SERIAL RS-232 / RS-422 / RS-485 INTERFACE DEFINITION
MODEL TLSD & TLSE FREQUENCY SYNTHESIZERS

GENERAL

Luff Research's models TLSD*xxxxxxxx*/xxx & TLSE*xxxxxxxx*/xxx frequency synthesizers are serially controllable frequency synthesizers. Frequency control can be accomplished by the following standard interface bus format:

      RS-232
      RS-422 (4 wire)
      RS-485 (2 wire)

Figure 1 shows the general interface.
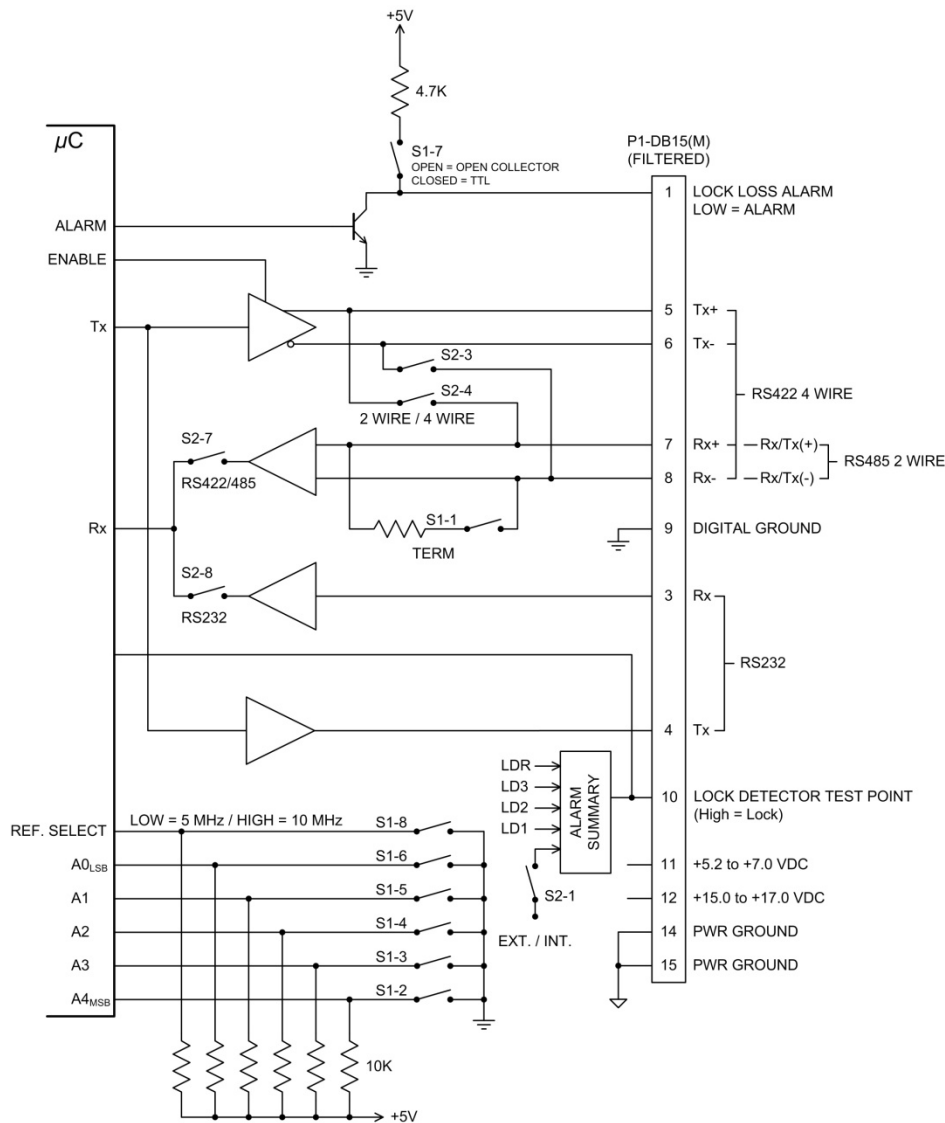

Figure 1

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The specific interface bus desired is determined by the dipswitch settings shown in figure 2 and 3.
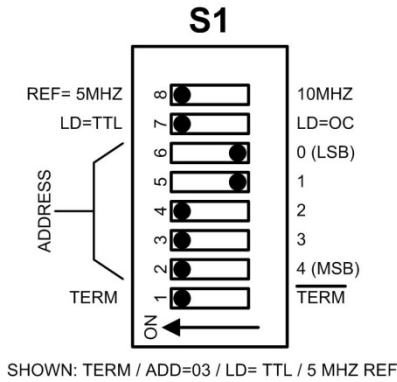(Note: unit is shipped with the setting shown in figure 2 & 3.)
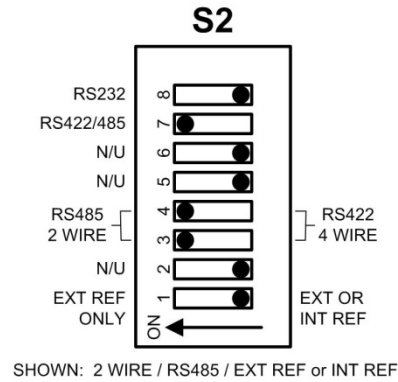

Figure 2

Figure 3

The unit operates in a command/response mode with no hardware flow control. The Data rate settings shall be:

- Baud Rate: 9600 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

DC POWER & FREQUENCY CONTROL INTERFACE

The DC power and frequency control is made through P1, which is a 15-pin male subminiature-D connector.

For RS232 interface, configure the 15 pin mating connector as shown below:

Pin#	Description
1	Lock Loss Alarm
3	Receive Data (Rx-RS232)
4	Transmit Data (Tx-RS232)
9	Digital Ground
10	Lock Detector Test Point
11	+5.2 to +7.0 VDC
12	+15.0 to +17.0 VDC
14,15	Power Ground
2,5,6,7,8,13	**Do Not Connect**

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For RS422 interface, configure the 15 pin mating connector as shown below:

Pin#	Description
1	Lock Loss Alarm
5	Transmit Data (Tx+)
6	Transmit Data (Tx-)
7	Receive Data (Rx+)
8	Receive Data (Rx-)
9	Digital Ground
10	Lock Detector Test Point
11	+5.2 to +7.0 VDC
12	+15.0 to +17.0 VDC
14,15	Power Ground
2,3,4,13	**Do Not Connect**

For RS485 interface, configure the 15 pin mating connector as shown below:

Pin#	Description
1	Lock Loss Alarm
7	Receive Data (Rx/Tx+)
8	Receive Data (Rx/Tx-)
9	Digital Ground
10	Lock Detector Test Point
11	+5.2 to +7.0 VDC
12	+15.0 to +17.0 VDC
14,15	Power Ground
2,3,4,5,6,13	**Do Not Connect**

NOTES:

1. Lock Detector Test Point on Pin 10 is for test only.
2. Multiple units may be wired together using the open collector output at Pin 1.
3. The digital ground on pin 9 and the power ground on pin 14 or 15 should be connected together at the connector.

REFERENCE FREQUENCY OPTION

S1 can be set for either a 5 MHz or 10 MHz reference frequency input. At the absence of an input reference frequency, the unit will automatically switch to an internal reference.

LOCK DETECTOR (LD) MONITOR POINT

The lock detector (LD) indicates failure within the synthesizer. The synthesizer operates on an external reference, however if the external reference is lost the synthesizer automatically switches to the internal reference. The LD can be set as shown below.

Ref. Mode	Ext. Ref. Only (S2-1 ON)	Int. Ref. Only (no Ext Ref)	Ext./Int. Ref. (S2-1 OFF)
LD (Ext. Ref.)	High	High	High
LD (Ext. Ref. Removed)	Low	N/A	High

There are two lock detector monitor points:

1. Pin 1 is a lock detector monitor point derived from the microcontroller. This output is high at lock. The level can be set via S1-7 to be either CMOS/TTL or open collector.

2. Pin 10 is the same LD function but is a fixed TTL level.

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SERIAL INTERFACE PROTOCOL

The synthesizer serial interface shall operate in a command/response mode. The remote host shall provide the desired frequency setting in ASCII values and the synthesizer shall respond with a command accepted or rejected response. An ASCII 'A' shall be returned if the command is accepted and an 'R' shall be returned if the command is rejected. The ACK/NACK response shall be followed by a carriage return. The synthesizer output can be turned off or on through the serial interface, in a similar fashion. Current status of the synthesizer can also be obtained via the serial interface. Two ASCII characters representing the address setting allow multiple synthesizers to be connected together in RS-422/RS-485 mode. The synthesizer shall only accept & respond to commands that include address values that match the dipswitch setting. Refer to Figures 1 and 2.

FREQUENCY COMMAND:

Command: $> n_1 n_2 Ffffff$ ↵
Response: $< n_1 n_2 A$

Where:
- \>Start of message HOST to SYNTH
- <Start of message SYNTH to HOST
- $n_1 n_2$ two ASCII values representing address '00' to '31' as set by S1.
- F is the ASCII value 'F' = 46 Hex.
- fffff is an ASCII representation of the desired frequency in 100 kHz steps.
- ↵ is the ASCII value for a carriage return.

Example for a synthesizer in the 7125 – 7960 MHz band:

Command: >01F71250 ↵
Response: <01A

Command: >01F80001 ↵
Response: <01R

STATUS REQUEST:

Command: >01? ↵
Response: <01Ffffffl

Where:
- \>Start of Message HOST to SYNTH
- <Start of Message SYNTH to HOST
- ? is the ASCII value 3F Hex.
- ↵ is the ASCII value for a carriage return.
- $n_1 n_2$ two ASCII values representing address '00' to '31' as set by S1.
- F is the ASCII value 'F' = 46 Hex.
- fffff is an ASCII representation of the current frequency in 100 kHz steps.
- l is the lock/unlock condition of the synthesizer, 'L' = Locked and 'U' = Unlocked.

Example:
Command: >01? ↵
Response: < 01F71250L

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MUTE COMMAND:

        Command: $>n_1n_2$Mm ↵
        Response: $<n_1n_2$A

        Where:

- \>Start of Message HOST to SYNTH
- <Start of Message SYNTH to HOST
- n_1n_2 two ASCII values representing address '00' to '31' as set by S1.
- M is the ASCII value 'M' = 4D Hex
- m is an ASCII value of '0' or '1'
  - '0' = synthesizer output is OFF
  - '1' = synthesizer output is ON

SUPPLIED EVALUATION SOFTWARE

The supplied software is a windows based graphic user interface (GUI) that allows the user to execute frequency control of the synthesizer with an intuitive windows utility box.

If there is any questions with the use of these utilities please call the Luff Research directly at:

Phone: 516-358-2880 or E-mail to: sales@luffresearch.com

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