MS2665C/67C/68C
Spectrum Analyzer
Operation Manual
Vol. 1
(Basic Operating Instructions)

15th Edition

For safety and warning information, please read this manual before attempting to use the equipment.
Keep this manual with the equipment.

ANRITSU CORPORATION

Document No.: M-W1335AE-15.0

Safety Symbols

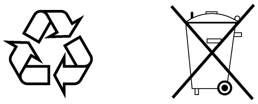
To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

DANGER ⚠	This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
WARNING ⚠	This indicates a hazardous procedure that could result in serious injury or death if not performed properly.
CAUTION ⚠	This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

🛇	This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.
○	This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.
△	This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.
□	This indicates a note. The contents are described in the box.
	These indicate that the marked part should be recycled.

MS2665C/67C/68C
Spectrum Analyzer
Operation Manual Vol. 1 (Basic Operating Instructions)

28 November 1997 (First Edition)
12 December 2007 (15th Edition)

Printed in Japan

For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

2. IEC 61010 Standard
   The IEC 61010 standard specifies four categories to ensure that an instrument is used only at locations where it is safe to make measurements. This instrument is designed for measurement category I (CAT I). DO NOT use this instrument at locations specified as category II, III, or IV as defined below.
   Measurement category I (CAT I):
   Secondary circuits of a device that is not directly connected to a power outlet.
   Measurement category II (CAT II):
   Primary circuits of a device that is directly connected to a power outlet, e.g., portable tools or home appliance.
   Measurement category III (CAT III):
   Primary circuits of a device (fixed equipment) to which power is supplied directly from the distribution panel, and circuits running from the distribution panel to power outlet.
   Measurement category IV (CAT IV):
   Building service-line entrance circuits, and circuits running from the service-line entrance to the meter or primary circuit breaker (distribution panel).

Electric Shock

3. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with an earth terminal. If power is supplied without earthing the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

For Safety

WARNING ⚠

Repair

WARNING ⚠

4. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Calibration

5. The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed. Be careful not to break the seal by opening the equipment or unit covers.

Falling Over

6. This equipment should always be positioned in the correct manner. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
   Always set up the equipment in a position where the power switch can be reached without difficulty.

Battery Fluid

7. DO NOT short the battery terminals and never attempt to disassemble the battery or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak. This fluid is poisonous.
   DO NOT touch the battery fluid, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

8. This instrument uses a Liquid Crystal Display (LCD). DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

CAUTION ⚠

Fuse Replacement

CAUTION ⚠

1. Always remove the mains power cable from the power outlet before replacing blown fuses. There is a risk of electric shock if fuses are replaced with the power cable connected. Always use new fuses of the type and rating specified on the rear panel of the instrument. There is a risk of fire if a fuse of a different rating is used.

   T5A indicates a time-lag fuse.

Cleaning

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Check Terminal

⚠

3. Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.
   - Maximum DC voltage ratings:
     RF Input DC 0 V
   - Maximum AC power ratings:
     RF Input +30 dBm
   - NEVER input a >+30 dBm and >DC 0 V power to RF Input.
   - Excessive power may damage the internal circuits.

For Safety

CAUTION ⚠

Replacing Memory Back-up Battery

This equipment uses a Poly-carbomonofluoride lithium battery to backup the memory. This battery must be replaced by service personnel when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

Note: The battery used in this equipment has a maximum useful life of 7 years. It should be replaced before this period has elapsed.

External Storage Media

This equipment uses memory cards as external storage media for storing data and programs.

If this media is mishandled or becomes faulty, important data may be lost. To prevent this chance occurrence, all important data and programs should be backed-up.

<u>Anritsu will not be held responsible for lost data.</u>

Pay careful attention to the following points.

- Never remove the memory card from the instrument while it is being accessed.
- The memory card may be damaged by static electric charges.
- The back-up battery in SRAM memory cards has a finite life. Replace the battery periodically. For details, refer to the explanation on the memory card later in this manual.
- Anritsu has thoroughly tested all external storage media shipped with this instrument. Users should note that external storage media not shipped with this instrument may not have been tested by Anritsu, thus Anritsu cannot guarantee the performance or suitability of such media.

Use in a residential environment

This instrument is designed for an industrial environment.
In a residential environment this instrument may cause radio interference in which case the user may be required to take adequate measures.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault, under the condition that this warranty is void when:

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Anritsu Corporation Contact

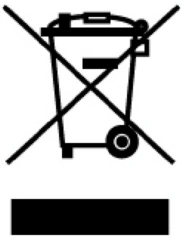
In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.
Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.
When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2002/96/EC (the “WEEE Directive”) in European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the sweep time is 1,000 seconds and data acquisition requires a long time, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, the standby function of this equipment must be modified.

ABOUT DETECTION MODE

This instrument is a spectrum analyer which uses a digital storage system. The spectrum analyzer makes level measurements in frequency steps obtained by dividing the frequency span by the number of measurement data points (501). This method of measurement cannot detect the signal peak level if the spectrum of a received signal is narrower than these frequency steps.

To resolve this problem, this instrument usually operates in positive peak detection mode and normal detection mode. In the positive peak detection mode, the highest level within the frequency range between the sample points can be held and traced. In the normal detection mode, both the positive peak and the negative peak can be traced.

Positive peak detection mode should be used for almost all measurements including normal signal level measurement, pulsed noise analysis, and others. It is impossible to measure the signal level accurately in sample detection mode or in negative peak detection mode.

Use of sample detection mode is restricted to random noise measurement, occupied frequency bandwidth measurement for analog communication systems, and adjacent-channel leakage power measurement, etc.

Measurement	Item
・ Normal signal	POS PEAK
・ Random noise	SAMPLE
・ Pulsed noise	NORMAL (POSI-NEG)
・ Occupied frequency bandwidth, adjacent-channel leakage power (for analog communication systems)	SAMPLE
・ Occupied frequency bandwidth, adjacent-channel leakage power (for digital communication systems)	POS PEAK or SAMPLE

When a detection mode is specified as one of the measurement methods, make the measurement in the specified detection mode.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

CE

1. Product Model

Model: MS2665C/MS2667C/MS2668C Spectrum Analyzer

2. Applied Directive

EMC: Directive 2004/108/EC
LVD: Directive 2006/95/EC

3. Applied Standards

- EMC: Emission: EN 61326-1: 2006 (Class A)
  Immunity: EN 61326-1: 2006 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-8 (RPFMF)	A
IEC 61000-4-11 (V dip/short)	B, C

*: Performance Criteria

A: During testing, normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Harmonic current emissions:
EN 61000-3-2: 2006 (Class A equipment)

- LVD: EN 61010-1: 2001 (Pollution Degree 2)

4. Authorized representative

Name:	Loic Metais European Quality Manager ANRITSU S.A. France
Address, city:	16/18 Avenue du Québec SILIC 720 Zone de Courtaboeuf 91951 Les Ulis Cedex
Country:	France

C-tick Conformity Marking

Anritsu affixes the C-tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-tick marking

N274

1. Product Model

Model: MS2665C/MS2667C/MS2668C Spectrum Analyzer

2. Applied Standards

EMC:Emission: EN 61326-1: 2006 (Class A equipment)

Power Line Fuse Protection

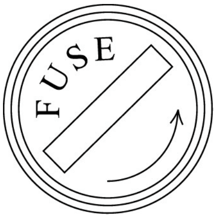
For safety, Anritsu products have either one or two fuses in the AC power lines as requested by the customer when ordering.

Single fuse: A fuse is inserted in one of the AC power lines.

Double fuse: A fuse is inserted in each of the AC power lines.

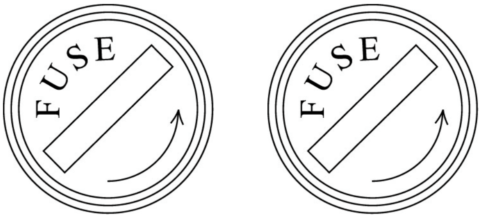
Example 1: An example of the single fuse is shown below:

Fuse Holder



Example 2: An example of the double fuse is shown below:

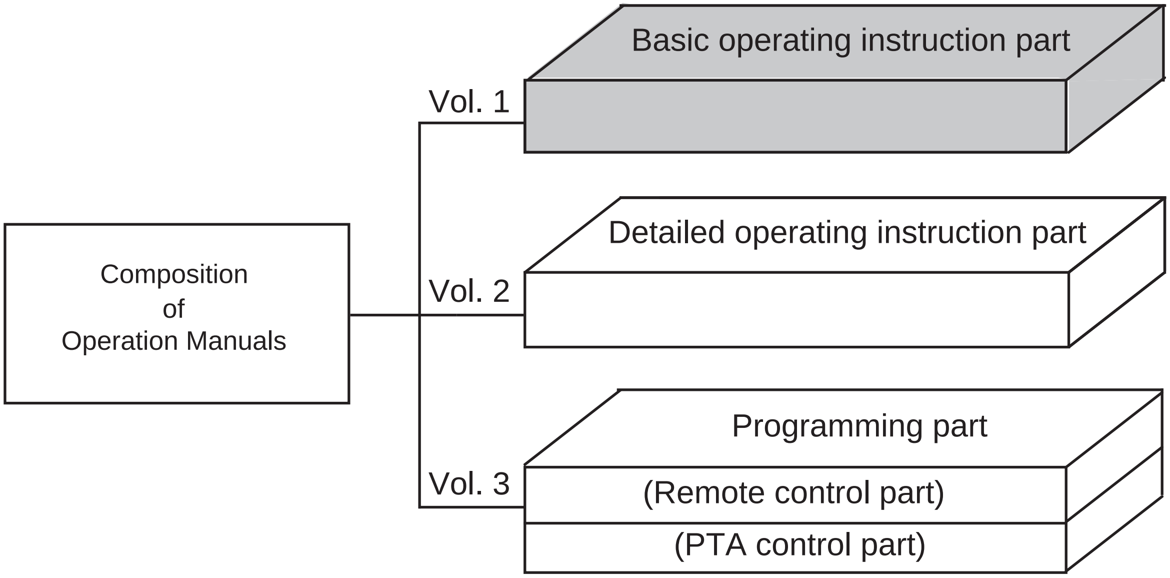
Fuse Holders



ABOUT THIS MANUAL

(1) Composition of MS2665C/67C/68C Operation Manuals

The MS2665C/67C/68C Spectrum Analyzer operation manuals of the standard type are composed of the following three documents. Use them properly according to the usage purpose.



Basic operating instruction part:	Basic Operating Instructions: Provides information on the MS2665C/67C/68C outline, preparation before use, panel description, basic operation, soft-key menu and performance tests.
Detailed operating instruction part:	Detailed Operating Instructions: Provides information on the detailed panel operating instructions on MS2665C/67C/68C that expand on the basic operation and soft-key menu in the Basic Operating Instruction Part.
Programming part:	Composed of the Remote Control Part and PTA Control Part. The Remote Control Part provides information on RS-232C remote control, GPIB remote control and sample programs, while the PTA Control Part describes about PTA operation and PTL commands.

TABLE OF CONTENTS

SECTION 1

GENERAL

This section outlines the MS2665C/67C/68C Spectrum Analyzer and explains the composition of this manual, the configuration of the MS2665C/67C/68C with the standard accessories, the options, the optional accessories, and peripherals for expanding the MS2665C/67C/68C capabilities, and the MS2665C/67C/68C specifications.

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SECTION 1
GENERAL

Product Outline

The MS2665C/67C/68C spectrum analyzer (henceforth called "this unit") is a portable type color LCD spectrum analyzer suited for signal analyses of radio equipment where the efficiency of frequency usage is increased and equipment are increasingly speeded and digitized.
Excellent in basic performance such as C/N, distortion, frequency/level accuracy, and easily operable following the display of the soft-key menu screen.
Excellent cost performance with rich options to cope with various applications.

Equipped with high-accuracy calibration signals and an attenuator, it can accurately calibrate switching errors of LOG/LIN scales, resolution bandwidth, reference level, etc. Since frequency response is corrected by built-in calibration data, it allows high-accuracy level measurement for a wide range.
As the switching of waveforms between frequency domain and time domain can be done by a touch and two waveforms are simultaneously displayed, signal analyses of both domains can be done efficiently. Moreover, our original zone marker function and multi-marker function (up to 10 markers) are also special mention.

This unit provides the MEASURE function that can perform measurement of various applications without requiring the intervention of external controllers. Therefore, the performance evaluation of radio equipment can be easily done in terms of frequency, noise, occupied frequency bandwidth, leak power from neighboring channels, etc.
In addition, as the template measurement of burst mean power and burst waveform are also available, it is suited for evaluating the performance of digital radio equipment.

■ Application

This unit is useful for the production, building and maintenance of electronic equipment and devices in the following fields.

- AM/FM radio equipment
- Digital cellular telephone/cordless telephone
- Satellite broadcasting, CATV and TV equipment
- Microwave equipment

Composition of Operation Manual

This Operation Manual is composed of 7 sections and appendixes A, B and C. The profile of each section is shown below.

Section composition	Explanation
SECTION 1 GENERAL	Product outline, standard configuration, options, applicable parts, peripheral devices, and specifications
SECTION 2 PREPARATIONS BEFORE USE	Operations to be done before applying power
SECTION 3 PANEL DESCRIPTION	Description about the front and rear panels
SECTION 4 SOFT-KEY MENU	Description using a soft-key menu
SECTION 5 BASIC OPERATION PROCEDURE	Basic operation procedures for operation guide
SECTION 6 PERFORMANCE TESTS	Tests used for checking performance
SECTION 7 STORAGE AND TRANSPORTATION	Cautions on storage and transportation
APPENDIX A	FRONT AND REAR PANEL LAYOUT
APPENDIX B	BLOCK DIAGRAM
APPENDIX C	PERFORMANCE TEST RECORD

Equipment Configuration

This paragraph describes the configuration of the MS2665C/67C/68C Spectrum Analyzer with standard accessories and the various options to expand the functions.

Standard configuration

The table below shows the configuration of the MS2665C/67C/68C spectrum analyzer with the standard accessories.

Standard Composition

Item	Model/Order NO.	Name	Qty.	Remarks
Main instrument	MS2665C/ MS2667C/ MS2668C	Spectrum Analyzer	1	
Accessories		Power cord	1	
	F0013	Fuse	2	T5 A 250 V
	W1335AE	Operation manual	1	

Options

The table below shows the options for the MS2665C/2667C which are sold separately.

Model-†Order No.†	Name	Remarks
MS2665C-01	Reference crystal oscillator	stability ≤2 ×10^{-8}/day
MS2665C/2667C/ MS2668C-02	Narrow resoluion bandwidth	30 Hz/100 Hz, 300 Hz
MS2667C/2668C-03	Narrow resoluion bandwidth	10 Hz, 30 Hz, 100 Hz, 300 Hz
MS2665C/2667C/ 2668C-04	High-speed time domain sweep	1.25 µs/div
MS2665C/2667C/ 2668C-06	Trigger/Gate circuit	Pre-trigger and post trigger avilable
MS2665C/2667C/ 2668C-07	AM/FM demodulator (Sound monitor)	Output to loudspeaker or earphone connector
MS2665C/2667C/ 2668C-10	Centronics interface	Not possible when GPIB installed
MS2665C-14	PTA Parallel I/O	Controlling external equipment from PTA. Not possible when Option 10 installed
MS2665C/2667C/ 2668C-15	Sweep signal output	X, Z

† Please specify the model/order number, name, and quantity when ordering.

Optional Accessories and Peripherals

The following table shows the optional accessories and peripherals for MS2665C/67C/68C which are all sold separately.

Optional Accesories (1/2)

Model † - Order No. †	Name	Remarks
J0561	Coaxial cord, 1 m	N-P-5W • 5D-2W • N-P-5W
J0104A	Coaxial cord, 1 m	BNC-P • RG-55/U • N-P-5W
J0322B	Coaxial cord, 1 m	SUCOFLEX104, 11SMA-11SMA
DGM010-02000EE	Coaxial cord, 2 m	N-P • N-P Junkohsya products.
DGM024-02000EE	Coaxial cord, 2 m	N-P • N-P Low loss Junkohsya products.
CSCJ-256K-SM	256 kB memory card	Meets PCMCIA Ver. 2.0 Type I
CSCJ-512K-SM	512 kB memory card	Meets PCMCIA Ver. 2.0 Type I
CSCJ-001M-SM	1024 kB memory card	Meets PCMCIA Ver. 2.0 Type I
CSCJ-002M-SM	2048 kB memory card	Meets PCMCIA Ver. 2.0 Type I
B0329G	Protective cover	3/4 MW4U
B0395A	Rack mount kit (IEC)	
B0395B	Rack mount kit (JIS)	
34AKNF50	Coaxial adaptor	K-P • N-J, DC-20 GHz
J0004	Coaxial adaptor	N-P • SMA-J (HRM554S)
J0055	Coaxial adaptor (NC-P • BNC-J)	
J0076	Coaxial adaptor (NC-P • F-J)	
B0391A	Carring case (hard type)	With casters, for MS2665C
B0391B	Carring case (hard type)	Without casters, for MS2665C
B0421A	Carring case (hard type)	With casters, for MS2667C/68C
B0421B	Carring case (hard type)	Without casters, for MS2667C/68C
MP612A	RF Fuse Holder	DC to 1000 MHz, 50 Ω (N)
MP613A	Fuse Element	For MP612A
MA8601A	DC Block Adaptor	50 Ω (10 kHz to 2.2 GHz)
MA2507A	DC Block Adaptor	50 Ω (9 kHz to 3.0 GHz)
J0805	DC Block Adaptor	50 Ω (10 kHz to 18 GHz)
MP1621A	50 Ω → 75 Ω Impedance Transformer	9 kHz to 3 GHz, with DC block capacitor (allowable voltage: 100 V)
MP614A	50 Ω ←→ 75 Ω Impedance Transformer	10 to 1200 MHz (transformer type)
J0121	Coaxial cord, 1 m	NC-P-3W • 3C-2WS • NC-P-3W
J0308	Coaxial cord, 1 m	BNC-P • 3C-2WS • NC-P-3W
J0063	Fixed attenuator for high power	30 dB (10 W, DC to 12.4 GHz)
J0078	Fixed Foxed Power for high power	20 dB (10 W, DC to 18 GHz)
J0395	Fixed attenuator for high power	30 dB (10 W, DC to 9 GHz)
MP640A	Branch	40 dB, DC to 1700 MHz
MP654A	Branch	30 dB, 0.8 to 3 GHz
MP520A	CM Directional Coupler	25 to 500 MHz, 75 Ω (NC)
MP520B	CM Directional Coupler	25 to 1000 MHz, 75 Ω (NC)
MP520C	CM Directional Coupler	25 to 500 MHz, 50 Ω (N)
MP520D	CM Directional Coupler	25 to 1000 MHz, 50 Ω (N)
MP526A	High Pass Filter	60-MHz band
MP526B	High Pass Filter	150-MHz band
MP526C	High Pass Filter	250-MHz band
MP526D	High Pass Filter	400-MHz band
MP526G	High Pass Filter	27-MHz band

† Please specify the model / order number, name, and quantity when ordering.

Optional Accesories (2/2)

Model · Order No.	Name	Remarks
J0064A	Coaxial to 7 GHz band waveguide adaptor	5.8 to 8.6 GHz, BRJ-7 · N-J
J0064C	Coaxial to 10 GHz band waveguide adaptor	8.2 to 12.4 GHz , BRJ-10 · N-J
J0007	GP-IB Cable	408JE-101
J0008	GP-IB Cable	408JE-102
J0742A	RS232C Cable	D-sub 25 pins (straight)
J0743A	RS232C Cable	For IBM PC/AT compatible, D-sub 9 pins (cross)

Peripheral Equipment

External Mixer (Oleson Microwave Labs Products)

Model · Order No. †	Name †	Remarks †
M42HW	Equipmentnal Mixer	18 to 26.5 GHz
M28HW	External Mixer	26.5 to 40 GHz
M22HW	External Mixer	33 to 50 GHz
M19HW	External Mixer	40 to 60 GHz
M15HW	External Mixer	50 to 75 GHz
M12HW	External Mixer	60 to 90 GHz
M10HW	External Mixer	75 to 110 GHz

† Please specify the model/order number, name, and quantity when ordering.

Specifications

Except where noted otherwise, specified values are obtained ofter warming up the equipment for 30 minutes at constant ambient temperature and when then perfoming calibration. The typical values are given for reference, and are not guaranteed.

Model		MS2665C
Frequency	Frequency range	9kHz to 21.2GHz
	Frequency band	band / frequency range / harmonic order of the mixer (N) 0 / 0 to 3.2GHz / 1 1– / 2.92 to 6.5GHz / 1 1+ / 6.4 to 8.1GHz / 1 2+ / 8.0 to 15.3GHz / 2 3+ / 15.2 to 21.2GHz / 3
	Frequency setting resolution	(1×N) Hz (Frequency domain), (100×N) Hz (Time domain)
	Pre-selector range	2.92GHz to 21.2GHz (band1–, 1+, 2+, 3+)
	Frequency readout accuracy	±(frequency readout×reference frequency accuracy + span×span accuracy + 100Hz×N) *Span: ≥10kHz×N, after calibration
	Marker frequency readout accuracy	Normal: Same as frequency readout accuracy, Delta: Same asfrequency span accuracy
	Frequency counter	Resolutions: 1Hz, 10Hz, 100Hz, 1kHz Accuracy: Frequency readout×reference frequency accuracy ±1LSD (when S/N is 20dB)
	Frequency span	Setting range: 0Hz, 1kHz to 21.3GHz Accuracy: ±2.5% (span ≥10kHz×N), ±5% (span ≤10kHz×N, with Option02)
	Resolution bandwidth (RBW) (3dB BW)	Setting range: 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz (manually or automatically settable according to frequency span) *Option02: 30Hz, 100Hz, 300Hz are added. Measurements of such as noise, C/N, adjacent channel leakage power by measure function are executed with the caluculated equivalent noise band width of the resolution band width. Accuracy: ±20% (RBW=1kHz to 1MHz), ±30% (RBW=3MHz) Selectivity (60dB:3dB): ≤15:1
	Video bandwidth (VBW)	1Hz to 3MHz (1-3 sequence), off *manually or automatically settable according to resolution bandwidth
	Signal purity and stability	Noise sidebands: ≤–95dBc/Hz+20LogN (1MHz to 21.2GHz, 10kHz offset)
		Residual FM: ≤20Hzp-p/0.1s (1GHz, span=0Hz) Frequency drift: ≤200Hz×N/min (span ≤10kHz×N, sweep time ≤100s) *After 1-hour warm-up at constant ambient temparature
	Reference oscillator	Frequency: 10MHz Aging rate: ≤2×10^{-6}/year (typical); Option01: ≤1×10^{-7}/year, 2×10^{-8}/day Temparature characterristics: ≤1×10^{-5} (typical, 0 to 50ºC); Option01: ≤5×10^{-8} (0 to 50ºC) *Reference frequency at 25ºC
Amplitude	Level measurement	Measurement range: Average noise level to +30dBm
		Maximum input level: +30dBm (CW average power, RF ATT: ≥10dB), ±DC 0 V
		Average noise level: ≤–115dBm (1MHz to 1GHz, band 0), ≤–115dBm + 1.5f [GHz] dB (1 to 3.1GHz, band 0) ≤–110dBm (2.92 to 8.1GHz, band 1), ≤–102dBm (8.0 to 15.3GHz, band 2) ≤–98dBm (15.2 to 21.2GHz, band 3) *Resolution bandwidth: 1kHz, video bandwidth: 1Hz, input attenuator: 0dB
		Residual response: ≤–90dBm (RF ATT: 0dB, input: 50Ω termination, 1MHz to 8.1GHz)
	Reference level	Setting range Log scale: –100 to +30dBm, or equivalent level, Linear scale: 224µV to 7.07V Unit Log scale: dBm, dBµV, dBmV, dBµV (e.m.f), W, Linear scale: V Reference level accuracy: ±0.4dB (–49.9dBm to 0dBm), ±0.75dB (–69.9 to –50dBm, 0.1 to +30dBm), ±1.5dB (–80 to –70dBm) *After calibration at 100MHz frequency, span 1MHz (when RF ATT, RBW, VBW and sweep time set to AUTO) RBW switching uncertainty: ±0.3dB (1kHz to 1MHz), ±0.4dB (1kHz to 3MHz) *After calibration, referenced to RBW 3kHz Input attenuator (RF ATT) Setting range: 0 to 70dB (10dB steps) *Manual settable or, automatically settable according to reference level Accuracy: ±0.3dB (0 to 50dB), ±1dB (0 to 70dB) *After calibration, referenced to frequecy 100MHz, input attenuator 10dB

(Continued)

Model		MS2665C
Amplitude	Frequency response	Relative: ±1.5dB (9kHz to 3.2GHz, band 0, RF ATT 10dB), ±1.0dB (100kHz to 3.2GHz, band 0, RF ATT 10dB) ±1.5dB (2.92 to 8.1GHz, band 1, RF ATT 10dB), ±3.0dB (8.0 to 15.3GHz, band 2, RF ATT 10dB) ±4.0dB (15.2 to 21.2GHz, band 3, RF ATT 10dB) *After pre-selector tuning at band 1, 2, 3, referenced to midpoint between highest and lowest frequency deviation in each band. Absolute: ±5.0dB (9kHz to 21.2GHz, RF ATT 10dB, referenced to 100MHz) *At band 1, 2, 3, after pre-selector tuning
	Scale Fidelity	Scale: 10div Log scale: 10, 5, 2, 1dB/div Linear scale: 10, 5, 2, 1%/div Fidelity (after calibration) Log scale: ±0.4dB (0 to –20dB), ±1.0dB (0 to –70dB), ±1.5dB (0 to –85dB), ±2.5dB (0 to –90dB) Linear scale: ±4% of reference level Marker level resolution Log scale: 0.01dB Linear scale: 0.02% of reference level
	Spurious response	2nd harmonic distortion: ≤–60dBc (10 to 200MHz, band 0, mixer level: –30dBm) ≤–70dBc(0.2 to 1.55GHz, band 0, mixer level: –30dBm) ≤–100dBc or noise level (1.46 to 10.6GHz, band 1, 2, 3, mixer level: –10dBm) Two signal 3rd order intermodulation distortion: ≤–70dBc (10 to 100MHz) ≤–80dBc (0.1 to 8.1GHz) ≤–75dBc or noise level (8.1 to 21.2GHz) *Frequency diffrence of two signals ≥50kHz, mixer input level: –30dBm
		Image response: ≤–65dBc (Input frequency ≤18GHz) ≤–60dBc (Input frequency >18GHz) Multiple respose: ≤–60dBc >band 1, 2, 3)
	1dB gain compression	≥–5dBm (≥100MHz, at mixer input level)
Sweep	Sweep time	Setting range: 20ms to 1000s (manual settable, or automatically settable according to span, resolution bandwidth and video bandwidth) Accuracy: ±15% (20ms to 100s), ±25% (110s to 1000s), ±1% (digital zero span mode)
	Sweep mode	Continious, single
	Time domain sweep mode	Analog zero span, digital zero span
	Zone sweep	Sweeps only in frequency range indicated by zone marker
	Tracking sweep	Sweeps while tracking peak points within zone marker (zone sweep also possible)
Functions	Numbers of points	501
	Detection mode	NORMAL: Simultaneously displays max. and min. points between sample points POS PEAK: Displays max. point between sample points NEG PEAK: Displays min. point between sample points SAMPLE: Displays momentary value at sample points Detection mode switching uncertaity: ±0.5dB (at reference level)
	Display	Color TFT-LCD, Size 5.5", Number of colors: 17 (RGB, each 64-scale settable), Intensity adjustment: 5 steps settable
	Display function	Trace A: Displays frequency spectrum Trace B: Displays frequency spectrum Trace Time: Displays time domain waveform at center frequency Trace A/B: Displays Trace A and Trace B simultaneously, simultaneous sweep of same frequency, alternate sweep of independent frequencies Trace A/BG: Display frequency region to be observed (background) and object band (foreground) selected from background with zone marker simultaneously, alternate sweep Trace A/Time: Displays frequency spectrum, and time domain waveform at center frequency simultaneously Trace move/calculation: A→B, B→A, A↔B, A+B→A, A–B+DL→A
	Storage functions	NORMAL, VIEW, MAX HOLD, AVERAGE, CUMULATIVE, OVERWRITE

(Continued)

Model		MS2665C
Functions	FM demodulation waveform display	Setting range: 2, 5, 10, 20, 50, 100, 200kHz/div Accuracy: ±5% of full scale (referenced to center frequency after calibration, DC-coupled, RBW 3MHz, VBW 1Hz, CW) Frequency response (3dB): DC (50Hz at AC coupled) to 100kHz (range ≤20kHz/div, VBW off), DC (50Hz at AC coupled) to 500kHz (range ≤50kHz/div, VBW off) *Usable RBW: ≥1kHz
	Signal search	AUTO TUNE, PEAK→CF, PEAK→REF, SCROLL
	Zone marker	NORMAL, DELTA
	Marker	MARKER→CF, MARKER→REF, MARKER→CF STEP SIZE, ΔMARKER→SPAN, ZONE→SPAN
	Peak search	PEAK, NEXT PEAK, NEXT RIGHT PEAK, NEXT LEFT PEAK, MIN DIP, NEXT DIP
	Multi-marker	Numbers of markers: 10 max. (HIGHEST 10, HARMONICS, MANUAL SET)
	Measure	Noise power (dBm/Hz, dBm/ch), C/N (dBc/Hz, dBc/ch), occupied bandwidth (power N% method, X–dB down method), adjacent channel leakage power (REF: total power method, REF: reference level method, REF: inband method, channel designate display: 2 channels×2, graphic diplay), average power of burst signal (average power in designate time range of time domain waveform), template comparison (upper/lower limits×each 2,time domain), MASK (upper/lower limits×each 2, frequency domain)
	Save/recall	Save and recall setting conditions and waveform data to internal memory (max.12) or memory card
	Hard copy	Printer (HP dotmatrix, EPSON dotmatrix or compatible model): Display data can be hard-copied via the RS232C, GPIB, or Centoronics (Option10) interface Plotter (HP-GL, GP-GL compatible models): Display data can be hard-copied via the RS232C or GPIB interface
	PTA	Language: PTL (interpreter based on BASIC) Progamming: Using editor of external computer Progamming memory: Memory card, upload/download to/from external computer Progamming capacity: 192kbyte Data processing: Directly accesses measurement data according to system variables, system subroutines, and system functions
	RS-232C	Output data to printer or plotter. Control from external computer (excluding power switch)
	GPIB interface	Functions: Meets IEEE488.2, Can be controlled as device from external controller (excluding power switch), or can control external equipment as controller Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C1, C2, C3, C4, C28
	Memory card interface	Functions: Save/recall measurement settings and data, uploads/downloads PTA programs, access SRAM, EPROM and flash EEPROM (can write to SRAM only), Supports cards up to 2MB Connector: PCMCIA Rel.2.0 2slots
	Correction	Autocorrection of MA1621A inpedance transformer insertion loss Correction accuracy (input attenuator: ≥10dB): ±2.5dB (9 to 100kHz), ±1.5dB (100kHz to 2GHz), ±2.0dB[*1] (2 to 3GHz)
Others	Input connector	N-J, 50Ω
	Auxiliary signal input and output	IF OUTPUT: BNC connector, 10.69MHz VIDEO OUTPUT(Y): BNC connector, 100MHz input, 75Ω terminated 0 to 0.5V ±0.1V nominal (from lower edge to upper edge at 10dB/div) 0 to 0.4V ±0.1V nominal (from lower edge to upper edge at 10%/div) COMPOSITE OUTPUT: For NTSC, 1Vp-p (75Ω terminated), BNC connector EXT REF INPUT: 10MHz ±10Hz, ≥0dBm (50Ω terminated), BNC connector
	Power (operating range)	AC 85 to 132 V/AC 170 to 250 V (automatic voltage switching), 47.5 to 63Hz, 380 to 420Hz (AC 85 to 132 V only), ≤330VA
	Conducted disturbance	Meets EN 61326-1: 2006 (Class A)
	Radiation disturbance	Meets EN 61326-1: 2006 (Class A)
	Harmonic Current Emission	Meets EN 61000-3-2: 2006 (Class A)
	Electrostatic Discharge	Meets EN 61326-1: 2006 (Table 2)
	Electromagnetic Field Immunity	Meets EN 61326-1: 2006 (Table 2)
	Fast Transient / Burst	Meets EN 61326-1: 2006 (Table 2)
	Surge	Meets EN 61326-1: 2006 (Table 2)
	Conducted RF	Meets EN 61326-1: 2006 (Table 2)
	Power Frequency Magnetic Field	Meets EN 61326-1: 2006 (Table 2)
	Voltage Dips / Short Interruptions	Mees EN 61326-1: 2006 (Table 2)
	Vibration	Mees MIL-STD-810D
	Dimensions and mass	177 (H)×320 (W)×351 (D), ≤13kg (without option)
	Ambient temparature	0 to 50ºC (operate), –40 to 75ºC (storage)

(Continued)

Model		MS2667C
Frequency	Frequency range	9kHz to 30.0GHz
	Frequency band	band / frequency range / harmonic order of the mixer (N) 0 / 0 to 3.2GHz / 1 1– / 3.1 to 6.5GHz / 1 1+ / 6.4 to 8.1GHz / 1 2+ / 8.0 to 15.3GHz / 2 3+ / 15.2 to 22.4GHz / 3 4+ / 22.3 to 30.0GHz / 4
	Frequency setting resolution	(1×N) Hz
	Pre-selector range	3.1GHz to 30.0GHz (band1–, 1+, 2+, 3+, 4+)
	Frequency readout accuracy	±(frequency readout×reference frequency accuracy + span×span accuracy) *Span: ≥10kHz×N, after calibration
	Marker frequency readout accuracy	Normal: Same as frequency readout accuracy, Delta: Same asfrequency span accuracy
	Frequency counter	Resolutions: 1Hz, 10Hz, 100Hz, 1kHz Accuracy: Frequency readout×reference frequency accuracy ±1LSD (when S/N is 20dB)
	Frequency span	Setting range: 0Hz, 1kHz to 30.1GHz Accuracy: ±5%
	Resolution bandwidth (RBW) (3dB BW)	Setting range: 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz (manually or automatically settable according to frequency span) *Option02: 30Hz, 100Hz, 300Hz are added. *Option03: 10Hz, 30Hz, 100Hz, 300Hz are added. Measurements of such as noise, C/N, adjacent channel leakage power by measure function are executed with the caluculated equivalent noise band width of the resolution band width. Accuracy: ±20% (RBW=1kHz to 1MHz), ±30% (RBW=3MHz) Selectivity (60dB:3dB): ≤15:1
	Video bandwidth (VBW)	1Hz to 3MHz (1-3 sequence), off *manually or automatically settable according to resolution bandwidth
	Signal purity and stability	Noise sidebands: ≤–95dBc/Hz+20LogN (1MHz to 30.0GHz, 10kHz offset) Residual FM: ≤20Hzp-p/0.1s (1GHz, span=0Hz) Frequency drift: ≤200Hz×N/min (span ≤10kHz×N, sweep time ≤100s) *After 1-hour warm-up at constant ambient temparature
	Reference oscillator	Frequency: 10MHz Aging rate: ≤1×10^{-7}/year, ≤2×10^{-8}/day Temparature characterristics: ≤5×10^{-8} (0 to 50ºC) *Reference frequency at 25ºC
Amplitude	Level measurement	Measurement range: Average noise level to +30dBm Maximum input level: +30dBm (CW average power, RF ATT: ≥10dB), ±DC 0 V Average noise level: ≤–115dBm (1MHz to 1GHz, band 0), ≤–115dBm + 1.5f [GHz] dB (1 to 3.1GHz, band 0) ≤–110dBm (3.1 to 8.1GHz, band 1), ≤–102dBm (8.0 to 15.3GHz, band 2) ≤–98dBm (15.2 to 22.4GHz, band 3), ≤–91dBm (22.3 to 30.0GHz, band 4) *Resolution bandwidth: 1kHz, video bandwidth: 1Hz, input attenuator: 0dB Residual response: ≤–90dBm (RF ATT: 0dB, input: 50Ω termination, 1MHz to 8.1GHz)
	Reference level	Setting range Log scale: –100 to +30dBm, or equivalent level, Linear scale: 224µV to 7.07V Unit Log scale: dBm, dBµV, dBmV, dBµV (e.m.f), W, Linear scale: V Reference level accuracy: ±0.4dB (–49.9dBm to 0dBm), ±0.75dB (–69.9 to –50dBm, 0.1 to +30dBm), ±1.5dB (–80 to –70dBm) *After calibration at 100MHz frequency, span 1MHz (when RF ATT, RBW, VBW and sweep time set to AUTO) RBW switching uncertainty: ±0.3dB (1kHz to 1MHz), ±0.4dB (1kHz to 3MHz) *After calibration, referenced to RBW 3kHz Input attenuator (RF ATT) Setting range: 0 to 70dB (10dB steps) *Manual settable or, automatically settable according to reference level Accuracy: ±0.3dB (0 to 50dB), ±1dB (0 to 70dB) *After calibration, referenced to frequecy 100MHz, input attenuator 10dB

(Continued)

Model		MS2667C
Amplitude	Frequency response	Relative: ±1.5dB (9kHz to 3.2GHz, band 0, RF ATT 10dB), ±1.0dB (100kHz to 3.2GHz, band 0, RF ATT 10dB) ±1.5dB (3.1 to 8.1GHz, band 1, RF ATT 10dB), ±3.0dB (8.0 to 15.3GHz, band 2, RF ATT 10dB) ±4.0dB (15.2 to 22.4GHz, band 3, RF ATT 10dB), ±4.0dB (22.3 to 30.0GHz, band 4, RF ATT 10dB) *After pre-selector tuning at band 1, 2, 3 and 4,referenced to midpoint between highest and lowest frequency deviation in each band. Absolute: ±5.0dB (9kHz to 30.0GHz, RF ATT 10dB, referenced to 100MHz) *At band 1, 2, 3, 4, after pre-selector tuning
	Scale Fidelity	Scale: 10div Log scale: 10, 5, 2, 1dB/div Linear scale: 10, 5, 2, 1%/div Fidelity (after calibration) Log scale: ±0.4dB (0 to –20dB), ±1.0dB (0 to –70dB), ±1.5dB (0 to –85dB), ±2.5dB (0 to –90dB) Linear scale: ±4% of reference level Marker level resolution Log scale: 0.01dB Linear scale: 0.02% of reference level
	Spurious response	2nd harmonic distortion: ≤–60dBc (10 to 200MHz, band 0, mixer level: –30dBm) ≤–70dBc (0.2 to 1.55GHz, band 0, mixer level: –30dBm) ≤–90dBc or average noise level (1.55 to 15GHz, band 1, 2, 3, 4, mixer level: –10dBm) Two signal 3rd order intermodulation distortion: ≤–70dBc (10 to 100MHz), ≤–80dBc (0.1 to 8.1GHz) ≤–75dBc or noise level (8.1 to 26.5GHz) ≤–75dBc or noise level (typical, 26.5 to 30GHz) *Frequency diffrence of two signals ≥50kHz, mixer input level: –30dBm
		Image response: ≤–65dBc (Input frequency ≤18GHz), ≤60dBc (Input frequency ≤22 GHz) ≤–55dBc (Input frequency ≤30GHz) Multiple respose/Out of band response: ≤60dBc (≤22GHz), ≤–55dBc (≤30GHz)
	1dB gain compression	≥–5dBm (≥100MHz, at mixer input level)
Sweep	Sweep time	Setting range: 20ms to 1000s (manual settable, or automatically settable according to span, resolution bandwidth and video bandwidth) Accuracy: ±15% (20ms to 100s), ±25% (110s to 1000s), ±1% (digital zero span mode)
	Sweep mode	Continious, single
	Time domain sweep mode	Analog zero span, digital zero span
	Zone sweep	Sweeps only in frequency range indicated by zone marker
	Tracking sweep	Sweeps while tracking peak points within zone marker (zone sweep also possible)
Functions	Numbers of points	501
	Detection mode	NORMAL: Simultaneously displays max. and min. points between sample points POS PEAK: Displays max. point between sample points NEG PEAK: Displays min. point between sample points SAMPLE: Displays momentary value at sample points Detection mode switching uncertaity: ±0.5dB (at reference level)
	Display	Color TFT-LCD, Size 5.5", Number of colors: 17 (RGB, each 64-scale settable), Intensity adjustment: 5 steps settable
	Display function	Trace A: Displays frequency spectrum Trace B: Displays frequency spectrum Trace Time: Displays time domain waveform at center frequency Trace A/B: Displays Trace A and Trace B simultaneously, simultaneous sweep of same frequency, alternate sweep of independent frequencies Trace A/BG: Display frequency region to be observed (background) and object band (foreground) selected from background with zone marker simultaneously, alternate sweep Trace A/Time: Displays frequency spectrum, and time domain waveform at center frequency simultaneously Trace move/calculation: A→B, B→A, A↔B, A+B→A, A–B+DL→A
	Storage functions	NORMAL, VIEW, MAX HOLD, AVERAGE, CUMULATIVE, OVERWRITE

(Continued)

Model			MS2667C
Functions	FM demodulation waveform display		Setting range: 2, 5, 10, 20, 50, 100, 200kHz/div Accuracy: ±5% of full scale (referenced to center frequency after calibration, DC-coupled, RBW 3MHz, VBW 1Hz, CW) Frequency response (3dB): DC (50Hz at AC coupled) to 100kHz (range ≤20kHz/div, VBW off), DC (50Hz at AC coupled) to 500kHz (range ≥50kHz/div, VBW off) *Useable RBW: ≥1kHz
	Signal search		AUTO TUNE, PEAK→CF, PEAK→REF, SCROLL
	Zone marker		NORMAL, DELTA
	Marker		MARKER→CF, MARKER→REF, MARKER→CF STEP SIZE, ΔMARKER→SPAN, ZONE→SPAN
	Peak search		PEAK, NEXT PEAK, NEXT RIGHT PEAK, NEXT LEFT PEAK, MIN DIP, NEXT DIP
	Multi-marker		Numbers of markers: 10 max. (HIGHEST 10, HARMONICS, MANUAL SET)
	Measure		Noise power (dBm/Hz, dBm/ch), C/N (dBc/Hz, dBc/ch), occupied bandwidth (power N% method, X–dB down method), adjacent channel leakage power (REF: total power method, REF: reference level method, REF: inband method, channel designate display: 2 channels×2, graphic diplay), average power of burst signal (average power in designate time range of time domain waveform), template comparison (upper/lower limits×each 2,time domain), MASK (upper/lower limits×each 2, frequency domain)
	Save/recall		Save and recall setting conditions and waveform data to internal memory (max.12) or memory card
	Hard copy		Printer (HP dotmatrix, EPSON dotmatrix or compatible model): Display data can be hard-copied via the RS232C, GPIB, or Centoronics (Option10) interface Plotter (HP-GL, GP-GL compatible models): Display data can be hard-copied via the RS232C or GPIB interface
	PTA		Language: PTL (interpreter based on BASIC) Progamming: Using editor of external computer Progamming memory: Memory card, upload/download to/from external computer Progamming capacity: 192kbyte Data processing: Directly accesses measurement data according to system variables, system subroutines, and system functions
	RS-232C		Output data to printer or plotter. Control from external computer (excluding power switch)
	GPIB interface		Functions: Meets IEEE488.2, Can be controlled as device from external controller (excluding power switch), or can control external equipment as controller Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C1, C2, C3, C4, C28
	Memory card interface		Functions: Save/recall measurement settings and data, uploads/downloads PTA programs, access SRAM, EPROM and flash EEPROM (can write to SRAM only), Supports cards up to 2MB Connector: PCMCIA Rel.2.0 2slots
	Correction		Autocorrection of MA1621A inpedance transformer insertion loss Correction accuracy (input attenuator: ≥10dB): ±2.5dB (9 to 100kHz), ±1.5dB (100kHz to 2GHz), ±2.0dB*1 (2 to 3GHz)
	External mixers	Frequency	Frequency range: 18GHz to 110GHz
			Frequency band configuration Band Frequency harmonic order of mixer K 18 to 26.5GHz 4 A 26.5 to 40GHz 6 Q 33 to 50GHz 8 U 40 to 60GHz 9 V 50 to 75GHz 11 E 60 to 90GHz 13 W 75 to 110GHz 16
			Span setting range: 0Hz,100 × N Hz to each bandwidth *N: harmonic order of mixer
		Amplitude	Level measurement Mixer conversion loss setting range: 15 to 85dB Maximum input level: Depends on the external mixer used Average noise level: Depends on the external mixer used Reference level setting range: –100dBm to (–25 + M) dBm (Log scale ,*M: mixer conversion loss) Frequency response: Depends on the external mixer used
		Input/output terminal	Suitable mixer: 2-port mixer only (Local frequency: 4 to 7GHz, IF frequency:689.3MHz) Display gain : 0±2dB (External mixer input level –10dBm, when mixer conversion loss is 15 dB)

(Continued)

Model		MS2667C
Others	Input connector	N-J, 50Ω
	Auxiliary signal input and output	IF OUTPUT: BNC connector, 10.69MHz VIDEO OUTPUT (Y): BNC connector, 100MHz input, 75Ω terminated 0 to 0.5V ±0.1V nominal (from lower edge to upper edge at 10dB/div) 0 to 0.4V ±0.1V nominal (from lower edge to upper edge at 10%/div) COMPOSITE OUTPUT: For NTSC, 1Vp-p (75Ω terminated), BNC connector EXT REF INPUT: 10MHz ±10Hz, ≥0dBm (50Ω terminated), BNC connector
	Power (operating range)	AC 85 to 132 V/AC 170 to 250 V (automatic voltage switching), 47.5 to 63Hz, ≤400VA
	Conducted disturbance	Meets EN 61326-1: 2006 (Class A)
	Radiation disturbance	Meets EN 61326-1: 2006 (Class A)
	Harmonic Current Emission	Meets EN 61000-3-2: 2006 (Class A)
	Electrostatic Discharge	Meets EN 61326-1: 2006 (Table 2)
	Electromagnetic Field Immunity	Meets EN 61326-1: 2006 (Table 2)
	Fast Transient / Burst	Meets EN 61326-1: 2006 (Table 2)
	Surge	Meets EN 61326-1: 2006 (Table 2)
	Conducted RF	Meets EN 61326-1: 2006 (Table 2)
	Power Frequency Magnetic Field	Meets EN 61326-1: 2006 (Table 2)
	Voltage Dips / Short Interruptions	Meets EN 61326-1: 2006 (Table 2)
	Vibration	Meets MIL-STD-810D
	Dimensions and mass	177 (H)×320 (W)×381 (D), ≤15kg (without option)
	Ambient temparature	0 to 50ºC (operate), –40 to 75ºC (storage)

(Continued)

Model		MS2668C
Frequency	Frequency range	9kHz to 40.0GHz
	Frequency band	band frequency range harmonic order of the mixer (n) 0 0 to 3.2GHz 1 1– 3.1 to 5.7GHz 1 1+ (n=1) 5.5 to 8.1GHz 1 1+ (n=2) 8.0 to 14.3GHz 2 2– (n=4) 14.1 to 26.5GHz 4 3– (n=6) 26.2 to 40.0GHz 6
	Frequency setting resolution	(1×N) Hz
	Pre-selector range	3.1GHz to 40.0GHz (band1–, 1+, 2– , 3–)
	Frequency readout accuracy	± (frequency readout × reference frequency accuracy + span × span accuracy) *Span: ≥ 10kHz × n, after calibration
	Marker frequency readout accuracy	Normal: Same as frequency readout accuracy, Delta: Same as frequency span accuracy
	Frequency counter	Resolutions:1Hz, 10Hz, 100Hz, 1kHz Accuracy: Frequency readout × reference frequency accuracy ± 1LSD (when S/N is 20dB)
	Frequency span	Setting range: 0Hz, 1kHz to 40.1GHz Accuracy: ±5%
	Resolution bandwidth (RBW) (3dB BW)	Setting range:1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz (manually or automatically settable according to frequency span) *Option02: 30Hz, 100Hz, 300Hz are added. Option03: 10Hz, 30Hz, 100Hz, 300Hz are added. Measurements of such as noise ,C/N, adjacent channel leakage power by measure function are executed with the calculated equivalent noise band width of the resolution band width. Accuracy: (20% (RBW= 1kHz to 1MHz), (30% (RBW=3MHz) Selectivity (60dB: 3dB): ≤ 15:1
	Video bandwidth (VBW)	1Hz to 3MHz (1–3 sequence), off *manually or automatically settable according to resolution bandwidth
	Signal purity and stability	Noise sidebands: ≤–95dBc/Hz + 20Log N (1MHz to 40.0GHz, 10kHz offset)
		Residual FM: ≤ 20Hzp-p/0.1s (1GHz, span=0Hz) Frequency drift: ≤200Hz (N/min (span ≤10kHz × n, sweep time ≤100s) *After 1-hour warm-up at constant ambient temperature
	Reference oscillator	Frequency:10 MHz Aging rate: $\le 1\times10^{-7}$/year, $\le 2\times10^{-8}$/day Temperature characteristics: $\le 5\times10^{-8}$ (0 to 50C°) *Reference frequency at 25C°
Amplitude	Level measurement	Measurement range: Average noise level to +30dBm
		Maximum input level: +30dBm (CW average power, RF ATT : ≥10dB), ±DC 0 V
		Average noise level: ≤–115dBm (1MHz to 1GHz, band 0), ≤–115dBm + 1.5 f[GHz] dB (1 to 3.1GHz, band 0) ≤–114dBm (3.1 to 8.1GHz, band 1–,1+(n=1)), ≤–113dBm (8.0 to 14.3GHz, band 1+(n=2)) ≤–105dBm (14.1 to 26.5GHz, band 2–), ≤–101dBm (26.2 to 40.0GHz, band 3–) *Resolution bandwidth: 1kHz,video bandwidth: 1 Hz,input attenuator:0dB
		Residual response: ≤–90dBm (RF ATT: 0dB, input: 50Ω termination, 1 MHz to 8.1GHz)
	Reference level	Setting range Log scale:–100 to +30dBm, or equivalent level, Linear scale:224µV to 7.07V Unit Log scale: dBm,dBµV,dBmV,dBµV (e.m.f), W, Linear scale: V Reference level accuracy: ±0.4dB (–49.9dBm to 0dBm), ±0.75dB (–69.9 to –50dBm, 0.1 to +30dBm), ±1.5dB (–80 to -70dBm) *After calibration at 100MHz frequency, span 1MHz (when RF ATT, RBW, VBW and sweep time set to AUTO) RBW switching uncertainty: ±0.3dB (1kHz to 1MHz), ±0.4dB (1kHz to 3MHz) *After calibration ,referenced to RBW 3kHz Input attenuator (RF ATT) Setting range: 0 to 70dB (10dB steps) *Manual settable or ,automatically settable according to reference level Accuracy: ±0.3dB (0 to 50dB), ±1 dB (0 to 70dB) *After calibration , referenced to frequecy 100MHz ,input attenuator 10dB

(Continued)

Model		MS2668C
Amplitude	Frequency response	Relative: ±1.5dB (9kHz to 3.2GHz, band 0), ±1.0dB (100kHz to 3.2GHz, band 0) ±1.5dB (3.1 to 8.1GHz, band 1–, 1+ (n=1)), ±3.0dB (8.0 to 14.3GHz, band 1+ (n=2)) ±4.0dB (14.1 to 26.5GHz, band 2– (n=4)) , ±4.0dB (26.2 to 40GHz, band 3– (n=6)) *RF ATT 10dB, after pre-selector tuning at band 1, 2, 3 and 4, refrenced to midpoint highest and lowest frequency deviation in each band Absolute: ±5.0dB (9kHz to 40GHz,band 1, RF ATT 10dB, referenced to 100MHz) *At band 1, 2, 3, after pre-selector tuning
	Scale Fidelity	Scale:10div Log scale: 10, 5, 2, 1dB/div Linear scale: 10, 5, 2, 1%/div Fidelity (after calibration) Log scale: ±0.4dB (0 to –20dB), ±1.0dB (0 to –70dB), ±1.5dB (0 to –85dB), ±2.5dB (0 to –90dB) Linear scale: ±4% of reference level Marker level resolution Log scale: 0.01dB Linear scale: 0.02% of reference level
	Spurious response	2nd harmonic distortion: ≤–60dBc (10 to 200MHz, band 0, mixer level: –30dBm) ≤–70dBc (0.2 to 1.55GHz, band 0, mixer level: –30dBm) ≤–90dBc or average noise level(1.55 to 15GHz, band 1, 2, 3, 4, mixer level: –10dBm) Two signal 3rd order inter-modulation distortion: ≤–70dBc (10 to 100MHz), ≤–80dBc (0.1 to 8.1GHz) ≤–75dBc or noise level (8.1 to 26.5GHz) ≤–75dBc or noise level (typical, 26.5 to 40GHz) *Frequency difference of two signals ≥50kHz,mixer input level: –30dBm
		Image response: ≤–65dBc (Input frequency ≤18GHz), ≤–60dBc(Input frequency ≤22GHz) ≤–55dBc (Input frequency ≤40GHz) Multiple response/Out of band response: ≤–70dBc (≤14GHz), ≤–60dBc (≤26GHz), ≤–55dBc (≤40GHz)
	1 dB gain compression	≥–5dBm (≥100MHz, at mixer input level)
Sweep	Sweep time	Setting range: 20ms to 1000s (manual settable, or automatically settable according to span, resolution bandwidth and video bandwidth) Accuracy: ±15% (20ms to 100s), ±25% (110s to 1000s), ±1% (digital zero span mode)
	Sweep mode	Continuous, single
	Time domain sweep mode	Analog zero span, digital zero span
	Zone sweep	Sweeps only in frequency range indicated by zone marker
	Tracking sweep	Sweeps while tracking peak points within zone marker (zone sweep also possible)
Functions	Numbers of points	501
	Detection mode	NORMAL: Simultaneously displays max. and min. points between sample points POS PEAK: Displays max. point between sample points NEG PEAK: Displays min. point between sample points SAMPLE: Displays momentary value at sample points Detection mode switching uncertainty: ±0.5dB (at reference level)
	Display	Color TFT-LCD, Size 5.5“, Number of colors:17 (RGB, each 64-scale settable), Intensity adjustment: 5 steps settable
	Display function	Trace A: Displays frequency spectrum Trace B: Displays frequency spectrum Trace Time: Displays time domain waveform at center frequency Trace A/B: Displays Trace A and Trace B simultaneously, simultaneous sweep of same frequency, alternate sweep of independent frequencies Trace A/BG: Display frequency region to be observed (background) and object band (foreground) selected from background with zone marker simultaneously, alternate sweep Trace A/Time: Displays frequency spectrum ,and time domain waveform at center frequency simultaneously Trace move/calculation: A→B, B→A, A→ , A+B→A, A-B+DL→A
	Storage functions	NORMAL,VIEW,MAX HOLD,AVERAGE,CUMULATIVE,OVERWRITE

(Continued)

Model			MS2668C
Functions	FM demodulation waveform display		Setting range: 2, 5, 10, 20, 50, 100, 200kHz/div Accuracy: ±5% of full scale (referenced to center frequency after calibration, DC-coupled, RBW 3MHz, VBW 1Hz, CW) Frequency response (3dB): DC (50Hz at AC coupled) to 100kHz (range ≤20kHz/div, VBW off), DC (50Hz at AC coupled) to 500kHz (range≥50kHz/div, VBW off) *Useable RBW: ≥1kHz
	Signal search		AUTO TUNE, PEAK→CF, PEAK→REF, SCROLL
	Zone marker		NORMAL, DELTA
	Marker		MARKER→CF, MARKER→REF, MARKER→CF STEP SIZE, ΔMARKER→SPAN, ZONE→SPAN
	Peak search		PEAK, NEXT PEAK, NEXT RIGHT PEAK, NEXT LEFT PEAK, MIN DIP, NEXT DIP
	Multi-marker		Numbers of markers: 10 max. (HIGHEST 10, HARMONICS, MANUAL SET)
	Measure		Noise power (dBm/Hz, dBm/ch), C/N (dBc/Hz, dBc/ch), occupied bandwidth (power N% method, X-dB down method), adjacent channel leakage power (REF: total power method, REF: reference level method, REF: inband method, channel designate display: 2 channels × 2, graphic diplay), average power of burst signal (average power in designate time range of time domain waveform), template comparison (upper/lower limits × each 2, time domain), MASK (upper/lower limits × each 2, frequency domain)
	Save/recall		Save and recall setting conditions and waveform data to internal memory (max.12) or memory card
	Hard copy		Printer (HP dotmatrix, EPSON dotmatrix or compatible model): Display data can be hard-copied via the RS232C, GPIB, or Centoronics (Option10) interface Plotter (HP-GL, GP-GL compatible models): Display data can be hard-copied via the RS232C or GPIB interface
	PTA		Language: PTL (interpreter based on BASIC) Progamming:Using editor of external computer Progamming memory: Memory card, upload/download to/from external computer Progamming capacity: 192kbyte Data processing: Directly accesses measurement data according to sysytem variables, system subroutines, and system functions
	RS-232C		Output data to printer or plotter. Control from external computer (excluding power switch)
	GPIB interface		Functions: Meets IEEE488.2, Can be controlled as device from external controller (excluding power switch), or can control external equipment as controller Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C1, C2, C3, C4, C28
	Memory card interface		Functions: Save/recall measurement settings and data,uploads/downloads PTA programs, access SRAM, EPROM and flash EEPROM (can write to SRAM only), Supports cards up to 2MB Connector: PCMCIA Rel.2.0 2 slots
	Correction		Autocorrection ofMA1621A impedance transformer insertion loss Correction accuracy(input attenuator: (10dB): ±2.5dB (9 to 100kHz), ±1.5dB (100kHz to 2GHz), ±2.0dB*1 (2 to 3GHz)
	External mixers	Frequency	Frequency Range: 18GHz to 110GHz
			Frequency band configuration Band Frequency harmonic order of mixer K 18 to 26.5GHz 4 A 26.5 to 40GHz 6 Q 33 to 50GHz 8 U 40 to 60GHz 9 V 50 to 75GHz 11 E 60 to 90GHz 13 W 75 to 110GHz 16
			Span setting range: 0Hz, 100 × N Hz to each bandwidth *N: harmonic order of mixer
		Amplitude	Level measurement Mixer conversion loss setting range: 15 to 85dB Maximum input level: Depends on the external mixer used Average noise level: Depends on the external mixer used Reference level setting range: –100dBm to (–25 + M) dBm (Log scale, *M: mixer conversion loss) Frequency response: Depends on the external mixer used
		Input/output terminal	Suitable mixer: 2-port mixer only (Local frequency: 4 to 7GHz, IF frequency: 689.31MHz) Display gain: 0 (2dB (External mixer input level –10dBm, when mixer conversion loss is 15dB)

(Continued)

Model		MS2668C
Others	Input connector	K-J, 50Ω
	Auxiliary signal input and output	IF OUTPUT:BNC connector, 10.69MHz VIDEO OUTPUT (Y): BNC connector,100 MHz input, 75Ω terminated 0 to 0.5V (0.1V nominal (from lower edge to upper edge at 10dB/div) 0 to 0.4V (0.1V nominal (from lower edge to upper edge at 10%/div) COMPOSITE OUTPUT: For NTSC, 1Vp-p (75Ω terminated), BNC connector EXT REF INPUT:10MHz ±10Hz, ≥0dBm (50Ω terminated), BNC connector
	Power (operating range)	AC 85 to 132 V/AC 170 to 250 V (automatic voltage switching), 47.5 to 63Hz, 380 to 420Hz (AC 85 to 132 V only), ≤400VA
	Conducted disturbance	Meets EN 61326-1: 2006 (Class A)
	Radiation disturbance	Meets EN 61326-1: 2006 (Class A)
	Harmonic Current Emission	Meets EN 61000-3-2: 2006 (Class A)
	Electrostatic Discharge	Meets EN 61326-1: 2006 (Table 2)
	Electromagnetic Field Immunity	Meets EN 61326-1: 2006 (Table 2)
	Fast Transient / Burst	Meets EN 61326-1: 2006 (Table 2)
	Surge	Meets EN 61326-1: 2006 (Table 2)
	Conducted RF	Meets EN 61326-1: 2006 (Table 2)
	Power Frequency Magnetic Field	Meets EN 61326-1: 2006 (Table 2)
	Voltage Dips / Short Interruptions	Meets EN 61326-1: 2006 (Table 2)
	Vibration	Meets MIL-STD-810D
	Dimensions and mass	177 (H) × 320 (W) × 381 (D), ≤15kg (without option)
	Ambient temperature	0 to 50˚C (operate), –40 to 75˚C (storage)

• Option 01: Reference crystal oscillator (MS2665C only)

Frequency	10MHz
Aging rate	$\leq 1\times10^{-7}$/year, $\leq 2\times10^{-8}$/day (referenced to 24 hours warmup)
Temparature stability	$\leq 5\times10^{-8}$/ (0º to 50ºC, referenced to 25ºC)
Buffered output	BNC connector, 10MHz, >2Vp–p (200Ω terminated)

• Option 02: Narrow resolution bandwidth

	MS2665C	**MS2667C/68C**
Resolution bandwidth (3dB)	30Hz, 100Hz, 300Hz	
Resolution bandwidth switching uncertainty	±0.4dB (referenced to 3kHz)	
Bandwidth accuracy	±20% (100Hz, 300Hz)	±20%
Selectivity (60dB: 3dB)	≤15:1 (300Hz, 100Hz) ≤20:1 (30Hz)	≤15 : 1

• Option 03: Narrow resolution bandwidth

	MS2667C	**MS2668C**
Resolution bandwidth (3dB)	10Hz, 30Hz, 100Hz, 300Hz	
Resolution bandwidth switching uncertainty	±0.4dB (referenced to 3kHz RBW)	
Selectivity (60dB:3dB)	≤15:1	
Bandwidth accuracy	±20%	
Average noise level	*RBW=10Hz,VBW=1Hz, RF ATT=0dB	
	≤135dBm (1MHz to 1GHz)	≤135dBm (1MHz to 1GHz)
	≤135dBm+1.5f[GHz]dB (1 to 3.1GHz)	≤135dBm+1.5f[GHz]dB (1 to 3.1GHz)
	≤130dBm (3.1 to 8.1GHz)	≤–132dBm (3.1 to 8.1GHz)
	≤–122dBm (8.0 to 15.3GHz)	≤–131dBm (8.0 to 14.3GHz)
	≤–118dBm (15.2 to 22.4GHz)	≤–123dBm (14.1 to 26.5GHz)
	≤–111dBm (22.3 to 30GHz)	≤–119dBm (26.2 to 40GHz)

• Option 04: High-speed time domain sweep

Sweep time	12.5µS, 25µS, 50µS, 100 to 900µS (one most significant digit settable) 1.0 to 19mS (two upper significant digit settable)
Accuracy	±1%
Marker readout resolution	Log scale: 0.1dB Linear scale: 0.2% Reference Level

• Option 06: Trigger/gate circuit

Trigger switch		FREERUN, TRIGGERD
Trigger source	EXT	Trigger level: ±10V (Resolution: 0.1V) Trigger slope: RISE/FALL Connector: BNC
	VIDEO	Trigger level: –100 to 0dB (Log scale, resolution 1dB) Trigger slope: RISE/FALL
	WIDE IF VIDEO	Trigger level: High, Middle, or Low selectable Bandwidth: ≥20MHz Trigger slope: RISE/FALL
	LINE	Frequency: 47.5 to 63Hz (Line lock)
Trigger delay	Pre-trigger	Displays waveform from previous max. 1 screen at trigger occurrence point Range: -Time Span to 0s Resolution: Time Span/500
	Post-trigger	Displays waveform from after max. 65.5ms at trigger occurrence point Range: 0 to 65.5ms Resolution: 1µs
Gate sweep		In frequency domain, displays spectrum of input signal in specified gate interval Gate delay: 0 to 65.5ms (from trigger point, resolution: 1µs) Gate width: 2µs to 65.5ms (from gate delay point, or external control, resolution: 1µs)

Option 07: AM/FM demodulator (Sound monitor)

Sound output	When internal loud speaker and earphone connector (Φ3.5 mini jack), adjustable volume

Option 10: Centronics interface

Function	Output data to printer (Centronics standard)
Connector	D-sub 25-pins (jack)

Option 14: PTA Parallel I/O* (MS2665C only)

<table>
<tr><td>Function</td><td>Controlling external equipment from PTA</td></tr>
<tr><td>System variables</td><td>The following controls are possible using PTA system variables:
<table>
<tr><th>System variable</th><th>Control description</th></tr>
<tr><td>IOA</td><td>Control of 8 bits parallel output port A</td></tr>
<tr><td>IOB</td><td>Control of 8 bits parallel output port B</td></tr>
<tr><td>IOC</td><td>Control of 8 bits parallel I/O port C</td></tr>
<tr><td>IOD</td><td>Control of 8 bits parallel I/O port D</td></tr>
<tr><td>EIO</td><td>Control of I/O switching port C and D</td></tr>
<tr><td>EXO</td><td>Control of trigger (I/O)</td></tr>
</table></td></tr>
<tr><td>PTL statements</td><td>Using PTA PTL statements allows control of interrupts input externally to the I/O ports
<table>
<tr><th>PTL statement</th><th>Control description</th></tr>
<tr><td>IOEN statement</td><td>Allow interrupt input</td></tr>
<tr><td>IODI statement</td><td>Prohibit interrupt input</td></tr>
<tr><td>IOMA statement</td><td>Masks interrupt input</td></tr>
<tr><td>ON TO GOTO statement</td><td>Changes program flow when interrupt occurs</td></tr>
<tr><td>ON TO GOSUB</td><td>Changes program flow when interrupt occurs</td></tr>
</table></td></tr>
<tr><td>Write strobe signal</td><td>Outputs a write strobe pulse (negative pulse) to an external unit when output port C or D is controlled</td></tr>
<tr><td>DC output</td><td>Supplies +5 V ±0.5 V (max. 100 mA) power for external equipment use</td></tr>
<tr><td>Signal logical level</td><td>Negative logic, TTL level
Rated current:
Output ports A, B:Max.output current Hi: 2.6 mA, Lo: 24 mA
Output ports C, D:Max.output current Hi: 15 mA, Lo: 24 mA
Other control output lines :Max. output current Hi: 0.4 mA, Lo: 8 mA</td></tr>
<tr><td>Cable connector</td><td>Amphenol 36 pins</td></tr>
<tr><td>Connector pin layout</td><td>
<table>
<tr><th>Pin No.</th><th>Name</th><th>Pin No.</th><th>Name</th></tr>
<tr><td>1</td><td>GND</td><td>19</td><td>Output port B (6)</td></tr>
<tr><td>2</td><td>Trigger input</td><td>20</td><td>Output port B (7) MSB</td></tr>
<tr><td>3</td><td>Trigger output1</td><td>21</td><td>I/O port C (0) LSB</td></tr>
<tr><td>4</td><td>Trigger output2</td><td>22</td><td>I/O port C (1)</td></tr>
<tr><td>5</td><td>Output port A (0) LSB</td><td>23</td><td>I/O port C (2)</td></tr>
<tr><td>6</td><td>Output port A (1)</td><td>24</td><td>I/O port C (3) MSB</td></tr>
<tr><td>7</td><td>Output port A (2)</td><td>25</td><td>I/O port D (0) LSB</td></tr>
<tr><td>8</td><td>Output port A (3)</td><td>26</td><td>I/O port D (1)</td></tr>
<tr><td>9</td><td>Output port A (4)</td><td>27</td><td>I/O port D (2)</td></tr>
<tr><td>10</td><td>Output port A (5)</td><td>28</td><td>I/O port D (3) MSB</td></tr>
<tr><td>11</td><td>Output port A (6)</td><td>29</td><td>Port C status 0/1:I/O</td></tr>
<tr><td>12</td><td>Output port A (7) MSB</td><td>30</td><td>Port D status 0/1:I/O</td></tr>
<tr><td>13</td><td>Output port B (0) LSB</td><td>31</td><td>Write strobe signal</td></tr>
<tr><td>14</td><td>Output port B (1)</td><td>32</td><td>Interrupt signal</td></tr>
<tr><td>15</td><td>Output port B (2)</td><td>33</td><td>(not used)</td></tr>
<tr><td>16</td><td>Output port B (3)</td><td>34</td><td>+5 V power supply</td></tr>
<tr><td>17</td><td>Output port B (4)</td><td>35</td><td>(not used)</td></tr>
<tr><td>18</td><td>Output port B (5)</td><td>36</td><td>(not used)</td></tr>
</table></td></tr>
</table>

* Not installed with Option10: Centronics interface

• Option 15: Sweep signal output

Sweep output (X)	0 to 10V ±1V (≥100kΩ termination, from left side to right side of display scale), BNC connector
Sweep status output (Z)	TTL level (low level with sweeping), BNC connector

SECTION 2

PREPARATIONS BEFORE USE

This section explains the preparations and safety procedures that should be performed before using the MS2665C/67C/68C Spectrum Analyzer. The safety procedures are to prevent the risk of injury to the operator and damage to the equipment. Insure that you understand the contents of the pre-operation preparations before using the MS2665C/67C/68C.
For connecting the GPIB cable and setting the GPIB address, see the Remote Control part of the separate Operation Manual Vol.3.

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SECTION 2
PREPARATIONS BEFORE USE

Installation Site and Environmental Conditions

Locations to be avoided

The MS2665C/67C/68C spectrum analyzer operates normally at temperatures from 0 to 50 ˚C. However, for the best performance, the following locations should be avoided.

- Where there is severe vibration
- Where the humidity is high
- Where the equipment will be exposed to direct sunlight
- Where the equipment will be exposed to active gases

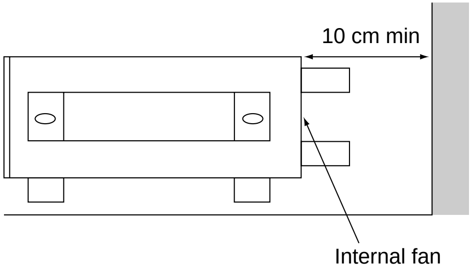
In addition to meeting the above conditions, to insure long-term trouble-free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

CAUTION ⚠

If the MS2665C/67C/68C spectrum analyzer is used at normal temperatures after it has been used or stored for a long time at low temperatures, there is a risk of short-circuiting caused by condensation. To prevent this risk, do not turn the MS2665C/67C/68C on until it has been allowed to dry out sufficiently.

Fan clearance

To suppress any internal temperature increase, the MS2665C/67C/68C has a fan on the rear panel as shown in the diagram below. Leave a gap of at least 10 cm between the rear panel and the wall, nearby equipment or obstructions so that fan ventilation is not blocked.



Safety Measures

This paragraph explains the safety procedures which should be followed under all circumstances not to counter the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

Power-on

WARNING ⚠

• Before power-on:	The MS2665C/67C/68C spectrum analyzer must be connected to protective ground. If the power is switched on without taking this countermeasure, there is a risk of receiving a accidental electric shock. In addition, it is essential to check the power supply voltage. If an abnormal voltage that exceeds the specified value is input, there is accidental risk of damage to the MS2665C/67C/68C and fire.
• During power-on	To maintain the MS2665C/67C/68C, sometimes it is necessary to make internal checks and adjustments with the covers removed while power is supplied. Very-high, dangerous voltages are used in the MS2665C/67C/68C, if insufficient care is taken, there is a risk of a accidental electric shock being received or of damage to the equipment. To maintain the MS2665C/67C/68C, request service by a service personnel who has received the required training.

In the following, special notes on safety procedures are extracted from sections other than Section 2.
To prevent accidents, read this section together with the related sections before beginning operation.

Input level to RF Input

Frequency range: 9 kHz to 21.2 GHz (MS2665C)
9 kHz to 30.0 GHz (MS2667C)
9 kHz to 40.0 GHz (MS2668C)

Measurement level: Apply the measured signal with average noise level of up to +30 dBm to the N-type connector RF Input of 50 Ω input impedance

CAUTION ⚠

The RF Input circuit is not protected against excessive power.
If a signal exceeding +30 dBm is applied with input attenuator setting ≥10 dB, the input attenuator and input mixer may be burned.
⚠ is a warning mark to prevent such damage.

Connector of RF Input

MS2665C:	N-J
MS2667C:	K-J
MS2668C:	K-J

CAUTION ⚠

In case of MS2667C/68C, if you connect N type connector to RF Input, use the coaxial adaptor 34 AKNF50 (K·P-N·J) (sold separately).

Installation

Rack mounting

The B0395A/0395B Rack Mount Kit (sold separately) is required to mount this unit in a rack. The installation method is included in the rack mount kit diagram.

Preparations before Power-on

This unit operates normally when it is connected to an AC 85 to 132 V, or AC 170 to 250 V (automatic voltage change) 47.5 to 63 Hz AC power supply. To prevent the following problems, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock
- Damage caused by abnormal voltage
- Ground current problems

Note:
- *The voltage and current rating are indicated on the rear panel when the instrument is shipped from the factory.*
- *In this manual, the power supply voltage and current ratings are represented by AC ** V and *** A, respectively.*

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the MS2665C/2667C.

WARNING ⚠

NO OPERATOR SERVICE-
ABLE PARTS INSIDE.
REFER SERVICING TO
QUALIFIED PERSONNEL.

CAUTION ⚠

FOR CONTINUED FIRE
PRORECTION REPLACE
ONLY WITH SPECIFIED
TYPE AND RATED FUSE.

WARNING ⚠

Disassembly, adjustment, maintenance, or other access inside this instrument by unqualified personal should be avoided. Maintenance of this instrument should be performed only by Anritsu trained service personnel who are familiar with the risk involved of fire and electric shock. Potentially lethal voltages existing inside this instrument, if contacted accidentally, may result in personal injury or death, or in the possibility of damage to precision components.

Always follow the instructions on the following pages.

Connecting the Power Cord

Check that the [Line] switch on the rear panel is turned off.

Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with an earth terminal.

WARNING ⚠

If the power cord is connected without the instrument earthed, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.

When connecting to the power supply, DO NOT connect to an outlet without an earth terminal. Also, avoid using electrical equipment such as an extension cord or a transformer.

CAUTION ⚠

If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by either turning off the [Line] switch on the rear panel, or by pulling out the power cord or the power inlet.

When installing the instrument, place the instrument so that an operator may easily operate the [Line] switch.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

It should be noted that, the [Power] switch on the front panel of the instrument is a standby switch, and cannot be used to cut the main power.

Replacing fuse

WARNING ⚠

- If the fuses are replaced while power is supplied, there is a serious risk of electric shock. Before replacing the fuses, set the power switch to OFF and remove the power cord from the power outlet.
- If power is supplied without protective grounding, there is a risk of accidental electric shock. In addition, if the AC power supply voltage is unsuitable, there is a risk of the internal circuits of the MS2665C/2667C being damaged by the abnormal voltage. Before supplying power again after changing the fuses, check that the protective grounding described previously is still connected, and check that the AC power supply voltage is suitable. Then, set the power switch to ON.

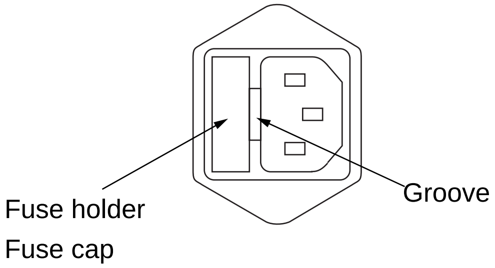
CAUTION ⚠

When there are no supplied spare fuses, the replacement fuses must have the same rated voltage and current as the fuses in the fuse holders.

- If the replacement fuses are not of the same type, they may not fit correctly, there may be a faulty connection, or the time taken to for the fuses to blow may be too long.
- When an abnormality occurs again, if the voltage and current rating of the fuses is incorrect, the fuses may not blow with a consequent risk of damage to the equipment by fire.

This instrument with standard accessories has two spare 5 A fuses. The fuses are mounted in the fuse holder and must be replaced if they blow. If the fuses must be replaced, locate and remedy the cause before replacing the blown fuses.

After performing the safety procedures described on the preceding page, replace the fuses according to the following procedure.

Step	Procedure
1	Set the front-panel [Power] switch to Stby and the rear-panel [Line] switch to OFF. Then, remove the power cord from the power-supply outlet.
2	Place the tip of a ball point pen in the groove of the fuse holder and pull the fuse holder towards you. Then remove the cap, together with the fuse. 
3	Remove the blown fuse from the cap and replace it with the spare fuse.
4	Replace the cap and fuse.

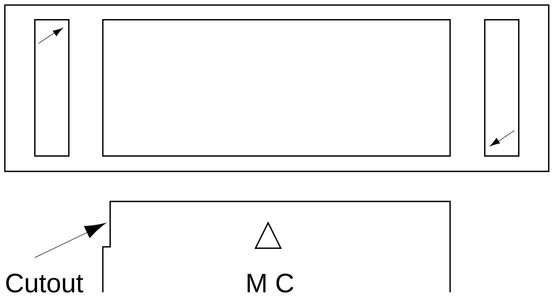
Precaution for Handling Memory Card

See para. 1.3 for the memory card to be used.
When a new memory card used to save any file, format it beforehand to MS-DOS.
When saving data to a memory card; confirm that the write-protect switch of the card is set at the NOT-PROTECTED side, and then install it to this instrument. (For the setting method, see the operation manual of the card.)

- Installing Memory Card

  Install the memory card to this instrument, with the cutout of the card at the position as shown below. Two card can be installed at the upper and lower sides.

Memory Card



- Removing Memory Card

  Push the left eject button to remove the memory card at the upper side.
  Push the right eject button to remove the memory card at the lower side.

- Replacing Battery of Memory Card

  Memory card has a battery. When the battery life ends, the saved data is erased. Replace the battery before the life end. (For the battery life and replacing method, see the operation manual of the card.)

SECTION 3

PANEL DESCRIPTION

In this section, the front and rear panels are described about the case in which all the options are attached to.

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SECTION 3
PANEL DESCRIPTION

In this section, the front and rear panels (Figs. 3-1 and 3-2) are described about the case in which all the options are attached to.

Table of Front and Rear Panel Features

No.	Panel Marking	Explanation of Function	
1	(LCD)	This is a 5.5 ” color TFT liquid crystal display (LCD). It displays the trace waveforms, the parameter settings, the values of marker, and the soft menu keys, etc.	
2	Menu On/Off	This toggles the soft-key menu display On/Off.	
3	F 1-F 6	These are the soft keys for selecting the soft-key menus linked to the panel key operation.	
4	More	This displays the next page of soft-key menus.	
5	Freq/Ampl	This is the frequency and level parameter data input section.	
		[Frequency]	Sets frequency.
		[Span]	Sets frequency span.
		[Amplitude]	Sets reference level.
		[– > CF]	Sets peak level signal frequency on screen to center frequency.
		[– > RLV]	Sets peak level on screen to reference level.
6	Marker	This section is related to operation of marker functions.	
		[Marker]	Sets marker.
		[Multi Mkr]	Sets multimarkers. Press this key after pressing the [Shift] key.
		[Peak Search]	Moves marker to currently-displayed peak level.
		[Marker – >]	Sets parameter according to marker value. Press this key after pressing the [Shift] key.
7	User	This is a user-dedicated key which users can specify.	

No.	Panel Marking	Explanation of Function	
8	Single	This sets the sweep mode.	
		[Single]	Executes single sweep.
		[Continuous]	Executes continuous sweeping. Press this key after pressing the [Shift] key. The initial default is continuous sweeping.
9	Recall	This executes recall/save.	
		[Recall]	Reads measurement parameters and waveform data from internal memory or memory card.
		[Save]	Saves measurement parameters and waveform data to internal memory or memory card.
10	Measure	This menu is for performing the various application measurements including frequency measurement, noise measurement, adjacent-channel leakage power measurement, etc.	
11	Display	This section is for selecting the trace waveform. Normally, in the frequency domain, up to two trace waveforms can be displayed. The zero-span (Time Domain) mode is selected simply by pressing the [Time] key.	
		[A, B]	Displays trace A or B waveform in frequency domain.
		[A/B, A/BG]	Displays trace A and B waveforms simultaneously, or displays trace A and BG (background frequency spectrum including trace A) simultaneously.
		[Time]	Switches to zero span (Time domain) mode to display time domain waveforms.
		[A/Time]	Displays trace A and the time domain waveform simultaneously.
12	Trig/Gate	[Trig/Gate]	Sets the sweep-start trigger and gate (to control waveform-data write timing) functions.
13	Coupled Function	This sets the RBW, VBW, sweep time and input attenuator.	

No.	Panel Marking	Explanation of Function
14	Entry	These keys set the numeric data, units and special functions. [Rotary knob] Used for moving marker and inputting data. [∧, ∨] Increments and decrements input data. [Shift] To execute panel functions indicated by blue letters, press this key and then press the blue-lettered key. [BS] Backspace key for correcting input mistakes. [0-9, . , +/–] Numeric-data setting keys. [GHz, MHz, kHz, Hz] Units keys for frequency, level, time, etc.
15	Preset	This sets the measurement parameters to the default values.
16	Local	This changes the remote status to the local status.
17	Copy	This outputs a hard copy of the screen to a printer or plotter.
18	Stby/On	This is the power switch. It can be used when the back-panel power switch is on. The power-on condition is fetched from the Stby condition when the key is pressed for about 1 seconds. The equipment is returned to the Stby condition from the power-on condition when the key is pressed again for about 1 second.
19	Memory Card	This is the slot to set memory cards which save/load the waveform data and measurement parameters etc. Up to two plug-in memory card can be used.
20	RF Input	This is the RF input connector.
21	Local Output	This is the output connector for external mixer local drive signal and input connector for if signal of external mixer. In case of MS2665C, this connector is not provided.
50	(Fan)	This is the cooling fan for ventilating internally-generated heat. Leave a clearance of at least 10 cm around the fan.
51	10 MHz STD	They are the input connector for an external reference crystal oscillator and the output connector of the 10 MHz Reference signal. When an external reference signal is input, the equipment switches automatically from the internal signal to the external signal. In case of MS2665C, if Option 01 is not attached to, this connector is not provided.
52	IF OUT	This is the IF output connector. This signal is bandwidth controlled by the RBW setting.

No.	Panel Marking	Explanation of Function
53	Video (Y)	This connector output a Y-axis signal that is proportional to the video detection signal output and is logarithmically compressed at log scale.
54	Composite Out	This is the video composite signal output connector.
55	O/I	This is the AC line power switch.
56	(Inlet)	This is the fused AC power inlet to which the supplied power cord is connected. It contains two time-lag fuses.
57	(Functional earth Terminal)	This is the terminal that is electrically connected to the chassis of the equipment.
58	RS-232C	This is the RS-232C connector. Connect it to an external system controller or printer, etc.
59	GPIB or Centronics	This connector is for use with a GPIB or Centornics (Option 10) interface. It is connected to an external system controller, or a printer etc.
60	Trig/Gate In (±10 V)	This is a input connector for external trigger/gate signal. (If Option 06 is not attached to, this connector is not provided.)
61	Phone	This is a output connector for earphone. (If Option 07 is not attached to, this connector is not provided.)
62	Sweep (X)	This is a output connector for sweep signal (X). (If Option 15 is not attached to, this connector is not provided.)
63	Sweep Status (Z)	This is a output connector for sweep status signal (Z). (If Option 15 is not attached to, this connector is not provided.)

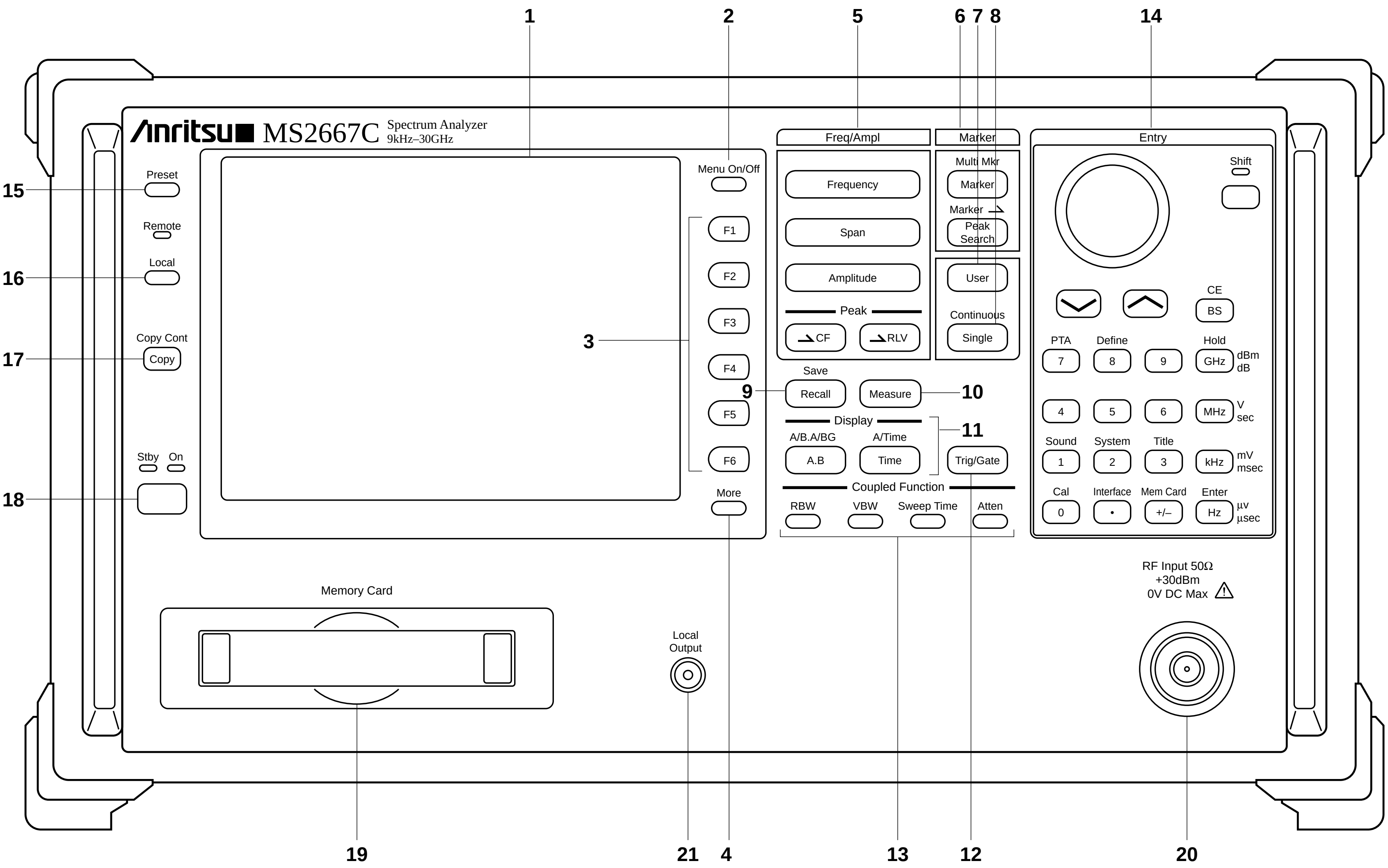


Fig. 3-1 Front Panel

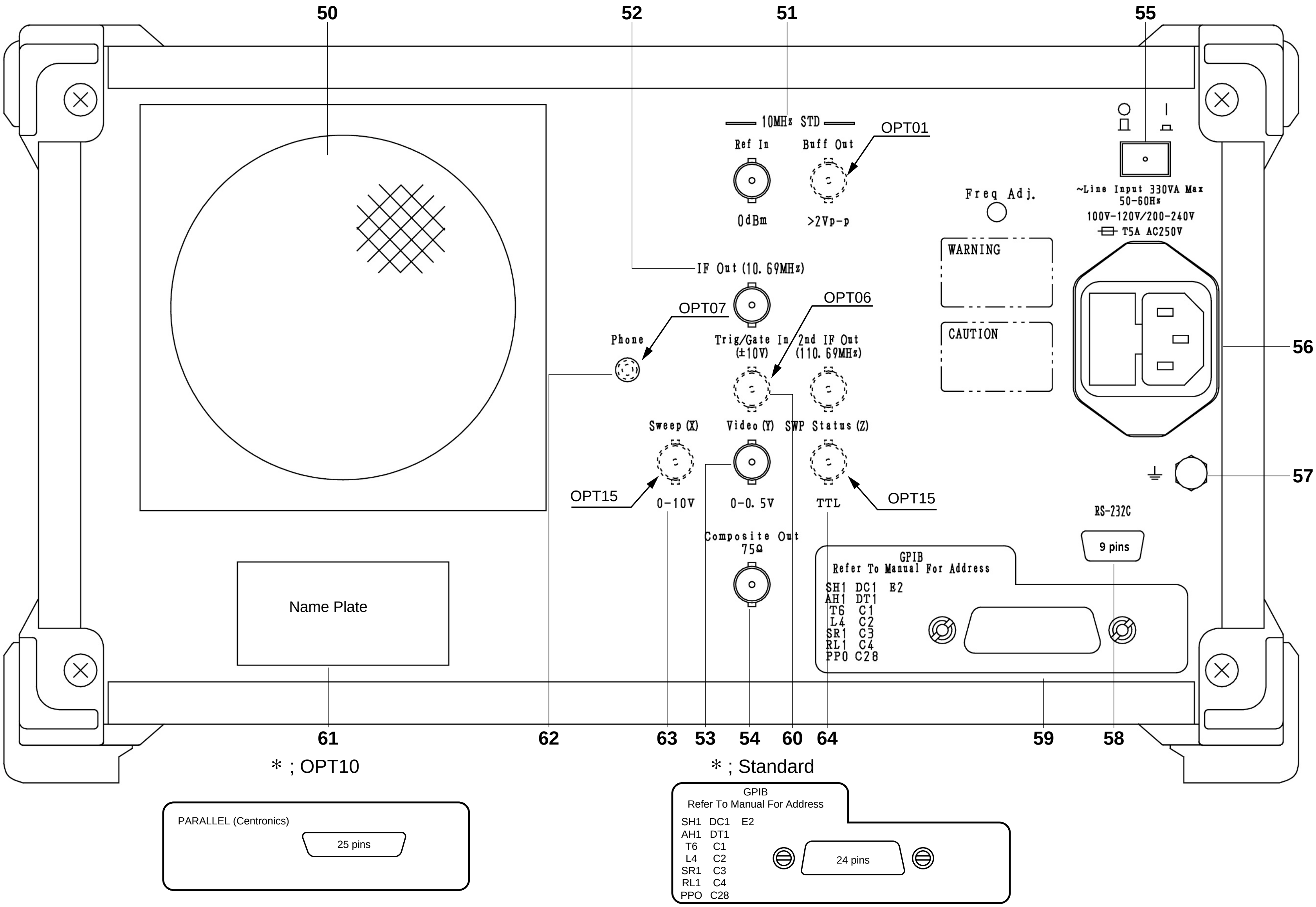


Fig. 3-2 Rear Panel

SECTION 4

SOFT-KEY MENU

In this section, soft-key menu functions and its hierarchical system are described using a tree.

TABLE OF CONTENTS

SECTION 4
SOFT-KEY MENU

In this section, soft-key menu functions and its hierarchical system are described using a tree.
Matters to be noted about the tree are shown below.

(1) Panel Key indicates a hard key on the front panel.

(2) Top menus are the menus at the top level which are displayed on the screen when the panel key is pressed. Lower menus indicates other menus below the top menus.

(3) When a soft key with an appended asterisk (*) is pressed in these menus, the menu moves to the lower menu indicated by the arrow symbol (->). However, if any not-supported-function soft key in an Option is pressed, an error message is displayed.

(4) When the Return key is pressed at a lower menu, the next-higher menu is returned.

(5) Menus with more than six items are split into several pages.

(6) The menu page construction and currently-displayed page are indicated in the lower part of the menu. To move to the next page, press the [More] key.

(7) Panel keys and soft keys prefixed by a sharp symbol (#) at the left of the menu frame, give an outline explanation of the function.

Soft-key Menu List

Menu		MS2665C Menu Tree (page/25)	MS2667C/68C Menu Tree (page/25)
A	A/B,A/BG	15	15
	A/Time	16	16
	ACP Setup1	8	8
	ACP Setup2	8	8
	ACP Setup3	8	8
	Ajd ch pwr	8	8
	Amplitude	2	2
	Attenuator	2, 3	2, 3
	Avg Count	14	14
B	Band	1	1
	Brightness	19	19
	Burst Pwr	11	11
C	C/N Meas	7	7
	Channel Power Measure	7	7
	Cal	20	20
	Ch Power	7	7
	Change Clr	19	19
	Check File	23	23
	Copy Cont	18	18
	Copy from	19	19
	Correction	2	2
	Count Setup	7	7
D	Def files	24	24
	Def Menus	24	24
	Define	24	24
	Define Clr	19	19
	Detection	14, 16	14, 16
	Dip	5	5
	Directory	22	22
	Disp Line	2, 4	2, 4
	Display	19	19
E	Edit Menu	24	24
	Ext Mix	-	2
	Expand	16	16

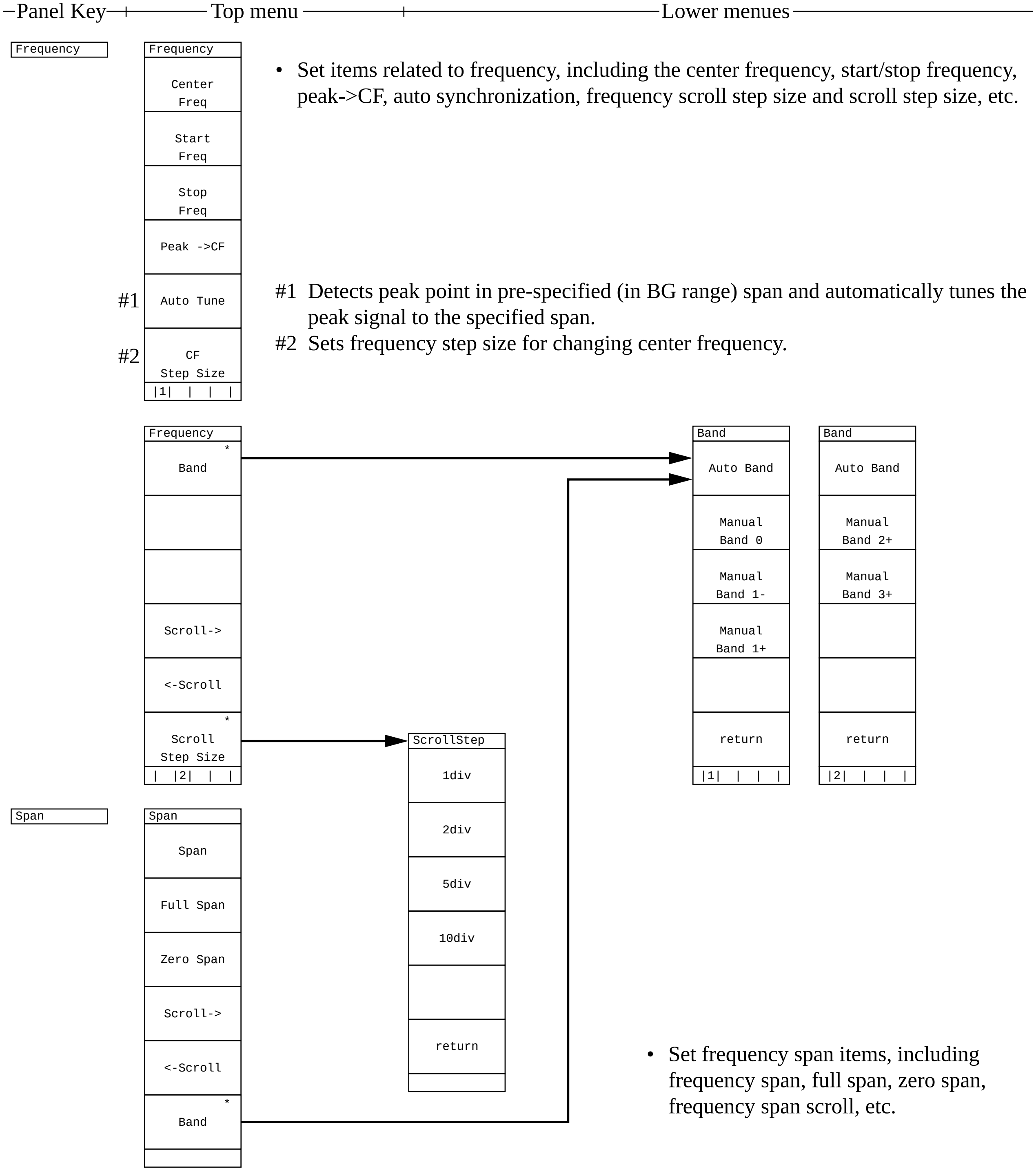
Menu		MS2665C Menu Tree (page/25)	MS2667C/68C Menu Tree (page/25)
F	File Ope		
	FM monitor	16	16
	Format	22	22
	Freq Count	7	7
	Freq Offset	-	1
	Frequency	1	1
G	Gate	17	17
	Gate Setup	17	17
H	Hold Count	14	14
I	Impedance	2	2
	Initialize	24	24
	Interface	21	21
	Int Mix	-	2
	Item	12, 18	12, 18
L	LCD Brightness	19	19
	Lib Exec	23	23
	Lib File	23	23
	Lib Memory	23	23
	Lib Prgm	24	24
	Lib Remove	23	23
	Lin Scale	2	2
	Line	9, 10	9, 10
	Load/Save	9, 10	9, 10
	Location	18	18
	Log Scale	2	2
	Lvl Offset	2	2
M	Manual Set	4	4
	Marker	4	4
	Marker→	4, 5	4, 5
	Mask Meas	9	9
	Measure	7, 10	7, 10
	Media	2, 9, 10, 22, 24	2, 9, 10, 22, 24
	Mem Card	2, 9, 10, 22	2, 9, 10, 22
	Mkr Func	4	4
	Mkr List	4	4
	Move Mask	9	9
	Move Temp	10	10
	Multi Marker	4	4
N	Noise Meas	7	7
O	OBW Setup	8	8
	Occ BW	8	8

Menu		**MS2665C** **Menu Tree (page/25)**	**MS2667C/68C** **Menu Tree (page/25)**
P	Paper Size	18	18
	Peak	5	5
	Plotter	18	18
	Pon State	19	19
	Preset	25	25
	Preslctr	20	20
	Printer	18	18
	PTA	22	22
	PTA Lib	23	23
R	RBW	3	3
	Recall	12	12
	Recl Media	12	12
	Ref Line	14	14
	Ref Step	2	2
	RS232C	21	21
S	Save	13	13
	Save Media	13, 18	13, 18
	Scroll Step	1	1
	Select	2, 9,10	2, 9, 10
	Set Date	19	19
	Set Time	19	19
	Setup	2	2
	Setup Mask	9	9
	Setup Temp	10	10
	Source	16, 17	16, 17
	Sound	19	19
	Span	1	1
	Storage	14, 16	14, 16
	Sweep Time	3	3
	Sweep Cntl	15, 16	15, 16
	System	19	19
T	Temp Meas	10	10
	Threshold	5	5
	Title	21	21
	Trace A, B	14	14
	Trace Calc	14	14
	Trace Move	14	14
	Trace Time	16, 17	16, 17
	Trnsformer	2	2
	Trig Ext	17	17
	Trig Video	17	17
	Trigger	17	17

Menu		MS2665C Menu Tree (page/25)	MS2667C/68C Menu Tree (page/25)
U	Units	2	2
	User1	6	6
	User2	6	6
	User3	6	6
V	VBW	3	3
W	Wide IF	17	17
Z	Zone Width	4	4

Menu Tree

MS2665C Menu Tree (1/25)



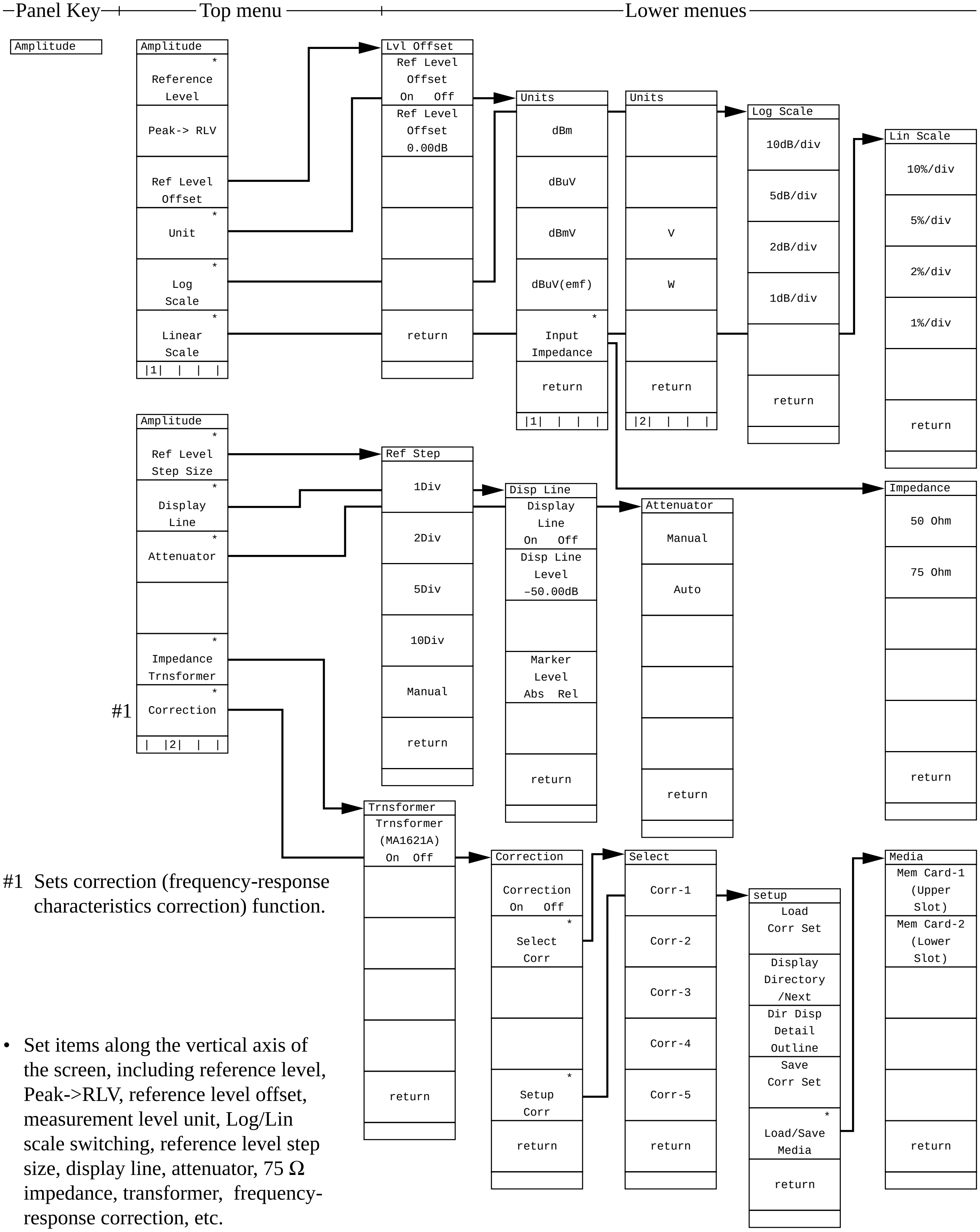
- Set items related to frequency, including the center frequency, start/stop frequency, peak->CF, auto synchronization, frequency scroll step size and scroll step size, etc.

#1 Detects peak point in pre-specified (in BG range) span and automatically tunes the peak signal to the specified span.

#2 Sets frequency step size for changing center frequency.

- Set frequency span items, including frequency span, full span, zero span, frequency span scroll, etc.

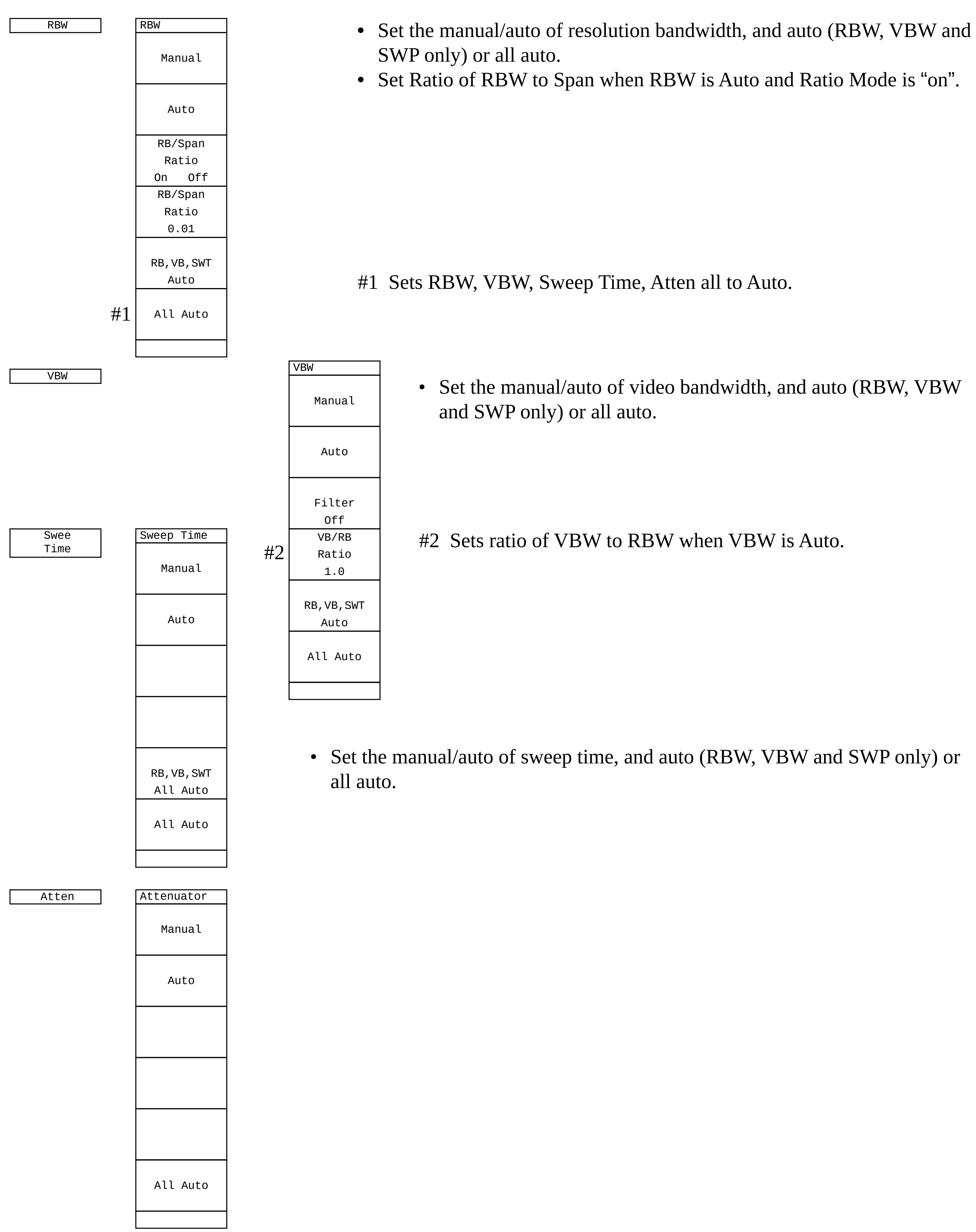
MS2665C Menu Tree (2/25)



#1 Sets correction (frequency-response characteristics correction) function.

- Set items along the vertical axis of the screen, including reference level, Peak->RLV, reference level offset, measurement level unit, Log/Lin scale switching, reference level step size, display line, attenuator, 75 Ω impedance, transformer, frequency-response correction, etc.

MS2665C Menu Tree (3/25)



- Set the manual/auto of resolution bandwidth, and auto (RBW, VBW and SWP only) or all auto.
- Set Ratio of RBW to Span when RBW is Auto and Ratio Mode is “on”.

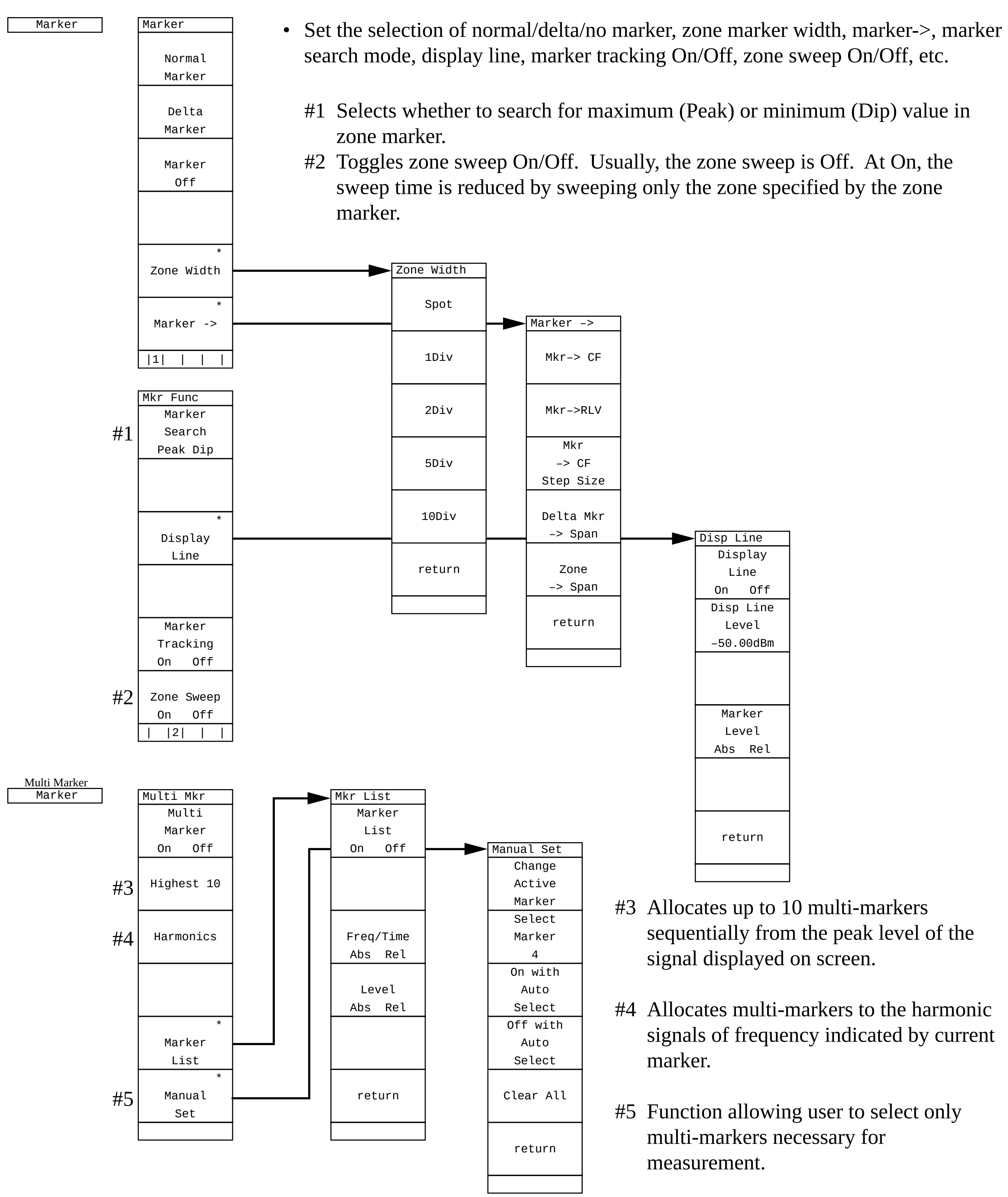
#1 Sets RBW, VBW, Sweep Time, Atten all to Auto.

- Set the manual/auto of video bandwidth, and auto (RBW, VBW and SWP only) or all auto.

#2 Sets ratio of VBW to RBW when VBW is Auto.

- Set the manual/auto of sweep time, and auto (RBW, VBW and SWP only) or all auto.

MS2665C Menu Tree (4/25)



- Set the selection of normal/delta/no marker, zone marker width, marker->, marker search mode, display line, marker tracking On/Off, zone sweep On/Off, etc.

#1 Selects whether to search for maximum (Peak) or minimum (Dip) value in zone marker.

#2 Toggles zone sweep On/Off. Usually, the zone sweep is Off. At On, the sweep time is reduced by sweeping only the zone specified by the zone marker.

#3 Allocates up to 10 multi-markers sequentially from the peak level of the signal displayed on screen.

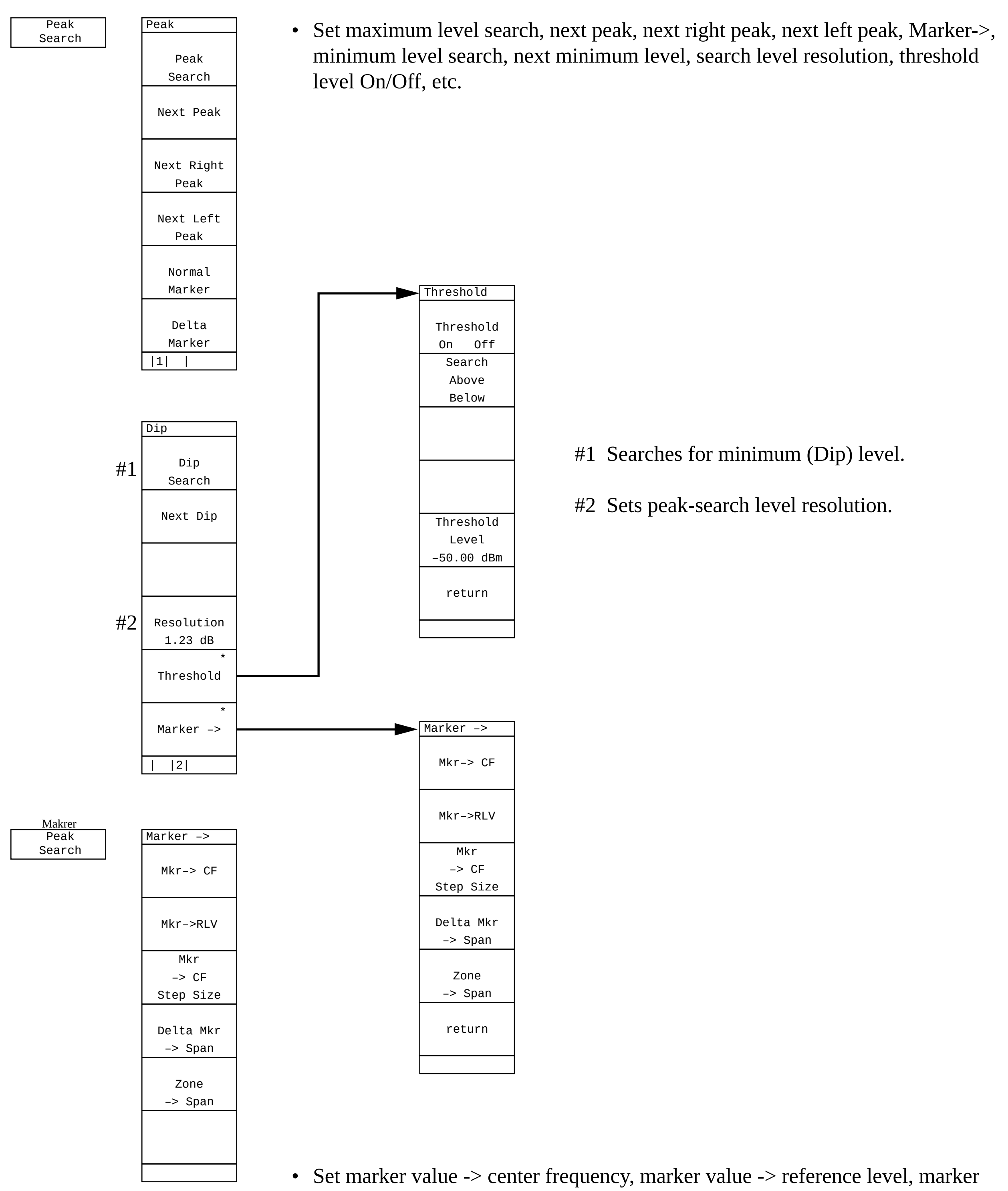
#4 Allocates multi-markers to the harmonic signals of frequency indicated by current marker.

#5 Function allowing user to select only multi-markers necessary for measurement.

#6 Select "absolute value" or "relative value (display line)" to display marker level.

- Set multi-marker On/Off, 10 multi-marker, harmonic multi-marker, listing of multi-marker values, selection of necessary markers, etc.

MS2665C Menu Tree (5/25)



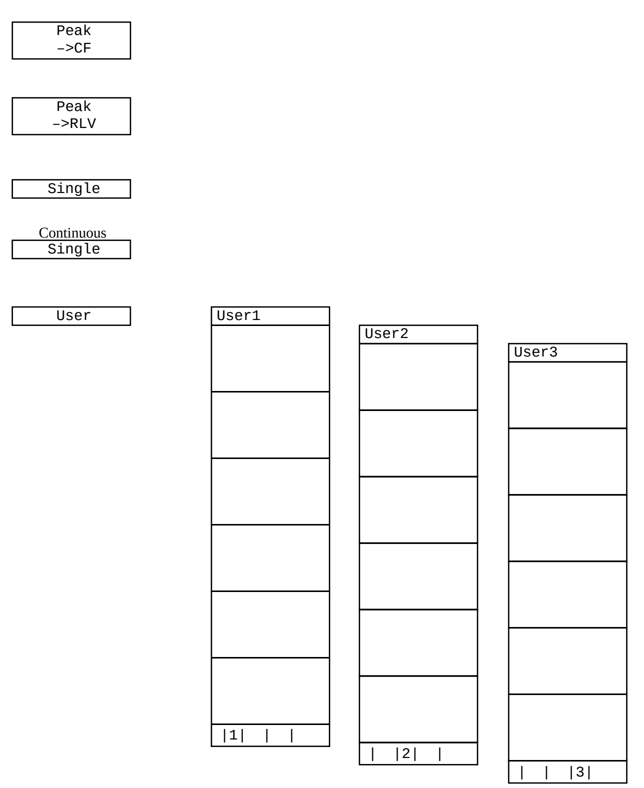
- Set maximum level search, next peak, next right peak, next left peak, Marker->, minimum level search, next minimum level, search level resolution, threshold level On/Off, etc.

#1 Searches for minimum (Dip) level.

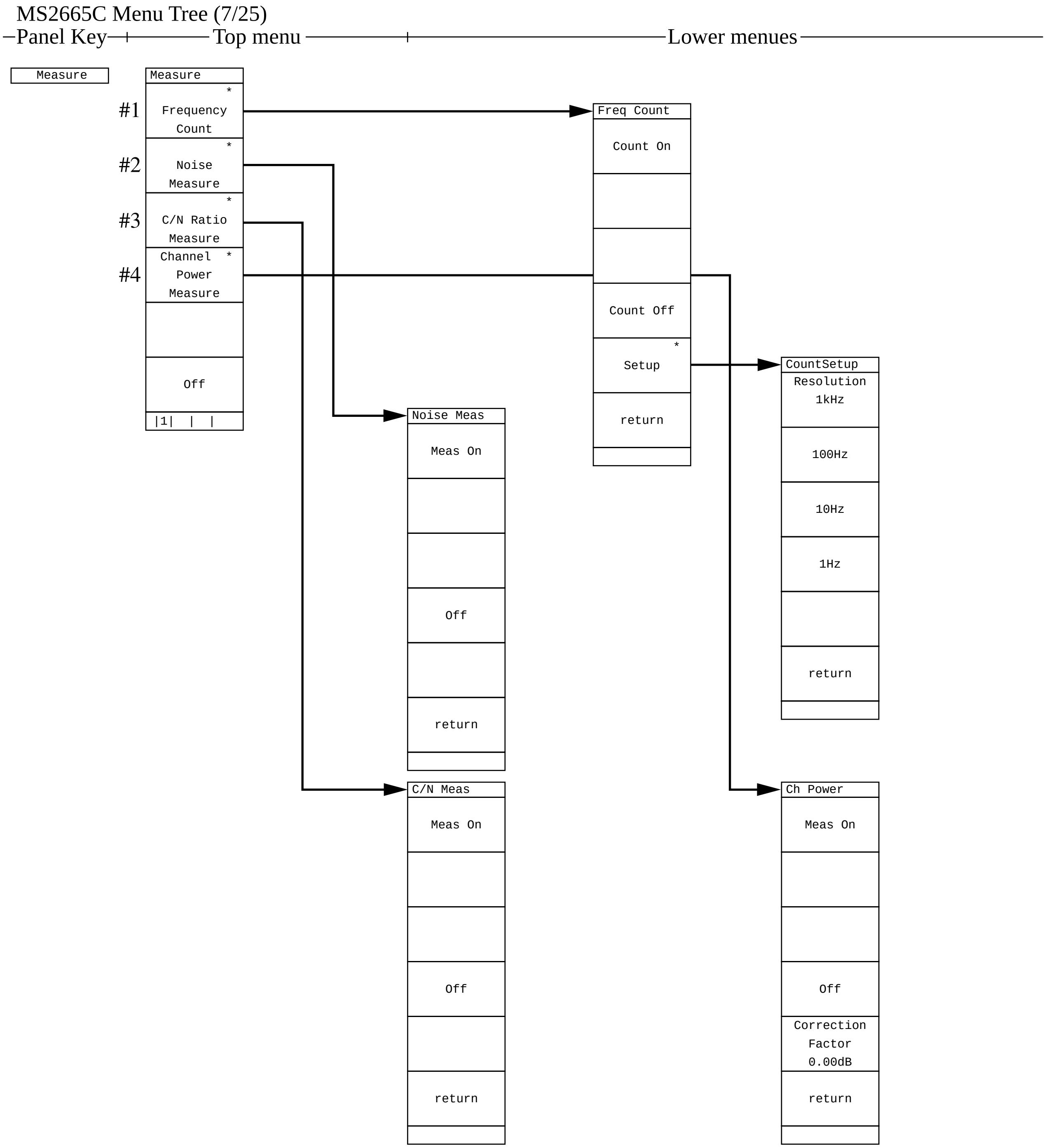
#2 Sets peak-search level resolution.

- Set marker value -> center frequency, marker value -> reference level, marker value -> CF step size, delta marker-> span, zone marker -> span, etc.

MS2665C Menu Tree (6/25)



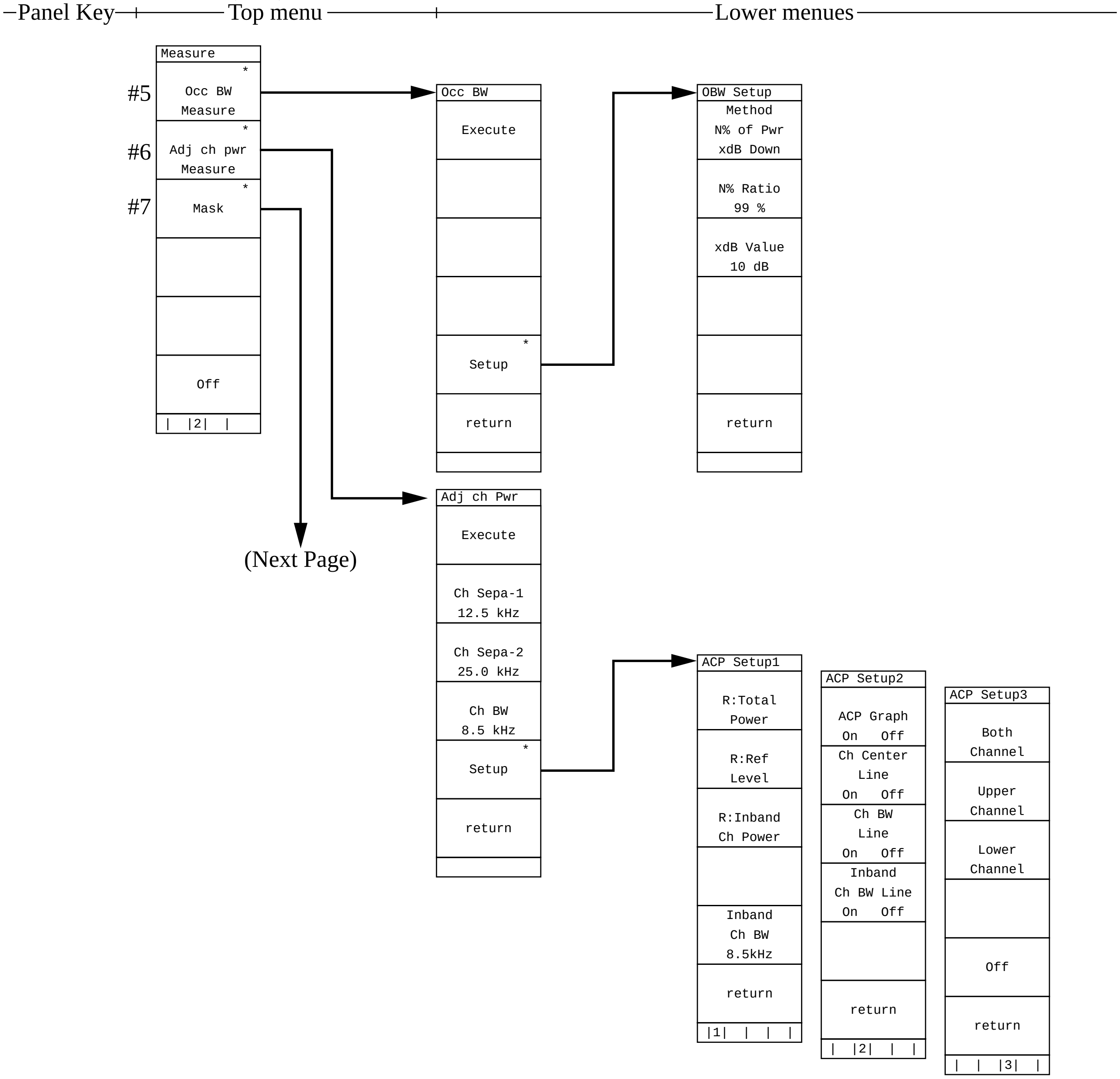
- The soft-key menu defined by the user is displayed. (See "User Define".)



- Perform measurement according to various applications:

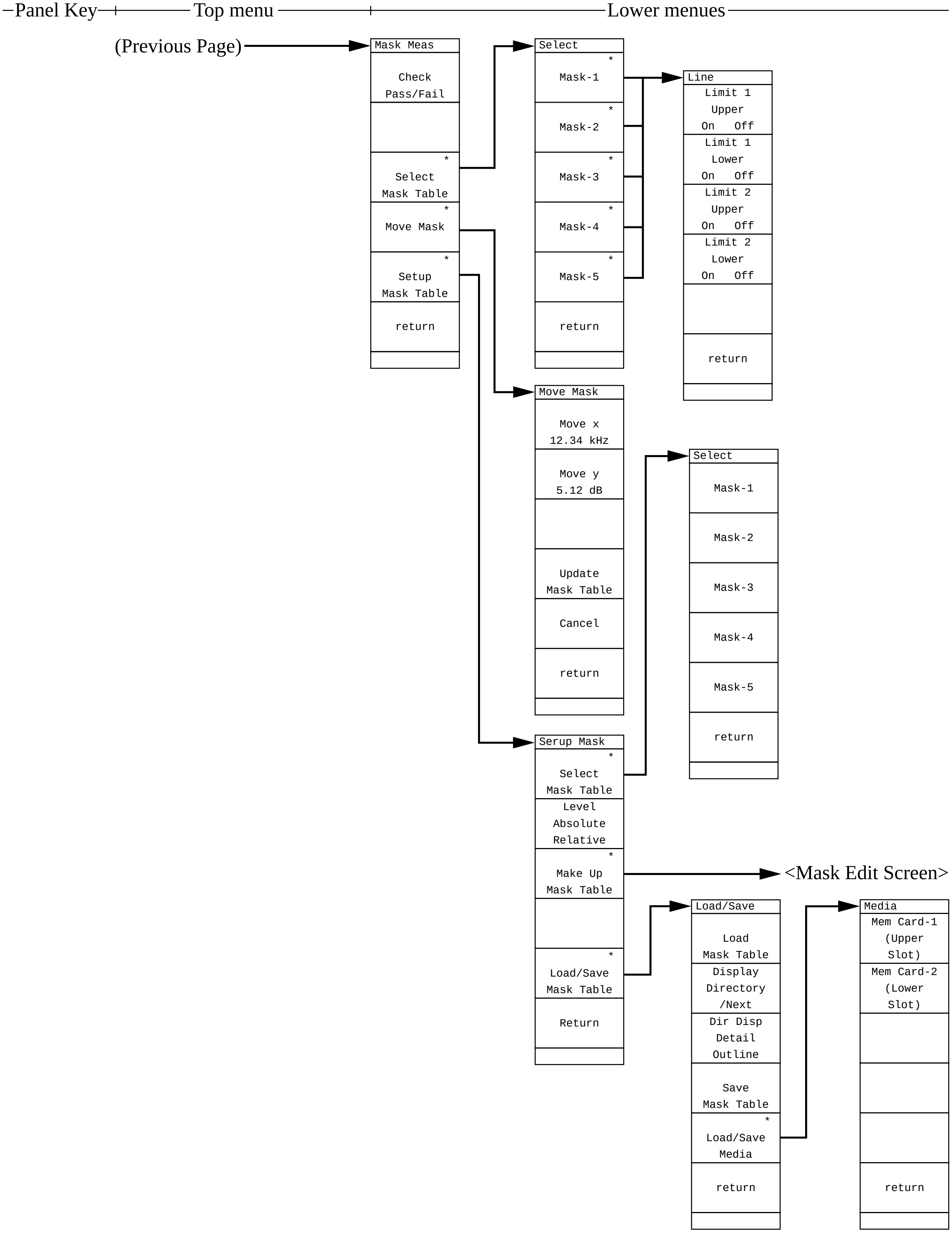
#1 Frequency Count:	Measure marker frequency with a high resolution. Select resolution from 1 kHz, 100 Hz, 10 Hz and 1 Hz.
#2 Noise Measure:	Measure the noise power within zone marker.
#3 C/N Ratio Measure:	Measure the ratio of carrier signal and noise power. Reference marker of the delta marker shall be set to the carrier, and marker's zone width specifies the power measured.
#4 Channel Power Measure:	Power with in the band indicated by zone marker is measured. It is possible to set an arbitrary calibration value.

MS2665C Menu Tree (8/25)

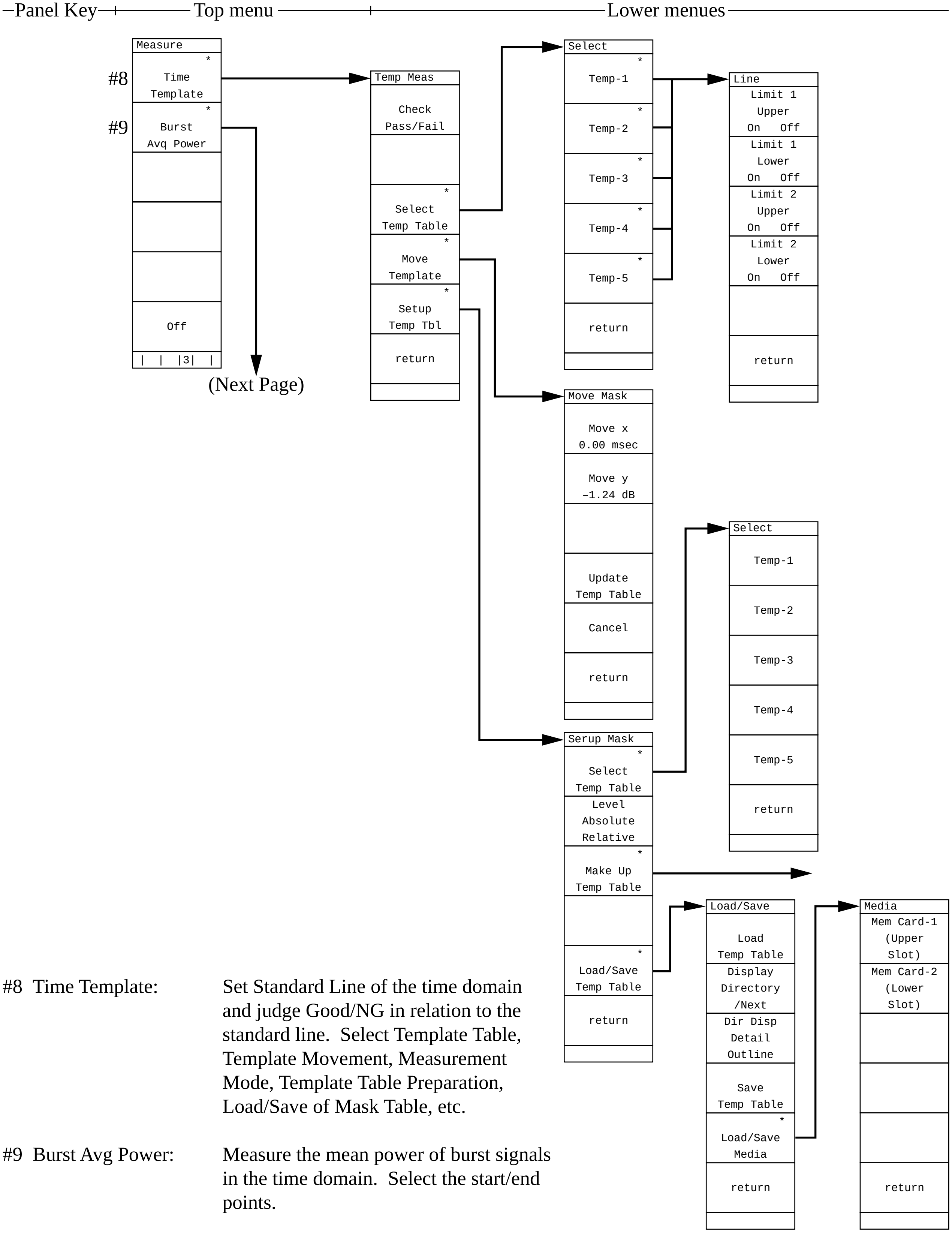


#5 Occ BW Measure:	Measure the occupied bandwidth. Select the X dB DOWN or N % of POWER mode.
#6 Adj ch pwr Measure:	Measure leak power from adjacent channels. Select Channel Separate, Channel Bandwidth and Measurement Mode (Method), On/Off of ACP Graph, On/Off of Channel Center Line and On/Off of Channel BW Line, Upper Channel, Lower Channel or Both Channel, etc.
#7 Mask:	Set Standard Line of the frequency domain and judge Good/NG in relation to the standard line. Select Mask Table, Mask Movement, Measurement Mode, Mask Table Preparation, Load/Save of Mask Table, etc.

MS2665C Menu Tree (9/25)

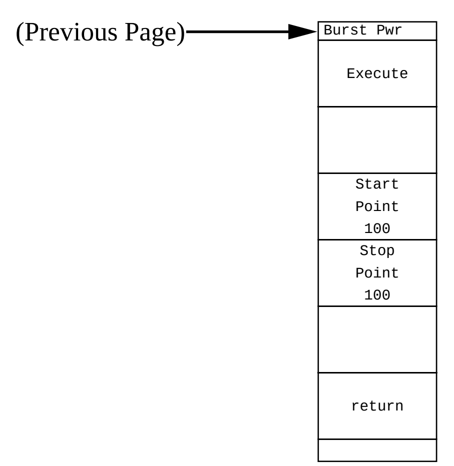


MS2665C Menu Tree (10/25)

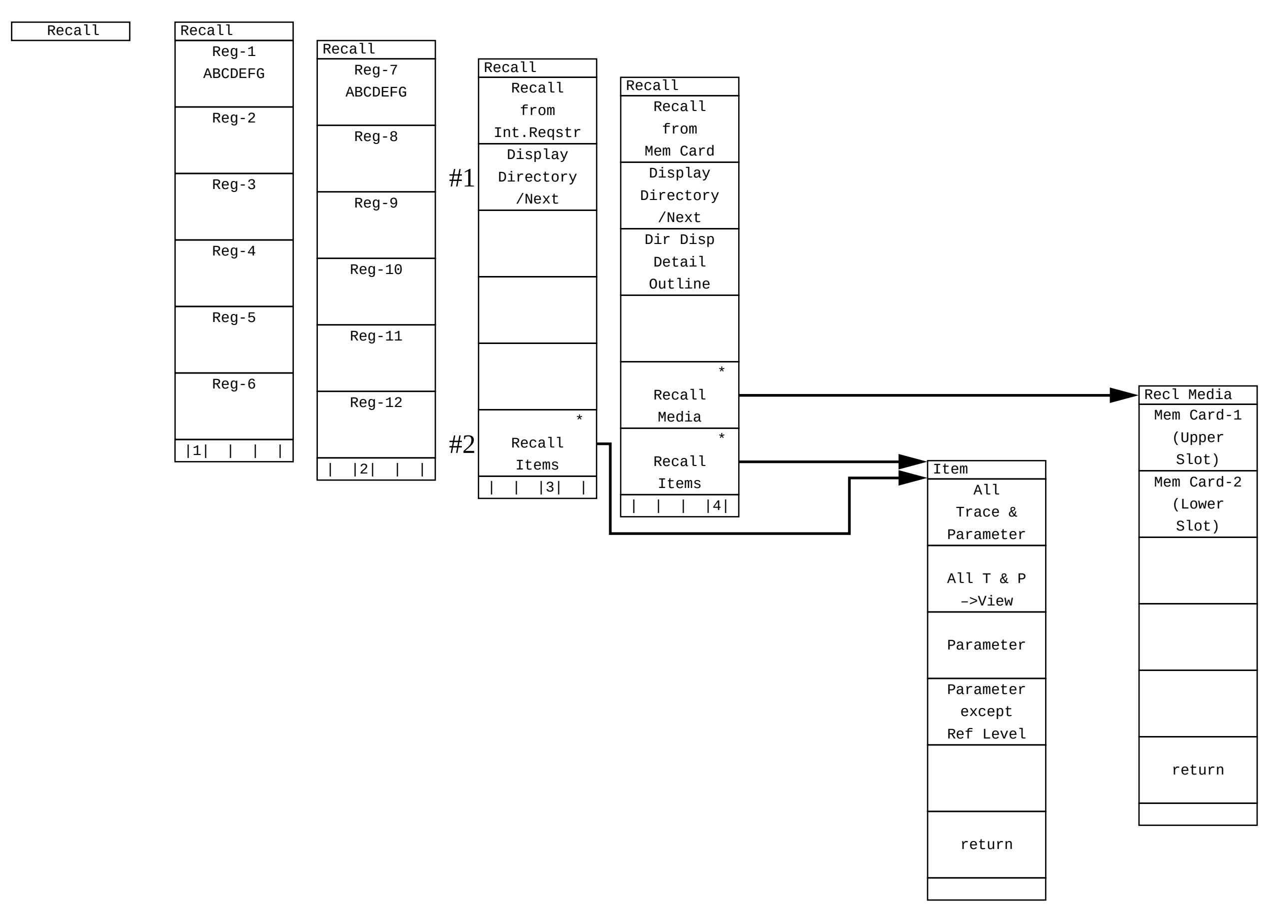


#8 Time Template:	Set Standard Line of the time domain and judge Good/NG in relation to the standard line. Select Template Table, Template Movement, Measurement Mode, Template Table Preparation, Load/Save of Mask Table, etc.
#9 Burst Avg Power:	Measure the mean power of burst signals in the time domain. Select the start/end points.

MS2665C Menu Tree (11/25)



MS2665C Menu Tree (12/25)



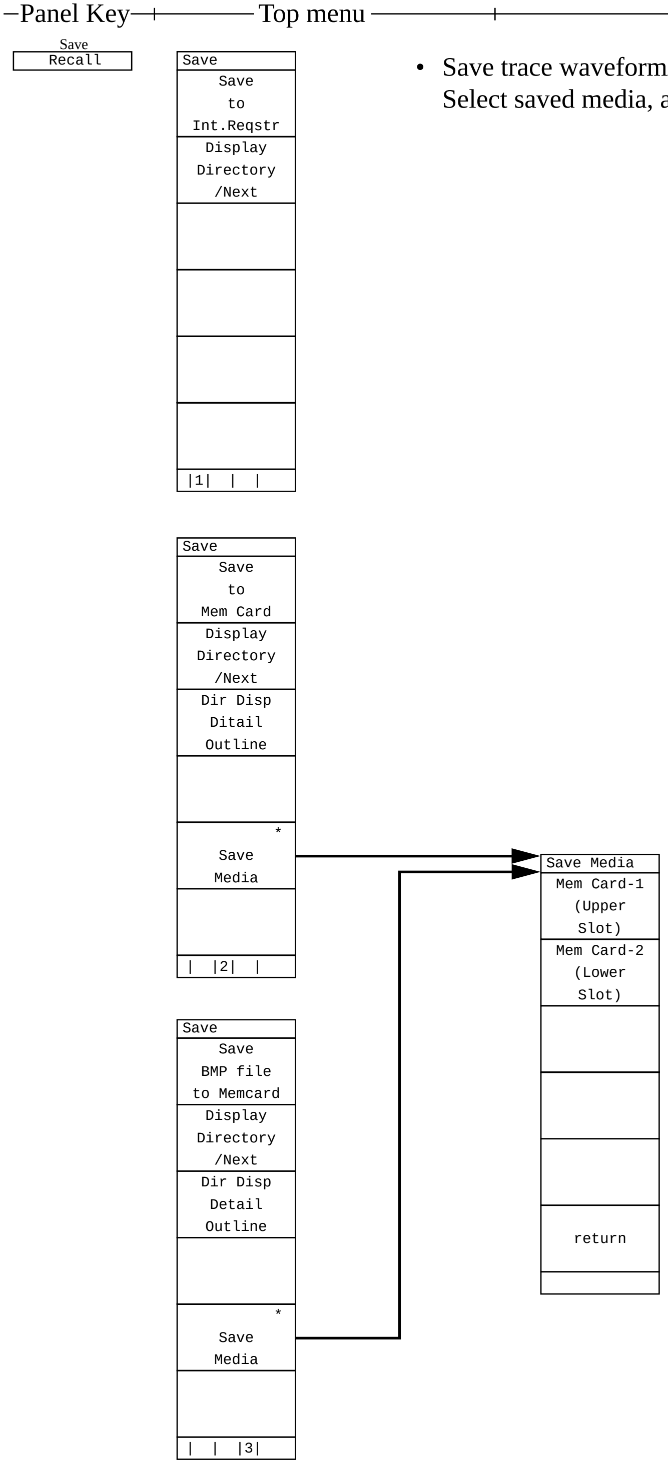
- Read out trace waveform/parameters from the internal memory or memory card. Select recall addresses and media/items, and display file directories.

#1 Displays list of internal-memory directories.

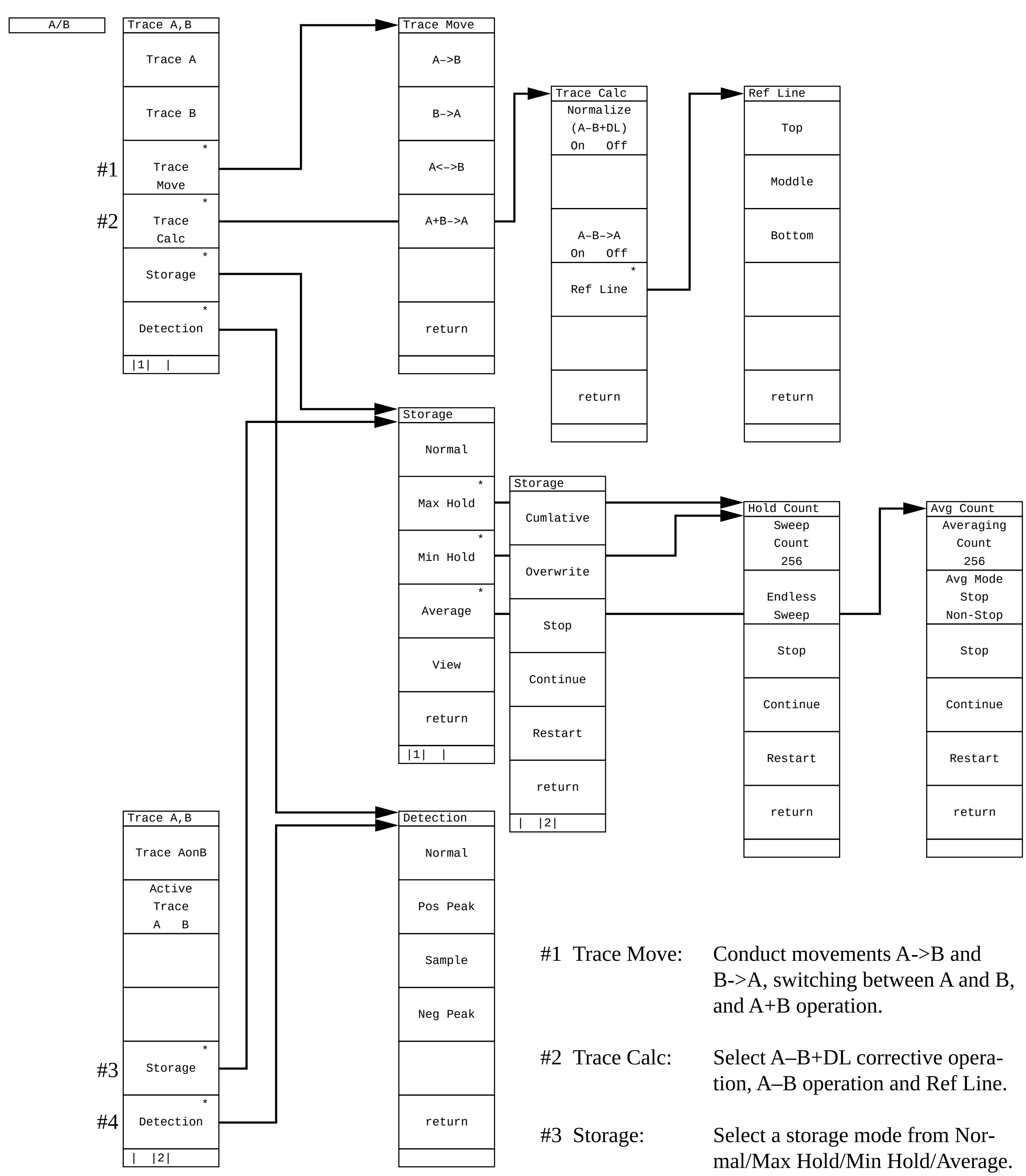
#2 Specifies items to be recalled
(trace waveform, parameter, etc.).

MS2665C Menu Tree (13/25)

- Save trace waveform/parameters to the internal memory or memory card. Select saved media, and display file directories.



MS2665C Menu Tree (14/25)



#1 Trace Move: Conduct movements A->B and B->A, switching between A and B, and A+B operation.

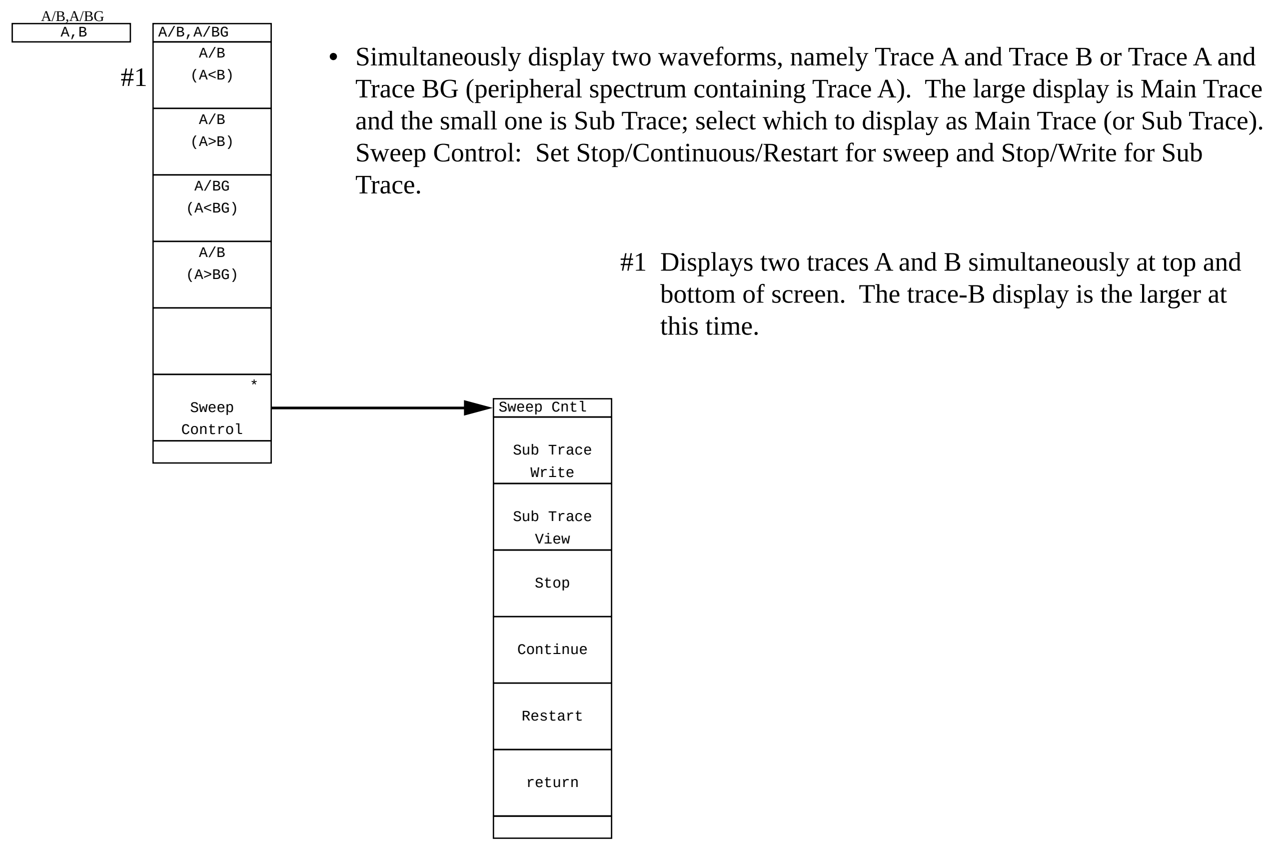
#2 Trace Calc: Select A–B+DL corrective operation, A–B operation and Ref Line.

#3 Storage: Select a storage mode from Normal/Max Hold/Min Hold/Average. Set Sweep Count, Rewrite/Overwrite, Stop Continue, Restart, etc.

#4 Detection: Select a detection mode from Normal/Pos Peak/Neg Peak/Sample.

- Select Trace A/B, movement between Trace A/B, sum/difference operation between Trace A/B and Ref Line, and designate the storage and detection modes and Active Trace.

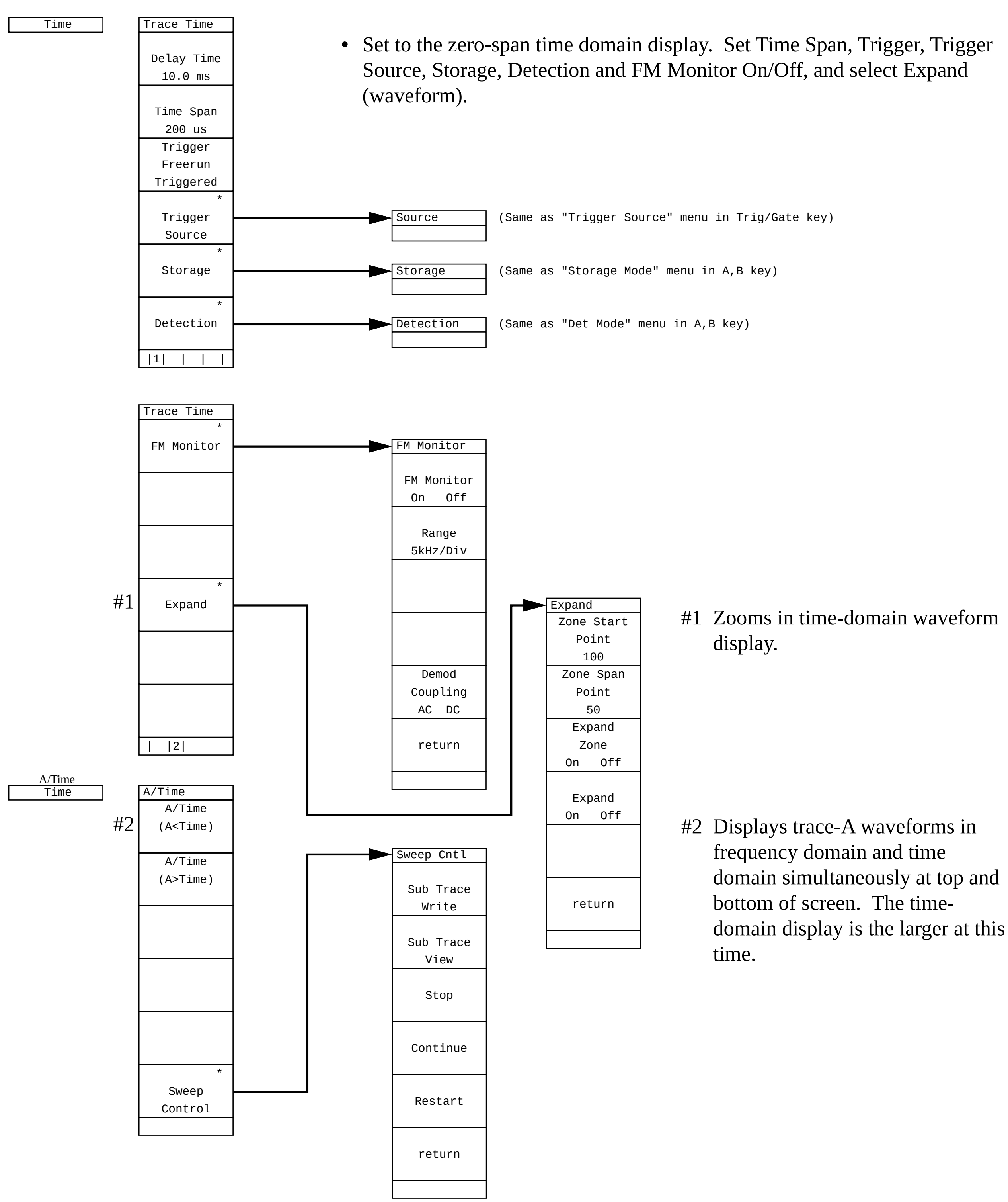
MS2665C Menu Tree (15/25)



- Simultaneously display two waveforms, namely Trace A and Trace B or Trace A and Trace BG (peripheral spectrum containing Trace A). The large display is Main Trace and the small one is Sub Trace; select which to display as Main Trace (or Sub Trace). Sweep Control: Set Stop/Continuous/Restart for sweep and Stop/Write for Sub Trace.

#1 Displays two traces A and B simultaneously at top and bottom of screen. The trace-B display is the larger at this time.

MS2665C Menu Tree (16/25)



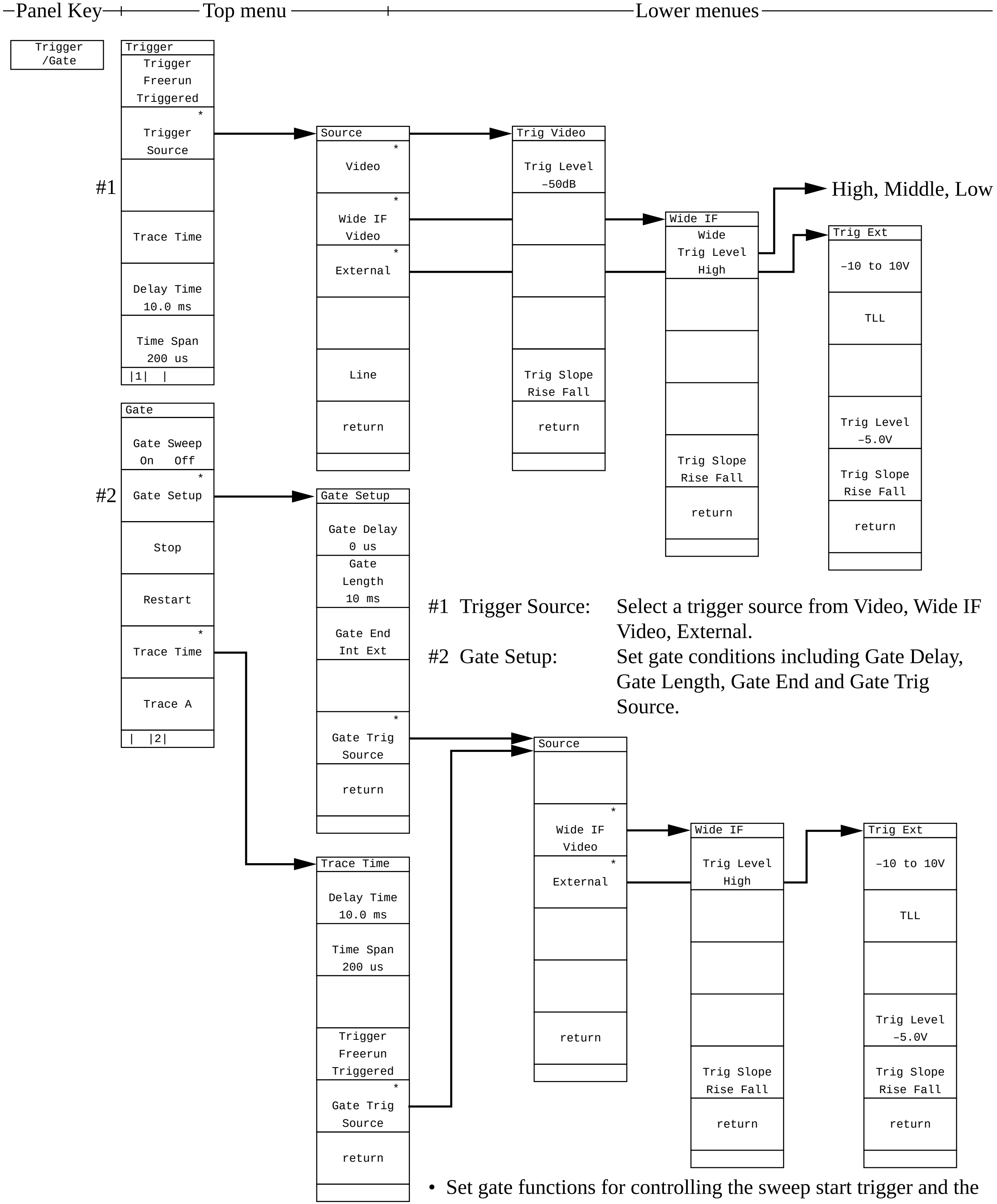
- Set to the zero-span time domain display. Set Time Span, Trigger, Trigger Source, Storage, Detection and FM Monitor On/Off, and select Expand (waveform).

#1 Zooms in time-domain waveform display.

#2 Displays trace-A waveforms in frequency domain and time domain simultaneously at top and bottom of screen. The time-domain display is the larger at this time.

- Simultaneously display waveforms of Trace a and Time Domain. Which to display as Main Trace (or Sub Trace) can be selected.

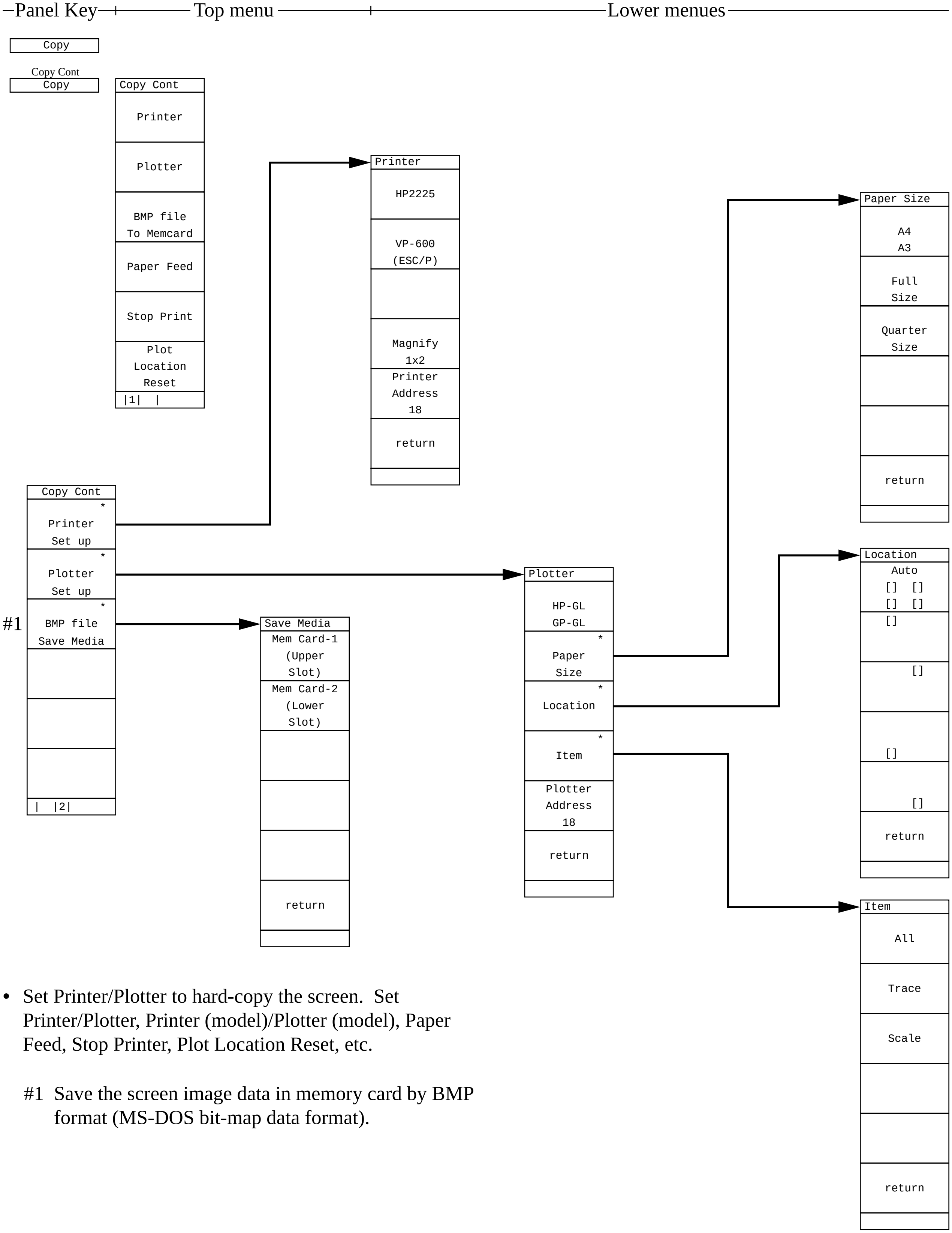
MS2665C Menu Tree (17/25)



#1 Trigger Source:	Select a trigger source from Video, Wide IF Video, External.
#2 Gate Setup:	Set gate conditions including Gate Delay, Gate Length, Gate End and Gate Trig Source.

- Set gate functions for controlling the sweep start trigger and the writing of waveform data. Set the trigger mode, trigger source, trace time, delay time and time span. Select On/Off, Stop and Restart of Gate Sweep.

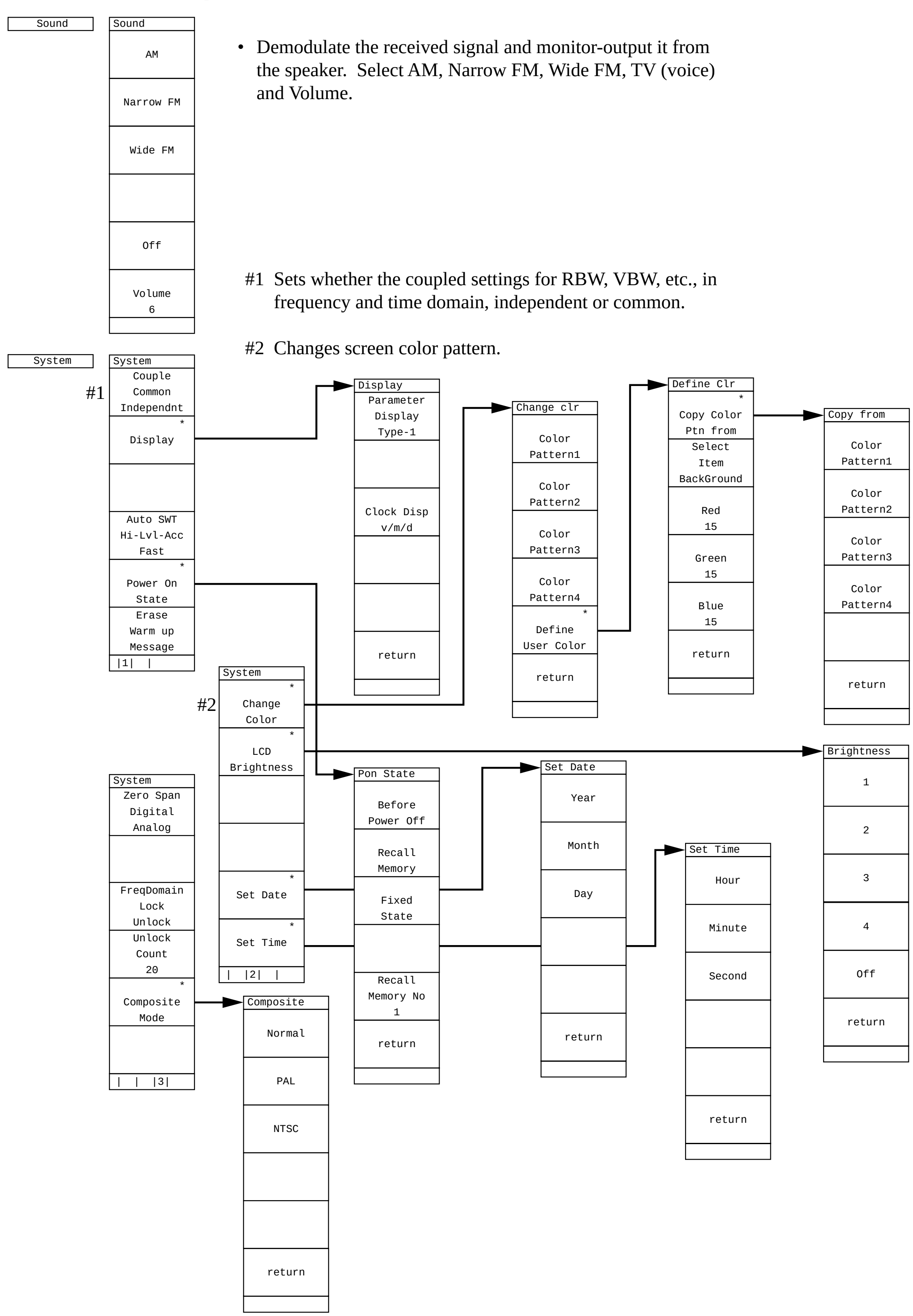
MS2665C Menu Tree (18/25)



- Set Printer/Plotter to hard-copy the screen. Set Printer/Plotter, Printer (model)/Plotter (model), Paper Feed, Stop Printer, Plot Location Reset, etc.

  #1 Save the screen image data in memory card by BMP format (MS-DOS bit-map data format).

MS2665C Menu Tree (19 /25)



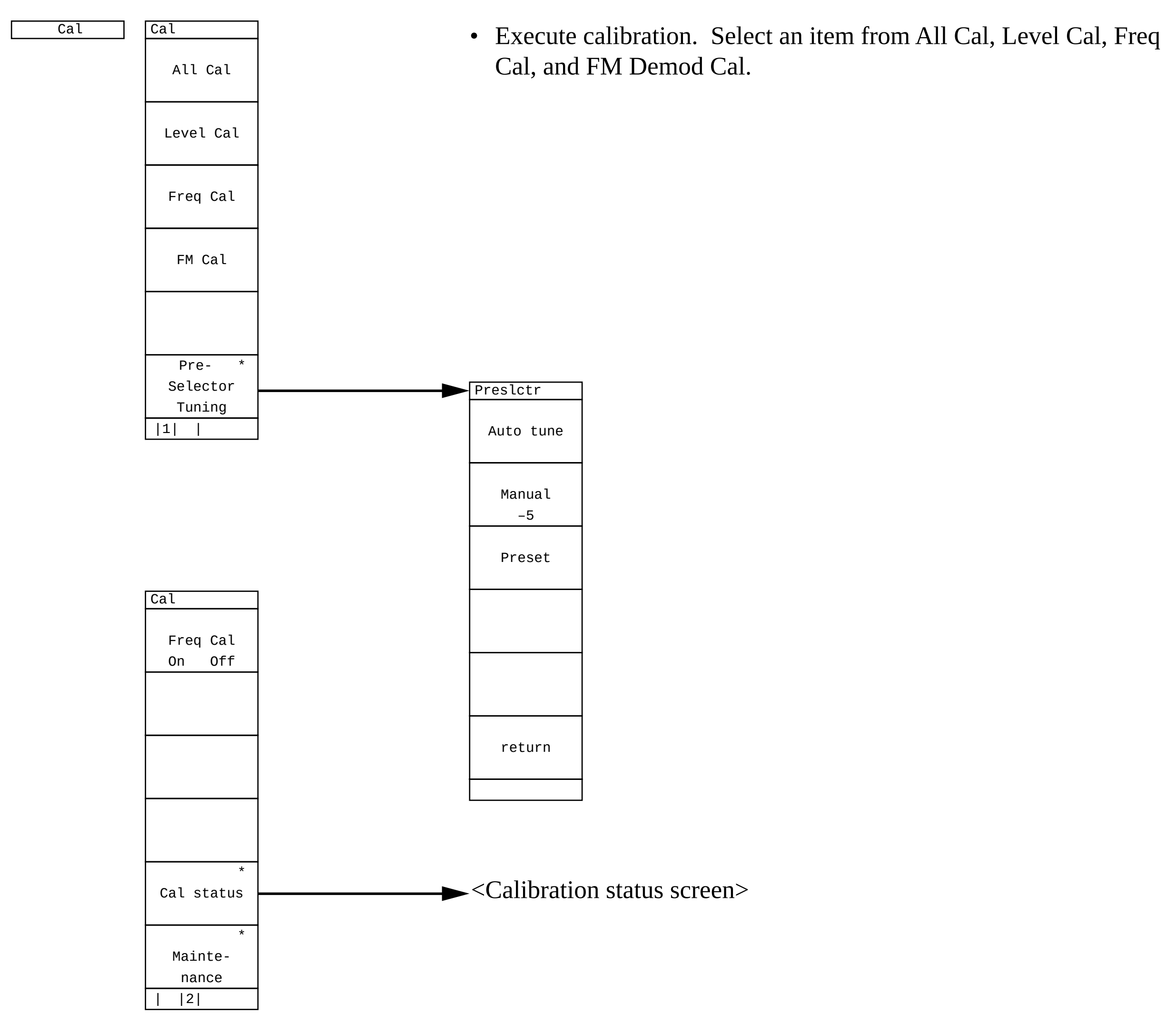
- Demodulate the received signal and monitor-output it from the speaker. Select AM, Narrow FM, Wide FM, TV (voice) and Volume.

#1 Sets whether the coupled settings for RBW, VBW, etc., in frequency and time domain, independent or common.

#2 Changes screen color pattern.

- Set various modes of systems of this device.
  Set Couple, Display, Color Pattern, Define User Color, Time Sweep, Power On State, etc.

MS2665C Menu Tree (20/25)

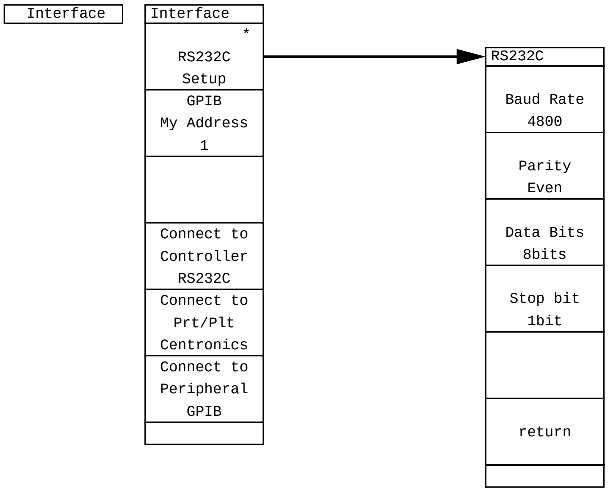


- Execute calibration. Select an item from All Cal, Level Cal, Freq Cal, and FM Demod Cal.

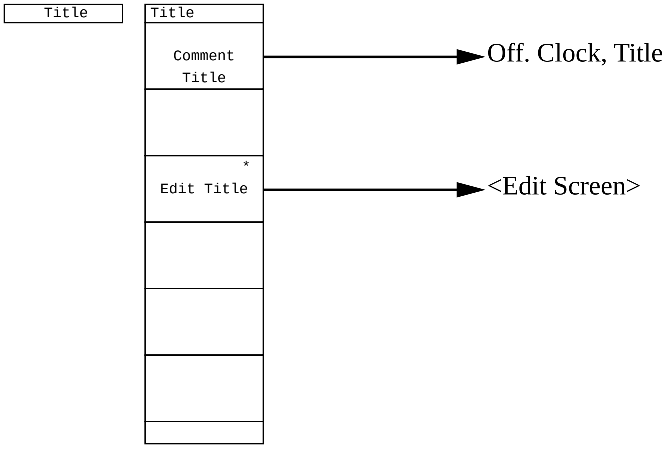
MS2665C Menu Tree (21/25)

Panel Key — Top menu — Lower menues

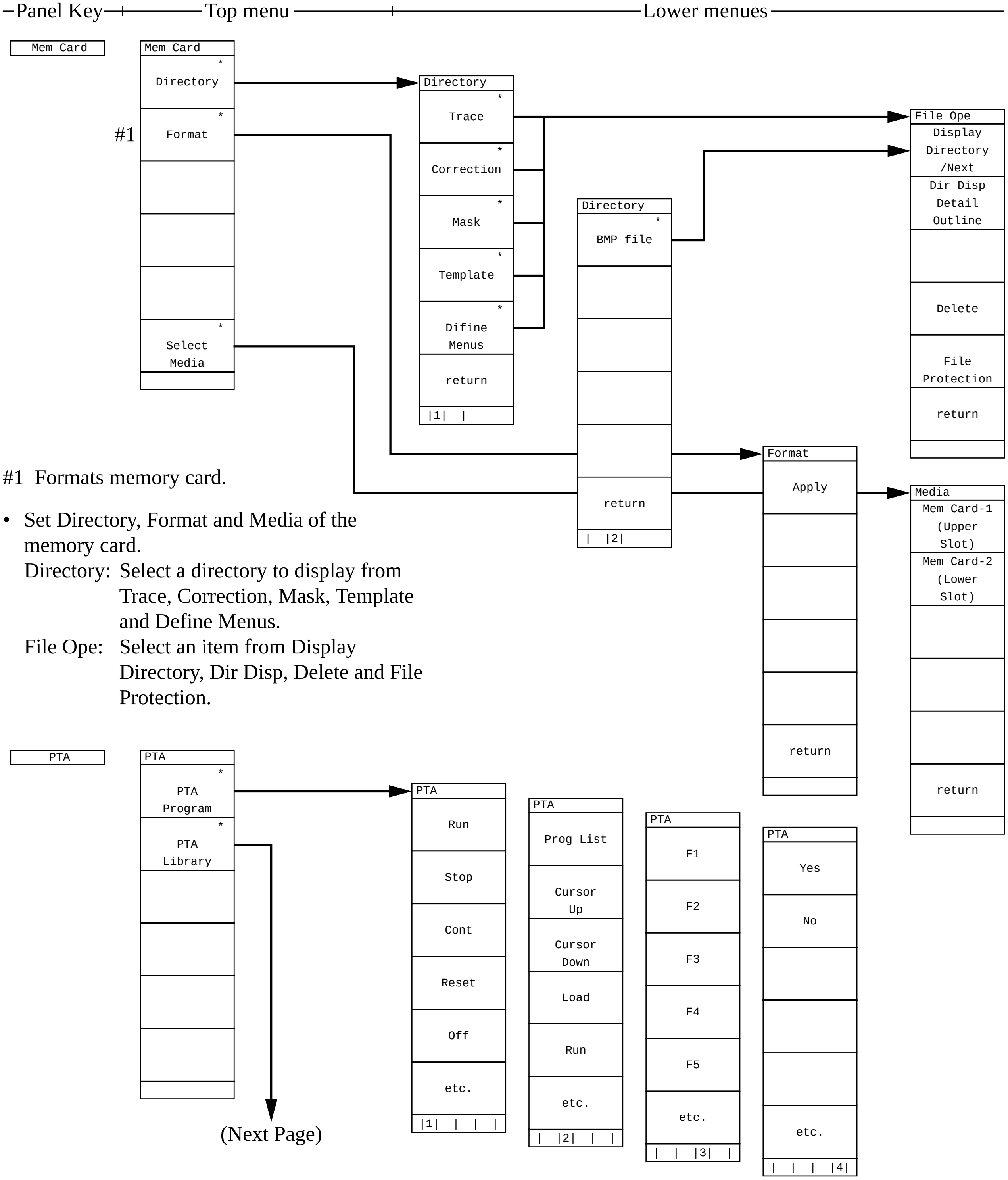
- Set interfaces for external devices to connect. Select RS232C, Centronics or GPIB, and set the RS232C interface, GPIB address, etc.



- Input a title to display on the screen.



MS2665C Menu Tree (22/25)

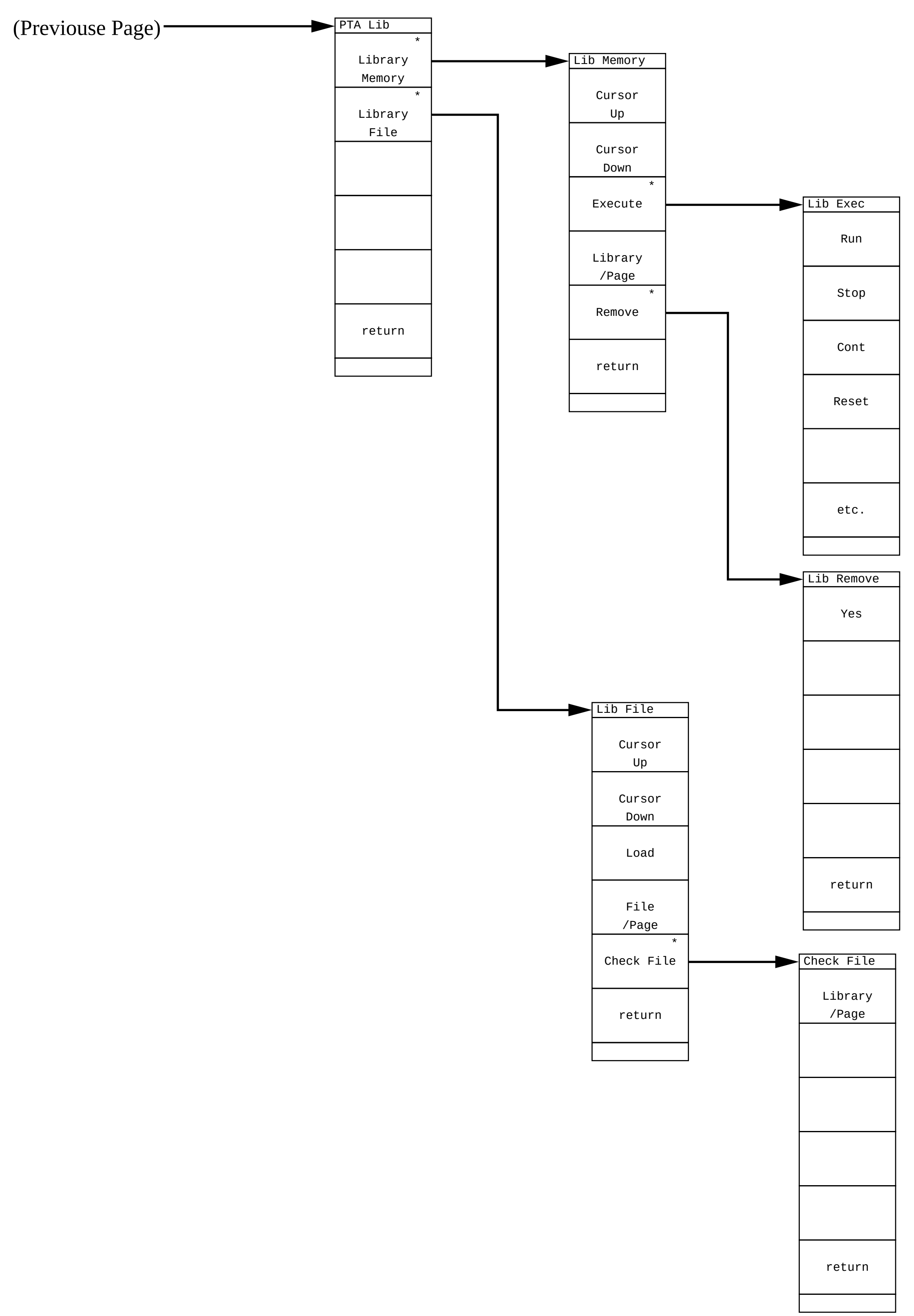


#1 Formats memory card.

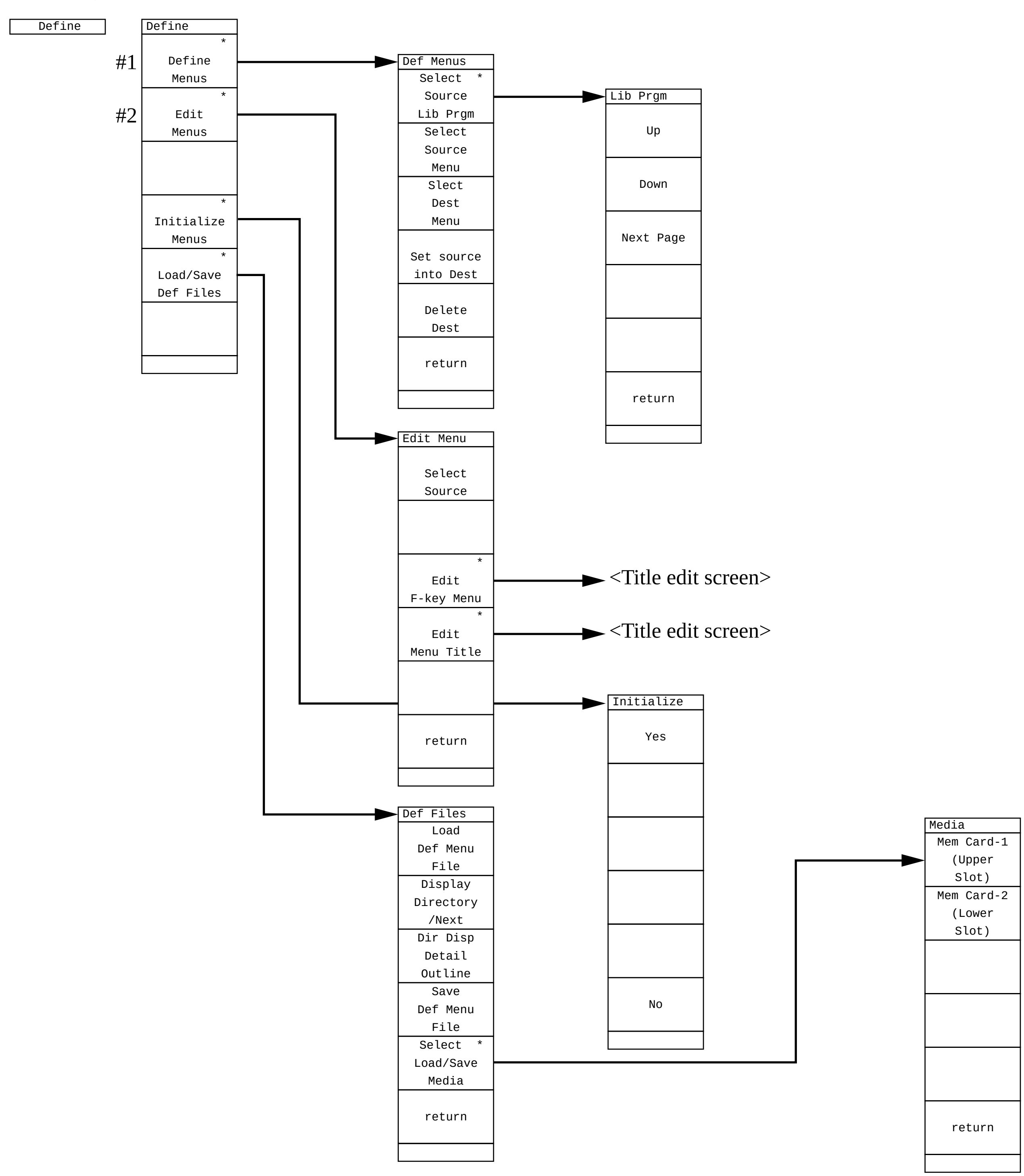
- Set Directory, Format and Media of the memory card.
  Directory: Select a directory to display from Trace, Correction, Mask, Template and Define Menus.
  File Ope: Select an item from Display Directory, Dir Disp, Delete and File Protection.

- Set PTA (personal test automation) that can build an auto measurement system without requiring external controllers.
  PTA Program: Select one from Run, Stop, Cont Reset, Prog List, Load, etc.
  PTA Library: Select one from Display/Run for the library program and Load/Check for the library file.

MS2665C Menu Tree (23/25)



MS2665C Menu Tree (24/25)

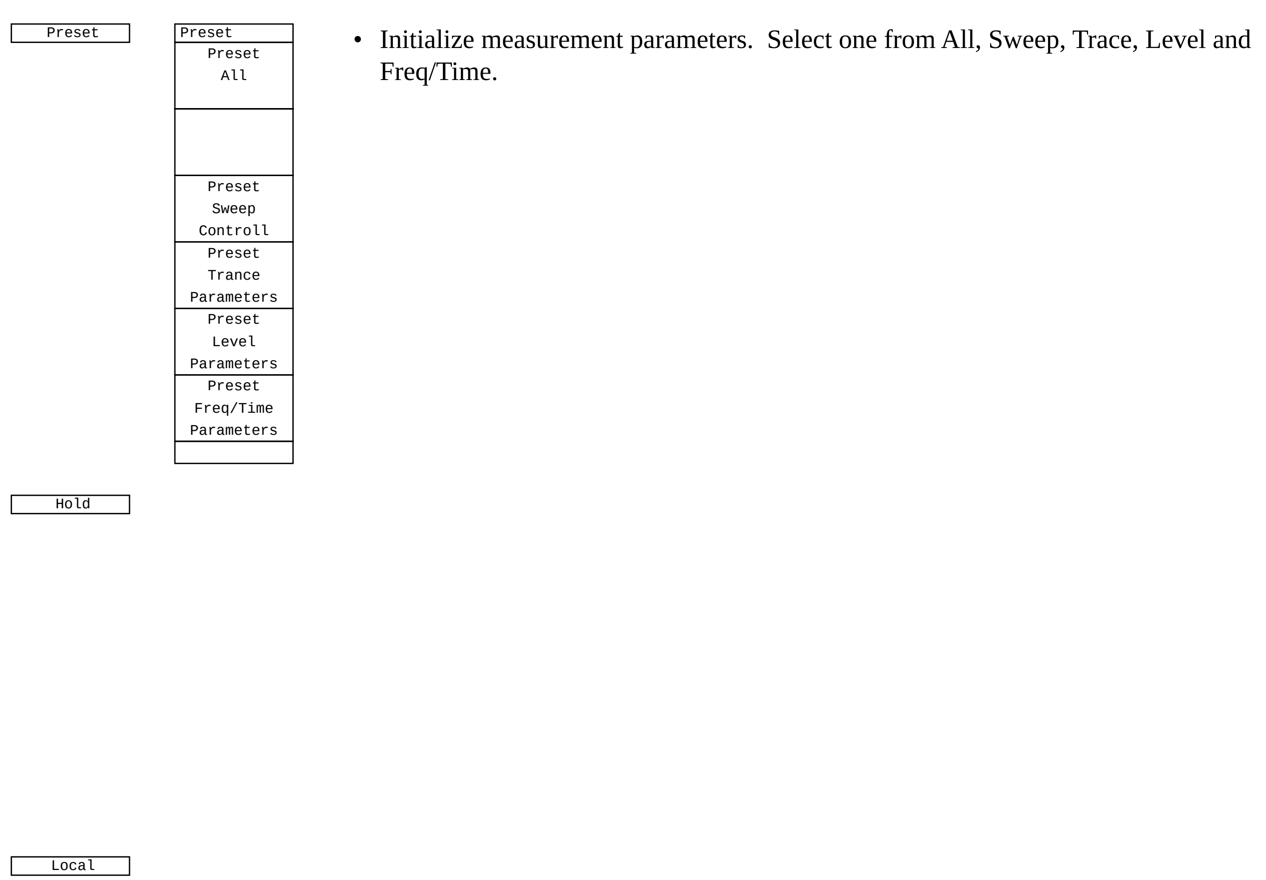


- Set Define, Edit, Initialize and Load/Save.

  #1 Define Menus: Select one from Source Menu, Source Library, Destination Menu, etc., and set Definition/Delete for the user menu.

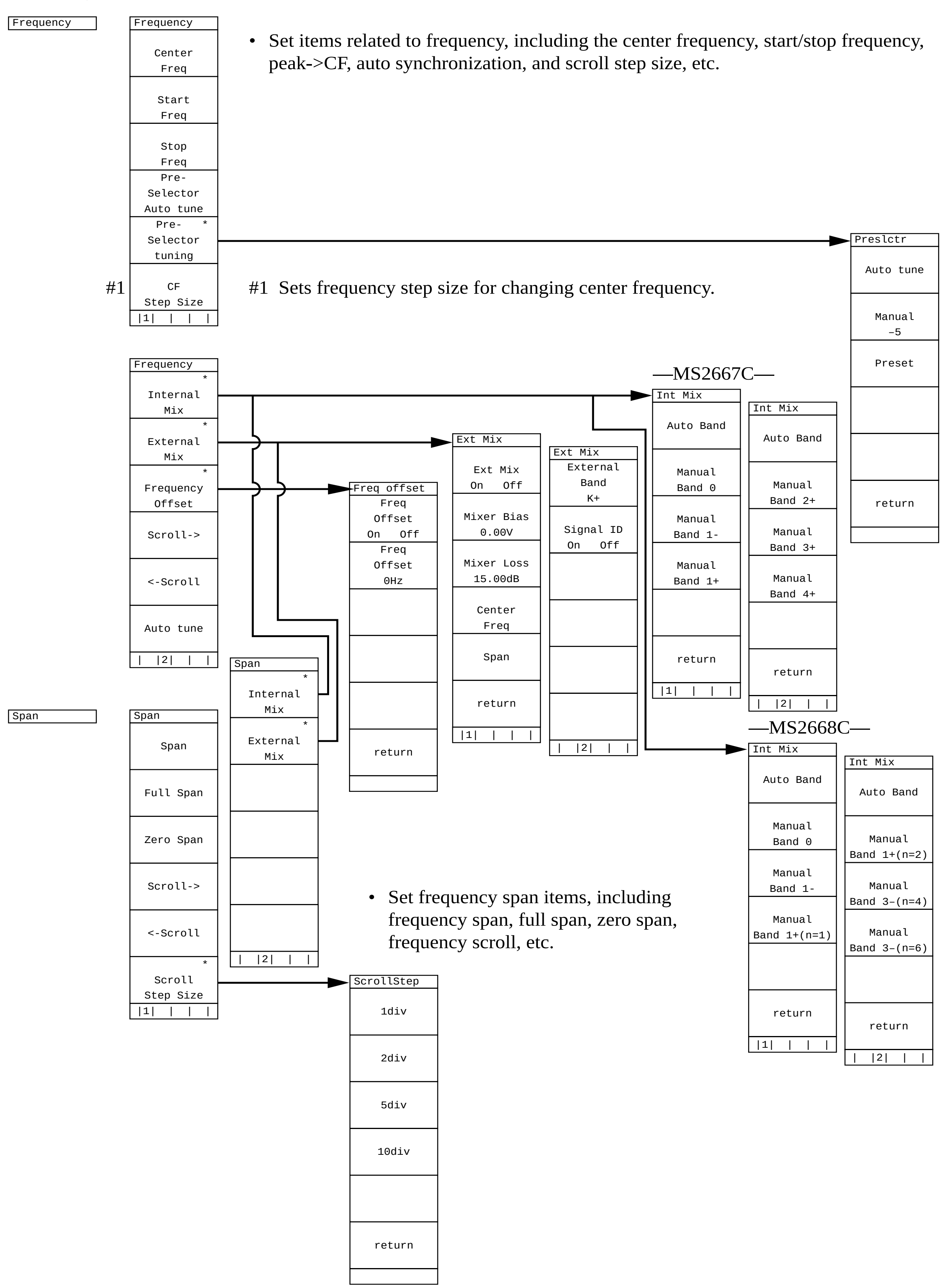
  #2 Edit Menu: Select a source and edit Menu Title.

MS2665C Menu Tree (25/25)



- Initialize measurement parameters. Select one from All, Sweep, Trace, Level and Freq/Time.

MS2667C/68C Menu Tree (1/25)

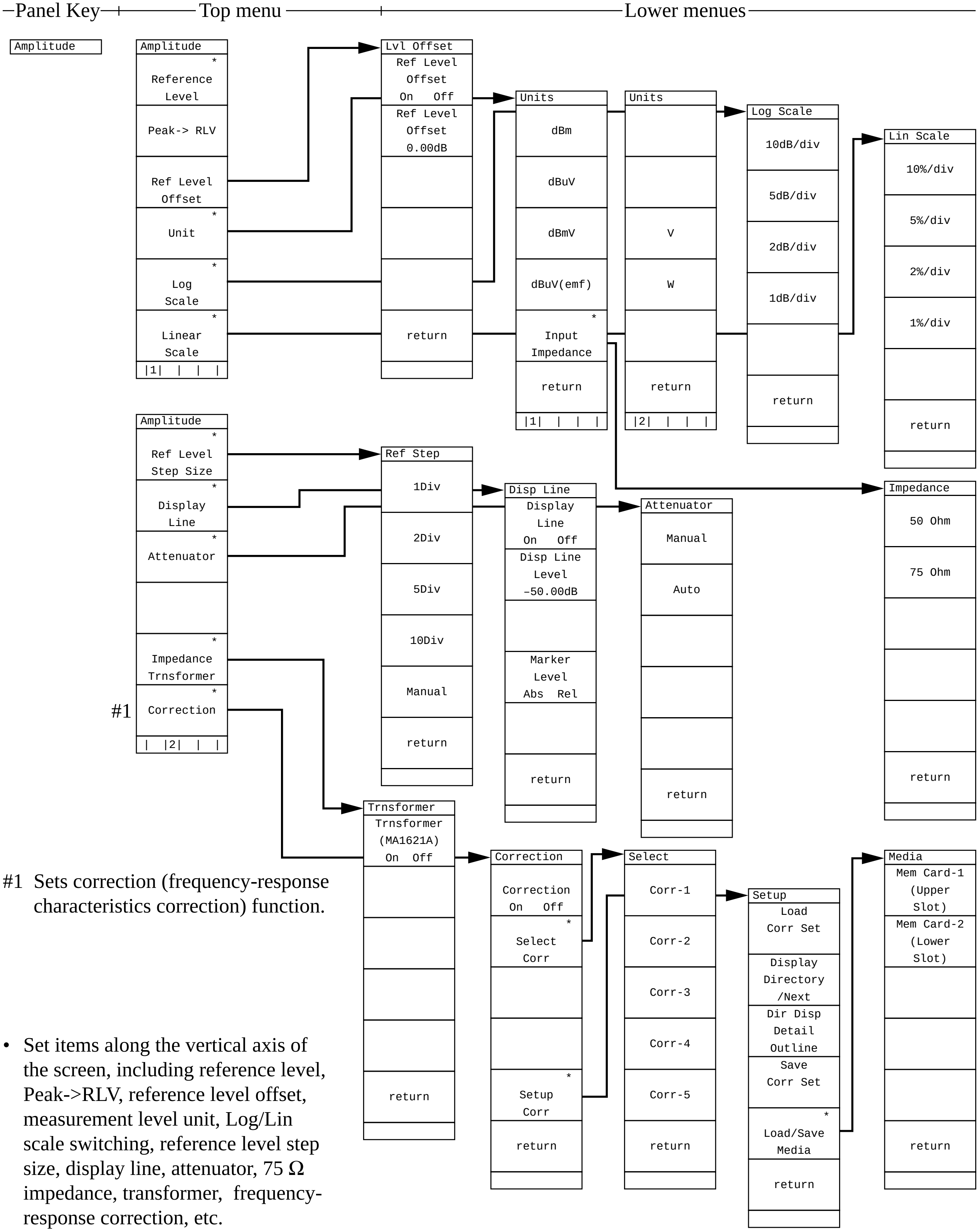


- Set items related to frequency, including the center frequency, start/stop frequency, peak->CF, auto synchronization, and scroll step size, etc.

#1 Sets frequency step size for changing center frequency.

- Set frequency span items, including frequency span, full span, zero span, frequency scroll, etc.

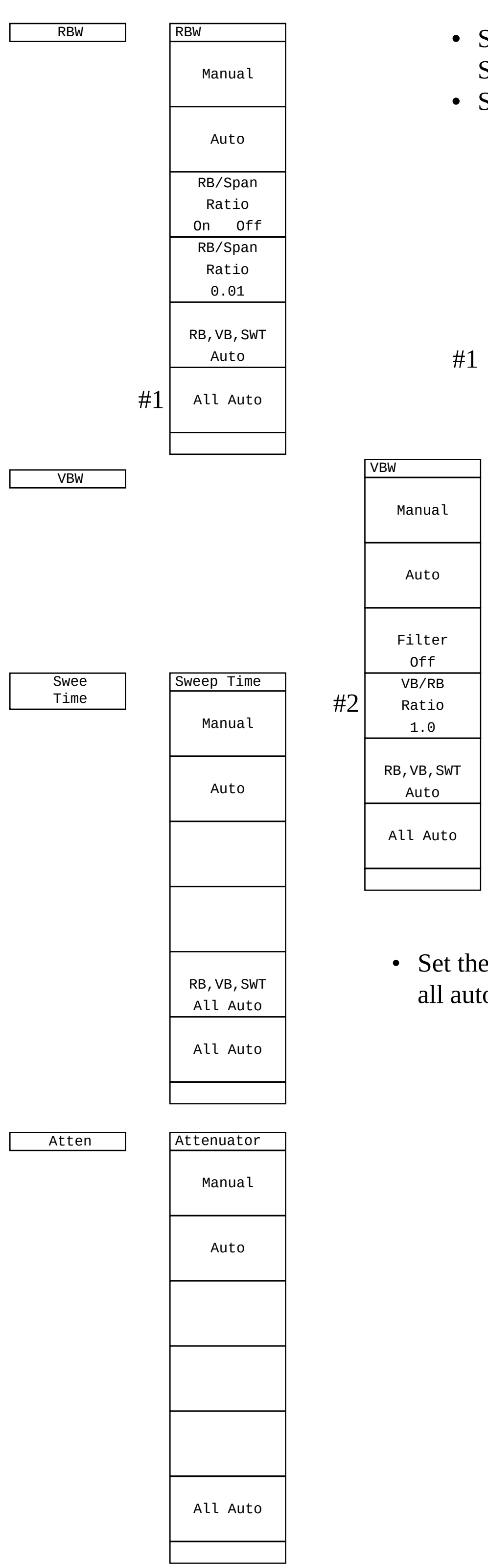
MS2667C/68C Menu Tree (2/25)



#1 Sets correction (frequency-response characteristics correction) function.

- Set items along the vertical axis of the screen, including reference level, Peak->RLV, reference level offset, measurement level unit, Log/Lin scale switching, reference level step size, display line, attenuator, 75 Ω impedance, transformer, frequency-response correction, etc.

MS2667C/68C Menu Tree (3/25)



- Set the manual/auto of resolution bandwidth, and auto (RBW, VBW and SWP only) or all auto.
- Set Ratio of RBW to Span when RBW is Auto and Ratio Mode is “on”.

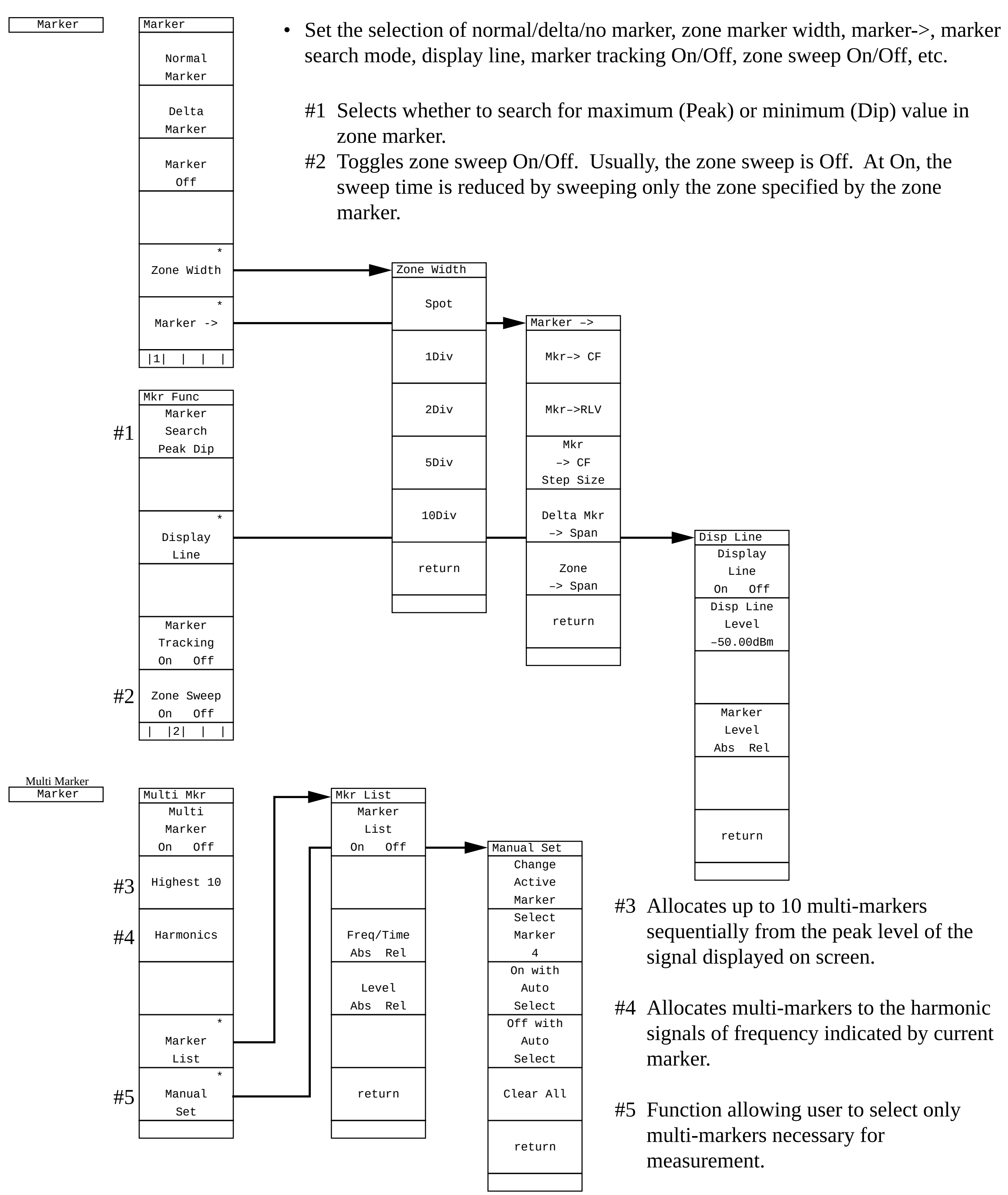
#1 Sets RBW, VBW, Sweep Time, Atten all to Auto.

- Set the manual/auto of video bandwidth, and auto (RBW, VBW and SWP only) or all auto.

#2 Sets ratio of VBW to RBW when VBW is Auto.

- Set the manual/auto of sweep time, and auto (RBW, VBW and SWP only) or all auto.

MS2667C/68C Menu Tree (4/25)



- Set the selection of normal/delta/no marker, zone marker width, marker->, marker search mode, display line, marker tracking On/Off, zone sweep On/Off, etc.

#1 Selects whether to search for maximum (Peak) or minimum (Dip) value in zone marker.

#2 Toggles zone sweep On/Off. Usually, the zone sweep is Off. At On, the sweep time is reduced by sweeping only the zone specified by the zone marker.

#3 Allocates up to 10 multi-markers sequentially from the peak level of the signal displayed on screen.

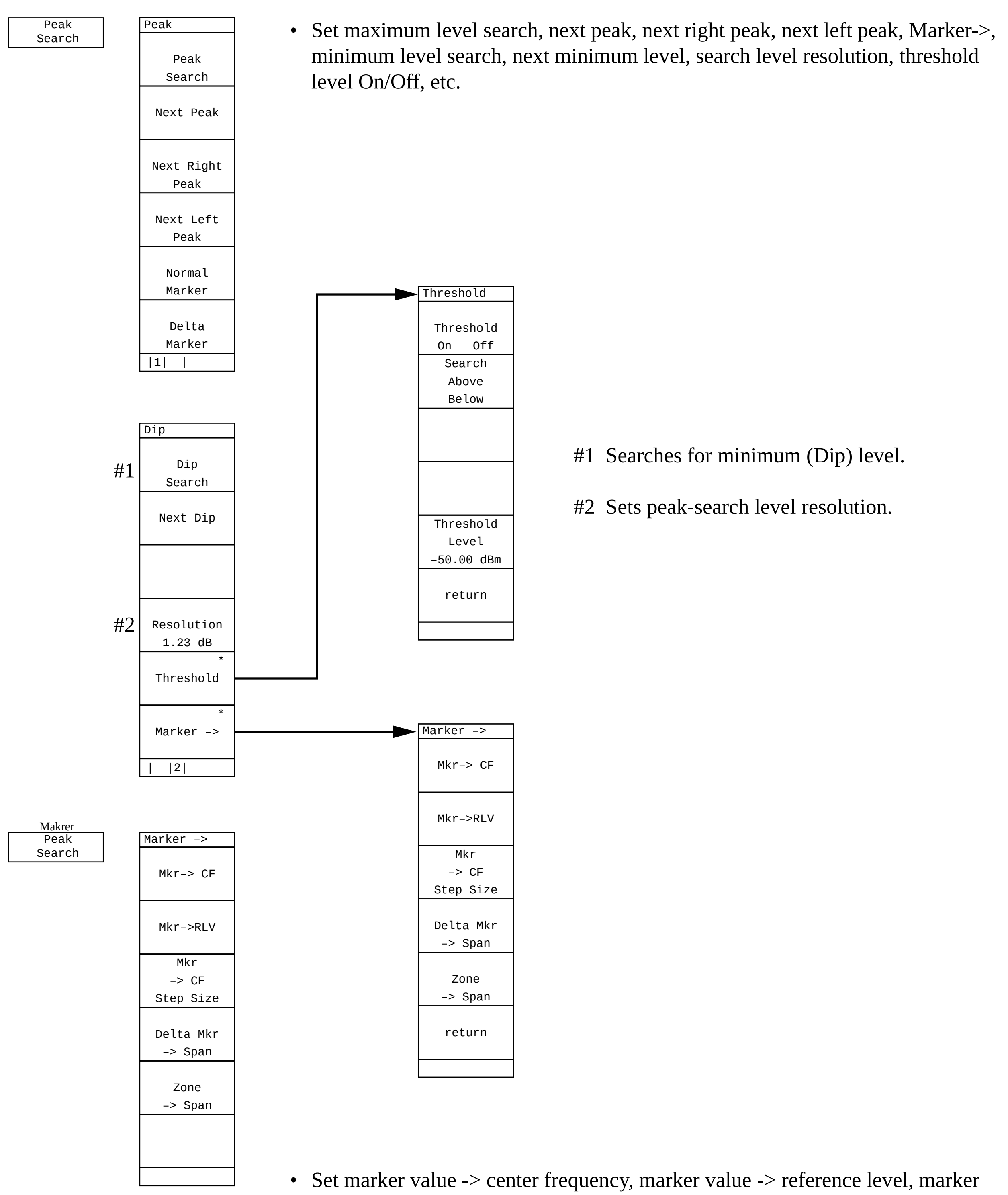
#4 Allocates multi-markers to the harmonic signals of frequency indicated by current marker.

#5 Function allowing user to select only multi-markers necessary for measurement.

#6 Select "absolute value" or "relative value (display line)" to display marker level.

- Set multi-marker On/Off, 10 multi-marker, harmonic multi-marker, listing of multi-marker values, selection of necessary markers, etc.

MS2667C/68C Menu Tree (5/25)



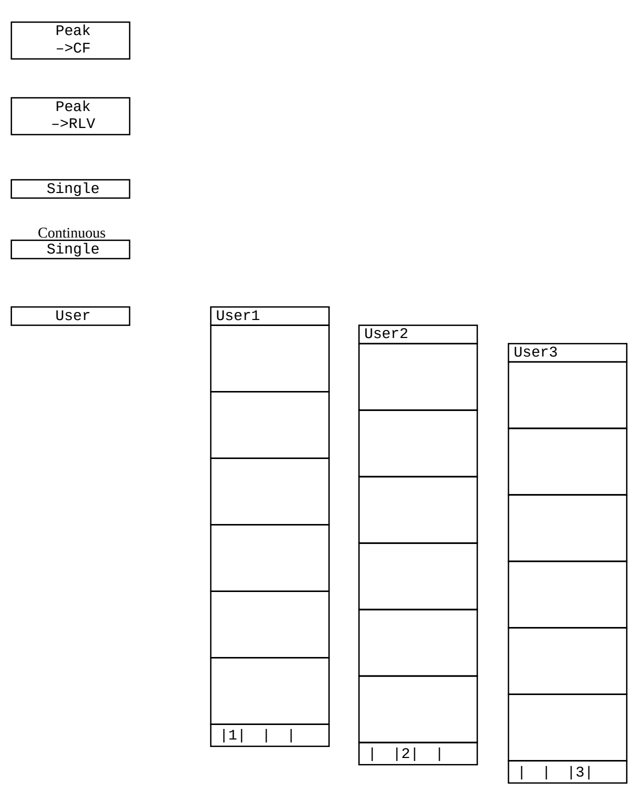
- Set maximum level search, next peak, next right peak, next left peak, Marker->, minimum level search, next minimum level, search level resolution, threshold level On/Off, etc.

#1 Searches for minimum (Dip) level.

#2 Sets peak-search level resolution.

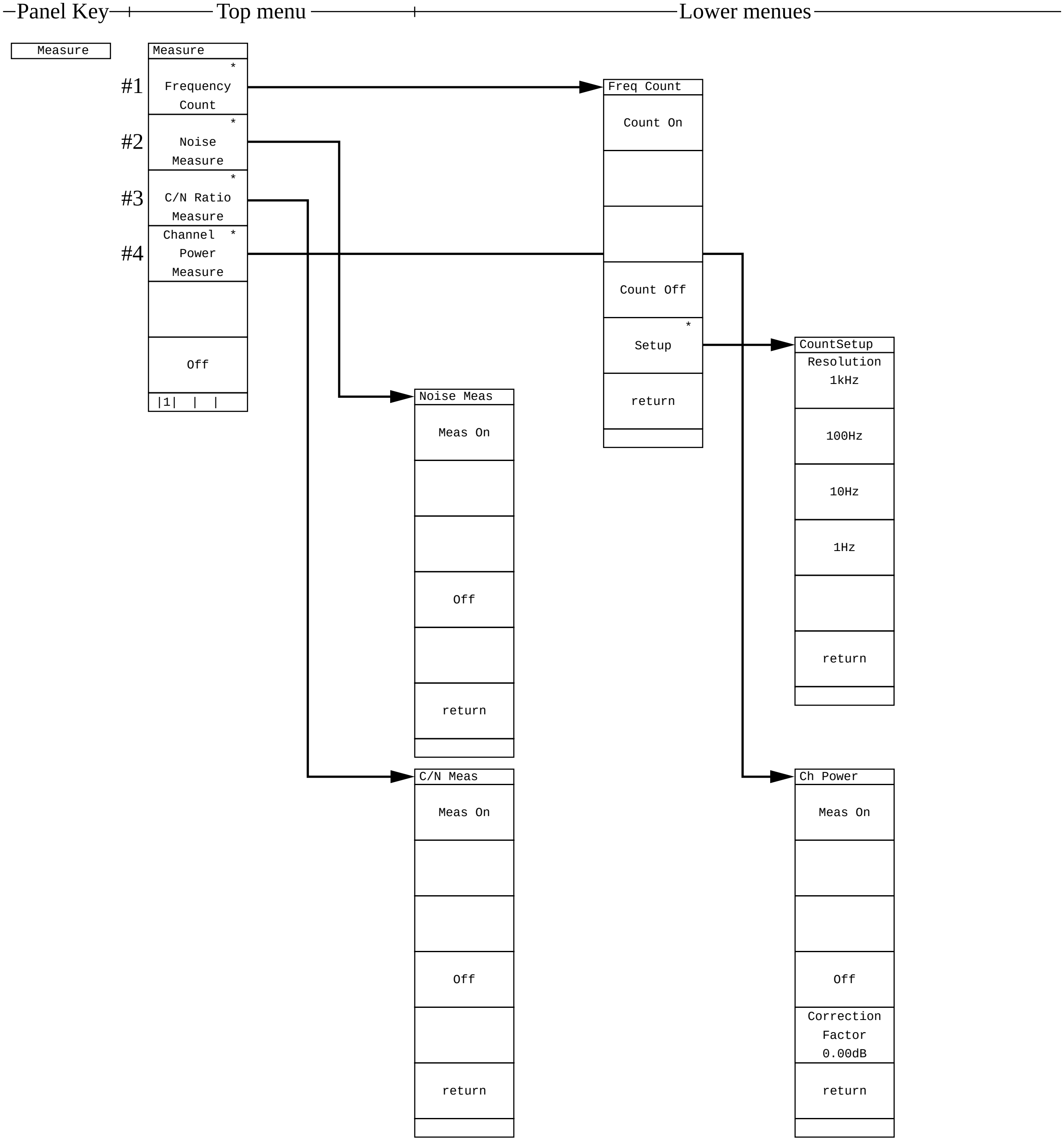
- Set marker value -> center frequency, marker value -> reference level, marker value -> CF step size, delta marker-> span, zone marker -> span, etc.

MS2667C/68C Menu Tree (6/25)



- The soft-key menu defined by the user is displayed.
  (See "User Define".)

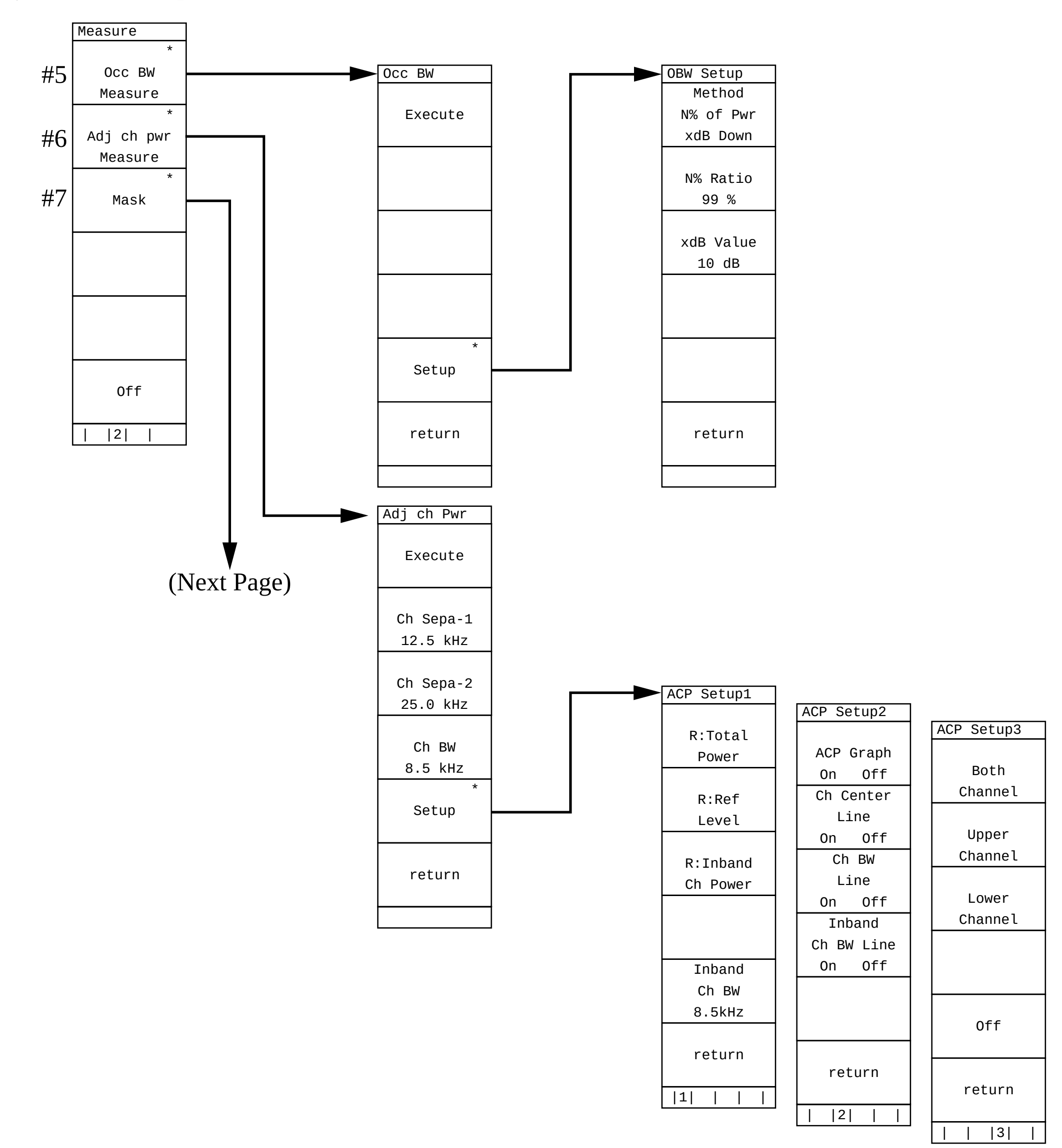
MS2667C/68C Menu Tree (7/25)



- Perform measurement according to various applications:

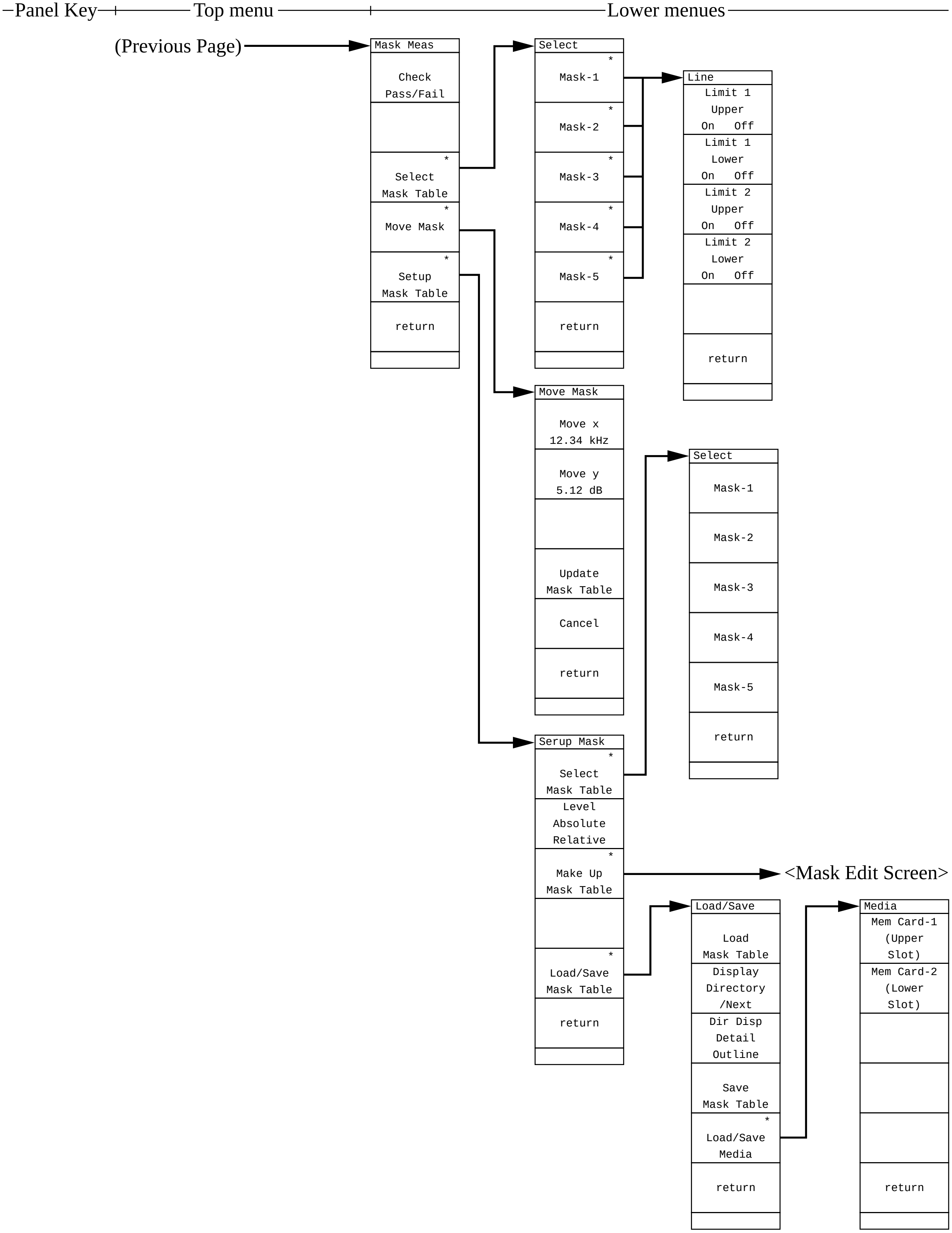
  #1 Frequency Count: Measure marker frequency with a high resolution.
  Select resolution from 1 kHz, 100 Hz, 10 Hz and 1 Hz.
  #2 Noise Measure: Measure the noise power within zone marker.
  #3 C/N Ratio Measure: Measure the ratio of carrier signal and noise power. Reference marker of the delta marker shall be set to the carrier, and marker's zone width specifies the power measured.
  #4 Channel Power Measure: Power with in the band indicated by zone marker is measured. It is possible to set an arbitrary calibration value.

MS2667C/68C Menu Tree (8/25)

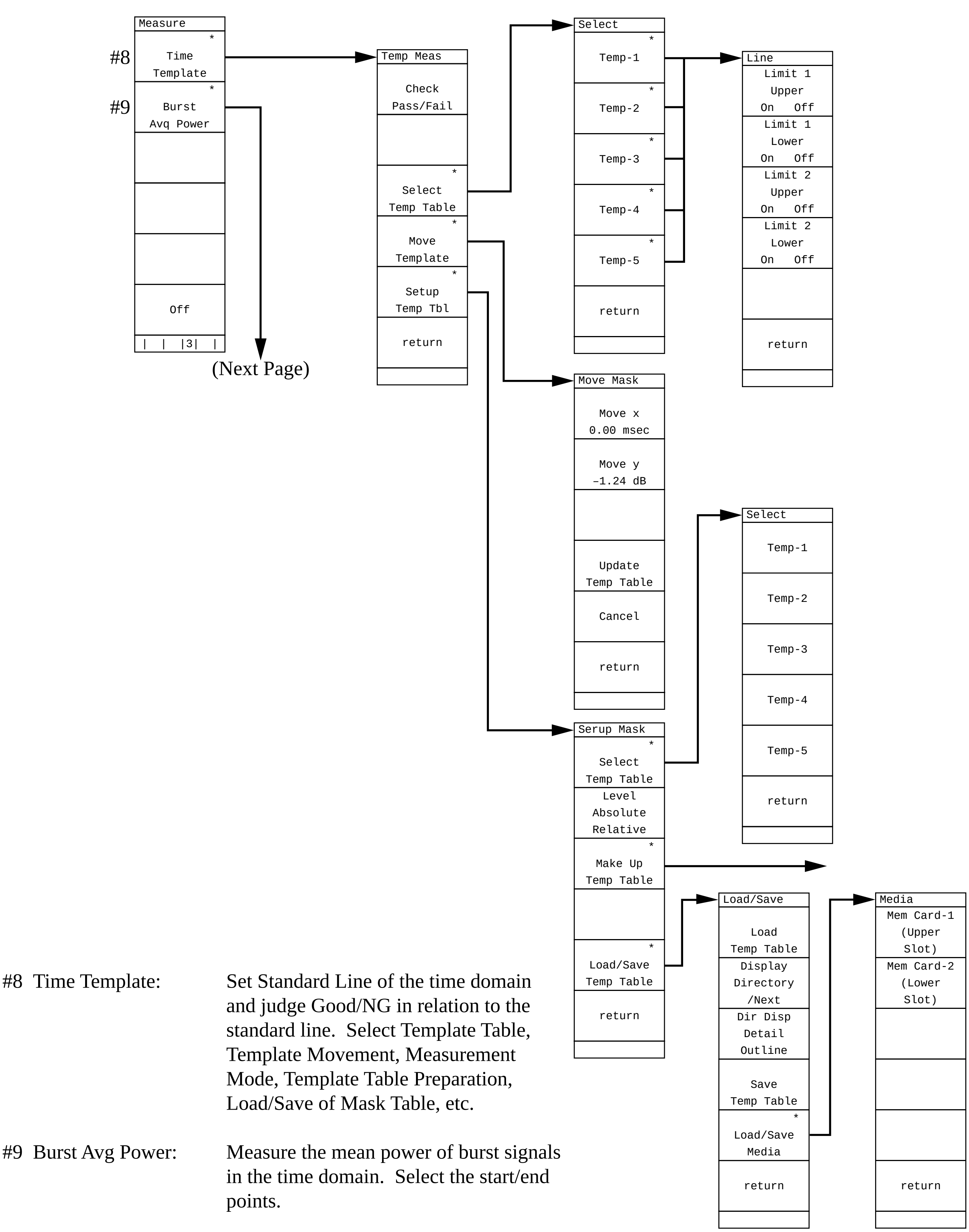


#5 Occ BW Measure:	Measure the occupied bandwidth. Select the X dB DOWN or N % of POWER mode.
#6 Adj ch pwr Measure:	Measure leak power from adjacent channels. Select Channel Separate, Channel Bandwidth and Measurement Mode (Method), On/Off of ACP Graph, On/Off of Channel Center Line and On/Off of Channel BW Line, Upper Channel, Lower Channel or Both Channel, etc.
#7 Mask:	Set Standard Line of the frequency domain and judge Good/NG in relation to the standard line. Select Mask Table, Mask Movement, Measurement Mode, Mask Table Preparation, Load/Save of Mask Table, etc.

MS2667C/68C Menu Tree (9/25)

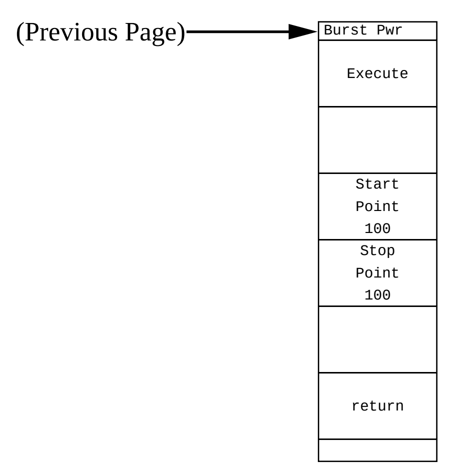


MS2667C/68C Menu Tree (10/25)

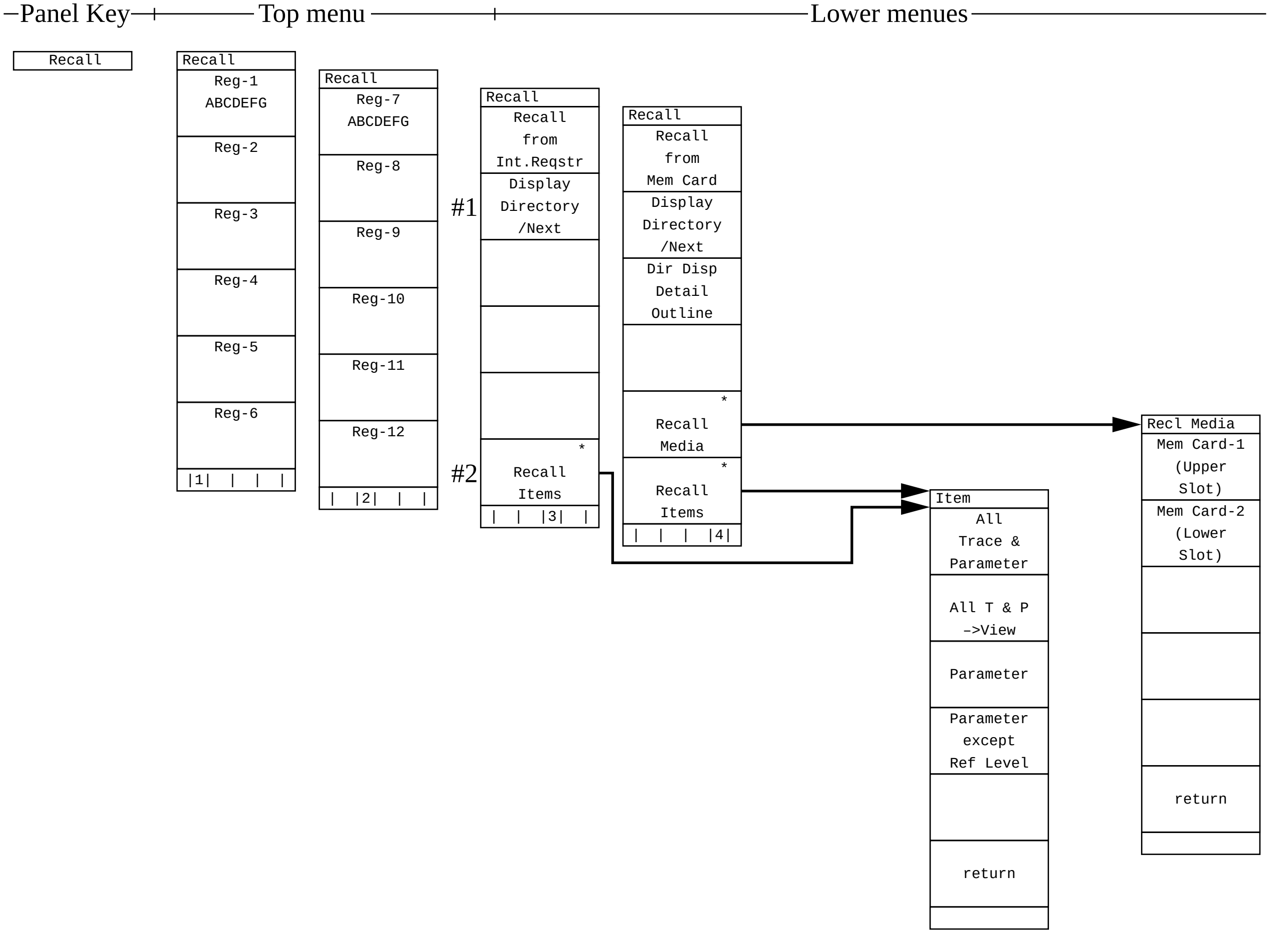


#8 Time Template:	Set Standard Line of the time domain and judge Good/NG in relation to the standard line. Select Template Table, Template Movement, Measurement Mode, Template Table Preparation, Load/Save of Mask Table, etc.
#9 Burst Avg Power:	Measure the mean power of burst signals in the time domain. Select the start/end points.

MS2667C/68C Menu Tree (11/25)



MS2667C/68C Menu Tree (12/25)

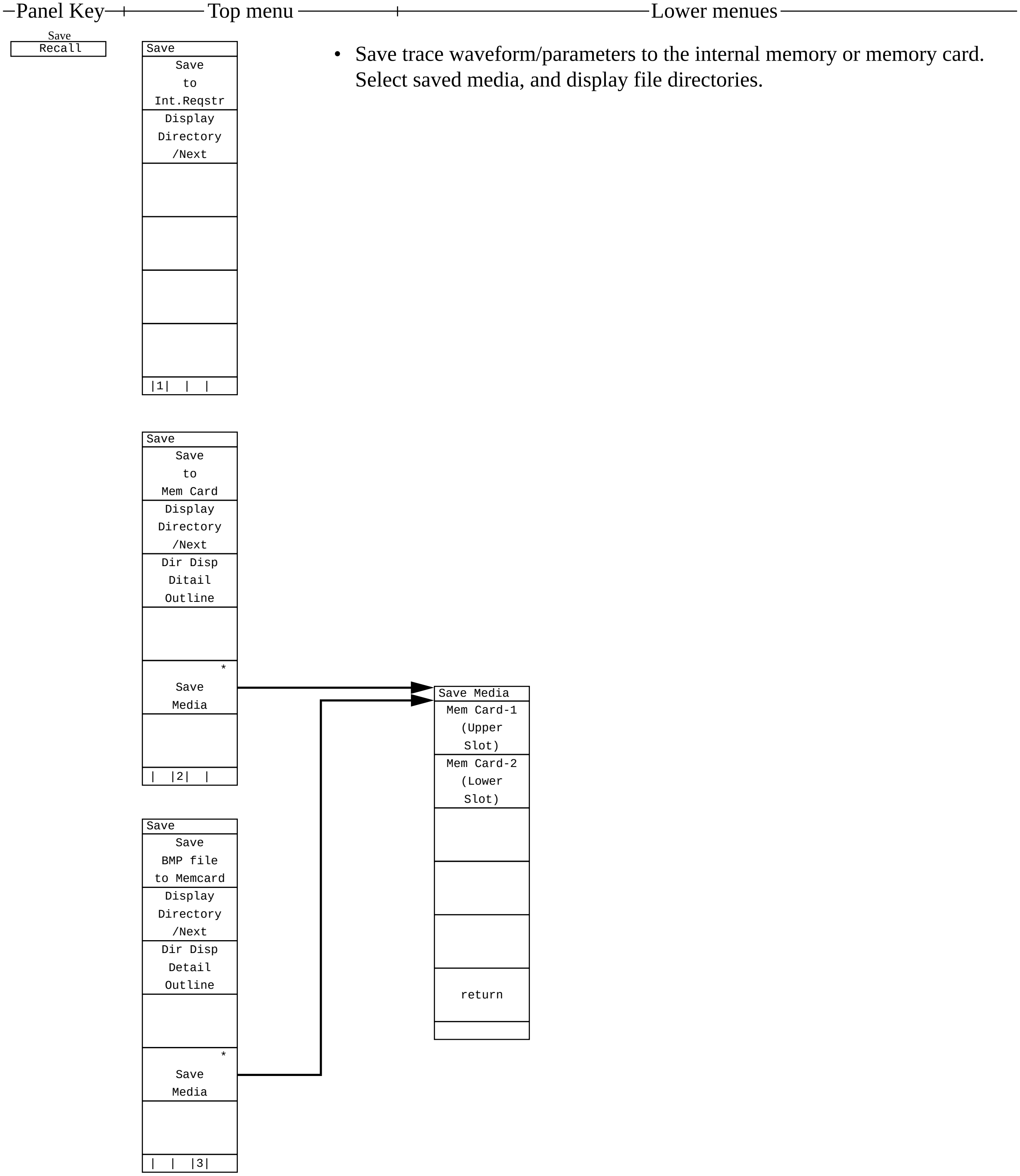


- Read out trace waveform/parameters from the internal memory or memory card. Select recall addresses and media/items, and display file directories.

#1 Displays list of internal-memory directories.

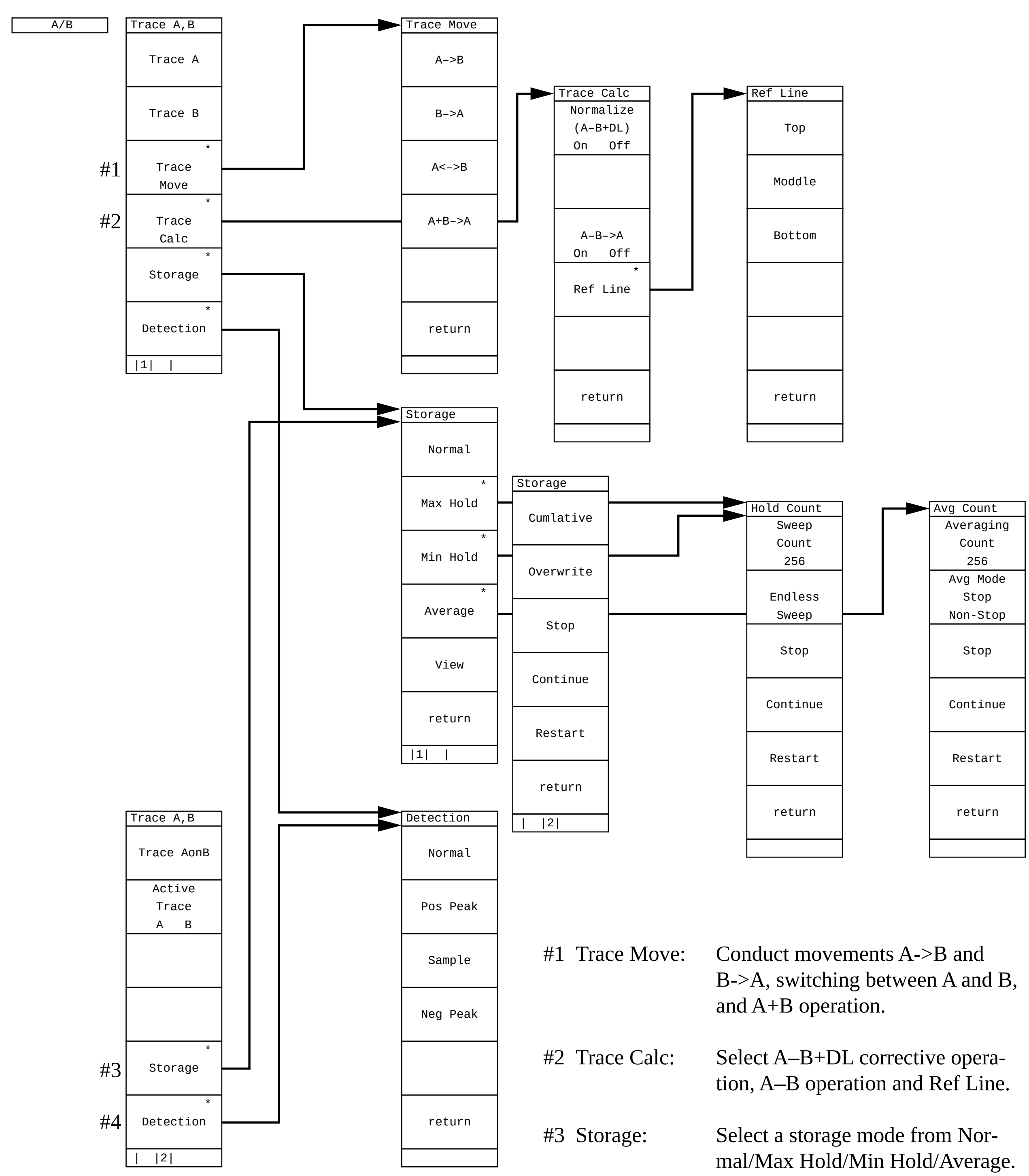
#2 Specifies items to be recalled
(trace waveform, parameter, etc.).

MS2667C/68C Menu Tree (13/25)



- Save trace waveform/parameters to the internal memory or memory card. Select saved media, and display file directories.

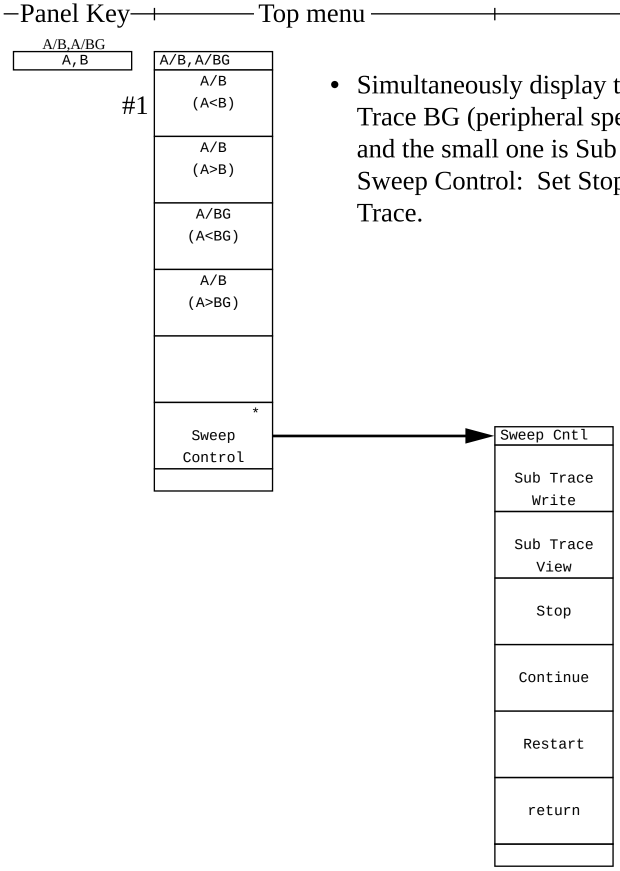
MS2667C/68C Menu Tree (14/25)



- Select Trace A/B, movement between Trace A/B, sum/difference operation between Trace A/B and Ref Line, and designate the storage and detection modes and Active Trace.

#1 Trace Move:	Conduct movements A->B and B->A, switching between A and B, and A+B operation.
#2 Trace Calc:	Select A–B+DL corrective operation, A–B operation and Ref Line.
#3 Storage:	Select a storage mode from Normal/Max Hold/Min Hold/Average. Set Sweep Count, Rewrite/Overwrite, Stop Continue, Restart, etc.
#4 Detection:	Select a detection mode from Normal/Pos Peak/Neg Peak/Sample.

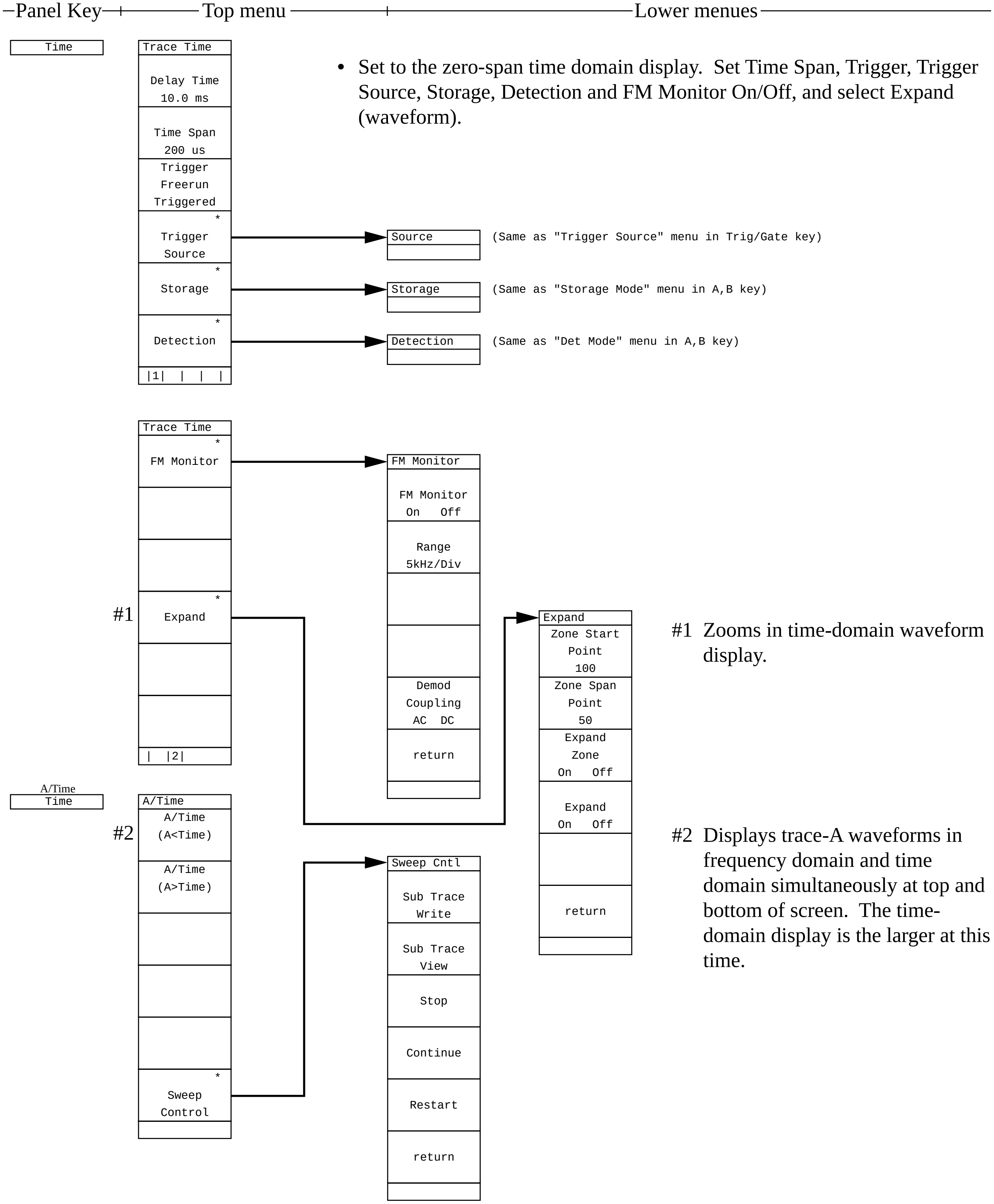
MS2667C/68C Menu Tree (15/25)



- Simultaneously display two waveforms, namely Trace A and Trace B or Trace A and Trace BG (peripheral spectrum containing Trace A). The large display is Main Trace and the small one is Sub Trace; select which to display as Main Trace (or Sub Trace). Sweep Control: Set Stop/Continuous/Restart for sweep and Stop/Write for Sub Trace.

#1 Displays two traces A and B simultaneously at top and bottom of screen. The trace-B display is the larger at this time.

MS2667C/68C Menu Tree (16/25)



- Set to the zero-span time domain display. Set Time Span, Trigger, Trigger Source, Storage, Detection and FM Monitor On/Off, and select Expand (waveform).

(Same as "Trigger Source" menu in Trig/Gate key)

(Same as "Storage Mode" menu in A,B key)

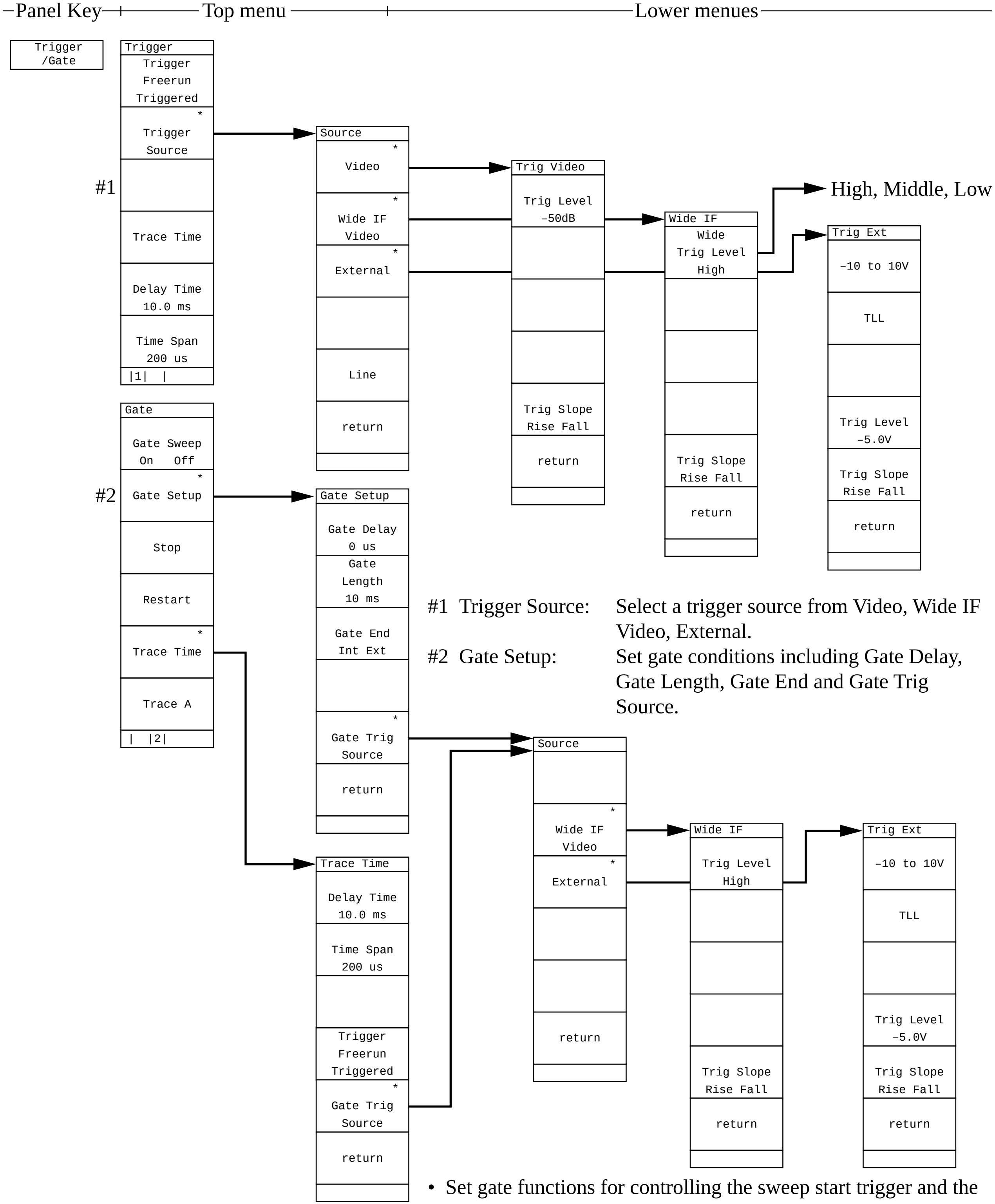
(Same as "Det Mode" menu in A,B key)

#1 Zooms in time-domain waveform display.

#2 Displays trace-A waveforms in frequency domain and time domain simultaneously at top and bottom of screen. The time-domain display is the larger at this time.

- Simultaneously display waveforms of Trace a and Time Domain. Which to display as Main Trace (or Sub Trace) can be selected.

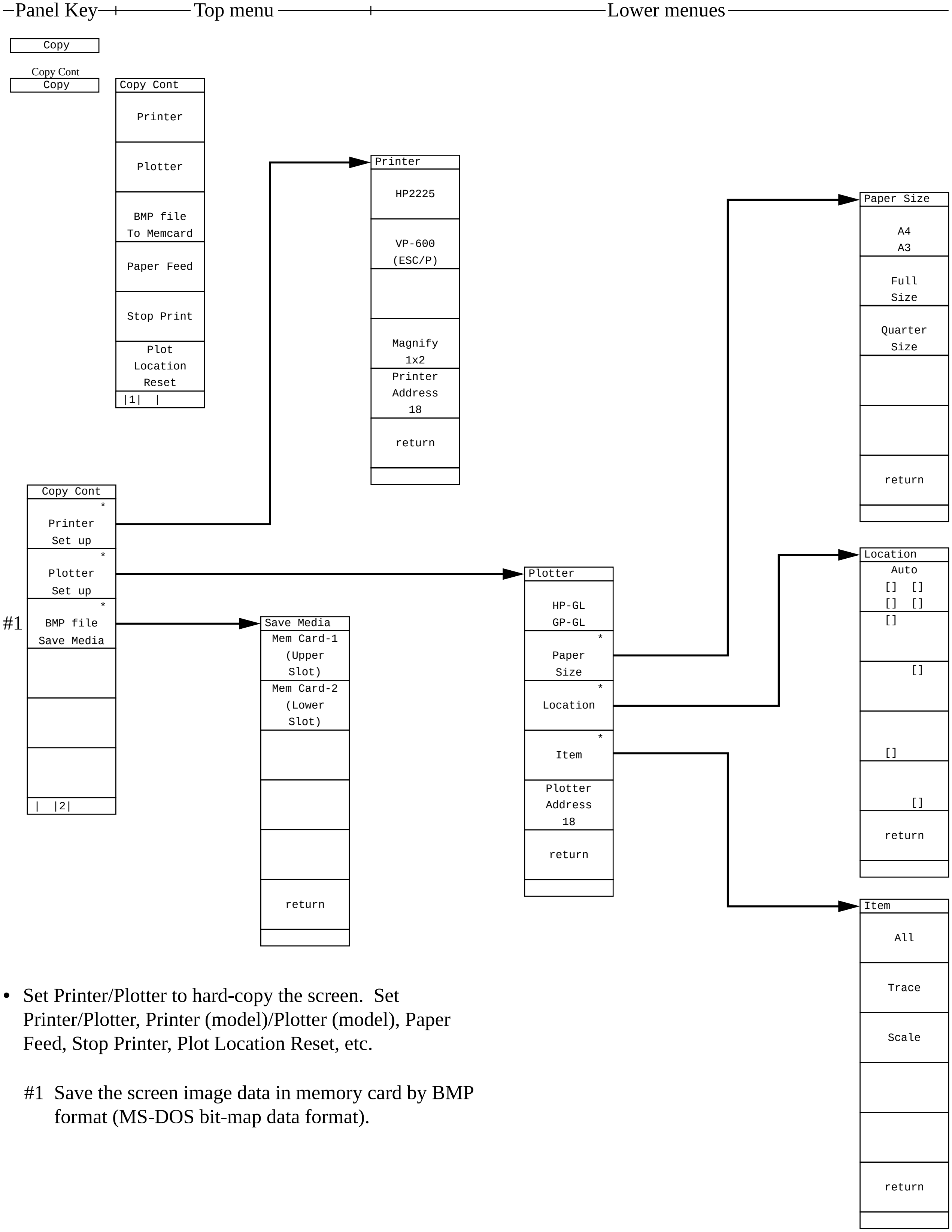
MS2667C/68C Menu Tree (17/25)



#1 Trigger Source:	Select a trigger source from Video, Wide IF Video, External.
#2 Gate Setup:	Set gate conditions including Gate Delay, Gate Length, Gate End and Gate Trig Source.

- Set gate functions for controlling the sweep start trigger and the writing of waveform data. Set the trigger mode, trigger source, trace time, delay time and time span. Select On/Off, Stop and Restart of Gate Sweep.

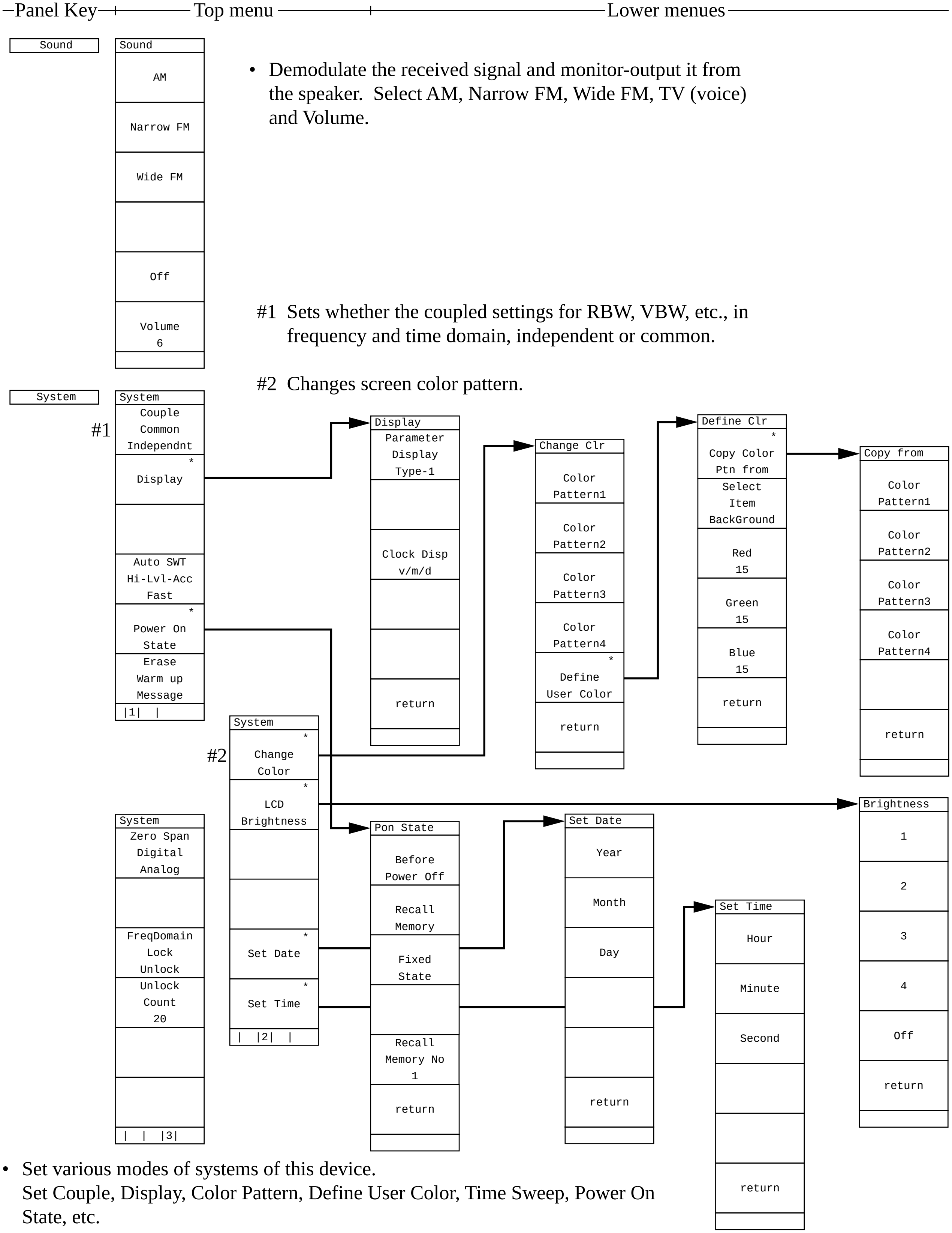
MS2667C/68C Menu Tree (18/25)



- Set Printer/Plotter to hard-copy the screen. Set Printer/Plotter, Printer (model)/Plotter (model), Paper Feed, Stop Printer, Plot Location Reset, etc.

#1 Save the screen image data in memory card by BMP format (MS-DOS bit-map data format).

MS2667C/68C Menu Tree (19 /25)



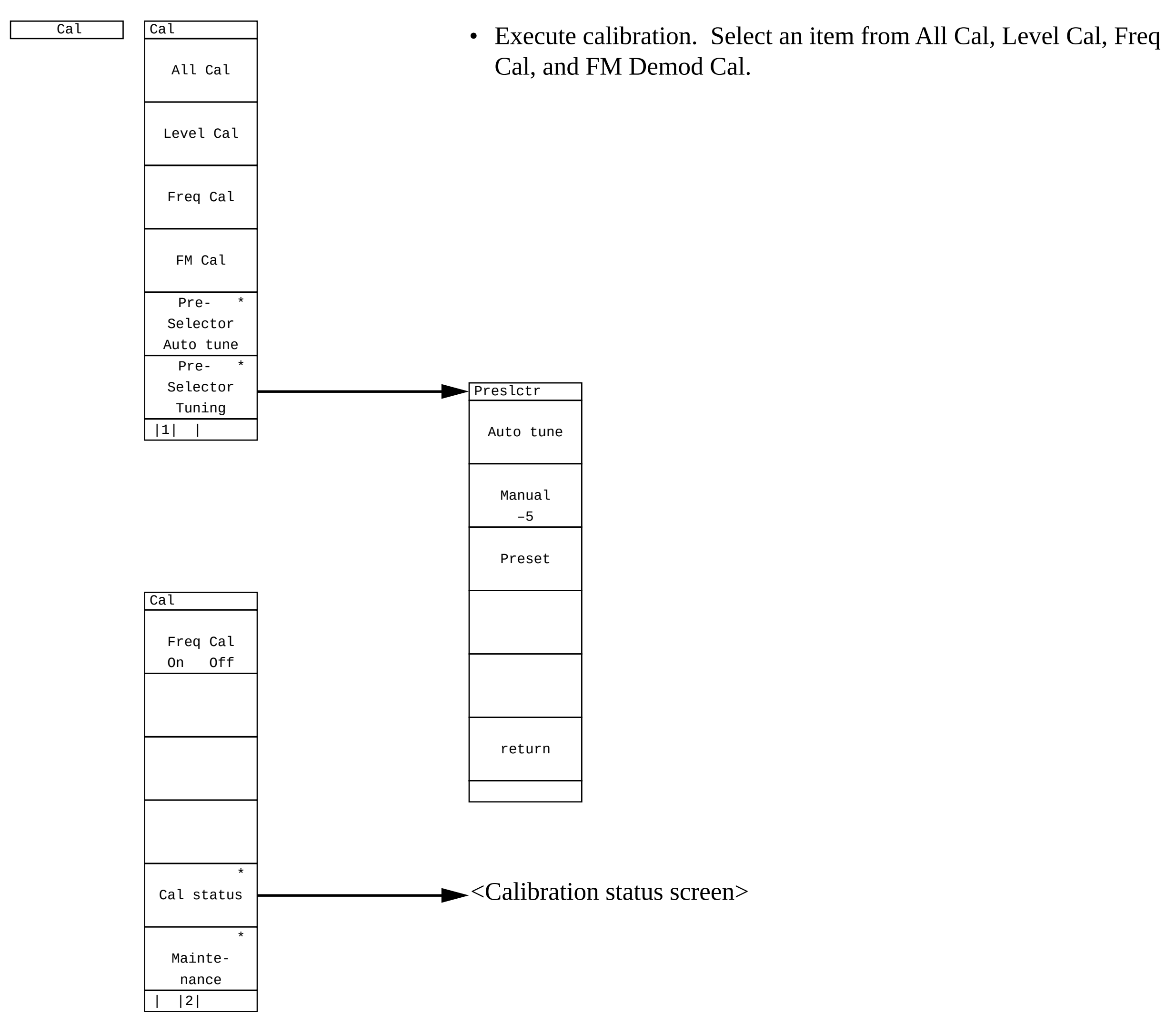
- Demodulate the received signal and monitor-output it from the speaker. Select AM, Narrow FM, Wide FM, TV (voice) and Volume.

#1 Sets whether the coupled settings for RBW, VBW, etc., in frequency and time domain, independent or common.

#2 Changes screen color pattern.

- Set various modes of systems of this device.
  Set Couple, Display, Color Pattern, Define User Color, Time Sweep, Power On State, etc.

MS2667C/68C Menu Tree (20/25)

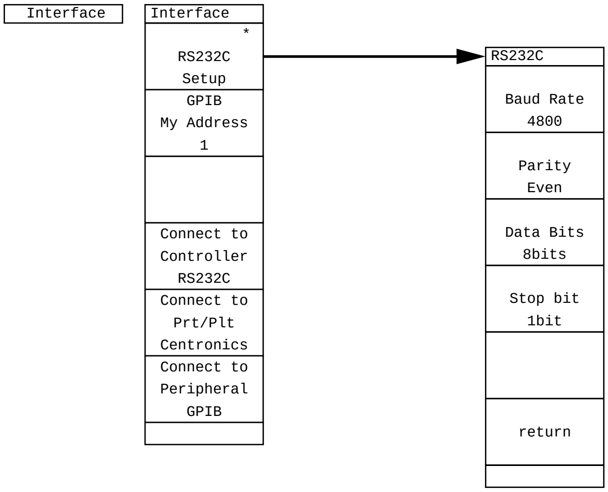


- Execute calibration. Select an item from All Cal, Level Cal, Freq Cal, and FM Demod Cal.

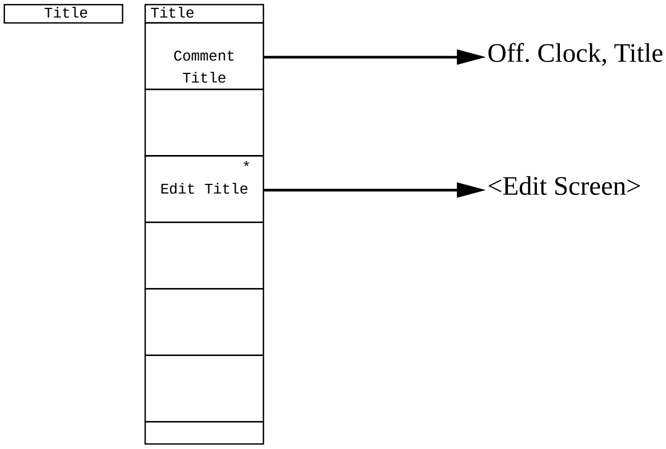
MS2667C/68C Menu Tree (21/25)

Panel Key — Top menu — Lower menues

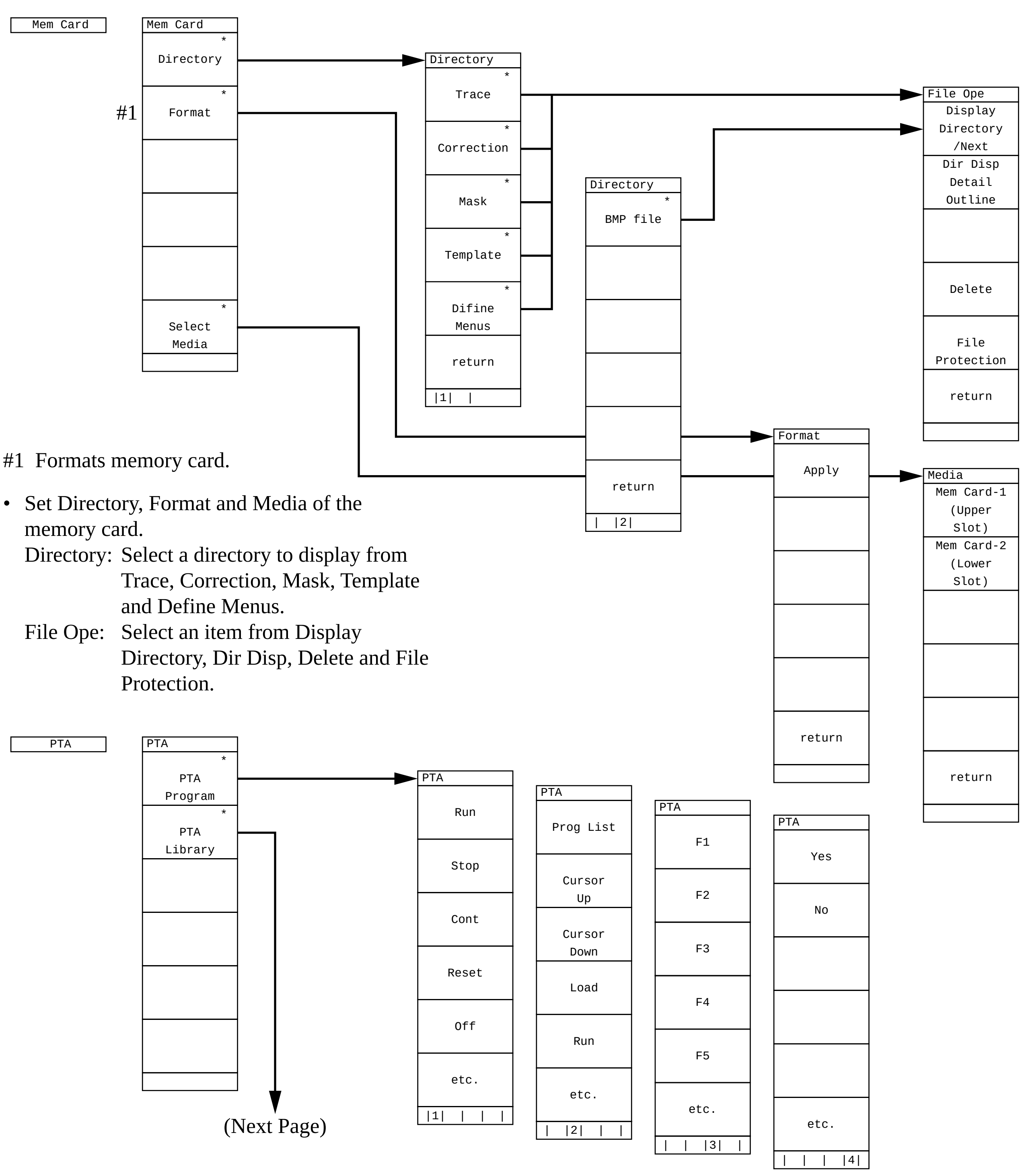
- Set interfaces for external devices to connect. Select RS232C, Centronics or GPIB, and set the RS232C interface, GPIB address, etc.



- Input a title to display on the screen.



MS2667C/68C Menu Tree (22/25)

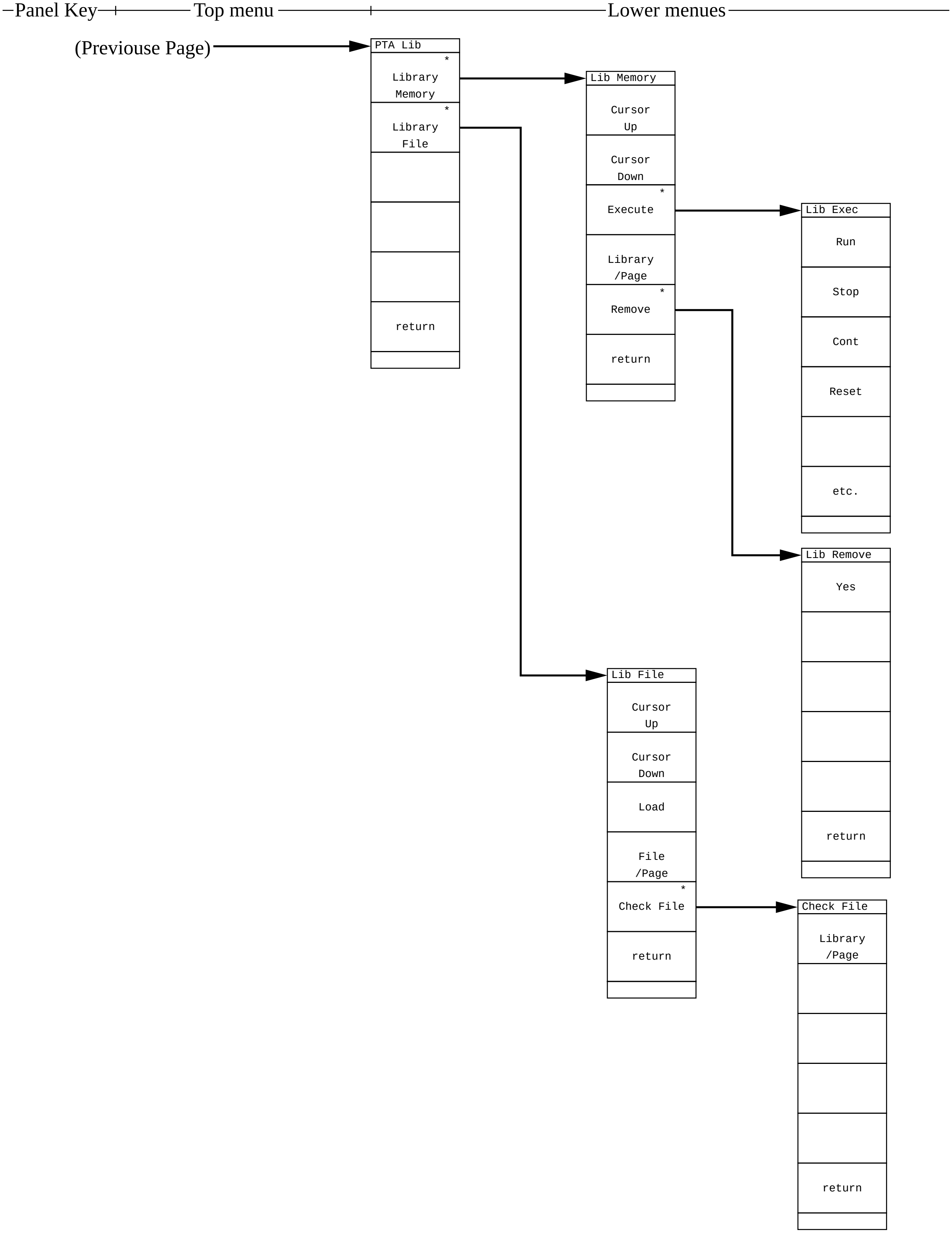


#1 Formats memory card.

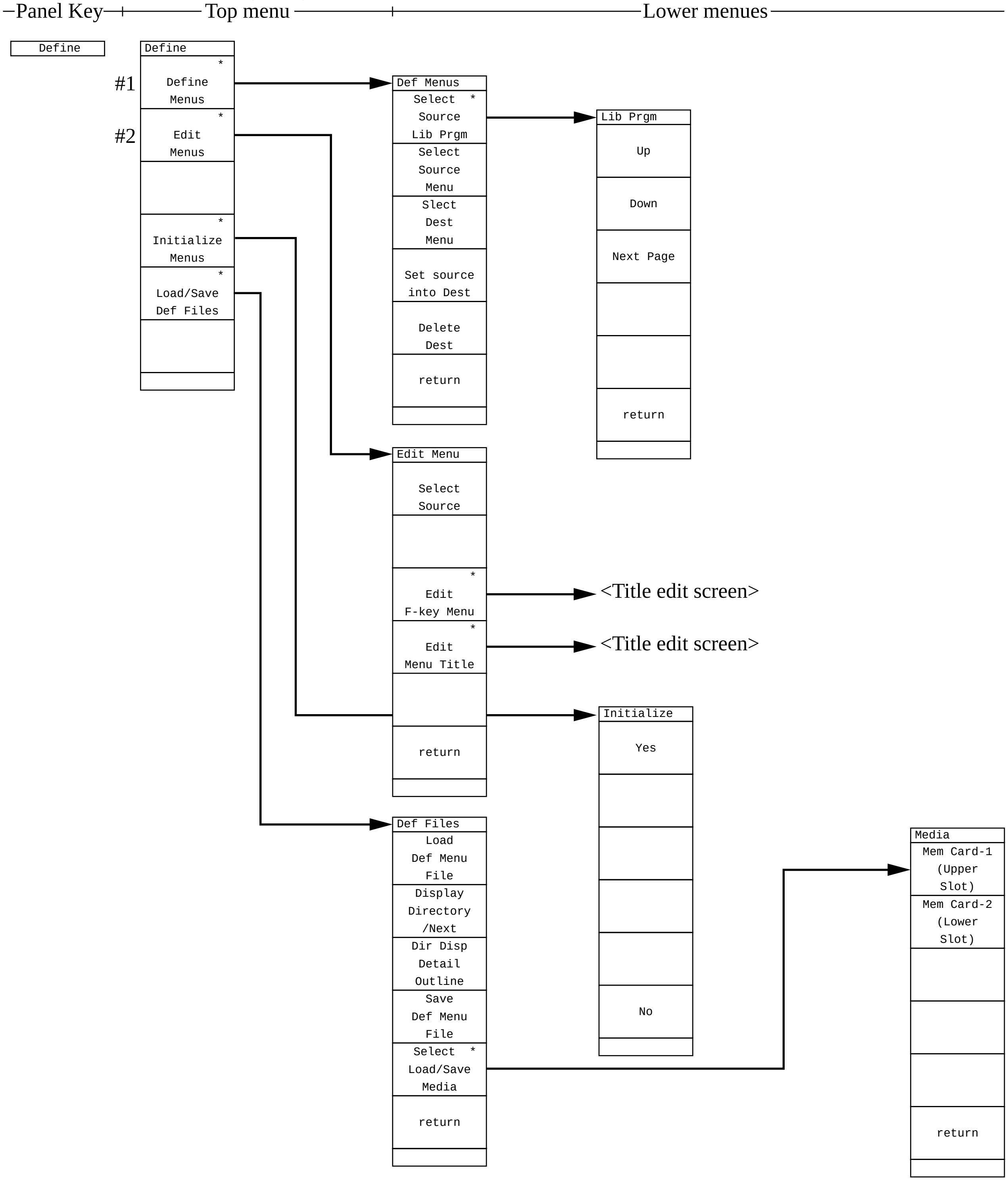
- Set Directory, Format and Media of the memory card.
  Directory: Select a directory to display from Trace, Correction, Mask, Template and Define Menus.
  File Ope: Select an item from Display Directory, Dir Disp, Delete and File Protection.

- Set PTA (personal test automation) that can build an auto measurement system without requiring external controllers.
  PTA Program: Select one from Run, Stop, Cont Reset, Prog List, Load, etc.
  PTA Library: Select one from Display/Run for the library program and Load/Check for the library file.

MS2667C/68C Menu Tree (23/25)



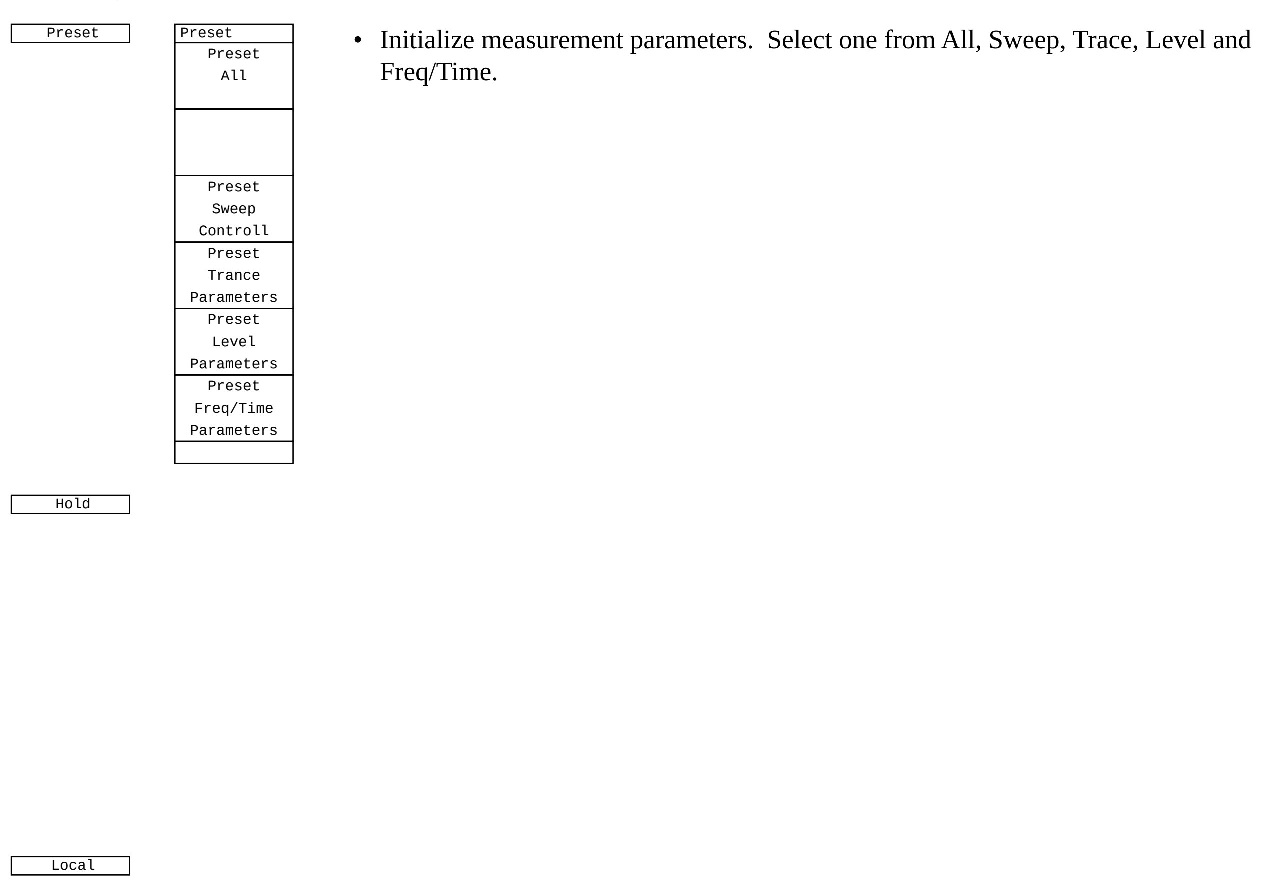
MS2667C/68C Menu Tree (24/25)



- Set Define, Edit, Initialize and Load/Save.

#1 Define Menus:	Select one from Source Menu, Source Library, Destination Menu, etc., and set Definition/Delete for the user menu.
#2 Edit Menu:	Select a source and edit Menu Title.

MS2667C/68C Menu Tree (25/25)



- Initialize measurement parameters. Select one from All, Sweep, Trace, Level and Freq/Time.

SECTION 5

BASIC OPERATION PROCEDURE

TABLE OF CONTENTS

SECTION 5
BASIC OPERATION PROCEDURE

The basic operation procedure of this equipment is explained here. The operations are listed on the right. Also, the explanation will advance assuming that a 2 GHz signal is applied to the input connector. Please read this manual while operating this equipment.

(☐ : Panel key, —— : Soft key)

<Actual operations>

(I) Signal display
  1) Turn the power on,
  2) execute automatic calibration,
  3) set the signal to the center of the screen, and
  4) enlarge and display the signal.
(II) Marker operation
  Check of the zone marker function.
  The "marker → CF" function check.
(III) "Measure" function check
(IV) Screen hard copy

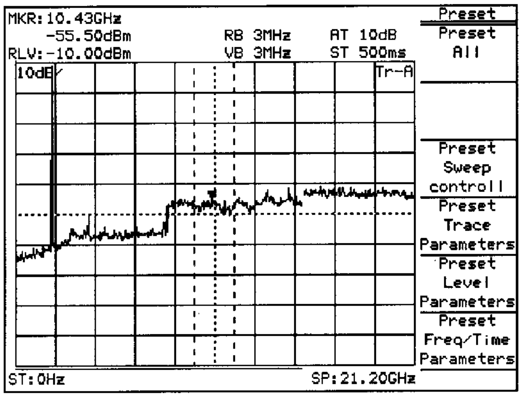
Signal Display

Turn the power on

Press the standby button on the rear panel, then press the power switch (0) on the front panel. In this case, continue pressing the power switch for one second or more.

Press Preset key.

Press Preset All key in the menu.



MKR:10.43GHz
-55.50dBm
RB 3MHz
AT 10dB
RLV:-10.00dBm
VB 3MHz
ST 500ms
ST:0Hz
SP:21.20GHz

Fig. 5-1

The power is turned on/off only when the power switch is pressed for one second or more. This prevents the power from being turned on/off easily by mistake.

When panel key (hard key) is pressed, the related soft key menu is displayed.

Partial resettings are enabled. This resetting includes only the display-related resetting or the resetting of special modes such as zone sweep.

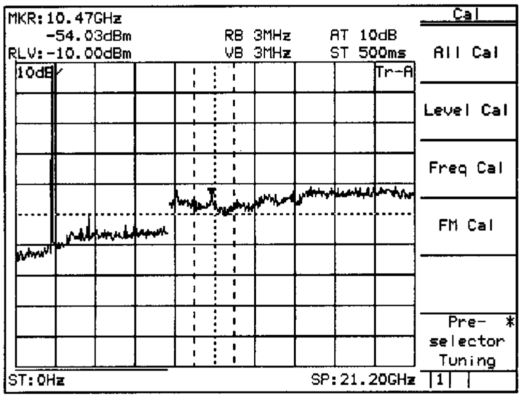
Execute automatic calibration

Wait after switching on the power supply of the machine (warm up period) till the internal temperature becomes stable. This period is approximately 10 minutes.

After warm up, execute automatic calibration.

Press Shift key then $\overset{\text{CAL}}{\boxed{0}}$ key.

Select All Cal from the menu displayed on the display.



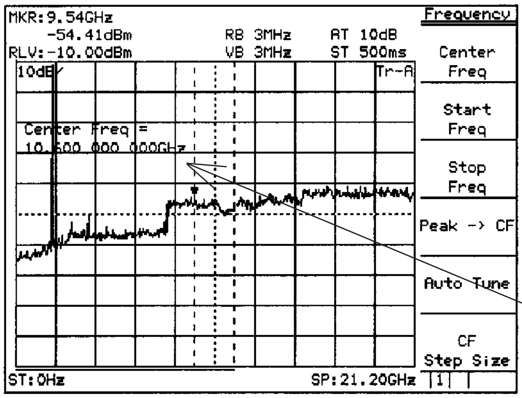
```
MKR:10.47GHz
    -54.03dBm          RB 3MHz    AT 10dB
RLV:-10.00dBm          VB 3MHz    ST 500ms
10dB/                                  Tr-A
ST:0Hz                        SP:21.20GHz
```

Fig. 5-2

Automatic Calibration is carried out by using an internal source without need for any external cable connection.
See "Detailed Operation Instructions" for detail information about contents of calibration.

Set the signal to the center of the screen

Press Frequency key.



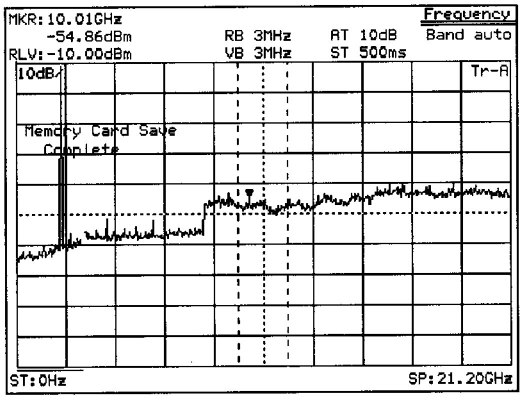
```
MKR:9.54GHz
    -54.41dBm          RB 3MHz    AT 10dB
RLV:-10.00dBm          VB 3MHz    ST 500ms
10dB/                                  Tr-A
Center Freq =
10.600 000 000GHz
ST:0Hz                        SP:21.20GHz
```

Fig. 5-3

When pressing Frequency, Span, Amplitude or Coupled Function key (s) which is used frequently, Center Frequency, Span, Reference Level, RBW or VBW function is selected and numeric value for the function can be entered into Entry area. This reduce key operation times.

This display section is called Entry area. Selecting the menu displays the current set value of the parameter. The set value can be changed by entering data in Entry area.

Press Menu On/Off key



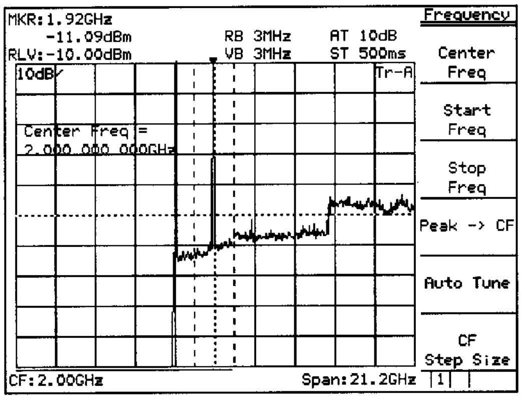
MKR:10.01GHz
-54.86dBm
RLV:-10.00dBm
RB 3MHz
VB 3MHz
AT 10dB
ST 500ms
Memory Card Save
Complete
ST:0Hz
SP:21.20GHz

Fig. 5-4

The display of the soft key menu can be switched on/off using Menu On/Off key. When the menu disappears, the scale is enlarged. Also, when the menu is displayed, the scale is reduced.

Press Menu On/Off key to return to previous screen.

Use the ten-key pad (numeric keys) to enter 2 GHz.



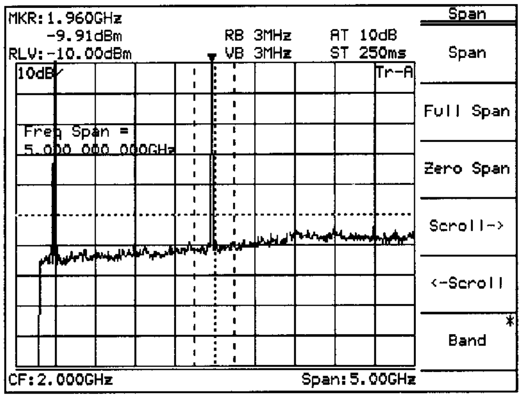
MKR:1.92GHz
-11.09dBm
RLV:-10.00dBm
RB 3MHz
VB 3MHz
AT 10dB
ST 500ms
Center Freq =
2.000 000 000GHz
CF:2.00GHz
Span:21.2GHz

Fig. 5-5

The following three methods to input numeric values to parameters are provided: direct input by the ten-key pad (numeric keys), up/down keys, and rotary knob.

Enlarge and display the signal

Press Span key , then press the V down key several times to enlarge the signal display.



MKR:1.960GHz
-9.91dBm
RLV:-10.00dBm
RB 3MHz
VB 3MHz
AT 10dB
ST 250ms
Freq Span =
5.000 000 000GHz
CF:2.000GHz
Span:5.00GHz

Fig. 5-6

Marker Operation

Here, checks that the signal frequency and level are displayed in a marker display area. The zone marker automatically fetches the highest level signal within the zone and displays the frequency and level.

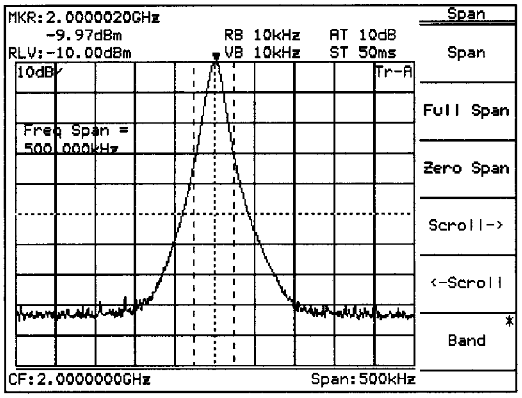

MKR:2.0000020GHz
-9.97dBm
RLV:-10.00dBm
RB 10kHz AT 10dB
VB 10kHz ST 50ms
Freq Span = 500.000kHz
CF:2.0000000GHz
Span:500kHz

Fig. 5-7

To check Marker → CF function, shift the signal from the center intentionally.
Press Frequency key and More key in order, and then Scroll → key two times.

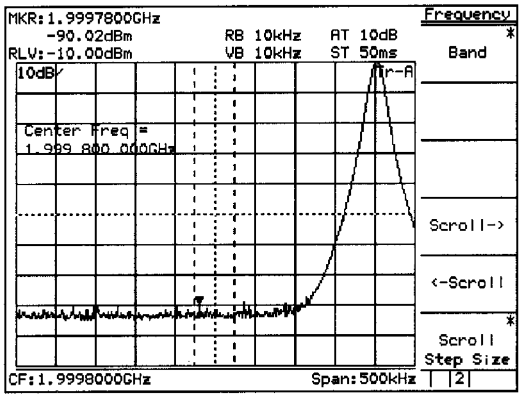

MKR:1.9997800GHz
-90.02dBm
RLV:-10.00dBm
RB 10kHz AT 10dB
VB 10kHz ST 50ms
Center Freq = 1.999 800 000GHz
CF:1.9998000GHz
Span:500kHz

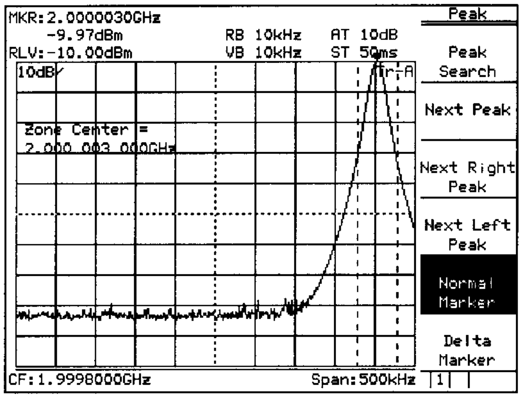
Fig. 5-8

The soft key menu marked by an asterisk on the upper right indicates that the menu can further be opened by pressing the key. Adversely, the soft key menu not marked indicates that the menu cannot be opened any more, so to speak, the end of menu opening.

The following items can easily be checked by the soft key menu tab: How many pages of the soft key menu being displayed currently are there?, and what page is displayed now?

To turn over the page, press More key.

Press Peak Search key.



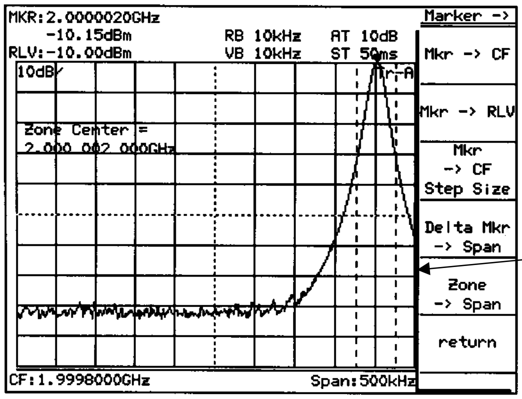
MKR:2.0000030GHz
-9.97dBm
RLV:-10.00dBm
RB 10kHz AT 10dB
VB 10kHz ST 50ms
Zone Center = 2.000 003 000GHz
CF:1.9998000GHz Span:500kHz

Fig. 5-9

The marker fetches the signal.

*Advanced operation memo: It is convenient that the page can also be turned over by repeatedly pressing the panel key. This method is used when key(s), such as Measure key, has a number of pages. Besides, the Freq/Ampl and Marker-related keys do not turn over the page by repeatedly pressing the panel key. For these keys, because the first page is important specially, it should always be displayed when the panel key is pressed.

Press More key and marker → key in order.

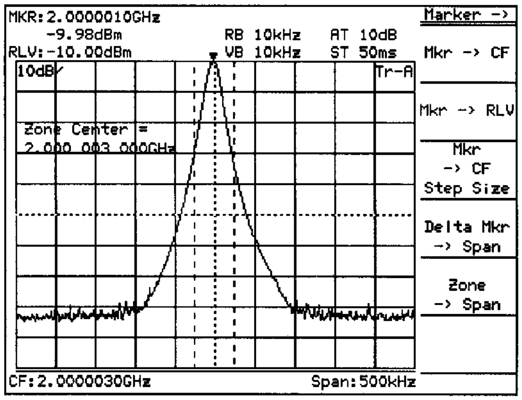


MKR:2.0000020GHz
-10.15dBm
RLV:-10.00dBm
RB 10kHz AT 10dB
VB 10kHz ST 50ms
Zone Center = 2.000 002 000GHz
CF:1.9998000GHz Span:500kHz

Fig. 5-10

When the soft key menu is pressed, a menu of function related to the menu is further displayed. In this case, as shown in the figure on the left, the thick line (the line on the preceding page) is displayed at the left of the soft key menu. This indicates that a new menu is overlapped with the preceding page.

Press marker → CF key.



MKR:2.0000010GHz
-9.98dBm
RLV:-10.00dBm
RB 10kHz AT 10dB
VB 10kHz ST 50ms
Zone Center = 2.000 003 000GHz
CF:2.0000030GHz Span:500kHz

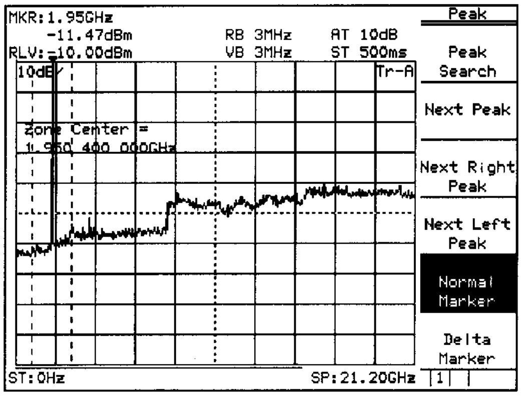
Fig. 5-11

The page opened by pressing the soft key can return to the preceding page by the Return key. Besides, it can be checked that which soft key menu was pressed previously to open the current menu, as the menu title is displayed on the upper row of the soft key.

Here, return to the screen of Fig. 5-8 and ensure that the screen changes to that of Fig. 5-11 only by pressing the → CF key.

"Measure" Function Check

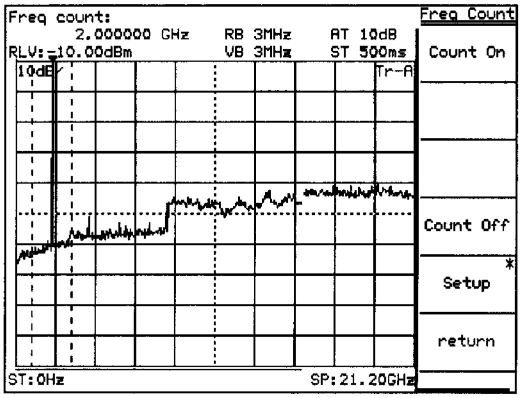
Press Preset key and Preset All key in order.
Press Peak Search key.
If the zero beat signal level (local feed through) is larger than the signal level and the marker fetches the 1st Local feed through, press "Next peak" key and put the marker on the signal.



MKR:1.95GHz
-11.47dBm
RLV:-10.00dBm
RB 3MHz
VB 3MHz
AT 10dB
ST 500ms
Zone Center = 1.950 400 000GHz
ST:0Hz
SP:21.20GHz

Fig. 5-12

Press the Measure key and Frequency Count key to set the function of high accuracy frequency measurement of the marker points.
Then, press the Count On key and start measurement.



Freq count:
2.000000 GHz
RLV:-10.00dBm
RB 3MHz
VB 3MHz
AT 10dB
ST 500ms
ST:0Hz
SP:21.20GHz

Fig. 5-13

The soft-key menu display can be switched On/Off by the Menu On/Off key.
However, keys that condition setting is not possible unless a menu is On unconditionally make the soft-key menu display On when pressing a panel key.

From the screen after executing measurement, press another panel key and change parameters, and then, pressing again the Measure key will automatically return to the menu of this screen and not to page 1 of the menu (page learning function).
It is a useful function when repeating measurement.

The frequency of marker points is displayed at the top left of the screen.
Incidentally, the internal counter correctly operates even at the full span condition, so an operation to reduce frequency span otherwise required is not necessary in this model.

Screen Hard Copy

The screen can be hard-copied with the VP-600 printer (Epson) via an RS232C interface, and the procedures are described below:

1) As illustrated below, connect the RS-232C connector and printer with an attached RS-232C cable.
2) Press the Copy key, and the currently displayed screen is hard-copied.
   If the printed copy is improper, check if the RS-232C interface is correctly set in the following sequence.
3) Press the Shift key and then the Interface key.
4) Press the Connect to Controller key several times to get None on the display, and press the Connect to Prt/Plt key several times and get RS-232C on the display.
   Now the printer can be operated with RS-232C.
5) Press the RS232C Setup key and set so that (or check if) the setting of RS-232C interface is the same between the main body and printer.
   (For the setting/checking of the RS-232C interface on the printer side, refer to the instruction manual of the printer.)
6) Press the Shift key and then the Copy Cont key.
7) Press the Printer/Plotter key and select Printer.
8) Press the Printer Setup key, and then press the VP-600 key.
9) Press the Magnify key several times and make the display 1×1.
10) Press the Copy key, and the currently displayed screen is hard-copied.

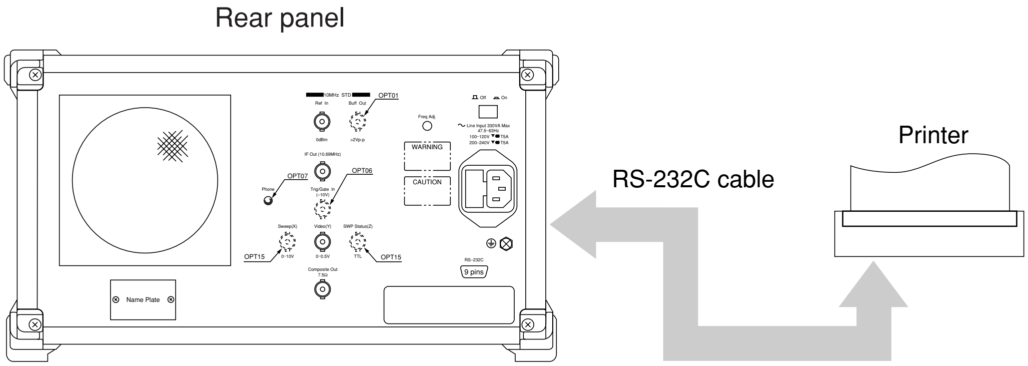


Fig. 5-14

Initialization (Restore shipment state)

This section describes how to initialize a parameter and waveform data that is not initialized by Preset key, like a correction factor, a standard line, a PTA program, Config information, etc.

1) Turn the power on, pressing the Preset key. Please continue pressing the Preset key until beep sounds. Beep sounds about 5 seconds later, after turning on the power switch.

SECTION 6

PERFORMANCE TESTS

In this section, measuring instruments, setup and operations necessary for conducting performance tests of MS2665C equipped with a reference oscillator (Option 01) and MS2667C/68C are described.

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SECTION 6
PERFORMANCE TESTS

Requirement for Performance Tests

Performance tests are used as preventive maintenance to prevent degradation of the MS2665C/67C/68C performance before it occurs.
Use the performance tests whenever necessary such as at acceptance and periodic inspection of the MS2665C/67C/68C and to verify performance after repair. Execute the performance tests listed below to verify the MS2665C/67C/68C performance at acceptance inspection, periodic inspection and after repair.

- Reference oscillator frequency stability
- Frequency readout accuracy
- Frequency span readout accuracy
- Resolution bandwidth and selectivity
- Sideband phase noise
- Frequency measurement accuracy
- Amplitude display linearity
- Frequency response
- Reference level accuracy
- Average noise level
- Second harmonic distortion
- Resolution bandwidth (RBW) switching uncertainty
- Input attenuator switching uncertainty
- Sweep time and time span accuracy

Execute the performance tests at regular intervals as preventive maintenance for important evaluation items. We recommend that the performance be inspected regularly once or twice a year.

If the specifications are not met at the performance tests, please contact Anritsu Corporation.

Instruments Required for Performance Test

A list of instruments required for performance test is shown below.

Instruments Required for Performance Test (1/2)

Recommended instrument name (Model name)	Required Performance †	Test item
Synthesized signal generator (MG3633A)	• Frequency range 100 MHz to 1 GHz Resolution of 1 Hz possible • Output level range –20 to 0 dBm Resolution of 0.1 dB possible • SSB phase noise ≤130 dBc / Hz (at 10 kHz offset) • Second harmonic ≤30 dBc • Amplitude modulation (0 % to 100 %, 0.1 to 400 Hz) possible • External reference input (10 MHz) possible	Frequency-span display accuracy Resolution bandwidth, selectivity Sideband noise Amplitude display linearity Reference-level accuracy Second-harmonic distortion Resolution-bandwidth switching error Input-attenuator switching error Sweep-time and time-span accuracy
Swept Frequency Synthesizer (69269A with Option 2A)	• Frequency range 10 MHz to 40.0 GHz Resolution of 2 kHz possible • Output level range –20 to 0 dBm Resolution of 0.1 dB possible • Pulse modulation possible Pulse width: 0.5 to 10 µs Repetitive cycle: 5 µs to 5 ms • External reference input (10 MHz) possible	Center-frequency display accuracy Frequency-span display accuracy Frequency measurement accuracy Frequency response Time-span accuracy
Attenuator (MN510C)	• Frequency 100 MHz • Maximum attenuation 70 dB (resolution 0.1 dB) possible with calibrated data	Amplitude display linearity Input-attenuator switching error

† Extracts part of performance which can cover the measurement range of the test item.

Instruments Required for Performance Test (2/2)

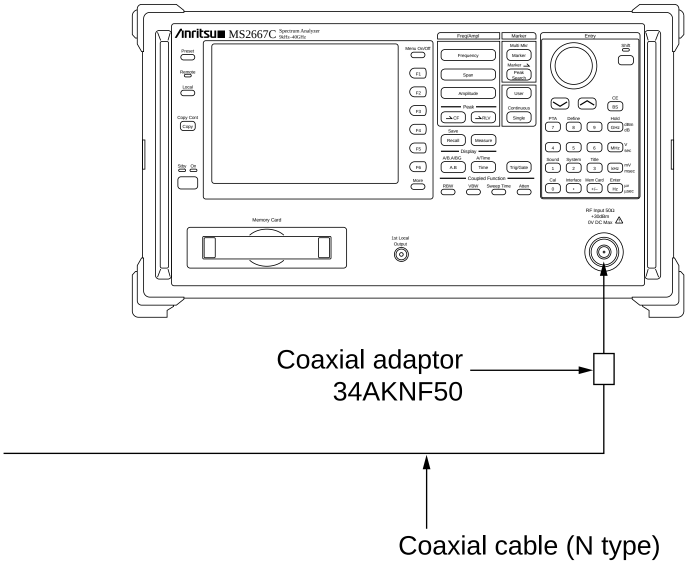
Recommended instrument name (Model name)	Required Performance †	Test item
Power meter (ML2437A)	• Main instrument accuracy ±0.02 dB • Frequency range 10 MHz to 40.0 GHz (depending on the power sensor type)	Frequency response Reference-level accuracy Input-attenuator switching error
Power sensor (MA2422A)	• Frequency range 10 MHz to 18 GHz • Measurement power range −30 to +10 dBm • Input connector N type	Frequency response Reference-level accuracy Input-attenuator switching error
Power sensor (MA2424A)	• Frequency range 10 MHz to 40.0 GHz • Measurement power range −30 to +10 dBm • Input connector K type	
50 Ω terminator (28S50)	• Frequency range DC to 40.0 GHz • VSWR ≤ 1.2	Average noise level
Low-pass filter (M-238C) (SAGE L20CA072)	• Attenuation ≥70 dB (at frequency: 2× (10 MHz and 1 GHz))	Second-harmonic distortion
Frequency counter (MF1601A)	10 MHz measurement possible Number of display digits: 10 • External reference input (10 MHz) possible	Reference-oscillator frequency stability
Frequency standard	• Frequency 10 MHz • Stability $\leq 1 \times 10^{-9}$/day	Reference-oscillator frequency stability Frequency readout accuracy Frequency measurement accuracy

† Extracts part of performance which can cover the measurement range of the test item.

Performance Test

The warm-up time depends on the test item. For test item other than oscillator frequency, warm-up the equipment for at least for thirty minutes and test the performance after the MS2665C/67C/68C stabilizes completely. Also, begin measurement after taking the warm-up time of the calibration instrument into full consideration. In addition, the test must be conducted at room temperature; there must be little AC power supply voltage fluctuation, and no noise, vibration, dust, humidity, etc.

In case of MS2667C/68C, if coaxial cable for the performance test is N type connector, connect the coaxial adaptor 34AKNF50 (DC to 20 GHz, sold separately) to the MS2667C/68C.



Reference oscillator frequency stability

The 10 MHz reference oscillator is tested for frequency stability.

In case of MS2665C, 10 MHz reference oscillator is option 01.

Stability is determined by measuring frequency variation after 24 hours and after 48 hours of power on at ambient temperatures of 0°C and 50°C.

In case of MS2665C, if a device is not to mount Option 01, this test is not available since there is no 10 MHz reference buffer output.

(1) Specifications

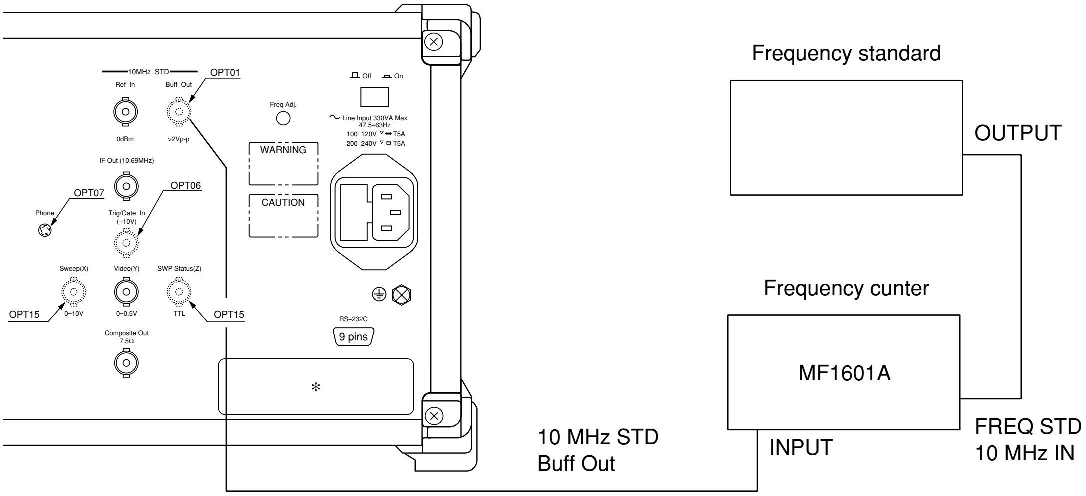
■ Reference oscillator

- Frequency: 10 MHz
- Aging rate: $\leq \pm 2\times10^{-8}$ /day
  After 24 hour warm-up at 25˚C ±5˚C
- Temperature stability: $\leq \pm 5\times10^{-8}$ at 0 and 50˚C referred to frequency at 25˚C

(2) Test instruments

- Frequency counter: MF1601A
- Frequency standard: with stability of $\leq \pm 1\times10^{-9}$/day

(3) Setup



Reference Oscillator Frequency Stability Test

(4) Procedure

Aging rate/day: Test this at the ambient temperature ±2˚C in a vibration-free place.

Step	Procedure
1	Set the change over switch (FREQ STD: INT/EXT) on the MF1601A counter rear panel to EXT.
2	Set the power supply switch on the spectrum analyzer rear panel to On and then the Power switch on the spectrum analyzer front panel to On.
3	Measure the frequency using the counter with 0.1 Hz resolution after 24 hours have passed after turning the power ON.
4	Measure the frequency using the counter after 24 more hours have passed from the step 3 measurement.
5	Calculate the stability by using the following equation. $\text{Frequency stability} = \dfrac{\text{(2nd reading of the counter)} - \text{(1st reading of the counter)}}{\text{(1st reading of the counter)}}$

Temperature stability: Test this performance in a vibration-free constant-temperature chamber.

Step	Procedure
1	Set up the spectrum analyzer in a constant-temperature chamber at 25˚C in the same setup.
2	Set the LINE and Power switches on the spectrum analyzer to On and wait until the spectrum analyzer internal temperature stabilizes (approx. 1.5 hours after the chamber temperature stabilizes).
3	When the internal temperature stabilizes, measure the frequency by using the counter with 0.1 Hz resolution.
4	Change the chamber temperature to 50˚C.
5	When the chamber temperature and the spectrum analyzer internal temperature re-stabilize, measure the frequency by using the counter.
6	Calculate the stability by using the following equation. $\text{Temperature stability} = \dfrac{\text{(counter reading at 50˚C)} - \text{(counter reading at 25˚C)}}{\text{(counter reading at 25˚C)}}$
7	Change the chamber temperature to 0˚C and repeat steps 5 and 6.

Frequency readout accuracy

Add the known frequency which serves as the center frequency reference to the spectrum analyzer as shown in the figure below and set CF (same value as the known reference frequency) and SPAN. At this time, check that the difference between the reading of the marker readout frequency (thick arrow in the figure) of the center frequency peak point, and the CF set value is ≤specifications.

As shown in the figure, the Synthesized Signal Generator uses the signal source phase-locked with the same accuracy as the frequency standard.

(1) Specifications

Frequency readout accuracy:

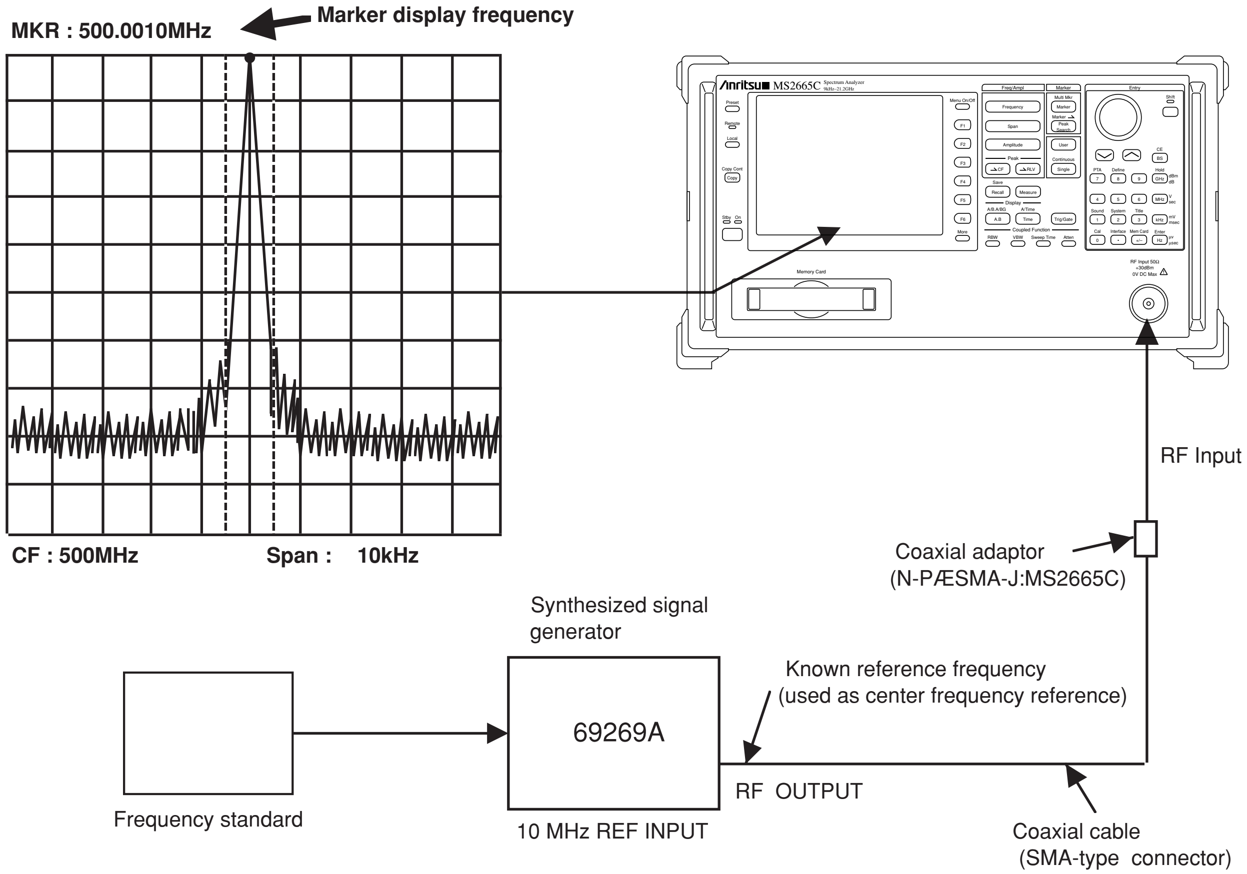
- MS2665C: ± (Readout frequency × frequency reference accuracy + span × span accuracy + 100 Hz × N);
  Span ≥ 10 kHz × N (after calibration)
- MS2667C/68C: ± (Readout frequency × frequency reference accuracy + span × span accuracy);
  Span ≥ 10 kHz × N (after calibration)

  (N is harmonic order at mixer)

(2) Test instruments

- Synthesized signal generator: 69269A
- Frequency standard

(3) Setup



Center-Frequency Readout-Accuracy Test

(4) Precautions

Set the signal generator output level to approx –10 to –20 dBm.

(5) Procedure

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate Freq Cal.
3	Set the signal generator output frequency equal to the center frequency (500 MHz) in the following table.
4	Set the spectrum analyzer to the center frequency in the following table.
5	Set the span (10 kHz) that corresponds to the center frequency (500 MHz) in the table by using the numeric/unit keys.
6	Read the marker frequency (indicated by thick arrow in the figure on the previous page) and check that the value is within the range between the maximum and minimum values shown in the following table.
7	Repeat steps 3 to 6 for other combination of the center frequency and span according to the combinations shown in the following table.

Frequency read out accuracy test

- MS2665C

Signal generator	Center frequency	Span frequency	Band	Frequency readout		
				Minimum value	Maker value	Maximam value
500 MHz	500 MHz	10 kHz 200 kHz 100 MHz	0 (1)	499.999 66 MHz 499.995 2 MHz 497.6 MHz		500.000 34 MHz 500.004 8 MHz 502.4 MHz
5 GHz	5 GHz	10 kHz 200 kHz 100 MHz	1– (1)	4.999 999 55 GHz 4.999 994 8 GHz 4.997 6 GHz		5.000 000 45 GHz 5.000 005 2 GHz 5.002 4 GHz
7.5 GHz	7.5 GHz	10 kHz 200 kHz 100 MHz	1+ (1)	7.499 999 50 GHz 7.499 994 8 GHz 7.497 6 GHz		7.500 000 50 GHz 7.500 005 2 GHz 7.502 4 GHz
12 GHz	12 GHz	20 kHz 200 kHz 100 MHz 1 GHz	2+ (2)	11.999 999 06 GHz 11.999 994 6 GHz 11.997 6 GHz 11.976 GHz		12.000 000 94 GHz 12.000 005 4 GHz 12.002 4 GHz 12.024 GHz
20 GHz	20 GHz	30 kHz 200 kHz 100 MHz 1 GHz	3+ (3)	19.999 998 55 GHz 19.999 994 3 GHz 19.997 6 GHz 19.976 GHz		20.000 001 45 GHz 20.000 005 7 GHz 20.002 4 GHz 20.024 GHz

- MS2667C

Signal generator	Center frequency	Span frequency	Band	Frequency readout		
				Minimum value	Maker value	Maximam value
500 MHz	500 MHz	10 kHz 200 kHz 100 MHz	0 (1)	499.999 5 MHz 499.99 MHz 495 MHz		500.000 5 MHz 500.01 MHz 505 MHz
5 GHz	5 GHz	10 kHz 200 kHz 100 MHz	1– (1)	4.999 999 4 GHz 4.999 99 GHz 4.995 GHz		5.000 000 6 GHz 5.000 01 GHz 5.05 GHz
7.5 GHz	7.5 GHz	10 kHz 200 kHz 100 MHz	1+ (1)	7.499 999 3 GHz 7.499 99 GHz 7.495 GHz		7.500 000 7 GHz 7.500 01 GHz 7.505 GHz
12 GHz	12 GHz	10 kHz 200 kHz 100 MHz 1 GHz	2+ (2)	11.999 998 8 GHz 11.999 99 GHz 11.995 GHz 11.95 GHz		12.000 001 2 GHz 12.000 01 GHz 12.005 GHz 12.05 GHz
20 GHz	20 GHz	10 kHz 200 kHz 100 MHz 1 GHz	3+ (3)	19.999 998 1 GHz 19.999 99 GHz 19.995 GHz 19.95 GHz		20.000 001 9 GHz 20.000 01 GHz 20.005 GHz 20.05 GHz
29 GHz	29 GHz	10 kHz 200 kHz 100 MHz 1 GHz	4+ (4)	28.999 998 9 GHz 28.999 99 GHz 28.995 GHz 28.95 GHz		29.000 001 1 GHz 29.000 01 GHz 29.005 GHz 29.05 GHz

- MS2668C

Signal generator	Center frequency	Span frequency	Band (L0 order)	Frequency readout		
				Minimum value	Maker value	Maximam value
500 MHz	500 MHz	10 kHz	0 (1)	499.999 5 MHz		500.000 5 MHz
		200 kHz		499.99 MHz		500.01 MHz
		100 MHz		495 MHz		505 MHz
5 GHz	5 GHz	10 kHz	1– (1)	4.999 999 4 GHz		5.000 000 6 GHz
		200 kHz		4.999 99 GHz		5.000 01 GHz
		100 MHz		4.995 GHz		5.05 GHz
7.5 GHz	7.5 GHz	10 kHz	1+ (n=1) (1)	7.499 999 3 GHz		7.500 000 7 GHz
		200 kHz		7.499 99 GHz		7.500 01 GHz
		100 MHz		7.495 GHz		7.505 GHz
12 GHz	12 GHz	10 kHz	1+ (n=2) (2)	11.999 999 3 GHz		12.000 000 7 GHz
		200 kHz		11.999 99 GHz		12.000 01 GHz
		100 MHz		11.995 GHz		12.005 GHz
		1 GHz		11.95 GHz		12.05 GHz
20 GHz	20 GHz	10 kHz	2– (n=4) (4)	19.999 999 1 GHz		20.000 000 9 GHz
		200 kHz		19.999 99 GHz		20.000 01 GHz
		100 MHz		19.995 GHz		20.005 GHz
		1 GHz		19.95 GHz		20.05 GHz
29 GHz	29 GHz	10 kHz	3– (n=6) (6)	28.999 998 9 GHz		29.000 001 1 GHz
		200 kHz		28.999 99 GHz		29.000 01 GHz
		100 MHz		28.995 GHz		29.005 GHz
		1 GHz		28.95 GHz		29.05 GHz
39 GHz	29 GHz	10 kHz	3– (n=6) (6)	38.999 998 7 GHz		39.000 001 3 GHz
		200 kHz		38.999 99 GHz		39.000 01 GHz
		100 MHz		38.995 GHz		39.005 GHz
		1 GHz		38.95 GHz		39.05 GHz

Frequency span readout accuracy

Using the setup shown in the figure below, set the frequencies corresponding the 1st and 9th division from the left side of the screen scale with the SG. The frequency difference between the peak levels at the 1st and 9th divisions is equal to the frequency span×0.8.

(1) Specifications

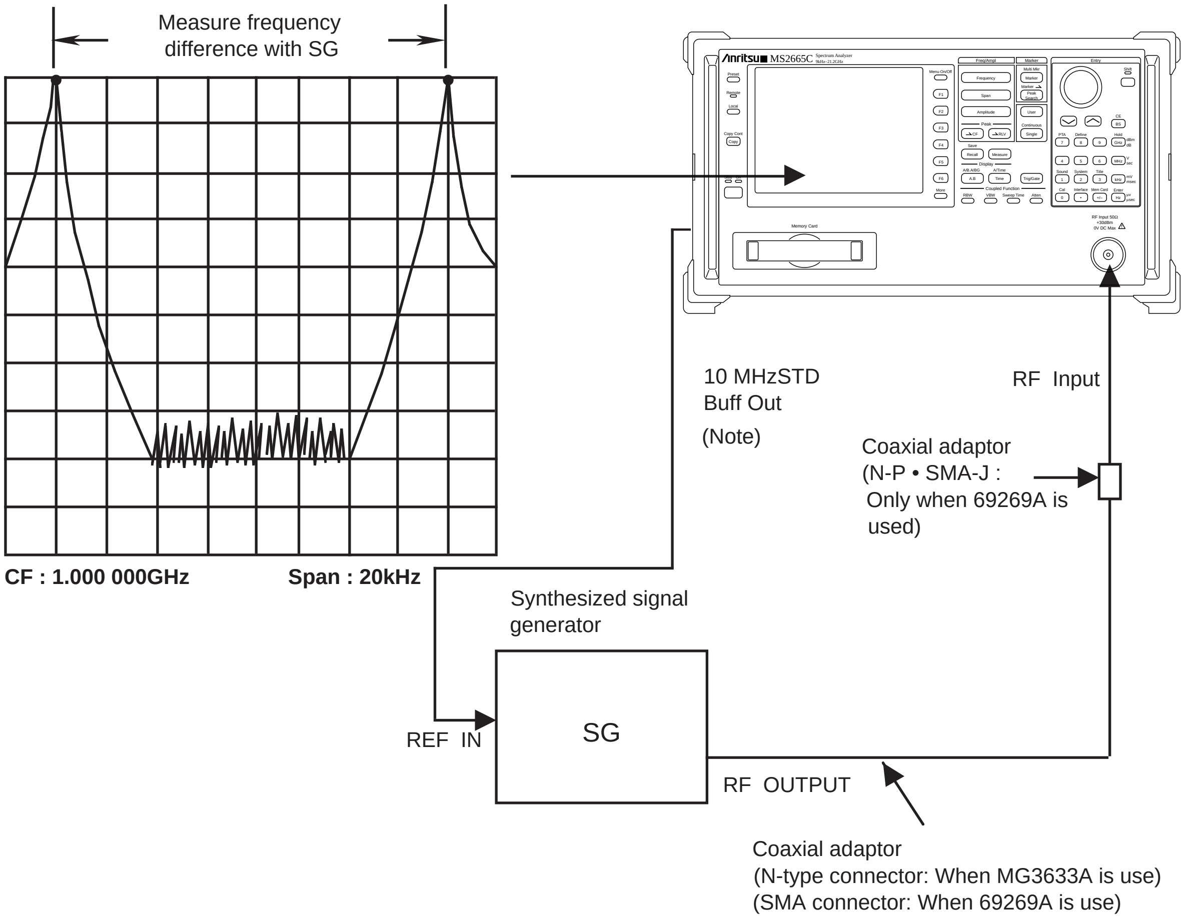
Frequency span readout accuracy

- MS2665C: ±2.5 % (span ≥10 kHz × N)
- MS2667C/68C: ±5 % (span ≥10 kHz × N)
  (N is harmonic order at mixer)

(2) Test instrument

- Synthesized signal generator: MG3633A
  69269A

(3) Setup



Frequency Readout Accuracy Test

(Note) In case of MS2665C, if there is no buffer output for the reference oscillator (Option 01) on the rear panel, input a reference signal from an external 10 MHz frequency standard to the main body and signal generator.

(4) Precautions

Set the signal generator output level to approx. –10 to –20 dBm.

(5) Procedure

Step	Procedure
1	Press the [Preset] key.
2	Operate Freq Cal.
3	Connect the MG3633A output to the spectrum analyzer RF Input.
4	Set the spectrum analyzer as shown below: Span .... 20 kHz Center Freq .... 1000 MHz
5	Set the MG3633A output frequency to the f_1 frequency (999.992 MHz) shown in the table on the next page.
6	Adjust the MG3633A output frequency to set the spectrum peak at the 1st division from the left end of the screen scale. Remember the frequency as f_1' .
7	After setting the MG3633A output frequency to the f_2 frequency (1000.008 MHz), adjust it to set the spectrum peak at the 9th division. Remember the frequency as f_2'.
8	Calculate $(f_2'–f_1')/0.8$ and check that the value is within the specified range (minimum to maximum values) shown in the table on the next page.
9	Repeat steps 4 through 8 for each frequency span with 1 GHz center frequency shown in the table on the next page.

Frequency-Span Readout-Accuracy Test

- MS2665C

MS2665C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1 GHz	20 kHz	0.999 99 2 GHz	1.000 008 GHz	19.5 kHz		20.5 kHz
	200 kHz	0.999 92 GHz	1.000 08 GHz	195 kHz		205 kHz
	2 MHz	0.999 2 GHz	1.000 8 GHz	1.95 MHz		2.05 MHz
	10 MHz	0.996 GHz	1.004 GHz	9.75 MHz		10.25 MHz
	100 MHz	0.96 GHz	1.04 GHz	97.5 MHz		102.5 MHz
	2 GHz	0.2 GHz	1.8 GHz	1.95 GHz		2.05 GHz
4.25 GHz	100 kHz	4.21 GHz	4.29 GHz	97.5 MHz		102.5 MHz
	1 MHz	3.85 GHz	4.65 GHz	0.975 GHz		1.025 GHz
	8.5 MHz	0.85 GHz	7.65 GHz	8.2875 GHz		8.7125 GHz
10.6 GHz	100 MHz	10.56 GHz	10.64 GHz	97.5 MHz		102.5 MHz
	1 GHz	10.2 GHz	11 GHz	0.975 GHz		1.025 GHz
	21.2 GHz	2.12 GHz	19.08 GHz	20.67 GHz		21.73 GHz

- MS2667C

MS2667C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1 GHz	20 kHz	0.999 992 GHz	1.000 008 GHz	19 kHz		21 kHz
	200 kHz	0.999 92 GHz	1.000 08 GHz	190 kHz		210 kHz
	2 MHz	0.999 2 GHz	1.000 8 GHz	1.9 MHz		2.1 MHz
	10 MHz	0.996 GHz	1.004 GHz	9.5 MHz		10.5 MHz
	100 MHz	0.96 GHz	1.04 GHz	95 MHz		105 MHz
	2 GHz	0.2 GHz	1.8 GHz	1.9 GHz		2.1 GHz
4.25 GHz	100 kHz	4.21 GHz	4.29 GHz	95 MHz		105 MHz
	1 GHz	3.85 GHz	4.65 GHz	0.95 GHz		1.05 GHz
	8.5 MHz	0.85 GHz	7.65 GHz	8.075 GHz		8.925 GHz
10 GHz	100 MHz	9.96 GHz	10.04 GHz	95 MHz		105 MHz
	1 GHz	9.6 GHz	10.4 GHz	0.95 GHz		1.05 GHz
	20 GHz	2 GHz	18 GHz	19 GHz		21 GHz
15 GHz	100 MHz	14.96 GHz	15.04 GHz	95 MHz		105 MHz
	1 GHz	14.6 GHz	15.4 GHz	0.95 GHz		1.05 GHz
	30 GHz	1.5 GHz	28.5 GHz	28.5 GHz		31.5 GHz

- MS2668C

MS2668C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1 GHz	20 kHz	0.999 992 GHz	1.000 008 GHz	19 kHz		21 kHz
	200 kHz	0.999 92 GHz	1.000 08 GHz	190 kHz		210 kHz
	2 MHz	0.999 2 GHz	1.000 8 GHz	1.9 MHz		2.1 MHz
	10 MHz	0.996 GHz	1.004 GHz	9.5 MHz		10.5 MHz
	100 MHz	0.96 GHz	1.04 GHz	95 MHz		105 MHz
	2 GHz	0.2 GHz	1.8 GHz	1.9 GHz		2.1 GHz
4.25 GHz	100 kHz	4.21 GHz	4.29 GHz	95 MHz		105 MHz
	1 GHz	3.85 GHz	4.65 GHz	0.95 GHz		1.05 GHz
	8.5 MHz	0.85 GHz	7.65 GHz	8.075 GHz		8.925 GHz
10 GHz	100 MHz	9.96 GHz	10.04 GHz	95 MHz		105 MHz
	1 GHz	9.6 GHz	10.4 GHz	0.95 GHz		1.05 GHz
	20 GHz	2 GHz	18 GHz	19 GHz		21 GHz
20 GHz	100 MHz	19.96 GHz	20.04 GHz	95 MHz		105 MHz
	1 GHz	19.6 GHz	20.4 GHz	0.95 GHz		1.05 GHz
	40 GHz	2 GHz	38 GHz	38 GHz		42 GHz

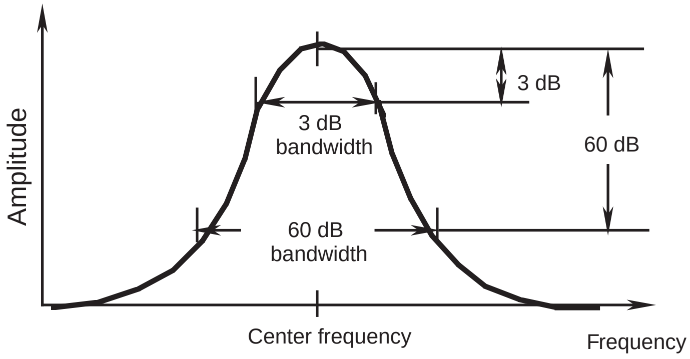
Resolution bandwidth (RBW) and selectivity

If there are two input signals with the frequency difference corresponding to 3 dB bandwidth (of IF final stage), these signals can be resolved as two spectrum waveforms.

This is called the resolution bandwidth.

Selectivity can be improved by narrowing the 60 dB bandwidth. The selectivity is defined by the ratio of the filter width, in Hz, at the –60 dB point, to the filter width, in Hz, at the –3 dB point, as shown in the formula below.

$$\text{Selectivity} = \frac{\text{60 dB bandwidth (Hz)}}{\text{3 dB bandwidth (Hz)}}$$



To test the resolution bandwidth and selectivity, first measure the resolution bandwidth (3dB bandwidth), then the 60 dB bandwidth and calculate the 60 dB/3 dB bandwidth ratio.

(1) Specifications

- Resolution bandwidth accuracy:

  ±20 % (RBW=1 kHz to 1 MHz)
  ±30 % (RBW=3 MHz)

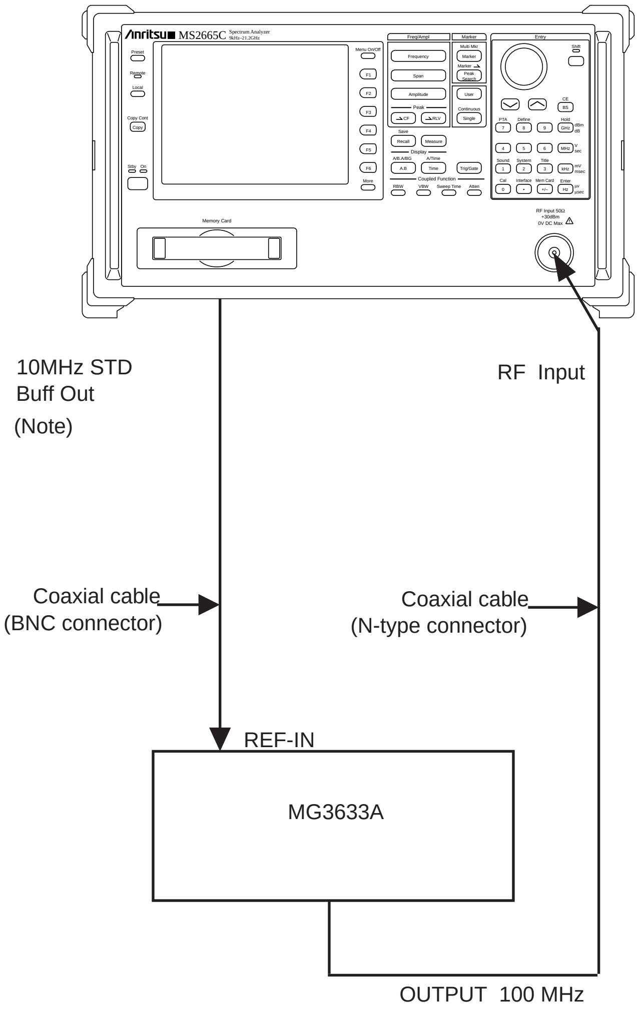
- Selectivity (60 dB/3 dB bandwidth):

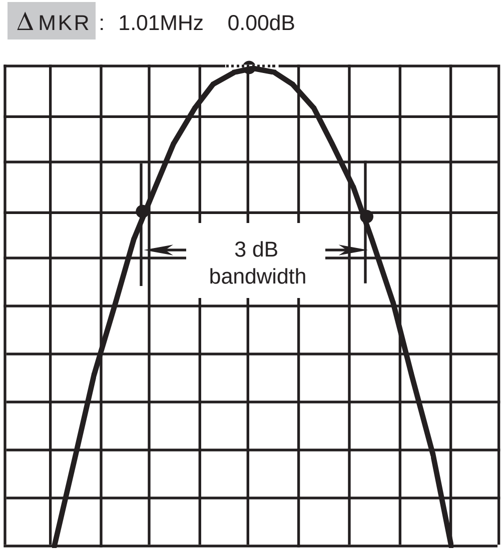
  ≤ 15:1 (RBW=1 kHz to 3 MHz)

(2) Test instrument

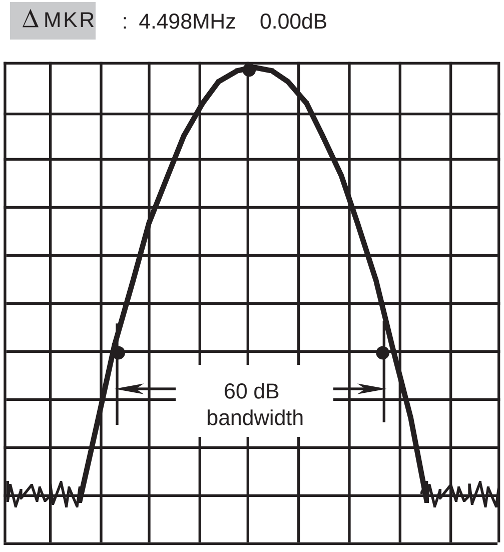
- Synthesized signal generator: MG3633A

(3) Setup





(a) Resolution bandwidth



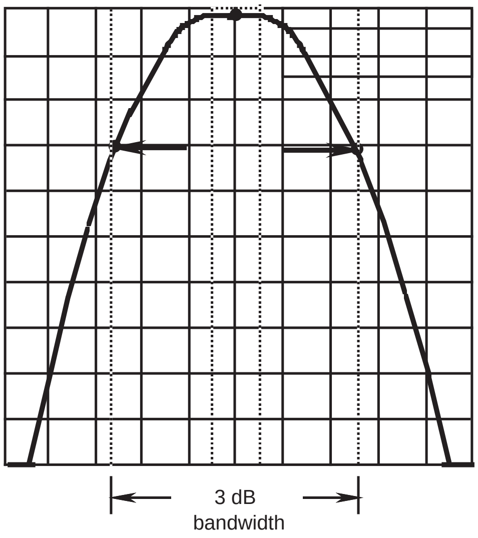
(b) 60 dB dropped bandwidth

Resolution Bandwidth/Selectivity Test

(4) Procedure

(a) Resolution bandwidth accuracy

Step	Procedure
1	Press the [Preset] key.
2	Perform all calibration.
3	Set the spectrum analyzer as shown below: Center Freq .... 100 MHz Span .... 5 MHz RBW (MANUAL) .... 1 MHz Scale .... LOG 1 dB / div
4	Press the [→ RLV] key and match the peak of the signal trace to the top line (REF LEVEL) on the screen.
5	Press the [Single] key to execute a single sweep, then check that the single sweep has been completed.
6	After pressing the Measure key, operate Occ BW Measure and Setup and display the setup menu of occupied frequency bandwidth measurement.
7	Select X dB Down and set it to 3 dB.
8	Press Return to return to the Occ BW Measure menu, and then press Execute.
9	The 3 dB resolution bandwidth value is displayed in the upper left-hand corner of the screen. Fill in this value in the table on the next page.
10	Repeat steps 3 to 9 for the frequencies other than the resolution bandwidth 1 MHz and the frequency span 5 MHz according to the combinations of resolution bandwidth and frequency span shown in the table on the next page.



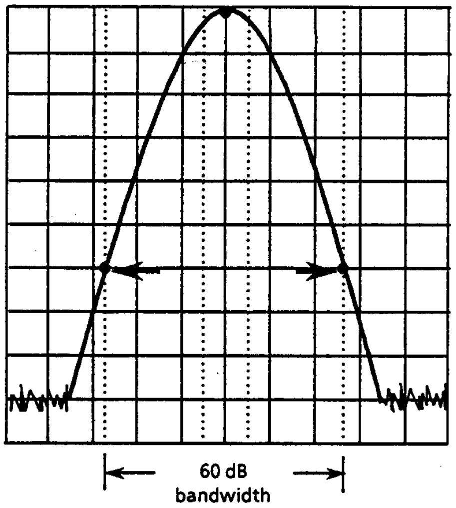
Bandwidth Measurement

Resolution Bandwidth (3 dB)

Resolution bandwidth	Frequency span	3 dB bandwidth
3 MHz	10 MHz	
1 MHz	5 MHz	
300 kHz	500 kHz	
100 kHz	200 kHz	
30 kHz	50 kHz	
10 kHz	20 kHz	
3 kHz	5 kHz	
1 kHz	2 kHz	

(b) Resolution bandwidth selectivity

Step	Procedure
1	Set the spectrum analyzer as shown below: Center Freq .... 100 MHz Span .... 20 MHz RBW (MANUAL) .... 1 MHz Scale .... LOG 10 dB/div VBW .... 100 Hz Marker .... NORMAL Zone Width .... 1 div
2	Press the [→ RLV] key to match the peak of the signal trace to the top line (REF LEVEL) on the screen.
3	Press the [Single] key to execute a single sweep, then check that the single sweep has been completed.
4	After pressing the Measure key, operate Occ BW Measure and Setup and display the setup menu of occupied frequency bandwidth measurement.
5	Select X dB Down and set it to 60 dB.
6	Press Return to return to the Occ BW Measure menu, and then press Execute.
7	The 60 dB resolution bandwidth value is displayed in the upper left-hand corner of the screen. Fill in this value in the table on the next page.
8	Repeat steps 1 to 7 for the frequencies other than the resolution bandwidth 1 MHz and the frequency span 20 MHz according to the combinations of resolution bandwidth and frequency span shown in the table on the next page.
9	For the 3 dB bandwidth, too, write the value of the Resolution Bandwidth (3 dB) table on the preceding page in the table on the next page.
10	For each resolution bandwidth in the table on the next page, confirm that the value calculated from (60 dB BW/3 dB BW) is ≤15.



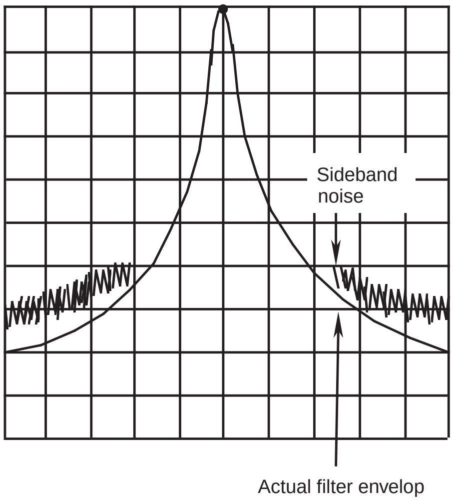
60 dB Bandwidth Measurement

Selectivity Test (60 dB/3 dB Bandwidth Ratio)

Resolution bandwidth	Frequency span	Video bandwidth	60 dB BW	3 dB BW	60 dB BW/30 dB BW
3 MHz	100 MHz	100 Hz			≤15
1 MHz	20 MHz	100 Hz			≤15
300 kHz	10 MHz	100 Hz			≤15
100 kHz	5 MHz	100 Hz			≤15
30 kHz	1 MHz	100 Hz			≤15
10 kHz	200 kHz	100 Hz			≤15
3 kHz	100 kHz	100 Hz			≤15
1 kHz	50 kHz	100 Hz			≤15

Sideband phase noise

When the resolution bandwidth is set to a fixed value and a signal that has far less sideband-noise level than the equipment to be tested is input, check the level of the noise as compared to the peak signal (dBc) at the specified frequency away from the peak.



Since the average value is measured for noise level, use a video filter for measurement.

This sideband noise is a spectrum response which is modulated by the internal noise of the spectrum analyzer. If this response is large, the actual filter envelope is masked by the noise as shown, which makes measurement impossible.

(1) Specifications

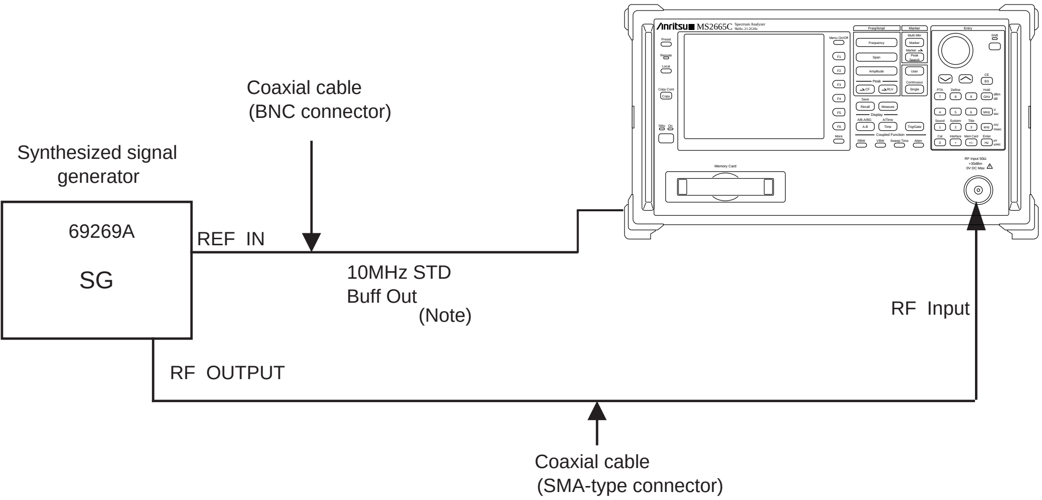
Sideband phase noise:

- MS2665C: ≤ –95 dBc/Hz+20 Log N (1 MHz to 21.2 GHz, 10 kHz offset)
- MS2667C: ≤ –95 dBc/Hz+20 Log N (1 MHz to 30.0 GHz, 10 kHz offset)
  (N is harmonic order at mixer)
- MS2668C: ≤ –95 dBc/Hz+20 Log N (1 MHz to 40.0 GHz, 10 kHz offset)
  (N is LO harmonic order at mixer)

(2) Test instruments

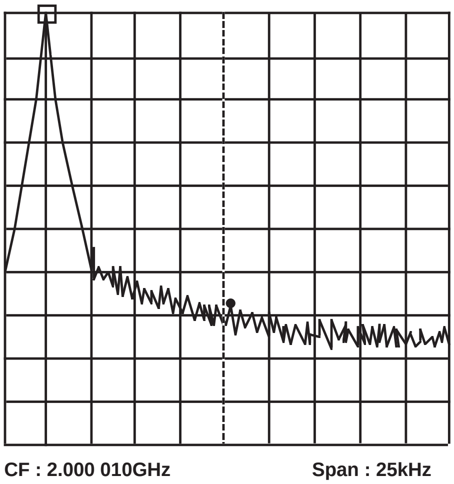
- Signal generator: 69269A Synthesized Signal Generator

(3) Setup



(4) Procedure

Step	Procedure
1	Press the [Preset] key.
2	Operate All Cal.
3	Set the 69269A output to 2 GHz and 0 dBm.
4	Set the spectrum analyzer as shown below: Center Freq .... 2.000 010 GHz Span .... 25 kHz Reference Level .... 0 dBm Attenuator .... 10 dB RBW .... 1 kHz VBW .... 10 Hz DET MODE .... SAMPLE
5	Press the [Peak Search] key to search for a peak point so that the peak point on the signal trace is included in the zone marker.
6	Press the [→ RLV] key to match the peak of the signal trace to the top line (REF LEVEL) on the screen.
7	After pressing the Measure key, select C/N Ratio Measure.
8	Press the Meas On key to start C/N measurement.
9	Set Zone Width of Marker to Spot.
10	Press the [Marker] key, then turn the rotary knobto move the zone marker to the right so that the zone center frequency is 10.0 kHz.
11	Make sure that the C/N value is –95 dBc+20 logN or less.
12	Repeat steps 3 through 11 for each frequency shown in the table on the next page.



Sideband Noise Measurement

- MS2665C

Center frequency	Signal generator	Harmonic order at mixer	Results	Spec.
2.000 01 GHz	2 GHz	1		–95 dBc/Hz
6.000 01 GHz	6 GHz	1		–95 dBc/Hz
10.000 01 GHz	10 GHz	2		–89 dBc/Hz
20.000 01 GHz	20 GHz	3		–85.5 dBc/Hz

- MS2667C

Center frequency	Signal generator	Harmonic order at mixer	Results	Spec.
2.000 01 GHz	2 GHz	1		–95 dBc/Hz
6.000 01 GHz	6 GHz	1		–95 dBc/Hz
10.000 01 GHz	10 GHz	2		–89 dBc/Hz
20.000 01 GHz	20 GHz	3		–85.5 dBc/Hz
26.500 01 GHz	26.5 GHz	4		–83 dBc/Hz

- MS2668C

Center frequency	Signal generator	Harmonic order at mixer	Results	Spec.
2.000 01 GHz	2 GHz	1		–95 dBc/Hz
6.000 01 GHz	6 GHz	1		–95 dBc/Hz
10.000 01 GHz	10 GHz	2		–89 dBc/Hz
20.000 01 GHz	20 GHz	4		–85.5 dBc/Hz
26.000 01 GHz	26 GHz	4		–83 dBc/Hz
39.000 01 GHz	39 GHz	6		–80 dBc/Hz

Frequency measurement accuracy

Set the marker point to the position at least 20 dB higher than the noise (or adjacent interference signal) to operate the built-in counter with the higher-S/N signal, and test the frequency measurement accuracy using Count On mode.

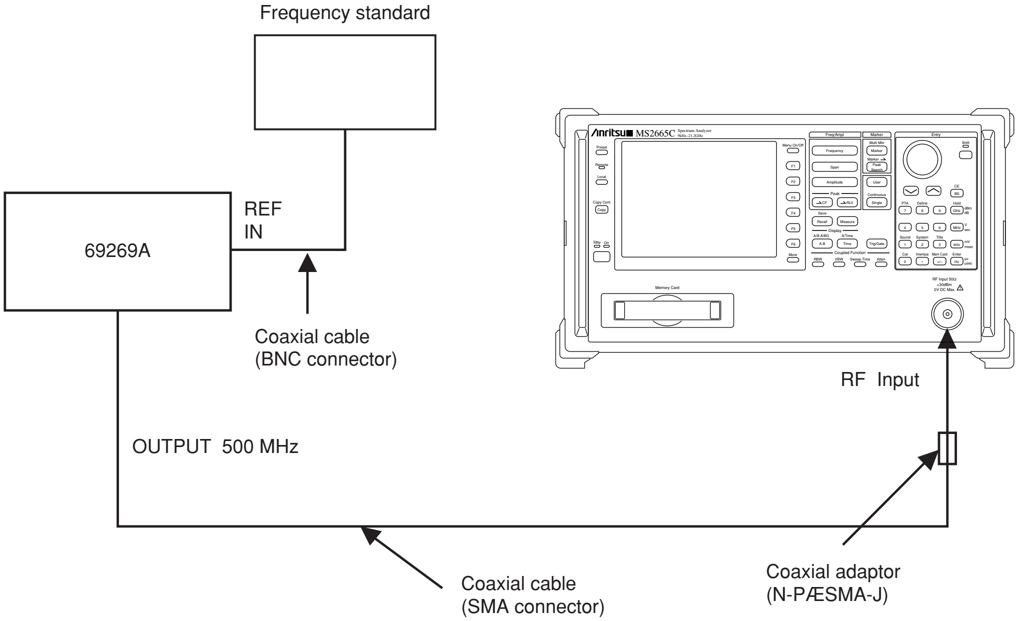
(1) Specifications

• Accuracy:	≤ (Readout frequency × reference oscillator accuracy ± (1 count))
• Resolution:	1 Hz, 10 Hz, 100 Hz, 1 kHz

(2) Test instrument

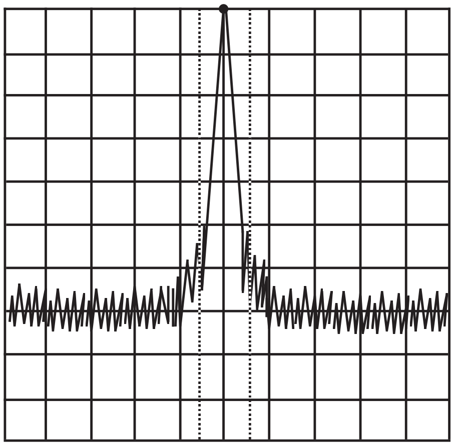
- Signal generator: 69269A
- Frequency standard

(3) Setup



Frequency Measurement Accuracy Test

(4) Procedure

Step	Procedure
1	Press the [Preset] key.
2	Set the 69269A to 500 MHz and –10 dBm.
3	Set the spectrum analyzer as shown below: Center Freq .... 500 MHz Span .... 50 kHz
4	Press the [Measure] key and set to Frequency Count. Press Setup and set Resolution to 1 Hz. Then, press the Return key and set to Count On.
5	Confirm that the FREQ reading at the upper-left of the screen is the RF INPUT frequency 500 MHz ± 1 Hz or less.  **Frequency Measurement**
6	Change the counter resolution to 10 Hz and confirm that the Freq reading is 500 MHz ±10 Hz or less.
7	• Change the counter resolution to 100 Hz and confirm that the Freq reading is 500 MHz ±100 Hz or less. • Change the counter resolution to 1 kHz and confirm that the Freq reading is 500 MHz ±1 kHz or less.

Amplitude display linearity

Test the error per vertical graduation for the LOG display. For the LOG display linearity, test that the graduation is equal to the logarithm (dB) of the input signal level.

Input the correct level signal to the RF Input via an external attenuator and calculate the error from the attenuation of the attenuator and the Δ marker reading at the trace waveform peak.

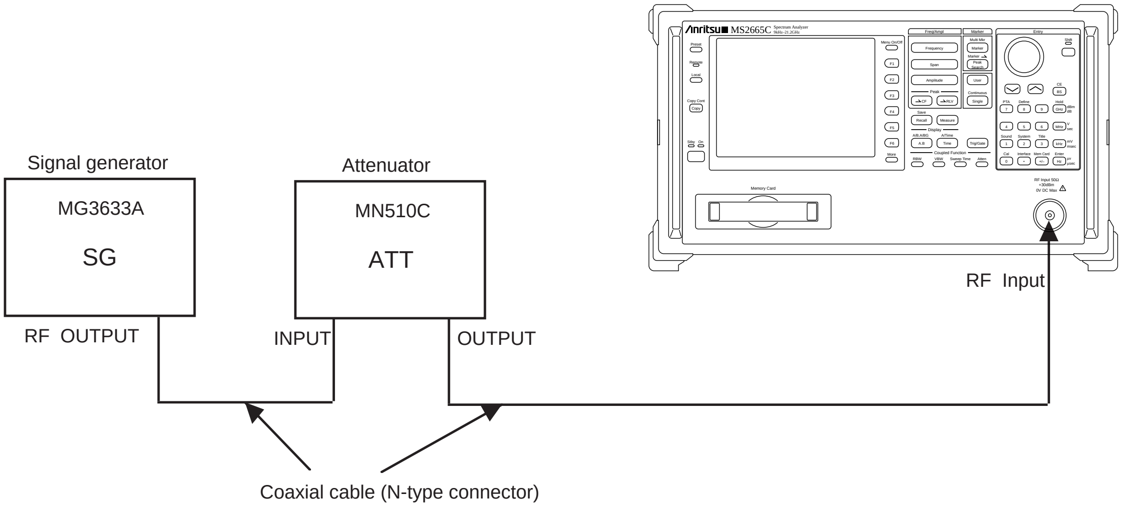
(1) Specifications

• Amplitude display linearity:	After automatic calibration	
	LOG:	±2.5 dB for 0 to –90 dB
		±1.5 dB for 0 to –85 dB
		±1 dB for 0 to –70 dB
		±0.4 dB for 0 to –20 dB

(2) Test instruments

• Signal generator:	MG3633A
• Attenuator:	MN510C

(3) Setup



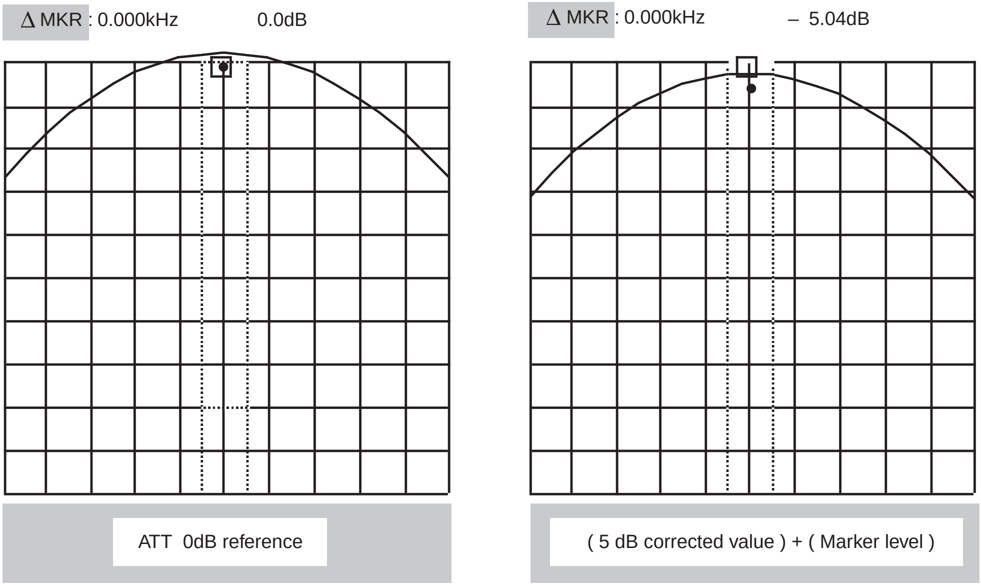
Amplitude Display Linearity Test

(4) Procedure

LOG display linearity

Step	Procedure
1	Press the [Preset] key.
2	Operate All Cal.
3	Set the MG3633A to 100 MHz and 0 dBm.
4	Set the MN510C to 0 dB.
5	Set the spectrum analyzer as shown below: Center Freq .... 100 MHz Span .... 10 kHz Reference Level .... 0 dBm Attenuator .... 10 dB RBW .... 3 kHz VBW .... 300 Hz
6	Press the [→ CF] key to set the spectrum waveform peak to the center of the screen.
7	Adjust the MG3633A output level so that the marker level reading is 0.0 dBm.
8	Press the [Marker] key sequentially to set the marker to Δ marker after the sweep is completed.

Step	Procedure
9	As shown on Fig. (b), read the level of the current marker when ATT is set at 5dB. An error is determined as calibrated ATT 5 dB value+Δ marker level.
10	Add a marker level corresponding to the calibrated ATT value when ATT is set as 10 to 90 DB (with 5 dB steps) and determine the error.



(a) Reference Point Setting

(b) Δ Marker Level when ATT is 5

Log Display Linearity (10 dB/div)

ATT setting (dB)	A	B	Error (dB)=A+B
	ATT Caliblation value	∆marker level (dB)	
0	0 (reference)	0 (reference)	0 (reference)
5	________	________	________
10	________	________	________
15	________	________	________
20	________	________	________
25	________	________	________
30	________	________	________
35	________	________	________
40	________	________	________
45	________	________	________
50	________	________	________
55	________	________	________
60	________	________	________
65	________	________	________
70	________	________	________
75	________	________	________
80	________	________	________
85	________	________	________
90	________	________	________

Frequency response

Generally, when one or more signals with a different frequency but the same amplitude are input, the spectrum analyzer displays the same amplitude for each spectrum on the screen.

(1) Specifications

Relative flatness:

• MS2665C:	±1.5 dB (9 kHz to 3.2 GHz, band 0)
	±1.0 dB (100 kHz to 3.2 GHz, band 0)
	±1.5 dB (2.92 to 8.1 GHz, band 1–/1+)
	±3.0 dB (8.0 to 15.2 GHz, band 2+)
	±4.0 dB (15.1 to 21.2 GHz, band 3+)
• MS2667C:	±1.5 dB (9 kHz to 3.2 GHz, band 0)
	±1.0 dB (100 kHz to 3.2 GHz, band 0)
	±1.5 dB (2.92 to 8.1 GHz, band 1–/1+)
	±3.0 dB (8.0 to 15.2 GHz, band 2+)
	±4.0 dB (15.1 to 21.2 GHz, band 3+)
	±4.0 dB (22.3 to 30 GHz, band 4+)
• MS2668C:	±1.5 dB (9 kHz to 3.2 GHz, band 0)
	±1.0 dB (100 kHz to 3.2 GHz, band 0)
	±1.5 dB (3.1 to 8.1 GHz,band 1–/1+ (n=1))
	±3.0 dB (7.9 to 14.3 GHz,band 1+ (n=2))
	±4.0 dB (14.1 to 26.5 GHz,band 2– (n=4))
	±4.0 dB (26.2 to 40 GHz,band 3– (n=6))

* RF ATT=10 dB, at band 1, 2, 3, 4, after tuning the pre-selector, referenced to the midpoint between highest and lowest frequency deviation in each band.

Absolute flatness:

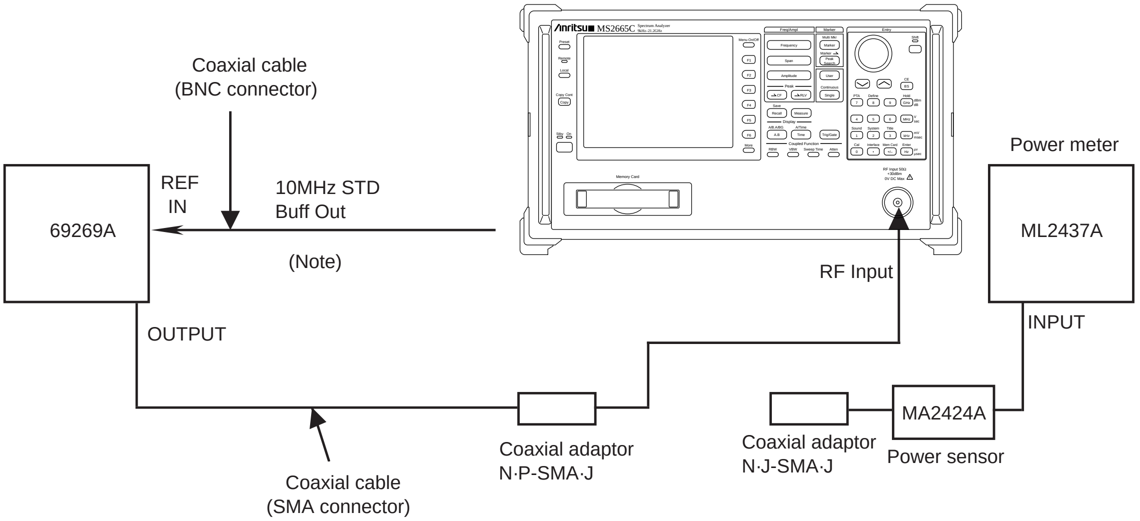
• MS2665C:	± 5.0 dB (9 kHz to 21.2 GHz)
• MS2667C:	± 5.0 dB (9 kHz to 30.0 GHz)
• MS2668C:	± 5.0 dB (9 kHz to 40 GHz)

* Referenced to 100 MHz, RF ATT=10 dB, at band 1,2,3,4, after tuning the pre-selector.

(2) Test instruments

• Signal generator:	69269A
• Power meter:	ML2437A
• Power sensor:	MA2424A

(3) Setup



Frequency Response Test

(Note) In case of MS2665C, if there is no buffer output for the reference oscillator (Option 01) on the rear panel, input a reference signal from an external 10 MHz frequency standard to the main body and signal generator.

(4) Precautions

This test should be performed after allowing the instrument to warm up for 60 minutes or more.

(5) Procedure

(a) Calibration of signal-generator 69269A

Step	Procedure
1	Set the 69269A as shown below: OUTPUT FREQ .... 100 MHz OUTPUT LEVEL .... –10 dBm
2	Connect the 69269A output to the power sensor input with a coaxial cable.
3	Read the power meter display.
4	Change the 69269A output frequency as shown in the tables on the next page and read the power meter display with level at 100 MHz as reference. This data is the calibration data.

(b) Readout of measured amplitude deviation (frequency response)

Step	Procedure
1	Connect the 69269A OUTPUT to the spectrum analyzer RF Input with a coaxial cable.
2	Press the spectrum analyzer [Preset] key.
3	Perform all calibration.
4	Set the spectrum analyzer as shown below: Band .... 0 Center Freq .... 100 MHz Span .... 200 kHz Reference Level .... –10 dBm
5	Press the [→ CF] key.
6	Set the marker mode to delta marker.
7	Set the spectrum analyzer band and center frequency as shown in the tables on the next page, then obtain the deviation from the formula below by reading the delta marker level at each frequency. Deviation = Delta marker level reading - Measurement frequency calibration value For Band 1– , 1+, 2, 3, 4, the preselector is peaked. (See Chapter 8 of Vol.2, "Detailed Panel Operation."

- MS2665C

Band	Frequency	Calibration Value (dBm)	Marker level (dB)	Deviation (dB)
0	100 MHz	0	0 (reference)	0 (reference)
0	500 MHz			
0	1 GHz			
0	1.5 GHz			
0	2 GHz			
0	3 GHz			
1–	3.1 GHz			
1–	4 GHz			
1–	5 GHz			
1–	6 GHz			
1–	6.5 GHz			
1+	6.5 GHz			
1+	7 GHz			
1+	7.5 GHz			
1+	8 GHz			
2+	8 GHz			
2+	9 GHz			
2+	10 GHz			
2+	11 GHz			
2+	12 GHz			
2+	13 GHz			
2+	14 GHz			
2+	15 GHz			
3+	15.2 GHz			
3+	16 GHz			
3+	17 GHz			
3+	18 GHz			
3+	19 GHz			
3+	20 GHz			
3+	21 GHz			

- MS2667C

Band	Frequency	Calibration Value (dBm)	Marker level (dB)	Deviation (dB)
0	100 MHz	0	0 (reference)	0 (reference)
0	500 MHz			
0	1 GHz			
0	1.5 GHz			
0	2 GHz			
0	3 GHz			
1–	3.1 GHz			
1–	4 GHz			
1–	5 GHz			
1–	6 GHz			
1–	6.5 GHz			
1+	6.5 GHz			
1+	7 GHz			
1+	7.5 GHz			
1+	8 GHz			
2+	8 GHz			
2+	9 GHz			
2+	10 GHz			
2+	11 GHz			
2+	12 GHz			
2+	13 GHz			
2+	14 GHz			
2+	15 GHz			
3+	15.2 GHz			
3+	16 GHz			
3+	17 GHz			
3+	18 GHz			
3+	19 GHz			
3+	20 GHz			
3+	21 GHz			
3+	22 GHz			
4+	23 GHz			
4+	24 GHz			
4+	25 GHz			
4+	26 GHz			
4+	27 GHz			
4+	28 GHz			
4+	29 GHz			
4+	30 GHz			

- MS2668C

Band	Frequency	Calibration Value (dBm)	Marker level (dB)	Deviation (dB)
0	100 MHz	0	0 (reference)	0 (reference)
	500 MHz			
	1 GHz			
	1.5 GHz			
	2 GHz			
	3 GHz			
1–	3.1 GHz			
	4 GHz			
	5 GHz			
	5.7 GHz			
1+ n=1	5.5 GHz			
	6.5 GHz			
	7.5 GHz			
	8 GHz			
1+ n=2	8 GHz			
	9 GHz			
	10 GHz			
	11 GHz			
	12 GHz			
	13 GHz			
	14 GHz			
2– n=4	15 GHz			
	17 GHz			
	19 GHz			
	21 GHz			
	23 GHz			
	25 GHz			
	26 GHz			
3– n=6	27 GHz			
	29 GHz			
	31 GHz			
	33 GHz			
	35 GHz			
	37 GHz			
	39 GHz			
	40 GHz			

Reference level accuracy

Here the absolute amplitude level at only 100 MHz is tested. Confirm the level accuracy after inputting an SG output (calibrated by a standard power meter) to the MS2665C/67C/68C.

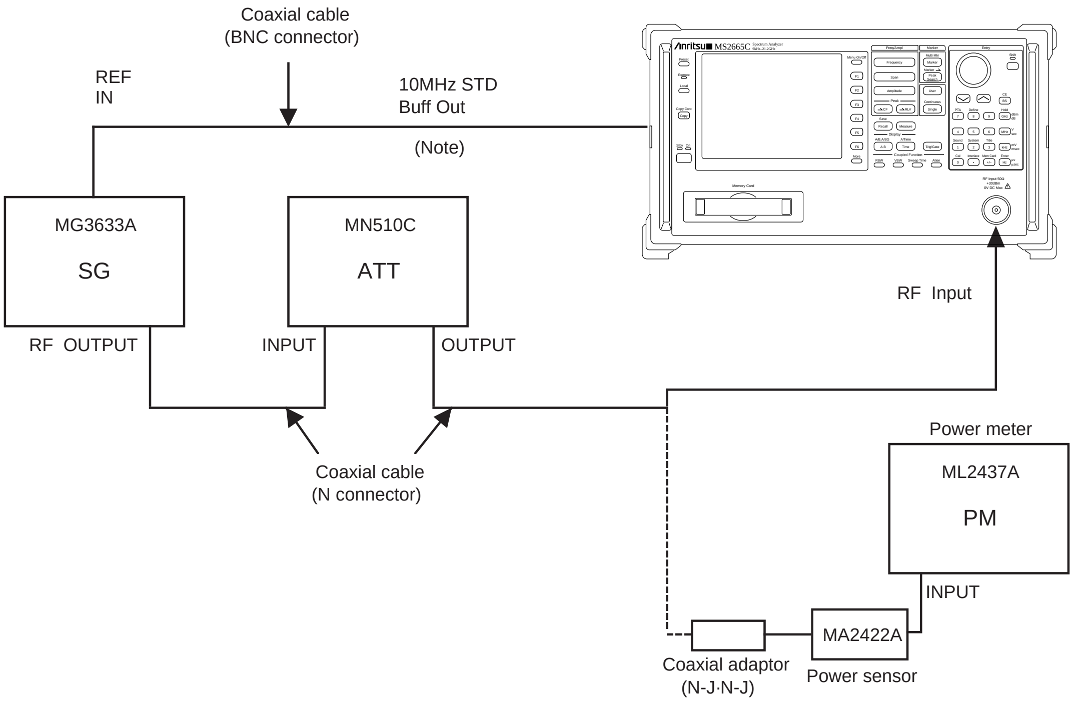
(1) Specifications

• Reference level accuracy:	At 100 MHz frequency and 1 MHz span after automatic calibration (Resolution bandwidth, video bandwidth, RF ATT and sweep time set to AUTO) ≤ ±0.4 dB (0 to –49.9 dBm) ≤ ±0.75 dB (–69.9 to –50 dBm, 0.1 to +30 dBm) ≤ ±1.5 dB (–80 to –70 dBm)

(2) Test instruments

• Signal generator:	MG3633A
• Attenuator:	MN510C
• Power sensor:	MA2422A
• Power meter:	ML2437A

(3) Setup



Reference Level Accuracy Test

(Note) In case of MS2665C, if there is no buffer output for the reference oscillator (Option 01) on the rear panel, input a reference signal from an external 10 MHz frequency standard to the main body and signal generator.

(4) Precautions

1) Set the resolution bandwidth, video bandwidth, ATT and sweep time to Auto.
2) This test should be performed after warming up this instrument for 60 minutes or more.

(5) Procedure

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Connect the attenuator OUTPUT to the power sensor input.
4	Set the SG frequency to 100 MHz and adjust the SG level so that the power meter indication is 0 dBm. At this time, set the attenuator to 0 dB.
5	Connect the attenuator OUTPUT to the spectrum analyzer RF Input connector.
6	Set the spectrum analyzer as shown below: Center Freq .... 100 MHz Span .... 1 MHz Reference Level .... 0 dBm
7	Press the [→ CF] to move the peak point of the spectrum waveform to the center of the screen.
8	Read the marker level.

Step	Procedure
9	Change the attenuator in 10 dB steps, set the reference level as shown in the table below and read the marker level each time.

Reference level setting	Marker readout	Correction factor of ATT	Error
0 dBm	dBm	dB	dB
–10 dBm	dBm	dB	dB
–20 dBm	dBm	dB	dB
–30 dBm	dBm	dB	dB
–40 dBm	dBm	dB	dB
–50 dBm	dBm	dB	dB
–60 dBm	dBm	dB	dB
–70 dBm	dBm	dB	dB
–80 dBm	dBm	dB	dB

10 Calculate the error from the following equation.

Error = Marker readout - reference level set value - correction factor of ATT

Average noise level

The internal noise distributed evenly in proportion to the resolution bandwidth over the whole measurement frequency band is called the average noise level.

(1) Specifications

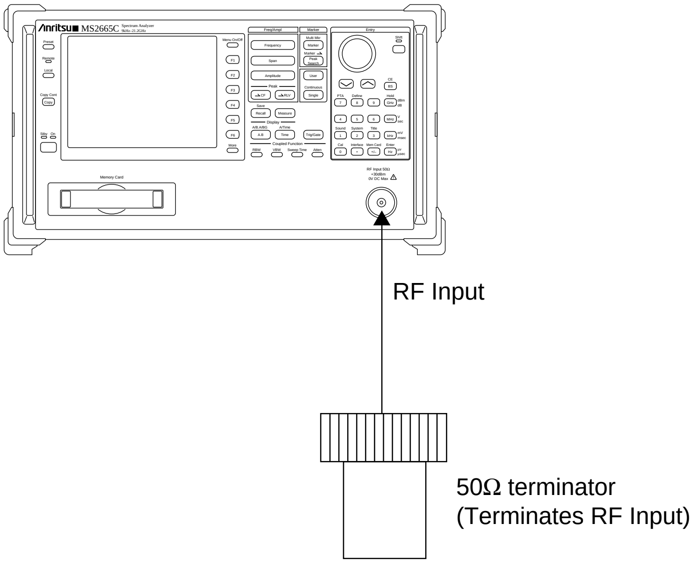
Average noise level: At 1 kHz resolution bandwidth, 1 Hz video bandwidth, and 0 dB RF ATT

- MS2665C:
  ≤–115 dBm (1 MHz to 1 GHz, band 0)
  ≤–115 dBm+1.5f [GHz] dB (1 to 3.1 GHz, band 0)
  ≤–110 dBm (2.92 to 8.1 GHz, band 1)
  ≤–102 dBm (8.0 to 15.3 GHz, band 2)
  ≤–98 dBm (15.2 to 21.2 GHz, band 3)
- MS2667C:
  ≤–115 dBm (1 MHz to 1 GHz, band 0)
  ≤–115 dBm+1.5f [GHz] dB (1 to 3.1 GHz, band 0)
  ≤–110 dBm (3.1 to 8.1 GHz, band 1)
  ≤–102 dBm (8.0 to 15.3 GHz, band 2)
  ≤–98 dBm (15.2 to 22.4 GHz, band 3)
  ≤–91 dBm (22.3 to 30 GHz, band 3)
- MS2668C:
  ≤–115 dBm (1 MHz to 1 GHz, band 0)
  ≤–115 dBm + 1.5f[GHz] dB (1 to 3.1 GHz, band 0)
  ≤–114 dBm (3.1 to 8.1 GHz, band 1–/1+ (n=1))
  ≤–113 dBm (7.9 to 14.3 GHz, band 1+ (n=2))
  ≤–105 dBm (14.1 to 26.5 GHz, band 2– (n=4))
  ≤–101 dBm (26.2 to 40 GHz, band 3– (n=6))

(2) Test instruments

- 50 Ω terminator: 28S50

(3) Setup



Average Noise Level Test

(4) Procedure

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Terminate the RF Input with a 50 Ω terminator.
4	Set the spectrum analyzer as shown below: Band .... 0 Start Freq .... 1 MHz Stop Freq .... 10 MHz Reference Level .... –40 dBm Attenuator .... 0 dB RBW .... 30 kHz VBW .... 3 kHz Detection .... Sample
5	Press the [Single] key to execute a single sweep.
6	Press the [→ CF] key to set the frequency at the peak level of the spectrum to the center frequency.
7	Press the [Shift] key and then the [Single] key to execute a continuous sweep.
8	Set the spectrum analyzer as shown below : (Time Domain) Span .... 0 Hz Reference Level .... –100 dBm RBW .... 1 kHz VBW .... 1 Hz
9	Press [Time], Storage, Average and Average Count keys in order and set the average count to 16.
10	Press the Continue key to start the averaging, and wait until the 16-time averaging sweep is completed.
11	Press the [Peak Search] key to execute peak search. At this point, read the level value at the marker.
12	Confirm that the marker reading is less than the specification, shown in the table on the next page.
13	Repeat steps 4 to 12 while setting Band/Start/Stop Freq from the table on next page so that the average noise level can be obtained.

- MS2665C

MS2665C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1 MHz	10 MHz	0		–115 dBm
10 MHz	100 MHz	0		–115 dBm
100 MHz	1 GHz	0		–115 dBm
1 GHz	2 GHz	0		–113.5 to –112 dBm
2 GHz	3.1 GHz	0		–112 to –110.35 dBm
2.92 GHz	4 GHz	1–		–110 dBm
4 GHz	5 GHz	1–		–110 dBm
5 GHz	6 GHz	1–		–110 dBm
6 GHz	6.5 GHz	1–		–110 dBm
6.4 GHz	7 GHz	1+		–110 dBm
7 GHz	8.1 GHz	1+		–110 dBm
8 GHz	9 GHz	2+		–102 dBm
9 GHz	10 GHz	2+		–102 dBm
10 GHz	11 GHz	2+		–102 dBm
11 GHz	12 GHz	2+		–102 dBm
12 GHz	13 GHz	2+		–102 dBm
13 GHz	14 GHz	2+		–102 dBm
14 GHz	15.3 GHz	2+		–102 dBm
15.2 GHz	16 GHz	3+		–98 dBm
16 GHz	17 GHz	3+		–98 dBm
17 GHz	18 GHz	3+		–98 dBm
18 GHz	19 GHz	3+		–98 dBm
19 GHz	20 GHz	3+		–98 dBm
20 GHz	21.2 GHz	3+		–98 dBm

- MS2667C

MS2667C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1 MHz	10 MHz	0		–115 dBm
10 MHz	100 MHz	0		–115 dBm
100 MHz	1 GHz	0		–115 dBm
1 GHz	2 GHz	0		–113.5 to –112 dBm
2 GHz	3.1 GHz	0		–112 to –110.35 dBm
3.1 GHz	4 GHz	1–		–110 dBm
4 GHz	5 GHz	1–		–110 dBm
5 GHz	6 GHz	1–		–110 dBm
6 GHz	6.5 GHz	1–		–110 dBm
6.4 GHz	7 GHz	1+		–110 dBm
7 GHz	8.1 GHz	1+		–110 dBm
8 GHz	9 GHz	2+		–102 dBm
9 GHz	10 GHz	2+		–102 dBm
10 GHz	11 GHz	2+		–102 dBm
11 GHz	12 GHz	2+		–102 dBm
12 GHz	13 GHz	2+		–102 dBm
13 GHz	14 GHz	2+		–102 dBm
14 GHz	15.3 GHz	2+		–102 dBm
15.2 GHz	16 GHz	3+		–98 dBm
16 GHz	17 GHz	3+		–98 dBm
17 GHz	18 GHz	3+		–98 dBm
18 GHz	19 GHz	3+		–98 dBm
19 GHz	20 GHz	3+		–98 dBm
20 GHz	21 GHz	3+		–98 dBm
21 GHz	22.4 GHz	3+		–98 dBm
22.3 GHz	23 GHz	4+		–91 dBm
23 GHz	24 GHz	4+		–91 dBm
24 GHz	25 GHz	4+		–91 dBm
25 GHz	26 GHz	4+		–91 dBm
26 GHz	27 GHz	4+		–91 dBm
27 GHz	28 GHz	4+		–91 dBm
28 GHz	29 GHz	4+		–91 dBm
29 GHz	30 GHz	4+		–91 dBm

- MS2668C

MS2668C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1 MHz	10 MHz	0		–115 dBm
10 MHz	100 MHz			–115 dBm
100 MHz	1 GHz			–115 dBm
1 GHz	2 GHz			–113.5 to –112 dBm
2 GHz	3.1 GHz			–112 to –110.35 dBm
3.1 GHz	4 GHz	1–		–114 dBm
4 GHz	5 GHz			–114 dBm
5 GHz	5.7 GHz			–114 dBm
5.5 GHz	6.5 GHz	1+ (n=1)		–114 dBm
6.5 GHz	7.5 GHz			–114 dBm
7.5 GHz	8.1 GHz			–114 dBm
7.9 GHz	9 GHz	1+ (n=2)		–113 dBm
9 GHz	10 GHz			–113 dBm
10 GHz	11 GHz			–113 dBm
11 GHz	12 GHz			–113 dBm
12 GHz	13 GHz			–113 dBm
13 GHz	14.3 GHz			–113 dBm
14.1 GHz	15 GHz	2– (n=4)		–105 dBm
15 GHz	16 GHz			–105 dBm
16 GHz	17 GHz			–105 dBm
17 GHz	18 GHz			–105 dBm
18 GHz	19 GHz			–105 dBm
19 GHz	20 GHz			–105 dBm
20 GHz	21 GHz			–105 dBm
21 GHz	22.4 GHz			–105 dBm
22.3 GHz	23 GHz			–105 dBm
23 GHz	24 GHz			–105 dBm
24 GHz	25 GHz			–105 dBm
25 GHz	26.5 GHz			–105 dBm
26.2 GHz	27 GHz	3– (n=6)		–101 dBm
27 GHz	28 GHz			–101 dBm
28 GHz	29 GHz			–101 dBm
29 GHz	30 GHz			–101 dBm
30 GHz	31 GHz			–101 dBm
31 GHz	32 GHz			–101 dBm
32 GHz	33 GHz			–101 dBm
33 GHz	34 GHz			–101 dBm
34 GHz	35 GHz			–101 dBm
35 GHz	36 GHz			–101 dBm
36 GHz	38 GHz			–101 dBm
38 GHz	40 GHz			–101 dBm

Second harmonic distortion

Even if a signal without harmonic distortion is input to a spectrum analyzer, the higher harmonics are generated by the analyzer input-mixer non-linearity and are displayed on the screen.

The second harmonic level is the highest harmonic displayed on the MS2665C/67C/68C spectrum analyzer. The main point of the test is to apply a signal (with a distortion that is lower than the spectrum analyzer internal harmonic distortion [at least 20 dB below]) to the spectrum analyzer and measure the level difference between the fundamental wave and the second harmonic. If a low-distortion signal source cannot be obtained, apply a low-distortion signal to the spectrum analyzer after passing the signal through a low-pass filter (LPF).

(1) Specifications

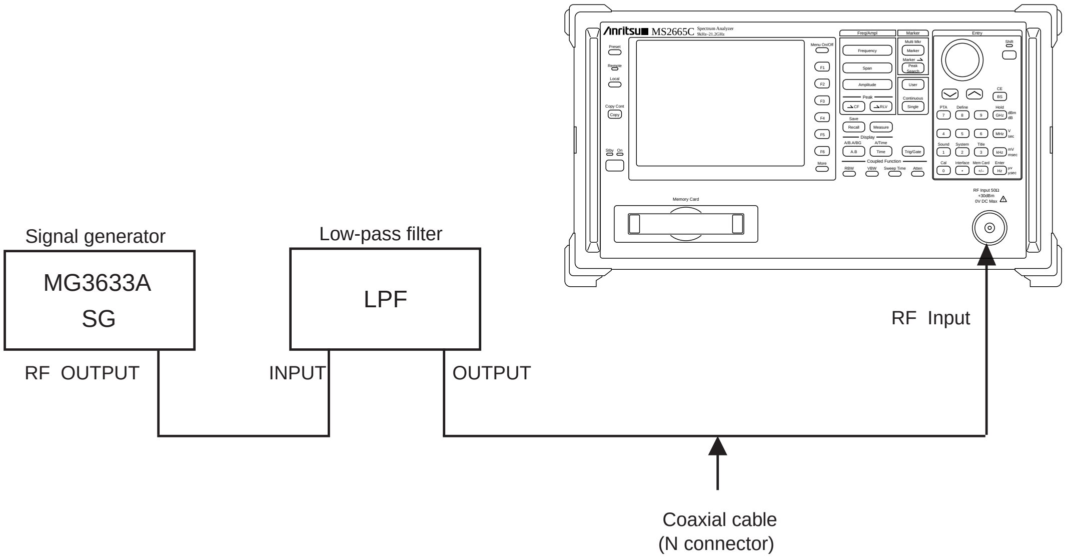
Second harmonic distortion:

- MS2665C
  - * Input level at mixer: –30 dBm
    ≤–60 dBc (10 to 200 MHz, Band 0)
    ≤–70 dBc (0.2 to 1.55 GHz, Band 0)
  - * Input level at mixer: –10 dBm
    ≤–100 dBc or noise level (1.46 to 10.6 GHz, band 1, 2, 3)
- MS2667C
  - * Input level at mixer: –30 dBm
    ≤–60 dBc (10 to 200 MHz, Band 0)
    ≤–70 dBc (0.2 to 1.55 GHz, Band 0)
  - * Input level at mixer: –10 dBm
    ≤–90 dBc or noise level (1.55 to 15 GHz, band 1, 2, 3, 4)
- MS2668C
  - * Input level at mixer: –30dBm
    ≤–60 dBc (10 to 200 MHz, band 0)
    ≤–70 dBc (0.2 to 1.55 GHz, band 0)
  - * Input level at mixer: –10 dBm
    ≤–90 dBc or noise level (1.55 to 20 GHz, band 1, 2, 3)

(2) Test instruments

• Signal generator:	MG3633A 69269A
• LPF:	With attenuation of 70 dB or more at twice the fundamental frequencies

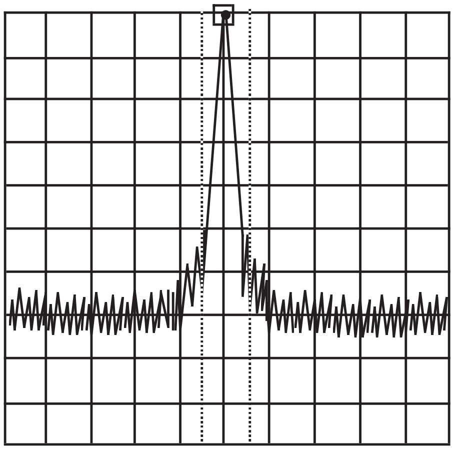
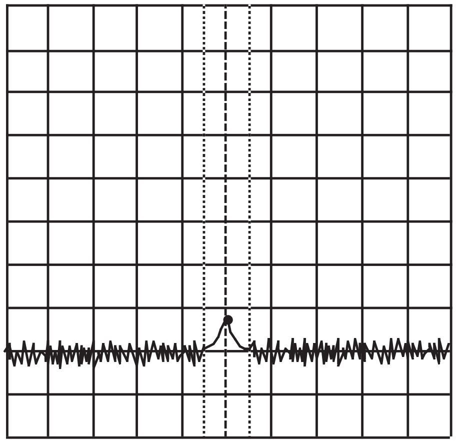
(3) Setup



Second Harmonic Distortion Test

(4) Procedure

Step	Procedure
1	Press the [Preset] key.
2	Operate All Cal.
3	Set the LPF cut-off frequency to approx. 12.8 MHz.
4	Set the SG output frequency to 10 MHz and the output level to –30 dBm.
5	Set the spectrum analyzer as shown below: Center Freq .... 10 MHz Span .... 10 kHz Reference Level .... –30 dBm Attenuator .... 0 dB
6	Adjust the SG output level so that peak of the spectrum waveform is at the REF LEVEL (the top horizontal line of the screen).

Step	Procedure
7	Move the marker to the peak of the spectrum waveform and make the marker the Δ marker. 
8	Set the center frequency to twice the fundamental wave frequency to display the second harmonic on the screen. The Δ marker reading indicates the level difference between the fundamental wave and the second harmonic. If the level difference is 80 dB or more, set the REF LEVEL to –50 dBm. Confirm that the ATT set value is 0 dB. 
9	Set the LPF cut-off frequency to approx. 1.2 GHz.
10	Set the SG as follows: OUTPUT FREQ .... 1 GHz OUTPUT LEVEL .... –30 dBm
11	Set the spectrum analyzer as follows: Center Freq .... 1 GHz Span .... 10 kHz Reference Level .... –30 dBm Attenuator .... 0 dB
12	Repeats steps 6 to 8.

Resolution bandwidth (RBW) switching uncertainty

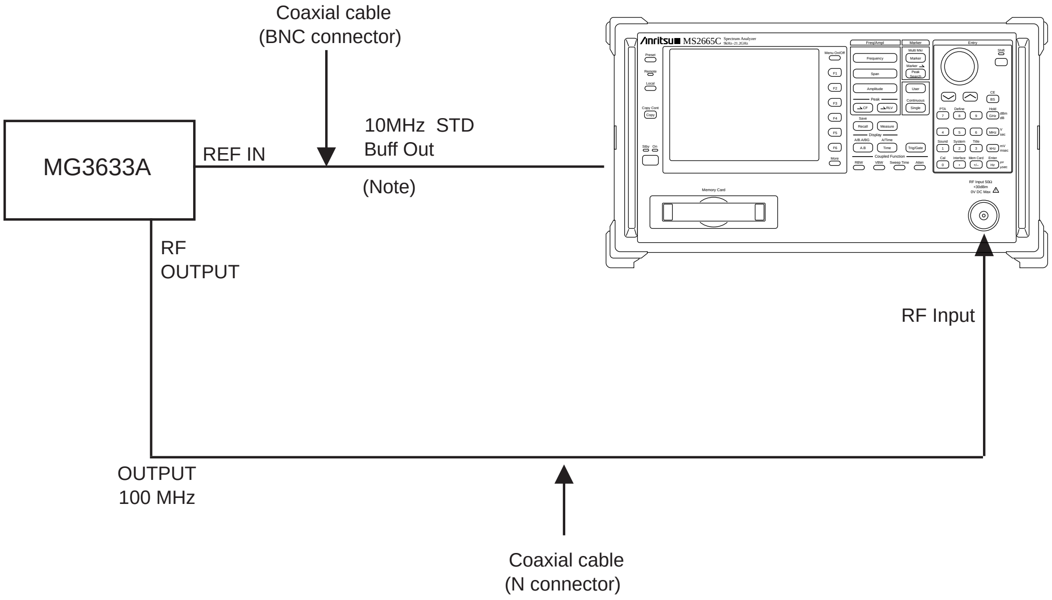
When the resolution bandwidth (RBW) is switched, its level error at the peak point is measured.

(1) Specifications

- Resolution bandwidth switching uncertainty (referenced to RBW: 3 kHz) : ±0.3 dB (RBW=1 kHz to 1 MHz)

  ±0.4 dB (RBW=3 MHz)

(2) Setup



Resolution Bandwidth Switching Error Test

(Note) In case of MS2665C, if there is no buffer output for the reference oscillator (Option 01) on the rear panel, input a reference signal from an external 10 MHz frequency standard to the main body and signal generator.

(4) Procedure

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Set the signal generator MG3633A as shown below. OUTPUT FREQ .... 100 MHz OUTPUT LEVEL .... 0 dBm
4	Set the spectrum analyzer as shown below. Center Freq .... 100 MHz Span .... 15 kHz Reference Level .... 0 dBm RBW .... 3 kHz
5	Press the [→ CF] key to move the signal spectrum peak to the center.
6	Press [Marker] key in that order to set the marker to Δ marker.
7	Set RBW and SPAN as shown in the table on the next page and measure the level deviation (error) of each RBW by following steps 8 and 9 below.
8	Press [Peak Search] key to conduct peak search and move the current marker to the peak point of the signal spectrum.
9	Read the Δ marker level value.

Resolution bandwidth (RBW) switching uncertainty

MS2665C/2667C setting		Δ marker readout	Specification
RBW	SPAN		
1 kHz	5 kHz		±0.3 dB
3 kHz	15 kHz	0.0 dB	Reference
10 kHz	50 kHz		±0.3 dB
30 kHz	150 kHz		±0.3 dB
100 kHz	500 kHz		±0.3 dB
300 kHz	1.5 MHz		±0.3 dB
1 MHz	5 MHz		±0.3 dB
3 MHz	10 MHz		±0.4 dB

Input attenuator (RF ATT) switching uncertainty

At this point, measure the switching error when the amount of attenuation in the RF input section is switched. When the input attenuator is switched, IF-section step-amplifier gain is switched. To keep this step-amplifier gain constant, the reference level is switched according to the amount of input attenuator attenuation.

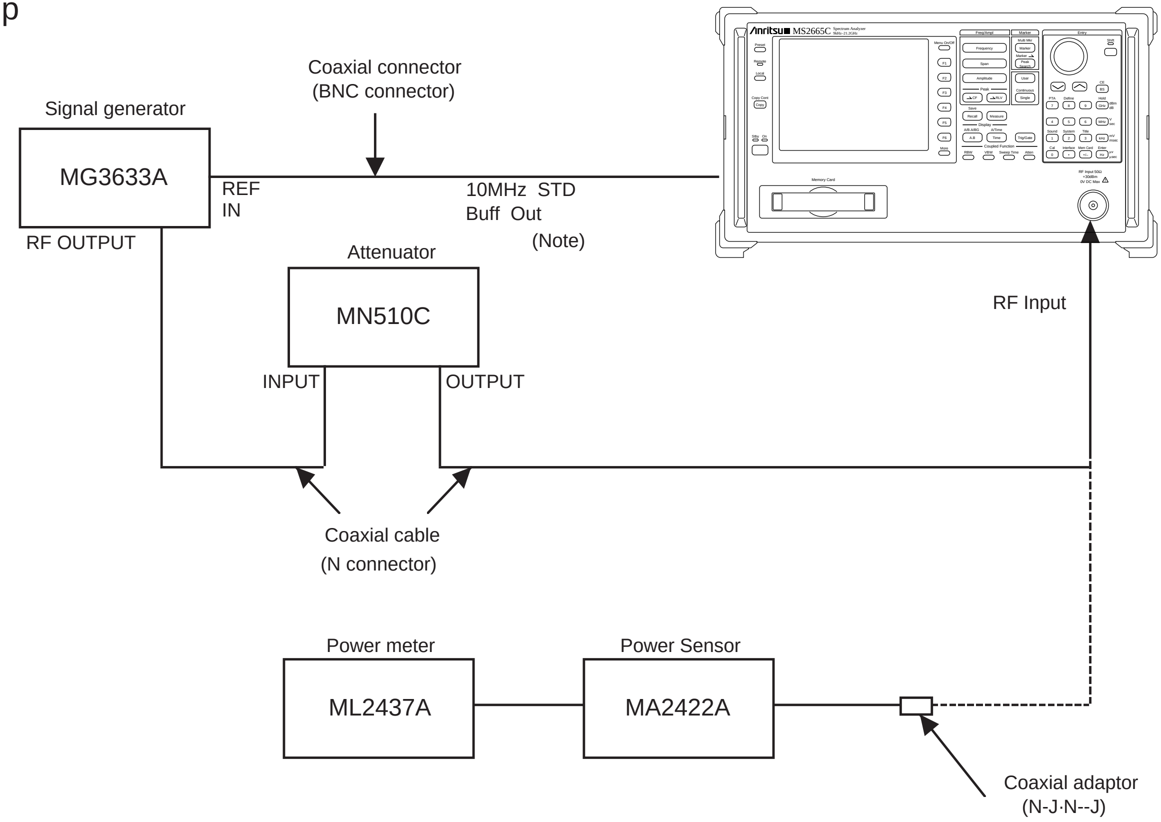
(1) Specifications

• Input attenuator switching error:	± 0.3 dB (at 0 to 50 dB, frequency 100 MHz and input ATT 10 dB)

(2) Test instruments

• Signal generator:	MG3633A
• Attenuator:	MN510C
• Power meter:	ML2437A
• Power sensor:	MA2422A

(3) Setup



Input Attenuator Switching Error Test

(Note) In case of MS2665C, if there is no buffer output for the reference oscillator (Option 01) on the rear panel, input a reference signal from an external 10 MHz frequency standard to the main body and signal generator.

(4) Procedure

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Set the spectrum analyzer as shown below: Center Freq .... 100 MHz Span .... 200 kHz
4	Set the signal generator MG3633A as shown below: OUTPUT FREQ .... 100 MHz OUTPUT LEVEL .... –10 dBm
5	Set the amount of attenuation of the attenuator MN510C to 0 dB.
6	Connect the output of the attenuator MN510C to the power meter via coaxial cable.
7	Adjust the signal-generator output level so that the indicated value of the power meter is -10.0 dBm.
8	Connect the coaxial cable of the attenuator output to the spectrum analyzer RF Input.
9	Press the [→ CF] key.
10	Set the reference level to –10 dBm and attenuation to 50 dB.
11	Read the marker level.
12	Set Reference Level, ATT of this device and the external ATT as shown in the table on the next page, and read the level of each marker.
13	Find the error by the formula below: Error = marker readout-Reference Level-correction factor of attenuator
14	Find the deviation by the formula below: Deviation = Error-error when ATT at 10 dB Confirm that the deviation is within ±0.3 dB.

Spectrum analyzer setting		Attenuator setting	Correction factor of attenuator	Marker readout	Error	Deviation
REF LEVEL	ATT					
–10 dBm	50 dB	0 dB	dB	dBm	dB	dB
–20 dBm	40 dB	10 dB	dB	dBm	dB	dB
–30 dBm	30 dB	20 dB	dB	dBm	dB	dB
–40 dBm	20 dB	30 dB	dB	dBm	dB	dB
–50 dBm	10 dB	40 dB	dB	dBm	dB	0 dB (reference)
–60 dBm	0 dB	50 dB	dB	dBm	dB	dB

Sweep time and time span accuracy

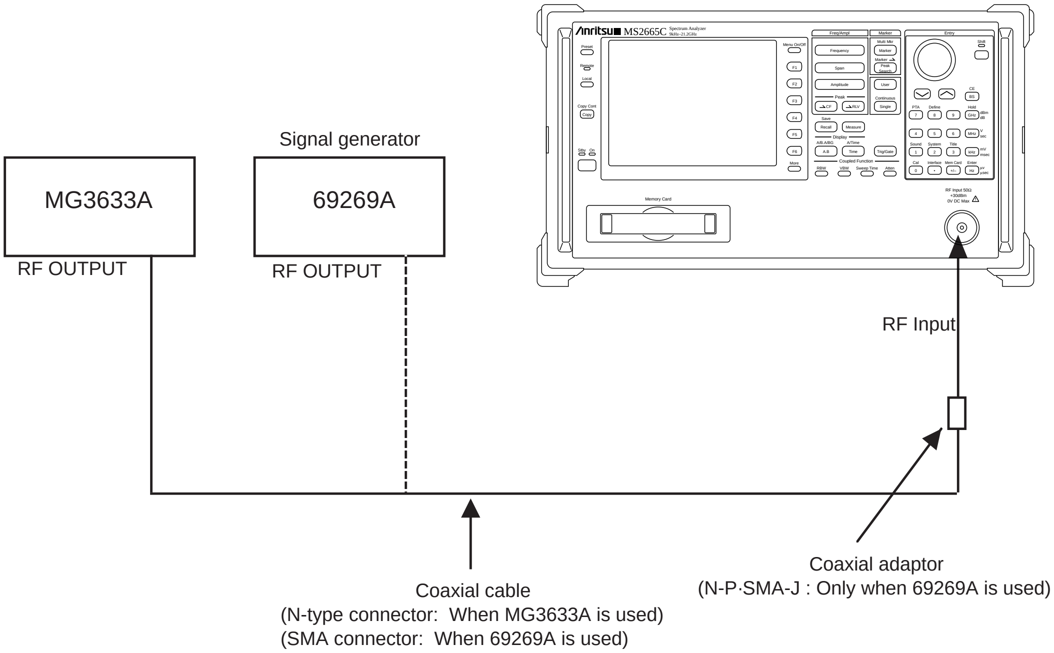
(1) Specifications

- Sweep time accuracy: ±15 % (20 ms to 100 s)
  ±25 % (110 s to 1000 s)
- Time span accuracy: ±1 % (digital zero span mode)

(2) Test instruments

- Signal generator: MG3633A
  69269A

(3) Setup



Sweep Time and Time Span Accuracy

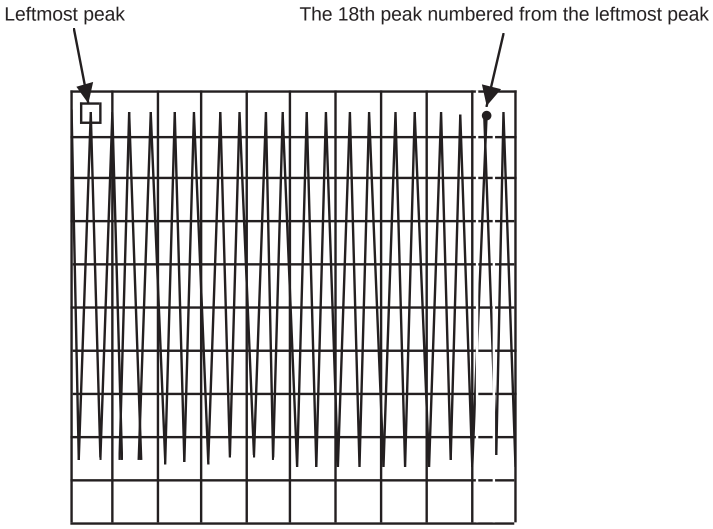
(4) Procedure

(a) Sweep Time

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Connect the MG3633A signal generator with the spectrum analyzer as shown in the setup diagram.
4	Set the spectrum analyzer as shown below: CENTER FREQ .... 100 MHz SPAN .... 51 kHz SWP TIME .... 50 ms RBW .... 1 MHz VBW .... 1 MHz
5	Set the MG3633A as shown below: OUTPUT FREQ .... 100 MHz OUTPUT LEVEL .... –16 dBm MODULATION .... AM (INT) 90 % MODULATION FREQ .... 400 Hz
6	Press the [→ RLV] key.
7	Set the scale to Linear.
8	Press the [Single] key, then wait until a single sweep execution is completed.
9	Set the marker zone width to 5 Hz (Zone Width=5 Hz).
10	Move the marker to the left of the screen using the knob and set the zone marker on the left most peak of the sine wave.
11	Setting the marker mode to Δ (delta), move the current marker to the right using the knob. Then set the zone marker to the 18th peak from the left most sine wave peak on the screen.
12	Read the frequency difference of the Δ marker, which corresponds to 90 % of the Sweep Time. Obtain the SWP TIME by the following equation. $\text{SWP TIME (calculated)} = \text{Setting SWP TIME} \times \frac{\Delta\text{marker readout}}{51000\ \text{(Hz)}}$

Step	Procedure
13	Measure at each setting shown in the table below according to steps 8 to 12.

Spectrum analyzer setting SWP TIME	Signal Generator AM modulation frequency	SWT TIME calculated	90 % of specification min/max
50 ms	400 Hz		38.25 ms/51.75 ms
200 ms	100 Hz		153 ms/207 ms
2 s	10 Hz		1.53 s/2.07 s
20 s	1 Hz		15.3 s/20.7 s
200 s	0.1 Hz		99 s/261 s



(b) Time span

Step	Procedure
1	Press the spectrum analyzer [Preset] key.
2	Operate All Cal.
3	Connect the MG3633A signal generator with the spectrum analyzer shown in the setup diagram.
4	Set the spectrum analyzer as shown below: CENTER FREQ .... 100 MHz SPAN .... 0 MHz SWEEP TIME .... 20 ms RBW .... 1 MHz VBW .... 1 MHz
5	Set the MG3633A as shown below: OUTPUT FREQ .... 100 MHz OUTPUT LEVEL .... –16 dBm MODULATION .... AM (INT) 90 % MODULATION FREQ .... 1 kHz
6	Press the [→ RLV] key.
7	Set the scale to Linear.
8	Press the [Single] key, then wait until a single sweep execution is completed.
9	Move the marker to the left of the screen using the knob and set the marker on the left most peak of the sine wave.
10	Setting the marker mode to Δ (delta), move the current marker to the right using the knob. Then set the marker to the 18th peak from the left most sine wave peak on the screen.
11	Read the time difference of the Δ marker, which corresponds to 90 % of the Time Span.
12	Measure at each setting shown in the table below according to step 4 to 11.

Spectrum analyzer time span	Signal Generator AM modulation frequency	ΔMarker readout	90 % of specification min/max
20 ms	1 kHz		17.82 ms/18.18 ms
200 ms	100 Hz		178.2 ms/181.8 ms
2 s	10 Hz		1.782 s/1.818 s
20 s	1 Hz		17.82 s/18.18 s
200 s	0.1 Hz		178.2 s/181.1 s

Service

If the instrument is damaged or does not operate as specified, contact your nearest Anritsu dealer or business office for repair. When you request repair, provide the following information.

(a) Model name and serial number on rear panel

(b) Fault description

(c) Name of a personnel-in-charge and address for contact when fault confirmed or at a completion of repair

SECTION 7

STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking and transportation of the MS2665C/67C/68C as well as the regular care procedures and the timing.

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SECTION 7
STORAGE AND TRANSPORTATION

Cleaning Cabinet

Always turn the spectrum analyzer POWER switch OFF and disconnect the power plug from the AC power inlet before cleaning the cabinet. To clean the external cabinet:

- Use a soft, dry cloth for wiping off.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage.
  After insuring that the cabinet has been thoroughly dried, use a soft, dry cloth for wiping off.
- If loose screws are found, tighten them with the appropriate tools.

CAUTION ⚠

Never use benzene, thinner, or alcohol to clean the external cabinet; it may damage the coating, or cause deformation or discoloration.

Storage Precautions

This paragraph describes the precautions to take for long-term storage of the MS2665C/67C/68C Spectrum Analyzer.

Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other dirt off the spectrum analyzer.

(2) Avoid storing the spectrum analyzer where:
  1) It may be exposed to direct sunlight or high dust levels.
  2) It may be exposed to high humidity.
  3) It may be exposed to active gases.
  4) It may be exposed to extreme temperatures (<–40˚C or >70˚C) or high humidity (≥90 %).

Recommended storage precautions

The recommended storage conditions are as follows:

- Temperature .... 0 to 30˚C
- Humidity .... 40 % to 80 %
- Stable temperature and humidity over 24-hour period

Repacking and Transportation

The following precautions should be taken if the MS2665C/67C/68C Spectrum Analyzer must be returned to Anritsu Corporation for servicing.

Repacking

Use the original packing materials. If the spectrum analyzer is packed in other materials, observe the following packing procedure:

(1) Wrap the spectrum analyzer in a plastic sheet or similar material.
(2) Use a cardboard, wooden box, or aluminum case which allows shock-absorbent material to be inserted on all sides of the equipment.
(3) Use enough shock-absorbent material to protect the spectrum analyzer from shock during transportation and to prevent it from moving in the container.
(4) Secure the container with packing straps, adhesive tape or bands.

Transportation

Do not subject the spectrum analyzer to severe vibration during transport. It should be transported under the storage conditions recommended before.

APPENDIXES

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APPENDIX A

FRONT AND REAR PANEL LAYOUT

This appendix shows the front and rear panel layout.

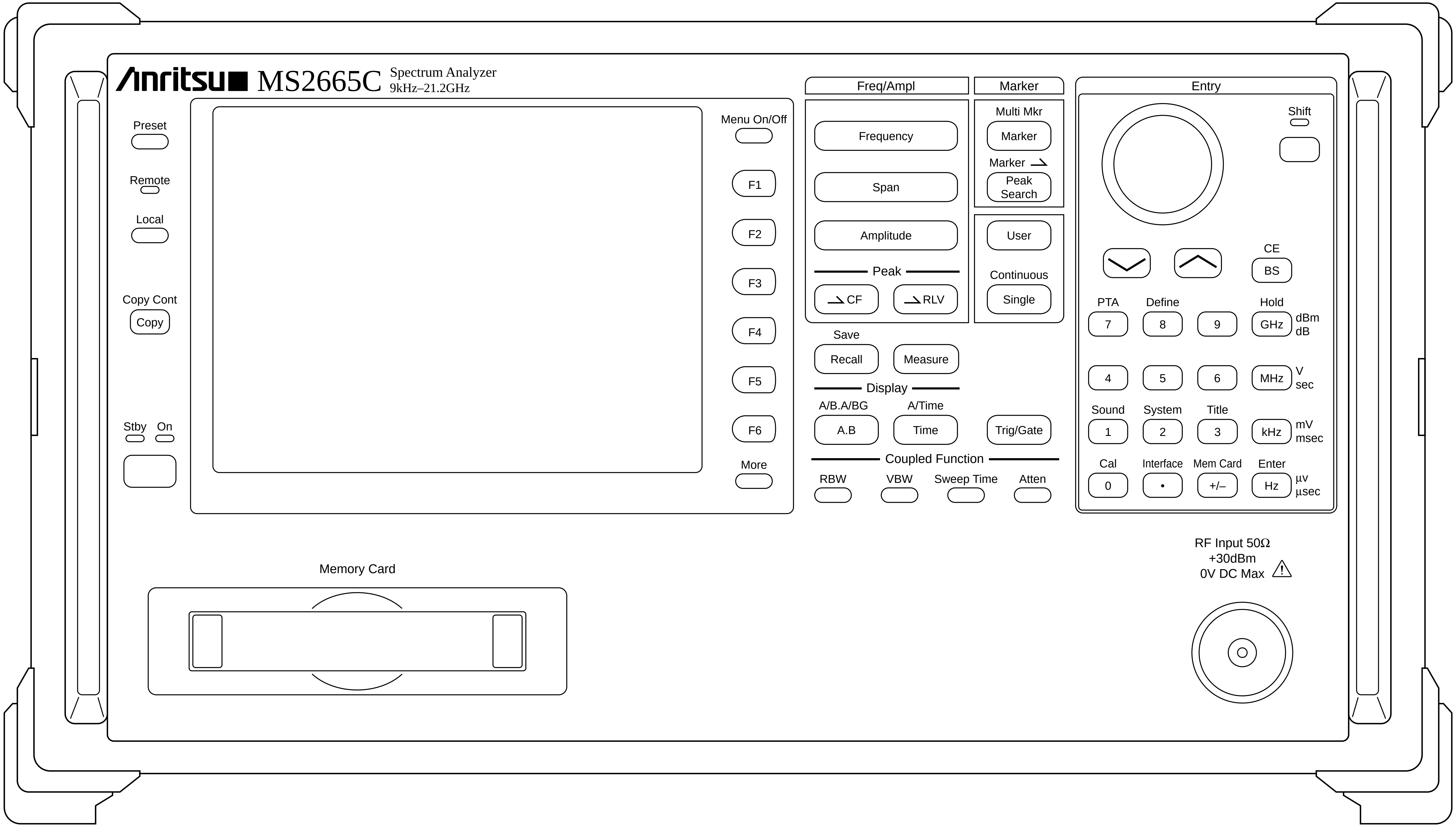


Fig. A-1 MS2665C Front Panel Layout

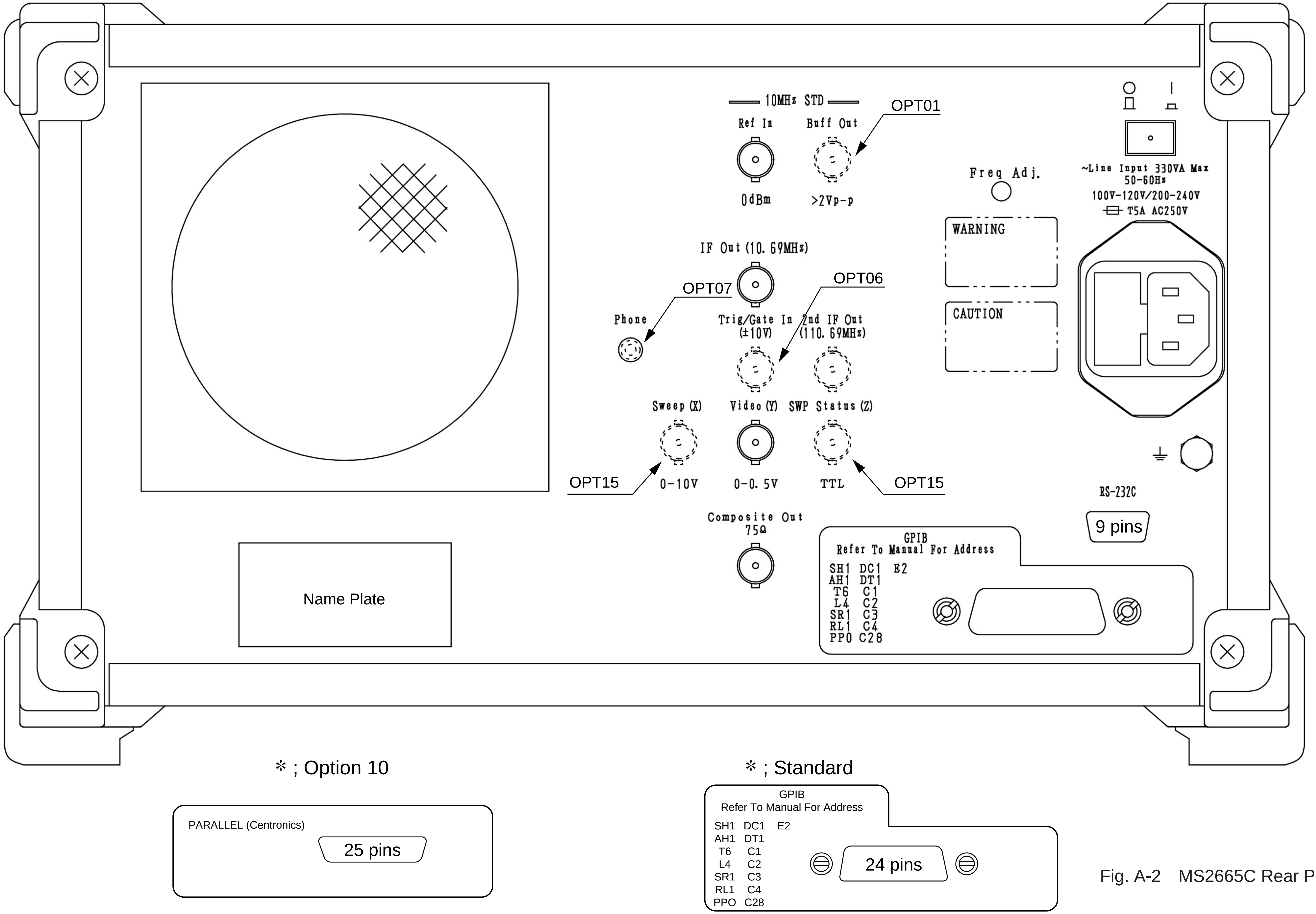


Fig. A-2　MS2665C Rear Panel Layout

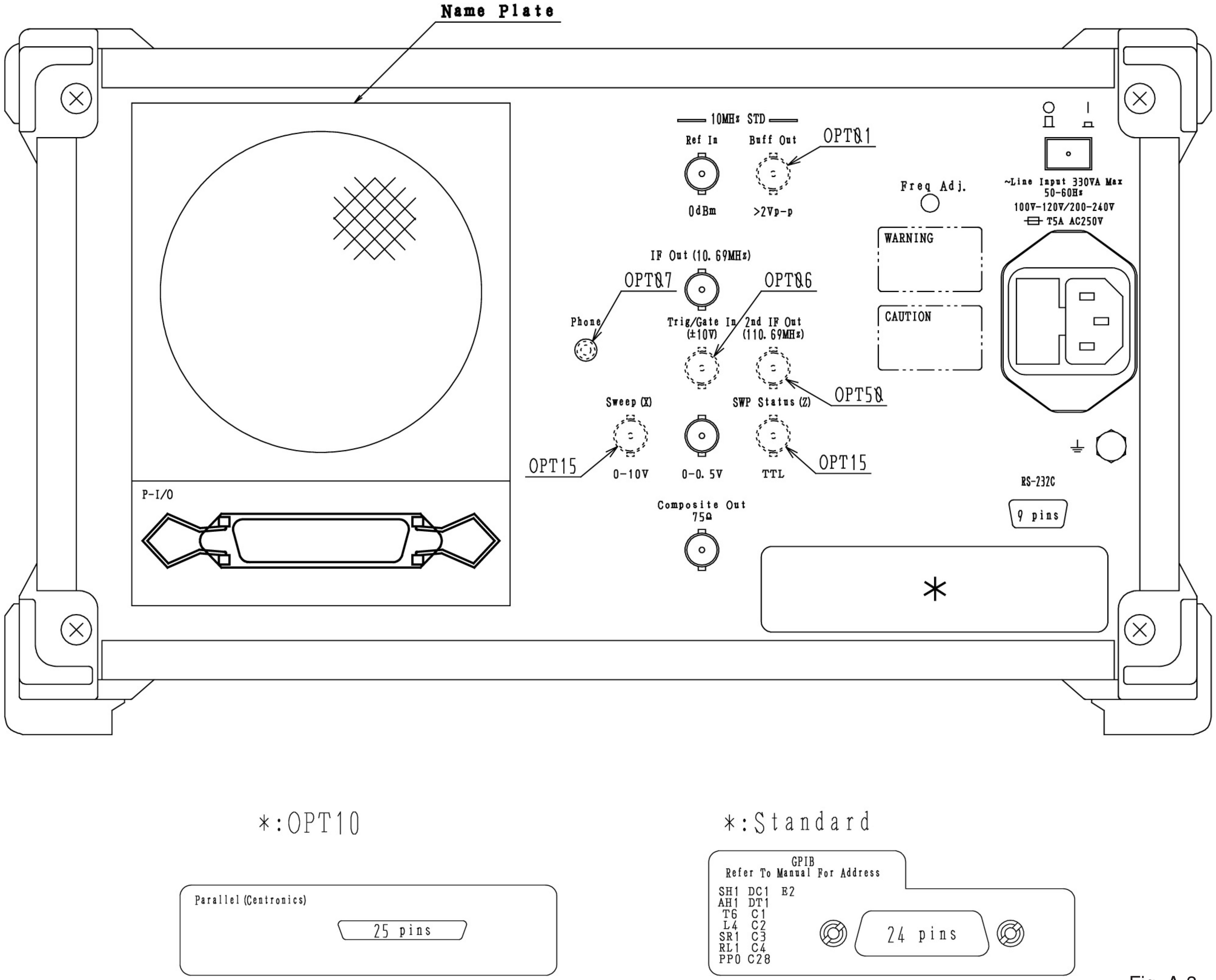


Fig. A-3 MS2665C (with Opt. 14) Rear Panel Layout

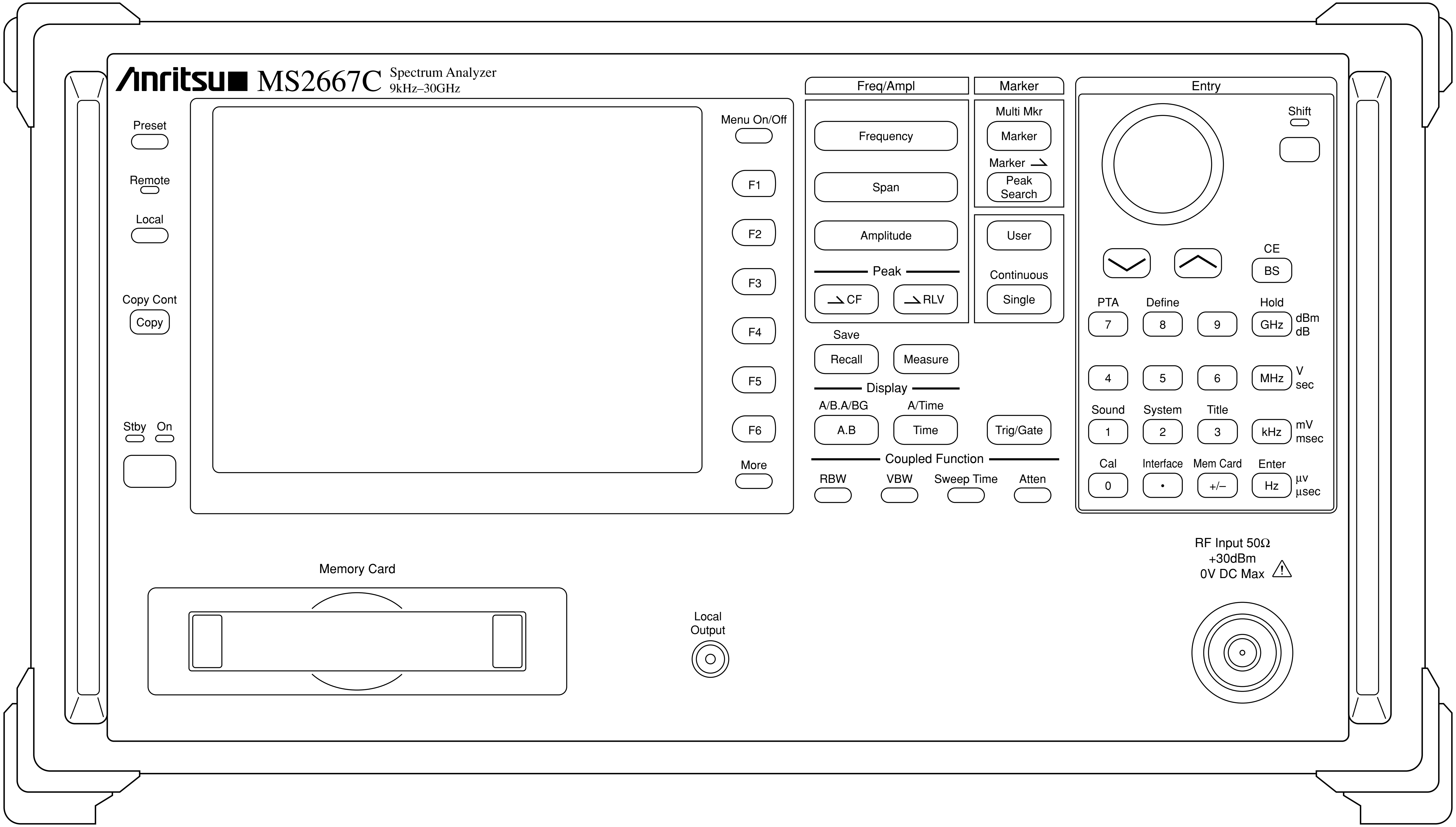


Fig. A-4 MS2667C Front Panel Layout

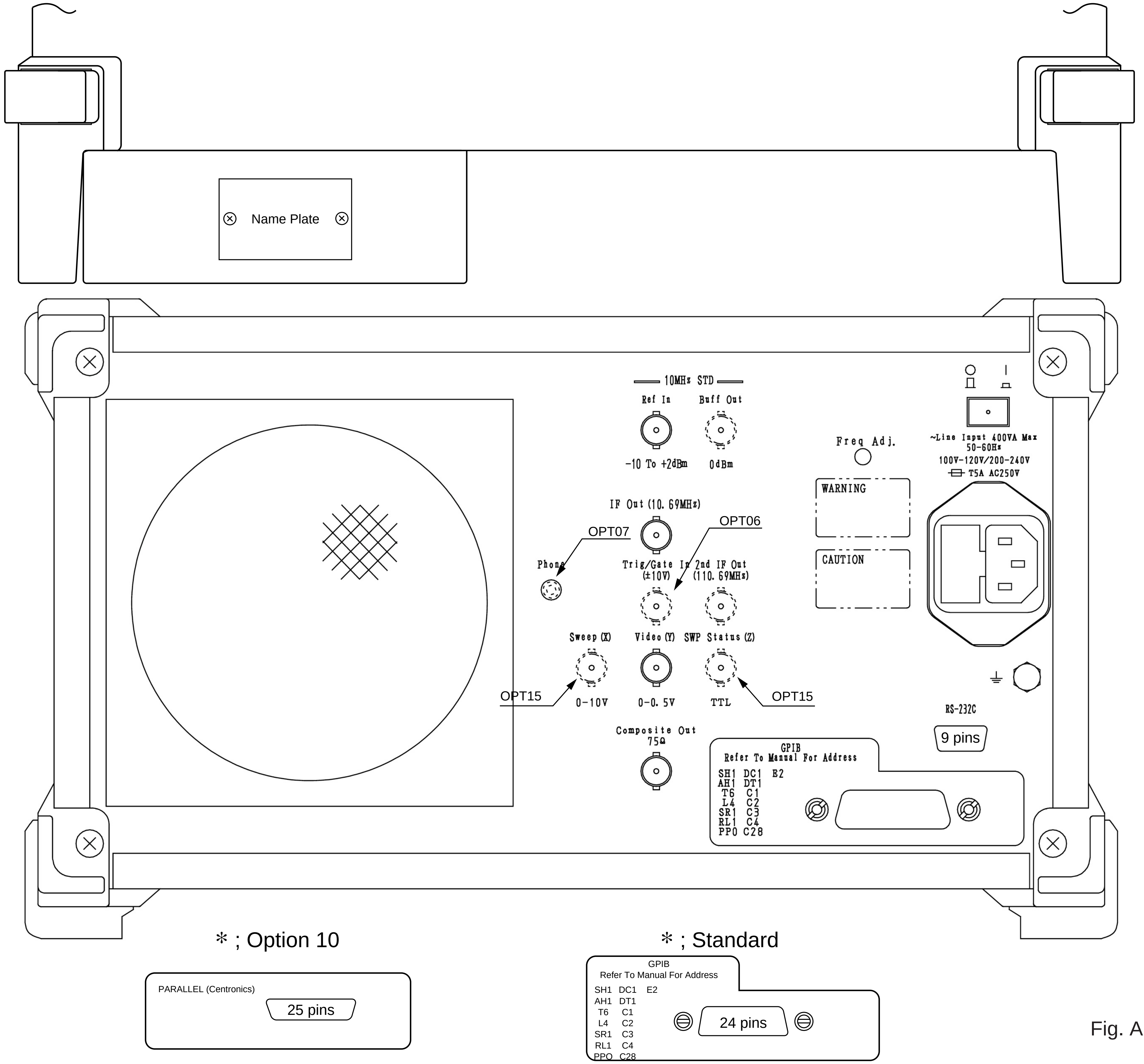


Fig. A-5 MS2667C Rear Panel Layout

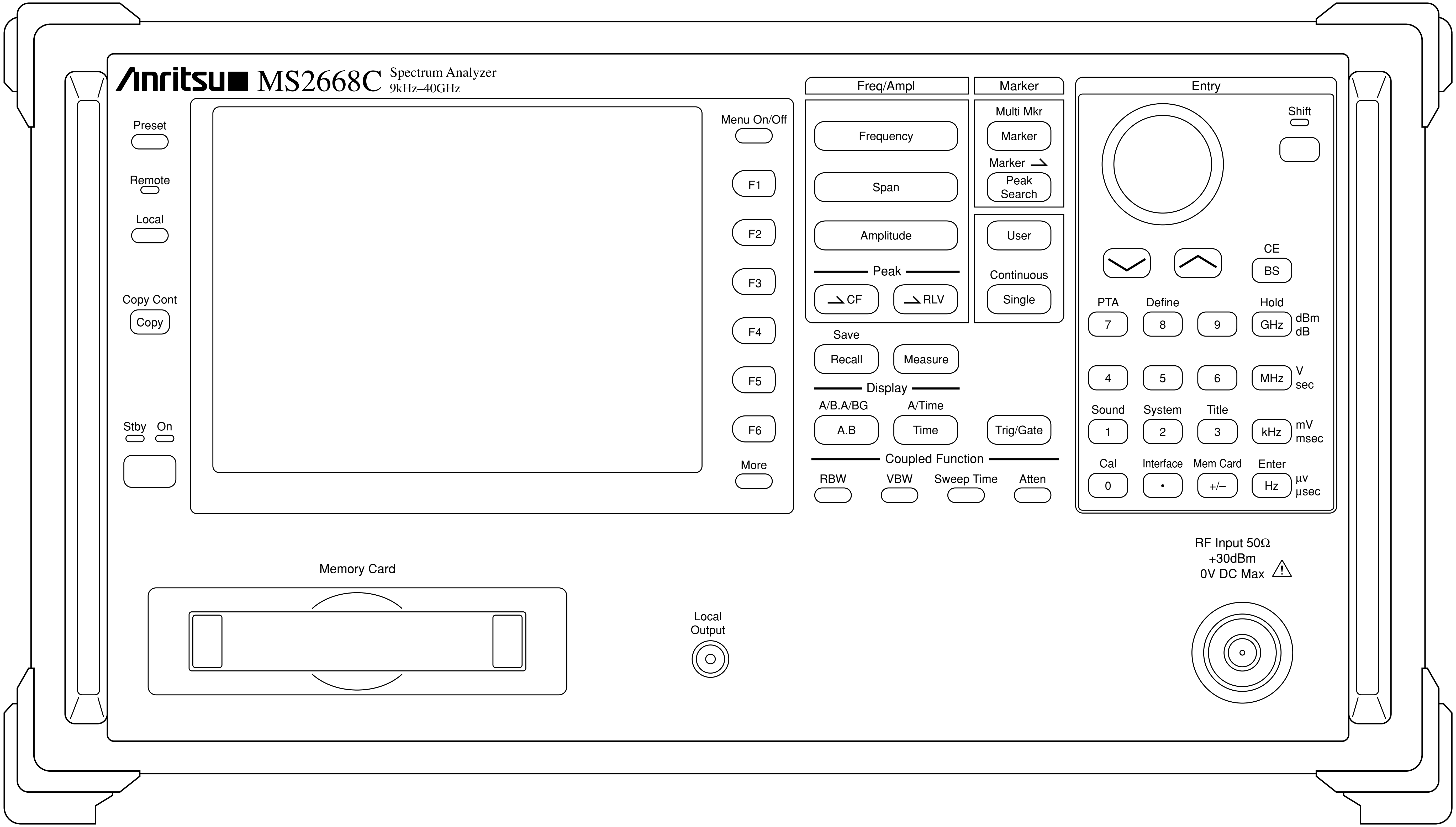


Fig. A-6 MS2668C Front Panel Layout

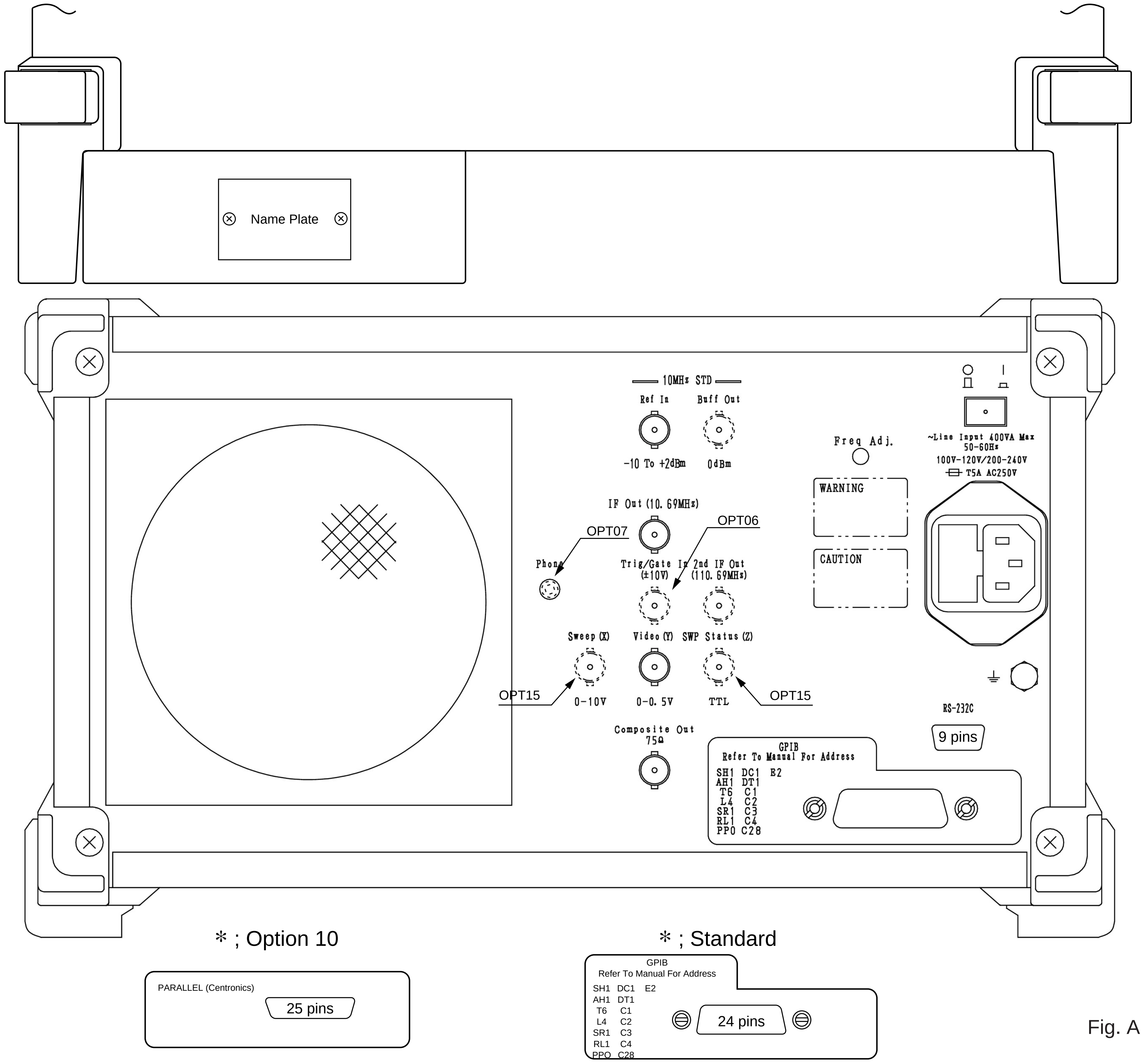


Fig. A-7 MS2668C Rear Panel Layout

APPENDIX B

BLOCK DIAGRAM

This appendix shows the Block Diagram of the MS2665C/67C/68C.

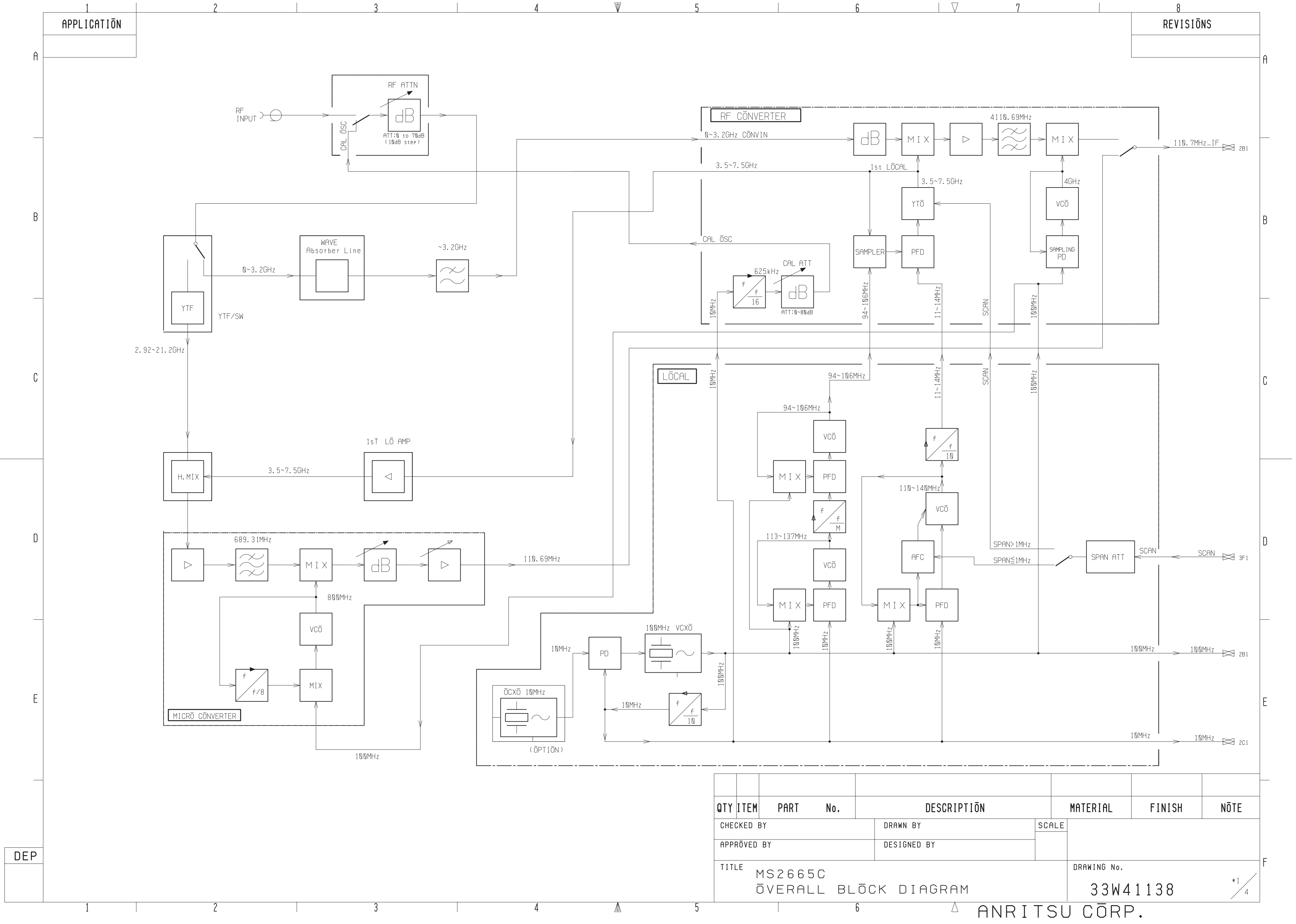


Fig. B-1 MS2665C Block Diagram (1/4)

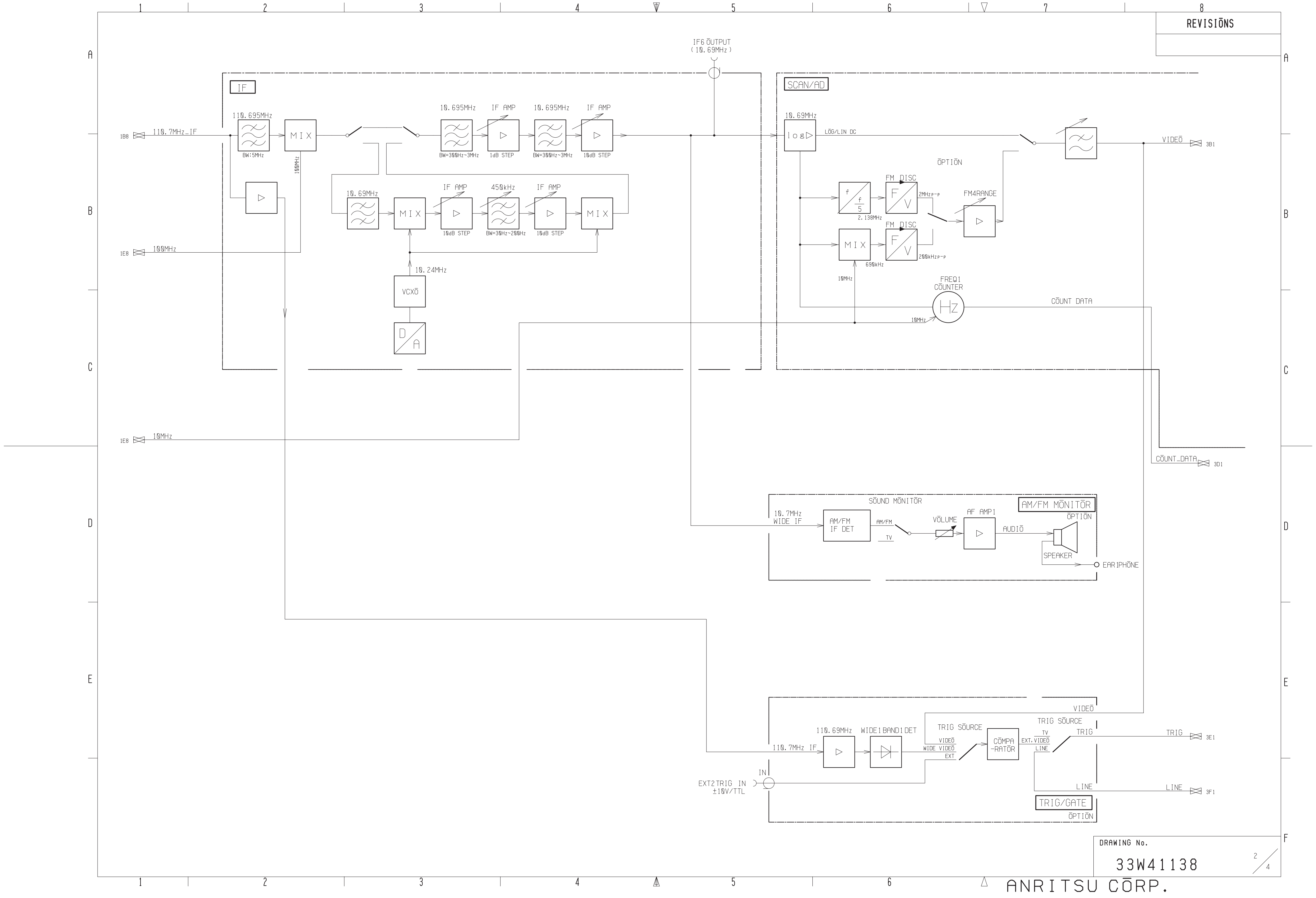


Fig. B-2 MS2665C Block Diagram (2/4)

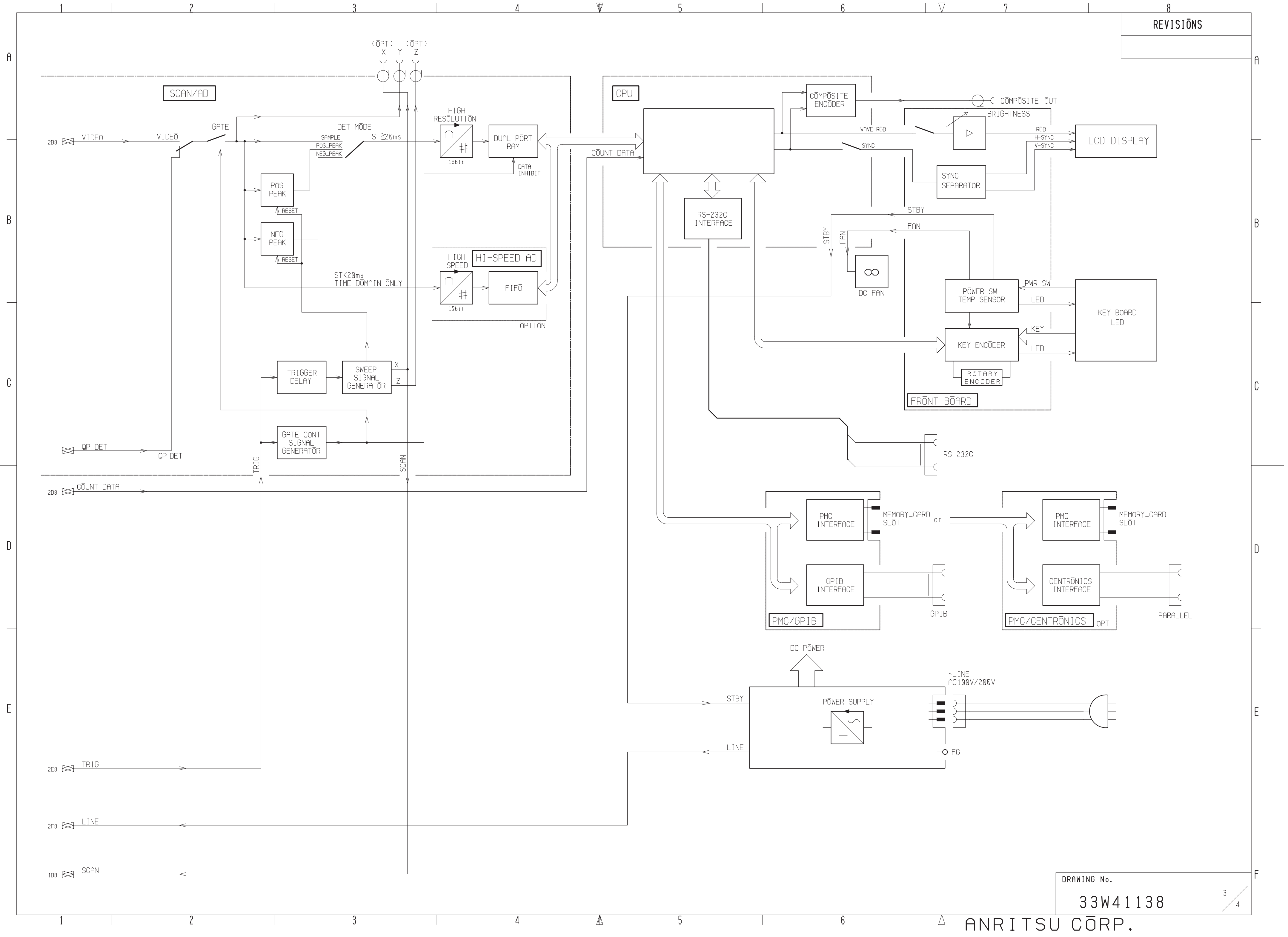


Fig. B-3 MS2665C Block Diagram (3/4)

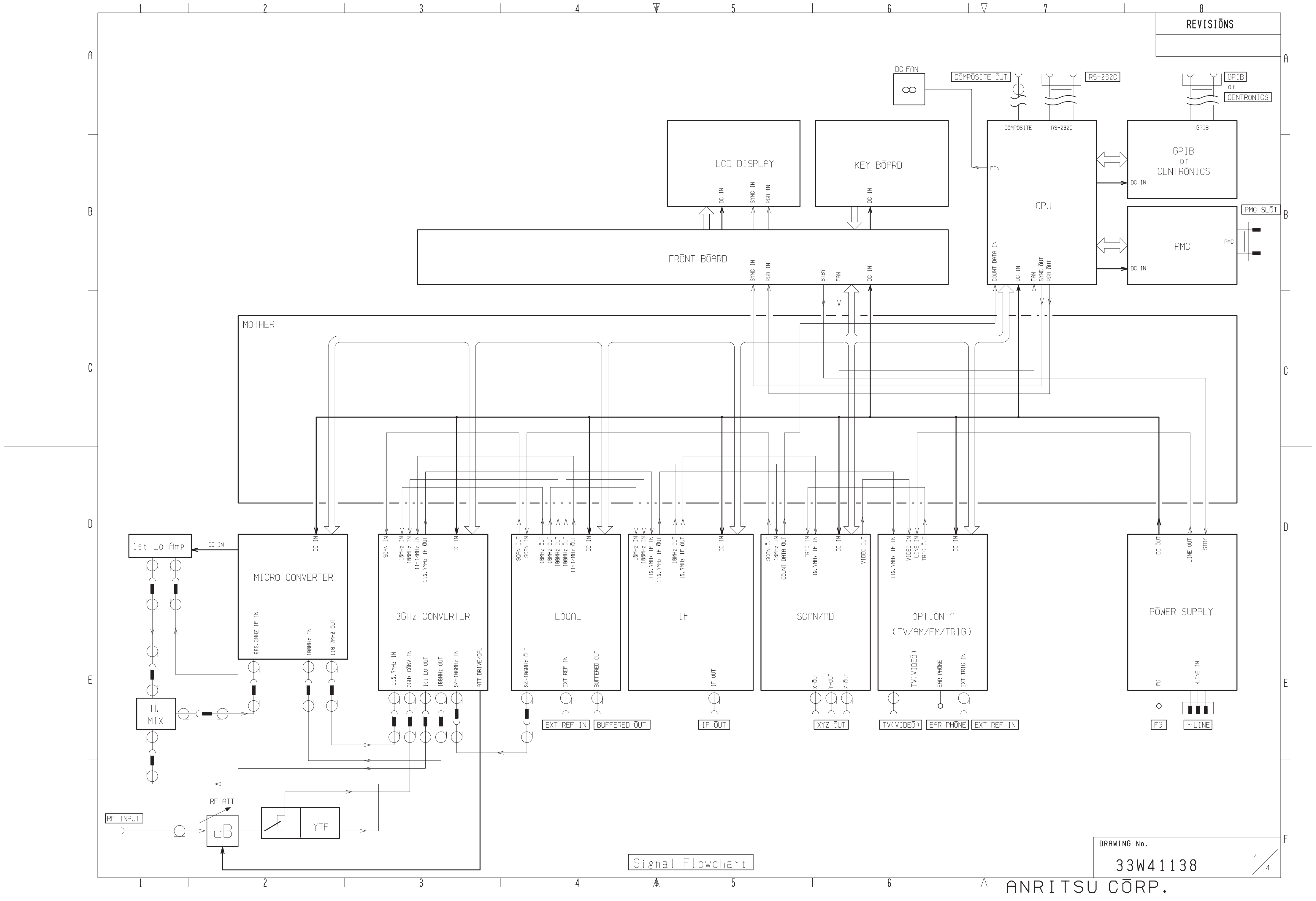
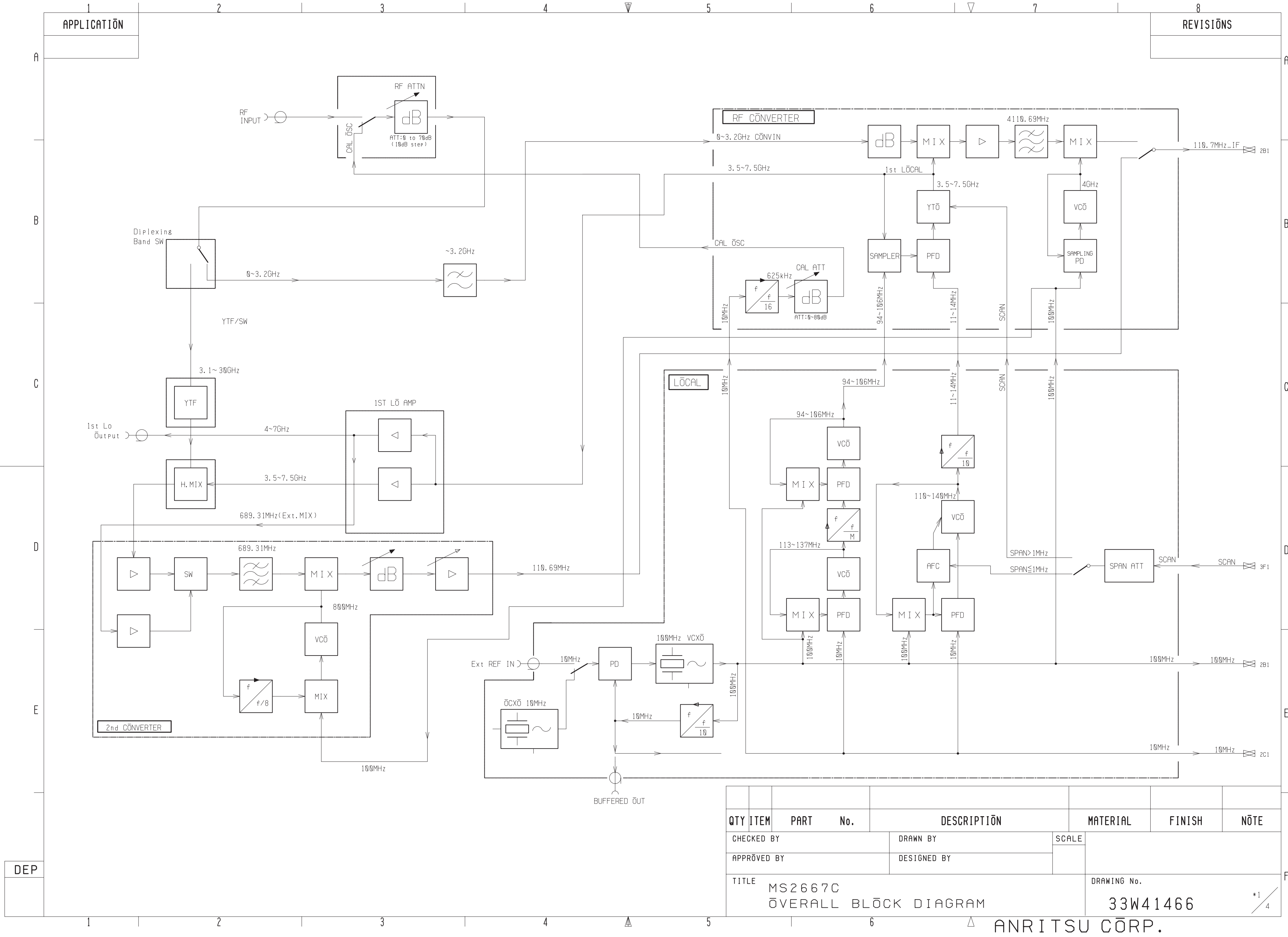


Fig. B-4 MS2665C Block Diagram (4/4)



QTY	ITEM	PART No.	DESCRIPTION	MATERIAL	FINISH	NOTE

CHECKED BY
DRAWN BY
SCALE
APPROVED BY
DESIGNED BY

TITLE
MS2667C
OVERALL BLOCK DIAGRAM

DRAWING No.
33W41466
*1/4

ANRITSU CORP.

Fig. B-5 MS2667C Block Diagram (1/4)

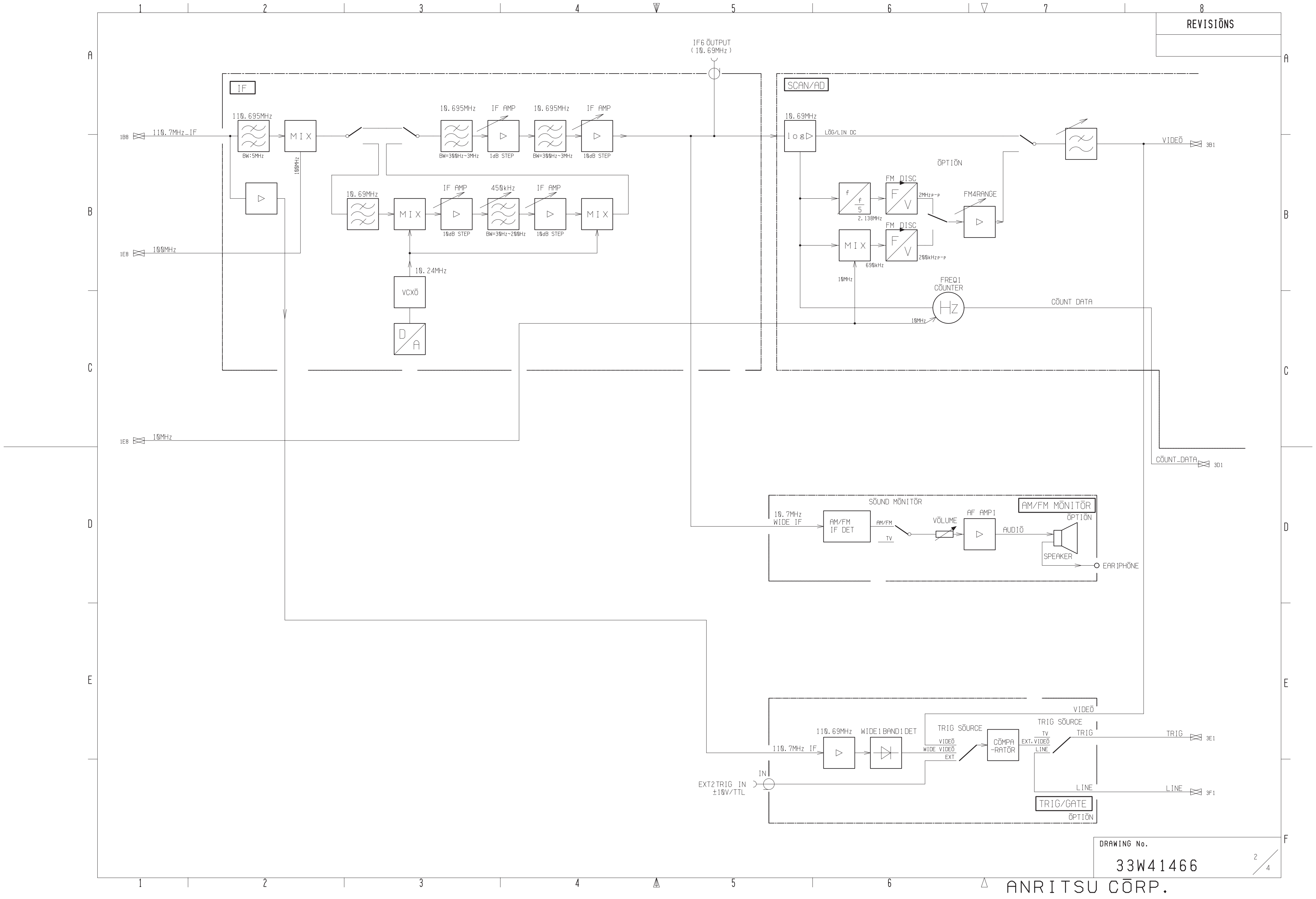


Fig. B-6   MS2667C Block Diagram (2/4)

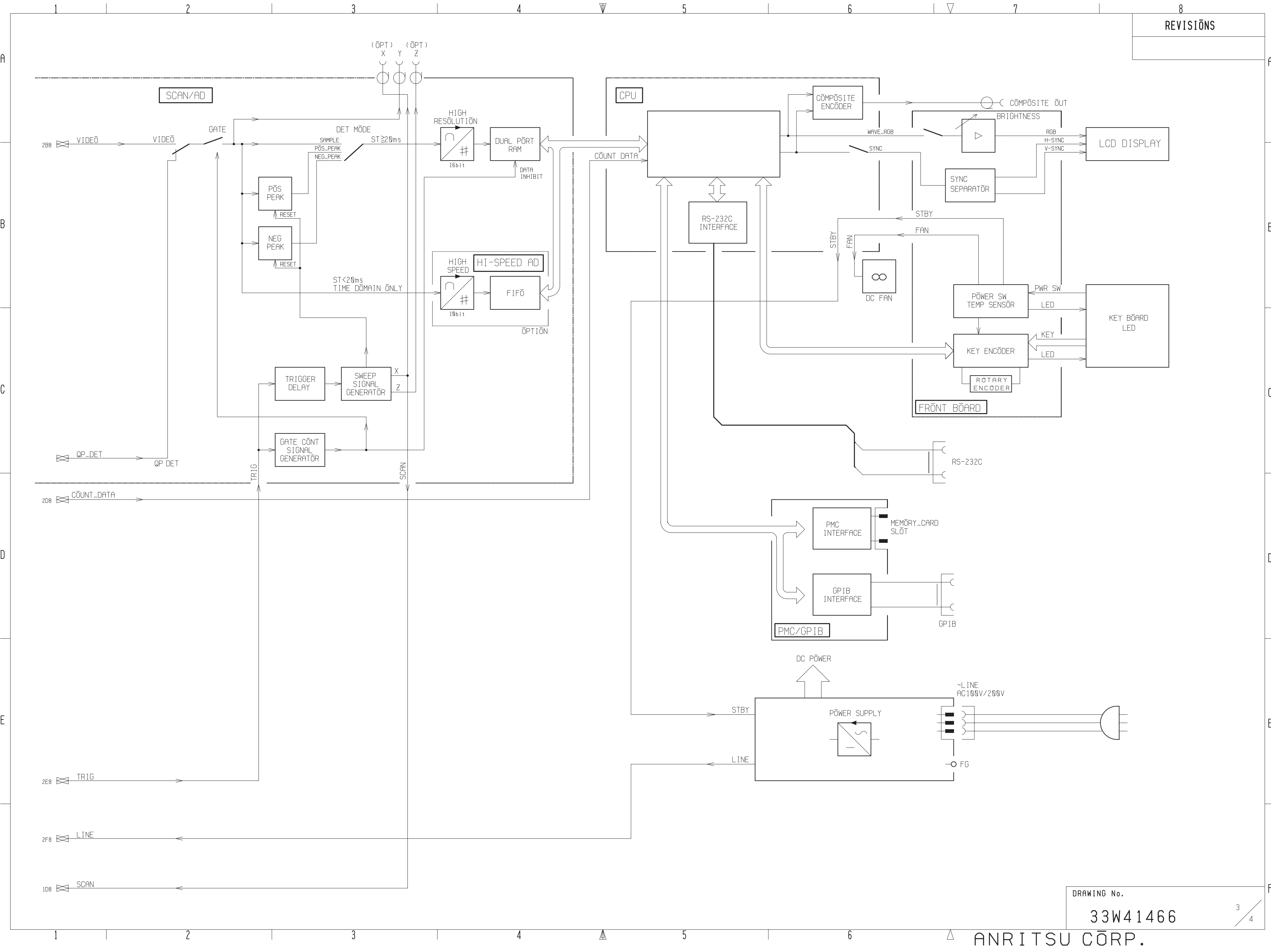


Fig. B-7 MS2667C Block Diagram (3/4)

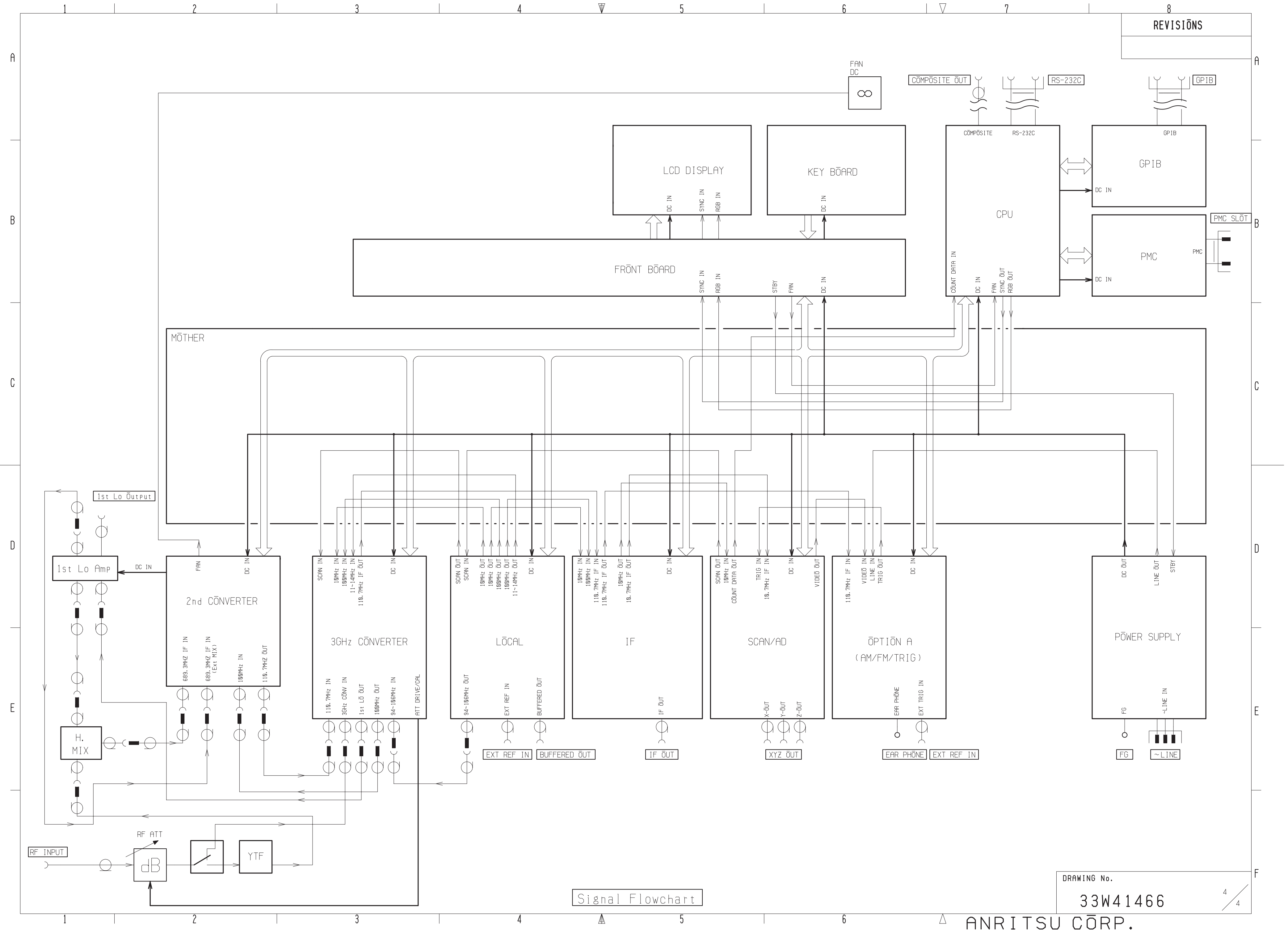


Fig. B-8   MS2667C Block Diagram (4/4)

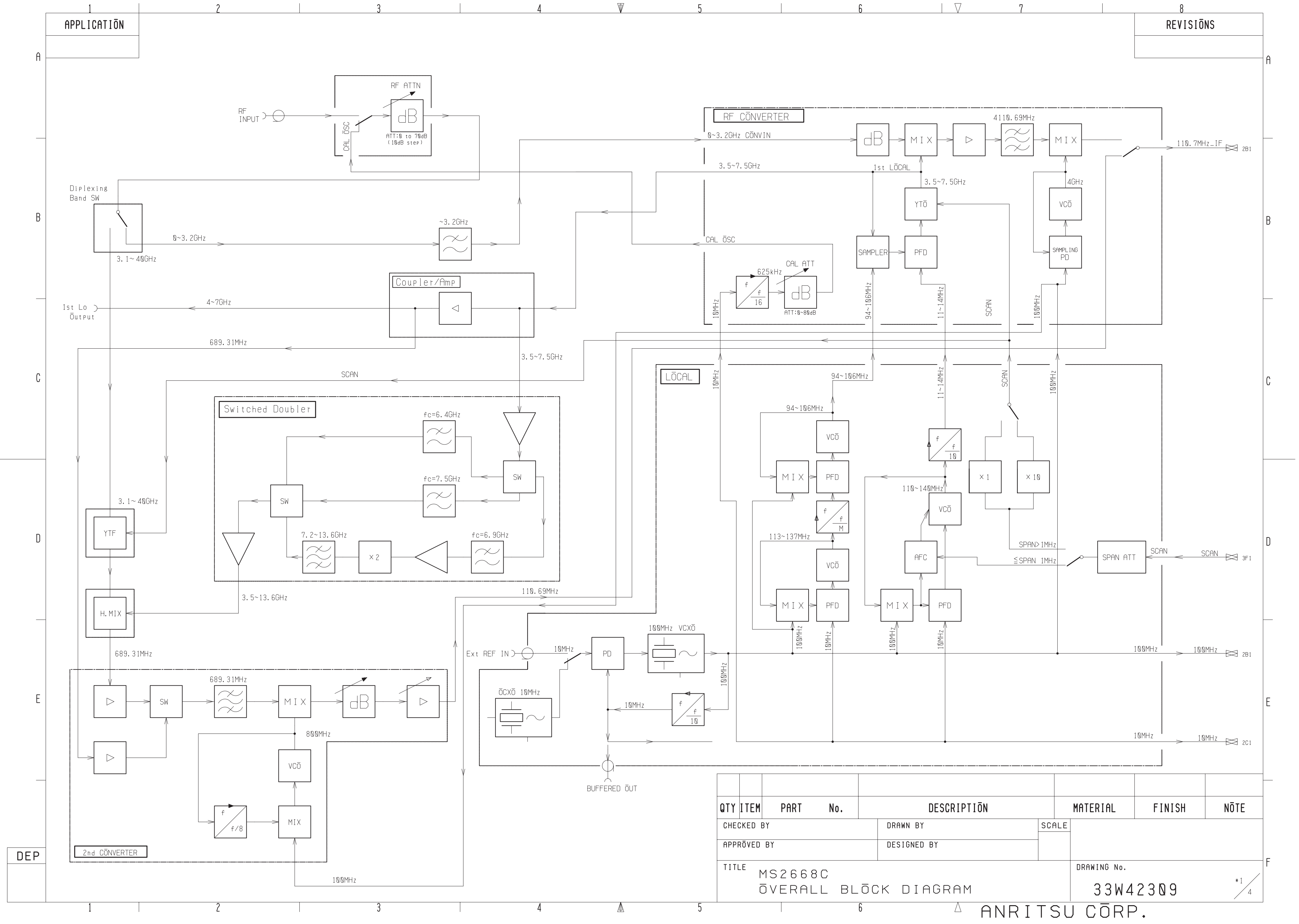


Fig. B-9 MS2668C Block Diagram (1/4)

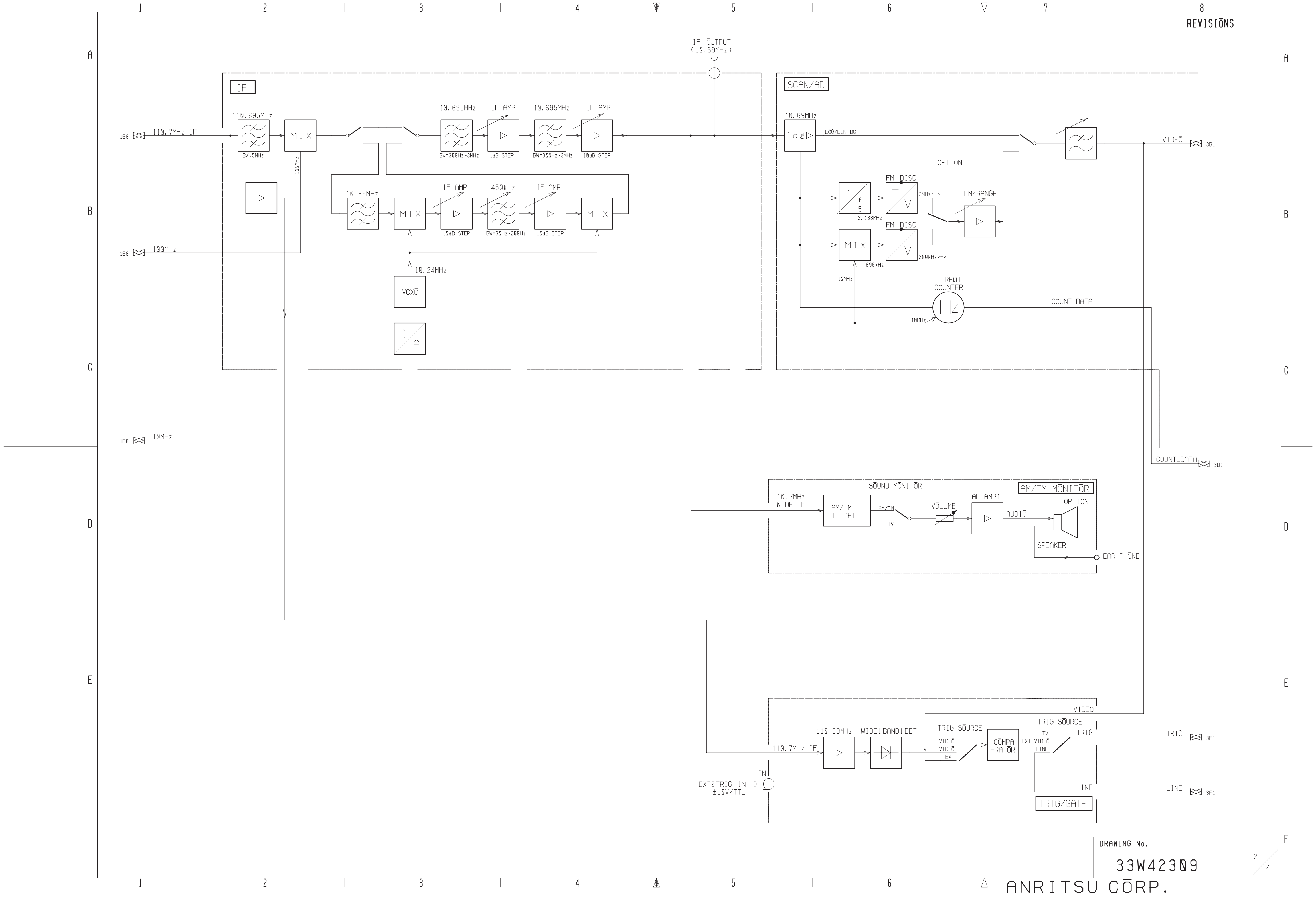


Fig. B-10 MS2668C Block Diagram (2/4)

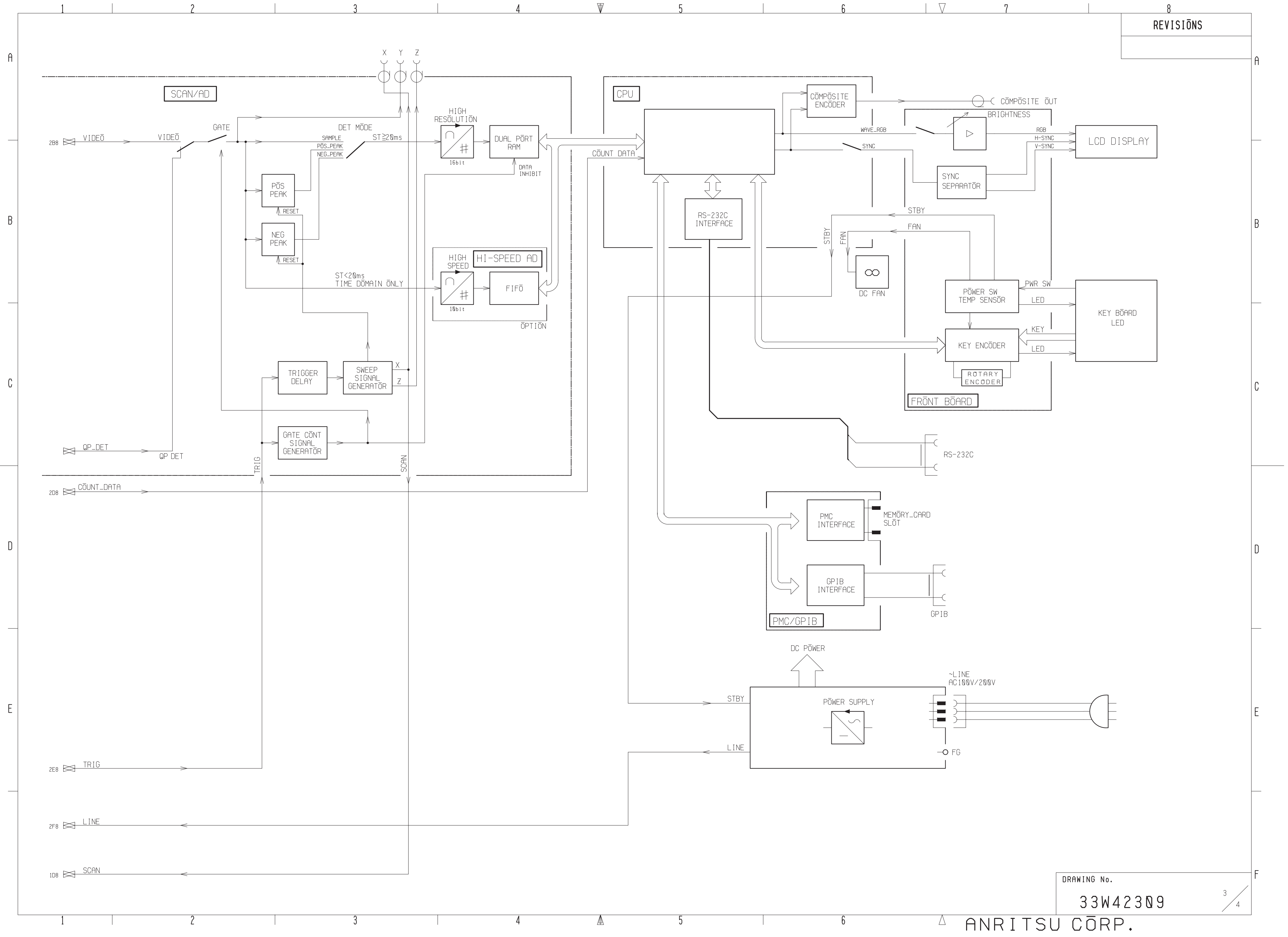


Fig. B-11   MS2668C Block Diagram (3/4)

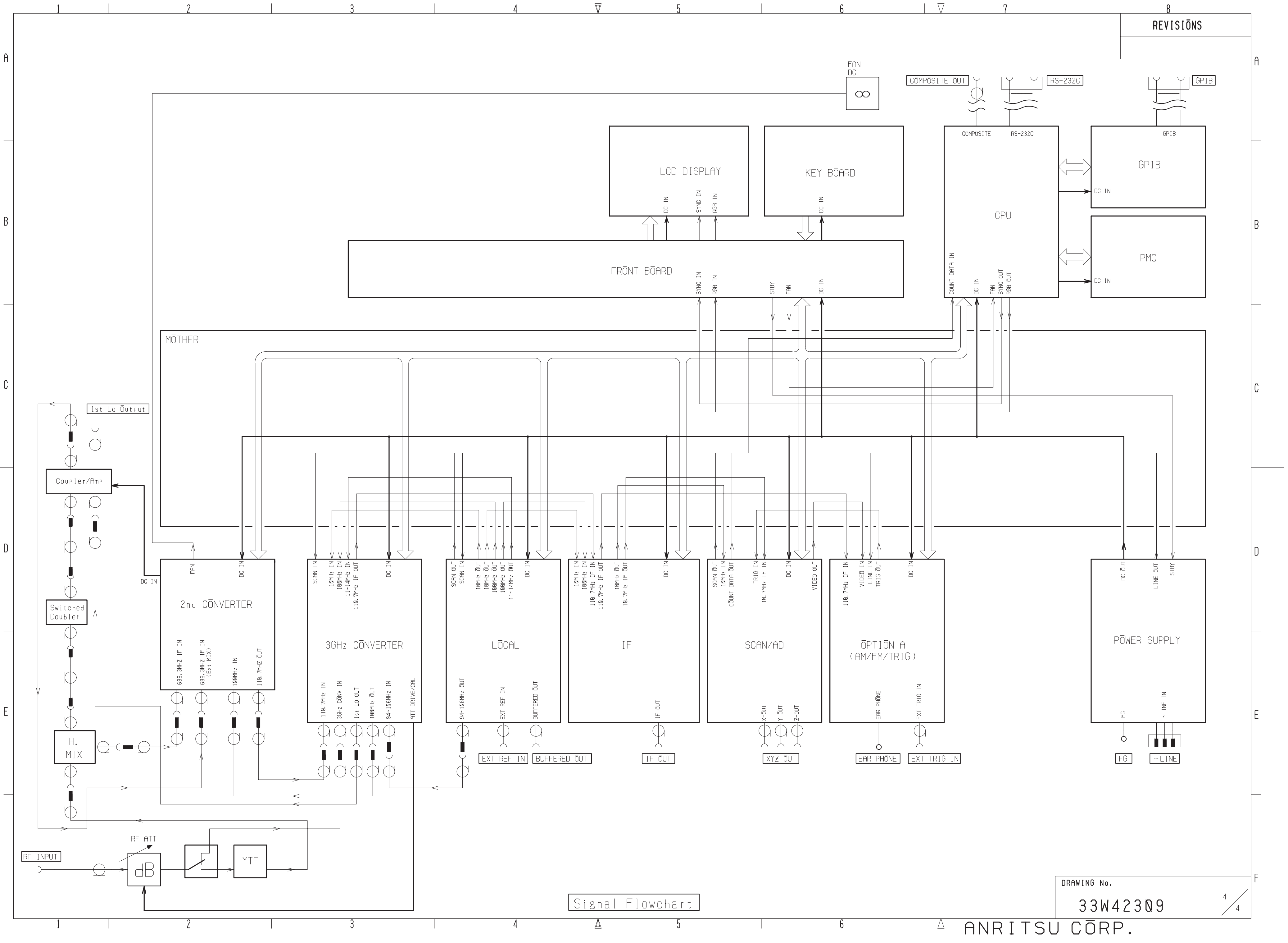


Fig. B-12 MS2668C Block Diagram (4/4)

APPENDIX C

PERFORMANCE TEST RECORD

MS2665C Performance Test Record

(1/12)

NO. ___________

DATE _________

SERIAL NO.___________________________________

OPTIONS_____________________________________

Date _______________

Tested by _______________

Ambient temparature _________ ºC

Relative humidity __________ %

Powermains line voltage (nominal) AC________V

Powermains line frequency (nominal) _________ Hz

Test Equipment used

Descriptions	MODEL NO.	Cal Date
Synthesized signal generator		
Synthesized Sweeper		
Attenuator		
Power meter		
Power senser		
Power senser		
50Ω Termination		
Low pass filter		
Frequency counter		
Frequency standard		

MS2665C Performance Test Record

(2/12)

SERIAL NO. ________________________ DATE ____________

Tested by ____________________________

Reference oscillator stability

- Frequency stability (aging rate)

Description	Min.	Result	Max.
Frequency stability/day	-2×10^{-8}		$+2\times10^{-8}$

- Temparature stability

Description	Min.	Result	Max.
Temparature stability	-5×10^{-8}		$+5\times10^{-8}$

Frequency readout accuracy

Signal generator	Center frequency	Span frequency	Band	Center frequency		
				Minimum value	Maker value	Maximam value
500MHz	10kHz 500MHz 100MHz	200kHz	0 (1)	499.999 66MHz 499.995 2MHz 497.6MHz		500.000 34MHz 500.004 8MHz 502.4MHz
5GHz	10kHz 5GHz 100MHz	200kHz	1– (1)	4.999 999 55GHz 4.999 994 8GHz 4.997 6GHz		5.000 000 45GHz 5.000 005 2GHz 5.002 4GHz
7.5GHz	10kHz 7.5GHz 100MHz	200kHz	1+ (1)	7.499 999 50GHz 7.499 994 8GHz 7.497 6GHz		7.500 000 50GHz 7.500 005 2GHz 7.502 4GHz
12GHz	20kHz 12GHz 100MHz 1GHz	200kHz	2+ (2)	11.999 999 06GHz 11.999 994 6GHz 11.997 6GHz 11.976GHz		12.000 000 94GHz 12.000 005 4GHz 12.002 4GHz 12.024GHz
20GHz	30kHz 20GHz 100MHz 1GHz	200kHz	3+ (3)	19.999 998 55GHz 19.999 994 3GHz 19.997 6GHz 19.976GHz		20.000 001 45GHz 20.000 005 7GHz 20.002 4GHz 20.024GHz

MS2665C Performance Test Record

(3/12)

SERIAL NO. ____________________ DATE __________

Tested by ____________________

Frequency span readout

MS2665C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1GHz	20kHz	0.999 99 2GHz	1.000 008GHz	19.5kHz		20.5kHz
	200kHz	0.999 92GHz	1.000 08GHz	195kHz		205kHz
	2MHz	0.999 2GHz	1.000 8GHz	1.95MHz		2.05MHz
	10MHz	0.996GHz	1.004GHz	9.75MHz		10.25MHz
	100MHz	0.96GHz	1.04GHz	97.5MHz		102.5MHz
	2GHz	0.2GHz	1.8GHz	1.95GHz		2.05GHz
4.25GHz	100kHz	4.21GHz	4.29GHz	97.5MHz		102.5MHz
	1MHz	3.85GHz	4.65GHz	0.975GHz		1.025GHz
	8.5MHz	0.85GHz	7.65GHz	8.2875GHz		8.7125GHz
10.6GHz	100MHz	10.56GHz	10.64GHz	97.5MHz		102.5MHz
	1GHz	10.2GHz	11.0GHz	0.975GHz		1.025GHz
	21.2GHz	2.12GHz	19.08GHz	20.67GHz		21.73GHz

MS2665C Performance Test Record

(4/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Resolution bandwidth accuracy

Resolution Bandwidth	Span	Bandwidth (3dB)	Specification
3MHz	10MHz		±30%
1MHz	5MHz		±20%
300kHz	500kHz		±20%
100kHz	200kHz		±20%
30kHz	50kHz		±20%
10kHz	20kHz		±20%
3kHz	5kHz		±20%
1kHz	2kHz		±20%

MS2665C Performance Test Record

(5/12)

SERIAL NO. ______________________ DATE ____________

Tested by ______________________

Resolution bandwidth selectivity

Resolution Bandwidth	Frequency Span	Video Bandwidth	60dB BW	3dB BW	60dB BW/ 3dB BW
3MHz	100MHz	100Hz			≤15
1MHz	20MHz	100Hz			≤15
300kHz	10MHz	100Hz			≤15
100kHz	5MHz	100Hz			≤15
30kHz	1MHz	100Hz			≤15
10kHz	200kHz	100Hz			≤15
3kHz	100kHz	100Hz			≤15
1kHz	50kHz	100Hz			≤15

Sideband phase noise

Center frequency	Results	Specification
2GHz		≤–95dBc/Hz
6GHz		≤–95dBc/Hz
10GHz		≤–89dBc/Hz
20GHz		≤–85.5dBc/Hz

MS2665C Performance Test Record

(6/12)

SERIAL NO. ______________________

DATE ____________

Tested by ______________________

Frequency measurement accuracy

Signal generator	Measurement Resokution	Min.	Results	Max.
500MHz	1Hz	499.999 989MHz	________	500.000 011MHz
500MHz	10Hz	499.999 98MHz	________	500.000 02MHz
500MHz	100Hz	499.999 9MHz	________	500.000 1MHz
500MHz	1kHz	499.999MHz	________	500.001MHz

Amplitude display accuracy

- Log scale Fidelity

ATT setting (dB)	A	B	Error (dB)=A+B	Spec
	ATT Calibration factor (dB)	Δ marker readout (dB)		
0	0 (reference)		0 (reference)	0 (reference)
5	________	________	________	±0.4dB
10	________	________	________	±0.4dB
15	________	________	________	±0.4dB
20	________	________	________	±0.4dB
25	________	________	________	±1.0dB
30	________	________	________	±1.0dB
35	________	________	________	±1.0dB
40	________	________	________	±1.0dB
45	________	________	________	±1.0dB
50	________	________	________	±1.0dB
55	________	________	________	±1.0dB
60	________	________	________	±1.0dB
65	________	________	________	±1.0dB
70	________	________	________	±1.0dB
75	________	________	________	±1.5dB
80	________	________	________	±1.5dB
85	________	________	________	±1.5dB
90	________	________	________	±2.5dB

MS2665C Performance Test Record

(7/12)

SERIAL NO. ____________________ DATE __________

Tested by ____________________

Frequency response

Band	Frequency	Calibration valve (dBm)	Marker readout (dB)	Deviation (dB)
0	100MHz	0	0 (reference)	0 (reference)
	500MHz			
	1GHz			
	1.5GHz			
	2GHz			
	3GHz			
1–	3.1GHz			
	4GHz			
	5GHz			
	6GHz			
	6.5GHz			
1+	6.5GHz			
	7GHz			
	7.5GHz			
	8GHz			
2+	8GHz			
	9GHz			
	10GHz			
	11GHz			
	12GHz			
	13GHz			
	14GHz			
	15GHz			
3+	15.2GHz			
	16GHz			
	17GHz			
	18GHz			
	19GHz			
	20GHz			
	21GHz			

MS2665C Performance Test Record

(8/12)

SERIAL NO. ____________________ DATE ____________

Tested by ____________________

Reference level accuracy

Reference Level setting	Marker readout	Correction factor of ATT	Error*1	Spec.
0dBm				±0.4dB
–10dBm				±0.4dB
–20dBm				±0.4dB
–30dBm				±0.4dB
–40dBm				±0.4dB
–50dBm				±0.75dB
–60dBm				±0.75dB
–70dBm				±1.5dB
–80dBm				±1.5dB

*1: Calculate the “Error” from the following equation

Error=Marker readout–Reference Level set value–corection factor of ATT

MS2665C Performance Test Record

(9/12)

SERIAL NO. ____________________ DATE __________

Tested by ____________________

Average noise level

MS2665C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1MHz	10MHz	0		–115dBm
10MHz	100MHz	0		–115dBm
100MHz	1GHz	0		–115dBm
1GHz	2GHz	0		–113.5 to –112dBm
2GHz	3.1GHz	1–		–112 to –110.35dBm
2.92GHz	4GHz	1–		–110dBm
4GHz	5GHz	1–		–110dBm
5GHz	6GHz	1–		–110dBm
6GHz	6.5GHz	1–		–110dBm
6.4GHz	7GHz	1+		–110dBm
7GHz	8.1GHz	1+		–110dBm
8GHz	9GHz	2+		–102dBm
9MHz	10GHz	2+		–102dBm
10GHz	11GHz	2+		–102dBm
11GHz	12GHz	2+		–102dBm
12GHz	13GHz	2+		–102dBm
13GHz	14GHz	2+		–102dBm
14MHz	15.3GHz	2+		–102dBm
15.2GHz	16GHz	3+		–98dBm
16GHz	17GHz	3+		–98dBm
17GHz	18GHz	3+		–98dBm
18GHz	19GHz	3+		–98dBm
19GHz	20GHz	3+		–98dBm
20GHz	21.2GHz	3+		–98dBm

MS2665C Performance Test Record

(10/12)

SERIAL NO. ______________________________ DATE ____________

Tested by _________________________________

Second harmonic distortion

Signal generator	Second harmonic distortion (dB)
10.1MHz	
100.1MHz	
500.1MHz	
800.1MHz	
1000.1MHz	
1499.9MHz	
2000.1MHz	
2500.1MHz	
5000.1MHz	

MS2665C Performance Test Record

(11/12)

SERIAL NO. ______________________ DATE ____________

Tested by ______________________

Resolution bandwidth switching uncertainty

MS2665C setting		Δ marker readout	Specification
RBW	SPAN		
1kHz	5kHz		±0.3dB
3kHz	15kHz	0.0dB	Reference
10kHz	50kHz		±0.3dB
30kHz	150kHz		±0.3dB
100kHz	500kHz		±0.3dB
300kHz	1.5MHz		±0.3dB
1MHz	5MHz		±0.3dB
3MHz	10MHz		±0.4dB

MS2665C Performance Test Record

(12/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ___________________________________

Input attenuator switching uncertainty

MS2665C setting							
Reference Level	ATT	Attenuator setting	Correction Factor of attenuator	Marker readout	Error	Deviation	Spec.
–10dBm	50dB	0dB	dB	dBm	dB	dB	±0.3dB
–20dBm	40dB	10dB	dB	dBm	dB	dB	±0.3dB
–30dBm	30dB	20dB	dB	dBm	dB	dB	±0.3dB
–40dBm	20dB	30dB	dB	dBm	dB	dB	±0.3dB
–50dBm	10dB	40dB	dB	dBm	dB	0dB (reference)	0dB (reference)
–60dBm	0dB	50dB	dB	dBm	dB	dB	±0.3dB

Sweep time and Time span accuracy

- Sweep time

MS2665C setting	Signal generator		
SWEEP TIME	AM Modulation frequency	SWT Time (calculated)	90% of specification min/max
50ms	400Hz	s	38.25ms/51.75ms
200ms	100Hz	s	153ms/207ms
2s	10Hz	s	1.53s/2.07s
20s	1Hz	s	15.3s/20.7s
200s	0.1Hz	s	99s/261s

- Time span accuracy

MS2665C setting	Signal generator		
Time span	AM Modulation frequency	Δ Marker readout	90% of specification min/max
20ms	1kHz	s	17.82ms /18.18ms
200ms	100Hz	s	178.2ms /181.8ms
2s	10Hz	s	1.782s /1.818s
20s	1Hz	s	17.82s /18.18s
200s	0.1Hz	s	178.2s /181.8s

MS2667C Performance Test Record

(1/12)

NO. ___________

DATE _________

SERIAL NO.___________________________________

OPTIONS______________________________________

Date _______________

Tested by _______________

Ambient temparature _________ ºC

Relative humidity __________ %

Powermains line voltage (nominal) AC________V

Powermains line frequency (nominal) _________ Hz

Test Equipment used

Descriptions	MODEL NO.	Cal Date
Synthesized signal generator		
Synthesized Sweeper		
Attenuator		
Power meter		
Power senser		
Power senser		
50Ω Termination		
Low pass filter		
Frequency counter		
Frequency standard		

MS2667C Performance Test Record

(2/12)

SERIAL NO. ________________________ DATE ____________

Tested by ________________________

Reference oscillator stability

- Frequency stability (aging rate)

Description	Min.	Result	Max.
Frequency stability/day	-2×10^{-8}		$+2\times10^{-8}$

- Temparature stability

Description	Min.	Result	Max.
Temparature stability	-5×10^{-8}		$+5\times10^{-8}$

Frequency readout accuracy

Signal generator	Center frequency	Span	Band (Mixing order)	Center frequency		
				Minimum value	Maker value	Maximum value
500MHz	500MHz	10kHz 200kHz 100MHz	0 (1)	499.999 5MHz 499.99MHz 495MHz		500.000 5MHz 500.01MHz 505MHz
5GHz	5GHz	10kHz 200kHz 100MHz	1– (1)	4.999 999 4GHz 4.999 99GHz 4.995GHz		5.000 000 6GHz 5.000 01GHz 5.05GHz
7.5GHz	7.5GHz	10kHz 200kHz 100MHz	1+ (1)	7.499 999 3GHz 7.499 99GHz 7.495GHz		7.500 000 7GHz 7.500 01GHz 7.505GHz
12GHz	12GHz	20kHz 200kHz 100MHz 1GHz	2+ (2)	11.999 998 8GHz 11.999 99GHz 11.995GHz 11.95GHz		12.000 001 2GHz 12.000 01GHz 12.005GHz 12.05GHz
20GHz	20GHz	30kHz 200kHz 100MHz 1GHz	3+ (3)	19.999 998 1GHz 19.999 99GHz 19.995GHz 19.95GHz		20.000 001 9GHz 20.000 01GHz 20.005GHz 20.05GHz
29GHz	29GHz	10kHz 200kHz 100MHz 1GHz	4+(4)	28.999 998 9GHz 28.999 99GHz 28.996GHz 28.95GHz		29.000 001 1GHz 29.000 01GHz 29.005GHz 29.05GHz

MS2667C Performance Test Record

(3/12)

SERIAL NO. ________________________ DATE ____________

Tested by ________________________

Frequency span readout accuracy

MS2667C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1GHz	20kHz	0.999 992GHz	1.000 008GHz	19.5kHz		21kHz
	200kHz	0.999 92GHz	1.000 08GHz	190kHz		210kHz
	2MHz	0.999 2GHz	1.000 8GHz	1.9MHz		2.1MHz
	10MHz	0.996GHz	1.004GHz	9.5MHz		10.5MHz
	100MHz	0.96GHz	1.04GHz	95MHz		105MHz
	2GHz	0.2GHz	1.8GHz	1.9GHz		2.1GHz
4.25GHz	100MHz	4.21GHz	4.29GHz	95MHz		105MHz
	1GHz	3.85GHz	4.65GHz	0.95GHz		1.05GHz
	8.5GHz	0.85GHz	7.65GHz	8.075GHz		8.925GHz
10.6GHz	100MHz	9.96GHz	10.04GHz	95MHz		105MHz
	1GHz	9.6GHz	10.4GHz	0.95GHz		1.05GHz
	20GHz	2GHz	18GHz	19GHz		21GHz
15GHz	100MHz	14.96GHz	15.04GHz	95MHz		105MHz
	1GHz	14.6GHz	15.4GHz	0.95GHz		1.05GHz
	30GHz	1.5GHz	28.5GHz	28.5GHz		31.5GHz

MS2667C Performance Test Record

(4/12)

SERIAL NO. ____________________ DATE __________

Tested by ____________________

Resolution bandwidth accuracy

Resolution Bandwidth	Span	Bandwidth (3dB)	Specification
3MHz	10MHz		±30%
1MHz	5MHz		±20%
300kHz	500kHz		±20%
100kHz	200kHz		±20%
30kHz	50kHz		±20%
10kHz	20kHz		±20%
3kHz	5kHz		±20%
1kHz	2kHz		±20%

MS2667C Performance Test Record

(5/12)

SERIAL NO. ____________________ DATE __________

Tested by ____________________

Resolution bandwidth selectivity

Resolution Bandwidth	Frequency Span	Video Bandwidth	60dB BW	3dB BW	60dB BW/ 3dB BW
3MHz	100MHz	100Hz			≤15
1MHz	20MHz	100Hz			≤15
300kHz	10MHz	100Hz			≤15
100kHz	5MHz	100Hz			≤15
30kHz	1MHz	100Hz			≤15
10kHz	200kHz	100Hz			≤15
3kHz	100kHz	100Hz			≤15
1kHz	50kHz	100Hz			≤15

Sideband phase noise

Center frequency	Results	Specification
2GHz		≤–95dBc/Hz
6GHz		≤–95dBc/Hz
10GHz		≤–89dBc/Hz
20GHz		≤–85.5dBc/Hz
26.5GHz		≤–83dBc/Hz

MS2667C Performance Test Record

(6/12)

SERIAL NO. ________________ DATE ________

Tested by ________________

Frequency measurement accuracy

Signal generator	Measurement Resokution	Min.	Results	Max.
500MHz	1Hz	499.999 989MHz	________	500.000 011MHz
500MHz	10Hz	499.999 98MHz	________	500.000 02MHz
500MHz	100Hz	499.999 9MHz	________	500.000 1MHz
500MHz	1kHz	499.999MHz	________	500.001MHz

Amplitude display accuracy

- Log scale Fidelity

ATT setting (dB)	A	B	Error (dB)=A+B	Spec
	ATT Calibration factor (dB)	Δ marker readout (dB)		
0	0 (reference)		0 (reference)	0 (reference)
5	________	________	________	±0.4dB
10	________	________	________	±0.4dB
15	________	________	________	±0.4dB
20	________	________	________	±0.4dB
25	________	________	________	±1.0dB
30	________	________	________	±1.0dB
35	________	________	________	±1.0dB
40	________	________	________	±1.0dB
45	________	________	________	±1.0dB
50	________	________	________	±1.0dB
55	________	________	________	±1.0dB
60	________	________	________	±1.0dB
65	________	________	________	±1.0dB
70	________	________	________	±1.0dB
75	________	________	________	±1.5dB
80	________	________	________	±1.5dB
85	________	________	________	±1.5dB
90	________	________	________	±2.5dB

MS2667C Performance Test Record

(7/12)

SERIAL NO. ________________ DATE ________

Tested by ________________

Frequency response

Band	Frequency	Calibration valve (dBm)	Marker level (dB)	Deviation (dB)
0	100MHz	0	0 (reference)	0 (reference)
	500MHz			
	1GHz			
	1.5GHz			
	2GHz			
	3GHz			
1–	3.1GHz			
	4GHz			
	5GHz			
	6GHz			
	6.5GHz			
1+	6.5GHz			
	7GHz			
	7.5GHz			
	8GHz			
2+	8GHz			
	9GHz			
	10GHz			
	11GHz			
	12GHz			
	13GHz			
	14GHz			
	15GHz			
3+	15.2GHz			
	16GHz			
	17GHz			
	18GHz			
	19GHz			
	20GHz			
	21GHz			
	22GHz			
4+	23GHz			
	24GHz			
	25GHz			
	26GHz			
	27GHz			
	28GHz			
	29GHz			
	30GHz			

MS2667C Performance Test Record

(8/12)

SERIAL NO. ______________________________ DATE ______________

Tested by _________________________________

Reference level accuracy

Reference Level setting	Marker readout	Correction factor of ATT	Error*1	Spec.
0dBm				±0.4dB
–10dBm				±0.4dB
–20dBm				±0.4dB
–30dBm				±0.4dB
–40dBm				±0.4dB
–50dBm				±0.75dB
–60dBm				±0.75dB
–70dBm				±1.5dB
–80dBm				±1.5dB

*1: Calculate the “Error” from the following equation

Error=Marker readout–Reference Level set value–corection factor of ATT

MS2667C Performance Test Record

(9/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Average noise level

MS2667C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1MHz	10MHz	0		–115dBm
10MHz	100MHz	0		–115dBm
100MHz	1GHz	0		–115dBm
1GHz	2GHz	0		–113.5 to –112dBm
2GHz	3.1GHz	0		–112 to –110.35dBm
3.1GHz	4GHz	1–		–110dBm
4GHz	5GHz	1–		–110dBm
5GHz	6GHz	1–		–110dBm
6GHz	6.5GHz	1–		–110dBm
6.4GHz	7GHz	1+		–110dBm
7GHz	8.1GHz	1+		–110dBm
8GHz	9GHz	2+		–102dBm
9MHz	10GHz	2+		–102dBm
10GHz	11GHz	2+		–102dBm
11GHz	12GHz	2+		–102dBm
12GHz	13GHz	2+		–102dBm
13GHz	14GHz	2+		–102dBm
14MHz	15.3GHz	2+		–102dBm
15.2GHz	16GHz	3+		–98dBm
16GHz	17GHz	3+		–98dBm
17GHz	18GHz	3+		–98dBm
18GHz	19GHz	3+		–98dBm
19GHz	20GHz	3+		–98dBm
20GHz	21GHz	3+		–98dBm
21MHz	22.4GHz	3+		–98dBm
22.3GHz	23GHz	4+		–91dBm
23GHz	24GHz	4+		–91dBm
24GHz	25GHz	4+		–91dBm
25GHz	26GHz	4+		–91dBm
26GHz	27GHz	4+		–91dBm
27GHz	28GHz	4+		–91dBm
28GHz	29GHz	4+		–91dBm
29GHz	30GHz	4+		–91dBm

MS2667C Performance Test Record

(10/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Second harmonic distortion

Signal generator	Second harmonic distortion (dB)
10.1MHz	
100.1MHz	
500.1MHz	
800.1MHz	
1000.1MHz	
1499.9MHz	
2000.1MHz	
2500.1MHz	
5000.1MHz	

MS2667C Performance Test Record

(11/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Resolution bandwidth switching uncertainty

MS2667C setting		Δ marker readout	Specification
RBW	SPAN		
1kHz	5kHz		±0.3dB
3kHz	15kHz	0.0dB	Reference
10kHz	50kHz		±0.3dB
30kHz	150kHz		±0.3dB
100kHz	500kHz		±0.3dB
300kHz	1.5MHz		±0.3dB
1MHz	5MHz		±0.3dB
3MHz	10MHz		±0.4dB

MS2667C Performance Test Record

(12/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ___________________________________

Input attenuator switching uncertainty

MS2667C setting							
Reference Level	ATT	Attenuator setting	Correction Factor of attenuator	Marker readout	Error	Deviation	Spec.
–10dBm	50dB	0dB	dB	dBm	dB	dB	±0.3dB
–20dBm	40dB	10dB	dB	dBm	dB	dB	±0.3dB
–30dBm	30dB	20dB	dB	dBm	dB	dB	±0.3dB
–40dBm	20dB	30dB	dB	dBm	dB	dB	±0.3dB
–50dBm	10dB	40dB	dB	dBm	dB	0dB (reference)	0dB (reference)
–60dBm	0dB	50dB	dB	dBm	dB	dB	±0.3dB

Sweep time and Time span accuracy

- Sweep time

MS2667C setting	Signal generator		
SWEEP TIME	AM Modulation frequency	SWT Time (calculated)	90% of specification min/max
50ms	400Hz	s	38.25ms/51.75ms
200ms	100Hz	s	153ms/207ms
2s	10Hz	s	1.53s/2.07s
20s	1Hz	s	15.3s/20.7s
200s	0.1Hz	s	99s/261s

- Time span accuracy

MS2667C setting	Signal generator		
Time span	AM Modulation frequency	Δ Marker readout	90% of specification min/max
20ms	1kHz	s	17.82ms/18.18ms
200ms	100Hz	s	178.2ms/181.8ms
2s	10Hz	s	1.782s/1.818s
20s	1Hz	s	17.82s/18.18s
200s	0.1Hz	s	178.2s/181.8s

MS2668C Performance Test Record

(1/12)

NO. ___________

DATE _________

SERIAL NO.___________________________________

OPTIONS_____________________________________

Date _______________

Tested by _______________

Ambient temparature _________ ºC

Relative humidity __________ %

Powermains line voltage (nominal) AC_________V

Powermains line frequency (nominal) _________ Hz

Test Equipment used

Descriptions	MODEL NO.	Cal Date
Synthesized signal generator		
Synthesized Sweeper		
Attenuator		
Power meter		
Power senser		
Power senser		
50Ω Termination		
Low pass filter		
Frequency counter		
Frequency standard		

MS2668C Performance Test Record

(2/12)

SERIAL NO. ______________________________ DATE ____________

Tested by ______________________________

Reference oscillator stability

- Frequency stability (aging rate)

Description	Min.	Result	Max.
Frequency stability/day	-2×10^{-8}		$+2\times10^{-8}$

- Temparature stability

Description	Min.	Result	Max.
Temparature stability	-5×10^{-8}		$+5\times10^{-8}$

Frequency readout accuracy

Signal generator	Center frequency	Span	Band (Mixing order)	Center frequency		
				Minimum value	Maker value	Maximum value
500MHz	500MHz	10kHz	0 (1)	499.999 5MHz		500.000 5MHz
		200kHz		499.99MHz		500.01MHz
		100MHz		495MHz		505MHz
5GHz	5GHz	10kHz	1– (1)	4.999 999 4GHz		5.000 000 6GHz
		200kHz		4.999 99GHz		5.000 01GHz
		100MHz		4.995GHz		5.05GHz
7.5GHz	7.5GHz	10kHz	1+ (1)	7.499 999 3GHz		7.500 000 7GHz
		200kHz		7.499 99GHz		7.500 01GHz
		100MHz		7.495GHz		7.505GHz
12GHz	12GHz	10kHz	1+ (2)	11.999 999 3GHz		12.000 000 7GHz
		200kHz		11.999 99GHz		12.000 01GHz
		100MHz		11.995GHz		12.005GHz
		1GHz		11.95GHz		12.05GHz
20GHz	20GHz	10kHz	2– (4)	19.999 999 1GHz		20.000 000 9GHz
		200kHz		19.999 99GHz		20.000 01GHz
		100MHz		19.995GHz		20.005GHz
		1GHz		19.95GHz		20.05GHz
29GHz	29GHz	10kHz	3– (6)	28.999 998 9GHz		29.000 001 1GHz
		200kHz		28.999 99GHz		29.000 01GHz
		100MHz		28.995GHz		29.005GHz
		1GHz		28.95GHz		29.05GHz
39GHz	39GHz	10kHz	3– (6)	38.999 998 7GHz		39.000 001 3GHz
		200kHz		38.999 99GHz		39.000 01GHz
		100MHz		38.995GHz		39.005GHz
		1GHz		38.95GHz		39.05GHz

MS2668C Performance Test Record

(3/12)

SERIAL NO. ______________________________ DATE ____________

Tested by _________________________________

Frequency span readout accuracy

MS2668C		Signal generator		Results		
Center frequency	Span	f_1	f_2	Minimum value	$\frac{f_2' - f_1'}{0.8}$	Maximum value
1GHz	20kHz	0.999 992GHz	1.000 008GHz	19.5kHz		21kHz
	200kHz	0.999 92GHz	1.000 08GHz	190kHz		210kHz
	2MHz	0.999 2GHz	1.000 8GHz	1.9MHz		2.1MHz
	10MHz	0.996GHz	1.004GHz	9.5MHz		10.5MHz
	100MHz	0.96GHz	1.04GHz	95MHz		105MHz
	2GHz	0.2GHz	1.8GHz	1.9GHz		2.1GHz
4.25GHz	100MHz	4.21GHz	4.29GHz	95MHz		105MHz
	1GHz	3.85GHz	4.65GHz	0.95GHz		1.05GHz
	8.5GHz	0.85GHz	7.65GHz	8.075GHz		8.925GHz
10.6GHz	100MHz	9.96GHz	10.04GHz	95MHz		105MHz
	1GHz	9.6GHz	10.4GHz	0.95GHz		1.05GHz
	20GHz	2GHz	18GHz	19GHz		21GHz
20GHz	100MHz	19.96GHz	20.04GHz	95MHz		105MHz
	1GHz	19.6GHz	20.4GHz	0.95GHz		1.05GHz
	40GHz	2GHz	38GHz	38GHz		42GHz

MS2668C Performance Test Record

(4/12)

SERIAL NO. ____________________________________ DATE _______________

Tested by ____

Resolution bandwidth accuracy

Resolution Bandwidth	Span	Bandwidth (3dB)	Specification
3MHz	10MHz		±30%
1MHz	5MHz		±20%
300kHz	500kHz		±20%
100kHz	200kHz		±20%
30kHz	50kHz		±20%
10kHz	20kHz		±20%
3kHz	5kHz		±20%
1kHz	2kHz		±20%

MS2668C Performance Test Record

(5/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Resolution bandwidth selectivity

Resolution Bandwidth	Frequency Span	Video Bandwidth	60dB BW	3dB BW	60dB BW/ 3dB BW
3MHz	100MHz	100Hz			≤15
1MHz	20MHz	100Hz			≤15
300kHz	10MHz	100Hz			≤15
100kHz	5MHz	100Hz			≤15
30kHz	1MHz	100Hz			≤15
10kHz	200kHz	100Hz			≤15
3kHz	100kHz	100Hz			≤15
1kHz	50kHz	100Hz			≤15

Sideband phase noise

Center frequency	Results	Specification
2GHz		≤–95dBc/Hz
6GHz		≤–95dBc/Hz
10GHz		≤–89dBc/Hz
20GHz		≤–85.5dBc/Hz
26GHz		≤–83dBc/Hz
39GHz		≤–80dBc/Hz

MS2668C Performance Test Record

(6/12)

SERIAL NO. ______________________ DATE ______________

Tested by ______________________

Frequency measurement accuracy

Signal generator	Measurement Resokution	Min.	Results	Max.
500MHz	1Hz	499.999 989MHz	________	500.000 011MHz
500MHz	10Hz	499.999 98MHz	________	500.000 02MHz
500MHz	100Hz	499.999 9MHz	________	500.000 1MHz
500MHz	1kHz	499.999MHz	________	500.001MHz

Amplitude display accuracy

- Log scale Fidelity

ATT setting (dB)	A	B	Error (dB)=A+B	Spec
	ATT Calibration factor (dB)	Δ marker readout (dB)		
0	0 (reference)		0 (reference)	0 (reference)
5	________	________	________	±0.4dB
10	________	________	________	±0.4dB
15	________	________	________	±0.4dB
20	________	________	________	±0.4dB
25	________	________	________	±1.0dB
30	________	________	________	±1.0dB
35	________	________	________	±1.0dB
40	________	________	________	±1.0dB
45	________	________	________	±1.0dB
50	________	________	________	±1.0dB
55	________	________	________	±1.0dB
60	________	________	________	±1.0dB
65	________	________	________	±1.0dB
70	________	________	________	±1.0dB
75	________	________	________	±1.5dB
80	________	________	________	±1.5dB
85	________	________	________	±1.5dB
90	________	________	________	±2.5dB

MS2668C Performance Test Record

(7/12)

SERIAL NO. ____________________ DATE ____________

Tested by ____________________

Frequency response

Band	Frequency	Calibration valve (dBm)	Marker level (dB)	Deviation (dB)
0	100MHz	0	0 (reference)	0 (reference)
	500MHz			
	1GHz			
	1.5GHz			
	2GHz			
	3GHz			
1–	3.1GHz			
	4GHz			
	5GHz			
	5.7GHz			
1+ n=1	5.5GHz			
	6.5GHz			
	7.5GHz			
	8GHz			
1+ n=2	8GHz			
	9GHz			
	10GHz			
	11GHz			
	12GHz			
	13GHz			
	14GHz			
2– n=4	15GHz			
	17GHz			
	19GHz			
	21GHz			
	23GHz			
	25GHz			
	26GHz			
3– n=6	27GHz			
	29GHz			
	31GHz			
	33GHz			
	35GHz			
	37GHz			
	39GHz			
	40GHz			

MS2668C Performance Test Record

(8/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ____________________________________

Reference level accuracy

Reference Level setting	Marker readout	Correction factor of ATT	Error*1	Spec.
0dBm				±0.4dB
–10dBm				±0.4dB
–20dBm				±0.4dB
–30dBm				±0.4dB
–40dBm				±0.4dB
–50dBm				±0.75dB
–60dBm				±0.75dB
–70dBm				±1.5dB
–80dBm				±1.5dB

*1: Calculate the “Error” from the following equation

Error=Marker readout–Reference Level set value–corection factor of ATT

MS2668C Performance Test Record

(9/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ___________________________________

Average noise level

MS2668C setting			Average noise level	
START FREQ	STOP FREQ	Band	Marker readout (dBm)	Specification
1 MHz	10 MHz	0		–115 dBm
10 MHz	100 MHz			–115 dBm
100 MHz	1 GHz			–115 dBm
1 GHz	2 GHz			–113.5 to –112 dBm
2 GHz	3.1 GHz			–112 to –110.35 dBm
3.1 GHz	4 GHz	1–		–114 dBm
4 GHz	5 GHz			–114 dBm
5 GHz	5.7 GHz			–114 dBm
5.5 GHz	6.5 GHz	1+ (n=1)		–114 dBm
6.5 GHz	7.5 GHz			–114 dBm
7.5 GHz	8.1 GHz			–114 dBm
7.9 GHz	9 GHz	1+ (n=2)		–113 dBm
9 GHz	10 GHz			–113 dBm
10 GHz	11 GHz			–113 dBm
11 GHz	12 GHz			–113 dBm
12 GHz	13 GHz			–113 dBm
13 GHz	14.3 GHz			–113 dBm
14.1 GHz	15 GHz	2– (n=4)		–105 dBm
15 GHz	16 GHz			–105 dBm
16 GHz	17 GHz			–105 dBm
17 GHz	18 GHz			–105 dBm
18 GHz	19 GHz			–105 dBm
19 GHz	20 GHz			–105 dBm
20 GHz	21 GHz			–105 dBm
21 GHz	22.4 GHz			–105 dBm
22.3 GHz	23 GHz			–105 dBm
23 GHz	24 GHz			–105 dBm
24 GHz	25 GHz			–105 dBm
25 GHz	26.5 GHz			–105 dBm
26.2 GHz	27 GHz	3– (n=6)		–101 dBm
27 GHz	28 GHz			–101 dBm
28 GHz	29 GHz			–101 dBm
29 GHz	30 GHz			–101 dBm
30 GHz	31 GHz			–101 dBm
31 GHz	32 GHz			–101 dBm
32 GHz	33 GHz			–101 dBm
33 GHz	34 GHz			–101 dBm
34 GHz	35 GHz			–101 dBm
35 GHz	36 GHz			–101 dBm
36 GHz	38 GHz			–101 dBm
38 GHz	40 GHz			–101 dBm

MS2668C Performance Test Record

(10/12)

SERIAL NO. ______________________ DATE ____________

Tested by ______________________

Second harmonic distortion

Signal generator	Second harmonic distortion (dB)
10.1MHz	
100.1MHz	
500.1MHz	
800.1MHz	
1000.1MHz	
1499.9MHz	
2000.1MHz	
2500.1MHz	
5000.1MHz	

MS2668C Performance Test Record

(11/12)

SERIAL NO. ________________________________ DATE ______________

Tested by ___________________________________

Resolution bandwidth switching uncertainty

MS2667C setting		Δ marker readout	Specification
RBW	SPAN		
1kHz	5kHz		±0.3dB
3kHz	15kHz	0.0dB	Reference
10kHz	50kHz		±0.3dB
30kHz	150kHz		±0.3dB
100kHz	500kHz		±0.3dB
300kHz	1.5MHz		±0.3dB
1MHz	5MHz		±0.3dB
3MHz	10MHz		±0.4dB

MS2668C Performance Test Record

(12/12)

SERIAL NO. ________________________ DATE ____________

Tested by ________________________

Input attenuator switching uncertainty

MS2668C setting							
Reference Level	ATT	Attenuator setting	Correction Factor of attenuator	Marker readout	Error	Deviation	Spec.
–10dBm	50dB	0dB	dB	dBm	dB	dB	±0.3dB
–20dBm	40dB	10dB	dB	dBm	dB	dB	±0.3dB
–30dBm	30dB	20dB	dB	dBm	dB	dB	±0.3dB
–40dBm	20dB	30dB	dB	dBm	dB	dB	±0.3dB
–50dBm	10dB	40dB	dB	dBm	dB	0dB (reference)	0dB (reference)
–60dBm	0dB	50dB	dB	dBm	dB	dB	±0.3dB

Sweep time and Time span accuracy

- Sweep time

MS2668C setting	Signal generator		
SWEEP TIME	AM Modulation frequency	SWT Time (calculated)	90% of specification min/max
50ms	400Hz	s	38.25ms/51.75ms
200ms	100Hz	s	153ms/207ms
2s	10Hz	s	1.53s/2.07s
20s	1Hz	s	15.3s/20.7s
200s	0.1Hz	s	99s/261s

- Time span accuracy

MS2668C setting	Signal generator		
Time span	AM Modulation frequency	Δ Marker readout	90% of specification min/max
20ms	1kHz	s	17.82ms/18.18ms
200ms	100Hz	s	178.2ms/181.8ms
2s	10Hz	s	1.782s/1.818s
20s	1Hz	s	17.82s/18.18s
200s	0.1Hz	s	178.2s/181.8s