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Model LT-2 and LT-2P

LTR® Communications Decoder
And
Application Software

User's Instruction Manual

Revision 1.01

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INTRODUCTION

Congratulations on your purchase of the LT-2 communications decoder. You will find enclosed with your new LT-2 a DB-9S RS232 adapter and a 6 wire modular cord. They are especially wired for the LT-2. The LT-2 is intended for the communications professional or hobbyist who needs the finest test equipment in order to properly monitor LTR or LTR compatible systems and service land mobile equipment.

This manual contains instructions for installation and operation of the LT-2 as well as for the LT-2P application program. At the end is a brief trouble shooting guide.

INSTALLING, ADJUSTING AND OPERATING YOUR LT-2

INSTALLATION
The LT-2 must be connected to a source of clean 10-15 VDC power and to the receiver. For best results, please use shielded wire for power and receiver connections.

GND:	Power supply return (-) lead.
+12V:	Positive side of the 10-15 VDC supply. If receiver is powered with 12 VDC, share with LT-2.
GND:	Shield of cable to receiver chassis ground.
INPUT:	From receiver (see AUDIO TAKEOFF POINT below)

AUDIO TAKEOFF POINT
To decode LTR, the LT-2 must be connected directly to the detector output (before de-emphasis). The De-Mod output on service monitors is suitable.

If you only wish to decode DTMF, a connection to the high side of the volume control may work or the speaker leads will probably suffice.

If in doubt about where your detector output is, simply contact a technical representative at the company who produced your radio. Alternatively, send us a schematic diagram, and we will attempt to assist you, however bear in mind the manufacturer of your radio knows more specific details about your radio than we do.

ADJUSTMENTS
DTMF will not reliably decode unless the audio is properly de-emphasized. Strap JP-1 must be left installed if you have connected directly to the detector. If you have taken audio past the receiver's built-in de-emphasis, remove the JP-1 shorting clip. Proper connection of JP-1 is essential for proper decoding of DTMF.

While receiving a transmission containing a LTR code (preferably about 1000 Hz. deviation) adjust the GAIN potentiometer P1 for 1.4 volts peak-peak measured at TP-1 using an oscilloscope. (TP-1 is located between the large fuse and the RS232 jack). If an oscilloscope is not available, turn P1 fully CCW and increase CW until LED D7 just begins to light. (D7 is adjacent to the P1 GAIN potentiometer). Be sure to make this adjustment only when an LTR encoded signal is being received. Be sure a signal with LTR is present, because the LED may also light on receiver noise when no signal is present resulting in an incorrect P1 setting.

NOTE: TP-2 is not used.

You must select the correct polarity. The LT-2 will not operate correctly and will not decode LTR unless the polarity is properly selected. If you have properly set the levels and no LTR codes are displayed nor output to the RS232 port, then change the JP-2 jumper. To select polarity, add or remove JP-2 as required.

The LT-2 also has a built in squelch circuit. After adjusting the pre-amp level, P1, above, set P2 fully CCW, then adjust P2 with no signal present to just above the threshold where the receive (REC) light goes out. The REC light is visible from the front panel. The adjustment is just like any normal squelch control. LTR will not decode with the REC light out. You may get some false decode signals if P2 is improperly adjusted and the light is on with no signal present.

<div align="center">OPERATION</div>

The LT-2 is fully automatic. When a DTMF tone or LTR code is decoded it appears in the digital display and one of the front panel LED's illuminates to indicate which type of tone or code is being decoded.

The displays used in the LT-2 are not capable of directly displaying the DTMF *, #, A, B, C or D. The * and # are displayed using - and ||. A, B, C and D are displayed using the numbers 1. 2. 3. and 4. Note that these are distinguishable from 1 2 3 and 4 because decimals accompany the digits. The Table below shows all the DTMF digits and how they appear on your LT-2.

1 = 1	5 = 5	9 = 9	A = 1.
2 = 2	6 = 6	0 = 0	B = 2.
3 = 3	7 = 7	* = -	C = 3.
4 = 4	8 = 8	# = ||	D = 4.

If a DTMF code occurs, the LT-2 temporarily stops displaying the LTR USER ID and displays the DTMF activity. When the DTMF concludes, the LT-2 replays the entire sequence (up to 32 digits) slowly so that you can observe ANI and speed-dialer codes that would be otherwise too fast to comprehend. Afterward, the LT-2 resumes decoding LTR USER ID automatically.

USER ID DISPLAY
Your LT-2 displays the USER ID in a compact form which is easily read. The HOME repeater and USER number is displayed. (Some LTR vendors refer to the USER number as a GROUP number. In this manual, the USER number refers equally to this three digit GROUP number. The term USER ID will refer to the complete HOME-USER 5 digit code. The term USER refers to the three digit USER number.) Other information in the LTR word are output on the RS232 port but are not visible on the display. The LT-2 displays the complete USER ID for the station using the channel. A built in algorithm discriminates between trunking codes for those users actually on the channel vs. those users not trunked off. Only the USER ID for the active group is displayed.

The four digit display of the LT-2 displays the USER on the right hand three digits. The HOME repeater is displayed on the left digit and decimal. The coding for HOME is as follows:

```
HOME Repeater    DISPLAY
     1              1
     2              2
     3              3
     4              4
     5              5
     6              6
     7              7
     8              8
     9              9
    10              0
    11              1.
    12              2.
    13              3.
    14              4.
    15              5.
    16              6.
    17              7.
    18              8.
    19              9.
    20              0.
```

Examples are shown below:

```
USER-ID      DISPLAY
07-203       7 2 0 3
13-034       3.  3 4
10-125       0 1 2 5
20-001       0.    1
15-240       5.2 4 0
```

ABOUT the RS232 SERIAL PORT
IBM Compatible Personal Computers use either DB-9 or DB-25 serial COM ports. The
DB-9 is more commonly used in recent years; therefore we have provided a DB-9 to
RJ-11 adapter along with a seven foot, six wire phone cord. If your computer
uses a DB-25 connector, you must obtain a DB-9 male to DB-25 female adapter from
your favorite computer store or build your own RJ-11 to DB-25 adapter.

IMPORTANT: Only a six wire phone cord with locking tabs on same side of cord may
be used. A six wire cord is supplied.

The RJ-11 to DB-9 adapter is wired as follows (with the locking tab up and the
modular phone jack facing you, pin 1 is on the right. This wiring is for a
"standard" 6 wire phone cable with the locking tab on the same side on both
ends. (This reverses pins 1-6 through the cable). If you wish to wire a DB-25,
then it is shown here also:

```
     RJ-11 DB-9S DB-25S
     pin   pin   pin    Description

     1     to    8      5      CTS
     2     to    3      2      TX Data
     3     to    5      1      Gnd
     4     to    n/c    7      Gnd
     5     to    2      3      RX Data
     6     to    7      4      RTS
                 4      6 --|  DTR
                 6      20--|  DSR Must be connected together
```

In addition, DB-9S pins 4 and 6 are shorted. (DTR to DSR). The equivalent pins
are 6 and 20 on the DB-25S. Although you see a lot of RJ-11 to DB-9/25 adapters,
there is no standard for their connection. The adapters are available commonly
in many electronic stores. If you are connecting to a modem, you will need a
null modem adapter to reverse pins 2 and 3 of DB-9S or to reverse pins 7 and 8
of the DB-9S.

LT-2P APPLICATION PROGRAM

INSTALLATION

If you purchased the LT-2P Program, you received a single 3.5 inch PC DOS compatible disk containing the LT2P.EXE application and an install program. The easiest way to install is as follows: (The symbol <CR> refers to the keyboard "ENTER" key.)

1) Place the new disk into your 3.5 inch drive.
2) Make this drive the current drrive. If it is drive A:, type A:<CR>. If it is drive B: type B:<CR>.
3) Type install<CR>

Install will ask you on which hard drive you wish to install the program and in which directory. It will modify AUTOEXEC.BAT on drive C: if required. This will allow you to run LT2P from any directory on your PC.

4) When installation is complete, remove the disk from your PC and reboot.

Reboot either by pressing CTRL+ALT+DEL or by pressing RESET or by cycling power to the computer. (If it is not convenient to reboot now, then you will need to run LT2P from the installation directory until you do reboot.)

5) Attach the LT-2 to either COM1 or COM2 serial port on this PC. See the instructions above about making the connections to the DB-9 or adapting to a DB-25 on your PC. **LT2P will NOT operate on any serial port other than COM1 or COM2.**

INTRODUCTION to the LT-2P APPLICATION

After installation of the LT-2P application on your computer, installation of the LT-2 on your receiver or service monitor, and after connecting the LT-2 serial cable to the PC, you are ready to explore the power of the LT-2P application. This is a summary of the features and screens available to you with this program.

Main (Run) screen (**F6** or **R**)

Displays a scrolling log of all received data from the LT-2 and a continuous log of the 20 most recently received USER IDs.

Initialization Screen (**F4** or **I**)

Allows setup of the COM port and selection of the USER IDs to be displayed and/or masked.

Active USER ID Screen (**F8** or **U**)

Displays the complete list of USER IDs that were detected during the monitoring time.

Time of Day Screen (**F2** or **D**)

Displays accumulated USER ID durations and sum of all usage as a percentage of available time each hour of the day.

Hit Screen (**F3** or **H**)

Displays Hits per USER ID (A Hit is a detected USER ID lasting 2 seconds or longer).

Total Time Screen (**F7** or **T**)

Displays the total accumulated time for each USER ID enabled by the initialization screen.

Observe Data Screen (**F5** or **O**)

Displays the raw data stream from the LT-2 to the serial port. This is useful for looking at the exact USER IDs being received by the LT-2 without software filtering.

Activity Screen (**F9** or **A**)

The Activity Screen displays the set of 20 possible repeaters on an LTR system. It shows the utilization of the system to the extent possible while monitoring a single repeater channel.

Help Screens (**F1** or **?**)

These are context sensitive help which shows details about the options available to you on any screen.

RUNNING THE LT-2P APPLICATION

To run the program type LT2P at the command prompt. There are two command line switches available, but normally they will not be used.

1.   /S[IM] Runs LT2P in a simulate mode. This reads a file named LT2P.SIM in your local directory (if it exists) and updates the display with a new line periodically. This can be used to demonstrate the capability of the program.

2.   /U[PDATE] Reads the file LT2P.LOG which contains information from previous sessions into the program. This allows data to be combined with current data to observe the information previously collected.

For example, to use the update option, type **LT2P/UPDATE** or **LT2P/U** at the command line prompt.

When the program starts, you will first see the Connect Systems, Inc. welcome and copyright notice. After pressing any key, you will see the Main Run Screen with just the headings and the help prompts at the bottom of the screen. Figure 1 shows the Main Run Screen.

As valid data is received, it is added to the LT-2 Log at the left of the screen. (Data is filtered by the program so that invalid and duplicate data is not recorded.) If a line is too long to display on the half screen available, then the line is "wrapped" with a back slash "\" at the end of the line. (This back slash was not in the data received from the LT-2.)

At the same time the accumulation table on the right is updated every second. This table is sorted in order of USER ID. If more than 20 codes have been recorded then only the most recently recorded 20 are shown on the screen.

The Total column shows the total time in MIN:SEC format. This is the total time which was accumulated under that USER ID during the time the program was running plus the accumulated time from the LT2P.ACC file, if it was previously saved. In addition, the time from the log (LT2P.LOG) if /UPDATE was used is included.

The Hits column shows the total number of hits or conversations recorded. A hit is any continuous activity with at least 2 seconds from that USER ID.

The Since column shows the number of HRS:MIN:SEC since the last recorded time for that USER ID. If the time exceeds 999 hours, the time field is replaced with a days display.

Next to the bottom of the screen is a line titled "System Repeaters." This displays a list of all the system repeaters detected within a recent interval. The list displays an asterisk (*) beside the repeater monitored. Other inferred repeaters are shown without the asterisk. The display shows the area bit as well as the repeater number. This provides for the possibility that a nearby repeater on the same frequency has a differing area bit.

MAIN (RUN) SCREEN
This is an example of the main screen.

```
    LT2P Log                    A H ID      Total  Hits  Since
    L 1 09 09 002 11            1 02 002   102:47  543   0:00:07
    L 1 09 02 003 11            1 02 003     8:19  195   0:00:20
    D 1                         1 05 011     0:32  12    118:56:58
    L 1 09 02 002 11            1 05 031     1:36  12    118:56:35
    L 1 11 09 025 11            1 06 041     1:18  12    118:55:54
    L 1 09 15 004 11            1 07 031     0:08  2     118:56:25
                                1 07 041     0:08  4     118:56:12
                                1 08 011     0:52  10    118:56:03
                                1 09 025     1:19  29     0:00:07
                                0 10 021     0:48  14    118:56:45
                                1 11 041     0:48  8     118:55:53
                                1 13 011     0:12  4     118:56:44
                                1 13 021     1:20  16    118:55:55
                                1 15 004    13:59  122    0:00:00
                                1 15 021     1:28  12    118:56:48
                                1 15 041     3:42  32    118:56:18
                                1 16 011     2:42  26    118:56:26
                                1 16 021     0:36  10    118:56:41
                                1 19 021     3:04  30    118:56:13
                                1 20 011     0:20  10    118:57:01
    System Repeaters *1-9 1-11
           F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P
```

Figure 1. Example of the RUN screen of the LT2P program.

Access to any other screen is obtained by pressing a keyboard key corresponding to the screen desired. The letter and function key for the desired screen is indicated above in the list of screens in this manual. An abbreviated list is at the bottom of every screen as a reminder. The complete list is also available by pressing the F1 function key or the ? key at any time.

INITIALIZATION SCREEN

To see the Initialization screen, press F4 or the letter I. Figure 2 is an example of the initialization screen.

```
LT2P Setup                Setup
PORT COM1 PRINTER LT2P.PRN
Masked      A..A HH..HH III..III    Display    A..A HH..HH III..III
            1..1 01..20 001..250               0..0 01..05 001..250




















        F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P,
         ^P, S, Arrows, ALT-D, ALT-M, TAB, SHIFT+TAB, ^X, ^V, *,
```

Figure 2. LT2P Initialization screen

In the initialization screen, you may change the COM port, change the printer, add USER IDs to monitor, or delete USER IDs to monitor.

To change the COM port, move the cursor (with the arrow keys) to the PORT line. By pressing the space bar, you may toggle the COM port from 1 to 2 and back. Pressing the letter S will save any settings from this screen to a file named LT2P.INI.

To change the destination of all print (CTRL+P) commands, move the cursor to the printer name. Use the arrow keys or the TAB key to accomplish this. Press the space bar to select the printer destination. One selection is a file, this file will contain an ASCII picture of the screen for future printing or for other uses.

To filter the USER ID's to be displayed, you may use the Mask and Display filters. The default Initialization Screen contains no display values and contains no mask values. A mask value overrides any display value. An example is warranted.

Suppose you wish to observe only AREA 0 repeaters and you wish to observe only USERs homed to repeaters 1 and 5. In addition, only USERs from 50 to 99 are to be monitored on repeater 5 but all users on repeater 1.

1) Add a new mask value by pressing ALT+M. The cursor will be under the 0 of the first column. This line, which reads 0..1 01..20 001..250 will mask ALL USER IDs. Type a 1, this changes the line to read 1..1 01..20 001..250. This masks all codes from repeater 1.

2) Add a new display value by pressing ALT+D. The cursor is under the 0. Press the right arrow and you will be under the 1. Type a 0(zero). Now all of the repeaters for AREA 0 are enabled.

3) Type 01 and 01 again. The line will look like this: 0..0 01..01 001..250. This allows display of all USER IDs homed on repeater 1.

4) Add a new display value by pressing ALT+D. The cursor is under the 0. Press the right arrow and you will be under the 1. Type a 0. Type 05. Type 05 again. Type 050 and 099. The line look like this: 0..0 05..05 050..099. This line permits home repeater 5 users 50-99.

You may save this configuration by typing an S on the keyboard. Examination of the file LT2P.INI will reveal the lines you just added. Since there is no limit to the number of lines you may have, you have complete flexibility to display those users you want to display.

Unless saved, the changes made will apply only to this session running the LT2P program. This allows you to make temporary changes without affecting your permanent LT2P.INI file.

ACTIVE USER ID SCREEN

Access this screen with the F8 or U key. Figure 3 shows the appearance of the
Active USER ID Screen.

```
            List of Active  USER IDs
   A HH Id  Since       Hits Total
   1 02 002 118:58:47 542  1:02:34
   1 02 003 118:58:55 194  0:08:15
   1 02 004 118:56:39 18   0:02:12
   1 02 021 118:56:10 14   0:02:02
   1 02 031 118:56:21 14   0:00:38
   1 02 041 119:01:21  8   0:00:56
   1 05 001 118:58:01 25   0:01:04
   1 05 002 118:58:21 32   0:01:06
   1 05 003 118:57:42 23   0:01:44
   1 05 011 118:55:20 12   0:00:32
   1 05 021 118:55:41 12   0:00:24
   1 05 031 118:54:57 12   0:01:36
   1 06 004 118:57:06 20   0:02:03
   1 06 041 118:54:16 12   0:01:18
   1 07 001 118:58:27 52   0:03:33
   1 07 004 118:57:23  8   0:00:16
   1 07 011 118:55:49 14   0:00:56
   1 07 031 118:54:47  2   0:00:08
```

        F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P, ,
                Figure 3. Tone Detection (Used Tone) Screen

The Active USER ID Screen simply shows a list of all detected USER IDs. Since
more USER IDs may be detected than fit on the screen, you may scroll through
them with the up and down arrow keys. You may also use the Initialization
Screen to reduce the number of USER IDs shown.

TIME OF DAY SCREEN

The Time of Day Screen depicts the utilization vs. time of day. This allows you to see where the peak utilizations are for each of the displayed USER IDs. Figure 4 shows an example of the Time of Day Screen.

```
         Time of Day Statistics, Seconds each Hour, 100 Seconds per *



      1500




      1000                              *
                                        *       *
                                        *       *
                              *         *       *
                              *         * *     *
       500                    *     * * * *     *
                              *     * * * *     *
                              *     * * * *     *
                              *   * * * *       *
                              *   * * * * * * * *
         0              * * * * * * * * * * *
      Hour   12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
            M                 AM              N            PM
                        All
      F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P, , , ->, <-, S
```

Figure 4. Time of Day Screen

While reading the Time of Day Screen, you may review any USER ID by using the left and right arrow keys to select a USER ID to view. In addition, use of the S key will toggle to a display of the total utilization for all USER IDs combined. Note that the total utilization may exceed one hour because of accumulation of data over many days. You need to take into account the number of days of monitoring to determine accurately the percentage utilization.

You may also see the time used as a fraction of one hour by pressing the % key. The percent key is a toggle, so you may return to the time display by pressing the % key again.

Using the UP and DOWN arrow keys, you may adjust the vertical scale factor to have better ability to see detail in times of lower utilization.

HITS SCREEN

The Hits Screen displays the number of hits recorded during the monitoring
interval. A hit is defined as a continuous USER ID detection of at least 2
seconds. Figure 5 is an example of a
Hits Screen.

```
                        Hits (5 per *) vs. Id
       75   ^ ^
            * *
            * *
            * *
            * *
       50   * *                         *
            * *                         *                              *
            * *                         *                     *        *
            * *                         *                     *        *
            * *              *          *                     *        *
       25   * *             *           *              *      * *      *
            * *          * * *          *              *      * *      *
            * * *        * * *        *   *          * *      * *    *      *      *      *
            * * * * *    * * * * * * * * *           * *    * * * * *    *      *    *
            * * * * * * * * * * * * * * * *        * * * * * * * * * * *    *    *
        0   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1
            2 2 2 2 2 2 5 5 5 5 5 5 6 6 7 7 7 7 8 8 8 8 9 0 0 1 1 2 2 3 3 3 3 4

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 2 3 4 0 0 0 1 2 3 0 4 0 0 1 3 4 0 0 1 4 2 0 2 0 4 0 3 0 0 1 2 0
            2 3 4 1 1 1 1 2 3 1 1 1 4 1 1 4 1 1 1 1 4 1 1 5 2 1 4 1 3 1 1 2 1 1 4
                                     USER ID
    F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P, , , ->, <-
```

Figure 5. Hits Screen

The Hit Screen displays only those USER IDs with at least one hit during the
monitoring time. If more than 35 USER IDs have at least one hit, then you may
scroll left and right using the LEFT and RIGHT arrow keys.

Using the UP and DOWN arrow keys, you may adjust the vertical scale factor to
have better ability to see detail in USER IDs of lower utilization.

TIME SCREEN

The Time Screen displays the total time per USER ID during the monitored time interval. USER IDs with no detected time greater than 2 seconds are not displayed. Figure 6 is an example of a Time Screen.

```
                Accumulated Time (50 Sec per *) vs. Id
   750    ^
          *
          *
          *
          *
   500    *
          * *
          * *
          * *
          * *
   250    * *
          * *                           *
          * *                           *                                   *
          * * * *           *         *   *           * *       *   *           *
          * * * *     * * * *     * * * *     *       * * *     * *   *           *   *
     0    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
          0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1
          2 2 2 2 2 2 5 5 5 5 5 5 6 6 7 7 7 7 7 8 8 8 8 9 0 0 1 1 2 2 3 3 3 3 4

          0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
          0 0 0 2 3 4 0 0 1 2 3 0 4 0 0 1 3 4 0 0 1 4 2 0 2 0 4 0 3 0 0 1 2 0
          2 3 4 1 1 1 1 2 3 1 1 1 4 1 1 4 1 1 1 1 4 1 1 5 2 1 4 1 3 1 1 2 1 1 4
                                  USER ID
  F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P, L, , , ->, <-
```

Figure 6. Time Screen

Using the LEFT and RIGHT arrow keys, you may scroll the Time Screen in the same manner as the Hit Screen above. Using the UP and DOWN arrow keys, you may adjust the vertical scale factor to have better ability to see detail in times of lower utilization.

OBSERVE RAW DATA SCREEN

The Observe Raw Data Screen is provided to allow display of the raw data output from the LT-2. This will be very useful for a service technician to be able to directly observe the data stream from the LTR equipment. This will make trouble shooting radio problems much easier. Refer to DESCRIPTION of RS232 OUTPUT at the end of this manual for interpretation of this data.

```
                        Observe Raw Data Screen

        L1 9 16 1 11
        L1 3 16 1 11
        L1 9 16 1 11
        L1 3 16 1 11
        L1 9 16 1 11
        L1 3 16 1 11
        L1 9 16 1 11
        L1 3 16 1 11
        L1 9 16 1 11
        L1 3 16 1 11
        L1 9 16 1 11
        L1 9 16 1 11
        L1 9 16 1 31
        L1 9 9 255 9
        L1 9 16 1 11
        L1 9 16 1 11
        L1 9 16 1 11
        L1 9 16 1 11
        L1 9 16 1 11


        F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P
```

Figure 7. Example Observe Raw Data Screen

ACTIVITY SCREEN

The Activity Screen is a picture of the system activity as determined by listening to a single repeater. The information available by monitoring a single repeater is limited to a list of all repeaters and the utilization on that repeater and the utilization by all USERs homed to that repeater. Thus, if you monitor repeater 9, all users homed to repeater 9 may be observed; however, USERs homed to repeater 11 will only be observed if they are trunked to repeater 9. Figure 8 is an example of the Activity Screen.

All repeaters are numbered on the screen. On the right of each number will appear the USER ID of the USER on that repeater. If no USER is detected on that repeater, a -- --- appears. This symbol indicates that the repeater is on the system, but no detected user is there. (Remember the ability for the LT-2 to detect users on other system repeaters is limited, see above.)

On the left of all detected repeaters are three possible characters. An asterisk designates that repeater as the repeater being monitored. In addition, there may be one or both of a 1 or a 0. The number is the AREA bit for that repeater. If your LT-2 is hearing an area 1 repeater and an area 0 repeater, both will be shown.

```
        Activity Screen
    R Hm USER              R Hm USER
    1                    1 11 -- ---

    2                      12

    3                      13

    4                      14

    5                      15

    6                      16

    7                      17

    8                      18

1*  9 15 004               19

   10                      20



    F1:?, F2:D, F3:H, F4:I, F5:O, F6:R, F7:T, F8:U, F9:A, P, ^P
```

Figure 8. Example of Activity Screen

PRINTING of SCREENS

Any of the screens, except the help screens, may be printed at any time by pressing Control-P. The screen is sent to the printer as normal text and should print properly on almost any printer. The printer is selected in the Initialization Screen.

IN CASE OF DIFFICULTY

My LT-2 decodes DTMF and but does not decode LTR.

You probably have not connected the LT-2 to the actual detector of the receiver. Connections to the speaker leads or to the volume control do not have enough low frequency bandwidth to work. Also, be sure the pre-amp level in the LT-2 is adjusted properly using TP-1 (as described in the manual pages 3 and 4) or using the internal LED sensor. You may also have the polarity jumper (JP-2) incorrect for your system. No USER IDs will be displayed if this jumper is incorrect.

My LT-2 decodes LTR but not all DTMF digits.

The most likely problem is that the de-emphasis jumper is incorrect. Since LTR works properly, you probably need the jumper (JP-1) changed.

My LT-2 decodes everything on the display but I see nothing on my computer terminal.

Be sure the port is properly selected. If you are not using LT-2P, make sure the baud rate is correctly set to 2400 baud. If you are using a terminal (not a computer) make sure you are using a null modem adapter to reverse the TXD and RXD data.

I am using Windows and sometimes when I use the LT2P program, it gives me a message about which MS-DOS Prompt I want to use.

Windows does not allow the use of the serial ports by more than one window at a time. Either you are using that serial port in another application, or you used LT-2P in another window before trying it in this window. If no other program is using the port, simply tell windows you want to use the other port, and it will work fine.

I am using Windows, and I lose data whenever I use another window.

Set up the MS-DOS prompt window (Using Settings...) to allow background running. If your computer is a 486 or better, it should be fast enough to keep up with the serial data from the LT-2P even with 30% background operation.

I accidentally quit LT2P but now I need that data back!

Run LT2P/U. This reads a log file (LT2P.LOG) which allows LT2P to start from where it left off. Obviously, any data sent while the program was not running will be lost. Much or all of the data may be lost if the computer crashes or you turn off power while LT2P is running.

I try to print a screen using the PRINT SCREEN button, but nothing happens.

LT2P can only print the screen with CTRL+P or CTRL+PRINTSCREEN. This is a side effect of the method used to interpret the keyboard and is not easily changed.

I try to print a screen using CTRL+P but nothing is on my printer.

The Initialization screen allows you to select your printer or to place the print results into a file named LT2P.PRN. You may have the printer selection incorrect. Also, please be sure your printer is actually connected and turned on and works with other applications.

DESCRIPTION OF LT-2 RS232 OUTPUT

This section is for those who choose to read the RS232 output directly or otherwise have interest in its format. It is not required to understand this format if using the LT-2P application.

The output of the LT-2 is a very simple, easy to read format, which may be observed by any terminal emulator program or by making a proper connection to an ordinary terminal. The serial data rate is 2400 baud and cannot be adjusted. Set the COM port on an IBM compatible as follows:

MODE COM1:2400,N,8,1,P

Replace COM1 with COM2 if the secondary serial port is used. (While you may use any serial port compatible with your terminal emulator, the LT-2P program available from Connect Systems, will operate only with COM1 or COM2.) The MODE setting is not required when using the LT-2P.

The data is formatted for readability but significant processing is left to the LT-2P program described in its section in this manual. The format is line oriented. Each line contains either an LTR code or a DTMF digit.

An LTR line starts with an `L'. The format is LA GG HH III FF where A is the area bit, GG is the GOTO field of the LTR word, HH is the HOME field of the LTR code, III is the USER or GROUP id field, and FF is the FREE repeater field of the LTR code. Every valid LTR word received is transmitted from the LT-2 to the RS232 port. Example: L0 12 12 234 16.

A DTMF line begins with the letter `D'. The D is followed immediately by the DTMF character received. Because of the nature of LTR encoding, each DTMF digit is sent individually rather than being buffered.

An example of an output is shown here:

```
    L0 12 12 234 16
    D6
    L0 12 12 234 16
    D4
    L0 12 12 234 16
    L0 12 12 234 16
    L0 12 12 234 16
    D2
```

This shows a repeating LTR code word with DTMF digits dialed during the receipt of these LTR codes.

LIMITED WARRANTY on LT-2

Connect Systems Inc. (CSI) hereby warrants our products to be free from defective workmanship for a period of one year and defective parts for a period of five years from date of sale to the initial end user. This warranty applies only to the original consumer / end user purchaser of each CSI product. During the first year of warranty, CSI will repair any of its products at no charge providing the defective unit is returned prepaid to Connect Systems Inc. During the years 2-5, there shall be no charge for replacement parts providing that the defective unit is shipped prepaid and service is performed by CSI. Conventional prevailing labor and shipping charges will apply following the end of the first year. CSI, at its sole discretion, will replace defective parts on an exchange basis for the first five years of ownership by the original purchaser. All shipping costs are the responsibility of the customer.

What is not covered by this limited warranty:

This warranty shall not apply if, in our judgement the defects are caused by misuse, lightning strikes, customer modification, water damage, negligent use, improper installation, overloads caused by external voltage fluctuations, use of unregulated power supply, damage caused in transit or handling or any abusive treatment not in accordance with ordinary product use or the product serial number has been removed, altered or defaced. Warranty on LT-2P software is printed on the next page.

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        If your new CSI product should ever fail, contact Connect Systems Inc. Customer Service Dept. for repair and warranty information at (805) 642-7184.

        Note: Connect Systems Inc. reserves the right to render a modest service charge when returned units are found to be free of parts or workmanship defect(s) (i.e. operating to factory specifications) within the first year of the warranty. Such units will be returned freight collect to the sender, including the appropriate service charge.

LIMITED WARRANTY on LT-2P

Connect Systems, Inc., guarantees that there are no defects in the media furnished with the LT-2P program. If you find the disk unreadable for any reason, you may return the disk for a replacement within 60 days of initial purchase to the address above.

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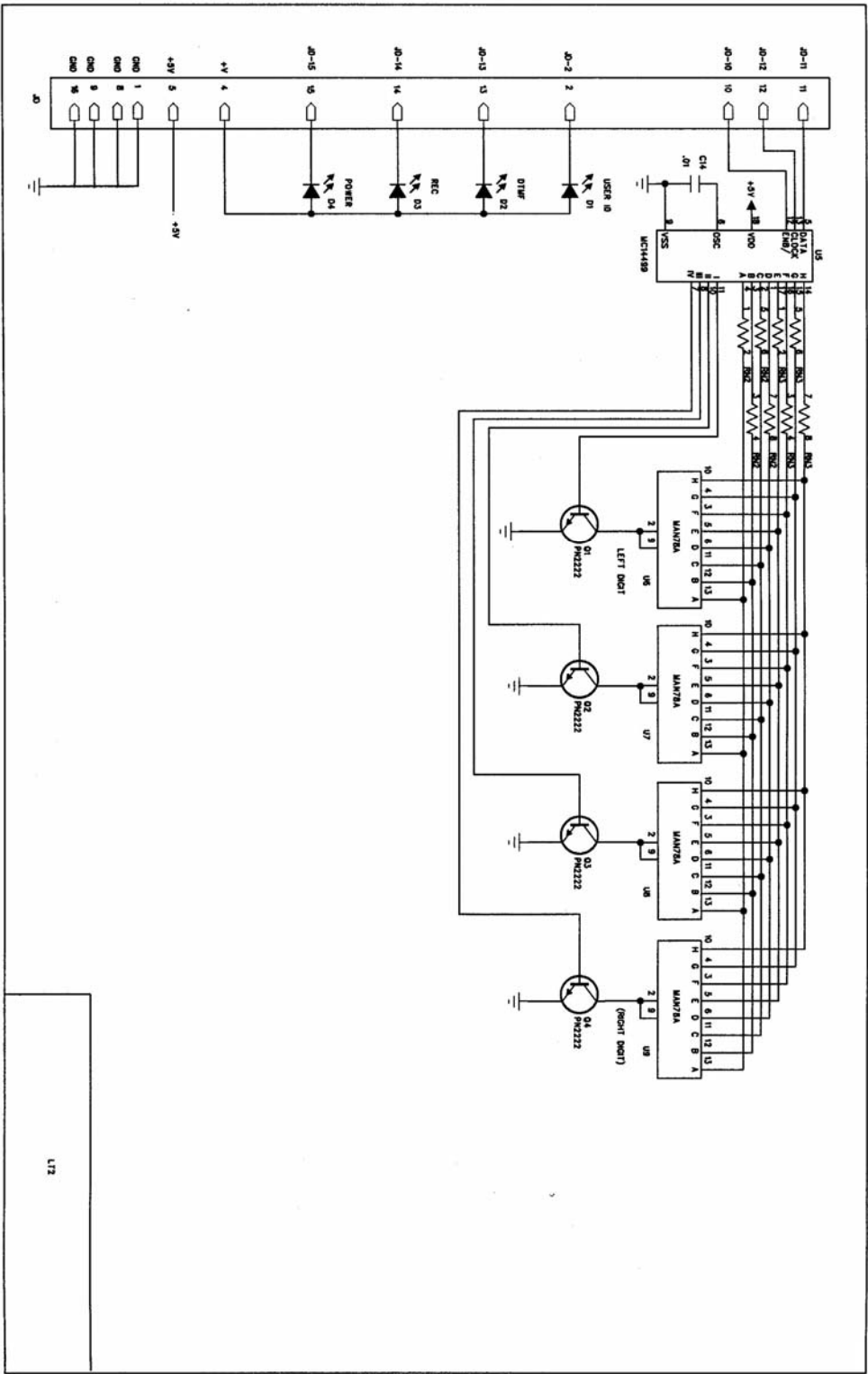
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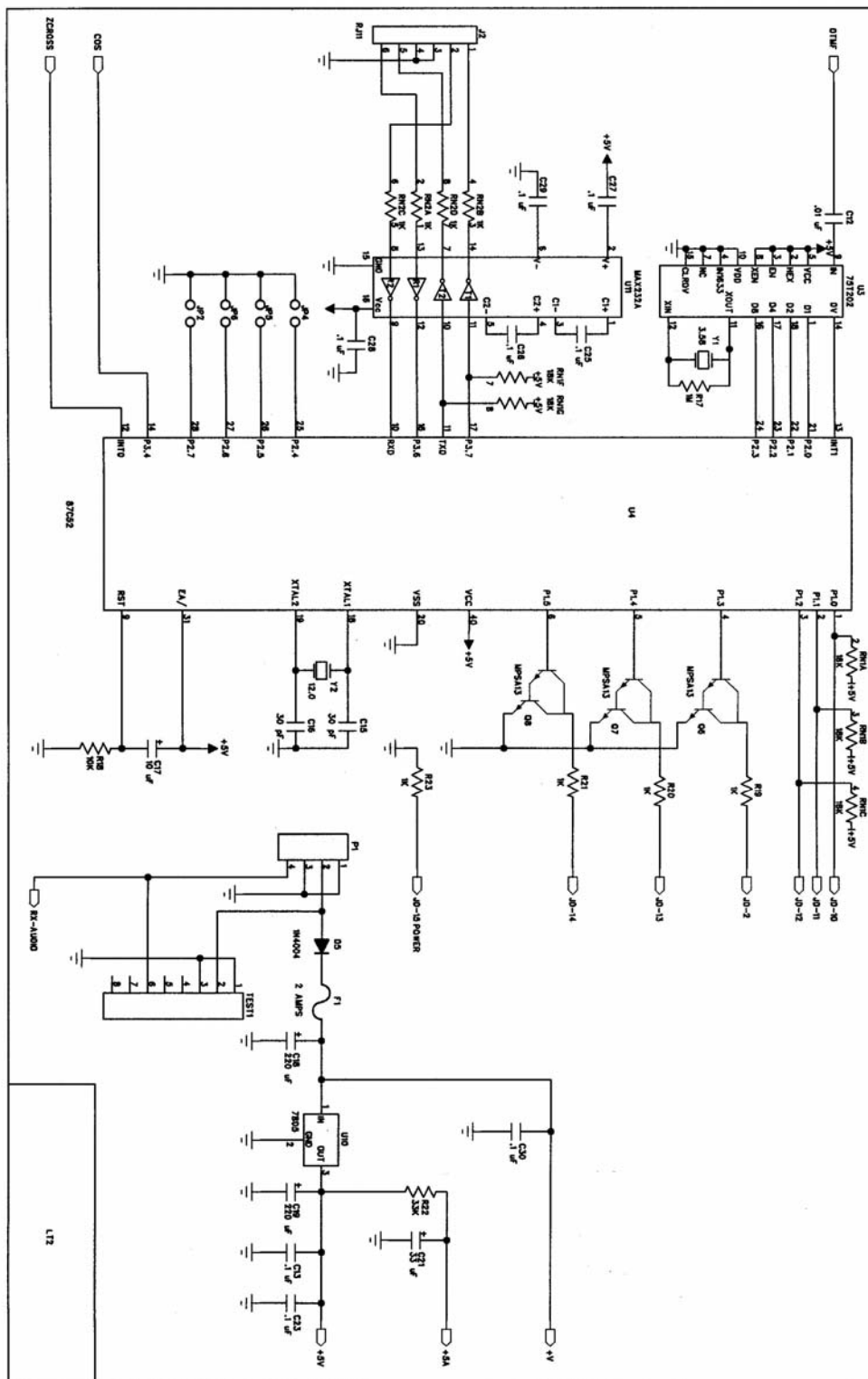
LT2 Schematic Sheet 1

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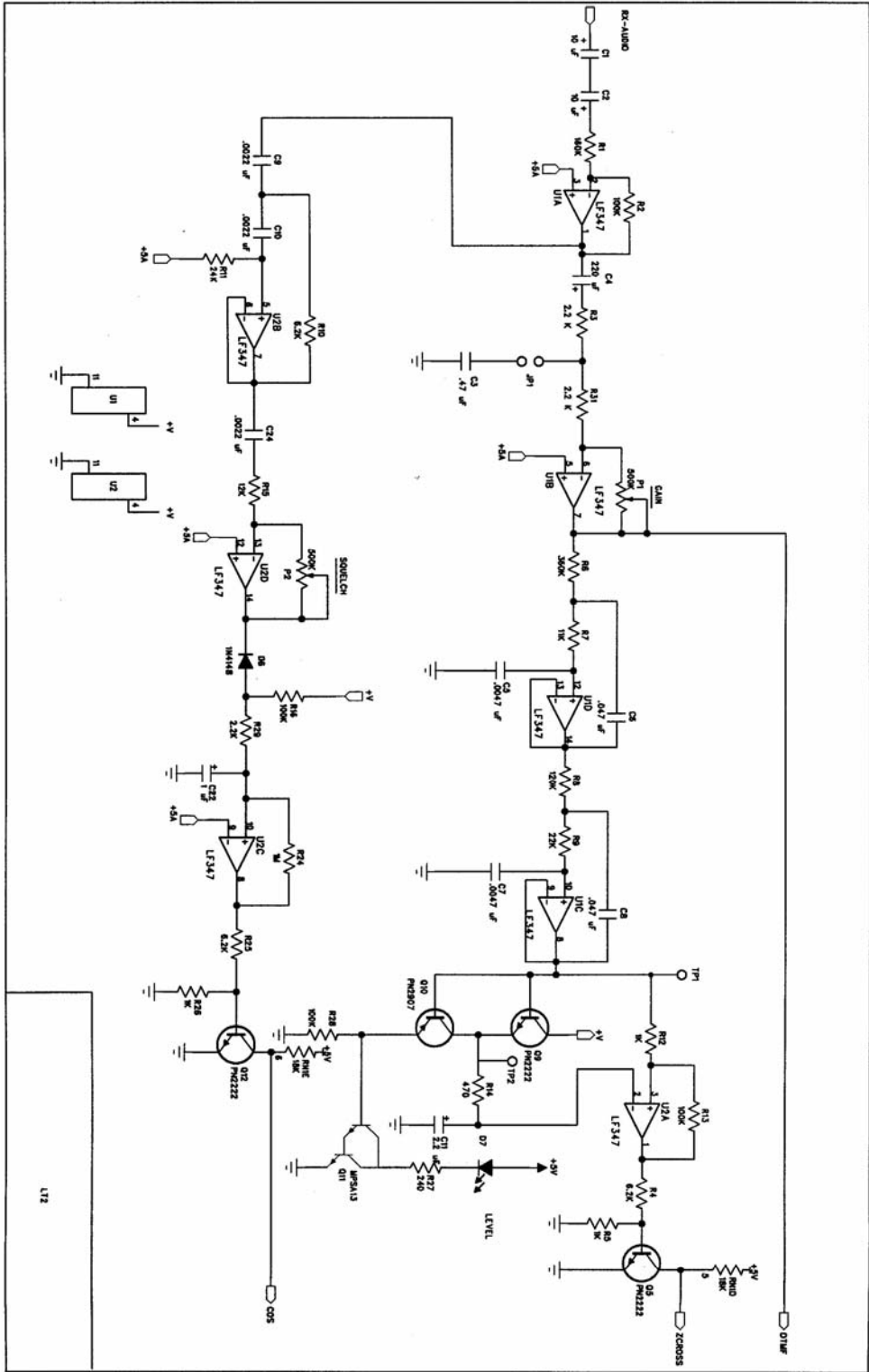
LT2 Schematic Sheet 2

LT2

LT2 Schematic Sheet 3