TDIF Multi-Channel Card

The TDIF card is an interface card for RADAR that provides 24 tracks of 24-bit digital audio input and output. The digital audio is divided into three DB25 connectors of 8 tracks each, and conforms to the TDIF connector standard found on Tascam DA88 digital recorders. Supports 48 kHz Single wire, 96 kHz Dual wire, 192 kHz Quad wire.

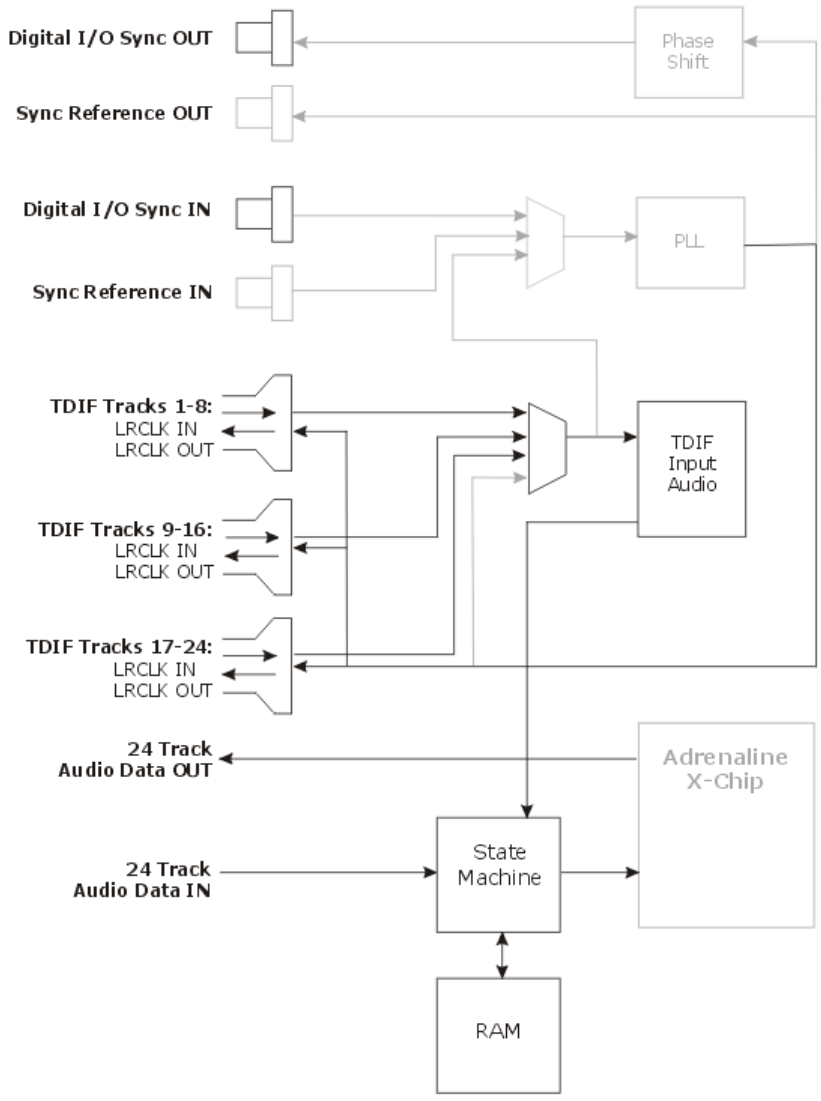
Connectors:

- There are eight channels of digital audio input and output per female DB25 connector.
- There are a total of three TDIF connectors on the rear panel of RADAR.
- This is NOT a pin to pin cable.

Pinout:

1	D out 1/2	**14**	Ground	**1**	D in 1/2	**14**	Ground
2	D out 3/4	**15**	Ground	**2**	D in 3/4	**15**	Ground
3	D out 5/6	**16**	Ground	**3**	D in 5/6	**16**	Ground
4	D out 7/8	**17**	Ground	**4**	D in 7/8	**17**	Ground
5	LRCK out	**18**	Emphasis out	**5**	LRCK in	**18**	Emphasis in
6	FS 0 out	**19**	FS 1 out	**6**	FS 0 in	**19**	FS 1 in
7	Ground	**20**	FS 1 in	**7**	Ground	**20**	FS 1 out
8	Ground	**21**	Emphasis in	**8**	Ground	**21**	Emphasis out
9	LRCK in	**22**	Ground	**9**	LRCK out	**22**	Ground
10	D in 7/8	**23**	Ground	**10**	D out 7/8	**23**	Ground
11	D in 5/6	**24**	Ground	**11**	D out 5/6	**24**	Ground
12	D in 3/4	**25**	Ground	**12**	D out 3/4	**25**	Ground
13	D in 1/2			**13**	D out 1/2		

CLOCK DIAGRAM



Functional blocks located on the TDIF card are darkened in the diagram

USING THE TDIF DIGITAL INTERFACE CARD

TDIF OUTPUT

With RADAR as a master, transferring digital audio from RADAR to an external box is quite straight forward. RADAR is always outputting TDIF digital audio, the TDIF LRCLKs (one for each 8-track cable), and both the Sync Ref and TDIF Word Sync outputs.

Just plug in the required cables and perform the transfer.

Note that more complex configurations for TDIF digital outputs are possible when RADAR syncs to an external box. This will be reviewed in the TDIF Input section.

External box must clock to RADAR.

TDIF INPUT

THE MYTH: Sync up the TDIF machines, and begin transferring audio.

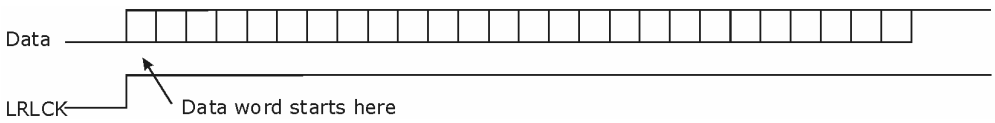
THE FACT: When it comes to TDIF digital transfers to the RADAR, the user must be concerned with syncing and framing. Although related, they are separate issues.

SYNCING

Who is the clock master? It will either be the RADAR or an external box.

FRAMING

How does the input TDIF circuit frame the input audio data? Input TDIF digital audio data consists of samples. Each sample is 24-bits in length, as shown:



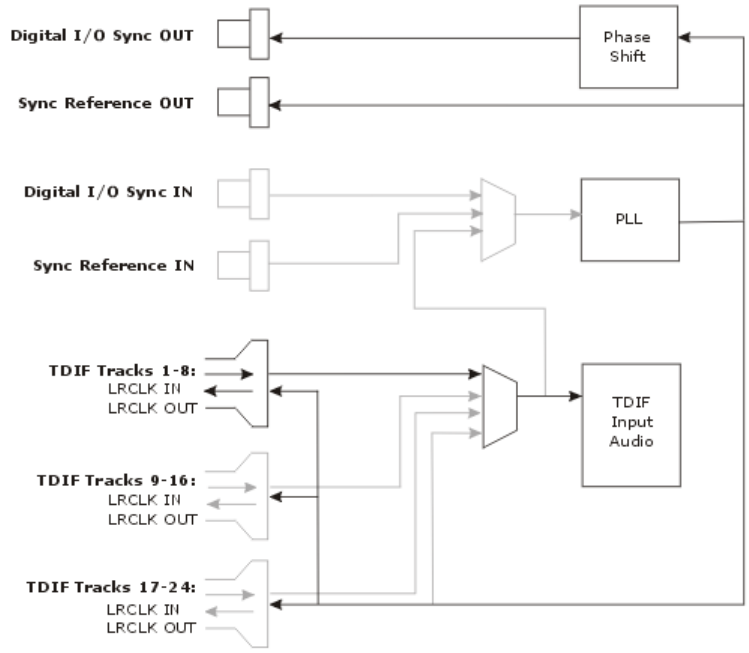
The TDIF card has an Audio Framer clock circuit. This circuit always needs the user to tell it what LRCLK must be examined to determine the audio sample starting location in the input TDIF data stream.

CONFIGURING RADAR FOR A TDIF TRANSFER

1. Sync up the RADAR: Press **SYNC**. Then select ***SYNC SOURCE:*** **TDIF** and then select ***CLOCK REF*: INTERNAL, TDIF L/R IN, TDIF WORD SYNC, WORDCLK: 48 kHz, OR VIDEO: NTSC.**

2. Provide the Framing Details: Select ***1-24 IN FRAMING REF:*** **L/R IN 1-8, L/R IN 9-16, L/R IN 17-24, OR L/R OUT (O2R)**. Then select ***TC REF:*** **INT** or **EXT** (chase to TC).

EXAMPLE 1 - RADAR AS CLOCK MASTER



Functional blocks are darkened in diagram

Who is the clock master?

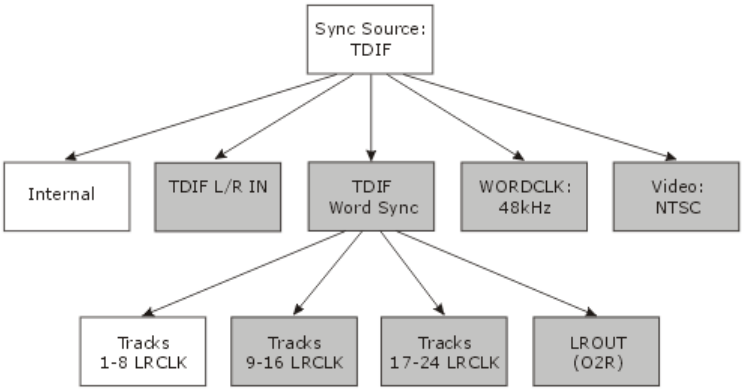
The RADAR generates a clock from its internal sync reference, or may be locked to externally generated SMPTE, MIDI, etc.

How does the input TDIF circuit frame the input audio data?

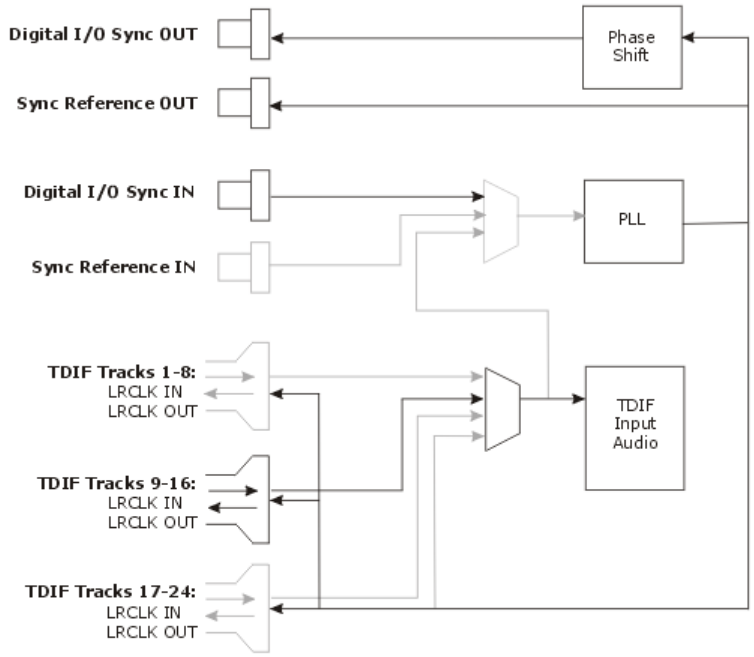
The input LRCLK on TDIF tracks 1-8 are examined by the Audio Framer to determine the start of each audio word and the point at which each audio data bit must be sampled. Ensure that the Audio Framer is fed an LRCLK. If there is no LRLCK on the selected Audio Framer clock source, there will likely hear clicks and pops.

When is this configuration used?

This is a typical configuration when a simple TDIF digital audio transfer is required between the RADAR and a single external box, such as a DA-88. See below. (Functional blocks are lightened in this diagram.)



EXAMPLE 2- EXTERNAL BOX AS CLOCK MASTER VIA TDIF WORD



Functional blocks are darkened in diagram

Who is the clock master?

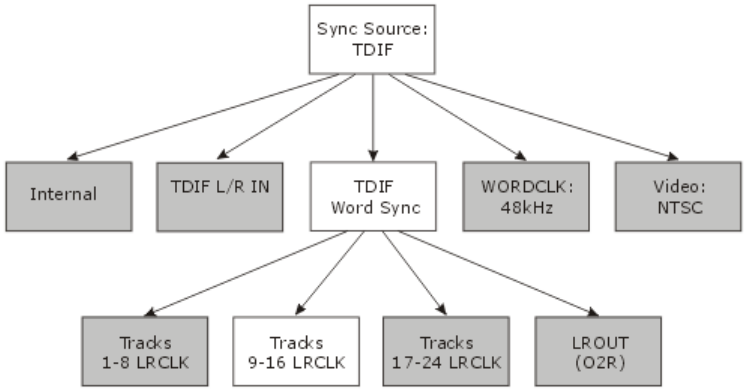
An external box, such as a DA-88. The RADAR generates a clock from the external digital I/O sync input.

How does the input TDIF circuit frame the input audio data?

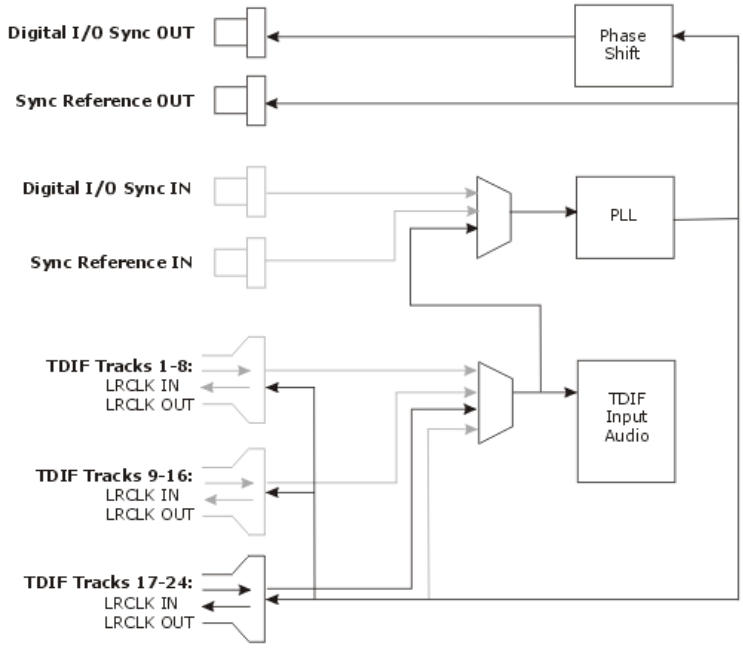
The input LRCLK on TDIF tracks 9-16 are examined by the Audio Framer to determine the start of each audio word and the point at which each audio data bit must be sampled. Ensure that the Audio Framer is fed an LRCLK. If there is no LRLCK on the selected Audio Framer clock source, will likely be clicks and pops.

When is this configuration used?

This is an alternate configuration to Example 1. Different environments (external equipment, temperature, humidity, electrical noise, reference jitter) result in more reliable performance with Example 1. Others are more reliable with Example 2. See diagram, below. (Functional blocks are lightened in this diagram.)



EXAMPLE 3 - EXTERNAL BOX AS CLOCK MASTER VIA LR CLK

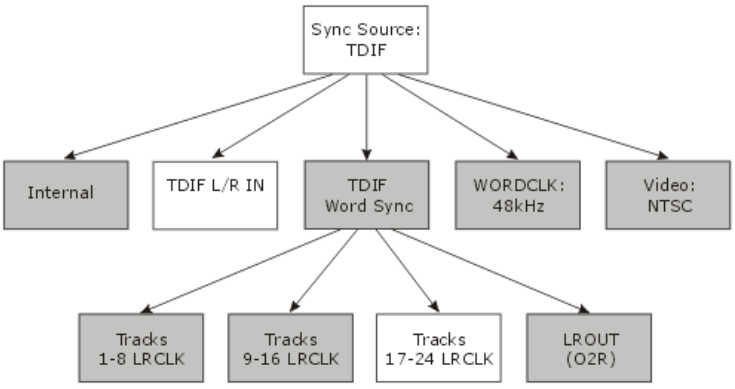


Functional blocks are darkened in diagram

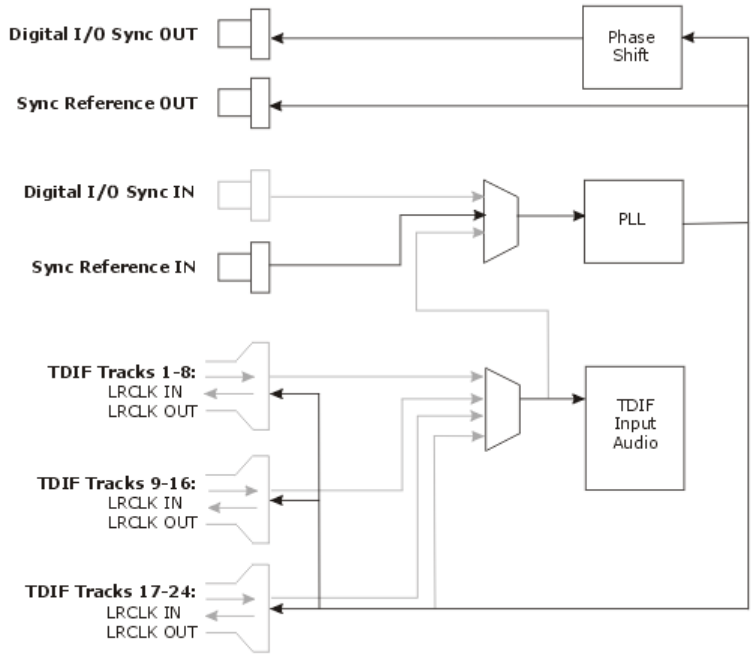
Who is the clock master?
The external TDIF device, such as a DA-88 or DA-38. The PLL syncs directly to the LRCLK in one of the DB25 TDIF connectors – in this case, tracks 17-24.

How does the input TDIF circuit frame the input audio data?
Syncing and framing use the same clock – the LRLCK on tracks 17-24.

When is this configuration used?
This configuration eliminates the need for a BNC wordclock cable when syncing a RADAR® to a DA-88, or any other external TDIF box. Because the DA-38 has no wordclock output, it cannot use Example 2 when used as a master. It must use this configuration. In our tests, this configuration often changes the susceptibility of the system to noise – sometimes for the better and sometimes for the worse. See diagram, below. (Functional blocks are lightened in this diagram.)



EXAMPLE 4 - EXTERNAL BOX AS CLOCK MASTER VIA WORD CLOCK



Functional blocks are darkened in diagram

Who is the clock master?

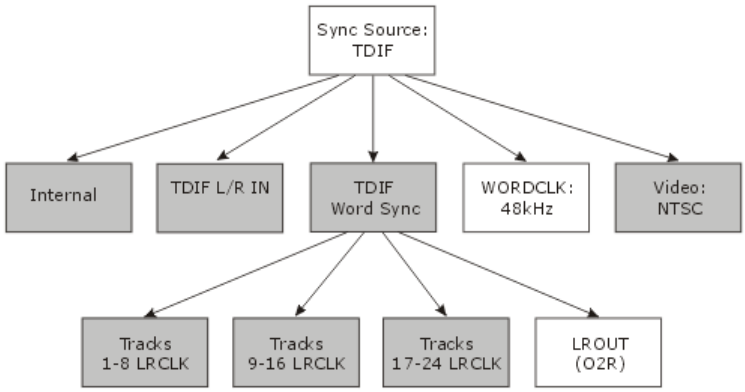
An external device, such as an O2R. A clean house clock, to which all boxes slave, may be used in this configuration.

How does the input TDIF circuit frame the input audio data?

The Audio Framer ignores the input LRLCK on the various groups of tracks and, instead, frames the input data according to the phase of the output TDIF LRCLK. Why does it do this? Certain boxes, such as the O2R, frame their output TDIF data according to the phase of their input TDIF LRCLK! So the RADAR® 's TDIF card must be configured to do the same thing in order to avoid clicks and pops.

When do I use this configuration?

Older versions of O2R TDIF interface cards require this configuration. It appears that there is a newer version that does not. See diagram, below. (Functional blocks are lightened in this diagram.)

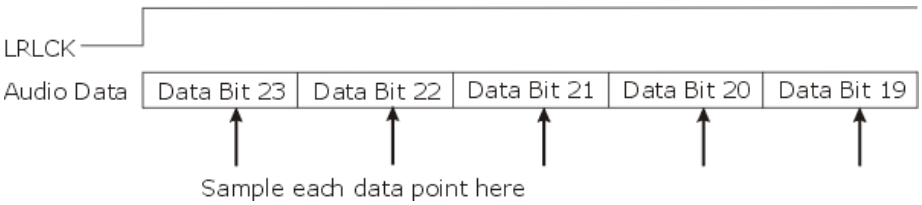


TDIF SETTINGS MENU

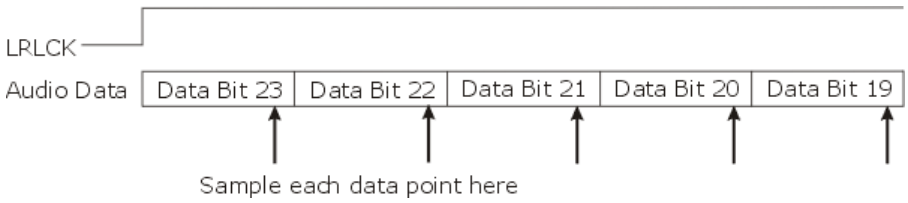
Several parameters of the TDIF digital audio interface can be set by the user. They are found in the TDIF Settings menu.

IN SAMPLE POINT

When receiving TDIF digital audio, the TDIF card's Audio Framer examines the user selected LRCLK to determine the start of each audio word. The Audio Framer defaults to sampling each audio bit in its exact center, as shown below. It uses the start of the LRCLK to determine this sampling position.



Sometimes, this can lead to problems. In some external TDIF boxes, the LRCLK output is not properly aligned to the output audio data. Also, cable length and driver/receiver delays can change this relationship. The result is shown below.



The Audio Framer has no way of knowing that the LRCLK and audio data are not properly aligned. It ends up sampling each audio bit near the end of the bit, rather than in the middle. If there is any jitter on the clock, this could result in sampling a bit at a bit boundary. This will result in clicks and pops in the audio.

If the user experiences clicks and pops in a noisy clock environment, he may suspect that the TDIF audio data and LRCLK are not properly aligned. The user can go into the **TDIF DIAGNOSTICS** menu and change the sampling point from its default ½ bit (center of the bit) to ¼ bit or ¾ bit.

SAMPLE RATE IN AND EMPHASIS IN

Each TDIF connector contains a pair of input sample rate indicator signals and an emphasis signal. These signals do not necessarily reflect the actual sample rate or emphasis of the input audio data. Some boxes ignore these signals, while others do not. RADAR provides the user with this information in the Diagnostics Menu.

The four possible sample rates are 48kHz, 44.1kHz, other, or no connect. No connect is indicated when the cable is not plugged in.

The two possible emphasis values are **on** or **off**.

SAMPLE RATE OUT AND EMPHASIS OUT

Each TDIF connector contains a pair of output sample rate indicator signals and an emphasis signal. The output sample rate is set automatically by RADAR and matches the sample rate of the box. The three possible sample rates are 48kHz, 44.1kHz, and other.

The value of the emphasis out is set by the user in the **DIAGNOSTICS MENU**.

Note that all output tracks (1-8, 9-16, and 17-24) always output the same sample rate and emphasis indicator values.