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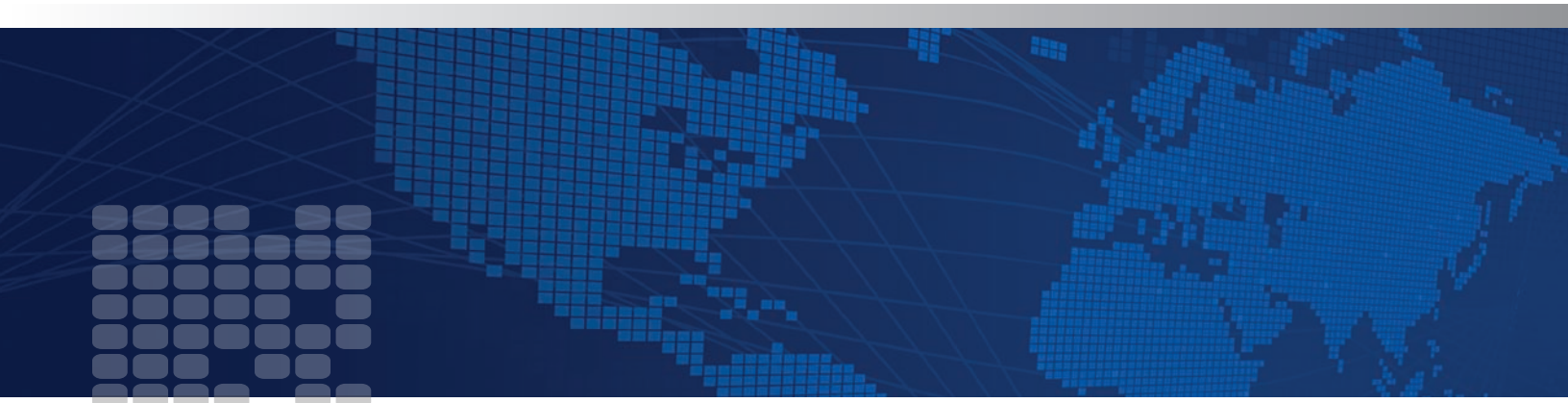

5300CI SMPTE Timecode Interface

Instruction Manual

Edition A
175-100134-00

5300CI

SMPTE COMPUTER TIME CODE INTERFACE

INSTRUCTION MANUAL

FCC COMPLIANCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, and can radiate, radio frequency energy, and, if not installed and used in accordance with standard installation procedures and instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

5300CI

SMPTE COMPUTER TIME CODE INTERFACE

INSTRUCTION MANUAL

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SECTION 1: Introduction

The 5300CI SMPTE Computer Time Code Interface provides simple-to-use SMPTE time code reading, or reading and generation, for IBM® PCs, ATs, and compatibles. It has its own built-in CPU, and does not require background processes that may interfere with other resident software. This card has two models: the 5300CI and the 5300CI-G.

Both the 5300CI and the 5300CI-G can be used as SMPTE longitudinal time code readers. These cards can read time code, and display it on the screen as hours, minutes, seconds, and frames. The reader is compatible with all formats of the SMPTE longitudinal time code.

The 5300CI-G is also designed to generate SMPTE longitudinal time code, allowing the user to set the start time and stop time code generation. Time code generation can continue while other programs are being executed on the PC. Please note that the reader and generator functions are mutually exclusive; that is, they cannot operate simultaneously.

In addition, both models of the 5300CI can be used to synchronize the clock in an IBM® PC, AT, or compatible to house (or Master) time distributed via SMPTE. With its generator function, the 5300CI-G can also serve as a source for house time.

SECTION 2: Operational Modes

2.1 5300CI SMPTE Computer Time Code Interface

2.1.1 Time Code Reader

The 5300CI can be used as a direct SMPTE time code reader, using the program SMPTE.EXE on the support software distribution disk. Running the SMPTE program brings up a reader menu. The F10 key is used to exit the program.

> ***NOTE: The reader program does not use interrupts.***

When in the reader menu, the card is configured as a SMPTE time code reader. The current time code is displayed as read at the bottom of the menu. If no time code is being fed to the card, the words NO SMPTE are displayed instead.

2.1.2 Time Code Synchronizer

The 5300CI can be used to synchronize the PC internal clock to a house time source distributed via time code. The program SMPTESET.COM performs this function.
SMPTESET is invoked by the following command line: SMPTESET /x where x is the interrupt number to be used by the card. This interrupt is set by Jumper J1 on the card. The interrupt to use is dependent upon the availability in a particular machine. Normal interrupt uses are as follows:

Interrupt	PC Usage	AT Usage
2	Usually free	Reserved
3	COM2	COM2
4	COM1	COM1
5	Fixed Disk	Free
6	Diskette Controller	Diskette Controller
7	LPT1	LPT1

The recommended interrupt selections are 2 in PCs and 5 in ATs. Jumper the card correctly prior to its insertion in the machine. If Interrupt 2 is used, type: SMPTESET /2. If Interrupt 5 is used, type: SMPTESET /5.
Once started, the SMPTESET program remains in memory, occupying less than 1KB. It keeps the system time equal to the received time at all times.
The SMPTESET program can also be started automatically each time the computer is booted by inserting the above command line in the computer's AUTOEXEC.BAT file. This will cause the computer to lock to the external SMPTE signal, if available, each time the system is turned on.

> ***NOTE: The program SMPTE cannot be run while SMPTESET is running, since this program assumes control of the 5300CI.***

2.2 5300CI-G SMPTE Computer Time Code Interface

2.2.1 Time Code Reader/Generator

The 5300CI-G can be used as a direct SMPTE time code reader/generator. The program SMPTE.EXE on the support software distribution disk allows the card to be used as either a time code reader or generator. Running the SMPTE program brings up one of two menus: a reader or a generator menu. The F1 is used to toggle between the menus. The F10 key is used to exit the program.

> ***NOTE: The reader/generator program does not use interrupts.***

2.2.1.1 Time Code Reader

When in the reader menu, the 5300CI-G is configured as a SMPTE time code reader. The current time code is displayed as read at the bottom of the menu. If no time code is being fed to the card, the words NO SMPTE are displayed instead.

2.2.1.2 Time Code Generator

When in the generator menu, the 5300CI-G is configured as a SMPTE time code generator. The generator menu has several options. The generation of time code can be started and stopped with the F2 and F3 keys, respectively. The operation of these keys is similar to the start and stop functions on a standard tape deck. The F4 key allows the user to enter a new time code. If the generator is running at the time this function is selected, it will be stopped so that the user can enter the new time code. The generator must then be restarted by pressing F2.

The F5 key stops the generator and presets the time code to 1:00:00/00. This is a common start time for programs that utilize time code. Starting a program at this point ensures that the program will not cross 0:00:00/00 (a problem for some synchronizers), but will have some room at the beginning for adding lead-ins, etc. Following the preset, the generator must be restarted by pressing F2.

The F6 key synchronizes the time code generator to the PC clock. This makes it easy to synchronize two or more PCs to the same time. The generator restarts immediately.

> ***NOTE: The generator does not stop upon exiting from the SMPTE program. The generator continues to operate in a background even after the program has been exited.***

2.2.2 Time Code Synchronizer

The 5300CI-G can be used to synchronize the PC internal clock to a house time source distributed via time code. The program SMPTESET.COM performs this function.
SMPTESET is invoked by the following command line: SMPTESET /x where x is the interrupt number to be used by the card. This interrupt is set by Jumper J1 on the card. The interrupt to use is dependent upon the availability in a particular machine. Normal interrupt uses are as follows:

Interrupt	PC Usage	AT Usage
2	Usually free	Reserved
3	COM2	COM2
4	COM1	COM1
5	Fixed Disk	Free
6	Diskette Controller	Diskette Controller
7	LPT1	LPT1

The recommended interrupt selections are 2 in PCs and 5 in ATs. Jumper the card correctly prior to its insertion in the machine. If Interrupt 2 is used, type: SMPTESET /2. If Interrupt 5 is used, type: SMPTESET /5.
Once started, the SMPTESET program remains in memory, occupying less than 1KB. It keeps the system time equal to the received time at all times.
The SMPTESET program can also be started automatically each time the computer is booted by inserting the above command line in the computer's AUTOEXEC.BAT file. This will cause the computer to lock to the external SMPTE signal, if available, each time the system is turned on.

2.2.3 Time Code Synchronized Generator

The 5300CI-G can be used to generate time code synchronized to the PC internal clock in order to serve as a house time source. The program SMPTEGEN.COM performs this function.
SMPTEGEN is invoked by the following command line: SMPTEGEN /x where x is the interrupt number to be used by the card. This interrupt is set by Jumper J1 on the card. The interrupt to use is dependent upon the availability in a particular machine. Normal interrupt uses are as follows:

Interrupt	PC Usage	AT Usage
2	Usually free	Reserved
3	COM2	COM2
4	COM1	COM1
5	Fixed Disk	Free
6	Diskette Controller	Diskette Controller
7	LPT1	LPT1

The recommended interrupt selections are 2 in PCs and 5 in ATs. Jumper the card correctly prior to its insertion in the machine. If Interrupt 2 is used, type: SMPTEGEN /2. If Interrupt 5 is used, type: SMPTEGEN /5.
Once started, the SMPTEGEN program remains in memory, occupying less than 1KB. It keeps the generated time equal to the system time at all times. Normally, SMPTEGEN will be installed in the computer's AUTOEXEC.BAT file.

NOTE: The program SMPTE cannot be run while either SMPTESET or SMPTEGEN are running, since these programs assume control of the 5300CI-G.

SECTION 3: Hardware Details

3.1 Input/Output Connections

The time code input is a balanced audio input. Pins 2 and 3 of the DB-15 connector are for input, with Pin 1 used for ground. Polarity is not important on the input or output. If an unbalanced input is used, ground the other input pin.
Time code output is on Pins 5 and 6, with Pin 4 being the associated ground. The input and output levels are preset to 0 dBm.

3.2 Setting the Output Level

The time code output left is preset at the factory to 0 dBm. This level can be adjusted by varying the setting of R20. This pot is labeled OUT on the card.
With the card in the generator mode, adjust R20 until the desired level, as measured on the output terminals, is achieved. Turning the control to the right increases the output level. It is recommended that this adjustment be made with the card connected to normal output termination (600 Ω).

3.3 Setting the Input Level

The input level control, R6, is adjusted at the factory for maximum capture range. Field adjustment should not be necessary, and is not recommended.

3.4 DIP Switch Settings

The 5300CI and 5300CI-G SMPTE Computer Time Code Interfaces have been preconfigured to an address of 310h. The software included with the card expects it to be at that address. The correct DIP switch settings, should they be changed accidentally, are as follows:

Switch	Setting
1	ON
2	ON
3	OFF
4	ON
5	ON
6	ON
7	OFF
8	OFF

SECTION 4: Other Software-Accessible Features

NOTE: This information is furnished as a courtesy to users of the 5300CI and 5300CI-G SMPTE Computer Time Code Interfaces who may wish to make use of additional features of the card that are not available with the standard software provided. Utilization of the information supplied herein may require proficiency in computer programming.

No warranty is provided on the information or features described herein, nor will any further support of any kind be given except on a custom basis at additional cost. Modifications to the 5300CI and 5300CI-G may be made without notification, and there are no guarantees that the software features described herein will be supplied or supported in the future.

4.1 Interrupt

The following information is necessary when using the 5300CI in a customized programming environment.

1) The interrupt is jumper-settable on the card, and is usually set to 5.

2) The I/O address is 310h (DIP Switch selected). There is only one address.

3) The interrupt is generated immediately following time code receptions, where the seconds field is 30, and the frames field is 0.

4) Additional interrupt options are available at the beginning and end of time code, and upon response to the PC system.

5) Interrupts are also generated when time code is lost and regained.

6) Time is set once per minute.

4.2 Commands

The procedure for sending a command to the 5300CI is as follows:

1) Output the command to 310h.

2) Read 310h, and wait for the commands response. This step is required if a fast PC is used. The response time is several milliseconds.

3) To avoid a BUSY WAITING FOR COMMAND response, the card can be set to generate an interrupt upon response, allowing for a fully interrupt-driven support routine.

Command	Description	Response
commandPC	Receives commands from the PC and executes them.	
0000xxxx	Set Frame units	24h
0001xxxx	Set User Group 1, 4 bits	25h
001000xx	Set Frame tens	26h
0011xxxx	Set User Group 2, 4 bits	27h
0100xxxx	Set Seconds units	24h
0101xxxx	Set User Group 3, 4 bits	25h
01100xxx	Set Seconds tens	26h
0111xxxx	Set User Group 4, 4 bits	27h
1000xxxx	Set Minutes units	24h
1001xxxx	Set User Group 5, 4 bits	25h
10100xxx	Set Minutes tens	26h
1011xxxx	Set User Group 6, 4 bits	27h
1100xxxx	Set Hours units	24h
1101xxxx	Set User Group 7, 4 bits	25h
111000xx	Set Hours tens	26h
1111xxxx	Set User Group 8, 4 bits	27h
28h	Clear enhanced (29h — 2fh) features	28h
29h	Set host interrupt on each response	29h
2ah	Set host interrupt at end of time code	2ah
2bh	Set host interrupt at start of time code	2bh
2ch	Set writes to buffer time	2ch
2dh	Set writes to generator time	2dh
2eh	Set buffer time valid for send	2eh
2fh		
e8h	Rec Time read request	e8h
e9h	Gen Time read request	e9h
eah	Set stopped mode	eah
ebh	Set receive mode	ebh
ech	Set generating mode	ech
edh	Get current mode	eah, ebh, ech
Dummy Commands for Synchronization		
eeh	Dummy Command	eeh
efh	Dummy Command	efh

Command	Description	Response
68h	Read rfru - Frame units	0000xxxx
69h	Read rug1 - User Group 1, 4 bits	0001xxxx
6ah	Read rfrt - Frame tens	001000xx
6bh	Read rug2 - User Group 2, 4 bits	0011xxxx
6ch	Read rsecu - Seconds units	0100xxxx
6dh	Read rug3 - User Group 3, 4 bits	0101xxxx
6eh	Read rsect - Seconds tens	01100xxx
6fh	Read rug4 - User Group 4, 4 bits	0111xxxx
a8h	Read rminu - Minutes units	1000xxxx
a9h	Read rug5 - User Group 5, 4 bits	1001xxxx
aah	Read rmint - Minutes tens	10100xxx
abh	Read rug6 - User Group 6, 4 bits	1011xxxx
ach	Read rhru - Hours units	1100xxxx
adh	Read rug7 - User Group 7, 4 bits	1101xxxx
aeh	Read rhrt - Hours tens	111000xx
afh	Read rug8 - User Group 8, 4 bits	1111xxxx

Interrupt Status Values

68h	Time set interrupt (Seconds=30, Frames=0)
69h	Gained time code
6ah	Lost time code
6bh	End of time code interrupt (after User Group 8)
6ch	Start of time code interrupt (after last sync bit)

No SMPTE time code is indicated by a frame unit of h’f (normally impossible).

NOTE: Enhanced features 28h — 2fh and the interrupt status values were added in Firmware Revision 2.02, and are not available in earlier firmware revisions. Contact the factory for information on an update.

4.3 Initializing the Card

The procedure for initializing the card is as follows:

1) Send the Set Receive Mode command (ebh).

2) Set the interrupt vector in the PC.

3) Activate the interrupt vector in the PC (unmask).

4.4 Interrupt Handler

The Interrupt Handler does the following:

1) Reads time code from the card.

2) Sets the PC clock from time code.

4.5 Reading Time Code

1) Send the Rec Time read request (e8h). This causes the current time to be copied into a reading area. This is done to allow accurate asynchronous reads.

2) Read each 4-bit SMPTE group using commands 68h — afh. Obviously, if the user bits are not needed, it is not necessary to read them. These can be read in any order.

4.6 Miscellaneous Notes

1) Reading the card port clears the interrupt. You must also be sure to clear the PC interrupt controller (ie. out 20h,20h).

2) A lack of input time code is indicated by a frame unit of 0fh.

3) The 5300CI cannot send and receive at the same time.

4) The data read is raw, and includes drop frame, color bits, etc.

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