Instruction Manual

ISA-730

Spectrum Analyzer
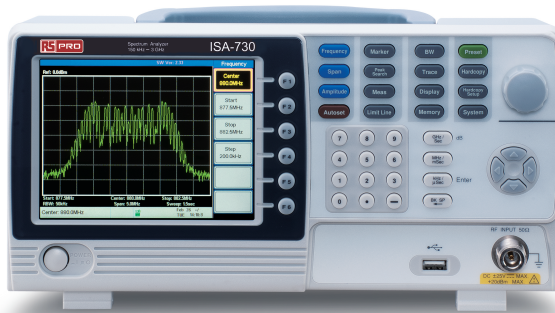
EN

Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to insure your safety and to keep the instrument in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.

⚠ WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
⚠ CAUTION	Caution: Identifies conditions or practices that could result in damage to the instrument or to other properties.
⚡	DANGER High Voltage
⚠	Attention Refer to the Manual
⏚	Earth (ground) Terminal

⏚ Frame or Chassis Terminal

🗑 Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline

⚠ CAUTION

- Do not place any heavy object on the instrument.
- Avoid severe impact or rough handling that leads to damaging the instrument.
- Do not discharge static electricity to the instrument.
- Use only mating connectors, not bare wires, for the terminals.
- Ensure signals to the RF input do not exceed +30dBm/ ±25V DC.
- Do not block the cooling fan opening.
- Do not disassemble the instrument unless you are qualified.

(Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. The instrument falls under category II.

- Measurement category IV is for measurement performed at the source of low-voltage installation.

- Measurement category III is for measurement performed in the building installation.

- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.

- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply ⚠ WARNING	- AC Input voltage range: 100V~240V - Frequency: 50/60Hz - To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.
Cleaning	- Disconnect the power cord before cleaning. - Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. - Do not use chemicals containing harsh material such as benzene, toluene, xylene, and acetone.
Operation Environment	- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) - Temperature: 5°C to 45°C - Humidity: 90% @ 45°C (Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The instrument

falls under degree 2.

Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity".

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

| Storage environment | - Location: Indoor |
| | - Temperature: -20°C to 60°C; <60°C/70% RH |

| Disposal | Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact. |

Power cord for the United Kingdom

When using the unit in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

⚠ WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow: Earth

Blue: Neutral

Brown: Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⏚ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm2 should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

This chapter provides a brief overview of the ISA-730, the package contents, instructions for first time use and an introduction to the front panel, rear panel and GUI.

ISA-730 Introduction

The ISA-730 is a low-cost, basic spectrum analyzer. The ISA-730 has all the basic features of our more advanced models, but in a smaller package, designed especially for education.

Main Features

Performance	• 150kHz~3GHz bandwidth
	• 100kHz resolution
Features	• Autoset with automatic floor level and span.
	• Marker table function
	• Limit line testing
	• Split window display
	• ACPR measurement
	• OCBW measurement
	• Automatic resolution bandwidth mode.
Interface	• 480×640 color LCD display
	• On-screen menu icons
	• VGA video output
	• RS-232C
	• USB 2.0 Host port for data storage

- USB 2.0 Device port for the virtual com port communication

Package Contents

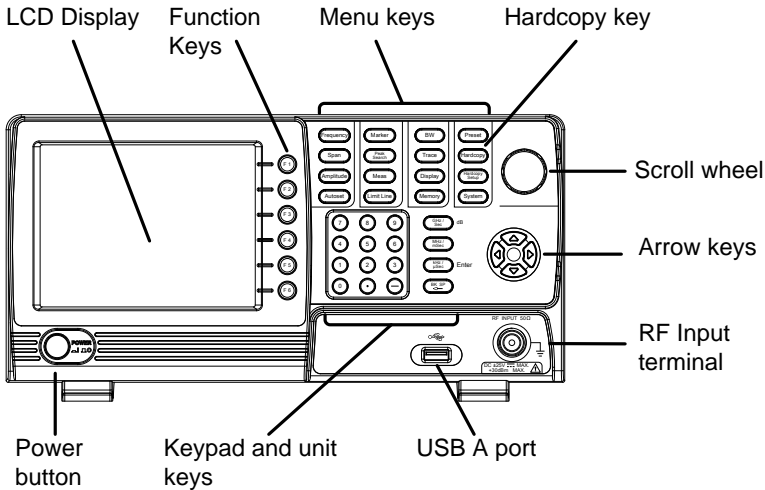Check the contents before using the ISA-730.

Opening the box
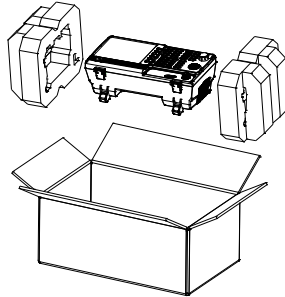
Contents (single unit)

- Main unit
- Quick Start Guide
- User Manual CD

- Power cord x1 (region dependent)
- Calibration certificate

Appearance
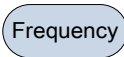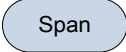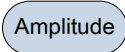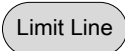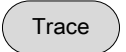
ISA-730 Front Panel

LCD Display   Function   Menu keys   Hardcopy key
               Keys

Scroll wheel

Arrow keys

RF Input
terminal

Power   Keypad and unit   USB A port
button   keys
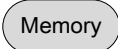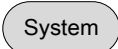
LCD display	640 X 480 color LCD display. The display shows the soft keys for the current function, frequency, amplitude and marker information.
Function keys	F 1 ~ F6 The F1 to F6 function keys directly correspond to the soft keys on the right-hand side of display.
Frequency	Frequency Sets the center frequency, start frequency, stop frequency and step frequency.

Span	Span	Sets the span, with options for full span, zero span and last span.
Amplitude	Amplitude	Sets the amplitude reference level, scale and amplitude units.
Autoset	Autoset	Automatically searches the peak signal with maximum amplitude and displays it with appropriate horizontal and vertical scales.
Marker	Marker	The Marker key is used to configure the markers, trace markers as well as other related functionality.
Peak Search	Peak Search	Finds each maximum and minimum peak. Used with the Marker functions.
Meas	Meas	Configures ACPR and OCBW measurements.
Limit Line	Limit Line	Sets and tests Pass/Fail limit lines.
BW	BW	Sets the resolution bandwidth.
Trace	Trace	Sets traces and trace related functions.
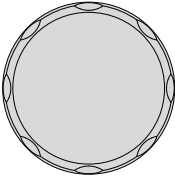
Display	Display	The Display key configures the split-screen windowing mode and the basic display properties.
Memory	Memory	The memory key is used to save or recall setup, trace and limit line data.
Preset	Preset	The *Preset* key will restore the spectrum analyzer to the factory settings.
Hardcopy	Hardcopy	The hardcopy key is a quick save key that will save a screen-shot of the display.
Hardcopy setup	Hardcopy Setup	Configures the hardcopy options.
System	System	The System key is used to configure the RS232 interface, language, update the firmware as well as other system options.
Power key	POWER	Turns the instrument on/off.
Scroll wheel		Edit values, select listed items.
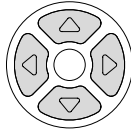
Arrow keys		Increment/decrement values (in steps), select listed items.
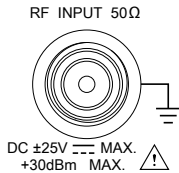
RF input terminal		RF input port. Accepts RF inputs.

- Maximum input: +30dBm (+20dBm measurable)

- Input impedance: 50Ω

- Maximum DC voltage: ±25V

- N-type: female
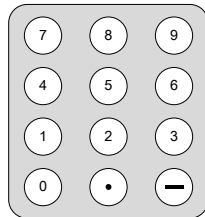
Numeric keypad		The numeric keypad is used to enter vales and parameters. It is often used in conjunction with the arrow keys and scroll wheel.

USB A, Micro SD		USB A port for saving/recalling settings/files to external memory. Only supports FAT/FAT32 formatting.

Rear Panel
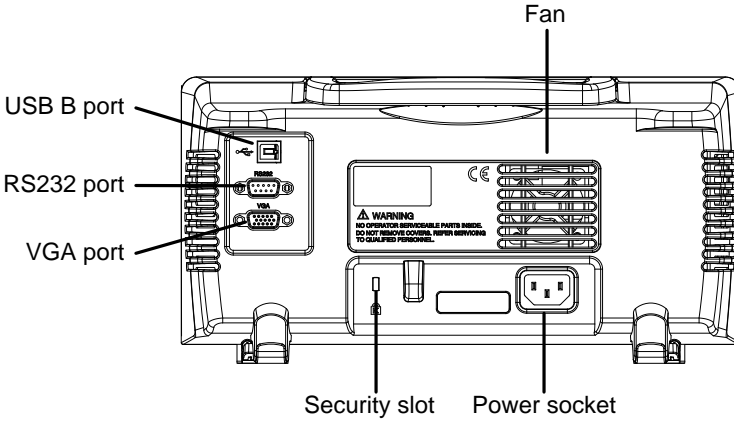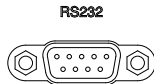
RS232   RS232 9 pin DSUB port.
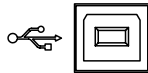
USB B   USB B Device port. USB 1.1/2.0

VGA   VGA video-out port. Supports SVGA
                         (480X640)

Fan
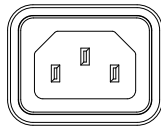
Power Socket   Power Socket:
                         100~240V, 50/60Hz.
                         15W Max

Security Slot   ▯   Kensington-type security slot.

                      🔒

Display

Marker information	(top center)
Function menu	(top right)
Reference level	(left)
Traces and waveforms	(left)
Frequency/ Bandwidth settings	(left)
Soft menu keys	(right)
Entry / Message area	(bottom)
Trace icons	(bottom)
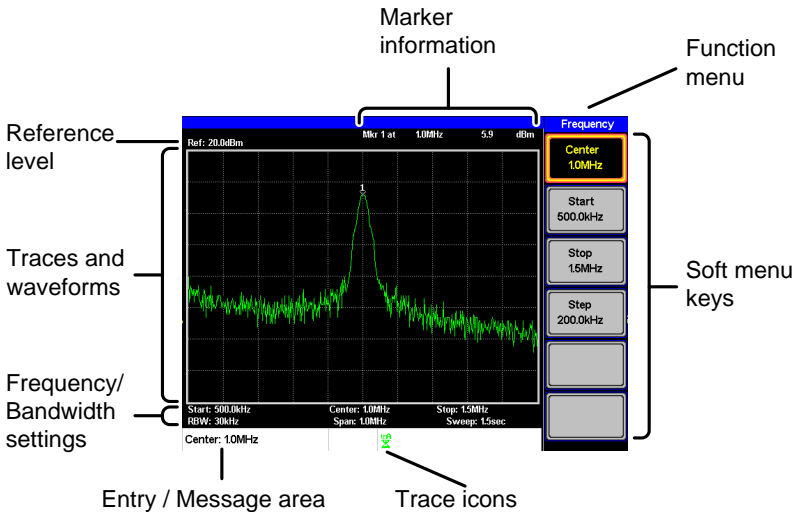
Reference level   Displays the reference level. For details, see page 38.

Marker information Displays marker information. For details see page 43.

Function menu   Displays the current function menu.

Soft menu keys   The Soft menu keys are associated with the F1 to F6 function keys to the right of the display.

Trace Icons   Displays the color of each active trace and the trace mode of
                         each active trace. See page 68 for more information about
                         traces.

Entry/Message area This area is used to show system messages, errors and input
                         values/parameters.

Frequency/   Displays the Start, Center and Stop frequencies, RBW, Span
Bandwidth settings and Sweep settings.

Trace and   Main display showing the traces (page 68), limit lines (62) and
waveforms   marker positions (43).

First Time Use Instructions

Use the procedures below when first using the ISA-730 to tilt the stand, power up the instrument, update the firmware and restore the unit back to the default settings. Lastly, the Conventions sections will introduce you to the basic operating conventions used throughout the user manual.

Tilting the Stand

Description   The ISA-730 has two adjustable tabs at the front that can be used to position the instrument into two preset orientations.

Leaning Position   Set the tabs down to have the ISA-730 leaning backward.
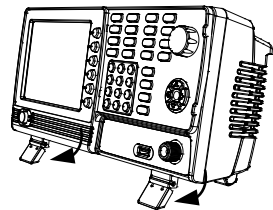
Upright Position   Set the tabs flat to have the ISA-730 in an upright position.
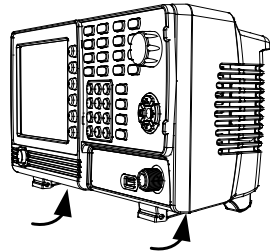
Power UP and Down

Power Up   1. Insert the AC power cord into the power
                   socket.
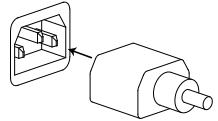
                2. Press the power button to turn the ISA-
                   730 on.
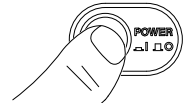
                3. The ISA-730 will begin to boot up in under a few seconds.

⚠ Note   If system fails to start, please see your local distributor.

Power Down   1. Press the power button to power down.
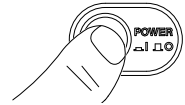
Software Update

Description   The ISA-730 allows the software to be updated by end-users.
                Before using the ISA-730, please check the website or ask
                your local distributor for the latest software.

                The update file, MAIN1.BIN, must be placed in the root
                directory of a USB flash drive.

System version   Before updating the software, please check the software
                    version.

1. Press $\binom{\text{System}}{}$ >*Information[F4].*

2. The system version is displayed on the
   SW Ver[F4] icon.

Software version
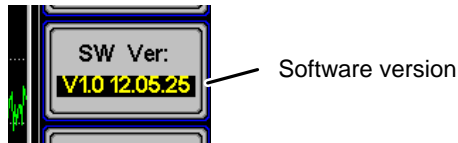
Update software   1. Place the update file, MAIN1.BIN, into the root directory of
                      a USB flash drive.

2. Insert the USB flash drive into the USB port on the front
   panel.

3. Press $\binom{\text{System}}{}$ >*Update From USB Flash[F5].*

4. *Press Update Now[F3]* to execute the update process.

- When the message "Programmed Successful" is displayed,
  the software has successfully completed the update
  procedure.

5. Reboot the system when the update procedure has finished by cycling the power button.

6. Check the software version again to confirm the update procedure.

⚠ Note   The upgrade process may take a few minutes.

USB Driver Installation

Description   If the type B USB port on the rear panel is to be used for remote control, then the USB driver must be installed. The USB driver is located in the CD that accompanied this manual.

Driver installation 1. Ensure the ISA-730 is turned on.

2. Connect the USB cable from the PC to the rear panel USB B port.

3. Windows will automatically detect the ISA-730 as a new device.

4. Follow the instructions to locate the ISA-730 driver on the accompanying CD and install the driver.

5. To see if the driver has been successfully installed, you

can check to see if the ISA-730 is recognized by the Windows Device Manager when the ISA-730 in connected to the PC.

6. In Windows XP go to: Start>Control Panel>Device Manager.

7. The ISA-730 should be shown under the Ports (COM & LPT) node:

⚠️ Note

If the USB driver installation fails, you can try to manually install the driver.

You can tell that the driver hasn't been installed if you see the AT91USBSerial icon in the ports node.

AT91USBSerial
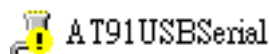
Right clicking this icon will allow you to manually install the ISA-730.ini driver.

Restoring Default Settings

Description   The factory default settings can be easily restored using the
                   Preset key on the front panel. The default settings cannot be
                   changed. See page 119 for a list of the factory default
                   settings.

Steps   1. Press (Preset).

                   • The spectrum analyzer will load the default factory settings.

Conventions

The following conventions are used throughout the user manual. Read the
conventions below for a basic grasp of how to operate the ISA-730 menu system
and front panel keys.

Soft Menu keys   The F1 to F6 function keys on the right side of the display
                   correspond directly to the soft-menu keys on their left.

F1 ~ F6 function keys

Soft-menu keys
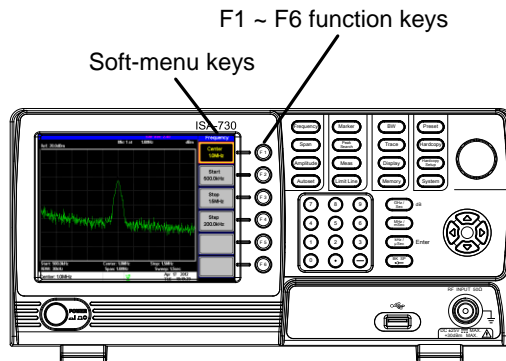
Input Parameter
Values

Ref. Level
20.0dBm

Selecting this type of menu key will allow you to enter a new
value with the numeric keypad or increment/decrement the
value using the scroll wheel or number pad. See the
parameter input description below for more details.

Toggle State

Scale
10 5 2 1

Pressing this menu key will toggle the state. Notice that any
soft-menu key that can be toggled will have the active
parameter underlined.

Toggle State & Input
Parameter

Display Line
-50dBm OFF

Pressing this menu key will allow you to toggle the state of
the function between on and off. When in the on-state, the
parameter value can be manually edited. Use the numeric
keypad to enter the new value or use the scroll wheel to
increment/decrement the current value. Again, the setting that
is underlined is the active setting.

Sub Menu

More

Pressing the *More* menu key will enter a submenu.

Sub Menu to select parameter

Units …
dBm

Pressing this type of menu key will enter a submenu to select a parameter.

Return to the Start of a Menu Tree.

When you have navigated down a menu tree and you wish to return to the start of the menu tree, simply press the same Menu again.

For example if you pressed:

(Trace) > *More[F6] > Min Hold[F2],*

simply press (Trace) again to return to the start of the Trace menu.

Active Function

Peak Hold

Pressing this type of menu key will activate that function. The menu key will be highlighted to show it is the active function.

Parameter input

Scroll wheel

Numerical keypad

Directional arrow keys

Backspace, Enter keys
and unit keys
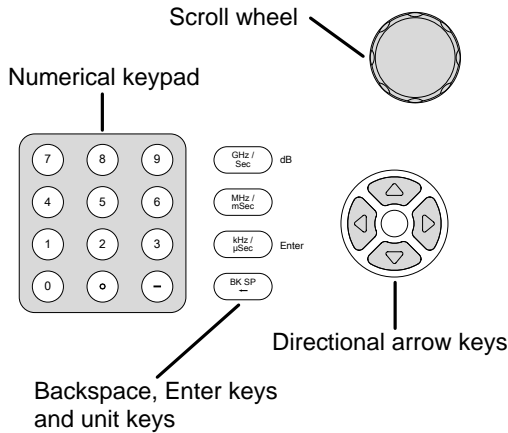
Parameter values can be entered using the numeric keypad, the scroll wheel and the arrow keys.

Using the numeric keypad

When prompted to enter a parameter, use the number keys (0~9), the decimal key (.) and the minus key (-) to enter a value. After a value has been entered, the unit keys can be used to select the units.

The value of the parameter is shown at the bottom of the screen as it is edited.

Edited parameter

Back Space   Use the backspace key to delete the last character or number
                           entered.

Using the scroll   Use the scroll wheel to alter the current value. Clockwise
wheel   increases the value, anti-clockwise decreases the value. The
                           scroll wheel is usually used for values that are highly variable,
                           such as the center frequency settings.

Directional arrows   Use the directional arrows to select discrete parameters or to
                           alter values by a coarser resolution than the scroll wheel.
                           Left/down decreases the value, right/up increases the value.
                           The directional arrows are usually used for values that are of
                           a discrete nature, such as selecting a memory location.

BASIC OPERATION

Frequency Settings

Center Frequency

Description   The center frequency function sets the center frequency and
                     centers the display to the center frequency.

Operation   1. Press (Frequency)>*Center[F1]* and enter the frequency and unit.

                         Range: 0kHz~3GHz
                         Default: 1.5GHz

Display
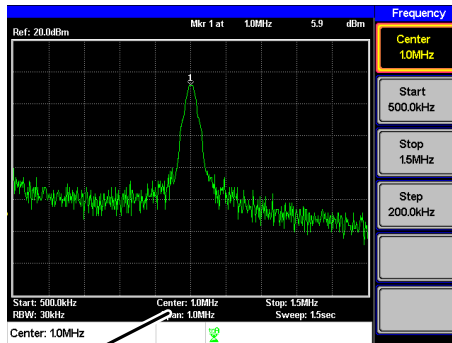
Set center frequency

Start and Stop Frequency

Description   The start/stop frequency function will set the start and stop
                     frequency of the span.

Operation
1. To set the start frequency, press (Frequency) > *Start[F2]* and enter the frequency and unit.

2. To set the stop frequency, press (Frequency) > *Stop[F3]* and enter the frequency and unit.

Range:	0kHz~3GHz
Default Start	0Hz
frequency:	3GHz
Default Stop	
frequency:	

Display

Start Frequency   Stop Frequency
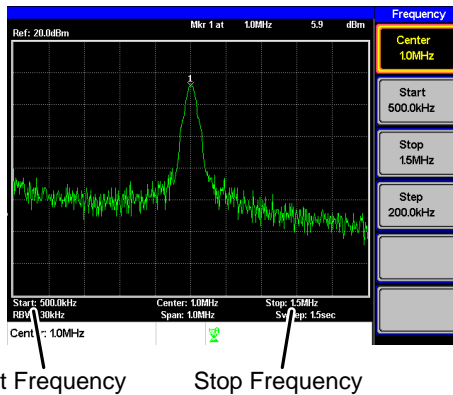
⚠ Note

The start and stop frequency can change when the span settings are used.

The stop frequency must be set higher than the start frequency (for spans ≠ 0).

Center Frequency Step

Description   The *Step* function sets the step size of the center frequency
                   when using the arrow keys.

                   When the arrow keys are used to alter the center frequency,
                   each press will move the center frequency by the step size
                   specified by the *Step* function.

                   By default, the center frequency step size is equal to 10% of
                   the span.

Operation   1. Press (Frequency) > *Step[F4]* and set the center frequency step
                      size.

                      Range: 1Hz~3GHz

Display

Span Settings

Span

Description   The Span function will set the frequency range of the sweep.

The sweep will be centered around the center frequency.

Setting the span will alter the start and stop frequencies.

Operation   1. Press (Span)> *Span[F1]* and enter the span frequency
range and unit.

Range: 0kHz~3GHz
Default Span: 3GHz

Display

Span

Set Span
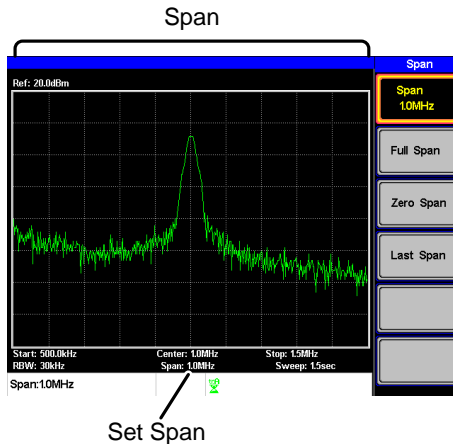
Full Span

Description   The Full Span function will set the span to the full frequency range.

This function will set the start and stop frequencies to 0Hz and 3GHz respectively.

Operation   1. Press $\left(\text{Span}\right)$ > *Full Span[F2]*.

Zero Span

Description   The Zero Span function will set the frequency range of the sweep to 0Hz and fixes the start and stop frequencies to the center frequency. The Zero Span function measures the time domain characteristics of the input signal at the center frequency. The horizontal axis is displayed in the time domain.

Operation   1. Press $\left(\text{Span}\right)$ > *Zero Span[F3]*.

The span changes accordingly.

Display

Time domain

0Hz Span
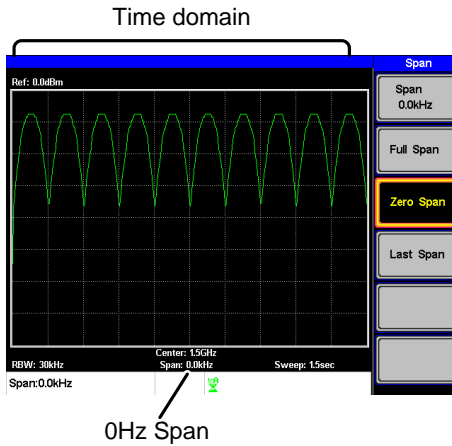
Example: Amplitude modulation

⚠ Note   The measurement functions such as ACPR and OCBW
                          are not available with the zero span setting:

Last Span

Description   The last span function returns the spectrum analyzer to the
                          previous span settings.

Operation   1. Press (Span) > Last Span[F4].

Amplitude Settings

The vertical display scale is defined by the reference level amplitude, attenuation, scale and external gain/loss.

Reference Level

Description   The reference level defines the absolute level of the amplitude on the top graticule in voltage or power.

Operation   1. Press (Amplitude) > *Ref. Level[F1]* and enter the reference level amplitude.

Range: -20dBm ~ 20dBm

Resolution: 10dBm

Display   Ref Level reading
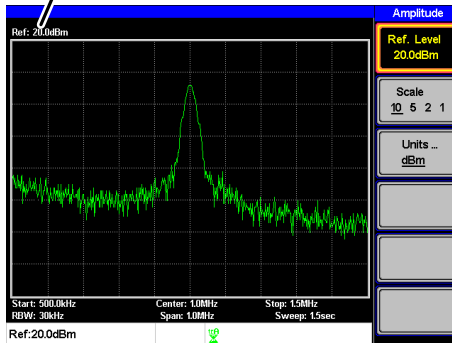
Amplitude Units

Description   The amplitude units can be set from dBm, dBmV or dBuV.

1. Press (Amplitude) > *Units …[F3]* to change the amplitude units.

Units: dBm, dBmV, dBuV

Scale/Div

Description   Sets the logarithmic units for the vertical divisions.

Operation   1. Press (Amplitude) > *Scale[F2]* repeatedly to select the vertical division units.

Scale Range: 10, 5, 2, 1

Display
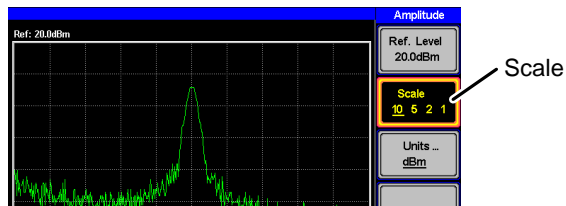
Autoset

The Autoset function searches the peak signals and picks the signal peak with the maximum amplitude, and then shows it in the display.

Using Autoset

Operation   1. Press [Autoset] > *Autoset[F1]*.

Autoset Range   Amplitude: Over the full amplitude range.

Span: Over the full span range.

Example:
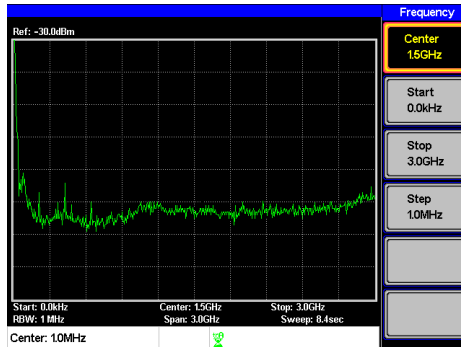
Before Autoset, default state
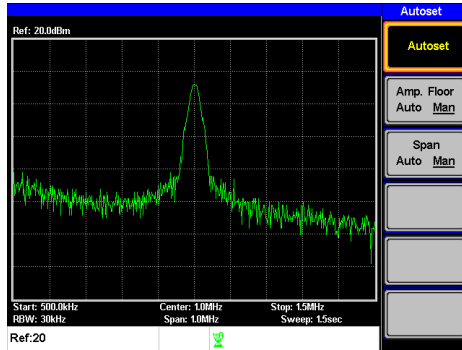
After Autoset

⚠ Note   RBW setting is reset to Auto when the Autoset function is
                used.

Limiting the Autoset Vertical Search Range

Description   You can set the amplitude floor so that the signals lower than
                the setting will be ignored by the Autoset search.

Operation   1. Press 〔Autoset〕 > *Amp.Floor[F2]* and switch the range from
                    Auto to Man.

                2. Enter the amplitude limit with the number pad and Enter
                    key.

                    Range: −50 to +20dBm

⚠ Note   See page 39 for setting the amplitude units.

Limiting the Autoset Horizontal Search Range

Description   You can change the frequency span limit in the display to get a better view of the Autoset result. By default, the frequency span after Autoset is set at 3MHz.

Operation   1. Press (Autoset) > *Span[F3]* and switch the range from Auto to Man.

2. Enter the span frequency for the Autoset search.

Manual Range: Full amplitude range.

Marker

A Marker shows the frequency and amplitude of a waveform point. The ISA-730 can activate up to 5 markers or marker pairs simultaneously.

The marker table and peak table functions help editing and viewing multiple markers in a single display.

The delta marker function allows you to see the frequency and amplitude differences between reference markers.

The ISA-730 can automatically move a marker to various locations including the peak signal, center frequency, and start/stop frequency. Other marker operations regarding signal peaks are available in the Peak Search function.

- Search for Peaks→ from page 52

- Peak Table→ from page 53

Activating a Marker

There are two basic marker types, normal markers and delta markers. Normal markers are used to measure the frequency/time or amplitude of a point on the trace. Delta markers are used to measure the difference between a reference point and a selected point on the trace.

Activate a Normal Marker

Operation   1. Press $\boxed{\text{Marker}}$ > *Marker[F1]* and select a marker number.

                    Marker: 1~5

                  2. Press *[F2]* to turn the selected marker on.

                  3. Press *Mode[F3]* and set the marker mode to Normal.

                  4. The display will show the marker on the trace (centered by default) with the marker measurement at the top of the display.

Maker No., Frequency, Amplitude
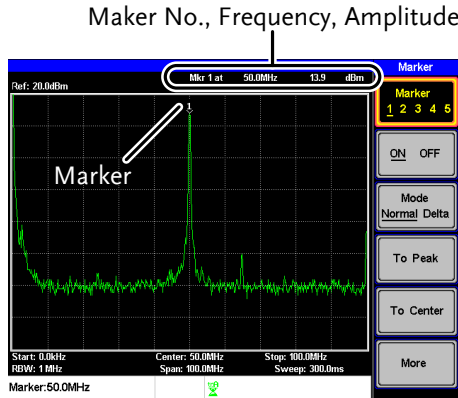
Activate a Delta Marker

Description   Delta markers are marker pairs that measure the difference in frequency and amplitude between a reference marker and a delta marker.

When delta markers are activated, the reference and delta marker appear at the position of the selected marker, or in the center of the display if the selected marker has not yet be activated.

The marker measurement is located at the top of the display, under the "normal marker" measurement.

Delta Markers   Ref: Reference marker, designated as $\underset{\vee}{1}$.

Delta: Delta marker, designated as $\overset{\blacktriangle}{\underset{\blacktriangledown}{1}}$.
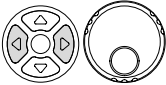
Operation

1. Press (Marker) > *Marker[F1]* and select a marker number.

2. Press *[F2]* to turn the selected marker on.

3. Press *Mode[F3]* to set the mode to Delta to activate the delta marker.

Delta maker No., Frequency, Amplitude
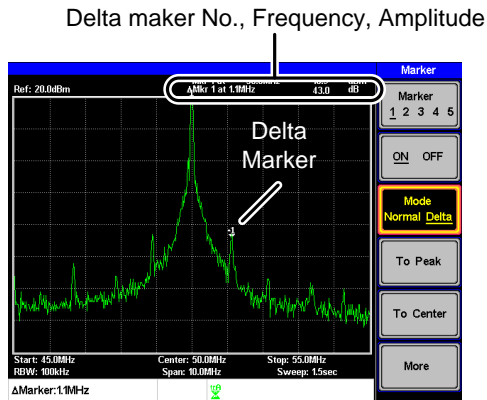
Move Marker Manually

Operation

1. Press (Marker) > *Marker[F1]* and select a marker number.

2. Use the left/right arrow keys to move the marker one screen division at a time or the use the scroll wheel to move the marker in fine increments (one pixel at a time).

3. Alternatively, the numeric keypad can be used to directly enter the frequency of the marker position.
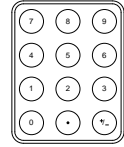
Move Marker to Preset Locations

Preset conditions
The currently selected marker (normal marker or delta marker) can be moved to a number of preset positions:

Center:	Move to center frequency.
Peak	Move to the highest peak.
Start:	Move to start frequency.
Stop:	Move to stop frequency.
Step:	Move to step frequency.
Ref. Level:	Move to reference level amplitude.

⚠ Note
When a marker is moved to a preset position the span and other settings may be automatically changed.

Move marker to peak:
1. Press (Marker) > *To Peak[F4]*.

Move marker to center:
2. Press (Marker) > *To Center[F5]*.

Move marker to
3. Press (Marker) > *More[F6]>Marker to ...[F4]* and select one of

other positions	the preset positions:

Marker to Start[F2]

Marker to Stop[F3]

Marker to Step[F4]

Marker to Ref. Level[F5]

Move Marker to Trace

Description	The Marker Trace function moves the selected marker to the currently active trace.

Operation
1. Press (Marker)> *Marker[F1]* and select a marker number.

2. Press *More[F6]>Marker Trace* and select a trace to assign the selected marker to. If *Auto* is selected, the selected marker is automatically assigned a trace.

   Marker Trace: Auto, A, B, C

3. In the example below, marker 1 is set to trace B.

Marker 1, Trace B
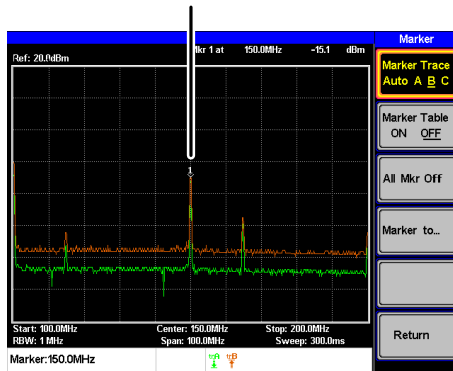
Turn All Markers On or Off

Description	All markers that have been activated, both normal and delta markers, can be turned off at the same time with the All Mrk Off function.
Operation	1. Press (Marker) > *Marker[F1] >More[F6]>All Mrk Off[F3]* and turn all the markers off.

Show Markers in Table

Description	The ISA-730 has a Marker Table function to show all the active markers and measurements at once.
Operation	1. Press (Marker) > *Marker[F1] >More[F6]>Marker Table[F2]* and turn the marker table on.

2. The display will split into two screens. The bottom half will show the Marker Table with the marker No. (normal, reference or delta), frequency and the amplitude of the marker.
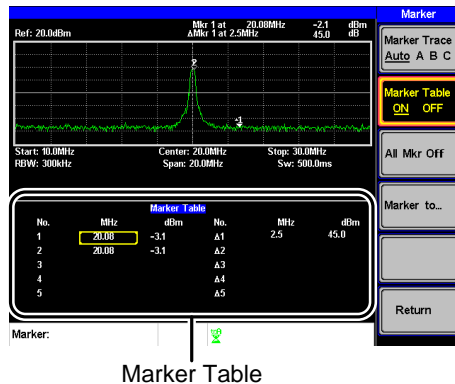
Marker Table

Edit Markers in Marker Table

Description

1. While the Marker Table function is the active function, the position of each marker and delta marker can be edited within the marker table.

2. Use the arrow keys to move the cursor to the frequency column of the desired marker.

Cursor
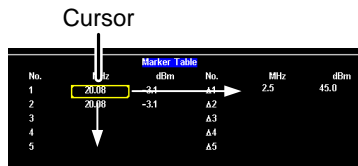
3. Enter the new position of the marker using the keypad and units keys.

Peak Search

The Peak Search key is used to find trace peaks. The currently active marker is used in conjunction with the peak functions to mark the peaks that are found. Peaks can be sorted by frequency or amplitude in the peak table.

Move Marker to Peak

Description	Move the active marker to the highest peak. The highest peak can be either found once or continuously.
Operation	1. Press (Marker)> *Marker[F1]* and select a marker number.
	2. Press (Peak Search)>*Peak Search[F1]*. The marker will move to the highest signal peak.
	3. To continually search for the peak each sweep, press, (Peak Search)>*More[F6]>Peak Track[F1]* and set *Peak Track* to ON.

Move Marker and Peak to Center

Description	The *Peak to Center* function moves the marker to the highest signal peak and moves the center frequency to that peak.

Operation	1. Press (Marker)> *Select Marker[F1]* and select a marker number.	
	2. Press (Peak Search) >*Peak to Center[F5]*.	

⚠ Note   3. The span will not be changed.

Search for Peaks

Description	The (Peak Search) key can be used to search for a number of different peaks.	
Peak Search	Next Peak:	Searches for next highest peak visible on the display.
	Next Peak Right:	Searches for the next peak to the right of the marker.
	Next Peak Left:	Searches for the next peak to the left of the marker.
	Min Search:	Searches for the lowest peak.
Operation	1. Press (Marker)> *Select Marker[F1]* and select a marker number.	
	2. Press (Peak Search) and select the type of peak you wish to find.	

Example:

Next Peak
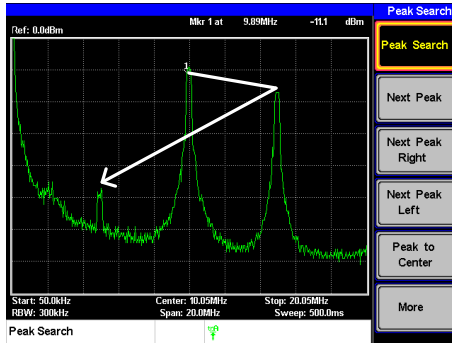
Example:

Next Peak Right
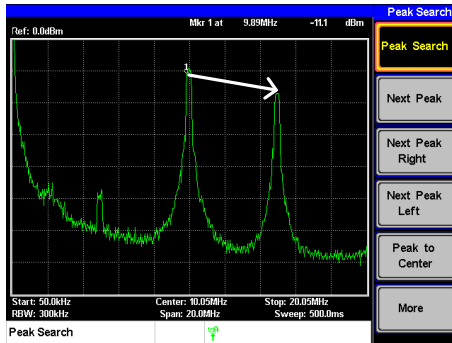
Example:

Next Peak Left
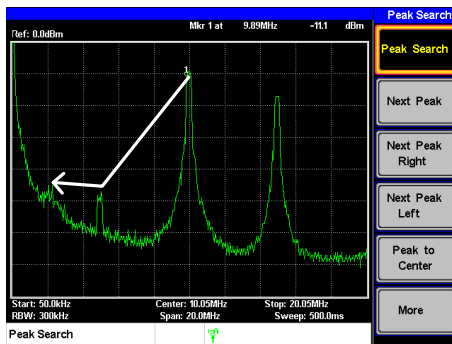
Peak Table

Description   The Peak Table function will display up to 5 peaks. The
                    amplitude and frequency for each peak is listed.

Operation   1. Press $\left(\begin{smallmatrix} Peak \\ Search \end{smallmatrix}\right)$ >More [F6]>Peak Table[F1] and turn the peak
                       table on.

                    2. Press Peak Sort[F2] and set the sorting type:

                       Freq: Sort by frequency in ascending order.
                       Amp: Sort by amplitude in ascending order.

Display   3. The bottom-half of the screen shows the peak table with
                       the peak marker no., frequency and amplitude.

Peak markers

Peak Table
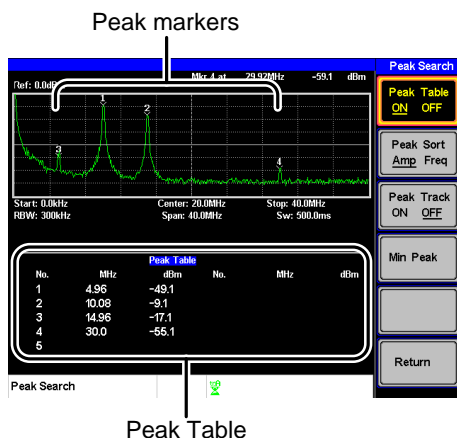
Measurement

This section describes how to use the automatic measurement modes. The ISA-730 includes the following measurements:

- ACPR → from page 56.
- OCBW → from page 59.

Channel Analysis Overview

Description	Channel analysis measurement includes ACPR (adjacent channel power) and OCBW (occupied bandwidth) measurements.	
Parameters	Channel bandwidth	The frequency bandwidth the target channel occupies. Range: Between 0Hz~3GHz (0Hz excepted)
	Channel Space	The frequency distance between each main channel. Range: Between 0Hz~3GHz

	Adjacent channel bandwidth 1 & 2	The frequency bandwidth the adjacent channels occupy.
		Range: Between 0Hz~3GHz (0Hz excepted)
	Adjacent channel offset 1 ~ 2	The frequency distance between the adjacent channels and main channel.
		Range: 1 Between 0Hz~3GHz (0Hz excepted)
	OCBW%	The ratio of occupied bandwidth to the amount of power consumed. Range: 0% to 100%, 0.1% resolution.

ACPR

Description   Adjacent channel power refers to the amount of power leaked to the adjacent channel from the main channel. This measurement is a ratio of the main channel power to power in the adjacent channel.

Example

Offset 1

Offset 2

Channel spacing

To next main channel

Operation:

Setting up the main channel
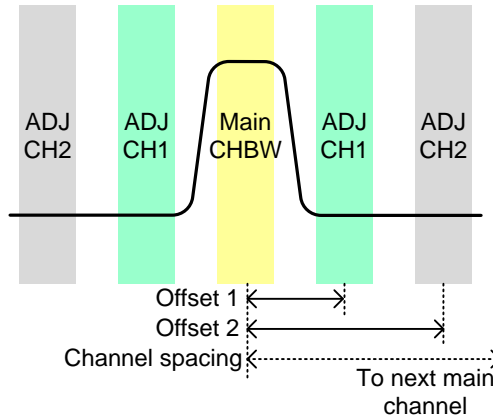
1. Press (Meas) > *ACPR[F2]* and turn ACPR on.

- Any other measurement mode will automatically be disabled.

2. The display splits into two screens. The top screen shows the sweep waveform. The bottom screen shows the ACPR settings and measurement results in real time.

- Turn ACPR off to return back to the normal mode.
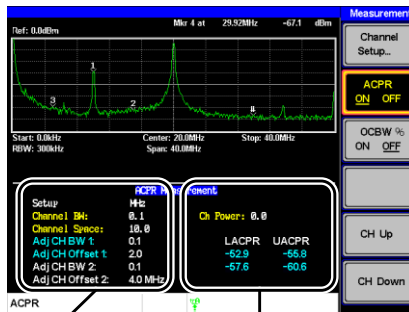
Channel setup   Measurements

3. Press *Channel Setup…[F1]* and set the following:

Main CH BW[F1]	Set the bandwidth of the main channel.
Main CH Space[F2]	Specify the channel spacing.

Note   The main channel bandwidth and space settings are shown in the setup area at the bottom of the screen, not on the soft-key icon.

Channel BW ⟶
Channel space ⟶
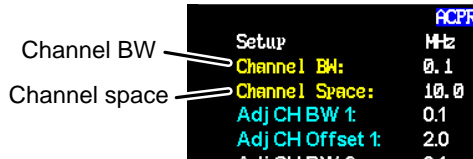
Operation: 1. Press *ADJCH Setup…[F3]* to setup the adjacent channels:

Setting up the
adjacent channel(s)

Adj CH BW 1[F1]	Sets the bandwidth of the 1st adjacent channel.
Adj CH Offs 1[F2]	Sets the channel offset of the 1st adjacent channel.
Adj CH BW 2[F3]	Sets the bandwidth of the 2nd adjacent channel.

Adj CH Offs 2[F4]   Sets the channel offset of the 2nd adjacent channel.

Note   The adjacent channel bandwidth and space settings are shown in the setup area at the bottom of the screen, not on the soft-key icons.

Adj CH1 settings ⎯⎯⎯

Adj CH2 settings ⎯⎯⎯

Channel Space:	10.0
Adj CH BW 1:	0.1
Adj CH Offset 1:	2.0
Adj CH BW 2:	0.1
Adj CH Offset 2:	4.0 MH

ACPR
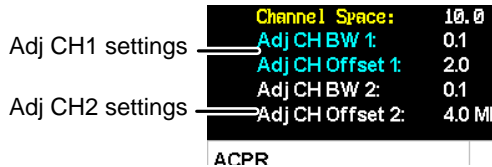
Move Channels Up/Down

1. Press the (Meas) again or press *Return[F6]* repeatedly to return to the start of the Measure menu tree.

2. Press CH Up[F5] to go to the next main channel.

3. Press CH Down[F6] to go to the previous main channel.

⚠ Note   The channel space (Main CH Space) setting determines where the next main channel is located.

OCBW

Description   Occupied bandwidth measurements are used to measure the power of the occupied channel as a percentage to the power of the channel.

Example

Operation:
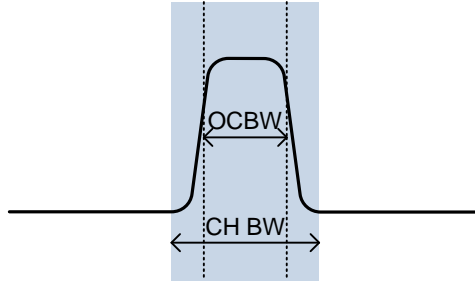
Setting up the main channel

1. Press (Meas) > *OCBW %[F3]* and turn OCBW on.

• Any other measurement mode will automatically be disabled.

2. The display splits into two screens. The top shows the channel bandwidth. The bottom screen shows the OCBW measurement results in real time.

• Turn OCBW off to return back to the normal mode.
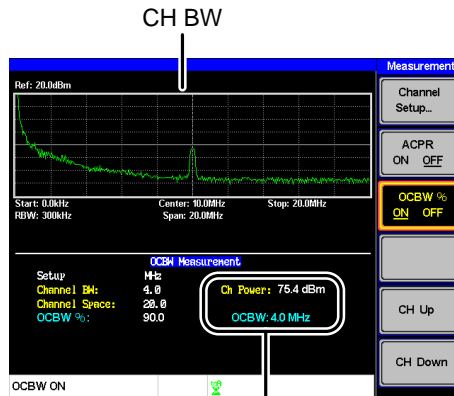
Channel power and OCBW power results

3. Press *Channel Setup…[F1]* and set the following:

Main CH BW[F1]   Set the bandwidth of the main
                    channel.

Main CH Space[F2]   Specify the channel spacing.

Note   The main channel bandwidth and space settings are shown in
                the setup area at the bottom of the screen, not on the soft-key
                icon.

Channel BW
Channel space

Move Channels   1. Press (Meas) again or press *Return[F6]* repeatedly to
Up/Down   return to the start of the Measure menu tree.

                2. Press CH Up[F5] to go to the next main channel.

                3. Press CH Down[F6] to go to the previous main channel.

⚠ Note   The channel space (Main CH Space) setting determines
                where the next main channel is located.

Limit Line Testing

The Limit Line function is used to set the upper or lower amplitude limits over the entire frequency range. The limit lines can be used to detect whether the input signal is above, below or within the limit lines.

The limit lines can be manually edited using 10 frequency points from the start to the stop frequencies.

To save and recall limit lines, please see page 79.

Activate a Limit Line

Operation

1. Press (Limit Line) to enter the Limit Line menu.

2. Press *H Limit[F1]* or *L Limit[F2]* and turn the high or low limit on or off.

    H Limit/L Limit: On, Off

- The H Limit is shown as a blue line.

- The L Limit is shown as a pink line.

High limit line

Low Line
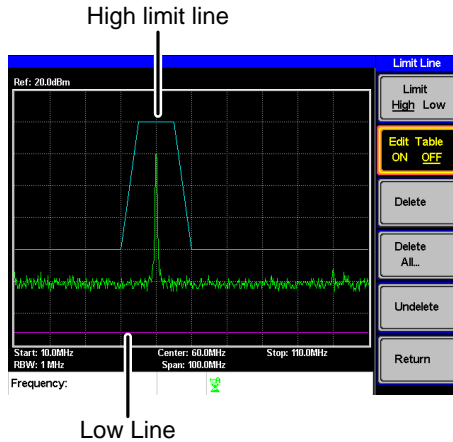
Creating a Limit (Point by Point)

Description   Create a limit manually, point by point. Ten manually selected frequency points can be used to create the upper or lower limit line.

Operation   1. Press (Limit Line) > *Limit[F1]* and select the limit line you wish to edit.

Limit: High, Low

2. Press *Edit Table[F2],* and turn the edit table on*.*

3. The ISA-730 is split into two screens. The top screen shows the trace and the selected limit line (high or low) and the bottom screen shows the limit line table.

Spectrum display
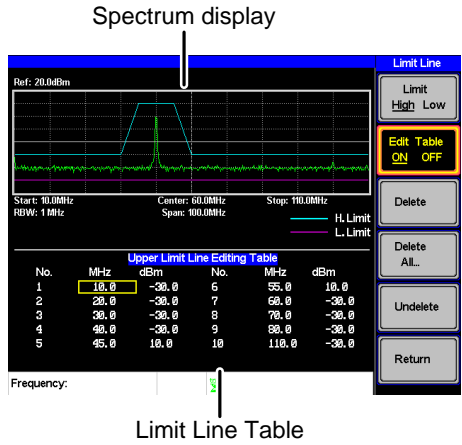
Limit Line Table

4. All 10 points will be displayed in a limit line table at the bottom of the display. By default, each point is set to 0dBm.

5. Use the arrow keys to move the cursor to the frequency column of the desired point.

Cursor
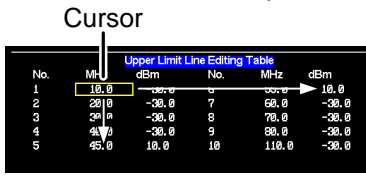
6. Enter the new frequency and amplitude of the point using the keypad and the unit keys.

7. Repeat steps 3-5 for the remaining points (A maximum of ten points).

8. To delete the selected point, press *Delete [F3]*.

9. To delete all the points, press *Delete All… [F4]*.

- The points will revert to their default frequency and amplitude values.

10. To delete a point from the editing table, press Delete.

- The whole points, including the frequency value and the amplitude are removed. This command reduces the number of points used in the limit line.

11. Press *Undelete[F5]* the restore the last point that was deleted.

Pass/Fail Testing

Description   The Pass/Fail testing uses the limit lines as boundaries. When the input signal escapes the boundary of the limit lines, then the test is judged as a FAIL, if the signal stays within the boundary, the test is judged as a PASS.
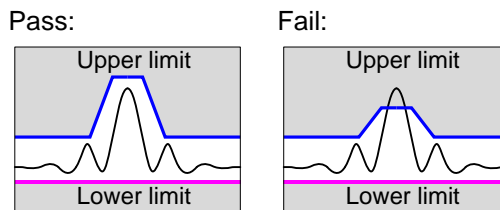
⚠️ Note	Before pass/fail testing can begin, limit lines for the upper and/or lower limits must first be saved and activated. See the page 62.

Operation	1. Press (Limit Line) >*Pass/Fail[F4]* to turn the testing on or off.
	2. The test result is updated in real-time at the bottom of the display.
	Pass: **PASS**
	Fail: **FAIL**

⚠️ Note	At least one limit line (high or low) must be turned on to enable testing.
	If only high limit line is on, each trace point has to be lower than the high limit line to get a PASS judgment, otherwise get the judgment will be FAIL.
	Conversely, if only low limit line is on then each trace point has to be higher than the low limit line to get a PASS, otherwise get the test will be judged a FAIL.

Bandwidth

BW key sets the resolution bandwidth (RBW). The resolution bandwidth and the sweep time are related. Please take into account how the sweep time is effected by the resolution bandwidth.

Resolution Bandwidth Setting (RBW)

Description	The RBW (Resolution Bandwidth) defines the width of the IF (intermediate frequency) filter that is used to separate signal peaks from one another. The narrower the RBW, the greater the capability to separate signals at close frequencies. But it also makes the sweep time longer under specific frequency spans (the display is updated less frequently).
Operation	1. Press (BW) > *RBW[F1]* and set the RBW to Auto or Man.
	2. Set the resolution bandwidth and unit for Man mode.
	Mode: Auto, Man
	Frequency Range: 1MHz, 300kHz, 100kHz
⚠ Note	The manual RBW is only available when the span≤10MHz. If the span is greater than 10MHz then the RBW is automatically set to Auto.

Trace

The ISA-730 is able to set the parameters of up to 3 different traces on the display at once. Each trace is represented by a different color and is updated with each sweep.

To save or recall traces to/from memory, see page 77.

Selecting a Trace

Description   Each trace (A, B, C) is represented by a different color. Trace A is green, trace B is orange and trace C is yellow. When activated, an icon for each trace color and function is shown at the bottom of the display. When a trace is selected, parameters can be set/edited from the Trace menu.

Display Icons
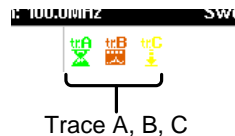
Trace A, B, C

Trace Type & Icon   The type of trace used determines how the trace data is stored or manipulated before being displayed. The analyzer updates each trace according to the type of trace used.

Clear & Write   The ISA-730 continuously updates the display with each sweep. This is the default trace type.

tr.B ↓ Peak Hold		The maximum or minimum points are maintained for the selected trace. The
tr.A ↓ Min Hold		trace points are updated each sweep if new maximum or minimum points are found.
tr.A View		View will hold the selected trace and stop updating the trace data for the selected trace. Pressing *View[F4]* will display the trace data that was cleared using the *Blank[F5]* key.
Blank		Clears the selected trace from the display and stores trace data. The trace data can be restored by pressing *View[F4]*.

Operation 1. Press (Trace)> *Trace[F1]* and choose a trace.

        Trace: A, B, C

2. Select the trace type:

Clear & Write[F2]

Peak Hold[F3]

View[F4]

Blank[F5]

More[F6]>Min Hold[F1]

| ⚠ Note | Traces B and C are set to *Blank* by default. |

Trace Math

Description	Performs trace math from two traces (A, B) and stores the results in trace A or swaps the data from trace A to trace B.

Math functions	A <--> B	Swaps the data from trace A to B and vice versa.
	A + B -> A	Adds trace A and B and stores the result in trace A.
	A – B -> A	Subtracts trace B from trace and stores the result in trace A.
	A + const ->A	Adds an offset to trace A.
	A – const ->A	Subtracts an offset from trace A.

| Operation | 1. Press (Trace) >*Trace Math..[F3]* and select a trace math |

function.

A <--> B *[F1]*

A + B -> A *[F2]*

A – B -> A *[F3]*

A + const ->A *[F4]*

A – const ->A *[F5]*

2. If A + const ->A or A + const ->A was selected, set the
   constant (offset value).

Constant: -40dBm ~ 40dBm

Average Trace

Description   The Average function averages the currently selected trace
                     for a user-defined number of times before it is displayed. This
                     feature smoothes the noise level, but has the drawback of
                     slowing down the display update rate.

Operation   1. Press (Trace)> *More[F6]* and toggle Avg on.

                     2. Set the number of averages.

                     Range: 4 ~ 100
                     Default: 4

Example:
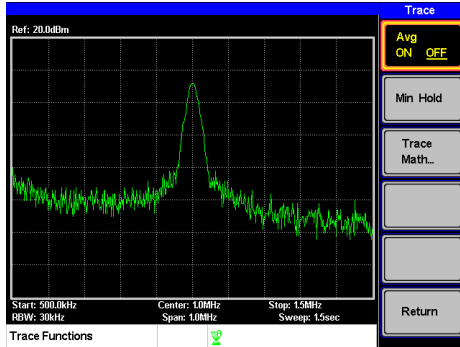
Average:Off
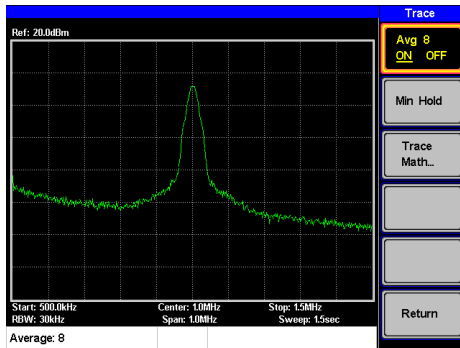
Average: On (8×)

Display

The Display key configures the basic display settings as well as the split screen modes.

Adjusting the LCD Brightness

Description   The LCD brightness levels can be adjusted to five pre-set
                   levels.

Operation   1. Press $\left(\text{Display}\right)$ > *LCD Dimmer[F1]* and use either the
                       number pad, the scroll wheel or arrow keys to set the
                       brightness.

Setting a Display Line (Reference Level Line)

Description   The Display Line function is used to super-impose a
                   reference level line over the traces.

Operation   1. Press $\left(\text{Display}\right)$ > *Display Line[F3]* to turn the display line on.

                   2. Set the display line level and press *Enter*.

Example:
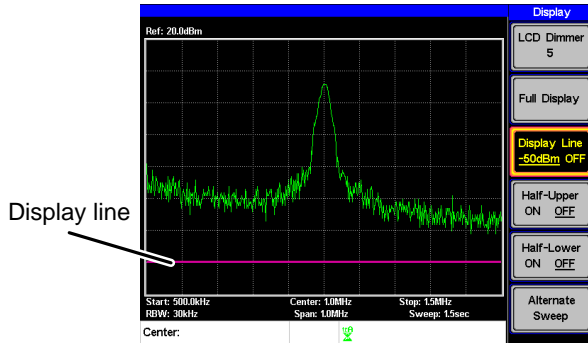
Display line

Display line set at -50dBm

Using the Video Out Port

Description   The ISA-730 has a dedicated VGA terminal to output the

display to an external monitor. The video output is always on.

Output resolution 480 x 640 (fixed)

Operation   1. Connect an external monitor to the rear

panel VGA terminal.

Split Spectrum View

Description   The split spectrum view is able to view two different sweep

ranges on the display at the same time using a split screen

view. The top and bottom view can have independent sweep

ranges, amplitudes, spans and other settings. However only

one split screen (top or bottom) can be swept each time.

Example

Upper spectrum

Lower spectrum
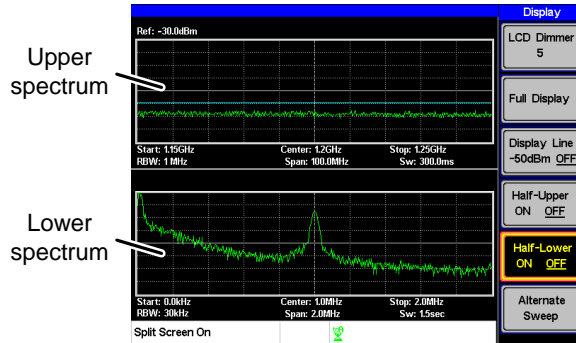
Split spectrum functions

Half-Upper   Half-Upper will put the spectrum analyzer into split screen mode. It will make the top sweep the active sweep and pause the bottom sweep. When Half-Upper is on, only the upper sweep parameters can be edited.

Half-Lower   Half-Lower will put the spectrum analyzer into split screen mode. It will make the bottom sweep the active sweep and pause the top sweep. When Half-Lower is on, only the lower sweep settings can be edited.

Alternate Sweep   This setting will alternate the sweep between the bottom and top spectrums. If alternate sweep is turned on, only the upper sweep parameters can be edited.

Operation

1. Press (Display) >*Half-Upper[F4]* or *Half-Lower[F5]* or *Alternate Sweep[F6]* to enable the split spectrum view.

- Turning Half-Upper on will automatically turn Half-Lower off.

- Turning Half –Lower on will automatically turn Half-Upper off .

- If Alternate Sweep is turned on, each sweep will alternate, but only the upper sweep parameters can be edited.

2. To return to a full-screen, single spectrum display, press *Full Display[F2]*.

⚠ Note

After exiting the split spectrum view, the analyzer will use the settings from the active window. The settings for the inactive screen will be retained for the next time that split spectrum view is used.

If the spectrum analyzer was in the Alternate mode, then the upper sweep settings will be returned.

Save/Recall Files

The ISA-730 can save and recall setup data, trace data and limit line data to and from internal memory. There are five memory locations for each save file type. These files cannot be saved to USB.

The Hardcopy key can be used to save image files to a USB flash drive.

Save/Recall Setup

Description	Setup data contains all the data necessary to recall the state of the ISA-730 to known state.
	Setup data contains the following data:
	Center frequency, Start frequency, Stop frequency, Step frequency, Ref. Level, Scale, Units, RBW
Save	1. To save the current settings, press (Memory) > *Setup To[F1]* and choose a memory location to save to with the arrow keys.
	Setup To: 1~5
	2. Press (kHz / μSec) Enter to execute the save.
Recall	1. To recall a setup, press (Memory) > *Setup From[F2]* and choose a memory location to recall from with the arrow

keys.

Setup From: 1~5

2. Press $\left(\begin{smallmatrix} kHz / \\ \mu Sec \end{smallmatrix}\right)$ Enter to execute the recall.

Save/Recall Trace Data

Description   The trace data can be saved/recalled for any of the A, B or C
                     traces to/from one of 5 pre-set internal memory locations. The
                     trace data cannot be recalled or saved to USB.

                     When saving or recalling trace data from a split spectrum,
                     only the active spectrum is saved/recalled.

Save   1. To save the current trace data, press (**Memory**) > *Save Trace
                         Data..[F3]*

                     2. Press Source Trace[F1] and select the source:

                         Source: A, B, C

                     3. Press Destination[F2] and select the memory location to
                         save to:

                         Destination: 1~5

                     4. Press *Start[F5]* to save the selected trace data.

Recall	5. To recall trace data, press (Memory) > *Recall Trace Data..[F3]*
	6. Press *Source Trace[F1]* and select the memory location to recall from:
	Source: 1~5
	7. Press *Destination[F2]* and select the destination trace
	Destination: A, B, C
	8. Press *Start[F5]* to recall the selected trace data.

Save/Recall Limit Lines

Description	Upper and lower limit lines can be saved to one of 5 pre-set internal memory locations. The limit line data cannot be saved to USB.
Save	1. To save the current upper and lower limit lines, press (Memory) > *Limitln to[F5]* and choose a memory location to save to with the arrow keys.
	Limit line: 1~5
	2. Press (kHz / μSec) Enter to execute the save.
Recall	3. To recall pre-saved upper and lower limit lines, press

(Memory) > *LimitIn from[F6]* and choose a memory location to recall from with the arrow keys.

Limit line: 1~5

4. Press (kHz / μSec) Enter to execute the recall.

Saving an Image File (Hardcopy)

Description   The Hardcopy key can be used to save a screenshot of the display to a USB flash drive. The screen shot is saved as a bitmap file.

Operation   1. Insert a USB flash drive into the USB port.

2. Press (Hardcopy) and the image file will begin saving.

- Wait a few moments for the file to save. When the file has finished saving, "Screen Saved OK" will appear at the bottom of the display.

⚠ Note   The file name will be automatically created in the following format:
File name: SCRXX.bmp

Where XX is a number that is incremented each time the file is saved.

⚠ Warning Do not remove the USB drive until the file has completed saving.

Hardcopy Setup

Description The Hardcopy Setup key is used set the image file properties of the bitmap file that is created when the Hardcopy key is pressed.

Ink Normal: This is the normal, default image setting.

Ink Saving: This will invert all the colors on the display so that the file will conserve ink when printed.

Operation 1. Press (Hardcopy Setup) and choose the image type:

Ink Normal[F1]

Ink Saving[F2]

⚠ Note The next time the Hardcopy key is pressed, the image will be saved using the settings above.

Load Default Settings

Description   The Preset key is used to load the default settings. The
                     default settings are listed in the appendix on page 119.

Operation   1. Press `Preset`.

                     • The system will load the preset settings and the screen will
                       update with the new settings.

⚠ Note   The default settings cannot be changed.

System Settings

System Information

Description	The System Information displays the following:

	Serial Number:	XX digit serial number
	HW Version:	Hardware version
	FW Version:	Firmware version
	SW Version:	Software version
	Language:	Shows the language number as seen in the System>Language menu.

Operation	1. Press (System)>*Information[F4]* to display the system information.
	• The system information will be displayed on the system menu soft-keys.

Example

System
information
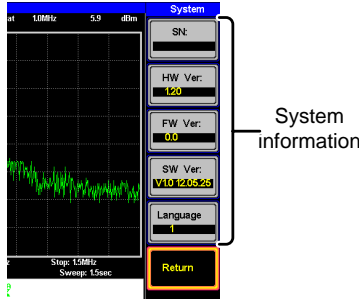
System Language

Description   The language option sets the icon display language.

Operation   1. Press (System)>*Language…[F3]* to bring up the Language
                     menu.

                     2. Choose a system language. The language number is the
                        number that will be displayed in the system information.

                     Language 1 English   Sets the language to English

                     Language 2 Chinese S   Sets the language to simplified
                                             Chinese

REMOTE CONTROL

This chapter describes basic configuration of IEEE488.2 based remote control.

Interface Configuration

Configure Remote Interface

USB configuration	PC side connector	Type A, host
	ISA side connector	Rear panel Type B, slave
	Speed	1.1/2.0 (full speed)
RS232 configuration	PC side connector	RS232 male port
	ISA side connector	RS232 female port
	Baud Rate:	9600, 19200, 38400, 57600, 115200.
	Parity:	None, Even, Odd, Space, Mark, Multidrop.
	Stop bit:	1, 1.5, 2.
	Data bit:	5, 6, 7, 8

Description	The ISA-730 can use either the type B USB port or the RS232 port on the rear panel for remote control.
	When using the USB B port, the ISA-730 uses a USB driver to simulate an RS232 connection with a PC via USB. It is these RS232 settings that are configured for remote control.
	Before using the USB B port for remote control, please install the USB driver. See page 22 for details.

Panel operation   1. USB Connection:

Connect a USB cable from the PC to the

rear panel USB B port.
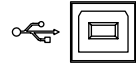
2. RS232 Connection:

Connect an RS232C cable from the PC to

the rear panel RS232 port.
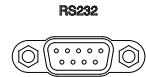
3. Press $\left(\text{System}\right)$ >*Serial Port…[F1]*> Serial[F1] to enter the

remote configuration.

4. Set the following RS-232 settings using the arrow keys:

Baud Rate[F1]: 9600, 19200, 38400, 57600, 115200.

Parity[F2]:   None, Even, Odd, Space, Mark,

Multidrop.

Stop Bit[F3]:   1, 1.5, 2.

Data[F4]:   5, 6, 7, 8

Remote Control Function Check

Functionality check Invoke a terminal application such as MTTTY (Multi-Threaded

TTY).

To check the COM port No., see the Device Manager in the

PC.

For WinXP go to;

Control panel → System → Hardware tab.

Run this query command via the terminal after the instrument has been configured for remote control (page 86).

*idn?

This should return the Manufacturer, Model number, Serial number, and Firmware version in the following format.

- RS PRO, ISA-730, *XXXXXXX*, V.VV

Manufacturer: RS PRO

Model number : ISA-730

Serial number : XXXXXXXXXXXX

Firmware version : V.VV

Command Syntax

Compatible	IEEE488.2	Partial compatibility
Standard	SCPI, 1999	Partial compatibility

Command Structure   SCPI (Standard Commands for Programmable Instruments) commands follow a tree-like structure, organized into nodes. Each level of the command tree is a node. Each keyword in a SCPI command represents each node in the command tree. Each keyword (node) of a SCPI command is separated by a colon (:).

For example, the diagram below shows an SCPI sub-structure and a command example.
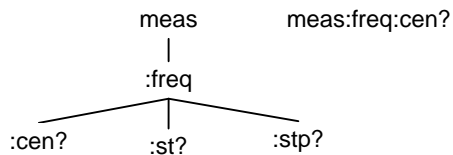
Command types   There are a number of different instrument commands and queries. A command sends instructions or data to the unit and a query receives data or status information from the unit.

Command types

Single Command	A single command with/without a parameter
Example	meas:freq:cen 100 MHz
Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned.
Example	meas:freq:cen?

Command Format

Meas:freq:cen   100 khz

   1   2 3 4 5
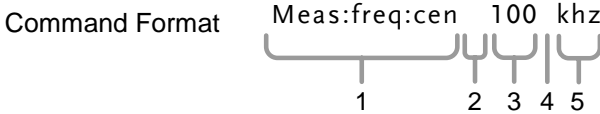
1. Command header   4. Optional space

2. Space   5. Unit or suffix.

3. Parameter 1

Common Input/Return Parameters

Type	Description	Example
<Boolean>	Boolean logic	0, 1
<NR1>	integers	0, 1, 2, 3
<NR2>	decimal numbers	0.1, 3.14, 8.5
<NRf>	any of NR1, 2	1, 1.5
<freq>	<NRf> + unit	2.5 mhz

		Unit = kHz, MHz, GHz.
		Note: The unit can be omitted (defaults
		to currently set unit).
<refl>	<NRf> + unit -30 dBm	
	Unit = dBm, dBmV, dBuV	
	Note: The unit can be omitted (defaults	
	to currently set unit).	
<ampl>	NR3 +unit 30.0 dBm	
	Note: The unit can be omitted. (Unit	
	defaults to current unit)	
<trace data>	{ -92, -91, ……., -89, -92, -92, -91 }	
	CSV data that represents each point in a	
	trace.	
<string>	ASCII string data.	

Message Terminator	LF	Line feed code (0x0A)

Command List

IEEE488.2 Standard Commands

*IDN?   ⟶ Query

Description	Queries the manufacturer, model number, serial number, and firmware version of the instrument.
Query Syntax	*IDN?

Return parameter	<string>	Returns the instrument identification as a string in the following format:
		RS PRO, ISA-730, XXXXXXXX, V.VV
		Manufacturer: RS PRO
		Model number : ISA-730
		Serial number : XXXXXXXX
		Firmware version : V.VV

Sweep Commands

Si   ⬭Set⬭ ⟶

Description	Stops the sweep.
Example	si

Sn   ⬭Set⬭ ⟶

Description	Continues a stopped sweep.
Example	sn

Ts   ⬭Set⬭ ⟶

Description	Resets the sweep and starts it once (i.e., sweeps one time).

Example	ts

Frequency Commands

meas:freq:cen

Set →

→ Query

Description	Sets or queries the center frequency.
Syntax	meas:freq:cen <freq>
Query Syntax	meas:freq:cen?
Parameter	<freq>	Center frequency.
Return parameter	<freq>	Returns the frequency and unit.
Example	meas:freq:cen 100 khz
	Sets the center frequency to 100kHz.
Query example	Meas:freq:cen?
	>100 kHz

meas:freq:st

Set →

→ Query

Description	Sets or queries the start frequency.
Syntax	meas:freq:st <freq>

Query Syntax	meas:freq:st?	
Parameter	<freq>	Start frequency
Return parameter	<freq>	Returns the start frequency and unit
Example	meas:freq:st 100 mhz	
	Sets the start frequency to 100MHz	
Query Example	meas:freq:st?	
	> 100000 kHz	

meas:freq:stp

Set →
→ Query
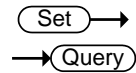
Description	Sets or queries the stop frequency.	
Syntax	meas:freq:stp <freq>	
Query Syntax	meas:freq:stp?	
Parameter	<freq>	Stop frequency
Return parameter	<freq>	Returns the stop frequency and unit
Example	meas:freq:stp 100 mhz	
	Sets the stop frequency to 100MHz	
Query Example	meas:freq:stp?	
	> 100000 kHz	

Span Commands

meas:span
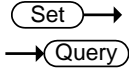
Description	Sets or queries the frequency span.
Syntax	meas:span <freq>
Query Syntax	meas:span?
Parameter	<freq>	Span frequency range
Return parameter	<freq>	Returns the span and unit
Example	meas:span 10 mhz
	Sets the span to 10MHz
Query Example	meas:span?
	> 10000.0 kHz

meas:span:full

Description	Sets the span to the full span.
Syntax	meas:span:full

Amplitude Commands

meas:refl:unit
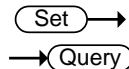
Description	Sets the reference level unit.	
Syntax	meas:refl:unit {1|2|3}	
Query Syntax	meas:refl:unit?	
Parameter/	1	dBm
Return parameter	2	dBmV
	3	dBuV
Query Example	Meas:refl:unit?	
	>1	
	The reference level units are dBm.	

meas:refl

Set →
→ Query
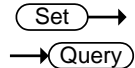
Description	Sets or queries the reference level.	
Syntax	meas:refl <refl>	
Query Syntax	meas:refl?	
Parameter	<refl>	Reference level in the currently selected unit (from the meas:refl:unit command).
Return parameter	<refl>	Returns reference level and unit.
Example	meas:refl 10	
	Sets the reference level to 10 dBm (for unit = dBm).	

Query Example	Meas:refl?
	>10 dBm

Marker and Peak Search Commands

meas:mark:on

Set →

→ Query

Description	Sets or queries which markers are turned on.
Syntax	meas:mark:on {<NR1>|all}
Query Syntax	meas:mark:on <NR1>?
Parameter	<NR1>	Marker number 1~ 5.
	all	All markers.

Return parameter	ON	The selected marker is on.
	OFF	The selected marker is off.
Example	meas:mark on 1	
	Turns marker 1 on.	
Query Example	Meas:mark 1?	
	>OFF	

meas:mark:off   Set ⟶

Description	Sets which markers are turned off.
Syntax	meas:mark:off {<NR1>|all}
Parameter	<NR1>	Marker number 1~ 5.
	All	All markers.
Example	meas:mark off 1	
	Turns marker 1 off.	

meas:mark:norm   Set ⟶

Description	Sets the selected marker to normal mode.
Syntax	meas:mark:norm <NR1>
Parameter	<NR1>	Marker number 1~ 5.
Example	meas:mark:norm 1	
	Sets marker 1 to normal mode.	

meas:mark:norm:freq? →(Query)

Description	Queries the frequency of the selected normal marker.	
Query syntax	meas:mark:norm:freq <NR1>?	
Parameter	<NR1>	Marker number 1~ 5.
Return parameter	<freq>	Returns the frequency and unit of the selected marker.
Example	meas:mark:norm:freq 1?	
	>1.5GHz.	

meas:mark:norm:level? →(Query)

Description	Queries the amplitude of the selected normal marker.	
Query syntax	meas:mark:norm:level <NR1>?	
Parameter	<NR1>	Marker number 1~ 5.
Return parameter	<amp>	Returns the amplitude and unit of the selected marker.
Example	meas:mark:norm:level 1?	
	>10.0dBm.	

meas:mark:delta (Set)→

Description	Sets the selected marker to delta mode. It also sets the relative frequency of the delta marker (in relation to the

normal marker frequency).

Syntax	meas:mark:delta <NR1> <freq>	
Parameter	<NR1>	Marker number 1~ 5.
	<freq>	Relative frequency of the delta marker.
Example	meas:mark:freq 1 10 MHz	
	Turns delta marker 1 on and sets its offset to 10MHz.	

meas:mark:delta:freq?   → Query

Description	Queries the (relative) frequency of the selected delta marker.	
Query syntax	meas:mark:delta:freq <NR1>?	
Parameter	<NR1>	Marker number 1~ 5.
Return parameter	<freq>	Returns the relative frequency and unit of the selected delta marker.
Example	meas:mark:norm:freq 1?	
	>12.0kHz.	

meas:mark:delta:level?   → Query

Description	Queries the amplitude of the selected delta marker.	
Query syntax	meas:mark:delta:level <NR1>?	
Parameter	<NR1>	Marker number 1~ 5.

Return parameter	<amp>	Returns the amplitude and unit of the selected delta marker.

Example	meas:mark:delta:level 1?
	>10.0dBm.

meas:mark:tomin   Set →

Description	Sets the selected marker to the minimum peak.

Syntax	meas:mark:tomin <NR1>

Parameter	<NR1>	Marker number 1~ 5.

Example	meas:mark:tomin 1
	Sets marker 1 to the minimum peak.

meas:mark:topeak   Set →

Description	Sets the selected marker to the peak.

Syntax	meas:mark:topeak <NR1>

Parameter	<NR1>	Marker number 1~ 5.

Example	meas:mark:topeak 1
	Sets marker 1 to the peak.

meas:mark:tonp   Set →

Description	Moves the selected normal or delta marker to the next peak.

Syntax	meas:mark:tonp <NR1>

Parameter	<NR1>	Marker number 1~ 5.

Example	meas:mark:tono 1
	Moves marker 1 to the next peak.

meas:mark:trace   ⊂ Set ⟩⟶

Description	Sets the selected marker to the selected trace.

Syntax	meas:mark:topeak <NR1> <trace>

Parameter	<NR1>		Marker number 1~ 5.
	<trace>	0	Auto (auto assign a trace)
		1	Trace A
		2	Trace B
		3	Trace C

Example	meas:mark:trace 1 2
	Sets marker 1 to trace B.

Trace Commands

meas:tra:val1:val2   ⊂ Set ⟩⟶

Description	Sets the mode for the selected trace.		
Syntax	meas:tra <trace><mode>		
Parameter	<trace>	1	Trace A
		2	Trace B
		3	Trace C
	<mode>	1	Clear and write mode
		2	Peak hold mode
		3	View mode
		4	Blank mode
		5	Minimum hold mode
Example	meas:tra 1 1		
	Sets trace A to clear and write mode.		

meas:tra:avg:on $\qquad$ (Set)⟶

Description	Turns the average function on and sets the number of averages for the slected trace.		
Syntax	meas:tra:avg:on <trace> <NR1>		
Parameter	<trace>	1	Trace A
		2	Trace B
		3	Trace C

<NR1>	4~20	Number of averages.

Example	meas:tra:avg:on 1 4
	Sets the number of averages used for Trace A to 4.

meas:tra:avg:off

(Set) ⟶

Description	Turns the average function off for the selected trace.		
Syntax	meas:tra:avg:on <trace>		
Parameter	<trace>	1	Trace A
		2	Trace B
		3	Trace C
		all	All traces
Example	meas:tra:avg:off all		
	Turns the average function off for all the traces.		

meas:tra:read

⟶ (Query)

Description	Returns the all the trace data for the selected trace.		
Query syntax	meas:tra:read? <trace>		
Parameter	<trace>	1	Trace A
		2	Trace B
		3	Trace C
		all	All traces

Return parameter	<trace data>	Comma separated data values encapsulated in brackets. i.e., {-92, -91, -90, ………-81}
Example	meas:tra:read? 1	
	>{ -92, -91, -90, -90, -90, -88, ……., -89, -92, -92, -91 }	
	Returns the trace data for the selected trace(s). A total of 501 trace points are returned, from the start frequency to the stop frequency. If "all" is selected, the trace data is returned in three lots, {trace A}{trace B}{traceC}. The units are in decibels. If the selected trace is not active, 0s will be returned for each trace point.	

Power Measurement Commands

meas:acpr

$\boxed{\text{Set}} \longrightarrow$
$\longrightarrow \boxed{\text{Query}}$
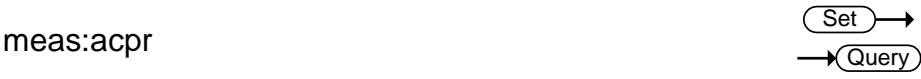
Description	Turns the ACPR function on or off, or queries its status.
Syntax	meas:acpr {on|off}
Query Syntax	meas:acpr?

21/11/2016 Version No. 002
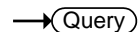
Parameter/ Return parameter	on	ACPR mode = on
	off	ACPR mode = off

Example	meas:acpr on
	Turns the ACPR function on.

meas:acpr:lower? → Query

Description	Returns the lower ACPR measurement result for the selected channel offset (offset 1 or 2).

Query syntax	meas:acpr:lower? {1|2}

Parameter	1	Channel offset 1
	2	Channel offset 2

Return parameter	<NR2>	Returns the ACPR measurement result.

Example	meas:acpr:lower? 1
	>6.0

meas:acpr:upper? → Query

Description	Returns the upper ACPR measurement result for the selected channel offset (offset 1 or 2).

Query syntax	meas:acpr:upper? {1|2}

Parameter	1	Channel offset 1
	2	Channel offset 2

Return parameter	<NR2>	Returns the ACPR measurement result.
Example	meas:acpr:upper? 1	
	>-11.8	

meas:ocbw

$\boxed{\text{Set}} \rightarrow$
$\rightarrow \boxed{\sqrt{\text{Query}}}$

Description	Turns the OCBW function on or off, or queries its status.	
Syntax	meas:ocbw {on|off}	
Query Syntax	meas:ocbw?	
Parameter/ Return parameter	On	OCBW mode = on
	Off	OCBW mode = off
Example	meas:ocbw on	
	Turns the OCBW function on.	

meas:ocbw:bw?

$\rightarrow \boxed{\sqrt{\text{Query}}}$

Description	Returns the OCBW in kHz.	
Query syntax	meas:ocbw:bw?	
Return parameter	<freq>	Returns the OCBW in kHz
Example	meas:ocbw:bw?	
	>4000kHz	

meas:ocbw:chpw?

$\rightarrow \boxed{\sqrt{\text{Query}}}$

Description	Returns the channel power in the current unit.
Query syntax	meas:ocbw:chpw?
Return parameter	<power> Returns the channel power
Example	meas:ocbw:chpw?
	>-63.5

Limit Line Commands

meas:lmtline:passfail

Set →
→ Query
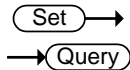
Description	Turns the Pass/Fail test on/off or queries its state.
Syntax	meas:lmtline:passfail {on|off}
Query Syntax	meas:lmtline:passfail
Parameter	on Turns the pass/fail test on.
	off Turns the pass/faill test off.
Return parameter	0 Fail
	1 Pass
Query example	meas:lmtline:passfail?
	>0

meas:lmtline:on

$\boxed{\text{Set}}\longrightarrow$

Description	Turns the limit lines on.
Syntax	meas:lmtline:on

meas:lmtline:off

$\boxed{\text{Set}}\longrightarrow$

Description	Turns the limit lines off.
Syntax	meas:lmtline:off

BW Commands

con:rbw:auto

$\boxed{\text{Set}}\longrightarrow$

Description	Sets the RBW to Auto.
Syntax	con:rbw:auto

con:rbw?

$\longrightarrow\boxed{\text{Query}}$

Description	Returns the RBW.
Query Syntax	con:rbw?

Return parameter	\<NR1\>	0	30kHz
		1	100kHz
		2	300kHz
		3	1MHz

Example	con:rbw?
	>1

con:rbw:man   (Set)⟶

Description	Sets the RBW for manual mode.

Syntax	con:rbw:man {0|1|2|3}

Parameter	\<NR1\>	1	100kHz
		2	300kHz
		3	1MHz

Example	con:rbw:man 1
	Sets the RBW to 100kHz.

con:rbw:mode?   ⟶(Query)

Description	Returns the RBW mode.

Query Syntax	con:rbw:mode?

Return parameter	auto	Auto mode
	manual	Manual mode

Example	con:rbw:mode?
	>auto

con:swt? →Query

Description	Returns the sweep time in milliseconds.
Query Syntax	con:swt?
Return parameter	<NRf>
Example	Con:swt?
	>1500

Display Commands

con:disp:split:upper Set →

Description	Turns on the split window function and sweeps the top window.
Syntax	con:disp:split:upper

con:disp:split:lower Set →

Description	Turns on the split window function and sweeps the bottom window.
Syntax	con:disp:split:lower

con:disp:split:alt $\overline{\text{Set}}$ ⟶

Description	Sweeps the upper and lower windows alternatively in the split window mode.
Syntax	con:disp:split:lower

con:disp:split:full $\overline{\text{Set}}$ ⟶

Description	Returns the spectrum analyzer to single window mode. The upper window is used as the active window.
Syntax	con:disp:split:full

Preset Commands

con:preset $\overline{\text{Set}}$ ⟶

Description	Loads the factory default settings. This is the equivalent to pressing the Preset key.
Syntax	con:preset

System Commands

con:sys:ser?

→ Query

Description	Returns the serial number.	
Query syntax	con:sys:ser?	
Return parameter	<string>	Returns the serial number in the following format:
		XXXXXXXX
Example	con:sys:ser?	
	> XXXXXXXX	

F~AQ~

- I connected the signal but it does not appear on screen.

- The trace is updated too slowly.

- I cannot see the trace on the screen.

- The performance does not match the specification.

I connected the signal but it does not appear on screen.

Run Autoset and let the ISA-730 find the best display scale for your target signal.

Press the Autoset key, then press *Autoset[F1]*. For details, see page 40.

The trace is updated too slowly on the screen.

The sweep time determines how often the trace is updated on the screen. To increase the sweep time, try reducing the span or using a wider RBW setting.

I cannot see the trace on the screen.

If you cannot see the trace on the screen, there may be a number of possibilities.

1. The trace is just off screen: Try to adjust the reference level with the amplitude key.

2. The trace may be in the "Blank" mode: Putting the trace into view mode will enable the trace to be viewed again.

The performance does not match the specification.

Make sure the device is powered On for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

For more information, contact your local dealer.

Appendix

ISA-730 Default Settings

The following default settings are the factory configuration settings for the spectrum analyzer (Function settings/Test settings).

Frequency	Center Frequency: 1.5GHz	Start Frequency: 0Hz
	Stop Frequency: 3GHz	CF Step: Auto
Span	Span: 3GHz	
Amplitude	Reference level: -30.0dBm	Scale Div: 10
	Units: dBm	
Autoset	Amp.Floor: Auto	Span: Auto
Marker	Marker: Off	
Peak Search	N/A	
Meas	ACPR: Off	OCBW: Off
Limit Line	H Limit: Off	L Limit: Off
	Pass/Fail: Off	
BW	RBW: Auto	
Trace	Trace: A: Clear&Write	Average: Off
Display	Full Display: Active	Display line: off
Memory	N/A	

Preset	N/A
Hardcopy	N/A
Hardcopy Setup	Ink Normal
System	N/A

ISA-730 Specifications

The specifications apply when the ISA is powered on for at least 30 minutes to warm-up to a temperature of 20˚C to 30˚C, unless specified otherwise.

Frequency

Frequency Range	Setting Range	150kHz to 3GHz
Center Frequency	Setting Resolution	0.1MHz
	Accuracy	within ±50kHz (frequency span : 0.3GHz to 2.6GHz, 20 ±5°C)
Frequency Span	Setting range	1MHz to 3GHz
	Accuracy	within ±3% (frequency span : 0.3GHz to 2.6GHz, 20 ±5°C)
Resolution Bandwidth	Setting Range	30KHz, 100KHz, 300KHz,1MHz,
SSB Phase Noise	-85dBc / Hz (typical, 500kHz offset, RBW : 30kHz, Sweep time: 1.5s, Span:1MHz@1GHz)	
Inherent Spurious Response	less than -45dBc @ -40dBm Ref. Level (typical less than -50dBc)	

Amplitude

Reference Level	Input Range	+20 to -40dBm
	Unit	dBm, dBV, dBµV
Average Noise Level	≤ -100dBm (typical, center frequency : 1GHz RBW : 30kHz)	

Frequency Characteristic	within ±3.0dB @300MHz~2.6GHz, within ±6.0dB @ 80~300MHz, 2.6~3GHz	
	Accuracy	Within ±2dB (1GHz);SPAN:5MHz; Ref. level 0dBm, input signal -10dBm
Input	Input Impedance	50ohm
	Input VSWR	less than 2.0@input att ≧10dB
	Input damage level	+30dBm (CW average power), 25VDC
	Input connector	N connector

Sweep

Sweep Time	Setting Range	300ms to 8.4s, auto (not adjustable)
	Accuracy	within ±2% (frequency span : full span)

General

Communication	Display	640*480 RGB color LCD
Interface	RS-232C	Sub-D female-D 9 pins
	USB Connector	USB Host/Device full speed supported
	USB Format	Supports FAT/FAT32 only
VGA Output	Sub-D female 15 pins	
Power Source	AC 100~240V, 50/60Hz	

Other

	Operating Temperature	5 to 45°C (Guaranteed at 25 ±5°C, without soft carrying case)
	Operating Humidity	Less than 45°C / 90%RH

	Storage Temperature	-20 to 60°C, less than 60°C / 70%RH
	Dimensions	296 (L) × 153 (W) × 105 (H) mm
	Weight	Approx. 2.2kg

ISA-730 Dimensions

Unit: mm

142.0

152.0

296.0

105.0

115.1
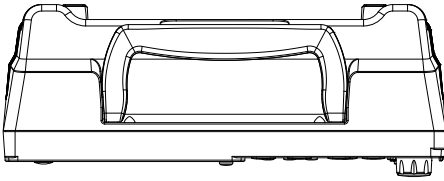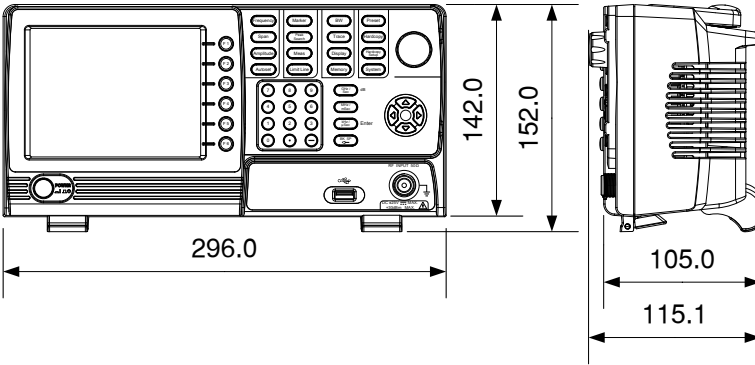
Declaration of Conformity

We declare that the below mentioned product

Type of Product: Spectrum Analyzer

Model Number: ISA-730

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to EMC: 2014/30/EU, LVD:2014/35/EU, WEEE: 2012/19/EU and RoHS: 2011/65/EU.

For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

◎ EMC

EN 61326-1: **EN 61326-2-1:**	Electrical equipment for measurement, control and laboratory use — EMC requirements (2013)	
Conducted and Radiated Emissions EN 55011: 2016		Electrical Fast Transients EN 61000-4-4: 2012
Current Harmonic EN 61000-3-2: 2014		Surge Immunity EN 61000-4-5: 2014
Voltage Fluctuation EN 61000-3-3: 2013		Conducted Susceptibility EN 61000-4-6: 2014
Electrostatic Discharge EN 61000-4-2: 2009		Power Frequency Magnetic Field EN 61000-4-8: 2010
Radiated Immunity EN 61000-4-3: 2006+A1: 2008+A2 :2010		Voltage Dip/ Interruption EN 61000-4-11: 2004

Low Voltage Equipment Directive 2014/35/EU	
Safety Requirements	EN 61010-1: 2010 (Third Edition) EN 61010-2-030: 2010 (First Edition)

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Limited Warranty

This meter is warranted to the original purchaser against defects in material and workmanship for 3 years from the date of purchase. During this warranty period, RS Components will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction. This warranty does not cover fuses, disposable batteries, or damage from abuse, neglect, accident, unauthorized repair, alteration, contamination, or abnormal conditions of operation or handling. Any implied warranties arising out of the sale of this product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. RS Components shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expense or economic loss. Some states or countries laws vary, so the above limitations or exclusions may not apply to you. For full terms and conditions, refer to the RS PRO website.

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