Manual Code Number 983-298

RE 201 Dual Channel Audio Analyzer

RE TECHNOLOGY

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Audio Generator 901–500

TABLE OF CONTENTS

1.1 - INTRODUCTION

This manual provides all the information required to operate the AUDIO GENERATOR option 901-500.

The four sections to follow are:

Section 2 - General Description

This section serves the purpose of presenting the Audio Generator, its capabilities and limitations and principle of operation in an overview form.

Section 3 - Operating Instructions

Two subsections describe the operation of the Audio Generator in the LEARN and EXECUTE modes respectively.

Section 4 - Audio Generator Tutorial

This section is devoted to an Audio Generator tutorial for quick acquaintance using a step-by-step procedure.

Section 5 - Softkeys

Several new softkey definitions are introduced when installing the Audio Generator. These are included in this section.

Information for testing, servicing and calibrating the Audio Generator is found in the RE201 service manual.

It is assumed that the user is familiar with the operation of the RE201 basic instrument when embarking on the study of the Audio Generator operation.

SECTION 2 GENERAL DESCRIPTION

The Audio Generator option is designed to generate with great accuracy test signals for all measurements performed by the RE201. Below, an overview of the Audio Generator capabilities is given followed by a discussion and a short description of the principle of operation.

2.1 - CAPABILITIES

The Audio Generator is capable of generating the following signals:

1. Single-tone sine-wave signal in a 1 Hz to 25 kHz range and 1 Hz resolution. The single-tone is used for frequency response and Total Harmonic Distortion (THD) measurements.

2. Two-tone sine-wave signal in a 10 Hz to 25 kHz range and 10 Hz resolution. Two-tone signals are used during Intermodulation (IM) and Difference Frequency distortion (DFIM) measurements.

3. Transient Intermodulation distortion (TIM) signal composed of a 3.2 kHz square or triangular wave superimposed with a 15 kHz sine-wave and subjected to a 30 kHz or 100 kHz bandwidth limitation.

4. Multi-tone sine-wave signal composed of up to 8 sine-wave components in a 10 Hz to 25 kHz frequency range and 10 Hz resolution. The operator may specify both the frequency and the relative amplitude of each component. Multi-tone signals are specially suited for quick frequency response measurements in e.g. tape recorders and equalizers.

5. 1 kHz reference signal having high spectral purity and stability.

In addition, manual control of frequency (single-tones only) and level may be exercised with the generator activated. For this feature, the cursor control keys are employed using user-selectable step sizes.

2.2 - DISCUSSION

The Audio Generator comes with two electrically floating outputs - L and R - having 600 ohms output impedance. The signal levels at the L and R outputs may be set independently in the range of 0.8 mVp to 8.87 Vp in steps of 0.1 dB.

All available signal types may be routed to both outputs, but not in any mix. In the case of mixed signals, one of the channels must be a 1 kHz reference signal or GROUND whereas the other may be any type of signal. A list of valid combinations is given in Fig. 2.1, page 3.

RIGHT CHANNEL SIGNAL	LEFT CHANNEL SIGNAL
single-tone	GND single-tone 1 kHz reference
DFIM-signal	GND DFIM-signal 1 kHz reference
IM-signal	GND IM-signal 1 kHz reference
Multi-tone	GND Multi-tone 1 kHz reference
TIM-signal	GND TIM-signal 1 kHz reference
1 kHz reference	GND 1 kHz reference single-tone DFIM-signal IM-signal multi-tone TIM-signal
GND	GND 1 kHz reference single-tone DFIM-signal IM-signal multi-tone TIM-signal

Fig. 2.1 - VALID SIGNAL COMBINATIONS

The definition of signal types, frequencies and output levels is performed in LEARN mode - exactly as with measurements. The defined signals are then activated in EXECUTE mode. A FUNCTION or SEQUENCE and a SIGNAL definition may be combined in a SETUP to perform a complex measurement in few keystrokes.

2.3 - PRINCIPLE OF OPERATION

The outstanding performance and flexibility of the Audio Generator owe to the fact that digital synthesis is employed for generating the signals. This holds for all signals except the TIM signal and the 1 kHz reference, which are derived from the 64 kHz master clock. More about that below.

The heart of the Audio Generator is a table of 32000 16-bit samples of a sine half-period stored in a Programmable Read Only Memory (PROM). From this table a full sine-wave may be constructed by reading the first half-period directly from the PROM and reading the second half-period using negated PROM values.

Reading the PROM values at a 64 kHz rate according to the scheme outlined above will produce the sampled amplitude values of a 1 Hz sine-wave. Feeding the digital sample values to a digital-to-analog converter (DAC) followed by an appropriate antialiasing filter will produce a pure 1 Hz sine-wave signal.

From this basic signal generation scheme, sine-waves of higher frequencies are derived by skipping a number of PROM table entries between each sample. As an example, consider a 125 Hz signal. Reading the PROM entries nos. 0, 125, 250, 375, 500, 625 .... at a 64 kHz rate will now produce the amplitude samples of a 125 Hz sine-wave and consequently a 125 Hz sine-wave at the DAC output.

Adjustment of output level is accomplished by digitally controlled attenuators following the DAC's.

In the case of two-tone or multi-tone signals, the scheme is more complex. To generate two or more sine-waves simultaneously, the microprocessor first calculates the amplitude sample values of each sine-wave component. Next, the values are scaled according to the relative amplitude definitions and finally, the samples are superimposed to produce the sample values of the composite signal. These values are stored in a Random Access Memory (RAM).

Reading the values from RAM and feeding them to the DAC produces the desired composite output signal. The level of the composite signal is adjusted by the output attenuator as before.

Exceptions from the scheme described above are the TIM and 1 kHz reference signals. The square or triangular wave of the IM signal is produced directly from the 64 kHz clock signal by means of frequency dividers and filters, while the 15 kHz sine-wave is generated as a single-tone. The 1 kHz reference is also derived from 64 kHz by frequency scaling followed by bandpass filtering.

Special precautions have been taken to avoid signal discontinuities when changing the frequency of a single-tone signal. The switching instant is taken to be near the points of zero voltage change per second of the signal, (near the top or bottom of the sine-wave). In this way, potential problems from ringing and transient decay in the circuit under test are minimized, while measurement sequences may run at full speed.

In this section, the definition of signal types in LEARN mode is described in subsection 3.1, while operation of the Audio Generator in EXECUTE mode is described in subsection 3.2. The Audio Generator tutorial is given in subsection 4.1.

3.1 - LEARN MODE

In LEARN mode, the operator may program the characteristics of the desired signal(s) and subsequently activate the signals in EXECUTE mode.

To enter LEARN mode from the IDLE mode, press the LEARN key and the following display will appear:

```
**********************************
       *** LEARN MODE ***




SELECT USING SOFTKEY
--------------------------------
SYSTEM   FUNCT   SEQUEN  PROGRAM
BASIC    DEFLT   SETUP   SIGNAL
**********************************
```

Fig. 3.1 - LEARN MODE DISPLAY

New to this display as compared to an RE201 without Audio Generator is the SIGNAL softkey legend (F8). Pressing the SIGNAL softkey enables inspection and/or modification of signal definitions. This is dealt with in the following subsection.

3.1.1 - SIGNAL Definition

Pressing SIGNAL softkey changes the display to:

```
**********************************
       *** LEARN MODE ***




ENTER SIGNAL NUMBER        [   ]
----------------------------------

**********************************
```

Fig. 3.1 - SIGNAL SOFTKEY ACTIVATED
The RE201 will now ask for signal number

The user must now enter the number (0 - 99) of the signal to be inspected or modified followed by ENTER. The numerical entry will appear in the square brackets on the status line.

Following ENTER, the desired signal definition display will appear. It may look like this:

```
*********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER     >          3
SIGNAL                  MFREQ3
MODE RIGHT              SIGNAL
LEVEL RIGHT                1 V
LOAD RIGHT                .6 K
MODE LEFT               SIGNAL
LEVEL LEFT                 1 V
LOAD LEFT                 .6 K


SIGNAL NUMBER              [   ]
---------------------------------
                            STORE
SHOW+     SHOW-
*********************************
```

Fig. 3.2 - LEARN SIGNAL DISPLAY

The operator may now modify the parameters by means of the cursor control keys, softkeys and numerical keys. The cursor control keys are used for moving the cursor (blinking >) to the desired field, while modification requires the softkeys or numerical keys followed by ENTER. The softkey menu will change according to the field pointed to by the cursor.

When pointing to the SIGNAL NUMBER field, the operator may scroll through the signal definitions by pressing SHOW+ or SHOW-.

Having completed the SIGNAL definition, the user must press STORE to save the parameters for later activation in EXECUTE mode. Alternatively, if no modifications are desired, EXIT is used for returning to the main LEARN mode display.

Parameters

		Note
SIGNAL NUMBER	0 - 99	
SIGNAL	<SFREQ>	1
	<MFREQ>	2
	<IM>	3
	<DFIM>	3
	<TIM30>	4
	<TIM100>	4
	<SQR/TRI>	4
MODE LEFT, MODE RIGHT	<SIGNAL>	5, 6
	<1 KHZ>	5, 6
	<GND>	5, 6
LEVEL LEFT, LEVEL RIGHT	<VRMS>	6, 7
	<VP>	6, 7
	<MVRMS>	6, 7
	<MVP>	6, 7
	<MWATT>	6, 7
	<DBM>	6, 7
	<+/->	6, 7
LOAD LEFT, LOAD RIGHT	<LOAD>	7
	<EMF>	7
LOAD	.001 - 31999	8
VRMS	.0005 - 6.27	9
VP	.0008 - 8.87	10
MVRMS	0.56 - 6270	9
MVP	0.8 - 8870	10
MWATT	.0001 - 16.3	11
DBM	-68.7 to +12.1	12

Notes

1. Single-frequency definition. Specify frequency in Hz (1 - 25000 Hz, 1 Hz resolution) and press ENTER, cf. Fig. 3.3.

2. Multi-frequency definition. Specify MFREQ number (0 - 9) and press ENTER, cf. Fig. 3.4. For multi-frequency (multi-tone) definitions, refer to subsection 3.1.2 below.

3. Signals for intermodulation and difference frequency distortion measurements. These definitions follow the corresponding FUNCTION definitions as explained in sec. 4.3 (DFIM and IM) of the RE201 manual. As an example, IM4 defines both the measurement to be performed and the signals for exciting the device under test. Following IM or DFIM softkey, the user must enter the number (0 - 9) and press ENTER. Activating the LEARN key allows for inspection/modification of the FUNCTION definition.

4. Standardized signals for transient intermodulation measurements. The user has the choice of 30 kHz (TIM30) or 100 kHz (TIM100) cutoff frequency (single-pole RC-filter). The TIM signal is composed of a 3.2 kHz square or triangular wave superimposed with a 15 kHz sine-wave. Pressing SQR/TRI softkey toggles between square wave and triangular wave modes. The selection is completed when pressing ENTER.

5. SIGNAL softkey selects the signal specified under the SIGNAL entry (notes 1 to 4). 1 KHZ softkey selects the standard 1 kHz reference signal. GND softkey grounds the output. Left and right channels are independent to the extent outlined in Fig. 2.1. The selection is completed when pressing ENTER.

6. LEVEL entry specifies output level independently in the L and R channels using either voltage or power notation. Voltage specification may be either volts or millivolts, (positive) peak or RMS depending on the softkey pressed. Cf. also Fig. 3.5.

   If GND was specified under SIGNAL (cf. note 5), LEVEL specification does not apply. If a load impedance is specified under LOAD LEFT or LOAD RIGHT (cf. note 7), the desired output voltage will be delivered into the specified load, provided the required voltage does not exceed the limitations of the Audio Generator.

   RMS specification applies to the total output signal whether single-tone, two-tone or multitone. For this reason, an exact voltage range cannot be given. The range is limited by the peak voltage handling capability of the Audio Generator.

   The milliwatt specification, using the MWATT softkey, is also

limited by the peak voltage capability and requires a LOAD LEFT and/or LOAD RIGHT specification. RMS values are implied.

When specifying dBm using DBM softkey, RMS values are implied. The load specification has only two choices: 600 ohm using .6 K entry or EMF. In the first case, the Audio Generator will deliver the specified power into a 600 ohm load, while in the second case, the EMF of the generator will be adjusted with reference to 774.6 mV (1 mW into 600 ohm). This type of specification is also known as dBu in the broadcasting nomenclature. The +/- softkey toggles the sign of the dBm specification,

7. Pressing LOAD softkey enables specification of the load impedance in kiloohms to which the desired output level (cf. note 6) shall be delivered.

   EMF softkey applies to electromotive force of the Audio Generator regardless of load impedance.

   It should be noted that the distortion specifications of the Audio Generator does only hold for load impedances at or above 600 ohm.

   The following limitations in the choice of parameters apply:

   LOAD - for DBM: only .6 K

   EMF - not valid for MWATT

   It should be emphasized that the output impedance of the Audio Generator is 600 ohms regardless of LOAD specification.

8. The operator is free to specify load impedances in the range indicated. However, the combined load and level specification is subject to the peak voltage limitation of the Audio Generator. Violations will be reported by the PARAMETER LIMIT EXCEEDED error message.

9. The VRMS and MVRMS ranges indicated in the list do only apply to the EMF of single-tone sine-wave signals for which a well-defined relation between peak and RMS values exists. Other types of signals are limited by the peak voltage capability of the Audio Generator. Violations will be reported by the PARAMETER LIMIT EXCEEDED error message.

10. The VP and MVP ranges indicated are the fundamental (positive) peak voltage EMF limitations of the Audio Generator. All types of signals must observe these constraints, and violations will be reported by the PARAMETER LIMIT EXCEEDED error message.

11. The MWATT range indicated applies to single-tone, sine-wave signals into a 600 ohm load only. For other load impedances and signal types, the output power will be limited by the peak voltage capability of the Audio Generator. Violations will be reported by the PARAMETER LIMIT EXCEEDED error message.

12. The DBM range indicated applies to single-tone, sine-wave signals into a 600 ohm load only. For other types of signals, the output power will be limited by the peak voltage capability of the Audio Generator. Specifying EMF adds to both upper and lower limits of the indicated range under similar assumptions as above. Violations will be reported by the PARAMETER LIMIT EXCEEDED error message.

```
**********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER                5
SIGNAL              >     5500 HZ
MODE RIGHT              SIGNAL
LEVEL RIGHT                1 V
LOAD RIGHT                .6 K
MODE LEFT               SIGNAL
LEVEL LEFT                 1 V
LOAD LEFT                 .6 K


SIGNAL                  [     ]HZ
---------------------------------
 SFREQ     IM    TIM30   STORE
 MFREQ    DFIM   TIM100
**********************************
```

Fig. 3.3 - LEARN SIGNAL DISPLAY
in the case of single-tones

```
*********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER              3
SIGNAL           >     MFREQ3
MODE RIGHT             SIGNAL
LEVEL RIGHT                1 V
LOAD RIGHT                .6 K
MODE LEFT              SIGNAL
LEVEL LEFT                 1 V
LOAD LEFT                 .6 K


SIGNAL                 MFREQ3
--------------------------------
 SFREQ     IM    TIM30   STORE
 MFREQ    DFIM   TIM100
*********************************
```

Fig. 3.4 - LEARN SIGNAL DISPLAY
in the case of multi-tones

```
*********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER              3
SIGNAL                 MFREQ3
MODE RIGHT             SIGNAL
LEVEL RIGHT      >         1 V
LOAD RIGHT                .6 K
MODE LEFT              SIGNAL
LEVEL LEFT                 1 V
LOAD LEFT                 .6 K


LEVEL RIGHT          -[     ] DBM
--------------------------------
  VRMS   MVRMS   MWATT   STORE
   VP     MVP     DBM     +/-
*********************************
```

Fig. 3.5 - LEARN SIGNAL DISPLAY
in the case of LEVEL specification

Default Values

SIGNAL	1000 HZ	(SINGLE-TONE)
MODE RIGHT, MODE LEFT	SIGNAL	(SIGNAL NO. 99: GND)
LEVEL RIGHT, LEVEL LEFT	1 V	
LOAD RIGHT, LOAD LEFT	EMF	

Signal no. 99 has grounded outputs as default values contrary to signals nos. 0 - 98. Consequently, signal no. 99 may be used for "turning off" the Audio Generator.

Shortcuts

When defining signals using the IM, DFIM and MFREQ types, the LEARN mode for these types may be entered directly from the LEARN SIGNAL mode in the following way:

1. Point the cursor to the SIGNAL field, cf. Fig. 3.3.
2. Enter the desired signal type into the status line using the softkeys and numeric keys (e.g. IM7 or DFIM3).
3. Press the LEARN key.

The display now changes to the appropriate LEARN mode directly instead of going through EXIT and FUNCT (soft-)keys. In fact, LEARN MFREQ is only accessible in this way, cf. sec. 3.1.2.

Softkeys used

+/-	SFREQ
1 KHZ	SHOW+
DBM	SHOW-
DFIM	SIGNAL
EMF	SQR/TRI
GND	STORE
IM	TIM100
LOAD	TIM30
MFREQ	VP
MVP	VRMS
MVRMS	
MWATT	

3.1.2 - MFREQ Definition

When in LEARN SIGNAL mode, the operator may enter LEARN MFREQ mode in the following way: First, move the cursor to the SIGNAL field, cf. Fig. 3.4. Next, the status line must contain an MFREQ reference as in Fig. 3.4. Following this, press the LEARN key. Subsequently, the display changes to the LEARN MFREQ layout shown in Fig. 3.6.

```
**********************************
      *** LEARN MFREQ ***

MFREQ NUMBER            >    3
FREQ # 1        400        1000 HZ
FREQ # 2        333        3000 HZ
FREQ # 3        200        5000 HZ
FREQ # 4        143        7000 HZ
FREQ # 5        111        9000 HZ
FREQ # 6         91       11000 HZ
FREQ # 7         77       13000 HZ
FREQ # 8         67       15000 HZ

MFREQ NUMBER                 [ ]
--------------------------------
                            STORE
 SHOW+    SHOW-
**********************************
```

Fig. 3.6 - LEARN MFREQ DISPLAY

When pointing to the MFREQ NUMBER field, the user may scroll through the MFREQ definitions by pressing SHOW+ or SHOW-.

The four cursor control keys are used for moving the cursor (blinking >) to the desired field, while modification requires the softkeys or numerical keys followed by ENTER. The softkey menu will change according to the field pointed to by the cursor.

Up to 8 frequencies may be defined, each having different relative levels. The level information is entered into the middle column, cf. Fig. 3.7, and the frequency information into the right column, cf. Fig. 3.8.

```
**********************************
      *** LEARN MFREQ ***

MFREQ NUMBER                  3
FREQ#1    >    400        1000 HZ
FREQ#2         333        3000 HZ
FREQ#3         200        5000 HZ
FREQ#4         143        7000 HZ
FREQ#5         111        9000 HZ
FREQ#6          91       11000 HZ
FREQ#7          77       13000 HZ
FREQ#8          67       15000 HZ

LEVEL  1      [    ]
---------------------------------
                              STORE
 DELETE   CREATE
**********************************
```

Fig. 3.7 - LEARN MFREQ DISPLAY when pointing to a LEVEL field

```
*********************************
      *** LEARN MFREQ ***

MFREQ NUMBER                3
FREQ # 1        400      > 1000 HZ
FREQ # 2        333        3000 HZ
FREQ # 3        200        5000 HZ
FREQ # 4        143        7000 HZ
FREQ # 5        111        9000 HZ
FREQ # 6         91       11000 HZ
FREQ # 7         77       13000 HZ
FREQ # 8         67       15000 HZ

FREQ  1                [      ]HZ
---------------------------------
                             STORE
 DELETE  CREATE
*********************************
```

Fig. 3.8 - LEARN MFREQ DISPLAY when pointing to a FREQ field

Numerical entries are completed when pressing ENTER. Frequencies may be deleted or created by pressing the DELETE or CREATE softkeys respectively.

Having completed the MFREQ definition, the information is stored by pressing STORE. Alternately, EXIT may be used if modifications are not desired.

Following STORE or EXIT, the RE201 returns to the same LEARN SIGNAL display from which LEARN MFREQ was entered. In order to transfer the MFREQ entry from the status line to the SIGNAL field, the operator must press ENTER. The MFREQ number is the original one entered despite possible use of SHOW+ or SHOW- softkeys.

Parameters

		Note
MFREQ NUMBER	0 - 9	
LEVEL # n	0 - 999	1, 3
FREQ # n	10 - 25000	2, 3

Notes

1. Relative level of one of the max. 8 multi-tone components ($1 \leq n \leq 8$). Entering a value of 0 implies that the component is removed from the signal. Note that the absolute output level of the MFREQ signal is specified in the SIGNAL definition using the desired MFREQ.

2. Frequency of one of the max. 8 multi-tone components ($1 \leq n \leq 8$). Frequency resolution is 10 Hz.

3. MFREQ components may be created or deleted by pressing the CREATE or DELETE softkeys respectively.

Default Values

LEVEL # n	1	
FREQ # n	1000*n	Hz
Number of MFREQ components	2	

Softkeys used

CREATE

DELETE

SHOW-

SHOW+

STORE

3.1.3 - Using SIGNALs in SETUPs

Inclusion of the Audio Generator option in the RE201 does not affect the operation of the remaining features of the LEARN mode except SETUPs.

Having entered LEARN SETUP mode in the usual way (cf. sec. 4.6 of the RE201 manual), the display shown in Fig. 3.9 turns up.

```
**********************************
      *** LEARN SETUP ***

SETUP NUMBER                 2
MEASUREMENT(S)             TIM5
SIGNAL NUMBER     >           5
GPIO    1110010110001010111O
```

```
SIGNAL NUMBER           [   ]
---------------------------------
                          STORE

**********************************
```

Fig. 3.9 - LEARN SETUP DISPLAY

New to this display is the line containing the SIGNAL NUMBER specification, enabling the operator to specify corresponding RE201 measurements, signals from the Audio Generator and stimuli of external equipment via the GPIO interface.

As indicated in Fig. 3.9, the operator specifies the desired signal number followed by ENTER. When the SETUP definition is completed, the SETUP is stored by pressing the STORE softkey. Alternately, EXIT may be used if modifications are not desired.

3.2 - EXECUTE MODE

In EXECUTE mode, the previously defined signals and measurements may be activated manually one by one or automatically as part of SETUPs.

In this mode, the step size parameters used for manual control of the output level and frequency of the Audio Generator, while activated, are also defined.

The IDLE display (when the Audio Generator option is installed) contains two new softkey definitions: GENCTRL (F4) (only when the Audio Generator is activated) and SIGNAL (F8), as shown in Fig. 3.10.

```
**********************************
         *** RE201 ***




ENTER COMMAND
---------------------------------
   DC                        GENCTRL
  W&F                         SIGNAL
**********************************
```

Fig. 3.10 - IDLE MODE DISPLAY

The use of these keys will be explained below.

3.2.1 - Activation of the Audio Generator

When the SIGNAL softkey is pressed, the RE201 requests the operator to key in the desired signal number followed by ENTER. This activates the Audio Generator using the desired signal definition.

Following signal activation, the user may execute single measurements or sequences as usual. If a signal definition is part of a SETUP, the Audio Generator will be activated automatically when executing the SETUP. For information on SETUPs, refer to sec. 4.5 of the RE201 manual and to sec. 3.1.3 of this manual.

Upon power-up, the Audio Generator is silent. Once activated, the Audio Generator cannot be turned off, but only switched from one signal to another. However, if it is desired to turn the signals off, signal no. 99 has grounded outputs as default values and this enables the user to silence the generator when selecting this signal (unless modified by the user).

3.2.2 - Manual Control of the Audio Generator

The manual control feature enables the operator to modify the output level and/or frequency of an active signal. The level and/or frequency may be specified directly via the GENCTRL entry. The modification may also be performed in steps via the cursor control keys. The step sizes are defined via the GENCTRL entry.

It should be noted, however, that frequency modification is only possible for single-tone signals, whereas output level modification is possible for any type of signal (except of course GND).

The GENCTRL softkey may be activated from the IDLE MODE display, cf. Fig. 3.10, as well as during measurement. It should, however, be noted that whenever the GENCTRL is activated, the measurements are suppressed, i.e. the results are not updated.

Pressing GENCTRL, the following display appears (shown activated from IDLE MODE):

```
**********************************
          *** RE201 ***
```

```
SELECT USING SOFTKEY
--------------------------------
LEV L    LEV B     LEV R  STATUS
LEVSTEP STEP CH   FREQ   FRQSTEP
**********************************
```

Fig. 3.11 - GENCTRL MENU

Please note that the menu shown above may be modified in accordance with the actual signal configuration as explained below.

Level and Level Step

The GENCTRL menu contains three entries for modifying the output level: LEV L, LEV B and LEV R, referring to left, both and right channels respectively. Pressing say LEV R, the following display appears:

```
*********************************
          *** RE201 ***
```

```
ENTER LEVEL (RIGHT)    [       ] V
---------------------------------
 VRMS      MVRMS     MWATT
  VP         MVP       DBM
*********************************
```

Fig. 3.12 - LEVEL CONTROL MENU

The operator may now specify the level exactly as in LEARN SIGNAL mode. Example: 50 mV RMS is entered as: MVRMS 5 0 ENTER.

Following ENTER, the output level will be 50 mV RMS and the RE201 will resume what was going on, when GENCTRL was activated.

It should be noted that if GND has been selected for a channel the corresponding LEV softkey and the LEV B softkey do not appear.

The level step is defined by pressing LEVSTEP in the GENCTRL menu, cf. Fig. 3.11. The display shown in Fig. 3.13 then appears:

```
**********************************
*** RE201 ***

DEFINE LEVEL STEP      [     ] DB
---------------------------------

**********************************
```

Fig. 3.13 - Defining LEVEL STEP size

The level step size can only be defined in dB. Following numeric input, the operator presses ENTER and the display returns to IDLE MODE, or to the measurement in progress, if any.

Finally, the operator may specify whether left, right or both channels should be affected by the level step feature. Returning again to the GENCTRL menu Fig. 3.11, the operator presses STEPCH and the display in Fig. 3.14 appears.

Pressing one of the three available softkeys - LEFT, BOTH, RIGHT - completes the selection, and the display returns to IDLE MODE.

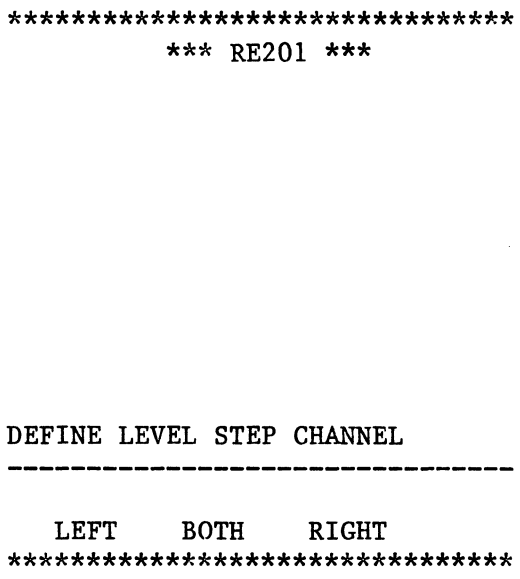

Fig. 3.14 - STEPCH MENU

The level step feature is activated by the cursor control keys "cursor up" (↑) and "cursor down" (↓), cf. Fig. 3.17. When activating one of these keys, the new output level is displayed on the status line. The only limits to the number of steps are the output voltage capabilities of the Audio Generator as discussed in sec. 3.1.1.

Frequency and Frequency Step

The frequency of a single-tone signal may be modified by the FREQ softkey of the GENCTRL menu Fig. 3.11. Pressing FREQ, the following display appears:

```
**********************************
          *** RE201 ***

ENTER FREQUENCY        [     ] HZ
----------------------------------

**********************************
```

Fig. 3.15 - Modifying frequency

The new frequency is entered via the numerical keypad followed by ENTER. Subsequently, the display returns to IDLE MODE, Fig. 3.10, and the output frequency will be changed.

Definition of frequency step size is performed by the FRQSTEP softkey of the GENCTRL menu Fig. 3.11. Pressing FRQSTEP provides the FREQUENCY STEP menu shown in Fig. 3.16.

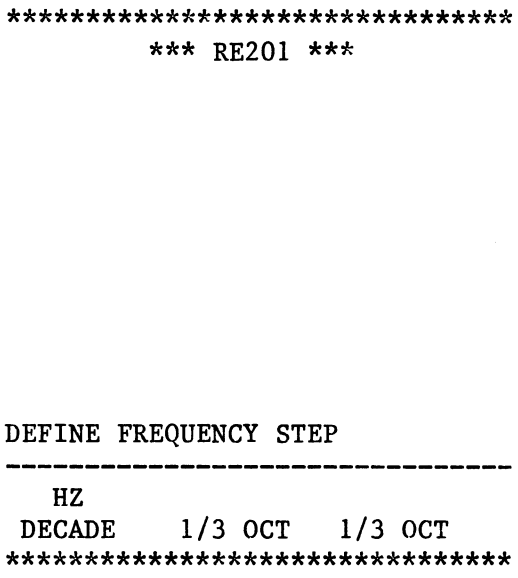

Fig. 3.16 - FREQUENCY STEP MENU

The 1/3 OCT and 1/1 OCT softkeys provide step sizes of 1/3 octave and one octave respectively and require no additional parameters.

The HZ softkey opens a numerical entry field on the status line for defining step size in Hz. The DECADE softkey opens a numerical entry field for defining step size in fractions of a decade.

Defining e.g. step size = 0.15 decades means that frequency will be multiplied by 10 raised to .15th power = 1.412538... each time "cursor right" (⟶) is pressed and divided by the same figure each time "cursor left" (⟵) is pressed.

Following numerical entry, the operator presses ENTER and the display subsequently returns to idle mode Fig. 3.10. The same holds for the 1/3 OCT and 1/1 OCT softkeys.

If a single-tone signal is defined in one channel and the 1 kHz reference or GND is selected for the other, it is evident that only the channel carrying the single-tone signal can have its frequency modified by a FRQSTEP definition. If neither channel carries a single-tone signal, the FREQ and FRQSTEP softkeys are absent.

Frequency stepping is activated by the cursor control keys "cursor left" (⟵) = frequency down and "cursor right" (⟶) = frequency up, cf. Fig. 3.17. The number of steps are only limited by the frequency capability of the Audio Generator as discussed in sec. 3.1.1.

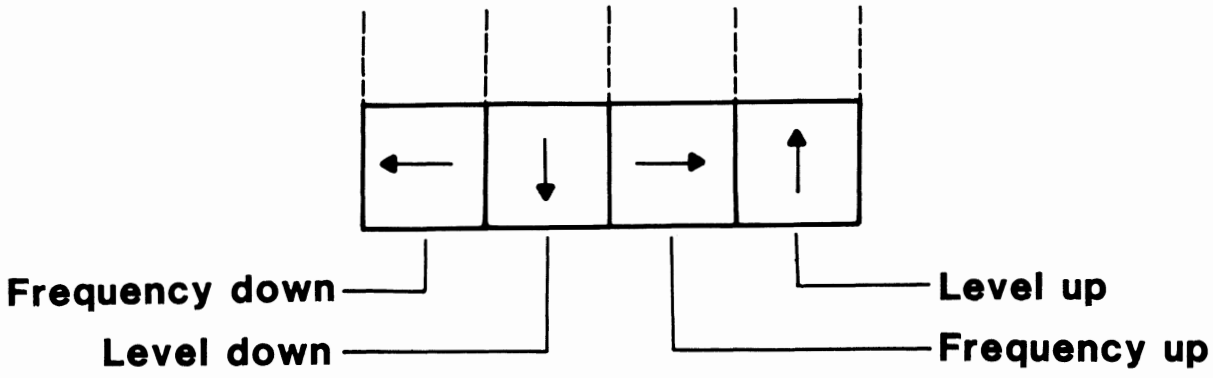

Fig. 3.17 - Level and Frequency Step Control Keys (autorepeating)

Parameters

		Note
LEV L, LEV B, LEV R	<VRMS>	1
	<VP>	1
	<MVRMS>	1
	<MVP>	1
	<MWATT>	1
	<DBM>	1
	<+/->	1
LEVSTEP	0.1 - 79.9	2
STEP CH	<LEFT>	3
	<BOTH>	3
	<RIGHT>	3
FREQ	1 - 24999	4
FREQSTEP	<HZ>	5
	<DECADE>	5
	<1/3 OCT>	5
	<1/1 OCT>	5
STATUS		6
HZ	0 - 24999	5
DECADE	0 - 1.99	5

Notes

1. LEV L, LEV B and LEV R definitions refer to left, both and right channel levels respectively. The parameter ranges and limitations are identical to those given in sec. 3.1.1 SIGNAL definition.

2. LEVSTEP defines the level step size in dB by numerical entry from keyboard. Cf. Fig. 3.13.

3. STEP CH defines which channel(s) should be affected by the manual level step feature via softkey entries: LEFT, BOTH and RIGHT. If only one channel is selected the other channel is denoted "OFF" in the LEVEL STEP field of the STATUS display.

4. The FREQ entry defines the frequency of a single-tone signal in Hz by numerical entry from keyboard.

5. The FRQSTEP entry defines the frequency step size in Hz for linear stepping and in fractions of a decade, 1/3 octave or 1/1 octave for logarithmic stepping. If the single-tone signal is selected in one channel only, the frequency step definition applies exclusively to this channel and the other channel is denoted "OFF" in the FREQ STEP field of the STATUS display.

6. The STATUS softkey displays the parameters of the currently active signal from the Audio Generator. The changes in level and/or frequency by manual stepping is reflected instantaneously in the STATUS display.

Default Values

LEVSTEP	1 dB
FRQSTEP	1/3 OCTAVE

Shortcuts

To enter STATUS display from EXECUTE mode without pressing softkey F4 twice (first GENCTRL and next STATUS), press and hold down F4 for approx. 1 sec. The RE201 then auto-repeats the key and provides the STATUS display nearly instantaneously.

Softkeys used

+/-	LEV B
1/1 OCT	LEV L
1/3 OCT	LEV R
BOTH	LEVSTEP
DBM	MVP
DECADE	MVRMS
FREQ	MWATT
FRQSTEP	RIGHT
GENCTRL	STATUS
HZ	STEP CH
LEFT	VP
	VRMS

3.2.3 - STATUS Display

The STATUS softkey in the GENCTRL menu, cf. Fig. 3.11, enables the user to obtain a quick verification of the presently active signal in the RE201 without going through LEARN mode. On pressing the STATUS softkey, the display could change to:

```
********************************
       *** SIGNAL 12 ***

SIGNAL          3150 HZ    3150 HZ

LEVEL             3 DBM      3 DBM

LOAD             .6 K       .6 K

LEVEL STEP        1 DB       1 DB

FREQ STEP       1/3 OCT    1/3 OCT


********************************
```

Fig. 3.18 - STATUS DISPLAY
in the case of single-tone signals

The first column of information gives the parameter names while the second and third columns hold the left and right channel parameters respectively.

In this case, a single-tone signal is active in both channels, and the operator is informed about all parameters defining the signal including STEP sizes used in manual control of the Audio Generator (cf. sec. 3.2.2).

The STATUS softkey may be used both during IDLE mode and during measurements (SEQUENCES and SETUPs). The RE201 returns to the normal display when pressing EXIT.

Whenever the STATUS display is active, the cursor control keys may be used for stepping of level and/or frequency. The values are immediately updated.

In the case of a two-tone or a TIM signal, the STATUS display may look like this:

```
**********************************
       *** SIGNAL 05 ***

SIGNAL       TIM30 TRI   TIM30 TRI

LEVEL            1 V         1 V

LOAD           EMF         EMF

LEVEL STEP     .1 DB       .1 DB




**********************************
```

Fig. 3.19 - STATUS DISPLAY in the case of TIM signals

In the case of a multi-tone signal, the STATUS display may look like this:

```
*********************************
       *** SIGNAL 03 ***

SIGNAL      MFREQ3      MFREQ3

FREQ# 1        400        1000 HZ
FREQ# 2        333        3000 HZ
FREQ# 3        200        5000 HZ
FREQ# 4        143        7000 HZ
FREQ# 5        111        9000 HZ
FREQ# 6         91       11000 HZ
FREQ# 7         77       13000 HZ
FREQ# 8         67       15000 HZ

LEVEL            1 V         1 V
LOAD            .6 K        .6 K
LEVEL STEP    .1 DB         .1 DB
*********************************
```

Fig. 3.20 - STATUS DISPLAY in the case of multi-tones

In this case, the second column informs about the relative levels of the individual components, while the third holds the corresponding frequencies.

4.1 - AUDIO GENERATOR TUTORIAL

In this section a number of examples covering all aspects of Audio Generator operation are given as a quick reference guide for the experienced user and as a learning guide for the first-time user.

The examples covering each type of signal definition will contain a complete, annotated keystroke sequence and copies of the RE201 display where appropriate. First, the operator will be guided from RE201 EXECUTE mode to the LEARN SIGNAL mode. Next, a number of signal definitions of increasing complexity will be given in addition to the definition of level and frequency steps for use in manual control of the Audio Generator. Finally, an example will reveal how to activate a desired signal in EXECUTE mode.

In the examples given, it is assumed that the RE201 in addition to the Audio Generator is equipped with the ZOOM facility (901-393). However, the operation of the RE201 is completely transparent to the presence of the ZOOM facility, except that the constraints on frequency spacing and lower frequency are more severe when the ZOOM facility is not present.

Each example is opened with a statement of the presumptions made. The keystrokes are presented as four columns of information - one holding the step no., the second holding the keystrokes, the third holding possible comments and the fourth giving references to figures as needed.

The use of the SHIFT key $\begin{matrix}\Delta\\ \nabla\end{matrix}$ is explicitly indicated in the sequence and is written on the same line as the function SHIFTED. No distinction is made between the fixed definition (hard) keys and the softkeys, as the latter are considered an extension of the fixed keyboard.

Numerical entries are written on one line, even if the number contains more than one digit and consequently requires more than one keystroke.

4.2 - Entering LEARN SIGNAL mode from IDLE or EXECUTE mode

Presumptions

The RE201 is powered up and is in IDLE or EXECUTE mode.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	LEARN	LEARN mode is entered. If a measurement Sequence or SETUP was active when pressing LEARN, an implicit EXIT is executed to stop activity.	
2	SIGNAL		
3	23	SIGNAL no. 23 is used as an example.	
4	ENTER	Following this, SIGNAL no. 23 definition appears and the RE201 is now in LEARN SIGNAL mode	4.1

```
**********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER    >          23
SIGNAL                    1000 HZ
MODE RIGHT              SIGNAL
LEVEL RIGHT                1 V
LOAD RIGHT               EMF
MODE LEFT               SIGNAL
LEVEL LEFT                 1 V
LOAD LEFT                EMF


SIGNAL NUMBER            [   ]
---------------------------------
                           STORE
SHOW+     SHOW-
**********************************
```

Fig. 4.1 - LEARN SIGNAL display

4.3 - Defining a single-tone Signal

Description

In this example, a 3150 Hz single-tone signal having a 100 mV RMS amplitude into a 1 kohm load in the left channel and a grounded output in the right channel is defined.

Presumptions

The RE201 is in LEARN SIGNAL mode. Cf. sec. 4.2. The cursor (blinking >) points to signal number field, cf. Fig. 4.1.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	↓	Scroll cursor down one line	
2	SFREQ	Only needed if another type of signal was present	
3	3150	Frequency in Hz	
4	ENTER	The number is transferred from the status line to the SIGNAL field	
5	GND	The right channel output is grounded	
6	ENTER		
7	SIGNAL		
8	ENTER	The 3150 Hz signal is selected for the left channel	
9	MVRMS	Level in millivolts RMS	
10	100	Level	
11	ENTER	The number is transferred from the status line to the LEVEL LEFT field	
12	LOAD		
13	1	Load in kiloohms	
14	ENTER	The definition is now complete	4.2
15	STORE	The definition is stored	
16	EXIT	The RE201 is now back to IDLE mode	

Discussion

As indicated in the example, the two channels need not output identical signals. However, having defined a single-tone in one channel, the other channel is restricted to one of three choices: the defined single-tone (SIGNAL softkey), GND or the 1 kHz reference (1 KHZ softkey). Cf. also Fig. 2.1. Entries that already contains the desired parameter may be skipped by pressing "cursor down" (↓).

```
**********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER    >          23
SIGNAL                    3150 HZ
MODE RIGHT                 GND
LEVEL RIGHT                GND
LOAD RIGHT                 EMF
MODE LEFT                SIGNAL
LEVEL LEFT                 100 MV
LOAD LEFT                    1 K


SIGNAL NUMBER              [   ]
---------------------------------
                           STORE
 SHOW+    SHOW-
**********************************
```

Fig. 4.2 - SIGNAL definition completed

4.4 - Defining a two-tone Signal

Description

In this example, an IM signal no. IM5 having a 50 Hz lower frequency and a 8000 Hz upper frequency is defined. The level will be 0.1 V RMS EMF in both channels. The measurement will consider second order IM products only, representation will be in per cent and averaging will be linear, using two loops.

Presumptions

The RE201 is in LEARN SIGNAL mode. Cf. sec. 4.2. The cursor (blinking >) points to signal number field, cf. Fig. 4.1.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	↓	Scroll cursor down one line	
2	IM	Select IM type signals	
3	5		
4	LEARN	Switch to LEARN IM Mode	4.3
5	↓	Scroll cursor down one line	
6	BOTH	Measurement in both channels	
7	ENTER		
8	50	Lower frequency	
9	ENTER		
10	8000	Upper frequency	
11	ENTER		
12	STORE	The IM5 definition is now stored and the RE201 returns to LEARN SIGNAL mode. The remaining IM parameters are default values.	4.4
13	ENTER	SIGNAL is defined as IM5	
14	SIGNAL		
15	ENTER	The IM signal is selected for the right channel	
16	VRMS	Level in volts RMS	
17	.1	Level	
18	ENTER	The number is transferred from the status line to the LEVEL RIGHT field	
19	EMF		
20	ENTER	EMF is entered into the LOAD RIGHT field	
21	SIGNAL		

22	ENTER	The IM signal is selected for the left channel	
23	VRMS	Level in volts RMS	
24	.1	Level	
25	ENTER	The number is transferred from the status line to the LEVEL LEFT field	
26	EMF	EMF is selected in the LOAD LEFT field	
27	ENTER	The definition is now complete	4.5
28	STORE	The definition is stored	
29	△ EXIT ▽	The RE201 is now back to IDLE mode	

Discussion

In this example, identical signals and signal levels were selected in both channels. This is not mandatory, however, and the possible combinations of signals may be found in Fig. 2.1. Signal levels may have any values provided the peak output voltage capability of the Audio Generator is not violated. Entries that already contain the desired parameter may be skipped by pressing "cursor down" (↓).

```
**********************************
         *** LEARN IM ***

FUNCTION            >      IM5
CHANNEL                   BOTH
LOWER FREQUENCY           700 HZ
HIGHER FREQUENCY         7000 HZ
FIRST IM PRODUCT            2
LAST IM PRODUCT             2
REPRESENTATION              %
AVERAGING                 LIN
NO. OF LOOPS                2

FUNCTION NUMBER            [ ]
----------------------------------
                          STORE
 SHOW+    SHOW-           DEFLT
**********************************
```

Fig. 4.3 - LEARN IM display

```
*********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER              24
SIGNAL           >       1000 HZ
MODE RIGHT               SIGNAL
LEVEL RIGHT                 1 V
LOAD RIGHT                 EMF
MODE LEFT                SIGNAL
LEVEL LEFT                  1 V
LOAD LEFT                  EMF


SIGNAL                     IM5
---------------------------------
 SFREQ     IM    TIM30   STORE
 MFREQ    DFIM   TIM100
*********************************
```

Fig. 4.4 - LEARN SIGNAL display after return from LEARN IM mode

```
*********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER    >         24
SIGNAL                     IM5
MODE RIGHT               SIGNAL
LEVEL RIGHT                .1 V
LOAD RIGHT                 EMF
MODE LEFT                SIGNAL
LEVEL LEFT                 .1 V
LOAD LEFT                  EMF


SIGNAL NUMBER              [  ]
---------------------------------
                           STORE
 SHOW+   SHOW-
*********************************
```

Fig. 4.5 - SIGNAL definition completed

4.5 - Defining a TIM Signal

Description

In this example, a triangular TIM signal having 30 kHz frequency cut-off and 75 mV RMS output into a 600 ohm load is defined in the left channel, and the 1 kHz reference having 75 mV RMS output level into a 600 ohm load is defined in the right channel.

Presumptions

The RE201 is in LEARN SIGNAL mode. Cf. sec. 4.2. The cursor (blinking >) points to signal number field, cf. Fig. 4.1.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	↓	Scroll cursor down one line	
2	TIM30	Select TIM signal with 30 kHz cut-off	
3	SQR/TRI	Switch to triangular mode	
4	ENTER	The signal selection is transferred from the status line to the SIGNAL field	
5	1 kHz		
6	ENTER	The 1 kHz reference is selected for the right channel	
7	MVRMS	Level in millivolts RMS	
8	75	Level	
9	ENTER	The number is transferred from the status line to the LEVEL RIGHT field	
10	LOAD	Load in kiloohms	
11	.6	Load	
12	ENTER	Cf. step no. 9	
13	SIGNAL		
14	ENTER	The TIM signal is selected for the left channel	
15	MVRMS	Level in millivolts RMS	
16	75	Level	
17	ENTER	Cf. step no. 9	
18	LOAD	Load in kiloohms	
19	.6	Load	
20	ENTER	The definition is now complete	4.6
21	STORE	The definition is stored	
22	△ EXIT ▽	RE201 is now back to IDLE mode	

Discussion

As indicated in the example, the two channels need not output identical signals. However, having defined a TIM signal in one channel, the other channel is restricted to one of three choices: the defined TIM signal (SIGNAL softkey), GND, or 1 kHz reference (1 KHZ softkey). Cf. also Fig. 2.1.

Signal levels may have any values provided the peak output voltage capability of the Audio Generator is not violated.

In case a field already contains the desired parameter value, the "cursor down" key (↓) may be used to skip to the next field.

```
********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER     >        25
SIGNAL                   TIM30 TRI
MODE RIGHT               1 KHZ
LEVEL RIGHT                 75 MV
LOAD RIGHT                  .6 K
MODE LEFT               SIGNAL
LEVEL LEFT                  75 MV
LOAD LEFT                   .6 K


SIGNAL NUMBER             [   ]
--------------------------------
                           STORE
 SHOW+    SHOW-
********************************
```

Fig. 4.6 - SIGNAL definition completed

4.6 - Defining a Multi-tone Signal

Description

In this example, a multi-tone signal MFREQ2 composed of the frequencies 30 Hz, 50 Hz, 100 Hz, 200 Hz, 1000 Hz, 5000 Hz, 10000 Hz and 15000 Hz is defined. The amplitudes are equal except for the 15000 Hz component, which is 5 times weaker than others. The signal will be applied to both channels and the peak amplitude will be 100 mV EMF.

Presumptions

The RE201 is in LEARN SIGNAL mode. Cf. sec. 4.2. The cursor (blinking >) points to signal number field, cf. Fig. 4.1. A default MFREQ definition having two tones is assumed when entering LEARN MFREQ mode.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	↓	Scroll cursor down one line	
2	MFREQ	Select MFREQ signal	
3	2	MFREQ number	
4	LEARN	Switch to LEARN MFREQ mode	4.7
5	↓	Scroll cursor down one line. The cursor now points to the level field of FREQ 1	
6	5	Relative level of FREQ 1	
7	ENTER	The number is transferred from the status line to the LEVEL 1 field	
8	5	Relative level of FREQ 2	
9	ENTER		
10	CREATE	Create FREQ 3 entry	
11	5	Relative level of FREQ 3	
12	ENTER		
13	CREATE	Create FREQ 4 entry	
14	5		
15	ENTER		
16	CREATE	Create FREQ 5 entry	
17	5		
18	ENTER		
19	CREATE	Create FREQ 6 entry	
20	5		
21	ENTER		

22	CREATE	Create FREQ 7 entry	
23	5		
24	ENTER		
25	CREATE	Create FREQ 8 entry	
26	1	Relative level of FREQ 8	
27	ENTER	Transfer number to LEVEL 1 field. Cursor returns automatically to top line. Frequencies, which have until now attained default values are subsequently defined.	4.8
28	↓	Scroll cursor down one line	
29	→	Scroll cursor right	
30	30	Frequency of FREQ 1	
31	ENTER		
32	50	Frequency of FREQ 2	
33	ENTER		
34	100	Frequency of FREQ 3	
35	ENTER		
36	200		
37	ENTER		
38	1000		
39	ENTER		
40	5000		
41	ENTER		
42	10000		
43	ENTER		
44	15000	Frequency of FREQ 8	
45	ENTER	The definition is now complete	4.9
46	STORE	The MFREQ definition is stored and RE201 returns to LEARN SIGNAL mode	
47	ENTER	MFREQ2 is entered into SIGNAL field	
48	SIGNAL		
49	ENTER	MFREQ2 is selected for the right channel	
50	MVP	Peak amplitude in mV	
51	100	Amplitude	
52	ENTER		
53	EMF		
54	ENTER		
55	SIGNAL		
56	ENTER	MFREQ2 is selected for the left channel	
57	MVP	Peak amplitude in mV	
58	100	Amplitude	
59	ENTER		
60	EMF		
61	ENTER	The definition is now complete	4.10
62	STORE	The definition is stored	
63	△ EXIT ▽	RE201 is now back to EXECUTE mode	

Discussion

The MFREQ definition is the most complex of all SIGNAL definitions available on the RE201 Audio Generator, which is also reflected in the number of steps required. However, once the basic principles are understood, the programming of this powerful feature is straight forward. As evident from the keystroke sequence it is convenient first to define the amplitudes of the frequency components - including the creation of new frequency entries as required - and subsequently modifying the default frequencies 1000 Hz, 2000 Hz etc. to the desired values.

Upon returning to LEARN SIGNAL mode it is important to include an ENTER in order to transfer the MFREQ2 definition to the SIGNAL field.

In case a field already contains the desired parameter value, the "cursor down" key (↓) may be used to skip to the next field.

```
**********************************
      *** LEARN MFREQ ***

MFREQ NUMBER      >          2
FREQ # 1          1       1000 HZ
FREQ # 2          1       2000 HZ




MFREQ NUMBER                [ ]
---------------------------------
                            STORE
 DELETE     CREATE
**********************************
```

Fig. 4.7 - LEARN MFREQ display

```
**********************************
      *** LEARN MFREQ ***

MFREQ NUMBER      >          2
FREQ # 1          5       1000 HZ
FREQ # 2          5       2000 HZ
FREQ # 3          5       3000 HZ
FREQ # 4          5       4000 HZ
FREQ # 5          5       5000 HZ
FREQ # 6          5       6000 HZ
FREQ # 7          5       7000 HZ
FREQ # 8          1       8000 HZ

MFREQ NUMBER                [ ]
---------------------------------
                            STORE
 SHOW+    SHOW-
**********************************
```

Fig. 4.8 - MFREQ level definitions completed

```
**********************************
       *** LEARN MFREQ ***

MFREQ NUMBER      >          2
FREQ # 1          5         30 HZ
FREQ # 2          5         50 HZ
FREQ # 3          5        100 HZ
FREQ # 4          5        200 HZ
FREQ # 5          5       1000 HZ
FREQ # 6          5       5000 HZ
FREQ # 7          5      10000 HZ
FREQ # 8          1      15000 HZ

MFREQ NUMBER                [ ]
---------------------------------
                            STORE
 SHOW+    SHOW-
**********************************
```

Fig. 4.9 - MFREQ frequency definitions completed

```
********************************
      *** LEARN SIGNAL ***

SIGNAL NUMBER     >         26
SIGNAL                   MFREQ2
MODE RIGHT               SIGNAL
LEVEL RIGHT                 100 MVP
LOAD RIGHT                  EMF
MODE LEFT                SIGNAL
LEVEL LEFT                  100 MVP
LOAD LEFT                   EMF


SIGNAL NUMBER               [   ]
--------------------------------
                            STORE
 SHOW+    SHOW-
********************************
```

Fig. 4.10 - SIGNAL definition completed

4.7 - Activating a Signal

Description

In this example a previously defined signal is activated

Presumptions

The RE201 is in IDLE or EXECUTE mode, cf. sec. 3.2. Signal no. 23 is taken as an example.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	SIGNAL	Following this, the RE201 requests the SIGNAL no.	
2	23	SIGNAL no.	
3	ENTER	The desired SIGNAL is now active	

Discussion

Immediately after power-on, the Audio Generator is silent and the GENCTRL softkey is absent from the display. Once activated, GENCTRL appears and the Audio Generator can no longer be turned off. However, selecting SIGNAL no. 99, which has grounded outputs as default values, allows the user to silence the generator whenever desired. Status information is obtained by pressing first GENCTRL softkey followed by STATUS (same physical key F4).

4.8 - Defining Level and Frequency Step Sizes

Description

In this example, level and frequency step sizes are defined for a single-tone signal to be used during manual modification of level and/or frequency in EXECUTE mode. The single-tone signal of sec. 4.3 will be used as a basis. Level step size will be 0.5 dB, and frequency step size will be 0.25 decade.

Presumptions

The RE201 is in IDLE (EXECUTE) mode and the signal defined in sec. 4.3 is activated.

Keystroke Sequence

STEP NO.	KEYS	COMMENTS	FIGURE REFERENCE
1	GENCTRL	GENCTRL menu is displayed	
2	LEVSTEP	Level step size is requested	
3	.5	Step size in dB	
4	ENTER	The RE201 returns to IDLE (EXECUTE) display	
5	GENCTRL		
6	STEPCH	Define channel to be stepped	
7	LEFT	Left channel is stepped. The RE201 returns to IDLE (EXECUTE) display	
8	GENCTRL		
9	FRQSTEP	Frequency step size is requested	
10	DECADE	Step size in decades	
11	.25	Step size	
12	ENTER	The RE201 returns to IDLE (EXECUTE) display	
13	GENCTRL		
14	STATUS	Display STATUS information to check parameters	4.11
15	△▽EXIT	The RE201 returns to IDLE (EXECUTE) display	

Discussion

In Fig. 4.11, the first column of information gives the parameter names, the second column holds the left channel parameters and the third column the right channel parameters.

If it is desired to return to the originally defined parameters for the presently active signal, the signal should be activated again by the keystroke sequence: SIGNAL 23 ENTER, in the case of signal no. 23. The information entered during LEARN SIGNAL mode is not affected by the operations carried out in the GENCTRL menu. Level and frequency stepping is carried out by means of the cursor control keys as shown in Fig. 3.17.

When the STATUS display is active, level and frequency stepping is reflected in the level and frequency fields immediately.

```
********************************
       *** SIGNAL 23 ***

SIGNAL          3150 HZ     GND

LEVEL            100 MV     GND

LOAD               1 K      GND

LEVEL STEP       .5 DB      OFF

FREQ STEP       .25 DEC     OFF


********************************
```

Fig. 4.11 - STATUS display

Description

The +/- softkey is used during signal definition for specifying the sign of a dBm output level from the Audio Generator.

The +/- softkey is also used during GENCTRL mode for modifying output level specified in dBm.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.

1/1 OCT

Description

The 1/1 OCT softkey is used during GENCTRL mode to define 1/1 octave frequency step size in manual control of the Audio Generator.

Mode

Only used in the GENCTRL mode.

1/3 OCT

Description

The 1/3 OCT softkey is used during GENCTRL mode to define 1/3 octave frequency step size in manual control of the Audio Generator.

Mode

Only used in the GENCTRL mode.

1 KHZ

Description

The 1 KHZ softkey is used during signal definition for specifying the 1 kHz reference signal of the Audio Generator.

Mode

Only used during LEARN SIGNAL mode.

BOTH

Description

In the GENCTRL mode, the BOTH softkey indicates that the amplitude of both channels should be affected in manual level stepping.

Mode

Used during GENCTRL mode for defining that both Audio Generator channels are stepped.

CREATE

Description

The CREATE softkey is used in MFREQ definition for creating a new entry in the list of single-tones from which the multi-tone signal is composed.

Mode

Only used during LEARN MFREQ mode.

DBM

Description

The DBM softkey is used during SIGNAL definition for specifying output level in dBm. Specifying DBM and 600 OHM as the LOAD, the desired power will be delivered into a 600 ohm load. Specifying DBM and EMF as the LOAD, the desired level will be referenced to 774.6 mV (1 mW into 600 ohms) and the electromotive force of the Audio Generator adjusted accordingly. This type of specification corresponds to the dBu of the broadcasting nomenclature. Cf. sec. 3.1.1.

The DBM softkey is also used during GENCTRL mode for modifying output level specified in dBm.

DECADE

Description

The DECADE softkey is used during GENCTRL mode for specifying the frequency step size in manual control of the Audio Generator frequency using the unit decades, i.e. a step size of 0.15 decades implies that the frequency is multiplied or divided by 10 raised to .15th power = 1.412538... for each step up or down respectively.

Mode

Only used in the GENCTRL mode.

DELETE

Description

The DELETE softkey is being used in MFREQ definitions for deleting unwanted entries in the list of single-tone components in the multi-tone signal.

Mode

Only used during LEARN mode for MFREQ SIGNALs.

DFIM

Description

The DFIM softkey is used during SIGNAL definition for entering signal specification for a DFIM measurement. The DFIM definition for a signal, e.g. DFIM2, corresponds to a DFIM measurement having the same number. Cf. 4.4 of the RE201 manual and sec. 3.1.1 of the Audio Generator manual.

Mode

Only used during LEARN SIGNAL Mode.

EMF

Description

The EMF softkey is used during SIGNAL definition when specifying output level. EMF specifies the electromotive force of the generator independent of the load impedance.

Mode

Only used during LEARN SIGNAL mode.

Description

The FREQ softkey is used during GENCTRL mode for modifying the frequency of a single-tone signal.

Mode

Only used in the GENCTRL mode.

FRQSTEP

Description

The FRQSTEP softkey is used during GENCTRL mode for specifying the frequency step size in manual control of the Audio Generator output level.

Mode

Only used in the GENCTRL mode.

GENCTRL

Description

The GENCTRL softkey opens a menu enabling the user to modify the Audio Generator output level and frequency (single-tones only) in EXECUTE. Further, the menu enables the user to specify level and frequency step sizes for manual control. Cf. sec. 3.2.2.

Mode

Only used in EXECUTE mode.

GND

Description

The GND softkey is used during SIGNAL definition when specifying grounded output(s), i.e. the generator is silenced.

Mode

Only used during LEARN SIGNAL mode.

HZ

Description

The HZ softkey is used during GENCTRL mode for specifying frequency step size in Hz.

Mode

Used in the GENCTRL mode.

IM

Description

The IM softkey is used during SIGNAL definition for entering signal specification for an IM measurement. The IM definition for a signal, e.g. IM3, corresponds to an IM measurement having the same number. Cf. sec. 4.4 of the RE201 manual and sec. 3.1.1 of the Audio Generator manual.

Mode

Only used during LEARN SIGNAL mode.

LEFT

Description

In the GENCTRL menu, the LEFT softkey defines the channel whose amplitude level is affected in manual level stepping.

Mode

Used during GENCTRL mode for defining the Audio Generator channel to be stepped.

LEV B

Description

The LEV B softkey is used during GENCTRL mode for specifying that the output level from both channels of the Audio Generator should be modified.

Mode

Only used in the GENCTRL mode.

LEV L

Description

The LEV L softkey is used during GENCTRL mode for specifying that the left channel output level from the Audio Generator should be modified.

Mode

Only used in the GENCTRL mode.

LEV R

Description

The LEV R softkey is used during GENCTRL mode for specifying that the right channel output level from the Audio Generator should be modified.

Mode

Only used in the GENCTRL mode.

LEVSTEP

Description

The LEVSTEP softkey is used during GENCTRL mode for specifying the level step size in manual control of the Audio Generator output level.

Mode

Only used in the GENCTRL mode.

LOAD

Description

The LOAD softkey is used during SIGNAL definition for entering load impedance specification. The Audio Generator will deliver the desired voltage or power into the specified load.

Mode

Only used during LEARN SIGNAL mode.

MFREQ

Description

The MFREQ softkey is used during SIGNAL definition for specifying a multi-tone output signal.

Mode

Only used during LEARN SIGNAL mode.

MVP

Description

The MVP softkey is used during SIGNAL definition for specifying output level in millivolts (positive) peak.

The MVP softkey is also used during GENCTRL mode for modifying output level specified in millivolts (positive) peak.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.

MVRMS

Description

The MVRMS softkey is used during SIGNAL definition for specifying output level in millivolts RMS.

The MVRMS softkey is also used during GENCTRL mode for modifying output level specified in millivolts RMS.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.

MWATT

Description

The MWATT softkey is used during SIGNAL definition for specifying output level into a particular load in milliwatts RMS.

The MWATT softkey is also used during GENCTRL mode for modifying output level specified in milliwatts RMS.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.

RIGHT

Description

In the GENCTRL menu, the RIGHT softkey defines the channel whose amplitude level is affected in manual level stepping.

Mode

Used during GENCTRL mode for defining the Audio Generator channel to be stepped.

SFREQ

Description

The SFREQ softkey is used during SIGNAL definition for specifying a single-tone output signal.

Mode

Only used during LEARN SIGNAL mode.

Description

The SHOW+ softkey indicates to the RE201 that the following definition should be shown during LEARN mode. This facilitates the inspection of MFREQ definitions and SIGNALS stored in the RE201. The SHOW+ key is autorepeating, i.e. keeping the key pressed "scrolls" through all definitions.

Mode

Used during LEARN Mode for SIGNALS and MFREQS.

SHOW-

Description

The SHOW- softkey indicates to the RE201 that the previous definition should be shown during LEARN mode. This facilitates the inspection of MFREQ definitions and SIGNALS stored in the RE201. The SHOW- key is autorepeating, i.e. keeping the key pressed "scrolls" through all definitions.

Mode

Used during LEARN mode for SIGNALS and MFREQ definitions.

SIGNAL

Description

In basic LEARN Mode, the SIGNAL softkey is used for entering the LEARN SIGNAL mode. The operator must also specify a signal number after pressing SIGNAL.

In LEARN SIGNAL mode, the SIGNAL softkey is used in the MODE LEFT and MODE RIGHT specifications to indicate that a user-defined SIGNAL is desired (SFREQ, MFREQ, IM, DFIM, TIM). Cf. sec 3.1.1 of the Audio Generator manual.

In EXECUTE mode, the SIGNAL softkey is used for enabling the Audio Generator. The user must also specify the signal number in this case.

Mode

Used in LEARN, LEARN SIGNAL and EXECUTE modes.

SQR/TRI

Description

The SQR/TRI softkey is used during TIM signal definition for selecting between square and triangular signal components. Pressing SQR/TRI toggles from one mode to the other.

Mode

Only used during LEARN SIGNAL mode.

STATUS

Description

The STATUS softkey is used in the GENCTL menu during EXECUTE mode for displaying information on the presently active signal. The display returns to normal by pressing EXIT.

Mode

Only used during GENCTRL mode.

STEP CH

Description

The STEP CH softkey is used during GENCTRL mode for defining which Audio Generator channel should be affected by manual control.

Mode

Only used in the GENCTRL mode.

TIM100

Description

The TIM100 softkey is used during SIGNAL definition for specifying a TIM test signal having a 100 kHz frequency limitation.

Mode

Only used during LEARN SIGNAL mode.

TIM30

Description

The TIM30 softkey is used during SIGNAL definition for specifying a TIM test signal having a 30 kHz frequency limitation.

Mode

Only used during LEARN SIGNAL mode.

Description

The VP softkey is used during SIGNAL definition for specifying output level in volts (positive) peak.

The VP softkey is also used during GENCTRL mode for modifying output level specified in volts (positive) peak.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.

VRMS

Description

The VRMS softkey is used during SIGNAL definition for specifying output level in volts RMS.

The VRMS softkey is also used during GENCTRL mode for modifying output level specified in volts RMS.

Mode

Used during LEARN SIGNAL mode.

Also used in the GENCTRL mode.