# CB ELECTRONICS

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## TG-1 Timecode Gearbox
## Timecode Standard/Framerate Converter

* Timecode Input any standard  . . . . . . . . . . . . . . . . . .  24, 25(EBU), 30(SMPTE), DROP FRAME
* Timecode Output any standard  . . . . . . . . . . . . . . . . .  24, 25(EBU), 30(SMPTE), DROP FRAME
* Input : Output Frame Rate Gearbox . . . . . . . . . . . . . . . . . . . . . 23.97 : 24 : 24.97 : 25 : 29.97 : 30
* Switchable Timecode Generator Lock Source . . . . . . . . . . . . . . . . . . . . . . . . . . . Reader, Video
* RS232 Serial Interface  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ASCII Protocol
* RS422 Sony P2 Output . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Video Slave at any Frame Rate
* 6 Preset configurations . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Easy Setup for Repeat Jobs

The Timecode Gearbox is used whenever you have to mix code standards, This is normally because someone has supplied you with an Audio or Video ant a different standard or Frame rate:-

Example 1:
> The M & E track has been supplied with 29.97 fps SMPTE timecode and you are working with 25 fps EBU timecode.

Example 2:
> You are dubbing the final mix to film @ 24 fps and you are supplied a Dialogue tape recorded to a 25fps Video.

The Timecode Gearbox may also be used to change standard/timecode value without gearbox action

Example 3:
> You are working with a system that does not recognise Drop frame code and you need to convert from drop to non drop.

Example 4:
> You have almost finished your Mix and a new video is supplied with different timecode.

The Synchroniser section of the TG-1 may be used to synchronize any non-linear VTR (V-Mod, V-1, Viper) or Dynamic scan VTR at a different frame rate.
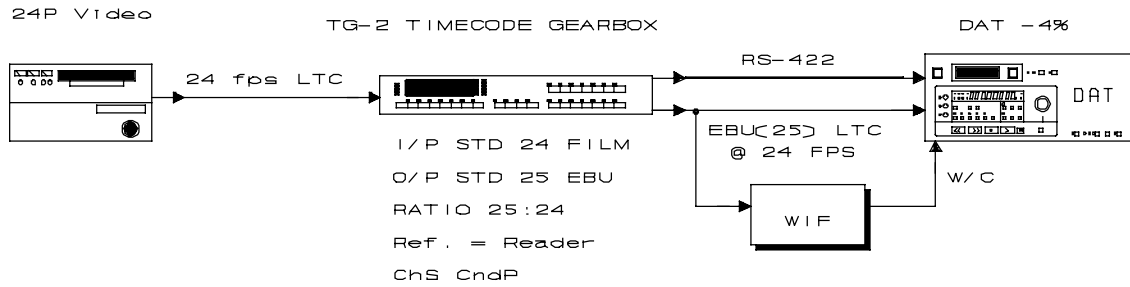
Example 5:
> You wish to prepare the music tracks for a 24fps Film to a 25fps PAL video, you can use the TG-1 to slave the Video to 24fps so that there is no pitch shift on the final version.

The Synchronizer section of the TG-1 may be used in the generation of different format tapes for release.
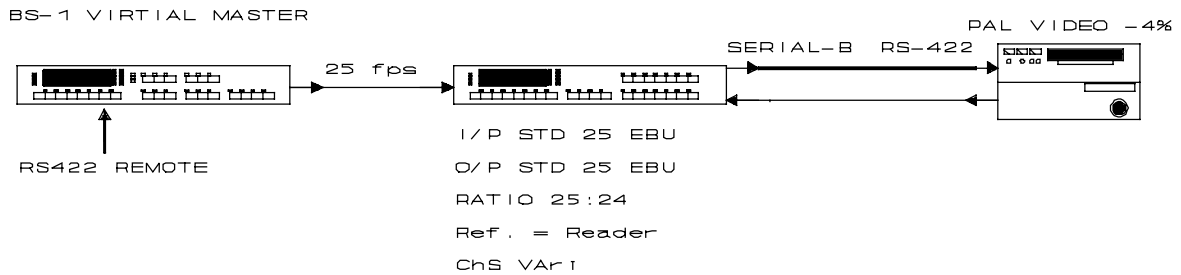
Example 6:
> You wish to make a NTSC release of a PAL video, use the TG-1 to slave the replay machine to the timecode output of the Record machine.
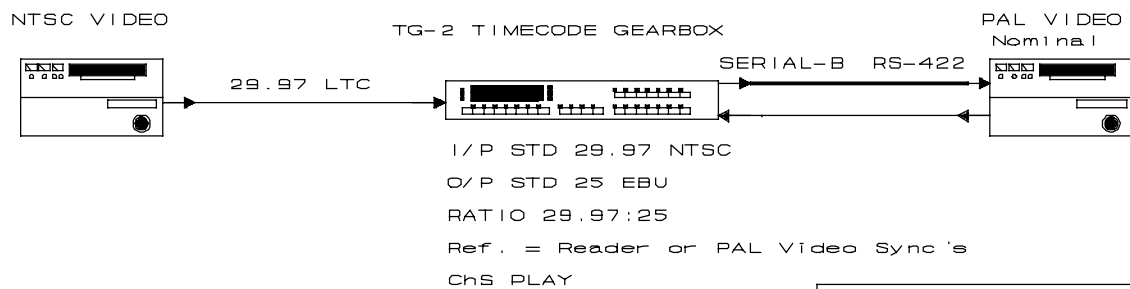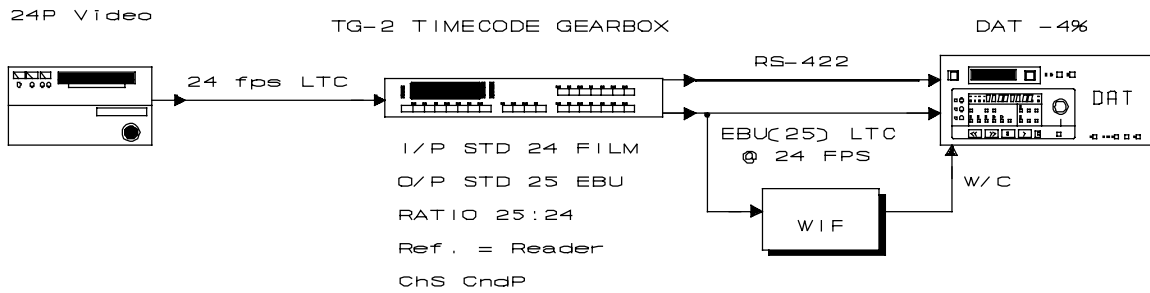
## Locking a 25fps DAT to a 24 fps Video

24P Video      TG-2 TIMECODE GEARBOX      DAT -4%

RS-422

24 fps LTC

DAT

I/P STD 24 FILM

O/P STD 25 EBU   EBU(25) LTC   W/C
        @ 24 FPS

RATIO 25:24

Ref. = Reader      WIF

ChS CndP

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## Slaving a 25 fps Video at 24 fps

BS-1 VIRTIAL MASTER          PAL VIDEO -4%

         SERIAL-B RS-422

25 fps

RS422 REMOTE

I/P STD 25 EBU

O/P STD 25 EBU

RATIO 25:24

Ref. = Reader

ChS VArI

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## Slaving a PAL Video to a NTSC Video

NTSC VIDEO     TG-2 TIMECODE GEARBOX     PAL VIDEO
                     Nominal

            SERIAL-B RS-422

29.97 LTC

I/P STD 29.97 NTSC

O/P STD 25 EBU

RATIO 29.97:25

Ref. = Reader or PAL Video Sync's

ChS PLAY

## Locking a 25fps DAT @-4% to a 24 fps Video

24P Video          TG-2 TIMECODE GEARBOX          DAT -4%

24 fps LTC

RS-422

EBU(25) LTC
@ 24 FPS

W/C

I/P STD 24 FILM

O/P STD 25 EBU

RATIO 25:24

Ref. = Reader

ChS CndP

WIF

---

## Locking a 25fps DAT to a 24 fps Video

24P Video          TG-2 TIMECODE GEARBOX          DAT Nominal

24 fps LTC

RS-422

EBU(25) LTC

W/C

I/P STD 24 FILM

O/P STD 25 EBU

RATIO 25:25

Ref. = Reader

ChS Cnd

WIF

---
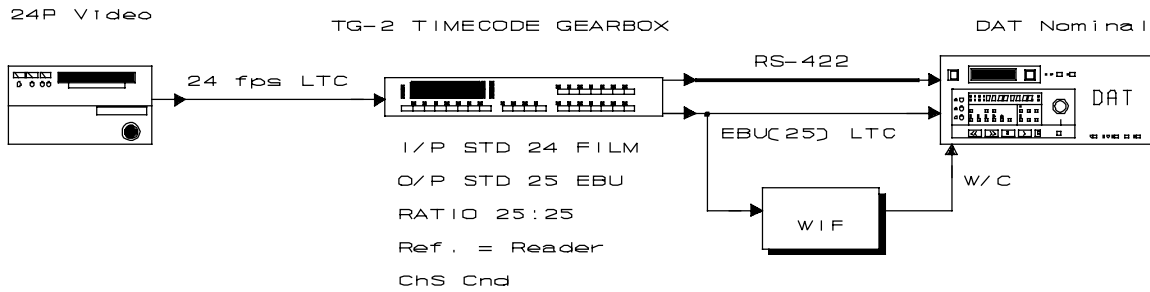
## Locking a 25fps DAT @ -0.1% to a NTSC Video
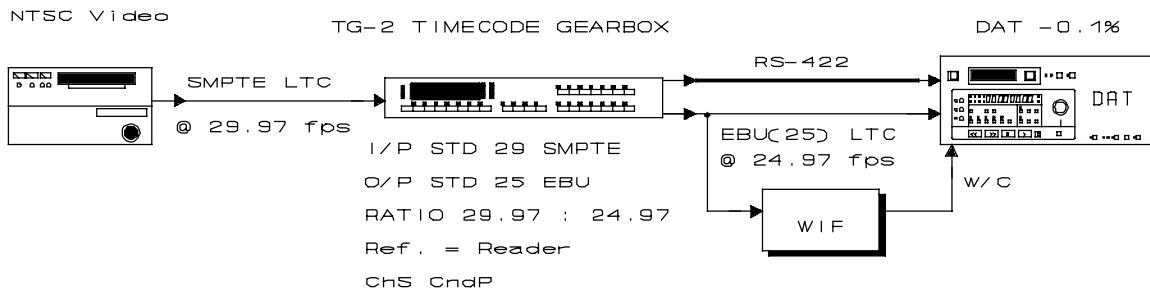
NTSC Video          TG-2 TIMECODE GEARBOX          DAT -0.1%

SMPTE LTC

@ 29.97 fps

RS-422

EBU(25) LTC
@ 24.97 fps

W/C

I/P STD 29 SMPTE

O/P STD 25 EBU

RATIO 29.97 : 24.97

Ref. = Reader

ChS CndP

WIF

## Locking 25fps coded 24P HD @ 24 from 24P HD

Master Recorder
24P Video

Slave Player
25fps Coded
24P

TG-2 TIMECODE GEARBOX

RS-422

24 fps LTC

Serial B

I/P STD 24 Auto

O/P STD 25 EBU

RATIO 24:24

Ref. = Reader or Slow PAL Video

ChS CndP
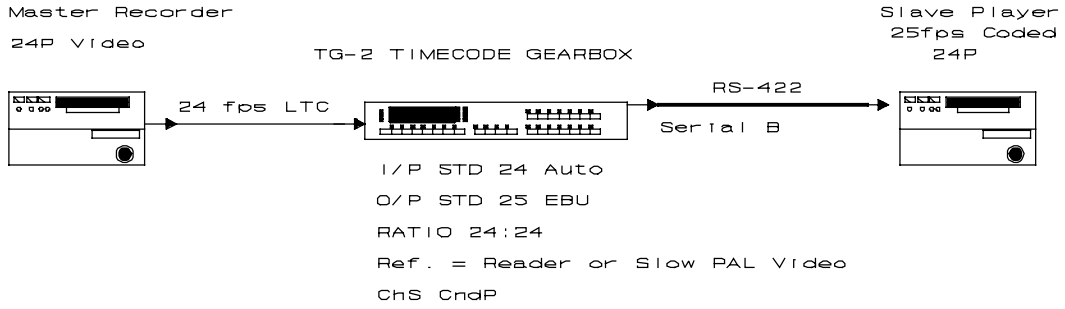
## Controlling 25fps coded 24P HD @ 24 from 24P HD

Master Recorder
24P Video

Slave Player
25fps Coded
24P

TG-2 TIMECODE GEARBOX

Serial B  RS-422

SERIAL A

LTC

I/P STD 24 Auto

O/P STD 25 EBU

RATIO 24:24

Ref. = Reader or Slow PAL Video

ChS CndP
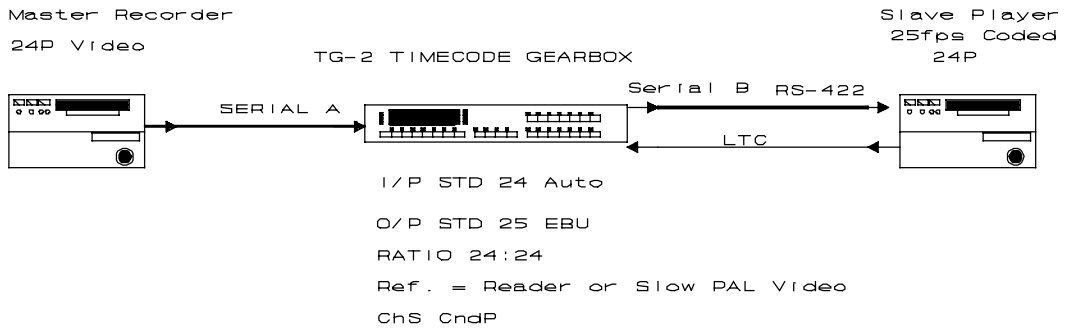
Recorder (Master) = NTSC (29.97) Video
Player (Slave) = 24P (23.98) HD Video
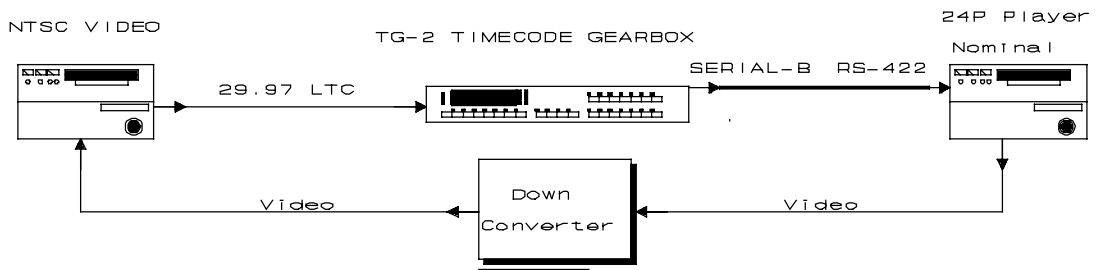
NTSC VIDEO

TG-2 TIMECODE GEARBOX

24P Player

Nominal

SERIAL-B  RS-422

29.97 LTC

Video

Down
Converter

Video

# Loading an Avid Media Composer
## Directly from 24P HDCAM

Avid

TG-2 TIMECODE GEARBOX

HDCAM
24P

Serial B

Serial B  RS-422

24 fps LTC

I/P STD 24 Auto

O/P STD 30 Auto

RATIO 24:30

Ref. = Reader or NTSC Video Sync

SEr GEN

Down
Converter

Video

Video

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## Appendices: hardware set-up

# DRAWINGS

### TG1FP
Front panel drawing showing KEY and Display functions.

### TCRCON
Rear panel drawing showing input/output connectors and typical video interconnection.

### FILMCOD-1
Frame rate input and timecode output

### FILMCOD-2
Fame rate measurement and generation.

### PSU-1
Video reference decoder, reference selection, reference monostable.

### PSU-2
Power fail detect, +12 volt, +6 volt, +5 volt, -12 volt regulator circuit, battery backup.

### VITVIDEO
Video inserter and microprocessor interface

### VITC
VITC reader analog and digital.

### MICROD-1
CPU, Front panel driver.

### MICROD-2
Time code reader and serial communications.

### TG1FRAME
Frame drawing showing all cabling.

# 1.0 DISPLAY

In normal operation the eight digit display may show any of the following:-

| | |
|---|---|
| **GEN.** | Generator timecode |
| **OFFSET** | Offset |
| **READER** | Reader timecode |
| **DIFF** | Difference |
| **G.USER** | Video Position |

Depress the **SELECT** key repeatedly until the required display is selected.

## 1.01 Generator timecode
To display the timecode output value, push the **[SELECT]** key repeatedly until the **GEN** LED is illuminated

## 1.02 Offset
The user specified offset between the Generator and reader.

## 1.03 Reader timecode
Timecode Reader 1 (Input)

## 1.04 Difference
The Difference display can show either of the following as selected in the **Unit Configuration**:-
| | |
|---|---|
| **diF REAd** | Generator position - Reader Position |
| **diF Uid** | Generator position - Video position |

## 1.05 Generator USER bits
The G.USER display can show one of the following as selected in the **Unit Configuration**:-
| | |
|---|---|
| **GUd USER** | Generator user bits |
| **GUd Vid** | Video (Serial B) position |
| **GUd tcr2** | Timecode Reader 2(Aux B) timecode input |

## 1.06 FRM.D
This key is used to enable or disable the display of frames. The **FRM.D.** LED is illuminated when the frame display is disabled.

This key also enable's and disable's the frame display in the inserted video if this option is fitted.

## 1.07 STD
**READER STANDARD**
These LED's will illuminate to indicate the standard and frame rate of the incoming code.

**GENERATOR STANDARD**
These LED's will illuminate to indicate the selected standard of the timecode generator.

**Note.** See the CONFIGURATION section for the method of selecting the generator frame rate and standard.

The standards recognised are as follows:-

| | |
|---|---|
| **24** | 24 Frame per second FILM timecode |
| **25** | 25 frame per second EBU timecode |
| **29** | 29.97 frame per second SMPTE non drop timecode |
| **29+30** | 29.97 frame per second SMPTE drop frame timecode |
| **30** | 30 frame per second SMPTE timecode |

## 1.08 REF

These LED's illuminate to indicate the selected frame rate reference for the timecode generator. The following external references may be selected:-

    **VIDEO**          External composite video input
    **READER**       Internally derived reader frame rate

When play speed code is present the reference LED will flash until the generator is locked to the incoming timecode and selected reference.

**Note:** See the **CONFIGURATION** section for method of selecting generator reference.

# 2.00 GENERATOR

## 2.10 G.RST
This key is used to stop, reset and start the generator to the preset start time. When the **G.RST** LED is illuminated the generator is stopped and reset to the preset start time. To start the generator depress the **G.RST** key, the generator will start and the **G.RST** LED will be extinguished.
**Note:** See the SETUP section for method of setting the preset start time.

## 2.11 FREEZE
Freeze(Stop) the generator, when the generator is Stopped the **Freeze** LED is illuminated.

## 2.20 JAM/TRANSLATE/GEARBOX
When the **JAM** LED is illuminated the generator is numerically locked to the reader, where the reader and generator standards are different or where the input and output ratio's are different the reader time will be translated. There are five different jam modes available, the various **JAM** modes are selected in the configuration section. The generator is always locked to the selected reference XTAL-VIDEO-EXT-LINE-READER, if it is required to lock the generator to an external code source then JAM should be enabled in the selected mode and the generator reference should be selected to READER.

The Ratio of input and output timecode speeds is set by two parameters in the configuration section (4.03, 4.04). Two parameters are used as to set this with one parameter would require 49 different settings! The Input and output ratios are set separately reducing this to a total of 14 different settings. To simplify use both an Auto-in and Auto-out mode have been included. The table below shows the input/output ratio when auto is used. Note that Auto assumes that drop and non-drop frame rates are the same for the purposes of speed translation.

## 2.21 RATIO IN : Auto / 23.97 / 24 / 24.97 / 25 / 29.97 /30
When set to Auto-In the input timecode standard frame rate is used for the input ratio of the frame rate gearbox. When Auto is disabled the 23.97, 24, 24.97, 25, 29.97, 30 keys may be used to set the input Ratio of the frame rate gearbox.

## 2.22 RATIO OUT: Auto / 23.97 / 24 / 24.97 / 25 / 29.97 / 30
When Auto-Out is enabled the 23.97 / 24 / 24.97 / 25 / 29.97 / 30 keys are used to set both the output timecode standard and the output ratio of the frame rate gearbox. When Auto is disabled the 23.87, 24, 24.97, 25, 29.97, 30 keys are set only the output ratio of the frame rate gearbox.

### Auto-In & Auto-Out

| | | |
|---|---|---|
| 24 | 24 | 1 : 1 |
| 24 | 25 | 24 : 25 |
| 24 | 29nd/29d | 24 : 30 |
| 24 | 30 | 24 : 30 |
| 25 | 24 | 25 : 24 |
| 25 | 25 | 1 : 1 |
| 25 | 29nd/29d | 25 : 30 |
| 25 | 30 | 25 : 30 |
| SMPTE DROP | 24 | 29.97 : 24 |
| SMPTE DROP | 25 | 29.97 : 25 |
| SMPTE DROP | 29nd/29d | 1 : 1 |
| SMPTE DROP | 30 | 1 : 1 |
| SMPTE ND | 24 | 30 : 24 |
| SMPTE ND | 25 | 30 : 25 |
| SMPTE ND | 29nd/29d | 1 : 1 |
| SMPTE ND | 30 | 1 : 1 |

| Table to show the speed translation when set for Auto in & Auto-out | | |
|---|---|---|
| Input Standard | Output Standard | Speed Translation |
| 24 | 24 | 0% |
| 24 | 25 | +4.167% |
| 24 | 29nd/29d | +24.875% |
| 24 | 30 | +25% |
| 25 | 24 | -4% |
| 25 | 25 | 0% |
| 25 | 29nd/29d | +19.88% |
| 25 | 30 | +20% |
| SMPTE DROP | 24 | -19.92% |
| SMPTE DROP | 25 | -16.583% |
| SMPTE DROP | 29nd/29d | 0% |
| SMPTE DROP | 30 | +0.1% |
| SMPTE ND | 24 | -19.92% |
| SMPTE ND | 25 | -16.583% |
| SMPTE ND | 29nd/29d | 0% |
| SMPTE ND | 30 | +0.1% |

Generator frame count =     (Reader frame count * OutRatio/InRatio)

## How it is done

Timecode time (HH:MM:SS:FF) is converted to and from a binary frame count, this conversion is carried out using the reader/generator standard and **not** the In/Out Ratio. The reader timecode is converted to a binary frame count using the timecode reader standard, the input frame count is converted to the Generator frame count using the In/Out Ratio, the Generator frame count is then converted to timecode using the timecode generator standard.

## 2.23 Displaying the % Deviation from Nominal Speed

Depress the ALT key to view the percentage deviation from play speed. This will display the Output code speed deviation as follows

If Input Standard = Output Standard then
    Speed Deviation% = (100 * Output Ratio / Input Ratio)-100
ELSE
    Deviation% = (100 * Output Ratio * Input FPS/Input Ratio * Output FPS)-100

where FPS = 'Frames per Second'.

In the timecode generator setup we can define the nominal speed of SMPTE Non Drop code as 29.97 or 30 frames per second **GStd29nd** and **G Std 30** as two separate frames rates for SMPTE non drop timecode, the timecode reader cannot distinguish between these two possibilities. The user must set a Flag **rStd29nd** or **r Std 30** this will set the assumed nominal speed of SMPTE Non Drop timecode. In video enviroments this should be set to rStd29nd.

Examples:-
1) Converting between 29.97 drop frame code and 29 on-drop code
        Use Auto-In and Auto-Out, set the generator standard to **GStd29nd, or G Std 30**.

2) Generating 25fps code to lock a DAT when running a film transfer at 25fps (4% fast)
    i) Disable Input Ratio **Auto**
    ii) Select Input ratio **24**
    iii) Enable Output Ratio **Auto**
    iv) Select Output Ratio **25**        This sets the output standard and frame rate.

## 2.24 JAM/TRANSLATE WITH OFFSET

It is often necessary to jam the generator to the reader with an offset. When using the gearbox this is always required as the offset changes with the timecode value. There are three ways of setting an offset as follows:-

1) Set the timecode value at which there is a zero offset
    Depress the **[SET]** key and select **GEN.**
    Use the **[<-]**, **[->]**, **[DEC]**, and **[INC]** keys to set the timecode value required.        Depress the **[SET]** key and exit setup with the **GEN.** LED illuminated.

2) Set the offset between the Reader and Generator timecode's.
    Depress the **[SET]** key and select **OFFSET**
    Use the **[<-]**, **[->]**, **[DEC]**, and **[INC]** keys to set the timecode offset required.
    Depress the **[SET]** key and exit setup with the **OFFSET.** LED illuminated.

**Setting a Negative offset**
    Depress the **[SET]** key and select **GEN.**
    Depress the **[DEC]**, and **[INC]** keys simultaneously to reset the Generator timecode value to 00:00:00:00.
    Select **READER** and set the Reader timecode value to the required negative offset.
    Depress the **[SET]** key and exit setup with the **READER** LED illuminated.

3) Set the Generator time required for a specified reader time.
    Depress the **[SET]** key and select **GEN.**
    Use the **[<-]**, **[->]**, **[DEC]**, and **[INC]** keys to set the Generator timecode value required.
    Select **READER** and set the Reader timecode value.
    Depress the **[SET]** key and exit setup with the **READER** LED illuminated.

Generator frame count =
    (Reader frame count * OutRatio/InRatio) + [generator reset frame count - (Reader Reset frame count * OutRatio/InRatio)]

Note 1.
    When Drop frame timecode is used care must be taken to ensure that the output code does not pass from 23:59:59:29 to 00:00:00:00 when converting assuming a 30 fps ratio. This is due to the 2592 frame difference in the number of frames in a day between 29.97 and 30 frame code.

CONSTANT
ONE HOUR OFFSET

TIMECODE
OUTPUT
VALUE

PIVOT POINT WITH
ONE HOUR OFFSET

PIVOT POINT
02:00:00:00

GEARBOX RATIO 24:25

GEARBOX RATIO 25:25
ZERO OFFSET

GEARBOX RATIO 25:24

TIMECODE INPUT VALUE
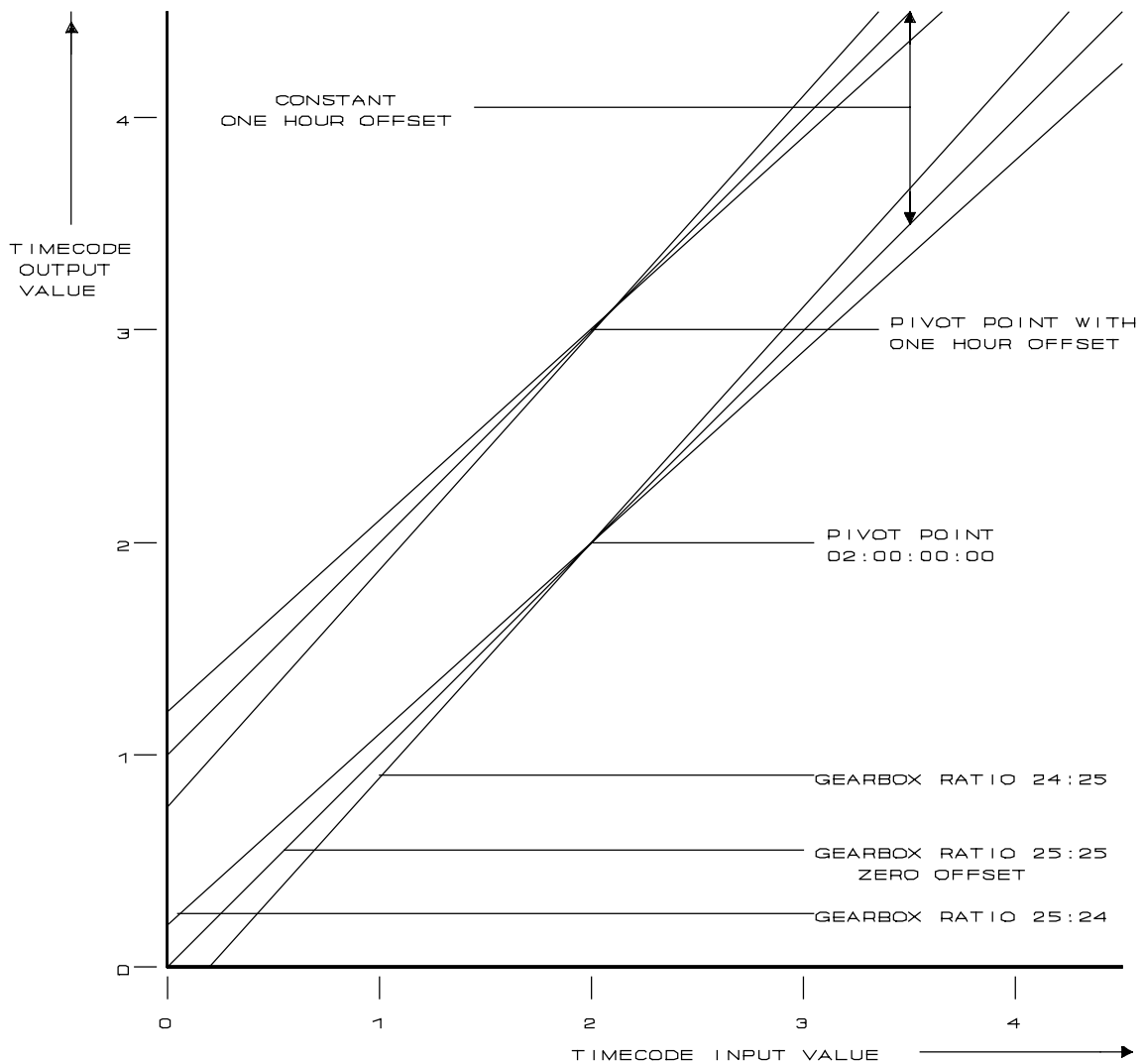
PIVOT POINT AND OFFSET DEFINED BY
    SET GENERATOR 03:00:00:00
    SET READER     02:00:00:00

## EXAMPLE
If the start of picture on a tape is at 9:55:23:13 and a time of 1:00:00:00 is required for the start of picture.:-

Depress the SET key so that the SET LED is illuminated.
Depress the SELECT key repeatedly until the GEN. LED is illuminated. Use the [<-[, [->], [INC], [DEC] keys until the  display shows 1:00:00:00.
Depress the SELECT key twice so that the READER LED is illuminated. Set the display to 09:55:23:13.
Depress SET to leave configuration. Enable JAM if and run the  tape, G.RST may be used to stop the generator, the generator should be enabled as soon as good code is read.

## 2.25 JAM EXAMPLES/TRANSLATE

# 3.0 GENERATOR SETUP

The GENERATOR SETUP mode is entered by depressing the **SET** key,  when the setup mode is active the **SET** LED is illuminated.

When the **SET** LED is illuminated the function of the **SELECT**  key is modified so that only the generator timecode, user bits, or reader timecode may be selected.

The user may then specify the generator reset timecode value, the generator user bits and the reader timecode which is equivalent to the generator timecode when jamming with an offset. The value is modified as follows, the decimal point is used as a cursor to indicate the digit which will be modified by the numeric or **INC** and **DEC** keys.  The cursor keys **<** and **>** move the cursor clockwise and anti-clockwise.

**CLEAR:** If both **INC** and **DEC** keys are depressed simultaneously  the current displayed data will be cleared to all zero's.

To leave the setup mode depress the **SET** key.

## 3.1 Set Sync Point: Exit SET with GEN led illuminated
To set a Sync point where both Generator and Reader times are identical, Select **GEN**, set the generator time and exit whist the **GEN** led is illuminated.

## 3.2 Set Offset: Exit SET with OFST led illuminated
To Set an Offset, sellect **OFST** adust to desired value using **inc, DEC, <-** and **->** keyst then exit with the **OFST** led illuminated.

## 3.3 Set Different Reader & Generator Sync Points: Exit SET with READ led illuminated
To set a sync point with different Generator and reader times.  Select **GEN** adjust to required output timecode value, then select **READ** and adjust to the desired input sync point. Exit with the **READ** led illuminated by depressing the **[SET]** key.

**Menu Flow Chart**
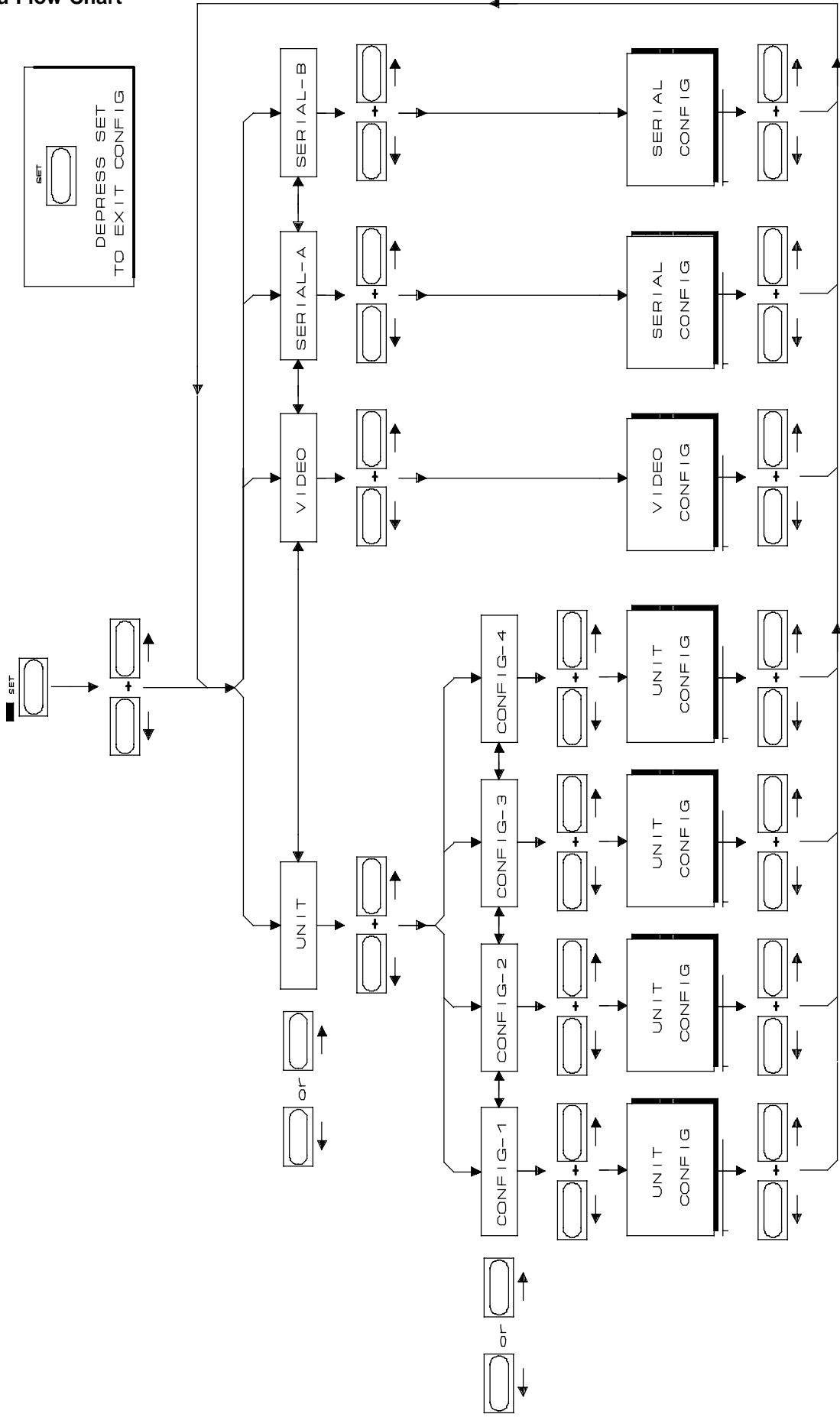
# 4. UNIT / EEPROM / SERIAL CONFIGURATION

**CONFIGURATION SELECTION**

The configuration of the unit is selected by first depressing the **SET** key so that the **SET** LED is illuminated then depress both **<-** and **->** simultaneously to enable configuration selection. The first display allows you to select which configuration you wish to adjust **UNIt / EEPRONN / VIdEO / SErIAL**. Make your selection and then depress **<-** and **->** simultaneously to select.

## 4.000 EEPROM

The adition of an EEPROM to the system allows the user to select between three different settings as follows:

1) Current: Held in battery backed RAM destroyed when Read User or Read Factory are selected or a Hard Reset command.
2) User: Selected by Read User or a hard reset command
3) Factory: Selected by Read Factory

The EEPROM section of the setup that determins the action to be taken on leaving Setup as follows
    **NoUPdAtE** No action
    **SAVE USR** Write current user setings from Batery backed RAM to EEPROM
    **LOAd USR** Write saved settings from EEPROM to Batery backed RAM
    **LOAd FAC** Write Factory Default settings to Batery backed RAM

Units shipped after May 2003 have the EEPROM fitted by default, older units can be updated by a a plug in PCB and new software.

## Installing EEPROM Software for the first time

When new software is installed where it is necessary to initialise user setup in the EEPROM as follows:-
i)        Enter Setup
ii)       Select the EEPROM Menu
iii)      Select **LOAd FAC**.
iv)      Exit setup.
v)       Enter setup
vi)      Select the EEPROM Menu
vii)     Select **SAVE USR**
iii)      Exit Setup and wait until **Urite EE** stopps flashing

## 4.00 UNIT CONFIGURATION

The first display in the unit configuration indicates witch of the four selectable setup's the unit is set to. The four choices **CONFIG 1** .. **CONFIG 4** may be selected simply by using the **INC, DEC, <-** or **->** keys, once you have chosen and modified the configuration use the **SET** key to exit.

### CONFIGURATION MODIFICATION

To modify a parameter within a selected configuration then simultaneously depress both **<-** and **->** keys a second time to enter the configuration menu (note. a third simultaneous depression of these keys will enter the **SERIAL CONFIGURATION MENU**). Once in the CONFIGURATION MENU the display indicates either the parameter to be modified or the various selections of a particular parameter as follows:-

> **G Std 25 / G Std 30 / G Std 24 / GStd 29d / GStd29nd**
> **GEn rEF**
> **GUSR SET / GU rdr t / GU rdr u**
> **GSPd SPH / GSPd PPH / GSPd SPP / GSPd PPP**
> **CONT ON  / CONT OFF**
> **SCodE ON / SCod OFF**
> **BURST 06**
> **Norn Out / PLAY Out / SYNC Out**
> **DroPO 10**
> **diF REAd / diF Vid**
> **USE SErb / ChS PLAY / ChS UAri / ChS Cnnd / ChS CndP**
> **GUd USER / GUdVid / GUd tcr2**
> **SEr Auto / SER GEN / SEr Port / SEr rdr**
> **Ain2997 / Ain 30**
> **ANONdroP / A   droP**
> **24 At 24 / 24 At 25**
> **OFST  00**

The **<** and **>** keys are used to select the parameter displayed. The **INC** and **DEC** keys are used to change the selection of the displayed parameter.

When the **SET** key is depressed both the CONFIGURATION and SETUP modes are exited. The parameters are then set as selected whilst in setup or CONFIGURATION.

## 4.01 GENERATOR STANDARD:
### G Std 25 / G Std 30 / G Std 24 / GStd 29d / GStd29nd

The generator standard may be set to any of the following:-

| | |
|---|---|
| **25** | 25 fps EBU timecode |
| **30** | 30 fps SMPTE non drop timecode |
| **24** | 24 fps FILM timecode |
| **29d** | 29.97 fps SMPTE drop timecode |
| **29nd** | 29.97 fps SMPTE non drop timecode |

The System will behave the same for both **30** and **29nd** unless Auto output is selected when the speed ratio is different.

## 4.02 GENERATOR REFERENCE:GEN REF

The generator frame rate reference may be set to any of the following:-
| | |
|---|---|
| **VIDEO** | External video reference. |
| **READER** | Internal reference from the time code reader. |

## 4.03 GENERATOR USER BIT SOURCE:        GEnU-PSt / GU-rdr t / GU-rdr u

The source for the generator user bits may be selected to the following:-
| | |
|---|---|
| **GEnU-PSt** | As preset by the user in **SETUP**. |
| **GU-rdr t** | Timecode reader time |
| **GU-rdr u** | Timecode reader User bits |

## 4.04 LOW/HIGH SPEED CODE:

### GSPd PPP / GSPd SPH / GSPd PPH / GSPd SPP

When the input pulse rate is below 2/3 of play speed the output frame rate can no longer track the input. When the input pulse rate is above 4/3 of play speed the output frame rate can no longer track the input.

**GSPd PPP**

Slow speed:- The timecode output frame rate is set to nominal speed and position update on change.

High Speed:- The timecode output frame rate is set to nominal speed and position update on change.

**GSPd SPH**

Slow Speed:- The timecode output frame rate is set at 1/4 of nominal speed and position update on change.

Hi Speed:- The timecode output frame rate is set at 4 x nominal speed and position update on change.

**GSPd PPH**

Slow speed:- The timecode output frame rate is set to nominal speed and position update on change.

Hi Speed:- The timecode output frame rate is set at 4 x nominal speed and position update on change.

**GSPd SPP**

Slow Speed:- The timecode output frame rate is set at 1/4 of nominal speed and position update on change.

High Speed:- The timecode output frame rate is set to nominal speed and position update on change.

## 4.05 CONTINUOUS CODE:  CONt OFF / CONt ON

The output when the film is stopped is determined by this flag:-

**CONT OFF**          No timecode output.

**CONT ON**          Stationary timecode.

## 4.06 STATIONARY CODE:  SCod ON / S Cod OFF

If the output is inhibited when the film is stopped some timecode readers will not recognise the jump in timecode value when G.RST is depressed. If this problem is encountered then setting this option to **S Cod OFF** may solve this problem. When enabled the generator starts one second before the G.RST point and than plays to the point.Synchronizers that work correctly with stationary code include the Adams Smith, Studer 4000 and Timeline, synchronizers that will not work with stationary code include Tascam, Studer 2000 and Q-Lock.

**S Cod ON**

Stationary code allowed, Time code numbers may be repeated.

**SCod OFF**

Stationary code not allowed, Time code numbers should increment to current position.

NOTE: See section 4.09, this must be set to CONt OFF.

## 4.07 BURST LENGTH: bUrSt 06

When **JAM CODE** is enabled and the generator is jammed to high speed code it is not possible to follow frame by frame because the generator runs at play speed only. The output of the generator jumps in value to follow the input code. Most readers require several sequential frames of code before they will read. **BURST** sets the number of sequential frames output. **BURST** may be set between 1 and 30.

## 4.08 TIMECODE OUTPUT: Norn Out / PLAY Out / SYNC Out

This flag determines when the timecode output is enabled as follows:-

**Norm Out**
The timecode output is enabled at all times.

**PLAY Out**
The timecode output is only enabled when generating incrementing Code at play speed.

**SYNC Out**
The timecode output is only enabled when the generator is phase locked.

## 4.09 JAM DROPOUT FILTER: droPO 10

When JAM is enabled this parameter sets the minimum length of dropout accepted before it is assumed that the input code has stopped. This parameter may be set between 1 and 99 frames.

A dropout longer than specified will result in the generator stopping with the numbers jammed to the last known good reader timecode. When new code arrives the generator starts up and re-jams to the new code.

## 4.10 DIFFERENCE DISPLAY: diF REAd / diF Vid

This parameter allows the user to display either the difference between the Generator and Reader or the difference between the Generator and Video Slave when the difference display is selected.

## 4.11 SERIAL B CHASE TYPE:
### ChS SERb / ChS PLAY / ChS UAri / ChS Cnnd

This parameter allows the user to set the serial chase type for each configuration. Note. When enabled this selection overrides the selection made in the serial B configuration.

**USE SERb**
Use the selection made in Serial B.

**ChS PLAY**
Chase then lock using variplay, send PLAY command once frame lock is acheived.

**ChS UAri**
Chase then lock using Vari-Play commands only.

**ChS Cnnd**
Send Chase command to machine.

**ChS CndP**
Send Chase until locked command to machine.

## 4.12 GEN USER DISPLAY: GUd USER / GUd Vid / GUd tcr2

The parameter allows the user to display different data in place of the Generator User bits as follows:-

| | |
|---|---|
| **GUd USER** | Generator user bits |
| **GUd Vid** | Video (Serial B) position |
| **GUd tcr2** | TCR2 (Aux B) timecode input |

## 4.13 SERIAL-A POSITION REPORT

This parameter defines the position reported by Serial-A when responding to a Sony Protocol position request as follows:

| | |
|---|---|
| **SEr Auto** | Timecode Generator output in play, converterted Video Machine position when stopped. |
| **SEr GEN** | Timecode Generator position (Gearbox Output) |
| **SER Port** | Video Machine Position (as reported on Serial-B), |
| **SEr rdr** | Timecode Reader Position (LTC Input) |

## 4.14 Default SMPTE Timecode Rate

This parameter defines the assumed speed for SMPTE timecode when set to Auto Input Ratio.

**Ain 2997**               In ratio = 29.97
**Ain 30**                  In Ratio = 30

## 4.15 Default DROP/NON-DROP for SMPTE Timecode

This parameter defines the Generator Standard when Auto out is enabled and either 29.97 or 30 are selected as the output Ratio.

**ANONdroP**         Output Standard for 29.97 & 30 = SMPTE Non-Drop
**A   droP**           Output Standard for 29.97 & 30 = SMPTE Drop

## 4.16 24 Frame timecode at 25 fps

This parameter is used when slaving a video machine running 24 frame code at 25fps via Port B

**24 At 24**          Normal, machine connected to port B running 24 frame timecode at 24 fps.
**24 At 25**          25 fps mode, connected to port B running 24 frame timecode at 25 fps.

## 4.17 Conversion Delay Correction +/- 10 frames

This parameter is used to correct for the delay incurred in video processing, The timecode output is adjusted only when in play. when stationary the timecode output is not adjusted.

## 4.2 SERIAL-A, SERIAL-B CONFIGURATION

See Section 7 Serial Communications

## 4.** USER CONFIGURATION TABLE

When installing new software or after a **HARD RESET** it is important that the configuration of the unit remains the same. This sheet is provided for that purpose, please write down the current configuration so as to be able to reset the unit correctly. Remember that the next engineer to use the unit may not be a fully understand why it has been set up in this way!

## GENERATOR SETUP

The user may then specify the generator reset timecode value, the generator user bits and the reader timecode which is equivalent to the generator timecode when jamming with an offset. The value is modified as follows, the decimal point is used as a cursor to indicate the digit which will be modified by the numeric or **INC** and **DEC** keys.  The cursor keys **<** and **>** move the cursor clockwise and anti-clockwise.

CLEAR:          If both **INC** and **DEC** keys are depressed simultaneously the current displayed data will be cleared to all zero's.

To leave the setup mode depress the **SET** key.

| Setting | Nominal | SELECT | |
|---|---|---|---|
| _____ | 10:00:00:00 | GEN | Generator Reset Time |
| _____ | 00:00:00:00 | OFFSET | Generator Reset USER |
| _____ | 00:00:00:00 | READER | Generator Reset OFFSET |

## UNIT CONFIGURATION

| Setting | Nominal | Options |
|---|---|---|
| _____ | CONFIG 1 | CONFIG 1 / CONFIG 2 / CONFIG 3 / CONFIG 4 |
| _____ | GEn Std 25 | GStd 24 / GStd 25 / GStd 29nd / GStd 30 / GStd 29d |
| _____ | Ref READER | VIDEO, READER |
| _____ | GUSR SEt | GUSR SEt / GU rdr t / GU rdr u |
| _____ | GSPd PPP | GSPd SPH / GSPd PPH / GSPd SPP / GSPd PPP |
| _____ | Cont ON | CONT ON / CONT OFF |
| _____ | SCode ON | SCodE ON / SCod OFF |
| _____ | bUrSt 06 | bUrSt 06 |
| _____ | Norn Out | Norn Out / PLAY Out / SYNC Out |
| _____ | droPO 10 | droPO 1-99 |
| _____ | diF Vid | diF Vid / diF REAd |
| _____ | USE SErb | USE SErb / ChS PLAY / ChS VAri / ChS Cmmd |
| _____ | GUd USER | GUd USER / GUd Vid / GUd tcr2 |
| _____ | SEr Port | SEr Port / SEr rdr / SEr GEN |
| _____ | nd-2997 | nd-2997 / nd-30 |

## SERIAL A CONFIGURATION

## SERIAL B CONFIGURATION

# 6.00 RESET

## 6.01 POWER UP RESET

When switched on the unit will reset, On reset the memory is not completely cleared since the current film position, timecode offset, and configuration are battery backed. If a memory backup failure is detected the unit will reset the whole memory. During the power up sequence the LED Display will show the following:-

| | |
|---|---|
| **LEd Good** | This indicates that the CPU, ROM, LED display, and driver are working correctly. |
| **Ran Good** | This indicates that the RAM has been checked and is good. |
| **RAn BAd** | This indicates that the RAM has been found to be bad. |
| **bC12** | This is the revision code of the software |
| **HArd rSt** | This indicated that an error was found in the configuration ram and that the memory backed ram has been reset. |

## 6.02 CPU CARD RESET

When servicing the unit it may be required to reset the unit without switching off the power. To do this short the two pins on the front of the PROCESSOR BD labels SW1.This will reset the unit in the same way as a power up reset.

## 6.03 SOFT RESET

A power up reset may be initiated from the front panel by a simultaneous depression of the **SELECT** and **SET** keys.

## 6.04 HARD RESET

If it is required to reset the battery backed memory manually a hard reset may be initiated from the front panel by simultaneous depression of the **SELECT** and **FREEZE** keys. This may be necessary when new software is fitted. CAUTION this will wipe the Configuration memory! If the front panel software is not working correctly the unit will only reset if the **SELECT** and **FREEZE** keys are depressed during the power up sequence.

## 6.05 MANUAL HARD RESET

The front panel hard reset is only possible if the front panel software is running correctly. If all else fails switch off the power, open the unit, and unplug the PROCESSOR BD.This will disconnect the memory from the backup battery.Replace the PROCESSOR BD, and power up the unit.

# 7.00 SERIAL COMMUNICATIONS

## 7.01 USING THE TG-1 WITH A SR/MR SYSTEM
The Serial-A port should be connected to the required machine control port on the SR/MR controller, the Serial-B port may be connected to a VTR. When the machine is connected to serial-B it is controlled through the TG-1 from the SR/MR keyboard.

The position reported to the SR/MR controller is determined by 4.14 SERIAL POSITION REPORT

## 7.02 SPECIAL COMMANDS FROM THE SR/MR
### MACRO 112 FEET or MACRO 158 LOCAL TIME or Macro 160 Set Generator
Use Store followed by Feet or Local Time will set the generator sync point when showing TG-1 as the machine ID.
Use Store followed by Set Generator to set the generator sync point with any machine id.

### MACRO 149 SET READER
Use **Store** followed by **Set Reader** to set the Reader sync point

### OFFSET
Use **Store** followed by **Chase/Offset** to set the offset between reader and generator.

### MACRO 198 and 199 DEC/INC Offset

## 7.10 SLAVING A VTR
To slave a VTR the following must be carried out.
1) The SYNCHRONISER should be setup as required with the VTR timecode output **if used** connected to **AUX-B** and the serial control to **SERIAL-B**.

2) The unit timecode output at the sync point should be the same as the timecode at the video start mark.

3) The VTR should be selected to **SERIAL REMOTE CONTROL**

4) Select the required 7.33 CHASE ALGORITHM dependant on the generator speed.

5) The synchroniser should be enabled using the **VITC** key as described below.

If all the above are carried out and the VTR timecode is within 2 hours of the current timecode the VTR will then locate to the current **GENERATOR TIMECODE** position (**GEN**).

If a VO9800 or VO9850 is used and you expect to use timecode on track 1 or 2 as well as the dedicated timecode track then it is recommended that the modification as detailed in our application note are carried out. The machine modification as designed by our Italian agents (Audio International) allows the use of time code from any of the tracks by a simple switch behind the front panel.

## 7.11 INCREMENT / DECREMENT OFFSET
To fine tune the synchronisation the offset may be adjusted whilst synchronised.
INCREMENT OFFSET:-          **SET + INC**
DECREMENT OFFSET:-         **SET + DEC**

This will adjust the TG-1 generator Output offset.

## 7.12 ENABLE
To Enable the synchroniser depress the **VITC** key so that the LED is illuminated.

## 7.13 MASTER TIMECODE
The master timecode is the timecode output from the TG-1, the video slave will be locked to this timecode.

## 7.2 SERIAL CONFIGURATION

**CONFIGURATION SELECTION**
The configuration of the unit is selected by first depressing the **SET** key so that the **SET** LED is illuminated then depress both **<-** and **->** simultaneously to enable configuration selection. The first display allows you to select which configuration you wish to adjust **UNIt / SERIAL A / SERIAL b**. Make your selection and then depress **<-** and **->** simultaneously to select.

To enter the SERIAL configuration mode first enable **SET** then when the **SET** LED is illuminated depress both **<** and **>** simultaneously. Use the **<** or **>** keys to select **SERIAL b.** In SERIAL CONFIGURATION the display indicates either the parameter to be modified or the various selections of a particular parameter in the same way as in CONFIGURATION.

> **0 INPUt / 1 USER / 2 bUU800 / 3 UO9850 / 4 A500 / 5 SSL SS / 6 dA-88 / 7 r-dAt**
> **SEr Pos / TAch-LtC / SEr-LtC**
> **rEC OFF / AUDIO  1 / AUDIO  2 / AUDIO 12**
> **SYNC ALL / SYNC ENb**
> **LOFSt 00**
> **PLAYd 08**
> **PAr-O OO**
> **LOCAtE02**
> **Loc OnLY/ Loc-Uind**
> **trYS  05**
> **Conn Nid / ConStArt**
> **Error 04**
> **ChS PLAY / ChS UAri / ChS Cnnd / ChS CndP**
> **RdY OFF / RdY A-U / RdY AU8d**
> **POS LtC / POS tin 1 / POS UltC / POS L-U / POS LUt**
> **R-P JoG / R-P VAri / R-P Shut**
> **F-P VAri / F-P Shut / F-P JoG / F-P PPLY**
> **BUH-1100 / tG-1  / bUU-950 / dA-88 / PCN-7030 / FOStEC**

The **<** and **>** keys are used to select the parameter displayed. The **INC** and **DEC** keys are used to change the selection of the displayed parameter.

When the **SET** key is depressed the SERIAL CONFIGURATION MENU, CONFIGURATION MENU and SETUP MODE are exited. The parameters are then set as selected whilst in setup or CONFIGURATION.

   **The serial configuration is used to optimize a video slave to the Master.**

## 7.21 MACHINE TYPE:
  **0 INPUT / 1 USER / 2 BUU800 / 3 U9850 / 4 A500  / 5 SSL SS / 6 dA-88 / 7 r-dAt**
Input, USER and seven different machines have been defined, when a machine type is changed (2..7) the parameters are updated with the factory preset information. When the machine type is not changed the user may adjust the individual variables for his machine.

0 INPUT
This should be used on SERIAL-A when remote control from a hard disk controller is used.

1 USER
This is selected to use the default parameters programed in the firmware.

2 BVU800

3 V9850

4 A500

5 SSL SS

The SSL Screen Sound has a slow start time and is set-up with a two second park offset and a 25 frame Play delay. The settings required will vary with the amount of audio on the work top.

6 dA-88

7 r-dAt

## 7.22 SLAVE POSITION SOURCE: SEr POS / TAch-LtC / SEr-LtC
The position of the Serial slave may be determined in two ways:-
**SEr POS**
This is the simplest selection, the position is determined via the RS422 serial link by using the timecode reader in the machine.

**TAch-LtC**
This selection uses the serial tach (Timer-1) from the machine and receives timecode via the rdr2 on the unit. The rdr2 input on the unit is **AUX-B**. Useful for machines without a timecode reader card or where a the timecode is no an audio track. Note This will auto switch the position request to Timer-1

**POS tin1**.
Use Timer 1

**SEr-LtC**
Use Ltc if Present in preference to the serial position data from the machine.

## 7.23 RECORD ENABLE: rEC OFF / AUDIO  1 / AUDIO  2 / AUDIO 12
In order to record on the serial slave it is necessary to send a record command as follows:-

**rEC OFF**          Record disabled
**AUDIO  1**          Record on Channel 1 only.
**AUDIO  2**          Record on Channel 2 only.
**AUDIO 12**          Record on Channels 1 & 2.

## 7.24 SYNCHRONISER ENABLE : SYNC ALL / SYNC ENb
The synchroniser is either always enabled and following the GENERATOR TIMECODE or he appropriate enable command must be used.
**SYNC ALL**
The synchroniser is always enabled, in this case the machine Local/Remote switch should be used to enable the synchroniser.

**SYNC ENb**
The **VITC** key is used as an enable key as described above.

## 7.25 LOCAL OFSET: LOFSt 00
This is a frame ofset added or subtracted to the master time only in play before locking the video slave.

## 7.26 START DELAY: PLAYd 08
If the video is parked less than two seconds ahead of the master it will wait for the master to arrive at its position. Video machines take a little time to accelerate to play speed. It is therefore necessary to send a play command to the video slave before the master arrives at the same point, **PLAYd** defines when to send the play command to the slave. Increase PLAYd if the video always has to speed up to lock, decrease PLAYd if the video always has to slow down to lock.

## 7.27 PARK OFFSET
Normally the video slave is parked at the same position as the master. When the slave has only a very small vari-speed range this will lead to very long lock-up times. The solution is to down-stream park the slave and trim the START DELAY for optimum performance.

## 7.28 LOCATE

This parameter is used to specify the effectiveness of the machines locate. If is mainly used when chasing as moving master. Set this number higher if the slave appears never to catch up with the master.

## 7.29 USE LOCATE Only or WIND and Locate

On some machines the locate is very slow on these machines it is better to Wind close to the master and then issue a locate command. On Tapeless machines it is better to always use the Locate command.

## 7.30 NUMBER OF TRY's

After locking the video machine it is released to video syncs, when this happens the video machine will sometimes move by one frame, the synchroniser will then take over and pull the video machine to zero error, and let go again. This parameter sets the maximum number of times the video may be pulled into lock.

## 7.31 COMMUNICATION POSITION

Commands are sent to the video machine once per frame. Depending on the relative phase of the Video and timecode changes the performance of the lock-up. This can also be tape dependant!

## 7.32 ALLOWABLE SYNC ERROR

Maximum allowable sync error in frames after the trying for zero error "Try" times, normally set to four to allow for a 8 field colour frame sequence.

## 7.33 CHASE ALGORITHM

| | |
|---|---|
| **ChS PLAY** | Use vari-play to pull machine into lock followed by a PLAY command |
| **ChS VAri** | Use vari-play to pull machine into lock, remain in vari-play. |
| **ChS Cnnd** | (Not For Video Mcn) Send a chase command to the machine. |
| **ChS CndP** | (Not For Video Mcn) Send a chase until locked command to the machine. |

## 7.34 SERIAL TRACK ARM COMMAND

This parameter determines the length of the edit preset (track arm) command sent to the slave machine. It is used if it is required to pass a record command from the serial input to the serial output.

| | |
|---|---|
| **RdY OFF** | No Ready Commands |
| **Rdy A-U** | U-matic and Betacam |
| **RdY AU8d** | 8 track Audio, Digital Betacam |

## 7.35 POSITION REQUEST TYPE

This parameter determins which positional information is requested from the machine

| | |
|---|---|
| **POS LtC** | LTC only |
| **POS tin1** | Timer 1 only |
| **POS VltC** | VITC only |
| **POS L-U** | VITC or LTC |
| **POS LUt** | VITC, LTC or Tach |

## 7.36 REVERSE SYNCHRONISE COMMAND

This parameter determines the reverse synchronisation command

| | |
|---|---|
| **R-P JoG** | Jog |
| **R-P VAri** | Vari-Play |
| **R-P Shut** | Shuttle |

## 7.37 FORWARD SYNCHRONISE COMMAND

This parameter determines the forward synchronisation command

| | |
|---|---|
| **F-P VAri** | Vari-Play |
| **F-P Shut** | Shuttle |
| **F-P JoG** | Jog |
| **F-P PPLY** | Programable Play (+/- 12.5%) |

## 7.37 MACHINE ID (Only used when 0 Input is selected in Section 7.21)

**bUH-1100**     All CB products will recognise this as a MC-1

**TG-1**   SR software recognise this.

**BUU-950**     Editors

**dA-88**  8 track record on earlier AMS software

**PCN-7030**     Test

**FOStEC**     Test

## 7.4 RS422 Interface cable:-

RS422 operation     Serial-A:- **PB4** link pins 1 & 2 (towards front of unit).

                       Serial-B:- **PB5** link pins 1 & 2 (towards front of unit).

| SERIAL-B (To Machine) | |
|---|---|
| 9 pin 'D' | Function |
| 1 | Internal |
| 2 | Rx Data A- |
| 3 | Tx Data B+ |
| 4 | Gnd. |
| 5 | +5v |
| 6 | Gnd. |
| 7 | Rx Data B+ |
| 8 | Tx data A- |
| 9 | Gnd |

# 8.00 REAR PANEL CONNECTIONS

## 8.01 POWER INPUT
The unit is supplied for either 220-250v A.C. or 110v-125v A.C. operation. The mains IEC input socket contains an integral power line filter and mains switch. The mains lead supplied should be connected as follows:-

| | |
|---|---|
| Brown | Live |
| Blue | Neutral |
| Green/Yellow | Earth |

Later units are supplied with a voltage selector switch.

## 8.02 INPUT XLR
The 3 pin XLR INPUT socket is a balanced input to the timecode reader. The input is connected as follows:-

| | |
|---|---|
| Pin 1 | Chassis |
| Pin 2 | Positive Input |
| Pin 3 | Negative input |

When connected to an unbalanced source of timecode the connection should be made as follows:-

| INPUT | SOURCE |
|---|---|
| Pin 1 | Chassis |
| Pin 2 | Signal |
| Pin 3 | Signal Ground |

## 8.03 OUTPUT XLR
The 3 pin XLR OUTPUT plug is a balanced output from the Time Code Generator. The output is connected as follows:-

| | |
|---|---|
| Pin 1 | Analog Ground |
| Pin 2 | Positive output |
| Pin 3 | Negative output |

When connected to an unbalanced load the connections should be made as follows:-

| OUTPUT | LOAD |
|---|---|
| Pin 1 | Ground |
| Pin 2 | Signal |
| Pin 3 | Leave open |

## 8.04 EXT. REF. BNC
Not Used

## 8.05 VIDEO REF. BNC's
The two VIDEO REF BNC's are connected in parallel and routed to the reference input of the time code generator. This input when selected should be fed with a nominal 1 volt composite or black and burst video signal. The input has an impedance of approximately 100K.

The video input will normally be fed from station sync's in parallel with the video recorder's. In an audio studio there is normally a Sony F1 or equivalent which may be used as a source of station

## 8.06 INSERT I/P BNC
not Used

## 8.07 INSERT O/P BNC's
Not Used

## 8.08 Serial A
RS422 operation     Serial-A:- **PB4** link pins 1 & 2 (towards front of unit).

## 8.09 Serial B
RS422 operation     Serial-B:- **PB5** link pins 1 & 2 (towards front of unit).

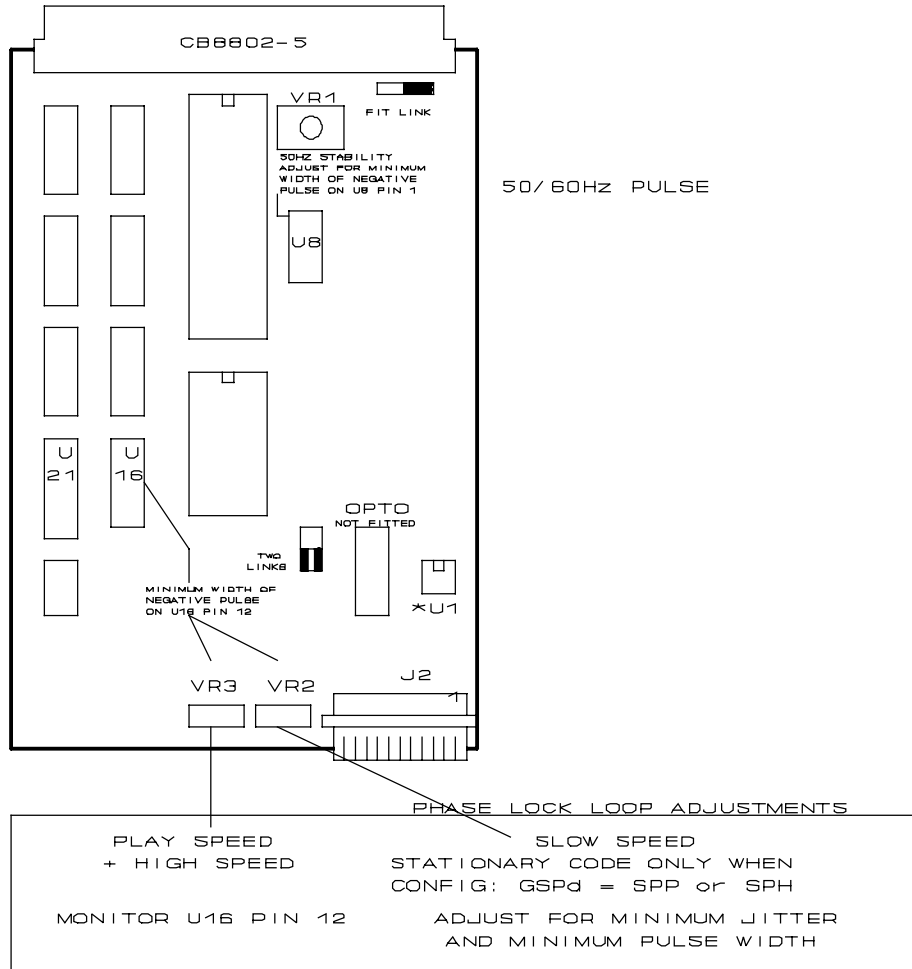| **SERIAL-B** (To Machine) | |
|:---:|:---:|
| 9 pin 'D' | Function |
| 1 | Internal |
| 2 | Rx Data A- |
| 3 | Tx Data B+ |
| 4 | Gnd. |
| 5 | +5v |
| 6 | Gnd. |
| 7 | Rx Data B+ |
| 8 | Tx data A- |
| 9 | Gnd |

## 8.10 AUX-B INPUT XLR
The 3 pin XLR INPUT socket is timecode reader 2 input. The input is connected as follows:-

Pin 1          Chassis
Pin 2          Positive Input
Pin 3          Negative input

When connected to an unbalanced source of timecode the connection should be made as follows:-
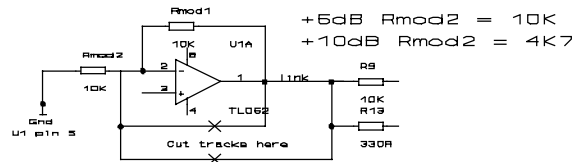
| INPUT | SOURCE |
|---|---|
| Pin 1 | Chassis |
| Pin 2 | Signal |
| Pin 3 | Signal Ground |

# TIMECODE GEARBOX CARD

## CB8802-5

VR1

FIT LINK

50HZ STABILITY
ADJUST FOR MINIMUM
WIDTH OF NEGATIVE
PULSE ON U8 PIN 1

U8

50/60Hz PULSE

U21   U16

OPTO
NOT FITTED

TWO
LINKS

MINIMUM WIDTH OF
NEGATIVE PULSE
ON U16 PIN 12

*U1

VR3   VR2

J2
1

### PHASE LOCK LOOP ADJUSTMENTS

PLAY SPEED
+ HIGH SPEED

MONITOR U16 PIN 12

SLOW SPEED
STATIONARY CODE ONLY WHEN
CONFIG: GSPd = SPP or SPH

ADJUST FOR MINIMUM JITTER
AND MINIMUM PULSE WIDTH

### TC OUTPUT LEVEL

The TC Output
is fixed at approx 0dBm.
To increase Output, cut tracks
to U1 pin 2 on component side.
Fit the two resistors Rmod1
and Rmod2 as shown.
Connect U1 pin 1 to end of R9
next to U1 pin 4.

Rmod1

10K    U1A

Rmod2

10K

Gnd
U1 pin 5

TL062

Cut tracks here

Link

R9

10K
R13

330R

+6dB Rmod2 = 10K
+10dB Rmod2 = 4K7

CB ELECTRONICS
LODDONSIDE, LANDS END HOUSE, BEGGARS