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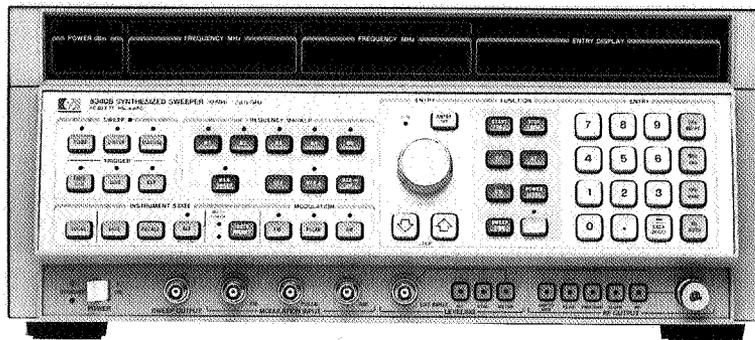
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Getting Acquainted with the HP 8340B/41B Synthesized Sweepers



INTRODUCTION

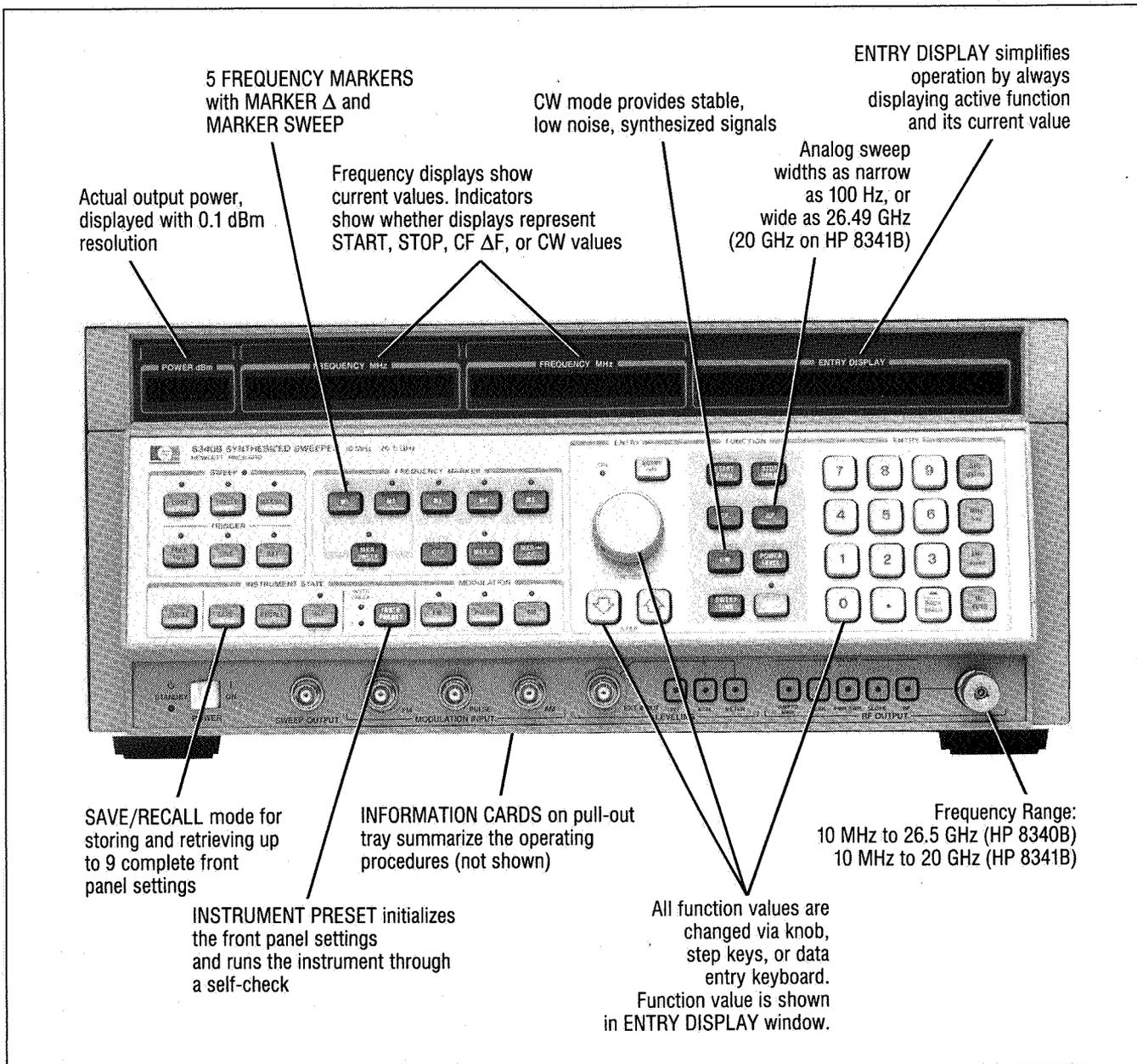
Anyone preparing to use the HP 8340B/41B for the first time should begin by reading this "Getting Acquainted" guide. This guide introduces the basic procedures needed for local (front panel), and remote (computerized) operation of the instrument. An HP 8340B/41B, a computer, and an HP-IB interface cable are all that is required to use this Getting Acquainted guide.

This guide doesn't have any detailed explanations – that is saved for the Operating Information guide of the

HP 8340B/41B operating manual. Instead, this guide is designed as a hands-on introduction to the HP 8340B/41B: press the buttons, program the computer, and watch the displays.

Most of the common operations of the HP 8340B/41B are covered in this guide. The in-depth explanations contained in Section III of the HP 8340B/41B Operating Manual will be easier to understand after you have completed this introductory material.

The first step in getting started is to check the line power module, as described in the following section.



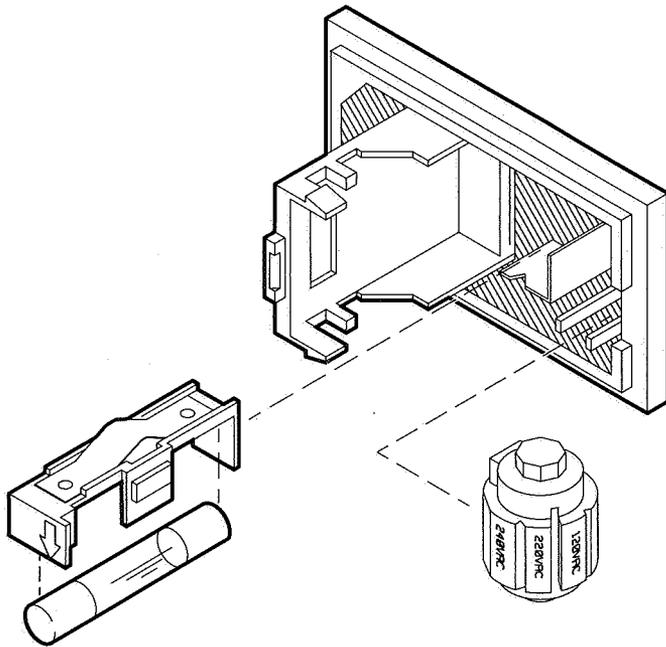
POWER-ON PROCEDURE

If the HP 8340B/41B has just been unpacked, the line-power module located on the rear panel of the instrument must be checked for the proper fuse rating and the correct positioning of the voltage-selector cam, as shown in the accompanying illustration.

After checking the line-power module, attach the ac power cord and apply power to the instrument. Flip the front-panel [LINE] switch from STANDBY to ON. Notice that the red OVEN and UNLK (unlocked) annunciators are being displayed in the upper right hand corner of the ENTRY DISPLAY.

One or both of these annunciators will remain on until the crystal oven reaches operating temperature, which will require 5 – 30 minutes from a cold start. When the [LINE] switch is in STANDBY, the crystal oven remains at operating temperature; therefore, do not unplug the HP 8340B/41B after it has been installed in its work area.

Although the HP 8340B/41B will not fully meet specifications while the OVEN or UNLK annunciators are on, some preliminary checks are described in the following Local Operation section.



CAUTION:

Do not attempt to rotate the voltage selector cam while it is installed in the line module or non-repairable damage will result. The cam must be completely removed from the line module, rotated to the proper position, and reinstalled. Refer to the instructions below.

Replacement of fuse

1. Pry open line module cover door.
2. Pull out fuse carrier.
3. Insert fuse of proper rating.
4. Place carrier back into line module.

Selection of Operating Voltage

1. Pry open line module cover door.
2. **REMOVE CAM FROM THE LINE MODULE.**
3. Rotate the cam to the desired voltage. (When the line module cover is closed, the selected voltage will be visible through a small window.)
4. Insert the cam back into the line module.
5. Close the line module cover door.

LOCAL OPERATION OF THE HP 8340B/41B SYNTHESIZED SWEEPER

Local operation is also called front-panel operation, because the desired HP 8340B/41B functions are initiated by pressing front-panel keys. The first keys to press are those that cause an internal check of the instrument, as described below.

PRELIMINARY CHECKS

Press and hold the **[INSTR PRESET]** key. Notice the red, green, and amber (yellow) LEDs and annunciators: Amber indicates which keys or functions are presently active; the single green LED indicates when the instrument is sweeping (on when sweeping, off during retrace and band-crossings); and red indicates trouble. If any red LED or annunciator turns on (such as OVEN or UNLK seen at cold power-on), refer to the HP 8340B/41B Operating and Service manual for further instructions.

Release the **[INSTR PRESET]** key, and observe the standard starting conditions: sweeping from 10 MHz to 26.5 GHz (20 GHz for HP 8341B), at 0.0 dBm. Press **[INSTR PRESET]** at any time to achieve this standard condition, including those times you may need a "panic" button to unscramble all of those keystrokes that you experimentally entered.

The displays are blank during the **[INSTR PRESET]** check. To check the displays, press **[SHIFT]**, then the **[FREE RUN]** key, which will cause every segment of every display element to light followed by a marching display of the entire character set.

To return to standard starting conditions, press either **[INSTR PRESET]** or cycle line power, which will turn off this diagnostic function. If you want to keep the previous front panel setup (i.e. start/stop or CW frequency, power level, etc.) cycle the line power.

[INSTR PRESET] resets all front panel controls to a pre-selected state. Any other diagnostic function can be deactivated by pressing **[SHIFT] [M5]**. A listing of the other diagnostic functions is contained in the HP 8340B/41B Information Cards, see below:

INFORMATION CARDS

Located below the front panel are information cards that contain a summary of the local and remote commands of the instrument. Slide the cards from their tray, and observe the format of the information: The key-shaped symbols indicate the front-panel keys that are pressed in local operation, the letters and numbers next to the key-shaped symbols are the programming commands used in remote operation, and an explanation of the function follows the symbols and commands.

Under **SHIFT KEY FUNCTIONS** on the lower information card, find **[SHIFT] [FREE RUN]** which is the key-stroke sequence you just used to activate the display self test. Notice that there are several other built-in diagnostic functions. For example, press **[SHIFT]**, then **[EXT]** which will display the condition of the internal oscillators (a flashing display indicates an unlocked oscillator; this diagnostic is usually called when the UNLK annunciator is lighted).

Feel free to try any of the functions described on the information cards. The HP 8340B/41B will not be damaged if any keys are pressed in an incorrect sequence. Press **[INSTR PRESET]** at any time to return to standard starting positions.

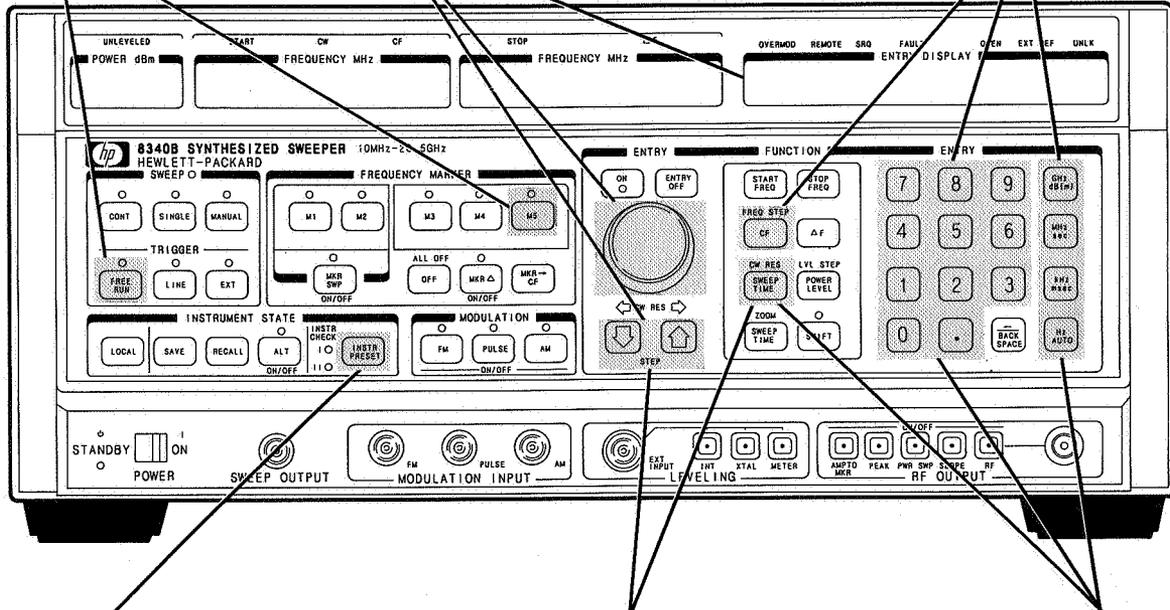
CW OPERATION

CW operation is one of the major applications of the HP 8340B/41B, and is easy to implement using front-

SHIFT, FREERUN
Starts display self test.
SHIFT, M5
Cancels diagnostic functions.

KNOB, STEP keys control active function. ENTRY DISPLAY shows active function.

STEP KEY sensitivity:
1. Press SHIFT, CF.
2. Enter value.
3. Select frequency unit.
4. Press CW to return to CW mode.



INSTRUMENT PRESET
Restores standard conditions.

KNOB sensitivity:
1. Press SHIFT, CW.
2. Use CW RES keys to change sensitivity.
3. Press CW to return to CW mode.

CW Operation:
1. Press CW.
2. Enter value.
3. Select frequency unit.

panel keys. In the CW mode, the instrument outputs a single, low-noise, synthesized frequency. To get the desired CW frequency, press [CW], then use the numeric keypad to enter the desired CW frequency, followed by the frequency unit (GHz, MHz, kHz, Hz). The frequency units (GHz, MHz, kHz, Hz) are on keys located to the right of the numeric keys. Try this example:

[CW] [12.345123456] [GHz]

Check the ENTRY DISPLAY in the upper right hand corner of the instrument, and the left FREQUENCY MHz display, which will both show **CW: 12345.123456 MHz** (the ENTRY DISPLAY always shows the most recently changed function, which in this case is the CW frequency). Notice that this microwave signal has single digit Hz resolution.

Try other CW frequencies in the 10 MHz to 26.5 GHz (20 GHz for HP 8341B) range. As you will see below, the CW frequency can be "tweaked" by using the [STEP] keys and the [KNOB], but first save this CW configuration for future recall. Press [SAVE], then [1] to save this CW instrument configuration in memory register 1.

STEP KEYS, KNOB

The [STEP] keys and the [KNOB] affect the function that is currently being displayed in the ENTRY DISPLAY window. When you were entering CW frequencies in the last example, your keystrokes were being displayed in the ENTRY DISPLAY window and you could have used the [STEP] keys or [KNOB] to control the CW frequency as well.

For example, enter the following:

[CW] [10] [GHz]

The ENTRY DISPLAY will show this value in MHz. Now alternately press the up-arrow and down-arrow [STEP] keys while watching the frequency change in the ENTRY DISPLAY window. Press and hold one of the [STEP] keys for a repeat action.

Next, alternately rotate the [KNOB] clockwise and counter-clockwise while watching the changing CW frequency in the ENTRY DISPLAY. the [KNOB] is usually used as a fine-sensitivity adjustment, with the [STEP] keys used as a coarse adjustment.

To change the sensitivity of the **[KNOB]**, press **[SHIFT]** then **[CW]**, which will activate the CW RES function. The flashing cursor in the ENTRY DISPLAY indicates the digit affected by the **[KNOB]**. Change the resolution by pressing the **[STEP]** key below the **◀ CW RES ▶** label. After you have positioned the flashing cursor over the desired digit, press **[CW]** to remove the cursor and return to the CW mode. Try the **[KNOB]** to see the effects of your sensitivity adjustment.

To change the sensitivity of the **[STEP]** keys, press **[SHIFT]** then **[CF]**, which will activate the FREQ STEP function (as labeled above the CF key). "STEP" will appear in the ENTRY DISPLAY. Enter the frequency step size you want, using the numerical keys, or the **[KNOB]**, or the **[STEP]** keys (which are in a 1-2-5 sequence), followed by a unit key (GHz, MHz, kHz, Hz). When you are finished, press **[CW]** to return to CW mode, and try the **[STEP]** keys to see the effects of your adjustment.

The **[STEP]** sensitivity you just set will also be the step size for the **[START FREQ]**, **[STOP FREQ]**, **[CF]** frequency keys, as well as markers **[M1]** - **[M5]**. All of these keys are described in this Getting Acquainted guide.

After setting a CW frequency, you will probably want to adjust the power level, which is described below.

POWER LEVEL

The power level, in dBm, is set by a procedure that is very similar to the CW frequency procedure. The HP 8340B/41B can output leveled power for CW or swept frequency operation, or a power sweep. The basic power level adjustment is described here.

To set the power level, press the **[POWER LEVEL]** key, then use the numeric keys to enter any desired power level, followed by the terminator key **[dB(m)]**. The minus (-) sign key is also labeled BACK SPACE; The HP 8340B/41B knows that this key is a minus key when used first in a keystroke sequence, and a back space key at all other times.

The selected power level can range from the minimum level of -110 dBm (-20 dBm for HP 8340Bs equipped with option 001 or 005), to the maximum level allowed, which varies with frequency (see the specifications table in Section I). For practice, enter the following:

[POWER LEVEL] [-20] [dB(m)]

ENTRY DISPLAY will show the selected power level, while the actual power is displayed in the POWER dBm window. If the selected power is beyond the range of the HP 8340B/41B, the closest possible power will be shown in the POWER dBm display.

When the power level is shown in the ENTRY DISPLAY, the power level can be controlled by the **[KNOB]** and **[STEP]** keys. The **[KNOB]** affects the power level at the best possible sensitivity, which is 0.05 dB, while the sensitivity of the **[STEP]** keys can be changed with the LVL STEP function.

To activate the LVL STEP function, press **[SHIFT]** then

the **[POWER LEVEL]** key (notice the label LVL STEP above the **[POWER LEVEL]** key). Then use the numerical keypad, or the **[KNOB]**, or the **[STEP]** keys (which have a 1-2-5 sequence) to set your desired power step size, followed by the **[dB(m)]** terminator key. Press the **[POWER] [LEVEL]** key to return to POWER LEVEL mode, then try the **[STEP]** keys to see the effects of your adjustment.

So far, you have set a fixed (CW) frequency and a fixed power level. Now you will set sweep operations, first with a power level sweep, then with frequency sweeps.

POWER SWEEP

NOTE: The POWER SWEEP example shown below does not apply to HP 8340B's equipped with Option 001 or 005, which are not equipped with a 90 dB step attenuator. Such instruments cannot produce power levels below -20 dBm. Power Sweep range with either of these options is -20 dBm to the maximum power available in the given frequency band.

The HP 8340B/41B can sweep the output power over as much as a 40 dB range. To prepare for this power sweep example, enter the following:

[CW] [12] [GHz]

[SWEEP TIME] [10] [sec]

The HP 8340B/41B is outputting a 12 GHz CW frequency, and with further instructions will perform power sweeps having a 10 second period. Next, press **[SHIFT]**, then **[PWR SWP]** which will show the ATN (attenuator) and ALC (automatic leveling control) values in the ENTRY DISPLAY.

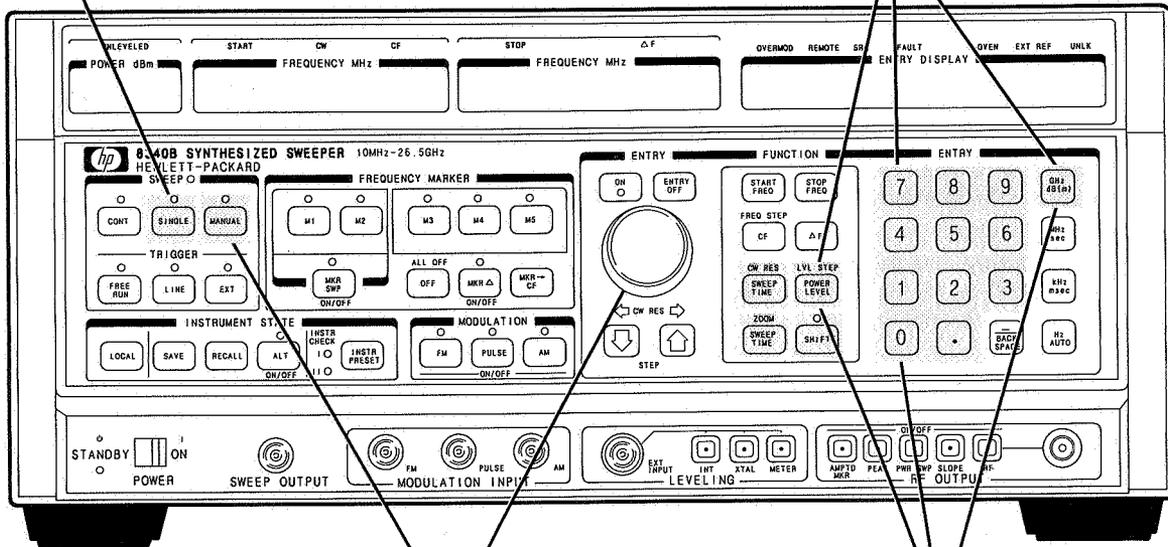
The HP 8340B/41B uses the ATN as the coarse adjustment (10 dB steps), and the ALC as the fine adjustment (0.05 dB steps) when you use the **[POWER LEVEL]** key to set a fixed output power. However, for a maximum-range power sweep the ALC must be decoupled from the ATN, which you just did by pressing **[SHIFT] [PWR SWP]**. After decoupling, the ATN and ALC can be set independently.

Use the **[STEP]** keys to change the ATN value (the clicking sound you hear is the attenuator pads being mechanically switched into place). The ATN value can range from 0 dB to -90 dB, in 10 dB steps. Set the ATN to -40 dB for this example.

Next, rotate the **[KNOB]** as you watch the ALC value change. The range is -20 dBm for the lowest value, to an upper value that depends on frequency (see the specifications; the specified upper value is +10 dBm at 12 GHz). The maximum effective upper value is determined by watching the POWER dBm display (which shows the ATN + ALC sum) as you increase the ALC value: The red UNLEVELED annunciator will light when you exceed the maximum value. The maximum range of your power sweep equals the maximum leveled range of the ALC, with the ATN providing a fixed offset.

SINGLE sweeps
Started when this key is pressed.

Power Level Step Size (STEP
keys increment):
1. Press SHIFT, POWER LEVEL.
2. Enter value.
3. Press dB(m).



MANUAL sweeps
Controlled by the rotary KNOB.

POWER LEVEL:
1. Press POWER LEVEL.
2. Enter value.
3. Press dB(m).

Set the ALC to -15 dBm for this example, using the **[KNOB]** or the numeric keys (with the **[dB(m)]** terminator key). The POWER dBm display will show -55 (-40 ATN plus -15 ALC), and the power sweep range can be at least 25 dB (ALC range of -15 to $+10$ dB).

The rest is easy. Press **[PWR SWP]**, and the ENTRY DISPLAY will display 0.00 dB/SWP. Use the **[STEP]** keys, or the **[KNOB]**, or the numerical keys (with the **[dB(m)]** terminator key) to change this to the desired sweep range. For this example, press

[25] [dB(m)]

and the HP 8340B/41B will power sweep from -55 dBm to -30 dBm, in a 10 second period.

Before leaving the power sweep function, there are two more keys you should try. Press **[SINGLE]** to change from CONTinuous sweeps to single sweeps, which start every time you press the **[SINGLE]** key (if you press **[SINGLE]** in the middle of a sweep, the sweep will stop). Next, press **[MANUAL]** which will allow you to use the **[KNOB]** to manually sweep through the -55 to -30 dBm range.

Press **[PWR SWP]** again to turn power sweep off, and press **[POWER LEVEL]** to re-couple the ATN and ALC.

Swept frequency operation is explained in the next section.

SWEPT OPERATION

The HP 8340B/41B can sweep a frequency span as wide as the frequency range of the instrument, or as small as 100 Hz, with 5 frequency markers available to you in the sweep span.

In this Getting Acquainted section, you will be introduced first to establishing swept operation using start/stop frequencies and center/ Δ frequencies, followed by marker operations.

START/STOP SWEPT OPERATION

The HP 8340B/41B will sweep from a selected start frequency to a selected stop frequency. To begin, press the **[START FREQ]** key, then enter the numerical value of your desired start frequency, followed by the appropriate frequency unit (GHz, MHz, kHz, Hz); for example:

[START FREQ] [144] [MHZ]

Then, press the **[STOP FREQ]** key, enter your desired stop frequency followed by the frequency unit; for example:

[STOP FREQ] [146] [MHZ]

The left FREQUENCY MHz display will show your start frequency, while the middle FREQUENCY MHz display (and ENTRY DISPLAY) will show your stop frequency.

Next, adjust the sweep time. In typical applications the sweep time can vary tremendously – from milliseconds in a network analyzer system to more than a minute in thermistor-based power meter systems. However, the sweep time adjustment procedure is the same: Press the **[SWEEP TIME]** key, then a numerical value followed by **[sec]** or **[msec]**. If the fastest possible sweep time is desired, press **[SWEEP TIME]** followed by **[AUTO]**. For example, enter the following:

[SWEEP TIME] [2.5] [sec]

Watch the green LED next to the SWEEP label, which will blink every 2.5 seconds. The LED will blink at each retrace, and at each bandcrossing for wideband sweeps (although you aren't crossing any bands in this example). Next, press **[SWEEP TIME]**, then **[AUTO]** to obtain the fastest possible sweep speed at this frequency span (10.00 msec).

Press **[SAVE]**, then **[2]** to save this start/stop example in storage register 2 for later use.

CENTER FREQUENCY Δ FREQUENCY SWEEP OPERATION

This is another way of establishing swept operation. Start/stop swept operation and center/ Δ frequency swept operation are just two different ways of defining the sweep limits.

As an example of CF/ Δ F mode, press **[CF]**, a numerical value for the desired center frequency, and the frequency unit (GHz, MHz, kHz, Hz); for practice, try:

[CF] [4] [GHz]

Then press the **[Δ F]** key, a numerical value for the span frequency, and the frequency unit; for example:

[Δ F] [1] [GHz]

The HP 8340B/41B is now sweeping from 3.5 to 4.5 GHz. The left FREQUENCY MHz display shows your center frequency, while the middle FREQUENCY MHz display (and the ENTRY DISPLAY) shows your delta frequency.

While **[Δ F]** is the active function (presently being displayed in ENTRY DISPLAY), try the **[KNOB]** and **[STEP]** keys and watch the changing **[Δ F]** frequency. This symmetrical expansion of the frequency span about the center frequency is one reason that CF/ Δ F swept mode is sometimes used instead of start/stop frequency sweeps. Next, you will add markers to the sweep field.

Press **[SAVE]**, then **[3]** to save this instrument configuration for future recall.

FREQUENCY MARKERS

The HP 8340B/41B has 5 frequency markers that can be used as fixed frequency "landmarks," or as variable frequency pointers on a CRT display. Your introduction to frequency markers will be made by continuing with the previous swept frequency examples.

To obtain the instrument configuration used in the start/stop swept frequency example, press **[RECALL]** then **[2]**, which will recall all of the instrument settings that you previously established and SAVED in storage register 2. The HP 8340B/41B should once again be sweeping from 144 MHz to 146 MHz, with a 10.00 ms sweep speed. Add a marker to this sweep field by pressing **[M1]**, then enter **[144.5] [MHz]**. This causes an intensified dot to appear at that frequency on a CRT display (to obtain a "spike" at that frequency instead of the intensified dot, press **[AMTD] [MKR]**).

For a second marker, press **[M2]**, then enter **[145.5] [MHz]**. This process can be continued for all 5 markers. Note that the marker presently being displayed in the ENTRY DISPLAY window is "active" and as such can be controlled by the numerical keyboard, **[KNOB]**, **[STEP]**, and **[OFF]** keys; pressing any marker key will make that marker the active one.

As an example of the marker delta **[MKR Δ]** function, press **[M3]**, enter **[145.6] [MHz]**, and press **[MKR Δ]**. **[MKR Δ]** causes the frequency difference between any two markers to be displayed in the ENTRY DISPLAY window, and the CRT trace is intensified between the two markers. Select the two markers by pressing any two marker keys. For example, press **[M1] [M2]**, then **[M2] [M3]**, and finally **[M1] [M3]** and watch the ENTRY DISPLAY for the frequency differences. Press **[MKR Δ]** again to turn off the **[MKR Δ]** function. **[MKR Δ]** is a useful aid in examining CRT traces as for example, in measuring the 3 dB bandwidth of a bandpass filter on a network analyzer display.

Once the **[M1]** and **[M2]** markers have been established, the Marker Sweep function will change the start/stop frequencies originally established to the frequencies of these two markers. This can serve as a "magnification" function that you can use to focus in on a selected portion of the CRT trace. As an example, press **[MKR SWEEP]**, which will change the start/stop sweep frequencies to the frequencies of markers **[M1]** and **[M2]** (marker sweep works only with **[M1]** and **[M2]**). Press **[MKR SWEEP]** again to turn off the Marker Sweep function and return the sweep to its previous start/stop limits.

MARKERS:

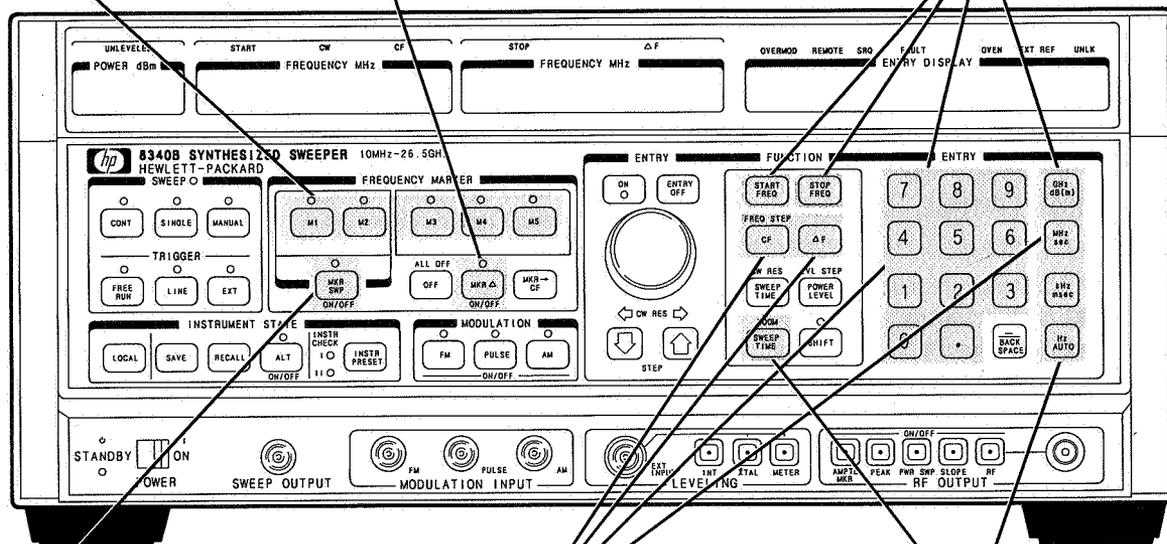
1. Press one M1-M5 key.
2. Enter value.
3. Select frequency unit.

MARKER DELTA:

1. Press MKR Δ .
2. Press any two markers M1-M5.
3. Read frequency difference in ENTRY DISPLAY.

START/STOP FREQUENCY SWEEPS:

1. Press START FREQ.
2. Enter value.
3. Press freq unit.
4. Press STOP FREQ.
5. Enter value.
6. Press freq unit.



MARKER SWEEP

Press MKR SWEEP.

HP 8340B/41B will sweep between M1-M2.

CF/ Δ F SWEEPS:

1. Press CF.
2. Enter value.
3. Select frequency unit.
4. Press Δ F.
5. Enter value
6. Select frequency unit.

SWEEP TIME:

1. Press SWEEP TIME, then AUTO to get fastest possible sweep.
or
1. Press SWEEP TIME.
2. Enter value.
3. Press sec or msec.

Markers are also used in exactly the same way with CF/ Δ F frequency swept mode, so at this point press [RECALL], then [3] to recall the CF/ Δ F swept mode settings stored in register 3 to continue with the marker examples. The HP 8340B/41B should once again be sweeping around a 4 GHz center frequency.

Markers are very easy to use, especially if you let the [KNOB] do the work for you. Try this example: Press [SHIFT] and [OFF] to turn off all markers (so you are starting with a clean slate), then press [M1]. [M1] will come up with its most recent frequency; however, at the first turn of the [KNOB] the frequency of [M1] will jump to the center frequency of the current sweep; that is, if [M1] came up at 144.5 MHz it will jump to 4.0 GHz as soon as the [KNOB] is turned. The 4 other markers can be brought into the sweep field in the same manner.

The final example of using markers is [MKR \blacktriangleright CF], which changes the center frequency of the sweep to

the frequency of one of the markers, which is another way of focusing in on a selected portion of the CRT trace. First, press one of the marker keys (the one that you want to become the center frequency) to bring that marker into the ENTRY DISPLAY. Then, press [MKR \blacktriangleright CF] to change the center frequency to the marker frequency. You can re-use the marker that just became the center frequency.

Markers are indispensable for swept frequency measurements, so practice with them until you are completely comfortable with their many features.

RECALL INSTRUMENT CONFIGURATIONS

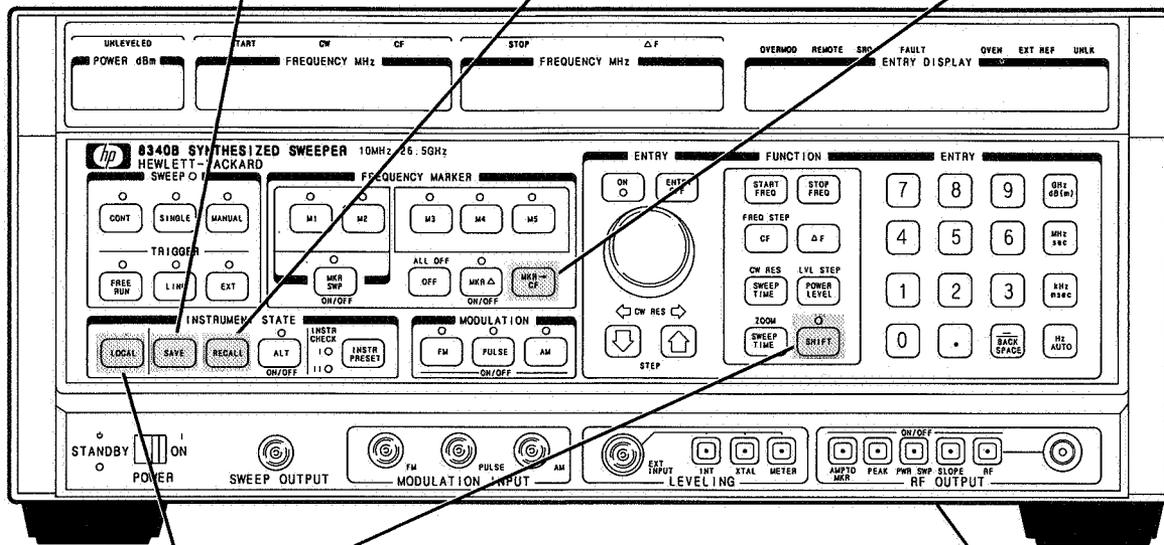
For the final Local Operation example, you will recall all of the instrument modes you previously created and saved (with the [SAVE] key) by using the [RECALL] key.

To recall any previously stored instrument configuration (stored by using the [SAVE] key), press [RECALL],

SAVE n
Stores instrument state in register n (1-9)

RECALL n
Recalls instrument state previously SAVED in register n (1-9).

MKR → CF:
1. Press one marker M1-M5
2. Press MKR → CF.
The center sweep frequency (CF) will change to the frequency of the marker.



SHIFT, LOCAL
Causes the HP-IB address to appear in the ENTRY DISPLAY.

Information Cards
Summarize operation procedures.

then the number of the storage register (1 to 9). For example:

[RECALL] [1] recalls the CW configuration used in this Getting Acquainted guide.

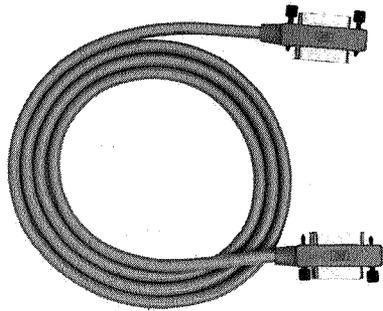
[RECALL] [2] recalls the start/stop sweep example used in this guide.

[RECALL] [3] recalls the center frequency/ Δ frequency example.

This completes the basic introduction to local (front panel) operation of the HP 8340B/41B Synthesized Sweepers. At this point, you are ready to study (as needed) the advanced features of Local Operation contained in Section III of the HP 8340B/41B Operating Manual.

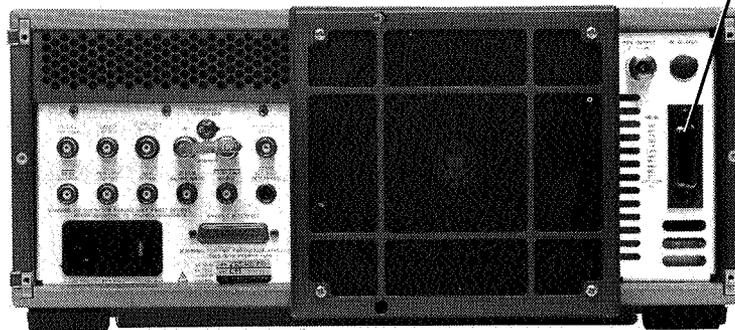
An introduction to remote (computerized) operation of the HP 8340B/41B is provided in the following text.

REMOTE OPERATION OF THE HP 8340B/41B SYNTHESIZED SWEEPERS



HP-IB Interface Cables Available

HP-IB Cable Part Numbers	Lengths
HP 10833A	1 m (3.3 ft.)
HP 10833B	2 m (6.6 ft.)
HP 10833C	4 m (13.3 ft.)
HP 10833D	0.5 m (1.6 ft.)



HP-IB CONNECTION

All front panel controls except the **[LINE]** switch can be remotely programmed via an HP-IB (Hewlett-Packard Interface Bus) computer system. Additionally, several special HP 8340B/41B functions are available in an HP-IB system that are not available from the front panel. This section provides an introduction to remote operation of the HP 8340B/41B.

Any HP-IB computer system can control the HP 8340B/41B; however, for simplicity only HP BASIC language commands will be used in this Getting Acquainted section. These BASIC commands are applicable to the HP 9000 series 200 and 300, and HP 80-series of computers. For other computers and other languages, consult the applicable computer manuals.

PREPARATION FOR USE

Prepare the instruments for remote operation by connecting an HP-IB cable between the computer and the HP 8340B/41B, and load the BASIC operating system into the computer (if necessary).

Next, check the HP-IB address of the HP 8340B/41B. If several instruments are connected to an HP-IB cable, each must have a unique address within the range of 00-30. The factory-set address for the HP 8340B/41B is

19, which can be seen in one of two ways: Flip the **[LINE]** switch from STANDBY to ON, and the HP-IB address will appear (momentarily) in the ENTRY DISPLAY; or press **[SHIFT]**, then **[LOCAL]** which will also cause the address to appear in the ENTRY DISPLAY.

To change the HP-IB address, press **[SHIFT]**, **[LOCAL]**, a numerical value (range 00 – 30), and any “terminator” key (GHz, MHz, kHz, Hz). The examples that follow use “19” as the HP 8340B/41B address.

PREPARATORY COMPUTER COMMANDS

HP-IB systems can be very complicated, with several instruments and lots of activity on the bus. Although your simple practice setup (one computer, one instrument) doesn't require any preparatory commands, the following 3 commands are so useful that you should become familiar with them at this time.

The “panic button” for an HP-IB system is the ABORT command. All activity on the bus is halted by this command:

ABORT 7

Enter this statement on the computer, then press the computer's **[EXECUTE]** or **[END LINE]** key. All HP-IB

instruments ("7" directs the command to the HP-IB system) have stopped transmitting on the HP-IB and are now listening for a command from the controller (computer).

Now you want to specifically tell the HP 8340B/41B that the computer is in command, not the front panel. To change the HP 8340B/41B from local (front panel) control to remote HP-IB operation, enter this command:

REMOTE 719

followed by pressing the [EXECUTE] or [END LINE] key. This command prepares the HP-IB (code "7") instrument located at address 19 for computer control. Notice that the amber REMOTE annunciator above the ENTRY DISPLAY is now lighted. Also notice that the front panel controls on the HP 8340B/41B no longer function, except for the [LINE] switch and the [LOCAL] key (pressing the [LOCAL] key will return front panel control to the HP 8340B/41B).

As the final preparatory command, enter

CLEAR 719

followed by [EXECUTE] or [END LINE], as usual. This command clears the internal status byte and extended status byte registers of the HP 8340B/41B, so you start with a "clean slate" before beginning a program. None of the front panel annunciators change when you execute this command. This completes the preparatory commands.

At this point, any front panel function (and several special functions) can be controlled by the computer. However, only a few commands will be presented in this Getting Acquainted guide – just enough to get you started. After this introduction, you will be prepared for the additional material contained in the Programming Notes and Operating Guides contained in Section III of the HP 8340B/41B Operating Manual.

DATA COMMANDS, OUTPUT

Data commands change the operating conditions of the HP 8340B/41B, and are typically the most often used commands in remote applications. All front panel keystroke operations can be replaced by a data command (except for the [LINE] switch). The format for outputting data commands is

OUTPUT 719; "CODE"

for the simplest commands, or

OUTPUT 719; "CODE DATA TERMINATOR"

for the commands that require numerical data. In both cases, the statements are followed by [EXECUTE] or [END LINE]. CODE is the characters that represent a front panel key, or a special function; all codes are

listed on the lower Information Card (located below the front panel of the HP 8340B/41B). DATA is the numerical value that is desired, and TERMINATOR is the desired unit (such as GHz, sec, dB(m), etc.). The TERMINATOR abbreviations are also listed on the Information Cards. Try each of the following commands as they are explained to you.

The simplest commands involve no numerical data. For example, Instrument Preset is established by this command:

OUTPUT 719; "IP"

For shifted commands, add SH; for example

OUTPUT 719; "SHT1"

starts the display self test, and

OUTPUT 719; "IP"

stops the display test. A complete code-data-terminator command for establishing a 12 GHz CW output is written:

OUTPUT 719; "CW12GZ"

The commands you have tried so far have had one command per statement; however, the commands can be strung back-to-back in the same statement. For example

OUTPUT 719; "CW12GZPL-50DB"

causes the HP 8340B/41B to output a 12 GHz CW signal at a power level of -50 dBm.

The HP 8340B/41B ignores spaces and unassigned characters that are placed in a command string, and automatically upshifts lower-case letters. Therefore, both of the following commands are functionally equivalent (although the statement with spaces requires a longer execution time):

OUTPUT 719; "FA8GHFB12GZPL0DBST500MS"

OUTPUT 719; "FA 8 Gz FB 12 Gz PL 0 dB ST 500 mS"

The second statement is easier to read and check for errors. Looking at the Information Cards, the above statement translates to a start frequency (FA) of 8 GHz, stop frequency (FB) of 12 GHz, power level (PL) of 0 dBm, and a sweep time (ST) of 500 milliseconds (mS).

There is also a command, EK, that is added to another code to enable KNOB control of that function on an otherwise remote front panel. For example:

OUTPUT 719; "EKFA" enables KNOB control of the start frequency

OUTPUT 719; "EKFB" enables KNOB control of the stop frequency

OUTPUT 719; "EKPL" enables KNOB control of the power level

This completes the introduction to sending data from the computer to the HP 8340B/41B; but how do you send data from the HP 8340B/41B to the computer (the reverse operation)?

DATA COMMANDS, INPUT

A set of commands allows the computer to read HP 8340B/41B conditions – such conditions as the start frequency, the power level, sweep times and many others. As an example, enter the following program, which will set and read the start frequency of the HP 8340B/41B:

```
10  REMOTE 719
20  OUTPUT 719; "FA 100 Mz FB 200 Mz PL - 50
    dB"
30  OUTPUT 719; "OPFA"
40  ENTER 719; A
50  DISP A; " MHz start frequency"
60  END
```

Press **[RUN]** on the computer. The HP 8340B/41B will start sweeping at 100 MHz (FA 100 Mz), stop sweeping at 200 MHz (FB 200 Mz), at a power level of -50 dBm (PL -50 dB). The command **OPFA** in line 30 translates as "Output Interrogated Parameter" (OP) the "Start Frequency" (FA). The value of the start frequency (the interrogated parameter) is placed in a buffer, and transferred to the computer's variable A in line 40 (A is an

arbitrary selection; any floating point variable can be used).

To read the stop frequency and the power level, modify the previous program from line 50 and beyond as follows:

```
50  OUTPUT 719; "OPFB"
60  ENTER 719; B
70  OUTPUT 719; "OPPL"
80  ENTER 719; C
90  DISP A; "MHz start"; B; "MHz stop"; C; "dBm
    power level"
100 END
```

Press **[RUN]** and the start frequency (variable A), stop frequency (variable B), and power level (variable C) will be set by the computer and the values will be displayed on the computer's screen.

This completes the introduction to remote operation of the HP 8340B/41B. Although only a few examples were presented, you will find that most of the other programming commands follow a very similar format, and they will be easy to learn after this introductory practice.

This also completes the Getting Acquainted guide. You should now be ready to study (as needed) the advanced features discussed in Section III of the HP 8340B/41B Operating Manual.



For more information, call your local HP sales office listed in the telephone directory white pages. Ask for the Electronic Instruments Department. Or write to Hewlett-Packard: **U.S.A.** - P. O. Box 10301, Palo Alto, CA 94303-0690. **Europe** - P.O. Box 999, 1180 AZ Amstelveen, The Netherlands. **Canada** - 6877 Goreway Drive, Mississauga L4V 1M8, Ontario. **Japan** - Yokogawa-Hewlett-Packard Ltd., 3-29-21, Takaido-Higashi, Suginami-ku, Tokyo 168. **Elsewhere** in the world, write to Hewlett-Packard Intercontinental, 3495 Deer Creek Road, Palo Alto, CA 94304.