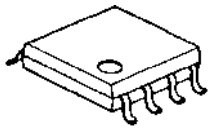
VHF Output RF Modulator IC

■ GENERAL DESCRIPTION

The **NJM2519A** is a RF modulator IC, especially designed for VHF band RF modulator and consists of video clamp circuit, white clip circuit ,video AM modulator and audio FM modulator.

■ PACKAGE OUTLINE

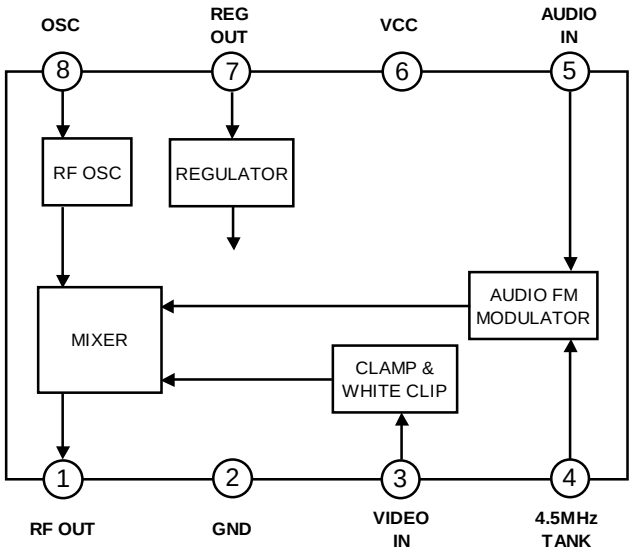


NJM2519AM

■ FEATURES

- Operating Voltage 5V
- VHF Oscillator on chip
- Bipolar Technology
- Package Outline DMP8

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V+	7	V
Power Dissipation	P d	300	mW
Operating Temperature	T o p r	- 20 to +75	°C
Storage Temperature	T s t g	- 40 to +125	°C

■ RECOMMENDED OPERATING CONDITION (Ta=25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V+		4.5	5	5.5	V

■ **CAUTIONS**

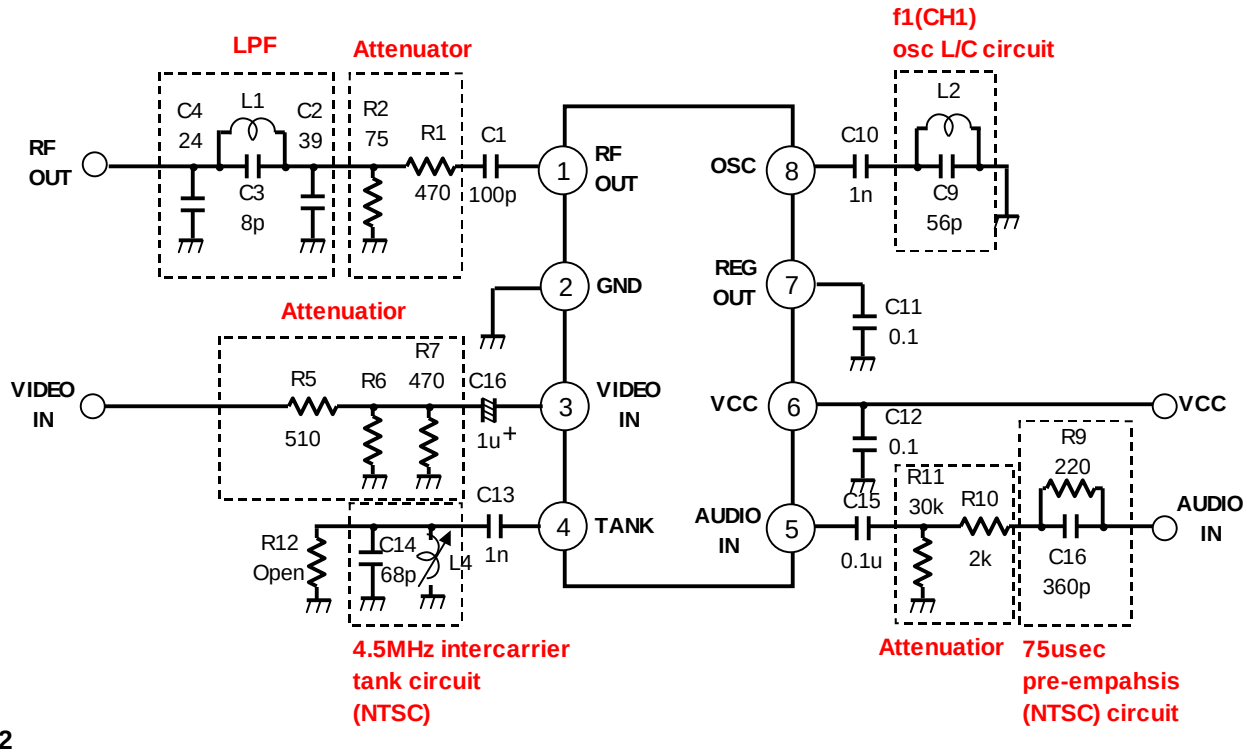
The contents on this document are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this document are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

APPLICATION CIRCUIT

Some of VHF output RF modulator circuits are shown below. All of them are suitable for USA market. For other markets, the value of external components should be reconsidered.

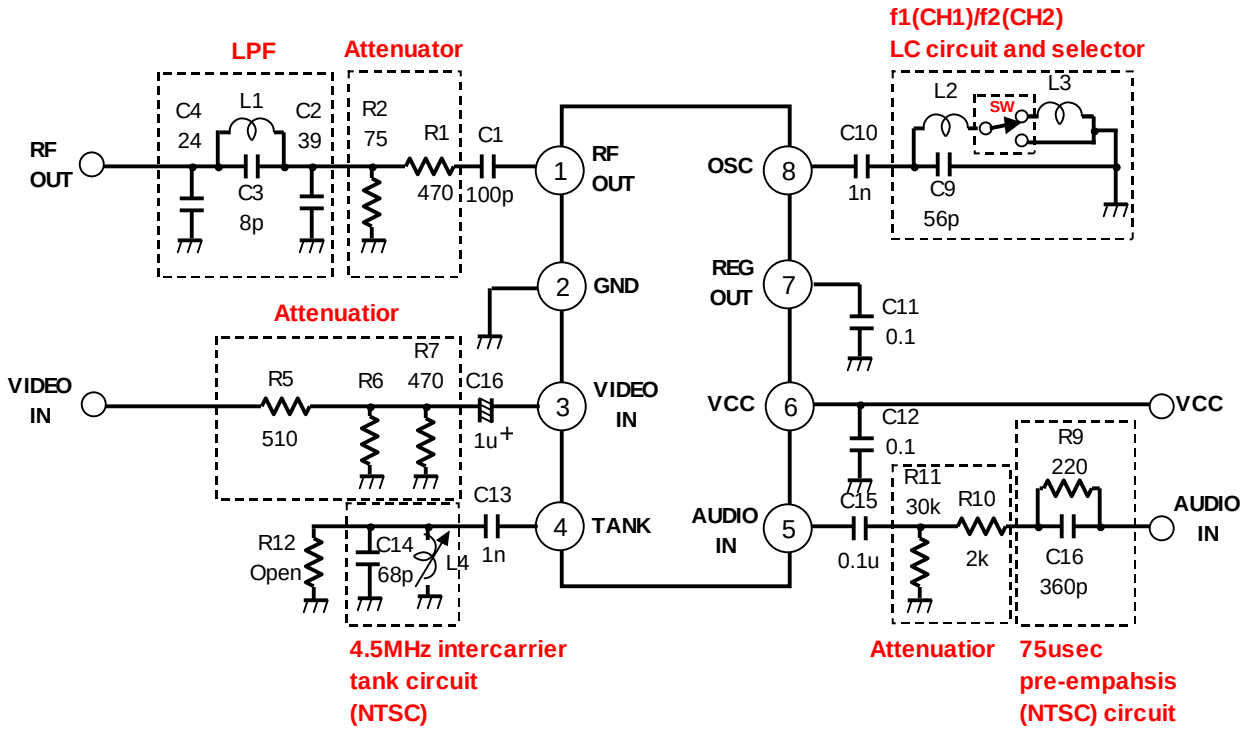
Circuit 1

- 1 output channel type
- External OSC circuit with LC circuit



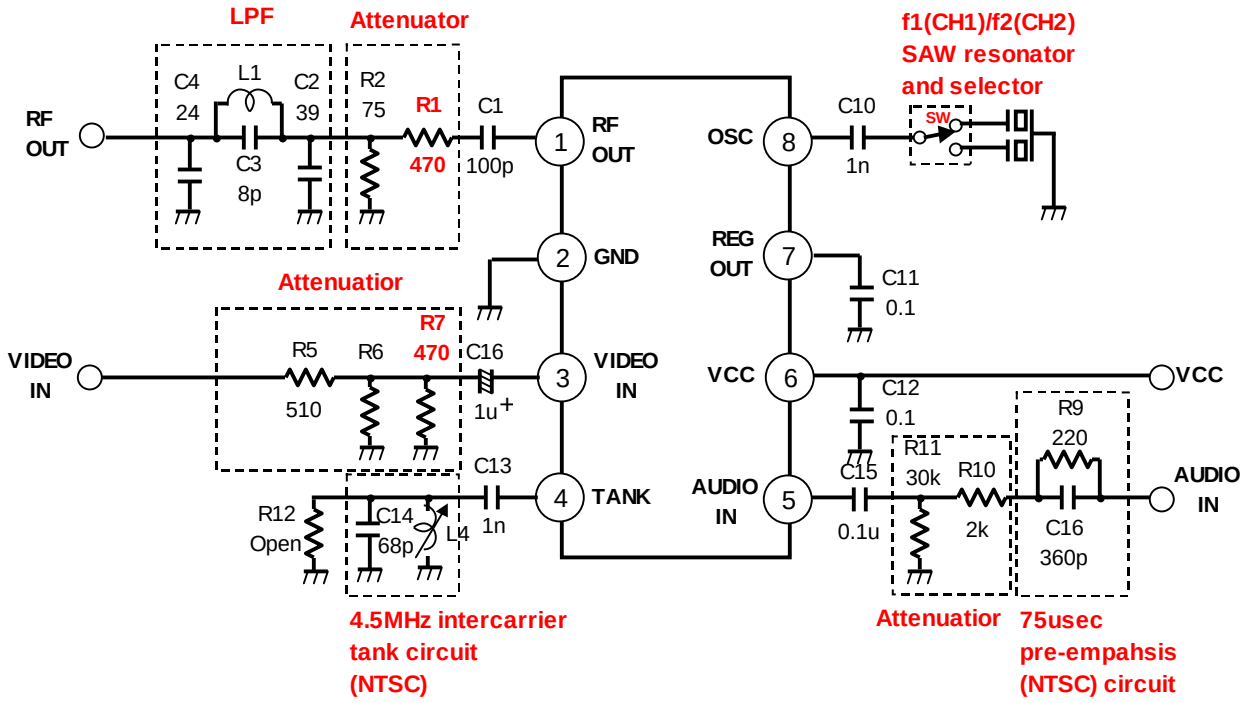
Circuit2

- 2-output channel selectable type
- External OSC circuit with LC circuit



Circuit 3

- 2-output channel selectable type
- External OSC circuit with SAW resonator



Circuit 4

- 2-output channel selectable type
- External OSC circuit with SAW resonator
- With built-in Antenna switch

Performance Data (Reference)

+B=5V, video input signal=1Vpp, audio input signal=1kHz/1.23Vrms, CH1/2=USA3/4, using NJH3031U001(Module)

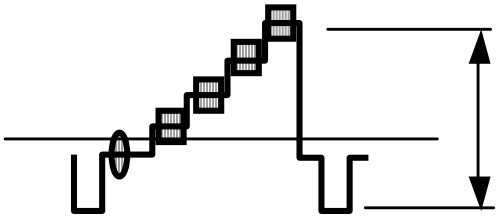
	USA 3CH(CH1)			USA 4CH(CH2)			
	No.1	No.2	No.3	No.1	No.2	No.3	Unit
Video Carrier Freq.	61.245	61.251	61.270	67.229	67.236	67.254	MHz
Audio Carrier Freq.	4.499	4.500	4.500	4..499	4.500	4.500	MHz
Video Carrier Signal	66.2	66.5	66.6	66.4	66.5	66.8	dBuV
P/S Ratio	16.3	16.3	16.6	16.2	16.3	16.5	dB
Video Modulation: AM	75.3	76.2	76.4	74.8	75.7	75.4	%
Differential Gain	2.9	3.2	2.7	3.0	3.2	3.0	%
Differential Phase	1.7	1.1	1.3	1.8	1.3	1.2	deg
Audio Modulation	73.2	77.4	74.0	73.2	77.4	74.0	%
Audio S/N	60.5	61.6	60.7	60.5	62.0	60.7	dB
Audio Distortion	0.1	0.1	0.1	0.1	0.1	0.1	%

For your reference, circuit diagram of NJH3031U001 is shown in next page.

INPUT AND OUTPUT SIGNAL

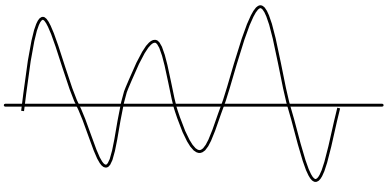
Video input signal

CVBS (Composite Video Base-band Signal)
Color signal includes chrominance subcarrier of 3.58MHz(NTSC)or 4.43(PAL) MHz



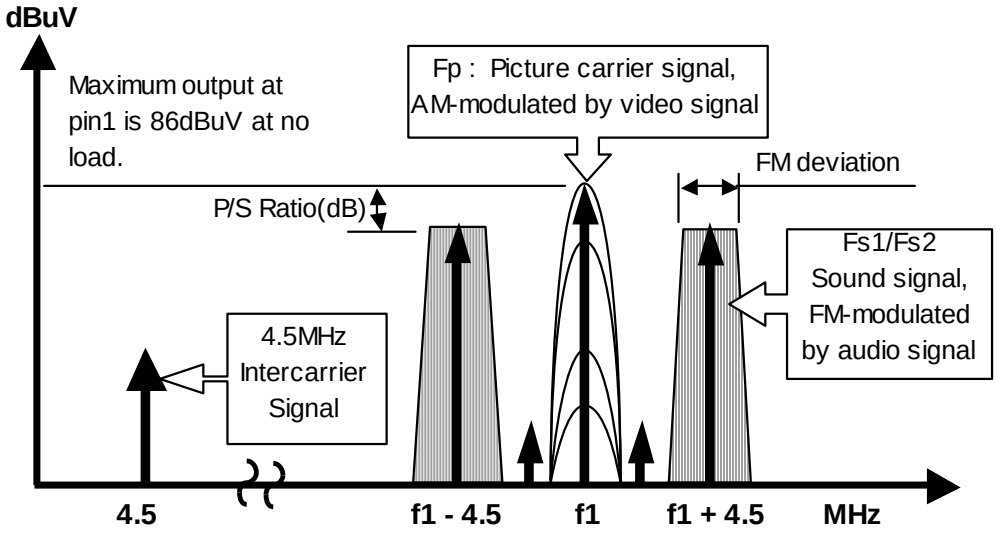
Audio input signal

- Monaural audio signal
- Audio-frequency signal
- Stereo / Multiplexed sound signal (including pilot signal)
  Because of wide frequency range of this signal, 75 / 50usec pre-emphasis circuit is not required. C16 should be removed.



RF output

This shows the frequency spectrum of main signals at pin1. When the external SW selects CH1 (CH2), the frequency of picture carrier signal is f1 (f2).

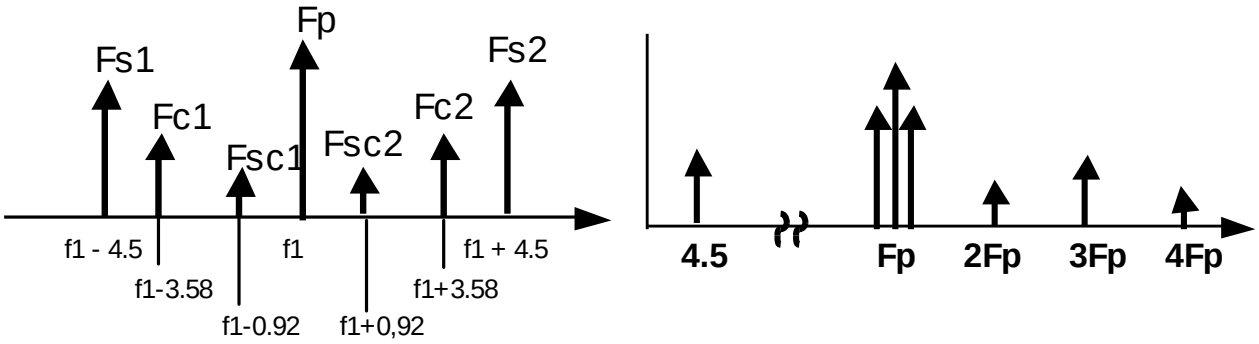


The actual RF output signals consist of desired signals and undesired signals.

Desired signal

- Fp : Picture carrier signal, AM-modulated by video signal with the center frequency of f1 or f2
- Fs1, Fs2: Sound signal, FM-modulated by audio signal with center frequency of f1± 4.5MHz

Undesired signal



For the case of NTSC-M, the frequencies of intercarrier and chrominance subcarrier signals are 4.5 and 3.58MHz, respectively.
The undesired signals are;

- 4.5MHz intercarrier signal
- Spurious signals (out of band)
  f1±2x4.5, f1±3x4.5….
  2f1, 3f1…..
  2x(f1±4.5), 3x(f1±4.5)……
- Fsc1,Fsc2: Harmonics of 3.58MHz and 4.5MHz (inside-band spurious)
  f1±(4.5-3.58)=f1±0.92MHz

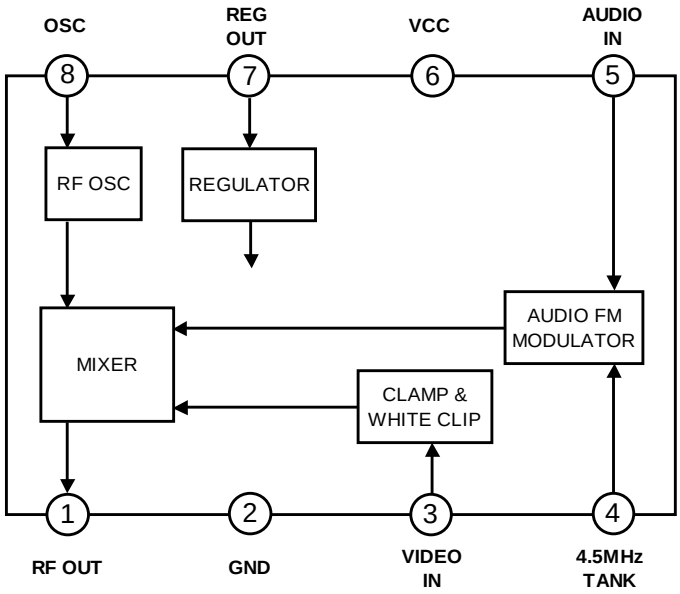
For the case of PAL-B, the frequencies of inter carrier and chrominance subcarrier signal are 5.5MHz and 4.43MHz, respectively.

The undesired signals are;

- 5.5MHz intercarrier signal
- Spurious signals (out of band)
  f1±2x5.5, f1±3x5.5….
  2f1, 3f1…..
  2x(f1±5.5), 3x(f1±5.5)……
- Fsc1,Fsc2: Harmonics of 4.43MHz and 5.5MHz (inside-band spurious)
  f1±1.07

EXPLANATION OF OPERATION

Block Diagram



VIDEO IN

CVBS (Composite Video Base-band Signal) is applied to pin1 through the attenuator and a capacitor. The recommended input signal level at pin1 is 0.5Vpp. DC level of CVBS should be lower than the DC value of IC at pin1. Otherwise, the polarity of capacitor should be paid attention to. The CVBS source is usually with the output impedance of 75ohm. The video input of the application circuit is designed with the input impedance of 1k ohm because of much higher than the output impedance of the CVBS source.

AUDIO IN

The audio frequency signal is applied to pin5 through the pre-emphasis circuit, attenuator, and capacitor. The time constant of C16xR9 is 75usec for NTSC, and 50usec for PAL. For the case of stereo signal or MPX signal, pre-emphasis circuit is not necessary. C16 should be removed.

TANK

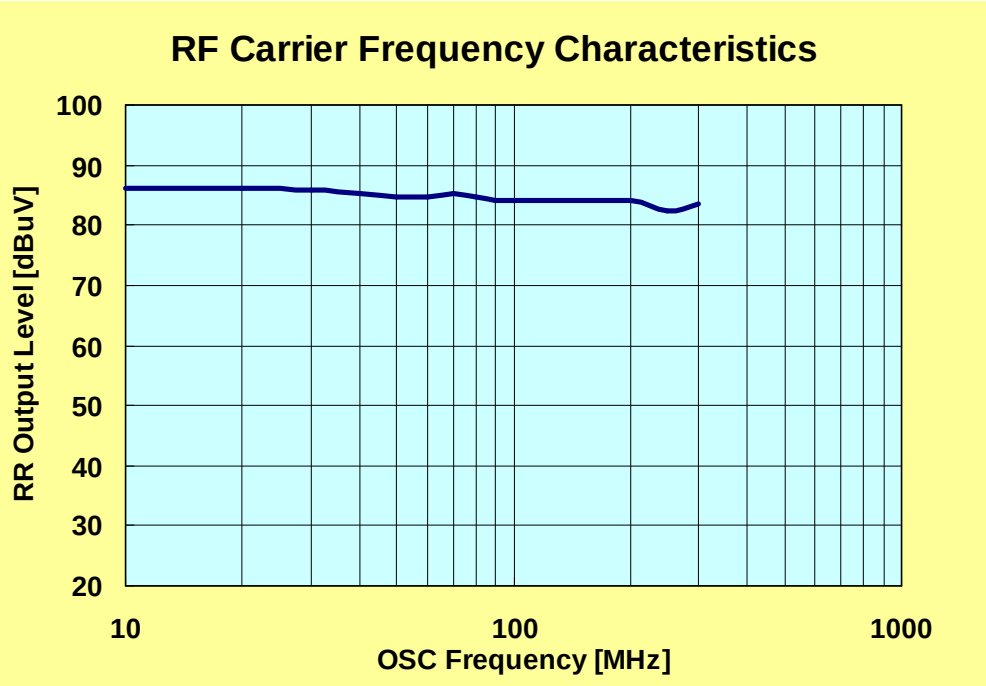
The tank circuit is connected to pin4 and determines the frequency of sound intercarrier. Please note that the quartz resonator is not suitable for this tank circuit. LC resonance circuit is recommended. The resonance frequency is 4.5MHz for NTSC, and 5.5MHz for PAL-B. For the case that LC resonance circuit has bad frequency stability or large frequency drift, TV set may have a big buzz.

OSC

The resonance circuit is connected to pin8 and determines the frequency of picture carrier. NJM2519A usually uses SAW resonator because the thermal stability of frequency is high. The quartz resonator is also available with the high thermal stability of frequency. Although LC circuit can be used as the resonance circuit, the technical consideration of the frequency stability may be more necessary than the use of SAW resonator and quartz resonator. The plot shown at right is the characteristics of RF output level versus frequency.

RF OUT

RF output signal level at pin1 is around 86dBuV without a load. Usually this RF output signal goes through the external circuit of attenuator and band pass filter. According to the measurement data, the available frequency is from 45MHz to 200MHz. These values are as your reference. These are given for information and not intended for the guarantee.

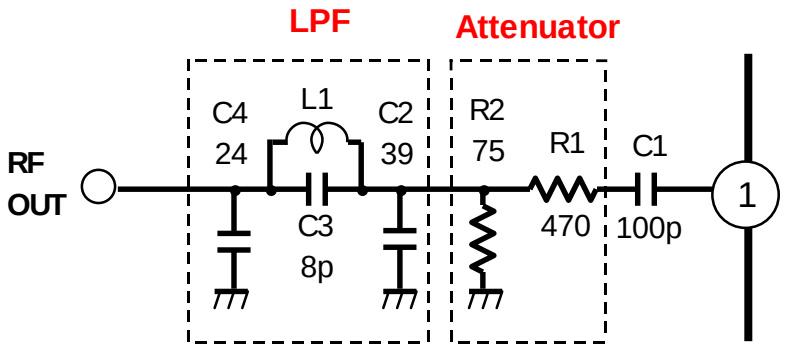

RF Carrier Frequency Characteristics
RR Output Level [dBuV]
100
90
80
70
60
50
40
30
20
10
100
1000
OSC Frequency [MHz]

EXPLANATION OF TERMINAL

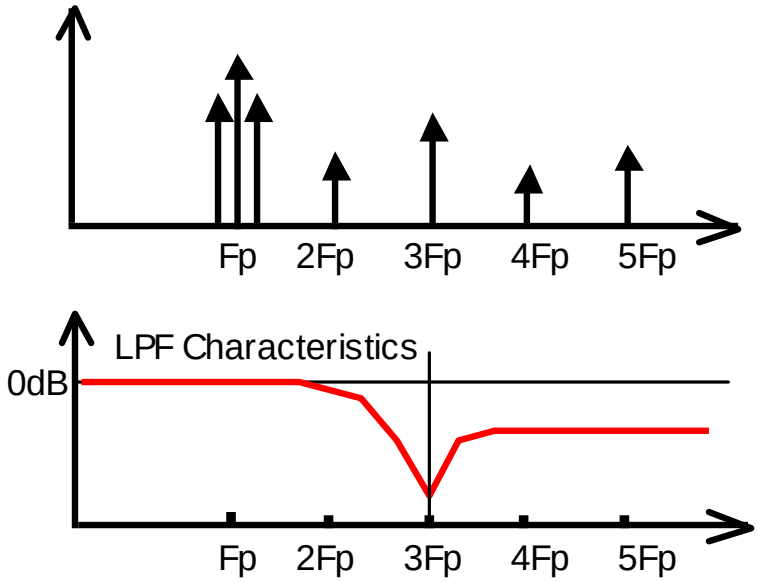
PIN1

RF output signal level at pin1 is around 86dBuV without a load. Usually this RF output signal goes through the external circuit of attenuator and band pass filter. According to the measurement data, the available frequency is from 45MHz to 200MHz. These values are as your reference. These are given for information and not intended for the guarantee.

- This is RF OUT terminal
- An attenuator and LPF are connected



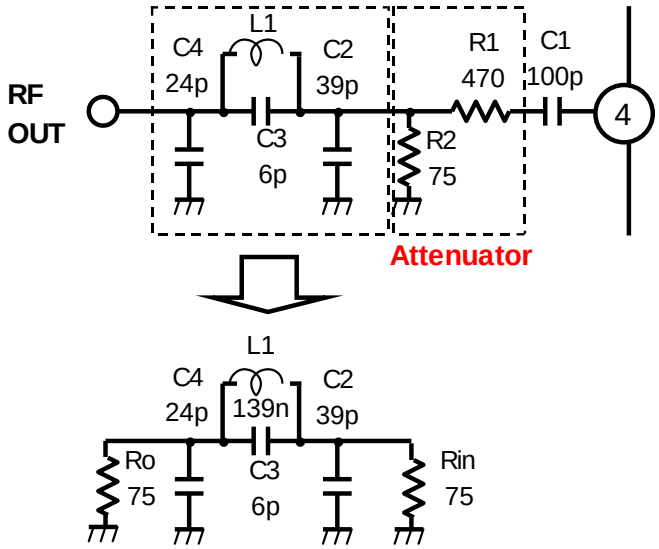
- LPF Characteristics
  The 3rd harmonics of the picture carrier signal is large, therefore the trap frequency of LPF is recommended at this 3rd harmonics.



How to design LPF with trap (reference)

- **Circuit**

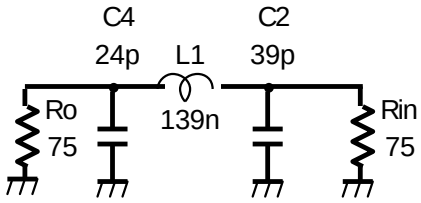
The following is an example of LPF circuit, which is used in our module, NJH3041U001 using NJM2536A.
The role is to reduce spurious signal, especially 3rd harmonics.
This circuit consists of two functions. One is a LPF with cut off frequency (fLPF) of 100MHz or 180MHz. The other is a trap circuit with trap frequency (fTRAP) of 180MHz. Because video carrier frequencies are 61.25MHz(f1) and 67.25MHz(f2), LPF is designed for 100MHz or 180MHz.



- LPF section

This is a π-type LPF. Fundamental specification is as follows.

I. Circuit



II. Coil

Because the role of this LPF is to reduce spurious signal, high Q is needed. Therefore, air coils are better.

III. Input /Output impedance (R io)

Rio=Rin=Ro=75ohm

IV. Cut off frequency (fLPF)

Because RF output signal frequencies are 61.25MHz(f1) and 67.25MHz(f2), cut off frequency is set around 100MHz otherwise the frequency of 3rd harmonics that is around 180MHz.

V. Calculation

Fundamental equations of LPF are:

$L1=Rio / (\pi fLPF)$, $C=1 / (Rio\ \pi fLPF)$ where C=C4=C2

Substituting for fLPF, and solving for L1 and C:

When fLPF=100MHz

L1=239nH, C=42pF

When fLPF=180MHz

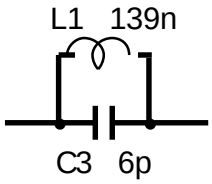
L1=133nH, C=24pF

These are initial value. Considering variation of value, experiment by using actual board, final values are decided.

- Trap circuit

  This is a trap for 3rd harmonics.

  I. Circuit



ftrap=180MHz

  II. Trap frequency (fTRAP)

  fTRAP=180MHz

  III. Coil

  For obtaining high Q of trap circuit, a capacitance of a parallel resonance circuit should be larger and inductance should be smaller. Considering the calculation result of LPF shown in previous page, we choose L=133nH as an initial value.

  IV. Calculation

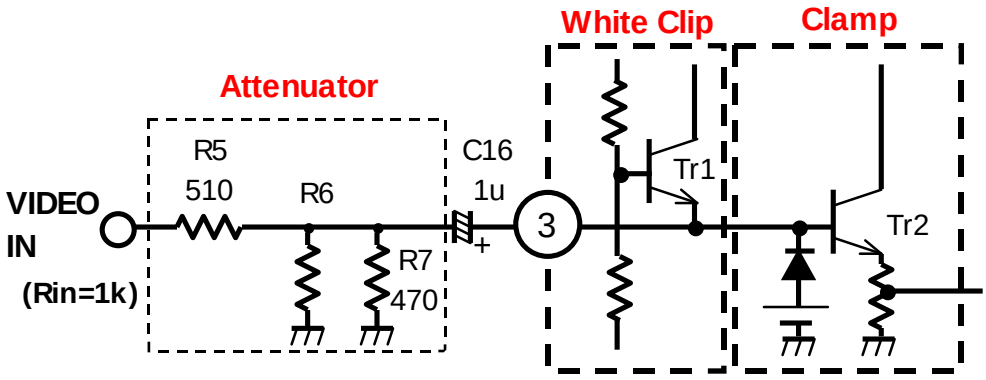
  Fundamental equation is

  $fTRAP2=(2 \pi (L1\ C3)^{1/2}) ^{-1}$

  Substituting for L1 and solving for C3:

  C3=6pF

PIN3

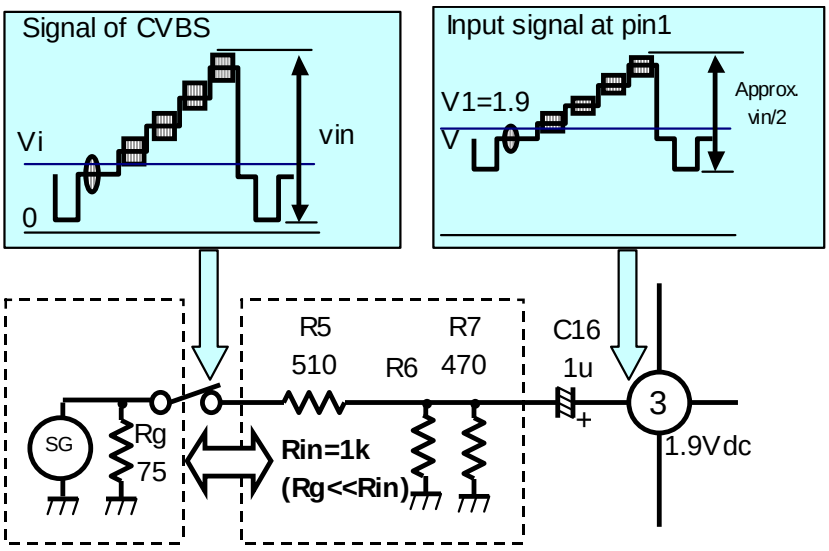


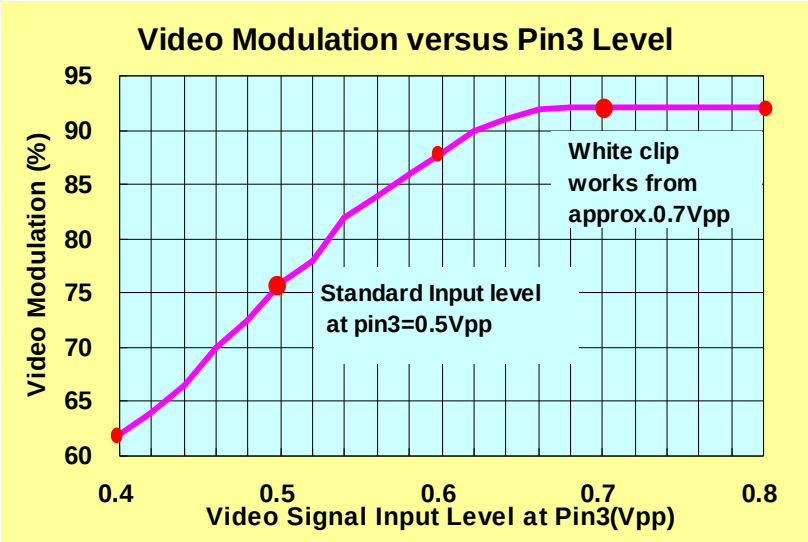
CVBS (Composite Video Base-band Signal) source feeds a composite video signal to VIDEO IN terminal. This signal is supplied to pin3 through an attenuator and a capacitor. The attenuator adjusts input signal level supplied to pin3. The recommended signal level at pin3 is 0.5Vpp. Pin3 is the input terminal of a white clip circuit and also a clamp circuit. These circuits are necessary for the internal modulation circuit to work well. The white clip circuit is a limiter to suppress the level of input signal that exceeds around 0.65V. The clamp circuit clamps the lowest level (that is the bottom of sync tip) of incoming video signal to pre-determined reference voltage level.

Attenuator and divider

CVBS (Composite Video Base-band Signal) source is in general designed to interface with 75.ohms output impedance. Therefore, input impedance of the attenuator circuit should be much higher than 75ohm, and usually designed more than ten times this output impedance of 75ohms. The recommended value is around 1kohm. Too big value is not recommended because it may influence to the performance of clamping. By adjusting the value of attenuator, input signal level to pin1 is controlled. In this application note, the output signal (peak to peak level) of this attenuator circuit is designed about half of input. The reason that output level is half against input is based on the following assumption.

- Typical output signal level of CVBS source is 1Vpp.
- NJM2536A is designed to have 75% video modulation for 0.5Vpp input at pin3.
  The characteristics of Video modulation depth versus input level at pin3 is shown on next page..
- 75% modulation is widely applied to the standard specification of RF modulator.



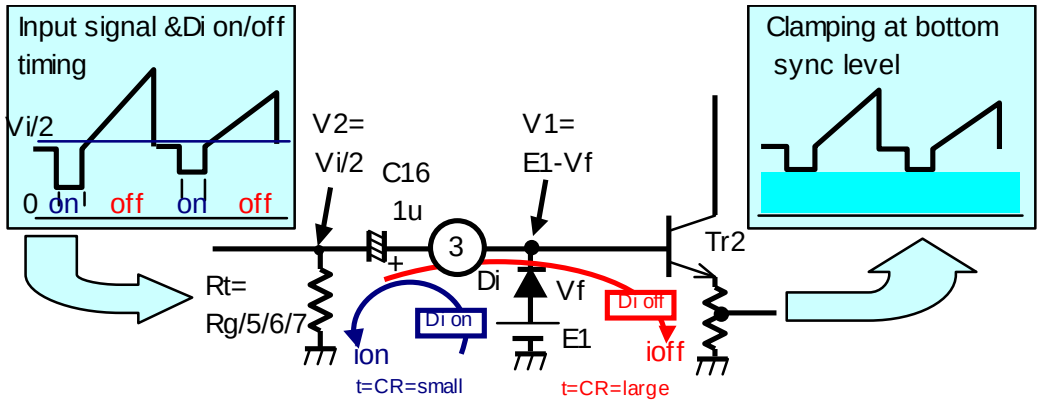


White clip circuit

A limiter is required to prevent over-modulation of FM modulated video signal. The over-modulation will cause spurious emissions by the modulated carrier, and distortion of the recovered modulation signal.

For a signal input level of up to 0.65V at pin3, video modulation is proportional to the signal input level at pin1. For a signal input level of over 0.65V at pin3, a white clip circuit is turned on, and is provided to ensure constant maximum modulation depth. According to the datasheet of NJM2519A, this depth is specified from 85 to 98% (typical 95%).

Clamp circuit



The clamp circuit clamps the lowest of incoming video signal level (that is the bottom of sync tip) to pre-determined reference. The above is a fundamental diode clamp circuit to show how to clamp.

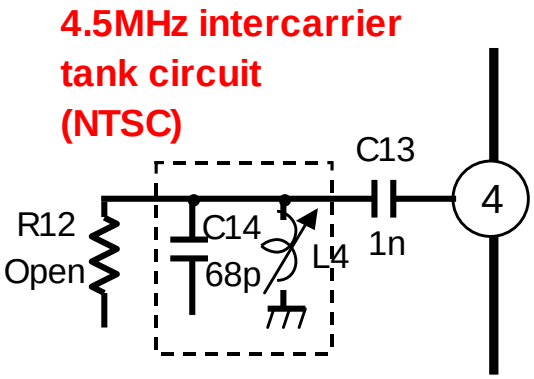
Input signal consists of sync signal and video signal. During the input is a sync signal, V2 is lower than Vi/2 and Di keeps on. The output at the emitter of Tr2 has a certain DC level. This level is called “pre-determined reference”. During the input is a video signal, V2 is higher than Vi/2, and Di keeps off. The output voltage at the emitter terminal of Tr2 is proportional to the input video signal level. The conditions for this clamp circuit to work well are:

- V2<V1
- Rt is small, that is, time constant is small. (t=C16xRt)

In general, C16 is a polarized capacitor. The polarity of capacitor C16 is determined by the comparison of DC voltage at pin1 and the DC output of CVBS. For smooth clamping, the DC level of CVBS (V2) is recommended to be lower than the DC voltage (V2) at pin3. In this case, the positive terminal of C16 is located at the side of pin3. However, there may be the case that V2 is higher than V1. In this case, the input voltage to the positive terminal of C16 becomes less than its negative terminal. In such a situation, only non-polarized capacitor should be used to perform clamping operation well.

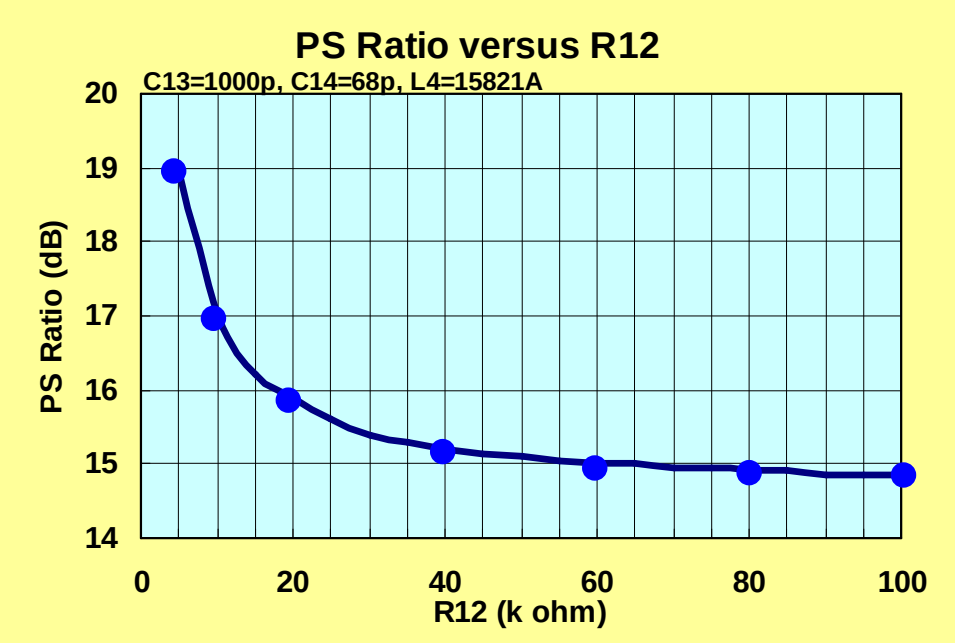
PIN4

This is the terminal for the connecting to TANK circuit.



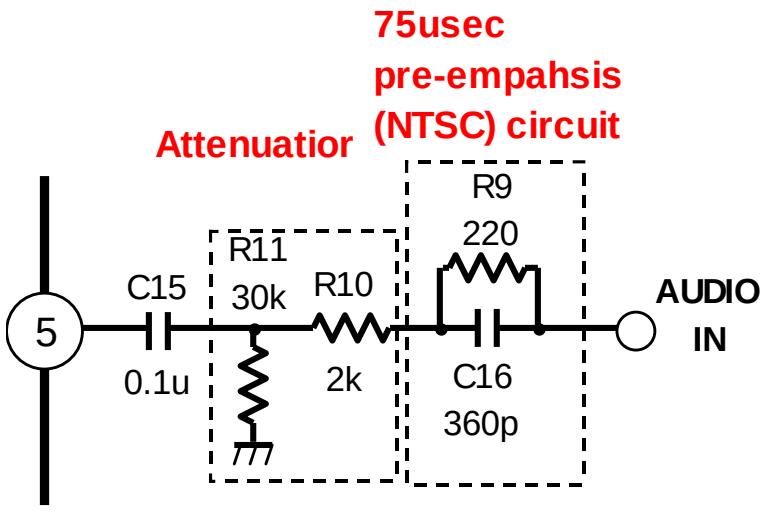
The external tank circuit consists of a variable transformer and capacitor. The value of L4 and C14 determines the the intercarrier frequency, where intercarrier means the difference of the frequency between the picture carrier and sound carrier.

PS ratio is adjusted by R12, where PS ratio means the difference of the level between picture carrier and sound carrier.

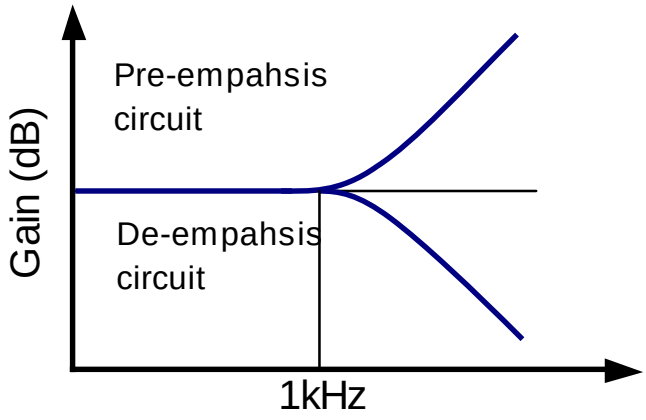


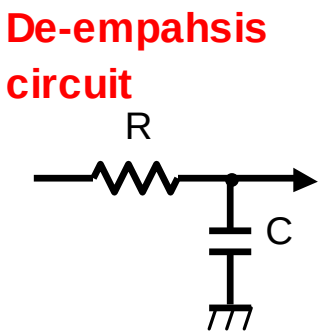
PIN5

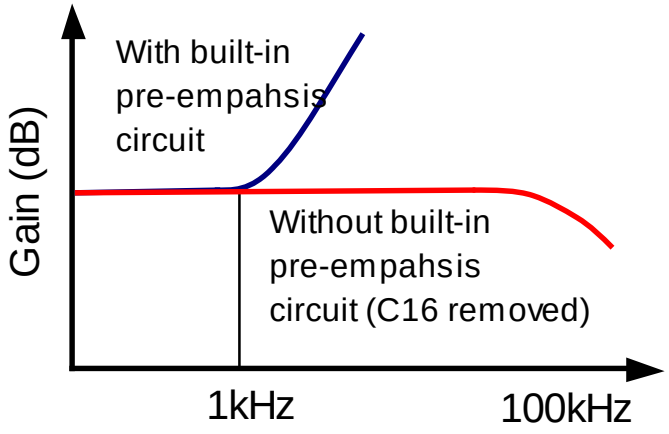
This is the AUDIO INPUT terminal.
An attenuator and pre-emphasis are connected.



There are two kinds of emphasis circuit, pre-emphasis circuit and de-emphasis circuit. The RF modulator uses the pre-emphasis circuit. In the case that audio input signal is the multiplexed sound signal, C16 is removed because of its wide frequency band.







SAW Resonator

SAW Resonator utilized Surface acoustic Wave, and is able to be applied to high frequency circuit where conventional crystal, ceramic resonators are not available, as SAW resonator oscillates stably with its fundamental mode over frequency range from around 50MHz to a few 100MHz.Therefore, oscillation circuit is simple and low cost.
We have recommended Kyocera's SAW resonator, KAR-61CT (61.25MHz/67.25MHz), as an external component of oscillator circuit for NJM2519A. However, Kyocera has stopped shipping this type because of its old production process. For customers' requirement, we evaluated several kinds of SAW resonators. The test items are frequency stability, impedance matching to our evaluation circuit, oscillation power, RF output level and spurious level under high, low and room temperatures. The test is carried out using our standard RF modulator circuit. According to our evaluation result, the following products can be regarded as a suitable SAW resonator for our RF modulator circuit with built-in NJM2519A.

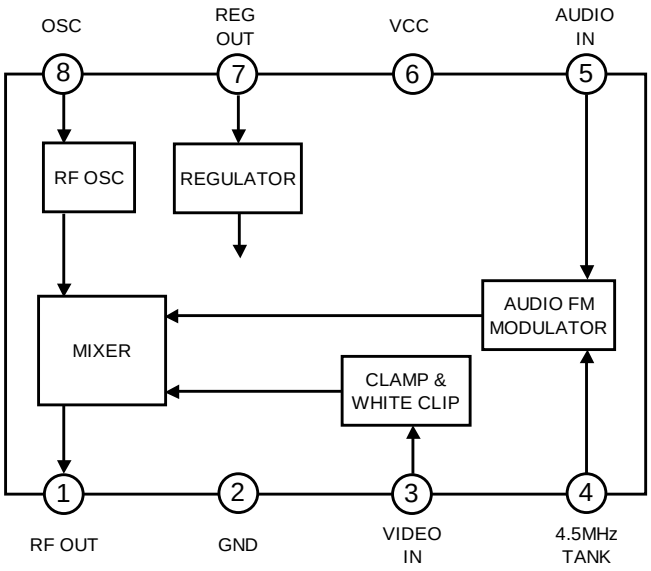
Supplier	Part Number	Note
Abracon Corporation	ASR61.24_67.24A01-SD06.	USA 3ch / 4ch
Hope Microelectronics Ltd.	HR3/4N SF712	USA 3ch / 4ch
TGS Crystals Ltd.	TGS SR 61.24/67.24LF	USA 3ch / 4ch

For product information on these SAW resonators, please contact each supplier.
Note that we have not considered variations in performance and reliability for production product of each SAW resonator. Therefore, this evaluation result has no guarantee that variations in performance of these SAW resonators can be tolerated for the desired performance of RF modulator circuit with built-in NJM2536A. The same goes to the change of the long-term characteristics of SAW resonator.

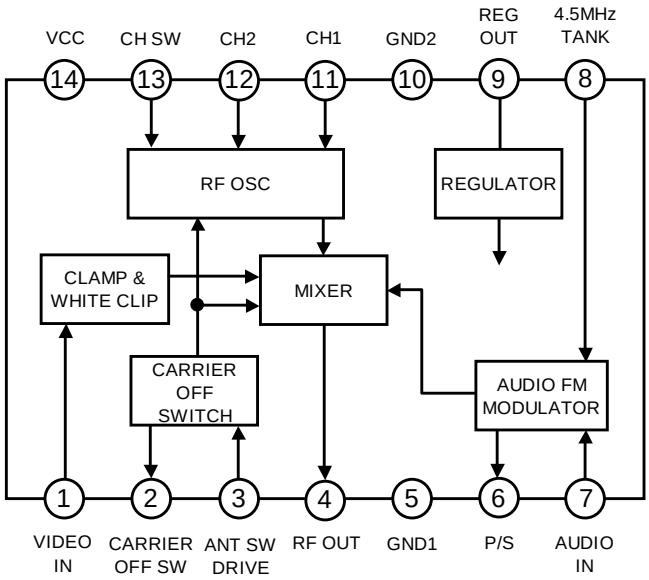
THE DIFFERENCE OF NJM2536A AND NJM2519A

Block Diagram

NJM2519A

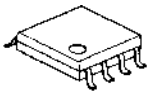


NJM2536A

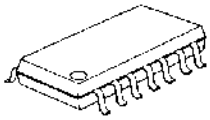


Package

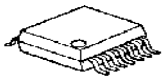
The number of pin and package
NJM2519A is in package of DMP8
NJM2536A is in package of DMP14 / SSOP14.



NJM2519A DMP8



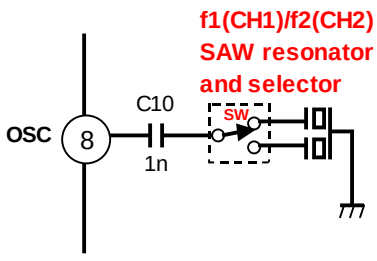
NJM2536A DMP14



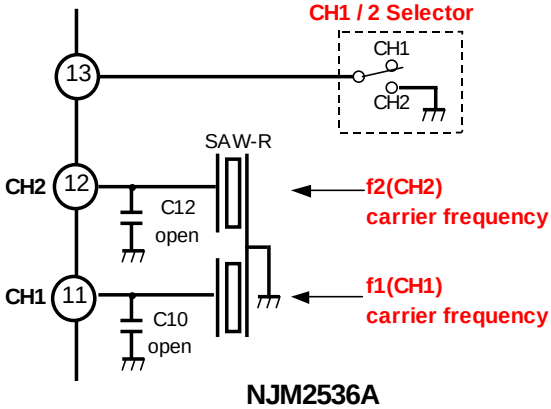
SSOP14

Channel selector switch (CH SW)

NJM2519A has only one pin to connect the external resonance circuit for picture carrier signal.
NJM2536A has two pins for the two different frequency of picture carrier signal.
For two channel select, NJM2519A needs the external switch to select two resonance circuits.



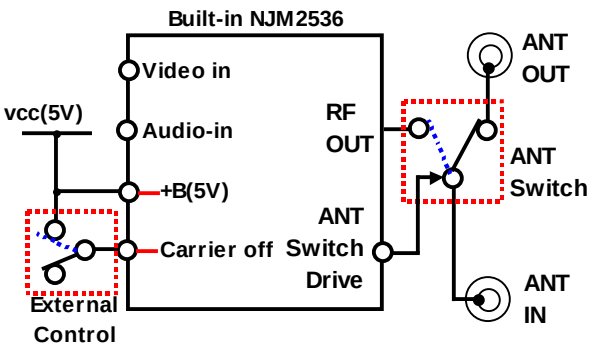
NJM2519A

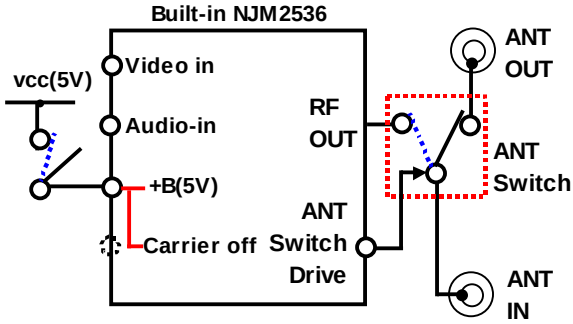


NJM2536A

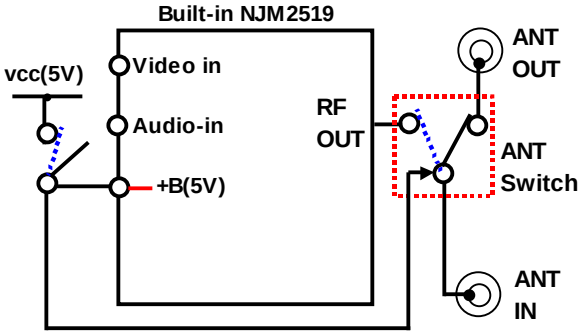
Antenna Selector Switch and CARRIER OFF SW

As described in the section " EXPALANTION OF TERMINAL, CARRIER OFF SW (Pin2) / ANT.SW DRIVE (Pin3)", there are two kinds of antennal switching operation for RF modulator model with built-in NJM2536A.



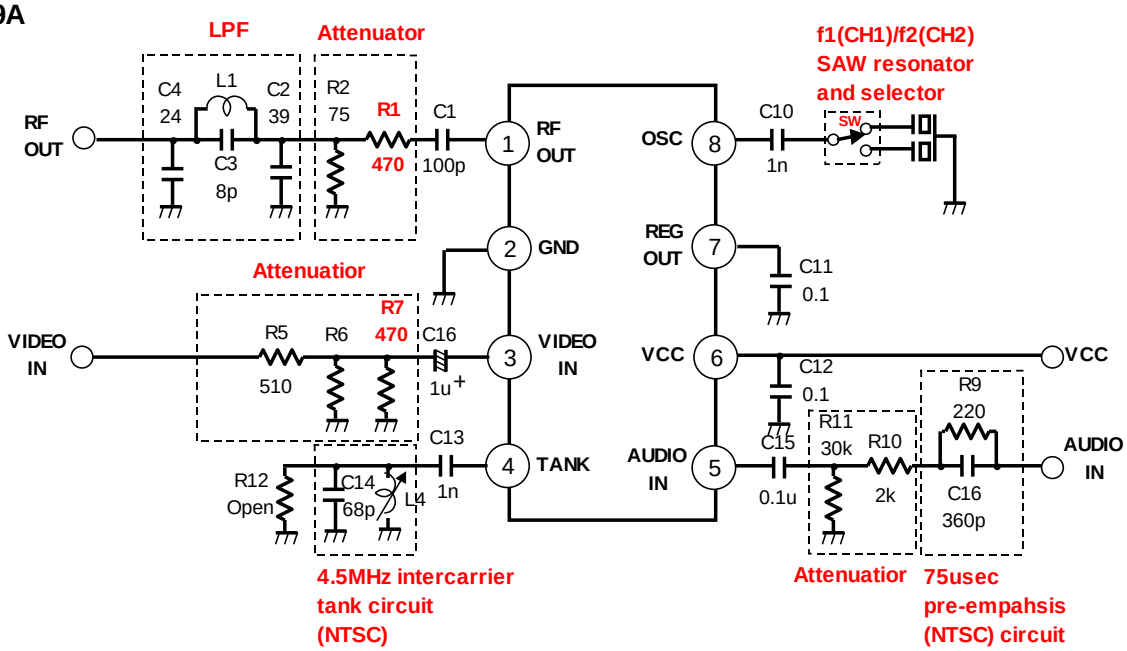


In the case of NJM2519A, an antenna switch circuit is directly connected to power supply and this power supply is also connected to Vcc terminal of NJM2519A.

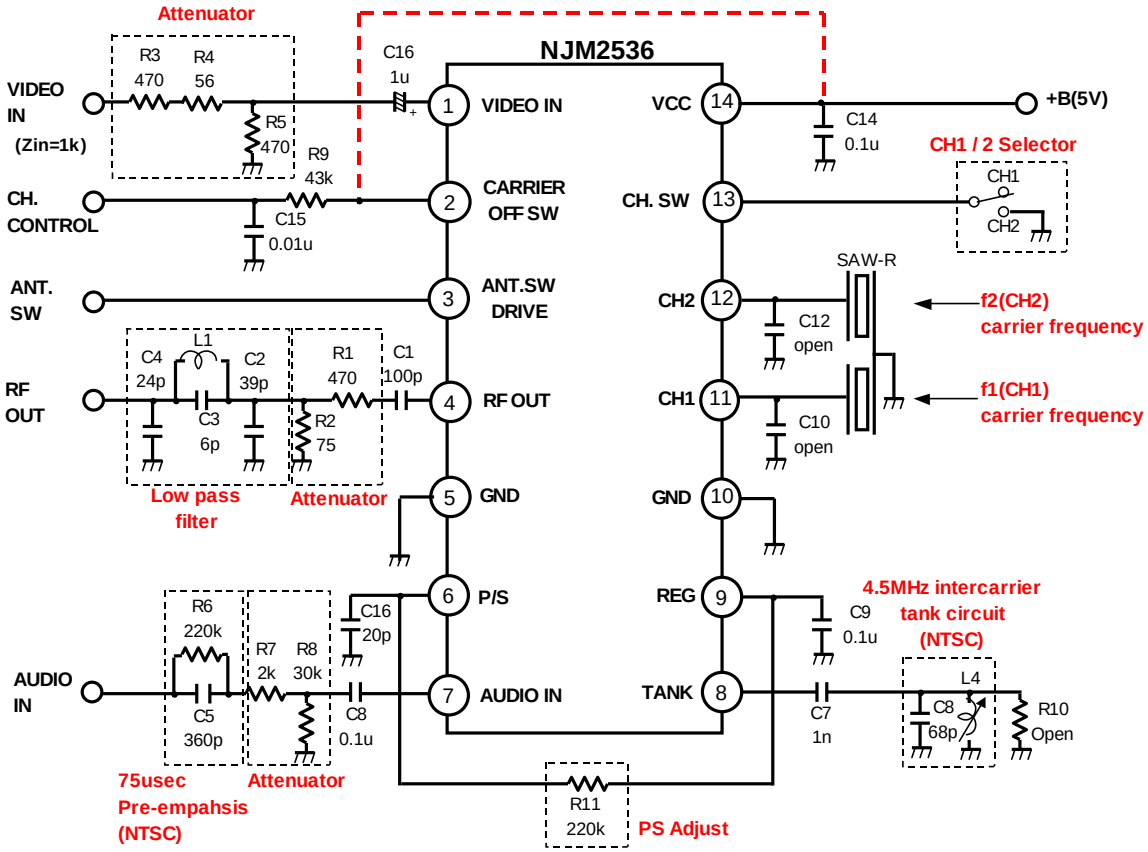


External Components

NJM2519A



NJM2536A



■ MEASUREMENT SYSTEM

1 General Purpose

This document is published for the assist in measuring the major characteristics of VHF output RF modulator.
The testing method in this sheet is only given for your information, without any guarantee as regards the RF modulator-related specifications published by New Japan Radio Co., Ltd.

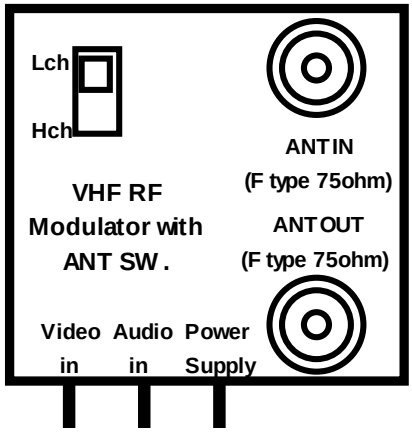
2 Items

3 Outline of RF Modulator (Example)

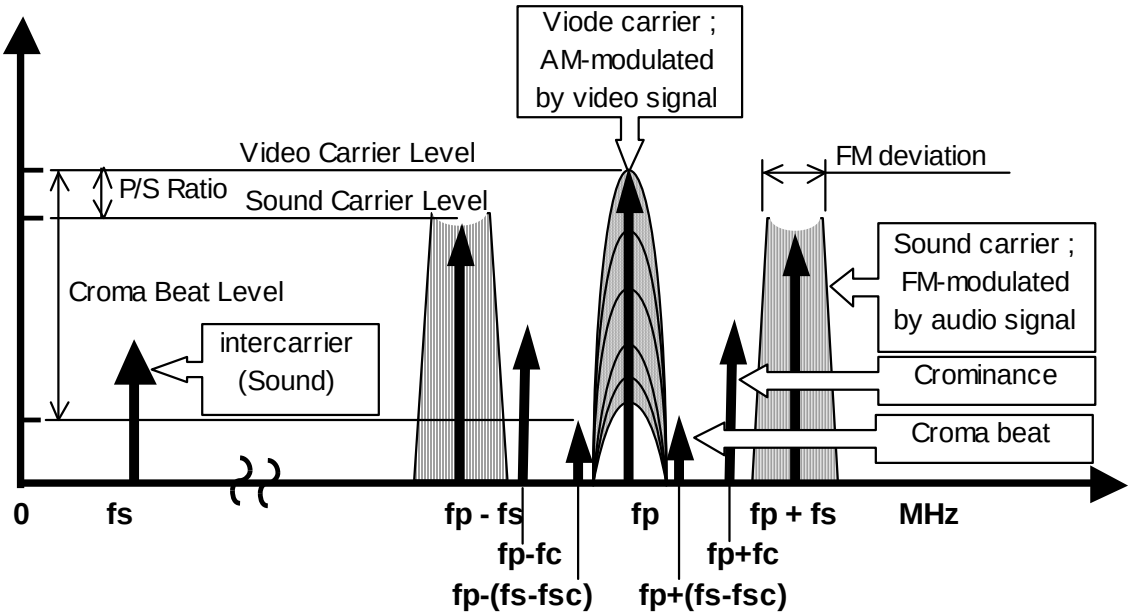
There are a few kind of output connectors of RF modulator.

3.1 NTSC
- Female F connector, 3/8-32
- RCA Jack

3.2 PAL
- PAL Jack (IEC) Connector
- RCA Jack

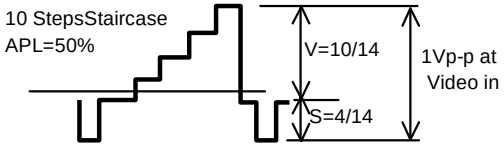


4 Example of Output Signal and Spectrums

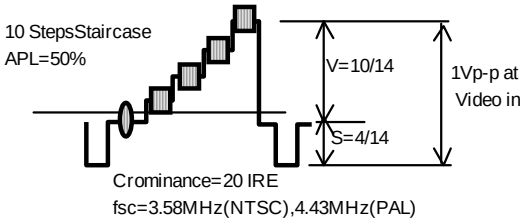


5 Example of Input Signal for measurement

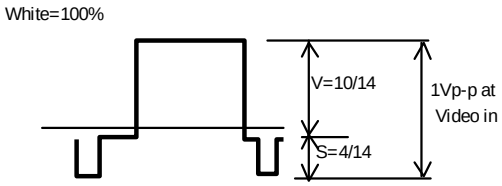
5.1 Video Signal / Composite Video Base band Signal (CVBS)



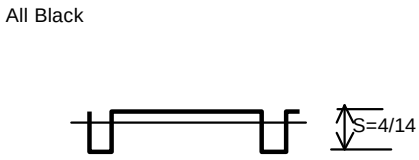
10 Steps Staircase Video Signal



Color Bar Video Signal



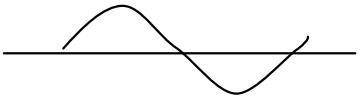
White Video Signal



Back Video Signal

5.2 Audio Signal

1kHz Sine Wave



Audio Signal

6 Video Modulation

6.1 Measurement Equipment

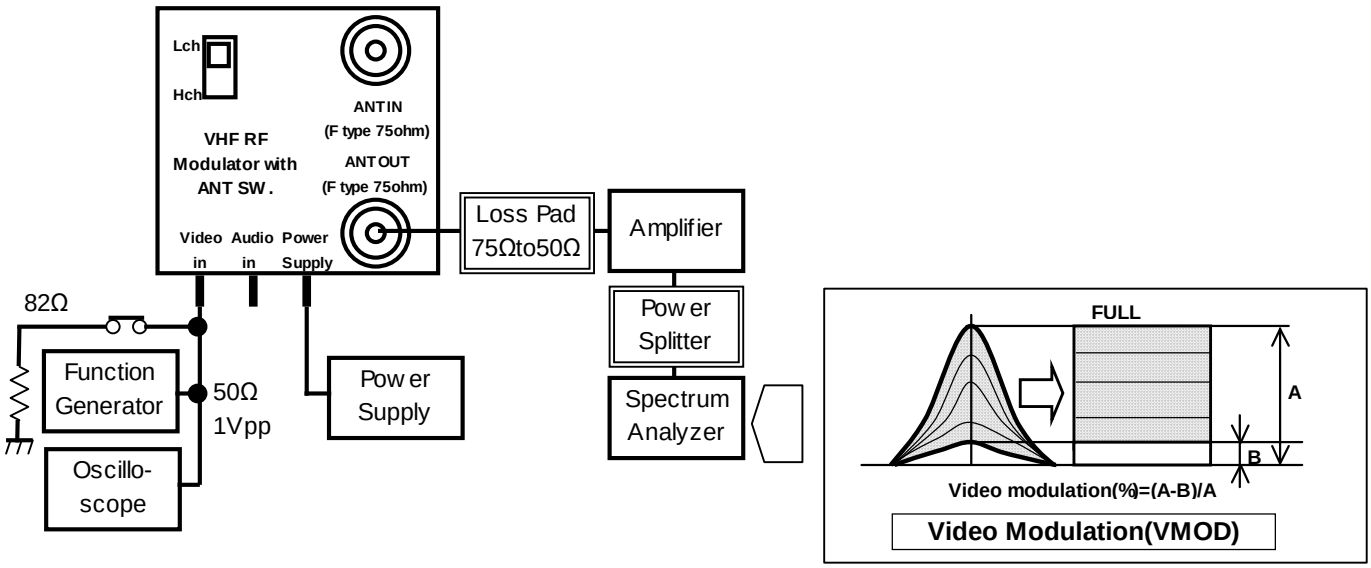
- Function Generator HP3314A, HP8648B or 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

6.2 Condition

- Input Signal
  Video signal Sine wave 15.625kHz, 10step staircase signal, 1Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN=0Hz(Full Span)	0Hz
Sweep time	1sec
Resolution Bandwidth	300kHz
VID. Bandwidth	3MHz
Scan mode	Linear

6.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Adjust the center frequency of spectrum analyzer until video carrier signal comes to the center.
3. Set the measurement condition of analyzer.
4. Read A and B.

Note: The amplifier and power splitter are necessary when the output level of RF modulator is small.

7 White Clipping Level

7.1 Measurement Equipment

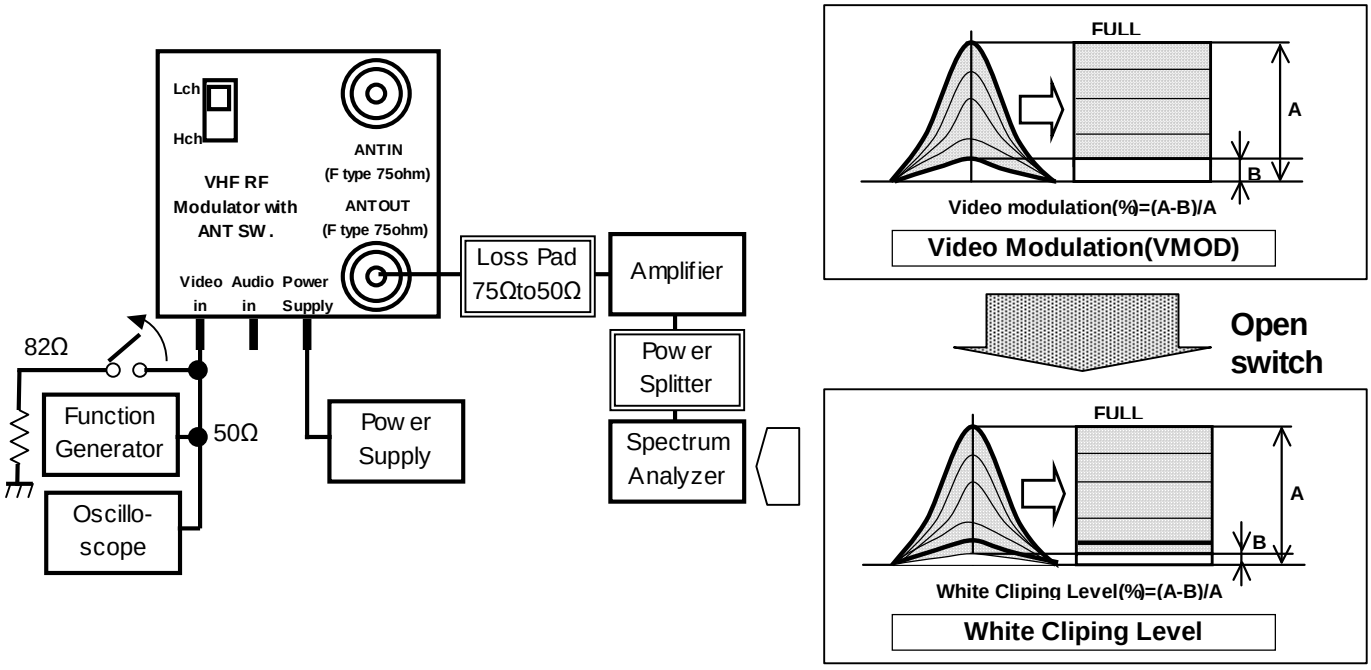
- Function Generator HP3314A, HP8648B or 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

7.2 Condition

- Input Signal and Level
  Video signal Sine wave 15.625kHz or 10step staircase signal, 1.5 Vpp or 2Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN=0Hz(Full Span)	0Hz
Sweep time	1sec
Resolution Bandwidth	300kHz
VID. Bandwidth	3MHz
Scan mode	Linear

7.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. After measuring video modulation, open the switch or change video signal level to 1.5V or 2V.
3. Read A and B.

Note: The amplifier and power splitter are necessary when the output level of RF modulator is small.

8 V / S Ratio

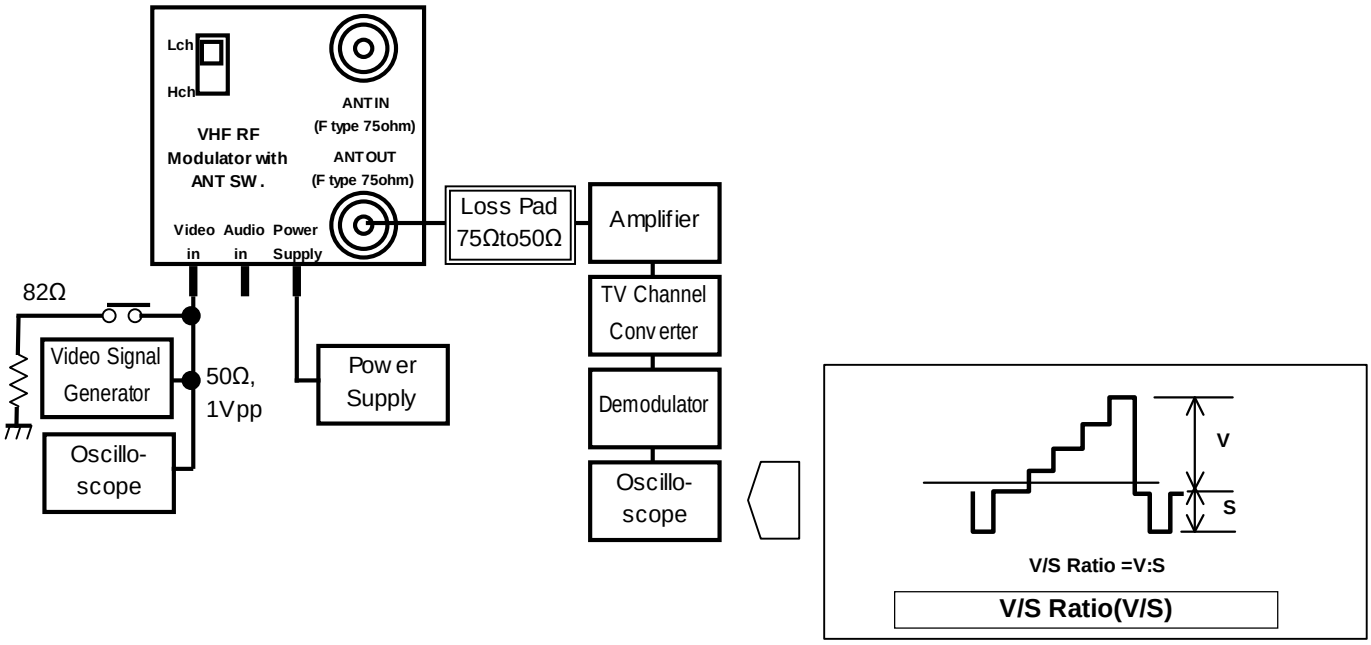
8.1 Measurement Equipment

- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)

8.2 Condition

- Input Signal and Level
  Video signal 10step staircase signal, 1Vpp
  Audio signal OFF

8.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Read V and S from oscilloscope display.

Note: The amplifier is necessary when the output level of RF modulator is small.

9 Video Amplitude Frequency Characteristics

9.1 Measurement Equipment

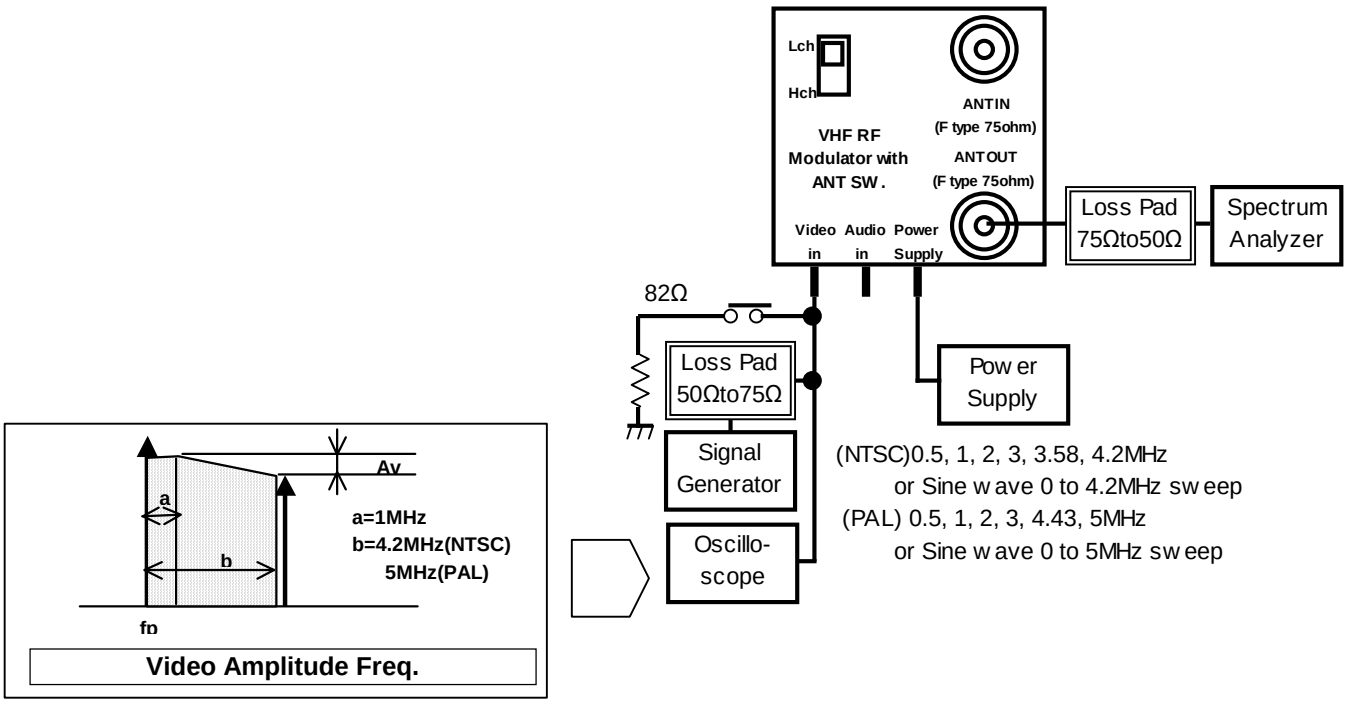
- Video Signal Generator HP8648B / HP3314A
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

9.2 Condition

- Input Signal and Level
  Video signal sine wave (NTSC) 0 to 4.3MHz sweep, (PAL) 0 to 5MHz sweep, 0.6Vpp or 1Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN	10MHz
Sweep time	1sec
Resolution Bandwidth	300kHz
VID. Bandwidth	AUTO
Scan mode	LOG, 10dB/div
Trace	MAX HOLD

9.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Adjust the center frequency of spectrum analyzer until video carrier signal comes to the center.
3. Wait until at least three sweeps of analyzer display have been taken.
4. Set maker of analyzer to fp+1MHz.
5. Measure maximum deviation of video amplitude from fp+1MHz between fp+1MHz to fp+ 4.2MHz(5MHz).

10 Differential Gain (DG), Differential Phase (DP)

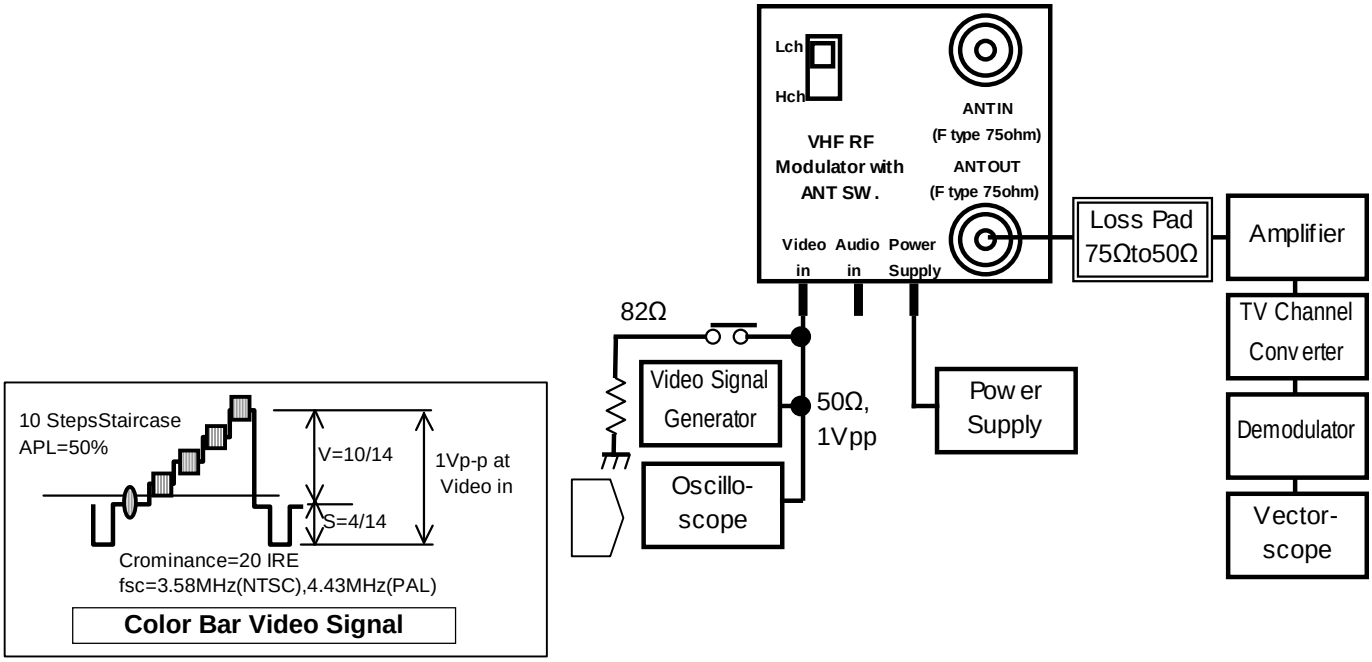
10.1 Measurement Equipment

- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)
- Vector scope 521A(Tektronix) or
  Video Measurement set VM700A (Tektronix)

10.2 Condition

- Input Signal
  Video signal Color bar signal (10step staircase signal, Chrominance 20IRE,APL50%), 1Vpp
  Audio signal OFF

10.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Measure DG and DP.

Note: The amplifier is necessary when the output level from RF modulator is enough to measure.

.

11 Video S/N

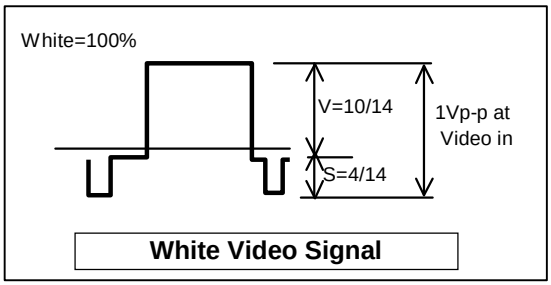
11.1 Measurement Equipment

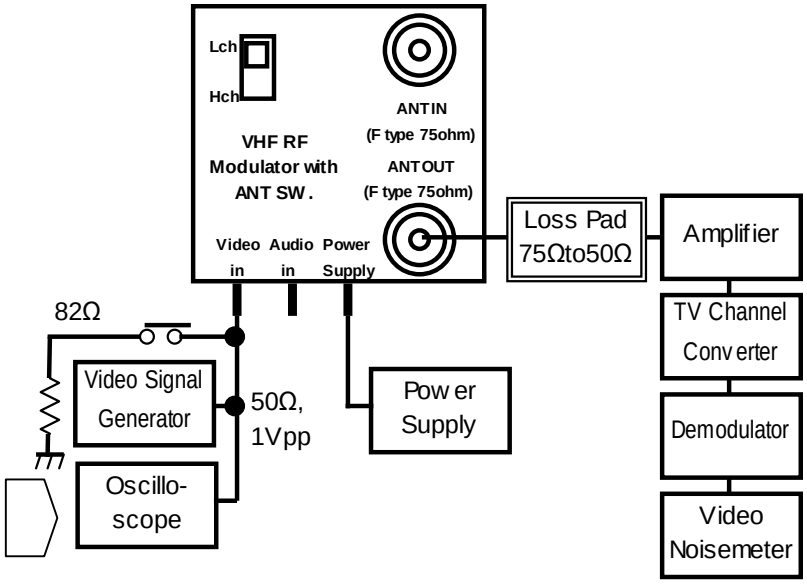
- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)
- Video Measurement set VM700A (Tektronix) OR
  Video Noise Meter

11.2 Condition

- Input Signal
  Video signal White Signal 100%, 1Vpp
  Audio signal OFF

11.3 Block Diagram and Testing Method





1. Set the modulator to the requested test conditions and connect as above.
2. Select video mode on noise meter.
3. Adjust noise meter level control until level display reads the requested value.
4. Take reading from meter.

Note: The amplifier is necessary when the output level from RF modulator is enough to measure.

12 Audio Modulation

12.1 Measurement Equipment

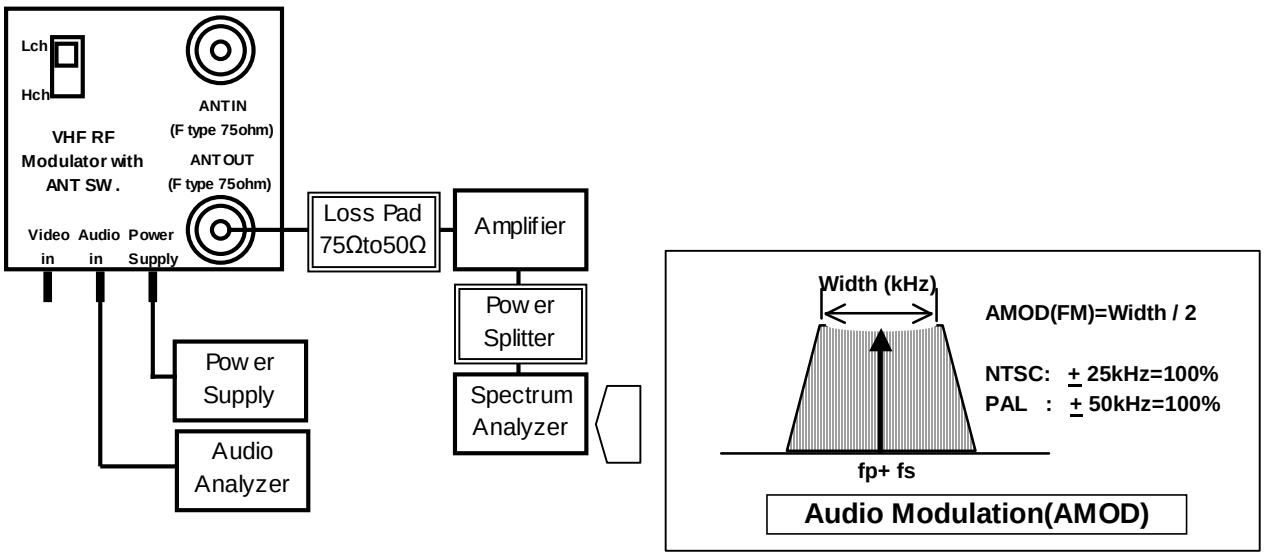
- Audio Analyzer HP8903B
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

12.2 Condition

- Input Signal and Level
  Video signal OFF
  Audio signal Sine wave 1kHz, specified input level.
- Spectrum Analyzer

SPAN	15okHz
Sweep time	500msec
Resolution Bandwidth	300kHz
Video Bandwidth	10kHz
Scan mode	LOG, 10dB/div

12.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Adjust the center frequency of spectrum analyzer until sound carrier signal comes to the center.
3. Read the width between lower peak and upper peak.

Note: The amplifier and power splitter are necessary when the output level from RF modulator is enough to measure.

13 Audio Amplitude Frequency Characteristics

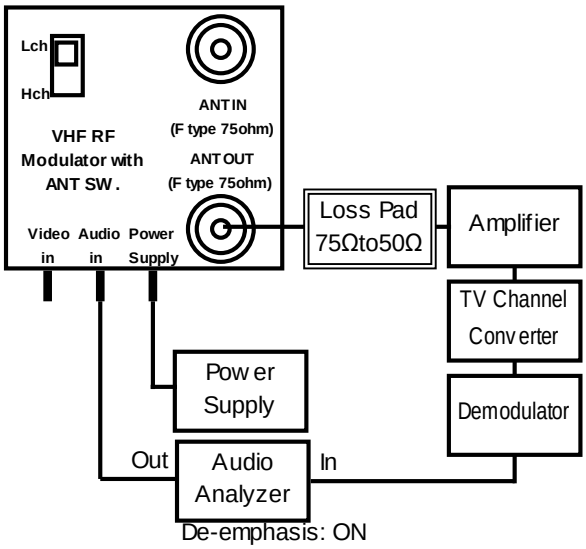
13.1 Measurement Equipment

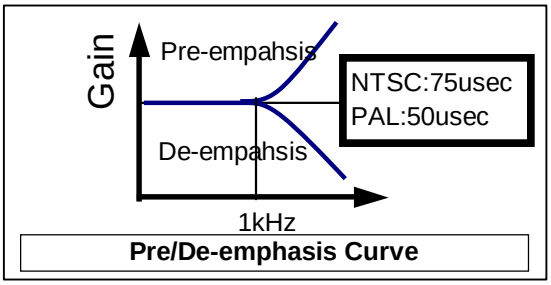
- Audio Analyzer HP8903B or
  Distortion Meter HP339A
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)

13.2 Condition

- Input Signal
  Video signal OFF
  Audio signal Sine wave 100Hz to 10kHz, specified input level

13.3 Block Diagram and Testing Method





Pre/De-emphasis Curve

RF modulator has a pre-emphasis circuit at audio input. Therefore, the de-emphasis circuit of audio analyzer should be ON when the audio analyzer reads the demodulated audio signal level of RF modulator.

1. Set the modulator to the requested test conditions and connect as above.
2. Set audio analyzer's output frequency to 1kHz and output to the specified input level of RF modulator.
3. Measure analyzer's input level from demodulator as reference level.
4. Change analyzer's output frequency from 100Hz to 10kHz, and measure analyzer's input level.

14 Distortion

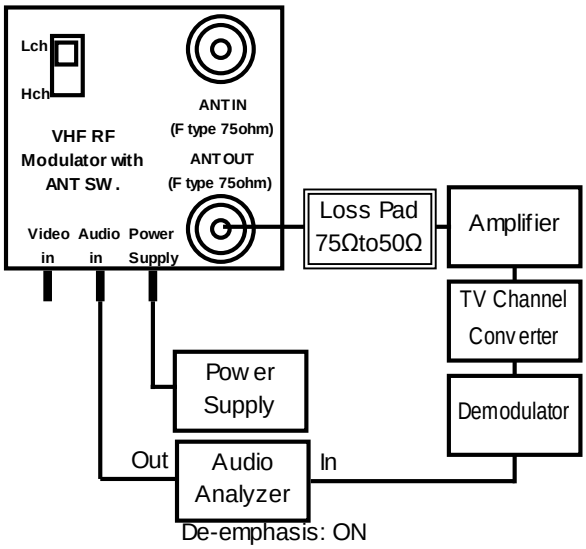
14.1 Measurement Equipment

- Audio Analyzer HP8903B or
  Distortion Meter HP339A
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)

14.2 Condition

- Input Signal
  Video signal OFF
  Audio signal Sine wave 1kHz, specified input level

14.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Set audio analyzer's output frequency to 1kHz and output to the specified input level of RF modulator.
3. Take measurement.

Note: The amplifier is necessary when the output level from RF modulator is enough to measure.

15 Audio S/N

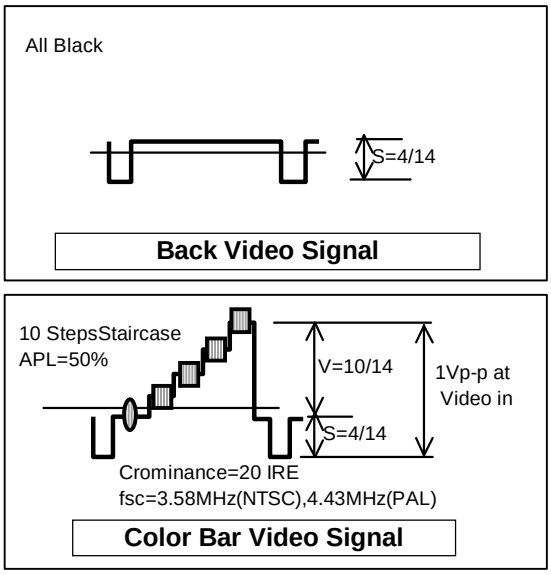
15.1 Measurement Equipment

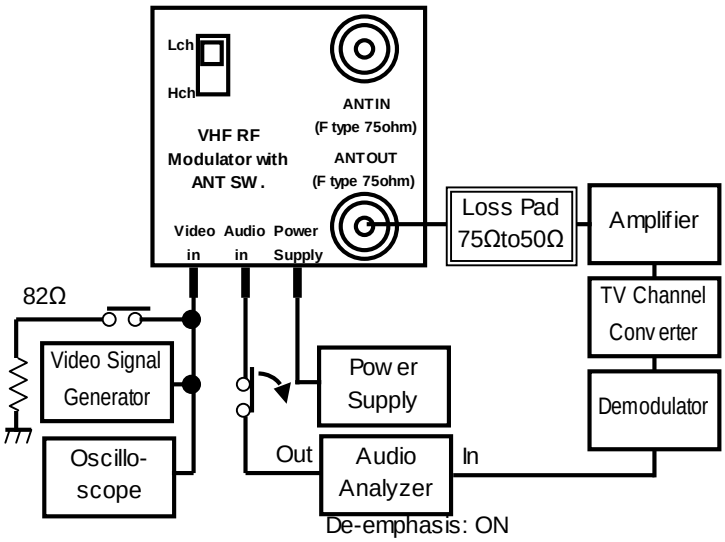
- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Audio Analyzer HP8903B or
  Distortion Meter HP339A
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)
- TV All Channel Down Converter 474A – R (Eiden Co., Ltd.)
- Multi-system TV IF Demodulator 479A (Eiden Co., Ltd.)

15.2 Condition

- Input Signal
  Video signal All black sync only or color bar signal
  Audio signal Sine wave 1kHz, specified input level

15.3 Block Diagram and Testing Method





1. Set the modulator to the requested test conditions and connect as above.
2. <S level measurement> With audio signal applied, set audio analyzer and measure signal level (use as reference level)
3. <N level measurement> cut audio input signal to modulator.
4. Set audio analyzer and measure noise level with reference to S level in dB.

Note: The amplifier is necessary when the output level from RF modulator is enough to measure.

16 Video Carrier Frequency (1)

16.1 Measurement Equipment

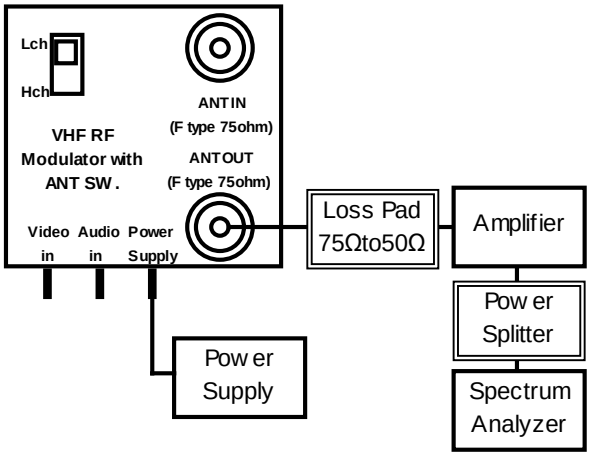
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

16.2 Condition

- Input Signal
  Video signal OFF
  Audio signal OFF
- Spectrum Analyzer

SPAN	10MHz
Sweep time	500msec
Resolution Bandwidth	100kHz
VID. Bandwidth	30kHz
Scan mode	LOG 10dB/div
Counter Resolution	100Hz

16.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Adjust the center frequency of spectrum analyzer until video carrier signal comes to the center.
3. Read the frequency of video carrier signal.

Note: The amplifier and power splitter are necessary when the output level from RF modulator is enough to measure.

17 Video Carrier Frequency (2)

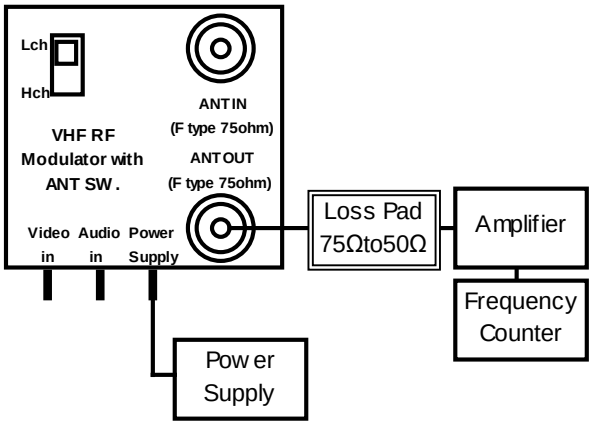
17.1 Measurement Equipment

- Frequency Counter SC-7103 (Iwatsu Electric Co., Ltd.)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)

17.2 Condition

- Input Signal
  Video signal OFF
  Audio signal OFF

17.3 Block Diagram and Testing Method



18 Video Carrier Output Level

18.1 Measurement Equipment

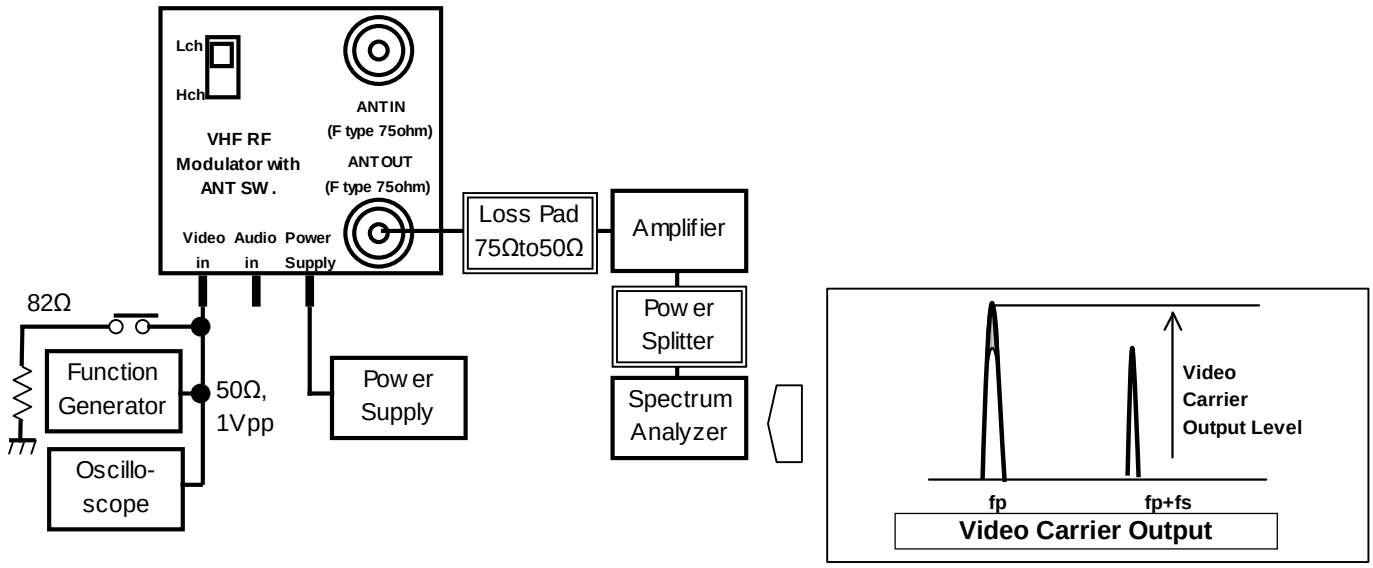
- Video Signal Generator HP3314A, HP8648B or 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

18.2 Condition

- Input Signal
  Video signal Sine wave 15.625kHz or 10step staircase signal, 1Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN	5MHz
Sweep time	1sec
Resolution Bandwidth	3MHz
VID. Bandwidth	1Mz
Scan mode	LOG 10dB/div

18.3 Block Diagram and Testing Method



1. Set the modulator to the requested test conditions and connect as above.
2. Adjust the center frequency of spectrum analyzer until video carrier signal comes to the center.
3. Read peak level of video carrier signal.
4. Correction factor
   Loss of pad + loss of splitter + loss of cable – amp gain

Note: The amplifier and power splitter are necessary when the output level from RF modulator is enough to measure.

19 Sound Carrier Frequency (Sound Inter-carrier frequency)

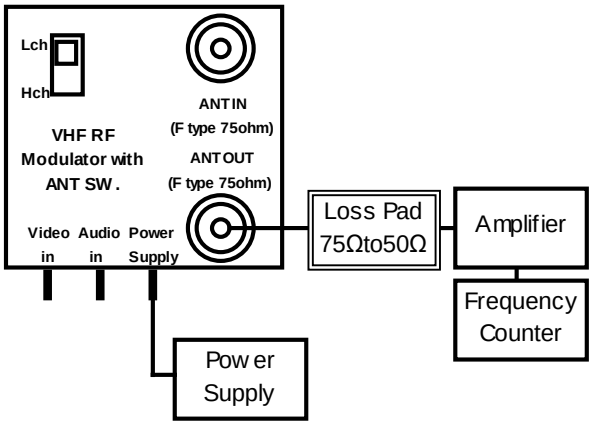
19.1 Measurement Equipment

- Frequency Counter SC-7103 (Iwatsu Electric Co., Ltd.)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)

19.2 Condition

- Input Signal
  Video signal OFF
  Audio signal OFF

19.3 Block Diagram and Testing Method



20 Sound Carrier Level / Out-band Spurious

20.1 Measurement Equipment

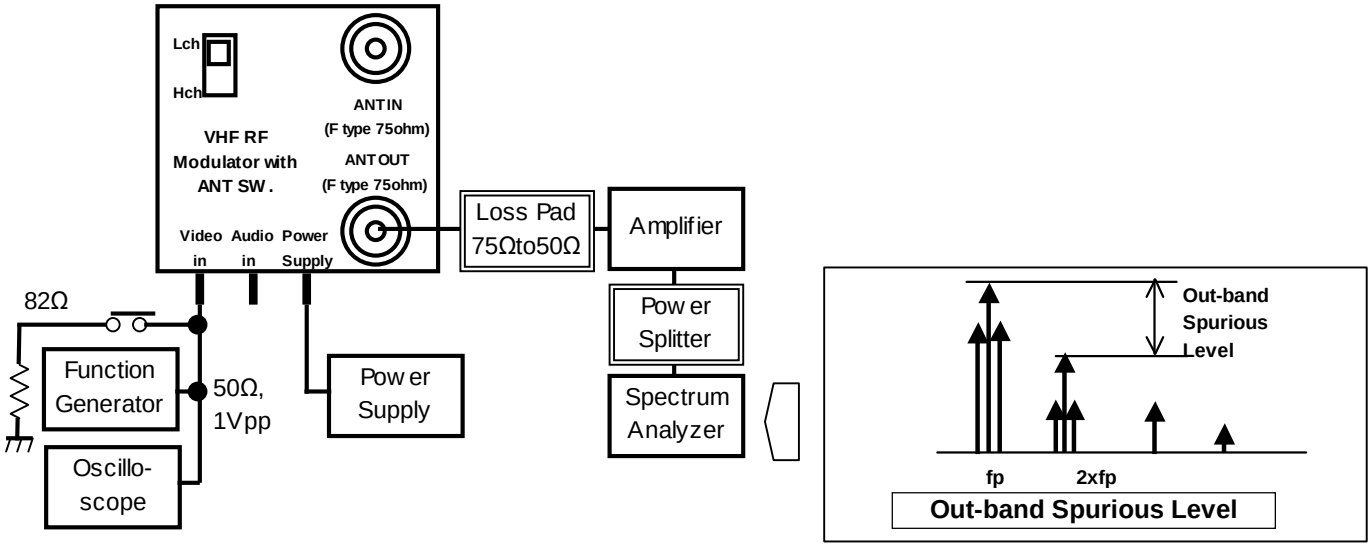
- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

20.2 Condition

- Input Signal
  Video signal 10step staircase signal, 1Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN	10MHz
Sweep time	500msec
Resolution Bandwidth	300kHz
VID. Bandwidth	10kHz
Scan mode	LOG 10dB/div

20.3 Block Diagram and Testing Method



Note: The amplifier and power splitter are necessary when the output level from RF modulator is enough to measure.

21 In-band Spurious

21.1 Measurement Equipment

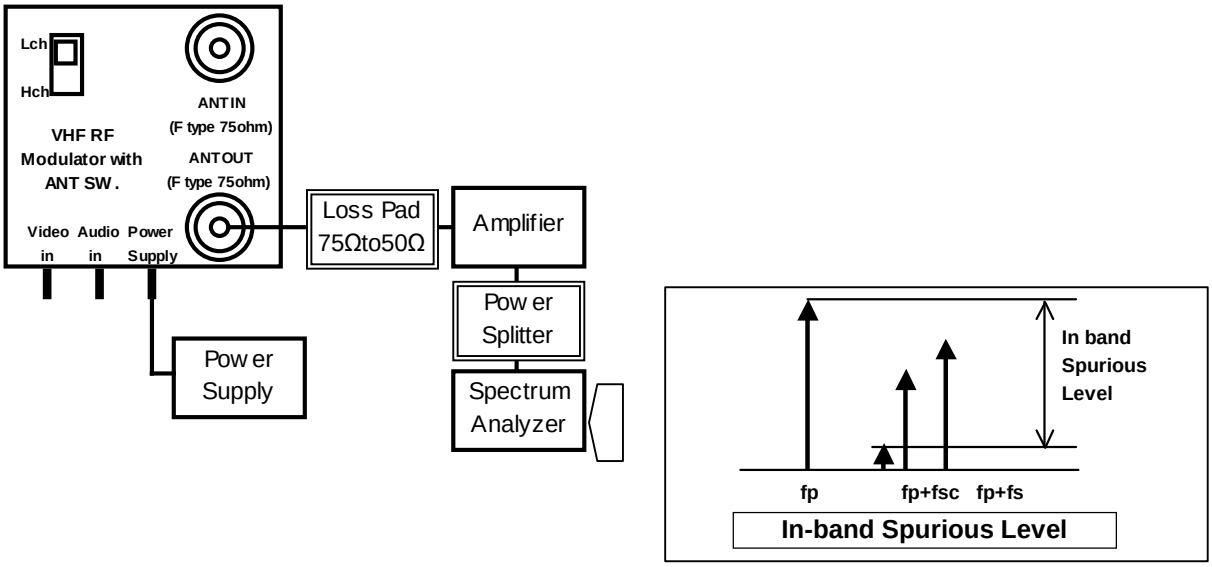
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

21.2 Condition

- Input Signal
  Video signal OFF
  Audio signal OFF
- Spectrum Analyzer

SPAN	200kHz
Sweep time	200msec
Resolution Bandwidth	10kHz
VID. Bandwidth	30kHz
Scan mode	LOG 10dB/div

21.3 Block Diagram and Testing Method



Note: The amplifier and power splitter are necessary when the output level from RF modulator is enough to measure.

22 Croma Beat

22.1 Measurement Equipment

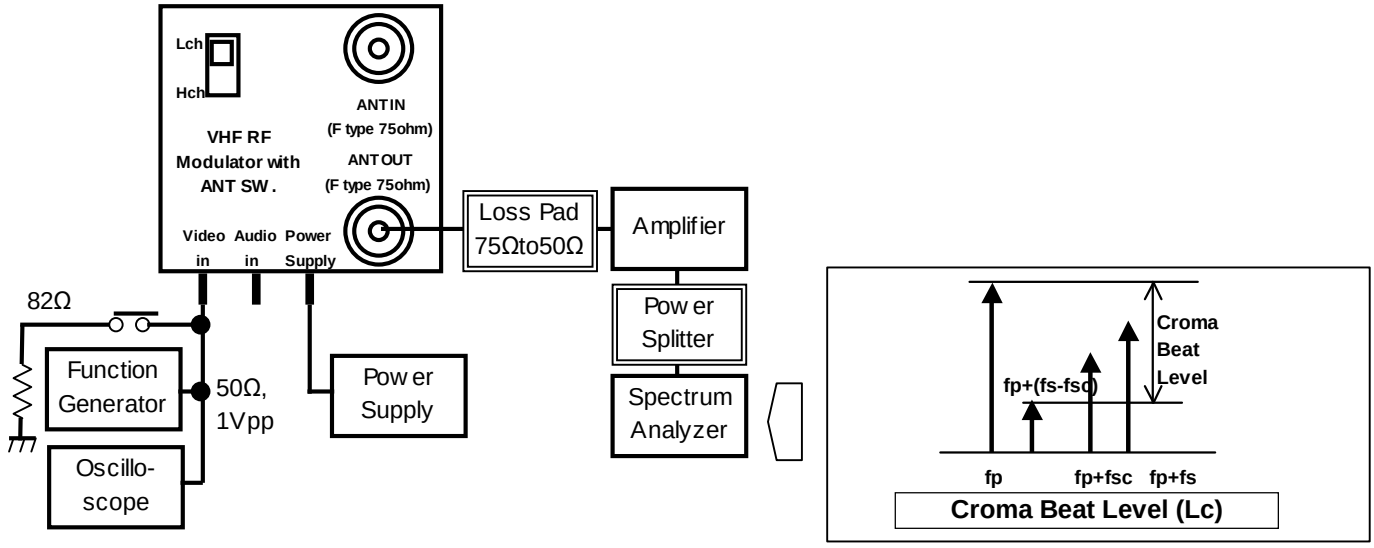
- Video Signal Generator 408NPS (Leader Electronics Corp.)
- Spectrum Analyzer HP8567A or R3265A (ADVANTEST)
- Amplifier LAC-4501A (Laboline Measurement Co., Ltd.)
- Matching Pad PD231 (STACK Electronics Co., Ltd.)

22.2 Condition

- Input Signal
  Video signal sine wave (NTSC) 4.3MHz, (PAL) 5MHz, 1Vpp
  Audio signal OFF
- Spectrum Analyzer

SPAN	10MHz
Sweep time	500msec
Resolution Bandwidth	300kHz
VID. Bandwidth	10kHz
Scan mode	LOG 10dB/div

22.3 Block Diagram and Testing Method



If you have any questions, please let us know without any hesitate.

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