Manual Code Number 983-298

RE 201 Dual Channel Audio Analyzer

re

RE TECHNOLOGY

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Audio Analyzer Manual

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Section One: Audio Analyzer Manual

Section Two: Audio Generator Manual

Audio Generator 901-500 (18.2 dBu)

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1 INTRODUCTION

1.1 Introduction

The RE201 is a unique, modularly designed audio analyzer which combines the ability to perform complex measurements over and over with user friendly operation.

Based on digital processing techniques, such as

* Fast Fourier Transformation (FFT)
* Digital filters with mixer (ZOOM)

combined with advanced analog circuitry the RE201 measures

* Harmonic Distortion
* SINAD
* Intermodulation Distortion
* Difference Frequency Distortion
* Transient Intermodulation Distortion
* Phase
* Frequency and Drift
* Separation/Crosstalk
* Level

  AVERAGE
  DC
  PEAK
  QUASIPEAK according to CCIR468-2
  RMS
  SELECTIVE

* Signal to Noise - weighted and unweighted
* Wow and Flutter

By means of options the instrument may be tailored to fit exactly the application that is needed - all options are plug-in units that are installed in the basic instrument.

The built-in software facilities reduce operation of the instrument to comprise only two modes:

* LEARN Mode
* EXECUTE Mode

During LEARN mode the user tells the instrument how to perform measurements and, with a few keystrokes, the RE201 measures in EXECUTE mode. All settings entered during LEARN mode are stored in non-volatile RAM, so once the measurements are defined they can be generated with a few keystrokes at any time.

The LEARN mode permits you to adapt the instrument to your application through the following steps:

* SYSTEM Parameters
* BASIC Parameters
* FUNCTIONS
* SEQUENCES
* SET-UPS.

SYSTEM Parameters set up the instrument to communicate with the outside world, i.e. printers, TV monitors, IEEE controllers etc.

BASIC Parameters determine the way in which the results should be displayed and give the RE201 a high degree of flexibility.

FUNCTIONS define the individual measurements to be performed: As many as 10 different definitions may be stored for each measurement offered by the RE201.

SEQUENCES are composed of a number of previously defined FUNCTIONS (single measurements), which will be executed sequentially and displayed simultaneously at EXECUTE time, thus facilitating check of parameter dependencies, i.e. THD as a function of level and frequency. 20 such sequences may be stored at a time.

Finally, SET-UPS consist of sequences or single measurements to be performed when the RE201 controls the Audio Generator and/or other instruments, such as RF generators, stereo generators, ARI coders, switch matrices etc. via the built-in Memory Bus interface and General Purpose I/O interface. As many as 100 set-ups may be stored at a time. Using the RE201 with other instruments with the RE201 as a controller allows you to create semi-automatic test systems without any software development or investment in external controller.

Of course, the RE201 also fits as a central part of test systems based on the IEEE488 bus.

Incorporation of the optional Audio Generator creates a complete test system for audio purposes, as this option is tailored to work with the RE201 being able to create all types of signals needed for the instrument (signals for test of THD, IM, DFIM, TIM etc) - also up to 8 tones may be created simultaneously, hereby facilitating test of frequency response etc.

2 GENERAL

This section contains general instructions for the installation and operation of the RE201 Dual Channel Audio Analyzer. Even if the design of the RE201 emphasizes the simplicity of use, you are recommended to read the contents of this section in order to make yourself fully familiar with all the capabilities of the instrument.

2.1 Installation

When unpacking the instrument, the accessories and the packing material should be inspected for any damage. If the RE201 and/or the accessories should be damaged, please notify the carrier and your local RE INSTRUMENTS representative or the factory. The packing material should be retained for inspection by the carrier in case of complaint. Refer to section 10 for a description of equipment and accessories.

Power Requirements

The RE201 will operate on either 115V or 220V AC line supplies. The required line voltage is selected by a slide switch on the rear panel ((22) on fig. 2.6, section 2).

In order to change the line voltage the locking plate must be removed by unscrewing the two securing screws. Switch the line switch to the required line voltage and replace the locking plate. Install the correct line fuse ((9) on fig. 2.8, section 2) for the selected power source using one of the bayonet heads. For more information refer to the Installation Guide delivered with the instrument.

Nominal AC voltage	Line fuse
115V	2 A (slow blow)
220V	1 A (slow blow)

***** Caution *****

Always make certain that the line voltage selector switch is set to the correct position and that a fuse having the correct rating is installed in the fuse holder before connecting the RE201 to any AC power source.

Battery Back-up

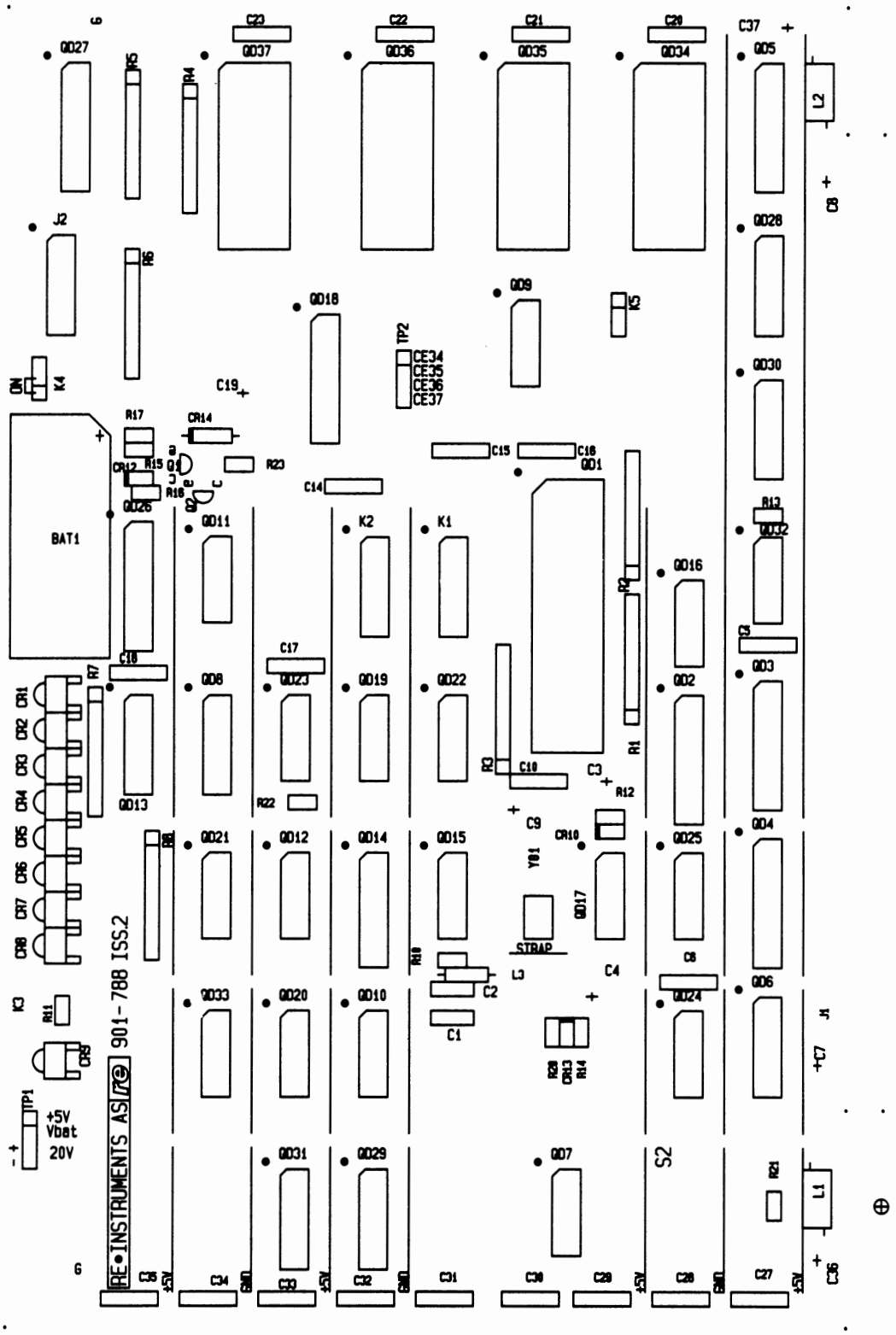
In the absence of line power, a battery power supply will be active to retain valid data in the RAM. If the line voltage disappears, a power fail protection circuit isolates the RAM and the battery will take over.

*** Note ***

If the RE201 has to be stored for more than two months without power on, it is recommended that the battery is isolated from the RAM by means of the jumper K4 on the 901-788 static computer placed in slot 5 to the right of the CRT section of the instrument (fig. 2.1). K4 isolates the battery when placed in position 2-3.

Whenever you start using the RE201 after a storage period, check that jumper K4 on the 901-788 is placed in position 1-2 to power the RAM from the battery (jumper towards battery).

Of course, the contents of the RAM will be lost during such periods of storage without back-up.



901-788 Static Computer
Fig. 2.1

Power Application

The following procedure should be used to apply power:

1. Check that the line voltage selector located on the rear panel is set to the correct position

2. Check that the line fuse located on the rear panel has the proper value (shown close to the fuse itself)

3. Connect the power cord supplied with the instrument between the power connector ((21) on fig. 2.6, section 2) on the rear panel of the instrument and the AC power receptacle.

***** Note *****

If this is the first power-up after delivery and/or a long storage period, check the position of K4 on the 901-788 static computer (refer to section on Battery Back-up) to make sure that it is correctly positioned.

4. Set the power switch ((8) on fig. 2.5) to ON.

2.2 Selftest

After a few seconds the display will contain the following information:

```
********************************
        *** RE201 TEST ***

CRT-RAM          901-789  PASSED
EPROM            901-789  PASSED
UARTS            901-790  PASSED
EPROM            901-789  PASSED
RAM              901-789  PASSED
RAM              901-789  PASSED
EPROM            901-527  PASSED
RAM              901-527  PASSED
BUTTERFLY UNIT   901-527  PASSED
ZOOM             901-393  PASSED
ANALOG SECTION   901-788  PASSED

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

Fig. 2.2

Thus, you are informed of the results obtained during the power-up SELFTEST (the code Nos. in parenthesis indicate the board being tested). If this test is successful another test display will appear:

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

SOFTWARE REVISIONS   A.B & C.D

OPTION(S)        SOFTWARE REVISION
Type 1                 1.2
-                      -
-                      -
Type N                 1.1

Type 1                 N/A
-                      -
-                      -
Type M                 1.2

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

Fig. 2.3

This shows you:

1. Which options are installed (options 1 - N in analog PCB compartment, options 1 - M in digital PCB compartment

2. Which software revisions have been installed (digital section: A.B, analog section: C.D)

During selftest the RE201 checks the entire contents of the RAM's having battery back-up. If part of the programming contents has been destroyed, the instrument will - while showing IDLE display - display the following message:

WARNING USER DEFINITION(S) LOST

as the destroyed blocks of data have been substituted by default blocks from Read Only memory.

If the computers in the RE201 detect an error you should refer to section 9 of this manual or the Service Manual.

2.3 CRT Intensity

To increase CRT intensity the 'INT' and the 'cursor-up' keys must be activated simultaneously ('INT' key activated first). The intensity will step in an auto-repeating mode until either max. intensity is reached or the keys are released.

To decrease CRT intensity the 'INT' and the 'cursor-down' key must be activated simultaneously ('INT' key activated first). The intensity will step in an auto-repeating mode until either min. intensity is reached or the keys are released.

The intensity setting will be stored in the RAM and will have battery back-up to ensure that the selected setting is restored at next power-up.

2.4 CRT Refresh Rate

Normally, it will not be necessary to modify the refresh rate, even if the line frequency used disagrees with the refresh rate. However, using external monitors normally demands conformity. To modify the refresh rate, change REFRESH RATE parameter in SYSTEM PARAMETERS (refer to section 4.1) by means of the LEARN mode.

IDLE Mode

Following selftest display and OPTIONS display (figs. 2.2 and 2.3) the following display will appear (other softkeys may appear depending on installed options, i.e. SINAD, WEIGH or W&F):

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



ENTER COMMAND
_____________________________
DC

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

Fig. 2.4 - IDLE display

Now the RE201 is ready to accept commands from the operator.

2.5 Front and Rear Panels

General

The following brief descriptions of the front and rear panels of the RE201 and the references given to sections describing the use of interfaces etc., serve the purpose of facilitating the understanding of "how to use the RE201".

Front Panel (fig. 2.5)

(1) 9" CRT - P39 (GR) phosphor

(2) SHIFT Key

Normally, red LED on (2) is off, indicating that text on keyboard printed in white is valid (fig. 2.7), whereas activating the SHIFT key, so that red LED is on, indicates that text printed in red is valid (fig. 2.6)

SHIFT key function will toggle, i.e. activating key (2) twice recreates initial position.

(3) SHIFT Key Off (refer to fig. 2.7)

When the SHIFT key has not been activated (3) is a keypad for numeric entries or for executing a SET-UP - ENTER tells the RE201 to accept input from the operator. Also used to enter softkeys etc.

SHIFT Key On (refer to fig. 2.6)

When the SHIFT key has been activated (3) is used to activate sequences (see section 4.5 SEQUENCES) - EXIT stops current RE201 activity.

(4) SHIFT Key Off (refer to fig. 2.7)

When the SHIFT key has not been activated the upper 8 keys (THD, IM ...) select DEFAULT measurement of THD, IM etc. (refer to section 4.4 FUNCTIONS).

"LEARN"	enters the RE201 into LEARN MODE
"INT"	together with "cursor up" or "cursor down" increases or decreases intensity on CRT (auto-repeating key) (refer to section 7 MISCELLANEOUS)

"COPY" enables hard copy of any screen contents to external printer via the RS232C interface (14) (refer to section 7 MISCELLANEOUS)

Cursor keys: used to control the cursor during LEARN MODE. Used to control level and frequency of Audio Generator, if this option is installed.

SHIFT Key On (refer to fig. 2.6)

When the SHIFT key has been activated the upper 8 keys (THDn, IMn ...) followed by a number 0-9 select a specific measurement of THD, IM etc. (refer to section 4.4 FUNCTIONS).

"LOCAL" when the RE201 is under control of an external controller via the IEEE interface and LOCAL LOCKOUT is not active, an operator may force the instrument to LOCAL mode, where the instrument is under control from the keyboards. Green LED on, indicates that the user has forced instrument to LOCAL. Activate LOCAL key once more to let controller take control again (refer to section 7 MISCELLANEOUS).

"TEST" activating this key initiates a selftest of the RE201 (refer to section 7 MISCELLANEOUS).

***** Note *****

activating the SHIFT key and TEST simultaneously during power-up resets the entire contents of the RE201 non-volatile RAM used to store all programmed information.

"CURSOR-UP" used to advance the RE201 to next SET-UP, when executing a SET-UP (refer to section 5.3 SET-UPS).

"CURSOR-DOWN" used to recall previous SET-UP, when executing a SET-UP (refer to section 5.3 SET-UPS).

(5) Softkeys - text for these keys appears on (1) below dotted line (status line) in the shape of text in inverse video blocks.

(6) Left and right channel inputs.
300 kOhm input impedance.
AC coupled.
Floating (isolated BNC).

(7) Connector for RE905 external keyboard. The RE905 duplicates all functions of built-in RE201 keyboard, including softkeys.

(8) Power on/off switch.

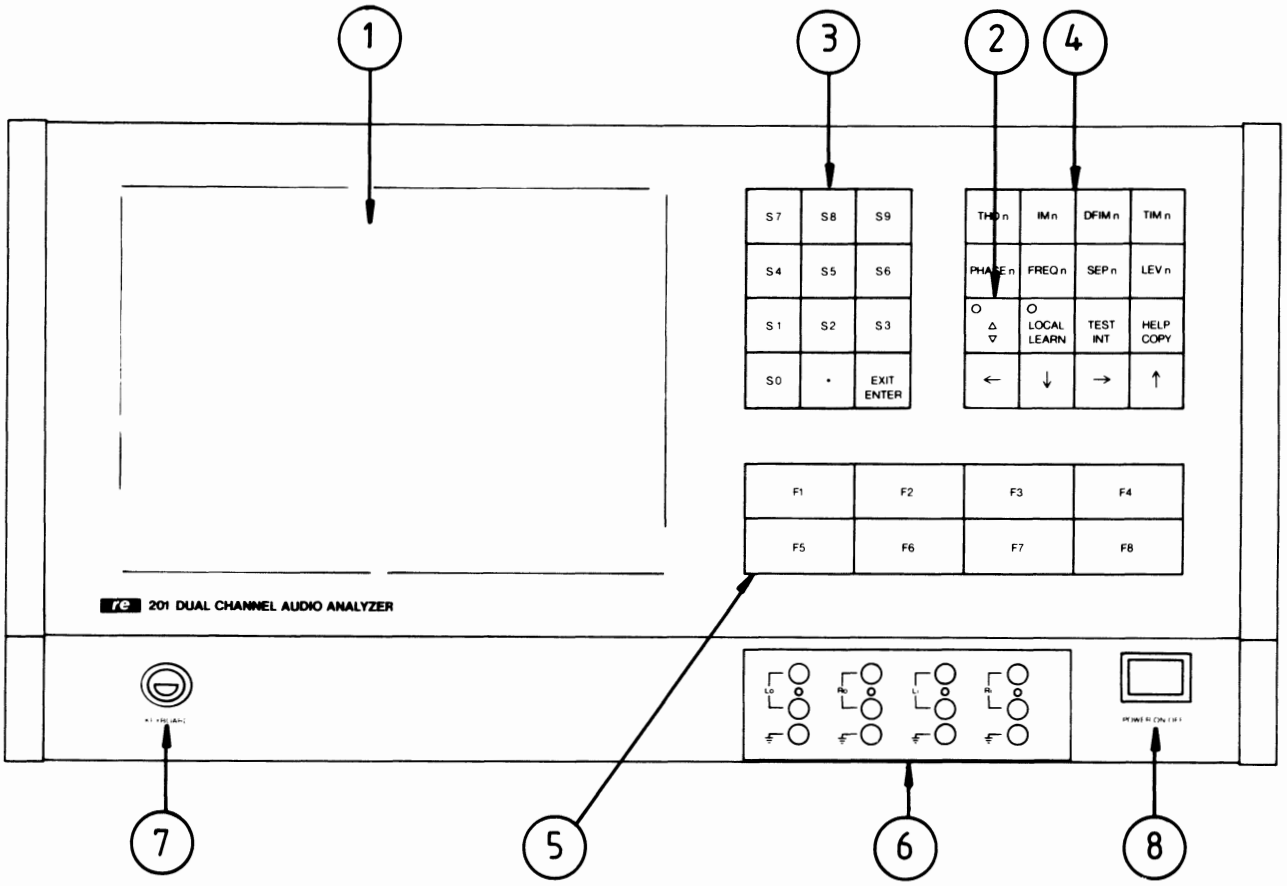


Fig. 2.5 - Front Panel

S7	S8	S9
S4	S5	S6
S1	S2	S3
S0	•	EXIT

THD n	IM n	DFIM n	TIM n
PHASE n	FREQ n	SEP n	LEV n
● △ ▽	○ LOCAL	TEST	HELP
←	↓	→	↑

F1	F2	F3	F4
F5	F6	F7	F8

Fig. 2.6 - Keyboard (SHIFT key activated)

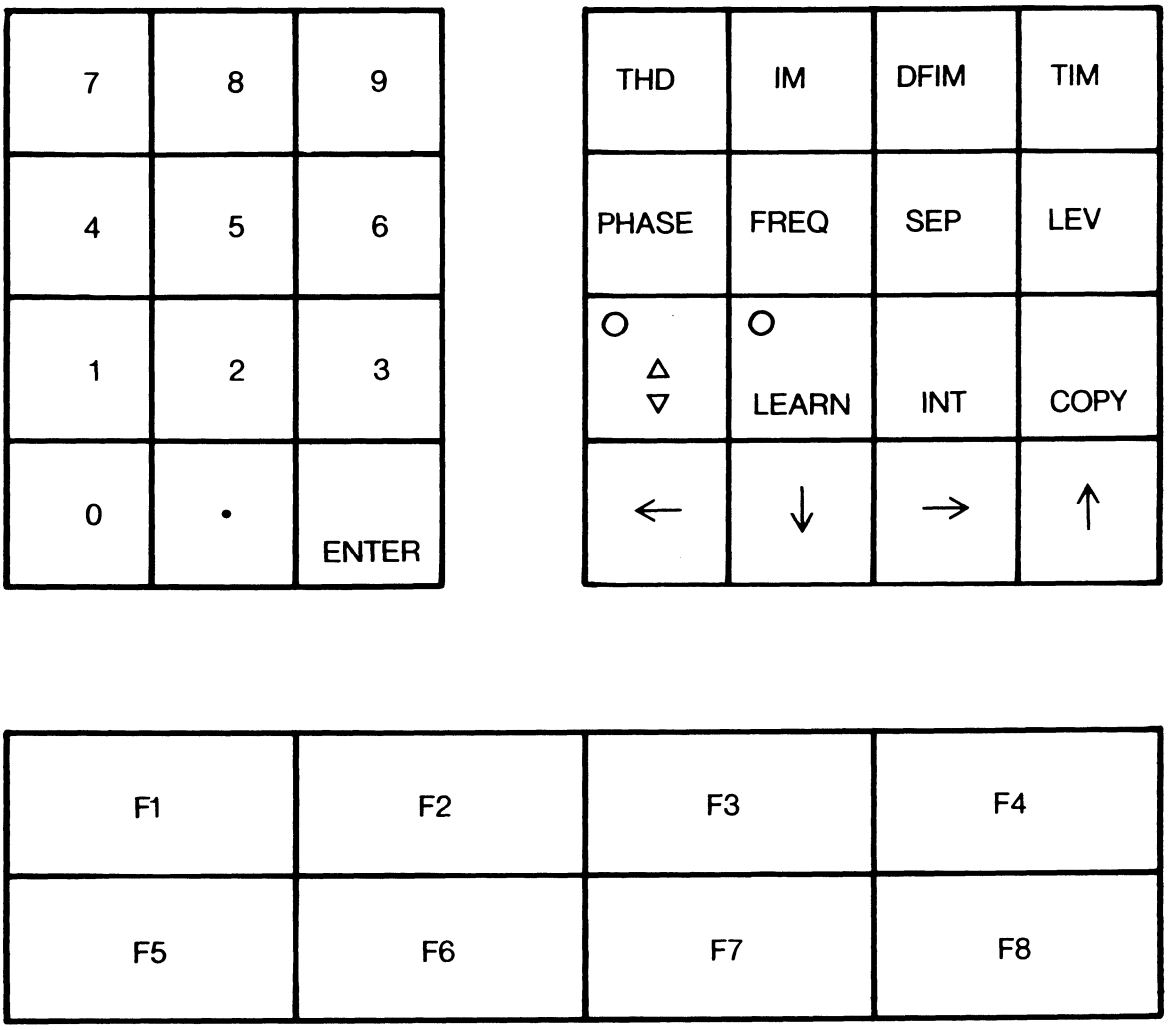


Fig. 2.7 - Keyboard (SHIFT key not activated)

Rear Panel (refer to fig. 2.8)

(9) LINE FUSE

220V AC: 1 A slow blow
115V AC: 2 A slow blow

(10) DC FUSE - 5 A slow blow - protecting internal circuitry against overvoltage

(11) General Purpose I/O (GPIO) Connector

Interface used to control external circuitry during SET-UP execution (refer to section 4.5 SET-UPS).

Pins 1 - 20	Standard LS-TTL output activated during execution of SET-UPS
Pin 21	Positive going LS-TTL pulse indicating valid outputs on pins 1-20
Pin 22	Negative going LS-TTL pulse indicating valid outputs on pins 1-20
Pin 23	Input for DC measurement No. 1 - DC1
Pin 24	Input for DC measurement No. 2 - DC2
Pin 25	Ground reference

*** N O T E ***

Pins 23 and 24 equal (16)

(12) Memory Bus Connector

Connects the RE201 to other RE instruments, e.g. RF generators, stereo generators, ARI coders equipped with RE Memory Bus option. Enables the RE201 to control other RE instruments during SET-UP execution to create test systems (refer to section 4.6 SET-UPS).

(13) Dust Filters

The grill may be swung down in order to clean the filter - this should be done once every second month depending on environmental conditions. Also, filters installed in the side panel and bottom should be cleaned.

(14) RS232C Interface Connector

Used to connect the RE201 to an external printer for documentation purposes using the COPY key or to connect the instrument to another RE201 or an external computer for dump/load of programming information via the PROGRAM softkey in LEARN mode.

Pin 2	Data in
Pin 3	Data out
Pin 4	RTS - request to send
Pin 5	CTS - clear to send
Pin 7	GND
Pin 20	DTR - data terminal ready (on - i.e + 3V to + 25V - whenever the RE201 is on)

To connect two RE201's via the RS232C interface please use the following connections:

Pin 2	Connects to	Pin 3
Pin 3	Connects to	Pin 2
Pin 4	Connects to	Pin 5
Pin 5	Connects to	Pin 4
Pin 7	Connects to	Pin 7

To set up the RS232C interface, refer to section 4.1 SYSTEM Parameters. For PROGRAM information, refer to section 7.0 MISCELLANEOUS.

(15) IEEE STD 488/1978 Port

The following subset is implemented:

SH1	SR1
AH1	RL1
T6	PP1
L4	DC0
DT1	C0

(16) DC Inputs

Measurements of DC (DC1 and DC2) may take place using this BNO connector.

DC1	Male part of connector
DC2	Female part of connector

This connector also connects to pins 23 and 24 in (11)

(17) Left and Right Channel Inputs

Identical to (6)

(18) Composite Video Output

75 Ohms - used to connect the RE201 to an external CRT monitor.

(19) Left and Right Channel Outputs

Outputs from optional Audio Generator (901-500).

(20) Ground Socket

This socket must be used to ground the RE201 when not grounded via the line cord in (21).

(21) Line Cord Receptacle

(22) Line Voltage Selector

When changing the line voltage, remember to exchange the line fuse (9).

(23) Type designation.

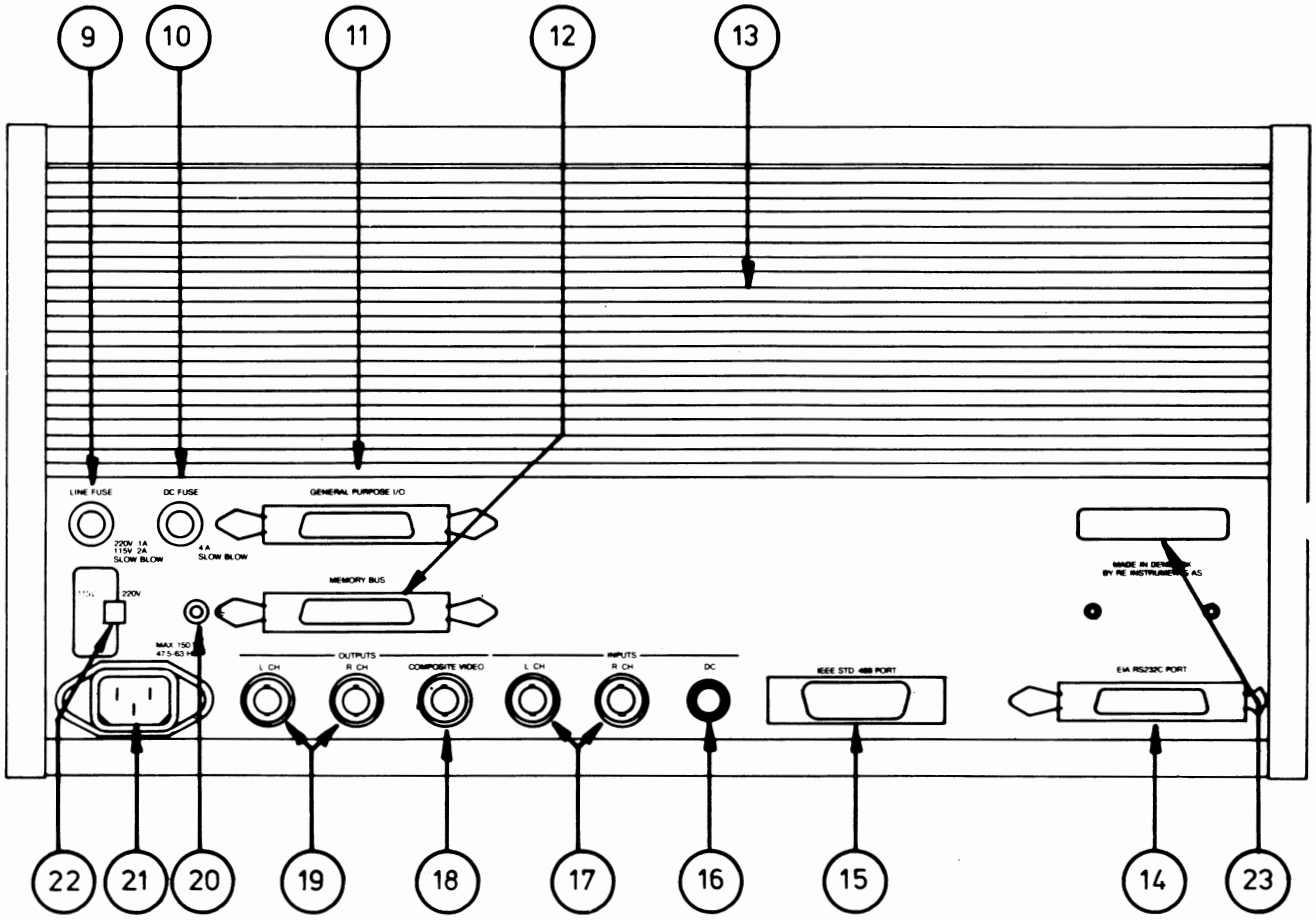


Fig. 2.8 - Rear Panel

3 RE201 OPERATION

This section is intended to introduce the basic building blocks of the RE201, i.e. FUNCTIONS, SEQUENCES and SET-UPS as well as SYSTEM parameters and BASIC parameters.

3.1 Measurement Hierarchy

The basic principle behind the RE201 is that the operator should be able to define the measurements to be performed in such a way that he has as much control over the instrument as possible. To these ends, there are several levels at which the user can define measurement methods used by the RE201.

The instrument has the basic capabilities to measure many different parameters (e.g. THD, LEVEL, PHASE etc.). Within each of these specific parameters there can be many different ways of measuring and of representing the results. This is the first level of definition flexibility that the RE201 affords the operator.

```
********************************
       *** LEARN THD ***

FUNCTION          >        THD9
CHANNEL                   RIGHT
FIRST HARMONIC                2
LAST HARMONIC                 9
REPRESENTATION               DB
AVERAGING                   LIN
NUMBER OF LOOPS               2


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

Fig. 3.1 - Typical FUNCTION Definition

Upon definition, the customized FUNCTION can be stored by a subscript designator. These subscript designators provide a convenient way for the operator to recall the appropriate measurement version to be executed.

```
 _________   _________   _________
!         !  !         !  !         !
!  THD9   !  ! LEVEL 1 !  ! LEVEL 2 !
!_________!  !_________!  !_________!

 _________   _________
!         !  !         !
! FREQ 4  !  ! PHASE 8 !
!_________!  !_________!
```

Fig. 3.2 - FUNCTIONS Identified by means of Subscript Designators

In addition to executing single measurement, the user can then string together several of these defined measurements into a SEQUENCE definition. When the SEQUENCE is recalled for execution, all the results of the various measurements will be obtained at one time.

```
*******************************
      *** SEQUENCE 6 ***

LEV2                    1.05V

THD9                 -76.06 DB

FREQ4                 62.3 HZ


_______________________________
   DC
   W&F
*******************************
```

Fig. 3.3 - SEQUENCE During EXECUTE Mode

The next level of definition is called a SET-UP. This level is used to control various test stimuli. There are chiefly three hardware type items associated with a SET-UP:

1. RE Memory Bus
2. 20 Pin TTL Output Bus
3. The Audio Generator Option

These items are, or provide a means of communicating with signal generators or process control devices. The SET-UP contains single FUNCTIONS, or SEQUENCES and controls the necessary instruments or hardware to provide a totally "set up" testing situation. The RE201 has the capability of defining 100 SET-UPS.

```
!                                                                    !
!  ___________________________________________   ________________   !
!  !                                         !   !              !   !
!  !     ******************************      !   ! Audio Generator !  !
!  !            *** SEQUENCE 6 ***           !   ! Setting      !   !
!  !                                         !   !______________!   !
!  !     LEV2                    1.05V       !                      !
!  !                                         !                      !
!  !                                         !   ________________   !
!  !     THD9                  -76.06 DB     !   !              !   !
!  !                                         !   ! RE Memory Bus !   !
!  !                                         !   ! Set-up       !   !
!  !     FREQ4                  62.3 HZ      !   !______________!   !
!  !                                         !                      !
!  !                                         !                      !
!  !                                         !   ________________   !
!  !     ___________________________         !   !              !   !
!  !        DC                               !   ! 20 Pin TTL   !   !
!  !        W&F                              !   ! Output State !   !
!  !     ******************************      !   !______________!   !
!  !_________________________________________!                      !
!                                                                    !
!        SEQUENCE 6                                                  !
!        (or a single measurement)                                   !
!                                                                    !
!                                                                    !
!                                                                    !
!  SETUP 25                                                          !
!____________________________________________________________________!
```

Fig. 3.4
SETUP including a SEQUENCE, AUDIO GENERATOR setting, RE Memory Bus control and TTL outputs

There are several parameters which are very general in nature and must be defined and customized to the individual application. These items are called SYSTEM parameters and BASIC parameters. SYSTEM parameters define instrument dependent quantities such as CRT refresh rate and interface information. The BASIC parameters define global measurement quantities such as load impedance and level, frequency and phase reference parameters. These parameters are not really executed like FUNCTIONS, SEQUENCES or SET-UPS, but are used to define the operating and test conditions.

```
!_________________________________!     !_________________________________!
!                                 !     !                                 !
!  BASIC Parameters:              !     !  SYSTEM Parameters:             !
!                                 !     !                                 !
!    * Load Impedances            !     !    * CRT Refresh Rate           !
!                                 !     !                                 !
!    * Frequency, Level and       !     !    * RS232C Settings            !
!      Phase References           !     !                                 !
!                                 !     !    * IEEE Address               !
!    * DC Input Calibration       !     !                                 !
!_________________________________!     !_________________________________!

!_____________________________________________________________________________!
!                                                                             !
!  !_____________________________________________!   !_________________!     !
!  !                                             !   !                 !     !
!  !     ******************************          !   ! Audio Generator !     !
!  !            *** SEQUENCE 6 ***               !   ! Setting         !     !
!  !                                             !   !_________________!     !
!  !     LEV2                     1.05V          !                           !
!  !                                             !                           !
!  !                                             !   _________________       !
!  !     THD9                   -76.06 DB        !   !                 !     !
!  !                                             !   ! RE Memory Bus   !     !
!  !                                             !   ! Set-up          !     !
!  !     FREQ4                   62.3 HZ         !   !_________________!     !
!  !                                             !                           !
!  !                                             !                           !
!  !                                             !   _________________       !
!  !     _________________________________       !   !                 !     !
!  !        DC                                   !   ! 20 Pin TTL      !     !
!  !        W&F                                  !   ! Output State    !     !
!  !     ******************************          !   !_________________!     !
!  !_____________________________________________!                           !
!                                                                             !
!        SEQUENCE 6                                                           !
!        (or a single measurement)                                            !
!                                                                             !
!  SETUP 25                                                                   !
!_____________________________________________________________________________!
```

Fig. 3.5

3.2 RE201 Operating System Structure

The philosophy of flexibility and a user defined measurement process demands a highly user friendly instrument. The RE201 uses a microprocessor based operating system with a user interface consisting of soft keys, fixed keys, and a CRT. All instructions are presented in a menu format on the CRT. To fully comprehend the intricate operation of the RE201, it is very helpful to begin with a general understanding of the operating system's structure.

The operating system is structured in nested levels, but consists chiefly of two modes; the LEARN mode and the EXECUTE mode. The LEARN mode refers to the menu driven system, which allows measurement definitions to be created and stored. The EXECUTE mode allows these customized measurements to be performed.

The LEARN mode is entered by pressing the "LEARN" key. Once in the LEARN mode, a menu of all the areas which may require definition will be displayed. At this point, a particular area of interest is entered for user definition.

Returning to any of the previous levels can be accomplished by pushing the "EXIT" key. The outermost level is that which is viewed immediately after power-up (IDLE mode).

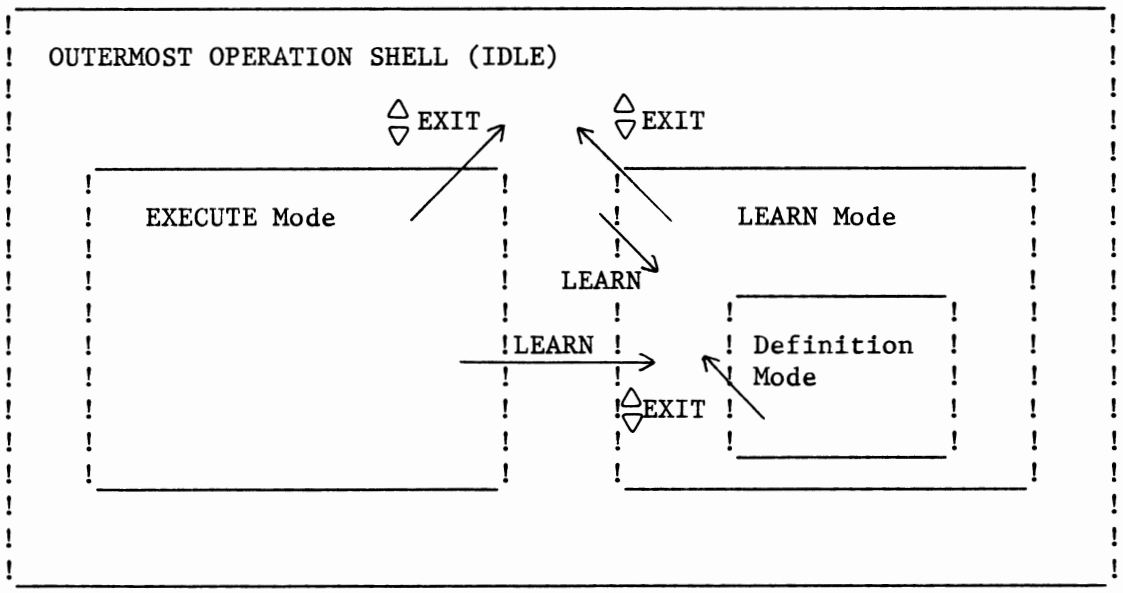


Fig. 3.6 - RE201 Operating System Concept

4 LEARN MODE

Whenever the RE201 displays the phrase ENTER COMMAND, the instrument is in the IDLE mode, where it is not executing any tasks.

However, normally the RE201 will be in one of two other modes: the LEARN or the EXECUTE mode.

LEARN Mode

When in the LEARN mode, the RE201 is instructed about the details of the measurements to be performed in the EXECUTE mode. In this way a very high degree of flexibility is obtained without complicating normal use of the instrument - even the most complex measuring tasks may be executed by using a maximum of three key entries.

To enter LEARN mode activate the key marked LEARN and the following display will appear:

```
                 ********************************
(1)                   *** LEARN MODE ***



(2)              SELECT USING SOFTKEY

(3)              SYSTEM  FUNCT   SEQUEN PROGRAM
                 BASIC   DEFLT   SETUP
                 ********************************
```

Fig. 4.1

Note that the instrument always

1. uses the headline for mode/state information
2. uses a dotted line for status line - all information exchanged between the instrument and operator will appear on this line
3. uses the last two lines to display the current softkey texts

4.1 Softkeys

In fig. 4.1 the keys F1 - F8 have got the following meaning:

```
 _________   _________   _________   _________
!         ! !         ! !         ! !         !
! SYSTEM  ! ! FUNCT   ! ! SEQUEN  ! ! PROGRAM !
!_________! !_________! !_________! !_________!

 _________   _________   _________   _________
!         ! !         ! !         ! !         !
! BASIC   ! ! DEFLT   ! ! SETUP   ! ! not used !
!_________! !_________! !_________! !_________!
```

Fig. 4.2

e.g. activating F2 activates a key named FUNCT. The name SOFTKEY is used to indicate that the software of the instrument changes the meaning of these keys - i.e. in stead of having say 60 keys all with a text printed on the key top, the instrument uses 8 keys. This is possible, because all 60 keys need not be accessible at the same time. This means that the use of softkeys gives an instrument which is user friendly and flexible.

Optional measurements are also accessible via softkeys (W&F, SINAD etc.), i.e. to activate/learn W&F measurements, you should use the softkey marked W&F as you would use e.g. the THD key.

All softkeys have been listed in section 8 together with a description of the softkey, the modes where this softkey is being used and if any options are necessary.

4.2 SYSTEM Parameters

Setting up an instrument to adapt a changing environment normally requires a lot of cut and try using tedious switches at the rear of the instrument. With the RE201 all these parameters are defined via the LEARN mode:

Parameters such as the CRT refresh rate (for external monitor), RS232C interface and IEEE bus settings have been collected as the SYSTEM PARAMETERS.

To inspect or change these parameters enter LEARN mode by activating the LEARN key and the following display will appear: (SIGNAL softkey only if 901-500 or 901-705 Audio Generator is installed):

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



SELECT USING SOFTKEY

SYSTEM   FUNCT   SEQUEN  PROGRAM
BASIC    DEFLT   SETUP   SIGNAL
*******************************
```

Fig. 4.3

To inspect/modify SYSTEM PARAMETERS enter <SYSTEM> key (F1):

```
*******************************
    *** SYSTEM PARM'S ***

CRT REFRESH RATE        >  50 HZ

BAUD RATE                9600
PARITY                   EVEN
STOP BIT(S)                 1

IEEE ADDRESS               10

CRT REFRESH RATE           50 HZ

                         STORE
  50 HZ  60 HZ
*******************************
```

Fig. 4.4 - SYSTEM Parameters

Use cursor keys to point to the parameter(s) to modify, enter new parameter values by means of a softkey or the numerical keyboard: Use the ENTER key to update the display. When all necessary parameters have been updated, activate the <STORE> key - the instrument will now be set up according to these parameters. Of course, the information is stored in non-volatile RAM in order to preserve the information during power-down periods. To leave LEARN mode, press EXIT (⇕ EXIT).

4.3 BASIC Parameters

The BASIC PARAMETERS contain 3 types of information:

1. Load impedance level for both channels:

   This information is used in case a LEVEL measurement must represent results in Watts.

2. References for frequency, voltage and phase measurements:

   This information is used in case FREQUENCY, LEVEL and PHASE measurements should represent a result related to a known reference - see description of softkeys

   < HZ REF >
   < %REF >
   < DB REF >
   < DEG REF >
   < RAD REF >

   in section 8.

3. Multiplication factors for the DC inputs:

   As the DC inputs have only one fixed range (±16V) with a resolution of 128 mV, it sometimes will be necessary to place amplifiers or attenuators outside the RE201. The DC factors allow the instrument to take such external influence into account so that the displayed results are corrected for this influence.

To inspect or change these parameters enter LEARN mode by activating the LEARN key. The display shown in fig. 4.1 will appear.

Enter <BASIC> key (F5) to inspect/modify BASIC PARAMETERS (fig. 4.5).

Column 2 of this display indicates values valid for the left channel while column 3 indicates values valid for the right channel.

By means of the cursor keys point to the parameters that must be modified (cursor right and cursor left are used to point to parameters in the right or left channel, while cursors up/down select the individual parameters), enter new values via the numeric key pad and press ENTER to update the display.

Press <STORE> (F4) to store BASIC PARM'S in non-volatile RAM: The instrument checks the validity of the entries - in case an error is found, the cursor will point to the error, and the operator will be prompted to enter valid value.

Parameters

```
*********************************
      *** BASIC PARM'S ***

IMPEDANCE      >  8 OHM     8 OHM
FREQUENCY      1000 HZ   1000 HZ
VOLTAGE           1 V       1 V
PHASE                       0 DEG

DC1 FACTOR                  1
DC2 FACTOR                  1


IMPEDANCE          OHM
_____________________________
                          STORE

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

Fig. 4.5

	Notes
IMPEDANCE	1 - 1000 Ohms
FREQUENCY	1 - 31999 Hz
VOLTAGE	0.0001 - 30 V
PHASE	0 - 360 DEG
DC1 FACTOR	0.001 - 1000
DC2 FACTOR	0.001 - 1000

Fig. 4.6 - Parameter Range for BASIC Parameters

4.4 FUNCTIONS

General

An individual measurement in an RE201 is called a FUNCTION - i.e. THD, IM, PHASE measurements are 3 different FUNCTIONS. Consequently, the keys used to activate a measurement are called FUNCTION KEYS.

Every function in an RE201, except for the DC measurements, may be tailored to be used in a specific situation by means of the LEARN mode. As it would be time-consuming to go to LEARN mode every time a parameter used by some function should be modified, the instrument allows the operator to store 10 FUNCTION DEFINITIONS per FUNCTION (actually, the LEV functions allow up to 20 such definitions to be stored).

Figs. 4.7 to 4.10 depict the operation of the RE201 in LEARN mode, in case a function definition should be inspected/modified.

1. Activate the LEARN key to enter LEARN mode:

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


SELECT USING SOFTKEY

SYSTEM   FUNCT   SEQUEN  PROGRAM
BASIC    DEFLT   SETUP   SIGNAL
********************************
```

Fig. 4.7 - LEARN mode display
('SIGNAL': only if Audio Generator is installed).

2. In order to inspect or modify a FUNCTION press F2 (<FUNCT> key):

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



ENTER FUNCTION
_______________________________

 W & F
*********************************
```

Fig. 4.8 - <FUNCT> key activated: Note that now options (W & F) appear in order to allow inspection/modification of parameters.

3. In order to inspect/modify a THD measurement, activate the key marked THDn:

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



ENTER FUNCTION NUMBER   THD
_______________________________

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

Fig. 4.9 - THDn key activated: The RE201 now asks for function number, i.e. which definition out of the 10 available should be displayed

4. To inspect THD definition No. 0, press the 0 key:

```
*******************************
      *** LEARN THD ***

FUNCTION        >        THD0
CHANNEL                  LEFT
FREQUENCY               TRACK
FIRST HARMONIC              3
LAST HARMONIC               3
REPRESENTATION             DB
AVERAGING                 LIN
NUMBER OF LOOPS             8


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

Fig. 4.10 - THD0 displayed

By means of the cursor keys you now point to the parameters to be modified - enter new values for parameters and finally, when all parameters are as wanted, the definition must be stored by pressing one of the keys

<STORE> or

<DEFLT>

Pressing <STORE> the operator stores the parameters in non-volatile RAM as definition number "Function number".

Pressing <DEFLT>, however, stores these parameters as the THD DEFAULT PARAMETERS.

Regarding (LEV) please note the following:

Function Nos. 10 to 19 (LEV) must be entered as '.' followed by 'number', i.e. "." "7" will display LEV definition No. 17;7 and 17 are distinguished by indicating 17 as a '7' in inverse video.

DEFAULT Function

In order to get access to a specific function several keys have to be activated to specify function and function number. Normally, one of the definitions stored will be the one mostly used - in order to activate this specific measurement the RE201 allows the user to point out one of the function definitions as the DEFAULT function. The default THD measurements are executed by just activating the THDn key whereas all other THD measurements call for 3 key entries. To inspect/modify a DEFAULT parameter block for a FUNCTION activate F6 (<DEFLT> key) when in LEARN mode (fig. 4.7).

When you activate <STORE> or <DEFLT> the instrument checks the parameters before storing in RAM. The RE201 then returns to main LEARN MODE display (fig. 4.7) ready for further definitions. In case no more programming must be performed, activate the EXIT key (key sequence ⇕, EXIT) to go to IDLE display.

Short Cuts

Experienced operators do not have to use softkeys to display a FUNCTION definition. To check THD3 enter

LEARN ⇕ THDn 3

in case the FUNCTION is the DEFAULT FUNCTION enter

LEARN THDn

Functions in Alphabetical Order

This section is a thorough description of all FUNCTIONS in the RE201, options enhancing their usefulness, parameters used and acceptable values, and finally a listing of all softkeys used in LEARN mode and EXECUTE mode. Section 8 contains a thorough description of all softkeys.

The DC Measurement

Description

The DC measurement is used to measure DC voltages. The RE201 has a special connector (BNO-type) at the rear of the instrument for this type of input allowing for 2 inputs called DC1 and DC2 (male part of BNO being DC1, female part being DC2) - pins 23 and 24 in GPIO connector also connect to BNO connector.

As the DC inputs of the instrument have a fixed range/resolution of ±16V/128 mV, the RE201 allows you to correct displayed results in case external attenuators/amplifiers have to be utilized - the gain/attenuation that must be multiplied onto results before display may be entered as DC ONE FACTOR /DC TWO FACTOR in BASIC PARAMETERS (sect. 4.3).

Parameters

None

Related Parameters

DC ONE FACTOR

DC TWO FACTOR

modified via	BASIC PARAMETERS

Softkeys Used

LEARN Mode	None
EXECUTE Mode	<DC>

The Difference Frequency Distortion Measurement (DFIM)

Description

The DFIM measurement is used to measure two-tone distortion (Difference Frequency Distortion). The RE201 selectively measures any combination of tone(s) from order 2 to order 9.

The difference frequency distortion of n'th order for n even is calculated as

$$d_n = \frac{U_{\frac{n}{2}(f_2-f_1)}}{\sqrt{2}\ U}$$

where $U_{\frac{n}{2}(f_2-f_1)}$ is the RMS value of the component frequency $\frac{n}{2}(f_2-f_1)$ and U is the RMS value of the total signal.

For n odd the results are calculated as

$$d_n = \frac{U_{(\frac{n+1}{2}f_2 - \frac{n-1}{2}f_1)} + U_{(\frac{n+1}{2}f_1 - \frac{n-1}{2}f_2)}}{\sqrt{2}\ U}$$

i.e. the arithmetic sum of sideband RMS levels divided by $\sqrt{2}$ times RMS level of total signal.

As there is no definition of "Total Difference Frequency Distortion" the RE201 only displays resulting distortion created by one (set of) combination tone(s).

Option Available

None.

Parameters

```
*******************************
      *** LEARN DFIM ***

FUNCTION        >        DFIM0
CHANNEL                  RIGHT
LOWER FREQUENCY          7000 HZ
HIGHER FREQUENCY         8000 HZ
IM PRODUCT                  2
REPRESENTATION              %
AVERAGING                 LIN
NUMBER OF LOOPS             2

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

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH> <RIGHT> <LEFT> <TBD>	1
LOWER FREQUENCY	29 - 24996	2, 3, 4
UPPER FREQUENCY	33 - 25000	2, 3, 4
IM PRODUCT	2 - 9	3, 4
REPRESENTATION	<%> <DB>	
AVERAGING	<LIN> <EXP>	
NUMBER OF LOOPS	1 - 64	5

Notes

1. Channel selected at execute time

2. UPPER FREQUENCY (FH) - LOWER FREQUENCY (FL) $\geq$4 Hz

3a. For IM PRODUCT (N) even:

$4 \times FL - 2 \times FH > N \times (FH - FL)$

3b. For IM PRODUCT (N) odd:

$4 \times FL - 2 \times FH > (N - 1) \times (FH - FL)$

4. A warning will be issued if the following conditions have not been fulfilled:

N even: $N \times (FH - FL) < FL - 4$

N odd: $(N - 1) \times (FH - FL) < FL - 4$

A warning is issued as even and odd products tend to overlap each other.

5. Only if AVERAGING = LIN.

<u>Softkeys Used</u>

LEARN Mode:	<%>	<LIN>	EXECUTE Mode:	<BOTH>
	<BOTH>	<RIGHT>		<LEFT>
	<DB>	<SHOW+>		<RIGHT>
	<DEFLT>	<SHOW->		
	<EXP>	<STORE>		
	<LEFT>	<TBD>		

The Frequency & Drift Measurement

Description

The FREQ measurement is used to measure

a) Frequency, absolute (HZ softkey)

b) Frequency, relative to reference(s) stored as BASIC PARAMETERS (HZ REF and %REF softkeys)

c) Drift according to DIN, NAB or JIS standards (%3.15 and %3.00 softkeys)

The RE201 measures the frequency of the largest composant in the band below 25 kHz - based on this information several types of read-outs (see above) are possible. Due to the fact that frequency measurements are based on spectral analysis the RE201 is relatively unaffected by low S/N ratios.

Option Available

None.

Parameters

```
********************************
       *** LEARN FREQ ***

FUNCTION                    FREQO
CHANNEL                     RIGHT
REPRESENTATION     >           HZ
AVERAGING                     LIN
NUMBER OF LOOPS                 1



REPRESENTATION                 HZ

%3.00    %3.15               STORE
HZ REF     HZ      %REF     DEFLT
********************************
```

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH>	
	<RIGHT>	
	<LEFT>	
	<TBD>	1
REPRESENTATION	<%3.00>	2
	<%3.15>	2
	<HZ REF>	
	<%REF>	
	<HZ>	
AVERAGING	<LIN>	
	<EXP>	
NUMBER OF LOOPS	1 - 64	3

Notes

1. Channel selected at execute time

2. DRIFT measurements (largest component from 2.625 kHz - 4.5 kHz)

3. Only if AVERAGING = LIN.

Related Parameters

FREQ references left & right channels

Modified via: BASIC PARAMETERS

Softkeys Used

LEARN Mode:	<%3.00>	<LEFT>	EXECUTE Mode:	<BOTH>
	<%3.15>	<LIN>		<LEFT>
	<%REF>	<RIGHT>		<RIGHT>
	<BOTH>	<SHOW+>		
	<DEFLT>	<SHOW->		
	<EXP>	<STORE>		
	<HZ>	<TBD>		
	<HZ REF>			

Harmonic Distortion - THD

Description

The THD measurement is used to measure harmonic distortion. The RE201 selectively measures up to 9 user-specified harmonics. In single channel measurements two types of results will be simultaneously displayed:

1. Main result - total harmonic distortion created by specified harmonic(s)

2. Distortion created by each harmonic

During sequences or two channel measurements only the main result will be displayed.

Options Available

1. Filter Option 901-525

Parameters

```
********************************
       *** LEARN THD ***

FUNCTION          >        THD0
CHANNEL                   RIGHT
FREQUENCY                 TRACK
FIRST HARMONIC                2
LAST HARMONIC                 9
REPRESENTATION                %
AVERAGING                   LIN
NUMBER OF LOOPS               2


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

		Notes
FUNCTION NUMBER	0 - 9 <BOTH>	
CHANNEL	<RIGHT> <LEFT> <TBD>	 1
FREQUENCY	<TRACK> 20 Hz - 12500 Hz	2 7
FIRST HARMONIC	2 - 9	3, 5
LAST HARMONIC	2 - 9	4, 5
REPRESENTATION	<%> <DB>	
AVERAGING	<LIN> <EXP>	
NUMBER OF LOOPS	1 - 64	6

Notes

1. Channel selected at execute time
2. Fundamental frequency found automatically
3. First harmonic * frequency $\leq$ 25 kHz
4. Last harmonic * frequency $\leq$ 25 kHz
5. First harmonic $\leq$ last harmonic
6. Only when AVERAGING = LIN

Softkeys Used

LEARN Mode:	<%>	<RIGHT>	EXECUTE Mode:	<BOTH>
	<BOTH>	<SHOW+>		<LEFT>
	<DEFLT>	<SHOW->		<RIGHT>
	<EXP>	<STORE>		
	<LEFT>	<TBDW->		
	<LIN>	<TRACK>		

The Intermodulation Distortion Measurement

Description

The IM measurement is used to measure Intermodulation Distortion. The RE201 selectively measures specified sidebands - in case upper sideband(s) are placed above 25 kHz upper sideband(s) will be assumed to be equal to lower sideband(s).
During single channel measurements two types of results will be displayed simultaneously:

1. Main result - intermodulation distortion created by specified IM product(s)

2. Distortion created by each IM product

During sequences or dual channel measurements only the main result will be displayed.

Option Available

1. Filter Option 901-525

Parameters

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

FUNCTION              >    IMO
CHANNEL                  RIGHT
LOWER FREQUENCY            700 HZ
HIGHER FREQUENCY          7000 HZ
FIRST IM PRODUCT             2
LAST IM PRODUCT              2
REPRESENTATION               %
AVERAGING                  LIN
NUMBER OF LOOPS              2

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

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH> <RIGHT> <LEFT> <TBD>	1
LOWER FREQUENCY	16 - 8000	2, 5
HIGHER FREQUENCY	48 - 25000	2, 5
FIRST IM PRODUCT	2 - 9	3
LAST IM PRODUCT	2 - 9	2, 3
REPRESENTATION	<%> <DB>	
AVERAGING	<LIN> <EXP>	
NUMBER OF LOOPS	1 - 64	4

Notes

1. Channel selected at execute time

2. 2 x LOWER FREQUENCY (FL) < HIGHER FREQUENCY (FH) - LOWER FREQUENCY x (LAST IM PRODUCT - 1)

3. FIRST IM PRODUCT $\geq$ LAST IM PRODUCT

4. Only if AVERAGING = LIN

5. A warning is issued if 5 x LOWER FREQUENCY > HIGHER FREQUENCY - LOWER FREQUENCY x (LAST IM PRODUCT - 1) as harmonics of the LOWER FREQUENCY overlap desired IM products.

Softkeys Used

LEARN Mode:	<%>	<LIN>	EXECUTE Mode:	<BOTH>
	<BOTH>	<RIGHT>		<LEFT>
	<DB>	<SHOW+>		<RIGHT>
	<DEFLT>	<SHOW->		
	<EXP>	<STORE>		
	<LEFT>	<TBD>		

The Level Measurements

General Description

The LEV measurements are used to measure LEVEL - by means of a MODE parameter measurements may be performed using

1. Average detector (<AVERAGE>)
2. Peak detector 20 Hz - 75 kHz (<PEAK>) - both positive and negative peak values will be measured
3. Quasi-peak detector according to CCIR468-2
4. True RMS detector (<RMS25>), 20 Hz - 25 kHz
5. True RMS detector (<RMS75>) broadband 20 Hz - 75 kHz
6. RMS detector, selectively down to 4 Hz (-80 dB) bandwidth (<SEL>).

Any measurement definition may be modified to any of the 6 types of measurement shown above by modifying the MODE parameter.

***** Note *****

As the LEV key gives access to 6 types of measurements, the RE201 allows up to 20 LEV parameter blocks to be defined and stored as opposed to the 10 that are normally allowed.

Parameter blocks 10 - 19 will be indicated as 0 - 9 but shown in inverse video. To recall a number above 9, enter '.' followed by "number", where 0≤ "number" ≤9. Entering '.', the RE201 will show an inverse video cursor to indicate that a number between 10 and 19 will be entered.

To display parameter block 18 during LEARN mode enter:

LEARN ⇕ LEVn . 8

or alternatively:

LEARN <FUNCT> LEVn . 8

The LEV measurement is an extremely powerful tool for measurements of amplitude response, as the results may be displayed directly in dB using either the reference from BASIC PARAMETERS or a measured value.

A softkey named <STO REF> appears during single or dual channel measurements (but not during sequences). It indicates that the user may store the result of the measurement as a new reference for measurements being displayed in DB REF ('dB REFERENCE') or %REF (per cent deviation from reference).

Pressing softkey <STO REF> modifies the softkey to <RCL REF> to indicate that

1. The instrument has accepted the key entry

2. Next measured value(s) will be stored as a new reference in the channel being used

3. The original reference(s) from 'BASIC PARAMETERS' may be recalled by pressing <RCL REF>.

In the interval between key entry and reference update the keyboard will be locked to ensure that the reference(s) has been updated.

Options Available

Filter Option	901-525
Weighting Filters Option	901-526

1. LEVEL AVERAGE (<AVERAGE>)

Description

When setting MODE = <AVERAGE>, the instrument will perform an average voltage measurement (full-wave rectified). The result will appear as an RMS-calibrated result. The average value obtained from a 1VRMS sine wave will be 1.00V, and not 900 mV. The results are scaled with the factor VRMS/Vmean referring to a sinusoid.

Parameters

```
*******************************
      *** LEARN LEVEL ***

FUNCTION                  LEV0
CHANNEL            >     RIGHT
MODE                   AVERAGE
DURATION                  100 MS
REPRESENTATION            VOLT


CHANNEL                   RIGHT
_______________________________
         TBD             STORE
LEFT     BOTH   RIGHT    DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	2
MODE	<AVERAGE>	
	<PEAK>	
	<QPEAK>	
	<RMS25>	
	<RMS75>	
	<SEL>	
DURATION	100 - 9999 ms	

REPRESENTATION	<DBM> <DB REF> <VOLT>

Notes

1. Function numbers above 9 entered as '.' 'number'.

2. Channel selected at execute time.

Softkeys Used

LEARN Mode:	<AVERAGE>	<RIGHT>	EXECUTE Mode:	<BOTH>
	<BOTH>	<SHOW+>		<LEFT>
	<DBM>	<SHOW->		<RCL REF>
	<DB REF>	<STORE>		<RIGHT>
	<DEFLT>	<TBD>		<STO REF>
	<LEFT>	<VOLT>		

Related Parameters

1. LEVEL references
   left & right channels

Modified via	BASIC PARAMETER
or using softkeys	<RCL REF> <STO REF>

2. LEVEL PEAK (<PEAK>)

Description

When setting MODE = <PEAK>, the instrument will measure positive and negative peak values PEAK+ and PEAK-. Only the integration time is programmable, as level peak will be presented in volts only.

During sequences a PEAK measurement will use 2 lines on the display. This will be indicated by the word 'USED' on line No. 2.

Parameters

```
*******************************
      *** LEARN LEVEL ***

FUNCTION                  LEVO
CHANNEL          >       RIGHT
MODE                      PEAK
DURATION                   100 MS
REPRESENTATION            VOLT



CHANNEL                   RIGHT
_______________________________
        TBD               STORE
LEFT    BOTH    RIGHT     DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	2
MODE	<AVERAGE>	
	<PEAK>	
	<QPEAK>	
	<RMS25>	
	<RMS75>	
	<SEL>	

DURATION	50 - 999 MS
REPRESENTATION	VOLT

Notes

1. Function numbers above 9 entered as '.' 'number'

2. Channel selected at execute time.

Softkeys Used

LEARN Mode:	<BOTH>	<PEAK>	EXECUTE Mode:	<BOTH>
	<DEFLT>	<SHOW+>		<LEFT>
	<LEFT>	<SHOW->		<RIGHT>
	<RIGHT>	<STORE>		
		<TBD>		

3. LEVEL QUASI PEAK (<QPEAK>)

Description

When setting MODE = <QPEAK>, the detector used will be as specified in CCIR468-2.

This detector is a peak detector with a charge time of 1.2 ms and a decay time of 300 ms.

To obtain a steady display, the detector output is filtered by an averaging function. The maximum value and the averaged result are displayed simultaneously (upper result max. value, and lower result averaged value).

The results appear as 'RMS-calibrated' results. The results are scaled with the factor VRMS/Vpeak referred to a sinusoid. During sequences a QUASI PEAK measurement will use 2 lines on the display. This will be indicated by the word 'USED' on line No. 2.

Necessary Option

Weighting Filters Option 901-526.

Parameters

```
********************************
      *** LEARN LEVEL ***

FUNCTION                  LEVO
CHANNEL            >     RIGHT
MODE                     QPEAK
DURATION                   100 MS
REPRESENTATION            VOLT


CHANNEL                  RIGHT
_______________________________
       TBD               STORE
LEFT   BOTH    RIGHT     DEFLT
********************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH> <LEFT> <RIGHT> <TBD>	 2
MODE	<AVERAGE> <PEAK> <QPEAK> <RMS25> <RMS75> <SEL>	
DURATION	100 - 9999 ms	
REPRESENTATION	<DBM> <VOLT> <DB REF>	

Notes

1. Function numbers above 9 entered as "." "number"

2. Channel selected at execute time

Related Parameters

1. LEVEL references
   left & right channels

Modified via or using softkeys	BASIC PARAMETER <RCL REF> <STO REF>

4. LEVEL RMS 25 kHz BANDWIDTH (<RMS25>)

Description

Setting MODE = <RMS25> the defined function will carry out measurements using a true RMS detector band limiting the signals to 25 kHz. You can select an integration time from 16 to 512 ms depending on the frequency content of the signal under measurement, i.e. according to the formulas below, low frequencies/components being close to each other call for high integration times, to give a result which has a low uncertainty.

Formulas:

One component	$\pm 8/ (f \times T)$ %
Two components	$\pm 16/ ((f2 - f1) \times T)$

where f, f1 and f2 are frequencies in kHz, T is the integration time in ms (f2 - f1) << f1

Example

Increased uncertainty due to integration time at 62.5 Hz:
(signal period = 16 ms):

at 16 ms	$\pm 8/ (16 \times 0.0625) = 8\%$ (0.7 dB)
at 512 ms	$\pm 8/ (512 \times 0.0625) = 0.25\%$ (0.02 dB)

Parameters

```
********************************
      *** LEARN LEVEL ***

FUNCTION                  LEVO
CHANNEL                   BOTH
MODE                     RMS25
DURATION                  256 MS
REPRESENTATION     >      DBR


REPRESENTATION            DBR
_________________________________
%REF    VOLT     WATT    STORE
DB REF DB REL    DBM    DEFLT
********************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	2
MODE	<AVERAGE>	
	<PEAK>	
	<QPEAK>	
	<RMS25>	
	<RMS75>	
	<SEL>	
DURATION	<16>	
	<32>	
	<64>	
	<128>	
	<256>	
	<512>	
REPRESENTATION	<%REF>	3
	<DBM>	4
	<DB REF>	5
	<DB REL>	6
	<VOLT>	
	<WATT>	7

Notes

1. Parameter blocks 10 to 19 accessed during key sequence '.' 'number'

2. Channel selected at execute time

3. Level expressed as % of reference - either level reference from 'BASIC PARAMETERS' or a reference stored, using <STO REF> key

4. dBm - 775 mV in 600 Ohms
   Note: regardless of impedance reference in 'BASIC PARAMETER' this representation works with 600 Ohms.

5. dB relative to reference - either reference from 'BASIC PARAMETER' (<STO REF> displayed) or reference stored, using <STO REF> key (<RCL REF> displayed)

6. dB relative to opposite channel (measurement of separation)

7. W in impedance specified in 'BASIC PARAMETERS'

Related Parameters

1. IMPEDANCE references
   left & right channels

2. LEVEL references
   left & right channels

Modified via	BASIC PARAMETERS
or using softkeys	<STO REF> <RCL REF>

Softkeys Used

LEARN Mode:	<%REF>	<DEFLT>	EXECUTE Mode:	<BOTH>
	<16>	<LEFT>		<LEFT>
	<32>	<RIGHT>		<RCL REF>
	<64>	<RMS25>		<RIGHT>
	<128>	<RIGHT>		<STO REF>
	<256>	<SHOW+>		
	<512>	<SHOW->		
	<BOTH>	<SHOW->		
	<DBM>	<STORE>		
	<DB REF>	<TBD>		
	<DB REL>	<VOLT>		
		<WATT>		

5. RMS 75 KHZ BANDWIDTH (<RMS75>)

Description

Following installation of the Filter Option 901-525 the RE201 will be able to measure level (RMS) in an increased bandwidth compared to the standard measurement (RMS25) offered by the RE201 basic instrument.

The extended level measurement will appear as an additional MODE during LEARN mode for the LEV measurements.

Necessary Option

In order to be able to perform an RMS75 measurement, the Filter Option 901-525 must be installed in the RE201 analog section.

Parameters

```
*******************************
      *** LEARN LEVEL ***


FUNCTION                 LEVO
CHANNEL                 RIGHT
MODE               >    RMS75
DURATION                  500  MS
REPRESENTATION           VOLT


MODE                    RMS75
_____________________________________
       RMS75                STORE
SEL    RMS25     PEAK       DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	2
MODE	<AVERAGE>	
	<PEAK>	
	<QPEAK>	
	<RMS25>	
	<RMS75>	
	<SEL>	
DURATION	1 - 999 ms	
REPRESENTATION	<%REF>	3
	<DBM>	
	<DB REF>	4
	<VOLT>	
	<WATT>	

Notes

1. 10 - 19 entered as "." followed by "number", where "number" = 0 ... 9, i.e. 12 is entered as "." "2".

2. Channel selected at Execute time.

3. Level expressed as % of reference - either level reference from 'BASIC PARAMETERS' or a reference stored, using <STO REF> key

4. dBm - 775 mV in 600 Ohms
   Note: regardless of impedance reference in 'BASIC PARAMETERS' this representation works with 600 Ohms.

Softkeys Used

LEARN Mode:			EXECUTE Mode:
	<%REF>	<RMS75>	<BOTH>
	<BOTH>	<SEL>	<LEFT>
	<DBM>	<SHOW+>	<RIGHT>
	<DB REF>	<SHOW->	
	<DEFLT>	<STORE>	
	<LEFT>	<TBD>	
	<PEAK>	<VOLT>	
	<RIGHT>	<WATT>	
	<RMS25>		

6. LEVEL SELECTIVE (<SEL>)

Description

When setting MODE = <SEL> the instrument will measure level selectively - the user is free to determine center frequency and bandwidth for the measurement.

As the measurement is performed by means of Fast Fourier Analysis on the incoming signal, the selectivity depends on a window function - the RE201 offers two such functions

1. Four Terms Blackmann-Harris (FTBH)

2. SINE

As a filter the FTBH has a relatively broad main lobe whereas side lobes are practically not present. This window will be used most of the time in order to ensure high isolation from other signals in the input spectrum.

On the other hand, the SINE window has a narrow (selective) main lobe and a relatively high side lobe level. This window should be used to detect closely spaced signals in the input spectrum.

Figs. 4.11 and 4.12 show the relative performance of these filters when using a basic RE201. The selectivity is 4 Hz/80 dB:

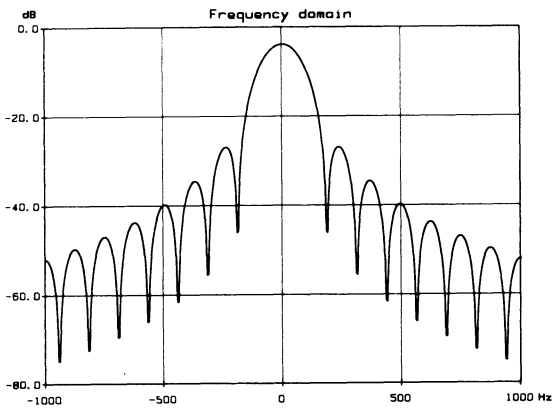


Fig. 4.11 - SINE

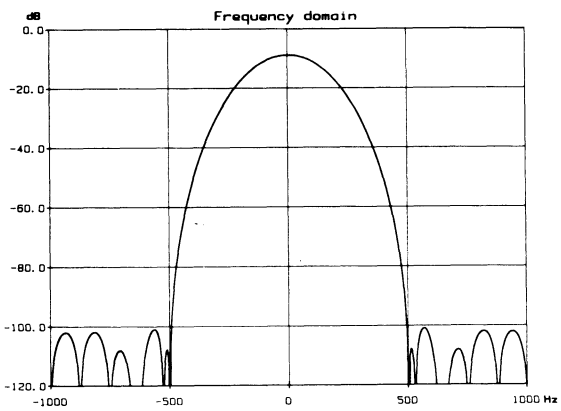


Fig. 4.12 - FTBH

Options Available

None.

Parameters

```
*******************************
      *** LEARN LEVEL ***

FUNCTION                  LEVO
CHANNEL                   BOTH
MODE                       SEL
WINDOW                    FTBH
CENTER FREQUENCY          1000 HZ
BANDWIDTH                    2 HZ
REPRESENTATION      >      DBR
AVERAGING                  LIN
NUMBER OF LOOPS              5


REPRESENTATION             DBR
_______________________________
%REF    VOLT     WATT     STORE
DB REF           DBM      DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	2
MODE	<AVERAGE>	
	<PEAK>	
	<QPEAK>	
	<RMS25>	
	<RMS75>	
	<SEL>	
WINDOW	<FTBH>	
	<SINE>	
CENTER FREQUENCY	20 - 24997 HZ	3
BANDWIDTH	2 - 25000 HZ	3
REPRESENTATION	<%REF>	4
	<DBM>	5
	<DB REF>	6
	<VOLT>	
	<WATT>	7
AVERAGING	<EXP>	
	<LIN>	
NUMBER OF LOOPS	1 - 64	8

Notes

1. Function numbers above 9 entered as '.' 'number'

2. Channel selected at execute time

3. Center frequency - 1/2 bandwidth $\geq$20

4. Level expressed as % of reference - either level reference from 'BASIC PARAMETERS' or a reference stored, using <STO REF> key

5. dBm - 775 mV in 600 Ohms
   Note: regardless of impedance reference in 'BASIC PARAMETER' this representation works with 600 Ohms!

6. dB relative to reference - either reference in 'BASIC PARAMETER' (<STO REF> displayed) or reference stored, using <STO REF> key (<RCL REF> displayed)

7. W in impedance specified in 'BASIC PARAMETERS'

8. Only if AVERAGING = LIN

Related Parameters

1. IMPEDANCE references
   left & right channels

   Modified via BASIC PARAMETERS

2. LEVEL references
   left & right channels

   Modified via BASIC PARAMETERS

   or using softkeys <STO REF>
   <RCL REF>

Softkeys Used

LEARN Mode:	<%REF>	<RIGHT>	EXECUTE Mode:	<BOTH>
	<BOTH>	<SEL>		<LEFT>
	<DBM>	<SHOW+>		<RCL REF>
	<DB REF>	<SHOW->		<RIGHT>
	<DEFLT>	<STORE>		<STO REF>
	<EXP>	<SINE>		
	<FTBH>	<STORE>		
	<LEFT>	<TBD>		
	<LIN>	<VOLT>		
		<WATT>		

PHASE and PHASE FLUCTUATION

Description

The PHASE measurement is used to measure the phase between the two input channels (RIGHT channel being the reference channel). Furthermore, this function is used to measure peak-to-peak phase fluctuations and phase difference from a reference value. The latter reference may be entered as part of the BASIC PARAMETERS or during measurements as a measured value, thus allowing for easy measurements of phase response.

During single PHASE measurements a softkey named <STO REF> (i.e. STORE REFERENCE) indicates that the current value may be stored as the new reference. When this softkey is activated, the reference entered as part of BASIC PARAMETERS is replaced by the next measured value. The instrument modifies the softkey to <RCL REF> (i.e. RECALL REFERENCE) in order to tell the operator that the original reference has been replaced. Activating the <RCL REF> key recalls the original BASIC PARAMETER and the softkey named <STO REF>. The softkeys change names when the RE201 has accepted the key entry. During PHASE measurements of long duration the instrument will appear to be slow as it waits for new measurements to come up before exchanging references. The keyboard will be locked in this period.

Options Available

None.

Parameters

```
*********************************
      *** LEARN PHASE ***

FUNCTION                  PHASE0
DURATION                     500 MS
REPRESENTATION     >         DEG



REPRESENTATION               DEG

RAD    RAD REF  RAD  P-P  STORE
DEG    DEG REF  DEG  P-P  DEFLT
*********************************
```

		Notes
FUNCTION NUMBER	0 - 9	
DURATION	100 - 32767 MS	1
REPRESENTATION	<DEG>	
	<DEG P-P>	2
	<DEG REF>	3
	<RAD>	
	<RAD P-P>	2
	<RAD REF>	3

Notes

1. 500 - 32767 ms during fluctuation measurements

2. Phase fluctuation in DEG or RAD

3. Relative measurements in DEG or RAD.

Related Parameters

PHASE reference

Modified via	BASIC PARAMETERS
or using softkeys	<STO REF>
	<RCL REF>

Softkeys Used

LEARN Mode:	<DEFLT>	<RAD P-P>	EXECUTE Mode:	<RCL REF>
	<DEG>	<RAD REF>		<STO REF>
	<DEG P-P>	<SHOW+>		<INVERT>
	<DEG REF>	<SHOW->		<NORMAL>
	<RAD>	<STORE>		

SEPARATION

Description

The SEP measurement is used to measure the separation between two channels. As the measurement is based on the utilization of the Fast Fourier Transform, it is possible to measure the separation from the right to the left channel and from the left to the right channel simultaneously. To perform this type of measurement two conditions should be fulfilled, viz. the two main signals must be sufficiently spaced in frequency and of equal amplitude. Both results are displayed in dB relative to the level of the test signal in the other channel.

Options Available

None.

Parameters

```
*******************************
      *** LEARN SEP ***

FUNCTION            >     SEP0
RIGHT FREQUENCY            400 HZ
LEFT FREQUENCY            1000 HZ
AVERAGING                  LIN
NUMBER OF LOOPS              2



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

		Notes
FUNCTION NUMBER	0 - 9	
RIGHT FREQUENCY	20 - 25000	1, 3
LEFT FREQUENCY	20 - 25000	2, 3
AVERAGING	<EXP> <LIN>	
NUMBER OF LOOPS	1 - 64	4

Notes

1. This is the test signal in the RIGHT channel

2. This is the test signal in the LEFT channel

3. The two test signals must be spaced more than 4 Hz to be able to perform the measurement

4. Only if AVERAGING = LIN.

Softkeys Used

LEARN Mode:	<DEFLT> <EXP> <LIN> <SHOW+> <SHOW-> <STORE>	EXECUTE Mode:	None

SINAD (<SINAD>)

The SINAD measurement is used by test engineers to obtain a measurement of the overall performance of audio equipment:

As

$$\text{SINAD} = \frac{\text{noise + distortion}}{\text{Total signal}} \times 100\%$$

a low value of SINAD tells the test engineer that THD is low and S/N ratio high. However, to decide whether SINAD is due to harmonic distortion or noise, the engineer has to use the THD measurement also offered by the RE201 - alternatively, a measurement of S/N could be used.

Necessary Options

The Filter Option (901-525) must be installed in the RE201 to permit this measurement to be performed. As soon as the Filter Option is installed, a softkey named <SINAD> will appear to enable you to access this new measurement (function).

Parameters

```
*******************************
      *** LEARN SINAD ***


FUNCTION              SINAD5
CHANNEL                 LEFT
FREQUENCY        >      1000  HZ
DURATION                 100  MS
REPRESENTATION             %


FREQUENCY                [   ]
_______________________________
                         STORE
TRACK                    DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	1
FREQUENCY	20 - 25000 Hz	
	<TRACK>	2
DURATION	1 - 999 ms	
REPRESENTATION	<%>	
	<DB>	

Notes

1. Channel selected at Execute time

2. The RE201 will automatically lock to the input signal.

Softkeys Used

LEARN Mode:	<%>	<RIGHT>	EXECUTE Mode:	<BOTH>
	<BOTH>	<SHOW+>		<LEFT>
	<DB>	<SHOW->		<RIGHT>
	<DEFLT>	<SINAD>		<SINAD>
	<FUNCT>	<STORE>		
	<LEFT>	<TBD>		
		<TRACK>		

TRANSIENT INTERMODULATION DISTORTION

Description

The TIM measurement is used for measuring Transient Intermodulation Distortion according to the proposed IEC standard to be incorporated in the IEC Publication 268-3.

A test signal consists of a square (triangle) wave (3.15 kHz/3.18 kHz) and a sine wave (15 kHz). TIM is expressed as

$$d_{TIM} = \frac{SQR\ (U_1^2 + U_2^2 + \ldots + U_9^2)}{Us}$$

where Un is the amplitude of intermodulation products at the frequencies fs - n x fq, n = 1 .. 9 (fs = 15 kHz, fq = 3.15/3.18 kHz) while Us is the amplitude of the sinusoid.

Only dTIM will be displayed as a result, as there is no further information to be obtained from a display containing all 9 intermodulation products.

Options Available

None.

Parameters

```
*********************************
       *** LEARN TIM ***

FUNCTION          >        TIMO
CHANNEL                   RIGHT
REPRESENTATION               %
AVERAGING                  LIN
NUMBER OF LOOPS              2


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

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH> <RIGHT> <LEFT> <TBD>	 1
REPRESENTATION	<%> <DB>	
AVERAGING	<LIN> <EXP>	
NUMBER OF LOOPS	1 - 64	2

Notes

1. Channel selected at execute time

2. Only if AVERAGING = LIN.

Softkeys Used

LEARN Mode:	<%>	<LIN>	EXECUTE Mode:	<BOTH>
	<BOTH>	<RIGHT>		<LEFT>
	<DB>	<SHOW+>		<RIGHT>
	<DEFLT>	<SHOW->		
	<EXP>	<STORE>		
	<LEFT>	<TBD>		

Weighted Measurements

Description

Following the installation of 901-526 Weighting Filters Option, a softkey named <WEIGH> will appear to allow access to weighted S/N measurements.

A weighted measurement consists of a weighting filter combined with one of the 20 LEV measurements. Thus, the detector used in a weighted S/N measurement is selected by means of a level definition. A typical LEARN mode display looks like shown below:

```
*******************************
      *** LEARN WEIGH ***


FUNCTION                 WEIGH5
APPLICATION            TELECOMM
FILTER            >  CCITT P53
MEASUREMENT                LEV0



TELECOMM FILTER    CCITT P53
-------------------------------
 CCITT                    STORE
 C-MESS                   DEFLT
*******************************
```

Fig. 4.12

During selection of the required level measurement it is possible to inspect and/or modify the level measurement by activating the LEARN key when the cursor in fig. 4.12 points to the "MEASUREMENT" parameter.

The RE201 will then enter LEARN mode for the level measurement selected. Following inspection/modification of the level measurement activate EXIT alternatively <STORE>/<DEFLT> in case parameters have been modified.

Example

You want to define a noise measurement according to CCITT P53 - the level measurement should then be RMS25 with an integration time of 256 ms. while the weighted measurement must contain the following parameters:

APPLICATION = TELECOM

FILTER = CCITT P53

Parameters

The available Weighting Filters are divided into four application groups by means of an APPLICATION parameter: Audio, Broadcast, Rumble and Telecommunication. The selection of the filters under a certain group - and the associated filter response curves are treated in detail in the following four sections.

1 - Audio Filters

Parameters

```
*********************************
      *** LEARN WEIGH ***

FUNCTION              WEIGH5
APPLICATION            AUDIO
FILTER            > IEC DB(A)
MEASUREMENT             LEV0



AUDIO FILTER       IEC DB(A)
--------------------------------
 CCIR/A  DIN BP  25 KHZ  STORE
 DB(A)   DB(B)   DB(C)   DEFLT
*********************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
APPLICATION	<TELCOM>	2
	<BRDCAST>	3
	<AUDIO>	
	<RUMBLE>	
FILTER	<DB(A)>	4
	<DB(B)>	4
	<DB(C)>	4
	<CCIR/A>	5
	<DIN BP>	6
MEASUREMENT	0 - 19	1, 7

Notes

1. Parameter blocks 10 - 19 accessed using key sequence "." "digit", "digit" being 0 - 9.

2. TELeCOMmunication

3. BRoaDCAST

4. A, B and C weighting filters according to the IEC 179 and DIN 45633 standards. See figures 4.13 to 4.15.

5. CCIR/ARM filter is a modified CCIR 468 filter to be used together with an Average Responding Meter. See fig. 4.16.

6. DIN 45300 BandPass filter. See fig. 4.17.

7. A detailed detection scheme should be specified as a LEVEL measurement.

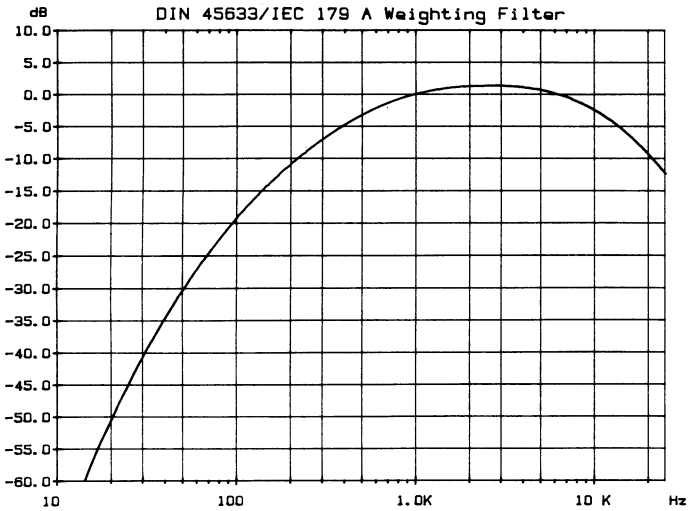
Related Parameters

1. IMPEDANCE references left & right channel Modified via	BASIC PARAMETERS
2. LEVEL references left & right channel	BASIC PARAMETERS
Modified via	BASIC PARAMETERS
or	<STO REF>
	<RCL REF>

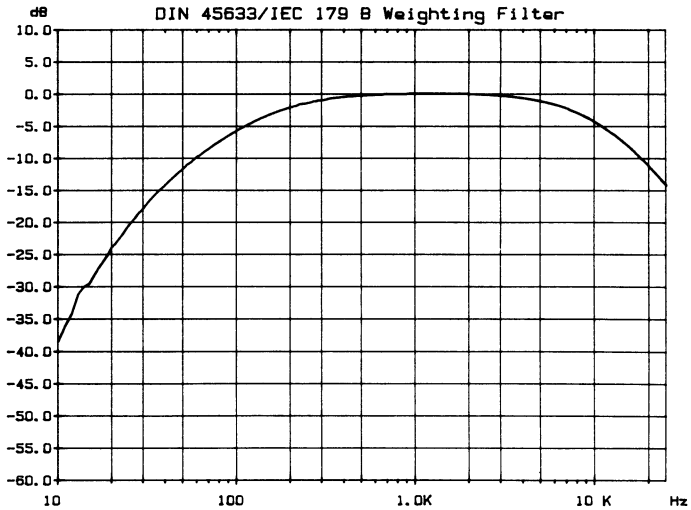
Softkeys Used

LEARN Mode:	<AUDIO>	<DIN BP>	EXECUTE Mode:	<BOTH>
	<DB(A)>	<CCIR/A>		<LEFT>
	<DB(B)>	<STORE>		<RCL REF>
	<DB(C)>	<DEFLT>		<RIGHT>
				<STO REF>

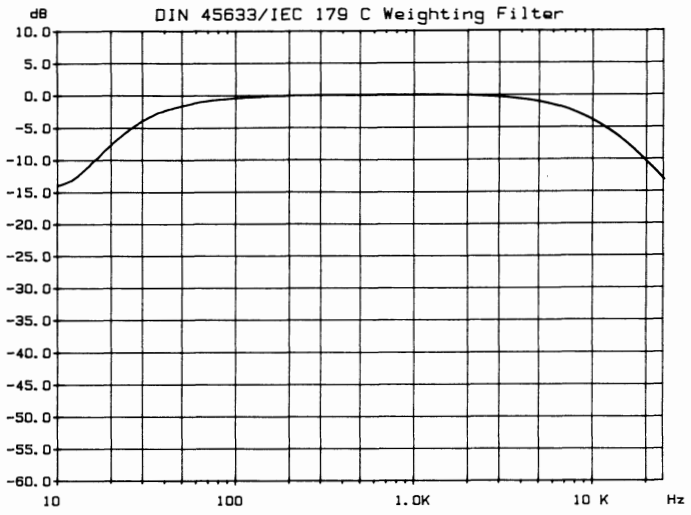
Filters Available



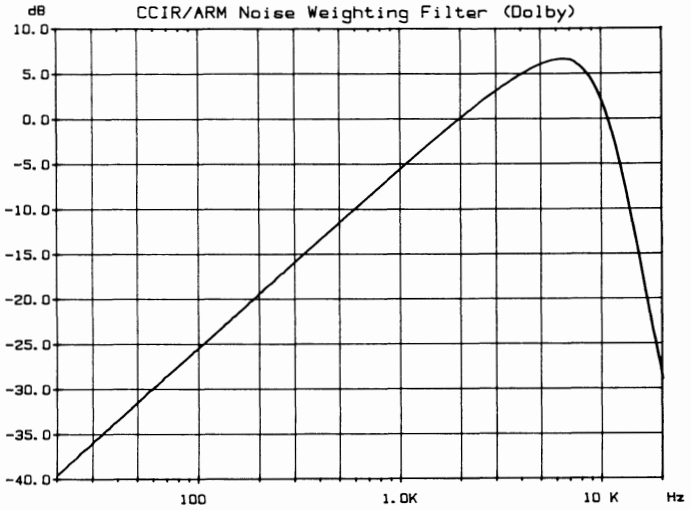
dB(A) Filter
Fig. 4.13



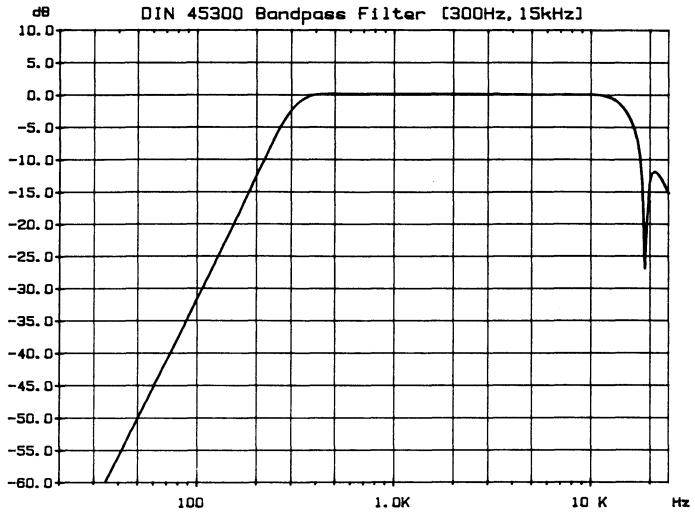
dB(B) Filter
Fig. 4.14



dB(C) Filter
Fig. 4.15



CCIR/ARM Filter
Fig. 4.16



DIN45300 Bandpass Filter
Fig. 4.17

2 - Broadcast Filters

Parameters

```
*********************************
      *** LEARN WEIGH ***

FUNCTION                 WEIGH5
APPLICATION            BROADCAST
FILTER            >     CCIR468
MEASUREMENT               LEV0



BROADCAST FILTER      CCIR468
--------------------------------
                           STORE
CCIR468 CCIR BP  CTALK    DEFLT
*********************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
APPLICATION	<AUDIO>	
	<BRDCAST>	3
	<RUMBLE>	
	<TELCOM>	2
FILTER	<CCIR468>	4
	<CCIR BP>	5
	<CTALK>	6
MEASUREMENT	LEV 0 - 19	1, 7

Notes

1. Parameter blocks 10 - 19 accessed using key sequence "." "digit", "digit" being 0 - 9.

2. TELeCOMmunication

3. BRoaDCAST

4. CCIR 468 filter. See fig. 4.18

5. CCIR BandPass filter. See fig. 4.19

6. CrossTalk filter. See fig. 4.20

7. A detailed detection scheme should be specified as a LEVEL measurement.

Related Parameters

1. IMPEDANCE references
   left & right channel

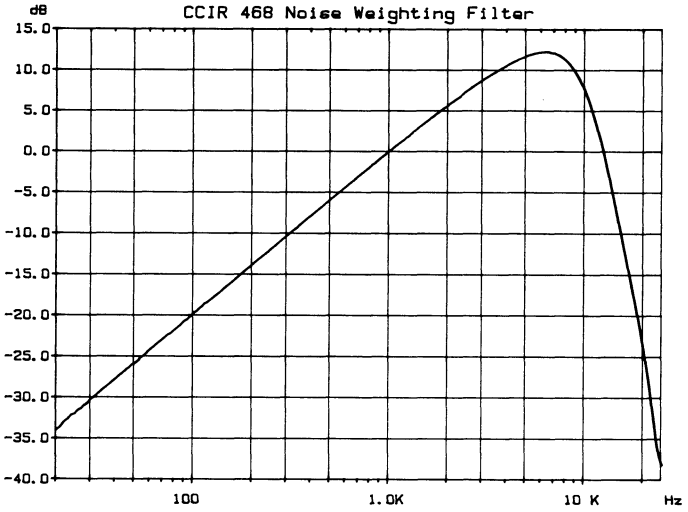
2. LEVEL references
   left & right channel

Modified via	BASIC PARAMETERS
or using softkeys	<STO REF>
	<RCL REF>

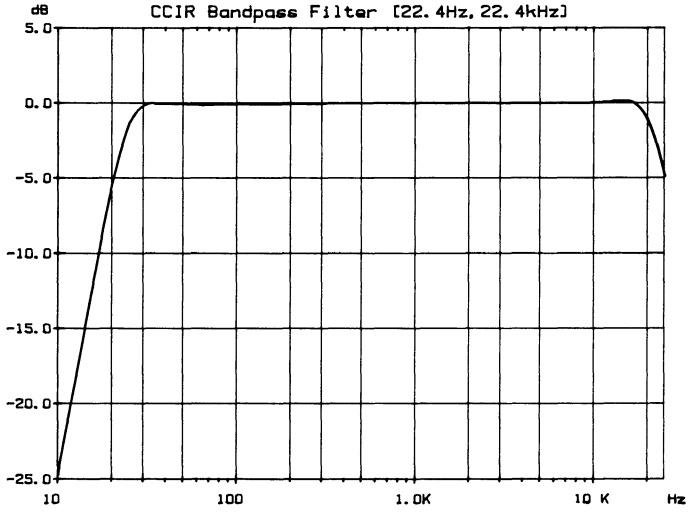
Softkeys Used

LEARN Mode:	<BRDCAST>	<CTALK>	EXECUTE Mode:	<BOTH>	<RIGHT>
	<CCIR 468>	<STORE>		<LEFT>	<STO REF>
	<CCIR BP>	<DEFLT>		<RCL REF>	

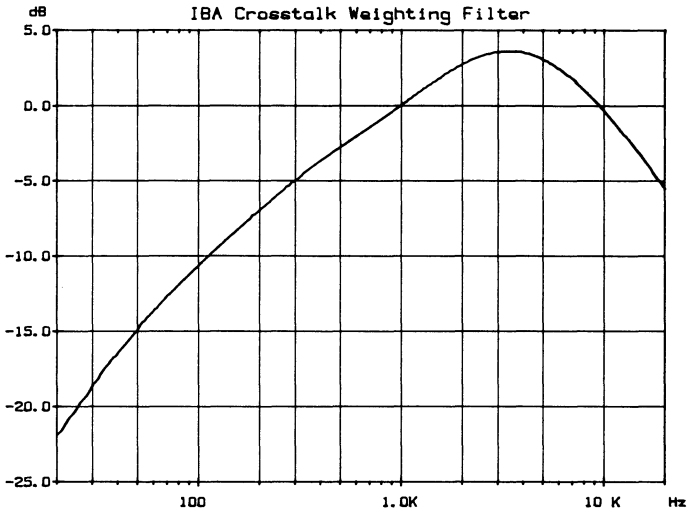
Filters Available



CCIR468 Filter
Fig. 4.18



CCIR Bandpass Filter
Fig. 4.19



Crosstalk Filter
Fig. 4.20

3 - Rumble Filters

Parameters

```
*********************************
      *** LEARN WEIGH ***

FUNCTION                 WEIGH5
APPLICATION              RUMBLE
FILTER            >       WEIGH
MEASUREMENT                LEV0



RUMBLE FILTER            WEIGH
--------------------------------
 WEIGH                     STORE
UNWEIGH                    DEFLT
*********************************
```

		Notes
FUNCTION	0 - 19	1
APPLICATION	<TELCOM>	2
	<BRDCAST>	3
	<AUDIO>	
	<RUMBLE>	
FILTER	<WEIGH>	4
	<UNWEIGH>	
MEASUREMENT	0 - 19	1, 5

Notes

1. Parameter blocks 10 - 19 accessed using key sequence "." "digit", "digit" being 0 - 9.

2. TELeCOMmunication

3. BRoaDCAST

4. WEIGHTED and UNWEIGHTED Rumble filters according to the DIN 45539 standard. See figures 4.21 and 4.22

5. A detailed detection scheme should be specified as a LEVEL measurement.

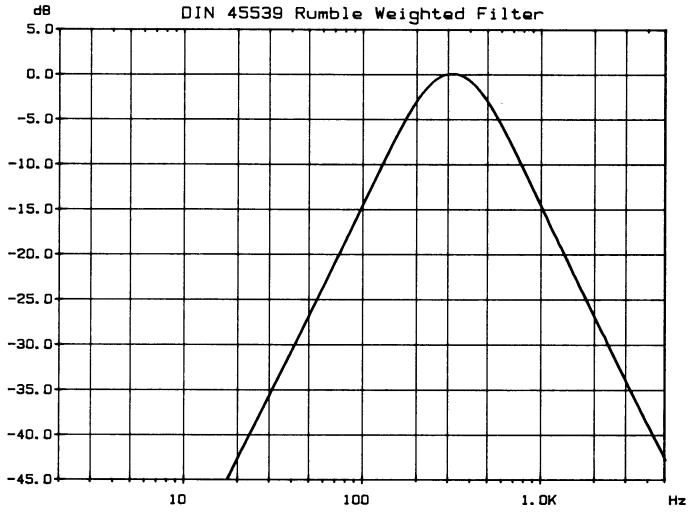
Related Parameters

1.	IMPEDANCE references left & right channel	BASIC PARAMETERS
2.	LEVEL references left & right channel	BASIC PARAMETERS
	Modified via or	BASIC PARAMETERS <STO REF> <RCL REF>

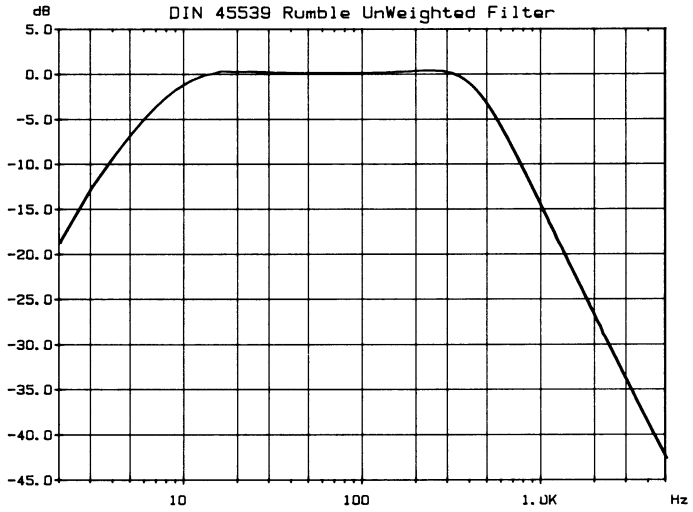
Softkeys Used

LEARN Mode:	<RUMBLE>	<STORE>	EXECUTE Mode:	<BOTH>	<RIGHT>
	<WEIGH>	<DEFLT>		<LEFT>	<STO REF>
	<UNWEIGH>			<RCL REF>	

Filters Available



DIN 45539 Weighted
Fig. 4.21



DIN 45539 Unweighted
Fig. 4.22

4 - Telecommunication Filters

Parameters

```
*******************************
      *** LEARN WEIGH ***

FUNCTION              WEIGH5
APPLICATION          TELECOMM
FILTER            >  CCITT P53
MEASUREMENT              LEV0



TELECOMM FILTER    CCITT P53
--------------------------------
 CCITT                   STORE
 C-MESS                  DEFLT
*******************************
```

		Notes
FUNCTION NUMBER	0 - 19	1
APPLICATION	<AUDIO>	2
	<BRDCAST>	3
	<RUMBLE>	
	<TELCOM>	
FILTER	<CCITT>	4
	<C-MESS>	5
MEASUREMENT	LEV 0 - 19	1, 6

Notes

1. Parameter blocks 10 - 19 accessed using key sequence "." "digit", "digit" being 0 - 9.

2. TELeCOMmunication

3. BRoaDCAST

4. CCITT P53 filter. See fig. 4.23

5. C-Message filter. See fig. 4.24

6. A detailed detection scheme should be specified as a LEVEL measurement.

Related Parameters

1. IMPEDANCE references
   left and right channel

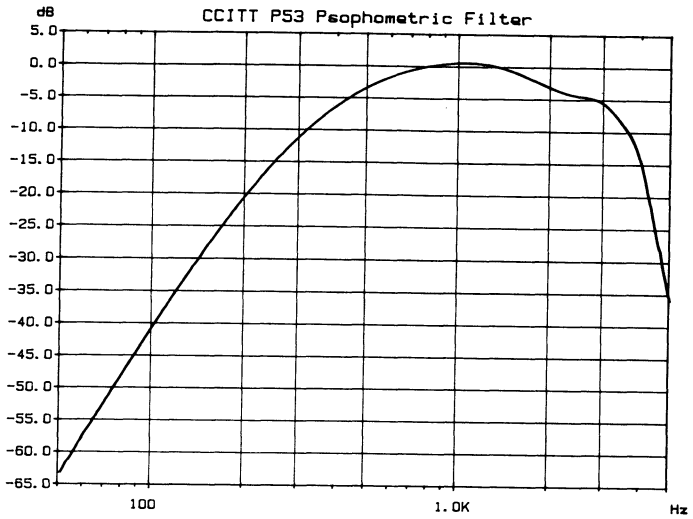
2. LEVEL references
   left and right channel

Modified via or using softkeys	BASIC PARAMETERS <STO REF> <RCL REF>

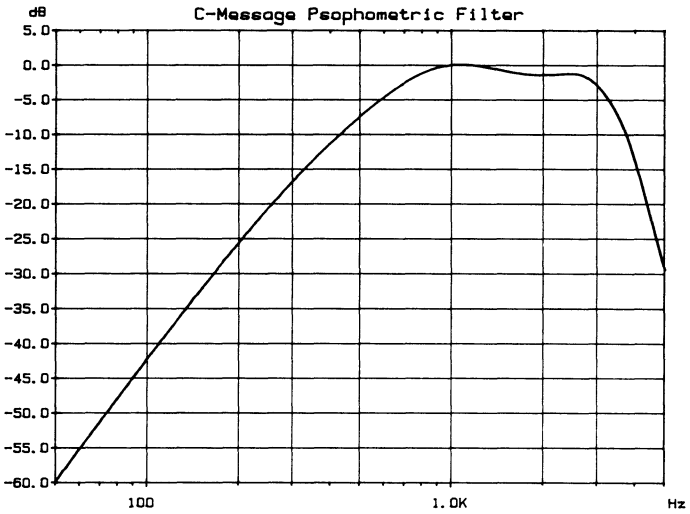
Softkeys Used

LEARN Mode:	<TELCOM>	<STORE>	EXECUTE Mode:	<BOTH>	<RIGHT>
	<CCITT>	<DEFLT>		<LEFT>	<STO REF>
	<C-MESS>			<RCL REF>	

Filters Available



CCITT P53 Filter
Fig. 4.23



C-Message Filter
Fig. 4.24

THE WOW & FLUTTER MEASUREMENT

Description

The W&F measurement is used for measuring Wow and Flutter according to DIN, JIS and NAB standards. The results may be weighted according to DIN 45507 or by using a 500 Hz or 200 Hz LP filter.

The results obtained are displayed by using a 2 sigma detector which delivers unambiguous results from the fluctuating readings of the W&F option board.

As soon as the W&F option board is installed in an RE201, the computer recognizes the presence of the board by

1. including W&F as an installed option in power-up display

2. displaying a <W&F> softkey to allow the user to gain access to 10 different W&F measurements.

Pressing the 'LEARN' key means that this softkey disappears as the LEARN Mode softkeys appear on the screen. However, when pressing the <FUNCT> or <DEFLT> softkey, the <W&F> softkey reappears to allow the user to define W&F measurements.

As the W&F board is working with very low frequency, the settling time is a problem. However, this problem is solved by the RE201, but sometimes results may be displayed with some delay, as the instrument starts measuring following the calculated settling time. Settling time increases as the range decreases (increased gain).

***** Note *****

The Wow & Flutter measurement does not automatically set the gain as this would increase the measuring time - instead a RANGE parameter has been included in the LEARN mode.

The RANGE should always be selected as low as possible in order to obtain the optimum performance as the errors on displayed results are a percentage of the RANGE parameter.

Necessary Option

Wow and Flutter Option 901-456

Parameters

```
*********************************
       *** LEARN W&F ***

FUNCTION                  W&FO
CHANNEL                  RIGHT
STANDARD                   DIN
FILTER            >        500 HZ
RANGE                        1 %
DURATION                   500 MS


FILTER                     500 HZ
--------------------------------
                           STORE
200 HZ   500 HZ  WEIGHT    DEFLT
*********************************
```

		Notes
FUNCTION NUMBER	0 - 9	
CHANNEL	<BOTH>	
	<LEFT>	
	<RIGHT>	
	<TBD>	1
STANDARD	<DIN>	
	<JIS>	
	<NAB>	
FILTER	<500 HZ>	
	<200 HZ>	
	<WEIGHT>	2
RANGE	<10%>	3
	<1%>	3
	<0.1%>	3
DURATION	1000 - 5000 MS	

Notes

1. Channel selected at execute time

2. Weighted according to DIN45507

3. Full scale values

Softkeys Used

LEARN Mode:	<0.1%>	<JIS>	EXECUTE Mode:	<BOTH>
	<1%>	<LEFT>		<LEFT>
	<10%>	<NAB>		<RIGHT>
	<200 HZ>	<RIGHT>		<W&F>
	<500 HZ>	<SHOW+>		
	<BOTH>	<SHOW->		
	<DEFLT>	<STORE>		
	<DIN>	<TBD>		

4.5 SEQUENCES

In the operational hierarchy of the RE201, SEQUENCES rank over FUNCTIONS, as the former consists of one or more of the latter.

Very often, the instrument will be used to study or verify parameter dependencies, i.e. how is harmonic distortion related to output level and frequency. Of course, output level, frequency and harmonic distortion could be measured as 3 individual tests, which should be performed and remembered every time one parameter (such as level) was changed. With the RE201 a SEQUENCE consisting of a relevant FREQ function, a LEV function and a THD function will be defined and executed. These 3 functions now will automatically be sequentially executed and the results displayed annotated on the CRT at the same time - you therefore may vary all parameters according to your own choice and watch for parameter dependencies.

All defined FUNCTIONS can be regarded as a library of measurement routines to be used either for single measurements or combined into a SEQUENCE.

When you wish to define and store a sequence consisting of a level measurement, a frequency measurement and a THD measurement (all of which should have been defined previously as FUNCTIONS), start with the RE201 showing the IDLE display (use EXIT key):

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


ENTER COMMAND
_____________________________
DC
W&F
********************************
```

Fig. 4.25 - RE201 IDLE display

Note: W&F option installed

1. Enter LEARN mode by activating the LEARN key:

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

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

Fig. 4.26 - RE201 LEARN mode

2. In order to inspect, modify or create a SEQUENCE, press <SEQUENCE> (F3).

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

ENTER SEQUENCE NUMBER     [    ]
_________________________________

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

Fig. 4.27 - RE201 following <SEQUEN> key

3. The RE201 offers 20 different sequences (0 - 19). The sequences 0 - 9 are selected directly via the keypad (S0 - S9), whereas the sequences 10 - 19 are selected by activating the '.' (decimal point) followed by one of the numeric keys - i.e. sequence No. 18 calls for the following key entries: '.' S8

Sequence numbers above 9 must be entered as '.' followed by a 'number', i.e. "." "7" will display sequence definition No. 17; 7 and 17 are distinguished by indicating 17 as a '7' in inverse video. If sequence number 0 has to be modified or created, enter a '0':

```
*******************************
      *** SEQUENCE 0 ***

            >



ENTER FUNCTION
_______________________________
DC                      STORE
W&F                     DELETE
*******************************
```

Fig. 4.28 - Sequence
(no previous definition has taken place)

If sequence number 0 already exists the display could look like this:

```
*******************************
      *** SEQUENCE 0 ***

            >            DC1

                        THD0

                       FREQ0



ENTER FUNCTION
_______________________________
DC                      STORE
W&F                     DELETE
*******************************
```

Fig. 4.29 - Sequence (defined)

In the latter case, SEQUENCE 0 consists of DC measurement No. 1, THD function 0 and FREQ function 0. A cursor (>) may be placed on any line using the cursor keys of the RE201. Activation of the <DELETE> key (F8) removes a function from that line. If a new function has to be entered, the old one does not have to be deleted as entering of a new function replaces the previous one.

The cursor has 9 positions in the display, i.e. up to 9 functions may be present in a sequence at the same time - also during EXECUTE mode results from the single functions will appear exactly on the line where the name of the function resides during LEARN mode.

In special cases:

Note that QUASIPEAK and PEAK measurements take up 2 lines as these functions deliver 2 results - the RE201 is handling this by printing 'USED' on the line following the function name. Also, the instrument does not allow the user to point to the line where result 2 will appear.

4. Now enter FUNCTIONS by activating the function keys (THDn, IMn, LEVn) followed by the FUNCTION NUMBER. The function name and number will appear on the STATUS LINE - activation of the ENTER key enters the function name on the line to which the cursor points:

```
*******************************
      *** SEQUENCE 0 ***

                          LEV0

                          THD0

                         FREQ0

                     >


ENTER FUNCTION
_____________________________
DC                     STORE
W&F                    DELETE
*******************************
```

Fig. 4.30 - Sequence

5. When the sequence is defined, activate <STORE> (F4) to store the sequence definition in the non-volatile RAM. The RE201 will return to the main LEARN display and be ready to "learn" more.

4.6 SET-UPS

RE INSTRUMENTS produces a broad range of equipment for use in the radio industry - RF generators, stereo generators, ARI coders, just to mention a few. All these instruments may be externally controlled by using the RE MEMORY BUS, which allows full instrument settings ("set-ups") to be stored and recalled in all attached instruments at the same time. Being very efficient and economical, this bus is ideal for customers having little or no programming experience, as the programming takes place via the front panel of the instruments themselves. The RE201 can control the memory bus, i.e. it acts as the heart of an effective low cost integrated test system.

Normally, a test system also needs some type of signals to control custom made switch matrixes, power supplies etc. Even these signals can be provided by the RE201 via the GPIO interface, which contains 20 TTL outputs and 2 load signals to gate information into external equipment.

A SET-UP in an RE201 contains the following items:

1. Set-up number

   Up to 100 SET-UPS may be stored in and recalled from an RE201 - also used to store/recall set-ups in attached instruments via the RE Memory Bus

2. Function or sequence

   This is the measurement(s) to execute when

   a) GPIO has been set

   b) other instruments have been set, and

   c) the optional Audio Generator has been set

3. Audio Generator setting

   If the optional Audio Generator is installed, the setting (type of signals, level etc.) to be used will be indicated here

4. GPIO output

20 bits of TTL output to be used by external circuitry

When executing SET-UP No. N the RE201 performs the following tasks:

1. Recalls previously stored setting No. N in attached instruments by sending the number N together with control signals via the Memory Bus

2. Outputs 20 bits of information to the GPIO bus together with 2 LOAD pulses to indicate valid information

3. Sets up the Audio Generator if this is present

4. Starts measuring according to FUNCTION or SEQUENCE, which is part of the RE201 SET-UP No. N

   i.e. selecting a new SET-UP in the RE201 recalls a new test step in a test procedure.

Defining a SET-UP

Connect the necessary instruments to the MEMORY BUS of the RE201 - use the EXIT key (⇕ EXIT) to get IDLE screen:

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


ENTER COMMAND
_____________________________
DC

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

Fig. 4.31 - IDLE screen

1. Enter LEARN mode by activating the LEARN key:

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

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

Fig. 4.32 - LEARN mode

2. To inspect/modify a SET-UP activate the <SETUP> key (F7):

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

```
ENTER SETUP NUMBER        [0]
_____________________________

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

Fig. 4.33 - SET-UP

3. Input the set-up number wanted (0 - 99) followed by ENTER - in this example a '9' was entered:

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

SETUP NUMBER        >       9

MEASUREMENT(S)          LEV0


GPIO     10101010101010111111


SETUP NUMBER            [    ]
_________________________________
                        STORE
 SHOW+   SHOW-
*********************************
```

4. Use the cursor control keys to point to the information that must be modified.

   To enter a FUNCTION to be executed as part of the set-up: press a function key (THD, IM) followed by the number of the function. Then press ENTER - to enter a sequence enter △▽ followed by sequence number.

   To modify GPIO output: use cursor keys to point to the pins to be modified, then enter '1' or '0' - 0 and 1 will auto-repeat during this operation.

5. Now, set up the attached instruments to the setting they should recall when SETUP No. 0 is executed, i.e RF level, frequency etc., by using the front panel switches of the instruments.

6. Press <STORE> (F4) on the RE201 for storage of the settings of the attached instruments <u>and</u> set-up in RE201.

   The RE201 will return to the main LEARN mode display and be ready for a new SETUP to be defined. When all necessary set-ups have been defined, use the EXIT key to go to IDLE display.

5 EXECUTE MODE

5.1 Functions

From IDLE display ("ENTER COMMAND") any measurement, including options, may be activated. However, new FUNCTIONS, SEQUENCES or SETUPS may also be activated at any time during measurements without entering "IDLE" mode. To execute THD measurement No. 0 (assuming that THD measurement 0 is not the DEFAULT measurement) activate the following keys:

△▽ THDn 0

Key 1 (△▽) indicates that a no-default measurement is being activated.

Key 2 (THDn) indicates that it is a THD measurement.

Key 3 (0) indicates the measurement number (0).

In case THD0 was the DEFAULT measurement, executing the measurement only takes one key:

THDn

The instrument now repeatedly performs measurements according to parameters. During measurements in a single channel the RE201 indicates the channel on line 1 of the display - when performing dual channel measurements results from the left channel appear left justified while results from the right channel appear right justified.

In case the measurement is not a standard FUNCTION of the RE201 (such as SINAD) the "hard"-key is just replaced by the softkey, i.e. activating SINAD measurement No. 5 takes the following keys:

△▽<SINAD> 5

***** Note *****

DC1 is executed by pressing <DC> followed by '1'.

DC2 is executed by pressing <DC> followed by '2'.

5.2 SEQUENCES

To execute a sequence: leave LEARN mode using the EXIT key. The numeric keys (0 - 9) have a red S in front of the digit - this indicates that a sequence is selected by activating the key ⇕ (red LED on, meaning that red text is valid) followed by a numeric key. To activate sequence 0 enter

⇕ S0

To activate sequences 10 - 19 (say 18) enter the following keys

⇕ . S8

Results from a sequence look as follows

```
*******************************
      *** SEQUENCE 6 ***

LEV2                    1.05V

THD9                  -76.06 DB

FREQ4                  62.3 HZ


_____________________________
   DC
   W&F
*******************************
```

Fig. 5.1 - Results from a sequence

i.e. on the left side of the screen the name of the function being used will be printed, while the results appear on the right side.

***** Note *****

Only main results will appear - i.e. THD does not "break down" main results into components, as is the case during execution of a single THD function. A maximum of 18 results could appear in a sequence: 9 functions each measuring in BOTH channels.

5.3 SET-UPS

To execute set-up No. N, just enter the number N followed by ENTER (LEARN mode not active):

```
*******************************
      *** SETUP 01 ***    RIGHT



RMS25                    15.7 DBR



 DC              STO REF
 W&F
*******************************
```

Fig. 5.2 - Results from a SET-UP

To advance one step in the test sequence (to set-up N+1), just press △▽ followed by 'cursor up' - to step back, press △▽ followed by 'cursor down'.

To jump in test sequence, e.g. to set-up No. 21, enter:

2 1 ENTER

At any time during EXECUTE mode, a set-up may be provoked by entering the number of the set-up followed by ENTER. To activate e.g. a FUNCTION while executing a SETUP, just enter 'function key' (default function) or △▽ 'function key' 'number' - also, sequences may be activated at all times. Thus, you are free to leave set-ups (where attached instruments are in REMOTE condition, i.e. no keys can be activated) so that you can measure other parameters or modify the setting of attached instruments.

6 TUTORIAL

6.1 Functions

To define and execute a phase measurement enter LEARN mode and press F2 <FUNCT>. Activation of the <FUNCT> key results in the following display (softkeys only appear in case options are installed):

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

```
ENTER FUNCTION
_____________________________
        WEIGH
 W&F    SINAD
*******************************
```

To define a PHASE measurement, activate the PHASE key:

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

```
ENTER FUNCTION NUMBER   PHASE
_____________________________

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

The instrument now asks which one of the 10 PHASE measurements (PHASE 0 - PHASE 9) which is going to be modified/inspected. E.g. enter a '0':

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

FUNCTION              > PHASE 0
DURATION                  100 MS
REPRESENTATION            DEG



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

When the cursor points to the first line, it is possible to renumber the measurement definition, i.e. if a definition should be equal to definition 0, except for one parameter, modify the function number to say 1 and modify the parameter in question.

Whenever the RE201 expects a numeric entry, a pair of brackets will appear - the distance between these brackets always indicates the maximum length of an allowed entry.

The softkeys <SHOW+> and <SHOW-> are used to "leaf through" all PHASE definitions, increasing or decreasing function numbers. These keys are auto-repeating - try "leafing" back and forward using softkeys <SHOW+> and <SHOW->.

The softkey <STORE> is activated for storage of a measurement definition in the non-volatile RAM. Simultaneously, the instrument checks all entered parameters for validity - if an illegal entry is found, an error message will appear on the status line, the cursor will point to the erroneous parameter and after a slight delay the instrument will ask for a new entry.

If the specific measurement defined has to be used extensively, it can easily be activated - this is where the DEFLT key should be used. <DEFLT> acts in exactly the same manner as <STORE>, but in addition the specific measurement (PHASE 0 in this case) has been appointed the DEFAULT PHASE measurement. Default measurements are activated by pressing the key having the name of the measurement. The nine other measurements must be activated by using 3 key entries, i.e.

⇕ , PHASEn, 7

for PHASE 7 in order to point out the exact measurement to be performed.

Use the 'cursor down' key to point to DURATION:

```
*******************************
      *** LEARN PHASE ***

FUNCTION                PHASE 0
DURATION          >       100 MS
REPRESENTATION            DEG



DURATION                [    ]MS
_____________________________________
                          STORE
                          DEFLT
*******************************
```

Again, the instrument expects a number entry - try entering another value, say 250 - all entries should be followed by "ENTER", i.e. use

"2" "5" "0" "ENTER"

to input the number 250 as DURATION parameter, telling the instrument to measure PHASE for 250 ms before outputting a result.

```
*******************************
      *** LEARN PHASE ***

FUNCTION                PHASE 0
DURATION                  250 MS
REPRESENTATION    >       DEG



REPRESENTATION            DEG
_____________________________________
  RAD  RAD REF RAD P-P   STORE
  DEG  DEG REF DEG P-P   DEFLT
*******************************
```

Note that the cursor automatically advances one step following the ENTER key. At the same time, the new DURATION value appears in the main display.

The REPRESENTATION parameter, i.e. how is a result to be presented, is entered by using softkeys, thus no bracket will appear. However, the RE201 displays the current value on the status line.

Refer to section 8 for a detailed description of all softkeys.

The most efficient way to measure PHASE response is by using the <DEG REF> key: press F6 and ENTER to update the display:

```
*******************************
      *** LEARN PHASE ***

FUNCTION            >  PHASE 0
DURATION                 250 MS
REPRESENTATION           DEG REF



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

All these exercises may be performed without any risk, as none of the parameters stored in the RAM has been modified - this only happens if <STORE> or <DEFLT> is activated and if no errors are detected.

If you want to skip the entry, activate the EXIT key:

△ EXIT
▽

Now press F4 (<STORE>) and the main LEARN mode display will be back. To leave LEARN mode: activate the EXIT key as above. You will then be back in IDLE display and be ready to start the measurements.

For activation of PHASE 0 measurement press:

⇕ PHASEn 0

```
*******************************
        *** PHASE 0 ***

PHASE                  44 DEG

 DC            STO REF INVERT
 W&F
*******************************
```

<STO REF> allows storage of the current measurement as a reference for future PHASE measurements having REPRESENTATION = DEG-REF or RAD-REF. Activate <STO REF>:

```
*******************************
        *** PHASE 0 ***

PHASE                   0 DEG

 DC           RCL REF  INVERT
 W&F
*******************************
```

Of course, the result will be 0 deg. as you are measuring the PHASE deviation from the reference which you just stored.

<RCL REF> indicates

1. that a measured value has been stored as reference
2. that the original reference (part of BASIC PARAMETERS) may be recalled by activating <RCL REF>.

By changing the frequency of the input of the device under test, the operator can now directly read the phase response from the RE201 referred to the previous value.

<INVERT> is used to invert the signal in the left channel, as ambiguity appears around 0 deg. PHASE difference. <INVERT> will show this by changing the reading to a steady 180 deg. - at the same time the <NORMAL> softkey indicates that

1. left channel has been inverted and

2. left channel may be brought back to normal by activating <NORMAL>.

Basic Parameters

What to do if you want to refer all PHASE readings to say 100 deg.? - This is also simple when using the RE201.

Go to LEARN mode by using the LEARN key - then activate F5 (<BASIC>):

```
*******************************
      *** BASIC PARM'S ***


IMPEDANCE     > 1000 OHM    1 OHM
FREQUENCY      31999 HZ     1 HZ
VOLTAGE           30 V   .001 V
PHASE                      0 DEG

DC1 FACTOR               .001
DC2 FACTOR               1000


IMPEDANCE      [     ]OHM
_____________________________
                        STORE

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

*** Note ***

Left column valid for left channel, right column valid for right channel.

Use the cursor keys to point to PHASE reference, modify to 100 deg., and press <STORE>. The PHASE reference, which is always active

whenever <STO REF> is displayed, will now be 100 deg. Leave LEARN mode by means of the EXIT key - PHASE measurements having representation DEG REF will now refer to 100 deg.

Amplitude Response with the RE201

Measuring amplitude response from 20 Hz to 25 kHz using level at 1 kHz as reference:

1. Define level measurements with representation = DB REF

2. Tune oscillator to 1 kHz and start the measurement

3. Press <STO REF> to store reading as reference (RE201 displays 0 DB REF)

4. Tune oscillator from 20 Hz - 25 kHz, and the RE201 directly displays amplitude response in dB.

Of course, this procedure may also be used in sequences where frequency, level and phase are measured. Thus, amplitude and phase response are directly measured as a function of frequency.

Weighted S/N Measurements

The following section describes the keystrokes necessary to program the RE201 for a noise measurement according to IEC 179 curve A.

The RE201 is assumed to be in IDLE or EXECUTE mode.

STEP NO.	KEYS	COMMENTS
1	LEARN <FUNCT> <WEIGH> .5	The RE201 is now brought to LEARN WEIGH no. 15 with cursor pointing to FUNCTION
2	↓ <AUDIO> ENTER	APPLICATION AUDIO is selected
3	<DB(A)> ENTER	The DB(A) weighting is selected
4	3	Now LEVEL measurement no. 3 is selected as detector for WEIGH no. 15

In case LEV3 has already been defined, go to step 10 - else:

to specify LEVEL no. 3 use the following steps:

5	LEARN	The RE201 is now in LEARN LEV mode and ready to learn LEVEL 3
6	↓ <LEFT> ENTER	Left channel is selected for the measurement
7	<RMS25> ENTER	Broadband RMS (25 kHz bandwidth) detection is entered
8	<256> ENTER	The duration is 256 ms, and
9	<DB REF> ENTER <STORE>	the representation is selected as DB REF
10	ENTER <STORE>	the level measurement is now part of WEIGH15

EXECUTE Mode

The RE201 is now ready to carry out the measurement. Typically, the IEC 179 measurement is carried out on an LF amplifier. In order to do so, the RE201 left channel is connected to the output of the amplifier, and a 1 kHz signal generator is connected to the input of the amplifier (the amplifier must give rated output power using this signal).

The following actions are now required:

STEP NO.	KEYS	COMMENTS
10	△ ▽ EXIT	The RE201 is brought to IDLE mode
11	△ ▽ <WEIGH> . 5	The RE201 will now measure the level of the 1 kHz signal in the left channel

12	<STO REF>	Pressing <STO REF> will modify the display to 0.0 DB REF, and this level is now used as reference
13		Switch off the 1 kHz signal
14	△ ▽ <WEIGH> . 5	The RE201 will now carry out the measurement once more, this time using the 1 kHz level as reference

The RE201 will now display the noise level of the amplifier according to IEC 179 curve A.

6.2 Sequences

A sequence in an RE201 consists of up to 9 previously defined FUNCTIONS (measurement definitions) being executed sequentially and displayed simultaneously. Using a sequence you may vary several input parameters for a Device Under Test simultaneously and watch all the effects of these variations on the screen at the same time.

In the following you are going to "design" a sequence allowing you to check:

1. Output level in watts
2. Peak output level in volts
3. THD in %
4. Frequency.

LEARN Mode

"Design" the following measurements via LEARN mode and <FUNCT> key:

```
*******************************
      *** LEARN LEVEL ***

FUNCTION                  LEV1
CHANNEL                  RIGHT
MODE                     RMS25
DURATION                   512 MS
REPRESENTATION     >      WATT



REPRESENTATION            WATT
_______________________________
  DB REF VOLT    WATT     STORE
  %REF   DBU     DBM      DEFLT
*******************************
```

Fig. 6.1 - Power measurement in RIGHT channel

```
*******************************
      *** LEARN LEVEL ***

FUNCTION                  LEV2
CHANNEL                  RIGHT
MODE          >           PEAK
DURATION                   100 MS



MODE                      PEAK
_______________________________
                          STORE
  SEL     RMS25    PEAK   DEFLT
*******************************
```

Fig. 6.2 - Peak measurement in RIGHT channel

```
*******************************
      *** LEARN THD ***

FUNCTION          >      THD3
CHANNEL                 RIGHT
FREQUENCY               TRACK
FIRST HARMONIC              2
LAST HARMONIC               9
REPRESENTATION              %
AVERAGING                 LIN
NUMBER OF LOOPS             2

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

Fig. 6.3 - THD measurement in RIGHT channel
Note: TRACK mode

```
*******************************
      *** LEARN FREQ ***

FUNCTION                FREQ4
CHANNEL                 RIGHT
REPRESENTATION    >        HZ
AVERAGING                 LIN
NUMBER OF LOOPS             1


REPRESENTATION             HZ
_______________________________
 %3.00   %3.15           STORE
 HZ REF    HZ     %REF   DEFLT
*******************************
```

Fig. 6.4 - Frequency measurement in RIGHT channel

To define the sequence: start from main LEARN mode display by means of the LEARN key:

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



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

Fig. 6.5 - Main LEARN mode display

Activate F3 (<SEQUEN>) to start definition of a sequence:

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



ENTER SEQUENCE NUMBER
_____________________________

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

Fig. 6.6 - Display following <SEQUEN> key activation

The RE201 now asks you to enter sequence number - the instrument offers 20 sequences: Sequence 0 - 9 entered as 0 - 9, whereas 10 - 19 must be entered as '.' followed by a number, i.e. sequence 19 is entered as

'.' 9

Try entering a '1':

```
*******************************
      *** SEQUENCE 1 ***

            >            LEV0


                         THD0


ENTER FUNCTION
_____________________________
 DC                     STORE
 W&F                    DELETE
*******************************
```

Fig. 6.7 - RE201 displaying current SEQUENCE 1 contents

If no SEQUENCE 1 has previously been defined, the function names will be missing. Delete any functions which are part of the sequence by means of the F8 (<DELETE>) key. Use the cursor control keys to point to the functions to be deleted.

The cursor (">") may be placed on any of the 9 lines in the sequence display. Thus, you may place a FUNCTION name on any of these 9 lines - when the sequence is executed, the results from the functions will appear exactly on the line where the function name appears during LEARN mode.

Point to the upper line by means of the cursor key:

```
*******************************
      *** SEQUENCE 1 ***

          >
```

```
ENTER FUNCTION
_____________________________
  DC                    STORE
  W&F                   DELETE
*******************************
```

Fig. 6.8

On this line you want the results from the power measurement (LEV1 - fig 6.1) to appear - therefore, activate the LEV key:

```
*******************************
      *** SEQUENCE 1 ***

          >
```

```
ENTER FUNCTION          LEVn
_____________________________
  DC                    STORE
  W&F                   DELETE
*******************************
```

Fig. 6.9

Here "n" equals the number of the current DEFAULT LEV measurement.

Activate the number "1" to have LEV1 entered - then press ENTER to place LEV1 in the main display:

```
*******************************
      *** SEQUENCE 1 ***

                          LEV1
         >
```

```
ENTER FUNCTION
_____________________________
  DC                    STORE
  W&F                   DELETE
*******************************
```

Fig. 6.10

The ENTER key will place function from status line in the display where the cursor has previously been placed - the cursor then advances to the next line.

To get a readable display: activate the 'cursor down' key to place an empty line between the functions, then activate the following keys:

"LEVn" "2" "ENTER"

to place the peak measurement in the main display (ref. fig. 6.2):

```
*******************************
      *** SEQUENCE 1 ***

                          LEV1

                          LEV2
                          USED
         >


ENTER FUNCTION
_______________________________
  DC                      STORE
  W&F                     DELETE
*******************************
```

Fig. 6.11 - Sequence containing a peak measurement

As a PEAK measurement delivers 2 results (PEAK+ and PEAK-), the RE201 indicates this by printing "USED" on the line following the function name and advancing the cursor to the following line. The instrument does not allow you to point to the line marked "USED" as this is part of a measurement.

Use cursor down to create an empty line in the display and enter the following keys to place the THD measurement from fig. 6.3 in the main display:

"THDn" "3" "ENTER"

```
*******************************
      *** SEQUENCE 1 ***

                          LEV1

                          LEV2
                          USED

                          THD3
                     >


ENTER FUNCTION
_______________________________
  DC                      STORE
  W&F                     DELETE
*******************************
```

Fig. 6.12

Finally, use cursor down and the following entries to place the frequency measurement from fig. 6.4 nicely in the display:

"FREQn" "4" "ENTER"

```
*******************************
      *** SEQUENCE 1 ***

                        LEV1

                        LEV2
                        USED

                        THD3

                       FREQ4
                   >

ENTER FUNCTION
_____________________________
  DC                    STORE
  W&F                   DELETE
*******************************
```

Fig. 6.13

The sequence has now been defined and must be stored in the non-volatile RAM - as usual. This is done by means of F4 (<STORE>). The main LEARN mode display (fig. 6.5) will appear again - activate EXIT (⇕ EXIT) to have the IDLE display back.

EXECUTE Mode

To execute SEQUENCE 1, simply enter the following keys (from IDLE mode or EXECUTE mode):

⇕ S1

If sequences above 9 have to be activated (say 11): enter the following key sequence:

⇕ . S1

The RE201 now starts execution of the previously defined sequence and will display results as shown in fig. 6.14:

```
*******************************
        *** SEQUENCE 1 ***

LEV1                   5.00 W

LEV2                  +8.93 V
                      -8.96 V

THD3                   0.05 %

FREQ4                   500 HZ


  DC
  W&F
*******************************
```

Fig. 6.14 - Results from SEQUENCE 1

These results were obtained with an impedance level = 8 ohms - to modify/inspect impedance level: refer to section 4.3 (BASIC PARAMETERS).

In case warnings or errors occur, they will be displayed on the status line - at the same time the last valid result of the measurement issuing the error will be indicated in inverse video.

Of course, channel = TBD is also available in sequences - the instrument will ask for channel when it encounters a FUNCTION in a sequence having channel = TBD.

6.3 Set-ups

Whenever the RE201 is used in a production environment, where standardized measurements must be carried out in a number of steps, the instrument should be operated by using set-ups.

A set-up in an RE201 consists of the following parts:

1. A set-up number to be sent to other instruments connected to the RE201 via the Memory Bus interface to recall a stored setting in these instruments

2. A FUNCTION or SEQUENCE to be executed whenever this particular set-up is activated

3. 20 bits of binary information to be sent to the GPIO bus on set-up activation

4. Optional: the setting of the Audio Generator option used when the set-up is activated.

LEARN Mode

As usual, you start out with the main LEARN mode display:

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


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

Fig. 6.15 - Main LEARN mode display

To inspect or modify a set-up: activate F7 (<SETUP>) key:

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



ENTER SETUP NUMBER        [   ]
_______________________________

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

Fig. 6.16

You now define 4 set-ups based on the functions and sequence previously described.

As the RE201 allows the operator to define up to 100 set-ups (0 - 99), let us start at e.g. set-up 6:

Enter the following key sequence to start definition of set-up 6:

"6" "ENTER"

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

1     SETUP NUMBER        >       6

2     MEASUREMENT(S)          LEV0

3

4     GPIO    11111000001111100000

      SETUP NUMBER            [   ]
_______________________________
                              STORE

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

Fig. 6.17

On line 1 the user may modify the set-up number to any number in the range 0 - 99.

By means of the cursor keys, the cursor (">") may point to any of the lines in the main display: Use the cursor key to point to line 2, then enter LEV1 (fig. 6.1) by entering

"LEVn" "1" "ENTER"

The cursor then advances to line 4 as line 3 is used by the optional Audio Generator.

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

SETUP NUMBER                 6

MEASUREMENT(S)            LEV1


GPIO      1100001111111111111
          ↑

GPIO PIN NUMBER              1
_____________________________
                          STORE

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

Fig. 6.18

The GPIO output is binarily programmed - by means of the 'cursor left' and 'cursor right', the operator may point to any pin in the GPIO interface (note: there is a one-to-one agreement between pin numbers displayed and actual pin numbers in the physical interface). A "1" corresponds to a voltage >2.4 V, whereas a "0" corresponds to a voltage <0.4 V. Of course, the numbers "0" and "1" are used during programming of the GPIO interface. Both numbers will auto-repeat during this operation.

When the GPIO has been programmed, activate F4 (<STORE>) to store the set-up in RAM - after this operation the main LEARN mode display will be back. Enter F7 (<SETUP>) again, then enter "7" as set-up number, modify MEASUREMENT(S) to LEV2 by entering "LEVn" "2" "ENTER", program GPIO, if necessary, and press F4 (<STORE>). Repeat the above with set-up No. 8 having MEASUREMENT(S) = THD3 and SETUP 9 having MEASUREMENT(S) = FREQ4.

Finally, define SETUP No. 10 as a SETUP having MEASUREMENT(S) = S1 (sequence No. 1) - enter

△▽ S1

when the instrument asks for MEASUREMENT(S). Press F4 (<STORE>) to save this last SETUP, and leave LEARN mode by activating the EXIT key (△▽ EXIT).

***** Note *****

If other instruments had been attached to the Memory Bus, these instruments should have been set up to desired setting immediately before activating <STORE> in order for this setting to be saved in the Memory Bus interface.

EXECUTE Mode

To execute SETUP No. 6 from IDLE mode or EXECUTE mode, just enter

"6" "ENTER"

Increase/Decrease SETUP Nos.

To step to the next set-up (7), just enter:

△▽ 'cursor up'

To step to the previous set-up (6), just enter:

△▽ 'cursor down'

To activate any SETUP (say 10), enter:

"1" "0" "ENTER"

Try starting at SETUP 6, step to SETUP 10 using cursor keys (shift mode) and then go directly back to set-up 6 using key sequence

"6" "ENTER"

7 MISCELLANEOUS

7.1 Miscellaneous

General

To enhance the versatility of the RE201, several utility keys have been implemented. Directly on the keyboard you will find COPY,INT, LOCAL and TEST, whereas <PROGRAM> is a softkey found in LEARN mode.

COPY Key

Activation of the COPY key sends the contents of the display via the RS232C interface to an external printer or computer. In this way important results or parameter values entered during LEARN mode may be documented directly from the CRT screen.

INT Key

To avoid intensity adjustment knobs on the RE201, also this task is performed by the computer via the keyboard:

To increase intensity: Press INT and 'cursor up' at the same time - to reduce intensity: Press INT and 'cursor down' at the same time. Note: INT key activated first.

Intensity is auto-repeating and the setting will be remembered, stored in the non-volatile RAM, so next time the instrument is powered up the setting will be perfect.

LOCAL Key

Activating ⇕, LOCAL commands the instrument to LOCAL mode (manual) when the instrument is being controlled by means of the IEEE488 bus. If LOCAL LOCKOUT has been sent from the controller, this key will be ignored, but if the instrument is forced to LOCAL mode, the green LED on the LOCAL key is lit. To enter REMOTE again: Activate ⇕, LOCAL again.

TEST Key

Activating ⇕, TEST allows you to initiate a complete selftest. Results from this test will be shown on the CRT.

***** Note *****

If the non-volatile RAM has lost its contents a special warning will be issued, and the instrument will be reprogrammed to RESET condition.

Activating △▽ and TEST simultaneously during power-up resets all contents of the RE201 to default values stored in ROM.

<PROGRAM> Key

Customers using several RE201's having the same programming contents (FUNCTIONS, SEQUENCES, etc.) need not repeat the somewhat cumbersome programming task for all the instruments - just connect them via the RS232C interface, and the <PROGRAM> key allows you to transfer information from one RE201 to another. Connecting the RE201 to a computer allows you to store the programming information on the computer - thus allowing for easy reconfiguration of the instrument.

1. When the instruments have been connected (refer to section 2.5) : Press LEARN key to go to LEARN mode - then enter <PROGRAM> (F4) on both units.

```
*******************************
        *** PROGRAM ***
```

```
SELECT USING SOFTKEY

 LOAD     FUNCT    SEQUEN
 DMP ALL           SETUP    SIGNAL
*******************************
```

Fig. 7.1

2. Enter <LOAD> key (F1) on the instrument which is going to accept the programming information - this instrument now waits for the transmitter to become active.

3a. To dump all information, i.e.

SYSTEM PARM'S
BASIC PARM'S
FUNCTION definitions
SEQUENCES
SETUPS
and SIGNAL definitions

activate <DMP ALL> on the RE201 to act as 'donor'.

3b. If you only want to dump a specific function block: enter <FUNCT> followed by the key indicating the function (say THDn).

3c. To dump all sequences: enter <SEQUEN>.

3d. To dump all SETUPS: enter <SETUP>.

3e. To dump all SIGNAL definitions: enter <SIGNAL>.

If for some reason the operation must be terminated: use the EXIT key (⇕ EXIT).

8 SOFTKEYS

8.1 Softkeys in Alphabetical Order

The keys F1 to F8 on the keyboard of the RE201 are so-called 'softkeys'. To facilitate the operation of the RE201 the function of these 8 keys will change depending on the choices offered by the instrument at any given moment. Of course, these changes are made in the software of the RE201.

The actual function of the softkeys is shown at the bottom of the CRT screen in the shape of inverse video blocks and softkeys as shown in fig. 8.1.

```
!                                                !
!                 *** RE201 ***                  !
!                                                !
!                                                !
!                                                !
!                                                !
!                                                !
!                                                !
!                                                !
!                                                !
!------------------------------------------------!
!                                                !
! !      !   !      !   !      !   !      ! !
! ! F1   !   ! F2   !   ! F3   !   ! F4   ! !
! !______!   !______!   !______!   !______! !
!                                                !
! !      !   !      !   !      !   !      ! !
! ! F5   !   ! F6   !   ! F7   !   ! F8   ! !
! !______!   !______!   !______!   !______! !
!________________________________________________!
```

Fig. 8.1 - Mapping of softkeys on inverse video blocks

This technique drastically reduces the number of keys, and thus facilitates the operation of the RE201. (As a curiosity: the 8 softkeys replace more than 80 normal keys).

In the following you will find a description of all softkeys used by the RE201 - a softkey will be indicated by framing the text in "<" and ">". The softkeys follow in strict alphabetical order - softkeys mainly consisting of numbers have been placed first in increasing values, so that <%3.00> follows < 2 > etc.

0.1%

Description

The <0.1%> softkey indicates to the RE201 that the range for a W&F measurement (full scale) should be 0.1% Wow & Flutter.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <0.1%> key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

1

Description

The < 1 > softkey indicates to the RE201 that the instrument will use 1 stop bit during transmission and reception via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

1%

Description

The < 1% > softkey indicates to the RE201 that the range for a W&F measurement (full scale) should be 1% Wow & Flutter.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 1% > key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

1.5

Description

The <1.5> softkey indicates to the RE201 that the instrument will use 1.5 stop bits during transmission and reception via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

2

Description

The < 2 > softkey indicates to the RE201 that the instrument will use 2 stop bits during transmission and reception via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

%3.00

Description

The <%3.00> softkey indicates to the RE201 that a FREQ measurement will be used for measuring DRIFT by means of a test tone according to the JIS and NAB standards for W&F measurements. These standards specify a 3.00 kHz test tone. The RE201 will measure the actual frequency originating from a tape recorder or turntable and calculate the drift in %. The results will be displayed as follows

DRIFT (JIS/NAB) 0.13%

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <%3.00> key:

FREQ - Frequency

%3.15

Description

The <%3.15> softkey indicates to the RE201 that a FREQ measurement will be used for measuring DRIFT by means of a test tone according to the DIN standard for W&F measurements. This standard specifies a 3.15 kHz test tone. The RE201 will measure the actual frequency originating from a tape recorder or turntable and calculate the drift in %. The results will be displayed as follows

DRIFT (DIN) 0.17%

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <%3.15> key:

FREQ - Frequency

10%

Description

The <10%> softkey indicates to the RE201 that the range for a W&F measurement (full scale) should be 10% Wow & Flutter.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <10%> key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

16

Description

The <16> softkey indicates to the RE201 that the integration time for a level measurement should be 16 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms.
(f2 - f1) << f1

Case a) deals with a single component, whereas
case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <16> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

25 KHZ

Description

The <25 KHZ> softkey is used for measurement of noise in 25 kHz bandwidth (flat frequency response).

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <25 KHZ> key:

WEIGH - WEIGHTED measurements *

* Option: Weighting Filters Option 901-526 must be installed.

32

Description

The < 32 > softkey indicates to the RE201 that the integration time for a level measurement should be 32 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f 2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms
(f2 - f1) << f1

Case a) deals with a single component, whereas
case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 32 > key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

50HZ

Description

The <50 HZ> softkey indicates to the RE201 that the composite video signal for an external TV monitor should contain a frame refresh rate of 50 Hz in order to ensure proper synchronization.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

60HZ

Description

The <60 HZ> softkey indicates to the RE201 that the composite video signal for an external TV monitor should contain a frame refresh rate of 60 Hz in order to ensure proper synchronization.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

64

Description

The < 64 > softkey indicates to the RE201 that the integration time for a level measurement should be 64 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f 2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms
(f2 - f1) << f1

Case a) deals with a single component, whereas case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 64 > key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

128

Description

The < 128 > softkey indicates to the RE201 that the integration time for a level measurement should be 128 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f 2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms
(f2 - f1) << f1

Case a) deals with a single component, whereas case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 128 > key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

200HZ

Description

The <200 HZ> softkey indicates to the RE201 that the filter used during measurement of Wow & Flutter should be a 200 Hz LP filter.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <200 HZ> key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

256

Description

The < 256 > softkey indicates to the RE201 that the integration time for a level measurement should be 256 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms.
(f2 - f1) << f1

Case a) deals with a single component, whereas case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 256 > key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

300

Description

The < 300 > softkey indicates to the RE201 that the instrument will use a baud rate of 300 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

500HZ

Description

The <500 HZ> softkey indicates to the RE201 that the filter used during measurement of Wow & Flutter should be a 500 Hz LP filter.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <500 HZ> key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

512

Description

The < 512 > softkey indicates to the RE201 that the integration time for a level measurement should be 512 ms. Integration time and uncertainty on results are connected as

a) Uncertainty = $\pm$ 8/(f x T) %

b) Uncertainty = $\pm$16/((f 2 - f1) x T) %

where f is frequency in kHz
T is integration time in ms
(f2 - f1) << f1

Case a) deals with a single component, whereas case b) deals with two closely spaced components.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < 512 > key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

600

Description

The < 600 > softkey indicates to the RE201 that the instrument will use a baud rate of 600 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

1200

Description

The < 1200 > softkey indicates to the RE201 that the instrument will use a baud rate of 1200 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

2400

Description

The < 2400 > softkey indicates to the RE201 that the instrument will use a baud rate of 2400 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

4800

Description

The < 4800 > softkey indicates to the RE201 that the instrument will use a baud rate of 4800 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

9600

Description

The < 9600 > softkey indicates to the RE201 that the instrument will use a baud rate of 9600 bits/sec. when transmitting/receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

%

Description

The < % > key is used for all distortion measurements to indicate that the result(s) should be displayed as a %, i.e. % THD.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < % > key:

DFIM - Dual Frequency Distortion
IM - Intermodulation Distortion
SINAD - Signal to Noise and Distortion
THD - Harmonic Distortion
TIM - Transient Intermodulation Distortion

%REF

Description

The < %REF > softkey indicates to the RE201 that the result from a measurement should be displayed as a percentage of a stored reference. This reference might be a specific one stored as part of BASIC PARAMETERS (<STO REF> shown) or an actual measurement stored as a result of activating a <STO REF> key (<RCL REF> shown). This definition means that when the value measured equals the reference being used, a result of 0% will be shown.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < %REF > key:

FREQ - Frequency
LEV - Level RMS, 25 kHz bandwidth (<RMS25>)
Level selective (<SEL>)
Level RMS, 75 kHz bandwidth * (<RMS75>)

* Option: Filter Option (901-525) must be installed.

AUDIO

Description

The <AUDIO> softkey is used to select a group of standard audio weighting filters.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurements are using the <AUDIO> key:

WEIGH
- DB(A) standard measurements
- DB(B) standard measurements
- DB(C) standard measurements
- DIN BP standard measurements
- CCIR Average Responding Meter measurements
- 25 kHz bandwidth measurement

* Option: Weighting Filters Option 901-526 must be installed.

AVERAGE

Description

The <AVERAGE> softkey indicates to the RE201 that the LEVEL measurement being defined should be performed as an AVERAGE measurement. The result will appear as an RMS-calibrated result. The "average value" obtained from a 1VRMS sine wave will be 1.00V and not 900 mV.

Mode

Only used during LEARN mode for LEVEL measurements.

Measurements

The following measurement is utilizing the <AVERAGE> key:

LEV - Level AVERAGE

* Option: Weighting Filters Option 901-526 must be installed.

BASIC

Description

The <BASIC> softkey indicates to the RE201 that the operator wants to inspect or modify BASIC PARAMETERS, i.e. references for measurements, impedances and DC multiplication factors.

Mode

Only used during LEARN mode.

BOTH

Description

The <BOTH> softkey indicates to the RE201 that the measurement being defined or executed should be performed in both channels. Measurements using both channels differ from single channel measurements by only displaying the main result - i.e. THD and not the harmonic contents.

Mode

Used during LEARN mode for FUNCTIONS and during EXECUTE mode for FUNCTIONS having channel = TBD (also FUNCTIONS being part of SEQUENCES).

Measurements

The following measurements use the <BOTH> key:

All except PHASE, SEParation and DC

BRDCAST

Description

The <BRDCAST> softkey is used to select a group of broadcast related weighting filters.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurements are using the <BRDCAST> key:

WEIGH - CCIR 468 standard measurement
- CCIR BP standard measurement
- IBA recommended CrossTALK measurements

* Option: Weighting Filters Option 901-526 must be installed.

CCIR468

Description

The <CCIR468> softkey is used to select the weighting filter specified in the CCIR468 standard.

Mode

Used during LEARN Mode for WEIGHTED measurements.

Measurements

The following measurement uses the <CCIR468> key:

WEIGH - BROADCAST measurement according to the CCIR468 standard

* Option: Weighting Filters Option 901-526 must be installed.

CCIR/A

Description

The <CCIR/A> softkey is used to select the weighting filter recommended by Dolby Labs to be used with an Average Responding Meter for AUDIO noise measurements.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <CCIR/A> key:

WEIGH - WEIGHTED AUDIO measurement recommended by Dolby Labs

* Option: Weighting Filters Option 901-526 must be installed.

CCIR BP

Description

The <CCIR BP> softkey is used to select the CCIR recommended 31,5 HZ - 16 kHz bandpass filter.

Mode

Used during LEARN Mode for WEIGHTED measurements.

Measurements

The following measurement uses the <CCIR BP> key:

WEIGH - BROADCAST measurement utilizing the CCIR BANDPASS filter

* Option: Weighting Filters Option 901-526 must be installed.

CCITT

Description

The <CCITT> softkey is used to select the weighting filter specified by the CCITT-P53 standard.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <CCITT> key:

WEIGH - TELeCOMmunication measurement according to CCITT-P53

* Option: Weighting Filters Option 901-526 must be installed.

C-MESS

Description

The <C-MESS> softkey is used to select the C-MESSAGE weighting filter recommended by AT&T.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <C-MESS> key:

WEIGH - TELECOMMUNICATION measurement using C-MESSAGE filter

* Option: Weighting Filters Option 901-526 must be installed.

CTALK

Description

The <CTALK> softkey is used to select the filter recommended by IBA for weighted CROSSTALK measurement.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <CTALK> key:

WEIGH - BROADCAST measurement of CROSSTALK recommended by the Independent Broadcasting Authorities in the United Kingdom (IBA)

* Option: Weighting Filters Option 901-526 must be installed.

DB

Description

The < DB > softkey is used for all distortion measurements to indicate that the result(s) should be displayed in dB, i.e. dB THD.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < DB > key:

DFIM - Dual Frequency Distortion
IM - Intermodulation Distortion
SINAD - Signal to Noise and Distortion
THD - Harmonic Distortion
TIM - Transient Intermodulation Distortion

DB(A)

Description

The <DB(A)> softkey is used to select the A weighting filter according to IEC 179.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <DB(A)> key:

WEIGH - WEIGHTED AUDIO MEASUREMENT
according to IEC 179 curve A

* Option: Weighting Filters Option 901-526 must be installed.

DB(B)

Description

The <DB(B)> softkey is used to select the B weighting filter according to IEC 179.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <DB(B)> key:

WEIGH - WEIGHTED AUDIO measurement according to IEC 179 curve B

* Option: Weighting Filters Option 901-526 must be installed.

DB(C)

Description

The <DB(C)> softkey is used to select the C weighting filter according to IEC 179.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <DB(C)> key:

WEIGH - WEIGHTED AUDIO measurement according to IEC 179 curve C

* Option: Weighting Filters Option 901-526 must be installed.

DBM

Description

The < DBM > softkey indicates to the RE201 that the results from a measurement should be displayed using the unit dBm (dB above 1 mV in 600 Ohms). Please note that DBM will use 600 Ohms regardless of impedance reference entered as part of BASIC PARAMETERS.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < DBM > key:

LEV - Level average (<AVERAGE>)
Level quasipeak (<Q-PEAK>)
Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)

* Option: Filter Option (901-525) must be installed.

DB REF

Description

The <DB REF> softkey indicates to the RE201 that the results from a measurement should be calculated and displayed in dB using a stored reference as 0 dB. This reference may be part of BASIC PARAMETERS (<STO REF> displayed) or an actual measured value stored by pressing the <STO REF> key (<RCL REF> displayed).

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <DB REF> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)
Level average (<AVERAGE>)

* Option: Filter Option (901-525) must be installed.

DB REL

Description

The <DB REL> softkey indicates to the RE201 that the results from a measurement should be calculated and displayed in dB relative to the opposite channel. By means of this softkey transfer functions, I/O gains etc. are easily obtained.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the <DB REL> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

DC

Description

The < DC > softkey indicates to the RE201 that the operator wants to execute a DC measurement. To select channel: a '1' or a '2' should be entered following < DC > (DC1 being male part of BNO connector).

Mode

Only used during EXECUTE mode.

Measurements

The following measurements use the < DC > key:

DC - DC ONE
DC TWO

DEFLT

Description

The <DEFLT> softkey indicates to the RE201 that

1) The measurement being defined should be stored as the default * measurement or that

2) the operator wants to inspect or modify a default * measurement.

Mode

Only used during LEARN mode.

Measurements

All measurements, with the exception of the DC measurement - use the <DEFLT> key.

* Normally, a measurement will be executed by using 3 key entries:

△▽ THDn '7' to execute THD measurement stored as No. 7.

However, one specific measurement out of 10 (20) may be designated as the DEFAULT measurement.

A DEFAULT measurement is executed by pressing only one key:

THDn

and is thus facilitating the execution of measurements being used very often.

DEG

Description

The < DEG > softkey indicates to the RE201 that the PHASE measurement being defined should have its result displayed in degrees.

Mode

Only used during LEARN mode for PHASE.

DEG P-P

Description

The <DEG P-P> softkey indicates to the RE201 that the PHASE measurement being defined will measure fluctuation. When executing this type of measurement the RE201 will take a number of phase readings for each 100 ms. integration time, calculate the mean phase and then display the fluctuation peak-peak. Typically, this type of measurement is used for checking mechanical irregularities on multichannel tape recorders.

Mode

Only used during learn mode for PHASE.

DEG REF

Description

The <DEG REF> softkey indicates to the RE201 that the results from a PHASE measurement should be displayed as a deviation in degrees from an internal PHASE reference. This reference might be the reference defined as part of BASIC PARAMETERS (<STO REF> displayed) or an actual measurement stored as reference by means of the <STO REF> key (<RCL REF> displayed), i.e. if an actual result is 10 deg. while the reference reads 90 deg., the resulting display will be -80 deg.

Mode

Only used during LEARN mode for PHASE.

DELETE

Description

The <DELETE> softkey indicates that the FUNCTION pointed to by the cursor should be deleted from a SEQUENCE - if a new function is to use the line being pointed to, <DELETE> is not necessary - just enter a new function.

Mode

Only used during LEARN mode for SEQUENCES.

DIN

Description

The < DIN > softkey indicates to the RE201 that the WOW & FLUTTER measurement being defined should measure according to the DIN standard.

Mode

Only used during LEARN mode for W&F. *

Measurements

The following measurements use the < DIN > key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

DIN BP

Description

The <DIN BP> softkey is used to select the DIN 45300 BANDPASS filter.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurement uses the <DIN BP> key:

WEIGH - WEIGHTED AUDIO measurement
recommended in the DIN 45300 standard

* Option: Weighting Filters Option 901-526 must be installed.

DMP ALL

Description

The <DMP ALL> (dump all) softkey indicates to the RE201 that the instrument should dump all internal memory being part of

BASIC PARAMETER	- definitions
FUNCTION	- definitions
SEQUENCE	- definitions
SETUP	- definitions
SYSTEM	- definitions

via the RS232C bus. The <DMP ALL> key is used to transfer the total programming information from one RE201 to another, or from an RE201 to an external computer, thus freeing the programmer for the tedious task of repeating the programming, in case several units have to be programmed with the same contents. Refer to the description of the <LOAD> key for further information.

Mode

Used in PROGRAM mode, a special part of the LEARN mode - refer to the <PROGRAM> softkey.

EVEN

Description

The <EVEN> softkey indicates to the RE201 that the instrument will use EVEN parity when receiving or transmitting via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

EXP

Description

The < EXP > softkey indicates to the RE201 that results from the measurement should be displayed using EXPONENTIAL averaging. Exponential averaging LOW PASS filters the results, and hereby diminish the influence from noise. (To watch the effect of < EXP > key: measure frequency by using < EXP > averaging. Change input abruptly and watch the results).

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < EXP > key:

DFIM - Dual Frequency Distortion
FREQ - Frequency
IM - Intermodulation Distortion
LEV - Level selective (<SEL>)
SEP - Separation
THD - Harmonic Distortion
TIM - Transient Intermodulation Distortion

FTBH

Description

The <FTBH> softkey indicates to the RE201 that the SELECTIVE measurement of level should be displayed using a Four Term Blackmann Harris window function (Filter). This filter has a selectivity of 475 Hz (-80 dB) when using a basic RE201. By means of the ZOOM facility, selectivities down to 24 Hz or 4 Hz may be obtained. The FTBH filter, of course, has a rather broad main lobe in order to be able to offer a high degree of isolation.

Mode

Only used during LEARN mode for LEVEL selective (<SEL>).

Measurements

The following measurements use the <FTBH> key:

LEV - Level selective (<SEL>)

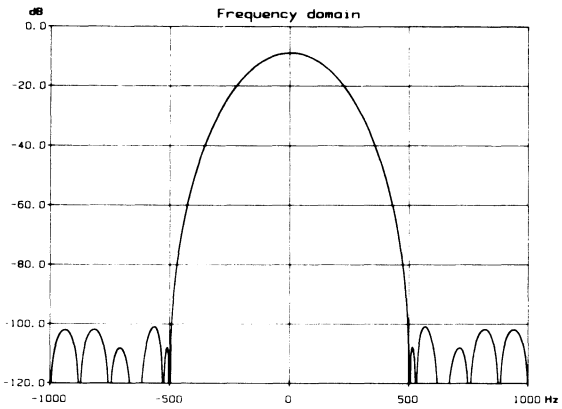


Fig. 8.2 - FTBH window

FUNCT

Description

The <FUNCT> softkey indicates to the RE201 that

1) the operator will inspect or modify a FUNCTION (single measurement) during LEARN mode

or that

* 2) the RE201 is to DUMP a specified block of FUNCTION definitions via the RS232C interface.

Following the <FUNCT> key the instrument will ask the operator to press the key indicating the function (say THD).

Mode

Used during LEARN mode and PROGRAM mode.

* takes place when in PROGRAM mode - see <PROGRAM> softkey description.

HZ

Description

The < HZ > softkey indicates to the RE201 that the FREQUENCY measurement being defined should display directly in Hz.

Mode

Used during LEARN mode for FREQ.

HZ REF

Description

The <HZ REF> softkey indicates to the RE201 that the FREQUENCY measurement being defined will display results in Hz deviation from a stored reference. This reference may be stored as part of BASIC PARAMETERS (<STO REF> displayed).

Mode

Only used during LEARN mode for FREQUENCY.

Measurements

The following measurements use the <HZ REF> key:

FREQ - Frequency

INVERT

Description

The <INVERT> softkey indicates to the RE201 that left channel should be inverted during a PHASE measurement. PHASE meters normally have great difficulty in measuring PHASE around 0 deg. due to ambiguity - inverting one signal thus removes this ambiguity as 0 deg. reading now reads 180 deg. Activating the <INVERT> key changes the key to <NORMAL>, and is hereby

1) indicating that left channel has been inverted, and

2) allowing the user to reestablish normal measuring conditions. Please refer to description of the <NORMAL> softkey.

Mode

Only used during EXECUTE mode during PHASE measurements.

Measurements

The following measurements use the <INVERT> key:

PHASE

JIS

Description

The < JIS > softkey indicates to the RE201 that the WOW & FLUTTER measurement being defined should measure according to the Japan Industry Standard.

Mode

Only used during LEARN mode for W&F *.

Measurements

The following measurements use the < JIS > key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

LEFT

Description

The <LEFT> softkey indicates to the RE201 that a measurement being defined or started should be performed only in the LEFT channel.

Mode

Used during LEARN mode for FUNCTIONS and EXECUTE mode for FUNCTIONS having channel = TBD.

Measurements

The following measurements use the <LEFT> key:

All, except PHASE, SEParation and DC.

LIN

Description

The < LIN > softkey indicates to the RE201 that the measurement being defined must integrate a number of readings before displaying a result - integration effectively increasing the dynamic range of the instrument: up to 64 readings may be integrated before a result appears.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following measurements use the < LIN > key:

DFIM - Dual Frequency Distortion
FREQ - Frequency
IM - Intermodulation
LEV - Level selective (<SEL>)
SEP - Separation
THD - Harmonic Distortion
TIM - Transient Intermodulation Distortion

LOAD

Description

The <LOAD> softkey instructs the RE201 to accept programming information from another RE201 or an external computer via the RS232C interface. The information entering the instrument contains tags indicating the exact type of definitions being accepted. Please refer to the following descriptions for further information:

<DMP ALL>
<FUNCT>
<PROGRAM>
<SEQUEN>
<SETUP>

To transfer a block of THD definitions:

1) Connect the two RE201's via their RS232C interface

2) Press LEARN, <PROGRAM> and <LOAD> on the accepting RE201

3) Press LEARN, <PROGRAM>, <FUNCT> and THD on the transmitting RE201

If the operation has to be aborted: Press ⇕ EXIT

Mode

Only used during PROGRAM mode - a special variety of the LEARN mode entered using key sequence LEARN, <PROGRAM>.

NAB

Description

The < NAB > softkey indicates to the RE201 that the WOW & FLUTTER measurement being defined should measure according to the NAB standard.

Mode

Only used during LEARN mode for W&F *.

Measurements

The following measurements use the < NAB > key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

NONE

Description

The <NONE> softkey indicates to the RE201 that the instrument should not use or check for PARITY when transmitting or receiving via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

NORMAL

Description

The <NORMAL> softkey indicates to the RE201 that LEFT channel should no more be inverted during a PHASE measurement. Refer to the description of the <INVERT> key for further information.

Mode

Only used during EXECUTE mode for PHASE following the activation of the <INVERT> key.

Measurements

The following measurements use the <NORMAL> key:

PHASE

ODD

Description

The < ODD > softkey indicates to the RE201 that the instrument will use ODD parity when receiving or transmitting via the RS232C interface.

Mode

Only used during LEARN mode for SYSTEM PARAMETERS.

PEAK

Description

The <PEAK> softkey indicates to the RE201 that the LEVEL measurement being defined should be performed as a PEAK measurement. The PEAK measurement delivers 2 results - positive PEAK and negative PEAK, and thus occupies 2 lines on the display.

Note: The RE201 is AC coupled.

Mode

Only used during LEARN mode for the LEV measurements.

Measurements

The following measurements use the <PEAK> key:

LEV - Level Peak

PROGRAM

Description

The <PROGRAM> softkey indicates to the RE201 that the operator wants to transfer complete programming information, such as

1) all THD definitions

2) all SEQUENCE definitions

3) all SETUP definitions

or 4) all information

The information may either be accepted (using the <LOAD> key) or transmitted (using the <FUNCT>, <SEQUEN>, <SETUP> or <DMP ALL> keys). Please refer to descriptions of these keys for further information.

Mode

Only used during LEARN mode.

QPEAK

Description

The <Q-PEAK> softkey indicates to the RE201 that the LEVEL measurement being defined should be performed as a QUASI-PEAK measurement.

The quasi-peak detector is in accordance with the CCIR 468-2 standard.

Both the maximum reading and the averaged reading are presented to the user. Both results are RMS-calibrated, ref. <AVERAGE>.

Mode

Only used during LEARN mode for LEVEL measurements.

Measurements

The following measurement is utilizing the <Q-PEAK> key:

LEV - Level QUASI-PEAK

* Option: Weighting Filters Option 901-526 must be installed.

RAD

Description

The < RAD > softkey indicates to the RE201 that the PHASE measurement being defined should have its results displayed in radians.

Mode

Only used during LEARN mode for PHASE.

RAD P-P

Description

The <RAD P-P> softkey indicates to the RE201 that the PHASE measurement being defined will measure fluctuation. When executing this type of measurement the RE201 will take a PHASE reading for each 100 ms. integration time, calculate the mean PHASE and then display the fluctuation peak-peak. Typically, this type of measurement is used for checking mechanical irregularities on multichannel tape recorders.

Mode

Only used during LEARN mode for PHASE.

RAD REF

Description

The <RAD REF> softkey indicates to the RE201 that the results from a PHASE measurement should be displayed as a deviation in radians from an internal PHASE reference. This reference might be the reference defined as part of BASIC PARAMETERS (<STO REF> displayed) or an actual measurement stored as reference by means of the <STO REF> key (<RCL REF> displayed), i.e. if an actual result is 0.1 radian while the reference reads 0.2 radian, the result displayed will be -0.1 radian.

Mode

Only used during LEARN mode for PHASE.

RCL REF

Description

The <RCL REF> softkey indicates to the RE201 that the original reference for the measurement being performed should be recalled. The original reference always stems from BASIC PARAMETERS. Which reference is recalled depends on the channels which are used during the measurement. The <RCL REF> softkey also indicates to the user that the original reference has been temporarily exchanged with a measured quantity using the <STO REF> softkey.

Mode

Only used during EXECUTE mode (single measurements).

Measurements

The following measurements use the <RCL REF> key:

FREQ - Frequency
LEV - Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)

* Option: Filter Option (901-525) must be installed.

RIGHT

Description

The <RIGHT> softkey indicates to the RE201 that a measurement being defined or started should be performed only in the RIGHT channel.

Mode

Used during LEARN mode for FUNCTIONS and EXECUTE mode for FUNCTIONS having channel = TBD.

Measurements

The following measurements use the <RIGHT> key:

All, except PHASE, SEParation and DC

RMS25

Description

The <RMS25> softkey indicates to the RE201 that the LEVEL measurement should be performed as an RMS measurement having a bandwidth of 25 kHz.

Mode

Used during LEARN mode for the LEV measurement.

Measurements

The following measurements use the <RMS25> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)

RMS75

Description

The <RMS75> softkey indicates to the RE201 that the LEVEL measurement should be performed as an RMS measurement having a bandwidth of 75 kHz.

Mode

Used during LEARN mode for the LEV measurement.

Measurements

The following measurements use the <RMS75> key:

LEV - Level RMS, 75 kHz bandwidth (<RMS75>) *

* Option: Filter Option (901-525) must be installed

RUMBLE

Description

The <RUMBLE> softkey is used to select a group of standard filters for rumble measurements.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurements are using the <RUMBLE> key:

WEIGH - WEIGHted rumble measurements
- UNWEIGHted rumble measurements

* Option: Weighting Filters Option 901-526 must be installed.

SEL

Description

The <SEL> softkey indicates to the RE201 that the LEVEL measurement should be performed as a selective measurement.

Mode

Used during LEARN mode for the LEV measurement.

Measurements

The following measurements use the <SEL> key:

LEV - Level selective (<SEL>)

SEQUEN

Description

The <SEQUEN> softkey indicates to the RE201 that a SEQUENCE is going to be inspected, created or modified during LEARN mode.

The RE201 offers the user 20 SEQUENCES - following the <SEQUEN> key the instrument prompts the operator to enter the number of the SEQUENCE. SEQUENCES 0 - 9 are entered by using the numeric keys - SEQUENCES 9 - 19 are entered by using the '.' key before a numeric key. The instrument distinguishes between 0 - 9 and 10 - 19 by displaying say 19 as a '9' in inverse video.

Alternatively, the <SEQUEN> softkey indicates to the RE201 that all SEQUENCE definitions should be dumped via the RS232C interface in PROGRAM mode. Refer to the description of the <PROGRAM> softkey for further information.

Mode

Used during LEARN mode for SEQUENCES and during transfer of all SEQUENCE definitions between e.g. 2 RE201's.

SETUP

Description

The <SETUP> softkey indicates to the RE201 that a SETUP is going to be inspected or modified during LEARN mode. The RE201 may store up to 100 SETUPS numbered from 0 - 99.

Alternatively, following the <PROGRAM> key, <SETUP> will indicate that all SETUP definitions should be transferred to an external device (second RE201 or computer) via the RS232C interface.

Mode

Used during LEARN mode for SEQUENCES and following <PROGRAM> softkey.

SHOW+

Description

The <SHOW+> softkey indicates to the RE201 that the following definition should be shown during LEARN mode. This facilitates the inspection of FUNCTIONS and SETUPS stored in the RE201. The <SHOW+> key is auto-repeating, i.e. keeping the key pressed "scrolls" through all definitions.

Mode

Used during LEARN mode for FUNCTIONS and SETUPS.

SHOW-

Description

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

Mode

Used during LEARN mode for FUNCTIONS and SETUPS.

SINAD

Description

The <SINAD> softkey is used to inform the RE201 that a measurement of SINAD should be performed. Also, this softkey informs the operator of the fact that the Filter Option (901-525) has been installed in the instrument.

Mode

This softkey is used during EXECUTE mode to access the measurement called SINAD and during LEARN mode for SINAD measurements.

Necessary Option

The Filter Option 901-525 must be installed in the RE201.

Measurements

The following measurement uses the <SINAD> softkey:

SINAD

SINE

Description

The <SINE> softkey indicates to the RE201 that a SINE window (filter) should be used during selective LEVEL measurements.

The SINE filter cannot suppress closely spaced signals (a basic RE201 using a SINE filter will have a selectivity of 500 Hz (-38 dB). However, because the side lobes are high, the main lobe is narrow and thus allowing for the detection of closely spaced components in the input spectrum.

Mode

Only used during LEARN mode for LEVEL selective.

Measurements

The following measurements use the <SINE> key:

LEV - Level selective (<SEL>)

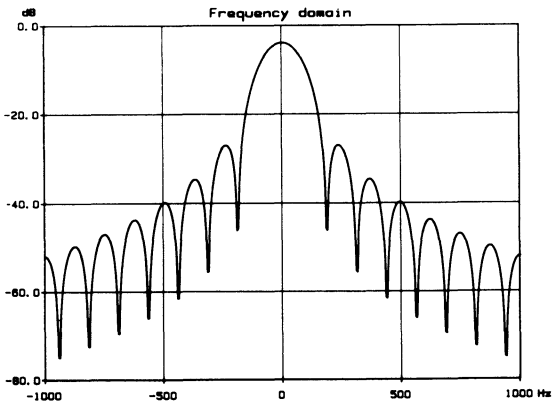


Fig. 8.3 - SINE WINDOW

STO REF

Description

The <STO REF> softkey indicates to the RE201 that the measurement following the activation of the <STO REF> key should temporarily replace the original reference stored as part of the BASIC PARAMETERS. The activation results in a changing of key text to <RCL REF> in order to

1) indicate to the user that the key has been accepted

2) indicate that the reference no longer stems from BASIC PARAMETERS

3) enable the user to recall the original reference

During the time from activation to actual update of reference the RE201 locks the keyboard to ensure that no error occurs. Refer to the description of the <RCL REF> softkey for further information.

***** Note *****

BASIC PARAMETERS still show original reference when displayed, even if reference has been exchanged!

Mode

Only used during EXECUTE mode for FUNCTIONS (single measurements).

Measurements

The following measurements use the <STO REF> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)
PHASE

* Option: Filter Option (901-525) must be installed.

STORE

Description

The <STORE> softkey indicates to the RE201 that the definition shown on the screen during LEARN mode should be stored in the non-volatile RAM.

Mode

Only used during LEARN mode.

SYSTEM

Description

The <SYSTEM> softkey indicates to the RE201 that the operator wants to inspect or modify SYSTEM PARAMETERS. Using these parameters the operator may set up the Composite Video Output, the IEEE bus and the RS232C interface.

Mode

Only used during LEARN mode of SYSTEM PARAMETERS.

TBD

Description

The <TBD> softkey (To Be Defined) indicates to the RE201 that the FUNCTION being defined will have to ask for channel information on activation during EXECUTE mode. Executing a measurement having a channel = TBD or a SEQUENCE containing such measurement(s) forces the instrument to stop, asking the user to enter channel by using one of the softkeys <BOTH>, <LEFT> or <RIGHT> before continuing.

Mode

Only used during LEARN mode for FUNCTIONS.

Measurements

The following FUNCTIONS use the <TBD> key:

All, except PHASE, SEP and DC

TELCOM

Description

The <TELCOM> softkey is used to select a group of telecommunications related weighting filters.

Mode

Used during LEARN mode for WEIGHTED measurements.

Measurements

The following measurements are using the <TELCOM> key:

WEIGH - CCITT-P53 standard measurement
- C-MESSAGE standard measurement

* Option: Weighting Filters Option 901-526 must be installed.

TRACK

Description

The <TRACK> softkey indicates to the RE201 that the THD measurement being defined will automatically track the input frequency so that the fundamental tone does not have to be specified.

If the fundamental is specified, an error will appear if the frequency "drifts" outside a certain range (±180 Hz in basic unit).

Mode

Only used during LEARN mode for THD.

Measurements

The following FUNCTIONS use the <TRACK> key:

SINAD - Signal to Noise and Distortion
THD - Harmonic Distortion

UNWEIGH

Description

The <UNWEIGH> softkey is used to select the filter to be used during UNWEIGHTED RUMBLE measurements in accordance with the DIN 45539 standard.

Mode

Used during LEARN Mode for UNWEIGHTED RUMBLE measurements.

Measurements

The following measurement uses the <UNWEIGH> key:

WEIGH - UNWEIGHTED RUMBLE measurement according to the DIN 45539 standard

* Option: Weighting Filters Option 901-526 must be installed.

VOLT

Description

The <VOLT> softkey indicates to the RE201 that the results from a measurement must be displayed in volts.

Mode

Only used during LEARN mode for LEVEL measurements.

Measurements

The following measurements use the <VOLT> key:

LEV - Level average (<AVERAGE>)
Level quasipeak (<Q-PEAK>)
Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)

* Option: Filter Option (901-525) must be installed.

W&F

Description

The < W&F > softkey indicates to the RE201 that a W&F measurement has been selected, either in conjunction with the LEARN mode or in conjunction with the EXECUTE mode. At the same time the < W&F > key indicates to the user that a Wow & Flutter option is installed in the instrument. Thus, the < W&F > key operates exactly like any other FUNCTION key, e.g. the SEP key.

Mode

Used in LEARN and EXECUTE modes for the Wow & Flutter option. *

* Option: Wow & Flutter (901-456) must be installed.

WATT

Description

The <WATT> softkey indicates to the RE201 that the LEVEL measurement must display its result(s) in WATT using the impedance specified as part of BASIC PARAMETERS as load.

Mode

Only used during LEARN mode for LEVEL measurements.

Measurements

The following measurements use the <WATT> key:

LEV - Level RMS, 25 kHz bandwidth (<RMS25>)
Level RMS, 75 kHz bandwidth (<RMS75>) *
Level selective (<SEL>)

* Option: Filter Option (901-525) must be installed.

WEIGH

Description

The <WEIGH> softkey indicates to the RE201 that a weighted measurement is to be performed. At the same time, the presence of the WEIGH legend indicates that the Weighting Filter option is present in the instrument. When present, the <WEIGH> softkey acts as a function key.

Mode

Used during LEARN and EXECUTE modes to access the Weighting Filter option.

* Option: Weighting Filters Option 901-526 must be installed.

WEIGHT

Description

The <WEIGHT> softkey indicates to the RE201 that the W&F measurement being defined should use a Weighting Filter according to DIN 45507.

Mode

Only used during LEARN mode for W&F.

Measurements

The following measurements use the <WEIGHT> key:

W&F - Wow & Flutter *

* Option: Wow & Flutter Option (901-456) must be installed.

9 ERRORS AND WARNINGS

9.1 Errors and Warnings

General

In all operational modes the RE201 supervises inputs to ensure that the results obtained are unambiguous and reliable. This results in a number of messages from the instrument, all of which will be displayed on the status line.

The RE201 distinguishes between WARNINGS and ERRORS - the former allowing operations to proceed, whereas the latter are fatal, so that operation is impossible. This section lists all warnings and errors in alphabetical order - all messages have a brief explanation.

LEARN Mode

Missing Option

The RE201 has found a parameter block containing parameters which may only be executed when the instrument has the ZOOM facility installed.

Parameter Limit Exceeded

Following the activation of the <STORE> or <DEFLT> key, the RE201 has found a parameter where limits have been exceeded. The instrument uses the cursor to point to the erroneous parameter, waits for a few seconds and then allows the operator to enter a new value. Check parameter values in section 4.4.

Warning Isolation Below 80 dB

A THD measurement has been defined where the isolation between input signal and harmonics is below 80 dB.

Warning Small Bandwidth

During definition of a selective level measurement the bandwidth has become so small that the RMS value of a signal at the center of the filter will not be correctly measured - however, the measurement will be carried out and the results may be used in relative measurements. This warning also appears when the measurement is executed!

Miscellaneous

Dumping in Progress

Parameter dump initiated via the <PROGRAM> key takes place - no new commands will be accepted till this operation has finished. To stop the operation: press EXIT.

Loading in Progress

Parameter load initiated via the <PROGRAM> key takes place - no new commands will be accepted till this operation has finished. To stop the operation: press EXIT.

Printer Not Ready

The COPY key has been activated, but the printer was not ready - the RE201 waits for the operator to turn on the printer, but a prolonged period of "non-readiness" will let the RE201 time out, thus allowing new operations to take place.

Printing in Progress Please Wait

Following activation of the COPY key the contents of the screen is being dumped. During this operation the RE201 will not accept new entries from the keyboard.

Receiver Not Ready

A "DUMP" has been initiated before the receiving instrument/computer was ready for the data - the RE201 waits for the receiver to become ready (no time out). To leave this situation, activate the EXIT key.

Select Channel

The instrument waits for the user to enter the channel to be used during measurements - input takes place via softkeys <BOTH>, <LEFT> and <RIGHT>, which will be displayed at the same time as the message appears.

Transmitter Not Ready

A "LOAD" has been initiated before the transmitting RE201/computer was ready - the RE201 waits for the transmitter to become ready (no time out) - to exit from this situation, use the EXIT key.

Warning - User Definition(s) Lost

Following a power-up or a selftest using "TEST" key, the instrument has found one or more stored user definitions (FUNCTIONS, SEQUENCES, BASIC PARAMETERS etc.) to have been destroyed. The instrument replaces the definition by definitions placed in EPROM - lost definitions normally indicate low battery voltage on back-up battery of the 901-788 static computer. Alternatively, it indicates that jumper K2 for back-up battery has not been correctly installed - refer to section 2 for more information.

EXECUTE Mode

Error Both Inputs Overload

The measurement cannot be performed as the input signal exceeds the dynamic range of the instrument - indicates overload in both channels.

Error Both Inputs Too Low

The measurement cannot take place as the level is too low to guarantee valid results. Indication valid for both inputs.

Error Frequency Out of Range

The RE201 checks the input spectrum to see if the signal corresponds to the parameters in the parameter block used for the measurement - if the input signal does not correspond to the parameter, an error message will be displayed.

Example: A THD measurement has "FREQUENCY" = 1000 Hz - if the input frequency drifts away from this frequency by more than 180 Hz, the instrument will issue an error message. In case the ZOOM facility is installed and is used to increase selectivity, the allowed deviation diminishes according to the increased selectivity, i.e. a measurement using ZOOM increasing selectivity by a factor of 128 only allows a deviation of 180/128 = 1.41 Hz.

Error Frequency Too High

The measurement cannot take place as the input frequency is too high.

Error Frequency Too Low

The measurement cannot take place as the input frequency is too low.

Error Left Ch. Input Overload

The measurement cannot be performed as the input signal exceeds the input range of the instrument - indication only valid for LEFT channel.

Error Left Ch. Input Too Low

The measurement cannot take place as the level is too low to guarantee valid results. Indication valid only for LEFT channel.

Error Right Ch. Input Overload

The measurement cannot be performed as the input signal exceeds the input range of the instrument - indication only valid for RIGHT channel.

Error Right Ch. Input Too Low

The measurement cannot take place as the level is too low to guarantee valid results. Indication valid only for RIGHT channel.

Error W&F Out of Range

The RANGE parameter of the Wow & Flutter measurement being executed should be adjusted to allow measurements of higher levels of W&F.

Warning Both Inputs Low

The measurement does not utilize the full dynamic range of the A/D converter - however, the measurement will continue as the "error" is non-fatal. Indication valid for BOTH channels.

Warning Harm. Close to Sideband

During LEARN mode or EXECUTE mode of an IM measurement the instrument warns the operator that possible harmonics from the low frequency input signal may interfere with the wanted IM sideband, and hereby create a possible measuring error.

Warning Isolation Below 80 dB

A THD measurement has been defined where the isolation between input signal and harmonics is below 80 dB.

Warning Left Ch. Input Low

The measurement does not utilize the full dynamic range of the A/D converter - however, the measurement will continue as the error is non-fatal. Indication only valid for LEFT channel.

Warning Odd/Even Products Close

During LEARN mode or EXECUTE mode of Dual Frequency Distortion (DFIM) the instrument warns the operator that odd numbered distortion products will be so close to even numbered products that isolation diminishes.

Warning Right Ch. Input Low

The measurement does not utilize the full dynamic range of the A/D converter - however, the measurement will continue as the error is non-fatal. Indication valid for RIGHT channel only.

Warning W&F Low

The W&F measurement may give erroneous results as the dynamic range is not properly utilized. The RANGE parameter of the W&F measurement should be modified.

9.2 Selftest Errors

If the error is found in the analog section, LED's CR1 - CR8 on the static CPU (fig. 2.1) installed in the section to the right of the CRT section will display a code indicating the error. This code must be interpreted as a binary number (LED 'on' - 1, LED 'off' = 0. LED CR1 is least significant bit).

Table 9.1

Code	Reason
2	Error in QD14 on 901-788 (Static Computer) - TMS9902 UART for interprocessor link
3	Error during discharge on Analog Frontend 901-421, alternatively missing cable from A/D converter (901-421 J4) to Static Computer 901-788 (J2)
4	Static Computer "hooks up" on A/D converter QA27 - check connection for "Start Conversion (No. 2) for 901-421 Analog Frontend
9	QD37 failed test (901-788)
33	QD37 failed test (901-788)
49	QD37 failed test (901-788)
97	QD36 failed test (901-788)
129	QD34 failed test (901-788)
130	QD34 failed test (901-788)
132	QD34 failed test (901-788)
136	QD34 failed test (901-788)
144	QD35 failed test (901-788)
160	QD35 failed test (901-788)

In case one of the options: Audio Generator, Filter Option or Weighting Filter Option has been installed the code on the LED's on the static CPU 901-788 should be interpreted as follows: The rightmost four LED's (CR4 - CR1) indicate which option is being tested while the leftmost four LED's (CR8 - CR5) indicate the QD No. of the chip being tested on this option.

Table 9.2

Audio Generator:	Code 5
Filter Option:	Code 6
Weighting Filters Option:	Code 7

During normal operation the CPU on 901-788 will be static (no clock) and CR9 will be off. If a key is activated or the main computer asks for service, the CPU will be activated and CR9 goes on. During operation the CPU updates the LED display as follows:

Table 9.3

Code	Reason
1	Gain in analog frontend is being adjusted
2	Digital section (main computer) has interrupted
4	Data being transmitted to digital section
16	Receiving data from digital section
32	Waiting for command from main computer
128	Overload has occurred in analog frontend

CR7 pulses whenever an instrument on the Memory Bus is uncalibrated.

A combination of these codes may occur.

If the error is found in the digital section, remove the shielding box placed at the rear of the instrument. During power-up LED's on the rear part of the motherboard or on the computerboard will show error codes as indicated above (LSB right justified when viewed from the front of the instrument).

Table 9.4

Code	Reason
1	Error during Cyclical Redundancy Check Character (CRCC) generation in QD41/42 on 901-527 (ARITHMETIC unit)
3	Error during check of QD37-40 on 901-527 (ARITHMETIC unit)
5	Error during test of data bus for butterfly unit (QD46-61) on 901-527 (ARITHMETIC unit)
7	Error during butterfly operation on 901-527 (QD46-61 and QD70-72) (ARITHMETIC unit)
8	Error during test of QD8 on 901-789 (computer)
9	Error during test of QD8 on 901-789 (computer)
11	Error during test of Refresh RAM QD12 on 901-789 (computer)
12	QD5 on 901-789 (computer) failed during Cyclical Redundancy Check
13	QD5 on 901-789 (computer) failed during Cyclical Redundancy Check
14	QD4 on 901-789 (computer) failed during Cyclical Redundancy Check
21	QD4 on 901-790 Motherboard failed (Interprocessor Link UART)
22	QD1 on 901-790 Motherboard failed (UART for RS232C communication)
24	Error on ZOOM board
25	Error on ZOOM board
26	Error on ZOOM board
27	Error on ZOOM board
28	Error on ZOOM board
29	Error on ZOOM board
30	Error on ZOOM board

When unpacking the RE201 you will find the following equipment and accessories:

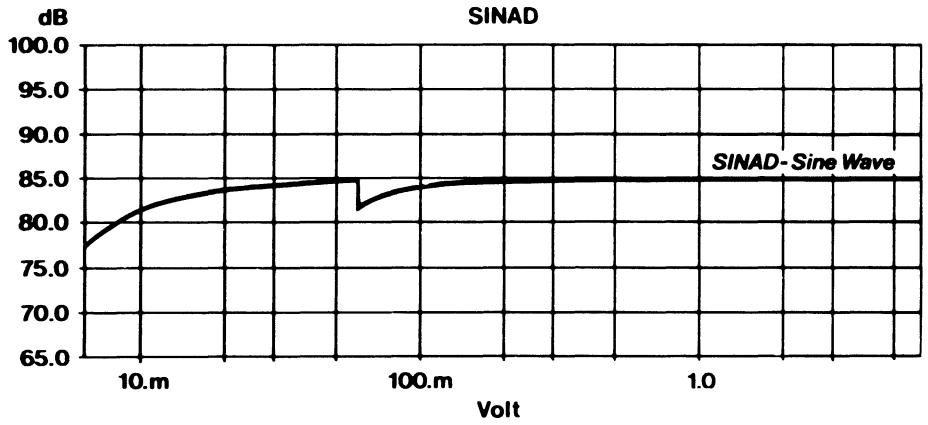
Code	Type	Description
380-292	RE201	Dual Channel Audio Analyzer
615-303	220V	Line Cord
615-403	110V	Line Cord
450-020	220V	Fuse, 1 A slow-blow (2)
450-028	220V	Fuse, 4 A slow-blow (2)
450-123	110V	Fuse, 2 A slow-blow (2)
450-130	110V	Fuse, 4 A slow-blow (2)
460-026	110V	Bayonet Head (6.3 x 32 mm)
460-025	220V	Bayonet Head (5 x 20 mm)
983-298		Operation Manual
983-297		Technical Manual
983-270		Installation Guide

Audio Generator

Signal modes	Sinewave, 1 kHz reference tone, SMPTE/DIN Intermodulation, Difference Frequency Distortion, Transient Intermodulation, Multitone, OFF (0V, 600 Ohms impedance)
Frequency accuracy	+/- 20 ppm
Output level range	0.8mV peak to 8.87V peak, EMF (-62.7 dBu* to 18.2 dBu) higher output available upon request
Output level resolution	0.1 dB
Flatness (ref.: 1 kHz)	+/- 0.1 dB
Level accuracy	+/- 0.1 dB + Flatness
Output circuit	2 balanced floating outputs, transformerless, short circuit protected
Output impedance	600 Ohms +/- 1% Others available upon request
Connectors	Isolated BNC, others available upon request

Sine Wave

Frequency range	1 Hz to 25 kHz
Frequency resolution	1 Hz
Total Harmonic Distortion	< -88 dB, typical -91 dB, 1 Hz to 1 kHz < -87 dB, typical -90 dB, 1 kHz to 9 kHz < -90 dB, typical -92 dB, 9 kHz to 25 kHz
Distortion and Noise - SINAD (125 kHz bandwidth)	< -82 dB, typical -85 dB, 1 Hz to 4 kHz < -81 dB, typical -84 dB, 4 kHz to 12.5 kHz < -83 dB, typical -86 dB, 12.5 kHz to 25 kHz

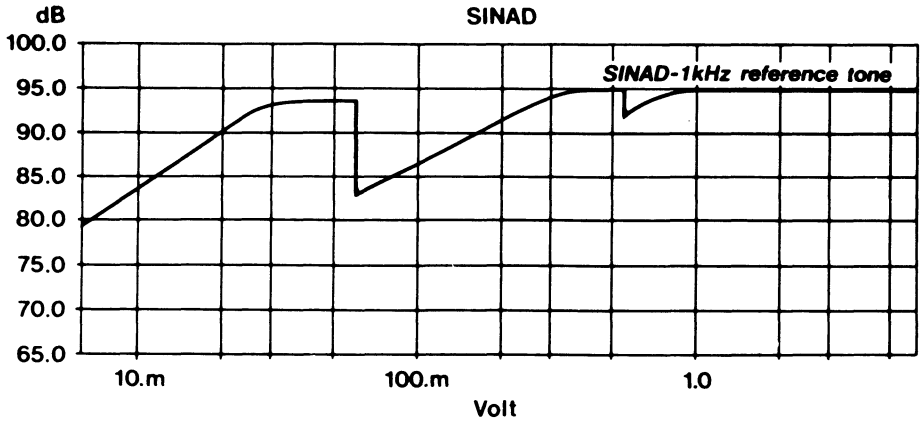


Sinewave SINAD
versus output level

* 0 dBu = 0.775 VRMS

1 kHz Reference Tone

Total Harmonic Distortion	< -97 dB (0.0015%)
Distortion and noise - SINAD (125 kHz bandwidth)	< -95 dB (0.002%)



1 kHz reference tone
SINAD versus output level

SMPTE/DIN Intermodulation Signal

Level ratio	4:1
Frequency range	10 Hz to 25 kHz
Frequency resolution	10 Hz
SMPTE/DIN Intermodulation	< -76 dB (0.02%) 300 Hz/7 kHz, 2nd to 4th order products included

DIN Difference Frequency Distortion Signal

Level ratio	1:1
Frequency range	10 Hz to 25 kHz
Frequency resolution	10 Hz
Difference Frequency Distortion	< -86 dB (0.005%), 14 kHz/15 kHz

Transient Intermodulation Signal

Description	3.2 kHz square or triangle wave and 15 kHz sine wave, peak level ratio 4:1
Cutoff frequency	30 kHz or 100 kHz selectable, (-3 dB)
Transient Intermodulation Distortion	< -75 dB (0.02%)

Multitones

Maximum number of tones	8 simultaneously
Relative level	1 to 999
Frequency range	10 Hz to 25 kHz
Frequency resolution	10 Hz

Manual Sweep

Functions controlled	Level and frequency
Level step	0.1 to 79.9 dB, 0.1 dB resolution
Frequency step	Linear: 1 Hz to 24.999 kHz, 1 Hz resolution Logarithmic: 1/3 octave, 1/1 octave or 0.01 decade to 1.99 decade 0.01 decade resolution

Audio Analyzer

Full scale range	Autoranging from 2.8mV peak to 22V peak (-51.8 dBu* to 25.7 dBu)
Residual noise, RMS (input short-circuited)	Typical 9 uV (- 99 dBu), 25 kHz bandwidth 4 uV (-106 dBu), A weighted 8 uV (-100 dBu), CCIR unweighted 13 uV (- 97 dBu), 125 kHz bandwidth
Input circuit	2 balanced floating inputs, transformerless, overload protected to 50V peak
Common mode rejection ratio	> 70 dB at 1 kHz
Maximum common mode voltage range	+/- 12V
Channel separation	> 110 dB at 1 kHz, > 95 dB at 15 kHz 600 Ohm generator impedance
Input impedance	330 kOhms parallel with 100 pF
Leakage	< 2 uV in a 1 inch (25 mm) two turn loop held 1 inch (25 mm) from the instrument
Connectors	Isolated BNC, others available upon request

Average AVERA

Calibration	RMS calibrated
Frequency range	20 Hz to 25 kHz
Cutoff frequencies	25 kHz, -0.1 dB; 41 kHz, -85 dB
Flatness (ref.: 1 kHz)	+/- 0.1 dB
Accuracy	+/- 3% + Flatness at 1.5V, +/- 4.5% + Flatness overall
Display modes	Volt, dBm or dB relative to stored reference or previously measured value

* 0 dBu = 0.775 VRMS

DC Level — DC

Range	+/- 16V
Resolution	125mV
Accuracy	+/- 125mV
Connector	BNO type and 25 pin Sub-D female

Peak — PEAK

Frequency range	20 Hz to 75 kHz
Flatness (ref.: 1 kHz)	+/- 0.1 dB
Accuracy	+/- 2% + Flatness
Display modes	Positive and negative peak voltages displayed simultaneously in Volts

Quasi-Peak, CCIR468 — Q-PEAK

Calibration	RMS calibrated
Frequency range	20 Hz to 25 kHz
Cutoff frequencies	25 kHz, -0.1 dB; 41 kHz, -85 dB
Accuracy	+/- 0.5 dB
Display modes	Mean and maximum quasi-peak value displayed simultaneously in Volts or dBm

True RMS — RMS25

Frequency range	20 Hz to 25 kHz
Cutoff frequencies	25 kHz, -0.1 dB; 41 kHz, -85 dB
Flatness (ref.: 1 kHz)	+/- 0.1 dB
Accuracy	+/- 1.5% + Flatness at 1.5V, +/- 3% + Flatness overall
Display modes	Volt, Watt, dBm, dB relative to the other input, dB or % relative to stored reference or previously measured value

True RMS — RMS75

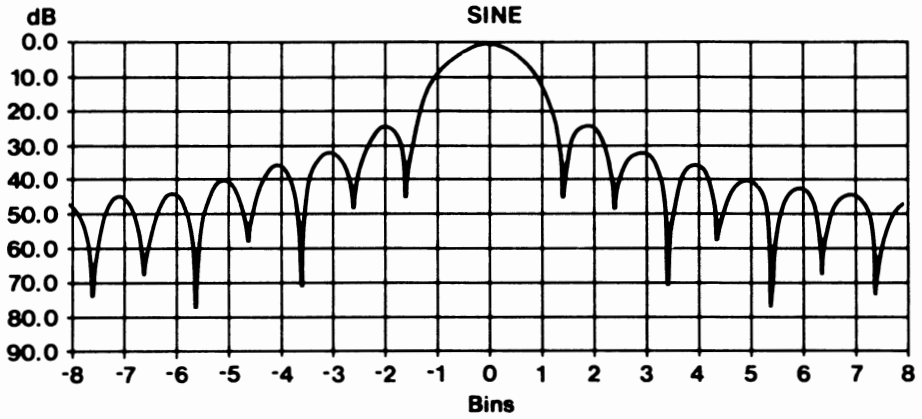
Frequency range	20 Hz to 75 kHz
Cutoff frequencies	75 kHz, -0.2 dB; 240 kHz, -3 dB
Flatness (ref. 1 kHz)	+/- 0.1 dB, 20 Hz to 50 kHz +/- 0.2 dB, 50 kHz to 75 kHz
Accuracy	+/- 2% + Flatness
Display modes	Volt, Watt, dBm, dB or % relative to stored reference or previously measured value

Weighted Noise — WEIGH

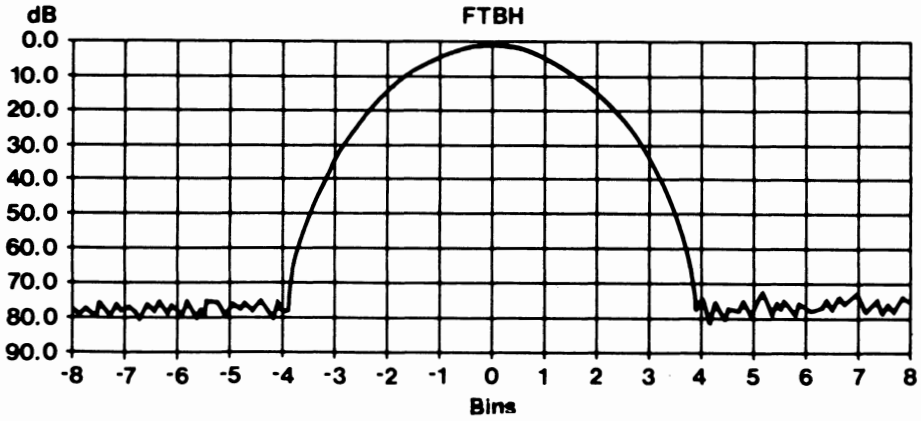
Standards	CCIR468-3, weighted and unweighted CCIR/ARM, DIN45633 (IEC-651 A, B, C) DIN45300 bandpass (300 Hz to 15 kHz) with 19 kHz notch, CCITT P53, AT&T C-message
Detectors	Average, Peak, Quasi-Peak (CCIR468), RMS selective RMS

Selective RMS — SEL

Frequency range	20 Hz to 25 kHz
Maximum selectivity	-80 dB at +/- 4 Hz
S/N ratio	Typical -74 dB
Flatness (ref.: 1 kHz)	+/- 0.1 dB
Accuracy	+/- 1.5% + Flatness at 1.5V, +/- 3% + Flatness overall
Display modes	Volt, Watt, dBm, dB or % relative to stored reference or previously measured value
Filters available	Refer to graphs below



Minimum bandwidth,
SINE Window
1 bin = 0.98 Hz



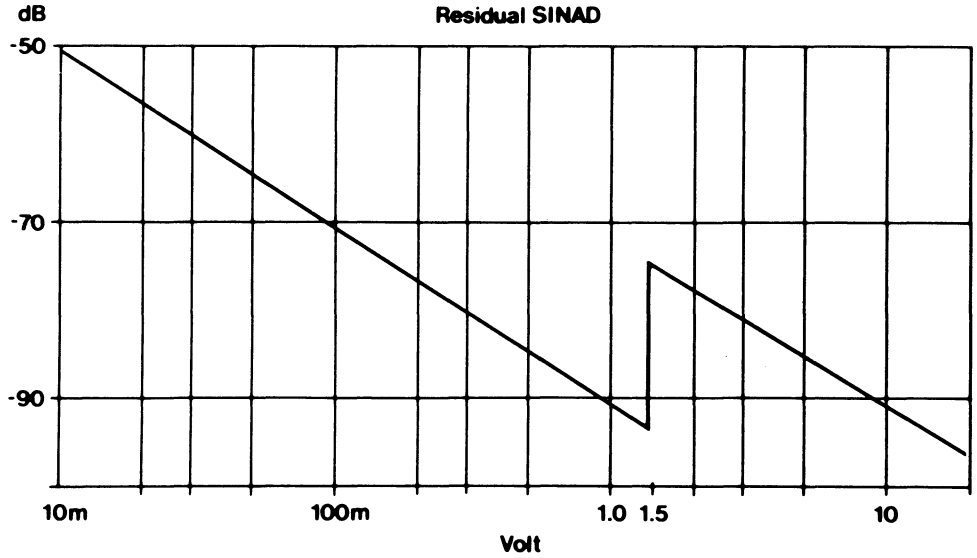
Minimum bandwidth
FTBH Window
1 bin = 0.98 Hz

Harmonic Distortion — THDn

Frequency range	20 Hz to 25 kHz, including harmonics
Sensitivity (0.5 VRMS to 1.5 VRMS)	< -100 dB (0.001%), typical -105 dB, THD 20 Hz to 12.5 kHz < -105 dB, typical -110 dB, single harmonic, 20 Hz to 5 kHz 50 Hz, 150 Hz and 15.625 kHz components below -87 dB, -90 dB and -95 dB, respectively
Sensitivity (5 VRMS to 15 VRMS)	As above
Sensitivity as a function of input level	Increases approx. 1 dB when the input level is increased by 1 dB from 5mV RMS to 0.5V RMS and from 1.5V RMS to 5V RMS
Harmonics included	Selectable 2nd to 9th via spectral analysis
Accuracy	+/- 2.5 dB, THD < -70 dB +/- 1.5 dB, THD > -70 dB
Maximum distortion	60% (-4.5 dB)
Display modes	%, dB

Distortion and Noise - SINAD — SINAD

Fundamental frequency range	20 Hz to 25 kHz
Noise bandwidth	125 kHz
Residual SINAD at 1V RMS	< -90 dB, typical -93 dB, 40 Hz to 25 kHz < -86 dB, typical -89 dB, 20 Hz to 40 Hz
Residual SINAD at 10V RMS	As above
Residual SINAD as a function of input level	Refer to graph
Accuracy	+/- 1.5 dB
Display modes	%, dB



Residual SINAD
versus input level

Difference Frequency Distortion — DFIMn

Standard	DIN45403
Frequency range	20 Hz to 25 kHz
Selectivity	4 Hz, -80 dB
Sensitivity	< -67 dB (0.04%)
Distortion products included	Selectable 2nd to 9th via spectral analysis
Accuracy	+/- 2.5 dB, DFIM < -45 dB +/- 1.5 dB, DFIM > -45 dB
Display modes	%, dB

Intermodulation — IMn

Standards	SMPTE/DIN45403
Frequency range	20 Hz to 25 kHz
Selectivity	4 Hz, -80 dB
Sensitivity	< -67 dB (0.04%), typical -72 dB, any intermodulation product
Intermodulation products included	Selectable 2nd to 9th via spectral analysis
Accuracy	+/- 2.5 dB, IM < -50 dB +/- 1.5 dB, IM > -50 dB
Display modes	%, dB

Transient Intermodulation — TIMn

Sensitivity	< -55 dB (0.2%)
Accuracy	+/- 2.5 dB, TIM < -35 dB +/- 1.5 dB, TIM > -35 dB
Display modes	%, dB

Frequency	**FREQn**
Range	4 Hz to 25 kHz
Resolution	0.1 Hz, below 200 Hz 1 Hz, above 200 Hz
Accuracy	+/- 0.1 Hz, 4 Hz to 60 Hz +/- 0.2 Hz, 60 Hz to 125 Hz +/- 0.8 Hz, 125 Hz to 200 Hz +/- 1.5 Hz, 200 Hz to 25 kHz
Display modes	Hz absolute, Drift (3.00 kHz or 3.15 kHz reference), Deviation in Hz or % relative to stored reference

Phase	**PHASEn**
Frequency range	20 Hz to 75 kHz
Range	0 degree to 360 degrees (0 to 2 pi radians)
Accuracy	+/- 1 degree (+/- 0.017 radian) at input level > 20mV RMS
Display modes	Peak to peak phase variations, mean phase represented as radians or degrees, absolute or relative to stored reference or previously measured value

Separation	**SEPn**
Description	R/L and L/R separation simultaneously measured selectively
Sensitivity	> 70 dB at equal input levels Crosstalk measurements performed using RMS25

Rumble	**RUMBLE**
Standards	DIN45539, A and B weighted IEC-98A, weighted and unweighted

Wow & Flutter	**W&F**
Standards	DIN 45507, NAB 1965, JIS C5551, CCIR, ANSI
Filters	Weighted according to DIN 45507, flat 0.2 Hz to 500 Hz or 0.5 Hz to 200 Hz
Full scale ranges	0.1%, 1% or 10%
Accuracy	+/- 3% of full scale
Display modes	2 sigma value in %

Interface Capabilities

IEEE488-1978 bus	
Subset implemented	SH1, AH1, T6, L4, SR1, RL1, PP1, DC0, DT1, C0
EIA RS-232-D bus	
Capabilities	Screen dump to printer, dump and load of measurement and/or signal definitions
Baudrates	300 to 9600 Baud
Stop bits	1, 1.5 or 2 bits
Parity	Odd, even or none
RE Memory bus	
Capabilities	Control of other RE products
Number of setups	100
GPIO bus	
Capabilities	Control of user supplied products
Description	20 bit programmable TTL outputs plus load pulses
Monitor output	
Capabilities	Composite video signal to drive external CRT monitors
Impedance	75 Ohms
Level	2.3 V peak

Instrument Speed

Minimum measuring time on the IEEE488 bus interface (autoranging disabled)

Measurement	Time to first result (seconds)		Measurements per second
Level Peak	0.33	Frequency > 50 Hz	3.6
Level RMS	0.16		61.0
Level Selective	0.28	Bandwidth > 600 Hz	8.1
Weighted Noise	1.70	Level > 1 mV, CCIR468-3	1.2
THD	0.32	Frequency > 1100 Hz THD > 0.1%	5.8
SINAD	2.40	Frequency > 200 Hz SINAD > 0.1%	1.0
DFIM	0.32	Dif. frequency > 500 Hz	6.0
IM	0.30	Low frequency > 500 Hz	6.7
TIM	0.32		5.9
Frequency	0.28	Frequency > 200 Hz	7.6
Phase	1.00		8.3
Separation	0.54		2.0
Wow & Flutter	3.6	W&F > 0.2%	0.8

Signal	Setup Time (seconds)	
Sinewave	0.08	
Multitone	2.6	10 Hz resolution, 8 components
	0.41	100 Hz resolution, 8 components
	0.20	1000 Hz resolution, 8 components
TIM	0.010	
1 KHz reference	0.08	
Level Change	0.08	

Non-volatile Memory Capacity

Measurement definitions	10 per measurement (20 level measurements)
Sequences	20, each consisting of up to 9 measurements
Audio generator signals	100
Multitone signals	10, each consisting of up to 8 components
Setups	100, containing paired measurements and signals, Memory bus setting and GPIO output

Physical Characteristics

Height	221.5 mm (8.72 inches)
Width	440 mm (17.32 inches)
Depth	570 mm (22.44 inches)
Net weight	24 kg (52.91 lbs.)
Shipping weight	31 kg (68.34 lbs.)

Power Requirements

Consumption	150VA
Line frequency	47.5 Hz to 63 Hz
Line voltage	90V to 130V AC
	190V to 260V AC

Environment

Operation	5° C to 40° C (41° F to 104° F)
Storage	-40° C to 70° C (-40° F to 160° F)
Humidity	20% to 80%, non-condensing

Ordering Information

Code	Type	Description
390-979	RE201	Dual Channel Audio Analyzer
Options		
901-456		Wow & Flutter Option
901-500		Audio Generator Option (18.2 dBu*, 600 Ohms)
901-525		Filter Option
901-526		Weighting Filters Option
901-705		Audio Generator Option (24.2 dBu*, 20 Ohms)
901-777		FSK

* 0 dBu = 0.775 VRMS

Accessories		
906-032	RE905	External Keyboard
617-761		Multicable for interconnecting the RE201 and RE Memory bus
906-033		Rack Mounting Kit
906-037		Service Kit

Data subject to change