DIGITAL CLOCK DISTRIBUTOR

LOCAL PRIMARY REFERENCE CE MARK COMPLIANT

FUNCTIONAL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1

2. SYSTEM DESCRIPTION 1
A. Output Signals 4
B. Input Reference Signals 4
C. SSM 5
D. Fuse and Alarm 5
E. Power 5
F. GPS Timing Antenna/Receiver (GTR) 5

3. CARD DESCRIPTIONS 7
A. GTI/C Cards 7
B. LOU/C Cards 11

4. SPECIFICATIONS 11

Figures

1. DCD-LPR/C Shelf without TOD 2
2. DCD-LPR/C Shelf with TOD 2
3. GTR Block Diagram 6
4. GTI/C Block Diagram (without LOU/C Card) 8
5. GTI/C Block Diagram (with LOU/C Card) 9
6. Time-of-Day System 10
7. LOU-1/C Block Diagram 11
8. LOU-2/C Block Diagram 11

Table

A. DCD-LPR/C Cards 3
B DCD-LPR/C System Specifications 12

1. GENERAL

1.01 This section provides functional descriptions and specifications for Symmetricom's Digital Clock Distributor Local Primary Reference CE Mark Compliant (DCD-LPR/C) System.

1.02 This section was reissued for the reasons listed below. Additions and changes are marked by change bars.

- Added a GTI/C card, part number 090-44140-18.
- Added information on SSM.
- Added Table A, DCD-LPR/C Cards.

1.03 All product names, service marks, trademarks, and registered trademarks used in this document are the property of their respective owners.

1.04 The following abbreviations are used in this document:

ACO	alarm cut-off
BITS	Building Integrated Timing Supply
CI/C	Clock Input
DCD	Digital Clock Distributor
GPS	Global Positioning System
GRI	group repetition intervals
GTI/C	GPS Timing Interface card
GTR	GPS Timing Antenna/Receiver
LOU/C	LPR Oscillator Unit
LPR	Local Primary Reference
MIS/C	Maintenance Interface, System
MRC/C	Multi-Reference Controller
pps	pulses per second
PRC	Primary Reference Clock
PRS	primary reference source
SSM	Synchronization Status Messaging
SSU	Synchronization Supply Utility
TNC/C	Transit Node Clock
TNC-E/C	Enhanced Transit Node Clock
TOD	Time-of-Day
UTC	Universal Coordinated Time

2. SYSTEM DESCRIPTION

2.01 The DCD-LPR/C provides Primary Reference Source (PRS)/Stratum-1 quality reference signals when used with the DCD-521/C Systems. Figure 1 shows the LPR/C without Time-of-Day (TOD); Figure 2 shows the LPR/C with TOD.

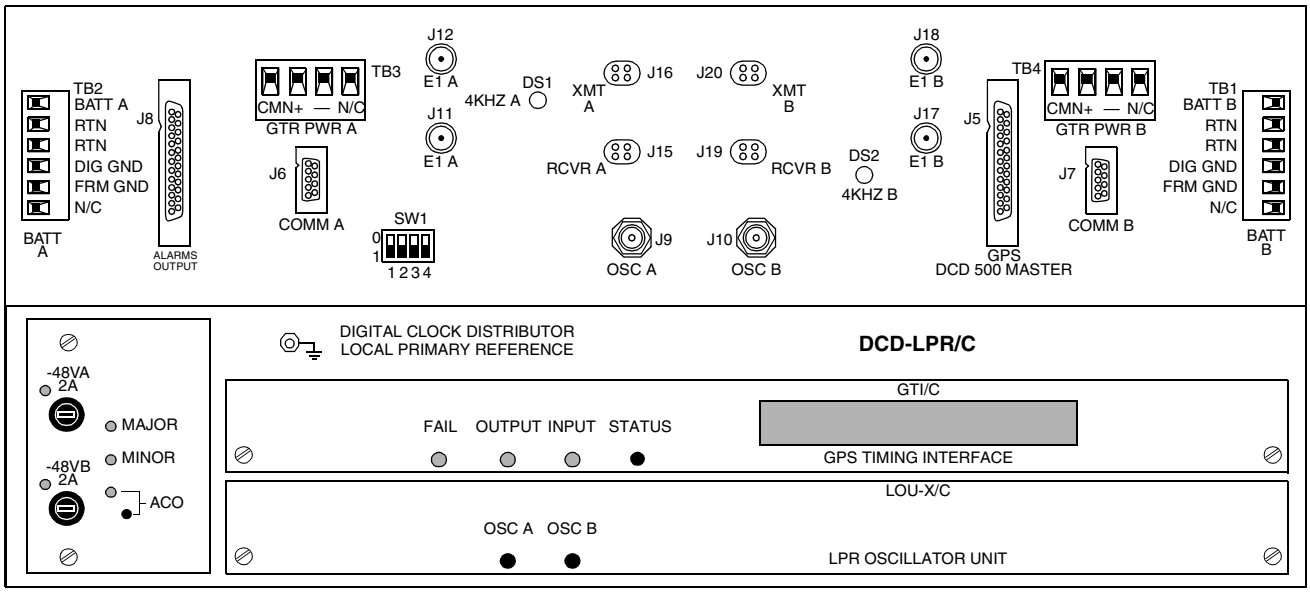


Figure 1. DCD-LPR/C Shelf without TOD

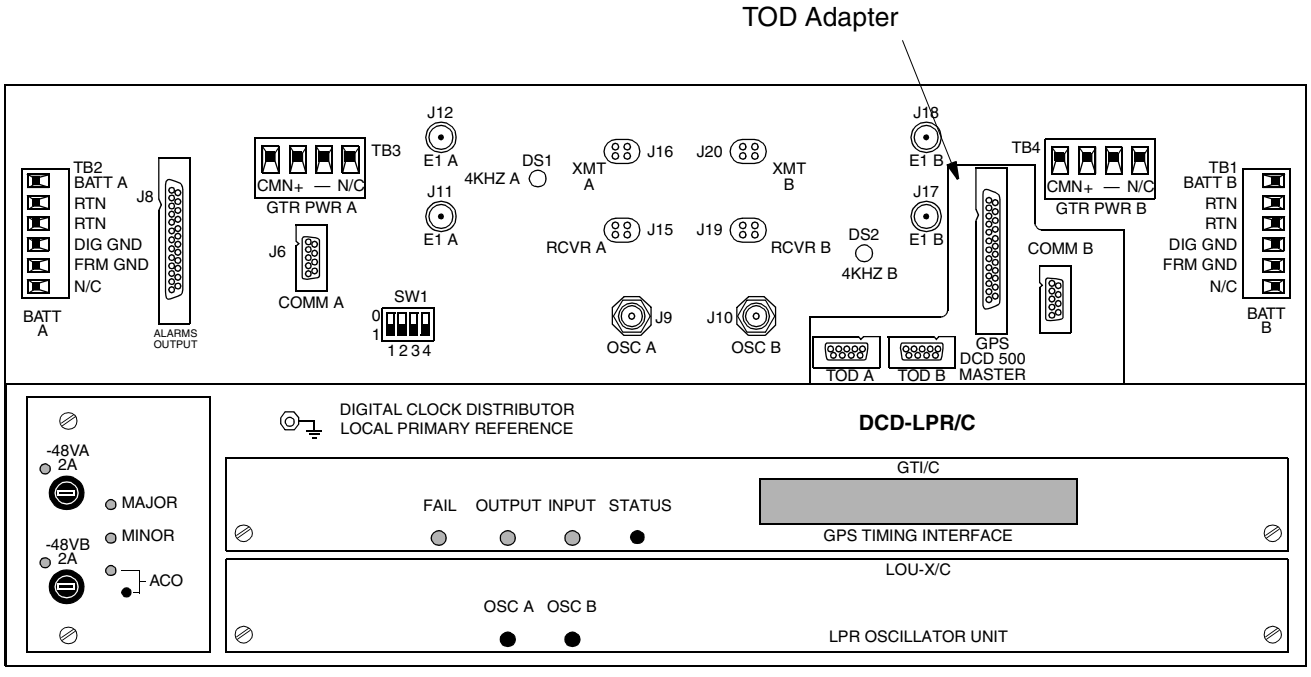


Figure 2. DCD-LPR/C Shelf with TOD

2.02 Cards which may be included in the DCD-LPR System are listed in Table A.

Table A. DCD-LPR/C Cards

CARD	NAME USED IN THIS SECTION	PART NUMBER	REVISION	FEATURES
GTI/C	GTI/C -12	090-44140-12	–	Input: 5 MHz or 10 MHz, rubidium or better quality clocks, TNC-E cards only Output: 2.048 Mb/s (E1) Framing format: CCS/CAS with or without CCS4
GTI/C	GTI/C -14	090-44140-14	D or earlier	Input: 5 MHz or 10 MHz, quartz, rubidium, or better quality clocks, any combination of two quartz, rubidium, or better quality clocks, or LOU card Output: 2.048 Mb/s (E1) Framing format: CCS/CAS with or without CCS4
GTI/C^{V5}	GTI/C -14	090-44140-14	E or later	
GTI/C^{V5}	GTI/C -16	090-44140-16	–	Input: 5 MHz or 10 MHz, quartz, rubidium, or better quality clocks, any combination of two quartz, rubidium, or better quality clocks, or LOU card Output: 2.048 Mb/s (E1) Framing format: CCS/CAS with or without CCS4 Time-of-Day
GTI/C^{V5}	GTI/C-18	090-44140-18	–	Input: 5 MHz or 10 MHz, quartz, rubidium, or better quality clocks, any combination of two quartz, rubidium, or better quality clocks, or LOU card Output: 2.048 Mb/s (E1) or 2.048 MHz (analog) Framing format: CCS/CAS with or without CCS4 Time-of-Day SSM capable
LOU/C	LOU-1/C	090-44145-01	–	Source: one oven-controlled crystal oscillator with two parallel outputs
LOU/C	LOU-2/C	090-44145-02	–	Source: two independent oven-controlled crystal oscillators, each with one output

Notes:
1. The ^{V5} indicates that this is a Version 5 card.
2. Where information is common to all GTI/C cards, these cards are collectively referred to as GTI/C cards.
3. Where information is common to both LOU/C cards, these cards are collectively referred to as LOU/C cards.

2.03 The DCD-LPR/C accepts up to two GTI/C plug-in cards. The DCD-LPR/C, when used in conjunction with the DCD Shelf and its clocks (rubidium or better quality, or quartz), is a network PRS as specified by industry standards. Using GPS services, the DCD-LPR/C System can provide independent and diverse timing sources for both network or office primary reference clock applications.

2.04 The LOU/C card can be installed in either slot of the DCD-LPR/C. The DCD-LPR/C equipped with an LOU/C card and a GTI/C card provides office PRS timing as specified by industry standards.

2.05 The GTI/C cards employ sophisticated ensembling to ensure the highest levels of reliability, comply with tightening PRS performance masks, and mitigate known performance degradation effects of GPS signals.

2.06 Ensemble averaging is a mathematical treatment of network synchronization. As a process, it treats a group of timing sources and their relative time errors simultaneously, to produce an output signal that achieves a greater overall accuracy and stability than any single source. In a timing ensemble arrangement, each timing reference is adjusted by the time error between itself and a weighted average of the group.

2.07 The advantages of ensemble averaging for precise time scale determination is a significantly reduced sensitivity to internal and external noise, and elimination of a master clock dependency. These facts provide survivability and greater stability for the group as a whole. This is because the output is essentially the best performance of the best sources in the ensemble.

2.08 The GTI/C extracts the UTC traceable clock and mitigates the effects of Selective Availability (SA). This is accomplished in two stages:

> ***Note:*** SA is the quasi-random, intentional degradation of the GPS System performance by the U.S. Department of Defense for non-military applications. These degradations include contamination of the orbit parameters and the satellite clocks. The result is to make the originally specified performance available only at selected times.

1. Simultaneous ensemble averaging of six satellites in the GTR's field of view; a maximum of eight satellites is processed in a round-robin method if visible.

2. Ensemble averaging of the uncorrected oscillator sources from the clocks in the DCD Shelf.

> ***Note:*** If LOU/C cards are used, the GTI/C takes the ensemble-averaged GTR signal information, but does not ensemble average the uncorrected oscillator input from the LOU/C card.

2.09 It is the combination of the six-satellite ensemble and the short-term stability of the uncorrected oscillator sources that removes the effects of SA, and provides PRS timing.

2.10 The GTI/C performs self-management and autonomous error checking. The DCD-LPR/C constantly monitors all stages of the PRS output signal generation. If a problem occurs that cannot be resolved by the GTI/C, an alarm is raised, and a message is displayed on the LCD display of each GTI/C card. Additional information may be obtained via the rear RS-232 port for debugging purposes only when necessary.

A. Output Signals

2.11 The GTI/C card converts the timing signals provided by the antenna(s) into two primary rate E1 (2.048 Mb/s) timing references, and passes them to the DCD Shelf via SMB connectors on the backplane.

B. Input Reference Signals

2.12 The DCD-LPR/C can accept two GPS radio navigational frequency references.

2.13 Two uncorrected oscillator sources are also used as timing reference sources to the GTI/C cards. The sources can be from the DCD Shelves (5 MHz), from a Symmetricom cesium clock source (5 MHz or 10 MHz), or from the LOU/C card. DCD Shelf clocks are an integral component of the DCD-LPR/C. These clocks provide true short-term stability to the GTI/C card required for PRS timing.

2.14 If the clock card is removed from the TNC A slot of the DCD Shelf (the primary source), the GTI/C card automatically switches its reference to the clock card installed in the TNC B slot. When the clock card is plugged back into the TNC A slot, the GTI/C card waits until 5 minutes after the TNC A card is active and providing clock output before switching its reference back to the TNC A.

2.15 Prior to switching its reference, the GTI/C card outputs a 600 ns transient pulse to cause the clock cards to perform a phase buildout, to prevent the timing output from moving. Occasionally, this may cause the clock card to momentarily display DRIFT/INP TOL alarms. The TNC A card then goes into freerun. This non service-affecting condition remains for approximately 1 minute, after which the condition clears.

C. SSM

2.16 The DCD-LPR/C can deliver Synchronization Status Messaging (SSM) messages to network elements and BITS/SSU equipment which require SSM input signals. The GTI/C card delivers the appropriate SSM message, depending on the status of the GPS system.

2.17 When the system is in a normal condition, and locked to the GPS satellites, the GTI/C card generates a PRC SSM message, indicating that the signal can be used as a primary reference signal. If the timing signal from the GTR degrades, or is invalid, the output of the GTI signal will change its SSM message to an unknown (UNK) message.

2.18 SSM operation is enabled by TL1 command via the MIS/C card. For details on TL1 commands, refer to the TL1 User's Guide provided with the MIS/C card.

D. Fuse and Alarm

2.19 Fuse and alarm functions monitor and filter the input power from two –48 volt dc office batteries, from the office power distribution panel.

2.20 Depending on which alarms are activated in the DCD-LPR/C, audible and visual alarm indicator outputs are activated.

2.21 Each GTI/C card is self-contained, and provides individual alarm and status information. Minimum alarm and status information for each GTI/C card is:

- Major alarm, form-C relay (visual and audible)
- Minor alarm, form-C relay (visual and audible)
- Status, form-C relay; reserved for future use

2.22 A front-panel ACO pushbutton, when pressed, silences the audible alarm, and lights the ACO lamp.

E. Power

2.23 The DCD-LPR/C Shelf is powered by two separate –48 volt dc office battery inputs. Both the redundant –48 volt dc inputs are fused on the shelf, then bused to the cards in the shelf. If one of the battery feeds/fuses fails, a fuse alarm is indicated.

2.24 The GTR contains active electronics, and receives power via a three-conductor cable. The power cable may be connected to the GTI/C or another source of appropriate power.

F. GPS Timing Antenna/Receiver (GTR)

2.25 The GTR is a six-channel GPS receiver, capable of simultaneously tracking up to eight Global Positioning System (GPS) satellites, and providing timing information to the GTI/C. The GTR also provides Universal Coordinated Time (UTC) information to the GTI/C for display.

2.26 The GTR is available with Time-of-Day capabilities; a version of the GTR is available with leap second capabilities. Twice a year (end of July and December), the US Naval Observatory (USNO) decides whether or not to add a leap second. This feature notifies timed equipment that the addition of a leap second is pending, and that tracking of the leap second should be implemented.

Note: Contact Symmetricom Customer Assistance Center (CTAC) regarding availability of the GTR with leap second capabilities at one of the following numbers:

- +44 1483 510300 (U.K.)
- +1 888 367 7966 (U.S.A.)

2.27 The GTR uses multiple satellites, and performs a majority vote on the timing information obtained from each satellite.

2.28 Majority vote is the process which validates reference sources against preset performance criteria. The algorithm measures and compares the timing information obtained from each timing source (e.g., a satellite). If during the process of the individual comparisons, the computed value exceeds one of the preset thresholds, that source is disqualified.

2.29 The distinguishing feature of the voting algorithm is the ability to qualify a timing source against a known performance threshold when viewed with respect to at least two other sources.

2.30 Using majority vote, the GTR discards unacceptable performance data results, and then ensemble averages the remaining qualified satellite information, to provide a precise timing signal to the GTI/C card. At any one time, the GTR can ensemble average a maximum of six satellites to derive an output timing solution.

2.31 The GTR outputs a 4 kHz clock used by the GTI/C to generate the disciplined timing signal for PRS accuracy, a 1 pps signal used for Time-of-Day applications (via the GTI/C card), and a 4 kb/s channel for transmitting GTR status information to the GTI/C.

2.32 These signals are Manchester-encoded, and transmitted over fiber optic cable. The fiber cable provides robust protection to the DCD-LPR/C System from electromagnetic interference (EMI) effects on this data channel link.

2.33 The GTR consists of four main sections (refer to Figure 3),

- Receiver
- Digital processor
- Phase-locked loop subsystem
- Encoder subsystem

2.34 The receiver accepts the GPS radio navigational signals, and sends the digitized GPS signal to the digital processor.

2.35 The digital processor provides the processing power required to track the satellites, position the receiver, and then derive an ensemble-averaged timing correction to the phase-locked loop subsystem.

2.36 The phase-locked loop subsystem provides a time lock to GPS by locking a local oscillator to the digitally processed GPS signals.

2.37 The encoder takes the GTR information, and Manchester-encodes the clocking signals and any data messages to the GTI/C.

2.38 For leap second capabilities, the GTR uses an algorithm that transmits a “leap second pending” message twice a year (end of July and December) for 2 months.

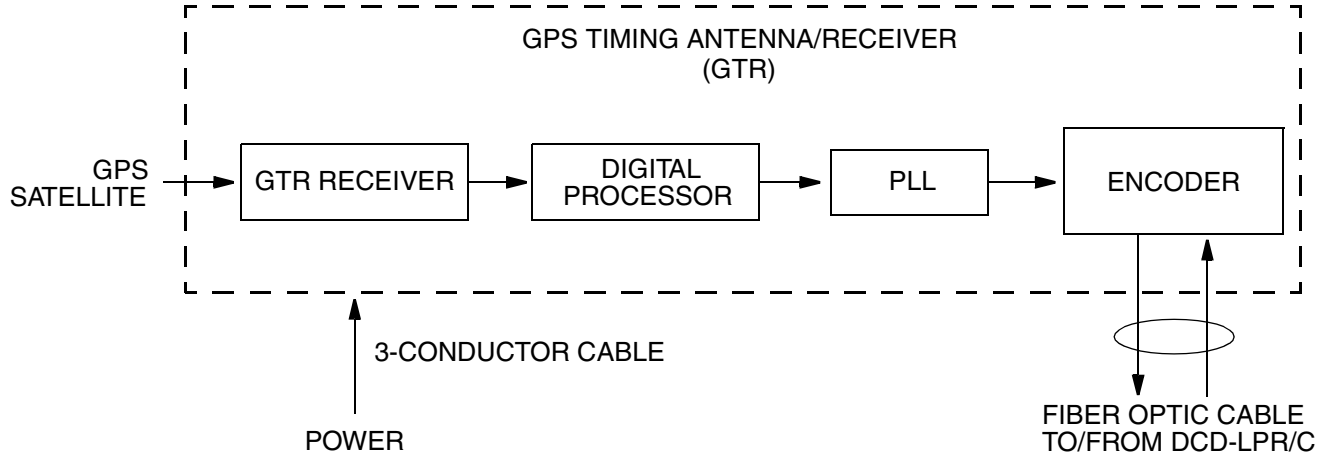


Figure 3. GTR Block Diagram

3. CARD DESCRIPTIONS

A. GTI/C Cards

3.01 The GTI/C forms the link to the roof-mounted GPS Timing Antenna/Receiver (GTR). The GTI/C takes the GPS signal information from the GTR and, using the oscillator inputs from a DCD-500-series or DCD-Cs Shelf, performs an ensemble-averaged timed correction to provide the outputs.

3.02 GTI/C -12, GTI/C -14, and GTI/C -16 cards provide an E1 output frequency of 2.048 Mb/s. The GTI/C -18 card provides an E1 output frequency of 2.048 Mb/s or an analog output frequency of 2.048 MHz, selectable via TL1 command. In addition, framing formats are switch-selectable (CCS/CAS).

3.03 Figure 4 shows a simplified block diagram of how the GTI/C works with the DCD Shelf. Figure 5 shows how the GTI/C works with the LOU/C to provide output timing to the DCD Shelf. Communication between the GTI/C and GTR is accomplished through a fiber optic link.

3.04 Information from the GTR is sent to a fiber optic receiver/transmitter in the GTI/C. The transmitter and receiver are incorporated into the DCD-LPR/C Shelf. The 4KHZ A DS1 and 4KHZ B DS2 lamps on the backplane light green (as appropriate) to indicate a 4 kHz signal from the GTR is present.

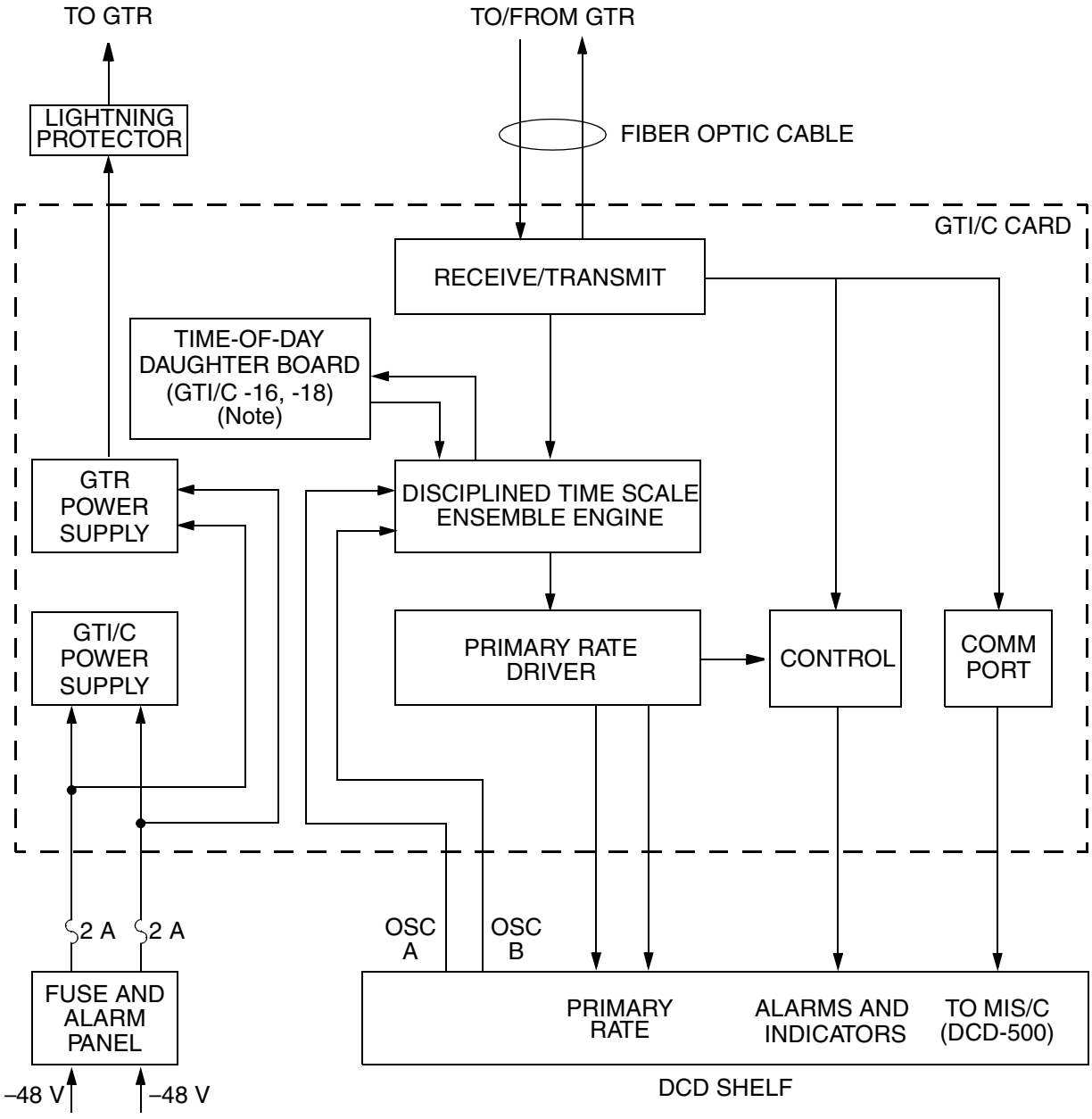
3.05 The receiver accepts the GPS signal information from the GTR, and sends it to an ensemble engine.

3.06 The GTI/C ensemble averages the signal using the oscillator inputs (from the DCD Shelf), or, inputs from a 10 MHz external source, and performs time correction. The corrected signal is sent to output drivers to provide the outputs to the timing output cards.

3.07 On power-up, the GTI/C card output is squelched. This condition persists until the GTI/C has qualified all the GPS inputs, correlated its position, and is ready for PRS operation. At this point, the GTI/C enters GTI/C LOCK, and outputs a valid E1 output synchronization signal.

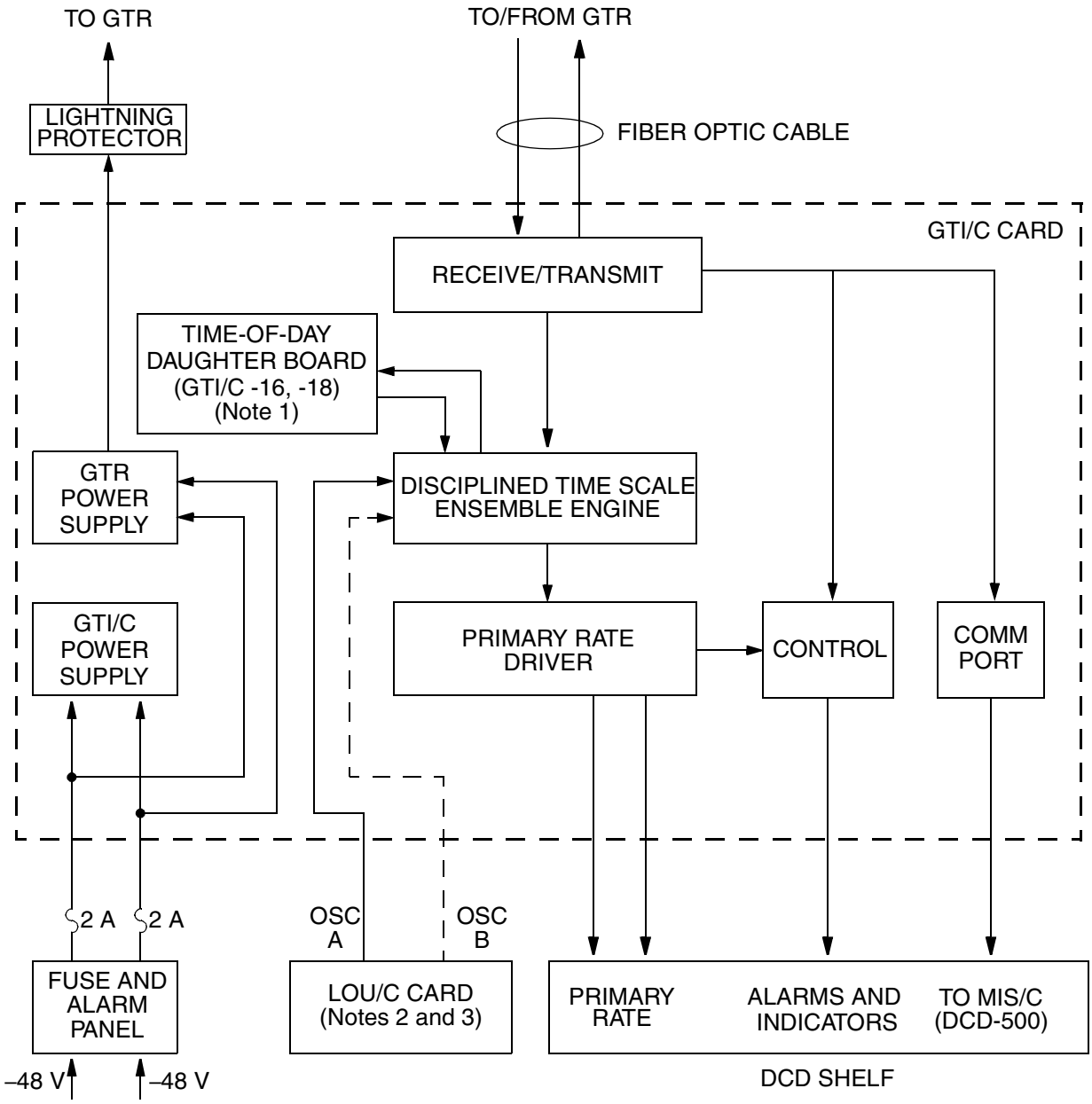
3.08 Typically, the GTI/C squelches the output when a major alarm is raised, e.g., loss of all inputs—both oscillators, and the GTR signal.

3.09 All alarm and status messages are displayed in the LCD display, and the pushbutton on the front panel is used to display time and status information.



Note: See Figure 6 for a diagram of the TOD system.

Figure 4. GTI/C Block Diagram (without LOU/C Card)



Notes:

1. See Figure 6 for a diagram of the TOD system.
2. In the LOU-1/C card, there is only one oscillator, but it provides 2 parallel outputs.
3. In the LOU-2/C card, both oscillators are active, but only one oscillator at a time provides timing; oscillator A is the primary source; oscillator B provides timing only when A has failed.

Figure 5. GTI/C Block Diagram (with LOU/C Card)

Time-of-Day

3.10 The GTI/C -16 and GTI/C -18 cards include the Time-of-Day (TOD) feature. These cards are similar to the GTI/C -14 card, with the following exceptions:

- An additional set of configuration switches on the GTI/C card daughter board are provided to set alarm integration for TOD alarms, baud rate, and TOD message formatting
- The Home Screen displays UTC time and date
- An event history log is available on the screen options. The history log displays the beginning and end of the event log, and an event stack which saves the last ten events with a timestamp
- The alarm response on a GTR power fault condition has been changed to be an immediate major alarm with no immediate effect on the GTI/C card output
- In the event of a minor alarm from an invalid GPS signal, the alarm lamp is off (instead of lit red)

3.11 The TOD engine and accompanying software produce a TOD output stream routed to the adapter. There are two RS-422 outputs from the adapter. If required, an RS-422–to–RS-232 converter can be added to provide an RS-232 signal (Figure 6).

3.12 The TOD engine uses the synchronization input signals from the GTR as a reference from which the output signal is generated. The synthesizer inputs provide a stable reference which is not phase-locked to the GTR in the short term. The GTR signal gives the approximate position of the 1 second mark in time. Using these signals, the phase measurement circuitry in the TOD engine, and the GTI/C phase measurements, the TOD engine can control the output phase to track the long-term average of the GTR signal.

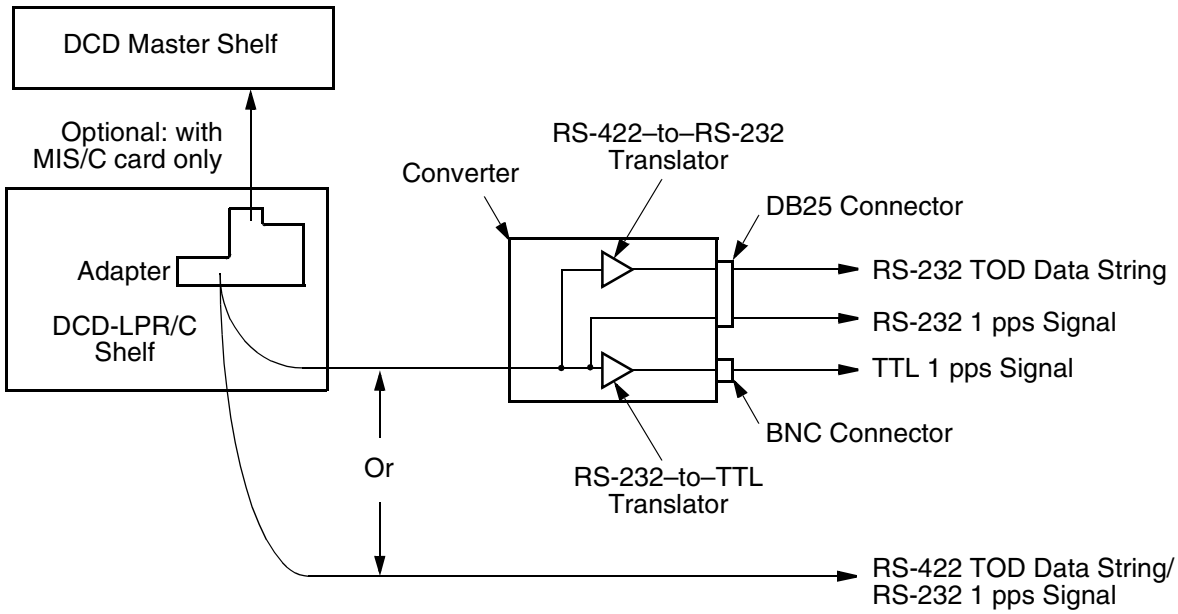


Figure 6. Time-of-Day System

SSM

3.13 The GTI/C -18 card is SSM capable. SSM messages are transmitted continuously until there is a state change determined by the GTI/C card. Also, the user can assign output messages by TL1 command. For details on TL1 commands, refer to the TL1 User's Guide provided with the MIS/C card.

B. LOU/C Cards

3.14 The LOU/C cards are typically used in applications requiring an upgrade to the existing system (e.g., upgrading a DCD Shelf equipped with a TNC/C to PRS level), or if connecting to a BITS from a manufacturer other than Symmetricom. When used with a DCD Shelf, the LOU/C can be used as timing reference sources to the GTI/C card to provide office PRS timing, as specified by GR2830.

3.15 The GTI/C takes the GPS signal information from the GTR and the uncorrected oscillator input from the LOU/C card, and sends the signal to an output driver to provide the outputs to the timing output cards.

3.16 Two LOU/C cards are available: LOU-1/C and LOU-2/C (see Figure 7 and Figure 8 for block diagrams). The LOU-1/C contains one oscillator with two parallel outputs, and the LOU-2/C contains two independent oscillators, each with one output. If using the LOU-2/C card, oscillator A is the preferred clock. Oscillator B becomes the preferred clock only if oscillator A fails.

3.17 If the oscillator fails in the LOU-1/C card, a lamp lights to indicate failure. If one of the oscillators fails in the LOU-2/C card, the other oscillator provides timing. Fault tolerance is achieved by using the redundant oscillators. If both oscillators fail in the LOU-2/C card, or the oscillator in LOU-1/C fails, the DCD-LPR/C defers to a degraded mask output, as specified by the Bellcore document GR2830.

4. SPECIFICATIONS

4.01 DCD-LPR/C System specifications are listed in Table B.

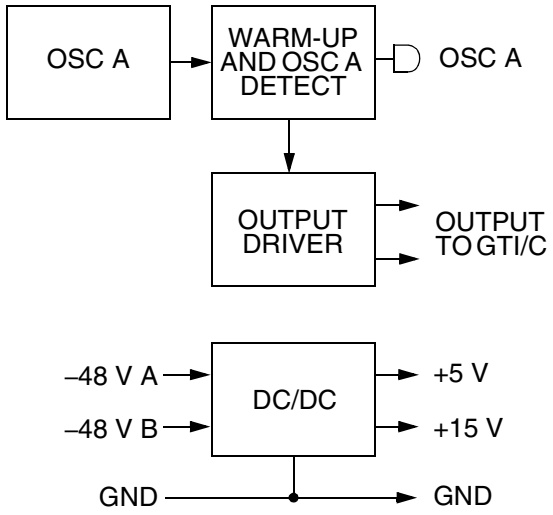


Figure 7. LOU-1/C Block Diagram

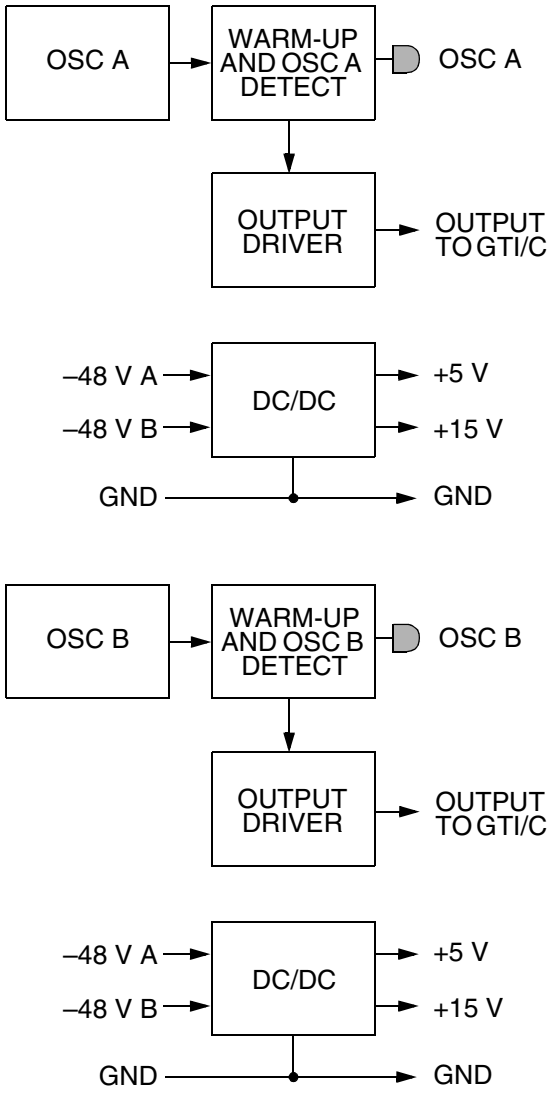


Figure 8. LOU-2/C Block Diagram

Table B. DCD-LPR/C System Specifications

<table>
<tr><th>ITEM</th><th>SPECIFICATION</th></tr>
<tr><td colspan="2">DCD-LPR/C SYSTEM</td></tr>
<tr><td>Sensitivity</td><td>Locks with signal-to-atmospheric noise level of –10 dB or better</td></tr>
<tr><td>Performance</td><td>
<table>
<tr><th rowspan="2">Observation Time MTIE (s)</th><th colspan="2">MTIE</th></tr>
<tr><th>TNC-E/C @ 25 °C</th><th>TNC/C, LNC/C, LOU-1/C, LOU-2/C @ 25 °C</th></tr>
<tr><td>1</td><td>8 ns</td><td>8 ns</td></tr>
<tr><td>10</td><td>10 ns</td><td>10 ns</td></tr>
<tr><td>100</td><td>10 ns</td><td>10 ns</td></tr>
<tr><td>1000</td><td>30 ns</td><td>60 ns</td></tr>
<tr><td>10000</td><td>100 ns</td><td>200 ns</td></tr>
<tr><td>100000</td><td>100 ns</td><td>600 ns</td></tr>
</table>
</td></tr>
<tr><td>CE Mark Certification Standards</td><td>EN55022, EN50082-1, and EN60950</td></tr>
<tr><td>Outputs</td><td>The GTI/C -12, -14, and -16 provide 2 E1 outputs: 2.048 Mb/s E1, CCS/CAS (switch-selectable)
The GTI/C -18 provides 2 outputs: 2.048 Mb/s E1 or 2.048 MHz analog (selectable via TL1 command), CCS/CAS (switch-selectable)</td></tr>
<tr><td colspan="2">Note: For details on TL1 commands, refer to the TL1 User's Guide provided with the MIS/C card.</td></tr>
<tr><td colspan="2">DCD-LPR/C SHELF</td></tr>
<tr><td>Alarm Output Audible and Visible
Major
Minor
Status (VIS only)
Type
Format
Contact Rating</td><td>
Activates if power is lost on GTI/C or if any major alarm condition exists on the GTI/C (e.g., loss of all inputs, or GTI/C has failed)
Activates if any minor alarm condition exists on the GTI/C (e.g., a single blown fuse or loss of a single input)
Not used
Dry contact
Normally open and normally closed
1.0 A @ 56 V dc, 0.6 A @ 125 V ac</td></tr>
<tr><td>Power
Voltage
Current
Shelf Fuses
Power Source Fuses</td><td>
–42 V dc to –56 V dc
Maximum 1 A
2 A
3 A</td></tr>
</table>

Table B. DCD-LPR/C System Specifications (Contd)

ITEM	SPECIFICATION
DCD-LPR/C SHELF(Contd)	
Environmental Temperature Humidity	 Operating: 0 °C to +45 °C Operating: 0% to 95%, noncondensing
Dimensions (HxWxD)	26.7 cm x 48.3 cm x 27.9 cm overall
Note: If mounting above equipment that produces heat, leave an additional 4.4 cm beneath the shelf for air flow.	
GTI/C -12 CARD	
Input Type	5 MHz or 10 MHz from DCD-500 series shelf (rubidium or better quality clocks), or DCD-Cs Shelf (cesium clock)
Output Frequency	2.048 Mb/s (E1)
Framing Format	CCS/CAS, with CRC4
Environmental Temperature Humidity	 Operating: 0 °C to +45 °C Operating: 0% to 95%, noncondensing
Dimensions (HxWxD)	4.92 cm x 35.08 cm x 19.37 cm
SSM Capable	No
GTI/C -14 OR GTI/C -16 CARD	
Input Type	5 MHz or 10 MHz from DCD-500 series shelf (quartz, rubidium or better quality clocks, combinations of the two clock types), or DCD-Cs Shelf (cesium clock), or LOU/C card
Output Frequency	2.048 Mb/s (E1)
Framing Format	CCS/CAS, with or without CRC4
Environmental Temperature Humidity	 Operating: 0 °C to +45 °C Operating: 0% to 95%, noncondensing
Dimensions (HxWxD)	4.92 cm x 35.08 cm x 19.37 cm
SSM Capable	No

Table B. DCD-LPR/C System Specifications (Contd)

ITEM	SPECIFICATION		
GTI/C -18 CARD			
Input Type	5 MHz or 10 MHz from DCD-500 series shelf (quartz, rubidium or better quality clocks, combinations of the two clock types), or DCD-Cs Shelf (cesium clock), or LOU/C card		
Output Frequency	2.048 Mb/s (E1) or 2.048 MHz (analog)		
Framing Format	CCS/CAS, with or without CRC4		
Environmental Temperature Humidity	 Operating: 0 °C to +45 °C Operating: 0% to 95%, noncondensing		
Dimensions (HxWxD)	4.92 cm x 35.08 cm x 19.37 cm		
SSM Capable	Yes		
SSM			
Quality Levels	Quality Level	Meaning	Hex Code
	PRC	Primary Reference Clock	02
	SSUT	Transit Node Clock	04
	SSUL	Local Node Clock	08
	SEC	SDH Equipment Clock	0B
	DNU	Do not use or idle code (no SSM message)	0F
	UNK	Unknown	00

Table B. DCD-LPR/C System Specifications (Contd)

ITEM	SPECIFICATION
TIME-OF-DAY (Optional)	
Data Signal	
Baud Rate	9600 b/s
Format	8 data bits, no parity, 1 start/stop bit
Physical/Electrical	Output of Adapter: Physical: DB9, female Electrical: RS-422 Output of Converter (optional): Physical: DB25, female Electrical: RS-232
Data Format	Cisco Systems: Time format: Year/month/day, hour:minute:second Alarm fields: Alarm severity, source, and cause where the TOD alarm codes are defined as follows: Alarm severity: NR = non-reporting MN = minor alarm MJ = major alarm Alarm source: TOD = TOD output card GTI = GTI CLA = Clock 1 CLB = Clock 2 PW1 = primary power feed PW2 = secondary power feed GTR = GTR GPS = GPS satellites Alarm cause: ACQ = acquiring UNL = unlocked FLT = fault LOS = loss NTP Type 4: Time format: Year Julian-date hour:minute:second:millisecond Alarm fields: Signal validity, sync status; defined as follows: Validity: * = valid ! = invalid Sync: [space] = insync ? = out of sync
1 pps Signal	
Pulse Width	800 µs
Accuracy	<1 µs compared to UTC
Physical/Electrical	Output of Adapter: Physical: DB9, female Electrical: RS-232 Valid edge: Falling Output of Converter (optional), DB25: Physical: DB25, female Electrical: RS-232 Valid edge: Falling Output of Converter (optional), BNC: Physical: BNC Electrical: TTL Valid edge: Rising

Table B. DCD-LPR/C System Specifications (Contd)

ITEM	SPECIFICATION
LOU/C CARDS (LOU-1/C, LOU-2/C)	
Source	LOU-1/C, one oven-controlled crystal oscillator LOU-2/C, two oven-controlled crystal oscillators
Accuracy 24 hours 20 years	 3.0×10^{-10} 1.0×10^{-6}
Warm-up Time	10 min
Environmental Temperature Humidity	 Operating: 0 °C to +45 °C Operating: 0% to 95%, noncondensing
Dimensions (HxWxD)	4.92 cm x 35.08 cm x 19.37 cm
ANTENNA/RECEIVER (GTR)	
Type	Stable phase centered active patch
Power	16 V to 32 V dc at 6.5 W
Fiber cable wave length	850 nm
Power cable between GTR and power source	Maximum 242.7 m with GTI providing power Maximum 242.7 m with an external power source
Cable types	For single lightning protector installations: one shielded 3-conductor cable, 1.47 mm (16 AWG) with a 1.47 mm (16 AWG) drain wire and one unshielded 3-conductor cable, 1.47 mm (16 AWG) For dual lightning protectors: one shielded 3-conductor cable, 1.47 mm (16 AWG) with a 1.47 mm (16 AWG) drain wire, one shielded 3-conductor cable, 1.47 mm (16 AWG), and one unshielded 3-conductor cable, 1.47 mm (16 AWG) 200 µ multimode fiber optic cables to connect the GTR to the DCD-LPR/C Shelf.
Environmental (GTR) Temperature Relative Humidity	 Operating: –40 °C to +70 °C (cannot be started at temperatures below –20 °C) Storage: –50 °C to +100 °C Up to 100%
Dimensions	29.8 cm diameter; 16.5 cm total height