The MS710A is a newly developed microwave spectrum analyzer designed to simplify microwave spectrum measurements. An internal YTF preselector permits full frequency coverage (100kHz to 23GHz) in just two bands, increasing operability. In addition, many new functions, such as PEAK CENTER which locates signals and moves them to the screen center, and HALF SCREEN SHIFT which facilitates analysis of adjacent frequency bands. These functions are supported by high-accuracy, high-stability local control employing PLL techniques.

A measurement range of $-115\,\text{dBm}$ to $+30\,\text{dBm}$ means both wide range and high sensitivity. In addition the preselector enables harmonic analysis with a dynamic range of 100dB. Another feature is an input overload tolerance.

The MS710A uses a digital memory that is free from flicker and permits simultaneous two-channel display, difference display and MAX HOLD display. Preset memory contents can also be displayed, and all CRT displays can be copied directly by a plotter or printer without use of a controller. GP-IB interface is a standard feature.

**Main specifications**
- **Frequency range:** 100kHz to 23GHz
- **Measurement level range:** $-115$ to $+30\,\text{dBm}$
- **Resolution bandwidth:** 1kHz to 3MHz
- **Dynamic range:** 100dB (1.7 to 23GHz)
- **GP-IB programmable**

**Main applications**
- Spectrum analysis of microwave devices and components
- Spurious emission and spectrum distribution measurements for analog and digital communications equipment
- Receiver interference measurements for radio communications and satellite earth stations
- Spurious and intermodulation measurements for direct broadcast satellite receivers and related equipment

**Application equipment**
- **Tracking Generator MH672A**
  The Tracking Generator MH672A is used in conjunction with the MS710A as a swept signal generator for the direct observation measurement of the frequency response. It can also be used as a level calibrated signal source because the output level is accurately controlled by the high-performance ALC circuit. (See page 75 for further detail.)
- **DPR7713A Printer**
  Connects directly to the MS710A. Using the parallel interface, the printer can be controlled independently by the GP-IB, permitting a continuous data logging with remote control operation.
- **Packet IIe PERSONAL TECHNICAL COMPUTER**
  Used as a controller for the MS710A.

Other applications and peripheral equipment are described on pages 79, 80 and 81.
SPECTRUM ANALYZERS

Features

Easy-to-use signal search functions

The internal preselector eliminates erroneous measurements due to image response and multiple response, even a wide span is used. From the full band sweep mode (in any band) simply pressing the PEAK CENTER key catches the signal into center screen. The SPAN UP/DOWN function then allows you to “zoom” in for more detailed analysis. Resolution bandwidth, sweep time, and other parameters are set automatically. Numerical entry of known signal frequencies is also possible, while the wide bandwidth minimizes the need to reselect bands.

By using the start and stop frequencies, random frequency span setting within the bandwidth becomes possible.

Internal preselector

Image response and multiple response are eliminated.

Two band coverage

Full frequency coverage in just two bands minimizes troublesome range selection.

PEAK CENTER and “ZOOMING” functions

The PEAK CENTER function pulls the maximum level signal displayed to center screen. Dedicated SPAN UP/DOWN key provides a signal “zooming” function independent of all other measurement parameters.

Conventional frequency stabilizer circuitry has limitation on the range of center frequency shift. However, the MS710A PLL circuit can operate at any value within the frequency band.

HALF SCREEN SHIFT function

These keys shift the center frequency up or down by half of the frequency span. Using this function, adjacent half screen area on the right or left of the full screen area can be observed.

High sensitivity cuts measurement time

Using the HALF SCREEN SHIFT prevents signals from being overlooked - as might happen with dial operation - even during the slowest sweeps.

Improved basic performance

- High sensitivity
- Low drift
- 100 dB dynamic range
Full range of protection and backup functions

- Large input overload tolerance
  The MS710A mixer circuit can handle input signals up to +30dBm at the 0dB INPUT ATT setting without damage. A data knob interlock function preventing the 0dB attenuator setting provides further protection.

- Power interrupt protection
  Last state memory and low-drift circuitry permit rapid recovery from power outages, even in automatic measurement configurations.

- Simultaneous display of a memorized specification line and a measured spectrum.

- Opens countless new application possibilities

- Simple go/no-go comparisons using memorized specification line
  Through the GP-IB, the controller can store a specification line in the channel B waveform memory, that can be retained even after the controller is disconnected.

- Programmable
  Preset memory list, store and hardcopy functions can be used to program up to ten sets of measurement parameters.

- Easy-to-use hardcopy function
  The entire screen display including grati- cules, the title, measurement conditions and waveform can be hardcopied directly without use of a controller.

- Last state memory
  Of ten preset memories, register 0 automatically stores the last panel setting before the instrument is reset.

- Waveform memory
  Two waveform memories (channels A and B) permit simultaneous display of both two channels for comparison or the A-B difference display. Both channels are provided with battery backup.

- Preset memory list can be displayed
  Up to nine sets of measurement conditions can be stored using the SAVE key with full memory backup. The photograph shows a sample parameter list.

- Direct plotting
  A hardcopy record can be produced by the specified plotter, the Anritsu DPR7713A or equivalent dot matrix type printer.

GP-IB installed as a standard feature
The GP-IB permits remote control of both data output and panel settings.
### Specifications

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>100kHz to 2GHz band and 1.7GHz to 23GHz band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting range</td>
<td>0 to 2GHz and 1.7 to 24.5GHz</td>
</tr>
<tr>
<td>Readout resolution</td>
<td>±(The following accuracy +2% of frequency span +10% of resolution bandwidth)</td>
</tr>
<tr>
<td>Readout accuracy</td>
<td>±1MHz/Center frequency 0MHz to 2GHz**</td>
</tr>
<tr>
<td></td>
<td>±1MHz/Center frequency 1.7GHz to 6.5GHz</td>
</tr>
<tr>
<td></td>
<td>±2MHz/Center frequency 6.5GHz to 12.5GHz</td>
</tr>
<tr>
<td></td>
<td>±3MHz/Center frequency 12.5GHz to 18.5GHz</td>
</tr>
<tr>
<td></td>
<td>±4MHz/Center frequency 18.5GHz to 24.5GHz</td>
</tr>
<tr>
<td></td>
<td>**(after calibrated using CAL OUTPUT)</td>
</tr>
<tr>
<td>Setting</td>
<td>Number/unit keys, data knob, peak center key, or half-screen shift key</td>
</tr>
<tr>
<td>Frequency span</td>
<td>Frequency span and resolution</td>
</tr>
<tr>
<td>Readout accuracy</td>
<td>±5% (200MHz/DIV to 6kHz/DIV), ±10% (5kHz/DIV to 1kHz/DIV)</td>
</tr>
<tr>
<td>Setting</td>
<td>Number/unit keys, data knob, or span up/down keys</td>
</tr>
<tr>
<td>Start frequency/ Stop frequency</td>
<td>Setting range and resolution</td>
</tr>
<tr>
<td>Readout accuracy</td>
<td>±(Center frequency accuracy +2.5% of span)</td>
</tr>
<tr>
<td>Setting</td>
<td>Number/unit keys or data knob</td>
</tr>
</tbody>
</table>

### Marker

- **NORMAL**
  - Displays the frequency of variable tuning marker

- **Δ (delta)**
  - Displays the frequency difference between two marker points

- **PEAK**
  - Marks input signal peak and displays its frequency

- **MKR → CF**
  - When pushed, the center frequency is set to the marker point frequency

### Resolution

- **Resolution bandwidth (6dB bandwidth)**
  - Setting range: 1kHz to 3MHz in a 1, 3, 10 sequence
  - Setting: May be selected manually or automatically coupled to frequency span

### Stability

- **Stability**
  - **Drift** (Typical value)
    - 100kHz to 2GHz band: 50kHz/1H (Initial drift), 5kHz/10 min after 1.5H warm up
    - 1.7GHz to 23GHz band: 30kHz/1H (Initial drift), 2kHz/10 min after 1.5H warm up
  - Center frequency: ±6.5GHz

- **Residual FM**
  - ±400Hz p-p (Center frequency ±6.5GHz, Span ≤100kHz/DIV)

- **Noise sidebands**
  - ≤-75dB (1kHz resolution bandwidth, 10Hz video bandwidth, 30kHz away from signal, center frequency 6.5GHz or less)

### Measuring range

- **Measuring range**
  - Average noise level to +30dBm

### Display

- **Display**
  - **LOG**
    - 10dB/DIV: 0 to -70dB from reference level
    - 5dB/DIV: 0 to -40dB from reference level
    - 2dB/DIV: 0 to -16dB from reference level
    - 1dB/DIV: 0 to -8dB from reference level

### Amplitude level

- **Lin**
  - 12.5%/DIV

- **Linearity**
  - ±0.2dB/1dB, ±1.5dB/70dB

- **Setting range**
  - -10dBm to +30dBm

- **Calibration output accuracy**
  - -10dBm ±0.3dB (100MHz ±10kHz)

- **Reference level accuracy**
  - ±2.0dB (Reference level -90dBm to -10dBm, frequency 100MHz, 0dB input attenuator, and after calibrated using CAL OUTPUT)

### Reference level accuracy

- **Setting range**
  - 0dB to 70dB, 10dB step
  - May be selected manually or automatically coupled to reference level

- **Error between steps**
  - ±1dB (0dB to 60dB, 100kHz to 2GHz)
  - ±2dB (0dB to 40dB, 100kHz to 23GHz)

- **Error of maximum accumulation**
  - ±2.2dB (0dB to 60dB, 100kHz to 2GHz)
  - ±3dB (0dB to 40dB, 100kHz to 23GHz)

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Continued on next page.
## Spectrum Analyzers

### Reference level
- **Frequency response**
  - ±2.5dB (100kHz start frequency, 1MHz stop frequency)
  - ±1.5dB (10MHz start frequency, 1.5GHz stop frequency)
  - ±1.5dB (1.5GHz start frequency, 2GHz stop frequency)
  - ±2.5dB (1.7GHz start frequency, 5.4GHz stop frequency)
  - ±3dB (5.4GHz start frequency, 12.5GHz stop frequency)
  - +4dB (12.5GHz start frequency, 25GHz stop frequency)

### Marker
- **NORM** (Normal): Displays the level of a variable tuning marker
- **Δ (delta)**: Displays the level difference of two markers
- **PEAK**: Marks input signal peak and displays the level

### 2nd Harmonic Distortion
<table>
<thead>
<tr>
<th>Input Frequency</th>
<th>Value Obtained by Subtracting the Input Attenuator Value from the Input Level</th>
<th>2nd Harmonic Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>100kHz to 10MHz</td>
<td>-40dBm</td>
<td>≤-60dB</td>
</tr>
<tr>
<td>10MHz to 200MHz</td>
<td>-30dBm</td>
<td>≤-70dB</td>
</tr>
<tr>
<td>200MHz to 850MHz</td>
<td>-30dBm</td>
<td>≤-80dB</td>
</tr>
<tr>
<td>850MHz to 11.5GHz</td>
<td>-10dBm</td>
<td>≤-100dB*</td>
</tr>
</tbody>
</table>

### Two Signal 3rd Intermodulation Distortion
- **Input Frequency**
  - 100kHz to 2GHz
  - 1.7GHz to 12.5GHz
  - 12.5GHz to 23GHz
- **Frequency Difference of Two Signal Inputs/Value Obtained by Subtracting the Input Attenuator Value from the Input Total Level**
  - ≥2.5MHz/-30dBm
  - ≥70MHz/-10dBm
  - ≥100MHz/-10dBm
- **Two Signal 3rd Intermodulation Distortion**
  - ≤-80dB
  - ≤-100dB*  

### Residual Response
- ≤-90dBm (0dB input attenuator, 10MHz to 6.5GHz fundamental mixing, and 50Ω termination)

### Average Noise Level
- ≤-95dBm (100kHz to 1MHz)
- ≤-115dBm (1MHz to 2GHz)
- ≤-110dBm (1.7GHz to 6.5GHz)
- ≤-100dBm (6.5GHz to 12.5GHz)
- ≤-95dBm (12.5GHz to 18.5GHz)
- ≤-85dBm (18.5GHz to 23GHz)
- 1kHz resolution bandwidth, 0dB input attenuator, and 3Hz video bandwidth

### Video Bandwidth
- 1Hz to 3MHz, 1, 3, 10 sequence
- May be selected manually or automatically coupled to frequency scan

### Video Input
- **Connector**: N type (nominal 50Ω)
- **Maximum input level**: +30dBm, DC 10V

### CRT Display
- **Display Area**: 80mm x 100mm
- **Display Item**: Graticule, signal traces, function setting value, error message, and title

### Signal Memory
- **Memory Capacity**: Horizontal 501 points, vertical 801 points, A and B channels, backed up by battery
- **Display**: NORMAL, MAX HOLD, AVERAGE, A channel-B channel

### Function Setting Memory
- Up to 10 sets of each function setting value can be saved or recalled. The memory list can be displayed on the CRT. Backed up by battery.

### Sweep
- **Sweep time**: 2ms/DIV to 10sec/DIV. May be selected manually or automatically coupled to frequency span, resolution bandwidth, and video bandwidth. For 0Hz frequency span, 2ms/DIV to 10sec/DIV with manual setting. When start/stop frequencies are set, the previous given time is set, time cannot be set manually.

### Trigger
- **Single**, free run, line, video, and external trigger

### Remote Control
- **Remote Control**: GP-IB (IEEE488, IEC625-1, 24 pins) All front panel functions (except power switch, CRT intensity, frequency calibration, level calibration, and trigger level adjustment knob) can be remotely controlled.

### Display
- **CRT Information**: CRT information can be plotted by the specified plotter or printer

### Power
- **AC 100V**
- **50/60Hz**: 180VA (Without Option 01)

### Dimensions and Weight
- **177H, 426W, 451Dmm, 25kg**

### Accessories Supplied
- Power cord, fuse, coaxial cable for calibration, and manual

* Less than specified level or average noise level.
** Specify one nominal ac line voltage between 100V and 250V when ordering.