



TC-5 LTC-Midi-USB-Display/Converter



- * **Large (0.56"/ 14 mm) Ultra Bright LED Display**..... Easy to Read
- * **Source LTC** **Output: Regenerated LTC, Midi, USB Midi**
- * **Source Midi** **Output: Regenerated LTC, Midi, USB Midi**
- * **Source USB Midi**..... **Output: Regenerated LTC, Midi, USB Midi**
- * **Source Virtual Machine**..... **Output: Regenerated LTC, Midi, USB Midi**
- * **Virtual Machine** **Controlled from 5pin Din and USB MMC Commands**
- * **Reference Inputs** **Video, Word Clock or Source**
- * **Timecode Regeneration**..... **Dropout and Jitter Suppression**
- * **Front Panel Controls** **Full control and setup**
- * **FP Start, Stop, Locate** **MMC to selected Timecode Source**
- * **Auto Configure**..... **From MTC, LTC or Video Syncs**
- * **Auto Detect Word Clock** **Presence and Frequency**
- * **Auto Detect Video Syncs** **SD Video, HD Video and Frame Rate**
- * **GPIO Port** **Biphase I/P, Start, Stop, Locate, Coincidence detector**
- * **User Configuration and Software Update**.....**Windows or Mac**
- * **1U 1/2 Rack (8.5x1.75", 216x44mm)**.....**Supplied with Optional Rack Mount Kit**

The TC-5 is a professional MTC/LTC interface with LED display, Video Sync, Word Clock input and USB port. The TC-5 is designed to be equally at home in Audio, Video and Lighting Environments, applications include Digital Audio Workstations, Non Linear Video Editors, Mixing Consoles, Show Control and Lighting Control.

As a test tool the TC-5 can also check the frequency of Timecode, MTC, Video and Word Clock. The TC-5 can also compare LTC with MTC

Audio Only Environment

When using timecode in a digital audio environment it is important that the timecode frame rate is locked to the incoming sample rate. The TC-5 is designed to use wordclock as a reference source. When the TC-5 is referenced to wordclock and

jammed to a timecode source the generator is phase aligned to the source after 10 frames, the timecode then free runs locked to wordclock.

Audio and Video Enviroments

In a Audio+Video environment there are two referece sources Wordclock and Video Syncs. They should always be locked, an easy way of doing this is to use a combined Video Sync and Wordclock generator. The timecode should be locked to the videosyncs as there are 1920 wordclocks to every video frame (48KHz/25fps). Locking to video syncs ensures that the audio keeps the correct phase relation ship to the video.

But when do you use lock to source?

Audio sources are not always locked to an external reference, in this case the TC-5 can be used in two possible ways.

- 1) If the audio source will lock to MTC then you can use the virtual machine in the TC-5 to generate both LTC and MTC locked to an external reference.
- 2) Generate LTC and MTC locked to the incoming LTC or MTC, the TC-5 averages the incoming timecode over 256 frames so as to minimise the jitter on the outgoing timecode.

Lock Indication

Until the timecode output is locked to video syncs or to a external source the Timecode Standard LED will flash.

Operational Modes	
LTC -> Midi+USB+LTC	Read LTC(Smpte), convert to Midi Timecode on USB and 5 pin Din, Regenerate LTC Output
MTC -> LTC+USB	Read MTC(Midi timecode) from 5 pin Din Midi Input, convert to LTC and USB-MTC
USB -> LTC+Midi	Read MTC(Midi timecode) from USB-Midi Input, convert to LTC and 5 pin Din MTC
VMC -> LTC+Midi+USB	Generate LTC, MTC-USB and MTC 5 pin Din from virtual machine, controlled from the front panel or MMC(Midi Machine Control) on USB or 5 pin Din Input
Biphase Counter	Count Biphase at 2 or 10 ppF, display as timecode 24/25 fps

LED	Display –Normal Operation	
LTC	LTC(Smpte) Linear Time Code	
Midi	5 pin Din Midi Timecode	
USB	USB Midi Timecode	
Selected	Defined by Configuration Menu	SEL Vir Virtual Machine Timecode
		SEL GEn Generator Timecode
		SEL LtcU LTC User Bits
		SEL BiPh Biphase Input
		SEL tEst Show selected test function
Note: The Display LED will flash if the timecode displayed is not the timecode source or Generator output.		

Keyboard/Display modes

Keyboard/Display Mode	Display	Select/Exit
Normal Operation	Selected Position	
Config Menu	Menu Selection	Depress and Hold '<' Key
Define Locate	Locate Point	Depress and Hold '>' Key

Key Functions				
Mode	'<' Key	'>' Key	'^' Key	'v' Key
Normal	MMC Stop	MMC Play	Display Select	Display Select
Key-Held	Enter/Exit Config	Set/Send Locate	-	-
Config Menu	Prev menu	Next Menu	Inc Selection	Dec Selection
Define Locate	Prev Digit	Next Digit	Inc Digit	Dec Digit

By providing multiple reference sources the TC-5 is designed to be equally at home in Audio Only environments or Combined Video and Audio Enviroments.

Sel	Generator Reference	
reF Vid	Video Syncs, bi-level or tri-level	
reF Cloc	Word Clock (Uses Video Sync input)	
reF Src	Defined by Source Menu	Src Vir – Internal Xtal
		Src Midi – 5 pin DIN Midi Timecode
		Src USB – USB Midi Timecode
		Src Ltc – Linear Timecode Input
		Src bIPh – Biphase Input (Future Option)

Configuration Menus		
Menu	Function	Options
1	Display Brightness	briGht 1 .. bright 8
2	Timecode Generator Source	Src Vir – Virtual Machine Src Midi – 5 pin Din Midi Input Src USB – USB Midi Input Src Ltc – LTC Timecode Src bIPh – Biphase input (Not yet implemented)
3	Generator Reference	reF Vid – Standard or High def video syncs reF Cloc – Wordclock reF Src – Timecode Generator source frame rate
4	Standard & Rate	PAL25, Nond 30, Filn 24, droP 30 PAL 249, Nond 299, Filn 239, droP 299
6	LTC Stationary code	StAt ON – Stationary Timecode Always On StAt OFF – Burst Output on position change
5	Selected Display	SEL Vir – Virtual Machine SEL Gen – LTC Generator SEL LtcU – LTC Reader User bits SEL biPh – Biphase Counter SEL tEst – Test function see menu 8
6	Normal/Advanced	NornAl – No advanced menu's displayed AdvancEd – Show advanced menu's
7	Test Display	t0 rEF: Refernce frame rate t1 Cloc: Wordclock Spmls per second t2 Vr-Lt: Difference Virtual machine - LTC, t3 Vr-Ub: Difference Virtual Machine – USB Midi t4 Vr-Ni: Difference Virtual Machine – 5pin Din Midi t5 Vr-bi: Difference Virtual Machine – USB Midi t6 Lt-Ub: Difference LTC Timecode – USB Midi t7 Lt-Ni: Difference LTC Timecode – 5 pin Din Midi t8 Lt-bi: Difference LTC Timecode – Biphase t9 UB-Ni: Difference USB Midi – 5 pin Din Midi tA Ub-bi: Difference USB Midi – Biphase tb Ni-Bi: Difference 5 pin Din Midi – Biphase
8	5 pin Din Midi ID	Nidi Id 0, Nidi Id 1, Nidi Id 2, Nidi Id 3
9	5 pin Din Midi Full Frame	Nidi Full: MTC Full frame Position N LocAtE: MTC Locate Command (Protools)
10	5 pin Din Midi Through Function	Nidi thru: Buffered Midi Input Nidi Out2: Second Midi Output
11	USB Midi ID	USb Id 0, USb Id 1, USb Id 2, USb Id 3
12	USB Full Frame	USB Full: MTC Full Frame Position U LocAtE: MTC Locate Command (Protools)
10	Measured Word Clock Rate	Cloc 441, Cloc 48, Cloc 88.2, Cloc 96, Cloc 176.4, Cloc 192
11	Biphase Pulses Per Frame	bi 2PPF: 48 or 50 Hz Biphase bi 10PPF: 240 or 250 Hz Biphase
12	Biphase Frame Rate	Bi 24FPS, Bi 25FPS
13	Reset to Factory	No ChAnG, FACTory

Pin	In/Out	GPIO Input Function
1	Input	Biphase A
6	Input	Biphase B
2		
7		
3		
8		
4		
9		
5		Ground

Recovery Mode

When programming the TC-5 a power failure or any corruption can cause the TC-5 not to work. A recovery mode is provided to overcome this problem, to enter the recovery mode-

- 1) Disconnect the Power (USB)
- 2) Depress and hold the '^' and '>' keys
- 3) Connect the Power (USB)
- 4) When the power up sequence is finished the display should read 'UPd ProG'
- 5) Re-programme the TC-5 using TC-5.bin and Windows or Mac software available from -

<http://www.colinbroad.com/cbsoft/tc-5/tc-5.html>

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