

Q6010001-1B

LG 3236 動作／調整指示書

資料番号

機種型番	LG 3236	コントロールド	資料番号
	LG 3236 S1	アンコントロールド	
			特注仕様書番号
			管理番号

発行時摘要			発行日		
構成変更のため再発行。 '05年6月切より適用。			'05年 8月 10日		
			承認	審査	起案
			川口	川口	高岸
改廃／検証記録					
変更／改訂日	記号	摘要	承認	審査	起案
'06年1月6日	A	23/33ページ FMステロ調整変更。 (06年3月切より適用)	川口	川口	永野
'06年9月19日	B	12/33ページ VCO電圧範囲変更 (VCO5 上端電圧) (06年9月切より適用)	川口	川口	永野
'06年10月18日	C	18/33, 21/33 ページ 変調、トリックス調整手順変更 (06年9月切より適用)	川口	川口	高岸
'06年11月30日	D	3/33, 10/33 ページ 変更 EXT AF調整治具追加、 EXT AF調整手順変更 (06年12月切より適用)	川口	川口	高岸
'06年12月29日	E	18/33, 21/33, 22/33, 29/33 ページ 変更 24/33			
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'07年3月26日	F	20/33, 22/33, 23/33 MATRIX調整手順変更 (調整用治具変更) SUB-DSB調整手順変更 (07年4月切より適用)	川口	川口	高岸
'07年6月6日	G	12/33 VCO5 下端電圧変更, VCO5 共振周波数追加 (07年5月切より適用)	川口	川口	高岸

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Created August 10, 2005 Revision
date Year Month Day

table of contents

1. Use the determination device The
substrate action and adjustment (1)

.....

2.2 CPU UNIT T-6403	4	2.2.1 Visual inspection	4	2.2.2 Confirmation of completion of writing to IC7 (EPM7064STC100)	4	2.2.3 Program loading	5
2.3 PANEL T-6388	5	2.3.1 Panel check	5	2.4 POWER & AF T-6402/T-6389 Simultaneous Modulation	6	2.4.1 INT AF OSC	6
2.4.2 FM MOD	8	2.4.3 AM MOD/ALC LEVEL (operation check)	9	2.4.4 EXT FM/L, EXT AM/R LEVEL	10	2.5 ATT& UNIT T-6343,T -6344	11
2.5.1 Measuring instruments used	11	2.5.2 Connection with a measuring instrument	11	2.5.3 Setting and measurement	11	2.6 RF UNIT T-6446	12
2.6.1 Adjustment position	12	2.6.2 Measuring instrument used	12	2.6.3 VR adjustment	12	2.6.4 VCO voltage range adjustment	12
2.6.5 Reference X'tal Oscillator Tuning	13	2.6.6 80 MHz LOCAL Oscillator Tuning	13	2.6.7 ALC level adjustment for VCO	13	2.6.8 LOW/HIGH Band level adjustment	13
2.6.9 DBM balance adjustment	14	2.6.10 Spurious check	14	2.6.11 FM external variable f special adjustment	14	2.6.12 RF UNIT installation and outer housing installation	14
2.7 ALC, AM, FM output adjustment POWER&AF T-6402	15	2.7.1 ALC coarse adjustment	15	2.7.2 AM Coarse Adjustment	15	2.7.3 FM coarse adjustment	16
2.7.4 Calibration	17	3.1 Measuring instruments used	17	3.2 Connection	17	3.3 Operation procedure	17
3.4 Operation check	17						

Created August 10, 2005 Revision
date Year Month Day

4. The substrate movement and adjustment (2)
18.118 4.2 STEREO T-4088

.....
.....
.....
4.2.4 SUB-DSB22 4.2.5 PILOT phase calibration24 4.2.6 Phase calibration with PILOT and 38 kHz
subcarrier25 4.2.7 STEREO separation.....26 4.2.8 STEREO FM MOD28

.....
4.3 Checking pre-emphasis characteristics31

How to use the Nittsu Model 5185 stereo demodulator32

Created on August 10, 2005 Revised on
November 30, 2006

1. Use the tester

1.1 List of measuring instruments used

Measuring device	strip pieces	example
oscilloscope	special 40MHz or higher Maximum sensitivity 5mV/DIV Must have XY MODE No XY phase difference	Phase adjustment Tektronix 2465 Other than phase adjustment 3100A
Digital Multimeters	Resolution 10mV error 0.5%	LDM-853A
DC power supply	Voltage 5V Current 0.5A	LPS-161
frequency	frequency 100MHz	MODEL 3216
Spectrum analyzer Measurement frequency 100k to 500MHz		Advantest TR4131
frequency counter	Determination of frequency number 100k ~ 200MHz resolution can be 1Hz frequency number accuracy ± 1 ppm	HP 5342A
Modulation Analyzer Measurement frequency 150k to 200MHz		HP 8901B
Measuring receiver Measurement frequency 150k to 200MHz		HP 8902A
low frequency oscillator	Vibration frequency 20Hz ~ 100kHz ATT resolution 0.1dB Skew rate 20Hz ~ 20kHz 0.01% or less	HP 8903B
millivolt meter	Measurement frequency 20Hz ~ 100kHz	HP 8903B
Distortion meter	Measurement frequency 20Hz to 100kHz Minimum distortion range 0.1%	HP 8903B
audio analyzer	Measurement frequency 20Hz ~ 100kHz	HP 8903B
stereo demodulator	Separation 60dB or more	Nippon Tsushinki Model5185
power meter power sensor	Measurement frequency 100k to 140MHz Measurement level -30dBm ~ 20dBm	HP 8902A HP 11722A
function generator frequency	200kHz or more	LG 1301
FM linear detector	RF frequency 200MHz	MDA-453
stereo signal generator	Composite stereo signal output	VP-7633A
[D] External modulation input level adjustment jig Amplitude gain ± 0.3 dB, ± 0.2 dB	The profit switching period is about 1 second	JG1179 Registration number 0598860000

The above measuring device is a representative example, and any equivalent product can be used.

Created August 10, 2005 Revision
date Year Month Day

2.2.3 Program load

- (1) Insert the program ROM into IC8 (IC socket). (2) Insert the jumper PIN into JP2. (3) When the power of the main unit is turned on, program loading starts. (4) 0 to 5 are displayed on the ADDRESS display section of the panel, and program loading is completed. (5) Press SHIFT + 99 + 39 + ADDRESS on the panel key to display the CAL default value.
is loaded.
- (6) 0 to 3 are displayed on the ADDRESS display section of the panel, and the CAL default value loading is completed.
do.
- (7) Turn off the power and remove the jumper PIN of ROM of IC8 and JP2.

yyy yyyyy

yyyyyy

2.3.1 Panel check

- (1) Key switch, rotary knob
Set SHIFT+9950+ADDRESS. The
key switch displays "01" on the INT key of FM/L on the ADDRESS display, and confirms that the number shifts
in the order of
down and right. Confirm that the rotary knob displays "00" for DOWN and "99" for UP on the
ADDRESS display. To cancel, press LOCAL key twice.
- (2) Set 7-segment
LED SHIFT+9951+ADDRESS and confirm that 0 to 9, each individual segment, and the decimal point light
up in that order.
- (3) Key switch LED
Set SHIFT+9952+ADDRESS and check that the lights are lit in order from top left to bottom to right.
- (4) Set the
individual LED SHIFT+9953+ADDRESS and confirm that the digit LED, 400Hz/1kHz LED, and
REMOTE LED light up in this order.

Created August 10, 2005 Revision date
Year Month Day

2.4 POWER & AF T-6402/T-6389 simultaneous modulation

*Make sure all VRs are centered before starting operation and adjustment.

~~~~~ ~~~~ ~~~~ ~~~~

- (1) Using a measuring device  
(1) Oscilloscope (2)  
Frequency counter (3)  
Distortion meter or audio analyzer
- (2) Connecting to measuring instruments  
~~~~~ Connect to measuring instruments with each TP terminal on the T-6402 and T-6389 boards.
- (3) Instrument panel setting
~~~~~ MODULATION SOURCE INT OF ON  
(Alternate switching with 400Hz/1kHz INT AF SW)
- (4) T-6402 adjustment and measurement  
~~~~~ Select MOD ON, FM ON, INT AF 1kHz in the panel setting. ~~~~~ Adjust VR11 so that the TP11 ripple waveform level is 150mVp-p. (3) Adjust VR12 so that the TP12 AF OSC level is 5Vp-p. (4) Iterative adjustments must be made to satisfy both (2) and (3). ~~~~~ Connect a frequency counter and an audio analyzer to TP12, and confirm that the standards shown in Table 1 are included. ~~~~~ Even when INT AF 400Hz is selected in the panel setting, adjust and check as above.

Table 1

| Item | Frequency | Distortion factor |
|------|---|-------------------|
| | 400Hz 388 ~ 412Hz 0.03% or less 1kHz 970 ~ 1030Hz 0.02% or less | |

Measured value 410Hz ----- 0.009%
1001Hz ----- 0.004%

~~~~~ By connecting an oscilloscope to TP12 and turning on the FM/L EXT SW, the INT OSC oscillation will stop. confirm.  
Also, even if the INT AF SW is ON, check that the oscillation stops when the MOD ON SW is OFF, and when MOD ON, AM ON and FM OFF.

Created August 10, 2005 Revision date  
Year Month Day

(5) Adjustment and measurement of T-6389

• Select MOD ON, AM ON, INT AF 1kHz in the panel setting. •

Adjust VR1 so that the TP1 ripple waveform level is 150mVp-p. • Adjust VR2 so that the

TP2 AF OSC level is 5Vp-p. (4) Iterative adjustments must be made to satisfy

both (2) and (3). • Connect a frequency counter and an audio analyzer

to TP2, and confirm that the standards shown in Table 1 are included.

• Even when INT AF 400Hz is selected in the panel setting, adjust and check as above. • By connecting an oscilloscope to TP2 and turning on the AM/R EXT SW, the INT OSC oscillation will stop. confirm.

Also, even if the INT AF SW is ON, check that the oscillation stops when the MOD ON SW is OFF, and when MOD ON, FM ON and AM OFF.



Created August 10, 2005 Revision  
date Year Month Day

yyyyy yyyyy

- (1) Using a measuring device
- Oscilloscope
  - Frequency counter
  - Distortion meter (or audio analyzer)

- (2) Connection to measuring instruments
- Connect to each TP terminal on the T-6402 and T-6389 boards.

(3) Instrument panel setting

• MODULATION

SOURCE INT AF (400Hz or 1kHz or DDS)  
FM/L EXT,AM/R EXT

MOD ON

FM (7 segment LED display 75.0kHz)

PILOT

MODE

ON

ON

OFF

switch as needed

• FREQUENCY MONO 7 segment LED display 100MHz

- (4) Adjustment and measurement
- TP32 shall be adjusted and measured.
  - (2) By setting INT AF 1kHz ON and operating the EDIT of MODULATION, the level of the 1kHz waveform can be adjusted. Confirm that changes. Of course, the MODULATION 7-segment LED display also changes, but see if the change in AF OSC level is increasing or decreasing according to the 7-segment LED display. (Ignore the absolute amount of the level)
  - (3) Confirm that switching is performed by INT AF and FM/L EXT SW. • Check that AF OSC is not output (0V short) when the MOD ON SW is turned OFF. • Even if the MOD ON SW is ON, if the AM SW is ON and the FM SW is OFF, AF OSC will not be output. confirm.
  - When MOD ON FM SW is ON, every time SHIFT+FM(FM 75k), SHIFT+EDIT1.0 (FM 22.5k) is pressed, the 7-segment LED display alternates between 75.0kHz and 22.5kHz. to confirm. Of course, confirm that the AF OSC output is also switched according to the 7-segment LED display. • Set the panel to FM75kHz, turn on the FM/L EXT SW, and input 1kHz, 1Vrms from the external OSC to the EXT MOD INPUT FM/L. Adjust VR31 of T-6402 so that the AF OSC level at TP32 is 4Vp-p. • Set INT AF to 1kHz and adjust VR12 of T-6402 so that the AF OSC level at TP32 is 4Vp-p. Also, when INT AF is set to DDS, the T-6389's Adjust VR21.
  - Switch the INT AF and check that the distortion rate is as follows. Also, INT AF to DDS and press the DDS key of FUNCTION, and confirm that the AF OSC output is also variable when the DDS frequency is varied with the rotary encoder.

| yyyyy     | Skew rate     | Actual value |
|-----------|---------------|--------------|
| yyyyy     | 0.03% or less | yyyyyy       |
| yyyy      | 0.02% or less | yyyyyy       |
| DDS(1kHz) | 0.2% or less  | yyyyy y      |

Created August 10, 2005 Revision date Year  
Month Day

2.4.3 AM MOD/ALC LEVEL (operation confirmation)

- (1) Using a measuring device
- Oscilloscope • Frequency Counter • Distortion Meter & Millival (Audio Analyzer) • Digital Multimeter

- (2) Connection with measuring equipment • **Connect with each TP terminal on the T-6402 board.**

- (3) Instrument panel setting
- |                |                                                  |                    |
|----------------|--------------------------------------------------|--------------------|
| MODULATION     | SOURCE INT AF (400Hz or 1kHz)<br>AM/R EXT        | } switch as needed |
|                | MOD ON ON<br>AM (7 segment LED display 30.0%) ON |                    |
| • OUTPUT LEVEL | 7 segment LED display 126.0dB •                  |                    |
| • FREQUENCY    | 7 segment LED display 1MHz                       |                    |

- (4) Adjustment and measurement • **U53 1PIN and TP33 shall be adjusted and measured.**

- (2) Set INT AF 1kHz ON and confirm that the output level of AF OSC changes by operating EDIT of MODULATION. Also confirm that the 7-segment LED display has changed.
- (3) Confirm that the INT AF and AM/R EXT SW have been switched.
- Check that the AF OSC level is not output when the MOD ON SW is turned OFF.
  - Confirm that AF OSC is not output when the FM SW is turned ON even if the MOD ON SW is ON.
  - When MOD ON, AM SW is ON, MODULATION 7 segment LED display is any number  
Press SHIFT+AM (AM 30%) and confirm that the display changes to 30.0%.
  - **When MOD ON SW is OFF and OUTPUT LEVEL 7 segment LED display is 126dB •, TP33 is DC 4.5V and Adjust VR33 so that (ALC LEVEL adjustment operation check)**

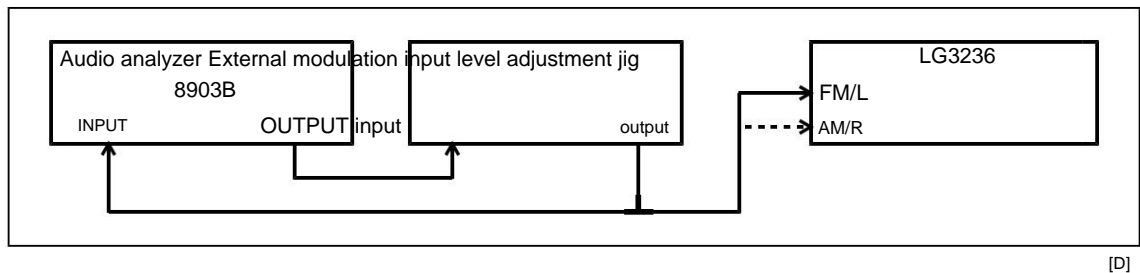
Created: August 10, 2005 Revised:  
November 30, 2006

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(1) Using a measuring device

(1) Audio analyzer (2) External
modulation input level adjustment jig [D]

(2) Connection with measuring instrument



(3) Panel settings

MODUIATION SOURCE FM/L EXT,AM/R EXT ON

(4) Adjustment and measurement (FM/L EXT)

Input 1kHz, 1Vrms from AF OSC output to EXT MOD FM/L INPUT.
(For 1Vrms, switch the jig to "through" to match.) [D]

(2) Switch the jig to "level adjustment" and adjust VR21 so that LOW and HIGH of the EXT LEVEL LED alternately light up at " $\pm 0.3\text{dB}$ " and both LOW and HIGH go out at " $\pm 0.2\text{dB}$ ". do.

[D]

1Vrms ----- 2.2dBm or 0dBV Odbm=1mW 600 Ω

(5) Adjustment and measurement (AM/R EXT)

Input 1kHz, 1Vrms from AF OSC output to EXT MOD AM/R INPUT.
(For 1Vrms, switch the jig to "through" to match.) [D]

(2) Switch the jig to "level adjustment" and adjust VR22 so that LOW and HIGH of the EXT LEVEL LED alternately light up at " $\pm 0.3\text{dB}$ " and both LOW and HIGH go out at " $\pm 0.2\text{dB}$ ". do.

[D]

1Vrms ----- 2.2dBm or 0dBV Odbm=1mW 600 Ω

Created August 10, 2005 Revision
date Year Month Day

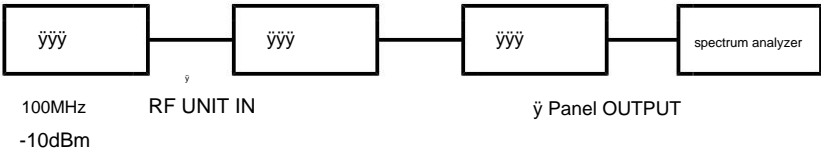
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2.5.1 Using the tester

- (1) SSG (ex. 3216) (2) Spectrum analyzer
(ex. R4131)

2.5.2 Connection with a measuring instrument

- (1) Connect the SSG and the spectrum analyzer, and when the SSG is set to 100 MHz and -10 dBm, Calibrate the level so that the display is -10 dBm.
- (2) The ATT and AMP units are built into the main unit and all wiring for power supply, control, etc. that it is
- (3) SSG on the input side (ATT input: RF UNIT side), and on the output side (AMP: panel OUTPUT) Connect a spectrum analyzer.



2.5.3 Setup and measurement

- (1) SSG to frequency 100kHz and 100MHz, output -10dBm (103dB) set.
- (2) Measure the output of both frequencies with a spectrum analyzer when the output level is set to each of the following on the panel of the main unit, and confirm that it is within the specified range.

| Output level setting | Measured value (spectrum analyzer) |
|----------------------|------------------------------------|
| | |
| | |

Note: Do not set the SSG output level above 0 dBm when the panel setting is above 101 dB. Because the devices in the AMP unit may be damaged.

- (3) Set the SSG to a frequency of 100 MHz and adjust the output level of the SSG so that the display of the spectrum analyzer is +10 dBm. (4) Measure the output with a spectrum analyzer when the output level is set to each of the following settings on the panel of the main unit in the same manner as above, and confirm that it is within the specified range.

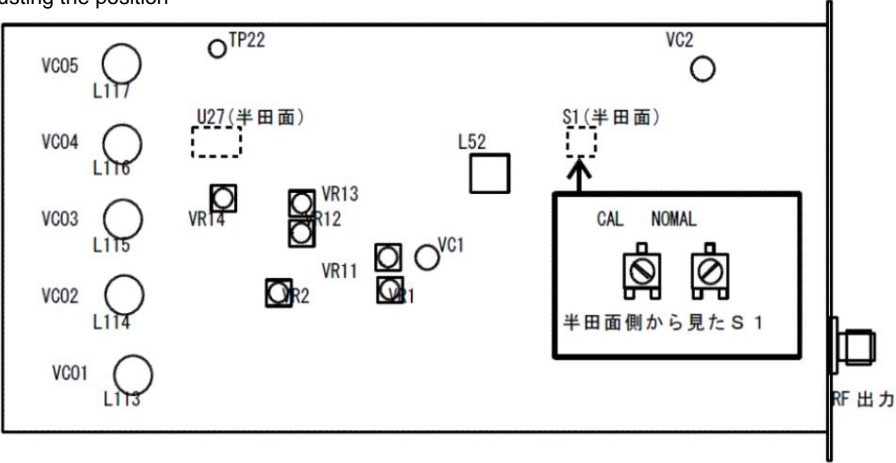
| Output level setting | Measured value (spectrum analyzer) |
|----------------------|------------------------------------|
| | |
| | |
| | |

Created on August 10, 2005 Revised on June 6, 2007

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2.6.1 Adjusting the position



2.6.2 Using the tester

- (1) Digital multimeter (2) Frequency counter (5342A) (3) Spectrum analyzer (4) Audio analyzer (5) Measuring receiver (6) Stabilized DC power supply [G]

2.6.3 VR adjustment

- (1) Confirm that all VRs are in the center position.

2.6.4 VCO voltage range adjustment (1)

Connection

Connect a digital multimeter to TP22.

(2)

Adjustment (1) Set the frequency to the lower end of each VCO in the panel setting. (2) Each L (113 to 117) is adjusted so that the voltage at the lower end of each VCO is within the specified range. (3) When the frequency is set to the upper end of each VCO in the panel settings, the voltage is the specified voltage. Confirm that

| VCO Lower frequency | Lower voltage | Adjustment L | Upper frequency | Upper voltage | |
|-----------------------|---------------|--|----------------------|---------------|--|
| ~~~~~ | ~~~~~ | $3.5V \pm 0.05V$ | L113 | 54.999MHz | $8.1V \pm 0.5V$ |
| 40MHz ~~~~ 55MHz ~~~~ | ~~~~~ | $3.9V \pm 0.05V$ | L114 | 75.999MHz | $9.0V \pm 0.5V$ |
| 76MHz ~~~~ 90MHz ~~~~ | ~~~~~ | $3.8V \pm 0.05V$ | L115 | 89.999MHz | $6.2V \pm 0.5V$ |
| 110MHz | ~~~~~ | $3.5V \pm 0.05V$ | L116 | 109.999MHz | $6.5V \pm 0.5V$ |
| | ~~~~~ | $3.0V \pm 0.05V$ | L117 | 170.000MHz | $10.4V \pm 0.5V$ |
| $2.85V \pm 0.05V$ [G] | | | $10.7V \pm 0.8V$ [B] | | |

- [G] { (3) VCO5 oscillation check } Set the frequency to 170MHz and supply TP22 with 1.7V from the DC stabilized power supply. (2) Confirm with a spectrum analyzer that the VCO5 oscillation does not stop (check the RF output with a spectrum analyzer). Since the VT voltage becomes the lower limit at about 2 V, it oscillates around 100 MHz. Spectrum analyzer settings are automatic except for frequencies of 10 to 200 MHz and Reference Lv of 20 dBm.

Created August 10, 2005 Revision
date Year Month Day

2.6.5 Reference X'tal Oscillator Tuning

- (1)
Connection Connect the frequency counter (5342A) to the RF output terminal.
- (2)
Adjustment Adjust VC2 so that the frequency is $100\text{MHz} \pm 10\text{Hz}$.

2.6.6 Adjustment of 80MHz LOCAL oscillator

- (1) Connection and
setting
Set S1 on the solder side to the CAL side. (Refer to the adjustment position diagram)
Connect the frequency counter (5342A) to the RF output terminal. (3) Set the frequency to 1MHz in the panel settings.
- (2)
Adjustment (1) Adjust L52 so that the oscillation frequency is $1\text{MHz} \pm 50\text{Hz}$. (2) Set S1 to the NOMAL side. (3) Confirm that the oscillation frequency is $1\text{MHz} \pm 3\text{Hz}$.

2.6.7 Adjustment of ALC level for VCO

- (1) Connection and
setting
Set the frequency to 40MHz in the panel setting.
(2) Apply the digital multimeter probe to TP1.
- (2) adjustment
VR14 is adjusted so that the voltage of TP1 is $0.35\text{V} \pm 0.1\text{V}$.

2.6.8 LOW/HIGH band level adjustment

- (1) Connection
Connect the RF output to the spectrum analyzer.
- (2)
Adjustment
Set the frequency to 1MHz and 40MHz.
(2) Adjust VR13 so that the 1MHz level is within $\pm 0.1\text{dB}$ of the 40MHz level.

Created August 10, 2005 Revision date
Year Month Day

2.6.9 Balancing DBM

(1) Connection

Connect the spectrum analyzer to the RF output terminal.

(2) Settings

• MODULATION MOD ON OFF (PILOT OFF)
• FREQUENCY 26.7MHz or 39MHz
• LEVEL 7 segment display 126dB

(3) Adjustment and

measurement • Set the frequency to 39MHz. (2) Adjust VR11 and VC1 so that the 80MHz LOCAL component is minimized. • Set the frequency to 26.7MHz. (4) Set the spectrum analyzer so that the spurious around 26.7MHz can be easily observed.

However, if the input ATT of the spectrum analyzer is too open, the input section of the spectrum analyzer will be distorted, and you may not be able to observe the spurious signal of the main unit correctly.

• Adjust VC3 so that the spurious around 26.7MHz is minimized. (6) Repeat steps (1) to (5) to minimize.

2.6.10 Spurious check (1) Connection

Connect a spectrum

analyzer to the RF output terminal.

(2) Setting

Set the frequency setting to 0.1 to 170MHz.

(3)

Measurement • Confirm that harmonics and spurious are -30 dBc or more in the entire frequency range above. confirm.

2.6.11 FM external variable frequency

adjustment

(1) Connection Connect the measuring receiver to the RF output terminal.
Input 1kHz, 1Vrms from AF OSC output to EXT MOD FM/L INPUT.

(2) Settings

RF=100MHz, MODE=MONO, SOURCE=FM/L EXT, AM=OFF
Adjust the panel FM deviation setting so that the measured value is 75kHz \pm 2kHz.
Set to 0dB in RATIO mode of measuring receiver when AF=1kHz.

(3) Adjustment

Adjust VR21 so that the deviation at 20Hz is 0.75dB based on AF=1kHz.

2.6.12 Mounting the RF UNIT and the outer housing (1) Mounting

the RF UNIT After adjusting the

RF UNIT, screw the shield case onto the T-6446. Also, the RF UNIT is screwed to the main body.

(2) Outer case mounting

Screw the lower outer housing together with the cord legs. Install the upper outer housing (do not screw).

Created August 10, 2005 Revision
date Year Month Day

2.7 ALC, AM, FM output adjustment POWER & AF T-6402

2.7.1 ALC coarse adjustment

(1)

Connection Connect the measuring receiver to the output terminal of the panel.

Note) Be sure to use the measuring receiver and sensor.

(2) Setting

| | |
|--------------------|-----------------------|
| Panel setting | |
| Frequency | 39.9999MHz and 170MHz |
| Output level 126dB | |
| | |

(3)

Adjustment • Set SHIFT+9930+ADDRESS on the main unit

panel. • When the last 3 digits of "dA0" on the FREQUENCY display section are set to "FFF" with the rotary knob,

Confirm that the output level is +19 dBm or higher.

• If it is less than +19dBm, adjust VR33 of T-6402.

2.7.2 AM Coarse Adjustment

(1)

Connection Connect the measuring receiver to the output terminal of the panel.

(2) Setting

| | |
|-------------------------------------|--------------------|
| Panel | |
| setting | |
| Frequency MOD | |
| AM | |
| SOURCE INT 1kHz, AM/R EXT switching | Output level 124dB |

(3)

Adjustment • Turn on the AM/R EXT SW and input 1kHz, 1Vrms from the external OSC to the EXT MOD INPUT

AM/R. (2) Set SHIFT+9930+ADDRESS on the main unit panel, and display "dA0" on the FREQUENCY display.

is displayed. • Set

to "dA0900" with the rotary knob. • Press the AMPTD key of EDIT once to

display "dA2" on the FREQUENCY display. • Set to "dA25b0" with the rotary knob. • Adjust VR32 of T-6402 so that the degree of modulation is 30%. • Set INT AF to 1kHz and set • to •. • Adjust

VR2 of T-6389 so that the degree of modulation is 30%.

Created August 10, 2005 Revision
date Year Month Day

2.7.3 FM coarse adjustment

- (1)
Connection Connect the measuring receiver to the output terminal of the panel.

(2) Setting

| Panel setting | |
|---------------|-------------------|
| Frequency | 110MHz and 170MHz |
| yyy | yy |
| yy | yyyyyy |
| yyy | yyy |
| yyy | yyy |

- (3)
Adjustment Set SHIFT+9931+ADDRESS on the main unit panel.

When the last 3 digits of "dA1yy" on the FREQUENCY display are set to "FFF" with the rotary knob,
Confirm that the FM modulation depth is 200 kHz or higher.

If it is less than 200kHz, adjust VR31 of T-6402.

Created August 10, 2005 Revision date
Year Month Day

3. calibration

After "2. Operation adjustment" is completed, perform automatic correction of the output level and the degree of modulation. Tighten the outer housing of the main body and age it sufficiently. Also, the measuring equipment to be used should be sufficiently aged.

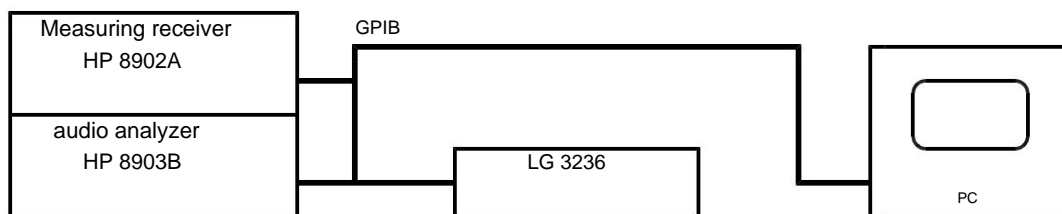
Note) Set the panel setting to the factory setting.

After that, set the GPIB address of the main unit to "2".

3.1 Measuring instruments

used (1) Measuring receiver HP 8902A
(2) Audio analyzer (3) PC HP 8903B (can be omitted for correction data acquisition)
(correction software "Automatic Measurement System for SSG" installed) (4) GPIB cable, GPIB card

3.2 Connection

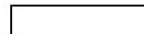


3.3 Operation

procedure (1) Start up the correction software "Automatic Measurement System for SSG" on the PC.
(2) The operation screen of the correction software is displayed. (3) Correction items are composed of the following four types.

yyyy yy yyyy yy yy
y yy yy yy

For each correction item there are get and send buttons.



- (4) Click on Acquisition and transmission of all correction data to obtain the correction data after checking each connected device.
Start acquisition. During data acquisition, the text on the button changes to Communicating.
After all correction data is acquired, the data is automatically sent to the main unit.
- (5) When the message "Finished" appears, click OK to start the calibration.
finish.

3.4 Operation check

After calibration, check the AM modulation depth and AM distortion rate with the measuring receiver. •Panel settings

FREQ=0.2 2MHz LEVEL=126dBu MOD ON AM=30% FM=OFF INT=1kHz

(1) AM modulation index

If it is out of 30%±1% (29 to 31%) at 2MHz, calibrate only AM again.

(2) AM distortion rate

If it is 0.39% or more at 0.2MHz, replace D10 and 11 in the AMP UNIT.

If re-CAL in (1) and changed in (2), check again.

Created on August 10, 2005 Revised on
March 19, 2007

4. Board operation and adjustment (2)

4.1 Simultaneous modulation T-6389

4.1.1 MONO/MAIN, L/R adjustment

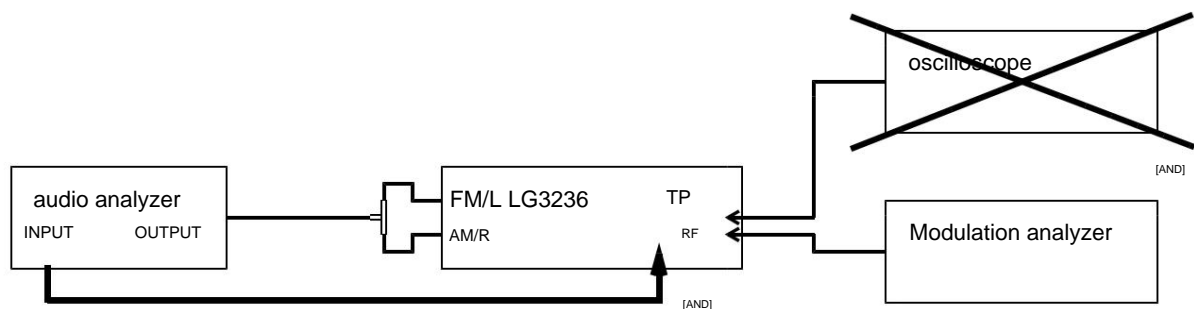
(1) Measuring

~~instruments used~~ ÷ Oscilloscope

[E] ÷ Modulation analyzer ÷ Audio analyzer

Each TP, IC pin voltage measurement, VR adjustment use an audio analyzer. [E]

(2) Connection with measuring instrument



(3) Panel settings

| | |
|-------------|---------------------|
| AGAINST | ON |
| FM | |
| MODE/SOURCE | ON Switch as needed |
| FREQUENCY | 100MHz |

(4) Adjustment and

measurement ÷ Set MODE = MONO, INT = 1kHz, MOD = 75kHz.
Make sure it's 75kHz.

(2) Set MODE to MAIN and adjust VR11 so that the amplitude of TP15 is the same as MONO.
At this time, confirm that MAIN is set to 75kHz.

÷ Set SOURCE to EXT for both FM and AM, and set 1kHz, 1Vrms from AF OSC to EXT MOD FM/L, AM/R INPUT.
input.

÷ Set VR3 (T-4088) to the middle point of the rotation range (after that, do not move VR3). [C]

~~÷ Adjust VR12 so that the amplitude of TP11 is the same as that of TP13. At this time, confirm that the FM deviation is 67.5kHz. [E]~~

[C] ÷ Make sure that the signal level of TP2 of the T-4088 is the same as the signal level of pin 13 of IC5 of the T-4088.
Adjust VR12 on T-6389. At this time, confirm that the FM deviation is 67.5kHz.

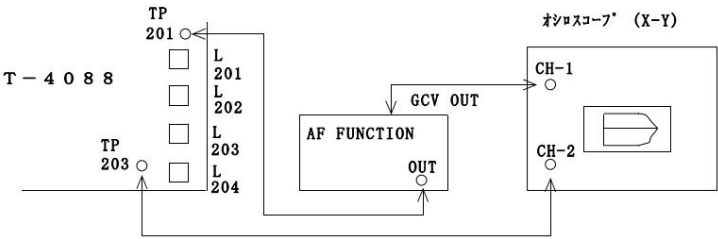
[AND]

Created August 10, 2005 Revision date Year
Month Day

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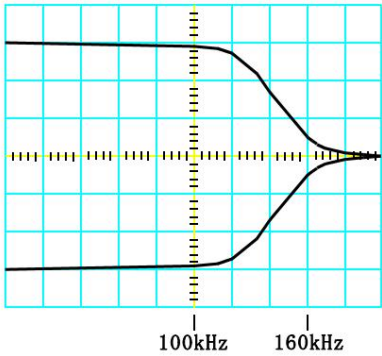
- (1) Using a measuring device  
Oscilloscope AF  
FUNCTION GENERATOR

- (2) Connection with measuring instrument



- (3) Instrument panel setting  
MODULATION  
~~~~~  
~~~~~

- (4) Adjustment and measurement  
Input the sweep waveform of ~200kHz from AF FUNCTION GENERATOR to T-4088 TP201. Set the input level so that the TP203 waveform is not distorted.  
Adjust the coils L201 to L204 so that the sweep waveform of TP203 looks like the figure below.



f	div on oscilloscope
characteristic 10kHz ~~~~~	
0dB (standard) 100kHz ~ -0.4dB	screen 6div 5.7div
120kHz ~ -0.8dB	5.43div
140kHz ~ -5dB	3.37div
160kHz ~ -16dB	0.95div

<Reference>  
L201 .....Adjustment of slope around 120kHz L204.....Low range (Adjustment of flatness around 40kHz)  
L202,L203~~~80kHz cutoff

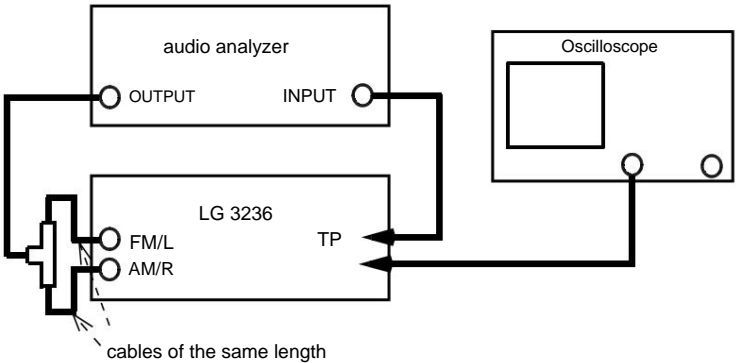
\*Note: Up to  
100kHz, it should be as flat as possible, and after that, it should be attenuated, and at 160kHz, it  
should be as flat as possible.

Created: August 10, 2005 Revised: March 26, 2007

~~~~~ ~~~~~

- (1) Using a measuring device
~ Oscilloscope ~ Audio
Analyzer

- (2) Connection with measuring
instruments ~ FM/L EXT, AM/R EXT



- (3) Panel setting ~
- | | | |
|------------|----------|---|
| MODULATION | SOURCE | Switch if necessary. Switch if necessary. |
| | STEREO | |
| | FREQ | 7MHz or more <u>90MHz</u> [F] |
| | FM 75kHz | ON |
| | PILOT | OFF |

* All audio analyzer filters are OFF

Created on August 10, 2005 Revised
on March 19, 2007

(4) Adjustment and measurement

- Set SOURCE to INT AF 1kHz and MODULATION to 67.5kHz.
- Press the MAIN button to switch to STEREO MAIN mode, and confirm that the TP51 AF LEVEL is about 1.2Vp-p.
- At this time, set the audio analyzer so that the TP51 AF LEVEL is 100% standard (0dB).
- Press the L button to enter STEREO L mode, and set the TP51 AF LEVEL to 50% (-6dB) of STEREO MAIN mode.
Adjust VR2 so that
- Press the SUB button to switch to STEREO SUB mode and check that the TP52 AF LEVEL is about 5Vp-p.
- At this time, set the audio analyzer so that the TP52 AF LEVEL is 100% standard (0 dB).
- Press the L button to enter STEREO L mode, and set the TP52 AF LEVEL to 50% (-6dB) of STEREO SUB mode.
Check if it is
- External modulation mode EXT L/R, 400Hz 1Vrms from audio analyzer to FM/L and AM/R simultaneously
~~to enter. Input to FM/L. At this time, set the audio analyzer so that the TP52 AF LEVEL is 100% reference (0 dB). [E]~~
- ~~Adjust VR53 so that AF LEVEL of TP52 is the minimum (target is 0Vp-p). [E]~~
- Change the connection of the audio analyzer output from FM/L to AM/R. At this time, AF LEVEL of TP52 is
Adjust VR53 for 0dB. [E]
- Set the external modulation mode to EXT L/R, and input 400Hz 1 Vrms from the audio analyzer to FM/L.
- (11) At this time, set the audio analyzer so that the TP51 AF LEVEL is 100% standard (0 dB).
- (12) Set the external modulation mode to EXT L/R, and input 400Hz 1 Vrms from the audio analyzer to AM/R.
- At this time, adjust VR51 so that AF LEVEL of TP51 is 100% standard (0dB).

Created: August 10, 2005 Revised: March 26, 2007

~~~~~

- (1) Using a measuring device

~ Oscilloscope ~ Frequency counter
- (2) Connection with the measuring instrument

~ Connect the measuring instrument to each TP terminal on the T-4088 board.
- (3) Panel setting ~

MODULATION

MOD ON

PILOT 7

segment display

OFF

ON PILOT 7.5kHz
- (4) Adjustment and measurement

~ Adjust VC101 so that the frequency at TP104 is 4.864MHz. ~ Confirm that the AF frequency of TP101 is 19kHz ± 2Hz. ~ Adjust VR103 so that the PILOT LEVEL at TP203 is about 140mVp-p. (coarse adjustment)

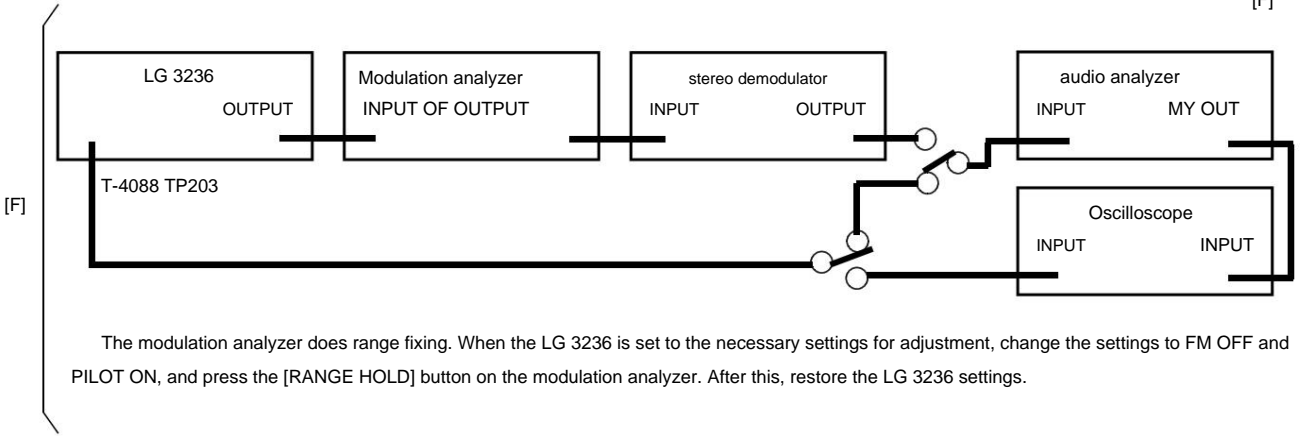
~~~~~

- (1) Using a measuring device

~ Oscilloscope ~ Audio Analyzer ~ Modulation Analyzer ~ Stereo Demodulator

- (2) Connection with the measuring instrument

~ Connect the measuring instrument to each TP terminal on the T-4088 board. Make the connection as shown below.



- (3) Panel setting ~

MODULATION

SOURCE

STEREO

FREQ

FM 67.5kHz

PILOT

LEVEL

Switch as necessary

as necessary

~~4MHz or more~~ 90MHz [F]

ON

OFF

126dBuV [F]

Created: August 10, 2005 Revised:
March 26, 2007

(4) Adjustment and

measurement of SOURCE FM/L EXT, AM/R EXT (external AF no signal). (2) Adjust VR151 and 152 so that the 38kHz component at TP203 is minimized. (Use millivolts) of SOURCE INT AF 1kHz, STEREO SUB. of Adjust

VR151-153 so that the SUB waveform at TP203 is vertically symmetrical. [F]

Minimal stereo demodulator output level after RF demodulation (modulation analyzer output)

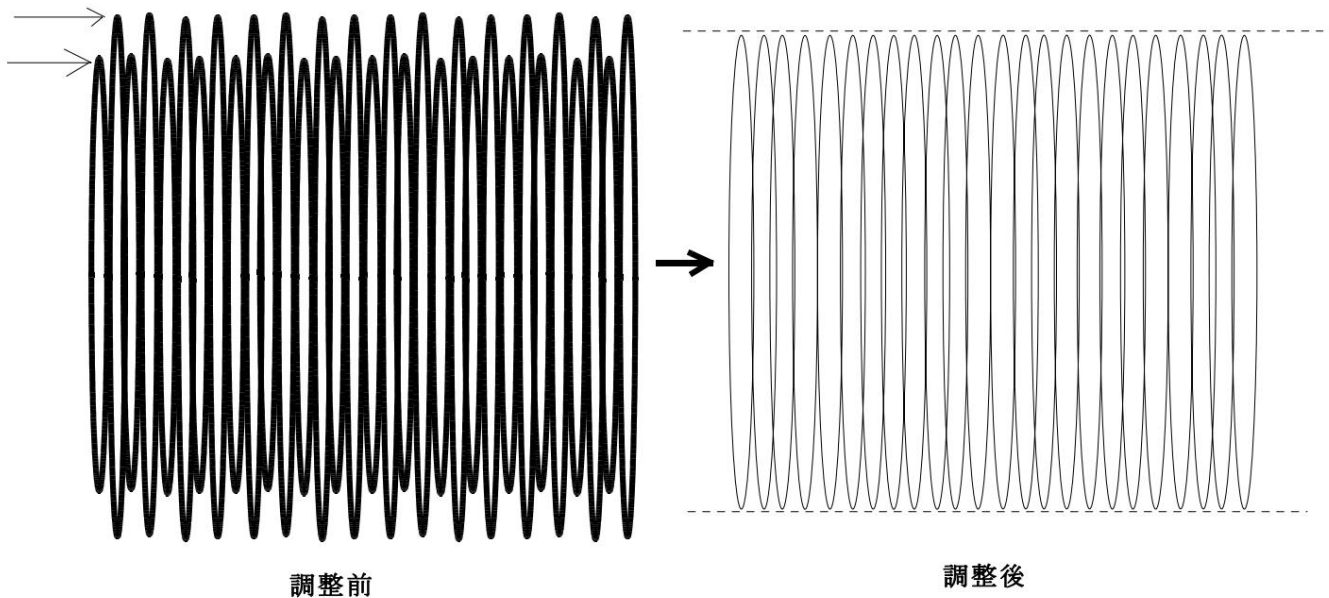
Adjust the VR153 so that [F]

If level adjustment with an audio analyzer is difficult, adjust while monitoring the output waveform of the stereo demodulator with an oscilloscope. However, the adjustment should be made with the indicated value of the audio analyzer.

[F] of

Confirm that the SUB waveform of TP203 of T-4088 is vertically symmetrical even if the FM MOD is changed in magnitude.

[F]



Created August 10, 2005 Revision date Year
Month Day

4.2.5 PILOT phase calibration

(1) Using a measuring device

• Oscilloscope Note) Use
SONY Tektronix (because the phase between channels is guaranteed)

(2) Connection with the

measuring instrument • Connect the measuring instrument to each TP terminal on the T-4088 board.

(3) Panel settings

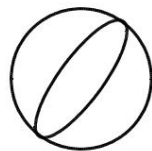
| | |
|-------------------|--------|
| MODULATION MOD ON | OFF |
| FM | ON |
| PILOT 7 | ON |
| segment display | 7.5kHz |
| MAIN | ON |

(4) Adjustment and measurement

• Calibrate the phases of CH-1 and CH-2 of the oscilloscope.

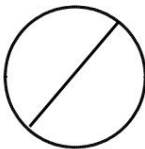
• Input T-4088 P101 (PILOT OUT for S1 specification) to CH-1 and T-6402 TP32 to CH-2 respectively, and set the oscilloscope to XY mode (CH-1 200mV/div, CH-2 20mV/div). do.

• Adjust VR102 of T-4088 so that it looks like (b) below (so that the middle point overlaps).

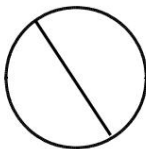


yy

out of phase



yy



yy

180° out of phase

Created August 10, 2005 Revision date Year Month
Day

4.2.6 PILOT, phase calibration with 38 kHz subcarrier

(1) Using a measuring device

• Oscilloscope

(2) Connecting to Measuring

Instruments • Connect to each TP terminal on the board of T-4088, T-6402.

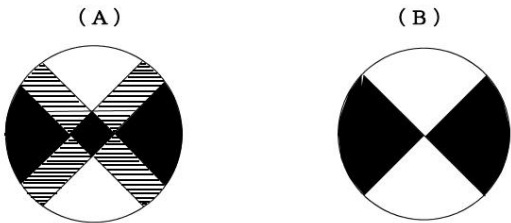
(3) Panel setting •

| | | |
|------------|-----------------|---------|
| MODULATION | SOURCE INT | 1kHz ON |
| | STEREO SUB | ON |
| | MOD ON | ON |
| | FM | ON |
| | PILOT 7 | OFF |
| | segment display | 67.5kHz |

(4) Adjustment and

measurement • Calibrate the phases of CH-1 and CH-2 of the oscilloscope. • Input T-4088 P101

(PILOT OUT for S1 specification) to CH-1 and T-6402 TP32 to CH-2 respectively, and set the oscilloscope to XY mode (CH-1, CH-2 200mV/div). • Adjust VR101 so that it looks like (B) below.



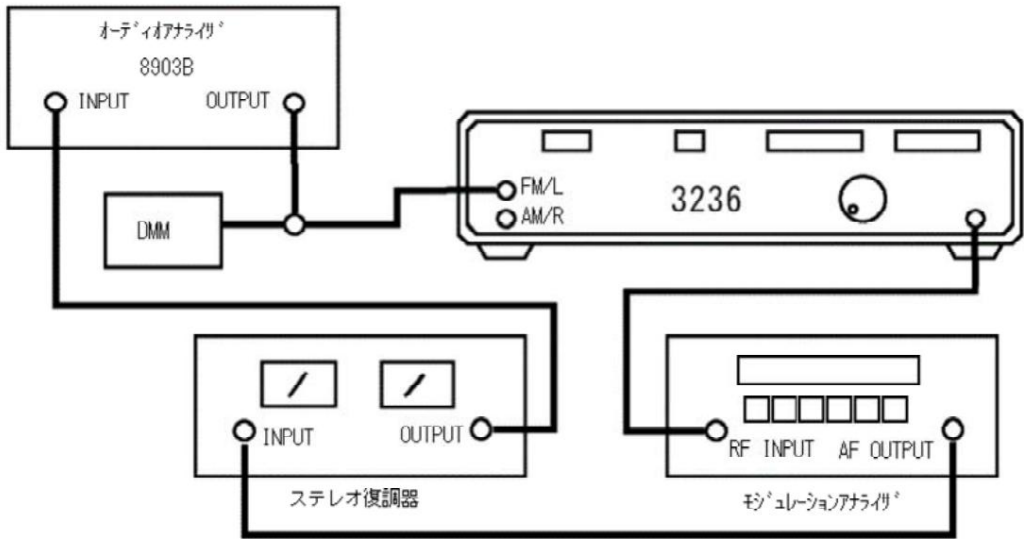
The center will not be a perfect point, but it will be adjusted so that it overlaps as a whole.

Created August 10, 2005 Revision date Year Month
Day

4.2.7 STEREO separation

- (1) Measuring instruments
- used ~ Audio analyzer ~ Stereo demodulator
 - ~ Digital multimeter ~ Modulation analyzer

(2) Connection with measuring instrument



(3) Panel settings

| | | |
|------------|-----------------|----|
| MODULATION | SOURCE FM/L EXT | ON |
| | STEREO L | ON |
| | MOD | ON |
| | ON FM 67.5kHz | ON |
| | PILOT 7.5kHz | ON |
| LEVEL | 126dB ~ | |
| FREQ | 90MHz | |

Connect the audio output of the audio analyzer to the LG 3236's FM/L connector, and change the modulation mode with L.

☐ ☐ R button

Created on August 10, 2005 Revised
on March 19, 2007

(4) Adjustment and measurement

• Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT FM/L.

• Set LG 3236 to FM MOD OFF and set it to PILOT only.

• Set the modulation analyzer to FM mode and adjust VR103 of the T-4088 so that the modulation analyzer indicates 7.50kHz.

(4) Set the LG 3236 to standard modulation and press the HOLD button on the modulation analyzer to fix the range (LG 3236 standard modulation setting button operation is SHIFT • FM ST 27.8k).

• Restore the modulation depth of the LG 3236, set it to FM MOD ON, and press the L button to set the modulation mode to L (The operation to restore the modulation depth of the LG 3236 is SHIFT • FM ST 75k).

• Push the PILOT LEVEL button of the stereo demodulator and adjust the LEVEL volume of the stereo demodulator so that the meter indication of the stereo demodulator is 10%.

• Set the audio analyzer so that the stereo demodulator output level is 0 dB.

• Press the R button on the stereo demodulator to set the mode to STEREO R.

• Adjust VR54 and VR101 of T-4088 so that the output of the stereo demodulator is minimized.

(10) Set the output frequency of the audio analyzer to 10kHz. Leave the stereo demodulator mode at STEREO R.

(11) Adjust VR52 of the T-4088 so that the output of the stereo demodulator is minimized.

(12) Set the output frequency of the audio analyzer to 30Hz.

(13) Adjust VR56 so that the output of the stereo demodulator is minimized.

• Repeat steps • to •.

• Press the R button on the LG 3236 to set the modulation mode to R, and press the L button on the stereo demodulator to set it to STEREO L. Measure separation. [E]

[AND]

(16) Set the LG 3236 to external modulation mode (both FM/L and AM/R are On). (17) Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT FM/L. (18) Press the L button of the stereo demodulator to set the output mode to L. Set the AF signal level from the stereo demodulator to 0 dB using the audio analyzer, press the R button of the stereo demodulator, and measure the separation. (19) Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT AM/R. (2) Press the R button of the stereo demodulator to set the output mode to R, set the AF signal level from the stereo demodulator to 0 dB with the audio analyzer, press the L button of the stereo demodulator, and measure the separation.

Confirm that the separation is 56 dB or more in both steps • to • and steps • to •. If the separation is less than 56dB, readjust from 4.2.2 MATRIX.

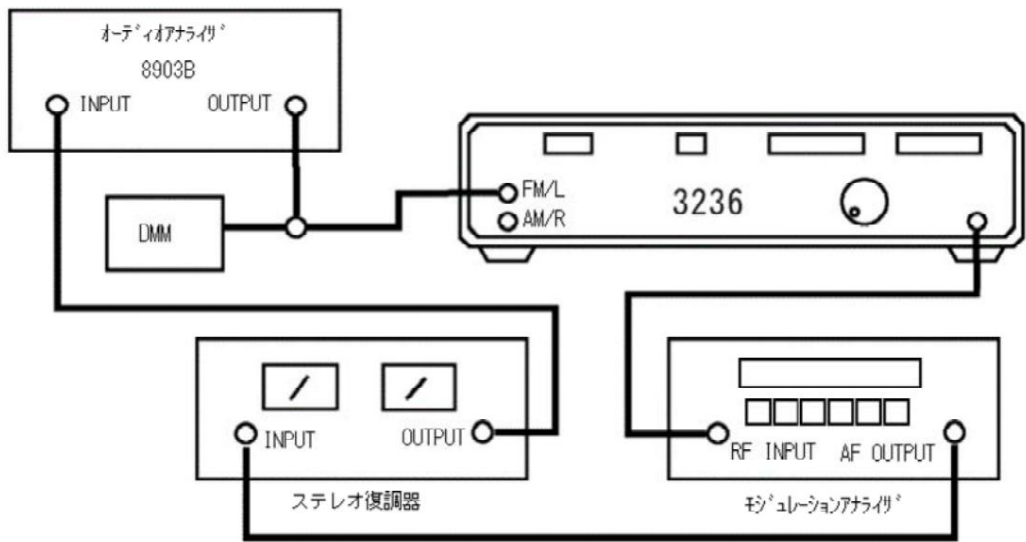
Created August 10, 2005 Revision date
Year Month Day

~~~~~ ST~~~~~

- (1) Using a measuring device  
~ Modulation Analyzer ~ Audio Analyzer ~  
Stereo Demodulator

The stereo demodulator should be calibrated in advance according to the procedure on page 32, "How to use the Nittsu Model 5185 stereo demodulator."

- (2) Connection with measuring instrument



- (3) Settings
- |                |                                |
|----------------|--------------------------------|
| Panel settings |                                |
| FREQ           | Switch as needed               |
| LEVEL          | 126dB ~                        |
| SOURCE         | Switch as needed               |
| STEREO         | Switch as needed               |
| MOD ON         | ON                             |
| FM 67.5kHz     |                                |
| PILOT 7.5kHz   | ON ON/OFF Switch as necessary. |

Modulation analyzer settings All OFF

Created on August 10, 2005 Revised on  
March 19, 2007

(4) Adjustment and measurement

(1) Set the frequency to 90MHz, set PILOT ON, FM MOD OFF, FM/L EXT, and connect the 3236 output to the modulation analyzer. Set the modulation analyzer to FM mode.

• Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT FM/L.

• Confirm that the indication of the modulation analyzer is  $7.50 \pm 1\text{kHz}$ .

(4) Set the LG 3236 to standard modulation, and press the HOLD button on the modulation analyzer to fix the range (the standard modulation setting button operation for the LG 3236 is SHIFT • FM ST 27.8k).

• Restore the modulation depth of the LG 3236, set it to FM MOD ON, and press the L button to set the modulation mode to L (The operation to restore the modulation depth of the LG 3236 is SHIFT • FM ST 75k).

• Push the PILOT LEVEL button of the stereo demodulator and adjust the LEVEL volume of the stereo demodulator so that the meter indication of the stereo demodulator is 10%.

• When the L button of the stereo demodulator is pressed to set the output mode to L, the output from the stereo demodulator Set the AF signal level to 0dB on the audio analyzer, press the R button on the stereo demodulator and measure the separation.

• Press the R switch on the LG 3236 to set the modulation mode to R.

When the stereo demodulator's R button is pressed to set the output mode to R, the output from the stereo demodulator's output is Set the AF signal level to 0dB on the audio analyzer, press the L button on the stereo demodulator, and measure the separation.

• Confirm that the separation is 56dB or more at 76 and 108MHz.

• Set LG3236 to external modulation mode (FM/L and AM/R are both On).

• Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT FM/L.

• When the L button of the stereo demodulator is pressed to set the output mode to L, the output from the stereo demodulator Set the AF signal level to 0dB on the audio analyzer, press the R button on the stereo demodulator and measure the separation.

[AND]

(13) Input 1kHz, 1Vrms from the audio analyzer to EXT MOD INPUT AM/R.

• Press the R button on the stereo demodulator to set the output mode to R, set the AF signal level from the output of the stereo demodulator to 0dB with an audio analyzer, press the L button on the stereo demodulator, and measure the separation. .

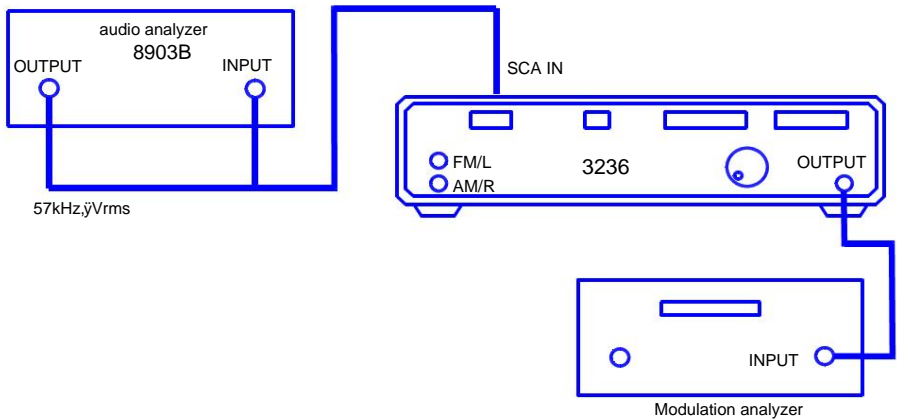
• Confirm that the separation is 56 dB or more at 76 and 108 MHz during external modulation.

Created August 10, 2005 Revision date Year Month Day

4.2.9 SCA FM MOD (S1 specification only)

- (1) Using a measuring device  
    ~ Modulation Analyzer ~ Audio Analyzer

(2) Connection with measuring instrument



(3) Settings

|                            |         |
|----------------------------|---------|
| Panel settings             |         |
| FREQ                       | 90MHz   |
| RF LEVEL                   | 126dB m |
| MOD ON 0kHz                | ON      |
| FM                         | ON      |
| PILOT                      | OFF     |
| Modulation Analyzer Filter |         |
|                            | OFF     |

(4) Adjustment and measurement

Input a 57 kHz, 1 V rms sine wave to SCA IN and adjust VR201 so that the FM deviation is 3.75 kHz.

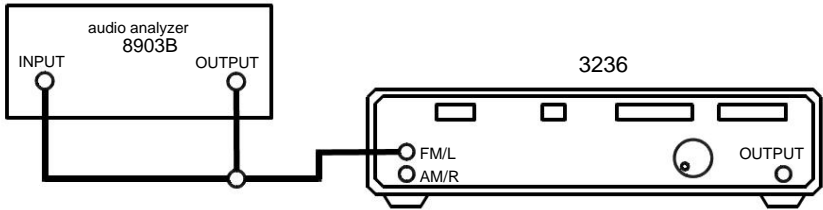
4.3 Checking pre-emphasis characteristics

- (1) Measuring instruments used

AF OSC

Millibar
- or audio analyzer

(2) Connection with measuring instrument



Measuring point  
MONO or ST/L → TP22 (T-6402 AF)  
ST/R → TP2(T-4088 STEREO)

- (3) Panel settings
- F=90MHz,MOD ON,FM ON,FM 75kHz,MONO,EXT FM/L or EXT AM/R,Pre-emphasis 50/75 μS

- (4) Confirmation method
- Input 1kHz or 10kHz, 1Vrms from external AF OSC to EXT FM/L.  
Set the FM/L EXT key to ON.
- (2) Compared to the value of millibar at TP22 of T-6402 when pre-emphasis is OFF,  
Make sure it meets the following standards.
- Input 1kHz or 10kHz, 1Vrms from external AF OSC to EXT AM/R.  
Set the AM/R EXT key to ON.
- Compared to the value of millibar at TP2 of T-4088 with pre-emphasis OFF,  
Make sure it meets the following standards.

|    |      |         |
|----|------|---------|
| μV | μV S | μV ± μV |
|    |      | μV ± μV |
|    | μV   | μV ± μV |
|    |      | μV ± μV |
| μV | μV S | μV ± μV |
|    |      | μV ± μV |
|    | μV   | μV ± μV |
|    |      | μV ± μV |

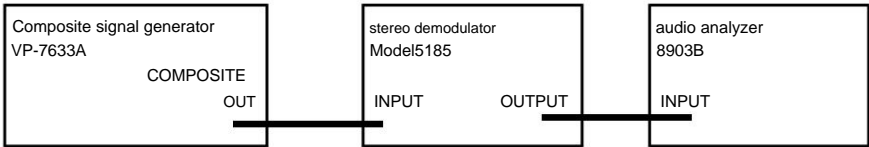


How to use Nittsu Model5185 stereo demodulator

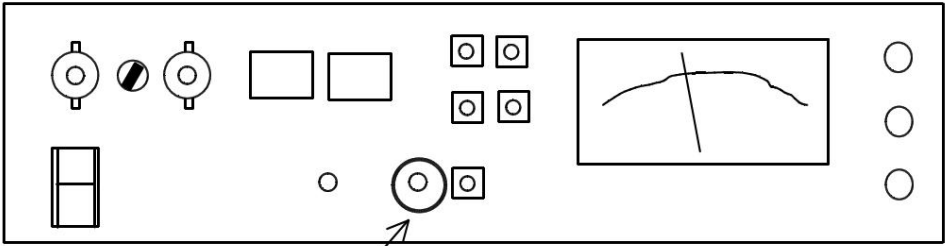
1. Calibration method

Nittsu Model 5185 is calibrated according to the following procedure. Do not use the Model5185 self-calibration function. Also, do not calibrate unless necessary.

Connection diagram



1) Aging for 2 hours or more before adjustment and measurement. 2) Connect the composite signal output of VP-7633A to the input terminal of Model5185. 3) At AF 1[kHz], the Model5185 is adjusted so that the separation is the best (60[dB] or more) for both L<sub>y</sub>R and R<sub>y</sub>L. Adjust with the PILOT PHASE adjustment volume.



PILOT PHASE adjustment volume

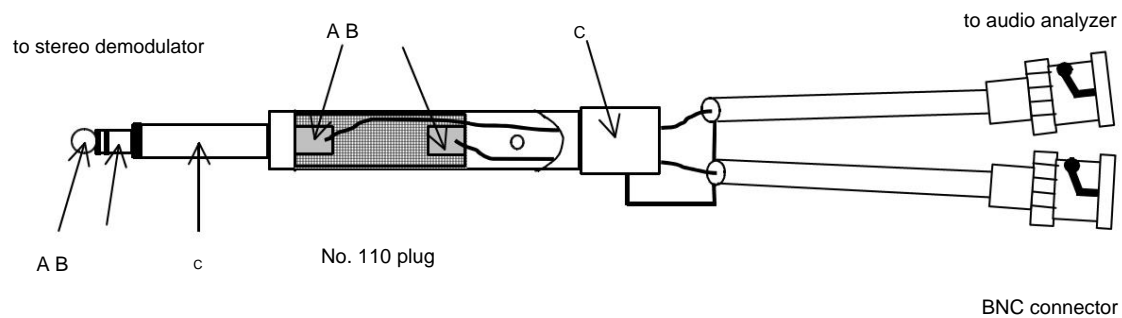
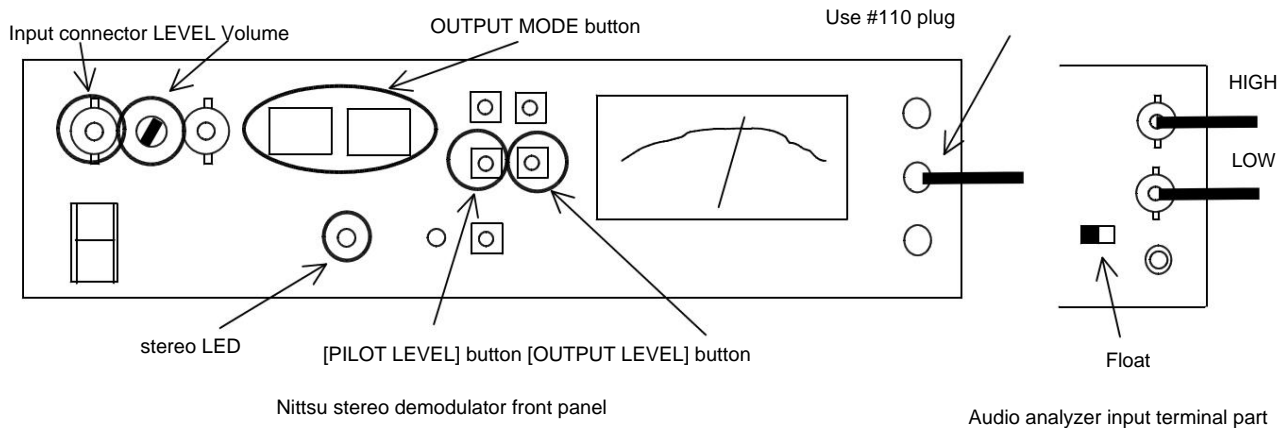
Nittsu stereo demodulator front panel

Created August 10, 2005 Revision  
date Year Month Day

## 2. Instructions

Input level (PILOT modulation level) adjustment for stereo separation measurement

1) Input a stereo signal. Confirm that the stereo LED is lit. 2) Press the [PILOT LEVEL] button to set the indicated value of the demodulator to PILOT mode. Confirm that the LED of the [PILOT LEVEL] button is lit. 3) Adjust the LEVEL volume so that the meter reading is 10[%]. The stereo demodulator output connector is for balanced output. Use the connected audio analyzer in differential input (balanced input) mode. Use a No. 110 plug-BNC cable and connect it to the SELECT output terminal on the front panel and the input terminal of the audio analyzer. 4) The stereo demodulator meter is switched by the mode switch. The [PILOT LEVEL] button displays the PILOT modulation level, and the [OUTPUT LEVEL] switch displays the output level. 5) Press the OUTPUT MODE switch to L/MONO or R to output the selected signal to the SELECT connector.



No. 110 plug - BNC cable connection diagram