SENCORE NEWS

HOW TO WITH INSTRUMENTS THRU *PIX FACTS*

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SENCORE FIELD ENGINEERS
OCTOBER, 1971

FACTS

You've Always Wanted to Know About

COLOR TV ALIGNMENT

FEATURING THE

SM158 Speed Aligner

FAST!

SM152 Sweep and Marker Generator

MOST COMPLETE!

See back cover for FREE offer

12 Most Frequently Asked questions about Sweep Alignment.

Jim Smith

The SENCORE Field Engineering department has been conducting sweep alignment workshops for over two and one-half years. A considerable background has been gained from these seminars and from the work with TV manufacturers in preparation for the meetings.

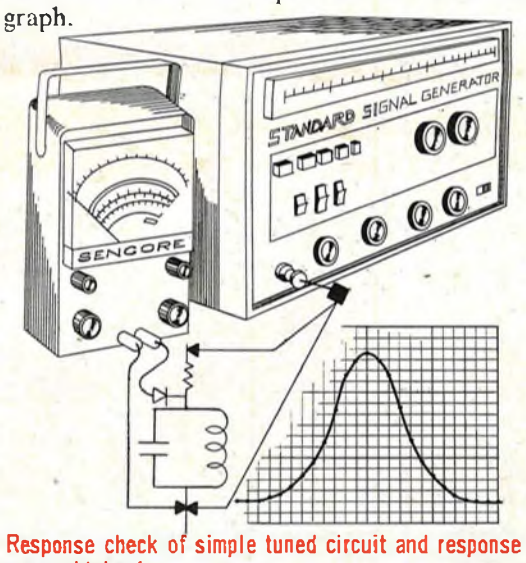
This issue of the SENCORE NEWS deals with the most frequently asked questions about alignment and alignment equipment at our seminars. We feel that we may be able to answer some of the questions you may have and help you to better understand receiver alignment. We would also encourage you to try your choice of SENCORE Sweep/Marker generators and make your purchase during our Special Offer.

Norm Pedersen

1 WHAT IS A SWEEP GENERATOR AND WHERE DO YOU USE IT?

You have heard many times that the sweep generator is a necessary tool in television servicing but may not know exactly what a sweep generator is and how it is used in your daily work. Let's cover the fundamentals of the sweep generator so that we can better understand how it is used to make your servicing easier and faster.

Let's use a simple tuned circuit. We can connect an RF generator with a constant output to the circuit, a volt meter with a detector probe across the coil and measure the frequency that the coil will respond to or its frequency response. By starting at a low RF frequency and slowly turning the frequency dial of the RF generator in small steps and recording the resultant DC voltage on a graph as shown, we can plot out a response curve of the tuned circuit. We can determine the exact frequency of resonance and the bandpass of the curve from this graph.

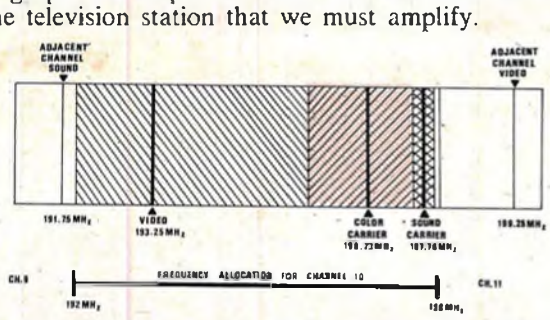


Response check of simple tuned circuit and response curve obtained.

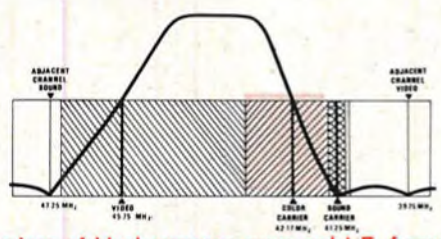
If each tuned circuit that we encountered during TV alignment had to be plotted in similar fashion, it would be a very time consuming task. The graph would have to be replotted each and every time that a simple coil tuning adjustment was made. Were this procedure used to attempt alignment of the many coils in a television IF strip, the job would take at least several hours and possibly days.

A simpler means of obtaining the response graph must be used to make alignment practical. The oscilloscope can be used to exhibit the graphic response curve if the frequency of the generator is varied at a rapid rate. This rate however is faster than can be done manually and therefore some electronic method must be used to change the RF generator frequency over the desired frequency band. This is the basic concept of modern sweep generators. The common rate of change is 60 times a second. This is readily available from the AC line and has been accepted as the standard sweep rate. 60 Hertz is also the frequency used in both Sencore sweep generators.

We have talked about the method of viewing the response of one tuned circuit but more than one tuned circuit is used in television receivers to obtain the necessary bandwidth to pass all the video and color information that is transmitted. Here is a graph of frequencies that are transmitted from the television station that we must amplify.



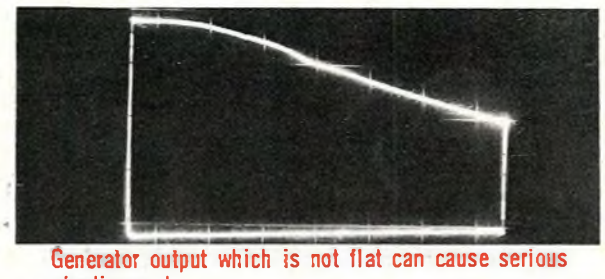
If we take three of the single tuned coils and gang them together so that the resultant addition of curves gives us the desired bandwidth then add amplification, we have an IF strip of today's color receiver. Here is an ideal IF sweep curve as it is found in today's television receiver. Note the signals and their relations to the curve.



Comparison of ideal response curve and I.F. frequency spectrum.

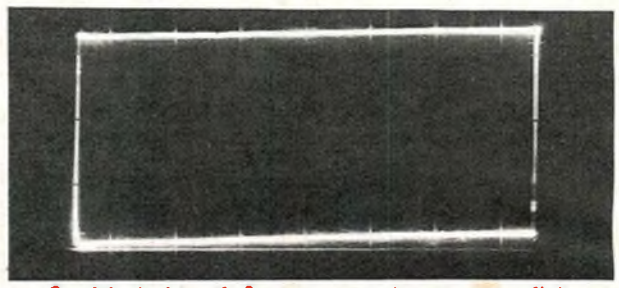
Only with a sweep generator can the shape and bandwidth of the curve be seen and conveniently adjusted to conform to this shape.

As we mentioned earlier when plotting the curve of the single tuned circuit, we had an RF generator with a constant output level. This must also be true of the sweep generator if it is to give a true representation of the curve that is formed by the three tuned circuits. The output level of the sweep signal must be flat. If it has peaks or valleys, then you will align the coils to compensate for the peak or valleys of the generator, making the alignment incorrect.



Generator output which is not flat can cause serious misalignment.

You can check a generator output for flatness by simply feeding the output of the RF cable into a demodulator probe and then into a scope. A flat output will look like two parallel lines in the scope screen. Any peaks or valleys indicate an output that is not flat, and this condition will give you incorrect alignment.



Careful design of Sencore generators assures flat sweep output.

Many hours were spent in the Sencore engineering department to make certain the output of the SM152 and SM158 sweep/marker generators is flat. Only with generators employing this careful design can you obtain consistent and accurate alignment results.

The sweep generator is used in television alignment of the tuner, IF and chroma stages. It is used to check and align both RF and IF stages in FM. The sweep generator is also often used to check antenna distribution systems for flat response across the RF band.

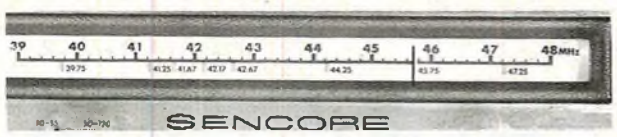
Troubleshooting is also a very important role played by the sweep generator in the service shop. The sweep generator is really the only practical way to isolate problems in any tuned circuit as it shows both gain and bandwidth of each amplifier. The IF amplifiers of a receiver are one of the more difficult sections to troubleshoot simply because gain alone is no criteria. Injecting a sweep signal into these stages and observing the output at the video detector will prove to be an effective shortcut for finding IF troubles. The same procedure can be used to quickly find problems in the RF and chroma circuits.

2 WHAT FREQUENCIES SHOULD BE COVERED BY THE SWEEP GENERATOR?

The right frequency coverage of the sweep generator is very important if it is to do the job for you. The following are the most commonly used frequencies that should be available on a sweep generator.

STANDARD 40 MHz IF: The generator should be able to cover the standard 40 MHz IF frequencies from 36 to 51 MHz with a very flat output. This is the band of frequencies needed for alignment of television receivers. Both Sencore Generators provide this coverage.

SPOT ALIGNMENT: This becomes a very important feature when you encounter a set which has been severely misaligned. Actually, it is simply an RF generator without any sweep covering the IF band of frequencies. It is used to preset or "peak" the IF transformers as a preliminary step in overall alignment on some receivers. This takes much of the guesswork out of aligning the difficult sets.



Preliminary adjustments are simplified with SM152 spot align band.

The Spot Align band eliminates the need for a separate RF generator to peak the IF transformers. This is an exclusive feature found only on the Sencore SM152 deluxe sweep and marker generator.

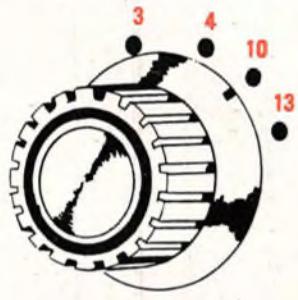
CHROMA THROUGH THE IF: (VSM) This is a must for alignment of the chroma bandpass amplifiers as recommended by major set manufacturers today. This signal is a 45.75 MHz crystal controlled Video carrier with a 42.17 MHz swept signal added. When the signal is passed through the IF stages, it mixes at the video detector and produces a 3.58 MHz swept chroma signal. This assures accurate chroma alignment on a color receiver as the entire IF/chroma response is observed. This important feature is available on both Sencore generators.

CHROMA SWEEP: This is a 3.58 MHz swept signal that is used to troubleshoot and align the chroma bandpass amplifiers as recommended by some of the set manufacturers. It can also be used to check the video amplifiers of the receiver as a troubleshooting aid to determine poor high frequency performance.

This is one more feature of the SM152 that makes it the most complete generator on the market today.

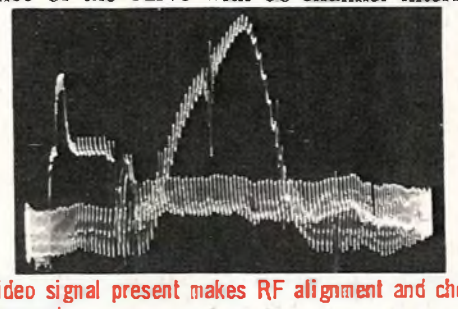
VHF - RF SWEEP: These are the standard TV channel frequencies used to make an overall alignment check and are also used in tuner repair and alignment. Only the Sencore SM152 and the RCA equipment covers all VHF channels, channel 2 all the way to channel 13 for a complete check of the tuner.

The Sencore SM158 Speed Aligner provides four VHF channels, two high and two low, for RF/IF overall checks.



Other generators available today either have no RF sweep provisions or supply only 2 channels of sweep signal. The lower cost mixing system used on these generators does not allow all channel coverage like the SM152. Extra beats and spurious signals appear on some channels making the output signal useless. This is why these generators are limited in their RF coverage. The Sencore sweep/marker generators on the SM152 uses fundamental frequencies for all channels, providing an answer for complete tuner alignment.

We call the SM158 a speed aligner because it does the job fast but not as complete as the SM152. Two extra RF channels are provided over other "speed aligner types" because TV reception on a channel being aligned can cause some alarming things; especially when taking a quick overall check from antenna terminals to video detector. Note the appearance of the curve with co-channel interference.



Video signal present makes RF alignment and checking rough.

UHF-RF SWEEP: This is a must for a complete check on today's receivers. A sweep generator without this feature is not complete as the UHF tuner should be checked to see that it operates properly before the receiver is returned to the customer. This is a general check to see if the tuner functions correctly and that there is no great suck out or loss of signal on the channels present in your area.

Only the Sencore SM152 has this feature.

FM - RF SWEEP: For complete FM alignment and checking, coverage of the FM RF frequencies is necessary. A sweep signal should be available so that the signal can be injected into the antenna terminals and the response curve viewed for an overall performance check. The Sencore SM152 gives you complete coverage of this important band of frequencies for FM.

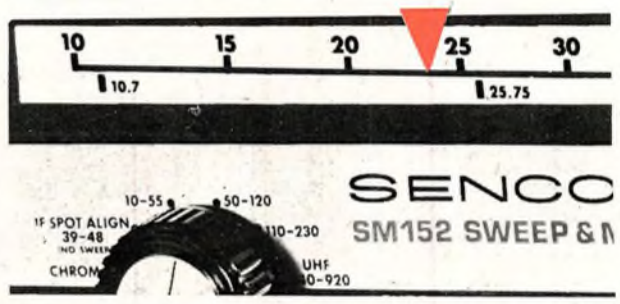
FM - IF SWEEP: A crystal controlled signal as well as a sweep signal should be available for a complete alignment of the FM receiver. Some manufacturers suggest the use of a 10.7 MHz crystal controlled CW signal while others recommend that a sweep signal be used in the alignment of the FM IF. For proper FM coverage, the generator should have both signals. The Sencore SM152 does.

21 MHz IF SWEEP: Older receivers and several Japanese imports use this IF frequency.

IMPORT SETS USING 21MHZ I.F. FREQUENCIES		
Delmonico/Nivico	Model	PTV-19T 4T-20V 5T-30V 4T-40 VPF-96 VPF-105 9T-14AEM
Sanyo	Model	16-PS2
Sony	Model	TVS-303W TV8-301W TV9-304W TV-304W

The chart above shows some of the Import sets that use the 21 MHzIF system. If you are going to service any import TV receiver, you will have to use the SM152 as it is the only generator with these IF frequencies (including the latest sweep and marker coming in from Japan).

Complete coverage of SM152 includes 21MHz IF frequencies.



3 WHAT SWEEP WIDTH IS NEEDED AND HOW DO WE DETERMINE ZERO REFERENCE?

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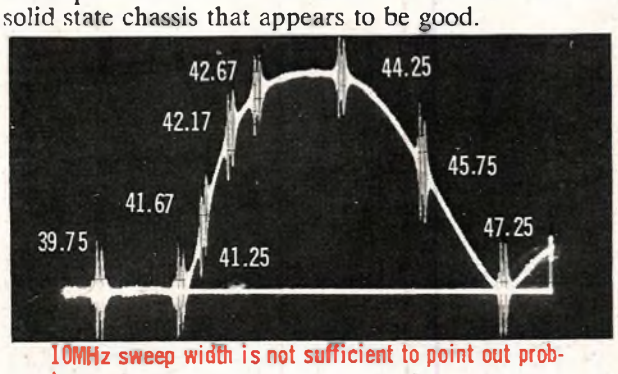
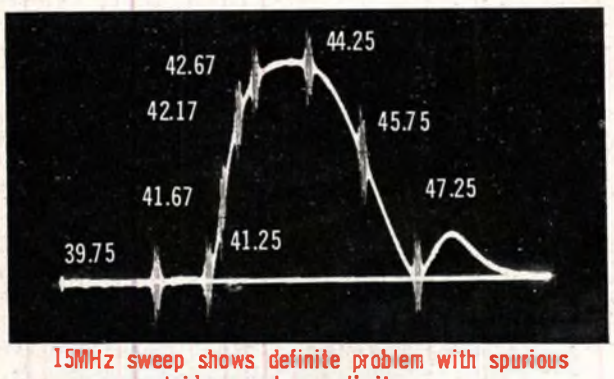
An important specification of any sweep generator is the sweep width. This determines the range of frequencies covered above and below the center frequency. If you refer back to the typical response curve and the associated signals, you will see that the generator must have at least 7.5 MHz sweep width to observe all of the response. The sweep width must be greater than 7.5 MHz if we wish to see beyond the adjacent signal traps to be sure that they are aligned correctly. Many coils can be mis-tuned and produce spurious response outside of the normal IF bandpass. This will lead to problems. Therefore, you should have capabilities of sufficient sweep width to see well beyond the normal IF response. Here is a curve of a late model Zenith solid state chassis that appears to be good.



10MHz sweep width is not sufficient to point out problems.

The sweep width used to exhibit this curve is 10 MHz so that we can see beyond the traps to be sure they are in proper adjustment. If you only used 10 MHz sweep width to view this curve you would probably expect the set to operate properly. But let us look further.

If we look at the same Zenith chassis and increase the sweep width to 15 MHz, we now see a new hump on the response curve past the 47.25 MHz trap where there theoretically should be no gain. If it is placed on a cable system or in a noisy area, you will have all kinds of difficulty with the picture.

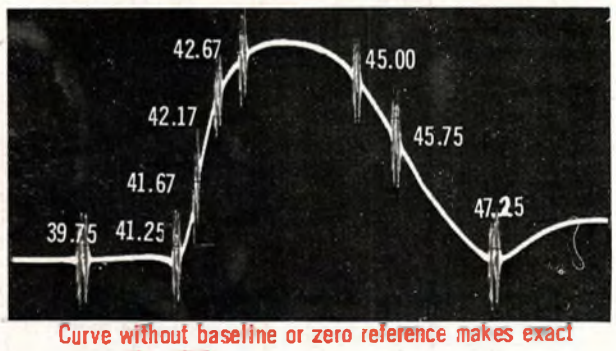


15MHz sweep shows definite problem with spurious response outside normal curve limits.

This is an indication of a misaligned IF and would be by-passed if the sweep generator did not have sufficient sweep width to allow you to see past the skirts and traps on the response curve. In this case, the mixer coil had been misadjusted, increasing the bandwidth of the link circuit beyond that needed for proper TV reception. The Sencore generators have been designed to provide a full 15 MHz sweep width. This allows you to achieve more accurate alignment results and more satisfied customers.

This same problem can also go unnoticed if there is no baseline to tell you that you have gain at a point where you should have none. Here, we have removed the baseline on the same receiver so you can see the difference.

This has been done to emphasize how difficult it is to check trap positions and maintain zero gain beyond the skirts of the curve without some form of reference. The zero baseline provided by Sencore generators give you a constant zero reference for easier, more accurate alignment.



Curve without baseline or zero reference makes exact trap setting difficult.

Here is an alignment curve taken from the Zenith Service manual. Note that the position of markers are referenced to the baseline in percentage. Positioning of the markers becomes easy with a reference. Judging where the markers should fall becomes a guess and a misalignment can occur if you remove the reference. Essentially every TV manufacturer uses the baseline as a reference to position the markers on their response curve. This is why both Sencore generators use a baseline. The sawtooth sweep used on most other generators does not produce a baseline, nor can it be added to the system.

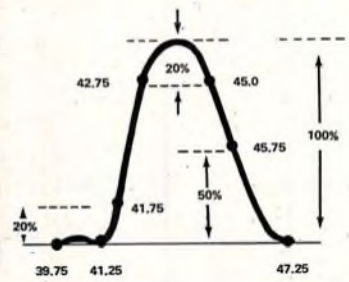


Figure 10—Overall Response Curve, Taken at Test Point C1.

Another important point, which often goes unmentioned by many test equipment manufacturers is the linearity of the sweep signal (moves from left to right at a constant speed). If the sweep is non-linear, the curve will be compressed and distorted on one side. This can be confused with an improper alignment curve. Sencore sweep generators have an ultra-linear sweep to eliminate this type of problem as a sinewave is used on both scope and sweep thus moving both at the same exact speed at all times; the result is a 100 percent linear action.

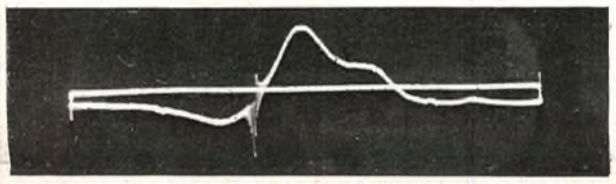
4 A BIT ON MARKERS

The response curve itself has little meaning unless you are able to mark critical frequency check points on the curve.

You must be able to determine accurately where the traps are to be positioned. Also, the position of the video and color carriers on the curve are important if the proper picture information is to be displayed. Let's look at a few of the common marker systems currently in use.

PREINJECTION MARKERS AND THEIR PROBLEMS

This is one of the earliest marker systems used. It simultaneously injects the RF generator signal and sweep signal into the IF amplifiers. When the signals arrive at the video detector, they mix and form a beat note that appears on the response curve as a birdie or marker. Many problems are encountered with this type of system. First, you are limited in the number of markers, generally only one at a time. This means that when you make an adjustment, you have to stop, set your marker generator to the different frequencies and observe their location on the curve. If more adjustments are required, you have to repeat the procedure. This is a very time consuming method. There is also another disadvantage to the preinjection marker system. It will overload the IF amplifiers if you inject too much RF signal from the marker generator and distort the response curve so that the curve is meaningless.

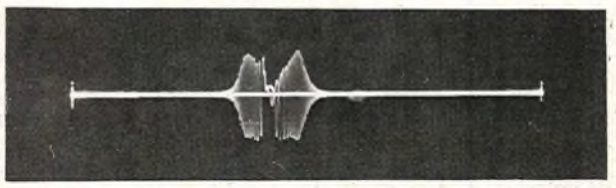


Pre-injection markers can cause severe overloading and curve distortion.

Trap action on the RF marker generator, with this system, is also a problem because the marker must actually pass through the trap and thus it may be "sucked out" and hard to see. If you increase the output of the generator to compensate for this action, you again overload the IF amplifiers and distort the curve shape.

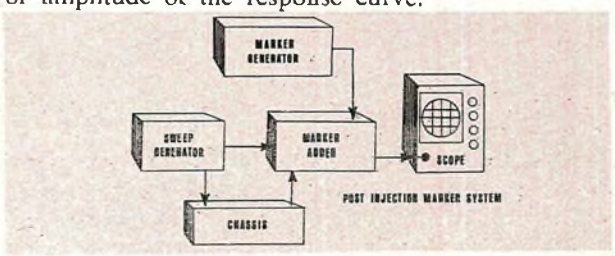
POST-INJECTION MARKERS

To overcome the problems of preinjection markers, a method was devised to add the markers to the response curve after it had been taken from the receiver. Adding the markers at this point is called post-injection. The markers are generated by applying a sample of the sweep signal and the desired marker frequencies to a detector. This then creates the marker pips.



Expanded "birdie" marker used in modern post-injection systems. Marker frequency shown accurately by zero beat point in center of birdie.

The resultant beat or birdie is amplified, then added to the curve after it comes from the television receiver. The total signal is then applied to the vertical input of the scope. The result is markers at the desired frequency that will not interfere with the shape or amplitude of the response curve.



The post-injection marker system allows you to use more markers than with the preinjection system, have more marker amplitude without interfering with the response curve, and eliminates the problem of interference.

Both Sencore generators, the SM152 and SM158, use the post-injection marker system to eliminate the preinjection marker problems. Twelve crystal controlled chroma and IF markers are available on both Sencore generators to insure you of the greatest accuracy for alignment. Eight push buttons give you fast selection of the markers you need; just push the button to turn the marker on, push the button again and turn the marker off; it's that simple.

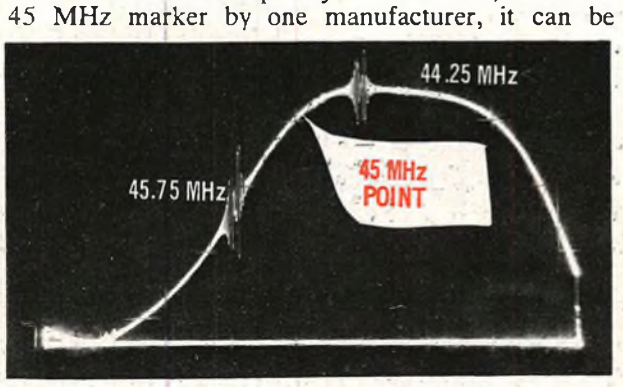
Sencore generators feature easy-to-use pushbutton markers with marker frequency listed on front panel.

The twelve marker frequencies on the Sencore sweep/marker generators are as follows: 39.75 MHz adjacent video trap, 41.25 MHz sound trap, 41.67 MHz lower color sideband, 42.17 MHz color carrier, 42.67 MHz upper color sideband, 44.25 MHz curve slope, 45.75 MHz video carrier, 47.25 MHz adjacent sound trap, 4.5 MHz sound trap, 4.08 and 3.08 MHz color sideband and 3.58 MHz color carrier markers are all available with the eight push buttons. These frequencies are marked for your convenience on each Sencore generator. Just push the button for the desired marker, whether it is for chroma or IF alignment. Any one or all of the markers may be placed on the response curve without causing interference or distorting the curve shape.

The SM158 is a speed aligner and we would not want you to take the time to look up marker frequencies. They are all called out by name on a simplified correlation chart above the push button. You simply select the marker you want, be it video, sound, etc.

Lights on a response curve to indicate marker position is a good idea but a quick look at the shape of the different manufacturers' curves makes you realize that the lights really can't be followed and that you must look at the manufacturers' literature for best results.

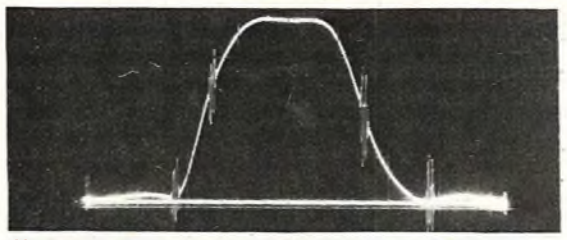
If an odd marker frequency is called out, as is the 45 MHz marker by one manufacturer, it can be



Ultra-linear sweep of Sencore generators allows unusual marker frequencies to be located accurately.

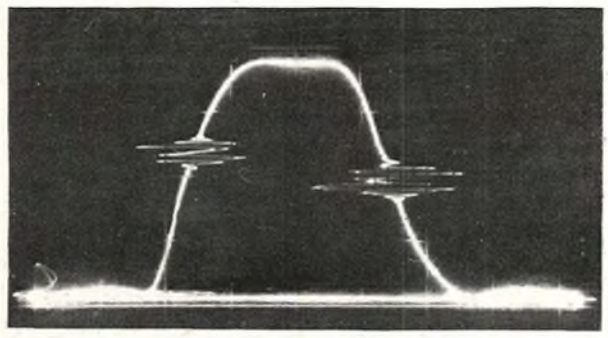
easily found due to the ultra linear sweep of these generators. The 45 MHz marker point will fall exactly half way between the 44.25 and 45.75 MHz markers.

The post-injection marker system offers one more advantage that you could not get with a preinjection marker system. That is the tiltable marker or the horizontal marker as some call it. By adding the markers after the response curve comes from the television receiver, they can be added to the vertical input of the scope for vertical markers or to the horizontal input for horizontal markers.



Vertical markers are sharp and crisp for easy viewing.

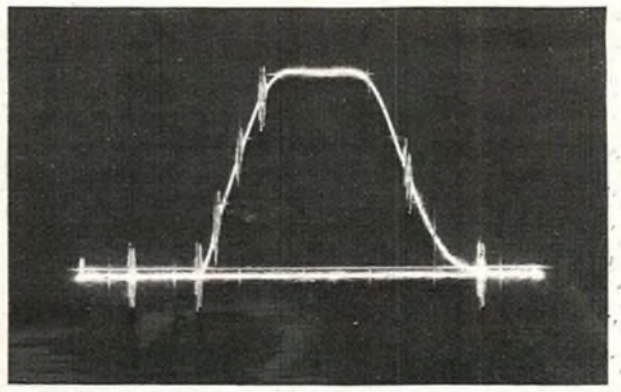
Here is a response curve showing the vertical markers as most often used. Here is a curve showing the horizontal markers as available on the Sencore SM158 with the flip of a switch.



Horizontal markers aid in accurate positioning of carrier markers.

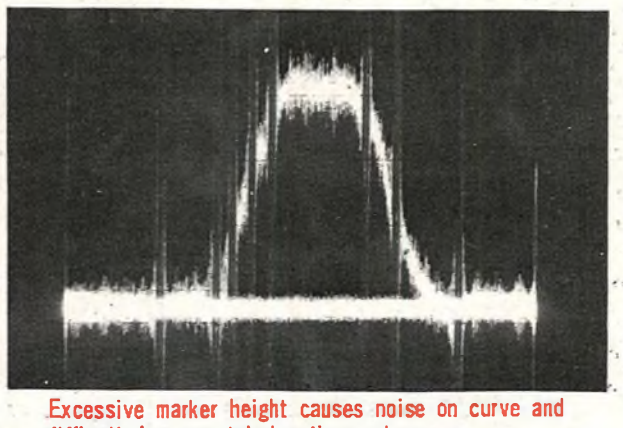
The horizontal markers are most often used to balance the two sections of the curve at the 6 DB points.

Marker amplitude is an important consideration on a sweep generator. Some generators make claims for a tremendous amount of marker amplitude which in reality is useless. You simply will want a visible indication on the curve as to where the desired frequency is located and no more for most of your alignment and troubleshooting.



Small, clean markers make alignment easy and accurate.

The photo here shows the marker level that is recommended for normal use. The second photo shows excessive marker amplitude. Note the noise on the curve making it harder to distinguish the dips of the traps.

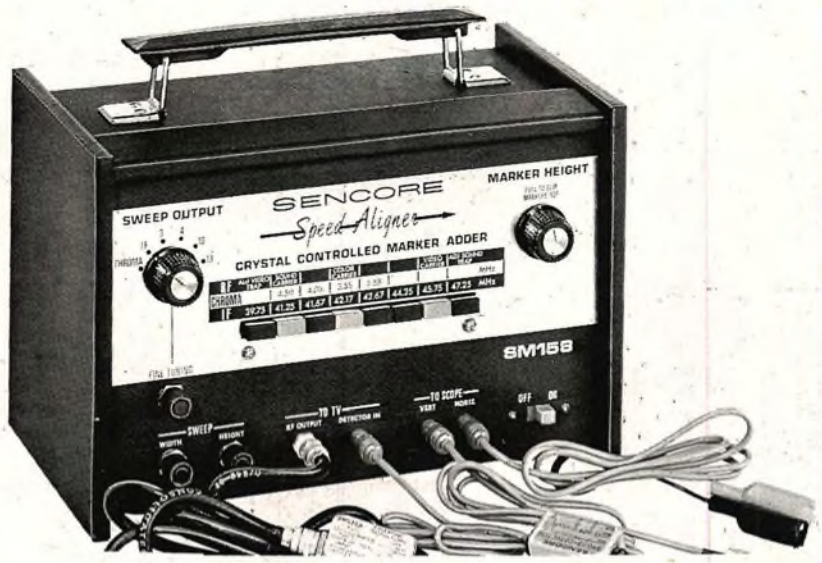


Excessive marker height causes noise on curve and difficulty in accurately locating markers.

Excessive marker amplitude can also overdrive the vertical amplifier in the oscilloscope causing the curve to appear distorted, giving you false indications. Be sure to use only the marker amplitude that is required to give you a visible indication on the curve.

SWEEP-MARKER GENERATORS

Speed Aligner SM158 $275.00



Deluxe Generator SM152 $450.00

Sencore all solid-state sweep marker generators are constructed to provide the necessary signals for sweep alignment and troubleshooting. The SM158 and SM152 have these common specifications:

- **CRYSTAL CONTROLLED MARKERS** for alignment accuracy.
- **15 MEGAHERTZ SWEEP WIDTH** to cover the entire IF band.
- **SIMPLE HOOKUP** with just four cables, 2 to TV, 2 to scope.
- **ZERO BASE LINE** for reference when adjusting traps and positioning carrier markers.
- **POST INJECTION MARKERS** for distortion free response curves.

If it is speed and simplicity that you want, the all crystal controlled SM158 is your answer and at $120.00 savings over competition.

- **PUSHBUTTON MARKERS** for the eight most often used IF frequencies: 39.75, 41.25, 41.67, 42.17, 42.67, 44.25, 45.75, and 47.25. Trap and carrier markers listed right on front panel for fast identification.
- **HORIZONTAL MARKERS** available at the flip of a switch.
- **2 EXTRA RF CHANNELS** to assure interference-free response curves on RF-4 RF channels in all.

If it is completeness that you want, the SM152 is the most complete on the market.

- **RF SWEEP FOR ALL BANDS,** VHF, UHF, FM, IF, and Chroma.
- **CALIBRATED RF OUTPUT AND CALIBRATED SWEEP WIDTH.**
- **IF SPOT ALIGN BAND** for pre-alignment adjustments.
- **RF MARKERS** for channels 4, 5, 10 and 13.
- **FM SWEEP** with markers for FM Alignment.

OSCILLOSCOPES

Dual Purpose Oscilloscope Vectorscope

THE FIRST REALLY COMPLETE SERVICE SCOPE

PS148 $269.50

- **WIDE BAND** 10 Hz to 5.2 MHz ± 1DB.
- **HIGH SENSITIVITY** 17mv rms per inch.
- **HIGH INPUT IMPEDANCE** 27 megohms shunted by 11pf low cap.
- **SEVEN THOUSAND VOLT** input rating with low cap probe, not 600 volts like other scopes.
- **DIRECT VERTICAL PEAK TO PEAK VOLTAGE READING** with input controls calibrated directly in volts p-p.
- **CONVERTS TO PROFESSIONAL VECTORSCOPE** with the flip of a switch. A truly complete scope with this feature.
- **FULL RANGE HORIZONTAL SWEEP** frequencies from 5HZ to 500KHz in five overlapping ranges.
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- **EXTERNAL INPUTS** for sync, sweep, Z axis and direct connections to deflection plates.

All New Dual-Trace Triggered or Free Running Oscilloscope

DC OR AC COUPLED

PS163 $495.00 Plus Probes

Never before has anyone presented a scope with such flexibility . . . and it's simple to operate. You simply push the button and view the screen. "What you see is what you get."

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Sencore pioneered the idea of using Field Effect Transistors to provide a high impedance, stable and reliable replacement for the troublesome and easily damaged VOMs and VTVMs. Many changes and improvements have been added since the first Sencore FE Multimeter was introduced. The newest FE meters are shown here. Each of these instruments has the same, high, 15 megohm input impedance on DC which provides minimum circuit loading. The stability and accuracy of these instruments makes trouble shooting a pleasure rather than a task.

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FAST REPLACING OLD FASHIONED VTVMs AND VOMs

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Standard Accuracy
2½% DC
4½% AC

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3% AC

ACCURATE
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INDUSTRY'S BEST VALUE IN MULTIMETERS

4½ Inch Field Effect Multimeters

LESS CIRCUIT LOADING THAN VTVM. 15 megohms on DC, 10 megohms on AC.

INSTANT STABILITY. Zero warmup time . . . ready with the flip of a switch.

FULL METER PROTECTION to 100 times AC overload. No more damaged meters.

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SPECIFICATIONS

14 DC Voltage ranges from 1 volt to 1000 volts full scale, 7 negative and 7 positive.

7 Zero Center ranges from .5 to 500 volts.

7 AC Voltage ranges from 1 to 1000 volts full scale.

5 DC current ranges from 100 microamps to 1 ampere full scale.

5 Resistance ranges from 1000 ohms to 100 megohms. 10 ohms center scale.

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MIGHTY MITE — THE WORLD'S MOST POPULAR TUBE TESTER.

NEW PIN ELIMINATION SWITCHES eliminate normal shorts caused by internal connections.

CHECKS MORE TUBES THAN EVER BEFORE. Pin elimination allows tubes to be tested which could not be checked before.

FULL RATED CATHODE EMISSION TEST.

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WORLD'S ONLY TUBE ANALYZER

TRUE MUTUAL CONDUCTANCE TEST using a 5000 Hertz square wave for true tube test.

TWO TESTERS IN ONE. The MU150 can be used to make the Mighty Mite tests as well as mutual conductance.

FULL RATED CATHODE EMISSION TEST.

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NEW CRT AUTO-TRACKER WITH COMPUTER MEMORY CIRCUITS.

PUSHBUTTON AUTOMATIC TRACKING TEST. Simply push a button to make the previously complicated tracking test.

COMPUTOR MEMORY CIRCUITS store CRT information for the tracking test.

CHECKS BLACK AND WHITE TUBES using the same procedure as color.

TESTS TRINITRON TUBES the same as domestic tri-gun tubes. Only one procedure for all tubes, all made possible through computer memory.

FILAMENT VOLTAGE now precisely set on meter.

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FE20 $129.50
with 30KV hi voltage probe

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FE160
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PUSHBUTTON OPERATION
with 7 inch meter

112 RANGES AT YOUR FINGERTIPS

HI-LO FIELD EFFECT MULTIMETERS—*A New Concept in FE Meters*

NOW . . . MEASURE RESISTANCES IN CIRCUIT IN SOLID STATE DEVICES WITH THESE HI-LO FIELD EFFECT MULTIMETERS.

FEATURES

LOW POWER OHMS using .08 volts to make in-circuit resistance measurements accurately. Allows you to use latest Howard Sams service information. Sams specifies it, only Sencore has it.

HIGH POWER OHMS for routine resistance measurements and to check front-to-back ratios of diodes. Meters would not be complete with low power ohms only.

ONE-TENTH VOLT FULL SCALE sensitivity on both AC and DC voltage. A must when servicing in solid state circuits with critical low voltage biases.

PROTECTED TO 1000 TIMES OVERLOAD. A truly burnout proof mutimeter. Tested in production with 1,000 volts on .1 volt range. Multimeter resistors protected by .6 amp fuse to save these valuable and expensive components. No more trips to factory when you accidentally measure volts on ohms range.

SPECIFICATIONS
FE20 and FE21

9 DC Voltage ranges from .1 to 1000 volts full scale
3 High Voltage ranges of 3, 10, and 30KV
9 DC Zero Center ranges from .05 to 500 volts
9 AC Voltage ranges from .1 to 1000 volts full scale
9 AC Peak-to-Peak ranges from .28 to 2800 volts
9 DC Current ranges from 100 microamps to 1 amp full scale
7 Hi Power ohms ranges from 1000 ohms to 1000 megohms
6 Lo Power ohms ranges from 1000 ohms to 100 megohms

FE160

10 DC Voltage ranges from .1 to 3000 volts full scale
10 DC Zero Center ranges from .05 to 1500 volts
9 AC Voltage ranges from .1 to 1000 volts
9 AC Peak-to-Peak ranges from .28 to 2800 volts
10 DC current ranges from 30 microamps to 3 amps full scale
10 AC current ranges from 30 microamps to 3 amps full scale
8 Hi Power ohms ranges from 600 ohms to 6000 megohms
7 Lo Power ohms ranges from 600 ohms to 600 megohms

IN-CIRCUIT TRANSISTOR & FET TESTERS

Full Tests In Or Out Of Circuit

TF17
$109.50

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Here are two testers that can simplify every solid state repair or troubleshooting job. They will test all transistors for beta gain right in the circuit. Flip the function switch to the right and they will test Field Effect transistors for actual transconductance . . . right in the circuit.
Here are some of their features:

IN-CIRCUIT TESTS eliminate the need for time consuming component removal and the possibility of circuit damage which can result.

TESTS BOTH TRANSISTORS AND FET's, in-circuit or out. Transistor tests can now be made fast and easy.

TRANSISTORS TESTED FOR AC BETA which duplicates their circuit performance. This is a dynamic test, not a DC test as used by some other testers.

FIELD EFFECT TRANSISTORS TESTED for actual transconductance by a dynamic test. The same type of test used to test vacuum tubes for Gm.

LEAKAGE TESTS ON TRANSISTORS for Icbo leakage performed out-of-circuit. You can be sure you have a defective transistor after it has been removed from circuit and time spent ordering a replacement.

ZERO BIAS TEST for field effect transistors. Quickly determine the Idss characteristics of the FET when matching or industrial sorting is necessary.

SIMPLE OPERATION with a single function control for all tests. No complicated set-up as used by other types of testers.

LARGE, EASY TO READ, COLOR KEYED METER for fast error-free tests. Color keyed to front panel for easy correlation.

COLOR GENERATORS

SENCORE

ALL AMERICAN MADE

SENCORE COLOR GENERATORS

Sencore Color Generators offer these all new outstanding features:

- **PERMA-LOCK CIRCUITS** which match or out-perform the digitals.
- **"PAINTED PATTERNS"** so rock solid you'll think they are painted on the screen.
- **SMALLER LINES AND DOTS** for the most precise convergence ever.
- **STANDARD PATTERNS** including RCA licensed color bars for every convergence need.

Caddy Bar Jr. new

- **"POCKET SIZED"** measuring a mere 2 x 4 x 6. (Size of two 5U4's)
- **PUSHBUTTON OPERATION** for ease of operation.
- **BUILT-IN PREHEATER** for cold days.
- **RETRACTABLE CORD.** No messy cords to untangle.
- **AUTOMATIC SHUTOFF** after 15 minutes if you forget. All electronic using computer memory circuit. No more run down batteries.

WORLD'S SMALLEST . . . BUT PERFORMS LIKE A GIANT

CG22

$89.00

STANDARD RCA LICENSED PATTERNS

Deluxe Color Bar Generator new

- **SENCORE EXCLUSIVES.** Single dot and single cross, movable so they can be positioned anywhere on screen to simplify dynamic convergence.
- **SENCORE EXCLUSIVE.** Thermostatic temperature control to warm unit on cold days or to dry out moisture, in humid areas.
- **GREATER LINE VOLTAGE** range means stable operation regardless of line potential.
- **HIGH STYLE** in two-toned vinyl clad steel attache case with mirror in cover.

CG159 **$169.50**

TIME SAVING INSTRUMENTS

PM157

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Power Monitor

THE MOST PRACTICAL SERVICE TOOL EVER DEVISED.

- **AC VOLTMETER** from 65 to 135 volts. Calibrated at 115 volts for more accuracy than VOM.
- **AC AMMETER** up to 10 Amps. Check fuse and circuit breaker currents in a flash.
- **AC WATTMETER** up to 1150 watts. A real trouble shooter.
- **DC AMMETER** up to 10 Amps.
- **FUSE RESISTOR CHECKER** with special scales for each resistor.
- **MAKE ALL TESTS** with interrupted line cord or test leads.
- **FULLY PROTECTED** against shock hazard to appliance, instrument and operator.

Field Strength Meter

- **HIGHLY SENSITIVE** all the way down to 30 micro-volts.
- **COMPLETE COVERAGE** of all VHF, UHF, and FM bands.
- **STANDARD REFERENCE** of zero DBJ. 1000 microvolts into 75 ohms for CATV and MATV work.
- **ACCURATELY CALIBRATED** in microvolts for direct signal strength reading, 3 DB VHF and FM, 6 DB UHF.
- **COMPLETELY PORTABLE** to go where you need it without extension cords.
- **BOTH 75 AND 300** ohm inputs.

FS134

$229.50

Component Substitutors

- **PROVIDES THE MOST OFTEN USED VALUES** of resistors, capacitors and electrolytics.
- **24 VALUES OF RESISTORS** from 10 ohms to 5.6 megohms in both ½ and 1 watt.
- **10 VALUES OF CAPACITORS** from 100pf to 0.5mfd at 600 volts.
- **2 ELECTROLYTICS:** 10 and 40mfd at 450 volts.

RC144 Handy "36"

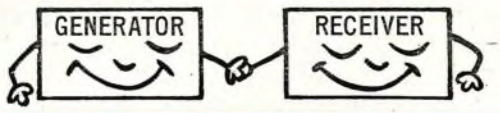
$19.95

RC146 Handy "75"

$69.95

- **75 MOST OFTEN NEEDED VALUES** of resistors, capacitors, electrolytics, power resistors, and universal rectifiers.
- **12 RESISTORS** from 10 to 5.6k, 1 watt.
- **12 RESISTORS** from 10K to 5.6M, ½ watt.
- **10 CAPACITORS:** 100pf to .5mfd, 600V.
- **10 ELECTROLYTICS** form 25 values.
- **POWER RESISTORS** at 20 watts, 2.5 to 15K.
- **UNIVERSAL** .5 amp selenium and silicon rectifiers.

5 MATCHING THE GENERATOR TO THE RECEIVER



A very important part of sweep alignment is matching the output of the sweep generator to the receiver. A mismatch between the RF output of the generator and the input of receiver can cause standing waves on the cable. This can cause the response to shift or change shape as you move near the cable. The cable should be terminated in its characteristic impedance at the end connecting to the receiver and, if possible, at the sending end as well.

Generator output and receiver must be properly matched for accurate alignment.

A good test of the impedance match of a sweep generator is to connect it to the receiver and then "milk" or "wipe" the cable from the generator to the receiver with your hand. Any body capacity effects that alter the shape of the curve, indicate standing waves on the line. Put the Sencore sweep generators to this test and they will stand out from all others on the market as the quietest. The use of shielded and low impedance cables on sweep generators is also part of the matching systems to reduce noise and assure proper match to the receiver. Each lead has its own ground connection, eliminating ground loops and other problems that are associated with common ground connections. If you have proper matching, but the RF leakage is high, the matching is meaningless as the leakage signal will get into the receiver and act similar to standing waves on the cable. The Sencore engineering staff put extensive effort into making the leakage from the Sencore generators as low as laboratory gear. This means that only the signal from the cable is reaching the receiver and its level can be controlled by the sweep height or SWEEP OUTPUT control on the generator.

Both Sencore generators come complete with a special designed pad to match the receiver antenna terminals, the mixer or any test point in the IF.

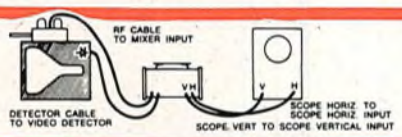
Carefully designed matching pad means proper match to receiver.

Here is the 39G22 matching pad supplied with both Sencore sweep/marker generators. It will match into the 300 ohm antenna terminals of any receiver using the red and green leads. When injecting into the mixer test point, or IF test points, use the black lead to ground and the red lead to the test point. This assures proper impedance match to any test point. Of equal importance is matching the generator to the receiver in the detector probe. If the improper probe is used, it can load or distort the response curve. The Sencore 39G23 standard detector probe (supplied with both Sencore Sweep generators) uses a series 27,000 ohm resistor to isolate the video detector test point from the input of the sweep generator. This eliminates the loading of the video detector caused by the capacity of a direct probe without isolation.

Special probe furnished with all Sencore generators provides detector probe and isolation probe in one.

The 39G23 is a special probe because it has a built-in demodulator that is used during chroma alignment and in troubleshooting procedures. The demodulator is a standard video detector that matches the detector circuits recommended by set manufacturers.

6 CONNECTING THE SWEEP GENERATOR TO THE RECEIVER



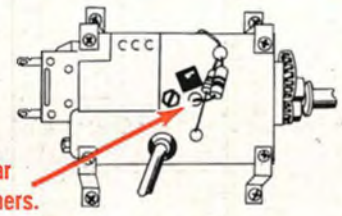
Connection of the sweep generator to the receiver obviously is an essential part of the alignment job. This can be difficult if you do not know the test points in the receiver. In most cases, the test points in one receiver are basically the same as in another. With a little knowledge of these points, you can quickly hook up to any receiver for a quick check or for full alignment.

The simplicity designed into the Sencore sweep/marker generators eliminate the long tedious task of equipment connection which has been prevalent in the past. Only 4 cables are required for the complete connection of both generator and oscilloscope.

The overall RF/IF check: The RF output cable from the sweep generator is connected to the antenna terminals. Here you use the red and green leads of the 39G22 matching pad so you match the 300 ohm input of the receiver. One word of caution here: *Do not align the receiver IF stages, except for a slight tilt adjustment, through the antenna terminals.* The reason being that you are not sure where the local oscillator in the tuner is set and you can misalign the receiver, especially the traps. We call your attention to this point because it is recommended by one test equipment manufacturer. Overall check should be just that — a check on alignment. Try it — you will see we are right.

The connection of the RF cable to the mixer test point for IF alignment is a little harder to find. In most cases, especially in tube type tuners, the mixer test point is right next to a square hole in the top of the tuner chassis.

Look for the feed through capacitor near the square hole. The red lead of the matching pad is connected to this point and the black lead to ground to provide the necessary low impedance match into the mixer. This information is screened on the matching pad cover for easy reference. Refer to the manufacturer's service information if you are in doubt as to the exact location of this test point.



Mixer test point located near square opening on most tuners.

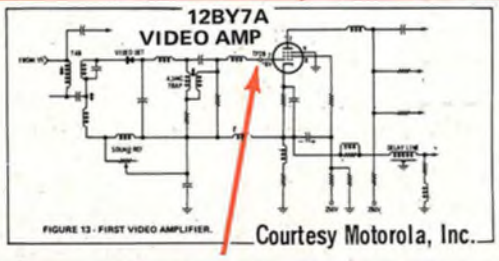
The 39G22 matching pad provides an excellent impedance match directly into a single IF amplifier such as recommended on the Zenith 4B25C19 chassis. The first step requires the signal injection directly into the 3rd IF stage. You simply connect the black lead of the pad to ground and the red lead to the test point called out in the manufacturer's procedure.

CONNECTING THE DETECTOR PROBE

The receiver response curve is picked up at the video detector (or other test point as noted) and coupled into the sweep generator marker adder sections. You will use the 39G23 standard detector probe supplied with the generators for this.

Do not connect to the video detector diode itself as it may change the curve shape. Most alignment instructions specify that a resistor ranging between 10K and 47K be placed in series with the scope (or detector lead) and the test point.

This is not needed when using Sencore equipment as the resistor is built into the 39G23 detector probe supplied with the SM152 or SM158.



Typical test point for video detector is grid of first video.

A demodulator probe is required for the chroma alignment as the signal take-off point is ahead of the chroma demodulators. The blue lead on the 39G23 standard detector probe connects to a demodulator for use in chroma alignment. This is clearly indicated on the probe cover.

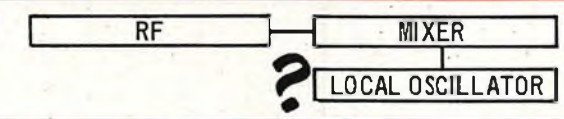
39623 probe provides chroma demodulator needed for chroma alignment.

This probe was designed to work with all manufacturers' receivers to give the proper alignment curve. If the chroma test point cannot be found or is not known, you can use the centertap of the chroma level control on most receivers, or the input to the chroma demodulator circuit.

The input leads to the oscilloscope are self explanatory. The vertical lead goes to the vertical input and the horizontal lead goes to the horizontal input.

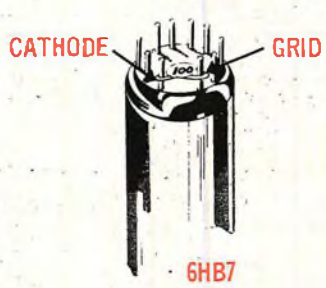
If you do not wish to use the horizontal marker feature of the Sencore generators, the horizontal drive lead need not be used. The sinewave sweep of the Sencore SM152 and SM158 allows you to use the line sweep function of your scope, further simplifying the connections.

7 WHAT TO DO WITH THE LOCAL OSCILLATOR?



There are times when a strong local oscillator in a TV tuner may feed enough signal into the IF's to cause extra beats and other problems when attempting alignment. If these symptoms occur, the local oscillator can be disabled quite easily.

A small .001 MFD disc capacitor from the grid of oscillator to the cathode will stop the oscillator. Simply wrap the leads of a small .001 MFD around the grid and cathode pins of the oscillator tube as shown here. Reinsert the tube into its socket and proceed with the alignment. Be sure to remove the capacitor after you have completed the alignment. The capacitor "kills" the local oscillator and no transmitted information will reach the video detector if it is not removed.



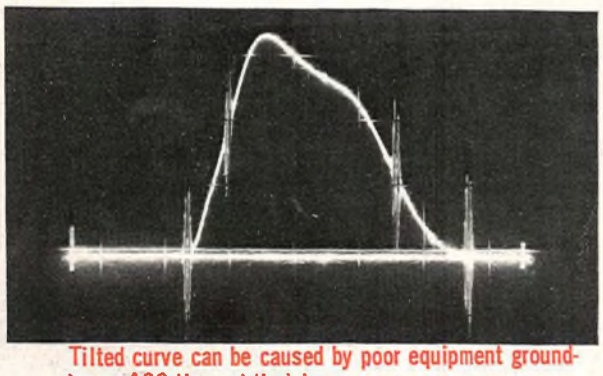
An often used procedure to disable the oscillator is to set the TV tuner between channels on the high end (10-13). This procedure should be used with caution. It interrupts the B plus voltage and opens the coils to the oscillator in the tuner. This procedure can sometimes cause a tilted curve due to the effect of the oscillator coils when they are switched back into the circuit.

An alternate injection method which can be used if a mixer test point is not readily accessible is to use a foil wrap on the mixer tube. Remove the tube from its socket, wrap with a layer of foil, wrap tape or other insulation over the foil and re-insert the tube. Connect the hot lead of the generator to the foil and black lead to tuner chassis.

8 TYING DOWN THE AGC

In all alignment procedures, the AGC line is always tied down. There are two very important reasons that this is done. First, it is necessary to establish a constant gain in the IF stages during alignment. Placing a constant bias on the AGC line keeps the gain from changing.

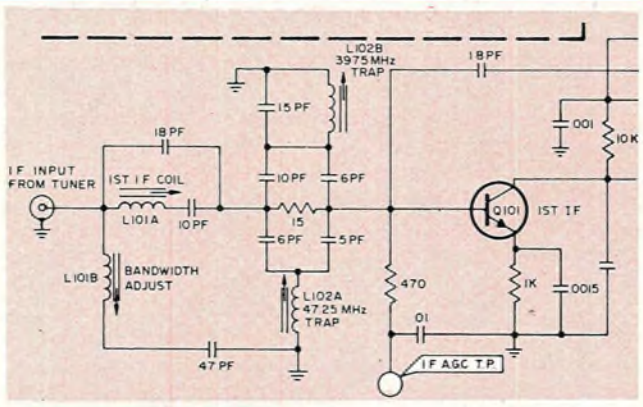
You will also find that if you do not tie down the AGC, the 60 Hertz sweep signal picked up at the video detector will be fed into the AGC system. This changes the gain of the IF's 60 times a second in step with sweep signal. The results are that the gain of the IF stages will change the shape of the curve causing a slight decrease in amplitude at one end and a corresponding increase at the other. If the receiver is aligned to a flat response under this condition, the receiver will not perform properly.



Tilted curve can be caused by poor equipment grounding or AGC line not tied down.

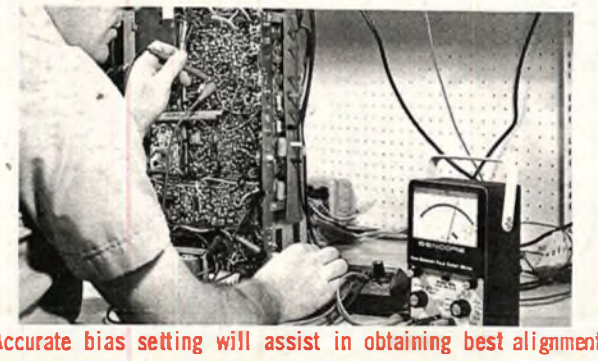
The biggest problem with AGC is locating the test points on the various chassis. Many manufacturers are starting to mark these points on their chassis for easier servicing. Regardless of the make of TV, tube or solid state, it is quite easy to find the IF AGC test point. The AGC is almost always used to control the gain of the first IF stage, so the AGC line will be connected to the controlling element of the first IF stage. In tube receivers, find the grid pin to locate the grid resistor. The bottom end of the resistor of end opposite the grid connection is the AGC test point. In solid state sets, it is generally a similar point. Just follow the base resistor from the first IF down and the end of the resistor opposite the base is generally the IF AGC test point. You will find either no base resistor, or the resistor goes to ground in some receivers. In this case, the AGC is tied to the second IF base through a resistor.

"I can find the test point, but how much voltage should I use?" This is a very common question as AGC bias voltages in the various receivers are not



Typical AGC test point in solid state IF's. Courtesy of Zenith Corp.

identical. In tube type receivers, you can usually apply a negative two volts to the AGC test point and be in good shape. Just use the calibrated output of the Sencore BE156 7 in 1 bias supply. In solid state, when no information is available, you can determine the voltage in several ways. Connect the bias supply and set the output to positive voltage. Slowly advance the control in the positive direction while watching the amplitude of the response curve. The curve will reach a peak or maximum amplitude at some point. If you increase the voltage, the curve will begin to decrease in amplitude. Continue advancing the control slowly until the curve drops about 25% in amplitude. This is the voltage to use on that set.

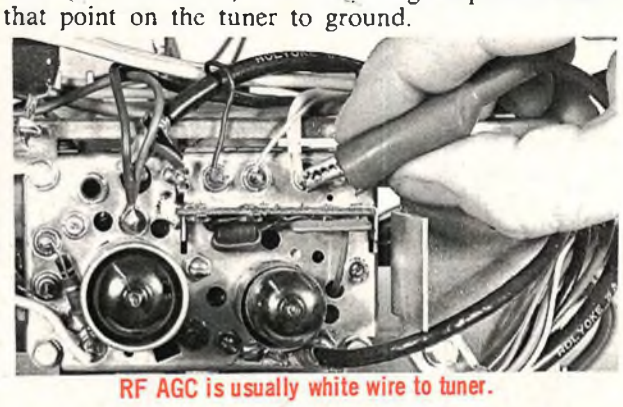


Accurate bias setting will assist in obtaining best alignment.

You can use the measured AGC voltage under strong signal conditions also. Connect a high impedance FE meter such as the Sencore FE16 to the AGC test point and tune in a strong station. Note the voltage and turn the tuner off that channel to an unused high channel for the alignment procedure. Without removing the FE from the test point, connect the output of the BE156 to the test point and slowly adjust the bias control until the meter reads the same voltage. Even though the BE156 is calibrated, the residual voltage on the solid state AGC line must be considered. Measuring the voltage present at the test point will prevent errors in biasing.

When aligning the chroma circuits, bias is generally required to assure that the chroma bandpass amplifier is operating and the color killer is disabled. Because each manufacturer differs in the connections and voltages required, it is impossible here to list each one. Generally, the chroma amplifier is turned on by a bias in the order of 2 volts positive, applied to the bottom end of the grid resistor. The blanker stage is cut off with a high negative voltage applied to the grid.

For overall RF/IF alignment checks, an additional bias source must be connected to the tuner AGC test point. This will assure constant RF gain and prevent overloading. The RF AGC test point is easy to locate on most tuners. It will be a brown or white wire (in most cases) and has a large capacitor from that point on the tuner to ground.



RF AGC is usually white wire to tuner.

Sencore considered adding a bias supply to the sweep generators when they were being developed. Careful testing pointed out a major problem which could occur if this were done.

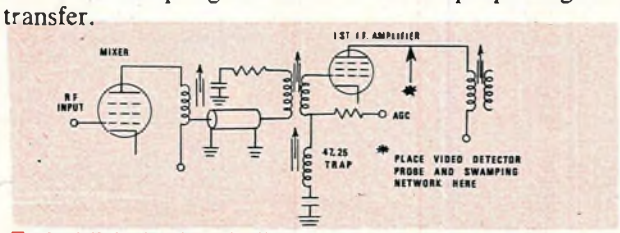
There could be interaction between the bias supply and the power supply of the sweep generator if the two were contained in the same unit. This is avoided, along with common grounds which can cause all sorts of problems, by making a separate bias supply like the BE156. The bias supply can also be used for general troubleshooting, if it is separate and convenient, like the BE156. See back cover.

Other questions regarding a built-in bias supply were raised. "What voltage levels do we provide to be certain any future sets will be covered." This is impossible to determine without a crystal ball. For example, a major set manufacturer has recently introduced a receiver requiring 67 volts negative bias for alignment. This development made all bias supplies, separate or included in the sweep generator, obsolete. We are sure you will agree that it is easier and less costly to replace a separate bias supply than to replace or make extensive modifications on a sweep generator.

9 LINK ALIGNMENT

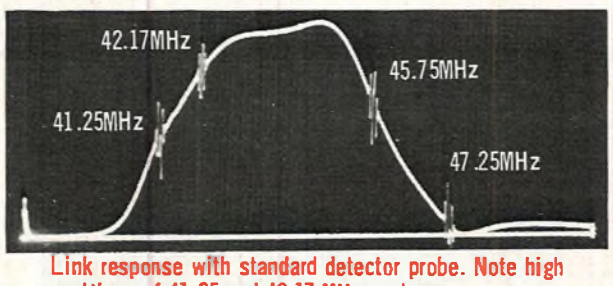
During the meetings which we present and the conversations with many technicians, we get the impression that there is some mystery surrounding link alignment. Link alignment is not new for it has been a part of color receiver alignment since the early color sets were produced.

The link alignment procedure is one of the first steps in the alignment of a large majority of color receivers in use today. The adjustment is made to assure proper coupling and bandpass between the tuner and the IF strip. The output of the tuner and the input of the IF's have to be complementary so the full range of frequencies present in the mixer output will also appear at the input to the first IF. The output characteristics of the tuner, the link cable (the coaxial cable between the tuner and IF), and the IF input characteristics will not always provide the perfect match and coupling that is necessary. The adjustments made during the link procedure will establish the tuned coupling circuit needed for proper signal transfer.



Typical link circuit and adjustments.

The adjustments usually associated with the link alignment are the mixer output coil, the first IF input coil, and a trap in the first IF to remove any adjacent channel sound interference. Perhaps some of the mystery of link alignment can be attributed to the fact that a special detector probe is needed to observe the response of the link. A conventional detector probe can sometimes cause the link alignment to be made incorrectly. The detector probe



Link response with standard detector probe. Note high positions of 41.25 and 42.17 MHz markers.

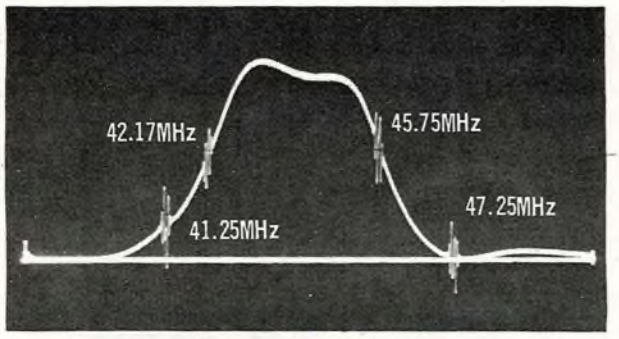
used to observe the link alignment must have two basic functions. The first to provide demodulation of the RF signal present at the output of the 1st IF, which is the test point used for this adjustment.

The second function of the link detector probe is to swamp out the output transformer of the first IF stage. What is meant by "swamp out" is to eliminate the normal resonant characteristics of this transformer. If this is not done, the output transformer can cause the link response to shift or exhibit tilt.

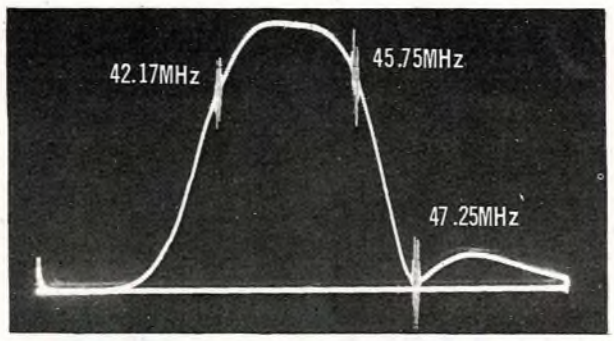
Another troublesome part of link adjustment is the low level of signal present at the first IF output. In many cases, the output is so low that a usable response is difficult or impossible to obtain with normal service instruments. Sencore studied the problem of link alignment in depth during the development of the sweep/marker generators we now manufacture to serve you. The link detector probe available for use with either Sencore generators has been designed to eliminate the "mystery" or difficulty of link alignment. The 39G26 Link Detector probe provides the necessary RF detector network as well as the all-important swamping circuit needed to remove the effects of the first IF output transformer. The big plus which has been designed into the Link Detector probe is the voltage quadrupler circuitry used. This now provides, for the first time, a signal output at the link test point which is of sufficient amplitude to allow you *accurate adjustment of the link response.*

Link detector probe connected for link alignment of Admiral K-10 chassis.

Whenever sets using the link alignment procedure are to be adjusted, the 39G26 Link Detector probe is a must.



Link detector probe shows correct response.

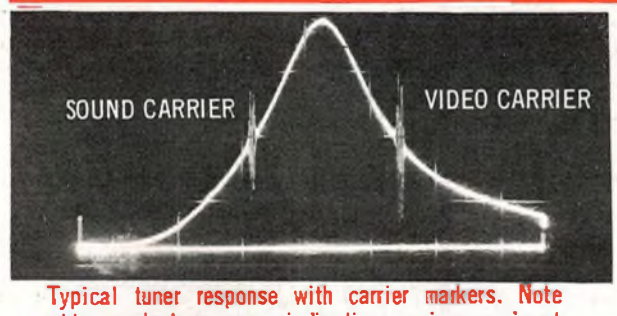


Typical link response curve after link adjustment.

The link adjustment is a relatively simple procedure. The IF sweep output of either the SM152 or SM 158 Sweep/Marker generator is applied to the mixer test point. The 39G26 Link Detector probe is connected to the output of the first IF stage. Proper AGC bias potentials are applied and the receiver is ready for link alignment.

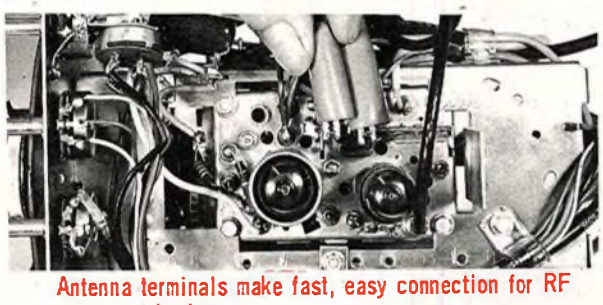
The mixer coil and the first IF input coil are adjusted to obtain a curve such as that shown here. The adjacent sound trap and its rejection control are adjusted for minimum response at 47.25 MHz. This is normally all the adjustments connected with the link alignment. A few receivers will also have a 39.75 MHz trap in the first IF input and this then would be adjusted as part of the procedure. The high level of RF output available on the Sencore sweep/marker generators and the 39G26 Link Detector Probe will provide more than adequate response to make the adjustment easy. The sharp markers which are selected by the simple push of a button will also speed your receiver alignment.

10 HOW IMPORTANT IS TUNER ALIGNMENT?



Typical tuner response with carrier markers. Note wide, peaked response indicating maximum gain at center channel.

The correct alignment and operation of the tuner should obviously be very important. Any information presented on the screen of the receiver must first pass through the tuner. UHF signals must pass through the tuner. UHF signals must pass through both tuners in order to supply the IF's and subsequently the picture tube with intelligent information. Any lack of gain or bandpass will be seen as a defect in the picture. The bandpass of the tuner must be wide to assure selection and amplification of all information transmitted for the station desired. The bandpass, however, cannot be excessively wide or problems of adjacent channel interference will develop. The gain of the tuner must be sufficient to supply a signal to the IF amplifiers. The IF amplifiers are

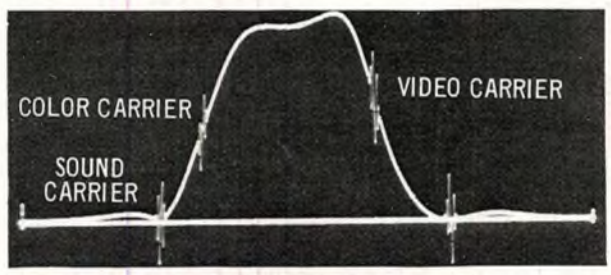


Antenna terminals make fast, easy connection for RF response checks.

responsible for the majority of the gain selectivity of the receiver. The tuner serves as a pre-selector to amplify the desired channel considerably more than adjacent channels. A set rule for checking the tuner may not be established, but many manufacturers recommend checking the RF-IF overall response after IF alignment has been completed. This means the signal is injected into the antenna terminals and the video detector test point is used as the signal take-off. The RF AGC bias must also be set to provide proper RF amplifier action. Normally, the 300 ohm output of the matching pad will be connected to the antenna terminals for the RF-IF overall response check. In most cases, a quick check of the response on one low VHF channel (2-6) and one High VHF channel (7-13) will be sufficient to determine proper tuner operation. This should be done on an unused channel in each band to prevent the video signal from a local station from distorting the response curve. The RF video signal present will make the results of the check difficult or impossible to interpret. Some sweep/marker generators available provide output for RF checks on only channels 4 and 10. This does satisfy the requirements of checking both high and low VHF bands but does not allow for the possibility of a local station operating on channel 4 and 10 or both in some cases.

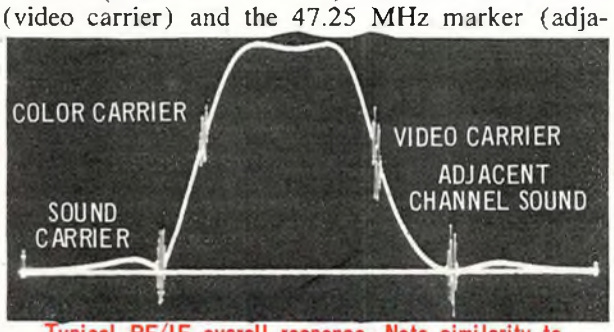
OVERALL RF-IF CHECK

Next, what are you to look for when you have the RF-IF overall response curve? The RF-IF overall response should have the same shape and symmetry as the IF overall response displayed. Any tilt or difference in shape of the RF-IF curve when compared to the IF curve indicates a fault in the tuner. If the tilt is the same on all channel checks, a minor touchup of the mixer or 3rd IF transformer will sometimes correct the situation. If the tilt or error varies from one channel to another, the problem definitely exists in the tuner. This points to an alignment job



Minor tilt in RF/IF response may be corrected by slight IF touchup.

on the tuner. The position of the markers should be essentially the same as the IF response curve. Using the SM158 Speed Aligner, the marker position can be checked by depressing the pushbuttons for the 41.25 MHz marker (sound carrier) 42.17 MHz marker (chroma subcarrier) 45.75 MHz marker (video carrier) and the 47.25 MHz marker (adjacent channel sound carrier). Adjust the receiver fine tuning until the 41.25 and 47.25 MHz markers appear at the baseline on either side of the response curve. The carrier markers should be near 50% amplitude and opposite each other on the curve. When the SM152 is employed, the RF check is made by selecting one of the RF carrier markers available. Each VHF and each UHF channel can be checked for response amplitude and shape with the SM152. Making this check gives you added assurance that the receiver will provide top performance when it is returned to the customer.



Typical RF/IF overall response. Note similarity to IF overall.

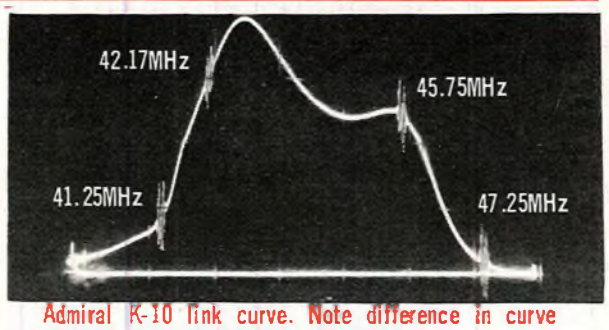
If it is suspected that one or two used channels have poor response, it is recommended that these are checked to determine whether a problem is actually present.

The SM152 with its 82 channel coverage is the ideal generator for this troubleshooting procedure. The calibrated RF output allows you to make meaningful checks of the RF gain, on each and every channel!

Every major set manufacturer supplies tuner alignment information and response curves should RF trouble develop. The test points vary somewhat depending on the tuner used and it is suggested that the manufacturer's instructions be followed. The set manufacturers supply you the information and the Sencore SM152 is the ONLY sweep/marker generator to provide all channel RF sweep to make this alignment. Be sure to consider this point before you make a large investment in sweep equipment.

11 IDIO SYNC RA SEES

As technicians we may be unable to correctly spell words such as this but working closely with the set manufacturers does allow us to keep up-to-date on all types of receivers. Regardless of the manufacturer, all sets must supply the CRT with the same information if the total picture is to be displayed. Therefore, every set will have essentially the same IF response curve. The RF-IF response will also be similar for all receivers. Each set will have some circuit difference but the overall result of the circuitry will be the same.

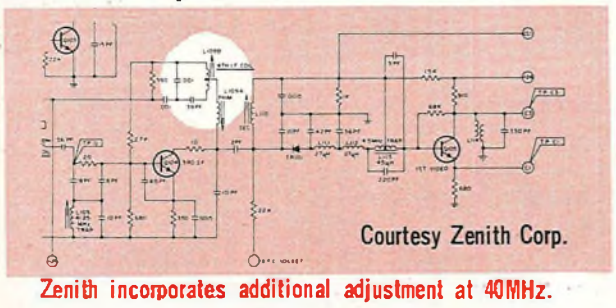


Admiral K-10 link curve. Note difference in curve shape compared to tube-type receivers.

There are distinct differences we have noted in some receivers and feel these should be brought to your attention. The Admiral K-10 hybrid color set for example, has two 41.25 MHz traps in the IF's. One is located in the 3rd IF in a conventional configuration. The other is located in the first IF input and is a part of the link alignment procedure. Therefore, it is important that both 41.25 MHz traps be set accurately for best performance. The K-10 solid state IF system has a somewhat different link response when compared to other receivers.

As shown, the 45.75 MHz video carrier marker is considerably lower on the curve than that shown in the curve in the Link Alignment section of this article. The tuner-IF link has a much higher gain or response at the color carrier frequency than most sets. The lack of gain at the video frequency is compensated for by having the 3rd IF tuned for a higher response at 45 MHz.

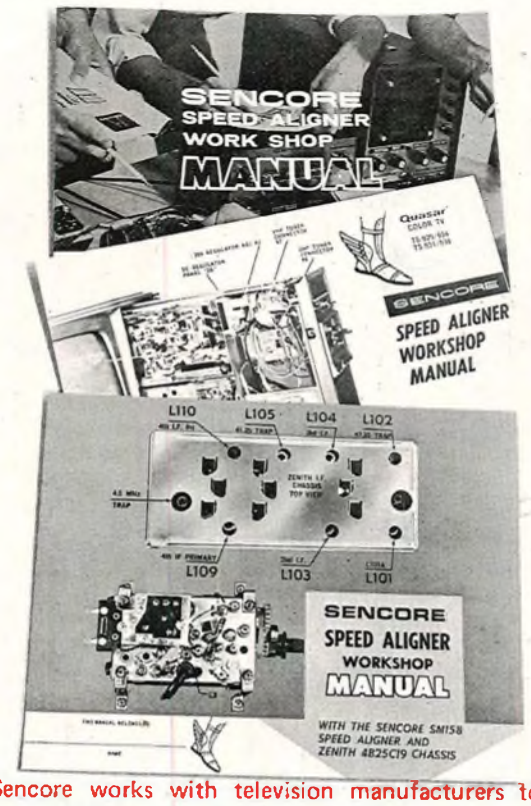
The Zenith 4B25C19 color chassis also has some minor differences when compared to most receivers. Zenith engineers have added a 40.0 MHz trap in the 3rd IF stage to add in rejection and the shaping of the overall response curve. Zenith also begins the



Zenith incorporates additional adjustment at 40MHz.

alignment with the 3rd IF stage and then goes to IF overall response. Zenith recommends that the sweep generator used to align this chassis has the capability of delivering approximately 350 millivolts IF sweep signal to the input of the 3rd IF. This signal requirement is greater than most sweep generators can provide. In tests made in the Sencore Field Engineering lab on over 50 Zenith chassis, the alignment was successfully accomplished with the normal output of the generator but the response amplitude was understandably lower than specified. Sencore worked with Zenith and has available a simple modification kit for the SM158 Speed Aligner which will provide approximately 400 millivolts of signal for Zenith 3rd IF alignment. Anyone owning or intending to purchase the Sencore SM158 may order the 39G31 RF Modification Kit directly from the Sencore Service Department for only $10.00. This simple change will permit you to follow all Zenith alignment specifications.

The Motorola Quasar II color receiver also uses an alignment procedure which adjusts the 3rd IF stage as the first step of the alignment procedure. The Quasar II incorporates a 39.75 MHz trap in the first IF stage. This information was brought out as we worked with Motorola Field Service department to develop the alignment procedure for the Quasar II receiver. The full alignment procedure is now available for the Quasar II in workshop manual form. This workshop manual was prepared and published by Sencore in conjunction with Motorola Inc.



Sencore works with television manufacturers to prepare training manuals on sweep alignment.

WHY SENCORE SWEEP AND MARKER GENERATORS?

We have tried to bring some of the key alignment points to your attention in this issue of Sencore News. We have also pointed to some pitfalls and problems which you may encounter due to differences in color receivers. The Sencore sweep and marker generators have been designed by service oriented engineers for service technicians. We feel that this approach to the development and manufacture of quality test equipment will provide the equipment you need to serve your customers better. Also by working closely with the set manufacturers, you can be sure the equipment has been engineered in such a manner that it will satisfy their equipment specifications. The SM158 Speed Aligner has been developed for the man who wants the ultimate in speed and simplicity. The preset outputs, simple controls and fast hook-up make it a valuable addition to any service organization. The true post-injection marker system and individual crystal marker oscillators means distortion-free response curves with bright, sharp markers. The horizontal marker feature makes accurate marker positioning a breeze. The SM158 provides all basic sweep frequencies and markers for the complete IF and chroma alignment of any set. The 4 RF channel sweep outputs permits interference free checking of RF-IF overall response. The SM158 is truly a feature-packed sweep/marker generator and it is priced as much as $120 less than comparable units!

The SM152 Deluxe Sweep/Marker generator is the most complete sweep/marker generator available today. The full selection of RF sweep frequencies from 10 MHz to 900 MHz gives complete RF coverage of television and FM frequencies. Calibrated RF output and Automatic Level Control means pinpoint accuracy in adjusting RF levels for alignment, testing and troubleshooting. The spot-align band serves as an RF generator without sweep for peaking transformers and setting traps in preparation for full sweep alignment. Chroma IF and Chroma Video signals are both available for any color alignment or troubleshooting need. Calibrated sweep width gives you complete control over the signal applied to the receiver. You are completely in command with marker size control, full marker amplitude control, sweep and pattern polarity reversal controls. The SM152 provides all necessary crystal markers for Chroma alignment and IF alignment plus markers for RF carriers on channels 4, 5, 10 and 13. The 10.7 FM marker is included as well as the 10.6 and 10.8 FM sideband markers. An external marker input has also been provided to make the SM152 the most complete generator you can buy. Consider all these features and pick one up the next time you are at your distributor and take advantage of our special offer shown below.

Sencore Alignment Special

FREE OFFER COUPON

(OFFER VOID WITHOUT COUPON)

Fill out this coupon and present to your SENCORE Distributor when you purchase your SM152 Deluxe Sweep/Marker Generator or SM158 Speed Aligner. You will receive a BE156 free with the SM158 and the FE16 free with the SM152.

Name_____

Address_____

City, State, Zip_____

Unit Purchased_____

Unit Free_____

SHOW THIS TO YOUR DISTRIBUTOR

Mr. Distributor: Sencore will replace to you on a no-charge basis the FE16 or BE156 used from your stock for this special program or an equivalent in other Sencore merchandise. Be sure to send this coupon with a copy of your sales invoice for the instruments listed to: Sencore, Inc., Promotion Dept., 3200 Sencore Drive, Sioux Falls, South Dakota 57107.

(Offer expires March 1, 1972)

FREE FE16

with the purchase of SM152 DELUXE SWEEP/MARKER GENERATOR

(until March 1, 1972)

FE16 $84.50

High Accuracy Field Effect Multimeter.

(SEE CENTER SECTION FOR FEATURES)

FREE BE156

with the purchase of SM158 SPEED ALIGNER

(until March 1, 1972)

A must for television alignment and servicing.

- Provides bias needed for any set; tube or solid state.
- 0-25 volts either positive or negative from each of three supplies.
- 0-75 volts negative to cover RCA.
- Separate, independent calibrated supplies.
- Extremely well filtered to prevent distortion of alignment curve.

BE156 $24.95

7 in 1 Bias Supply