
in-phase	12 V PP	6 V PP	11.9 11.4 V PP	-7.0	+1.4	-2.3
out-of-phase	12 V PP	4 V PP	10.9 10.3 V PP	-2.5	+6.0	+1.4
out-of-phase	12 V PP	6 V PP	11.0 10.6 V PP	-1.5	+7.0	+2.3
no 3.58M-Hz	0 V PP	6 V PP	1.4 V PP	-2.0	+2.1	+.07
90 degrees	12 V PP	6 V PP	13 & 10 V PP	-5.0	+5.0	+.01

Chart 1 These DC and p-p voltages were recorded in a simulated diode demodulator circuit under the conditions stated. Parts tolerances were ±10 percent. The measurements were made with scope and VTVM calibrated and read only to the accuracy necessary for good troubleshooting standards; therefore, they should be representative of actual conditions.



by Wayne Lemons

Test your skill at troubleshooting solid state Part 2

Answer this quiz to test and improve your skill at analyzing solid-state defects.

A two-stage direct-coupled preamplifier that amplifies the tiny signal voltage from a tape head is the subject of our solid-state quiz this month.

Tips About Circuit Actions

Two kinds of direct-coupling are designed into this simple circuit. The collector of Q1 is connected to the base of Q2, and the emitter of Q2 through R3 supplies the base-bias voltage for Q1. Therefore, defects which change the DC voltage at any element of either transistor tend to change the DC voltages at all the other elements. The voltage through R3 is DC negative feedback, which attempts to keep the voltage at the emitter of Q2 from changing.

In addition, both transistors have emitter resistors which also stabilize against temperature and voltage changes. Consequently, small changes in the values of the components don't critically change the gain or operation.

Figure 1 shows the circuit and two of the DC voltages, the collector voltage of Q2 and the supply voltage. Both voltages are the same: +12 volts.

Solid-State Quiz

Take the quiz now, filling in a mark for either "yes" or "no", then go to my explanation of the answers which follow.

1. Is the tape head open? Yes____ No____
2. Is C1 shorted or leaking? Yes____ No____
3. Does Q1 have an open junction? Yes____ No____
4. Is Q1 shorted between collector and emitter? Yes____ No____
5. Does Q1 have near-zero current? Yes____ No____
6. Is R1 open? Yes____ No____
7. Is R2 open? Yes____ No____
8. Is R3 open? Yes____ No____
9. Is Q2 shorted between collector and emitter? Yes____ No____
10. Is Q2 open? Yes____ No____
11. Is it likely that R4 is shorted? Yes____ No____
12. Is C2 either open or shorted? Yes____ No____
13. Is R5 open? Yes____ No____
14. Is C3 open or shorted? Yes____ No____

Quiz Answers

Check your answers against these:

1. No. No defect of the tape head could possibly have any effect on the collector voltage.
2. No. If C1 were shorted or leaky, this would reduce the base bias of Q1. In turn, the collector of Q1 (and the base of Q2) would become more positive, and this would increase the collector current of Q2 and lower the collector voltage.
3. No. An open in any element of Q1 would increase its collector voltage and decrease the collector voltage of Q2, as given in No.2.
4. Yes, it's possible. The collector voltage of Q1 would decrease to nearly zero, thus driving the base of Q2 to cutoff, and Q2 collector voltage would rise to the supply voltage.
5. Yes, it's possible. But only if R1 opened completely. Then Q1 would have no collector voltage, Q2 would have no

base voltage and the collector of Q2 would rise to the supply voltage.

6. Yes. Refer to No. 5.
7. No. This would stop all collector-emitter current of Q1 causing the collector voltage to rise. Therefore, the collector voltage of Q2 would decrease.
8. No. Without R3, Q1 would not conduct, the base of Q2 would become very positive, Q2 would saturate and Q2's collector voltage would be near zero.
9. No. A collector-to-emitter short in Q2 would give about 2.5 volts at both the collector and emitter (according to ohms law).
10. Yes, it's possible. An open in any element of Q2 would cause the collector to rise to the supply voltage.
11. No. Although this defect would give the +12 volts at the collector, resistors of this type almost never short unless severely overloaded. And even if Q2 shorted, only about 25 milliwatts would be applied to R4; certainly not enough to burn it.
12. No. An open C2 would not change the voltage at R6, which should be zero when C2 is either normal or open. A shorted C2 would add R6 as a voltage divider from collector to ground, and reduce the collector voltage slightly.
13. Yes, it's possible. The only path to ground would be through R3 and the base-emitter circuit of Q1; certainly enough to cutoff Q2 and give a collector voltage equal to the supply voltage.
14. No. If C3 shorted, Q2 would be without emitter voltage. In turn, there would be no base voltage of Q1, so its collector and Q2's base voltage would increase. Decrease of emitter voltage and an increase of base voltage to Q2 would saturate it and cause nearly zero volts at the collector. An open C3 would reduce greatly the gain of Q2 (also Q1 by negative feedback), but have no effect on the DC voltages.

CHART 1

		Normal DC Voltages Of Fig. 1		
Q1	base +.74	emitter +.04	collector +1.75	B/E bias +.7
Q2	base +1.75	emitter +1.18	collector +7.3	B/E bias +.6
		DC Voltages With R5 Open		
Q1	base +.75	emitter +.05	collector +1.6	B/E bias +.7
Q2	base +1.6	emitter +1.19	collector +12	B/E bias +.48
		DC Voltages With R4 Open		
Q1	base +.58	emitter 0.0	collector +1.25	B/E bias +.58
Q2	base +1.25	emitter +.59	collector +.63	B/E bias +.65
		DC Voltages With Q2 Collector Open		
Q1	base +.58	emitter 0.0	collector +1.25	B/E bias +.58
Q2	base +1.25	emitter +.59	collector +12	B/E bias +.65

What Have We Proved?

Looking at the "no" answers shows that by using only two voltage readings we have eliminated the tape head, C1, R2, R3, R4 and C3 as possible sources of the trouble. Also, we are sure Q1 is not open, and Q2 is not shorted.

Possible defects still remaining are: a shorted Q1, an open Q2, open R1, or an open R5.

Next, suppose we measure the base-to-ground voltage of Q2 and find that it is +1.6 volts. Mark which of the following (perhaps more than one) components might be defective:

open R1 ( ) open R5 ( ) shorted Q1 ( ) open Q2 ( ).

You should have indicated both R5 and Q2 because they can reduce the current through R4 to zero. A collector-to-emitter short in Q1 would have reduced the Q1 collector voltage (and Q2 base voltage) to about .5 volt. An open R1 would have provided zero volts to the base of Q2, cutting off the emitter current.

Therefore, an open R5 and an open Q2 are still suspects. R5 can be measured in-circuit with an ohmmeter; the interaction of other components should not seriously change the reading.

Q2 also can be measured for "diode" action between base-and-emitter and base-and-collector. Remember that it is possible to have a collector-to-emitter short which does not affect the diode readings from base to both emitter and collector. However, it isn't possible to have an open from collector to emitter that doesn't show on the diode test.

The diode effect of Q2 checked okay; therefore, Q2 is not open.

R5 Is Open

The only component not cleared of suspicion is R5. When checked by an ohmmeter, it measured nearly open in-circuit and completely open out-of-circuit.

Because it had been some time since we located this particular defect in the course of normal servicing, we reconstructed the problem in a breadboarded circuit (Fig. 1) and measured all the transistor voltages. Chart 1 shows those voltages, both with and without R5.

Do you notice anything strange about those voltages? With the exception of the collector voltage of Q2, they are all within the conventional ±10 percent tolerance. If we had shown you all the voltages before you began the quiz, they wouldn't have helped your diagnosis! In this case, logical reasoning and the measurement of the parts values were more effective in troubleshooting than any analysis of the DC voltages could ever be.

Symptoms Of An Open Emitter Circuit

When the base voltage of a transistor is not changed, increasing the value of an emitter resistor (such as R5) increases the emitter voltage, decreases the forward bias, and permits less collector-emitter current. As the value is increased at a linear rate, the rate of voltage increase from emitter-to-ground levels off. The decreasing emitter current accounts for this action.

Each new value of emitter resistance finds two opposing forces at work. The larger resistance decreases the forward bias, which decreases the emitter current. On the other hand, the decrease of emitter current reduces the voltage from emitter to ground, and this increases the forward bias which increases the emitter current. After a short period of time, a point of equilibrium is reached, and the voltage and current become stable.

As the value of the emitter resistor is increased, a point is reached where no apparent changes occur. At this point, the collector-emitter current is virtually zero. However, the emitter voltage can never rise above the voltage which (relative to the base voltage) results in a practical cutoff of current.

An alternate high-resistance path remains through R3, the base-emitter junction of Q1, and R1 to ground. The emitter voltage rises, but only a few millivolts. But that increased emitter voltage is the source of the base bias for Q1. Therefore, Q1 draws a tiny bit more collector current which reduces the voltage at Q1's collector and Q2's base.

The reduction of base voltage and the increase of emitter voltage to Q2 is just enough to bias it near enough to cutoff so there is no measurable drop across the collector resistor.

The point is this: those millivolts are important when they contribute to the bias of transistors.

Now you know why most technicians think troubleshooting direct-coupled stages is difficult!

Opens In The Collector Circuit of Q2

Here's an interesting question: How does an open in the collector circuit of Q2 affect the DC voltages in both stages? Of course, the same closed loop which causes the interdependent voltages remains. But the importance of the two basic actions previously described is reversed. In a non-defective circuit, the DC voltage at the base of Q2 is determined mainly by the conduction of Q1. This is no longer the case when Q2's collector circuit is open.

First, an open in the collector circuit of Q2 naturally stops all collector-emitter current; so the emitter voltage **must** decrease. Then, if the base current is not increased, the emitter voltage will be nearly zero. However, the base current does increase.

Because the emitter voltage of Q2 is the source of the bias for Q1, it follows that Q1 will have insufficient bias, thus increasing the collector voltage. This action **would** occur except for another which now becomes important: The base-emitter circuit of Q2 remains intact, and current flows through R1, the base-emitter junction of Q2, and R5 to ground. With less reduction of base-emitter voltage because of the lower emitter voltage, the base-emitter current increases. The "diode" effect prevents the base-emitter voltage from exceeding about .7 volt.

Therefore, assuming no current in Q1, and +.7 volt across base and emitter of Q2, calculations for the base and emitter voltages (measured to ground) go like this:

- From the supply voltage of +12 volts, subtract the +.7 volt bias.
- The remainder of +11.3 volts is applied to R1 and R5 in series.
- By ohm's law, the drop across R5 should be +.61 volts. Therefore, the base of Q2 should measure about +1.31 volts.

The $64 question is: How accurate were the voltages obtained by calculation compared to the actual voltages measured in the breadboard circuit? The answer is found in Chart 1, where the base of Q2 is listed as +1.25 volts, and the emitter is +.59 volts, thus making a bias of about +.65 volt. The results were well within useful limits, and prove that the analysis was correct.

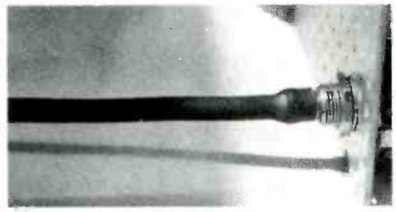
Still Stumped By Solid State?

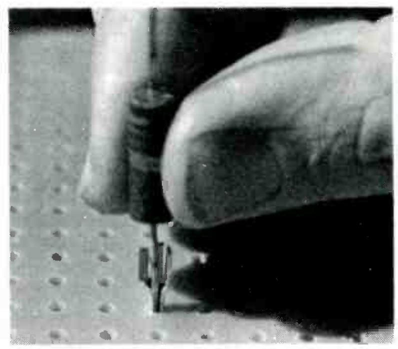
If you have questions about the actions of solid-state components, write to the editor about them. Perhaps we can answer them in future quiz features. □

phototip Exchange

by A. E. Plavcan

Shrinkable plastic tubing can be used as an emergency or inexpensive shaft extender, as pictured. Apply a layer of tape with adhesive on both sides to the shaft, then heat the tubing with a match or heat gun and slip the hot end over the shaft of the control. Allow the tubing to cool before use.





Push-in type terminals, used in experimental breadboards or in strengthening circuit-board connections, can be installed easily by using the wire lead of a 1-watt resistor as an insertion tool. □

"I TINKERED AROUND WITH IT A LITTLE BEFORE I GAVE UP."

catalogs literature

Circle appropriate number on Reader Service Card.

ANTENNAS

100. Antenna Specialists Co.—announces a new amateur radio catalog with an expanded line of two meter, six meter, and three-quarter meter amateur base and mobile antennas.

101. Blonder-Tongue, Inc.—announces a booklet presenting the basic facts necessary to understand MATV systems. A Glossary of Terms is included for further understanding.

102. Jerrold Electronics Corp.——has introduced a new 10-page guide to installing TV and FM antennas covering antenna selection, masts, mounts, lead-in wire, lightning protection and multi-set systems. Tips on how and where to take lead-in wire into the house, how to run coaxial cable and twinlead indoors and out, and how to drill through exterior walls are included.

AUDIO

103. Atlas Sound—introduces an 8-page color brochure of loudspeakers, paging and intercom speakers, projector horns and drivers, mobile and industrial communications units, hi-fi and sound columns. Included are 100 individual models of loudspeakers and accessories.

104. Mellotone, Inc.—introduces a new catalog featuring CHANGE-A-GRILLE self-stick acoustic fabric for speaker grilles. Swatches of six basic patterns are attached to the catalog showing fabric styles and colors.

105. Switchcraft, Inc.—introduces a 28-page catalog listing its line of phone jacks and plugs, switches, connectors, adapters, and molded cable assemblies. Each part is listed by number and the page on which it is found.

CCTV

106. GBC Closed Circuit TV Corp.—announces a new 20-page catalog, which illustrates and describes all of the components necessary to a complete video communications system. The catalog illustrates monitors ranging from 5-inch units to a 20-inch solid-state unit.

FUSES

107. Littelfuse, Inc.——announces a new four-page catalog featuring its product line of exact replacement fuse and circuit breaker caddy assortments designed for domestic and foreign electronic equipment service requirements in the field.

KITS

108. Heath Co.—announces their 1972 Heathkit catalog, reportedly featuring over 350 kit projects. Projects for the home, the car, and workshop included.

MARINE ELECTRONICS

109. Raytheon Co.—introduces the Webster antennas and seven new antennas designed for use with standard and single sideband marine radio-telephone and citizens band radios. The Webster antennas for VHF/FM radio are offered in 3 dB, 6 dB, and 9 dB models.

Circle 25 on literature card

SEMICONDUCTORS

110. GTE Sylvania—has published a 12-page supplement, designated ECG 212D-2, cross referenced with more than 7,100 industrial part numbers with the Sylvania types which replace them.

111. North American Electronics—announces a new catalog supplement (N-72) describing 70 new products. Included are miscellaneous accessories as a universal AC adapter and a low-cost auto burglar alarm, audio cables and adapters, DIN cables, speakers and accessories, and a selection of 13 semiconductors.

SERVICE AIDS

112. Castle Television Tuner Service, Inc.—literature describing the Castle TV Tuner Subber—solid-state, portable unit for field service of color or black and white TV receivers.

SHOP EQUIPMENT

113. Kole Enterprises, Inc.—announces a 36-page color catalog which includes 31 sizes of corrugated stock/parts bins, flat and vertical storage bins, transfer and magazine files and shipping cartons.

TECHNICAL PUBLICATIONS

114. Howard W. Sams & Co., Inc.—announces publication of a new 96-page 1972 Technical and Scientific Book Catalog. Described are over 800 hardbound and softbound books which cover "do-it-yourself" titles from the Audel Division, amateur radio publications, audio visual materials, instructor's guides and student workbooks. Titles range from "ABC's of Air Conditioning" to Writer's and Editor's Technical Stylebook."

115. Sencore, Inc.—Speed Aligner Workshop Manual, Form No. 576P, provides 20 pages of detailed, step-by-step procedures for operation and application for Sencore Model SM 158 Speed Aligner sweep marker generator.

116. Sylvania Electronic Components Div.—has published the 14th edition of their technical manual, which includes mechanical and electrical ratings for receiving tubes, television picture tubes and solid-state devices.

TEST EQUIPMENT

117. Leader Instruments Corp.—announces the 1972 Catalog of Leader Test Equipment. Test equipment included is the LBO-301 portable triggered-sweep oscilloscope, LSW-300 new solid-state post injection sweep/marker generator, and the LCG-384 miniportable, solid-state battery operated color-bar generator.

118. Lectrotech, Inc.—announces the 1972 catalog. "Precision Test Instruments for the Professional Technician". It contains specifications and prices on sweep marker generator, oscilloscopes, vectorscopes, color bar generators and other test equipment.

119. Speco Components Specialists, Inc.—announces their 43-page, 1972 catalog of VOM multitesters and meters for TV technicians. Individual features and specifications for each instrument are included.

TOOLS

120. Jensen Tools and Alloys—has announced a new catalog No. 470, "Tools for Electronic Assembly and Precision Mechanics." The 72-page handbook-size catalog contains over 1,700 individually available items.

121. Plato Products, Inc.—introduces a 28-page, 2-color soldering tip catalog, No. 0372. Illustrated with dimensioned drawings to facilitate accurate selection, the new catalog features tips to fit leading brands and models of soldering irons.

TRANSFORMERS/COILS

122. Essex Controls Division—new Stancor Transformer Catalog No. 207 lists over 1,900 standard transformers for design engineers. Full technical data, mounting dimensions, photographs and other specifications on the line of audio transformers, power transformers, chokes and inductors are included. A complete listing of all Stancor sales offices and stocking warehouses is included.

123. J.W. Miller Co.—announces a new 92-page radio and TV replacement coil cross reference guide for known domestic and foreign color and black and white TV sets, home and car radios. Over 22,000 replacement coils for 327 manufacturers names reportedly are listed. □

antenna systems report

Features and/or specifications listed are obtained from manufacturers' reports. For more information about any product listed, circle the associated number on the reader service card in this issue.

Antenna Installers Meter

Product: Model FS-733 by Sadelco, Inc.

Features: Model FS-733 is solid-state and portable, is battery operated and housed in a rugged case with an accessory compartment. Meter reads in dBmV (and microvolts) to show signal levels, and provides continuous coverage 54-216 MHz for VHF TVFM. Additional features include: taut-band suspension meter gold plated attenuator switches, safety switch turns off power when cover is closed and audio output jacks with crystal earphone provided.

Weight: 4 lbs. 6 oz.

Price: The Model FS-733 sells for $215.00.

Circle 50 on literature card

Stick-on Indoor Antenna

Product: M-100 VHF-UHF-FM indoor antenna by Gavin Electronics

Features: The antenna has a stick adhesive that attaches to the back of any model TV set. Called the "Retracable Receptor", the telescoping body of the antenna slides down behind the set when not in use. A rotating scanner head allows the receptors dipoles to be moved for best possible positioning. Installation takes 12 seconds and separate color coded VHF-UHF lead wires are then connected.

Price: Model M-100 sells for $7.95.

Circle 51 on literature card

Antenna Amplifier

Product: Model TA-82 Colorcaster II by Jerrold Electronics

Features: Model TA-82 is a two set antenna signal amplifier which amplifies UHF and VHF TV channels, plus FM stations. The Colorcaster II is solid-state and encased in cycolac housing that mounts behind a TV set, in the basement, attic or any place else that is convenient. Mounting screws are supplied.

Specifications: Gain at each output is 8 dB at VHF and FM; 5 dB at UHF. Input and output impedances are 300 ohms, matched to twinlead. Response is flat within ½ dB per channel and isolation between outputs is at least 15 dB.

Price: Model TA-82 Colorcaster II sells for $21.50. □

Circle 52 on literature card

Circle 27 on literature card

audio systems report

Features and/or specifications listed are obtained from manufacturers reports. For more information about any product listed, circle the associated number on the reader service card in this issue

Four-Channel Quadrafones

Product: Model K-6LCQ by Koss Corp.

Features: The K-6LCQ is designed with slide volume-and-balance controls and foam earcup cushions. It also features a self-adjusting headband and a 10-foot long coil cord with two three-circuit plugs. The new model features a stereo/four-channel switch, making it compatible with both modes of sound reproduction. It is available in regent bronze with brown trim.

Price: Model K-6LCQ sells for $39.95.

Circle 61 on literature card

Linear Suspension Speaker System

Product: Model 15 by Onkyo Sales Section

Features: The three-way speaker system features a 10-inch woofer, a 1⅜ inch hemispheric dome mid-range and a 1 inch hemispheric dome tweeter. The woofer has a ported cone cap, said to help eliminate nonlinear distortion for full-bodied bass response. A three-way crossover network provides clean transitions at 1,000 Hz and 7,000 Hz. In addition, the Model 15 features a rear mounted crossover control panel with individual 5-position, mid-range and tweeter control switches, variable in ±2 dB steps.

Specifications: Frequency range is 30-20,000 Hz; maximum power capacity is 40 watts; minimum amplifier power is 10 watts RMS/Channel; impedance is 8 ohms; level controls; high and mid-range in 5 steps, each ±2 dB; and crossover frequency is 1,000 Hz, 7,000 Hz.

Size and Weight: 22⅜ inches x 12⅝ inches x 11⅜ inches and weighs 11 pounds.

Price: Model 15 sells for $149.95.

Circle 62 on literature card

Five-Mixer Audio Control Console

Product: Model B-503 by McMartin Industries, Inc.

Features: The B-503 features dual program channel capability at a nominal +8 dBm, 600 ohm balanced output. Input flexibility with plug-in modules to accommodate microphone or high -level input requirements for each of the five input mixing channels is provided. Two inputs per channel are available through interlocked pushbuttons preswitching.

Specifications: Each program channel delivers frequency response characteristics of ±0.5 dB, 30-

bookreview

ABC's Of Industrial Electronics
Author: J. A. Wilson
Publisher: Howard W. Sams & Co., Inc., Indianapolis, Indiana
Size: 5½ inches x 8½ inches, 96 pages
Price: Softcover, $3.95.

Chapter 1 of this new volume discusses the three basic control system elements: a transducer, a switching component, and an amplifier. Chapter 2 covers the power supply systems: Power sources, power factor, rectifiers, and filters are a few of the various areas covered. The electronic technician is also exposed to the numerical control systems and methods of programming machine operations with punched or magnetic tape.
Contents: Components For Industrial Electronic Circuits—Power Supply Systems—Amplifiers For Control Systems—Introduction To Switching And Logic Circuits—Logic Circuits In Industrial Control Systems—Numerical Control Systems.

How To Interpret TV Waveforms (TAB Book No. 616)
Author: Forest H. Belt
Publisher: TAB Books, Blue Ridge Summit, Pennsylvania
Size: 8¾ inches x 5⅝ inches, 256 pages
Price: Softcover, $4.95; hardcover, $7.95.

The waveform photos, over 250, appearing in this new book have been collected through studying television circuit breakdowns; everyone is authentic, taken from a set troubled by the fault described. The book shows what the normal waveforms should look like at key test points—in addition to showing what happens to each key waveform under various component fault conditions.

Contents: The Nature Of Waveforms—Setting The Scope For TV Waveforms—Sweep Alignment Curves For Troubleshooting—A TV Set's Own Waveforms—Waveforms Created By Station Signals—Signals For Testing Color Stages.

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Electronic Servicing, Circulation Dept.
1014 Wyandotte St., Kansas City, Mo. 64105

15,000 Hz with THD of 0.5 percent or less at ±18 dBm output level. The self-contained unit includes 4-watt RMS monitor amplifier output and complete cue facilities.
Price: The Model B-503 sells for $950.00.

Circle 63 on literature card

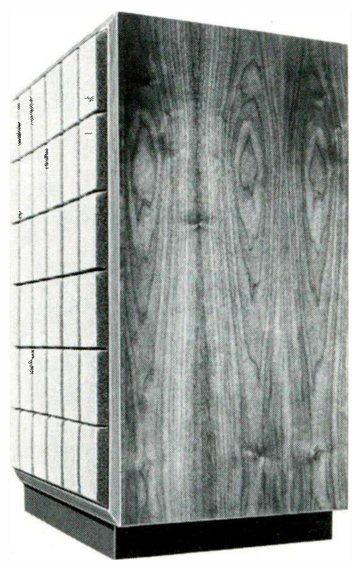
Quad-Synthesizer

Product: Four-channel system adapter by Robins Industries Corp.
Features: The adapter derives two additional channels from existing two-channel stereo material by making use of differential phase relationships of the two signals. The adapter is added between the amplifiers and the speakers, two additional speakers are required to gain the quadraphonic sound. The adapter is a synthesizer that enables two-channel stereo to produce a four-channel effect.
Price: The quad-synthesizer sells for $6.95, with volume and balance controls added the unit sells for $9.95.

Circle 64 on literature card

Speaker System

Product: Fifteen inch, three-way floor speaker by Utah Electronics.
Features: The new 4-speaker, three-way speaker system has a high compliance 15-inch woofer and a 2-inch diameter voice coil with a 6¾ pound magnetic structure. Cloth edge rolls smooth the response of the accoustically isolated 5-inch midrange. Two domeradiator tweeters, with horn amplification, assure reproduction of the



high frequencies throughout a wide dispersion angle. Separate controls for the midrange and tweeters permit the owner to reshape the overall system response.
Size: 27 inches x 20½ inches by 14 inches.
Price: The MP 3000 sells for $199.95. □

Circle 65 on literature card

TO GET MORE INFORMATION

...on items advertised or described in this publication, use the Reader Service Card.

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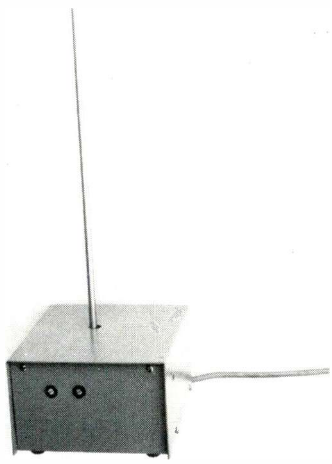
productreport

for further information on any of the following items, circle the associated number on the reader service card.

Microwave Intrusion Detector

Product: A5-001 Space Switch by Mountain West Alarm Supply Co.

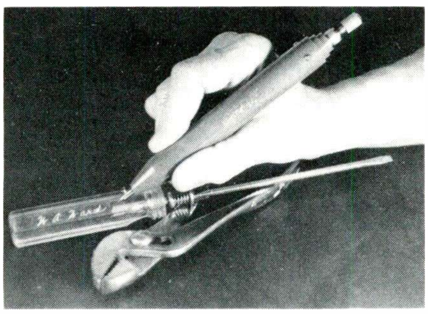


Features: The Space Switch is an all solid-state Microwave (UHF) Doppler Radar System. Microwave transmissions penetrate most non-metallic structures like, plaster, wood and concrete and are reflected by metal. Movements from an intruder set off the alarm circuits while a digital filter rejects movements of small animals and other false alarms.
Specifications: Wall to wall and floor to ceiling protection is provided over as much as 3500 square feet or a 30 foot radius. The A5-001 is powered by 110 VAC or optional 12 VDC battery.
Size and Weight: The Space Switch measures 3¾ inches x 6 inches x 7 inches and weighs 4 pounds.
Price: The A5-001 sells for $185.00.

Circle 70 on literature card

Marking And Etching Instrument

Product: Mark VII by Electro Stylus.
Features: The Mark VII is streamlined like a pen or pencil with no overhanging bulge. It operates by plugging it directly into house current. Noise level of this instrument is very low. Points are interchangeable for ease in engraving on many materials. The Mark VII has many uses in the home, business and industry.



Size and Weight: The Mark VII is 3/4 inch in diameter and weighs 7 ounces.
Price: The Mark VII, with standard steel points sells for $19.95; carbide point, $2.95; diamond point, $7.95. A booster box for additional power is $7.95.

Circle 71 on literature card

Replacement Picture Tubes

Product: Mark II electron gun by General Electric Tube Products.
Features: The Mark II utilizes 20 percent smaller aperture holes to concentrate electron beams on the screen's phosphor spots. The tubes are tested for all electrical characteristics, each is given a 30-KV test to detect any tendency toward arcing. Samples are life-tested for 2,000 hours without significant degradation of electrical or screen performance characteristics.

Circle 72 on literature card

Chemical Spray Valve

Product: ADJUSTA-SPRAY by Chemtronics, Inc.
Features: The new valve can be used with variable spray intensity and a special spray nozzle that may be used with or without extender tubes. ADJUSTA-SPRAY is available on 8-ounce cans of TUN-O-FOAM tuner cleaner/lubricant and TUN-O-BRITE tuner cleaner/polisher/lubricant.
Price: ADJUSTA-SPRAY is available on TUN-O-FOAM and TUN-O-BRITE at $2.39.

Circle 73 on literature card

(Continued on page 64)

(Continued from page 63)

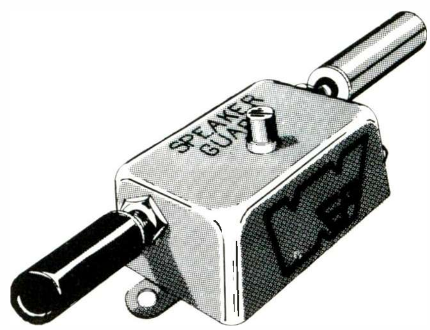
Miniature Screwdriver Sets

Product: Mini-Driver Set M-50 and M-60 by Xcelite, Inc.
Features: Set M-50 contains five drivers for slotted head screws, with tips ranging from .040 inches to .100 inches in width. With an overall length of 2 1/8 inches, each driver has a blade length of 7/8 inch and a handle measuring 3/8 inch by 1 1/4 inch. The set is housed in a snap-close, flexible, plastic, see-thru pouch. Set M-60 consists of the same five flat-tip drivers plus one size 00 Phillips type driver and a piggyback torque-amplifier handle which fits over the handles of any of the mini-drivers. All handles are of clear, durable, color-coded plastic for instant identification.
Price: Set M-50 sells for $2.50; Set M-60 sells for $3.50.

Circle 74 on literature card

Speaker Guard

Product: Speaker Guard by Workman Electronic Products, Inc.
Features: The Speaker Guard consists of a resistor and a circuit breaker. An overload in wattage of the amplifier output activates the circuit breaker and prevents damage.
Specifications: Eighteen different models are available with varying combinations of wattage and speaker ohmic values.



Circle 75 on literature card

Fuse Clips

Product: TRON fuse clips by Bussmann Mfg.
Features: There are TRON fuse clips with two mounting tabs for alignment; the tabs are bowed in such a way that the fuse clip can be snapped into the circuit board. This holds the clip firmly in place while being wane soldered, eliminating the need for riveting. For stringent requirements clips can be furnished in Beryllium Copper, a high quality metal that has the ability to retain spring pressure under adverse conditions, thus preventing heating due to loose contacts. Clips are also available in Spring Bronze metal.

Circle 76 on literature card

Universal Key Driver

Product: GLA key driver by Jensen Tools and Alloys.
Features: It accomodates hex (Allen type), spline (Bristol type), clutch-head, Scrulox, cross recessed (Phillips type), Reed and Prince, or any other type of L-key within its dimensional capability. The key is slipped into one of nine different bushings, the bushing is slid into the handle, and the tool is ready for use. There are no set screws to tighten and no broached holes or plastic to strip or break.
Specifications: A 20-piece set is offered which includes the basic GLA tool, nine bushings, a nine-piece hex-key set including all sizes from 0.050 to 3/16 inch, and a wooden box with thumb cover screws. The GLA tool is 5 inches long by 3/4 inches hex and is made of hard aluminum.
Price: The GLA tool sells for $14.25. ☐

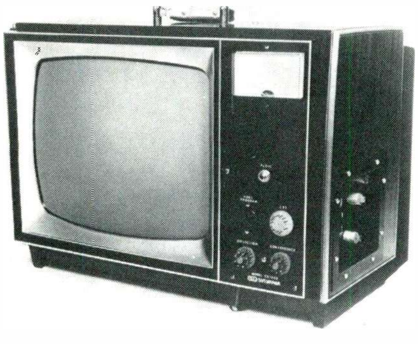
Circle 77 on literature card

test equipment report

Features and/or specifications listed are obtained from manufacturers' reports. For more information about any product listed, circle the associated number on the reader service card in this issue.

Color TV Test Unit

Product: Chek-A-Color, Model CK1500X by GTE Sylvania.
Features: The CK1500X is designed to test solid-state, hybrid, or tube-type receivers. The picture tube provides 14-inches of viewable screen area and is equipped with dual circuits for the testing of high and low focus-voltage receivers. Sixty-one adapters and extensions allow the testing of more than 5,000 chassis sold under 42 brand names. The accessories sold as standard equipment are: solid-sate yoke programmer which provides a range of impedances with front-panel switching to match deflection systems in both solid-state and tube-type receivers; a 3.4 inch high voltage meter for monitoring anode voltage from zero to 34KV; a 4-inch speaker to provide audio signals for chassis being monitored; a setup manual, referencing adapters and extensions for servicing different brands and models.



Size and Weight: 15 inches x 20 inches x 16 inches and weighs 34 lbs.
Price: Model CK1500X sells for $239.15, Model CK1500 with no accessories included, but offered as options sells for $172.50.

Circle 80 on literature card

Digital Multimeter

Product: Model LDM-850 by Leader Instruments Corp.
Features: Scale accuracy is as good as 1.0 percent or greater and provides a 3 1/2 digit non-blinking display up to 1,999. A dual-slope operating mode is offered with a maximum input voltage of 1,000VDC and 350VAC with 10 megohms of input impedance. Sensitivity ranges are from 100μV to 1V with current from 0.2mA to 1,000mA, AC or DC. Resistance is reported at 200 ohms to 2 megohms. Other features include: automatic polarity reversal and overrange lamp indication; sampling frequency is 200m/sec with instant response. The unit has a dual power supply for field or in-shop testing.

Size and Weight: 10 inches x 7 3/4 inches x 3 1/4 inches and weighs 10 lbs.
Price: Model LDM-850 sells for $299.50.

Circle 81 on literature card

Dual Trace Oscilloscope

Product: Model PM3110 by Test & Measuring Instruments
Features: Three selector switches control trigger source (inputs A or B or external), trigger polarity, and trigger mode (high frequency, TV and line). No DC balance knobs are needed because two independent vertical amplifiers are internally corrected for drift. The unit displays either A or B or both depend-

ing on the setting of the input control switches, selection of A and B is automatic.
Specifications: Sensitivity can be multiplied by 10 times to 5mV/cm by means of the input control switches; in the high sensitivity model, bandwidth is 5 MHz. Horizontal sweep can be expanded up to 50 cm. The graticule is 8 by 10

cm instead of the usual 6 by 10, permitting the use of the entire 8 by 10 cm CRT face for measurements. Protection against input overloads of up to 1,000 volts DC or AC peak for up to 30 seconds is provided by the cathode follower input. Inputs of 500 volts DC or AC peak can be accepted indefinitely.

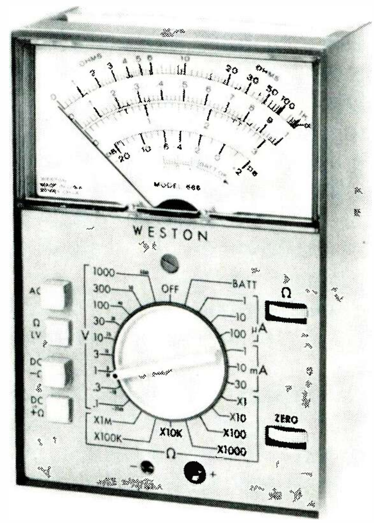
Circle 38 on literature card

Weight: The PM3110 weighs 19 pounds.
Price: The PM3110 sells for $550.00. Optional accessories include probes and viewing hood.

Circle 82 on literature card

Solid-State Circuit Tester

Product: Model 666 by Weston Instruments.
Features: Twelve ranges for current measurements are offered with a lowest full scale range of 1 microamp, eighteen voltage ranges, from 100 mV full scale through



1000 volts, and fourteen ohms ranges, featuring seven low power ohms ranges for "in circuit" measurements of semiconductors. A special differential-FET input circuit provides 10 megohms impedance. Diode protection on the meter movement as well as protection with an externally replaceable fuse, input-reversal switch, temperature and frequency compensation and a self-shielded taut band mechanism are all included in the design of the Model 666. The tester is warranted to withstand a five foot drop.
Price: The Model 666 circuit tester sells for $132.50.

Circle 83 on literature card

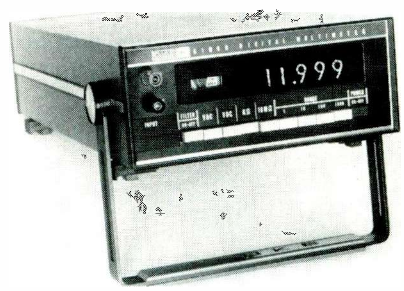
Resistance Decades

Product: Model 1122 and 1124 by Special Instruments & Machinery Co.
Features: There are ten wire-wound, low inductance, manganin resistors, operated by ratchet type, rotary switches for each dial. The unit comes with switches and binding posts mounted on the top panel.
Specifications Accuracy is 0.05 percent with a long-time stability. Each single resistor can carry up to 0.5 watt. Design of the unit allows a high insulation resistance.
Price: Model 1122 sells for $415.00 and the Model 1124 sells for $495.00

Circle 84 on literature card

Digital Multimeter

Product: Model 8100B by John Fluke Mfg. Co., Inc.
Features: AC and DC volts are measured in four ranges to 1200 volts and ohms in five ranges to 12 megohms. Readout is four full digits plus "1" for 20 percent overranging. Also included is an active 2-pole switchable filter and automatic polarity indicator. All functions are push-button selectable. Options available are: rechargeable battery pack, RF and high voltage,



probes, switches AC-DC current shunts, a ruggedized case and data output.
Price: The Model 8100B sells for $595.00. □

Circle 85 on literature card

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Kansas City, Mo. 64105

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This classified section is available to electronic technicians and owners or managers of service shops who have for sale surplus supplies and equipment or who are seeking employment or recruiting employees.

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- All letters capitalized— 35 cents per word

Each ad insertion must be accompanied by a check for the full cost of the ad.

Deadline for acceptance is 30 days prior to the date of the issue in which the ad is to be published.

This classified section is not open to the regular paid product advertising of manufacturers.

Use your Scope (any model, no rewiring) to Test Transistors Incircuit. Simple instructions $1.00. Schek Technical Services, 8101 Schrider St. Silver Spring, Maryland 20910. 9-72-6t

FOR SALE

EVERYTHING MUST GO—Test equipment. Tubes, Transistors. Tools. etc. Send for list and prices. Bob Greher, 10144 Dunbarton Dr., El Paso, Texas 79925. 10-72-2t

Antique tubes, Riders manuals, Hickok, Model 600A tester, reasonable price. Goodwin Radio Shop, Rankin, Illinois 60960. 10-72-1t

For Sale: Tubes, Transistors, Meters, Misc. Also plastic bread boards with plug-in plastic encapsulated resistors, caps, etc. Some military equipment. Send stamped self-addressed envelope for list. Jim Dorrell, 2627 Abilene St., Aurora, Colorado 80010. 10-72-1t

FOR SALE, Sencore CR143 CRT tester, $65. Heathkit IG-28 Dot Bar generator, $55. Jerrold AIM-718 VHF-UHF field strength meter, $85. All in perfect condition. Don Masters, P.O. Box 16 North Sandwich, N.H. 03259 (603) 284-6400. 10-72-1t

TV & RADIO TUBES 36c EA.!! Free color catalog. Cornell, 4221 University, San Diego, California 92105 9-72-6t

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Cash for good used single or double oven CRT rebuilding machine and supplies. State best price, itemized list, polaroid picture, and condition in first letter. All inquiries answered, write Dept. 501, Electronic Servicing, 1014 Wyandotte, Kansas City, Mo. 64105 10-72-1t

Send in your true anecdote or short, amusing troubleshooting story to share with our readers. We reserve the right to edit and print all contributions to this column.

advertisers' index

SAMS PHOTOFACT

Supplement to 1972 ANNUAL INDEX

Covers PHOTOFACT Set Numbers 1218 thru 1271 and Specialized Volumes AR-109 thru AR-128, CB-37 thru CB-41, MHF-21 thru MHF-29, TR-90 thru TR-106, TSM-129 thru TSM-136 Released.

JANUARY—SEPTEMBER 1972

This Supplement is your Index to new models covered by PHOTOFACT since December 1971. For model coverage prior to this date see the 1972 PHOTOFACT Annual Index. Use this Supplement with the Annual Index—together they are your complete Index to PHOTOFACT coverage of over 90,000 models.

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. Folder No.

CURTIS MATHES
Curtis Mathes Mfg. Co.
P.O. Box 5610
Dallas, Texas 75222
★Ch. C/CMC37 .... 1244—1
Ch. 47-2 .... 1230—5
Ch. 47-3 .... 1238—4
Ch. 55 .... 1264—4

D

DELCO
(See Auto Radio and Recorder Listings)

DODGE
(See Auto Radio Listing)

DUMONT
DuMont Radio & Television
14th & Coles Streets
Jersey City, N. J. 07302
★19DP01 (Ch. 30K18-1B) .... 1257—1
★19DP02W (Ch. 31K18-1B) .... 1257—1
★19DP03W (Ch. 33K18-1B) 1257—1
★25DC04W/06S/07M (Ch. 32K16) .... 1253—1
★59T01WN (Ch. 120976A) .... (PCB1211-4) 1102—1
★59T02WN (Ch. 120984A) .... (PCB1211-4) 1102—1
★Ch. 30K18-1B (Runs 10 thru 15) .... 1257—1
★Ch. 31K18-1B (Runs 10 thru 15) .... 1257—1
★Ch. 32K16 (Runs 13 thru 17) .... 1253—1
★Ch. 33K18-1B (Runs 13, 14, 15) .... 1257—1
★Ch. 120976A .... (PCB1211-4) 1102—1
★Ch. 120984A .... (PCB1211-4) 1102—1

E

E.C.I.
(Also See Courier)
Fanon/Courier Corporation
990 South Fair Oaks Avenue
Pasadena, California 91105
Address Change

EIA
Production Code Source 1248

ELECTROHOME
Electrohome Limited
809 Wellington Street North
Kitchner, Ontario, Canada
★Andorra C10-206 (Ch. C10B) .... 1259—1
●Apollo M11-206 (Ch. M11-A) .... 1236—1
★Atwood C10-220 (Ch. C10A) .... 1259—1
●Bradford M11-212 (Ch. M11-A) .... 1236—1
●Brandon M04-210 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
●Breton M11-211 (Ch. M11-A) .... 1236—1
★Broadview C10-208 (Ch. C10B) .... 1259—1
★Cabaret C10-207 (Ch. C10B) .... 1259—1
★Cavalier C10-209 (Ch. C10C) .... 1259—1
★Claridge C10-202 (Ch. C10) .... 1259—1
●Comet M04-215 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
★Conestoga C10-204 (Ch. C10) .... 1259—1
★Corsair C07-144 (Ch. C7-E) .... 1198—1
●Croydon M11-201 (Ch. M11-A) .... 1236—1
★Crusader C07-151 (Ch. C7H-E) (Similar to Chassis) .... 1198—1
★Dundurn C07-147 (Ch. C7H-E) (Similar to Chassis) .... 1198—1
●Gemini M11-205 (Ch. M11-A) .... 1236—1
●Glendale M04-202 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
★Hampton C07-145 (Ch. C7A-E) (Similar to Chassis) .... 1198—1
●Jupiter M04-205 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
★Keswick C10-201 (Ch. C10) .... 1259—1
★Langford C10-221 (Ch. C10A) .... 1259—1
●Meteor M04-204 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
★Parkdale C09-110 (Ch. C9-B) .... 1213—1
●Polaris M04-203 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
●Verdun M04-201 (Ch. M4-Z) (Similar to Chassis) .... 1176—1
★Versailles C09-109 (Ch. C9-B) .... 1213—1
★Ch. C9-B .... 1213—1
★Ch. C10,A,B,C .... 1259—1
●Ch. M4-Z (Similar to Chassis) .... 1176—1
●Ch. M11-A .... 1236—1

ELECTROPHONIC
(Also See Recorder Listing)
Electrophonic Corp. of America
101-10 Foster Avenue
Brooklyn, New York 11236
T-9 .... TSM-131
T-16 .... TSM-130
T-17 .... TSM-131
T-107 .... MHF-22
T-108 .... MHF-23
T-109 .... MHF-23
T-500A MHF-23
T-700 .... MHF-26
T-800 .... MHF-28
T-4100 .... MHF-21
T-4200 .... MHF-27
Ch. 24M .... 1217—4
Ch. 26C (Similar to Chassis) .... 1207—3
Ch. 31H .... 1222—4

ELECTROPHONIC—Cont.
Ch. 32M .... 1236—5
Ch. 41, 43 .... 1224—4
Ch. 64M .... 1217—4
Ch. 76K .... 1214—4
Ch. 77K .... 1221—5

ELGIN
(Also See Recorder Listing)
Elgin National Industries, Inc.
50-35 56th Road
Maspeth, New York 11378
R1750 .... TSM-136
RM-4100 .... MHF-29
RM-4200 .... MHF-29
RM-4210 .... MHF-29
RM-4300 .... MHF-29
RM-4340 .... MHF-29

EMERSON
(Also See Recorder Listing)
Emerson Television Sales Corp.
14th & Coles Streets
Jersey City, New Jersey
●9FP02/03/04W (Ch. T2R2-1A, -2A) .... 1230—1
10ES01W/02M/03S (Ch. 121007) .... 1151—5
●12FP01/02/03W (Ch. T2R3-1A, -2A) .... 1230—1
●16FP05/06W (Ch. T12K3-1A) .... 1254—1
●16FP07W (Ch. T13K3-1A) .... 1254—1
●18BP01 (Ch. T25H4-1A) (Similar to Chassis) .... 1211—1
★18EP04 (Ch. 30K17-1A) .... 1252—1
●19BP08/09W (Ch. T25H4-1A) .... 1211—1
●19BP10 (Ch. T25H4-1A) .... 1211—1
●19BP40W (Ch. T25H4-1B) . 1211—1
★19CP04W (Ch. 33K18-1A) 1252—1
★19EP01 (Ch. 30K18-1A) .... 1252—1
★19EP02W (Ch. 31K18-1A) .... 1252—1
★19EP03R (Ch. 32K18-1A) .... 1252—1
●19FP04/05W (Ch. 11H5) . 1222—1
●19FP10 (Ch. T12K3-1A) .... 1254—1
●19FP11W (Ch. T12K3-1B) .... 1254—1
●19FP12W (Ch. T13K3-1B) .... 1254—1
●20FP01/02W (Ch. 16H5) . 1222—1
★21CT03W (Runs 13 thru 17, Ch. 32K1687-4) (Similar to Chassis) .... 1244—1
★21ET01 (Ch. 11K1663-40) (Similar to Chassis) .... 1207—1
★21ET02W (Ch. 32K1687-2) .... 1244—2
●22BC01W/02M/03S (Ch. 12H5) .... 1222—1
●22BS02W (Ch. 14H5) (Similar to Chassis) .... 1222—1
●22BT05W (Ch. 12H5) .... 1222—1
●22FC01W/02M/03S (Ch. 12H5) .... 1222—1
●22FC06W/07M/08S (Ch. 12H5) .... 1222—1
●22FS01W (Ch. 14H5) .... 1222—1
●22FT01W (Ch. 12H5) .... 1222—1
●22FT04W (Ch. 12H5) .... 1222—1
★23EC10W/12S (Ch. 5K1675-4) (Similar to Chassis) .... 1207—1
★23EC13W (Ch. 11K1670-2) (Similar to Chassis) .... 1207—1
★25CC20W/21M/22S (Runs 13 thru 17, Ch. 32K1673-35) (Similar to Chassis) .... 1244—1
★25EC11W (Ch. 11K1663-41) (Similar to Chassis) .... 1207—1
★25EC14M/15W/16S (Ch. 32K1673-32) .... 1244—2
★25EC17W/19S (Ch. 32K1686-4) .... 1244—2
★25EC23W/24S (Ch. 30K2091-2) .... 1248—POM
31M15 .... MHF-26
31M17, A MHF-24
31P68 .... TSM-136
●Ch. T2R2-1A, -2A .... 1230—1
●Ch. T2R3-1A, -2A .... 1230—1
●Ch. T12K3-1A,-1B (Runs 10, 11, 12) .... 1254—1
●Ch. T13K3-1A,-1B (Runs 10, 11, 12) .... 1254—1
●Ch. T25H4-1A,-1B .... 1211—1
★Ch. 5K1675-4 (Similar to Chassis) .... 1207—1
●Ch. 11H5 (Run 24) .... 1222—1
★Ch. 11K1663-40, -41 (Similar to Chassis) .... 1207—1
★Ch. 11K1670-2 (Similar to Chassis) .... 1207—1
●Ch. 12H5 (Run 24) .... 1222—1
●Ch. 14H5 (Run 24) .... 1222—1
●Ch. 16H5 (Run 24) .... 1222—1
★Ch. 30K17-1A .... 1252—1
★Ch. 30K18-1A .... 1252—1
★Ch. 30K2091-2 .... 1248—POM
★Ch. 31K18-1A .... 1252—1
★Ch. 32K18-1A .... 1252—1
★Ch. 32K1673-32 (Runs 13 thru 17) .... 1244—2
★Ch. 32K1673-35 (Runs 13 thru 17) (Similar to Chassis) .... 1244—1
★Ch. 32K1686-4 .... 1244—2
★Ch. 32K1687-2 .... 1244—2
★Ch. 32K1687-4 (Runs 13 thru 17) (Similar to Chassis) .... 1244—2
★Ch. 33K18-1A,-1B .... 1252—1

F

FANON-MASCO
(Also See Recorder Listing)
Fanon/Courier Corporation
990 South Fair Oaks Avenue
Pasadena, California 91105
SFT-900 (Guardsman) CB-37
T-606 .... CB-41
T-808 .... CB-38
T-909 .... CB-40
CHB-4 .... CB-37

FISHER
Fisher Radio Corp.
11-40 45th Road
Long Island City, N.Y. 11101
250-T MHF-24
400-T MHF-24

FORD
(See Auto Radio and Recorder Listings)

G

GARRARD
(See Changer Listing)

GENERAL ELECTRIC
(Also See Recorder Listing)
For TV Models
General Electric Company
College Blvd.
Portsmouth, Virginia 23705
For Radio and Phonograph Models
General Electric Company
1101 Broad Street
Utica, New York 13501
A211g (Ch. PK160) (Similar to Chassis) .... 1209—4
A242g (Ch. PK160) (Similar to Chassis) .... 1209—4
A401h (Ch. TU540, CP1,PA40) .... 1219—5
A401g (Ch. TU540, PA40, CP1) .... 1219—5
A482g (Ch. PK160) (Similar to Chassis) .... 1209—4
A534h (Ch. TU540-1, PA40, CP1) .... 1219—5
A536g (Ch. TU540, CP1,PA40) .... 1219—5
A634h (Ch. TU540-1, PA40, CP1) .... 1219—5
A818h (Ch. TU540-1, CP1,PA135) .... 1248—4
C151k (Ch. PK160) .... 1209—4
C241g (Ch. PK160) (Similar to Chassis) .... 1209—4
C351k (Ch. TU540-11, PA40, CP1) .... 1219—5
C445g (Ch. TU540-1, PA40, CP1) .... 1219—5
C481g (Ch. PK160) (Similar to Chassis) .... 1209—4
C524k (Ch. TU540-1, PA40, CP1) .... 1219—5
C524m (Ch. TU540, CP1,PA40) .... 1219—5
C550g (Ch. TU540, PA40, CP1) .... 1219—5
C557g,h,j (Ch. TU540-14, PA40-5,-6) (Similar to Chassis) .... 1219—5
C614g (Ch. TU540-1, PA40, CP1) .... 1219—5
C651g (Ch. TU540, PA40, CP1) .... 1219—5
C657g, h (Ch. TU540-15, PA40-3) (Similar to Chassis) .... 1219—5
C771g (Ch. TU540,CP1,PA40) (Similar to Chassis) .... 1219—5
C817g,h (Ch. TU540-10, CP1,PA135) .... 1248—4
C819h (Ch. TU540-1, CP1,PA135) .... 1248—4
C961g (Ch. PK160) (Similar to Chassis) .... 1209—4
C4335A .... 1257—4
C4350A,B .... 1236—4
C4540A,B,C .... 1245—5
C4570A .... 1239—4
★CBM250NWD-2 (Ch. N-2) . 1219—1
★CBM261CMD-1 (Ch. C-1) (Similar to Chassis) .... 1100—2
★CBM261CWD-2 (Ch. C-2) . 1231—2
★CBM264CWD-2 (Ch. C-2) . 1231—2
G210g (Ch. PK160) (Similar to Chassis) .... 1209—4
G240g (Ch. PK160) (Similar to Chassis) .... 1209—4
G402g (Ch. TU240, PA40, CP1) .... 1221—4
G402h (Ch. TU540, PA40, CP1) .... 1219—5
G480g (Ch. PK160) (Similar to Chassis) .... 1209—4
G514g (Ch. TU540-1, PA40, CP1) .... 1219—5
G542g (Ch. TU540, PA40, CP1) .... 1219—5
G543h,k (Ch. TU540-1, PA40, CP1) .... 1219—5
G618g (Ch. TU540-1, PA40, CP1) .... 1219—5
G960g (Ch. PK160) (Similar to Chassis) .... 1209—4
H530g (Ch. TU540-1, PA40, CP1) .... 1219—5
★JA5301WD (Ch. JA) .... 1242—POM
★JA6212WD (Ch. JA) .... 1242—POM
★M234GWD-1 (Ch. G-1) (Similar to PCB 1057-3) 973—2
★M810CWD-2 (Ch. C-2) .... 1231—2
★M910LWD-2 (Ch. L-2) .... 1231—2
★M911LMP-2 (Ch. L-2) .... 1231—2
★M913LPN-2 (Ch. L-2) .... 1231—2
★M916LPN-1 (Ch. L-1) (Similar to PCB 1175-3) 1100—2
★M916LPN-2 (Ch. L-2) .... 1231—2
★M922LWD-2 (Ch. L-2) .... 1231—2
★M930LWD-1 (Ch. L-1) (Similar to PCB 1175-3) 1100—2
★M930LWD-2 (Ch. L-2) .... 1231—2
★M931LMP-1 (Ch. L-1) (Similar to PCB 1175-3) 1100—2
★M931LMP-2 (Ch. L-2) .... 1231—2
★M933LCT-2/934LEA-2 /935LMD-2/936LMD-2 (Ch. L-2) .... 1231—2
M8614A TSM-133
M8615A TSM-132
P464g,h (Ch. T7N-J) (Similar to Chassis) .... 979—5
P794g (Ch. TU540-14, PA40-5) (Similar to Chassis) .... 1219—5
P1820M/1821M TSM-136
P2835A TSM-130
P2950B TSM-132
P4830A TSM-130
P4920A TSM-134
P4980A TSM-135
T361p,n (Ch. T2P) .... 1192—4

GENERAL ELECTRIC—Cont.
T440p (Ch. T2P) .... 1192—4
T541j,k (Ch. T7N-J) (Similar to Chassis) .... 979—5
T2040,A MHF-28
T4840A TSM-133
●TR105TVY (Ch. T-6) .... 1242—2
●TR110TEB (Ch. T-6) .... 1242—2
●TR115RTX-2 (Ch. R-2) 1242—POM
●TR120RVY-1 (Ch. R-1) . 1220—2
●TR463UVY-1 (Ch. U-1) (Similar to Chassis) .... 1257—2
●TR465UWD-1 (Ch. U-1) . 1257—2
●TR468UWD-1 (Ch. U-1) (Similar to Chassis) .... 1257—2
V972g,h (Ch. PK6) .... 1237—4
V982g .... 1237—4
●WM020WEB-1/WVY-1 (Ch. W-1) .... 1221—1
●WM153SCH-3 (Ch. S-3) .... 1217—1
●WM194SWD-3 (Ch. S-3) .... 1217—1
★WM201HGR-4 (Ch. H-4) . 1223—2
★WM201HWD-4 (Ch. H-4) .... 1223—2
★WM202HVY-4 (Ch. H-4) .... 1223—2
★WM203HWD-4 (Ch. H-4) 1223—2
★WM205HWD-4/206HWD-4 (Ch. H-4) .... 1223—2
★WM212HWD-4 (Ch. H-4) 1223—2
★WM218HWD-4/219HWD-4 (Ch. H-4) .... 1223—2
★WM225HWD-4 (Ch. H-4) 1223—2
★WM257NWD-2 (Ch. N-2) 1219—1
★WM260CBG-2, CWD-2 (Ch. C-2) .... 1231—2
★WM264CWD-2 (Ch. C-2) .... 1231—2
★WM266CWD-2 (Ch. C-2) .... 1231—2
★WM270CBW-2,CWD-2 (Ch. C-2) .... 1231—2
★WM274CWD-2 (Ch. C-2) .... 1231—2
★WM277CWD-2 (Ch. C-2) .... 1231—2
★WM279CCT-2/279CEA-2 (Ch. C-2) .... 1231—2
★WM351NBW-2/353NWD-2 (Ch. N-2) (Similar to Chassis) .... 1219—1
★WM355NWD-2 (Ch. N-2) (Similar to Chassis) .... 1219—1
★WM381CWD-2/382CWD-2/ 383CWD-2 (Ch. C-2) . 1231—2
★WM385CCT-2,CEA-2, CMD-2 (Ch. C-2) .... 1231—2
★WM386CEA-2,CMD-2 (Ch. C-2) (Similar to Chassis) .. 1231—2
★WM389CCT-2,CMD-2 (Ch. C-2) .... 1231—2
●WM433WD-D2 (Ch. D-2) (Similar to Chassis) .... 1200—1
●WM435WD-D2 (Ch. D-2) (Similar to Chassis) .... 1200—1
838h (Ch. TU540-1, CP1, PA135) .... 1248—4
8630A MHF-25
★Ch. C-2 .... 1231—2
Ch. CP1 .... 1219—5, 1221—4, 1248—4
Ch. CP1-1,-6,-7,-8, -11,-12,-13 .... 1219—5, 1221—4
★Ch. H-4 .... 1223—2
★Ch. JA .... 1242—POM
★Ch. L-2 .... 1231—2
★Ch. N-2 .... 1219—1
Ch. PA40,-1,-2,-3,-4 .... 1219—5, 1221—4
Ch. PA135 .... 1248—4
Ch. PK6 .... 1237—4
●Ch. R-1 .... 1220—2
●Ch. R-2 .... 1242—POM
●Ch. T-6 .... 1242—2
Ch. TU240,-8,-9,-10, -11,-12,-13 .... 1221—4
Ch. TU540 .... 1219—5
Ch. TU540-1 .. 1219—5, 1248—4
Ch. TU540-10 .... 1248—4
Ch. TU540-11 .... 1219—5
●Ch. U-1 .... 1257—2
●Ch. W-1 .... 1221—1

GENERAL MOTORS CORP.
(GMC) (See Auto Radio and Recorder Listings)

GRANTLINE
W. T. Grant Company
1515 Broadway, Times Square
New York, New York 10036
Address Change

H

HAMMOND
(See Auto Radio and Recorder Listings)

HEATHKIT
Heath Company
Benton Harbor, Michigan 49023
★GR-481 .... 1234—SED

HITACHI
(Also See Auto Radio and Recorder Listings)
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N. Y. 11101
★CFA-440 .... 1241—1
★CFA-461 .... 1231—3
★CNU-871 .... 1241—1
★CNU-881 .... 1231—3
★CNU-891 .... 1231—3
★CSU-691 .... 1241—1
★CSU-790 .... 1231—3
★CTU-970 .... 1231—3
★CWU-220 .... 1230—2
DPK-321(U) MHF-24
●IU-54 .... 1223—3
KC-770E,H .... 1225—4
KC-773 .... 1251—4
KC-775H .... 1242—4
KC-776 .... 1262—4
KH-930 .... TSM-136
KH-1108M TSM-136
KS-2210 .... MHF-24
●P-22G,R (Similar to Chassis) .... 1233—1

HITACHI—Cont.
●S-87/88 (Similar to Chassis) .... 1233—1
●SU-86 (Ch. SV-A) .... 1233—1
●TU-76 (Ch. SV-A) .... 1233—1
●TWU-68/69 (Ch. SV-A) . 1233—1
●TWU-73 (Ch. SV-A) .... 1233—1
●Ch. SV-A .... 1233—1

I

INLAND-DYNATRONICS
(See Auto Radio and Recorder Listings)

INTERNATIONAL
(See Auto Radio Listing)

J

JEEP
(See Auto Radio Listing)

JERROLD
Jerrold Electronics Corp.
The Jerrold Building
15th & Lehigh
Philadelphia, Pa. 19132
AMA-50 (AM RF Rebroadcast Amp.) .. 1226—SED
AT-* (Audio-Trol) .... 1229—SED
SPM-2 (VHF/UHF Amp) 1225—SED
SPM-106 (VHF/UHF Amp) .... 1225—SED
U5V .... 1232—SED
106 (VHF/UHF Amp) . 1225—SED
454T (UHF Converter Amp) .... 1232—SED
465SS (Oscillator/Power Supply) .... 1232—SED
3550 (VHF-FM Amp) .. 1224—SED

JOHN DEERE
(See Auto Radio Listing)

JOHNSON
E. F. Johnson Company
11 32nd Avenue, S.W.
Waseca, Minnesota 56093
Messenger 120 .... CB 41
Messenger 121 .... CB-40
Messenger 124-M CB-39
Messenger 323-M CB-40
242-0120 .... CB-41
242-0121 .... CB-40
242-0134 .... CB-39
242-0152 .... CB-12
242-0156 .... CB-12
242-0158-001 .... CB-40

JULIETTE
(See Recorder Listing)

JVC
JVC America, Inc.
50-35 56th Road
Maspeth, N.Y. 11378
●2450, 2451 .... 1264—1
●2460, 2462 .... 1264—1
●2850 .... 1259—2
●2860/61/62 .... 1259—2
●3230 .... 1252—2
8805 .... 1252—6

K

KARMANN GHIA
(See Auto Radio Listing)

KAY-TOWNES
Kay-Townes Antenna Company
Turner Chapel Road
Rome, Georgia 30161
AB-4000/4100 (VHF/FM Amp) .... 1225—SED
AB-4200 (VHF-UHF-FM Distribution Amp) .... 1224—SED
AB-4400 .... 1224—SED
AB-4500 (VHF/UHF/FM Distribution Amp) .. 1238—SED
AB-4600 (VHF/UHF Distribution Amp) .. 1223—SED
AB-4700 (VHF/UHF/FM Distribution Amp) .. 1223—SED
AB-4800 (VHF/FM Distribution Amp.) .. 1223—SED
AB-4900 (VHF/FM Amp) .... 1225—SED
AB-5000 (VHF/UHF/FM Amp) .... 1225—SED
AB-5100 (Antenna-Mounted Amp) .... 1224—SED
AB-5200 (VHF/UHF/FM Amp) .... 1225—SED
AB-5300 (VHF/UHF/FM Amp) .... 1229—SED
AB-5400 (VHF/UHF/FM Distribution Amp) .. 1229—SED
AB-5800 (VHF/UHF/FM Distribution Amp) .. 1229—SED
AB-6000 (VHF/FM Mast-Mounted Amp) .... 1223—SED
AB-6100/6200/6300 (VHF/FM Amp) .... 1229—SED
AB-7000 (UHF Amp) .. 1249—SED
AB-7100 (VHF Amp) .. 1225—SED
AB-7200 (UHF Amp) .. 1228—SED
AB-7300 (TV Preamp) .. 1261—SED
AB-7400 (VHF Amp) .. 1238—SED
AB-7500 (VHF Amp) .. 1238—SED
AB-7600 .... 1240—SED
AB-7700 (VHF/UHF/FM Amp) .... 1249—SED
AB-7800 (VHF/UHF/FM Amp) .... 1228—SED
AB-7900 (82 Channel Amp) .... 1253—SED
AB-8000 (VHF/FM Antenna Mounted Amp) .... 1232—SED
AB-8100 VHF/FM Amp) . 1254—SED
AB-8200 (VHF/UHF/FM Antenna Mounted Amp) .... 1232—SED
AB-8300 (TV/FM Preamp) .... 1261—SED
AB-8600 (82 Channel Distribution Amp) .. 1253—SED
AB-8700 (VHF/FM Amp) 1228—SED
AB-8800 (VHF/FM Amp) 1228—SED

KAY-TOWNES—Cont.
AB-9000 (VHF Distribution Amp) .. 1238—SED
AB-9100 (VHF Distribution Amp) .... 1226—SED
AB-9400 (VHF/UHF/FM Distribution Amp) .. 1226—SED
AB-9500 (VHF/UHF/FM Distribution Amp) .. 1238—SED
AB-9900 .... 1240—SED

KENWORTH
(See Auto Radio Listing)

KNIGHT
Allied Radio Shack
2617 West Seventh Street
Fort Worth, Texas 76107
C-22 .... 1256 SED

L

LAFAYETTE
Lafayette Radio Electronics
111 Jericho Turnpike
Syosset, L. I., New York 11791
Dyna-Com 3A (99-31940L) CB-37
Dyna-Com 12a (99 32484) CB-38
Dyna-Com 23 (99-32567L) CB-41
HB-23A (99-32351WX) .. CB-38
LA-226 .... 1256—SED
LR-100 (99-02214WX) .. MHF-23
Telsat SSB-25 (99-32377W) CB-37
99-02214WX MHF-23
99-31940L CB-37
99-32351WX CB-38
99-32377W CB-37
99-32484 .... CB-38
99-32567L CB-41

LEAR-JET
(See Auto Radio Listing)

LINCOLN
(See Auto Radio and Recorder Listings)

LLOYD'S
(Also See Recorder Listing)
Lloyd's Electronics of California, Inc.
18601 South Susana Road
Compton, California 90221
1M53-07A MHF-27
1N27-127A TSM-136

M

MACK TRUCK
(See Auto Radio Listing)

MAGNAVOX
(Also See Recorder Listing)
The Magnavox Company
Bueter Road
Fort Wayne, Indiana 46803
1P9282 .... MHF-21
1R1707 .... 1212—5
1R1729 .... 1229—5
1R1736 .... 1216—5
1R1811 .... MHF-27
1R9270 .... MHF-27
1V9053/9054 .... MHF-27
2K8886 .... MHF-24
Chassis A510-02-AA,-BA (Similar to Chassis) .... 923—5
Chassis A511-01-BA (Similar to Page 57) .. MHF-16
Chassis A512-01-AA MHF-21
Chassis A512-02-AA (Similar to Page 5) MHF-21
Chassis AMP86-01-20,-30 (Similar to Chassis) .... 550—10
Chassis AMP86-04-00, AMP86-05-00 (Similar to Chassis) .. 550—10
Chassis AMP86-06-00, AMP86-07-00 (Similar to Chassis) .. 550—10
Chassis AMP86-09-00 (Similar to Chassis) ... 550—10
●Chassis CU362/363 (Similar to Chassis) .... 205—6
●Chassis CU372/373 (Similar to Chassis) .... 205—6
Chassis R214-08-00 (Similar to Chassis) .... 875—6
Chassis R214-09-00 (Similar to Chassis) .... 878—6
Chassis R214-10-00 (Similar to Chassis) .... 877—7
Chassis R214-11-00 (Similar to Chassis) .... 878—6
Chassis R222-06-AA,-CD (Similar to Chassis) ... 1009—5
Chassis R222-78-AA, R222 79-AA (Similar to Chassis) .... 1009—5
Chassis R222-80-AA,R222-81-AA (Similar to Chassis) .... 1009—5
Chassis R222-82-AA,R222-83-AA (Similar to Chassis) ... 1009—5
Chassis R224 .... 1234—SED
Chassis R231-01-AA,R231-02-AA, R231-03-AA .... 1235—4
Chassis R240-01-AA MHF-24
Chassis R264-09-AA (Similar to Chassis) .... 975—6
Chassis R264-10-AA,R264-11-AA (Similar to Chassis) .... 1037—5
Chassis R264-79-AA (Similar to Chassis) .. 975—6
Chassis R278-01-AA MHF-27
Chassis R278-02-AA MHF-27
●Chassis T910-17-EE (Similar to PCB 973-3) . 810—2
★Chassis T933-01-AB,AD,BB, CB,CD,DB, T933-02-AB,AD, T933-03-AB,AD,BB,CB,CD,DB (Similar to Chassis) .. 1005—1
★Chassis T933-04-AB,AZ,BB,BZ, CB,CZ,DB,DZ, T933-05-AB, T933-06-AB,AD,BB,CB,CD,DB (Similar to Chassis) .. 1005—1
★Chassis T933-07-AB,AZ,BB,BZ, CB,CZ,DB,DZ, T933-08-AB, T933-09-AB (Similar to Chassis) .. 1005—1
★Chassis T933-10-AD,CD, T933-11-AB,AC,BB,BC, CB,CC,DB,DC, T933-12-AB,AC,AD (Similar to Chassis) .. 1005—1

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. / Folder No.

MAGNAVOX—Cont.

★Chassis T933-13-AB,AD,CB,CD, T933-14-AB,AD,CB,CD, T933-15-AB,AD,BB,CB,CD,DB (Similar to Chassis) ..1005—1
★Chassis T933-16-AB,AD,CB,CD, T933,17,AB,AC,AD,CB,CC,CD, T933-18-AB,AD,BB,CB,CD,DB (Similar to Chassis) ..1005—1
★Chassis T933-19-AB,AC,AD, T933-20-AB, T933-21-AD,CD, (Similar to Chassis) ..1005—1
★Chassis T933-22-AD,CD, T933-23-AD,CD, T933-24-AD,BC,CD,DC (Similar to Chassis) ..1005—1
★Chassis T933-25-AA,AB,AD,BA, BB,CA,CB,CD,DA,DB, T933-26-AA,AB,AC,AD (Similar to Chassis) ..1005—1
★Chassis T952-01-AA ....1237—2
★Chassis T952-02-EB .....1237—2
★Chassis T952-06 Series 1218-POM
★Chassis T952-08 Series 1218-POM
★Chassis T952-10 Series 1218-POM
★Chassis T952-11 Series 1218-POM
★Chassis T952-12 Series 1218-POM
★Chassis T952-13 Series 1218-POM
★Chassis T956-01-CB,-EB..1259—3
★Chassis T956-02-CB,-EB..1259—3
★Chassis T956-03-CB .....1259—3
★Chassis T957-01-AA, -BA,-CA,-DA,-EA,-FA ..1270—1
★Chassis T957-02-AA, -BA,-CA,-DA,-EA,-FA ..1270—1
●Chassis T959-01-AA .....1249—2
★Chassis T960 Series ..1230-POM
●T961-01-AA ....1258—1
★Chassis T962-01-AA,-AB,-BA, -BB,-CA,-CB,-DA,-DB ..1253—2
★Chassis T962-02-AA,-AB, -BA,-BB ....1253—2
★Chassis T962-05-AA,-AB, -BA,-BB ....1253—2
★Chassis T962-06-AA,-AB,-BA, -BB,-CA,-CB,-DA,-DB ..1253—2
★Chassis T962-07-AA,-AB, -BA,-BB ....1253—2
★Chassis T962-71-AA,-AB,-BA, -BB,-CA,-CB,-DA,-DB ..1253—2
★Chassis T962-72-AA,-AB, -BA,-BB ....1253—2
★Chassis T962-75-AA,-AB, -BA,-BB ....1253—2
★Chassis T962-76-AA,-AB,-BA, -BB,-CA,-CB,-DA,-DB ..1253—2
★Chassis T962-77-AA,-AB, -BA,-BB ....1253—2
●Chassis T963-01-AA ..1248-POM
★Chassis 704060-1 (TV Remote Control Unit) ....1270—1A
★Chassis 704061-1 (TV Remote Control Unit) .1253—2A
★Chassis 704064-1 (TV Remote Control Unit) .1253—2A
★Chassis 704069-1 (TV Remote Control Unit) ....1270—1A

MALLORY
(See Recorder Listing)

MARANTZ
Marantz Co., Inc.
8150 Vineland Avenue
Sun Valley, California 91352

22 ....MHF—29

MASSEY FERGUSON
(See Auto Radio Listing)

MASTERWORK
Masterwork Audio Products
1080 Goffle Road
Hawthorne, New Jersey 07506

M500 ....MHF—25
M504 ....MHF—28

MAYFAIR ELECTRONICS
(See Recorder Listing)

MEDALLION
(See Auto Radio and Recorder Listings)

MERCURY
(See Auto Radio and Recorder Listings)

MGA
(Also See Auto Radio Listing)
Mitsubishi International Corp.
7045 North Ridgway Ave.
Lincolnwood, Illinois 60645

●BB-092 ....1258—2
●BS-130 ....1222—2
●BS-131 ....1238—1
★CH-121 ....1218-POM
★CH-141 ....1218-POM
★CH-160 ....1218-POM
★CH-190/191 ....1218-POM
★CM-253A/-254A/-255A/ -256A ....1239—1
★CS-165 ....1218-POM
★CS-195 ....1218-POM

MIDLAND
(Also See Recorder Listing)
Midland International Corp.
For CB Models
Midland Communications Co.
P.O. Box 19032
Kansas City, Mo. 64141
For All Other Models
P.O. Box 1903
Kansas City, Mo. 64141

11-432 ....1248—5
11-436,A ....1259—4
13-762 ....CB—41
13-868 ....CB—37
13-874 ....CB—38
13-880B ....CB—39
●15-109B ....1253—3
●15-112B ....1232—1
★15-212 ....1255—1
★15-219 ....996—1
★15-225 ....1261—1
★15-228 ....1263—1
19-570 ....MHF—28
19-574 ....MHF—28

MORSE ELECTRO PRODUCTS
(Also See Recorder Listing)
Morse Electro Products Corp.
101-10 Foster Avenue
Brooklyn, New York 11236

T-9 ....TSM—131
T-16 ....TSM—130
T-17 ....TSM—131
T-107 ....MHF—22
T-108 ....MHF—23
T-109 ....MHF—23
T-500A ....MHF—26
T-700 ....MHF—26
T-800 ....MHF—28
T-4100 ....MHF—21
T-4200 ....MHF—27
Ch. 24M ....1217—4
Ch. 26C (Similar to Chassis) ....1207—3
Ch. 31H ....1222—4
Ch. 32M ....1236—5
Ch. 41, 43 ....1224—4
Ch. 64M ....1217—4
Ch. 76K ....1214—4
Ch. 77K ....1221—5

MOTOROLA
(Also See Auto Radio and Recorder Listings)
Motorola, Inc.
9401 West Grand Avenue
Franklin Park, Ill. 60131

●BP309HH (Ch. C12TS-465,T) (Similar to PCB1185-3) 1091—2
●BP318HW (Ch. E12TS-465,T) (Similar to PCB1185-3) 1091—2
●BP403HW (Ch. C12TS-465) (Similar to PCB1185-3) 1091—2
●BP461HW (Ch. 16TS-597,T) (Similar to Chassis) ...1087—2
●BP523HN (Ch. Q19TS-597) (Similar to Chassis) ...1087—2
●BP529HW (Ch. K19TS-597) (Similar to Chassis) ...1087—2
●BP530HW (Ch. Q19TS-597) (Similar to Chassis) ...1087—2
●BP531HW (Ch. 19TS-597T) (Similar to Chassis) ...1087—2
●BP533HW (Ch. C19TS-597T) (Similar to Chassis) ...1087—2
●BP535HW (Ch. D19TS-597T) (Similar to Chassis) ...1087—2
SK102GW ....MHF—24
SK104GW ....MHF—22
SK106GW ....MHF—26
SK107GM ....MHF—24
SK550GS-1/552GC-1 (Ch. GHS-2500/2600) (Similar to Chassis) ...1080—5
SK559HW (Ch. GHS-2500/2600) (Similar to Chassis) ...1080—5
SK564HK (Ch. GHS-2500/2600) (Similar to Chassis) ...1080—5
SK570HP/572HS/573HW (Ch. EHS-62351) (Similar to Chassis)....1089—4
TP2E ....TSM—136
★TT687HW (Ch. ATS-938) 1212-POM
★TT934HW (Ch. ATS-938) 1212-POM
★TU905HW (Ch. ATS-938) 1212-POM
★TU944HW/945HS/946HK (Ch. ATS-938) 1212-POM
★WP477HW (Ch. E16TS-929) ....1240—1
★WP483HW (Ch. E16TS-929) ....1240—1
★WP563GWC (Ch. F18TS-929) ....1240—1
★WP572HW,HWC (Ch. F18TS-929) ....1240—1
★WP572HWQ (Ch. F18TS-929Q) ....1240—1
★WP573HW (Ch. F18TS-929) ....1240—1
★WP580HW (Ch. F18TS-929) ....1240—1
★WP581HW (Ch. 19TS-931) 1230-POM
★WT680GWAC (Ch. STS-934) (Similar to Chassis) ...1205—2
★WT685HW, HWC (Ch. TS-938) 1212-POM
★WT688HW (Ch. TS-938) 1212-POM
★WT809HN (Ch. TS-934) (Similar to Chassis) ...1205—2
★WT933HW, HWC (Ch. TS-938) 1212-POM
★WU834GWAC/835GSAC/ 836GPAC (Ch. STS-934) (Similar to Chassis) ..1205—2
★WU855HW (Ch. STS-934) (Similar to Chassis) ...1205—2
★WU904HW, HWC/906HW, HWC/907HS/908HP,HPC (Ch. TS-938) 1212-POM
★WU911GWAC/912GWAC/ 914GPAC (Ch. STS-934) 1205—2
★WU937GUAC (Ch. STS-934) (Similar to Chassis) ...1205—2
XC1HHA (Ch. FHT12) .....1085—6
●YBP403HW (Ch. YC12TS-465) (Similar to PCB1185-3) .1091—2
●YBP523HN (Ch. YQ19TS-597) (Similar to Chassis) ...1087—2
●YBP535HW (Ch. YD19TS-597T) (Similar to Chassis) ...1087—2
●ZD402HU (Ch. ZDCTS-465) (Similar to PCB1185-3) 1091—2
●ZD523HN (Ch. ZDQ19TS-597) (Similar to Chassis) ..1087—2
ZP232HN (Ch. CHS-3504)..1074—5
●ZV521HN (Ch. ZVL19TS-597T) (Similar to Chassis) ...1087—2
●ZV531JW (Ch. ZV19TS-597T) (Similar to Chassis) ...1087—2
●ZW402HU (Ch. ZWC12TS-465) (Similar to PCB1185-3) ....1091—2
●ZW523HN (Ch. ZWQ19TS-597) (Similar to Chassis) 1087—2
★Ch. ATS-938 ....1212-POM
●Ch. E12TS-465, T (Similar to PCB1185-3) ....1091—2
★Ch. E16TS-929 (Codes B-31 thru B-43,845 thru C-00,C-09) ....1240—1
Ch. EHS-62351 (Similar to Chassis) ....1089—4
★Ch. F18TS-929 (Codes B-31 thru B-43,845 thru C-00,C-09) ....1240—1

MOTOROLA—Cont.

Ch. GHS-2500/2600 Chassis) ....1080—5
●Ch. K19TS-597 (Similar to Chassis) ....1087—2
●Ch. Q19TS-597 (Similar to Chassis) ....1087—2
★Ch. TS-938 ....1212-POM
●Ch. YQ19TS-597 (Similar to Chassis) ....1087—2
●Ch. ZDQ19TS-597 (Similar to Chassis) ....1087—2
●Ch. ZWQ19TS-597 (Similar to Chassis) ....1087—2
★CH. 19TS-931 ....1230-POM

MUNTZ
Television Manufacturers of America
Muntz TV Division
1020 Noel Avenue
Wheeling, Illinois 60090

★55-109 (Ch. AS-9042) ...1261—3
★8100-2 (Ch. AS-9042) ...1261—3
Ch. AS-8115-2 (8115-2).. 1265—5
★Ch. AS-9042 ....1261—3
Ch. 8115-2 ....1265—5

N

NIVICO
JVC America, Inc.
50-35 56th Road
Maspeth, N.Y. 11378

4220 (Similar to Page 29) (Radio Ch. Only) .....MHF—3
8201 ....TSM—136

NORELCO
(Also See Changer and Recorder Listings)
Norelco Service, Inc.
30-30 Review Avenue
Long Island City, New York 11101
Address Change

O

OLDSMOBILE
(See Auto Radio and Recorder Listings)

OLYMPIC
(Also See Recorder Listing)
Olympic Int'l. Ltd.
Service Dept.
89-89 Union Turnpike
Glendale, N.Y. 11227

CS821 ....MHF—25
CS840/841/842 (Ch. 329-1) ....1261—4
CST849 (Ch. 329-1) .....1261—4
CT822 ....MHF—25
●3P70 ....1237—3
●6P71 ....1221—2
●7T140 (Ch. NEC) ......1209—1
●9P94 ....1219—2
40CC20,B (Ch. 329) .....1261—4
40CC20T (Ch. 329-3) ....1261—4
40SC21 (Ch. 329) ....1261—4
40SC21T (Ch. 329-3) ....1261—4
40SC22 (Ch. 329) ....1261—4
40SC22T (Ch. 329-3) ....1261—4
50FP80B (Ch. 329) ......1261—4
54SC72 (Ch. 330) ....1256—4
54SC72T (Ch. 330, TDA 301) ....1256—4
60CD60B (Ch. 329) ......1261—4
60CD60BT (Ch. 329-3) ...1261—4
60CD61B (Ch. 329) ......1261—4
60CD61BT (Ch. 329-3) ...1261—4
60SD63B (Ch. 330) ......1256—4
60SD63BT (Ch. 330, TDA 301) ....1256—4
67SC71B (Ch. 330) ......1256—4
67SC71T (Ch. 330, TDA301) ....1256—4
72SD70B (Ch. 330) ......1256—4
72SD70BT (Ch. 330, TDA301) ....1256—4
Ch. TDA301 ...1256—4A, 1261—4A
Ch. 329,-1,-3 ....1261—4
Ch. 330 ....1256—4

OPEL
(See Auto Radio Listing)

P

PACE
Pathcom, Inc.
24049 S. Frampton Ave.
Harbor City, Calif. 90710

100-S ....CB—41

PACKARD BELL
(Also See Recorder Listing)
Teledyne Packard Bell Electronics
12333 West Olympic Blvd.
Los Angeles, Calif. 90064

RPC-234 (Ch. 18HF6) .....1215—4
RPC-238 (Ch. 18HF6) .....1215—4
RPC-252 (Ch. 18HF7) .....1215—4
RPC-311/312/314 (Ch. 36HF2) (Similar to Chassis) .....1204—4
RPC-344/346/348 (Ch. 18HF6) ....1215—4
RPC-352 (Ch. 18HF7) .....1215—4
RPCT-344/346 (Ch. 18HF6, TPAK-25) For Radio Ch...1215—4
For Tape Player (Similar to Page 80) ....HTP—1
RPS-09 (Ch. 18HF7) .....1215—4
RPS-105/107 (Ch. 36HF2) (Similar to Chassis) .....1204—4
RTS-24 ....MHF—25
RTS-115 (Ch. 36HF2, TRA-14) For Radio Chassis .....1204—4
For Recorder Chassis (See Page 107) ....TR—66
RTS123 (Similar to Page 78) ....MHF—25
RTS123A ....MHF—27

PACKARD-BELL—Cont.

★1C524WL 1236-POM
★1C624 ....1164—2
●1M123/125 ....1172—1
●1M323/325 ....1172—1
●1M523/525 ....1174—1
●1M623/625 ....1175—2
★2C842/844 (Ch. 98C32 or 98C34) ......1124—2
★2C852/854 (Ch. 98C32 or 98C34) ......1124—2
★2C934 (Ch. 98C32 or 98C34) ......1124—2
★2C954 (Ch. 98C32 or 98C34) ......1124—2
Ch. 18HF6,18HF7 ....1215—4
Ch. 36HF2 (Similar to Chassis) ....1204—4
★Ch. 98C34 (Similar to Chassis) ....1124—2

PANASONIC
(Also See Auto Radio and Recorder Listings)
Matsushita Electric Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101

●AN-96 (Similar to Chassis) 1146—1
●AN-132,C ....1240—2
●AN-142,C ....1240—2
●AN-152D,DC ....1240—2
●AN-162 (Similar to Chassis) ....1240—2
★CT-392, C 1218-POM
★CT-394, C 1218-POM
★CT-395VR 1230-POM
★CT-396 ....1236-POM
★CT-771 ....1242-POM
★CT-991P (Late Prod.) .....1228—2
RC-6121,C ....1255—4
RE-6451, C ....1211—5
RE-7412 ....MHF—29
RE-7430,C ....MHF—24
RE-7800, C ....MHF—22
RF-550 ....TSM—136
RF-759,C ....TSM—136
RS-820S ....MHF—23
SA-40 ....MHF—27
SC-555 (Similar to page 49) ....MHF—19
SD-203 ....MHF—28
SE-2030 ....MHF—23
SE-2070 ....MHF—26
SG-635 ....1228—5
●TR-003, C 1224-POM
●TR-005, C 1224-POM
●TR-425R, RC ....1235—1
●TR-445T ....1243—3
●TR-465R 1230-POM
●TR-475 ....1248-POM
●TR-489R ....1265—1
●TR-499 ....1242-POM
●TR-522 ....1230-POM
●TR-539 ....1268—1
●TR-542 ....1242-POM
●TY-703P ....1265—1

PEARCE-SIMPSON
Pearce-Simpson, Inc.
4701 N.W. 77th Ave.
Miami, Florida 33152

Cougar 23 ....CB—38
Wildcat II ....CB—40

PENNEYS-PENNCREST
(Also See Auto Radio and Recorder Listings)
J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N.Y. 10019

★CR201 (TV Remote Control Unit) ....1225—2A
★CT202 (TV Remote Control Unit) ....1225—2A
★685-4827A/4828 ....1233—2
1310 ....MHF—26
1312 ....MHF—28
●1317 ....1242-POM
●1412 ....1242-POM
1701 ....MHF—29
●2321,2322 ....1239—2
●2324A ....1100—3
●2331A ....1100—3
●2335 (Similar to Chassis) ..1162—1
●2341 ....1270—2
●2365 (Similar to Chassis) .1089—3
●2366 (Similar to Chassis) ..1089—3
★2852 ....1230-POM
★2853 ....1225—2
★2855, A ....1221—3
★2856 ....1218-POM
★2857 ....1230-POM
★2861/62/63 ....1221—3
★2871, A ....1218—1
★2872 ....1230-POM
★2885A ....1236—2
★2886 ....1224—2
★2887, A ....1221—3
★2889 ....1242-POM
3810 ....TSM—132
3840 ....TSM—129
3850 ....TSM—130
●4356A/57A/58A ....1226—1
●4392A ....1226—1
4801 ....1241—4
★4834B/35B ....1247—1
★4848B ....1247—1
★4854B/55B ....1247—1
★4896B ....1247—1
5138 ....1237—5
5906 ....1224—5
6681 ....MHF—24
6825, A ....MHF—21
★6892A/93A ....1247—1

PHILCO-FORD
Philco-Ford Corporation
Tioga & "C" Streets
Philadelphia, Pa. 19134

●B413BBE/414BAV/415BWA (Ch. 3BL23) 1236-POM
●B451BBK (Ch. 3BM23) .1248-POM
●B461BWA (Ch. 3BM23) 1248-POM
●B522AWH (Ch. 20P24) ....(PCB-1211-4) 1148—1
●B532AWA (Ch. 20P24) ....(PCB-1211-4) 1148—1
●B661AWA (Ch. 20ST30AV) ....1241—2
●B709BWH (Ch. 20ST30B) (Similar to Chassis) ...1241—2
●B712AWH,AWH-1/713AAV (Ch. 20ST30AV) ....1241—2

PHILCO-FORD—Cont.

●B717AWA,AWA-1 (Ch. 20ST30AV) ....1241—2
●B717AWA2 (Ch. 20ST30B) (Similar to Chassis) ..1241—2
●B718AWA (Ch. 20ST30AV) ...... 1241—2
●B733AWA,AWA-1 (Ch. 21ST31V) ..... 1241—2
●B855AWA (Ch. 21ST31V) .1241—2
●B872BPC (Ch. 21ST31V) ..1241—2
●B913BWA (Ch. 3BL23) 1236-POM
★C3052BWA (Ch. 2CN20) 1248-POM
★C3751AWA 1 (Ch. 2CP30) 1236-POM
★C3761BWA (Ch. 2CP31) 1248-POM
★C4860AWA (Ch. 22LT45) ..1268—2
★C4870AWA (Ch. 22LT45) ..1268—2
★C4875AWA (Ch. 22LT45R,RM30A) ....1268—2
★C7200AWA (Ch. 22QT79) 1239—3
★C7210AWA (Ch. 22QT80) 1239—3
★C7229AWA (Ch. 22QT80) 1239—3
★C7250AWA/51AMA/52APC (Ch. 22QT80) ....1239—3
★C7272ALP (Ch. 22QT80) .1239—3
★C7310AWA (Ch. 22ST80)..1235—2
★C7310AWAB-1 (Ch. 2CY80) 1236-POM
★C7320AWA (Ch. 22ST80) .1235—2
★C7320AWAB-1 (Ch. 2CY80) 1236-POM
★C7337BPC (Ch. 2CY80) 1236-POM
★C7340AWA (Ch. 22ST80)..1235—2
★C7345AWA (Ch. 22ST80) .1235—2
★C7360AFW/61AMA (Ch. 22ST80) ....1235—2
★C7362APC, AMD (Ch. 22ST80) ....1235—2
★C7370AWA/72ALP (Ch. 22ST80) ....1235—2
★C7382ADKB (Ch. 21ST91P or PS) (Similar to Chassis) ....1235—2
★C7382ALK (Ch. 21ST91P) .1235—2
★C8180AWA/8182ALK (Ch. 22ST81,10PR705A) For TV Ch. ....1235—2
For Radio Ch. ....1241—5
★C8180AWA-2/8182ALK 2 (TV Ch. only-22ST81) .1135—2
★C9270AWA (Ch. 22LT45) .1268—2
★C9350AWA/52APC (Ch. 22QT80) ....1239—3
★C9440AWA (Ch. 22ST80). 1235—2
★C9450AWA/52APC (Ch. 22ST80) ....1235—2
H350UWA/351UMA/352UDK (Ch. 10PR705,U70STDK) 1241—5
H353AWA/354AMA/355ALK (Ch. 10PR705) ....1241—5
H450UWA/451UMA (Ch. 10PR705,U70STDKA) 1241—5
H460UWA (Ch. 10PR705,U70STDKA) .. 1241—5
H461AWA/462AMD (Ch. 10PR705,A) ....1241—5
H462UDK (Ch. 10PR705,U70STDKA) ...1241—5
H510AWA (Ch. 10PR705A) 1241—5
H540UWA (Ch. U150ST) ..1232—5
H572UDK (Ch. U150ST) ..1232—5
H952ALK (Ch. T20STX) (Similar to Chassis) ....1140—6
R574WA ....1260—5
★RM30A (TV Remote Control Unit) ......1268—2A
●T1240TN (Ch. 19L21) (Similar to Chassis) ....1052—1
★T5062WAX (Similar to Chassis) ....1032—2
Ch. RT105B ....1241—5
Ch. U70STDK,STDKA ....1241—5
Ch. U150ST ....1232—5
★Ch. 2CN20 ....1248-POM
★Ch. 2CP30 ....1236-POM
★Ch. 2CP31 ....1248-POM
★Ch. 2CY80 ....1236-POM
●Ch. 3BL23 ....1236-POM
●Ch. 3BM23 ....1248-POM
Ch. 9PS70 ....1241—5
Ch. 10PR705,A ....1241—5
●Ch. 20P24 (Run 7) ....(PCB 1211-4) 1148—1
●Ch. 20ST30AV (Run 5) .. 1241—2
●Ch. 20ST30B (Similar to Chassis) ....1241—2
●Ch. 21ST31V (Run 5) ......1241—2
★Ch. 21ST90T ....1174—2
★Ch. 21ST91P ....1235—2
★Ch. 22LT45,R ....1268—2
★Ch. 22QT79 ....1239—3
★Ch. 22QT80 ....1239—3
★Ch. 22ST80/81 ....1235—2

PHILMORE
Philmore Mfgr. Co., Inc.
40 Inip Drive
Inwood, N.Y. 11696

PIONEER
U.S. Pioneer Electronics Corporation
178 Commerce Road
Carlstadt, New Jersey 07072

SX-440 ....MHF—22
SX-770 ....MHF—24
SX-990 ....MHF—21

PLYMOUTH
(See Auto Radio Listing)

PONTIAC
(See Auto Radio and Recorder Listings)

PORSCHE
(See Auto Radio and Recorder Listings)

R

RCA
(Also See Recorder Listing)
RCA Sales Corporation
600 North Sherman Drive
Indianapolis, Indiana 46201

●AP191W (Ch. KCS171E) ....(PCB 1216-4) 1061—1
●AP301W (Ch. KCS174H) ....(PCB 1232-4) 1115—2

RCA—Cont.

●AQ098E (Ch. KCS176XB, RC-3006) ....1224—1
●AQ122W (Ch. KCS188A) ..1227—2
●AQ127B (Ch. KCS188A) ..1227—2
●AQ151W (Ch. KCS168XA) ....1268—3
●AQ154A,W (Ch. KCS168XA) ....1268—3
●AQ158WR (Ch. KCS168XB,KRT5A) ... 1251—1
●AQ186F, WEN (Ch. KCS171F,R,AB) ....(PCB 1216-4) 1061—1
●AQ191W (Ch. KCS171E,P,AA) ....(PCB 1216-4) 1061—1
●AQ194W (Ch. KCS171E,P,AA) ....(PCB 1216-4) 1061—1
●AQ198WEN/200W (Ch. KCS172D,E) (Similar to Chassis) ....1198—3
●AQ201WEN (Ch. KCS174H,L,M) ....(PCB 1232-4) 1115—2
●AR108Y (Ch. KCS176XH) 1254-POM
●AR-122W (Ch. KCS188B) ....1261—2
●AR-123W (Ch. KCS188A) ....1261—2
●AR-127B (Ch. KCS188A) ....1261—2
●AR128E (Ch. KCS187A) 1242-POM
●AR151W (Ch. KCS168XD) 1248-POM
●AR154F (Ch. KCS168XD) 1248-POM
●AR158WR (Ch. KCS168XE) 1248-POM
●AR191W (Ch. KCS171AE) 1242-POM
●AR-192W (Ch. KCS172L) 1242-POM
●AR193W (Ch. KCS186B) 1254-POM
●AR194F/195WEN (Ch. KCS171AE) 1242-POM
●AR-200W (Ch. KCS172M) 1242-POM
●BQ221WEN (Ch. KCS179XA,XF,XK) ....(PCB 1252-4) 1160—1
●BR225WEN (Ch. KCS179XM) 1254-POM
★CQ222W/223L/224W/ 226L/227W/228S (Ch. KCS183D,E) ....1236—3
●CR222W/223L (Ch. KCS183F) 1254-POM
●CR229L (Ch. KCS183F) 1254-POM
★EQ325E,H (Ch. CTC51B) (Similar to Chassis) .....1209—3
★EQ-391W (Ch. CTC52XAB) 1242-POM
★EQ425W (Ch. CTC55XAB) 1242-POM
★EQ446EEN (Ch. CTC52A) (Similar to Chassis) ......1211—3
★EQ449WR (Ch. CTC55XT) (Similar to Chassis) .....1203—2
★EQ-469W (Ch. CTC63XA) 1242-POM
★EQ475W (Ch. CTC59XA) 1212-POM
★EQ475WR (Ch. CTC59XB) 1212-POM
★ER-334W (Ch. CTC51E) 1242-POM
★ER-338W (Ch. CTC51XU) 1242-POM
★ER-390W (Ch. CTC52XAE) 1242-POM
★ER-395W (Ch. CTC52XAE) 1242-POM
★ER403E/405W (Ch. CTC53C) ....1271—1
★ER410WEN (Ch. CTC53D) ....1271—1
★ER415W (Ch. CTC53XU) ....1271—1
★ER420WEN (Ch. CTC53XU) ....1271—1
★ER425W (Ch. CTC55XAB) ....1271—1
★ER425WR (Ch. CTC55XAH,KRT5B) ......1271—1
★ER-430W (Ch. CTC63XC) 1242-POM
★ER475W (Ch. CTC59XD) 1248-POM
★ER475WR (Ch. CTC59XE) 1248-POM
★FQ485W (Ch. CTC50XR) .1226—2
★FQ505W (Ch. CTC46A) .1243—2
★FQ505WR (Ch. CTC46B) ..1243—2
★FQ517W (Ch. CTC39XAR) .1246—2
★FQ517WR (Ch. CTC39XAT) 1246—2
★FQ535W (Ch. CTC39XAK) .1246—2
★FQ545W (Ch. CTC46H) . .1243—2
★FQ547WR (Ch. CTC54A, CTP20A,CRK14C) ......1254—2
★FR-505WX (Ch. CTC46A) 1242-POM
★FR-510WENX (Ch. CTC46A) 1242-POM
★GQ561W/563L (Ch. CTC50XR) ....1226—2
★GQ575A,W (Ch. CTC46A) .1243—2
★GQ579L (Ch. CTC46A) ..1243—2
★GQ583S (Ch. CTC46A) ..1243—2
★GQ599W (Ch. CTC39XAJ) 1246—2
★GQ619W (Ch. CTC39XAJ) 1246—2
★GQ621W/623L/625D,S (Ch. CTC39XAJ) ......1246—2
★GQ627L (Ch. CTC39XAJ) .1246—2
★GQ634L (Ch. CTC39XF) .1246—2
★GQ636D,S (Ch. CTC39XF) 1246—2
★GQ637D,S (Ch. CTC39XAJ) 1246—2
★GQ653W (Ch. CTC39XAJ) 1246—2
★GQ657L (Ch. CTC39XAJ) .1246—2
★GQ661D,S/662W/663L/665D,S (Ch. CTC39XAJ) ....1246—2
★GQ669W (Ch. CTC46H) (Similar to Chassis) ....1243—2
★GQ673L (Ch. CTC46H) (Similar to Chassis) ....1243—2
★GQ677D,S (Ch. CTC46H) (Similar to Chassis) ....1243—2
★GQ679W (Ch. CTC46H) ..1243—2
★GQ681WR (Ch. CTC54A, CTP20A,CRK14C) ......1254—2
★GQ709L (Ch. CTC46H) ..1243—2
★GQ711LR (Ch. CTC54A, CTP20A,CRK14C) ......1254—2
★GQ715D,F (Ch. CTC46H) .1243—2

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. Folder No.

RCA—Cont.

★GQ719D,S (Ch. CTC46H) . 1243-2
★GQ721DR,SR (Ch. CTC54A, CTP20A,CRK14C) 1254-2
★GQ723W (Ch. CTC46H) . 1243-2
★GQ725W (Ch. CTC46H) .. 1243-2
★GQ729W (Ch. CTC46H) .. 1243-2
★GQ737L/739D,S,Q,Y (Ch. CTC46H) 1243-2
★GQ745W (Ch. CTC46H) .. 1243-2
★GQ749W (Ch. CTC46H) .. 1243-2
★GQ759L (Ch. CTC46H) . 1243-2
★GQ769D,S (Ch. CTC46H). 1243-2
★GQ819W (Ch. CTC46H) .. 1243-2
★GQ829F (Ch. CTC46H) . 1243-2
★GQ839L (Ch. CTC46H) . 1243-2
★GQ841LR (Ch. CTC54A, CTP20A,CRK14C) 1254-2
★GQ849F (Ch. CTC46H) ... 1243-2
★GQ859D,S (Ch. CTC46H). 1243-2
★GQ861DR,SR (Ch. CTC54A, CTP20A,CRK14C) 1254-2
★GQ879W (Ch. CTC46H) .. 1243-2
★GQ881W (Ch. CTC46H). 1243-2
★GQ887L (Ch. CTC46H) .. 1243-2
★GQ893D,S (Ch. CTC46H). 1243-2
★GR-530WX (Ch. CTC46A) 1242-POM
★GR-534LX (Ch. CTC46A) 1242-POM
★GR-538DX,SX (Ch. CTC46A) 1242-POM
★GR-544AX,LX (Ch. CTC46A) 1242-POM
★GR-548DX,GX,SX (Ch. CTC46A) 1242-POM
★GR612W (Ch. CTC39XAJ,XAB) 1254-POM
★GR657L (Ch. CTC39XAJ,XAB) 1254-POM
★GR661D,S (Ch. CTC39XAJ,XAB) 1254-POM
★GX726W (Ch. CTC46H) (Similar to Chassis) .. 1243-2
★HP908L/910D,S (Ch. CTC39XP, RC-1239D, RS-253F) For TV Chassis .... 1126-3 For Radio/Amp. Chassis (Similar to) 1169-6
★HQ901A,W (TV Ch. Only CTC46A) 1243-2
★HQ907W (TV Ch. Only CTC46P) 1243-2
★HQ919W (TV Ch. Only CTC46P) 1243-2
★HQ923L (TV Ch. Only CTC46P) 1243-2
★HQ927D,S (TV Ch. Only CTC46P) 1243-2
★HQ935SR (TV & Remote Ch. only-CTC54P, CTP20A, CRK14C) 1254-2
★HQ941SR/943SR,DR (TV & Remote Ch. only CTC54H, CTP20A, CRK14C) 1254-2
●JP192W (Ch. KCS171J,T,AC) ....(PCB 1216-4) 1061-1
★JP956W (Ch. CTC53XAD) . 1271-1
●KF185E,J (Ch. KCS142R) (Similar to Chassis) ... 728-3
RK329E MHF-27
RLM50A (Similar to Page 75) TSM-82
RVM685E TSM-134
RVM694E TSM-130
RVS856R 1238-5
RVS881W 1238-5
RVS884L 1238-5
RVS888D 1238-5
RZC288 .... MHF-29
RZC941W-K MHF-24
RZM152E TSM-136
RZS454T 1238-5
RZS476W 1217-5
VPP50E (Ch. RC-3003A, RS-243A) 1242-5
VPP62R (Ch. RC-3004A, RS-265B) 1262-5
VPT26W (Ch. RC-3005) .. 1250-4
VQP62B (Ch. RC-3004A, RS-265F) 1262-5
VQT10W/11L/12S (Ch. RC-3005B) 1250-4
VQT18W/19L (Ch. RC-3005B) 1250-4
VQT20W/21L (Ch. RC-3005A,B) 1250-4
VQT22S (Ch. RC-3005A) . 1250-4
VRE08W/09L (Amp Ch. Only—RS-265D) 1207-4
VRP48S (Ch. RS-271B) .. 1208-4
VRP56W (Ch. RS-265D) .. 1207-4
VRP62R (Ch. RC-3004A, RS-265F) 1262-5
VRT20W/21L/22S (Radio Ch. Only RC3005B) 1250-4
VS1001W (Ch. RS-265D) .. 1207-4
VS1002W (Ch. RS-265D) .. 1207-4
VS1200W (See Page 75) .. MHF-20
VS1300WV MHF-28
VS1400Y MHF-29
VS3001W MHF-27
VS4000 .... MHF-26
VZP30G (Ch. RS-270B)... 1208-4
VZP33B,J (Ch. RS-270B) . 1208-4
VZP38B (Ch. RS-270B) .. 1208-4
●193K019MV (Similar to PCB 655-4) .... 553-?
★Ch. CRK13A (TV Remote Control Unit) 1243-2
★Ch. CRK14C (TV Remote Control Unit) 1254-2A
★Ch. CTC39XAJ,XAK,XAR, XAT,XF 1246-2
★Ch. CTC39XAJ,XBJ (1973 Prod.) 1254-POM
★Ch. CTC46A (1972 Prod.) 1243-2
★Ch. CTC46A (1973 Prod.) 1242-POM
★Ch. CTC46B,H,P 1243-2
★Ch. CTC50XR 1226-2
★Ch. CTC51B (Similar to Chassis) 1209-3
★Ch. CTC51E,XU 1242-POM
★Ch. CTC52XAB,XAE .. 1242-POM
★Ch. CTC53C,D 1271-1
★Ch. CTC53XAD 1271-1
★Ch. CTC53XU 1271-1
★Ch. CTC54A,H,P 1254-2
★Ch. CTC55XAB 1271-1
★Ch. CTC55XAH 1271-1

Set No. Folder No.

RCA—Cont.

★Ch. CTC55XT (Similar to Chassis) 1203-2
★Ch. CTC59XA,XB 1212-POM
★Ch. CTC59XD,XE 1248-POM
★Ch. CTC63XA,XC 1242-POM
★Ch. CTP20A (TV Remote Control Unit) 1254-2A
●Ch. KCS148R (Similar to Chassis) 728-3
●Ch. KCS168XA 1268-3
●Ch. KCS168XB 1251-1
●Ch. KCS168XD,XE 1248-POM
●Ch. KCS171AA,AB,AC,E,F, J,P,R,T....(PCB 1216-4) 1061-1
●Ch. KCS172L,M 1242-POM
★Ch. KCS173K,L,N,P 1061-1
★Ch. KCS174H,L,M ....(PCB 1232-4) 1115-2
●Ch. KCS176XB 1224-1
●Ch. KCS176XH 1254-POM
●Ch. KCS179XA,XF,XK ....(PCB 1252-4) 1093-1
●Ch. KCS179XM 1254-POM
●Ch. KCS183D,E 1236-3
●Ch. KCS183F 1254-POM
●Ch. KCS186B 1254-POM
●Ch. KCS187A 1242-POM
●Ch. KCS188A 1227-2
●Ch. KCS188A (1973 Prod.) 1261-2
●Ch. KCS188B 1261-2
●Ch. KRT5A (TV Remote Control Unit) 1251-1A
★Ch. KRT5B (TV Remote Control Unit) 1271-1
Ch. RC-3003A 1242-5
Ch. RC-3004A 1262-5
Ch. RC-3005A,B 1250-4
Ch. RC-3006 .... 1224-1A
Ch. RS-243A 1242-5
Ch. RS-265B,F 1262-5

RANGER
(See Auto Radio and Recorder Listings)

RAYMER
Trutone Electronics, Inc.
14660 Raymer Street
Van Nuys, California 91405

LTS-1 (Speaker Line Tester) 1217-SED
795 (10 Watt Amplifier) 1217-SED
801-35 (35 Watt Amp) . 1253-SED
872-35 .... 1261-SED

RAYTHEON (Also see Belmont) For CB
Raytheon Co.
213 E. Grand Avenue
So. San Francisco, Calif. 94080

RAY-1015 (See Photofact Servicer) 625

REALISTIC
(Also See Recorder Listing)
Allied Radio Shack Corporation
2727 West 7th Street
Fort Worth, Texas 76107

TRC-100B (21-134) CB-38
12-1474 1236-6
21-134 .... CB-38

REGENCY
Regency Electronics, Inc.
7900 Pendleton Pike
Indianapolis, Indiana 46226

CB-291 .... CB-37
Sprint/23 (CB-291) CB-37

RENAULT
(See Auto Radio Listing)

ROBERTS
(See Recorder Listing)

ROBYN
Robyn International, Inc.
P.O. Box 478
Rockford, Michigan 49341

BB-123 .... CB-39
TR-123C CB-38

ROSS
(Also See Recorder Listing)
Ross Electronics Corporation
2834 South Lock Street
Chicago, Illinois 60608

8450 .... TSM-133
8802 .... TSM-135
8875 .... TSM-134

S

SAAB
(See Auto Radio Listing)

SANYO
(Also See Radio and Recorder Listings)
Sanyo Electric, Inc.
1200 West Walnut Street
Compton, California 90220

★21C10 .... 1200-POM
●21T41 1232-2
●21T42 1260-2
●21V71, 21V72 1219-3
★51C11 .... 1224-POM
★81C13,81C14 1258-3
●90T41 1263-2
★91C12 1258-3
★91C16/17 .... 1224-POM
★91C18 .... 1230-POM
●91V17 .... 1224-POM
●91V71 1238-2
★6502,6503 1258-3

SBE
Linear Systems, Inc.
220 Airport Boulevard
Watsonville, California 95076

Catalina CB-41
Console CB-41
SBE-7CB (Sierra) CB-39
SBE-8CB (Console) CB-41
SBE-9CB (Catalina) CB-41
Sierra CB-39

Set No. Folder No.

SEARS-SILVERTONE
(Also See Recorder Listing)
Sears, Roebuck & Company
303 East Ohio Street
Chicago, Illinois 60611

132.20360001 (Similar to Chassis) 1214-5
132.20890000 1222-5
132.20920000 1214-5
132.20920001 (Similar to Chassis) 1214-5
132.22800001 .... TSM-131
132.31003000/3001 1227-4
499.74060000/60001 ..... MHF-23
528.31214100-101 (Similar to Chassis) 1175-6
528.31216100/101 (Similar to Chassis) 1175-6
528.31303006/007 (Similar to Chassis) 1175-6
528.31304006/007 (Similar to Chassis) 1175-6
528.31305006/007 (Similar to Chassis) 1175-6
528.31314101 (Similar to Chassis) 1175-6
528.31516102 (Similar to Chassis) 1175-6
528.32880100 .... MHF-25
★528.41880100 ...... 1212-POM
★528.43050001 thru 43050021 ....(PCB 1219-4) 1127-3
★528.43140021 thru .43140039 1263-3
★528.43146012 thru .43146035 1263-3
★528.43150021 thru .43150039 1263-3
★528.43156012 thru .43156035 1263-3
★528.43160021 thru .43160039 1263-3
★528.43166012 thru .43166035 1263-3
★528.43170021 thru .43170039 1263-3
★528.43176012 thru .43176035 1263-3
★528.43220006 thru .43220028 1263-3
★528.43260001 (Similar to Chassis) 1208-3
★528.43260002 thru .43260019 1263-3
★528.43266000 thru .43266004 (Similar to Chassis) 1208-3
★528.43266005 thru .43266019 1263-3
★528.43290100 thru .43290108 1256-1
★528.43300100 thru .43300107 1256-1
★528.43310100 thru .43310107 1256-1
★528.43320100 thru .43320107 1256-1
★528.43330100 thru .43330107 1256-1
★528.43341100 thru .43341126 1250-2
★528.43351100 thru .43351126 1250-2
★528.43361100 thru .43361126 1250-2
★528.44100000 thru .44100024 1249-3
●528.50070006 thru .50070010 ....(PCB 1245-4) 1190-3
●528.50130100 thru .50130107 1269-2
●528.50400004 thru .50400023 ....(PCB 1245-4) 1190-3
●528.51030000 thru .51030021 1248-1
●528.51030103 1248-1
●528.51031200 1248-1
●528.51130100 thru .51130118 1248-1
●528.51140007/0008/0009/0010 ....(PCB 1220-4) 1134-3
●528.51150007 thru .51150015 ....(PCB 1220-4) 1134-3
●528.51150016 thru .51150025 ....(PCB 1244-4) 1134-3
●528.51710906 thru .51710915 ....(PCB 1220-4) 1130-3
●528.51710916/917 (Similar to PCB 1220-4) 1130-3
●528.51720906 thru .51720915 ....(PCB 1220-4) 1130-3
●528.51720916/917 (Similar to PCB 1220-4) 1130-3
548.74200100 1240-4
★562.40801000/1001 ....(PCB 1216-4) 1154-3
★562.40900000 1255-2
●562.50230100 1247-2
●562.50270100 1247-2
●562.50271200 (Similar to Chassis) 1247-2
●562.50310100 1247-2
564.22790100 .... TSM-129
★564.40050100 ...... 1224-POM
★564.40570000/0001 1229-3
★564.41220001 ....(PCB 1247-4) 1169-2
★564.41221100 ...... 1242-POM
★564.41230100 ...... 1242-POM
●564.49980100 1184-1
●564.50020200 (Similar to Chassis) 1184-1
●564.50080100 1228-3
3264 (Ch. 528.69680/681) 983-6
★4033 (Ch. 562.10512) ....(PCB 1229-4) 1123-3
★41101 (Ch. 564.80161/162) ....(PCB 1228-4) 1147-1
★71741 (Ch. 528/529.62540/ 41/42/43/44/45/46/47 /48/52/53/54/55/61 /63/630/31/32/33/34 /35/36/37/38/42/43 /44/45/51/53 872-3
★Ch. 11G9NB (TV Remote Control Unit) 1208-3A
Ch. 528.69681 (Similar to Chassis) 983-6
★Ch. 528.72730/31/32/33/34/35 (Similar to Chassis)... 1091-3
★Ch. 562.10512 ....(PCB 1229-4) 1123-3
★Ch. 564.80161/162 ....(PCB 1228-4) 1147-1

Set No. Folder No.

SETCHELL-CARLSON
Setchell-Carlson, Inc.
New Brighton
St. Paul, Minnesota 55112

602C,CR,CU (Ch. X162).. 608-3

SHARP
(Also See Recorder Listing)
Sharp Electronics Corp.
10 Keystone Place
Paramus, N.J. 07652

★C-922W 1254-POM
★C-1921 .... 1254-POM
★C-2011 .... 1218-POM
★C-2031 .... 1218-POM
★C-9311 .... 1218-POM
FXH-47 1218-4
SA-301U MHF-28
●TF-90P 1218-2
★TF-90PA 1255-3
●TU-95PA 1256-2
●TW-93P/94P 1218-2
●2U-121S 1218-POM
●2W-141D 1250-3
●3S-27R,W 1254-POM
●3S-111R,W 1260-3

SIMCA
(See Auto Radio Listing)

SINGER
Singer Consumer Prod. Div.
30 Rockefeller Plaza
Room 6228
New York, New York

●HE-7010 1251-2
●HE-7020 1251-2
●HE-7030 1248-2
★HE-8001 1264-2
●HE-8121 1266-1

SONY
(Also See Recorder Listing)
Sony Corp. of America
47-47 Van Dam St.
Long Island City, N.Y. 11101

HP-150 (CSA), (E), (UL) MHF-28
HP-180W MHF-27
★KV-1210U (Late Prod. Ch. SCC-06-E) 1232-3
★KV-1220U (Ch. SCC-10-A, SCC-A04-AA,-CA) 1218-3
★KV-1224 (Ch. SCC-19A-A) 1224-POM
★KV-1720 .... 1212-POM
★KV-9000U (Ch. SCC-B-01- AA,-BA,-DA) 1222-3
TFM-C590W 1265-4
TFM-C690W 1265-4
TFM-117WA TSM-136
TFM-1000WA TSM-136
TFM-8100W TSM-136
●TV-112 1242-3
●TV-730 (Ch. SMC-155A) ... 1235-3
●TV-740 1245-2
●TV-750 .... 1254-POM
●TV-900UA (Ch. SMC-160) 1234-2
●TV-940 (Ch. SMC-157) 1234-2
●TV-950 .... 1254-POM
★Ch. SCC-A01-AA,-BA,-DA . 1216-2
★Ch. SCC-A04-AA,-CA 1218-3
★Ch. SCC-B-01-AA,-BA,-DA . 1222-3
★Ch. SCC-06-E (Late Prod.) . 1232-3
★Ch. SCC-08-A,-B 1216-2
★Ch. SCC-10-A 1218-3
★Ch. SCC-19A-A 1224-POM
●Ch. SMC-155A 1235-3
●Ch. SMC-157 1234-2
●Ch. SMC-160 1234-2

SOUNDESIGN
(Also See Recorder Listing)
Realtone Electronics Corp.
34 Exchange Place
Jersey City, N.J. 07302

4962 .... TSM-133
4965 .... TSM-134
4983 .... TSM-135

SYLVANIA
(Also See Recorder Listing)
GTE Sylvania, Inc.
700 Ellicott Street
Batavia, N.Y. 14021

ACS12WH (Ch. R32-3) 1258-5
ACS14 (Ch. R33-3) MHF-27
BK370WH, YL (Ch. 375-2) . 1226-4
BK375WH (Ch. 375-2) 1226-4
BK380W (Ch. 375-2) 1226-4
BT320GN, WH (Ch. 375-1) 1226-4
BT330WH (Ch. 375-1) 1226-4
BT335W (Ch. 375-1) 1226-4
BT350W (Ch. 375-3) 1226-4
BT355P (Ch. 375-3) 1226-4
★CD70-1 (Ch. D14-8) 1245-3
★CD72-1/74-1 (Ch. D14-10) 1245-3
★CD82WR-2 (Ch. D14-11) . 1245-3
★CE81W-2/83P-2/85W-4 (Ch. D15-5) 1271-2
★CE88K-3 (Ch. D15-5) 1271-2
★CE1181W (Ch. D15-3) 1271-2
★CE1188P-2/1189W (Ch. D15-3) 1271-2
★CE1191W-1/1193K-1 (Ch. D15-3) 1271-2
★CE1197P-1 (Ch. D15-3) .. 1271-2
★CE1197P-3 (Ch. D15-7) .. 1271-2
★CF701W-2/702W-2/704W-2 /706K-2 (Ch. D16-9) 1264-3
★CF713P-3 (Ch. D16-9) 1264-3
★CF1403K 1, N-1 (Ch. D16-9) 1264-3
★CF1407DP-1/1407P-1 (Ch. D16-9) 1264-3
★CL479P-3/P-7 (TV Ch. Only E01-13) 1251-3
★CL594CR-3 (Ch. E01-14).. 1251-3
★CL810W-4/811W-3/813P-3 (Ch. D16-9) 1264-3
★CL818W-3, W-4, W-5 (Ch. D16-9) 1264-3
★CL860W-1 (Ch. E01-7) 1251-3
★CL860W-2 (Ch. E01-17) .. 1251-3
★CL862P-1 (Ch. E01-7) 1251-3
★CL862P-2 (Ch. E01-17) .. 1251-3
★CL875P-1 (Ch. E01-7) 1251-3
★CL875P-2 (Ch. E01-17) .. 1251-3
★CL882P-1 (Ch. E01-7) 1251-3
★CL882P-2 (Ch. E01-17) .. 1251-3

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SYLVANIA—Cont.

★CL883BT-1 (Ch. E01-7) ... 1251-3
★CL883BT-2 (Ch. E01-17) ... 1251-3
★CL960WR-1 (Ch. E01-8) .. 1251-3
★CL960WR-2 (Ch. E01-18).. 1251-3
★CL962PR-1 (Ch. E01-8) .. 1251-3
★CL962PR-2 (Ch. E01-18) .. 1251-3
★CL975PR-1 (Ch. E01-8) .. 1251-3
★CL975PR-2 (Ch. E01-18).. 1251-3
★CL982PR-1 (Ch. E01-8) .. 1251-3
★CL982PR-2 (Ch. E01-18).. 1251-3
★CL983BTR-1 (Ch. E01-8).. 1251-3
★CL983BTR-2 (Ch. E01-18) . 1251-3
★CL1200GD-2 (Ch. D16-4) . 1264-3
★CL1202W-2/1204K-2 (Ch. D16-5) 1264-3
★CL1211W-2 (Ch. D16-5) .. 1264-3
★CL1221W-1/1223K-1 (Ch. D16-5) 1264-3
★CL1231W-1 (Ch. D16-7) .. 1264-3
★CL1233K-1 (Ch. D16-7) .. 1264-3
★CL1237DP-1/1237P-1 (Ch. D16-7) 1264-3
★CL1243K-1 (Ch. D16-5) .. 1264-3
★CL1247P-1 (Ch. D16-5) .. 1264-3
★CL1251W-2/1253K-1 (Ch. D16-7) 1264-3
★CL1257P-1/1258P-1 (Ch. D16-7) 1264-3
★CL1263N-1 (Ch. D16-7) .. 1264-3
★CL1266E-2 (Ch. D16-7) .. 1264-3
★CL1279H-2 (Ch. D16-5) .. 1264-3
★CL1283K-2 (Ch. D16-5) .. 1264-3
★CL1293P-2 (Ch. D16-5) .. 1264-3
★CL1297P-2/1298P-2 (Ch. D16-5) 1264-3
★CL1302WR-2 (Ch. D16-6) . 1264-3
★CL1321WR-2 (Ch. D16-6) . 1264-3
★CL1351WR-2 (Ch. D16-3) . 1264-3
★CL1353KR-1 (Ch. D16-3) . 1264-3
★CL1357PR-1/1358PR-1 (Ch. D16-3) 1264-3
★CL1366ER-2 (Ch. D16-3) . 1264-3
★CL1417P-2 (Ch. D16-7) .. 1264-3
★CL1421W-2/1423K-2 (Ch. D16-7) 1264-3
★CL1433N-2 (Ch. D16-7) .. 1264-3
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★CX1174W-2 (Ch. D19-2) .. 1269-3
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★CX1176D-2 (Ch. D19-2) .. 1269-3
★CX1176D-3 (Ch. D19-7) .. 1269-3
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★CX1177WR-4 (Ch. D19-4, RC11) 1269-3
★CX2174W (Ch. D19-5) 1269-3
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Exponent 7/20BG (Ch. P61-1) 1213-4
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●MT1034WH (Ch. A10-1) .. 1266-2
●MT1035BK (Ch. A10-1) .. 1266-2
●MW22BK (Ch. A09-1) 1230-3
●MW1041AV/1042GD (Ch. B14-1) 1202-3
●MW1044/45 (Ch. A09-1) . 1230-3
●MY1080GD (Ch. B10-4) ....(PCB 1234-4) 1047-2
●MY1081WH-S/82BK-S/83W-S (Ch. B10-3) ....(PCB 1234-4) 1047-2
●MZ200 (Ch. B12-2) ....(PCB 1211-4) 1094-2
●MZ1091BG/1092W/1093K/ 1094W-2/1095W-2/1096K-2/ 1097P-2 (Ch. B10-6) .. 1244-3
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SC422-2/424 (Ch. R44-1).. 1208-5
SC432 (Ch. R45-1) 1250-5
SC433,-1,-2/434,-1,-2 (Ch. R45-1) 1250-5
SC441-1 (Ch. R45-1) 1250-5
SC442,-1/445,-1 (Ch. R45-1) 1250-5
SCT447 (Ch. R45-7) 1250-5
SCT447-2 (Ch. R45-7, TC4) 1250-5
SCT447X/448 (Radio Ch. Only R45-7) 1250-5
TR129 .... TSM-136
TR144BK (Ch. 373-1) ... TSM-129
TR146BK TSM-134
●Ch. A09-1 1230-3
●Ch. A10-1 1266-2
●Ch. B10-3,-4 ....(PCB 1234-4) 1047-2
●Ch. B10-6 (Codes 00,01).. 1244-3
●Ch. B12-1,-2 (Codes 01, 02) ....(PCB 1211-4) 1094-2
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★Ch. D12-11 (Code 06) ....(PCB 1234-4) 1143-1
★Ch. D12-15 (Code 07) ....(PCB 1234-4) 1143-1
★Ch. D14-6 (Codes 01, 02, 50, 51) 1245-3
★Ch. D14-7 (Codes 01,02) 1245-3
★Ch. D14-8,-10 (Codes 00,50,51) 1245-3
★Ch. D14-11 (Code 00) .. 1245-3
★Ch. D15-3 (Codes 65 thru 84) 1271-2
★Ch. D15-5 (Codes 65 thru 79) 1271-2
★Ch. D15-7 (Code 50) 1271-2
★Ch. D16-3 (Codes 50 thru 54) 1264-3
★Ch. D16-4 (Codes 50 thru 70) 1264-3
★Ch. D16-5 (Codes 50 thru 93) 1264-3

Set No. Folder No.

SYLVANIA—Cont.

★Ch. D16-6 (Codes 50 thru 75) 1264-3
★Ch. D16-7 (Codes 50 thru 98) 1264-3
★Ch. D16-9 (Codes 50 thru 87) 1264-3
★Ch. D16-13 (Codes 50, 51) 1264-3
★Ch. D19-1 (Codes 02,03,05) 1269-3
★Ch. D19-2 (Codes 02 thru 07) 1269-3
★Ch. D19-3 1269-3
★Ch. D19-4 (Codes 01,02) . 1269-3
★Ch. D19-5 1269-3
★Ch. D19-7 1269-3
★Ch. E01-7,-8 1251-3
★Ch. E01-13,-14 1251-3
★Ch. E01-17,-18 1251-3
Ch. P61-1,-2 1213-4
Ch. R15-1,-2 1065-6
Ch. R15-4 1065-6
Ch. R32-1,-2,-3,-4,-5,-7 .. 1258-5
Ch. R33-3,-4 .... MHF-27
Ch. R45-1,-7 1250-5
Ch. R49-3 .... MHF-25
★Ch. RC11 (TV Remote Control Unit) 1269-3A
Ch. TC4 1250-5
Ch. 373-1 .... TSM-129
Ch. 375-1,-2,-3 1226-4

SYMPHONIC
(Also See Recorder Listing)
Symphonic Radio & Elec. Corp.
Foot of John Street
Lowell, Massachusetts 01852

P2711A (Ch. A-886) (Similar to Chassis) 1139-6
●TPS-300 1226-3
1143 (Ch. R-835) MHF-23
1932 1244-5
Ch. R-835 .... MHF-23

T

TEABERRY
Teaberry Electronics Corp.
3401 Shadeland Ave.
Indianapolis, Indiana 46226

Big "T" CB-41
Twin "T" CB-40

TENNA
(See Auto Radio and Recorder Listings)

TMA (See Muntz)

TOSHIBA
Toshiba America, Inc.
41-06 Delong Street
Flushing, N.Y. 11355

★C501S (Ch. TAC-6410) 1230-POM
★C811S (Ch. TAC-6350) 1230-POM
★C812D (Ch. TAC-6350 1230-POM
550C MHF-26
★Ch. TAC-6330 .... 1230-POM
★Ch. TAC-6350 .... 1230-POM
★Ch. TAC-6410 .... 1230-POM

TOYOTA
(See Auto Radio and Recorder Listings)

TRAM
Tram Electronics, Inc.
P.O. Box 187, Lower Bay Rd.
Winnisquam, N.H. 03246

Titan IIA CB-40

TRIUMPH
(See Auto Radio Listing)

TRUETONE
(Also See Auto Radio and Recorder Listings)
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Mo. 64108

★ADM2255A-27 ...... 1212-POM
EL15055D-07 1257-5
EL15059D-07 1257-5
IST5929A-17 1215-5
●MIC3012A-07 (Similar to Chassis) 1164-1
MIC3014C-27 (See page 97) TSM-111
●MIC3220A-27 ...... 1236-POM
●MIC3909B-17 (Similar to Chassis) 1109-3
●MIC3912B-17 1240-3
●MIC3912C-17 1256-3
●MIC3916B-17 1224-3
●MIC3916C-17 1254-3
●MIC3918C-27 1224-3
●MIC3919B-17 1224-3
●MIC3919C-17 1254-3
★MIC4015A-17 1257-3
★MIC4212A-27 1265-2
★MIC4218A-27 1246-3
MIC6220A-27 .... TSM-135
TEW6270A-17 1243-4
TEW6275A-17 1249-4
TEW6295A-17 (Similar to Chassis) 1001-5
★2DC2255 .... 1212-POM
●2DC3012 (Similar to Chassis) 1164-1
●2DC3220 .... 1236-POM
●2DC3912B 1240-3
●2DC3912C 1256-3
●2DC3916B 1224-3
●2DC3916C 1254-3
●2DC3918C 1224-3
●2DC3919B 1224-3
●2DC3919C 1254-3
2DC4015 1257-3
★2DC4212 1265-2
★2DC4218 1246-3
4DC5055 1257-5
4DC5059 1257-5
4DC5929 1215-5
4DC6220 .... TSM-135
4DC6270 1243-4
4DC6275 1249-4
4DC6295 (Similar to Chassis) 1001-5

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. Folder No.

V

V-M
V-M Corporation
375 West Main Street
Benton Harbor, Mich. 49023
323BL-1, BR-1, RG-1, YE-1 (Ch. 20116) 1033-7
335-3 (Ch. 20117) (Similar to Chassis) 1045-9
339BK-1 (Ch. 20117) 1045-9

VOLKSWAGEN
(See Auto Radio and Recorder Listings)

VOLKSWAGEN TRANSPORTER
(See Auto Radio Listing)

VOLVO
(See Auto Radio Listing)

W

WARDS AIRLINE
(Also See Auto Radio and Recorder Listings)
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607
GCI-2090A 1231-4
GCI-2095A 1231-4
GCI-2422A,B (Radio Ch. Only) 1163-8
GCI-2432A,B (Radio Ch. Only) 1163-8
GCI-2452A,B (Radio Ch. Only) 1163-8
GCI-2521A 1219-6
GCI-2531A 1219-6
GCI-2541A 1219-6
GCI-2551A 1219-6
GCI-2621A 1220-5
GCI-2641A 1220-5
GCI-2651A 1220-5
●GCI-11102A, B, C, D 1241-3
●GCI-11132A, B, C, D 1241-3
●GCI-11262A,B 1241-3
★GCI-12102A 1248-3
●GCI-13162A 1230-POM
●GCI-14821A 1227-3
●GCI-14841A 1227-3
●GCI-14851A 1227-3
★GCI-15921A
For Similar TV Ch. 1217-3
For Similar Radio Ch. 1219-6
★GCI-15951A
For Similar TV Ch. 1217-3
For Similar Radio Ch. 1219-6
★GCI-16322A 1224-POM
★GCI-16342A 1224-POM
★GCI-16522A 1224-POM
★GCI-16542A 1224-POM
★GCI-16552A 1224-POM
★GCI-17321A,B 1220-3
★GCI-17341A,B 1220-3
★GCI-17351A,B 1220-3
★GCI-17421A 1220-3
★GCI-17441A 1220-3
★GCI-17451A 1220-3
GEN-1352A (See Page 89) TSM-99
GEN-1382A TSM-132
GEN-1392A TSM-133
GEN-1481A TSM-133
GEN-1745A MHF-25
GEN-1971A 1223-4
GEN-1981A 1247-5
GEN-6011A MHF-23
GEN-6031A MHF-24
GEN-6111A MHF-25
GEN-6211A TSM-129
GEN-6411A 1243-5
●GEN-11442A 1247-3
●GEN-11482A 1247-3
●GEN-11492A 1247-3
●GEN-11562A 1262-2
●GEN-11741B 1218-POM
●GEN-11861A,B,C 1271-3
●GEN-11961B 1230-POM
★GEN-12442A 1248-POM
●GEN-13442A 1234-3
★GHJ-17198A (Similar to Chassis) 1075-2
JWR-2814A,B MHF-21
●UBD-11663A 1270-3
62-1352 (See Page 89) TSM-99
62-1382 ....TSM-132
62-1392 ....TSM-133
62-1481 ....TSM-133
62-1971 1223-4
62-1981 1247-5
62-6211 ....TSM-129
62-6411 1243-5
●63-13442 1234-3

WEBCOR ELECTRONICS
(Also See Recorder Listings)
Webcor Electronics
59-50 Queens Midtown Expressway
Maspeth, New York 11378
ST180 ....MHF-29

WELTRON
(Also See Auto Radio and Recorder Listings)
Weltron Company, Inc.
514 East Peabody Street
Durham, North Carolina 27702
WFMX-104 ....TSM-129
2001 ....TSM-131

WESTINGHOUSE
(Also See Recorder Listing)
Westinghouse Electric Corp.
Consumer Electronics Div.
Route 27 Vineard Road
Edison, N.J. 08817
PAS7150A (Ch. V4003C03) MHF-25
RCF9100A (Ch. V3012C01) MHF-26
RCF9120A (Ch. V3014C01) MHF-24
RCF9150A (Ch. V3014C02) MHF-29
RPM5230A (Ch. V3031C01) TSM-135
Ch. V3012C01 ....MHF-26
Ch. V3014C01 ....MHF-24
Ch. V3014C02 ....MHF-29
Ch. V3031C01 ....TSM-135
Ch. V4003C03 ....MHF-25

WHEEL HORSE
(See Auto Radio Listing)

WHITE MOTOR CO.
(See Auto Radio Listing)

WINEGARD
Winegard Company
3009-1 Kirkwood
Burlington, Iowa 52601
AC-223B(OB) (VHF/UHF Amp) 1242-SED
AC-295B(OB) (VHF/UHF Amp) 1242-SED
AC-623B (TV Preamp) ..1259-SED
AC-695B (TV Amp) 1242-SED
BC-870 (TV Distribution Amp) 1259-SED
DA-425 (UHF Amp) ..1245-SED
DA-815 (TV Amp) ..1249-SED
DA-825A (VHF-UHF Amp) 1245-SED
L-283A (TV Preamp) ...1255-SED
RD-2-87 (VHF/UHF Preamp) 1259-SED
RD-870 (VHF/UHF Preamp) 1254-SED
8C-274/0A (TV Distribution Amp) 1255-SED

WOLLENSAK
(See Recorder Listing)

Y

YORK
(See Recorder Listing)

Z

ZENITH
Zenith Sales Corporation
1900 N. Austin Ave.
Chicago, Illinois 60639
B471R 1246-4
C585W MHF-29
C587W (Ch. 29CT20) MHF-24
●C1335C,F,L,P (Ch. 12CB12X) 1252-3
●C1335C1,F1,L1,P1 (Ch. 12CB12X) 1252-3
●C1335C2,F2,L2,P2 (Ch. 12CB12X) 1252-3
●C1335C3,F3,L3,P3 (Ch. 12CB12X) 1252-3
●C1340W,W1,W2,W3 (Ch. 12CB12X) 1252-3
●C1835C,C1,C2,C3,G,G1, G2,G3 (Ch. 16DB12X) 1265-3
●C1840W,W1,W2,W3 (Ch. 16DB12X) 1265-3
★C2915W (Ch. 20CC50Z)..1238-3
★C2915W1 (Ch. 20CC50)..1238-3
★C2915W2 (Ch. 20CC50Z).1238-3
★C2915W3 (Ch. 20CC50)..1238-3
★C2950W (Ch. 18CC29) (Similar to Chassis) 1225-3
★C2952M,M1 (Ch. 25CC50) .1267-3
★C2954DE,DE1,P,P1 (Ch. 25CC50) 1267-3
★C2958W (Ch. 25CC25) ...1262-3
★C2963W (Ch. 25CC50) ...1267-3
★C2965W7 (Ch. 18CC30) (Similar to Chassis) 1225-3
★C2983W11 (Ch. 20CC50Z).1238-3
★C2983W12 (Ch. 20CC50).1238-3
★C2983W13 (Ch. 20CC50Z) 1238-3
★C2983W14 (Ch. 20CC50) 1238-3
★C2984W,W2 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★C2997W (Ch. 20CC50Z) ..1238-3
★C2997W1 (Ch. 20CC50) ..1238-3
★C3510C1,C3,C6 (Ch. 14CC14) 1233-3
★C3510C7 (Ch. 14CC14Z) ..1233-3
★C3510C8 (Ch. 14CC14Z) (Similar to Chassis) 1233-3
★C3520W1,W3 (Ch. 14CC14) 1233-3
★C3520W7,W8 (Ch. 14CC14Z) 1233-3
★C3710C1,C3,L1,L3 (Ch. 14CC15) 1233-3
★C3710C7,L7 (Ch. 14CC15Z) 1233-3
★C3710C8,L8 (Ch. 14CC15Z) (Similar to Chassis) 1233-3
★C3710C9,L9 (Ch. 14C15Z) 1233-3
★C3722W3 (Ch. 14CC16) ..1233-3
★C3722W8 (Ch. 14CC16Z) ..1233-3
★C3722W18 (Ch. 14CC16Z) (Similar to Chassis) 1233-3
★C3910W7 (Ch. 18CC29) (Similar to Chassis) 1225-3
★C3910W8 (Ch. 18CC29) ..1225-3
★C3914W7,W9 (Ch. 18CC30) (Similar to Chassis) 1225-3
★C3914W8 (Ch. 18CC30) ..1225-3
★C4020W,W2 (Ch. 19DC20) 1230-POM
★C4024W2 (Ch. 19DC20) 1230-POM
★C4025W5 (Ch. 19CC19) (Similar to Chassis) 1215-3
★C4028W2 (Ch. 19DC20) 1230-POM
★C4030W5 (Ch. 19CC19) (Similar to Chassis) 1215-3
★C4030W11,W13 (Ch. 19CC19Z) (Similar to Chassis) 1215-3
★C4208W1 (Ch. 20CC50) ..1238-3
★C4208W6,W11 (Ch. 20CC50Z) 1238-3
★C4509W11,W12 (Ch. 20CC50) 1238-3
★C4509W16,W17 (Ch. 20CC50Z) 1238-3
★C4512W1,W3 (Ch. 20CC50) 1238-3
★C4512W6,W7 (Ch. 20CC50Z) 1238-3
★C4512W31,W32 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★C4516W,W2 (Ch. 20CC50) 1238-3
★C4516W5 (Ch. 20BC50) (Similar to Chassis) ...1197-2
★C4516W31,W32 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★C4517M,M2 (Ch. 20CC50) 1238-3

ZENITH—Cont.
★C4517M31,M32 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★C4518DE2,P,P2 (Ch. 20CC50) 1238-3
★C4518DE6,P6,P7 (Ch. 20CC50Z) 1238-3
★C4518DE31,DE32,P31, P32 (Ch. 20CC50Z) (Similar to Chassis) ...1238-3
★C4519W (Ch. 25CC50) ...1267-3
★C4519W11 (Ch. 25CC25)..1262-3
★4707W,W1 Ch. 25CC50) ..1267-3
★C4707W11 (Ch. 25CC50) ..1267-3
★C4707W12 (Ch. 25CC50) ..1267-3
★C4720W (Ch. 25CC50) ...1267-3
★C4720W12 (Ch. 25CC50) ..1267-3
★C4722W (Ch. 25CC50) ...1267-3
★C4724M (Ch. 25CC50) ...1267-3
★C4725W (Ch. 25CC50) ...1267-3
★C4726DE,P (Ch. 25CC50) .1267-3
★C4727M (Ch. 25CC50) ...1267-3
★C4728DE,P (Ch. 25CC50) .1267-3
★C4730X/4730X11 (Ch. 25CC25) 1262-3
★C4733W (Ch. 25CC50) ...1267-3
★C4733W11 (Ch. 25CC50) ..1267-3
★C4736M (Ch. 25CC50) ...1267-3
★C4736M11 (Ch. 25CC50) ..1267-3
★C4738DE,P (Ch. 25CC50) .1267-3
★C4738DE11,P11 (Ch. 25CC50) 1267-3
★C4745W1 (Ch. 25CC50) ..1267-3
★C4786W11 (Ch. 25CC55) .1266-3
★C4787P,P11 (Ch. 25CC55) 1266-3
★C4788DE,DE11 (Ch. 25CC55) 1266-3
★C4789P,P11 (Ch. 25CC55) .1266-3
★C5722W1 (Ch. 14CC16) ..1233-3
★C5722W7 (Ch. 14CC16Z) .1233-3
★C5722W17 (Ch. 14CC16Z) (Similar to Chassis) 1233-3
★C6030W4 (Ch. 19CC19, S-86335) (Similar to Chassis) 1215-3
★C6030W13 (Ch. 19CC19Z) (Similar to Chassis) 1215-3
★C6509W16 (Ch. 20CC50Z) 1238-3
★C6707W (Ch. 25CC50) ...1267-3
★C6707W11 (Ch. 25CC50) ..1267-3
★C6730X (Ch. 25CC25) ...1262-3
★C6730X11 (Ch. 25CC25, S-87986,S-83596) 1262-3
★C6733W (Ch. 25CC50) ...1267-3
★C6733W11 (Ch. 25CC50) ..1267-3
★C6736M (Ch. 25CC50) ...1267-3
★C6736M11 (Ch. 25CC50) ..1267-3
★C6738DE,P (Ch. 25CC50) .1267-3
★C6738DE11,P11 (Ch. 25CC50) 1267-3
★C6745W (Ch. 25CC50) ...1267-3
★C6786W11 (Ch. 25CC55) .1266-3
★C6787P,P11 (Ch. 25CC55) .1266-3
★C6788DE,DE11 (Ch. 25CC55) 1266-3
★C8720W11 (TV Ch. Only— Ch. 25CC50) 1267-3
★C8720W31 (Ch. 25CC50) ..1267-3
★C8775P,P11 (Ch. 25CC55) 1266-3
★D8720W (Ch. 25CC50) 1267-3
Royal 73J2 (Ch. 23-1, 24-1) TSM-131
R73J2 (Ch. 23-1,24-1)..TSM-131
★S2929W13 (Ch. 14CC16Z) (Similar to Chassis) 1233-3
★S-83596 (TV Remote Control Unit) .1238-3,1262-3A, 1266-3A,1267-3A
★S-86436 (TV Remote Control Unit) 1238-3
★S-87861 (TV Remote Control Unit) 1233-3A
★S-87941 (TV Remote Control Unit) 1233-3A
★S-87976 (TV Remote Control Unit) 1267-3A
★S-87986 (TV Remote Control Unit) .1262-3A,1266-3A
●T2616W,W1,W2,W3 (Ch. 12CB12X) 1252-3
●T2628W,W1,W2,W3 (Ch. 16DB12X) 1265-3
★T2824W1,W3 (Ch. 14CC14) 1233-3
★T2824W7 (Ch. 14CC14Z) 1233-3
★T2824W8 (Ch. 14CC14Z) (Similar to Chassis) 1233-3
★T2824W9 (Ch. 14CC14Z) 1233-3
★T2828W1,W3 (Ch. 14CC16) 1233-3
★T2828W8 (Ch. 14CC16Z) .1233-3
★T2828W18 (Ch. 14CC16Z) (Similar to Chassis) 1233-3
★T2833W8 (Ch. 18CC30) ..1225-3
★T2836W5 (Ch. 19CC19) (Similar to Chassis) 1215-3
★T2837W2 (Ch. 19DC20) 1230-POM
★T2851W2 (Ch. 20CC50) ..1238-3
★T2851W7 (Ch. 20CC50Z)..1238-3
★T2851W31,W32 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★T2853DE2,P2 (Ch. 20CC50) 1238-3
★T2853DE7,P7 (Ch. 20CC50Z) 1238-3
★T2853DE31,DE32,P31,P32 (Ch. 20CC50Z) (Similar to Chassis) 1238-3
★T2861W (Ch. 25CC50) 1267-3
★T2861W11 (Ch. 25CC50) ..1267-3
★T2863DE (Ch. 25CC50) ..1267-3
★T2863DE11 (Ch. 25CC50) .1267-3
★T2865M (Ch. 25CC50) 1267-3
★T2865M11 (Ch. 25CC50) ..1267-3
★T2998DE11,P11 (Ch. 25CC50) 1267-3
★T2998DE31,P31 (Ch. 25CC50) 1267-3
●Ch. 12CB12X 1252-3
Ch. 12KT40Z8 ....TSM-74
★Ch. 14CC14,Z/15,Z/16,Z .1233-3
●Ch. 16DB12X 1265-3
★Ch. 18CC29/30 1225-3
★Ch. 19CC19Z (Similar to Chassis) 1215-3
★Ch. 19DC20 ....1230-POM
★Ch. 20CC50,Z 1238-3
Ch. 23-1 ....TSM-131
Ch. 24-1 ....TSM-131
★Ch. 25CC25 1262-3
★Ch. 25CC50 1267-3
★Ch. 25CC55 1266-3
Ch. 29CT20 ....MHF-24

AUTO RADIOS AND TAPE PLAYERS

A

ALLIS-CHALMERS
1BTAC AR-112

AMERICAN MOTORS
American Motors Corp.
14250 Plymouth Road
Detroit, Michigan
1JA4105 (3632704) AR-122
3632704 ....AR-122

AMPEX
Ampex Consumer Equipment Division
2201 Lunt Avenue
Elk Grove Village, Illinois 60007
Micro 40 ....AR-111
Micro 44 ....AR-110

ASTRO-LINE
(See Boman Astrosonix)

AUDI
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Illinois 60131
Sapphire XVII AR-124
1AU1121 ....AR-118
1VW4112 ....AR-124

AUDIOVOX CORPORATION
Audiovox Corporation
150 Marcus Blvd.
Hauppauge, New York 11787
Address Change

AUTOMATIC
Automatic Radio Mfg. Co., Inc.
2 Main Street
Melrose, Massachusetts 02176
APX-2334 ....AR-120
CFE-6745A AR-119
EMS-2121 ....AR-119
EXP-8012 ....AR-121
MES-1454 ....AR-119
MIN-9945 ....AR-121
MNE-6725A AR-123
MNI-1410 ....AR-123
MXR-8404 ....AR-125
PPX-2389 ....AR-127

B

BOMAN ASTROSONIX
Boman Astrosonix-Div. of California Auto Radio, Inc.
9426 Stewart & Gray Road
Downey, California 90241
BM-900VW AR-128
BM-907 ....AR-116
BM-909 ....AR-119
BM-910 ....AR-111
BM-926 ....AR-119
BM-960 ....AR-121
BM-1000 ....AR-117
BM-1900 ....AR-126
BM-2900 ....AR-120
CR-500 ....AR-109
CR-520 ....AR-122
CR-820 ....AR-124
CR-800 ....AR-109
SP-90 ....AR-116
VW1-72-FM AR-128
100-M AR-115
300-PB AR-116
400-FM AR-112
600-MPX AR-113

BRITISH LEYLAND
(Also See Triumph)
British Leyland Motors, Inc.
600 Willow Tree Road
Leonia, N. J. 07605
F8SMXR (R100) AR-122
F9SMB (HAC725) AR-122
HAC725 ....AR-122
HAC731 ....AR-128
R100 ....AR-122
1BM2132 (HAC731) AR-128

BUICK
United Delco Distributors
14BFMT2 ....AR-120
14BPBT2 ....AR-114
24AFP1 ....AR-118
24APB1 ....AR-115
24APB2 ....AR-125
24AT411 ....AR-112
24BFM1 ....AR-113
24BFMT1 ....AR-120
24BFP1 ....AR-110
24BPB1 ....AR-117
24BPB2 ....AR-124
24BPBT1 ....AR-114
24BPBT2 ....AR-128
24BT411 ....AR-112
7307554 ....AR-112
7313514 ....AR-118
7313604 ....AR-115
7313604 (1972 Prod.) AR-125
7930134 ....AR-114
7930134 (1972-1/2 Prod.) AR-128
7930144 ....AR-120
7930224 ....AR-117
7930224 (1972-1/2 Prod.) .AR-124
7930234 ....AR-110
7930244 ....AR-113
7935374 ....AR-112

C

CADILLAC
United Delco Distributors
15CFMT3 ....AR-114
25CFMT1,2 ....AR-114
25CFP1 ....AR-112
25CMW1,2 ....AR-110

CADILLAC—Cont.
25CT411 ....AR-112
7930015 ....AR-112
7930025 ....AR-110
7930495 ....AR-112
7937005 ....AR-114

CARTAPE
Car Tapes, Inc.
9180 Kelvin Ave.
Chatsworth, California 91311
CT-4800 ....AR-119
CT-8000 ....AR-123
CT-8200 ....AR-121
CT-8800 ....AR-123
CT-8900 ....AR-116
CT-8999 ....AR-123
X-8100 ....AR-119

CHANNEL MASTER
Channel Master Corp.
Ellenville, N.Y. 12428
6203 ....AR-116
6204 ....AR-113
6280 ....AR-128
6282 ....AR-122
6283 ....AR-126
6285 ....AR-125
6286 ....AR-124
6291 ....AR-121
6292 ....AR-119

CHEVROLET
United Delco Distributors
11BFMT2 ....AR-118
11BPBT2 ....AR-115
21AFMI AR-109
21AFP1 ....AR-117
21AFP2, 21AFP3 ....AR-127
21AFPK1 ....AR-117
21AFPK2, 21AFPK3 ....AR-127
21APB1 ....AR-110
21APB2 ....AR-124
21APBK1 ....AR-110
21APBK2 ....AR-124
21AT411 ....AR-112
21BFM1 ....AR-114
21BFM3 (Similar to Page 41) AR-114
21BFM4 (Similar to Page 41) AR-114
21BFMT1 ....AR-118
21BFP1 ....AR-113
21BFP2 (See Page 61) AR-113
21BFPK1 ....AR-113
21BFPK2 (See Page 61) ..AR-113
21BPB1 ....AR-112
21BPB2 ....AR-120
21BPBK1 ....AR-112
21BPBK2 ....AR-120
21BPBT1 ....AR-115
21BPBT2 ....AR-125
21HPB1 ....AR-112
21HPB2 ....AR-120
21HPBK1 ....AR-112
21HPBK2 ....AR-120
21TFP1 ....AR-117
21TFP2, 21TFP3 ....AR-127
21TPB1 ....AR-110
21TPB2 ....AR-124
21TT411 ....AR-112
21VFP1 ....AR-117
21VFP2, 21VFP3 ....AR-127
21XFMT1 ....AR-118
21XPBT1 ....AR-115
7305841 ....AR-110
7305841 (1972 1/2 Prod.) AR-124
7313971 ....AR-112
7314201 (1972 Prod.) AR-112
7314201 (1972 1/2 Prod.) AR-120
7314211 ....AR-114
7930061 ....AR-115
7930061 (1972 1/2 Prod.) AR-125
7930121 ....AR-118
7930161 ....AR-115
7933241 ....AR-110
7933241 (1972 1/2 Prod.) AR-124
7933251 ....AR-117
7933251 (1972 1/2 Prod.) AR-127
7933261 ....AR-109
7933291 (1972 Prod.) AR-112
7933291 (1972 1/2 Prod.) AR-120
7933301 ....AR-113
7933501 ....AR-110
7933501 (1972 1/2 Prod.) AR-124
7933511 ....AR-117
7933511 (1972 1/2 Prod.) AR-127
7933641 (1972 Prod.) AR-112
7933641 (1972 1/2 Prod.) AR-120
7935021 (1972 Prod.) AR-112
7935021 (1972 1/2 Prod.) AR-120
7936011 ....AR-113
7936181 ....AR-115
7936191 ....AR-118
7936271 ....AR-117
7936601 ....AR-112
7936721 ....AR-127
7937571 ....AR-117
7937571 (1972 1/2 Prod.) AR-127

CHRYSLER
Chrysler Corp.
P.O. Box 1118
Detroit Michigan 48231
1PD1209 ....AR-128
1PD1211 ....AR-128
2PD1209 ....AR-128
2PD1211 ....AR-128
2PD1212 ....AR-128
2PF1203 ....AR-128
28BFW1 ....AR-109
2884631 ....AR-61
2884750 (1PD1211, 2PD1211) AR-128
2884759 (0BBJ, 1BBJ) AR-89
2884759 (2PD1212) AR-128
3501013 (1PD1209, 2PD1209) AR-128
3501156 (2PF1203) AR-128
3501164 (28BFW1) (1972 Prod.) AR-109

CRAIG
Craig Corp.
2302 East 15th Street
Los Angeles, California 90021
1901 ....AR-118
3122 ....AR-122
3126 ....AR-121
3127 ....AR-117

D

DELCO
United Delco Distributors
20BCT11 ....AR-115
7937400 ....AR-115

DODGE
(Also See MoPar)
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231
AR-615SG-BL,-L AR-117
ARA-10L, W AR-117
1DP2010 ....AR-109
1PD1209 ....AR-128
1PD1211 ....AR-128
2PD1209 ....AR-128
2PD1211 ....AR-128
2PD1212 ....AR-128
2PF1203 ....AR-128
2884750 (1PD1211, 2PD1211) AR-128
2884759 (2PD1212) AR-128
3420889 (1DP2010) AR-109
3501013 (1PD1209, 2PD1209) AR-128
3501156 ....AR-122
3501156 (2PF1203) AR-128
3501157 ....AR-109

F

FO-MO-CO
(See Ford, Lincoln, Mercury)

FORD
Ford Motor Co.
Dearborn, Mich.
C35A-18810-H,-J 1256-SED
C9AA-19A241 ....AR-73
C80A-19A049E AR-87
DOOA-18806 ....AR-83
DOZA-19A242 ....AR-86
D1AA-19A242AD AR-104
D1ZA-19A242AD AR-104
D2AA-19A241-125 ....AR-127
D2AA-18806 ....AR-126
D2BA-18810 (Similar to Page 51) AR-59
D2DA-18806 ....AR-125
D2HA-18806 ....AR-126
D2HA-18810 (Similar to Page 51) AR-51
D2TA-19A241-125 ....AR-126
D2TA-18806 ....AR-126
D2TJ-18806 ....AR-124
D2UA-18806 ....AR-126
D2ZA-19A241 ....AR-127
D20A-19A241 ....AR-127
D20A-18806 ....AR-122
D22A-18806 ....AR-125
1/2 FD4103 (D1AA-19A242AD) AR-104
1BTF AR-115
1FBF (D1AA-19A241) AR-94
1FBO (D1OA-19A241) AR-94
1FBTP (D1TA-19A241) AR-94
1FBZ (D1ZA-19A241) AR-94
1FD4103 (D1AA-19A242AD) AR-104
2BTB/BTT/BTW (Similar to Page 51) AR-59
2FBF, 2FBFAK (D2AA-19A241-125) AR-127
2FBO (D2OA-19A241) AR-127
2FBTP (2FBTPAC) (D2TA-19A241-125) AR-126
2FBZ (D2ZA-19A241) AR-127
2FD4103 (D1AA-19A242AD) AR-104
2MZ4101 (D1ZA-19A242AD) AR-104
3TMS (C3SA-18810-J) ..1256-SED
3TMS (F) (C3SA-18810-H) 1256-SED

G

GENERAL MOTORS CORP. (GMC)
United Delco Distributors
26TCFP2, 26TCFP3 ....AR-127
26TFP1 ....AR-117
26TRMP1 ....AR-110
26TRMP2 ....AR-124
26TT411 ....AR-112
26TTCP1 ....AR-110
26TTCP2 ....AR-124
7305516 ....AR-110
7305516 (1972 1/2 Prod.) AR-124
7308166 ....AR-112
7931466 ....AR-117
7931466 (1972 1/2 Prod.) AR-127
7931766 ....AR-110
7931766 (1972 1/2 Prod.) AR-124

H

HAMMOND (See Boman Astrosonix)
920 (Similar to Page 45) ..AR-101

HITACHI
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N.Y. 11101
CS-1000IC AR-111
CS-1050IC AR-123
CS-1150IC AR-123
CS-1700IC AR-123
TRQ-206 ....AR-116

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. / Folder No.

I

INLAND-DYNATRONICS
Inland Dynatronics, Inc.
10 Horizon Blvd.
South Hackensack, N. J. 07606

AF-604 ... AR-124
FM-404 ... AR-125
MPX-2000 ... AR-128
S-75 ... AR-121
S-85 ... AR-119
S-900 ... AR-119
WV-209A ... AR-124
WV-509 ... AR-122
X-304 ... AR-122
203A ... AR-124

INTERNATIONAL
International Harvester Co.
180 N. Michigan Avenue
Chicago, Illinois 60601

F9SMIH ... AR-124
1BTIH ... AR-110
1HA1914 (244793-R91) ... AR-120
1HA1918 (244766-R91) ... AR-125
244766-R91 ... AR-125
244793-R91 ... AR-120

J

JEEP
Kaiser-Jeep Corp.
200 Industrial Drive
Plymouth, Michigan

1KJ1024 (981030) ... AR-118
1KJ1025 (981026) ... AR-118
1KJ1048 (984336) ... AR-118
981026 (1KJ1025) ... AR-118
981030 (1KJ1024) ... AR-118
984336 (1KJ1048) ... AR-118

JOHN DEERE

1AR4231 ... AR-110
1BTJD ... AR-113
7SMJD ... AR-110

K

KARMANN GHIA
Volkswagen of America
Englewood Cliffs, New Jersey

Sapphire XV ... AR-118
1VW1116 ... AR-118
2VW1116 ... AR-118

KENWORTH

K370-C-2 ... AR-126
K345393 ... AR-122
1KW1904 (K345393) ... AR-122
1KW2915 (K370-C-2) ... AR-126

L

LEAR—JET
Lear Jet Industries, Inc.
6868 South Plumber Avenue
Tucson, Arizona 85706

LINCOLN
Ford Motor Co.
Dearborn, Mich.

C3VA-18810-K,-L ... 1256-SED
D2VA-19A241 ... AR-127
D2VA-18806 ... AR-126
D20A-19A241 ... AR-127
D20A-18806 ... AR-122
1FBL (D1VA-19A241) ... AR—97
2BL, 2BLAF (D2VA-18806) ... AR-126
2FBL (D2VA-19A241) ... AR-127
2FBO (D20A-19A241) ... AR-127
2MT4108 (D1LA-19A242AA) ... AR-104
3TMC (C3VA-18810-L) ... 1256-SED
3TMC(F) (C3VA-18810-K) ... 1256-SED

M

MACK TRUCK

U7MMT ... AR-112
204SX28 ... AR-108

MASSEY FERGUSON

1BTMF ... AR-117

MEDALLION
Medallion Automotive Products Company
P.O. Box 1903
Kansas City, Missouri 64141

65-201/-202 ... AR-124
65-203 ... AR-120
65-486 ... AR-123
65-500 ... AR-116
65-501A ... AR-121
65-502 ... AR-123
65-505 ... AR-119
65-506 ... AR-123

MERCURY
Ford Motor Co.
Dearborn, Mich.

DOMA-19A242C ... AR—85
D0RJ-19A241A ... AR-109
D0WA-19A242A ... AR—86
D2AA-19A241-125 ... AR-127
D2AA-18806 ... AR-126
D2DA-18806 ... AR-125
D2HA-18806 ... AR-126
D2TA-18806 ... AR-126
D2UA-18806 ... AR-126
D2ZA-19A241 ... AR-127
D20A-19A241 ... AR-127
D20A-18806 ... AR-122
1/2 MY4106 (D1MA-19A242AD) ... AR-105
1CP2033 (D0RJ-19A241A) ... AR-109
1FBA (D1YA-19A241) ... AR—98
1FBG (D1GA-19A241) ... AR—98
1FBM (D1MA-19A241) ... AR—98
1FBW (D1WA-19A241) ... AR—98
2FBF, 2FBFAK (D2AA-19A241-125) ... AR-127
2FBO (D20A-19A241) ... AR-127
2FBZ (D2ZA-19A241) ... AR-127

MGA
Mitsubishi International Corp.
7045 North Ridgeway Ave.
Lincolnwood, Illinois 60645

AR-615SG-BL,-L ... AR-117
ARA-10L,W ... AR-117

MGB (See British Leyland)

MOTOROLA
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Ill. 60131

CMX501 ... AR-127
F8SMP (200) ... AR-125
P718S ... AR-116
TM200S ... AR-111
TM718S ... AR-116
2MP2031 ... AR-127
7SMFT ... AR-109
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O

OLDSMOBILE
United Delco Distributors

13BFMT2 ... AR-117
13BPBT2 ... AR-118
23AFM1 ... AR-112
23AFP1 ... AR-115
23AFP2, P3 ... AR-128
23APB1 ... AR-120
23APB2 ... AR-128
23AT411 ... AR-112
23BFM1 ... AR-110
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23BFMT1 ... AR-117
23BFP1 ... AR-114
23BPB1 ... AR-115
23BPB2 ... AR-125
23BPBT1 ... AR-118
23BPBT2 ... AR-126
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7935003 ... AR-120
7935003 (1972 1/2 Prod.) ... AR-128
7935013 ... AR-112
7935023 ... AR-115
7935023 (1972 Prod.) ... AR-125
7935033 ... AR-110
7935063 ... AR-118
7935063 (1972 1/2 Prod.) ... AR-126
7937413 ... AR-112
7938303 ... AR-115
7938303 (1972 1/2 Prod.) ... AR-128
7938313 ... AR-114

OPEL
United Delco Distributors

24LPB1 ... AR-114
24LPB2 ... AR-126
24PPB1 ... AR-112
24PPB2 ... AR-127
7312234 ... AR-112
7312234 (1972 1/2 Prod.) ... AR-127
7930254 ... AR-112
7930254 (1972 1/2 Prod.) ... AR-126

P

PANASONIC
Matsushita Elec. Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101

CX-351EU ... AR-111
CX-830EU ... AR-111

PENNEYS—PENNCREST
J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N.Y. 10019

981-0101 ... AR-119
981-0105 ... AR-121
981-5225 ... AR-125

PLYMOUTH
(Also See MoPar)
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231

1PD1209 ... AR-128
1PD1211 ... AR-128
2PD1209 ... AR-128
2PD1211 ... AR-128
2PD1212 ... AR-128
2PF1203 ... AR-128
2884750 (1PD1211, 2PD1211) ... AR-128
2884759 (2PD1212) ... AR-128
3501013 (1PD1209, 2PD1209) ... AR-128
3501156 ... AR-122
3501156 (2PF1203) ... AR-128
3501157 ... AR-109

PONTIAC
United Delco Distributors

12AFP1, 12AFPK1 ... AR-120
12BFMT2 ... AR-115
12BPBT2 ... AR-117
12FFP1, 12FFPK1 ... AR-120
12GFP1, 12GFPK1 ... AR-120
21AFM1 ... AR-113
21AFP1, 21AFPK1 ... AR-120
21APB1 ... AR-114
21APB2, 21APBK2 ... AR-126
21APBK1 ... AR-114
21XFMT1 ... AR-115
21XPBT1 ... AR-117
22AFM1 ... AR-113
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22AFP3 (See Page 89) ... AR-120
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22APB1 ... AR-114
22APB2, 22APBK2 ... AR-126
22APBK1 ... AR-114
22AT411 ... AR-112
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22BFPK2 (See Page 99) ... AR-109
22BPB1 ... AR-118
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22BPB3 (Similar to page 93) ... AR-115
22BPBK1 ... AR-118
22BPBK2 ... AR-115
22BPBK3 ... AR-122
22BPBT1 ... AR-117
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22BT411 ... AR-112
22FBPK1 ... AR-114
22FFM1 ... AR-113
22FFP1, P2 ... AR-120
22FFP3 (See Page 89) ... AR-120
22FFPK1, K2, K3 ... AR-120
22FPB1 ... AR-114
22FPB2, 22FPBK2 ... AR-126
22FT411 ... AR-112
22GFM1 ... AR-113
22GFP1, P2 ... AR-120
22GFP3 (See Page 89) ... AR-120
22GFPK1, K2, K3 ... AR-120
22GPB1 ... AR-114
22GPB2 ... AR-126
22GPBK1 ... AR-114
22GPBK2 ... AR-126
22XT411 ... AR-112
7307302 ... AR-114
7307302 (1972 1/2 Prod.) ... AR-126
7307332 ... AR-114
7307332 (1972 1/2 Prod.) ... AR-126
7307402 (1971 1/2 and 1972 Prod.) ... AR-120
7307432 (1971 1/2 and 1972 Prod.) ... AR-120
7307702 ... AR-113
7312332 ... AR-114
7312892 ... AR-114
7312892 (1972 1/2 Prod.) ... AR-126
7312912 ... AR-114
7312912 (1972 1/2 Prod.) ... AR-126
7312922 (1971 1/2 and 1972 Prod.) ... AR-120
7312942 (1971 1/2 and 1972 Prod.) ... AR-120
7313522 ... AR-114
7313522 (1972 1/2 Prod.) ... AR-126
7313532 (1971 1/2 and 1972 Prod.) ... AR-120
7313542 ... AR-113
7313552 ... AR-114
7313552 (1972 1/2 Prod.) ... AR-126
7313562 (1971 1/2 and 1972 Prod.) ... AR-120
7930012 (1972 Prod.) ... AR-118
7930012 (1972 1/2 Prod.) ... AR-122
7930022 ... AR-109
7930032 ... AR-112
7930202 ... AR-115
7930202 (1972 Prod.) ... AR-118
7930202 (1972 1/2 Prod.) ... AR-122
7930212 ... AR-109
7930242 ... AR-117
7930242 (1972 1/2 Prod.) ... AR-127
7930252 ... AR-115
7930492 ... AR-112
7930542 ... AR-113
7933241 ... AR-114
7933241 (1972 1/2 Prod.) ... AR-126
7933251 ... AR-120
7933261 ... AR-113
7933501 ... AR-114
7933501 (1972 1/2 Prod.) ... AR-126
7933511 ... AR-120
7934782 ... AR-112
7936181 ... AR-117
7936191 ... AR-115
7936232 ... AR-112

PORSCHE
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Illinois 60131

Sapphire XVII ... AR-124
1PE1123 ... AR-118
1VW4112 ... AR-124

R

RANGER
Ranger Auto Radio
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128

R-71-T ... AR-111

RENAULT
Renault, Inc.
750 Third Ave.
New York, New York 10017

1RE1926 (55569-00) ... AR-118
1RE1927 (55569-01) ... AR-118
1RE1928 (55569-04) ... AR-118
55569-00/-01/-04 ... AR-118

S

SAAB
Saab, Inc.
100 Waterfront
New Haven, Conn.

0BSA,0BSAA,0BSAB ... AR-113
0BSA99 ... AR-113
1BSA ... AR-113
1BSA99 ... AR-113
9FBSA,9FBSAB ... AR-110
9FBSA99 ... AR-110

SANYO
Sanyo Electric, Inc.
1200 West Walnut Street
Compton, California 90220

FT-863 ... AR-127
FT-883 ... AR-121

SIMCA
Chrysler Corporation
P.O. Box 1118
Detroit, Michigan 48231

1BS1,1BS1B ... AR-114

T

TENNA
Tenna Corporation
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128

TC-80-T ... AR-116
TC-82-T ... AR-111

TOYOTA
Toyota Motors Distributors, Inc.
2055 W. 190th St.
P.O. Box 2991
Torrance, Calif. 90509

CR-122FT ... AR-114
CR-127FT ... AR-114
CR-523FT ... AR-117
CR-528FT ... AR-117
CX-161FTB ... AR-114
CX-165FTB ... AR-114
RT-60DFT ... AR-122
RT-60LFT ... AR-115
86120-20090 (CR-122FT/127FT) ... AR-114
86120-20110 (CR-523FT/528FT) ... AR-117
86120-22010 (RT-60DFT) ... AR-122
86120-22040 (RT-60LFT) ... AR-115
86260-14010 (CX-165FTB) ... AR-114
86260-20011 (CX-161FTB) ... AR-114

TRIUMPH
British Leyland Motors, Inc.
600 Willow Tree Road
Leonia N.J. 07605

0BTR,0BTRA,B ... AR-110
1BTR ... AR-110
9FBTR ... AR-113

TRUETONE
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Missouri 64108

1TC7004A-07 ... AR-111
MIC7003A-17 ... AR-116
4DC7003 ... AR-116
4DC7004 ... AR-111

V

VOLKSWAGEN
Volkswagen of America
Englewood Cliffs, New Jersey

Sapphire XV ... AR-118
Sapphire XVII ... AR-124
1VW1116 ... AR-118
1VW1118 ... AR-118
1VW4112 ... AR-124
2VW1116 ... AR-118
3VW1116 ... AR-118

VOLKSWAGEN TRANSPORTER
Volkswagen of America
Englewood Cliffs, New Jersey

Sapphire XV ... AR-118
1VW1116 ... AR-118
2VW1116 ... AR-118

VOLVO
Volvo Distributors, Inc.
Volvo Drive
Rockleigh, New Jersey

0BV0,0BV0C,D ... AR-109
1BV0,1BV0C,D ... AR-109
1VV2032 (279971) ... AR-120
1VV2908 (279971) ... AR-120
2VV2016 (279959-1972 Prod.) ... AR-120
9FBV0,9FBV0C,D ... AR-112

W

WARDS—RIVERSIDE
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607

ZCX-16753A,B,C,D ... AR-116
61-16753 ... AR-116

WELTRON
Welton Company, Inc.
514 East Peabody Street
Durham, North Carolina 27702

717,718 ... AR-111

WHEEL HORSE
Wheel Horse
515 West Ireland Road
South Bend, Indiana 46614

1BTWH ... AR-114

WHITE MOTOR CO.
White Motor Co.
842 E. 79th St.
Cleveland, Ohio 44101

1WM2134 (02-7074020) ... AR-118
02-7074020 ... AR-118

RECORD CHANGERS

A

ARVIN
Arvin Industries, Inc.
1531 Thirteenth Street
Columbus, Indiana 47201

2006703-2 (Similar to Changer) ... 1109-4

G

GARRARD
British Industries Corp.
Westbury, New York 11590

40MKII (Similar to Chassis) ... 754-7

N

NORELCO
Norelco Service, Inc.
30-30 Review Avenue
Long Island City, N.Y. 11101
Address Change

RECORDERS AND TAPE PLAYERS

A

ADMIRAL
Admiral Corp.—National Service Div.
P.O. Box 845
Bloomington, Illinois 61701

Chassis 6D5 ... TR-104
Chassis 6V2 ... TR-100
Chassis 8A5 ... TR—99
CTR571 ... TR—99
CTR591 ... TR-100
STR671 ... TR-104
1C9000 ... TR-100

AIRCASTLE
Spiegel, Inc.
1061 West 35th Street
Chicago, Illinois 60609

YTC-99,A ... TR-104

AMBASSADOR
Allied Purchasing Corp.
401 Fifth Avenue
New York, N.Y. 10016

2V960 ... TR-95

AMERICAN MOTORS
American Motors Corp.
14250 Plymouth Road
Detroit, Michigan

1JA4105 (3632704) ... AR-122
3632704 ... AR-122

AMPEX
Ampex Consumer Equipment Division
2201 Lunt Avenue
Elk Grove Village, Illinois 60007

Micro 7,A ... TR-104
Micro 9A (Similar to Page 5) ... TR-81
Micro 32 ... TR-101
Micro 40 ... AR-111
Micro 44 ... AR-109
Micro 52 ... TR-103
Micro 54 ... TR—97
Micro 70 ... TR—99
761 ... TR-95
767 ... TR-95
1461 ... TR-95
1467 ... TR-95

ARVIN
Arvin Industries, Inc.
1531 Thirteenth Street
Columbus, Indiana 47201

20L32-19 (Ch. 1.00981) ... TR-104
40L31-19 (Ch. 1.48701, 1.48702) ... TR-92
Ch. 1.00981 ... TR-104
Ch. 1.48701/702 ... TR-92

AUDI
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Illinois 60131

Sapphire XVII ... AR-124
1VW4112 ... AR-124

AUDIOVOX CORPORATION
Audiovox Corporation
150 Marcus Blvd.
Hauppauge, New York 11787
Address Change

AUTOMATIC
Automatic Radio Mfg. Co., Inc.
2 Main Street
Melrose, Mass. 02176

CFE-6745A ... AR-119
EMS-2121 ... AR-119
EXP-8012 ... AR-121
MES-1454 ... AR-119
MIN-9945 ... AR-121
MNE-6725A ... AR-123
MNI-1410 ... AR-123
PED-2512 ... TSM-134
PEL-2501 ... TSM-134
PPX-2389 ... AR-127

B

BOMAN ASTROSONIX
Boman Astrosonix-Div. of Califonia Auto Radio, Inc.
9426 Stewart & Gray Road
Downey, California 90241

BM-900VW ... AR-128
BM-907 ... AR-116
BM-909 ... AR-119
BM-910 ... AR-111
BM-926 ... AR-119
BM-960 ... AR-121
BM-1000 ... AR-117
BM-1900 ... AR-126
BM-2900 ... AR-120
SP-90 ... AR-116
VW1-72-FM ... AR-128

BRADFORD
W. T. Grant Company
1515 Broadway, Times Square
New York, New York 10036

WTG-52506 ... TR-102
WTG-60939 ... TSM-132
2053D30 ... TSM-132
2104S41 ... TR-102

BUICK
United Delco Distributors

14BFMT2 ... AR-120
14BPBT2 ... AR-114
24AT411 ... AR-112
24BFMT1 ... AR-120
24BPBT1 ... AR-114
24BPBT2 ... AR-128
24BT411 ... AR-112
7307554 ... AR-112
7930134 ... AR-114
7930134 (1972 1/2 Prod.) ... AR-128
7930144 ... AR-120
7935374 ... AR-112

C

CADILLAC
United Delco Distributors

15CFMT3 ... AR-114
25CFMT1,2 ... AR-114
25CT411 ... AR-112
7930495 ... AR-112
7937005 ... AR-114

CARTAPE
Car Tapes, Inc.
9180 Kelvin Ave.
Chatsworth, California 91311

CT-4800 ... AR-119
CT-8000 ... AR-123
CT-8200 ... AR-121
CT-8800 ... AR-123
CT-8900 ... AR-116
CT 8999 ... AR-123
PI-8 ... TSM-133
X-8100 ... AR-119

CHANNEL MASTER
Channel Master Corp.
Ellenville, N.Y. 12428

6201 ... TSM-129
6202 ... TSM-131
6203 ... AR-116
6204 ... AR-113
6205 ... TSM-130
6208 ... TSM-130
6291 ... AR-121
6292 ... AR-119
6304 ... TR-100
6306 ... TR-101
6311 ... TR-105
6314 ... TR-106
6327 ... TR—98

CHEVROLET
United Delco Distributors

11BFMT2 ... AR-118
11BPBT2 ... AR-115
21AT411 ... AR-112
21BFMT1 ... AR-118
21BPBT1 ... AR-115
21BPBT2 ... AR-125
21TT411 ... AR-112
21XFMT1 ... AR-118
21XPBT1 ... AR-115
7313971 ... AR-112
7930061 ... AR-115
7930061 (1972 1/2 Prod.) ... AR-125
7930121 ... AR-118
7930161 ... AR-115
7936181 ... AR-115
7936191 ... AR-118
7936601 ... AR-112

CRAIG
Craig Corp.
2302 East 15th Street
Los Angeles, California 90021

2606 ... TR-90
2609 ... TR—96
3122 ... AR-122
3126 ... AR-121
3127 ... AR-117

CROWN RADIO
Crown Radio Corp.
228 E. Harris Ave.
South San Francisco, Calif. 94080

CRC-410FW ... TR-101
CRC-7550F ... TR—98
CSC-505FW ... TR-106
CTR-320W ... TR-93
CTR-8750 ... TR-94

D

DELCO
United Delco Distributors

20BCT11 ... AR-115
7937400 ... AR-115

E

ELECTROPHONIC
Electrophonic Corp. of America
101-10 Foster Avenue
Brooklyn, New York 11236

T-9 ... TSM-131
T-16 ... TSM-130
T-17 ... TSM-131

ELGIN
Elgin National Industries, Inc.
50-35 56th Road
Maspeth, New York 11378

R5600 ... TR—97

EMERSON
Emerson Television Sales Corp.
14th & Coles Streets
Jersey City, New Jersey

ERT100 ... TR-106

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. / Folder No.

F

FANON-MASCO
Fanon/Courier Corporation
990 South Fair Oaks Avenue
Pasadena, California 91105
Address Change

FORD
Ford Motor Company
Dearborn, Michigan
D1AA-19A242AD AR-104
D1SA-19A242AB AR-102
D1ZA-19A242AD AR-104
1/2 FD4103 (D1AA-19A242AD) AR-104
1FD4103 (D1AA-19A242AD) AR-104
2FD4103 (D1AA-19A242AD) AR-104
2MZ4101 (D1ZA-19A242AD) AR-104

G

GENERAL ELECTRIC
General Electric Company
1001 Broad Street
Utica, New York 13501
M8500A TR-102
M8614A TSM-133
M8615A TSM-132

GENERAL MOTORS CORP. (GMC)
United Delco Distributors
26TT411 .... AR-112
7308166 .... AR-112

H

HAMMOND
(See Boman Astroxonix)
920 (Similar to Page 45) .. AR-101

HITACHI
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N.Y. 11101
CS-1000IC AR-111
CS-1050IC AR-123
CS-1150IC AR-123
CS-1700IC AR-123
KCT-1250H TR-104
TRQ-20(A), (W)/-21(A), (W) TR-105
TRQ-206 .... AR-116
TRQ-232S TR-95
TRQ-250,E,R,W TR-91
TRQ-253 (A), (E) TR-96
TRQ-260 (A),(W) TR-92
TRQ-280 (A),(E),(W) TR-93
TRQ-286(A), (W) TR-106

I

INLAND DYNATRONICS
Inland Dynatronics, Inc.
10 Horizon Blvd.
South Hackensack, N.J. 07606
S-75 .... AR-121
S-85 .... AR-119
S-900 .... AR-119

J

JULIETTE
Topp Electronics, Inc.
4201 N. W. 77th Ave.
Miami, Florida 33166
CTP-2032 .... TR-91

Set No. / Folder No.

L

LINCOLN
Ford Motor Company
Dearborn, Michigan
D1LA-19A242AA AR-104
2MT4108 (D1LA-19A242AA) AR-104

LLOYD'S
Lloyd's Electronics of California, Inc.
18601 South Susana Road
Compton, California 90221
1V20-114A TR-92
9V72A-114A TR-96

M

MAGNAVOX
The Magnavox Company
Bueter Road
Fort Wayne, Indiana 46803
1V9002 .... TR-90
1V9029 .... TR-106
1V9033 .... TR-105
2V9030 .... TR-102

MALLORY
P. R. Mallory & Co., Inc.
3029 E. Washington Street
Indianapolis, Indiana 46206
MCR1211 (Similar to page 47) TR-97

MAYFAIR
Mayfair Electronics Co.
666 West Kenzie
Chicago, Illinois 60610
2060 .... TR-102

MEDALLION
Medallion Automotive Products Company
P.O. Box 1903
Kansas City, Missouri 64141
65-486 .... AR-123
65-500 .... AR-116
65-501A AR-121
65-502 .... AR-123
65-505 .... AR-119
65-506 .... AR-123

MERCURY
Ford Motor Company
Dearborn, Michigan
1/2 MY4106 (D1MA-19A242AD) AR-105
2MR4111 (2MR1) AR-105

MERCURY (PAX LTD.)
Pax, Ltd.
5125 Church Street
Skokie, Ill. 60076
PM-600 .... TR-103
20-1025 .... TR-90
20-1035 .... TR-92

MIDLAND
Midland International Corp.
P.O. Box 1903
Kansas City, Missouri 64141
12-140 .... TR-94
12-157 .... TR-91
12-440 .... TR-92

MORSE ELECTRO PRODUCTS
Morse Electro Products Corp.
101-10 Foster Avenue
Brooklyn, New York 11236
T-9 .... TSM-131
T-16 .... TSM-130
T-17 .... TSM-131

Set No. / Folder No.

MOTOROLA
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Illinois 60131
CP500EN-1 (Ch. CHS-3600) (See Page 91) HTP-7
GP40GW TR-91
LP200HE (Ch. DHS-3600) (Similar to Page 91) HTP-7
P718S AR-116
TM200S AR-111
TM718S AR-116
Ch. DHS-3600 (Similar to Page 91) HTP-9
Ch. TD138J AR-116

N

NORELCO
Norelco Service, Inc.
30-30 Review Avenue
Long Island City, New York 11101
RR25 .... TR-101
1320 .... TR-96
1440 .... TR-90
1530 .... TR-94
1570 .... TR-105
2400,P TR-92

O

OLDSMOBILE
United Delco Distributors
13BFMT2 .... AR-117
13BPBT2 .... AR-118
23AT411 .... AR-112
23BFMT1 .... AR-117
23BPBT1 .... AR-118
23BPBT2 .... AR-126
7930053 .... AR-118
7930063 .... AR-117
7930093 .... AR-117
7935063 .... AR-118
7935063 (1972 1/2 Prod.) AR-126
7937413 .... AR-112

OLYMPIC
Olympic Int'l Ltd.
Service Dept.
89-89 Union Turnpike
Glendale, New York 11227
Ch. TAA301 .... 1261-4A

P

PACKARD BELL
Teledyne Packard Bell Electronics
12333 West Olympic Blvd.
Los Angeles, Calif. 90064
TRD-120 (Similar to Page 34) TR-73

PANASONIC
Matsushita Electric Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101
CX-351EU AR-111
CX-830EU AR-111
RQ-209AS TR-97
RQ-209DAS TR-90
RQ-222AS TR-95
RQ-224AS/224S TR-98
RQ-226S TR-94
RQ-236S TR-93
RQ-243S TR-99
RQ-420S TR-105
RS-256UAS TR-96

Set No. / Folder No.

PENNEY'S—PENNCREST
J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N.Y. 10019
981-0101 .... AR-119
981-0105 .... AR-121
3300 .... TR-100
3810 .... TSM-132
3840 .... TSM-129
3850 .... TSM-130
6232,6233 (Similar to Page 136) TR-18
6569 .... TR-98

PONTIAC
United Delco Distributors
12BFMT2 .... AR-115
12BPBT2 .... AR-117
21XFMT1 .... AR-115
21XPBT1 .... AR-117
22AT411 .... AR-112
22BFMT1 .... AR-115
22BPBT1 .... AR-117
22BPBT2 .... AR-127
22BT411 .... AR-112
22FT411 .... AR-112
22XT411 .... AR-112
7307702 .... AR-112
7930242 .... AR-117
7930242 (1972 1/2 Prod.) AR-127
7930252 .... AR-115
7930492 .... AR-112
7934782 .... AR-112
7936181 .... AR-117
7936191 .... AR-115
7936232 .... AR-112

PORSCHE
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Illinois 60131
Sapphire XVII AR-124
1VW4112 .... AR-124

R

RCA
RCA Sales Corporation
600 North Sherman Drive
Indianapolis, Indiana 46201
YYB385T TR-103
YZB385T TR-103
YZB386E TR-103
YZB526S TR-106

RANGER
Ranger Radio
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128
R-71-T AR-111

REALISTIC
Allied Radio Shack Corporation
2727 West 7th Street
Fort Worth, Texas 76107
TR-8 (14-912) TR-91
TR-8A (14-912A) TR-91
14-912,A TR-91

ROBERTS
Rheem Manufacturing Co.
Califone-Roberts Div.
6050 West Jefferson Blvd.
Los Angeles, Calif. 90016
80 (Similar to page 95) .. TR-73
525 .... TR-93
526 (Similar to Page 75) .. TR-100
530 .... TR-93
808, D TR-99

ROSS
Ross Electronics Corporation
2834 South Lock Street
Chicago, Illinois 60608
8450 .... TSM-133
8875 .... TSM-134

Set No. / Folder No.

S

SANYO
Sanyo Electric, Inc.
1200 West Walnut Street
Compton, California 90220
FT-863 .... AR-127
FT-883 .... AR-121

SEARS-SILVERTONE
Sears, Roebuck & Company
303 East Ohio Street
Chicago, Illinois 60611
174.34940000 .... TR-97
400.34171100 (Similar to page 97) TR-89
564.21180200 (Similar to page 83) TR-72
564.34300000 .... TR-100
564.34401700 (Similar to page 93) TR-62

SHARP
Sharp Electronics Corp.
10 Keystone Place
Paramus, N. J. 07652
RD-416U TR-100
RD-425U TR-99
RD-426U TR-92
RD-428U TR-104

SONY
Superscope, Inc.
8150 Vineland Ave.
Sun Valley, Calif. 91353
TC-8W TR-96
TC-60 .... TR-98
TC-60A TR-105
TC-90 .... TR-106
TC-95,A TR-104
TC-100 (Serial #258,171 and Later (USA) #309,101 and Later (Canada) TR-90
TC-110A TR-102
TC-125 .... TR-100
TC-160 .... TR-93
TC-180/AV TR-99
TC-330 .... TR-101
TC-352D TR-97
TC-640 .... TR-103
TC-650 .... TR-94
TC-651 (Similar to Page 65) . TR-94
TC-707C (Similar to Page 65) TR-94
TC-1180 .... TR-99
TC-2120 .... TR-100
TC-2200 .... TR-93
TC-6350 .... TR-97
TC-9400 .... TR-103

SOUNDESIGN
Realtone Electronics Corp.
34 Exchange Place
Jersey City, N.J. 07302
4962 .... TSM-133
4965 .... TSM-134
7628 .... TR-103

SYLVANIA
GTE Sylvania, Inc.
700 Ellicott Street
Batavia, New York 14021
CT150 (Ch. TC4) TR-94
Ch. TC4 .... TR-94

SYMPHONIC
Symphonic Radio & Electronic Corp.
Foot of John Street
Lowell, Massachusetts 01852
AT-115 .... TR-90
CR-142 .... TR-90

T

TENNA
Tenna Corporation
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128
TC-80-T AR-116
TC-82-T AR-111

Set No. / Folder No.

TOYOTA
Toyota Motor Sales U.S.A., Inc.
2055 West 190th Street
Torrence, Calif. 90501
CX-161FTB AR-114
CX-165FTB AR-114
86260-14010 (CX-165FTB) . AR-114
86260-20011 (CX-161FTB) . AR-114

TRUETONE
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Mo. 64108
ITC7004A-07 .... AR-111
MIC7003A-17 .... AR-116
4DC7003 .... AR-116
4DC7004 .... AR-111

VOLKSWAGEN
Volkswagen of America
Englewood Cliffs, New Jersey
Sapphire XVII AR-124
1VW4112 .... AR-124

W

WARDS (AIRLINE-RIVERSIDE)
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607
GEN-3930A TR-95
GEN-3960A TR-105
GEN-6211A TSM-129
ZCX-16753A,B,C,D AR-116
61-16753 .... AR-116
62-6211 .... TSM-129
62-3930 .... TR-95

WEBCOR
United Sound & TV Co.
5036 Venice Blvd.
Los Angeles, Calif. 90019
EP-2203-1 (Similar to Chassis) 608-14

WELTRON
Weltron Company, Inc.
514 East Peabody Street
Durham, North Carolina 27702
WFMX-104 .... TSM-129
717,718 .... AR-111
2001 .... TSM-131

WESTINGHOUSE
Westinghouse Electric Corp.
Consumer Electronics Div.
Route 27 Vineard Road
Edison, New Jersey 08817
TSC4030A, B TR-102
TSC8020A TR-102

WOLLENSAK
3M Company
Revere-Mincom Div.
2501 Hudson Rd.
St. Paul, Minnesota 55119
4400 .... TR-98
4410 .... TR-98
4500 .... TR-97
4510 .... TR-97
6150 (Lots A,B) TR-93
6154 (Lots A,B) TR-93
6250 .... TR-91
6350 .... TR-91
6360 .... TR-91
6364 .... TR-91

Y

YORK
York Radio Corp.
15 Empire Blvd.
So. Hackensack, N. J. 07606
CTR-12 .... TR-95

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