[C] [181] [SPEC] : Decoding aborted approx. 2 s after the last tone. (Applies to selective-call decoding only)

[C] [185] [SPEC] : Decoding started via IEC bus and autorun control (= DECODE command) with the possibility of sending further commands to the CMT before the end of decoding.

[C] [186] [SPEC] : Readout of DECODE result via IEC bus and autorun control without restart of decoding.

[C] [190] [SPEC] : The separators are also displayed

[C] [191] [SPEC] : The display of separators is suppressed (Default, only with VDEW signalling, code number 16 effective!)

[C] [500] [SPEC] <f> [SPEC]
[C] [515] [SPEC] <f> [SPEC] : Load the frequency of each call number (0 to F) of the sequence USER 0 in Hz (300 Hz < f < 4 kHz and f = 0) (Protect)

[C] [560] [SPEC] <T> [SPEC] : Tone duration of the tone 1st sent 10 ms to 5000 ms (USER 0) (Protect)

[C] [561] [SPEC] <T> [SPEC] : Tone duration of the following tones 10 ms to 5000 ms (USER 0) (Protect)

[C] [562] [SPEC] <T> [SPEC] : Pause duration 0 and 10 ms to 5000 ms (USER 0) (Protect)

[C] [600] [SPEC] <f> [SPEC]
[C] [615] [SPEC] <f> [SPEC] : Load the frequency of each call number (0 to F) of the sequence USER 1 in Hz (300 Hz < f < 4 kHz and f = 0) (Protect)

[C] [660] [SPEC] <T> [SPEC] : Duration of the tone 1st sent 10 ms to 5000 ms (USER 1) (Protect)

[C] [661] [SPEC] <T> [SPEC] : Duration of the following tones 10 ms to 5000 ms (USER 1) (Protect)

[C] [662] [SPEC] <T> [SPEC] : Pause duration 0 and 10 ms to 5000 ms (USER 1) (Protect)

[C] [700] [SPEC] <f> [SPEC] to
[C] [715] [SPEC] <f> [SPEC] and
[C] [720] [SPEC] <f> [SPEC] to
[C] [735] [SPEC] <f> [SPEC] :

Load the frequency of each call number (0 to F) of the sequence USER 2 in Hz (300 Hz < f <4 kHz and f = 0). (Protect)

[C] [700] [SPEC] to
[C] [715] [SPEC]

corresponds to the nominal frequency of AF INT 1 and

[C] [720] [SPEC] to
[C] [735] [SPEC]

corresponds to the nominal frequency of AF INT 2.

[C] [760] [SPEC] <T> [SPEC] : Duration of the tone 1st sent 10 ms to 5000 ms (USER 2) (Protect)

[C] [761] [SPEC] <T> [SPEC] : Duration of the following tones 10 ms to 5000 ms (USER 2) (Protect)

[C] [762] [SPEC] <T> [SPEC] : Pause duration 0 and 10 ms to 5000 ms (USER 2) (Protect)

2.3.8.5 Control Functions to Call Calibration Routines and the Self-test (D...SPEC)

[D] [0] [SPEC] : Offset adjustment of DC measuring circuit (A/D converter and DC preamplifier).
This offset adjustment is automatically repeated at certain intervals.
Calling this function also produces an offset adjustment at the defined point in time.

[D] [1] [SPEC] : Offset adjustment of power measurement.
Before calling this function it must be ensured that an RF power is not applied to the input RF IN/OUT.
The level of the RF test generator is reduced to -47 dBm if it is > -47 dBm.

[D] [2] [SPEC] : Calibration of the modulation characteristic of the RF test generator (CMT in transmitter test, mode FM).

Before calling up this routine, the modulation mode FM must be set.

[D] [5] [SPEC] : Automatic offset adjustment in CMT switched off.

[D] [12] [SPEC] : All LCD segments are switched on for approx. 5 s for checking.

[D] [13] [SPEC] : All LEDs are switched on for approx. 5 s for checking.

[D] [14] [SPEC] : Checking the spin wheel.
The analog bar in the RF level field is increased by rotating the spin wheel clockwise and decreased by rotating counterclockwise.
This test mode is switched off by pressing the key "0".

[D] [15] [SPEC] : Checking the keyboard.
After switching on this test mode, the key code of each key pressed is output in the α display corresponding to the numbers in Fig. 2-1 to 2-9. This test mode is switched off by pressing the key "0".

[D] [20] [SPEC] : Measurement of battery voltage in the basic unit. This voltage is output in the α display; nominal value: 3.6 V; at voltages <2.4 V, the battery should be replaced.

[D] [21] [SPEC] : Measurement of battery voltage of Autorun Control CM-B5.
This voltage is output in the α display; nominal value 3.6 V; at voltages <2.4 V, the battery should be replaced.

[D] [22] [SPEC] : Measurement of battery voltage of Transfer Memory CM-Z1.
This voltage is output in the α display; nominal value: 3.6 V; at voltages <2.4 V, the battery should be replaced.

[D] [25] [SPEC] : Memory test of Transfer Memory (CM-Z1).
The state of the memory is indicated in the α display. Note that the memory test overwrites the transfer memory contents.

[D] [30] [SPEC] : Offset adjustment of RMS meter (DEMOD or AF voltmeter).
After replacement of the battery and when maximum accuracy of the AF voltmeter in the 50-mV range is required (eg. [D] [2] [SPEC]), this adjustment is to be carried out as follows:

- Switch on level measurement
- Switch off CCITT filter, if required
- Apply 40.00 mV RMS/800 Hz sinewave to connector AF VOLTM with the highest possible accuracy (error <0.1 %)
- [D] [30] [SPEC]

2.3.8.6 Display of the Options Fitted

Enter: [50113] [SPEC]

The options are indicated on the alphanumeric display in hexadecimal form (4 bits are combined to one digit 0 to F):

Module		Bit No. 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2nd AF Synthesizer	CMT-B7																1
Oscilloscope	model 54															1	
Autorun Control	CM-B5														1		
IEC Bus	CM-B4													1			
Duplex Modulation Meter	CM-B9												1				
Select. ZVEI	CM-B11											1					
Select. CCIR	CM-B11										1						
Select. EIA	CM-B11									1							
Select. DTMF	CM-B11								1								
RF Millivoltmeter	CM-B8							1									
Adjacent-channel Power Meter	CMT-B6						1										
SSB/AF Analysis	CMT-B10					1											
-					1												
-				1													
-			1														
-		1															
Example:																	
Readout on alphanumeric display		0				3				0				3			
Binary		0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1

RF Millivoltmeter
DTMF
Oscilloscope
2nd AF Synthesizer

2.3.9 Oscilloscope

The CMT (model 54) has a built-in oscilloscope which can display external or internal signals.

All set parameters such as the connected signal source, horizontal deflection and vertical deflection are output directly on the screen.

The currently selected signal source is indicated by an arrow at the corresponding position in the status line. It can be moved to the left and right using the mode keys 92 and 93.

Examples:

Display of signals at INPUT EXT 97 (AC coupling):

```
        ▼
AC   DC   BEAT    DEMOD   AF    AUTO
```

Display of the demodulated signal:

```
                  ▼              ▼
AC   DC   BEAT    DEMOD   AF    AUTO
```

An additional arrow above the symbol AUTO means that only the three positions AC, DC and INTERNAL can be selected using the mode keys and selection of the internal signal source has been determined by the key DEMOD·BEAT / AF EXT 8 on the basic instrument.

The position BEAT cannot be selected using the mode keys; it must be selected using DEMOD·BEAT 8.

The oscilloscope in position INTERNAL is also switched between DEMOD and AF if the CMT mode changes between transmitter test and receiver test.

In addition to the sources specified in the status line, the oscilloscope can also output the signal at connector AF VOLTM without the fundamental wave (1 kHz) used to measure the SINAD value.

The switchover is made using [131] [SPEC] .

It is possible to return to BEAT, DEMOD or AF using [132] [SPEC] .

The deflection factors are output on the screen and can be increased or decreased using the pairs of keys TIME/DIV 94 and AMPLITUDE/DIV 95.

The horizontal deflection factors can be set between 10 µs/div and 20 ms/div.

The vertical scale is displayed in the correct unit corresponding to the applied signal and, with DEMOD, also corresponding to the type of modulation.

Signal	Range		Unit
	min.	max.	
AC / DC	5 mV	10 V	mV V
BEAT	---	---	---
DEMOD			
AM	0.1 %	40 %	%
FM	5 Hz	40 kHz	Hz kHz
ΦM	0.01 rad	10 rad	rad
AF	1 mV	2 V	mV V
SINAD	---	---	---

Amplifiers are switched on and off in the basic instrument if necessary with DEMOD and AF to increase the dynamic range; the vertical scale on the oscilloscope is then also changed. Very large ranges with small signals (and vice versa) are also not always selectable using the keys AMPLITUDE/DIV 95.

The CMT has an autorange function to display internal signals. The most suitable display range is automatically selected by pressing the key BEST RANGE INT 96 and the associated LED lights up briefly.

Pressing of the key BEST RANGE INT 96 only produces an effect with DEMOD selected and the modulation measurement active (MAX PK + ±/2 -) or with AF selected and the AF voltmeter (LEVEL) active.

This adjustment is carried out continuously if the key is pressed longer (> 0.3 s) and the LED lights up continuously. The function is switched off by pressing briefly again.

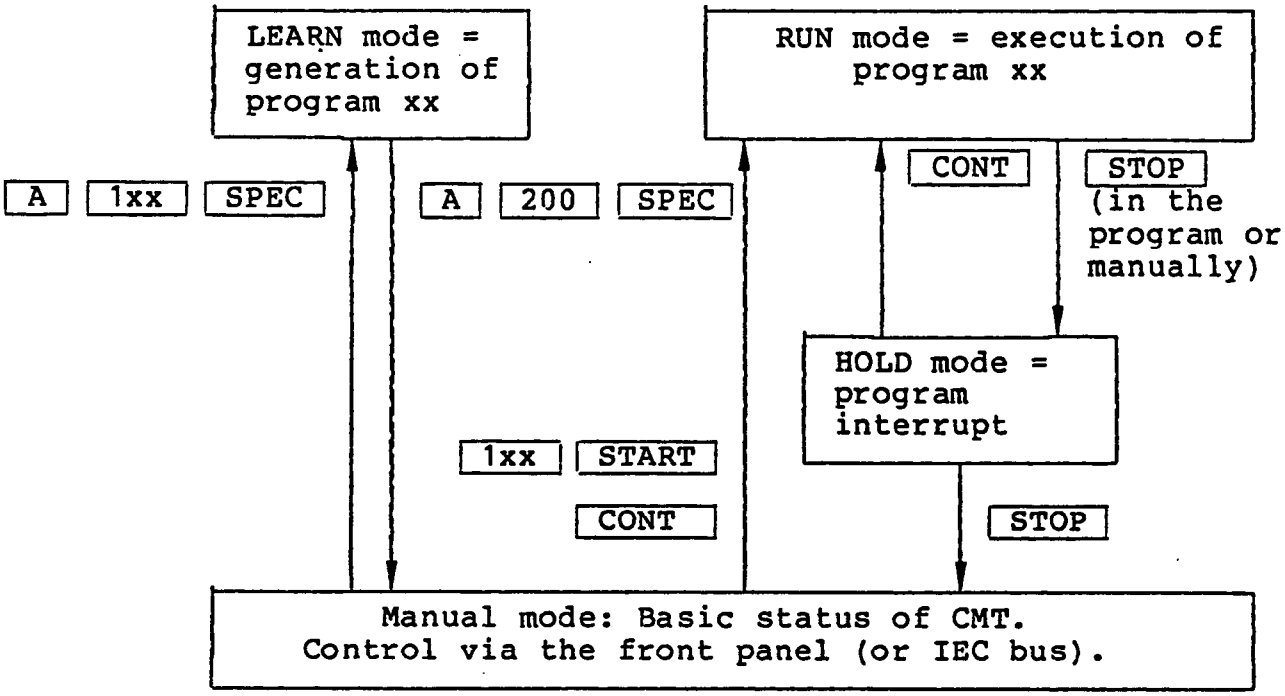
All oscilloscope function keys except BEST RANGE INT 96 are fitted with an autorepeat capability, i.e. prolonged pressing of a key corresponds to repeated pressing in succession.

2.3.10 Autorun Control

The option CM-B5, if fitted, allows up to 100 different test programs defined via the front-panel keys to be stored (in LEARN MODE) and repeated as often as required (in RUN mode) without the need for an external controller.

2.3.10.1 Control Modes of the CMT with Autorun Control

xx corresponds to the program number: 00 to 99



Manual mode

After switching on, the CMT automatically enters this status; control is exclusively via the front-panel keys.

LEARN mode

The instrument works as in manual mode (except for the rotary knob which is used for selection of program lines). In addition, each pressing of a key is temporarily stored in a buffer. When a command is entered completely, it can be stored in the program by pressing the STORE key.

RUN mode (START LED lights up)

After starting a program, the CMT executes all commands successively.

HOLD-Mode (START and STOP LED light up)

When the STOP key is pressed or the STOP function occurs in the running program, the RUN MODE is interrupted (HOLD mode).

The program is continued by pressing the CONT key and aborted by pressing the STOP key.

2.3.10.2 Memory Allocation and Configuration of a Control Program

Up to 100 different programs identified by the program numbers (00 to 99) can be stored. The maximum available storage space is divided up among the individual programs according to their length. If the available storage space is occupied by several programs with excessive length, generation of further programs is no longer possible (error message: NO MORE MEMORY).

```
000 PROGRAM 00    to    000 PROGRAM 45    to    000 PROGRAM 99
001 command 1           001 command 1           001 command 1
002 command 2           002 command 2           002 command 2
003 command 3           003 command 3           003 command 3
004 command 4           004 command 4           004 command 4
005 command 5           005 command 5           005 command 5
006 command 6           006 command 6
007 command 7           007 command 7
                        008 command 8
to                      009 command 9

999 command 999
```

The program configuration is based on lines, i.e., each stored command corresponds to a program line with an associated line number. The storage space required by the individual commands is 6, 12, 18 or 24 bytes, depending on the number of keys pressed.

During the program run, command 1 is executed first (line 0 always contains the head line with program number), followed by commands 2, 3, etc. and finally by the last stored command. For this purpose, autonumbering of lines when writing the program is provided and retained even when lines are inserted or deleted subsequently.

To enable fast location of a particular program, a directory is provided where the content of each line 001 is stored. By entering [A] [605] [SPEC], line 1 of the first loaded program and the associated program number are output in the α display. Variation by means of the rotary knob allows to display the head line of all programs, which are not empty.

Switching off is possible via [A] [606] [SPEC].

Example:

[A] [605] [SPEC] Output in the α display: 15 RADIO $23

15 is the program number of the first loaded program, "RADIO $23" is contained in line 1 in program 15.

2.3.10.3 Generating a Control Program

2.3.10.3.1 Program Call/Program Termination

By entering the command [A] [1xx] [SPEC] in manual mode, a program is selected (00 < xx < 99 = program number) and prepared for insertion of new commands.

This causes the following message to be output in the α display:

000 PROGRAM xx

line number — program number

From then on, the CMT is in LEARN mode, i.e., all complete commands can be stored in sequence or inserted into an existing program from the indicated line number onwards by pressing the STORE key.

The input [A] [200] [SPEC] permits to quit the LEARN mode after completion of the program and to return to manual mode. This command is acknowledged in the α display by the message ">PROG READY<".

Example:

[A] [123] [SPEC]	Output in the α display: 000 PROGRAM 23
Enter commands	
[A] [200] [SPEC]	Return to manual mode
	output in the α display: PROG READY

2.3.10.3.2 Storing the Commands

The commands are stored completely, i.e. after entering the terminating key, the command can be stored once by pressing the STORE key. If the command is not stored, the buffer will be cleared again when the next command is entered. Thus, it is possible to carry out any instrument setting required (e.g. to produce a particular operating status) without incorporating it into the program.

Input errors, such as overflow, underflow, wrong unit, syntax errors, as well as command abort (CLEAR or illegal key) cause the command to be completely deleted so that it can no longer be stored by STORE.

After storing a command, the α display presents the corresponding output in plain text.

Example:

Input	α display
[2] [kHz] [AF INT 1]	(AF INT1 2.000 kHz)
[STORE]	001 AF INT1 > 001 >kHz 2
[500] [mV] [V_0 MOD GEN] (too much)	
Correction	
[5] [mV] [V_0 MOD GEN] (correct)	
Store	
[STORE]	002 AF OUTPUT > 002 >mV 5

2.3.10.3.3 Selection of Program Lines/Checking the Commands

In LEARN mode, the rotary knob abandons its normal function (variation of the individual setting parameters) and is used for selection of the individual program lines (turning it clockwise increases the line number).

Furthermore, direct selection of a particular program line is also possible using the SPEC function [A] [1xxx] [SPEC] (000 < xxx < 999 = line number). The current position can be seen from the command line indicated in the α display (including line number).

Easy selection by means of the rotary knob and output of each selected command in the α display permit the program to be checked easily and quickly.

Example:

[A] [1034] [SPEC] Select line 34

Output in the α display:
034 command 34 ...

2.3.10.3.4 Insertion of Commands

When a particular position in the program has been selected using the rotary knob or [A] [1xxx] [SPEC] , each newly stored command is inserted in the following line number; the line numbers of the subsequent commands are incremented accordingly.

Example:

[A] [1034] [SPEC]

or selection using the rotary knob: select command 34

```
034 command 34  →          →  034 command 34
035 command 35     new command    035 new command
036 command 36                    036 command 35
037 command 37                    037 command 36
...                               038 command 37
                                  ...
```

2.3.10.3.5 Deletion of Commands and Command Blocks

For deleting commands, the first line to be deleted must be selected. By entering the command [A] [2xxx] [SPEC] (with 000 < xxx < 999), a program block with the length xxx is deleted from this position.

The input [A] [2000] [SPEC] (or [A] [2001] [SPEC]) only deletes the current line.

Example:

[A] [1034] [SPEC] : Select line 34

```
→ 34 command 34
  35 command 35
  36 command 36
  37 command 37
  38 command 38
  39 command 39
```

[A] [2000] [SPEC] : Line 34 is deleted, the following line numbers are decremented.

```
→ 34 command 35
  35 command 36
  36 command 37
  37 command 38
  38 command 39
```

[A] [2003] [SPEC] : Lines 34, 35, 36 are deleted.

```
→ 34 command 38
  35 command 39
```

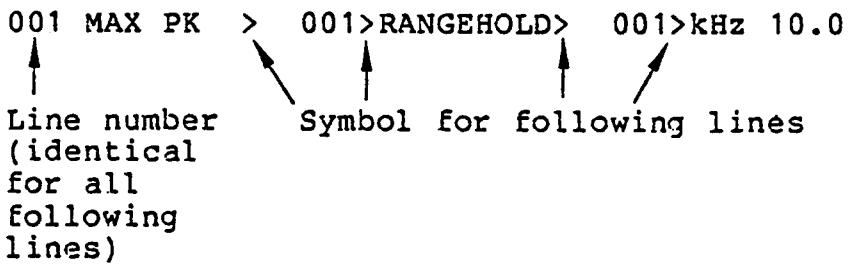
2.3.10.3.6 Representation of the Commands in the α Display

Commands requiring more than 9 characters for representation use several lines with the same number, which can be output in the α display using the rotary knob.

Example:

Representation of the command: [MAX PK] [RANGE HOLD] [10.0] [kHz]

Display:



A complete list of the possible commands and their representation in the α display can be obtained from Section 2.3.10.7.

2.3.10.3.7 Program Example

Input	α display
[A] [123] [SPEC] **Start of program**	000 PROGRAM 23
[TXRX]	
[STORE]	001 XMITTER
[2] [kHz] [AF INT 1]	(AF INT 1 2.000 kHz)
[STORE]	002 AF INT1 > 002>kHz 2
[500] [mV] [V_0 MOD GEN] (too much)	
Correction	
[5] [mV] [V_0 MOD GEN] (correct)	
Store	
[STORE]	003 AF OUTPUT > 003>mV 5
[COUNT f]	
[STORE]	004 RF COUNT
[POWER]	
[STORE]	005 POWER
[MAX PK]	
[STORE]	006 MAX PK
[1000] [STOP]	
[STORE]	007 STOP > 007>1000
[TXRX]	
[STORE]	008 RECEIVER
[145] [MHz] [SET f RX]	
[STORE]	009 SET RF RX > 009>MHz 145
[10] [µV] [V_0 SYNTH]	
[STORE]	010 RF OUTPUT > 010>µV 10
[MOD OFF]	
[STORE]	011 MOD OFF
[2.8] [kHz] [INT 2]	(Omission of STORE: Command is executed on the instrument but not stored in the program.)
[0] [INT 2]	(Cancel of command)
[2.8] [kHz] [INT 1]	
[STORE]	012 MOD INT 1 > 012>kHz 2.8
[LEVEL]	
[STORE]	013 AF LEVEL
[2000] [STOP]	
[STORE]	014 STOP > 014>2000
[A] [200] [SPEC] **End of program**	

2.3.10.4 Special Functions in Conjunction with Autorun Control

2.3.10.4.1 Measurement Tolerances

Each time a measurement is called up in LEARN mode, a lower or upper limit or a tolerance window consisting of both limit values can be specified for evaluation of the result. If, during the following program run, the measured value lies within the limits thus defined, the green TOL IN LED lights up, and the program is executed without interruptions. If the value falls outside the tolerance, the red TOL OUT LED lights up and the program run is interrupted (HOLD mode).

The measurement producing the out-of-tolerance result is continuously repeated, enabling the user to make an adjustment.

Example:

Input	α display
[POWER]	
[STORE]	015 POWER
[5.5] [W] [UPPER]	
[STORE]	016 UPPER TOL> 016>W 5.5
[4.5] [W] [LOWER]	
[STORE]	017 LOWER TOL> 017>W 4.5

→ **Total Evaluation**

If tolerance limits have been entered into a test program, a tolerance evaluation is automatically accomplished at the end of the program.

Possible cases:

- All tolerances lie within the tolerance window

  At the end of the program, the message "TOTAL TOL IN" is output in the α display, the green TOL IN LED lights up and, with the printer in on-line operation, the following line appears in the printout:

LINE	COMMAND ..	PARAMETER	RESULT	TOL
..	..	..	..	..
***	TOTAL TOLERANCE			OK

- One or more tolerances lie outside the tolerance window

  At the end of the program, the message "TOTAL TOL OUT" is output in the α display, the red TOL OUT LED lights up and, with the printer in on-line operation, the following line appears in the printout:

LINE	COMMAND	PARAMETER	RESULT	TOL
..	..	..	..	..
***	TOTAL TOLERANCE			FAULT

Behaviour of autorun control with tolerance evaluation

If special function [A] [510] [SPEC] has been used to switch to tolerance stop (interruption of RUN mode if tolerance is exceeded), the autorun control switches to HOLD mode (STOP LED lights up) to display the evaluation result. The result can now be read off and the program run finished by pressing STOP or CONTINUE.

In the event that [A] [511] [SPEC] has been used to switch to tolerance continue, the instrument does not switch to HOLD mode. The tolerance evaluation messages are only displayed according to the time between the autorun control commands. In this case, the printout is of crucial importance.

The tolerance evaluation of logarithmic values (in unit dB) is internally accomplished such as if these values were negative (10 % corresponds to -20 dB, but +20 dB is displayed). Therefore, the function of Lower/Upper Limit is reversed.

When processing the command sequence

```
SINAD
STORE              015 SINAD
20 dB LOWER
STORE              016 LOWER TOL>
                   016>dB 20
10 dB UPPER        017 UPPER TOL>
STORE              017>dB 10
```

a SINAD result of 15 dB would be within the tolerance limits, whereas 25 dB or 5 dB are beyond the tolerance range.

2.3.10.4.2 STOP Function

If the STOP command is stored in the program in LEARN mode, the CMT enters the HOLD mode at this position in the program run. In this mode, any settings can be carried out on the CMT or the device under test and the program run continued by entering CONT.

Input of the command [Numerical value] [STOP] (with 10 < value < 10000) causes the CMT to stop the program run at this position for a period of time (in ms) corresponding to the numerical value.

If the last command prior to STOP calls up a measurement, this measurement is continued during the complete wait time to enable the user to carry out adjustments.

Example:

Input	α display
[STOP]	
[STORE]	005 STOP

The program run is interrupted here; the CMT can be set as required in HOLD mode. When CONT is entered, the program run is continued with command 006.

Input	α display
[COUNT f]	
[STORE]	006 RF COUNT
[2000 STOP]	
[STORE]	007 STOP > 007>2000

After execution of the command 006, the program is stopped for 2000 ms. After this period, the program is automatically continued in line 008.

Input	α display
[POWER]	
[STORE]	008 POWER

2.3.10.4.3 Conditional Program Continuation

Incorporation of the command <No> [CONT] (0 < No < 5) into the program causes the CMT to stop the program run and wait for a particular event.

No	Event
0	RF power at connector RF IN/OUT drops
1	RF power >0.5 W is applied to connector RF IN/OUT
2	reserved
3	reserved
4	reserved

2.3.10.4.4 Programming of Messages

If the CMT is to output messages in the alphanumeric display during the program run in order to request particular entries or to specify e.g. type of transceiver and date/number of test report in the test-report printout, the front panel keys can be converted to alphanumeric keys by entering [A] [500] [SPEC] in LEARN mode. Each key is assigned a letter from the alphabet (see Table 2-3), the normal key functions are suppressed.

Only the following 3 keys have a control function:

[CLEAR]	Clears the input character by character String input is further possible.
[STORE]	Stores the message. Switches off string input.
[SPEC]	Switches off string input.

A message can contain up to 33 characters, all further inputs are ignored.

In the test-report printout, the complete message is output, whereas the output in the alphanumeric display is confined to 14 characters (can be checked in the following lines in LEARN mode).

The character $ is used as identification for the display and the program listing.

⚠ If, in a program line, commands are sent to the CMT which cause the output on the alphanumeric display to be changed (e.g. search routines), it is possible that an immediately following message does not appear in the alphanumeric display. This problem can be solved by inserting a waiting time prior to output on the alphanumeric display.

Example:

```
010  SINAD 20 dB
011  STOP  50
012  $ NEXT STEP
```

Example:

The following messages are to be incorporated into the program:

Message 1 RECEIVER TEST - RADIO-SET $12345
Message 2 TX-FREQUENCY*

Input	α display
[A] [101] [SPEC]	
[STORE]	000 PROGRAM 01
[A] [500] [SPEC]	
Input of message 1 on the front panel according to Table 2-3	
[RECEIVER TEST - RADIO-SET $ 12345]	
[STORE]	001 RECEIVER > 001>TEST - RA> 001>DIO-SET $> 001>12345
[TXRX]	
[STORE]	002 RECEIVER
[A] [500] [SPEC]	
Input of message 2 on the front panel according to Table 2-3	
[TX-FRF] (error, delete)	
[CLEAR]	
[TX-FREQUENCY *]	
[STORE]	003 TX-FREQUE> 003>NCY*
[STOP]	
[STORE]	004 STOP
[MAX PK]	
[STORE]	005 MAX PK
[A] [500] [SPEC]	
[TRY] (abort superfluous input of message)	
[SPEC]	
[HP]	
[STORE]	006 HP IN

Associated output in the α display in RUN mode:

```
Message 1     RECEIVER TEST
Message 2     TX-FREQUENCY*
```

Associated line in test-report printout:

```
Message 1     RECEIVER TEST - RADIO-SET $12345
Message 2     TX-FREQUENCY*
```

Table 2-3

Key	Item number (front-panel views)	Alphanumeric characters
0	39	0
1	39	1
2	39	2
3	39	3
4	39	4
5	39	5
6	39	6
7	39	7
8	39	8
9	39	9
A	42	A
B	43	B
C	44	C
D	45	D
COUNT f	5	E
SET f TX	6	F
DECODE	7	G
DEMOD•BEAT	8	H
AF INT 1	9	I
AF INT 2	10	J
POWER	14	K
ACP	15	L
V_0 SYNTH OFF	16	M
PROBE	17	N
MAX PK	23	O
POLARITY SELECT	24	P
PK HOLD	25	Q
DIST TX	26	R
HP	27	S
CCITT TX	28	T
V_0 MOD GEN	32	U
V_0 MOD GEN+20dB	33	V
S/N	34	W
V_0 MOD GEN OFF	35	X
CCITT RX	36	Y
TXRX	60	Z
LOCK	62	SPACE
ACK TEST	64	$
DISPLAY CHANGE	65	+
START	67	*
CONT	68	‖
STOP	70	<
PRINT	72	>
TOL UPPER	74	?
TOL LOWER	75	/
•	41	•
-	40	-

2.3.10.4.5 Repetition of Program Blocks

If one or more operations are to be performed repeatedly, they can be combined to a repetition block.

The start of this command sequence and the number of repetitions are set as follows (in LEARN mode):

- Select the last line before the repetition block.
- Enter [A] [505] [SPEC] [xxx] [SPEC]

  (xxx corresponds to the desired number of repetitions)

  Output in the α display: 023 REP START>
  023>xxx

The end of the repetition block is identified after the last line by entering [A] [506] [SPEC] . Identification in the program: "REP STOP"

Example:

Input	α display
[TXRX]	
[STORE]	001 RECEIVER
[A] [505] [SPEC] [12] [SPEC]	
[STORE]	002 REP START> 002>12
[SET f RX]	
[STORE]	003 SET RF RX
[STOP]	
[STORE]	004 STOP
[SINAD·DIST]	
[STORE]	005 SINAD
[A] [506] [SPEC]	
[STORE]	006 REP STOP

When this section of the program is executed, the output frequency of the test generator is requested 12 times (SET f RX before STOP) and the SINAD value measured subsequently. It is thus possible to measure e.g. the receiver sensitivity on all channels of a 12-channel transceiver.

2.3.10.5 Execution of a Control Program

2.3.10.5.1 Starting a Program

Each stored program (at least one command line entered) can be called up in manual mode (not via IEC bus) using the command [1xx] [START] (00 < xx < 99). If the same program is to be run again, it will be sufficient to press the CONTINUE key instead of repeating the above entry. If this key is pressed immediately after switching on the CMT, the program 00 is started (corresponds to [100] [START] . All current measurements of the CMT are immediately aborted and the front-panel keys switched off (except for STOP and PRINT).

As the initial status of the CMT (TX/RX mode) at the program start does not necessarily correspond to LEARN mode it is recommended to define this status clearly in the first command lines.

Starting with line 1, all commands are executed in sequence according to their line number as fast as possible. To enable observing the program run on the slower LCDs for testing, a pause can be inserted after each command (see Section 2.3.10.4.2).

2.3.10.5.2 Program Interrupt

A program interrupt can be caused by

- pressing the STOP key during the program run
- a STOP function in the program
  (STOP or 100 STOP = 100 ms pause)
- a measured value which exceeds of falls below the programmed tolerance values.

The instrument then enters the HOLD mode which permits operation as in manual mode. In addition, the automatic test can be completely switched off by pressing the STOP key once again or the program be continued with the next command via CONT.

2.3.10.5.3 End of Programm

After execution of the last command of the called program, the automatic test switches off automatically. It is likewise possible to return to HOLD mode at any point in the program by pressing STOP. By pressing again, the automatic test is switched off completely.

2.3.10.5.4 Special Features During Program Run

Contrary to manual mode, each measurement is made only once during the program run and the result stored in the displays. However, in HOLD mode and if the measured value is outside the tolerance the last command (provided it is a measurement call) is continuously repeated until the program is continued.

When a STOP function occurs in the program and if the last but one command was a setting where no parameter was specified, this measurement parameter is requested in the α display.

Example:

```
032 RF COUNT
033 STOP
```

As long as the CMT is in HOLD mode, the last measurement call is repeated, in the above example the frequency count RF COUNT.

```
034 SET RF TX
035 STOP
```

When this STOP function occurs, the entry of the operating frequency for the transmitter test is requested by the message "*SET RF TX*" in the α display.

```
036 ...
```

As the instrument status may be different for each program run (TX/RX mode, filter on/off, etc.) all important parameters should be set at the start of the program.

Example:

Switch on transmitter test

in receiver test	in transmitter test
[TXRX] [STORE]	[TXRX] [TXRX] [STORE]

Program line: 001 XMITTER

Switch on receiver test

in receiver test	in transmitter test
[TXRX] [TXRX] [STORE]	[TXRX] [STORE]

Program line: 001 RECEIVER

In LEARN mode, each change in the instrument status should therefore be stored in the program.

2.3.10.6 Deletion of Programs/Initialization of Autorun Control

Deletion of Programs:

[A] [3xx] [SPEC] [STORE] (with 00 < xx < 99).

Deletion of complete programs is only possible in manual mode.

When this function is called up, the message "REALLY DELETE?" appears in the α display of the CMT. When STORE is entered to acknowledge this function, the selected program is deleted. All other entries abort the selected function.

Example:

[A] [356] [SPEC] [STORE] Program 56 is deleted.

Initialization of Autorun Control:

[A] [800] [SPEC] [STORE]

This procedure needs only be performed on the option CM-B5 after switching the instrument on for the first time or replacing the battery, all programs, possibly available test reports and control variables being deleted.

2.3.10.7 List of Commands of Autorun Control

Command codes (1st line)

Command (acc. to definition)	Representation
COUNT f	RF COUNT
SET f RX	SET RF RX
SET f TX	SET RF TX
Δf	CH. SP.
DECODE	DECODE
CODE	CODE
DEMOD	DEMOD CNT
BEAT	BEAT CNT
AF EXT	AFEXT CNT
AF INT 1	AF INT1
AF INT 2	AF INT2
POWER	POWER
V_0 SYNTH.	RF OUTPUT
ACP	ACP
V_0 SYNTH. +6 dB	RFOUT+6dB
	RFOUT-6dB
V_0 OFF	RFOUT ON
	RFOUT OFF
PROBE	PROBE
MAX PK	MAX PK
INT 1	MOD INT1
POLARITY SELECT	+ PK
	- PK
	+-/2 PK
INT 2	MOD INT2
PK HOLD	PKHLD ON
	PKHLD OFF
EXT	MOD EXT
DIST	TX DIST
MOD OFF	MOD OFF
HP	HP IN
	HP OUT
1 V_{RMS}	EXT 1VRMS
CCITT TX	CCITT TX
	CCITT OUT
EXT CAL	EXT CAL
V_0 MOD GEN	AF OUTPUT
AF-LEVEL	AF LEVEL
V_0 MOD +20 dB	AF OUT+20
	AF OUT-20
SINAD	SINAD
DIST	RX DIST
S/N	S / N
V_0 OFF	AFOUT ON
	AFOUT OFF
CCITT RX	CCITT RX
	CCITT OUT
SPEC	SPEC
STORE	STORE
RECALL	RECALL

Command (acc. to definition)	Representation
TXRX	XMITTER RECEIVER
LOCK	LOCK ON LOCK OFF
ACK TEST	ACK ON ACK OFF
DISPLAY CHANGE	DISPL1 TX frequency field DISPL1 RX DISPL2 TX RF level field DISPL2 RX DISPL3 TX modulation field DISPL3 RX DISPL4 TX AF level field DISPL4 RX
STOP	STOP
CONT	CONTINUE
PRINT	PRINT
TOL LIMITS UPPER	UPPER TOL
TOL LIMITS LOWER	LOWER TOL
INPUT SELECT	INPUT 2 RF IN/OUT
NARROW	NARROW.IN NARROW.OUT
Oscilloscope mode	OSC MODE
Oscilloscope X deflect.	OSC TIME
Oscilloscope Y deflect.	OSC AMPL

1st following line

Numerical values or special functions

Key labelling	Representation
CLEAR	CLEAR
RANGE HOLD	RANGEHOLD
ANALOG SELECT	ANAL.SEL.
α-DISPL SELECT	ALPHA SEL
ΔVAR	DELTA VAR
REF	REF

2nd and 3rd following line

Numerical values or special functions
(CLEAR in the 1st following line)

Key labelling	Representation
RANGE HOLD	RANGEHOLD
ANALOG SELECT	ANAL.SEL.
ΔVAR	DELTA VAR
REF	REF

2.3.10.8 Printing of Test Logs / Program Listings

2.3.10.8.1 Facilities and Control of Printer Function

If a printer with parallel interface (Centronics), such as PUD2/ PUD3, is available, program listings and test logs can be output using the PRINT key 71.

Depending on the operating mode of the CMT, this key has different functions.

Manual Mode

[100] [PRINT] to [199] [PRINT] :

Print listing of control program 100 to 199. Printing starts when the PRINT key is pressed, the PRINT LED lights up.

[PRINT]

As long as the PRINT LED is lighting, indicating that a program listing is being printed, this command causes printing to be aborted and the PRINT LED goes out. However, the content of the CMT output buffer or the printer input buffer is still output.

If the PRINT LED is extinguished, generation of a test log can be switched on or off for the subsequent program run by pressing the PRINT key (several times, if required). This is acknowledged by output of the messages **"PRINTER ON"** or **"PRINTER OFF"** in the α display.

→ **Logical Connection of the Printer when Switching on the CMT**

- Upon switch-on of the CMT, the printer is connected and switched to on-line operation. CMT declares the printer to be present (logically available).

- Upon switch-on, the printer is not connected or in off-line operation. CMT declares the printer to be not present (logically not available).

LEARN mode

[PRINT] [STORE]

Pressing the PRINT key in LEARN mode does not lead to an immediate start of printing, but allows a PRINT ON or PRINT OFF command to be stored in the program. It is thus possible to suppress printing in each program for individual program blocks, e.g. for time-critical program parts. With the printer switched off (PRINTER OFF), these commands have no effect.

If the PRINT LED lights after pressing the PRINT key, PRINT ON is stored using [STORE] ; if it is extinguished, this corresponds to PRINT OFF (toggle function).