

Laipac Technology, Inc.

105 West Beaver Creek. Rd. Unit 207 Richmond Hill Ontario L4B 1C6 TEL: 905-762-1228 FAX: 905-770-6143

|                                 |                      |                     |
|---------------------------------|----------------------|---------------------|
| <b>TITLE: TF30 GPS Receiver</b> | <b>SPECIFICATION</b> | <b>PART NO:</b>     |
|                                 |                      | <b>DOCUMENT NO:</b> |
|                                 |                      | <b>PAGE: 1 of 9</b> |

**SPECIFICATION  
(Preliminary)**

PRODUCT : GPS Receiver

MODEL : TF30

DATE : Dec.2000

| Customer Approval           |       |          |
|-----------------------------|-------|----------|
| Final                       | Check | Approval |
| <input type="checkbox"/> OK |       |          |
| <input type="checkbox"/> NG |       |          |
| Document No.                |       |          |
| Part No.                    |       |          |

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|   |   |  | <b>DOCUMENT NO:</b> |
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| <b>1. Electrical Characteristics</b>    |   |  |                     |
| 1.1 General                             | Frequency<br>C/A code<br>Channels   | L1,1575.42MHz<br>1.023 MHz chip rate<br>12   |                     |
| 1.2 Accuracy                            | Position<br>Velocity<br>Time  | 25 meters CEP without SA<br>0.1 meters/second, without SA<br>1 microsecond synchronized to GPS time  |                     |
| 1.3 DGPS Accuracy                       | Position<br>Velocity  | 1 to 5 meters, typical<br>0.05 meters/second, typical  |                     |
| 1.4 Datum                               | WGS-84  |  |                     |
| 1.5 Acquisition Rate                    | Reacquisition<br>Cold start<br>Warm start<br>Hot start  | 0.1 sec., average<br>45 sec., average<br>38 sec., average<br>8 sec., average   |                     |
| 1.6 Dynamic Condition                   | Altitude<br>Velocity<br>Acceleration<br>Jerk  | 18,000 meters (60,000 Feet) max.<br>515 meters/sec.(1000 Knots) max.<br>4 g., max.<br>20 meters/sec. <sup>3</sup> max.   |                     |
| 1.7 Power                               | Main Power<br>Supply Current,<br>continuous<br>Supply Current,<br>TricklePower mode<br>Backup Power<br>Backup Current | 3.3 Vdc± 10%<br>~ 140 mA<br>~ 50 mA ( <i>under determined</i> )<br>+2.5V to 3.1V<br>10µA typical   |                     |
| 1.8 External Reset                      | Active low input  |  |                     |
| 1.9 Serial Port                         | Electrical interface<br>Protocol<br><br>NMEA output<br><br>DGPS protocol  | Two full duplex serial communication(TTL level)<br>Design-in binary and NMEA-0183,<br>Version 2.20 with a baud rate selection<br>GGA, GLL, GSA, GSV, RMC, and VTG (on customer<br>request) Default six NMEA<br>(Baud Rate :4800)<br>RTCM SC-104, version 2.00, type1,2 and 9<br>WAAS Supported |                     |
| 1.10 Time-1PPS Pulse                    | Level<br>Pulse duration<br>Time reference<br>Measurements   | TTL<br>100 ms<br>At the pulse positive edge<br>Aligned to GPS second, ± 1µ sec.  |                     |
| <b>2. Environmental Characteristics</b> |   |  |                     |
| 2.1 Temperature                         | Operating range<br>Storage range  | - 20 °C to + 75 °C<br>- 40 °C to +85 °C  |                     |

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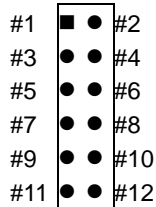
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| 2.2 Physical characteristics    | Dimension                       | < 40 X 40 mm   |
|                                 | Antenna connector               | MCX type   |
|                                 | Interface connector             | 12-pin ( 2X 6) low profile socket, 1mm<br>8-pin ( 2X 4) JTAG, 1mm  |
| 3. Antenna                      | Passive or Active Antenna       |  |
| 4.CPU Throughput                | GPS Signal Processor & Software | Integrated 16-bit,50 MHz ARM7TDMI CPU core & 1M DRAM memory<br>90% CPU throughput available for user tasks |

|                                 |                      |                     |
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5. Connector Layout (Low Profile Socket)

Top View



Pin-out of the 12-pin digital interface connector

| Pin # | Name     | Description                      |
|-------|----------|----------------------------------|
| 1     | VCC      | +3.3V +- 10% DC Power Input      |
| 2     | TXA      | Host Serial Data Output A        |
| 3     | RXA      | Host Serial Data Input A         |
| 4     | TXB      | Aux. Serial Data Output B        |
| 5     | RXB      | Aux. Serial Data Input B (DGPS)  |
| 6     | TIMEMARK | 1PPS Time Mark Output            |
| 7     | BAT      | Battery Backup Power Input       |
| 8     | GPIOA    | General Purpose Input/Output     |
| 9     | RESET    | Reset, Active Low                |
| 10    | RESERVED | Reserved                         |
| 11    | GROUND   | Ground                           |
| 12    | BOOTSEL  | Internal/External Boot selective |

※The Host Serial Data I/O is nominally a CMOS logical high +5VDC.

※The Host Serial Data Input A (Pin# 3) suggest to an active high(ex.100KΩ serial to +Vcc) when not used.

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| <p>6.Environmental Characteristics: TBD</p> |                      |                     |

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|                         |                      |                      |
|-------------------------|----------------------|----------------------|
| <b>TITLE: NMEA-0183</b> | <b>SPECIFICATION</b> | <b>PART NO: TF30</b> |
| <b>Protocol</b>         |                      | <b>DOCUMENT NO:</b>  |
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NMEA-0183 format as defined by the National Marine Electronics Association(NMEA), Standard For Interfacing Marine Electronic Devices, Version 2.20, January 1, 1997.

## *NMEA Output Messages*

*Table 1* NMEA-0183 Output Messages

| NMEA Record | Description                              |
|-------------|--|
| GGA         | Global positioning system fixed data     |
| GLL         | Geographic position - latitude/longitude |
| GSA         | GNSS DOP and active satellites           |
| GSV         | GNSS satellites in view                  |
| RMC         | Recommended minimum specific GNSS data   |
| VTG         | Course over ground and ground speed      |

## *GGA--- Global Positioning System Fixed Data*

Table 2 contains the values for the following example:

\$GPGGA , 161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , 0000\*18

*Table 2* GGA Data Format

| Name                   | Example    | Units  | Description                       |
|------------------------|------------|--------|-----------------------------------|
| Message ID             | \$GPGGA    |        | GGA protocol header               |
| UTC Position           | 161229.487 |        | hhmmss.sss                        |
| Latitude               | 3723.2475  |        | ddmm.mmmm                         |
| N/S Indicator          | N          |        | N=north or S=south                |
| Longitude              | 12158.3416 |        | dddmm.mmmm                        |
| E/W Indicator          | W          |        | E=east or W=west                  |
| Position Fix Indicator | 1          |        | See Table 3                       |
| Satellites Used        | 07         |        | Range 0 to 12                     |
| HDOP                   | 1.0        |        | Horizontal Dilution of Precision  |
| MSL Altitude           | 9.0        | meters |                                   |
| Units                  | M          | meters |                                   |
| Geoid Separation       |            | meters |                                   |
| Units                  | M          | meters |                                   |
| Age of Diff. Corr.     |            | second | Null fields when DGPS is not used |
| Diff. Ref. Station ID  | 0000       |        |                                   |
| Checksum               | *18        |        |                                   |
| <CR> <LF>              |            |        | End of message termination        |

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| <b>Protocol</b>         |                      | <b>DOCUMENT NO:</b>  |
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*Table 3* Position Fix Indicator

| Value | Description                           |
|-------|---------------------------------------|
| 0     | Fix not available or invalid          |
| 1     | GPS SPS Mode, fix valid               |
| 2     | Differential GPS, SPS Mode, fix valid |
| 3     | GPS PPS Mode, fix valid               |

### *GLL--- Geographic Position – Latitude/Longitude*

Table 4 contains the values for the following example:

\$GPGLL , 3723.2475,N,12158.3416,W,161229.487,A\*2C

*Table 4* GLL Data Format

| Name          | Example    | Units | Description                      |
|---------------|------------|-------|----------------------------------|
| Message ID    | \$GPGLL    |       | GLL protocol header              |
| Latitude      | 3723.2475  |       | ddmm.mmmm                        |
| N/S Indicator | N          |       | N=north or S=south               |
| Longitude     | 12158.3416 |       | dddmm.mmmm                       |
| E/W Indicator | W          |       | E=east or W=west                 |
| UTC Position  | 161229.487 |       | hhmmss.sss                       |
| Status        | A          |       | A=data valid or V=data not valid |
| Checksum      | *2C        |       |                                  |
| <CR> <LF>     |            |       | End of message termination       |

### *GSA---GNSS DOP and Active Satellites*

Table 5 contains the values for the following example:

\$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5\*33

*Table 5* GSA Data Format

| Name                       | Example | Units | Description                      |
|----------------------------|---------|-------|----------------------------------|
| Message ID                 | \$GPGSA |       | GSA protocol header              |
| Mode 1                     | A       |       | See Table 6                      |
| Mode 2                     | 3       |       | See Table 7                      |
| Satellite Used in solution | 07      |       | Sv on Channel 1                  |
| Satellite Used in solution | 02      |       | Sv on Channel 2                  |
| Satellite Used             |         |       | Sv on Channel 12                 |
| PDOP                       | 1.8     |       | Position Dilution of Precision   |
| HDOP                       | 1.0     |       | Horizontal Dilution of Precision |
| VDOP                       | 1.5     |       | Vertical Dilution of Precision   |
| Checksum                   | *33     |       |                                  |
| <CR> <LF>                  |         |       | End of message termination       |

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Table 6 Mode 1

| Value | Description       |
|-------|-------------------|
| 1     | Fix not available |
| 2     | 2D                |
| 3     | 3D                |

Table 7 Mode 2

| Value | Description                                     |
|-------|---|
| M     | Manual- forced to operate in 2D or 3D mode      |
| A     | Automatic-allowed to automatically switch 2D/3D |

*GSV---GNSS Satellites in View*

Table 8 contains the values for the following example:

\$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42\*71

\$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42\*41

Table 8 GGA Data Format

| Name                            | Example | Units       | Description                           |
|---------------------------------|---------|-------------|---------------------------------------|
| Message ID                      | \$GPGSV |             | GSV protocol header                   |
| Number of Messages <sup>1</sup> | 2       |             | Range 1 to 3                          |
| Message Number <sup>1</sup>     | 1       |             | Range 1 to 3                          |
| Satellites in View              | 07      |             |                                       |
| Satellite ID                    | 07      |             | Channel 1 (Range 1 to 32)             |
| Elevation                       | 79      | Degree<br>s |                                       |
| Azimuth                         | 048     | Degree<br>s | Channel 1 (Maximum 90)                |
| SNR (C/No)                      | 42      | DBHz        | Channel 1 (True, Range 0 to 359)      |
| Satellite ID                    | 27      |             | Range 0 to 99, null when not tracking |
| Elevation                       | 27      | Degree<br>s | Channel 4 (Range 1 to 32)             |
| Azimuth                         | 138     | Degree<br>s | Channel 4 (Maximum 90)                |
| SNR (C/No)                      | 42      | DBHz        | Channel 4 (True, Range 0 to 359)      |
| Checksum                        | *71     |             | Range 0 to 99, null when not tracking |
| <CR> <LF>                       |         |             | End of message termination            |

1. Depending on the number of satellites tracked multiple messages of GSV data may be required.



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*RMC---Recommended Minimum Specific GNSS Data*

Table 9 contains the values for the following example:

\$GPRMC , 161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,\*10

Table 9 RMC Data Format

| Name               | Example    | Units   | Description                      |
|--------------------|------------|---------|----------------------------------|
| Message ID         | \$GPRMC    |         | RMC protocol header              |
| UTC Position       | 161229.487 |         | hhmmss.sss                       |
| Status             | A          |         | A=data valid or V=data not valid |
| Latitude           | 3723.2475  |         | ddmm.mmmm                        |
| N/S Indicator      | N          |         | N=north or S=south               |
| Longitude          | 12158.3416 |         | dddmm.mmmm                       |
| E/W Indicator      | W          |         | E=east or W=west                 |
| Speed Over Ground  | 0.13       | knots   |                                  |
| Course Over Ground | 309.62     | degrees | True                             |
| Date               | 120598     |         | ddmmyy                           |
| Magnetic Variation |            | degrees | E=east or W=west                 |
| Checksum           | *10        |         |                                  |
| <CR> <LF>          |            |         | End of message termination       |

*VTG---Course Over Ground and Ground Speed*

Table 10 contains the values for the following example:

\$GPVTG , 309.62,T, ,M,0.13,N,0.2,K\*6E

Table 10 VTG Data Format

| Name       | Example | Units   | Description                |
|------------|---------|---------|----------------------------|
| Message ID | \$GPVTG |         | VTG protocol header        |
| Course     | 309.62  | degrees | Measured heading           |
| Reference  | T       |         | True                       |
| Course     |         | degrees | Measured heading           |
| Reference  | M       |         | Magnetic                   |
| Speed      | 0.13    | knots   | Measured horizontal speed  |
| Units      | N       |         | Knots                      |
| Speed      | 0.2     | km/hr   | Measured horizontal speed  |
| Units      | K       |         | Kilometer per hour         |
| Checksum   | *6E     |         |                            |
| <CR> <LF>  |         |         | End of message termination |