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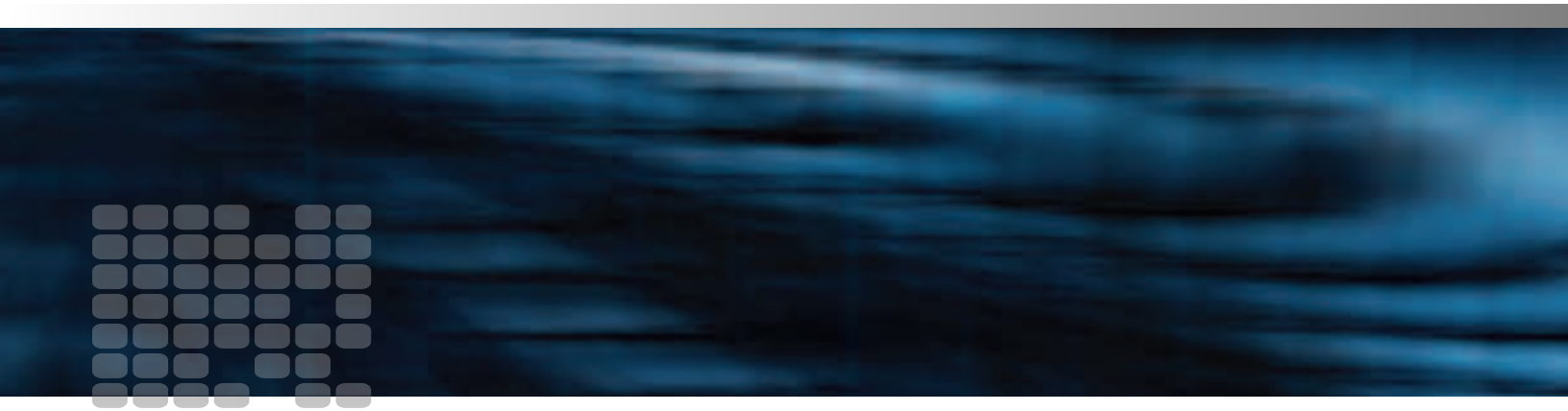
UDT-5700/5701



Up/Down Timer

Instruction Manual

Revision B
5700 MAN

UDT-5700/5701
UP/DOWN TIMER

MCU/UDT5700-A V2.95

INSTRUCTION MANUAL

About This Manual

Chapter 1: Introduction

Briefly describes the functionality of the UDT-5700/5701, highlighting the features and specifications.

Chapter 2: Installation

Provides general instruction and timecode connections information.

Chapter 3: Operation Summary

Summarizes operational procedures for quick and easy reference.

Chapter 4: Starting Counts Using External Triggers

Provides information on the use of the Foot Pedal using the GPI connector.

Chapter 5: Operational Reference: Basic Operation

Describes the basic operation and gives examples of basic operation, highlighting key functions.

Chapter 6: Operational Reference: Advanced Functions

Provides information about time considerations, drop-frame timing and using the PRESET key.

Chapter 7: Operational Reference: Interface Functions

Describes the use of general purpose interface input and outputs and the method used to program them.

Chapter 8: Operational Reference: Internal Operations

Provides information on UDT Diagnostics, Internal Timing and Jumper Configuration. This section is intended for troubleshooting and repair.

Appendix A: Connector Pin Outs

Provides the pin outs for the connectors used in the UDT 5700/5701.

Copyright Information

Warranty Information

The Limited Warranty Policy provides a complete description of your warranty coverage, limitations, and exclusions, as well as procedures for obtaining warranty service. To view the complete warranty, visit www.broadcast.harris.com/leitch.

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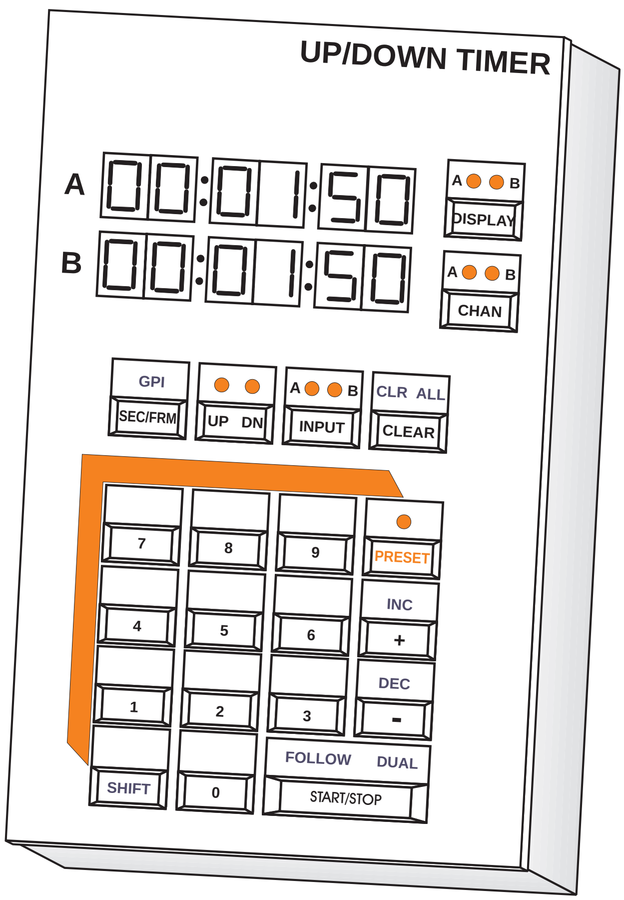
UDT 5700/5701
UP/DOWN TIMER
OPERATIONAL MANUAL

CHAPTER 1

Introduction



1.1 Overview

The UDT-5700/5701 Up/Down Timer is a dual-channel, fully programmable up/down counter/timer for use in numerous applications. The main features of the UDT are separated into four sections. These are **Basic Operations, Advanced Functions, Interface Functions** and **Internal Operations**.

Basic Operations explains simple uses of the UDT and provides a brief description of the individual keys.

Advanced Functions details the more powerful features of the UDT and provides examples of its application and use.

Interface Functions explains the connections and use of the UDT with other devices.

Internal Operations deals with particulars of the circuitry within the UDT and is intended for troubleshooting and repair.

Appendix A lists the pin outs of the two external connectors used with the UDT.

The UDT is available in both desktop (UDT-5700) and rack-mount (UDT-5701) versions. All references to the UDT-5700 in this manual are equally applicable to the UDT-5701, unless otherwise specified.

Note: This manual was written for SMPTE Timecode operations. When operating the UDT-5700/5701 with EBU timecode, all references to 30-frame operation must be replaced by 25-frame operation.

1.2 Features and Specifications

INPUTS

SMPTE/EBU Timecode

Input . . . . . SMPTE/EBU or SMPTE Drop Frame

Level . . . . . 4 Vp-p, +/-12 dB

Impedance . . . . . High Z, balanced

Reference timecode . . . . . SMPTE/EBU (For Timebase only)

Level . . . . . 4 Vp-p, +/-12 dB

Impedance . . . . . High Z, balanced

GPI Inputs

Closures to Ground . . . . . 5 General Purpose Interface Inputs

Impedance . . . . . High Z, unbalanced

Min. Closure Duration . . . . . 33 ms

Delay Between Closures . . . . 33 ms

Programmability . . . . . Any key function

1.2 Features and Specifications (Continued)

OUTPUTS

SMPTE/EBU Timecode

Format . . . . . SMPTE/EBU or SMPTE Drop Frame

Outputs . . . . . Two per channel

Output 1

Level . . . . . +10 dBm nominal unloaded,
-3 dB into 180 Ω

Impedance . . . . . Low Z, balanced

Output 2

Level . . . . . +4 dBm nominal

Impedance . . . . . 600Ω, balanced

GPI Outputs

Closures to Ground . . . . . 4 General Purpose Interface Outputs

Impedance . . . . . High Z, unbalanced

Closure Duration . . . . . Programmable, 33 ms to 1 s

Programmability . . . . . Any time match or sequence endpoint

Off State Voltage . . . . . 5 V pull-up through 10 kΩ

RS-232/RS-422 INTERFACE

Interface Type . . . . . Data set

Data Format . . . . . 9600 baud, 8 bits, 1 stop bit, no parity

Output Formats . . . . . Continuous HH:MM:SS or HH:MM:SS.FF

1.2 Features and Specifications (Continued)

ADDITIONAL FEATURES

Independent Channels	2
Presets	20, Channel independent
Simultaneous Start/Stop	Anytime
Leading Zero Blanking	Yes
Brightness Control	User selectable
Built-in Diagnostics	Included, electrical and mechanical
Chaining (Follow) Buffer	6 sequences deep per channel
Time Calculations	Addition and Subtraction (Stand-alone or to a channel)
One Key Calculations	Single frame or single second increment or decrement

Front Panel Display

Time Readout	Dual 6-digit, 7-segment readouts
Readout Formats	Hours:Minutes:Seconds or Minutes:Seconds.Frames
Display Format	24 Hours
Rollover/Rollunder	23:59:59.29 and 00:00:00.00 respectively

1.2 Features and Specifications (Continued)

MECHANICAL

UDT-5700

Width . . . . . 4.5 inches

Length . . . . . 7.0 inches

Depth . . . . . 1.75 inches - deepest point

UDT-5701

Width . . . . . 19.0 inches Electrical

Voltage . . . . . +8 Vdc, 250 mA

Depth . . . . . 7.25 inches

Height . . . . . 1.75 inches

ELECTRICAL

Voltage . . . . . +/-8 Vdc, 250 mA

CHAPTER 2

Installation

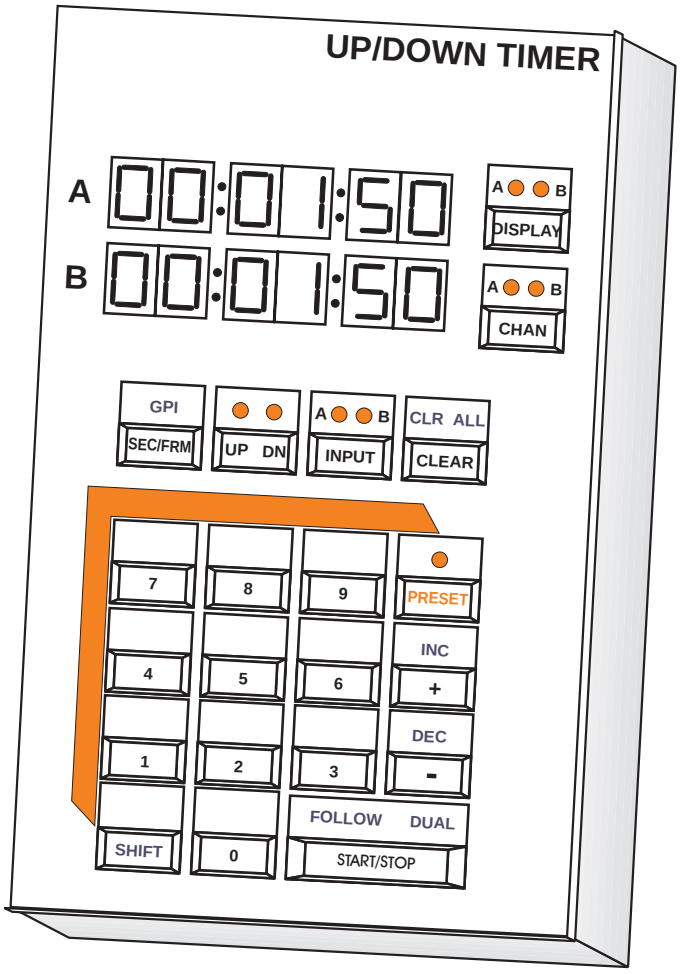
2.1 General

The UDT-5700/5701 Up/Down Timer is carefully inspected, tested and calibrated before shipment to ensure years of stable and trouble-free service. Please check the equipment for any visible damage which may have been caused during transit.

To operate the UDT, connect the black transformer to the UDT using the telephone-type cable supplied. The cable should easily snap into place on both the transformer and the rear panel of the UDT at the jack labeled as POWER or +8Vdc. Plug the transformer into a 115 VAC/60 Hz socket and the UDT will turn on automatically.

The UDT will operate as a stand-alone unit without external connections, other than power as mentioned above.

The power consumption of the unit is 250 mA at +8 Vdc via the transformer. In order for the unit to operate with maximum stability, it is recommended that the power remain applied 24 hours a day



2.2 Timecode Connections

Appendix A contains the pin outs of the external I/O connector. The basic timecode input and output connections are detailed below.

2.2.1 Output Timecode — Single Remote Display

Connect the remote timecode display (such as the DTD-5200 Series display) to primary TC output at pins eight and 10 on the external 37-pin I/O connector. This is the LO-Z (low source impedance) output from the UDT. (In a 600 Ohm system with proper terminations use pins seven and nine.) Both outputs (LO-Z and 600 Ohm) are balanced signals and should NOT be connected to ground. Pins 25 to 32 on the UDT are available for ground connections. The DISPLAY key will now allow both channels to be viewed remotely on the single display.

2.2.2 Output Timecode — Dual Remote Displays

Connect the **first** remote timecode display (such as the DTD-5200 series display) to primary TC output using pins eight and 10 on the external 37-pin I/O connector. This is the LO-Z (low source impedance) output from the UDT. (In a 600 Ohm system with proper terminations use pins seven and nine.)

Connect the **second** remote timecode display to secondary TC output using Pins 12 and 14 on the UDT's I/O connector. (In a 600 Ohm system with proper terminations, use Pins 11 and 13.)

Both outputs (LO-Z and 600 Ohm) are balanced signals, and should NOT be connected to ground. Pins 25 to 32 on the UDT are available for ground connections. The SHIFT-DISPLAY key should now be pressed to lock the outputs on Channel A and Channel B, respectively, assuming the 'A' LED is lighted on the DISPLAY key.

> ***The timecode connections should be made with shielded cable, if possible, especially if long distances are separating the UDT and the remote display(s).***

2.2.3 Input Timecode — Reference Input Only

If a more precise timecode source is available, such as the CSD-5300 Master Clock Driver, it should be connected to the UDT's timecode reference input. This will then give the UDT the same accuracy as the master source, and will frame-lock the two together.

Connect the external timecode to the UDT using Pins 18 and 19 on the UDT 37-pin I/O connector. ***(If drop frame timecode is used, the internal jumpers in the UDT must be set for drop frame. Otherwise, the UDT will seem to gain time, since the timebase for drop frame is faster than real time.)***

Note that connecting timecode to the reference input does not allow the UDT to read this timecode, only to use it for oscillator stability. To read this timecode and remain stable, see the following section.

2.2.4 Input Timecode — Reading Input Timecode

In order to read an external timecode source, the timecode must be applied to both the timecode input pins and the timecode reference input pins on the UDT.

As mentioned previously, the reference input must be connected to pins 18 and 19 on the UDT. To read this timecode source, the timecode must also be applied to the timecode input pins 16 and 17. To simplify cabling when reading input timecode, pins 16 and 18, and pins 17 and 19 may be tied together to form a single timecode input for both the reference and input connections.

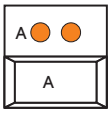
Note that it is NOT possible to read Input timecode unless the timecode is also connected to the reference input. However, it is possible to connect timecode to the reference input for use only as a timebase. This timecode should be more precise than the UDT in order to maintain stability.

CHAPTER 3

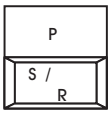
Operation Summary

The following is a step-by-step graphic description of the basic functions provided by the UDT-5700 and UDT-5701:

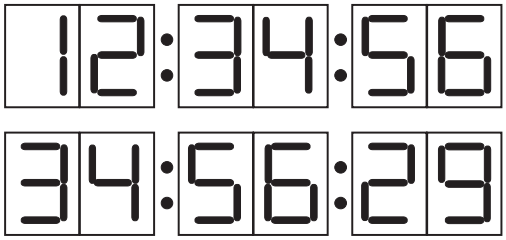
3.1 Entering Time and Direction



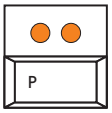
Select channel A or B using the CHAN button.



Select display format, either hours:minutes:seconds (SEC) or minutes:seconds:frames (FRM)



Enter the time via the keypad in hours:minutes:seconds or minutes:seconds:frames. If a mistake occurs when entering the time, press the CLEAR key and reenter the time.

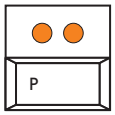


Select the direction.

Press START/STOP to start countdown, count-up or select other modes.

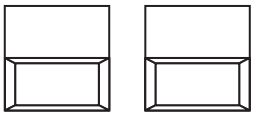
3.2 Loading PRESETs

Enter the time with the keypad as above.

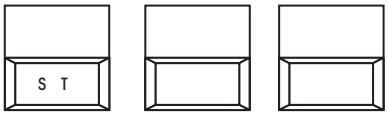


Select direction.

Select PRESET mode. The LED will start flashing.

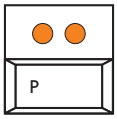


A total of 20 memory locations or 'presets' are available. To select a memory location, press its corresponding number from 0 to 9, or



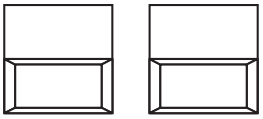
simultaneously press the SHIFT key and its corresponding key number (e.g. for the second memory location, press 1; for the thirteenth location, press SHIFT and 2). The PRESET light will stop flashing to indicate that the memory location has been selected.

3.3 Recalling PRESETs

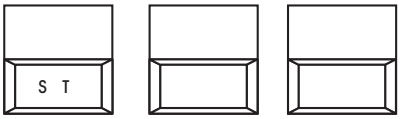


Select channel A or B.

Select PRESET mode. The LED will start flashing.



Select the memory location as previously described above in "Loading Presets", using (0 - 9)

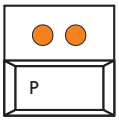


or (10 - 19).

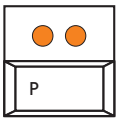
Press START/STOP to begin the count.

3.4 Elapsed Time

3.4.1 Using Input Time Code

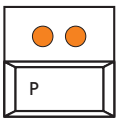


Select channel A or B.



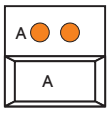
Input timecode. The counter will accept timecode and display it on the selected channel.

Mark the elapsed time (the counter will stop counting).

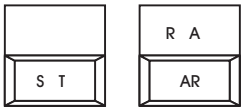


Return to timecode.

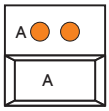
3.4.2 Using 2 Channels



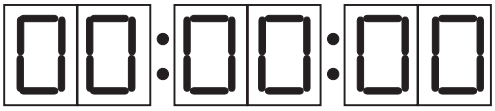
Select channel A or B.



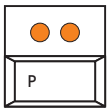
Press SHIFT and CLR ALL.



Select the other channel.

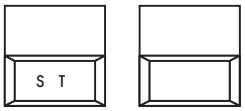


Enter the start time.



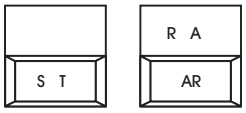
Select channel UP or DOWN.

Press START/STOP. The counting will start in the direction selected.

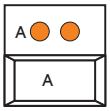


Mark the time; repeat. The current channel will show the elapsed (marked) time, while counting will continue in the other channel.

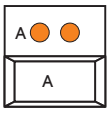
3.5 Sending Time to Remote Display



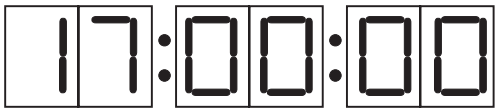
Press SHIFT and CLR ALL.



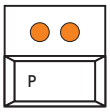
Select the channel to be displayed. When using a single remote display, use the A timecode output. The display will toggle between channels A and B. Whenusing two remote displays, use both the A and B timecode outputs. The display key will swap channels A and B. Simultaneously pressing the SHIFT and DISPLAY keys will lock the display selection as stated in Section 17 "Disabling Display Selection."



Select the channel (STOP, and if necessary, CLEAR).



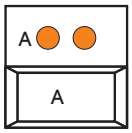
Enter the start time via the keypad or PRESET.



Press CHAN twice. The time will be sent to the remote display.

3.6 Stopping and Restarting

3.6.1 One Channel

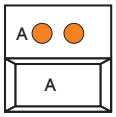


Select the channel.

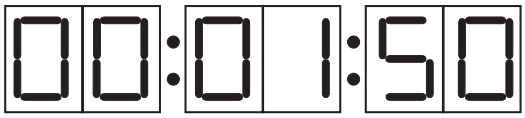
Press START/STOP.

Press START/STOP again to restart.

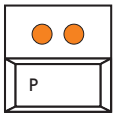
3.6.2 Two Channels Simultaneously



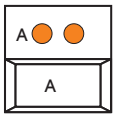
Select the channel.



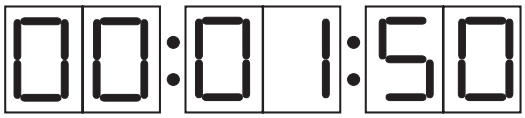
Enter the start time via the keypad or PRESET.



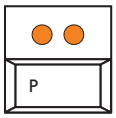
Select the direction.



Select the other channel.



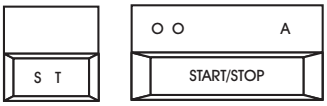
Enter the start time via the keypad or PRESET.



Select the direction.

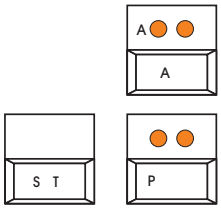
Start both channels by pressing START/STOP.

3.6.3 Stopping Two Channels Simultaneously



Stop both channels by pressing SHIFT and START/STOP.

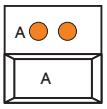
3.7 Reversing the Direction of the Count



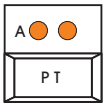
Select the channel.

Reverse the direction by pressing SHIFT and UP/DN.

3.8 Displaying Input Timecode (Input Timecode Required - One Channel Only)

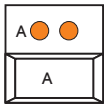


Select the channel.

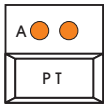


Press INPUT once to display the time. Press again to turn off the input and continue counting.

3.9 Countdown to End of Program (Input Timecode Required)



Select the channel.



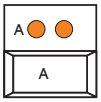
Input time code.

Press the - key once.

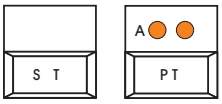
Enter the end of the program via the keypad or PRESET (must be **greater than** the current time from the input timecode).

Complete your selection by pressing START/STOP. The result is automatically started as a down count.

3.10 Returning to Input Timecode After Countdown (Input Timecode Required)



Select the channel.

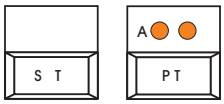


Simultaneously press the SHIFT and INPUT keys. The LED of the corresponding channel will be flashing.

Enter the time via the keypad or PRESET and if necessary, select the down direction.

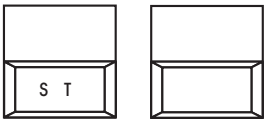
Start the countdown by pressing START/STOP. At the end of the countdown, the selected channel will display the input timecode.

To Disable



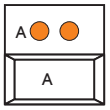
Note: If the other channel is being used (e.g. countdown, calculation, etc.), be sure to return to the desired channel in order to return to time after the countdown.
Simultaneously press the SHIFT and INPUT keys.

3.11 Swapping Channels

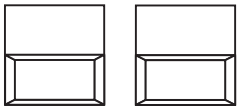


Simultaneously press the SHIFT and 4 key to swap channels.

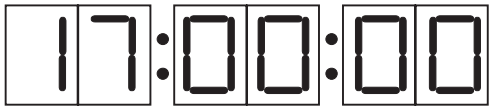
3.12 Adding/Subtracting Time to Existing/Running Count



Select the channel.



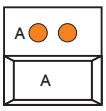
Select the operation, addition (+) or subtraction (-).



Enter the time via the keypad.

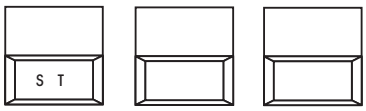
Perform the operation by pressing the START/STOP key, which corresponds to an "equal" or "result" key.

3.13 Adding or Subtracting Time (Small Increments)



Select the channel.

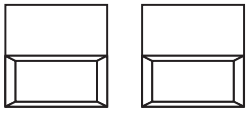
Select the display format, seconds (SEC) or frames (FRM).



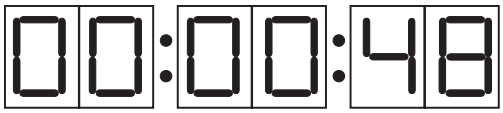
Each time INC or DEC is pressed, time is added or subtracted according to the smallest increment on display (seconds or frames).

3.14 Calculator

Enter the time via the keyboard.

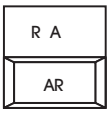


Select the operation, addition (+) or subtraction (-).



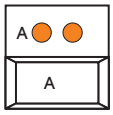
Enter the time via the keypad. (Press CLEAR if a mistake is made.)

Pressing the START/STOP key will perform a total in real time. The result may be stored as a PRESET.

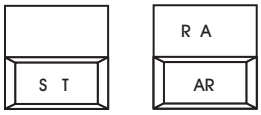


Return to the display of time by pressing CLEAR or press START/STOP to start the result as a new count.

3.15 Sequence of Countdowns (Follow Buffer)

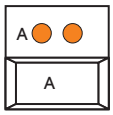


Select the channel.

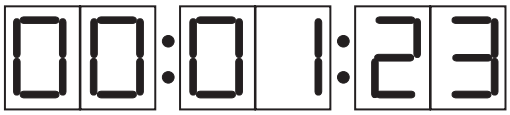


Pressing CLEAR ALL will clear the follow buffer and channel information.

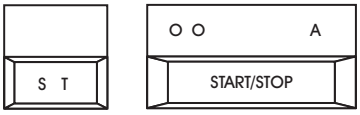
Enter the first countdown via the keypad or PRESET.



Press the CHAN button twice to complete and pause the first countdown.



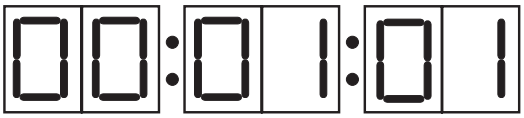
Enter the second countdown via the keypad or PRESET.



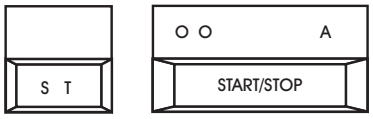
Simultaneously press both the SHIFT and START/STOP keys to complete the second countdown.

If more counts are desired in the sequence, continue as shown. Otherwise, skip to the end.

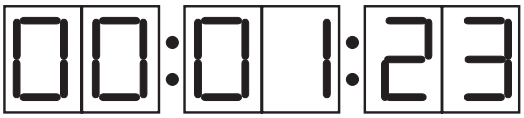
3.15 Sequence of Countdowns (Follow Buffer) - (Continued)



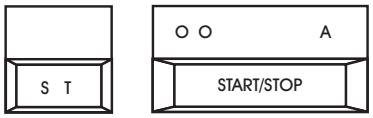
Enter the third countdown via the keypad or PRESET.



Complete the entry by pressing SHIFT and START/STOP.

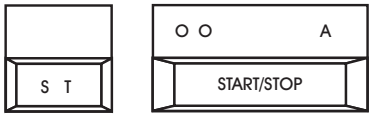


Enter the fourth countdown via the keypad or PRESET.

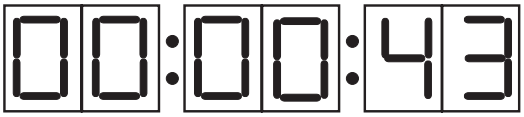


Complete the entry by pressing SHIFT and START/STOP.

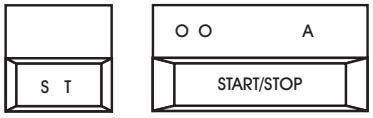
Enter the fifth countdown via the keypad or PRESET.



Complete the entry by pressing SHIFT and START/STOP.

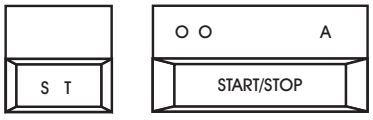


Enter the sixth countdown via the keypad or PRESET.



Complete the entry by pressing SHIFT and START/STOP.

Enter the seventh countdown via the keypad or PRESET.

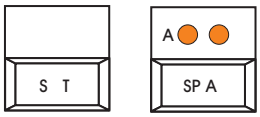


Complete the entry by pressing SHIFT and START/STOP.

Start the sequence: The first sequence entered and that currently being displayed.

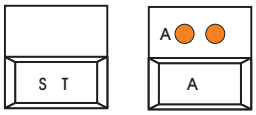
Note: While the sequence is running, countdowns may be continually added on to its end for a total of up to six countdowns at a time.

3.16 Disabling Display Selection



To disable, simultaneously press the SHIFT and DISPLAY keys. To re-enable, press both keys again.

3.17 Disabling channel Selection

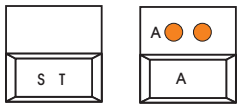


To disable, simultaneously press the SHIFT and CHANNEL keys. To re-enable, press both keys again.

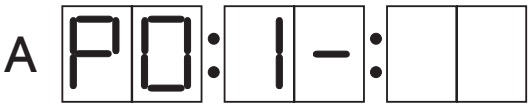
3.18 Programming GPI Outputs

When programming GPI outputs or inputs, any running count will be paused. Also, remove all GPIs connected to the unit before programming. A total of four GPI outputs can be programmed. These are:

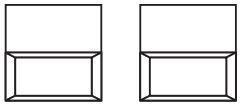
P O TP T



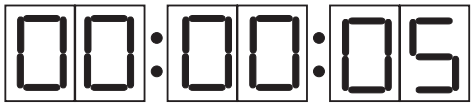
Simultaneously press both the SHIFT and SEC/FRM keys to program output #1.



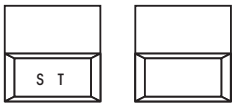
The middle LED indicates the output number. XX indicates the duration of contact closure (one to 29 frames).



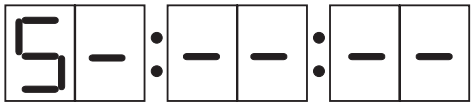
To change the duration, select the INC or DEC key depending on whether an increase or decrease is desired.

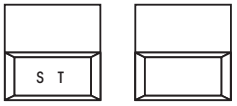


Channel B indicates the activation time, which is entered via the keypad only.

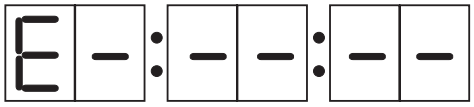


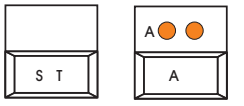
Simultaneously pressing both the SHIFT and + keys to program GPI output to activate at the start of the count.



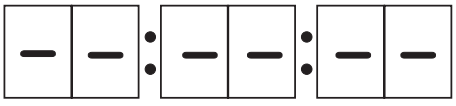


Pressing the SHIFT and - key will cause the GPI output to activate when the count reaches zero (e.g. end of countdown).

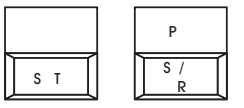




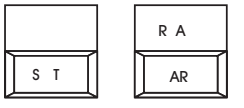
Simultaneously press both the SHIFT and SEC/FRM keys to program output #1.



P O TP TS



Execute as per output #1.
Note: Pressing the SHIFT and GPI keys a second time (e.g. as when programming output #2 after output #1) will store the previous output program (e.g. output #1) into memory.

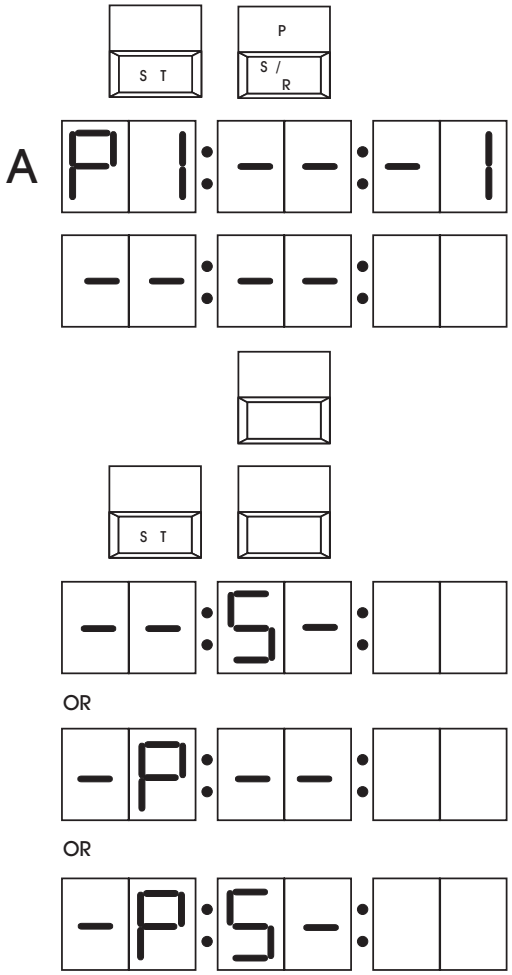


Pressing the SHIFT and CLEAR keys will exit at any time. Current GPI output status will not be stored into memory.

3.19 Programming GPI Inputs

Remove all GPI connections before programming.
There are a total of **five GPI inputs**. These are accessed after the GPI outputs and are programmed as follows:

P P T



Execute five times from normal display by pressing the SHIFT and GPI keys four times.

The left two LEDs of channel A indicate the GPI input. The right two LEDs of channel A indicate the number of the GPI input that is being programmed. (1 for the first of 5 GPI inputs is shown.)

The right LED of channel B indicates the key that will be remotely controlled by the GPI. XX = Key Number.

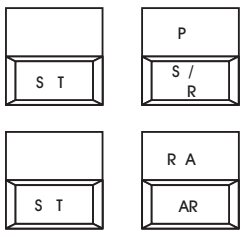
Press any key to be activated by GPI. (All keys except PRESET and GPI may be used.) The combination of SHIFT and the desired key can also be activated by the GPI. This will be indicated by displaying an S in the middle LED of Channel B.

PRESET sequences may be recalled and started also. Press the PRESET key followed by the appropriate digit key (0 to 9 or SHIFT 0 to 9).

PRESET recall mode is indicated by the P in the Channel B display.

(YY may only be key number 1 to 10 for the PRESET recall option.)

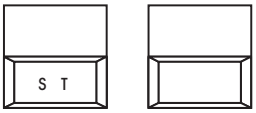
P P TS



Execute as per input #1.
Note: The numbers indicated in this example have no particular significance. Refer to Appendix B for the key numbers and their corresponding keys.

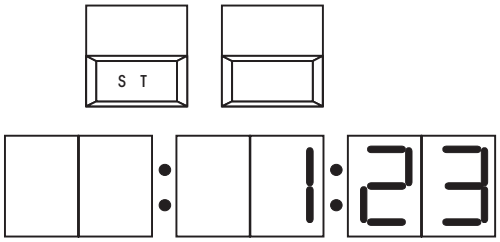
Execute again to return to normal display. Note that both channels will be paused but the input timecode will return immediately.

3.20 Brightness of Display



There are 15 levels of brightness, some of which will appear to flicker in certain environments. Thus, select only those which suit your requirements.

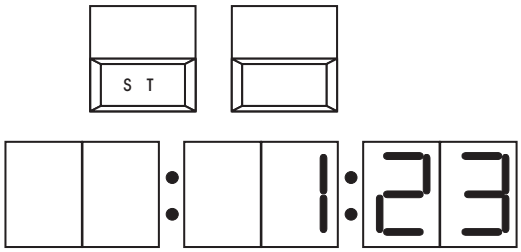
3.21 Leading Zero Blanking



Pressing the SHIFT and 9 keys prior to entering the time will remove the zeros before a number on the display.

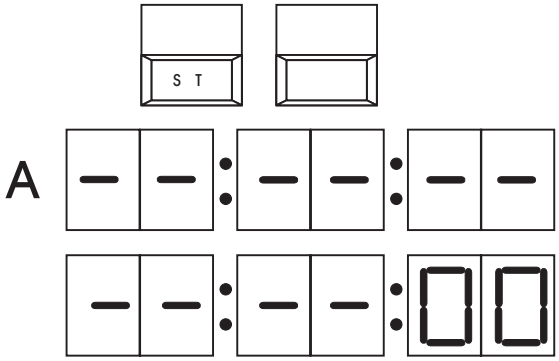
Note: Leading zero function will not affect the remote displays.

3.22 Re-enabling Lead Zeros



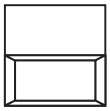
Pressing the SHIFT and 9 keys again will re-enable the zeros before a number on the display.

3.23 Serial Output Format Change



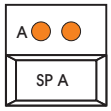
Pressing the SHIFT and 7 keys will pause both channels.

The right LEDs of channel B indicate the format: 00 = HH:MM:SS, while 25 or 30 = HH:MM:SS.FF.



Press the + key to obtain the correct format (i.e. HH:MM:SS or HH:MM:SS.FF).

Then press START/STOP to return to normal operation.



Pressing the DISPLAY key will clear the serial output screen following a format change.

Note: The format may also be changed via a terminal which is displaying serial output.

C H A P T E R 4

Starting Counts Using External Triggers

4.1 Introduction

When using the UDT 5700 Up Down Timer it is often desirable to start a count up or count down sequence in response to an external trigger such as a foot switch, push button or other contact closure event. In this mode it is possible for a user to remotely activate a count up or count down sequence using a single button or foot pedal operation.

A recent upgrade to the UDT's software permits such operation. To determine if your UDT unit supports this operation verify that its software revision is V2.95 or greater.

The firmware revision is indicated on the unit's EPROM chip inside the unit. For further information or to request an upgrade contact your Customer Service representative.

4.2 Operation

The UDT 5700 includes a Preset feature that allows the user to specify up to 20 Preset Count Sequences (numbered 0 - 9 and SHIFT 0-9). A count sequence includes a Start Time value and a Count Direction (up or down). The Preset feature is useful in that it allows a user to recall a specific count sequence with a mininum number of keystrokes.

The UDT 5700 also features 5 assignable GPI (General Purpose Interface) contact closure inputs. Each of these 5 inputs can be user assigned to any function including starting of Preset Count sequences.

CAUTION: When assigned to a preset count sequence, a closure on the GPI input automatically recalls the Preset Time and direction and simultaneously starts the count operation (regardless of what state the UDT is in when the contact closure input was asserted). The count in progress is terminated, and the preset time and direction is loaded and begins in the Preset direction.

CAUTION: Footswitch operation takes precedence over all other operations and users using the UDT.

Note that it is possible to program several different count sequences and assign them to the 5 GPI contact closure inputs. This allows different foot switches, push buttons or other contact closures to trigger different count events.

4.3 Configuring The UDT for Externally Triggered Count Sequences

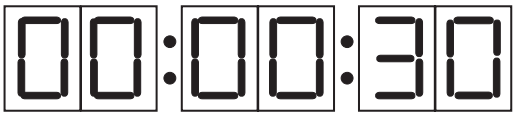
There are three simple steps to configuring the UDT for externally triggered count sequences:

1. Load a Preset Count buffer with the desired start count and count direction.
2. Program a GPI input to recall and start the programmed Preset Buffer.
3. Wire the Foot Switch, Pushbutton or Contact Closure to the UDT's GPI input. (Available on the 37 pin D connector as in Appendix A.)

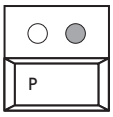
The steps are outlined in more detail in the two examples that appear below.

Example 1. Configure GPI input 1 to trigger a count down from 30 seconds

Step 1. Load Preset Buffer 1 with a count down from 30 seconds

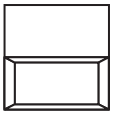


Type 3 then 0 to specify a start time of 30 seconds.



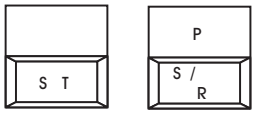
Press the Up/Dn direction key to select Down direction.

Select PRESET mode. The LED will start flashing.

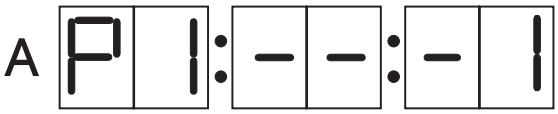


Press the 1 Key to specify Preset 1.
The PRESET Key light will stop flashing to indicate that the Preset Buffer has been programmed.

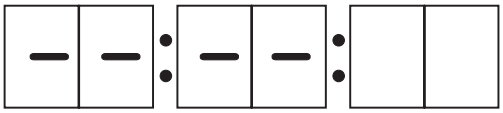
Step 2. Program GPI input 1 to trigger Preset 1.



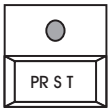
While holding Down the SHIFT key,
Press the GPI Key 5 times to select GPI 1.
(The 6th time selects GPI 2)



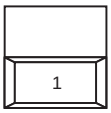
The two left-most characters of channel A's display show PI indicating the programming of a GPI input.
The right character shows that it is GPI input 1 in this case.



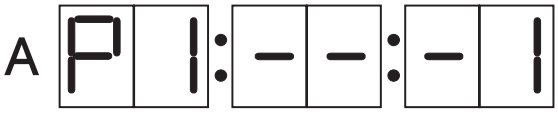
The right LED of channel B indicates the key that will be remotely controlled by the GPI. XX = Key Number. (whatever was previously programmed)



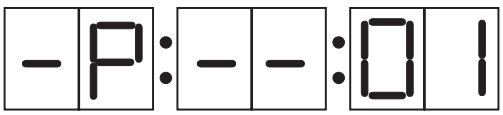
Press the PRESET Key ensuring its light is illuminated.



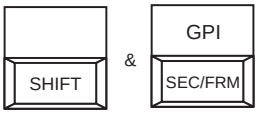
Press the 1 Key to select Preset 1 for recall.



Channel A's LED display continues to display PI---1 indicating that GPI input 1 is being programmed on GPI 1.



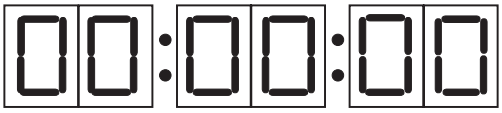
The 2 characters of channel B's LED display now shows P for Preset while the last characters display 01 to confirm that this GPI input is programmed to recall Preset 1.



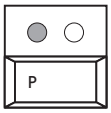
Press the SHIFT&GPI key combination 5 more times to exit from GPI programming mode.

Example 2. Configure GPI input 2 to trigger a count up from 0 seconds

Step 1. Load Preset Buffer 2 with a Count Up from 0 Seconds

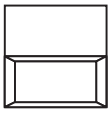


Type 0 to specify a count of 0 seconds.



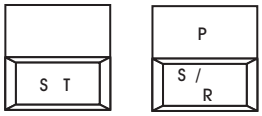
Press the Up/Dn direction key to select Up direction.

Select PRESET mode. The LED will start flashing.

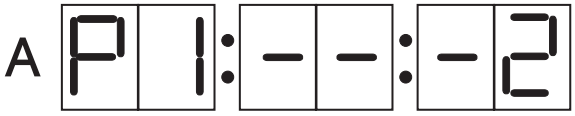


Press the 2 Key to specify Preset 2.
The PRESET Key light will stop flashing to indicate that the Preset Buffer has been programmed.

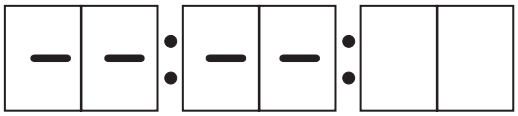
Step 2. Configure GPI input 2 to trigger Preset 2.



While holding Down the SHIFT key,
Press the GPI Key 6 times to select GPI 2.

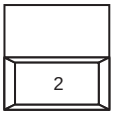


The two left-most characters of channel A's display show PI indicating the programming of a GPI input.
The right character shows this is GPI input 2 in this case.

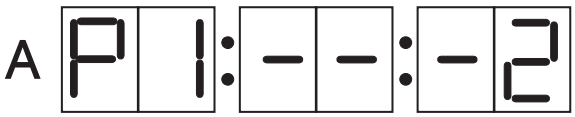


The right LED of channel B indicates the key that will be remotely controlled by the GPI. XX = Key Number. (whatever was previously programmed)

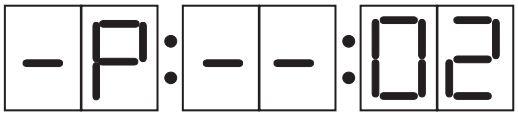
Press the PRESET Key ensuring its light is illuminated.



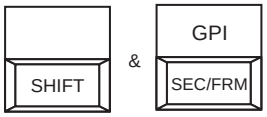
Press the 2 Key to select Preset 2 for recall.



Channel A's LED display continues to display PI---2 indicating that GPI input 2 is being programmed.



The 2 characters of Channel B's LED display now shows P for Preset while the last characters display 02 to confirm that this GPI input is programmed to recall Preset 2.



Press the SHIFT&GPI key combination 4 more times to exit from GPI programming mode.

4.4 Installing The External Switch

Figure 4.1 below shows a typical wiring diagram for installing an external foot switch to trigger a preset count up or down operation.

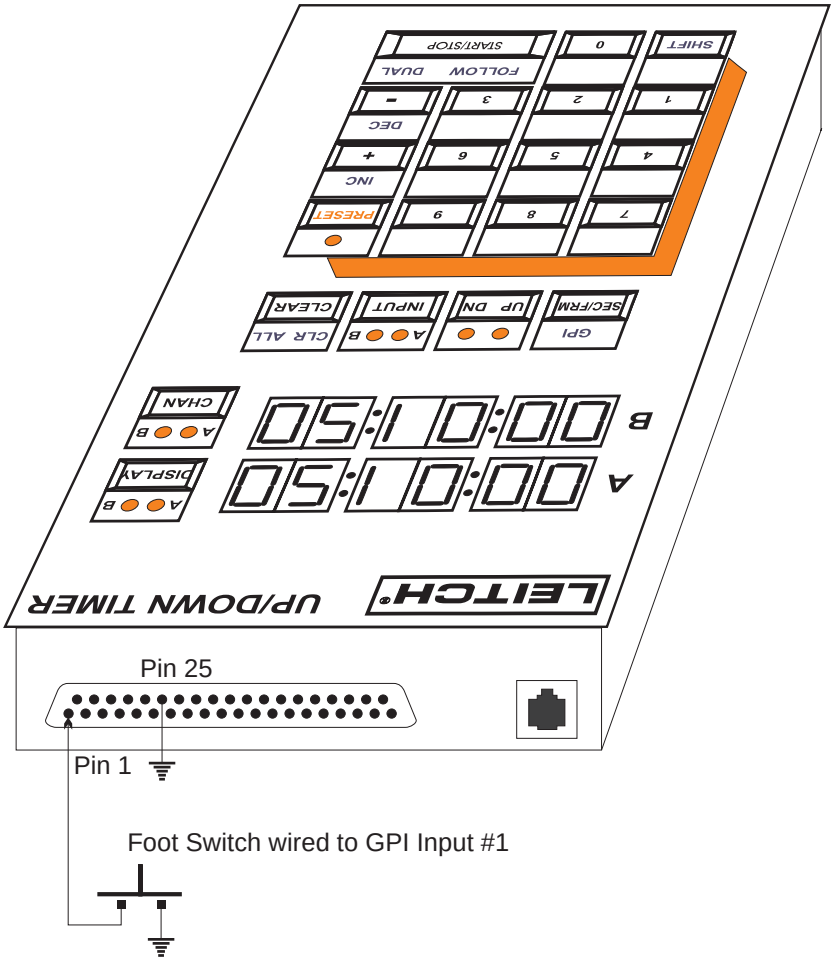


Figure 4-1. Installation Wiring of Foot Switch

The details showing the pin out for the UDT's 37 pin D shell I/O connector is shown in Appendix B on page B-3.

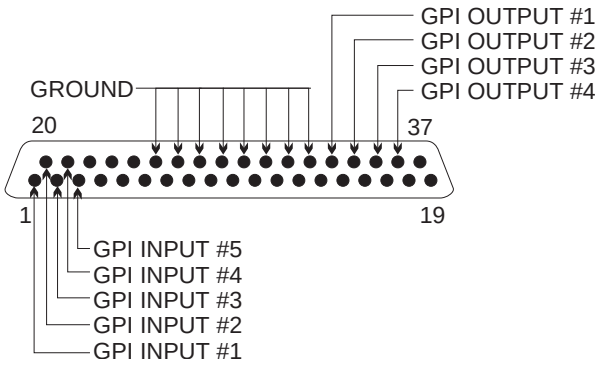


Figure 4-2. 37 Pin Connector

C H A P T E R 5

Operational Reference: Basic Operations

5.1 Overview of Basic Operations

UDT is essentially a pair of timers operating within the same enclosure. A timing sequence refers to either an up or down "count," which may be started or stopped at any time.

The UDT operates like a stopwatch with a combination START/STOP key. It will start a stopped count or stop a running count. The CLR-ALL (SHIFT-CLEAR) key acts like a reset function. It will either stop or reset the count to zero.

A typical **timing sequence (count**) is entered by means of the numeric keypad. This is called the edit mode since a timing sequence is being "edited." The UP/DN key sets the direction. An up count will begin at the time entered and count up. A down count will begin at the time entered and count down to zero. Pressing the START/STOP key will immediately begin the sequence.

The UDT can switch between the two available channels using the CHAN key. This allows one timing sequence to operate independently of the other. LEDs on the CHAN key indicate the currently "active" channel. The term **active** represents the channel which will accept an input from the numeric keypad. The two channels are called Channel A (top display) and Channel B (bottom display). LEDs on the CHAN, DISPLAY, and INPUT keys are designated as such.

The UDT has two SMPTE/EBU timecode outputs, **primary** and **secondary**. The outputs, however, are not specifically assigned from a particular channel. Either channel may be routed to the primary output using the DISPLAY key. LEDs on the DISPLAY key indicate the channel being sent to the Primary output, while the other channel is sent to the Secondary output. This switchable output is very useful when there is only one remote time display available (such as the DTD-5200 or DTD-5220). Either channel may be viewed remotely on a single display by means of the DISPLAY key.

5.2 Operational Examples

A few brief operational examples follow which highlight the basic timing functions that the UDT may perform.

Down Count: Enter the START time using the numeric keypad. The end time is automatically assumed to be 00:00:00. Press the UP/DN key until the LED above DN is illuminated. Press the START/STOP key to begin the sequence.

Up Count: Enter the START time using the numeric keypad. Press the UP/DN key until the LED above UP is illuminated. Press the START/STOP key to begin the sequence. (Note that there is no defined end time on an up count.)

To Read Input Time Code: Select the channel on which the timecode is to appear by using the CHAN key. Press the INPUT key to access the input timecode. The appropriate LED on the INPUT key will illuminate to indicate the presence of input timecode. The input may be turned off simply by pressing the INPUT key again. The timing will, however, continue without interruption. (Note that any calculations or functions performed on input timecode will automatically disable the input, as if the INPUT key was pressed again. Also note that only one channel may have input timecode at a time.)

> ***Note: When using input timecode, the reference input timecode must also be connected for the UDT to function properly.***

Automatic Program End Time Down Count (Requires Input Timecode): Select the channel to be used. Press the INPUT key to read the current time from the input timecode. Press the "-" (minus) key and then enter the time at which the program will end. Press the START/STOP key. The resulting DOWN count will be the time remaining until the program end is reached.

Simultaneous Dual Channel Start: Enter the first count (time and direction) on either channel and press the CHAN key. The other channel will become the active channel while the previous channel will remain paused. Enter the second count (time and direction) and then press the START/STOP key. Both channels will begin their respective counts together.

5.3 Key Functions

A brief explanation of each key is given below followed by the corresponding shifted (SHIFT) function of that key.

START/STOP: This key performs two separate functions depending on the current operating mode. After entering a time using the keypad, the START/STOP key functions as an "enter" key. It accepts this time and transfers it immediately to the active channel, along with the direction of the count. This immediately begins the counting sequence. However, pressing the START/STOP key while a sequence is running will pause the sequence until the START/STOP key is pressed again. This key operates only on the active channel.

Additionally, the START/STOP key serves as an "equals" key when performing time calculations. See Chapter 4, **Advanced Functions,** and section *Time Calculations* in this manual for more information.

FOLLOW DUAL (SHIFT-START/STOP): The shifted START/STOP key also performs two functions depending on the mode of operation. After entering a timing value with the keypad, the FOLLOW key accepts the timing data entered, but places the sequence into the follow buffer. The entered timing sequence does not begin until the end of the current sequence. This function may be used to "stack" a chain of sequences together, each following the previous sequence. See Chapter 4, **Advanced Functions,** and section *Using the Follow Buffer* in this manual for more information.

While a timing sequence is running, the DUAL key will pause **both** channels immediately. Pressing START/STOP will restart the currently active channel, while pressing the DUAL key again will restart both channels. In this manner, the DUAL key will operate like the START/STOP key, except it will operate simultaneously on both channels.

UP/DN: This key is used to indicate the direction of the timing sequence. The LED above either the UP or DN label indicates the direction of the sequence in the active channel. Up counting always begins at zero, while down counting always ends at zero. The UP/DN key will operate only while entering a time sequence (edit mode) and will not change direction otherwise.

SHIFT-UP/DN: The shifted UP/DN function instantly changes the direction of the currently active channel and updates the UP/DN key LED accordingly.

5.3 Key Functions (Continued)

CHAN: This key changes the active channel. The active channel is indicated by the LEDs located on the CHAN key.

SHIFT-CHAN: This key combination effectively locks the CHAN key on the active channel and prevents any additional switching of channels. This function may be un-locked at any time by again pressing the SHIFT-CHAN combination. This feature allows a particular channel to remain undisturbed.

DISPLAY: The DISPLAY key switches the channel to be sent to the remote display primary output. The LEDs located on the DISPLAY key indicate the channel available at the output. The secondary output always contains the timecode of the channel not on the primary output.

SHIFT-DISPLAY: The SHIFT-DISPLAY automatically locks the DISPLAY key in the current position and prevents additional switching. This is useful when two remote displays are dedicated to particular channel outputs. The function can be disabled by again pressing the SHIFT-DISPLAY key combination. LEDs on the DISPLAY key will still indicate the correct output.

PRESET: This key serves a double function, allowing sequence programming and access to the pre-programmed sequence keys. By entering a timing sequence (time and direction) followed by the PRESET key and a digit from 0 to 9, the sequence will be stored at the selected digit key (0 to 9, or SHIFT 0 to 9). The PRESET key LED will flash while waiting for a digit key to be pressed to store the sequence. The sequence may now be recalled by pressing the PRESET key and then pressing the correct digit key. The PRESET key and LED will stay active until the PRESET key is pressed again. Note that after recalling the sequence, the START/STOP or FOLLOW key must be pressed to actually start the timing. The status of the PRESET key (recall mode) is maintained during power failures.

PRESET time values can also be recalled and started immediately by a GPI Input. See Chapter 5, **Interface Functions**, and sections 1 and 2 on *Using and Programming the GPI Inputs and Outputs*.

5.3 Key Functions (Continued)

SEC/FRM: This key combination shifts the currently active channel between the HH:MM:SS and MM:SS.FF display. Each channel may be shifted independently of the other. To indicate the frames display, the top dot of the far right column is turned off. When entering timing data while in frames display, the far right entry is frames not seconds. This feature only changes the display on the UDT itself; any attached remote displays will not change formats.

> ***NOTE: For down counts, see* Chapter 4*: Advanced Functions the Section** *Timing Considerations.*

GPI (SHIFT-SEC/FRM): This key is used to program the General Purpose Interface (GPI) inputs and outputs. See Chapter 5 **Interface Functions** sections *Using the General Purpose Interface* and *Programming the GPI Inputs and Outputs*.

+ (Plus): This key is used when performing time addition calculations. This key is pressed and then the time to be added is entered using the keypad. To perform the addition, press the START/STOP key. The time entered will be added to the time on the active channel. This function is active even if the channel is paused.

To add time without affecting the currently active channel, enter the time and then press the + (Plus) key, then enter the second time, and finally press the START/STOP key to obtain the total. The UDT remains in edit mode while displaying the total. To use this total as a timing sequence, press the START/STOP key or the FOLLOW key. To clear the result, press the CLEAR key and the previous count will return unaffected to the display.

INC (SHIFT +): The INC function causes the currently active channel to increase time incrementally by either one second or one frame. This incrementation also occurs when the active channel is paused, or when entering a timing sequence in the Edit Mode. One second is incremented when the display shows HH:MM:SS, while one frame is incremented when displaying MM:SS.FF.

- (Minus): This key is used when performing time subtraction calculations. Refer to the + (Plus) key description above for more information.

DEC (SHIFT -): The DEC function causes the currently active channel to decrease time decrementally by one second or one frame each time it is pressed. See the INC key description above for more details.

5.3 Key Functions (Continued)

CLEAR: This key is used to clear keypad data entries from the active channel display and to correct keypad data entry mistakes while entering a time value in the edit mode. When performing time calculations, pressing CLEAR will clear the previous entry and the timer will remain in the current mode of operation. Pressing CLEAR again, however, will turn off the current mode. Pressing CLEAR while a channel is paused (stopped) will reset the channel as if CLR ALL were pressed.

CLR ALL (SHIFT-CLEAR): This key clears the currently active channel back to — —:— —:— — and stops whatever timing sequence was on that channel. The direction (UP or DN) remains unchanged, Edit Mode is turned off, and any pending time calculations are removed. Additionally, the Follow Buffer is cleared for that channel.

INPUT: This key is used to select the input SMPTE/EBU timecode (if available) for use on a particular channel. When pressed, the input timecode will appear on the currently active channel and on the corresponding output, depending on the status of the DISPLAY key. The LED on the INPUT key for the currently active channel will be illuminated to indicate that the time shown is an external input. Performing any function on the channel while it is using external timecode will turn off the external input but continue timing internally. Such functions as INC, DEC, addition or subtraction, and START/STOP (pausing), will deactivate the external input but the timing will continue to run under internal control.

Only one channel is allowed to have the external timecode at a time. If the INPUT key is pressed while the opposite channel already has external timecode, then the new channel will acquire the timecode and the previous channel will continue timing but on the UDT's internal reference.

The UDT will follow the input timecode's format (drop frame or non-drop frame) regardless of previous internal settings. Status of the input is maintained during power failures so that if selected, input timecode automatically returns after a power outage.

Note: *When using input timecode, the reference input timecode must also be connected for the UDT to function properly.*

SHIFT-INPUT: This key combination is used to activate/deactivate the Return-to-input feature which allows a timing sequence to return to input timecode when completed. Pressing SHIFT-INPUT enables the Return-to-input function for the currently active channel only if the other channel does **not** have the input timecode already. The Return-to-input feature automatically returns the current channel to input timecode (if available) when a sequence ends. Note that just as only one channel may have Time Code input at a time, only one channel may be using the Return-to-input feature at a time. If the other channel is currently using the input timecode, this feature will **not** steal the input timecode from it. The appropriate INPUT key LED will flash while a sequence is running to indicate that Return-to-input is activated.

5.3 Key Functions (Continued)

0 to 9: These are the data input keys arranged like a calculator keypad for easy use.

0 to 9 while in PRESET mode: The digit keys store or recall preset time sequences as programmed by the operator.

SHIFT-0 to SHIFT-9 while in PRESET mode: The shift digits also store or recall preset time sequences.

SHIFT-0: Not used.

SHIFT-1: Used to change the local display brightness in small decrements. There are a total of 15 possible brightness levels.

SHIFT-2: Not used.

SHIFT-3: Not used.

SHIFT-4: Used to immediately transfer or transpose Channel A to Channel B, and vice versa. This is useful for elapsed timing. For example, Channel B contains the running sequence, while Channel A is cleared. Pressing SHIFT-4 at the correct moment will switch the count sequence to Channel A, but freeze the last count value on Channel B. Pressing SHIFT-4 again repeats the operation, freezing the last value on Channel A and switching the count to Channel B. Note that the follow buffers for the two channels are **not** switched.

SHIFT-5: Not used.

SHIFT-6: Not used.

SHIFT-7: Used to change the characteristics of the serial RS-232/RS-422 communications port. See Chapter 5: **Interface Functions**, *Serial Communications Operation* section in this manual.

SHIFT-8: Enters diagnostic mode to allow the UDT to perform self -tests on the display and keypad. For more details, see Chapter 5: **Interface Functions**, *UDT Diagnostics* section of this manual.

SHIFT-9: This toggles the leading zero blanking control. Pressing this key combination will enable leading zero blanking on both channels. Pressing it again will disable blanking. This changes only the display on the UDT, while the remote time displays are **not** changed.

C H A P T E R 6

Operational Reference: Advanced Functions

6.1 Timing Considerations

As with any timing/counting process, the question of what to do with the “zeroth second always arises. In most real time applications, the “zeroth second is also the 60th second so the confusion is minimal.

To allow precise operation, the UDT does **not** count the zeroth second unless specifically required. This is because most down counts will end at zero and the visual transition from :01 to :00 is the actual end of the sequence.

To accommodate this “lost” second, the UDT will add 30 frames (one second) to any time entered for a down count. An entry of :45 is actually started as :45.29 so the :45 will remain on the display for one second before changing to :44. This may at first appear as though the sequence has not been started correctly due to the 45th second being counted up front. The end of the sequence then, will occur at the :01.00 to :00.29 transition after 45 seconds have elapsed.

The opposite is true for an up count sequence, which always displays the total elapsed time. Therefore, the “zeroth” second is counted and the display does not change to :01 until one second has elapsed.

When the UDT is displaying time in MM:SS.FF mode, the above notes are disregarded. Since the user may enter the frames, these are not altered at the start of a count. A down count then, will count the “zeroth” second since the count occurs in frames and the end will be at the :00.01 to :00.00 transition.

When switching between modes, the UDT automatically adds or subtracts 30 frames (one second) so the end transition is always correct for the current display mode.

6.2 Drop Frame Timing

The UDT may be set to automatically count time in drop frame fashion if required. This is only useful when the input timecode is running at video timecode rates (faster than real time). Drop frame time will "drop" or not count frames one and two of every minute except minutes 00, 10, 20, 30, 40 and 50.

> ***NOTE: By definition drop frame is unavailable when using EBU timecode.***

Drop frame timing is activated by a jumper selection on the inside of the unit. If requested, the UDT may be shipped pre-configured for drop frame timing. Otherwise, see the Section 3 *Jumper Configuration* in Chapter 6, Internal Operations, of this manual.

Note that input time code (if activated) reads the timecode, drop frame or not, directly into the indicated channel. This will bypass the UDT's internal drop frame settings (internal jumper setting) due to the channel input overwrite. However, if the INPUT key is again pressed so the counting returns to the internal reference then the drop frame process will begin. This is useful for viewing timecode (30 fps) on one channel and the drop frame timecode equivalent (29.97 fps) on the other channel.

> ***Also note that time calculations do* not *perform the drop frame function during the calculation.***

6.3 Simultaneous Start

Typically, both timing channels available on the UDT will be used independently. However, there is occasion to reference the two together even though the actual timing sequences may differ. An application may require a 30-minute down count for total program length and a 12-minute down count for the time to the first break. Since these are both related, they must both start at the same time.

To accomplish a simultaneous start, first enter a timing sequence as usual and set the UP/DN key appropriately. Do not, however, press the START/STOP or FOLLOW keys. Instead, press the CHAN key to change to the opposite channel.

After doing so, the CHAN LED will blink on the previous channel and remain solid on the new channel. The previous channel will be paused at the start of the sequence just entered.

Next, enter the timing sequence which is to be coincident with the sequence on the previous channel. Again, be sure to set the UP/DN key LED for the appropriate direction. To start both sequences, just press the START key. Both channels will begin immediately with their respective timing sequences.

6.4 Using the PRESET Key

The PRESET key operates as a permanent memory function for storing and recalling often-used timing sequences, even when the UDT is turned off. There are 20 available preset locations, one for each of the digit keys 0 through 9 and each of the shifted digit keys. Each preset location may contain a full time value along with a direction.

- To program a preset time value:

  1. Enter the time using the keypad and press the UP/DN key to indicate the correct direction.
  2. Next, press the PRESET key followed by the digit key (or shifted digit key) which contains this preset time value. The yellow LED on the PRESET key will flash while waiting for a digit key to be pressed.
  3. Press the desired digit key or shift digit key.

- To recall a preset time value:

  1. Press the PRESET key (without any keypad entry present in the channel) and the LED will remain constantly illuminated.
  2. Pressing the appropriate digit key will then recall the associated preset time value and direction. (The LEDs on the UP/DN key will change accordingly.)

The recalled time value does **not** immediately start when recalled in this manner. The START/STOP key or FOLLOW key must still be pressed in order to begin the sequence. This is just as if the preset time value was entered manually, one digit at a time.

Pressing the PRESET key while the yellow LED is illuminated will disable the preset mode and return to normal operation.

Note that while a preset time may be entered using numbers greater than or equal to 60 (e.g. as :90), the time will automatically be converted to standard notation (e.g. to 1:30) for storage and future recall.

A PRESET time value may also be recalled using a GPI input trigger. Time values recalled by GPI inputs start immediately and may be recalled at any time, even when PRESET mode is not active. If PRESET mode was not active, a GPI input trigger will not activate PRESET mode. It will, however, recall and start the PRESET time value and then return to the previous operating mode. (See the GPI Programming in Chapter 5, Interface Functions, Section 2, of this manual.)

6.4.1 Summary of PRESET Operations

To Store a PRESET Time And Direction: Enter a start or end time using the keypad. Press the UP/DN key to indicate the correct direction desired. Finally, press the PRESET key followed by a digit key (or shifted digit key) 0 to 9. The PRESET key LED will flash while waiting for a digit key for the assignment of the time entered.

To Recall a PRESET Time Sequence: Press the PRESET key so the LED remains illuminated (not flashing). Press the digit key (or shifted digit key) of the sequence to recall. If an error is made, simply press another digit key. The recalled sequence will also change the UP/DN key LEDs accordingly. Press the START/STOP key (or FOLLOW key) to begin the sequence.

> ***Note: PRESET time sequences may also be recalled by GPI inputs when PRESET mode is not activated (the PRESET key LED is off).***

6.5 Using the Follow Buffer

The UDT is equipped with a powerful memory capable of remembering timing sequences in order. This memory function allows one timing sequence to start immediately following the endpoint of the previous sequence. Up to six sequences per channel may be linked together in such a manner.

The sequence to follow is entered in the same way as a normal timing sequence.

- First, the time value is entered with the numeric keypad, and a direction is selected using the UP/DN key.
- Next instead of pressing the START/STOP key press the FOLLOW key to store the sequence.
  If another sequence is to follow the one just stored, repeat the procedure.

> ***Note that the sequences are "stacked" in order. The first sequence stored will be the first one retrieved.***

An example would be if four events were to be down counted in succession, :60, :10, :30, and :15. Instead of "manually" starting each event individually, each event could pre-programmed to follow one another.

The procedure would be as follows:

- First, enter and start the first count sequence, since it provides plenty of time to program the remaining three sequences.
- Next, enter :10, set the UP/DN key for DN and press FOLLOW instead of START/STOP. The channel display will return to the running sequence after storing the :10 second down count.
- Next, enter :30 and press FOLLOW.
- Finally, enter :15 and again press FOLLOW.

Now, when the :60 second count reaches :00 it will reset to :10 and continue the down count. Upon reaching :00, it will reset again to :30 and continue. Finally after reaching :00 for the third time, it will reset to :15 and count down a last time (unless another sequence has been entered into the follow buffer).

6.5 Using the Follow Buffer (Continued)

Although the follow buffer only has room for six sequences, the buffer may be continually reloaded. As a sequence is retrieved and begins running on the channel, the follow buffer opens the previously occupied location in storage. Another sequence may now be added to the chain.

Do not leave unwanted sequences in the follow buffer because they may suddenly start up when the current channel reaches an endpoint. **To clear the follow buffer, simply press CLR ALL and that particular channel's buffer will be erased.** Also, when input timecode is selected for a particular channel, that channel's follow buffer is erased to prevent unwanted operation.

Note that entering 00:00 on the follow buffer is a legal operation, but it is still direction-dependent. This is different from entering 00:00 and START, which will automatically assume an UP count.

Also note that an UP count in the follow buffer always starts at 00:00:00 and counts UP to the time entered. This is different from a normal UP count, which begins at the time entered and counts up indefinitely.

6.6 Time Calculations

The UDT's time calculator functions allow both stand-alone timing calculations and on-the-fly calculations involving running time sequences. In addition, single seconds or frames may be added (or subtracted) immediately to a running time sequence, using only a single keystroke. While a time sequence is running, a fixed amount of time may be added or subtracted by pressing the + (plus) or - (minus) key, entering the time, and pressing the START/STOP key. Addition/subtraction occurs at the moment the START/STOP key is pressed.

To Perform Time Calculations Without Disturbing A Time Sequence:

- The first time is entered, followed by the appropriate add or subtract (+ or -) key.
- Next, the second time is entered and the START/STOP key pressed to obtain the result. The result will keep the UDT in the Edit Mode, so that pressing START/STOP again will cause the result to be entered as a new time sequence.
- Pressing the CLEAR key will remove the result from the display. ***Note that the result cannot be added to or subtracted from the currently running time sequence in the channel. To perform such an operation, the result must be re-entered as mentioned in the previous paragraph.***

When a subtraction is made (from a running time sequence), a roll-under occurs and a down count is automatically started. This allows a quick method for creating a down count to the end of a program already in progress. Assuming time-of-day input timecode is available, press the INPUT key to retrieve the current time. By subtracting the time at which the program will end (a time typically larger than the current time, i.e. a future time) the result will immediately start as a down count.

6.6.1 Special Notes on Time Calculations

All time calculations are absolute; the difference between two times is always from the earliest to the latest time, regardless of the order of the times. For example, 09:00:00 - 15:00:10 will give 06:00:10 as a result, the same as 15:00:10 - 09:00:00.

Note that performing time calculations on a timing sequence does not alter the fact that the parameters of the original sequence still remain.

6.7 Remote Display Preload

When a remote display is used with the UDT, either on the primary or secondary timecode outputs, the time displayed will mimic the selected channel.

Occasionally, an operator may want to display the start of the next sequence without actually starting the sequence. This may be useful to indicate to others such things as the length of the upcoming segment and the time remaining.

This May Be Achieved As Follows:

- Enter the timing sequence and direction and then press the CHAN key **twice**. This effectively starts a sequence and immediately pauses it. The UDT does the start and the pause internally before any time has elapsed.
- The sequence remains paused (and the CHAN LED remains flashing) until the START/STOP key is used to restart the sequence.

C H A P T E R 7

Operational Reference: Interface Functions

Note: Do not activate any of the GPI Inputs while performing any of the Programming functions described in these sections (GPI outputs, inputs, and serial communications.) Unknown operation may result.

7.1 Using the GPI Inputs and Outputs

One of the more versatile features of the UDT is its ability to be controlled remotely by other devices and, conversely, to control other devices.

The UDT has five GPI inputs which may be used to mimic the key functions of any key on the UDT. Each GPI input acts as a key on the main unit. For this reason, one input must be released before another may be recognized. Also, any input (closure-to-ground potential) must remain low for at least one frame (33msec). Once recognized, the input operation is triggered at the start of the next frame as a key function.

All UDT keys, with the exception of the GPI key itself and the PRESET key, may be programmed to became activated by a GPIiInput.

The GPI outputs, of which there are four, may be programmed for activation by any time match or time sequence endpoint. A time match occurs when the time on the activation channel exactly matches (to the second, but at frame 00) the time programmed for the GPI output. (An endpoint is either a starting or ending time sequence.)

This allows one output to become active when a sequence begins, another when it reaches a specific point (e.g. :30), and a third when it ends (at perhaps 1:00).

Each output is programmable from a particular channel. The duration of activation may range from one to 29 frames (33msec to one second) and may be programmed individually for each output.

Each output is optically isolated from the UDT's main processor and is driven by a NPN transistor with a 10K Ohm resistor pull-up to five volts.

To use other voltage level outputs (with the appropriate external pull-up resistors), UDT resistor network RN3 must be removed.

7.2 Programming the GPI Inputs and Outputs

The UDT contains five GPI inputs and four outputs which may be programmed to be activated at any time. The UDT maintains the GPI programming information even when power is lost.

Programming is performed sequentially, first the outputs and then the inputs. The GPI key is used to access the programming routine. While programming the inputs and outputs, all other UDT functions are suspended and timing sequences are automatically paused.

To access the programming section, press the GPI key (SHIFT-SEC/FRM). The top display (Channel A) will show P0:1—:XX, where XX represents a duration time in frames (one to 29). The bottom display (Channel B) will indicate the activation time.

Pressing the + and - keys will change the duration appropriately. Entering an activation time with the keypad digits will change the current activation time. Press the CHAN key is pressed to change the channel on which the activation is to occur.

Using the INC key will place the particular output in a “start always” mode, that is, the output will be activated one frame after a timing sequence starts. The Channel B display will indicate this condition by displaying S—:— —:— —. Similarly, the DEC key will set the output for “end always” and the display will be E—:— —:— —.

To disable a particular output, press the SHIFT-0 key combination. The Channel B display will revert to 0 —:— —:— — to indicate that the output is turned off.

To accept any changes to the output configuration or to move on to the next output, press the GPI key. The Channel A display will indicate the second output as PO:2-:XX in a similar manner.

This part of the programming sequence may be exited at any time by pressing the CLR ALL (SHIFT-CLEAR) key.

Following access to all four outputs, the UDT will then enter the input programming mode by displaying PI:— —:—1 on the top display. The bottom display will show the key number of the input activation in the rightmost digit positions. Pressing any key, including a SHIFT key combination, will allow that key to be activated by that GPI input. A shifted key combination is shown by — —:S—:XX where XX is the normal key number.

Pressing the PRESET key will allow PRESET time sequences to be recalled and immediately started by the GPI input. When the PRESET key is pressed, its LED is illuminated and the bottom display will appear as —P:— —:XX or —P:S— —:XX, where XX may now only be key number 1 to 10. Only keys 0 to 9 and Shift 0 to 9 can be programmed in this mode since these refer to the PRESET time values. (See Using

the PRESET key section.) To deactivate this programming feature, press the PRESET key again until the LED is off.

When programmed in this manner, the GPI input will recall the time value from the designated PRESET storage location (keys 0 to 9 or Shift 0 to 9) and start this sequence immediately.

Enter a new key by pressing that particular key. To move to the next input, press the GPI key which is one of the two keys that may **not** be programmed.

By continually pressing the GPI key, all inputs may be accessed and programmed if desired.

GPI input programming may **only** be exited by pressing the GPI key so that all inputs are accessed. The CLR ALL key may be a programmed key and is, therefore, unavailable for use as an escape key. There is no other escape procedure; all five inputs must be accessed by pressing the GPI key. Following the fifth input (PI:— —:—5), the programming section will be exited and the UDT will return to normal operation with both channels paused.

7.3 Serial Communications Operation

The UDT offers two serial communications options: an RS-232 output or an RS-422 output. Unless specified otherwise when ordering, **RS-232 is the default output**. The rear cover of the UDT must be removed to determine which output option is installed. The default communications settings are 9600 baud, eight data bits, one stop bit, no parity.

The UDT provides ASCII character time outputs via this serial port, the output options being continuous HH:MM:SS or HH:MM:SS.FF. The format is similar in both cases; the time is sent as mentioned (including colons and period), followed by a carriage return prior to the beginning of the specified second or frame.

The serial output follows the primary timecode output. Pressing the DISPLAY key will change the output from one channel to the other. When the DISPLAY key is pressed, the serial port sends a form feed/clear screen character to clear the terminal display.

To access the serial communications options, press the SHIFT-7 key combination. Note that while accessing the serial communications options, the UDT will automatically pause both channels and suspend all other timing operations.

The UDT lower display indicates which option is currently selected. The display will read — —:— —:00 for continuous second output (HH:MM:SS), and — —:— —.30 for continuous frame output (HH:MM:SS.FF). Alternately, ‘25’ may be displayed instead of ‘30’ when using EBU timecode. The terminal display is self-explanatory.

To change the output options, press the + (plus) key to step through the selections and press the START/STOP key to accept a particular output option. Similarly, on the terminal keyboard, use the SPACE bar to step through the selections and the RETURN/ENTER key to accept an option as indicated.

This section may be exited at any time by again pressing the SHIFT-7 key combination or the CLR ALL key.

The HH:MM:SS.FF format still operates correctly for serial output when using external input timecode.

The serial port output type (RS-232 or RS-422) is determined by the IC installed on the 5700UC module in socket U1 or U2. A 14-pin DIP (LT1081) in U1 indicates RS-232, while an 8-pin DIP (SN75179B) in U2 is for RS-422. The user may change the output type by changing the IC installed in the appropriate socket.

C H A P T E R 8

Operational Reference: Internal Operations

8.1 UDT Diagnostics

The UDT self-diagnostic routine is accessed by pressing the key combination SHIFT-8. This begins an automated sequence that determines if all keys are mechanically operational and all LED displays functioning correctly. During the diagnostics routine all other UDT operations are suspended.

Upon entering the diagnostics mode, the UDT will display the software version number and current configuration.

The Channel A display will contain the version number of the software installed. Channel B will contain the original UDT release date. To continue with diagnostics, press any key.

Following the revision displays, the LED test will begin. All LEDs, both seven-segment and key LEDs, will be illuminated. They will remain illuminated until a key is pressed to begin the key mechanical test. If a segment or a particular key's LED is not illuminated, then the unit requires service.

Following the LED test, a key test is initiated to verify that all keys are mechanically sound. The key test begins when a key is pressed during the initial LED test.

When a key is pressed, the two-digit number corresponding to the key will be displayed on Channel B in the rightmost digit positions. The leftmost digit positions on Channel B will indicate the key number of any remaining keys to be pressed.

Pressing each key in turn, except the SHIFT key, the remaining key number should increase. If all keys have been pressed (including both the left and right side of the START/STOP key) then the remaining key number will be 26.

An unsuccessful test will not reach the state mentioned. Instead, the key number of the key which was not recognized will remain on the lower display in the leftmost digit positions.

8.1 UDT Diagnostics (Continued)

The number 26 is the number of the first GPI input. To complete the remainder of the test, the five GPI inputs must be activated (grounded) just as if they were keys. Once this is accomplished, the remaining key number will be replaced by two dashes to indicate completion. If the GPI inputs are normally not used, they do not need to be tested.

To allow testing of the four GPI outputs, the digit keys 1 to 4 directly correspond to outputs 1 to 4. By pressing any of these keys, the corresponding output will be activated (grounded) for approximately 200msec.

To exit diagnostics at this point or earlier, press the SHIFT-8 key combination again or the CLR ALL key. Upon exiting, the UDT will perform a soft reset as if the unit lost power momentarily, testing the internal reset/latch-up protection circuitry.

8.2 Internal Timing

The UDT-5700 operates internally on a frame reference. That is, although both channels are independent, their outputs are frame-locked. However, since they are independent, one channel may be currently sending frame 12 while the other is sending frame 28. Note, however, that this is not in any way actually locked to a true video frame. Real time is simply counted in a 30-frame-per-second fashion.

When using an external timecode input to the UDT, the internal reference is locked to the input timecode. Both the Primary output and the secondary output will be frame-locked to the timecode input — all will output the SMPTE data at the same time, although one may be on frame five, one on frame 18, and the input Time Code on Frame 22.

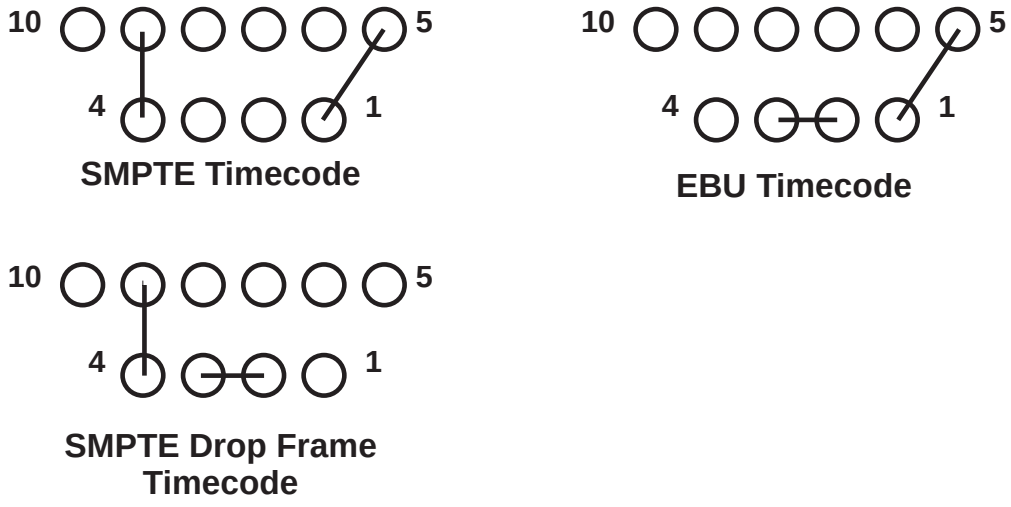
The reference timecode input is only used as a bit-to-bit timing reference (essentially, a 2400Hz clock) when applied to the UDT. If the reference timecode input is unused, it should be tied to the input timecode if available.

Note that input timecode will not function correctly unless the reference timecode input is tied to the input timecode source.

8.3 Jumper Configuration

The UDT contains an assortment of internal jumpers to select various additional options. One such option is drop frame timing. (See the section *Drop Frame Timing* in Chapter 4: **Advanced Functions** of this manual.) Another is the use of SMPTE or EBU (30 or 25 frames operation) timecode standards.

The diagram below indicates the correct jumper configurations for normal timing and Drop Frame timing. The jumper is located on the main processor circuit board, 5700UC, and is designated as W1.



Note: By definition, there is* no *drop frame mode for EBU timecode.

APPENDIX A

Connector Pin Outs

A.1 Power Connector (RJ11)

Signal	*RJ11 (AMP #520250-2) (DUPONT #68898-002)*
(Not Used)	1
(Not Used)	2
+8 volts unregulated	3
Ground	4
Ground	5
(Not Used)	6

A.2 I/O Connector (37-Pin 'D' connector)

Signal	*37-Pin (AMP #745784-3) (COMPAR #TDN-37SYB)*
GPI Input #1	1
GPI Input #3	2
GPI Input #5	3
RS-422 Input (+)	4
RS-422 Output (-)	5
RS-232 Input	6
Primary TC Out (600 Ohm)	7
Primary TC Out (Lo-Z)	8
Primary TC Out (600 Ohm)	9
Primary TC Out (Lo-Z)	10
Secondary TC Out (600 Ohm)	11
Secondary TC Out (Lo-Z)	12
Secondary TC Out (600 Ohm)	13
Secondary TC Out (Lo-Z)	14
Spare (Unused)	15
Timecode Input	16
Timecode Input	17
Timecode REFERENCE Input	18
Timecode REFERENCE Input	19
GPI Input #2	20
GPI Input #4	21
RS-422 Input (-)	22
RS-422 Output (+)	23
RS-232 Output	24
Ground	25
Ground	26
Ground	27
Ground	28
Ground	29
Ground	30
Ground	31
Ground	32
GPI Output #1	33
GPI Output #2	34
GPI Output #3	35
GPI Output #4	36
Unregulated + 8 volts	37

A.3 Self-Diagnostic Mode, Switch to Key Comparison

In the self-diagnostic mode, the switch numbers correspond to the actual keys on the left.

Keys	***Switch Number***
0	10
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
CLEAR	11
PRESET	13
DISPLAY	14
UP/DN	15
START/STOP	16, 22
+	17
-	18
INPUT	19
CHAN	20
SEC/FRM	21
GPI #1	26
GPI #2	27
GPI #3	28
GPI #4	29
GPI #5	30

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