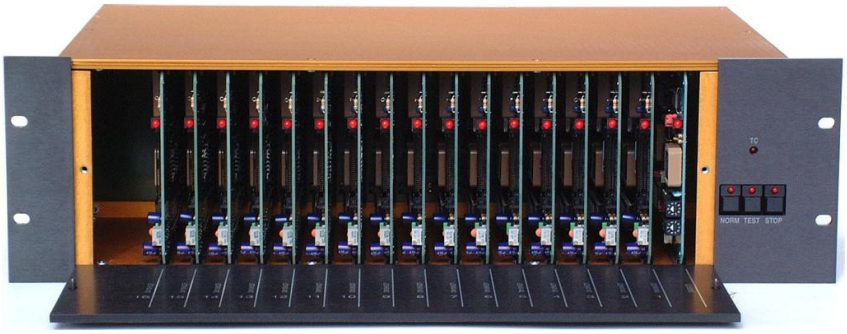
Nuoptix Solid State
Digital Audio Products

Product Features
Product Specifications

Technical Information
Application Notes

Type 3 Playback Unit



Type 4 Playback Unit

Type 5 Playback Unit

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revised: April 25, 2022

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Overview

Nuoptix Solid State Digital Audio Systems are the worlds most widely used solution for ultra high quality and high reliability professional digital audio sound applications such as theme park rides, parades, and announcement systems. Nuoptix solid state digital audio systems can be synchronized to virtually any timecode based system such as SMPTE. Nuoptix digital audio systems provide true audiophile quality without limitation on the number of channels or run time. Nuoptix systems can provide theme park wide or full parade synchronization using a single Nuoptix DTMF based broadcast synchronization signal. Nuoptix systems are compatible with all professional and PC based digital audio recording and editing systems. Furthermore, the Nuoptix modular design approach provides complete flexibility in system design. For applications from a single 5 second sound effect to a 100 channel 96 minute long theme park wide sound extravaganza locked to film running 50 times a day for the next 20 years, Nuoptix is the solution.

Nuoptix manufactures three varieties of digital audio packages.
1) A 5 channel, 1¾" tall (standard 1U 19" rack mount) system.
2) A 16 channel, 5¼" tall (standard 3U 19" rack mount) system.
3) A stereo channel, 2" tall x 4.6" wide x 10½ deep unit.
All electronics are contained on 4½" x 6" plug in cards to facilitate programming.

Both versions provide up to 96 minutes of 16 bit high quality audio per channel using currently available Compact Flash (CF) memory modules. All channels can be synchronized to "follow timecode". The timecode can be either Nuoptix DTMF timecode or SMPTE 30 frame non-drop timecode. Channels not used to "follow timecode" can be used for synchronous or non-synchronous applications. These channels are triggered by a simple external "closure to ground". The units can also accept RS232 commands for control in applications not requiring timecode synchronization.

Multiple units can be controlled/synchronized by a single timecode signal. These systems were designed for remote multi-channel synchronous operation such as parades with FM broadcast using the Nuoptix DTMF timecode synchronizing signal. A narrow bandwidth FM channel is all that is required to transmit the Nuoptix DTMF timecode signal. This system is applicable to any remote and multiple-channel solid state digital audio application.

Stand Alone Sound Boards

Using Compact Flash Memory

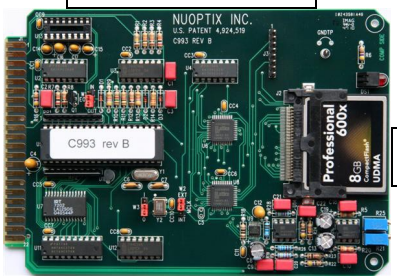
Part Numbers:

- C990 plays standard mono only linear PCM wave files
- C993 plays standard stereo or mono linear PCM wave files

Features:

- Plays standard wave files
- Ultra High Fidelity, professional quality
- Long play times, up to 25 hours for mono
- Single card solution
- Solid State digital audio, using Non-Volatile memory
- Low power consumption, <1watts
- Ultra high reliability in all environments
- Five year warranty
- Simple closure for Start and Stop operation
- On board Volume control
- On board Play indicator lamp
- Uses standard 44 card edge connector
- Internal or external master clock
- Uses standard Compact Flash technology
- Uses standard PC audio .wav files
- Easy to re-program
- Can synchronize to SMPTE or Nuoptix DTMF timecode using the C992 card
- Ideal for multi-channel professional applications
- Compatible with all professional digital audio editing systems
- Automatically stops at end of message
- Supports FAT16/32 up to 32GB
- RoHS Compliant

Stereo version



C993

Specifications:

Playtimes:	25 hours for mono @ 44,100 sample rate
Size:	4½ x 6½"
Power Req:	+5VDC @ 150mA (total power <0.7watts)
THD(1KHz):	<0.001%
Bandwidth:	20KHz
S/N ratio:	96db - 'C' weighted (internal oscillator)
Output:	unbalanced, $5V_{p-p}$=FS no load, drives 600Ω FS
Resolution:	16 Bits

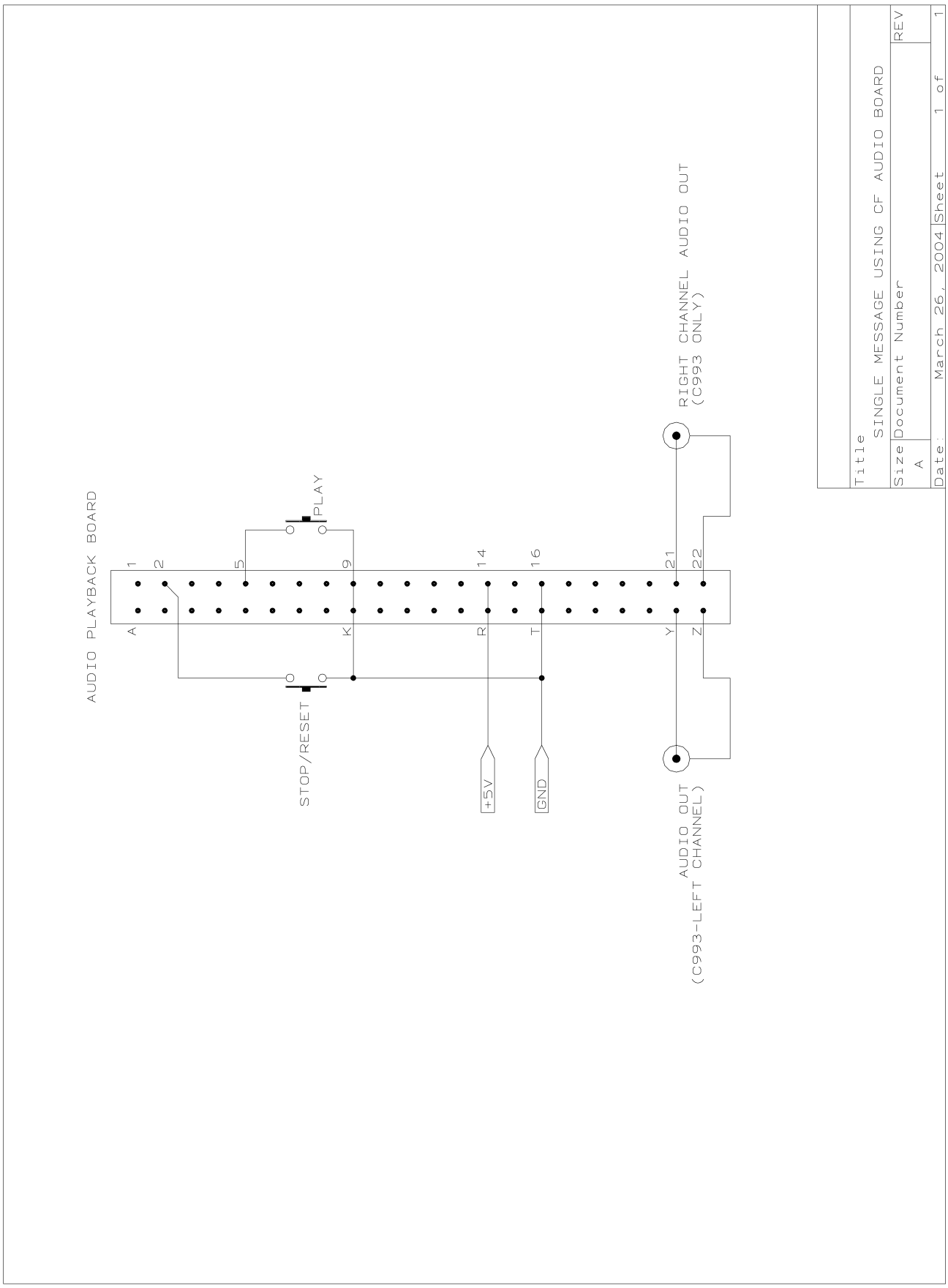
Stand Alone Sound Board Using CF Memory

Name	Pin#		Name
N/C	**A**	**1**	FACLK
N/C	**B**	**2**	Reset In
N/C	**C**	**3**	MCLK In
N/C	**D**	**4**	N/C
N/C	**E**	**5**	Start In
N/C	**F**	**6**	N/C
Run Out	**H**	**7**	N/C
EOF Out	**J**	**8**	Error
Gnd	**K**	**9**	Gnd
N/C	**L**	**10**	N/C
FASD	**M**	**11**	N/C

Name	Pin#		Name
N/C	**N**	**12**	N/C
N/C	**P**	**13**	N/C
+5V	**R**	**14**	+5V
N/C	**S**	**15**	N/C
Gnd	**T**	**16**	Gnd
N/C	**U**	**17**	N/C
N/C	**V**	**18**	N/C
N/C	**W**	**19**	N/C
N/C	**X**	**20**	N/C
Audio L Out	**Y**	**21**	Audio R Out
Com	**Z**	**22**	Com

Name	I/O	Active	Description
Audio Out	O		Audio Output, <500Ω unbalanced. ($5V_{p-p}$=100%)
Reset In	I	Low	Low on this pin resets the address counter and stops the audio.
MCLK	I		Master clock, 256x sample rate.
Start	I	Low	Low on this pin starts the audio playing.
Run	O	High	High while card is running. Open collector, sources 100ma.
EOF Out	O	Low	Goes low 0.150uS after last sample or end of file mark. Used for looping and connects to the C992 controller board.
+5V	I		Power input. +5volts @ 190mA
Com	I		Analog common
Gnd	I		Digital ground
N/C			Unused pin. Leave unconnected.
FACLK	I		Fast access clock. Data clocked on falling edge.
FASD	I		Fast access serial data. 20 bits, MSB first. One fast access = one sector or 512 bytes.

Once the board has started, the sound file will play to the end then stop. Hold the Start pin low to loop.
W1: Shunt over IN for stand alone use. Shunt over OUT for use with the C992 controller card. This jumper IN allows the "end of file mark" to reset the card.
W2: Shunt over INT for stand alone use. Shunt over EXT for use with the C992 controller card. This jumper selects either the Internal master clock or an External master clock. (256x Sample Rate).


AUDIO PLAYBACK BOARD
1
2
5
9
14
16
21
22
A
K
R
T
Y
Z
PLAY
STOP/RESET
+5V
GND
RIGHT CHANNEL AUDIO OUT
(C993 ONLY)
AUDIO OUT
(C993-LEFT CHANNEL)
Title
SINGLE MESSAGE USING CF AUDIO BOARD
Size
A
Document Number
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Date
March 26, 2004
Sheet
1 of
1

Timecode Reader Boards

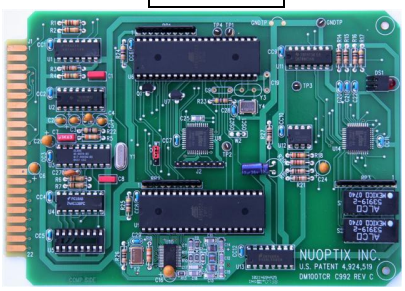
Part Number:

- C992 (replaces the older C977 card)

Features:

- Resolves to SMPTE 30FND, or Nuoptix DTMF* timecode
- Direct Digital Synthesis (DSS), Digital PLL
- On board RS232 serial communications port
- Timecode indicator lamp
- On-board delay offset switches for 30FND modes
- 44,100 or 48,000 sample rates available
- Low power consumption, <0.7watts
- Continuous operation
- Uses standard 44 card edge connector
- RoHS Compliant

C992



Specifications:

Size:	4½ x 6½"
Power Req:	+5VDC @ 130mA

*DTMF timecode can be used to synchronize multiple channels to radio or telephone line using a proprietary DTMF timecode for full parade or theme park ride synchronization.

Select one of the following options when ordering:

- Read DTMF-F, Output SR=44100 (for parade float use)
- Read DTMF-F, Output SR=48000 (for parade float use)
- Read DTMF-S, Output SR=44100 (for parade float use)
- Read DTMF-S, Output SR=48000 (for parade float use)
- Read SMPTE 30FND, Output SR=44100 (for either parade float or CCF use)
- Read SMPTE 30FND, Output SR=48000 (for either parade float or CCF use)
- RS232 controlled, Output SR=44100 (for CCF use)
- RS232 controlled, Output SR=48000 (for CCF use)

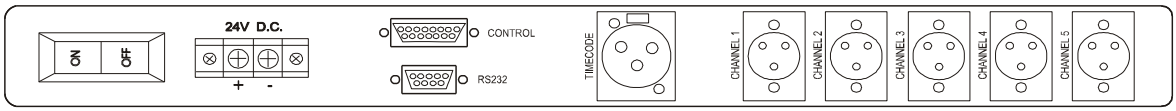
Timecode Reader Boards

Name	Pin#		Name
End Mark Disable	**A**	**1**	FACLK
N/C	**B**	**2**	Reset
MCLK Out	**C**	**3**	Em
Run In	**D**	**4**	Ext TC LED
Normal In	**E**	**5**	Test In
Stop In	**F**	**6**	Stop/Rst Out
RS232 Out	**H**	**7**	Error In
RS232 In	**J**	**8**	N/C
Gnd	**K**	**9**	Timecode
N/C	**L**	**10**	N/C
FASD	**M**	**11**	N/C

Name	Pin#		Name
N/C	**N**	**12**	N/C
N/C	**P**	**13**	N/C
+5V	**R**	**14**	+5V
Start 2	**S**	**15**	Start 1
Start 4	**T**	**16**	Start 3
Start 6	**U**	**17**	Start 5
Start 8	**V**	**18**	Start 7
Stop 2	**W**	**19**	Stop 1
Stop 4	**X**	**20**	Stop 3
Stop 6	**Y**	**21**	Stop 5
Stop 8	**Z**	**22**	Stop 7

Name	I/O	Active	Description
Timecode	I		This is timecode input either Nuoptix DTMF or SMPTE. $2V_{pp}$ max for DTMF and $5V_{pp}$ for other.
Em	I	Low	Low on this pin plays an emergency message.
RS232 In	I		RS232 serial data in. 9600,N,8,1
RS232 Out	O		RS232 serial data out. 9600,N,8,1
Error	I	Low	When low this input stops the audio and resets the system.
Run	I	Low	When low this input stops the audio and resets the system.
Normal In	I	Low	Low on this pin puts unit in Normal Mode.
Test In	I	Low	Low on this pin puts unit in Test Mode.
Stop In	I	Low	Low on this pin puts unit in Stop Mode.
N/C			Unused pin.
Ext TC LED	O	Low	This output is used to illuminate an external TC LED.
Reset	O	Low	This output is not used.
Stop Out	O	Low	This output stops external memory expander boards.
MCLK	O		256x Sample Clock phased locked to incoming timecode.
Start 1-8	O	Low	This output used to start external memory expander cards.
Stop 1-8	O	Low	This output used to stop external memory expander cards.
+5V	I		Power input. +5volts @ 130mA
Gnd	I		Ground
Loop Mark Dis	I	Low	This input disables LoopMark used for looping
FACLK	O		This clocks fast access data on falling edges.
FASD	O		This 20 bit data advances the audio. One fast access = one sector or 512 bytes.

The Type 3 Playback Unit



Rear Panel View

This unit has five outputs and comes in a 1¾" (1U) tall rack mount case. Up to five channels can operate in either "follow timecode mode" for sync operation or "RS232" mode. The remaining channels can be independently triggered for non-sync applications.

The timecode can be either Nuoptix DTMF timecode or SMPTE 30FND timecode. The type 3 case can provide up to 96 minutes of audio per channel.

This unit can accommodate up to five Nuoptix audio cards. It requires one C992 timecode reader/controller. The timecode reader/controller can operate in either timecode mode or RS232 control mode.

The timecode reader/controller card checks for audio errors while playing. If any errors are detected, the controller will re-sync accordingly. This is another built in failsafe feature of the system.

These chassis are now manufactured RoHS compliant.

Connections

POWER INPUT: This unit can operate from 18-36 VDC (24 VDC Nominal) @ 3 amps MAX. **Warning**: Inadvertently reversing the polarity will permanently damage the power supply. Models which operate 100-240 VAC 50/60Hz are also available. The input connector is located on the back panel. The power switch is also a circuit breaker.

AUDIO OUTPUTS: All audio outputs are unbalanced with a 600Ω impedance. Male 3 Pin XLR connectors are used with pin 2 high and pins 1 and 3 ground.

TIMECODE INPUT: Timecode input uses a 3 pin female XLR connector with pin 2 high and pins 1 and 3 ground. Input is unbalanced with a 10KΩ impedance. The DTMF receiver accepts a wide range of input levels from 0.1 to 2.0 V_{p-p} ($1V_{p-p}$ nominal). The DTMF signals must not be clipped or compressed.

THE CONTROL CONNECTOR: The connector is a female 15 pin 'D' connector labeled CONTROL on the rear panel. This input is used for the following functions:

NON-SYNC CHANNEL START: These inputs are used to "trigger" the remaining non-sync channels. The inputs are active low and require a "closure to ground". The inputs are internally pulled up with a 20KΩ to +5 volts.

Pin 1-Channel 1 start
Pin 2-Channel 2 start
Pin 3-Channel 3 start
Pin 4-Channel 4 start
Pin 5-Channel 5 start

EXTERNAL MODE SWITCH: These inputs are a remote for the three front panel mode switches. The inputs are active low and require a "closure to ground". The inputs are internally pulled up with a 10KΩ to +5 volts.

Pin 6-NORM
Pin 7-TEST
Pin 8-STOP

SPECIAL PURPOSE INPUT: This input can be used for special applications. Contact Nuoptix for details. The input is active low and requires a "closure to ground". The input is internally pulled up with a 1KΩ to +5 volts.

Pin 9-SPECIAL INPUT

DISABLE LOOPMARK: This input is used to disable "LoopMark" for CCF applications. The input is active low and requires a "closure to ground". A closure to ground will cause the unit to ignore the "LoopMark" and therefore disable looping. The input is internally pulled up with a 1KΩ to +5 volts. Contact Nuoptix for details.

Pin 10-DISABLE LOOPMARK

POWER and GROUND:

Pin 12 → +5 Volts
Pins 13-15 → GROUND

Card Installation and Motherboard Jumpers

Install the C992 timecode reader/controller card in slot J0 with the components facing upward. Install the remaining slots with the required number of Nuoptix C990 audio cards starting with J1 and going up to J5. If timecode or RS232 commands are to be used, the associated audio card must be installed first starting with J1. Any channels triggered by a "closure to ground" must be installed after the timecode/RS232 channels. Remove the top cover by unscrewing all the screws on the top cover.
Each audio channel has three shunt settings, W?A, W?B and W?C where '?' is the channel number. For channels that are to be triggered externally, via a "closure to ground", place all three shunts over the right two pins.
For all other channels, place the shunts over the left two pins.
If all 5 channels are to be used with timecode or RS232 control, place a shunt over the right two pins of W6 (labeled OUT); otherwise, set shunt over the left two pins (labeled IN). Now you can put the top cover back on.

Operation

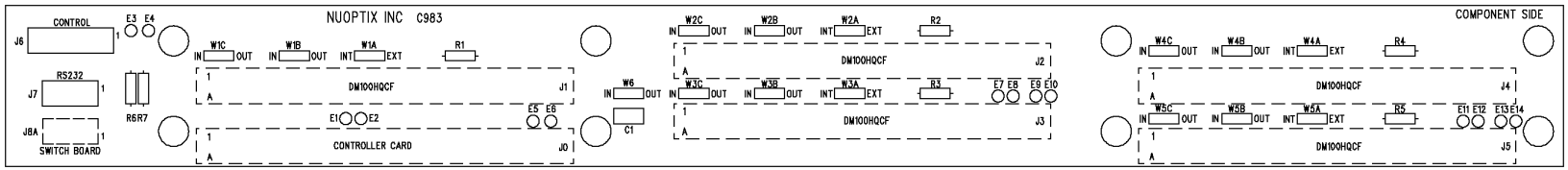
Power the unit ON by toggling the power switch on the rear panel to the ON position. The unit will default to the NORM mode as indicated by the light above the NORM switch on the front panel.

NORM mode: When in the NORM mode the synchronous channels will "follow timecode" or accept applied "RS232" commands depending on the application. The non-sync channels can be triggered by an external "closure to ground" on the appropriate input pin. The light above the NORM switch will be lit.

TEST mode: When the TEST button is pressed the unit will start all synchronous channels from the beginning and will ignore external timecode and RS232 commands. These channels will play to the end and loop continuously. The remaining non-sync channels will not play by pressing the TEST button. They will only start with an external input as mentioned above. The light above the TEST switch will be lit.

STOP mode: When the STOP button is pressed all channels will stop. All synchronous channels will ignore external timecode and RS232 commands; however, the remaining non-sync channels can be restarted with an external "closure to ground" after the STOP button is pressed. The light above the STOP switch will be lit.

The red light above the TEST switch indicates when valid timecode is being received.


NUOPTIX INC C983
COMPONENT SIDE
CONTROL
J6
RS232
J7
J8A
SWITCH BOARD
E3 E4
R6R7
W1C
W1B
W1A
R1
DM100HQCF
J1
E1 E2
E5 E6
CONTROLLER CARD
J0
W6
C1
W2C
W2B
W2A
R2
DM100HQCF
J2
W3C
W3B
W3A
R3
E7 E8 E9 E10
DM100HQCF
J3
W4C
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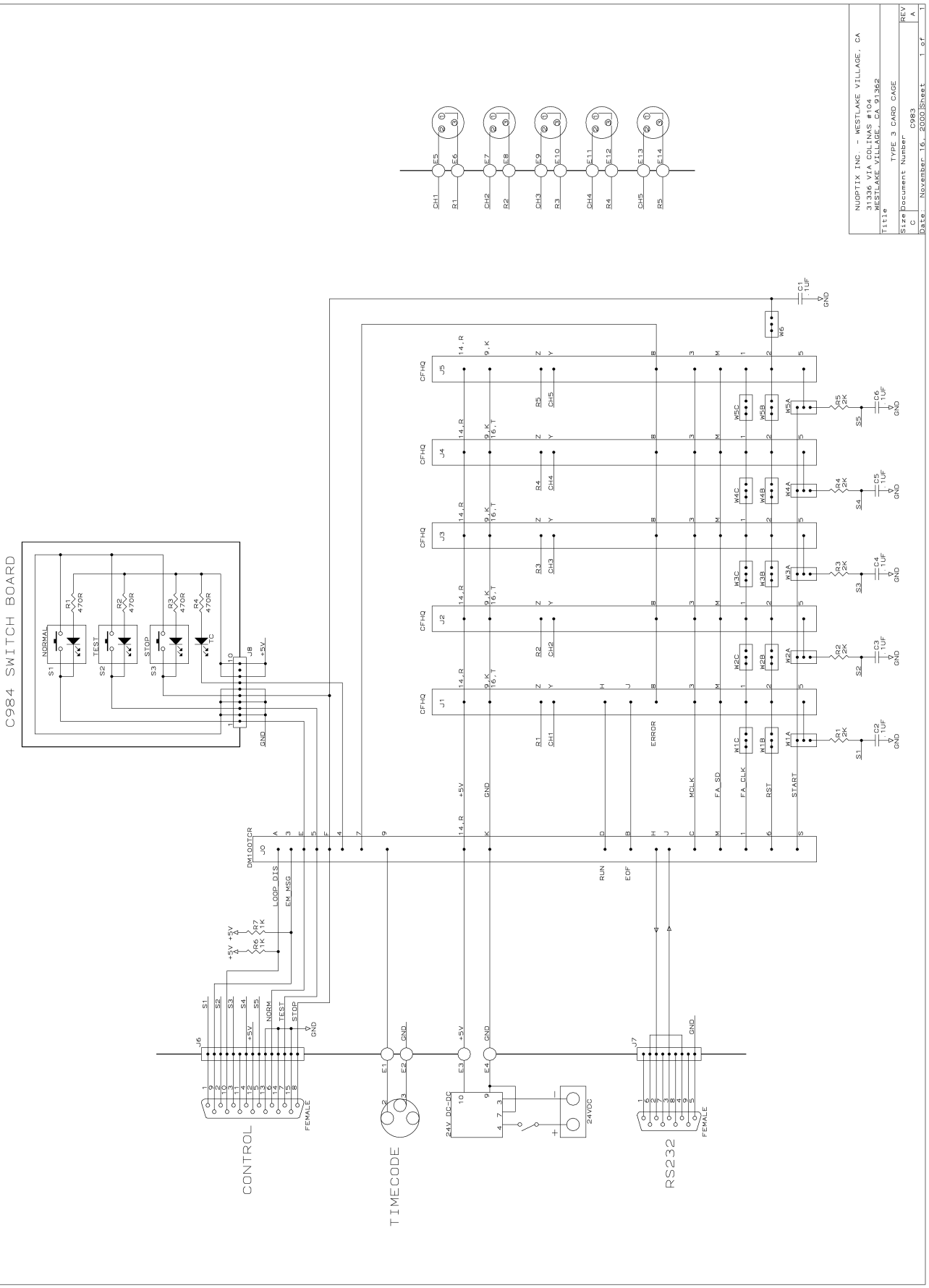
W5C
W5B
W5A
R5
E11 E12 E13 E14
DM100HQCF
J5


NUOPTIX INC. - WESTLAKE VILLAGE, CA
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 91362
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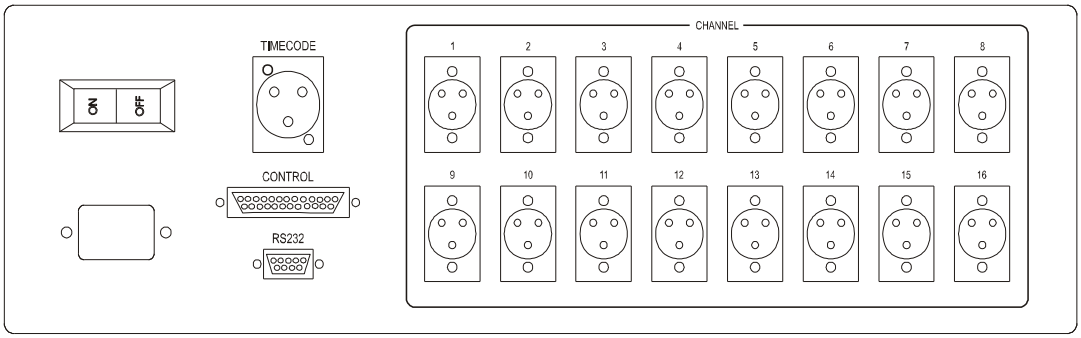
Size C Document Number C983 REV A
Date: November 16, 2000 Sheet 1 of 1
C984 SWITCH BOARD
NORMAL
TEST
STOP
TC
CONTROL
TIMECODE
RS232
24V DC-DC
24VDC
FEMALE
DM100TCR
CFHQ
LOOP DIS
EM MSG
ERROR
RUN
EOF
MCLK
FA_SD
FA_CLK
RST
START
+5V
GND

The Type 4 Playback Unit



Rear Panel View

This unit has sixteen outputs and comes in a 5¼" tall (3U) rack mount case. Up to sixteen channels can operate in either "follow timecode mode" for sync operation or "RS232" mode. The remaining channels can be independently triggered for non-sync applications.

The timecode can be either Nuoptix DTMF timecode or SMPTE 30FND timecode. The type 4 case can provide up to 96 minutes of audio per channel.

This unit can accommodate up to sixteen Nuoptix audio cards. It requires one C992 timecode reader/controller. The timecode reader/controller can operate in either timecode mode or RS232 control mode.

The timecode reader/controller card checks for audio errors while playing. If any errors are detected, the controller will re-sync accordingly. This is another built in failsafe feature of the system.

These chassis are now manufactured RoHS compliant.

Connections

POWER INPUT: This unit can operate from 18-36 VDC (24 VDC Nominal) @ 2 amps MAX. **Warning**: Inadvertently reversing the polarity will permanently damage the power supply. Models which operate 100-240 VAC 50/60Hz are also available. The input connector is located on the back panel. The power switch is also a circuit breaker.

AUDIO OUTPUTS: All audio outputs are unbalanced with a 600Ω impedance. Male 3 Pin XLR connectors are used with pin 2 high and pins 1 and 3 ground.

TIMECODE INPUT: Timecode input uses a 3 pin female XLR connector with pin 2 high and pins 1 and 3 ground. Input is unbalanced with a 10KΩ impedance. The DTMF receiver accepts a wide range of input levels from 0.1 to 2.0 V_{p-p} ($1V_{p-p}$ nominal). The DTMF signals must not be clipped or compressed.

THE CONTROL CONNECTOR: The connector is a female 25 pin 'D' connector labeled CONTROL on the rear panel. This input is used for the following functions:

NON-SYNC CHANNEL START: These inputs are used to "trigger" the remaining non-sync channels. The inputs are active low and require a "closure to ground". The inputs are internally pulled up with a 20KΩ to +5 volts.

Pin 1-Channel 1 start
Pin 2-Channel 2 start
Pin 3-Channel 3 start
Pin 4-Channel 4 start
Pin 5-Channel 5 start
Pin 6-Channel 6 start
Pin 7-Channel 7 start
Pin 8-Channel 8 start
Pin 9-Channel 9 start
Pin 10-Channel 10 start
Pin 11-Channel 11 start
Pin 12-Channel 12 start
Pin 13-Channel 13 start
Pin 14-Channel 14 start
Pin 15-Channel 15 start
Pin 16-Channel 16 start

EXTERNAL MODE SWITCH: These inputs are a remote for the three front panel mode switches. The inputs are active low and require a "closure to ground". The inputs are internally pulled up with a 10KΩ to +5 volts.

Pin 17-NORM
Pin 18-TEST
Pin 19-STOP

SPECIAL PURPOSE INPUT: This input can be used for special applications. Contact Nuoptix for details. The input is active low and requires a "closure to ground". The input is internally pulled up with a 1KΩ to +5 volts.

Pin 20-SPECIAL INPUT

DISABLE LOOPMARK: This input is used to disable "LoopMark" for CCF applications. The input is active low and requires a "closure to ground". A closure to ground will cause the unit to ignore the "LoopMark" and therefore disables looping. The input is internally pulled up with a 1KΩ to +5 volts. Contact Nuoptix for details.

Pin 21-DISABLE LOOPMARK

POWER and GROUND:

Pin 22 → +5 Volts
Pins 23-25 → GROUND

Card Installation and Motherboard Jumpers

Install the C992 timecode reader/controller card in slot J0 with the components facing upward. Install the remaining slots with the required number of Nuoptix C990 audio cards starting with J1 and going up to J16. If timecode or RS232 commands are to be used, the associated audio card must be installed first starting with J1. Any channels triggered by a "closure to ground" must be installed after the timecode/RS232 channels. Remove the top cover by unscrewing all the screws on the top cover.
Each audio channel has three shunt settings, W?A, W?B and W?C where '?' is the channel number. For channels that are to be triggered externally, via a "closure to ground", place all three shunts over the lower two pins.
For all other channels, place the shunts over the top two pins.
If all 16 channels are to be used with timecode or RS232 control, place a shunt over the lower two pins of W17 (labeled OUT); otherwise, set shunt over the top two pins (labeled IN). Now you can put the top cover back on.

Operation

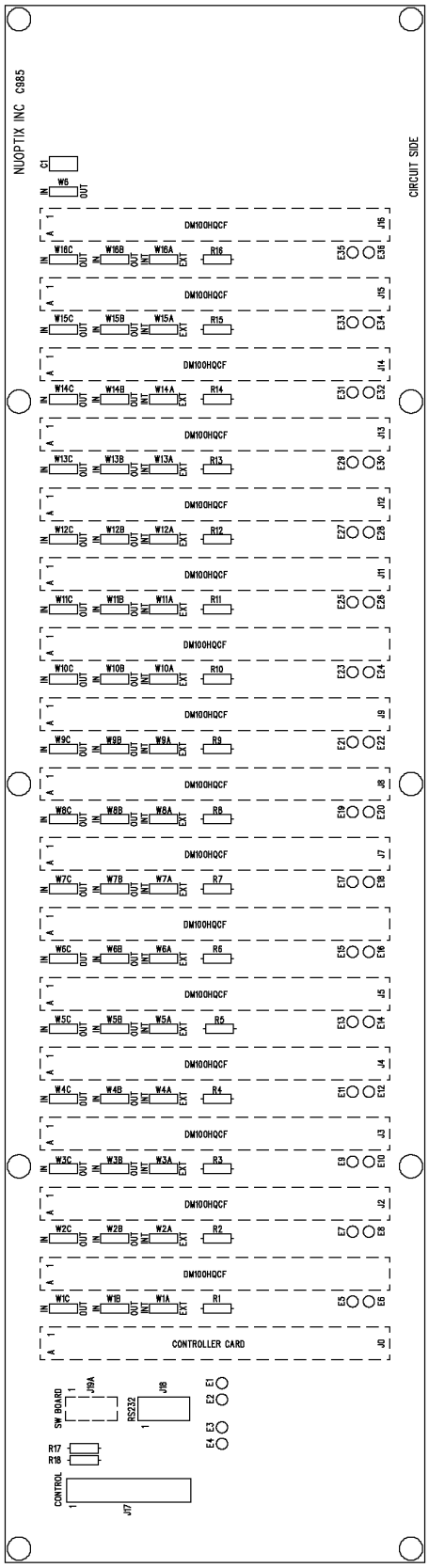
Power the unit ON by toggling the power switch on the rear panel to the ON position. The unit will default to the NORM mode as indicated by the light above the NORM switch on the front panel.

NORM mode: When in the NORM mode the synchronous channels will "follow timecode" or accept applied "RS232" commands depending on the application. The non-sync channels can be triggered by an external "closure to ground" on the appropriate input pin. The light above the NORM switch will be lit.

TEST mode: When the TEST button is pressed the unit will start all synchronous channels from the beginning and will ignore external timecode and RS232 commands. These channels will play to the end and loop continuously. The remaining non-sync channels will <u>not</u> play by pressing the TEST button. They will only start with an external input as mentioned above. The light above the TEST switch will be lit.

STOP mode: When the STOP button is pressed the all channels will stop. All synchronous channels will ignore external timecode and RS232 commands, however the remaining non-sync channels can be restarted with an external "closure to ground" <u>after</u> the STOP button is pressed. The light above the STOP switch will be lit.

The red light above the TEST switch indicates when valid timecode is being received.


NUOPTIX INC C985
CIRCUIT SIDE
C1
W6
DM100HQCF
J16
W16C
W16B
W16A
R16
E36
E35
J15
W15C
W15B
W15A
R15
E33
E34
J14
W14C
W14B
W14A
R14
E31
E32
J13
W13C
W13B
W13A
R13
E29
E30
J12
W12C
W12B
W12A
R12
E27
E28
J11
W11C
W11B
W11A
R11
E25
E26
W10C
W10B
W10A
R10
E23
E24
J9
W9C
W9B
W9A
R9
E21
E22
J8
W8C
W8B
W8A
R8
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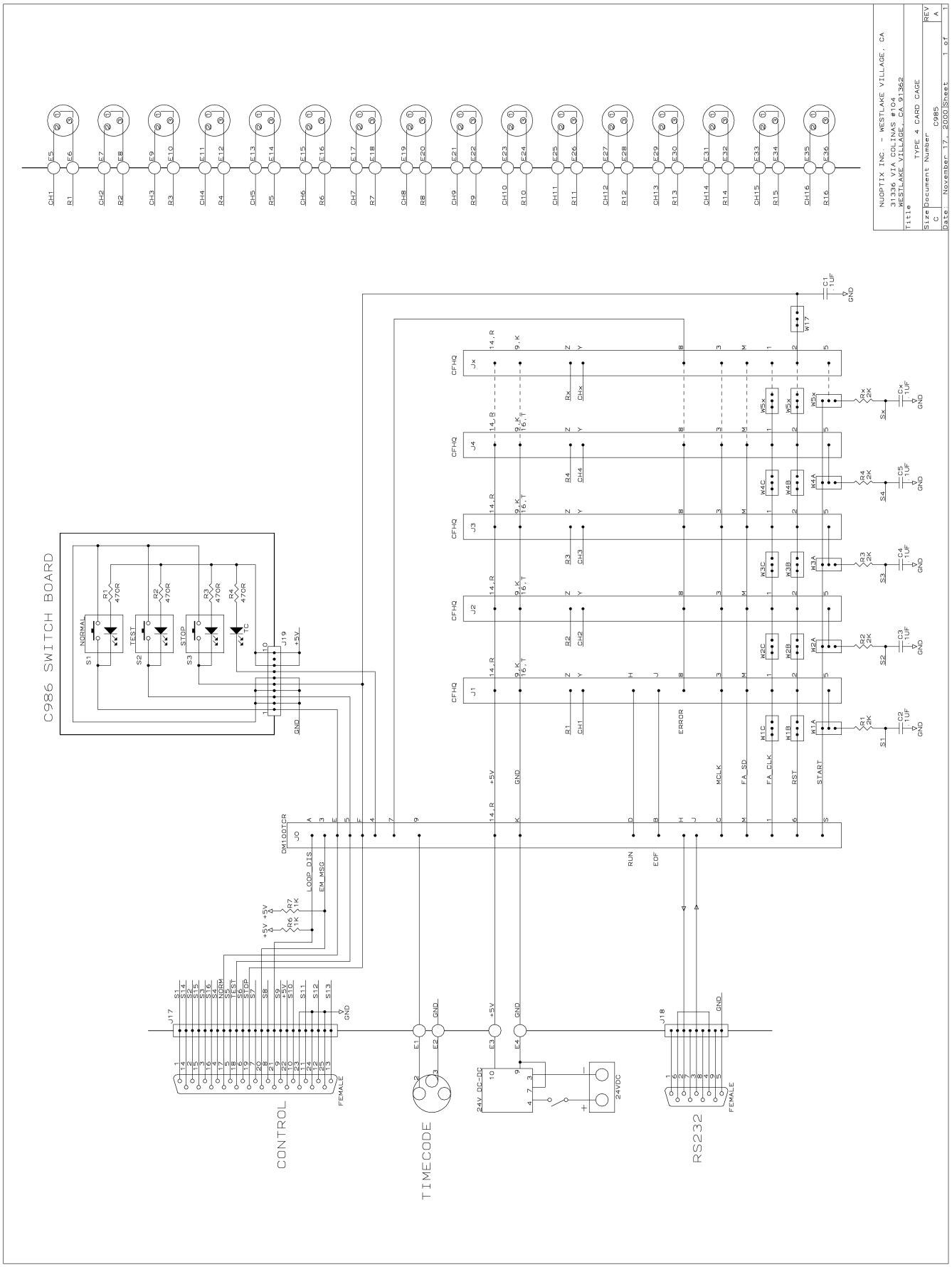
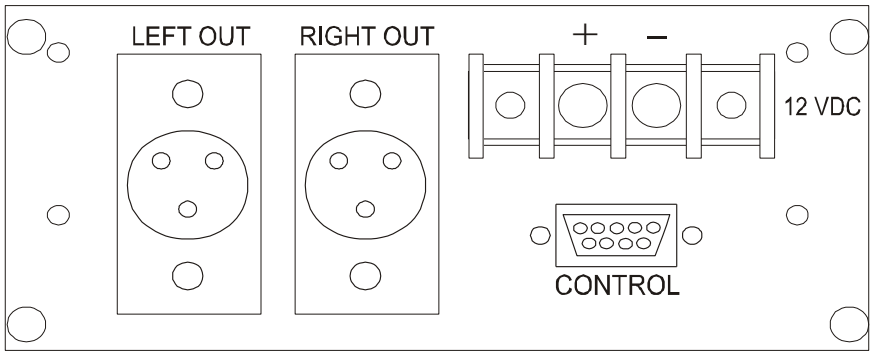
E20
J7
W7C
W7B
W7A
R7
E17
E18
W6C
W6B
W6A
R6
E15
E16
J5
W5C
W5B
W5A
R5
E13
E14
J4
W4C
W4B
W4A
R4
E11
E12
J3
W3C
W3B
W3A
R3
E9
E10
J2
W2C
W2B
W2A
R2
E7
E8
W1C
W1B
W1A
R1
E5
E6
CONTROLLER CARD
J0
SW BOARD
J19A
RS232
J18
E1
E2
E3
E4
R17
R18
CONTROL
J17


NUOPTIX INC. - WESTLAKE VILLAGE, CA
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 91362
Title TYPE 4 CARD CAGE
Size C Document Number C985 REV A
Date: November 17, 2000 Sheet 1 of 1
C986 SWITCH BOARD
CONTROL
TIMECODE
RS232
24V DC-DC
24VDC
FEMALE
DM100TCR
CFHQ
LOOP DIS
EM MSG
ERROR
RUN
EOF
MCLK
FA_SD
FA_CLK
RST
START
+5V
GND

The Type 5 Playback Unit



Rear Panel View

This unit has two outputs and comes in a 4.6" wide x 2" tall x 10½ deep enclosure. One stereo channel can operate in either "follow timecode mode" for sync operation or accept RS232 commands.

The timecode can be DTMF timecode or SMPTE 30FND timecode. This type 5 case can provide up to 48 minutes of stereo or 96 minutes of mono.

This unit requires one Nuoptix C993 playback card for stereo or mono operation. It also accepts one C992 timecode reader card for timecode sync operation. It does not require a C992 card for RS232 non-sync playback operation.

The C992 timecode reader/controller card checks for audio errors while playing. If any errors are detected, the controller will re-sync accordingly. This is another built in failsafe feature of the system.

These chassis are now manufactured RoHS compliant.

Connections

POWER INPUT: This unit can operate from 9-18 VDC (12 VDC Nominal) @ 1 amps MAX. **Warning**: Inadvertently reversing the polarity will permanently damage the power supply. The input connector is located on the back panel.

AUDIO OUTPUTS: Audio outputs are unbalanced with a 600Ω impedance. Male 3 Pin XLR connectors are used with pin 2 high and pins 1 and 3 ground.

THE CONTROL CONNECTOR: The connector is a female 9 pin 'D' connector labeled CONTROL on the rear panel. This input is used for the following functions:

RUN INDICATOR: This output is for an external LED which indicates when audio is playing.

Pin 1 - Run (open collector)

RS232 SIGNALS:

Pin 2 - RS232 out
Pin 3 - RS232 in

MODE SWITCH: These inputs are active low and require a "closure to ground". The inputs are internally pulled up with a 10KΩ to +5 volts.

Pins 4&5 - GROUND
Pin 6 - NORM
Pin 8 - STOP
Pin 9 - TEST

TIMECODE INPUT: This input is unbalanced with a 20KΩ impedance. The DTMF receiver accepts a wide range of input levels from 0.1 to 2.0 V_{p-p} ($1V_{p-p}$ nominal). The DTMF signals must not be clipped or compressed.

Pin 7 - Timecode input.

Operation

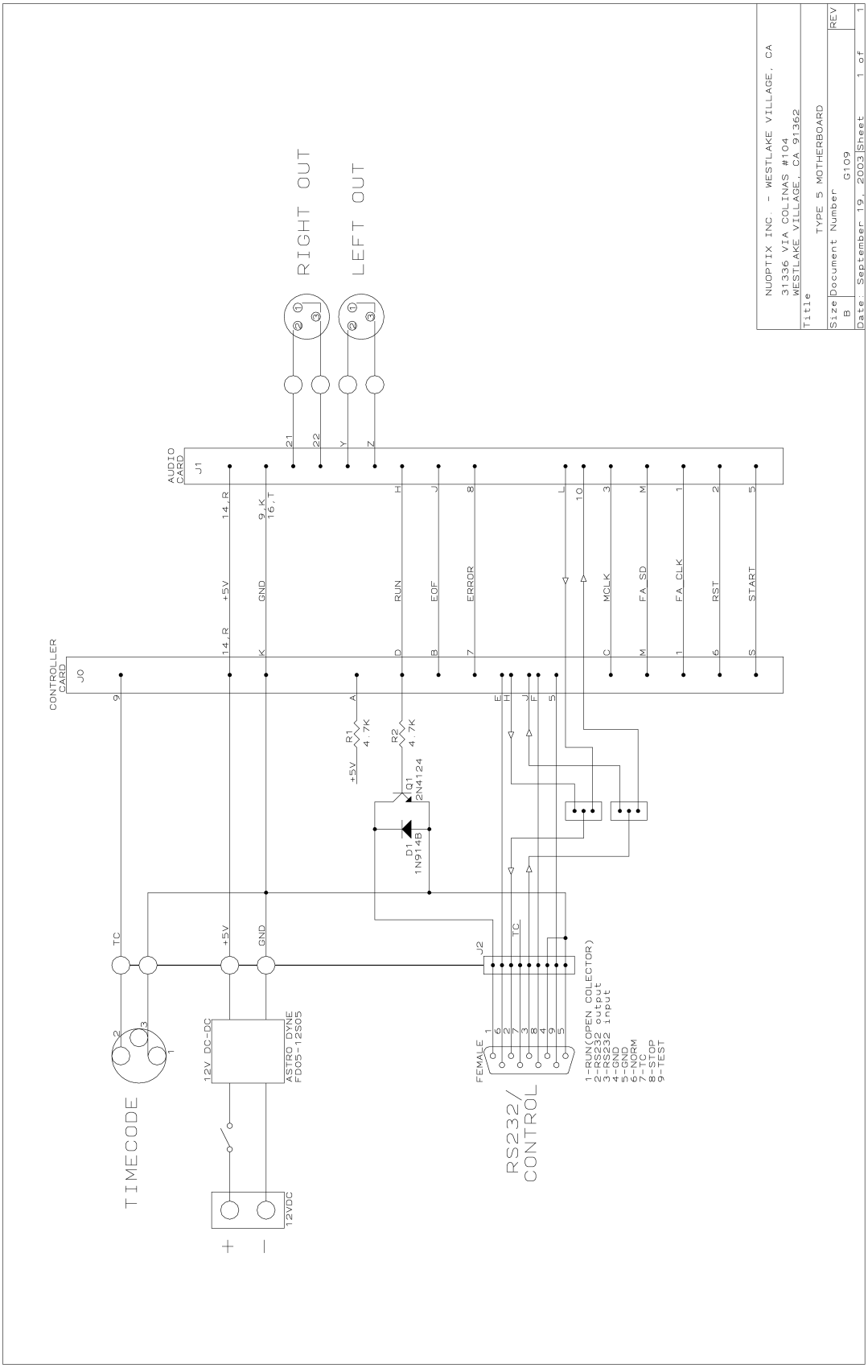
Power the unit ON by toggling the power switch on the rear panel to the ON position. The unit will default to the NORM mode.

NORM mode: When in the NORM mode, the audio will "follow timecode".

TEST mode: When in the TEST mode, the unit will start playing from the beginning. These channels will play to the end and loop continuously.

STOP mode: When in the STOP mode, the unit will stop playing audio.

The top red light indicates when valid timecode is being received.


NUOPTIX INC. - WESTLAKE VILLAGE, CA
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 91362
Title
TYPE 5 MOTHERBOARD
Size B
Document Number G109
REV
Date: September 19, 2003 Sheet 1 of 1
RIGHT OUT
LEFT OUT
AUDIO CARD
J1
CONTROLLER CARD
J0
+5V
GND
RUN
EOF
ERROR
MCLK
FA_SD
FA_CLK
RST
START
R1 4.7K
R2 4.7K
Q1 2N4124
D1 1N914B
TC
J2
TIMECODE
12V DC-DC
ASTRO DYNE FD05-12S05
12VDC
RS232/ CONTROL
FEMALE
1-RUN(OPEN COLECTOR)
2-RS232 output
3-RS232 input
4-GND
5-GND
6-NORM
7-TC
8-STOP
9-TEST

CCF Audio Track Construction:

Please refer to diagrams CCF audio track construction (method 1) and CCF audio track construction (method 2) on the following two pages.

Method 2 is recommended because easiest to implement and when an inter-loop is required, the "same audio chunks" need only be 35 mS long. The only drawback when using method 2, is that the parade float audio will start playing two seconds after the façade audio starts. They will, of course, be in sync when the parade float audio does start playing. This delay only happens when the CCF first starts. All subsequent loops play properly, as expected. If this is not a problem for your attraction, then this method is recommended. Otherwise, use the method 1 procedure.

DTMF packets come in groups of six DTMF tones. The "Loop-Point" should not occur within a DTMF packet. If the "Loop-Point" does lie within a DTMF packet, the entire DTMF packet should be muted. Muting one or more consecutive DTMF packets is not a problem.

The DTMF timecode track is now created using a Windows utility program called "DTMFgen.exe". The following three files must be in your path and reside in the same directory (e.g., C:\util or C:\HQ): DTMFgenV20.exe, dtmf36.bin, dtmf44.bin.
You may create a shortcut for "DTMFgenV20.exe" to your desktop if you like. This utility can be found at our website http://www.jrsky.com/utilities.html
Click on utilities.zip to download the files.

To run the program:
1) Click on the "DTMFgenV20.exe" icon.
2) Select either DTMF-F (default) or DTMF-S
3) Select the method, either Method 2 (default) or Method 1. See the following text for details.
4) Now enter the "Sample Length". This is the total number of samples as in the master audio track, assuming the master audio track is edited to loop perfectly at the end.
5) Now click on "Generate".

The created DTMF timecode file, "tc.wav", will appear in the same directory where the "DTMFgenV20.exe" resides. If you have just one main loop, nothing else is required. If you have an inner loop, then you will have to add a Loop-Point using the "WaveLoop.exe" Window utility program. If you required an inner loop and if you are using Method 2, then you will need to change one of the DTMF tones to an '*' tone. See the diagram on page 23 for details.

The DTMF track must go in the Channel 1 position of the CCF player. If an inter-loop is required, the DTMF track also must have the "Loop-Point" applied to the DTMF.wav track. Only one "Loop-Point" is necessary for the inner-loop point as the audio will automatically loop at the end of the audio track. Fifty milliseconds of silence should be added to the end of audio on channels 2-16. Channels 2-16 should not have a Loop-Points applied to them.

NOTE: If you are uncertain or uncomfortable in creating the DTMF timecode track, we will be happy to make it for you. All we need to know is if you want to use Method 1 or Method 2, and where the "Loop-Point" should be placed if required. You would still be responsible for the façade and float audio tracks.

Card Settings for CCF unit:

C992 Controller Card settings:

Shunt for W1 in the O position.

C990 or C993 Audio Card settings:

Shunt for W1 in the OUT position.
Shunt for W2 in the EXT position.
Shunt for W3 in the O position (C993 only).

The RS232 settings are:

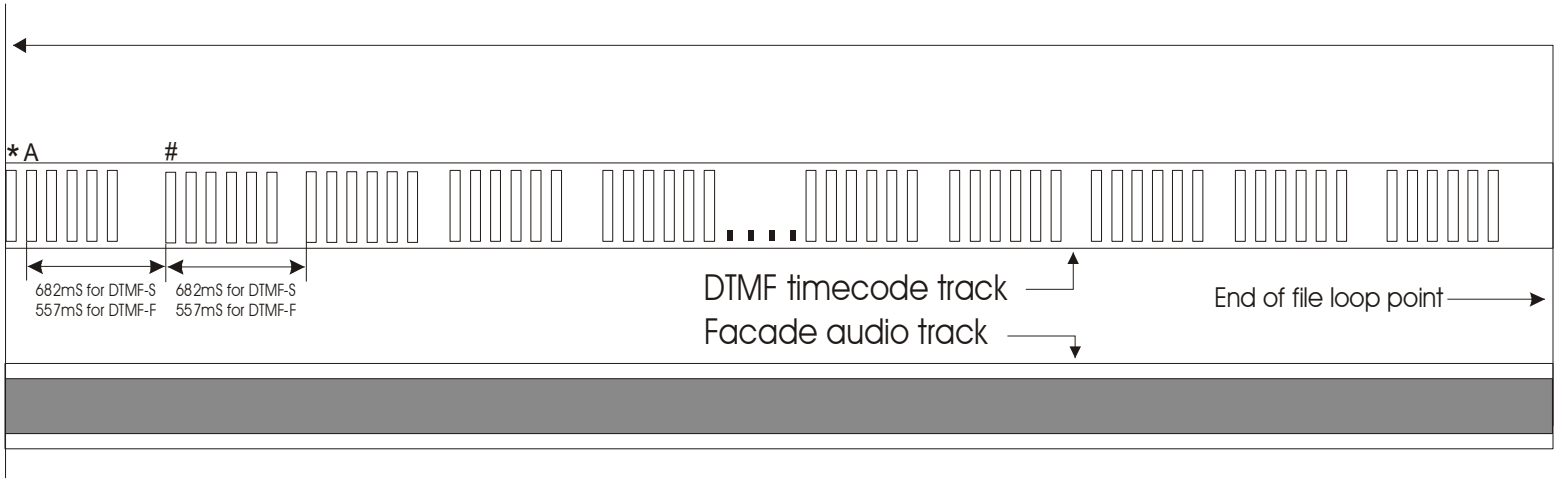
9600N81, no hardware control, no software control.

The RS232 commands are:

Enter a number 1-99 then 'p' or 'P' to select file to Play.
Enter a number 1-99 then 'x' or 'X' to select neXt file to play.
's' or 'S' to Stop (default at power up).
'e' or 'E' to Enable LoopMark (default at power up).
'd' or 'D' to Disable LoopMark.
'n' or 'N' to select NORMAL mode.
'H' to set ecHo on (default).
'h' to set echo off.

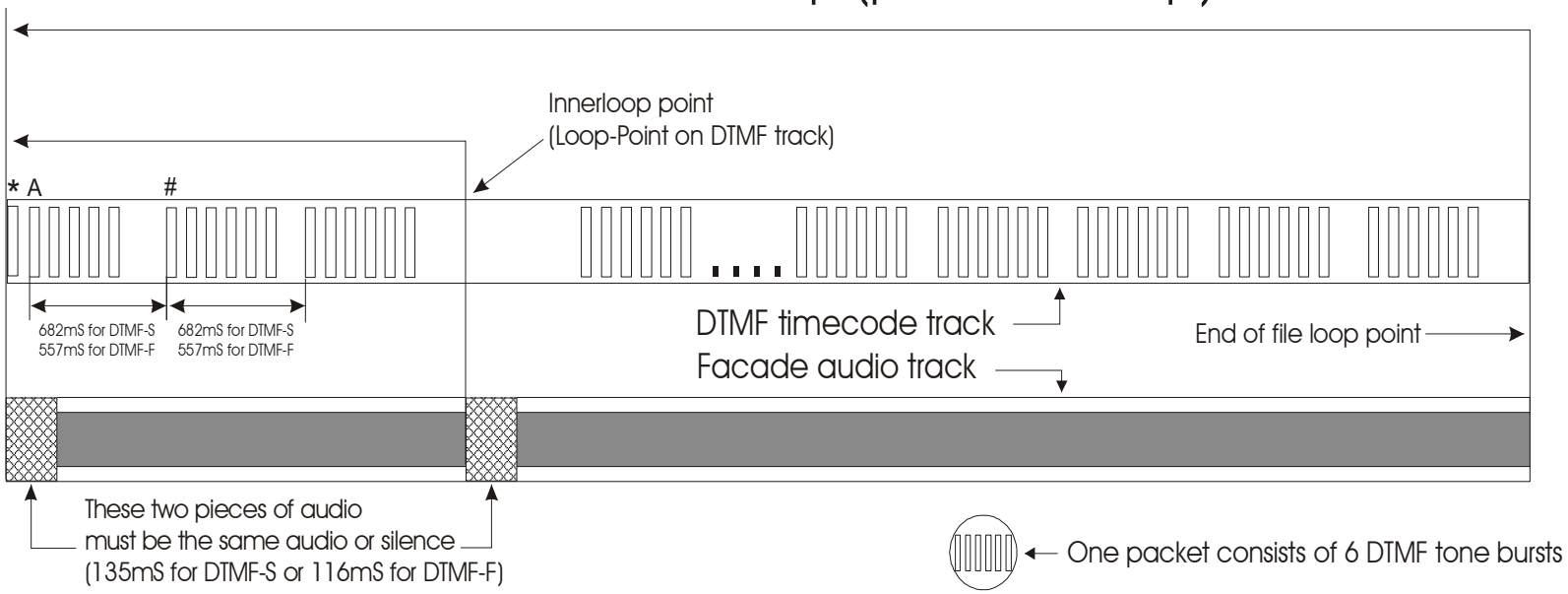
Notes:
1) The CCF unit must be in the NORM mode to receive RS232 commands.
2) When using the new RS232 rev C firmware, the system will also lock to SMPTE 30FND if present at the timecode input.

CCF audio track construction (method 1)



Single loop parade

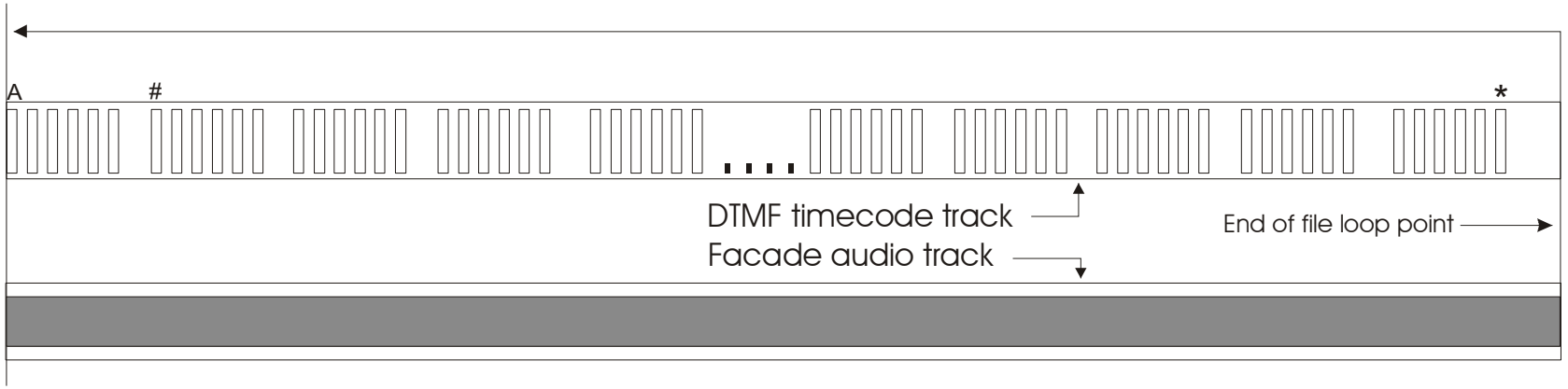
Parade with inner-loop (pre-show loop)



CCF audio track construction (method 2)

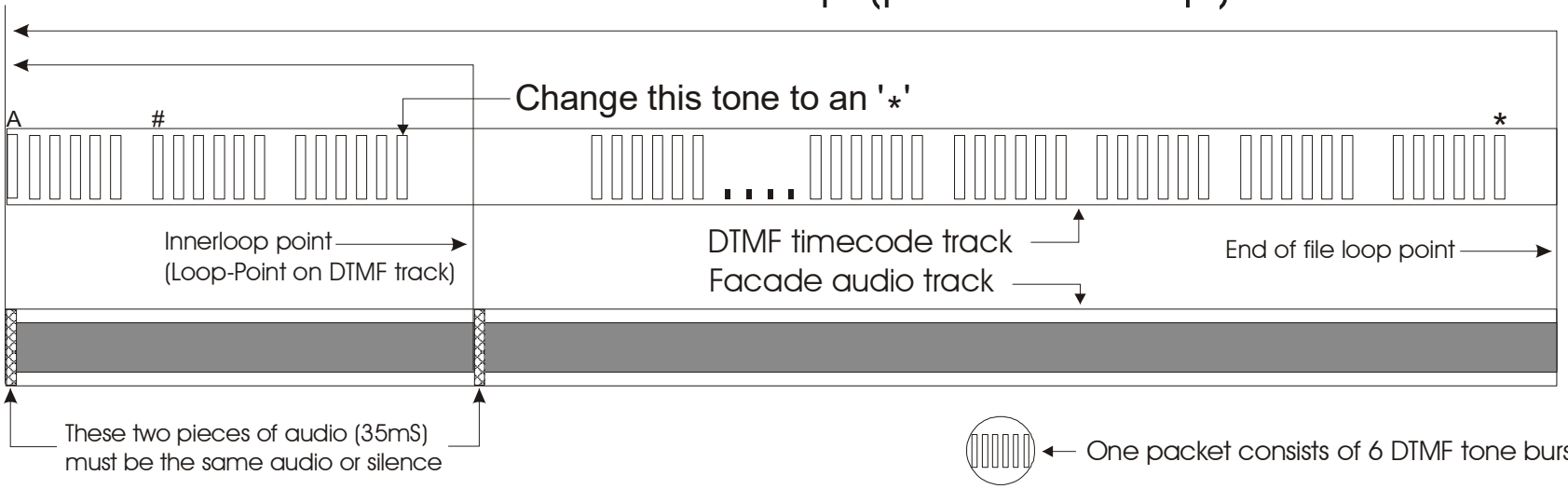
(recommended method)

Note: when using this method, the float audio will start
2 seconds after the CCF unit starts playing.



Single loop parade

Parade with inner-loop (pre-show loop)



Parade Float Audio Track Construction:

All the float audio players that follow the transmitted CCF DTMF timecode will have a 35mS delay with respect to the CCF façade audio. There are two ways to correct this; either add an external audio delay unit to all the CCF audio channels or advance the float audio tracks. The first solution requires additional hardware and adds extra cost to the parade system. The second solution does not require additional hardware or cost and therefore is the recommended solution.

Please refer to the diagram "Parade float audio track construction".
Modify the audio track as shown in the diagram. If you are using an external audio delay for the CCF façade audio, then do not cut and paste the audio chunk as shown in the diagram.

"Loop-Point" should not be applied to any of the parade playback unit tracks. However the channel 1 audio track must have the exact total number of samples as the DTMF track in the CCF unit. All the other audio tracks in the parade playback units must have the exact same or greater number of samples as the DTMF track. Fifty milliseconds of silence should be added to the end of audio on channels 2-5.

The DTMF signal applied to the Type 3 and 4 units should not exceed 2 volts peak to peak at the input.

C992 Controller Card settings:
Shunt for W1 in the O position.

C990 Audio Cards settings:
Shunt for W1 in the OUT position.
Shunt for W2 in the EXT position.

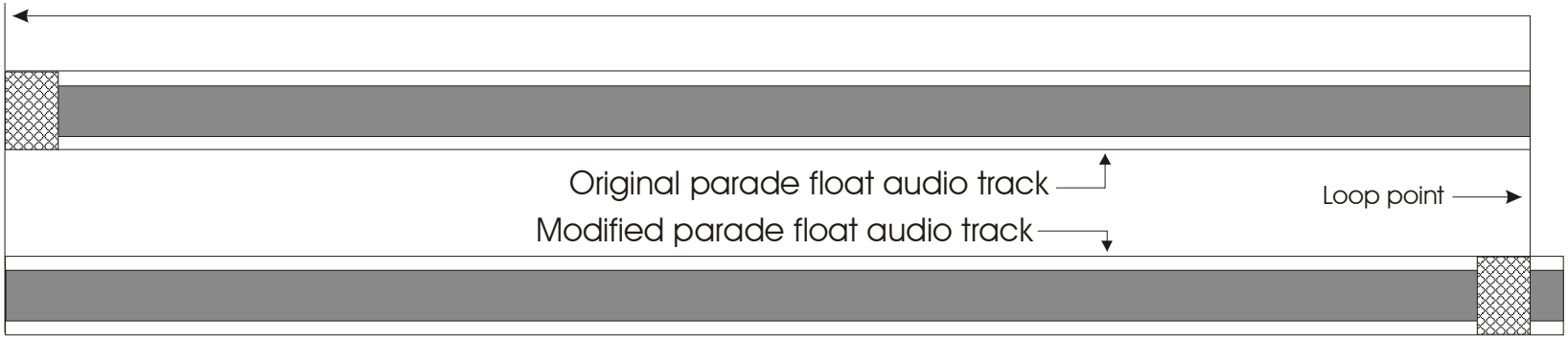
DTMF frequency matrix

col 0 1209 Hz	col 1 1336 Hz	col 2 1477 Hz	col 3 1633 Hz

row 0 697 Hz	1 val=1	2 val=2	3 val=3	A val=13
row 1 770 Hz	4 val=4	5 val=5	6 val=6	B val=14
row 2 852 Hz	7 val=7	8 val=8	9 val=9	C val=15
row 3 941 Hz	* val=11	0 val=10	# val=12	D val=0

Parade float audio track construction

(when not using external delay units for the CCF facade audio tracks)

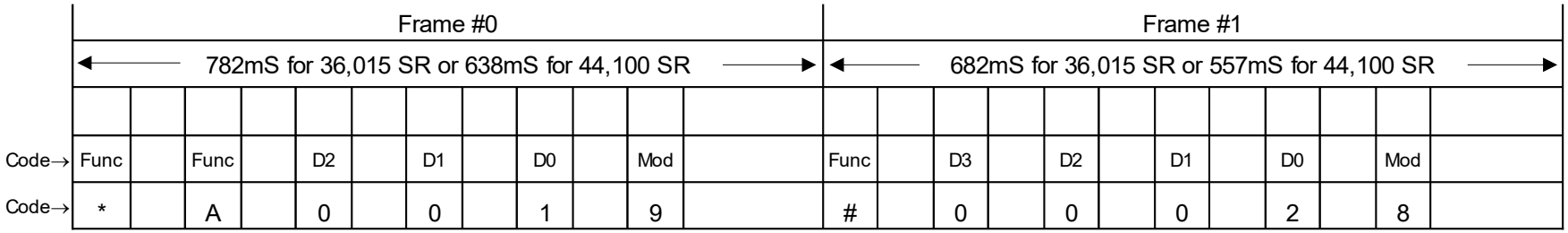


Procedure:
Cut audio from the beginning of the original track, then paste to the end.
(35mS when using Method 2 (see CCF audio construction), or
135 mS when using Method 1 and using DTMF-S or
116 mS when using Method 1 and using DTMF-F).

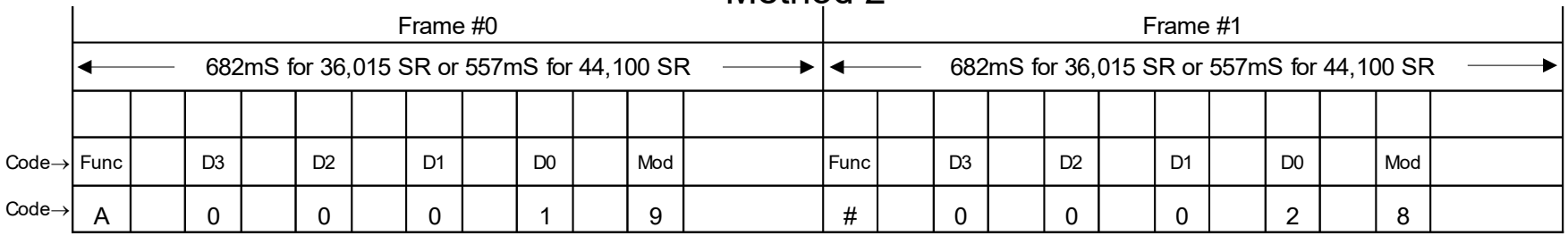
Add 50 mS of silence

DTMF Timecode Timing

Method 1



Method 2



Func:
Pre-tone for ReStart=DTMF(*), value 11
Sync =DTMF(#), value 12
ReStart =DTMF(A), value 13
Pre-tone for Stop =DTMF(B), value 14
Stop =DTMF(C), value 15
NextToPlay =DTMF(D), value 0

Frame:
D3..D0

Mod:
Modulo10(D3+D2+D1+D0)

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revised: March 1, 2006
Drawn by: Joe Dellaria

What Compact Flash Memories to Purchase

Not all Compact Flash memories are the same. Only high performance Type I Compact Flash memories that use SLC technology will work in this application. Compact Flash using TLC or MLC, will not work. On some memories, we have found the Compact Flash "Command to DRQ" time to exceed 2 mS. These modules will not work for Nuoptix applications. The "Command to DRQ" time is related to the controller used inside the Compact Flash. We would recommend purchasing all Compact Flash memory modules directly from Nuoptix as we qualify all the modules that we sell. All Lexar Compact Flash work at the time of the printing.

Formatting the Compact Flash

The Compact Flash (CF) must be formatted every time prior to copying a Nuoptix audio file to the CF module. You cannot simply delete a Nuoptix audio file and copy another to the CF memory.

Windows2000 & XP method to format the Compact Flash media.
1) From the Windows Desktop double left click on "My Computer".
2) Single right click on the appropriate "Removable Disk" for your Compact Flash adapter.
3) Single left click on "format…".
4) Select "Quick" for the "Format type" option.
5) Select "FAT, FAT16 or FAT32 (NTFS & exFAT will not work) for "File System".
6) You will get a dialog box warning you that all data on the removable disk will be erased. Click "OK" to the warning.
7) After formatting is complete, click "OK" and "Close".

Copying a file to the Compact Flash

Copy the audio wave file to the Compact Flash as you would any other file. Long file names are now acceptable. Wait for the Compact Flash activity light to stop blinking before removing the media. If you are running Windows 2000 or XP, you must first eject the drive before you remove the media. Failure to do this will result in audio data corruption. (This may not apply to all Compact Flash adapters. Read manufacturer's guidelines.)

Note: The above procedure applies only to the C990 & C993 boards that have a label marked as "C990 rev G or C993 rev C " or higher on the U5 micro-controller chip. If this chip has a different label marking or no label, then only "short file names" can be used (i.e., 8.3 filenames, eight characters or less plus the .wav extension) and these must be formatted with FAT16 only. Upgrade chips are available for $10/each.