



Operation Manual

MFC-R2

Annex to TSW200E1's Operation Manual

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1 - Introduction

Using the MFC-R2 module, the TSW200E1 can operate as simulator or analyser in a communication that uses MFC-R2 signalling. As an analyser, the equipment gets Forward (caller) and Backward (called) signals, identifying the line signalling (digital R2) and the signalling between registers (MFC) for every channel. It is possible to observe the communication without interfering on it.

As a simulator, it performs as one of the communication extremes, answering to the incoming calls or starting a call. In that way, it is possible to verify which of the sides of the communication is at fault.

For both operating ways, the equipment stores the last performed test in memory, for later analysis. It stores the CAS changes and the coded tones. The telephone numbers that were dialled or received are also stored.

2 - MFC-R2 Module Operation

2.1 - MFC-R2 Test Configuration

This module configuration is pretty straightforward and it consists of one screen when the chosen operating mode is analyser or four screens when the simulator mode is chosen. In the screen below, the user can choose the operation mode between ANALYSER or SIMULATOR. For the simulator mode, the MFC communication parameters must be defined. In the screen below, the user chooses if the equipment will operate as analyser or simulator and he or she programs the line parameters. To change any of the parameters, take the cursor to the line of the parameter to be changed and use the keys ← and → to change it.

MFC- R2	
Mode:	SIMULATOR ◀
PCM:	PCM30C
Termination:	75Ω UNBAL
Line Code:	HDB3
Polarity:	NORMAL
Country:	ITU- T
	MODULE MEMORY NEXT
F1	F2 F3 F4

- **PCM:** Selects the frame structure. The structures are PCM30 and PCM30C
- **Line Code:** Allows the user to choose the line code between HDB3 and AMI.
- **Termination:** It is possible to choose the cable termination impedance as 75 ohms UNBAL, 120 ohms BAL, HIGH-Z UNBAL or HIGH-Z BAL.
- **Polarity:** Selects the polarity of the signal as NORMAL, where the standard pattern bits are normally transmitted, or as INVERTED, where the bits are inverted.
- **Country:** Selects the country where the test is performed so as to correctly interpret the MFC signalling. Available options are Brazil, Mexico or ITU-T.

The following screens are only shown when the SIMULATOR option is chosen.

The level of the tones sent for MFC communication and the interdigit time (time between sending each digit and the next) can be chosen on the screen shown above. These two parameters correspond to a configuration common to Forward and to Backward modes. The interdigit time can be selected from 0 to 999 milliseconds. When 0 is chosen, the communication is compelled, which means that the tones start to be sent when it is detected that the response tone has stopped.

Note: Usually, some error that may occur can be solved by setting the Level to -10dBm.

MFC-R2		
Level:	-10 dBm	◀
Interdigit Time:	000 ms	
BACK	MODULE	NEXT
F1	F2	F3
		F4

On the screen shown below, the user can select the parameters to define the operation when the equipment sends Forward signals.

FORWARD		
1 st Digit:	001 ms	◀
Channel:	01	
DID Number:	123P456P*#0	
ANI:	7890123456	
Category:	II- 2	
Forced AB:	01	
BACK	MODULE	NEXT
F1	F2	F3
		F4

- **1st Digit:** defines the duration time of the first sent tone, from 0 to 999 milliseconds. If 0 is chosen, the tone stops when the equipment receives the response tone.
- **Channel:** the channel that the equipment will use to make the calls.
- **DID (Direct Inward Dial) number:** phone number to be called
- **ANI (Automatic Number identification) number:** phone number assumed as the equipment's own
- **Category:** defines the category assumed by the equipment, from II-1 to II-6.
- **Forced AB:** If the keys CLEAR and DATA are pressed during the test, the AB bits of line signalling for the selected channel are forced to the value selected in this parameter.

Note: The equipment works the following way: "A" calls "B". So, the DID(B) and ANI(A) fields should have extra attention and should not be blank.

To edit the phone numbers, press DATA with the cursor pointing to the phone number to be edited. On the following editing screen, use the alphanumeric keys to choose the desired number. These numbers can have up to 14 digits. When entering smaller numbers, the user can let blanks after the number using the <F2> EMPTY option. The remaining parameters can be edited using the ← and → keys.

On the following screen, the parameters used when the equipment operate in Backward mode

are shown.

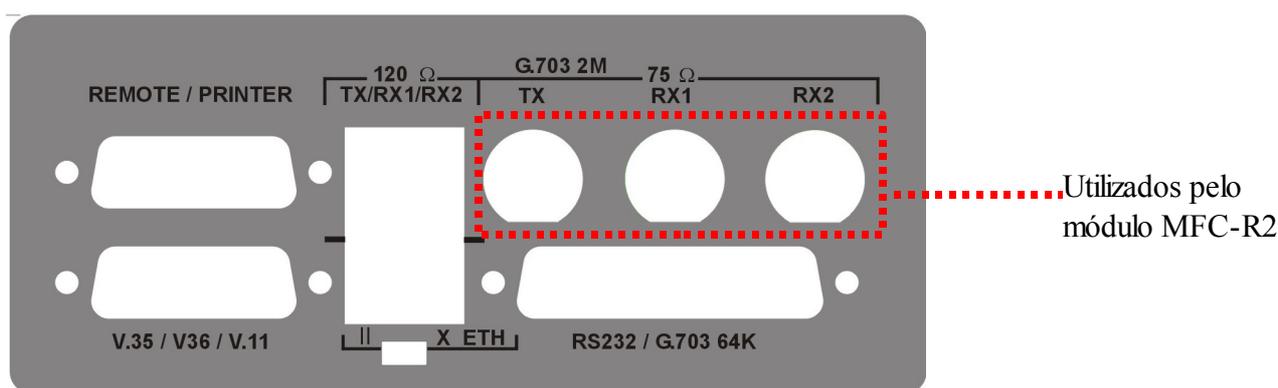
BACKWARD			
Number of DIDs:	04 ◀		
Number of ANIs:	20		
Final Status:	B-1		
Ask First for:	DID (B)		
BACK	MODULE		
F1	F2	F3	F4

- **Number of DIDs:** defines how many digits the equipment needs to receive to complete the call;
- **Number of ANIs:** defines the maximum digits' number it will ask the caller;
- **Final Status:** the status that ends a call is defined by this parameter (see [Appendix B](#));
- **Ask First for:** defines which of the two numbers must be requested first. These parameters can be edited using the ← and → keys.

2.2 - Performing the MFC-R2 test

The screens displayed during test execution are nearly the same for the simulator and for the analyser. The differences are on the function keys menu screen.

The two modes use the G.703 2M interface BNC connectors. The analyser uses two receptions (RX1 and RX2) and it does not use the transmission connector. The simulator uses the reception RX1 and the transmission TX. See the equipment connectors on the figure below.



To run the test, press the START key.

The state of each channel is shown on the following screen. The channels in use can be checked. This screen can be accessed from the STATE screen and from the PHONES screen, using the <F1> key (ABAB).

CAS AB BITS											
CH STATE			CH STATE			CH STATE					
01:	→CALL		11:	IDLE		21:	IDLE				
02:	IDLE		12:	IDLE		22:	IDLE				
03:	IDLE		13:	IDLE		23:	IDLE				
04:	IDLE		14:	IDLE		24:	IDLE				
05:	IDLE		15:	IDLE		25:	IDLE				
06:	IDLE		16:	IDLE		26:	IDLE				
07:	IDLE		17:	IDLE		27:	IDLE				
08:	IDLE		18:	IDLE		28:	IDLE				
09:	IDLE		19:	IDLE		29:	IDLE				
10:	IDLE		20:	IDLE		30:	IDLE				
						STATE			BITS		
F1			F2			F3			F4		

There is an arrow at the side of the used channel indicating the origin of this call:

Arrow	Analyser	Simulator
→	Call originated through RX1	TSW200E1 is forward
←	Call originated through RX2	TSW200E1 is backward

<F4> key allows the user to choose the way this information is displayed, by pressing the option BIT the ABAB bit values are shown, while by choosing CODE the code is displayed.

Is the equipment works as an analyser, it has two operational ways. The test always starts in SCAN mode, in which each call made has its MFC signalling captured. When the SCAN mode is off, the equipment tracks the channel in which the first call happens until it ends, without catching the tones of others calls. When it ends, the equipment tracks the channel in which the next call happens the same way. To enable/disable the SCAN mode, press simultaneously PRINT and ERROR keys.

Still at analyser, the <F1> key (AUTO or MANUAL) selects which way the audio channel will be analysed. If AUTO is selected, the tones of every call that comes will be listened. If MANUAL is selected, a cursor will show which channel is selected as audio source. To move it, use ←, ↑, → and ↓ keys. This option works only at this screen, at all the others, the mode is always AUTO.

The <F2> key (ALARMS) leads to the alarms screen. These screens show the seconds counters which contain PCM30 or PCM30C alarms, as chosen. To reset these counters, press CLEAR. The alarm screens are shown below.

ALARMS		
	RX1	RX2
SIGNAL LOSS	00000	00000
AIS	00000	00000
FAS LOSS	00000	00000
REMOTE ALARM	00000	00000
RMF ALARM	00000	00000
ABAB		NEXT

F1 F2 F3 F4

Pressing <F4> (NEXT), another screen is shown.

ALARMS		
	RX1	RX2
CAS LOSS	00000	00000
CRC ERROR	00000	00000
BACK		

F1 F2 F3 F4

- SIGNAL LOSS: This counter is incremented whenever 255 consecutive bits are 0.
- AIS: This counter is incremented whenever 255 consecutive bits are 0;
- FAS LOSS: Counter that indicates FAS sync loss. The counter is incremented whenever there are three consecutive FAS words with error or if bit 2 of the odd frames is received with error for three consecutive times;
 - REMOTE ALARM: The counter is incremented whenever bit 3 (A) of the NFAS word is set for three consecutive times;
 - RMF ALARM: In the 2Mbps G.704 analysis, the counter is incremented whenever bit 6 of timeslot 16 is set for two consecutive times;
 - CAS LOSS: Counter that indicates multi frame sync loss. In the 2Mbps G.704 analysis, when two consecutive MFAS words are in error or when many ABCD words are equal to 0000, the equipment is not capable of identifying the MFAS (0000) and it flags a CAS sync loss. So, it is necessary to set at least a bit of each ABCD word for channels 1 to 15;
 - CRC ERROR (only at PCM30C): Counter that indicates CRC sync loss. This counter is incremented every time that, for a thousand CRC words, there are 915 or more in error.

By pressing <F3> key, the user can see the STATE screen shown below. On this screen the line signalling modifications are presented. The meaning of these modifications for every channel is also displayed.

05/06/2006	CH	FLBL	DESCRIPTION
13:23:31:698	01	0010	SEIZED
13:23:31:707	01	0011	SEIZED ACK
13:23:34:946	01	0001	ANSWERED
13:23:40:472	01	1001	CLEAR FWD
13:23:40:481	01	1010 *	IDLE

ABAB	FILTER	CALL	FREEZE
F1	F2	F3	F4

If the equipment operates as an analyser, it is possible to send to the loudspeaker the data from one of the receptions or to turn the sound off. At test start, <F3> displays AUDIORX1 but the audio is turned off. Press AUDIORX1 to turn audio on and to send the data from connector RX1 to the loudspeaker and then the indication AUDIORX2 is shown. If the user now presses AUDIORX2, connector RX2 data is sent to the loudspeaker and then AUDIOOFF is shown. If AUDIOOFF is pressed, the audio is turned off and AUDIORX1 is shown again. In hardware E or newer, it is possible to hear both RX1 and RX2 simultaneously.

When the equipment works as a simulator, the <F3> (CALL) option is displayed when the test is started. It allows the execution of a call using the channel chosen at the configurator. If it is pressed and the call is taken, the CALL indication over <F3> turns to VOICE. After this, the equipment sends DTMF tones when the numeric keys (0 to 9) are pressed. When <F3> (VOICE) is pressed, the indication over <F3> turns to DTMF, the microphone is turned on and the sound that it captures is sent to the equipment as data. The user can toggle between VOICE and DTMF by pressing the <F3> key. The data which are present at the reception of the equipment are sent to the loudspeaker. The user can use the volume keys to adjust the loudspeaker sound level. When the call is over, <F3> shows CALL again.

The option <F2> (FILTER) allows the user to choose if the equipment presents the line signalling only for a specific channel or not. In the screen shown bellow the user can edit the channel using the <F2> (+) and <F3> (-) keys. In this screen the <F1> (OFF) key turns the filter off, and the <F4> (ON) turns the filter on. When the filter is on, only the information related to the selected channel is stored.

FILTER			
<u>00</u>			
OFF	+	-	ON
F1	F2	F3	F4

MFC-R2

The <F4> (FREEZE) option in the STATE screen allows the user to freeze the screen for analysis of the displayed data, up to that moment. The small asterisk is a cursor that can be dragged about the screen using the ↑ and ↓ keys. This allows the user to observe all the data and not only the ones displayed on-screen at the moment that the FREEZE option is pressed. Each time that the cursor is placed beside SEIZE ACK, the MFTONES option is shown over the <F2> key. This indicates that an MFC signalling exchange has occurred and allows access to the following screen. Although, not every call allows the MFTONES option, only the ones tracked since its start.

TIMESTAMP 13:23:31:707 CHANNEL: 01				
DIG	TONE	LEV	DUR	DESCRIPTION
	HZ	dBm	ms	
A1	1035	-07	031	Send next digit
	1152	-05	031	
I15	1860	-03	173	Final
	1980	-03	173	
A3	0886	-07	031	Charge to Gr. B
	1035	-07	031	
I11	1380	-03	174	Without prior.
	1500	-03	174	
B1	1003	-06	032	
	1152	-05	032	
		PHONES	STATE	FREEZE
F1	F2	F3	F4	

The information presented is related to the tones sent for the call defined on the previous screen. Each pair of tones has their frequencies presented in Hertz, their level in dBm, their duration and the corresponding meaning shown on that screen. The tones duration is mostly lower than 1 second, that is the reason it is shown in milliseconds. But this equipment can measure tones durations that go through 511 seconds. If a tone duration is greater than a second the value is displayed in a **reverse background**.

On that screen, the <F2> key displays PHONES. When pressed, it causes the screen below to be presented. This screen displays the DID and ANI numbers and the duration of the call (CALL TIME).

If the call is still in progress, the CALL TIME is blank. If the MFC communication does not change the ANI numbers, this parameter is also blank.

PHONES			
DID #:	1234567890		
ANI #:			
Call Time:	325s		
ABAB	MFTONES	STATE	
F1	F2	F3	F4

The equipment presents a statistics screen, displaying the number of modifications in the line

signalling, the number of calls made and the number of sent and received tones.

STATISTICS			
STATES	=	5	
CALLS	=	1	
TONES	=	24	
MEMORY USED	=	00%	
BACK		CALL	
F1	F2	F3	F4

It also shows the percentage of memory that has already been used during the test. This is done because when the memory is full, new data is not stored and displayed anymore. To get to that screen, press ERROR from any of the previous screens.

If, at any step of the test, the equipment freezes or not answers to commands, press CLEAR to unlock it.

2.3 - Memory and Printout

The CAS MFC-R2 module stores the last performed test in memory, for later analysis. It stores the the line signalling (digital R2) and the signalling between registers (MFC). The telephone numbers that were dialled or received are also stored. To see the results, the procedures are the same as when the test is being run.

The test results can be printed during execution or later, from the equipment memory. Pressing the PRINT key in any memory visualisation screen causes the TSW200E1 to display the print management screen. For more details about printing results, consult the TSW200E1 Operation Manual section 6.3.

If it is desired to print while the test is running, it is necessary to setup printing before the test starts. While the test is running, press PRINT. Many printings can be done during the same test.

Appendix A - Category Tables

ITU-T Category	
Designation	Description
II-1	Without priority
II-2	With priority
II-3	Maintenance
II-4	
II-5	Operator
II-6	Data Tx
II-7	Without transf.
II-8	Data Tx
II-9	With priority
II-10	With transf.

Brazil Category	
Designation	Description
II-1	Assinante comum
II-2	Tarifa especial
II-3	Manutencao
II-4	Telef. publico
II-5	Telefonista
II-6	Equip. de dados
II-7	Serv. Internac.
II-8	Dados internac.
II-9	Com prioridade
II-10	Com transfer.

Mexico Category	
Designation	Description
II-1	No definido
II-2	Norm sin prior
II-3	Mantenimiento
II-4	No definido
II-5	ATME
II-6	Mantenimiento

Appendix B - Final Status Tables

Final Status ITU-T	
Designation	Description
B-1	
B-2	Send info tone
B-3	Line busy
B-4	Congestion
B-5	Unallocated
B-6	Line free, charge
B-7	Line free, no charge
B-8	Line out of order

Final Status Brazil	
Designation	Description
B-1	Livre, tarifar
B-2	Linha Ocupada
B-3	Numero Mudado
B-4	Congestionado
B-5	Livre s/tarifar
B-6	Reter p/chamado
B-7	Numero vago
B-8	

Final Status Mexico	
Designation	Description
B-1	Libre
B-2	Linea ocupada
B-3	No definido
B-4	Congestion
B-5	Libre, no cobre