Traffic Products and Warning Systems

SYSTEM 3000

INSTRUCTION MANUAL

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FCC NOTICE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to subpart J of part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which the user will at their expense, be required to correct the interference.

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CONSIDERATION

Consideration should be given to implementation of grounding and protective measures to minimize loss of functions due to electrical overcurrent or overvoltage conditions, lightning events or other interference above or below the normal tolerances for the equipment. Protective measures and installation means and methods should be in accordance with National and Local electrical codes.

LIMITED WARRANTY

ELTEC warrants devices manufactured by ELTEC to be free of defects in material and workmanship for a period of 25 months from the date of purchase by the original purchaser. ELTEC will repair or replace any unit returned prepaid within the warranty period as long as there is no evidence that the unit has been misused, abused, damaged by input over voltage, output overloads, lightning, or water, or altered in any manner without the expressed written permission of ELTEC. ELTEC disclaims any warranties expressed or implied, including warranties of merchantability and/or fitness for a particular purpose. In no event shall ELTEC be held liable for incidental or consequential damages. Warranty repairs will be handled during normal business hours and returned, prepaid by ground transportation. For assistance with troubleshooting and problem determination or to obtain an RMA for return, contact ELTEC technical support at 800-227-1734.

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We are open Monday through Friday from 8:00 AM to 5:00 PM Central time. We are available Saturday by advance appointment.

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DLPRO VERSION: _____

CONFIGURED BY: _____

INSTALLED BY: _____

DATE INSTALLED: _____

Section 1

System Description
and
Theory of Operation
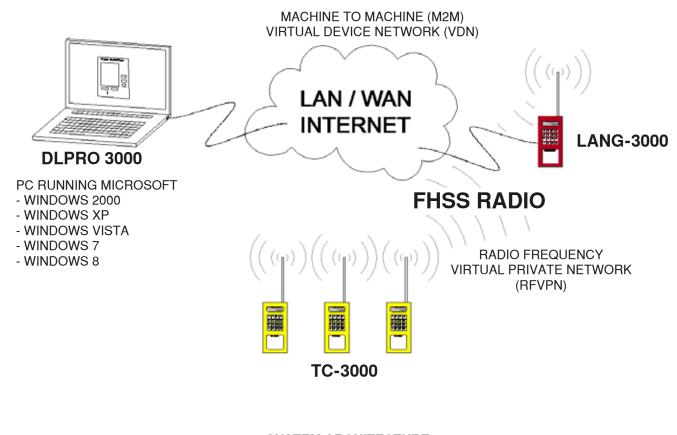
1.1 SYSTEM 3000

ELTEC's System 3000 is a programmable, IP-addressable network clock system that provides centralized configuration, administration and control. The system utilizes machine to machine (M2M) virtual device networking (VDN) over private network or public internet combined with local, frequency-hopping spread spectrum radio (FHSS) to provide real-time, closed-loop feedback for time-based control and background system monitoring. Network communication can be established through hard-wired copper or fiber systems or through wireless connections such as Wi-Fi, WiMAX, cellular, or data radios.

The System 3000 (Figure 1.1) is comprised of the Time Clock (TC-3000), Local Area Network Gateway (LANG-3000) and Data Link PROfessional software (DLPRO 3000) running on a host computer. The DLPRO 3000 software allows communication with up to two hundred fifty-five (255) network gateways. Each LANG-3000 can accommodate up to six distinct groups of clocks with each group containing as many as twenty TC-3000 clocks. Each group of clocks in the system can be independently programmed with a unique weekly schedule, holiday schedule and multiple exception schedules.

System supervisory and control capabilities allow manual operation of any clock or group directly from the host console as well as monitoring of system parameters including cabinet temperature, system battery voltage, solar panel voltage and radio frequency (RF) communication status. Internal monitoring of system voltages and expected operational states can provide E-mail notifications to administrators and maintenance personnel based upon user configurable threshold values.

SYSTEM ARCHITECTURE

Figure 1.1

1.2 TC-3000 PROGRAMMABLE TIME CLOCK

The TC-3000 is the field unit which locally controls a relay and integral DC flasher as programmed through a user defined schedule. The schedule includes a weekly program of up to six ON/OFF operations per day, a holiday/no-school schedule of up to 20 holidays, and exception days for irregular activities such as early dismissal, late starts, and snow delays. The schedule is typically programmed for one year, but may be programmed for longer periods provided the user does not exceed 20 holidays or 365 exception days. Manual override duration is programmable from one minute to ten hours.

The TC-3000 is typically programmed from the host computer using the DLPRO 3000 software. It can also be programmed from its associated LANG or directly at the clock using the keypad on the front of the clock. Program elements are opened by typing the appropriate access sequence and a key word for each entry is displayed to guide the user through the programming process. Once the required information is entered for each field, the display advances to the next field until all data for that program element is entered. The TC-3000 provides 'type-over', 'back up' and 'field skip' features during the entry process to facilitate error correction, simplify navigation and make programming quick and easy. Program schedules can be reviewed or edited at any time without disturbing the operation of the clock.

The TC-3000 maintains time and date during power outages for a minimum of seven days with its rechargeable capacitive backup system. Program information is stored in non-volatile memory (NVRAM) and is kept during power off conditions for the life of the clock. When installed and communication with the host system is established, time and date are updated by the host computer during system monitoring or when the Sync command is used. When communications are down or when operating in stand-alone mode, the real-time clock maintains time and date information with a quartz crystal accuracy of two seconds per month.

Although designed to integrate into the System 3000 for remote programming and control, the TC-3000 can operate as a stand-alone time-based controller.

Technical information, programming functions, and operating parameters concerning the TC-3000 are provided in Section 7—Appendix (pages 29–30).

Figure 1.2 describes the hardware features of the TC-3000 programmable time clock.

Figure 1.2

1 WATT 900 Mhz RADIO
- No FCC License Required
- Selective Addressing
- Inherent Privacy/Security
- Interference Rejection

2–LINE LCD
- Date, Time, and Status
- View/Edit Programs
- View/Edit System Parameters

16–KEY KEYPAD
- Local Programming Testing, and Override
- [A] Attention Functions
- [*] Star Functions

SYSTEM DECAL
- Program Function Reference
- System Function Reference
- Technical Support Number

CIRCULAR PIN CONNECTOR
- Power, Control, and Monitoring
- Distinct AC or DC Power Wiring
- Simple Installation or Replacement

1.3 LANG-3000 NETWORK GATEWAY

LANG-3000 is the network gateway which provides the interface between the DLPRO 3000 host control console and the TC-3000 programmable time clock. The LANG can also function as a clock, perfoming local control of a relay and integral DC flasher as programmed. Each LANG-3000 can accommodate up to six distinct groups of time clocks with up to twenty clocks in each group. Each group of clocks connected through the LANG can have a unique weekly schedule, holiday schedule and exceptions. The TC-3000's within each group are typically programmed from the host computer using the DLPRO 3000 software; however the program schedules may also be programmed manually at the LANG using the integral keypad and display and sent to the clocks in each group. Program elements are opened by typing the appropriate access sequence and a key word for each entry is displayed to guide the user through the programming process. Once the required information is entered for each field, the display advances to the next field until all data for that program element is entered. The LANG-3000 provides 'type-over', 'back up' and 'field skip' features during the entry process to facilitate error correction, simplify navigation and make programming quick and easy. Program schedules can be reviewed or edited at any time without disturbing the operation of the LANG.

The LANG-3000 maintains time and date during power outages a minimum of 7 days with its rechargeable capacitive backup system. Program information is stored in non-volatile memory (NVRAM) and is kept during power off conditions for the life of the unit. When installed and communication with the host system is established, time and date are updated by the host computer during system monitoring or when sync command is used. When communications are down or operating in stand-alone mode, a real-time clock maintains time and date information with a quartz crystal accuracy of two seconds per month.

Technical information, programming functions, and operating parameters concerning the LANG-3000 can be found in Section 7—Appendix (pages 31–32).

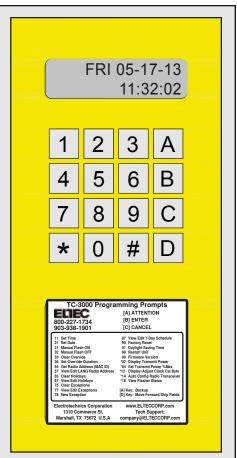Figure 1.3 describes the hardware features of the LANG-3000 gateway.
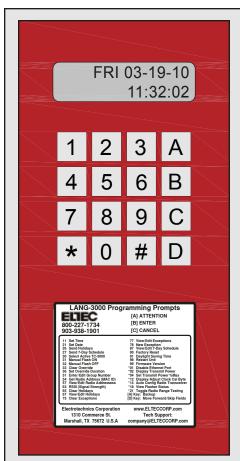
Figure 1.3

1 WATT 900 mhz RADIO
- No FCC License Required
- Selective Addressing
- Inherent Privacy/Security
- Interference Rejection

2–LINE LCD
- Date, Time, and Status
- View/Edit Programs
- View/Edit System Parameters

16–KEY KEYPAD
- Local Programming
  Testing, and Override
- [A] Attention Functions
- [*] Star Functions

ETHERNET PORT
- RJ45 Standard
- XPORT Device Server

SYSTEM DECAL
- Program Function Reference
- System Function Reference
- Technical Support Number

CIRCULAR PIN CONNECTOR
- Power, Control, and Monitoring
- Distinct AC or DC Power Wiring
- Simple Installation or Replacement

1.4 DLPRO 3000 SOFTWARE APPLICATION

The DLPRO 3000 Host Console software runs on a host computer providing the user interface for system configuration, administration and control.

The DLPRO 3000 software operation and use are described Sections 3–5.

1.5 SYSTEM REQUIREMENTS

OPERATING SYSTEM:............... Windows 7, Vista, XP, 2000 SP 4, Windows 8, or Server 2003–Server 2009

MEMORY REQUIREMENTS:	RAM USED	HARD DISK USED	
DLPRO 3000 Host Software	18M	1M	
E-mail Server	6M	4M	
Device Installer	17M	6M	Required for system configuration only
Data folders/files	-	64K	For an average system with 40 time clocks

NETWORK DATA THROUGHPUT:

During schedule programming:	255 bytes for each time clock.	Total data transfer for programming weekly schedule, holiday/no school days and exception days.
During system monitoring:	20 bytes per time clock per full system cycle (cycle time is user-programmable)	Varies according to the number of time clocks per LANG.

ACCESS TO INTERNET, INTRANET, OR A LAN

RJ45 Ethernet Jack

Section 2
Getting Started

2.1 RECORDING SYSTEM COMPONENTS AND SERIAL NUMBERS

Prior to starting system installation, the user is encouraged to record the model, serial, and part number for each device in the system. This manual contains form 6.1 LANG/Clock ID Number Record (page 43)

2.2 INSTALLING AND CONFIGURING DLPRO 3000 SOFTWARE

The DLPRO 3000 software should be installed on a server or workstation computer which can be accessed by all system users and administrators. It is not required that the host computer be dedicated for the System 3000.

DLPRO 3000 offers support for Microsoft based operating systems and can be loaded on systems running Windows XP, Windows Vista, Windows 7, Windows 8, Server 2003–2009.

Insert the DLPRO 3000 disk into the computer's CD ROM drive. The installation program should start automatically. If it does not, navigate to the CD ROM drive using 'My Computer' or 'Windows Explorer' and double-click on the Setup.exe file to start the installation.

Install in the following folder: C:**Program Files\DLPRO** (Windows XP and earlier)

Install in the following folder: C:**Program Files (x86)\DLPRO** (Windows 7 and later)

At the Installation Summary screen, click 'NEXT' to begin the installation. The Installation Progress window will display with a progress bar, wait for the installation to complete. The Installation Complete window will display, indicating the program has been installed. Click 'NEXT' to exit from the installation program. A window may pop up stating that a system restart is required, select 'Restart Now' and wait for the computer to re-boot.

For resolution of any issues encountered during installation, refer to the software trouble shooting in Section 8.2

2.3 XPORT SETUP

The LANG-3000 requires configuration of its ethernet port (XPort Device Server) to establish a connection with the DLPRO host console.

This is accomplished by assigning the LANG a unique IP Address Configuration to identify it on the network and a Port Number for the connection. The private port address range of 64100 to 64999 is recommended.

A Group Configuration Record spreadsheet is provided in Section 6—Forms and Log Sheets (page 47) to document port numbers, MAC ID's and other information to assist in system configuration.

Initial configuration may be accomplished using the XPORT web interface which can be accessed from a web browser (e.g. Firefox, Internet Explorer, etc.). Under certain circumstances the XPORT configuration may require installation of the LANTRONIX Device Installer software, instructions are provided in the Appendix, Section 7.3.

Figure 2.3.1

Access to the web configuration interface requires connecting a workstation or laptop PC to the LANG using the provided red cross over cable to establish a peer to peer network. On the PC, open the Local Area Connection Status window (Figure 2.3.1), click on Properties to display the Local Area Connection Properties window and select the Internet Protocol Version 4 (TCP/IPv4) item from the list and click properties (Figure 2.3.2). Select "Use the Following IP Address" and enter the IP Address and subnet mask as shown in Figure 2.3.3. Click 'OK' to save changes to the IP configuration.
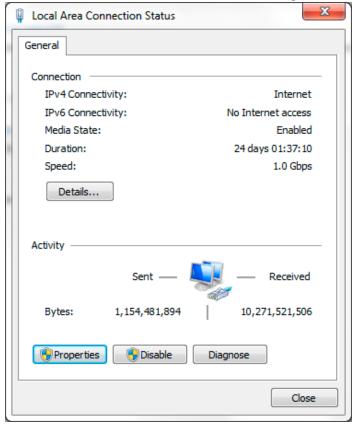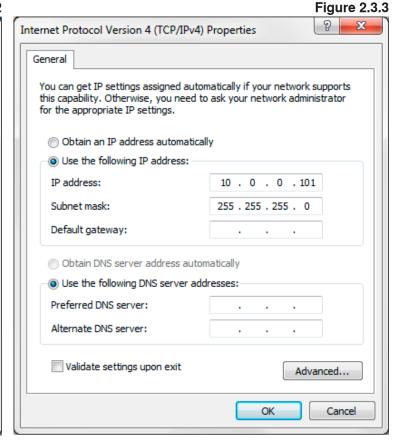
Local Area Connection Status

General

Connection

IPv4 Connectivity:	Internet
IPv6 Connectivity:	No Internet access
Media State:	Enabled
Duration:	24 days 01:37:10
Speed:	1.0 Gbps

Details...

Activity

Sent — Received

Bytes: 1,154,481,894 | 10,271,521,506

Properties   Disable   Diagnose

Close

Figure 2.3.2

Local Area Connection Properties

Networking

Connect using:

Broadcom NetLink (TM) Gigabit Ethernet

Configure...

This connection uses the following items:

☑ Client for Microsoft Networks
☑ QoS Packet Scheduler
☑ File and Printer Sharing for Microsoft Networks
☑ Internet Protocol Version 6 (TCP/IPv6)
☑ Internet Protocol Version 4 (TCP/IPv4)
☑ Link-Layer Topology Discovery Mapper I/O Driver
☑ Link-Layer Topology Discovery Responder

Install...   Uninstall   Properties

Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

OK   Cancel

Figure 2.3.3

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:

IP address:	10 . 0 . 0 . 101
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

○ Obtain DNS server address automatically
● Use the following DNS server addresses:

Preferred DNS server:	. . .
Alternate DNS server:	. . .

☐ Validate settings upon exit

Advanced...

OK   Cancel

Connect the LANG to the PC using the crossover cable and open the web browser. Enter the IP Address (default address: 10.0.0.100) of the LANG into the address field of the browser and hit 'Enter.' (Figure 2.3.4) The 'Authentication Required' window will display, there is no initial password set. Press 'OK' to proceed to the XPort Device Server Configuration Manager (Figure 2.3.5).

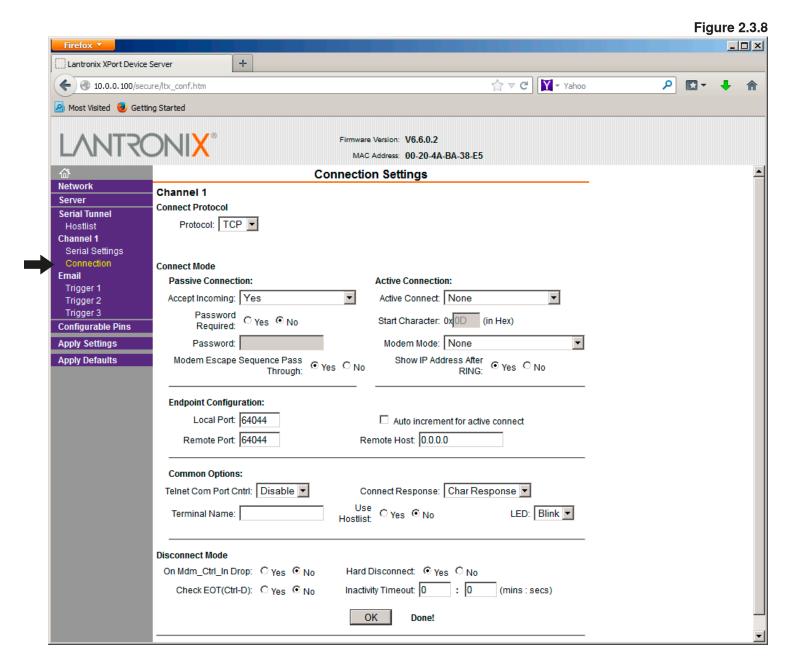**Figure 2.3.4**

Figure 2.3.5

Select 'Network' in the right column to access Network Settings (Figure 2.3.6).

Figure 2.3.6

Enter the network settings in the appropriate fields and click the 'OK' button at the bottom of the window. The word 'Done!' should display next to the button (Figure 2.3.7).

Select 'Connection' under 'Channel 1' in the left column to access Connection Settings (Figure 2.3.8). Enter the Local Port and Remote Port in the 'Endpoint Configuration' section. Verify that the remaining settings are consistent with those shown in Figure 2.3.7/8 and click 'OK.'

Figure 2.3.8

Verify Serial Settings as shown in Figure 2.3.9.

Once all settings are input and verified, click on 'Apply settings' in left column. The progress bar will display, indicating the settings are being applied. Once the settings have been saved, verify the correct IP Address has been saved in LANG using the '[A] 53' command.

Figure 2.3.9

2.4 E-MAIL SETUP

The DLPRO 3000 software includes a simple mail transfer protocol (SMTP) mail server. To install the mail server, insert the DLPRO installation disk and double click on the 'Agsmail.exe' icon found in the 'INSTALL Support Files' folder. The default installation parameters will work properly, although the 'create desktop icon' box can be unchecked, as it will not be used.

Once installation is complete start the server (start>programs>ArGoSoft Mail Server).This will activate the server although nothing will appear on the screen. Now right click on the ArGoSoft icon found in the right hand side of the taskbar at the bottom of the screen. Select Options and the setup window (Figure 2.4.1) will appear.

Click on the red check mark to ascertain and fill the DNS Server IP Address. The field will automatically populate. Finally, select the options as shown in Figure 2.4.1 and close the window. The mail server installation is now complete.

To test the E-mail server, start up DLPRO, highlight any port number on the main menu and press the E-mail List button. Now enter a valid E-mail address and press Send Test E-mail (Figure 2.4.2). The E-mail should be received shortly. Should it not be sent, right click on the ArGoSoft icon in the taskbar and select Show. Information will be displayed in a log file indicating the nature of the problem.

As a final setup step the user will enter all E-mail addresses to which advisories are to be sent and send a test message asking for receipt confirmation.

Figure 2.4.1

Figure 2.4.2

2.5 FIELD INSTALLATION

The user is now ready to install the LANG-3000 and the TC-3000 time clocks in the field.

The first step is to record the RF ID of each TC-3000 and the Port number of the LANG-3000 (Forms are provided in Section 6). This data will be required for entry into DLPRO 3000.

To facilitate verification of a good RF signal between a LANG and its clocks a field testing function is available. This feature can be utilized as follows: With the equipment in place program the LANG's RF ID into a clock to be tested by entering A57 on the clock's keypad then A98 to reset. To start the test simply enter *21 on the clock. The clock will send a signal to the LANG and wait for the LANG's signal in response. The clock then displays two numbers representing signal loss for the two signals. The first number represents how strong the clock's signal reached the LANG. Likewise, the second number is how strongly the LANG answered back. This sequence repeats every three seconds and the signal loss (RSSI) numbers are updated. The testing continues for about 3 minutes or can be toggled off by again entering *21 on the clock's keypad.

As the RSSI numbers represent signal loss, lower numbers indicate a stronger signal. The values for RSSI range from 10-12 for no loss up to 255 for an unsuccessful transmission. RSSI values of 160 and lower are desired for consistent communication. Trees and time-of-year when testing should be considered in evaluating RSSI. Marginal results in the absence of foliage could likely mean that communications will fail once trees leaf out that lie along the path between the LANG and clock.

See Section 7—Appendix 7.4 for a detailed procedure to determine RF signal strength.

ELTEC can perform a topographical RF survey for a proposed installation. This computer-based study evaluates terrain, foliage and buildings to determine the likelihood of good RF communication for a system.

Once the LANG-3000 and TC-3000 are installed in the field, the user is now ready to program the system. This is typically done using DLPRO 3000 software, which is discussed in the next section. Programming can also be done at the LANG-3000 or TC-3000 using the keypad and commands, found in the Appendix on pages 30 and 32.

2.6 SYSTEM SECURITY
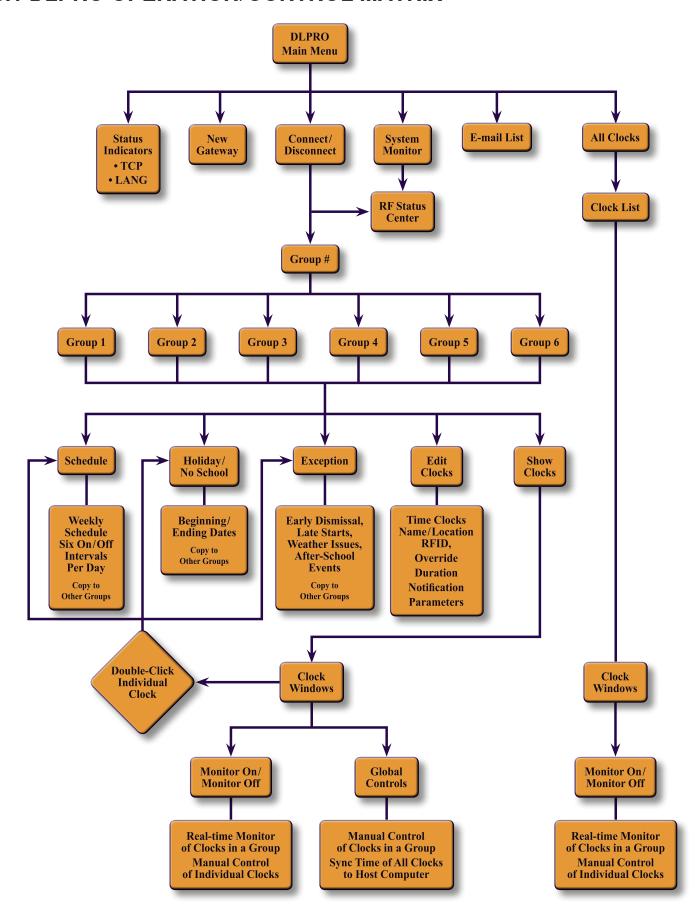
The radios integrated into the LANG-3000 gateway and its associated TC-3000 time clocks employ frequency-hopping spread spectrum (FHSS) modulation techniques that deliberately use a large bandwidth to send small amounts of information. The process of spreading the signal bandwidth and then collapsing it through coherent correlation with a local reference contained in the receiver offers a combination of selective addressing, inherent message privacy/security and interference rejection. By utilizing the unique radio MAC ID's of the clocks and gateways to selectively address each component the system is able to restrict radio communication access to those radio's which are included in the system. The FHSS modulation inherently provides the data privacy/security.

Wired network communication between the LANG-3000 gateway and the DLPRO 3000 host console software utilizes an embedded networking processor module (device server) integrated into the LANG-3000 that establishes a machine to machine virtual device network (VDN) between the gateway and the host utilizing TCP.

Section 3

DLPRO 3000

3.1 DLPRO OPERATION/CONTROL MATRIX

DLPRO Main Menu

- **Status Indicators**
  - • TCP
  - • LANG
- **New Gateway**
- **Connect/ Disconnect**
- **System Monitor**
  - **RF Status Center**
- **E-mail List**
- **All Clocks**
  - **Clock List**

Group #

- **Group 1**
- **Group 2**
- **Group 3**
- **Group 4**
- **Group 5**
- **Group 6**

Schedule

Weekly Schedule Six On/Off Intervals Per Day

Copy to Other Groups

Holiday/ No School

Beginning/ Ending Dates

Copy to Other Groups

Exception

Early Dismissal, Late Starts, Weather Issues, After-School Events

Copy to Other Groups

Edit Clocks

Time Clocks Name/Location RFID, Override Duration Notification Parameters

Show Clocks

Double-Click Individual Clock

Clock Windows

- **Monitor On/ Monitor Off**
  - **Real-time Monitor of Clocks in a Group Manual Control of Individual Clocks**
- **Global Controls**
  - **Manual Control of Clocks in a Group Sync Time of All Clocks to Host Computer**

Clock Windows

- **Monitor On/ Monitor Off**
  - **Real-time Monitor of Clocks in a Group Manual Control of Individual Clocks**

3.2 ENTERING DATA FOR LANG-3000s

Open DLPRO 3000 by navigating to the program from the Start Button. The DLPRO Main Menu displays as shown in Figure 3.2.1.

The configuration information is entered for each LANG-3000 in the system by clicking on the 'NEW GATEWAY' button and typing the description/location information (5-22 characters, see Figure 3.2.2). Select OK. The port number for each new gateway entered will default to 64100. To change the port number to the desired value double-click on the HOST PORT field, type the correct port number and hit 'Enter'. A 'Change
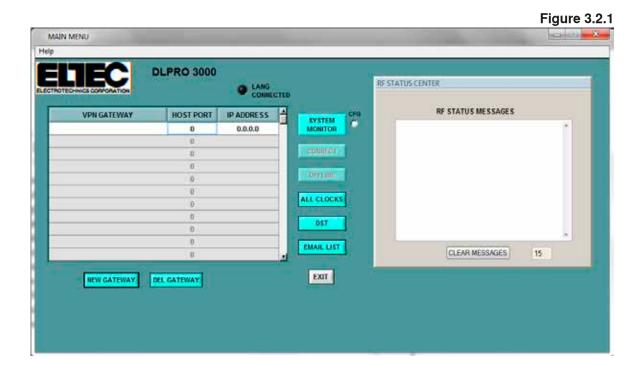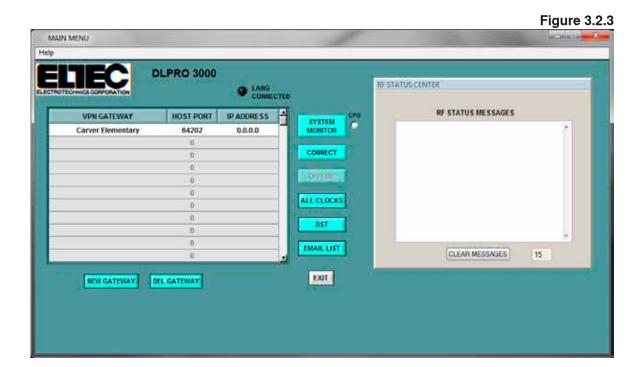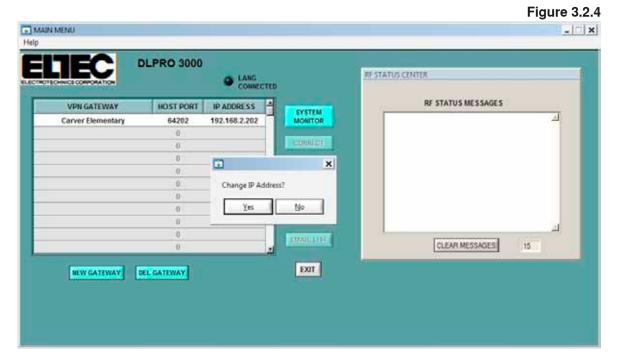
Figure 3.2.1

Figure 3.2.2

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Name/Port Number?' box will pop up, click 'YES' to confirm the change. For example, if the first LANG identified as Carver Elementary and the port number is 64202, the information would appear as shown in Figure 3.2.3. The port munber entered must correspond to the port number that is programmed into the LANG. For simplicity, the port number may be left at 64100 for all gateways.
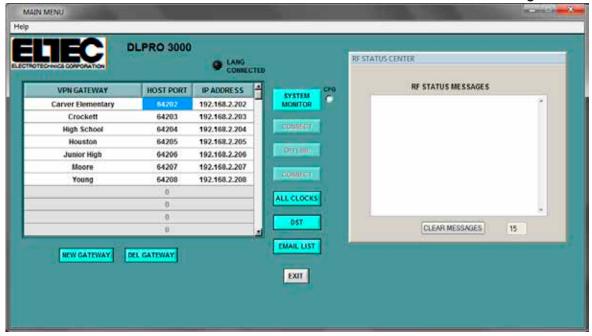
To enter the LANG IP Address, double-click in the IP Address field (see Figure 3.2.4). Type the address and hit 'Enter.' A 'Change IP Address?' box will pop up, click 'Yes' to confirm the change. Continue to input LANG-3000's until all system gateway data has been entered. For example, if the system has seven LANGs, the Main Menu window would appear as seen in Figure 3.2.5.

Figure 3.2.3

Figure 3.2.4

Figure 3.2.5

Each record in the main window corresponds to a LANG in the network. The System 3000 will support 256 LANGs. The DST (Daylight Saving Time) button will open the DST window in which the user can toggle DST on or off and confirm dates. (Figure 3.2.6) The selected DST settings are downloaded to the clocks when the default schedule is loaded.

Figure 3.2.6

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3.3 CONNECTING TO THE LANG-3000 AND ENTERING DATA FOR GROUPS

To enter data for a specific LANG and its associated TC-3000 time clocks, select the desired LANG-3000 in the DLPRO Main Menu window by clicking on the port number on the Host Port field and then clicking CONNECT (Figure 3.3.1). The GROUP window will display (Figure 3.3.2) allowing the selection of one of the six groups being managed. The MAIN MENU window will continue to be displayed on the screen (Figure 3.3.3) and the RF STATUS window will begin to log status messages for the communication session.

Figure 3.3.1
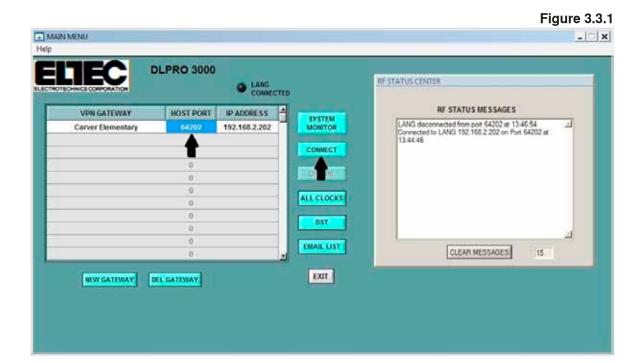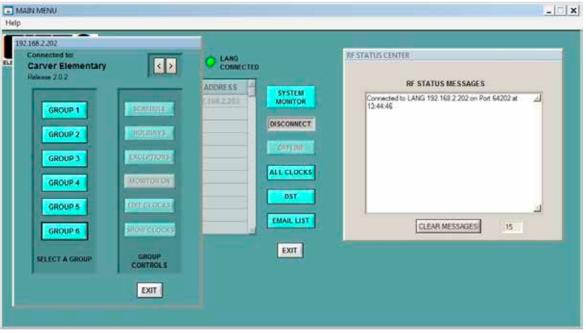
Figure 3.3.2

When the host computer has successfully connected and is communicating, the 'LANG CONNECTED' light is green. (Figure 3.3.2) If the LANG connected light is not green, then communication has not been established with the LANG-3000, and the GROUP window will not open. Firewall restrictions configured in the host computer could be responsible, check firewall settings and allow an exception for either the software and/or port (See troubleshooting section in Section 8.2).

To provide a name to a group, move the cursor over the group button and right click. The 'EDIT GROUP DESCRIPTION' window will open (Figure 3.3.3). Enter the description or name and hit enter. When you move the cursor over the group, the group name will appear next to the button (Figure 3.3.4)

Figure 3.3.3

Figure 3.3.4

Select one of the six groups being managed by this gateway to activate the Group controls for further operations as shown below (Figure 3.3.4). When a group is selected, the other group buttons "grey out" and are not accessible. Restricting all subsequent operations to the selected group. When a group is selected, the SCHEDULE, HOLIDAY, EXCEPTION, EDIT CLOCKS and SHOW CLOCKS functions become available. Entering data for the clocks in each group is covered in Section 3.4.

Figure 3.3.5

3.4 ENTERING DATA FOR TC-3000 TIME CLOCKS

To enter data for the TC-3000 time clocks assigned to Group 1 of LANG 1 click on Edit Clocks (Figure 3.4.1). This opens the TIME CLOCKS window, as shown in Figure 3.4.2. Double-click in each field to enter the appropriate data.

Figure 3.4.1

Figure 3.4.2

Carver Elementary: GROUP 1

	TC3000 NAME / LOCATION	RF ID	COM CFG	OVERRIDE DURATION (h:mm)	LOW VOLTAGE ADVISORY	EXCESSIVE LOAD ADVISORY (Amps)	HI TEMPERATURE ADVISORY (°F)
1	NAME	000-000-000	CLOCK	0:10	11.6	2.5	140
2			CLOCK	0:10	11.6	2.5	140
3			CLOCK	0:10	11.6	2.5	140
4			CLOCK	0:10	11.6	2.5	140
5			CLOCK	0:10	11.6	2.5	140
6			CLOCK	0:10	11.6	2.5	140
7			CLOCK	0:10	11.6	2.5	140
8			CLOCK	0:10	11.6	2.5	140
9			CLOCK	0:10	11.6	2.5	140
10			CLOCK	0:10	11.6	2.5	140

SAVE   SEND to LANG   EXIT

The NAME/LOCATION of the TC-3000 time clock can be anything meaningful that will assist in identifying the clock. It must be at least 9 characters long and may not be more than 21 characters long.

The RF ID is the nine-digit number of the radio's Media Access Control (MAC) ID used in the TC-3000 time clock. The MAC ID is assigned by the radio manufacturer and cannot be changed by the user. It must be entered in the format ###-###-### (Figure 3.4.3). Refer to the GETTING STARTED section on pages 5–13 and the System 3000 Group Configuration Record on page 47. The RF ID can be obtained using the [A] 54 command on the clock.

Figure 3.4.3

Carver Elementary: GROUP 1

	TC3000 NAME / LOCATION	RF ID	COM CFG	OVERRIDE DURATION (h:mm)	LOW VOLTAGE ADVISORY	EXCESSIVE LOAD ADVISORY (Amps)	HI TEMPERATURE ADVISORY (°F)
1	Carver eastbound	145-032-063	CLOCK ▼	0:10	11.5	2.5	140
2	Carver westbound	145-224-043	CLOCK ▼	0:10	11.5	2.5	140
3	Carver northbound	145-042-057	CLOCK ▼	0:10	11.5	2.5	140
4	Carver southbound	145-224-036	CLOCK ▼	0:10	11.5	2.5	140
5			CLOCK ▼	0:10	11.6	2.5	140
6			CLOCK ▼	0:10	11.6	2.5	140
7			CLOCK ▼	0:10	11.6	2.5	140
8			CLOCK ▼	0:10	11.6	2.5	140
9			CLOCK ▼	0:10	11.6	2.5	140
10			CLOCK ▼	0:10	11.6	2.5	140

SAVE   SEND to LANG   EXIT

The COM CFG field is used to define the unit as a LANG or clock and to define the path for repeater functionality (Figure 3.4.4). The LANG can be used as a clock, but must be the first clock in the first group. **Repeater** functionality is available when a clock cannot be reached directly by the LANG. A path is established

Figure 3.4.4

Carver Elementary: GROUP 1

	TC3000 NAME / LOCATION	RF ID	COM CFG	OVERRIDE DURATION (h:mm)	LOW VOLTAGE ADVISORY	EXCESSIVE LOAD ADVISORY (Amps)	HI TEMPERATURE ADVISORY (°F)
1	Carver LANG eastbound	145-223-244	LANG ▼	0:10	11.5	2.5	140
2	Carver westbound	145-224-043	✔ LANG	0:10	11.5	2.5	140
3	Carver northbound	145-042-057	CLOCK	0:10	11.5	2.5	140
4	Carver southbound	145-224-036	PATH	0:10	11.5	2.5	140
5			CLOCK ▼	0:10	11.6	2.5	140
6			CLOCK ▼	0:10	11.6	2.5	140
7			CLOCK ▼	0:10	11.6	2.5	140
8			CLOCK ▼	0:10	11.6	2.5	140
9			CLOCK ▼	0:10	11.6	2.5	140
10			CLOCK ▼	0:10	11.6	2.5	140

SAVE   SEND to LANG   EXIT

between the LANG and clock via a chain of one or more clocks. The PATH function is selected by clicking on the arrow on the right of the COM CFG column. Selecting PATH will open the 'RF ROUTING' window. The RF ID for each clock in the path is entered, starting with the clock closest to the LANG and ending with the one closest to the pathed clock. Click 'DONE' to save the path information (Figure 3.4.5).

Figure 3.4.5

The OVERRIDE DURATION defines the length of time that the clock will operate in a 'manual' mode. The override command can be sent to TC-3000 time clocks from DLPRO or initiated from the keypad of the clock using the [A] 31 command. Manual control functions are explained in more detail in the Real Time Interface section of this manual. Enter the desired default value for the override duration. The override time may be up to 9 hours and 59 minutes.

The LOW VOLTAGE ADVISORY defines the set point for notification of a low battery voltage condition on a solar power system. When the system voltage drops below the set point, an advisory message can be generated to notify the system administrator. For a 12-volt system, 11.6 volts would be appropriate and is the default value. Threshold can be set based upon the characteristics of each system.

'EXCESSIVE LOAD ADVISORY' is reserved for functionality that is not implemented at this time.

The 'HIGH TEMPERATURE ADVISORY' establishes the temperature threshold. When the cabinet temperature exceeds the set threshold a system advisory message can be generated to notify the system administrator. By default this value is 140°F.

Once the data for all TC-3000 time clocks for Group 1 has been entered, click SAVE and then click SEND to LANG to transmit data (Figure 3.4.6). When the LANG receives the data it stores the configuration for GROUP 1 and updates the configuration of each clock in the group.

The RF Status Center window will display a confirmation (Figure 3.4.7) indicating the group update has been received and successfully processed.

Should the status center indicate a failure, recheck the RF ID of each clock in the group. Also, see Section 2.5—Field Installation and Section 7.4—RF Signal Strength Test Function *21 for the means of checking RF integrity and correcting RF failures.
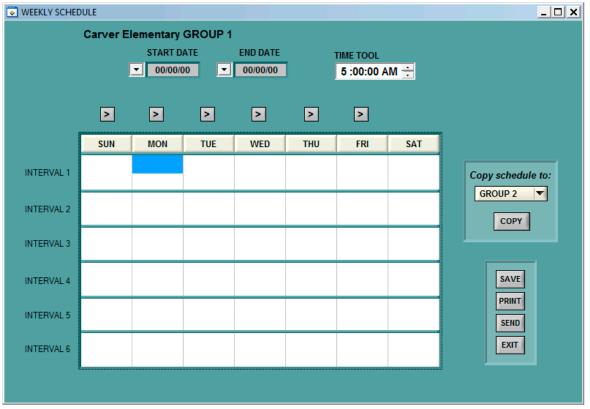
Figure 3.4.6

Figure 3.4.7

3.5 CREATING WEEKLY SCHEDULES
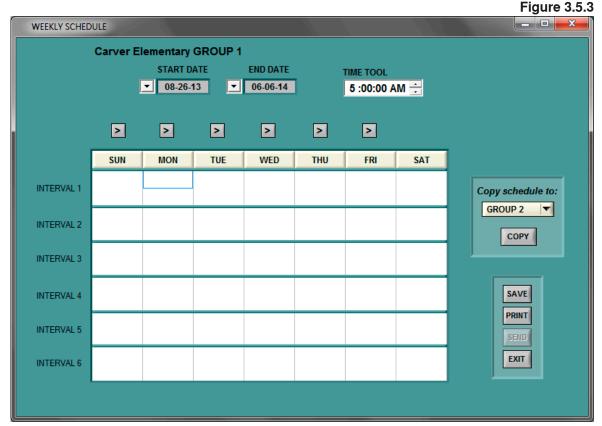
From the GROUP window, access the weekly schedule by clicking on the SCHEDULE button (Figure 3.5.1). The weekly schedule is the default schedule and runs for the period specified, typically this schedule is Monday through Friday. (Figure 3.5.2)

Figure 3.5.1

Figure 3.5.2

The default start and end dates are not defined. Select the period to run this weekly schedule using the fly-out calendar that appears when the arrow in the box to the left of the start and end date is selected. The start and end dates may be a period greater than 1 year and a date that has already passed may be selected as a start date. Typically the START DATE is the first day of school for the school year and the END DATE is the last day of the school year. For a school year that starts August, 2013, and ends June, 2014, the screen will appear similar to Figure 3.5.3.

The Weekly Schedule offers the capability to enter up to six different ON/OFF times. These are the default, everyday ON/OFF times.

Select the cell for the first interval to enter an ON or OFF time. The top half of the cell is for the ON time and the bottom half is for the OFF time. The time is entered using the Time Tool at the top of the screen or keyboard. To change the hour select the hour section of the display and to change the minute select the minute section of the display. While the second's section of the display can be changed it has no effect on the data sent to the clock. The clock assumes all ON/OFF execution times are on the minute. Monday intervals of operation from 7:00 AM to 8:30 AM and 2:00 PM to 3:30 PM are shown in Figure 3.5.4.

Once the schedule has been defined for the first day, it can be copied to the other days of the week by clicking on the > (greater than) sign above the column. This copies the schedule to the next day (Figure 3.5.5). Repeat the process until the schedule is entered for Monday through Friday, as in Figure 3.5.6.

The Weekly Schedule also offers the flexibility of having a variation of the standard schedule. A schedule would then resemble Figure 3.5.7. Where there is an additional interval form 11:30 AM to 12:30 PM, Monday, Wednesday and Friday.

Figure 3.5.4

Figure 3.5.5

26
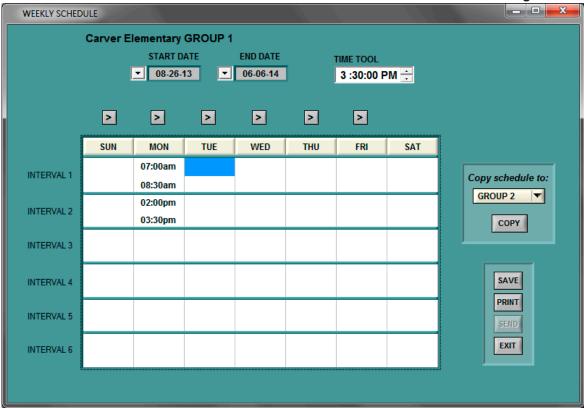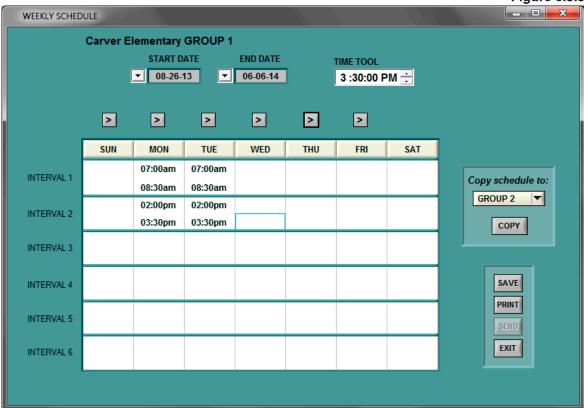
Figure 3.5.6
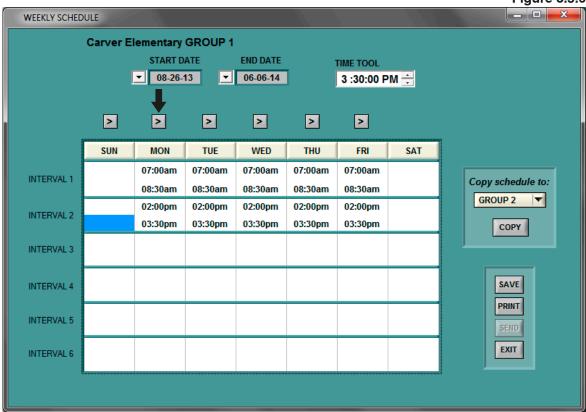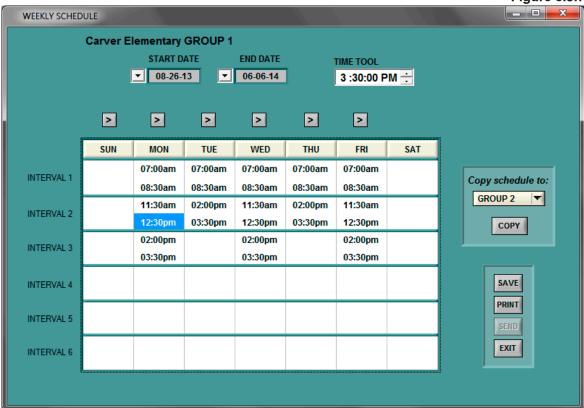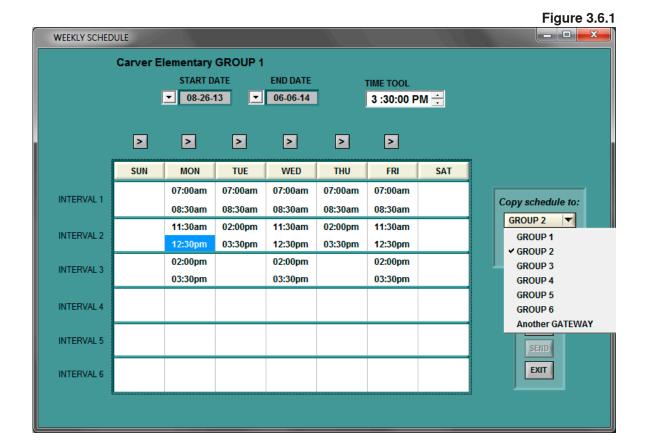
Figure 3.5.7
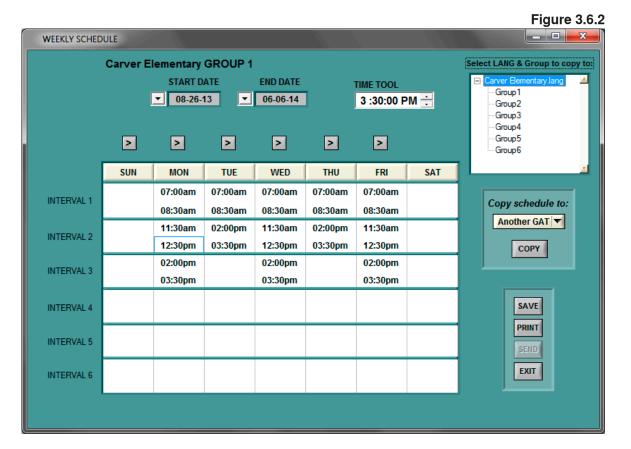
3.6 COPYING SCHEDULES

DLPRO 3000 offers the capability to copy a schedule from one group to another group. Open fly-out window on the copy box by clicking the arrow button and select the group to which the schedule is to be copied. Click on the COPY button and the system automatically copies to the group selected (Figure 3.6.1).

Figure 3.6.1

The option of selecting 'Another LANG' also appears in the fly-out window. A list of available LANGs appears. The list of LANGs can be expanded to show the available groups with each LANG. Select the LANG and GROUP to copy the schedule (Figure 3.6.2). Select COPY and a message appears that confirms the schedule has been copied (Figure 3.6.3).

Figure 3.6.2

Figure 3.6.3
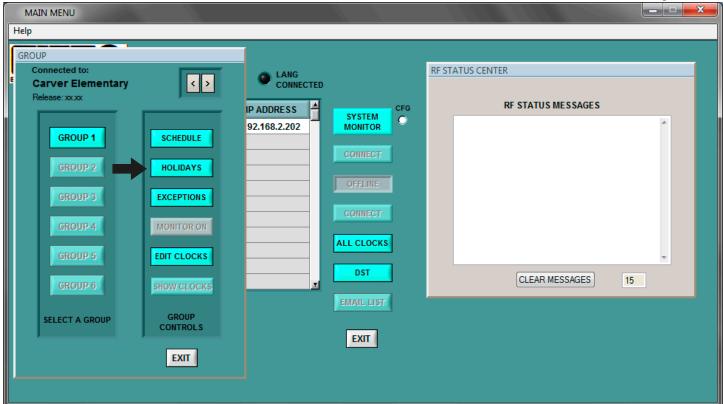
3.7 HOLIDAY/NO SCHOOL DAYS

Holiday/No School Days are days when there is no school and the beacons should not operate. Holiday/No School days are inclusive meaning that the start date is the first day that the beacons do not flash and the end date is the last day the beacons do not flash. The next scheduled school day the beacons operate as programmed. Holiday/No School days may be defined for a single day or multiple days For a single Holiday/No School Day, the first day and last day are the same. The system supports up to 20 Holiday/No School Days. The days do not need to be entered in chronological order.

The screen for entering Holiday/No School Days is opened by selecting the group number and then clicking on the Holidays button on the Group Screen (Figure 3.7.1).

Figure 3.7.1

Enter the name of the Holiday/No School Days. Use the calendar fly-out to select the first day and last day of the Holiday/No School Days (Figure 3.7.2).

After entering the Holidays/No School Days save the data and send it to the group by using the buttons provided at the bottom right of the Holiday/No School Days window.

For typical holidays the window should look similar to Figure 3.7.3.

Figure 3.7.2

Figure 3.7.3
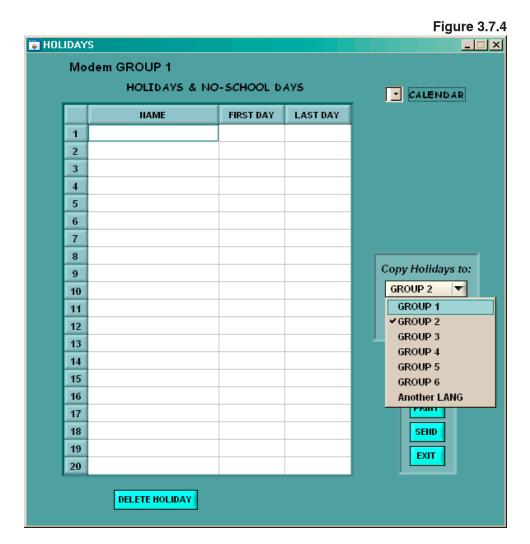
Since most schools in a school district will have the same holidays, the program provides an easy method to copy the Holiday/No School Days to another group. Open the fly-out window on the copy box by clicking the arrow button and select the group to which the Holiday/No School Days are to be copied. Click on the COPY button and the system automatically copies the Holiday/No School Days schedule to the group selected.

The option of selecting 'Another LANG' also appears in the fly-out window (Figure 3.7.4). A list of available LANGs appears. The list of LANGs can be expanded to show the available groups with each LANG. Select the LANG and GROUP to copy the schedule. Select COPY and a message appears that confirms the Holiday/No School Days has been copied. Refer to Section 3.6 (Copying Schedules).

Figure 3.7.4

3.8 EXCEPTIONS

Exceptions are exactly what the name implies, exceptions to the weekly schedule or the Holiday/No School schedule. Typically, exceptions are used for early dismissals, late starts, or after hours events such as football games, or other times the flashers are needed. Since the clock will run an exception for the entire day, all ON/OFF events must be included in the schedule. For example, for an early dismissal, not only must the early dismissal ON/OFF time be included in the schedule for that day but also the normal morning ON/OFF time must also be included. Also, a single no-school day can be programmed as an exception more efficiently than as a holiday. Up to three hundred sixty-five (365) exceptions may be scheduled. An early dismissal for the example schedule with dismissal at 11:30 AM for September 1, 2014 is shown in Figure 3.8.1.
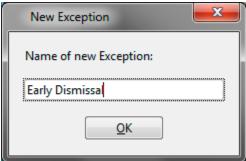
Figure 3.8.1

An exception can be copied to another date by selecting copy. A window appears at the bottom left of the screen (Figure 3.16). Selecting the down arrow displays fly-out calendar. Select the date desired.

An exception can also be copied to another Group or to another LANG. Clicking on the COPY EXCEPTIONS opens a window. Select the desired group or select the desired LANG. If another LANG is selected, a new fly-out window appears. Select the desired LANG and Group. Select copy. A new window opens advising the existing exceptions in the LANG and Group being copied to will be deleted. Selecting yes allows the copy to complete. Selecting NO cancels the COPY action.

A feature called NAMED EXCEPTIONS is available for the benefit of the user. A named exception can be used repeatedly throughout the year—e.g. two-hour late starts, one-hour early dismissals. To create a named exception, click on the NAMED EXCEPTIONS button. A window called New Exception will open. Enter a meaningful name such as Early Dismissal shown in Figure 3.8.2 and click OK.

Enter the time for clock operation. Remember all On-Off times that are to occur that day must be entered. Next using the pop-up calendar, select the dates for the exception schedule. An example of a scheduled exception can be seen in Figure 3.8.3. after each date is selected, Figure 3.8.4 will appear. Click OK.

This feature is most useful for late starts due to inclement weather. When the user is notified that a late start will occur, the named exception is selected. The screen will look like Figure 3.8.3. Select the date, click OK, and exit. The user will see the scheduled date in the "Select exception day to view, edit, use or delete" window. There cannot be two exceptions on the same day—i.e. Early Dismissal and Home Football Games.

A number of functions are available within the exception module. A graphic display of the Exception screen display is shown in Figure 3.8.5. A description of each button and its function follows Figure 3.8.5.

In the middle left hand side of the screen is a View, and Edit box. Clicking on an exception date displays the times associated with the exception.

Figure 3.8.3

Pre-defined Exceptions

NAMED EXCEPTIONS   *Early Dismissal*

Select a named exception to
view, edit, use or delete:

Early Dismissal

To use a named exception,
select one, then pick the date
using the calendar tool.

NEW

SAVE NAMED

DELETE

INTERVALS

07:00am

08:30am

11:30am

12:30pm

TIME TOOL

5 :00:00 AM

CALENDAR

08-01-14

EXIT

Figure 3.8.4

Exception Created for specified date

Early Dismissal on 11-26-14...If done, please return to Dated Exceptions
and send to time clocks.

OK

Figure 3.8.5

COPY – copies the exception for the date shown (above the Intervals column) to the date selected in the fly-out box.

SAVE – saves the exception just created.

DELETE – deletes the exception shown in the Intervals column. A prompt appears to verify the action. Selecting YES deletes the exception, selecting NO cancels the deleting.

SEND – Sends the exception shown in the Intervals column to the LANG.

DELETE FROM TIME CLOCKS – Deletes the exception shown in the Intervals column to the LANG and to all TC-3000 time clocks in the group.

The lower right box has three buttons in it. These buttons are global in nature.

SEND ALL – sends all exceptions to all TC-3000s in the selected group.

CLEAR CLOCKS ALL EXCEPTIONS – clears all exceptions for all TC-3000s in the selected group. This should be done each year prior to downloading any new exceptions.

EXIT – closes the exception window and returns to the Group screen.

Above the lower right.

NAMED EXCEPTIONS – a shortcut feature that allows users to assign names to known exception times.

3.9 DLPRO COMMAND HIERARCHY

MANUAL – Highest priority.

EXCEPTION – Modified school day schedule. Takes priority over HOLIDAY/NO SCHOOL SCHEDULE and SCHEDULE.

HOLIDAY/NO SCHOOL SCHEDULE – Takes priority over SCHEDULE.

SCHEDULE – Weekly School Schedule (default)

Refer to 3.1 Matrix for further understanding.

Section 4

Real Time Interface TC-3000 Time Clocks

4.1 DISPLAYING REAL TIME CLOCK INFORMATION

The clocks can be controlled and monitored in real time from the host computer.

On the Group window, the user can display information about all clocks in a specific group by clicking on the Show Clocks button. Once the clocks are displayed (Figure 4.1.1 and 4.1.2), clicking Monitor ON establishes communication with the clocks to display real-time information. The display below shows the "virtual clock" windows for a group with two clocks

The following information is displayed in Figures 4.1.1 and 4.1.2 for the user's reference:

DATE – Date currently stored in the TC-3000 time clock.

TIME – Time currently stored in the TC-3000 time clock.

RSSI – The relative signal strength between the LANG-3000 and the TC-3000 time clock (Values will display in the range of 10-254). The first number is the RSSI being seen by the LANG-3000, and the second number is the RSSI being seen by the TC-3000 time clock. A lower RSSI indicates stronger signal strength. *Note: If a LANG is also serving as a time clock, the RSSI will be 000-000.*

OVERRIDE – The time duration of an override command. The override duration is displayed in hours: minutes and can be a maximum of 9 hours and 59 minutes.

VIRTUAL LED – The "virtual LED" represents the state of the beacon being controlled by the TC-3000 time clock. It will be yellow, black, or red.

Yellow: is on because the schedule dictates that it be on;

Red: is on because the LED has been turned on manually through an override command, or the local panel switch has been turned on;

Black: is on because the schedule or a manual override dictates that it be off.

PROGRAM STATUS – The block to the right of the light shows what state the LED should be in and why. In our example, the clock is scheduled to be off. The words are in black indicating that the light state is attributed to a program (Weekly, Holiday/No School, or Exception) schedule. If the light (whether On or Off) was due to manual control (override), then the words would be in red.

RTCC DEVIATION – The time difference between the DLPRO host PC and clock

BATTERY VOLTS – Battery volts are displayed both analog and digitally. The value is the battery voltage in a solar system. If the system is an AC system as in the graphic display on the right, the battery volts read 11.9 – 12.0 volts.

SOLAR VOLTS – Voltage being generated by solar panels.

ENCLOSURE TEMP – The enclosure temperature displays the temperature in the cabinet in degrees F.

TIMED OUT – Number of consecutive times a clock has failed to respond to the LANG-3000's status request. The number increments up by 1 on each failed response and increments down by 1 on each successful response.

MAX – Total of failed responses.

Figure 4.1.1
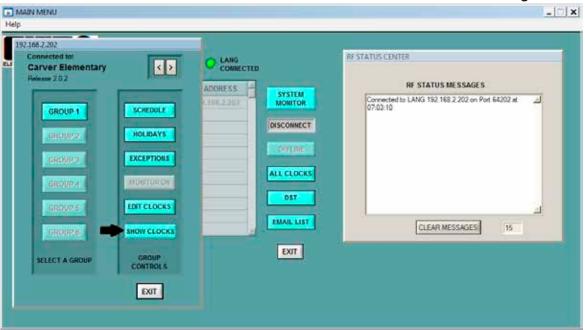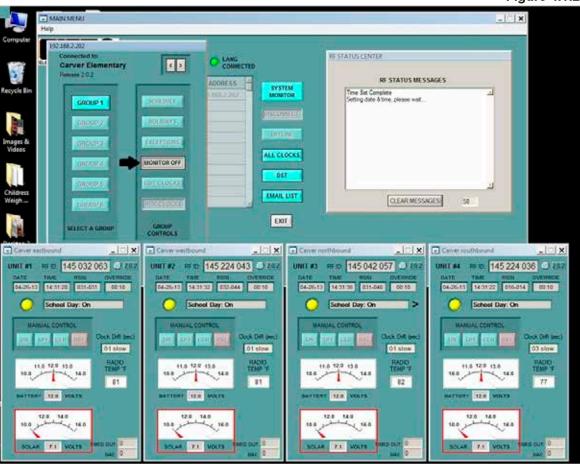
Figure 4.1.2

4.2 MANUAL CONTROL (OVERRIDE)

Any program for the TC-3000 time clock can be overridden manually from the clock, the LANG or the DLPRO. At the LANG or clock, *manual controls* are similar and are accomplished using the A 31 (ON), A 32 (OFF), or A 33 (Clear) functions. When manually controlling the clock from the LANG, the clock must be in the current active group and be selected as the active clock. The LANG can also manually control all clocks within a group simultaneously (Figure 4.2.1). Manual control from the clock and LANG are described in more detail in Sections 7.1 and 7.2.

The following commands apply to an individual clock within a group. The On button toggles the beacon on for the override duration. The Off button ensures that the beacon is off for the override duration. The Clear switch resets any override command and returns TC-3000 time clock control to a scheduled program state.

When all Clocks of a particular Group are viewable on the host, an individual clock can be reconfigured, reviewed or updated for specific tasks. Double-click on the clock under question, Set Active Unit window will ask Select Unit (#) for Further Actions. Select Yes and the Schedule, Holiday, and Exception button are enabled; this feature is useful when one clock has been replaced within a group. The DLPRO retains the information of each unit and sending/updating a new unit is expedited via this process.

4.3 GLOBAL CONTROLS GROUP SCREEN

These commands are viewable when "Show Clocks" button is toggled (refer to Figure 4.3.1) are global and apply to all clocks within the group. The On button toggles all the beacons on for the override duration. The Off button ensures that the beacons are off for the override duration. The Clear switch resets any override command and returns TC-3000 time clock control to a program schedule. The Sync button sets the time and date of each clock in the group to that of the host PC. Synchronizing within the Global Command Section will only synchronize those clocks in that specific group (Figure 4.2.1).

Figure 4.2.1

4.4 REAL TIME CLOCK DISPLAY (Show Clocks)

A typical display for a group with a number of clocks is shown in Figure 4.4.1. If there are more clocks in the group than can be displayed, the arrow at the right of the "Connected To" display can be used to scroll right or left to view the other clocks.

Section 5

System Monitoring

5.1 SYSTEM MONITORING

The System 3000 provides the capability to monitor system performance in a background mode. In this mode DLPRO 3000 successively connects to each LANG in the system and sequentially interrogates every clock in each group, cycling through the entire system until the monitor is turned off. The system monitor gathers information from each clock to determine communication status, battery voltage and program operational state. The clocks reported data is compared to expected operation and user programmed thresholds and the information is displayed in the System 3000 Monitor Window. For satisfactory status, a green check mark is displayed. For unsatisfactory status, a red X is displayed. After three monitoring cycles, if communication cannot be established with a clock or a reported value falls outside defined thresholds, an E-mail advisory notification can be sent to system administrators to initiate corrective action.
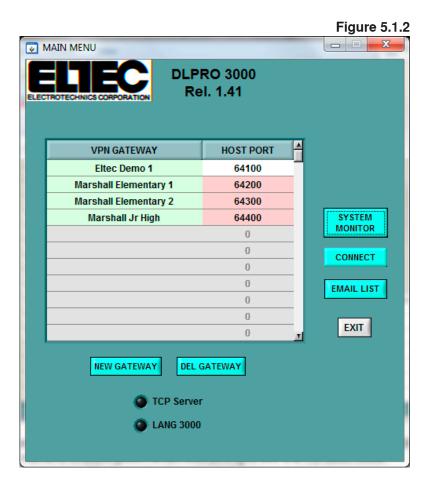
Using the ELTEC Demo 1 LANG-3000 example, if the gateway can successfully communicate with all clocks in its defined group, the clocks battery voltages are above 11.6 V DC, and the clocks are not in an override state, two green check marks should display for each clock. The current operational state of the TC-3000 clocks and the program status (at this time of day on this day of the week the clock should be off and should be running the weekly schedule) will be displayed in the last column. The System Monitor screen will appear as Figure 5.1.1. Note that in Example 1 there are two different groups and each group has a different schedule.

Figure 5.1.1

	GATEWAY (LANG)	GROUP	TC-3000	Comm	Vbatt	Override	State
1	Eltec Demo 1	1	Back Panel	✓	✓	N	School Day: Off
2	Eltec Demo 1	1	AC Clock 1	✓	✓	N	School Day: Off
3	Eltec Demo 1	2	Group 2 AC Clock	✓	✓	N	School Day: On
4		0					
5		0					
6		0					
7		0					
8		0					
9		0					
10		0					
11		0					
12		0					
13		0					
14		0					
15		0					
16		0					
17		0					
18		0					
19		0					
20		0					
21		0					
22		0					
23		0					
24		0					
25		0					

Referring to the graphic display above, observe that the cell with the TC-3000 clock name is shaded green when everything is OK. If a TC-3000 clock parameter is not OK, the cell will be shaded pink.

In the System monitor mode, the name of the LANG will also be shaded whenever it has been interrogated. If all parameters for all clocks are within specification, the cell displaying the port number on the Main Menu window will not be shaded. If a parameter is outside the operating parameter specification, the cell displaying the port number on the Main Menu window will be shaded pink (Figure 5.1.2).

Figure 5.1.2

5.2 E-MAIL NOTIFICATION

   While running in System Monitor mode DLPRO continuously tracks operational parameters. Those conditions and parameters that are repeatedly abnormal are reported via E-mail. For example, should a solar powered clock's battery voltage dip below the specified threshold and remain low for several minutes, the system will issue an E-mail to all recipients. Such advisory E-mails contain all the information (LANG name, Clock name, time of noted deviation, value (voltage, temperature) required to address the issue. Refer to Section 2.4 page 11 for E-mail setup. A list of addresses can be built to always know where E-mails are routed (Figure 5.2.1). The user is cautioned that an e-mail will not be sent unless the port to the LANG is open during system monitoring or during real time interaction.

Figure 5.2.1

Section 6

Forms and Log Sheets

6.1 LANG/CLOCK ID NUMBER RECORD
Information found on individual LANGs and clocks.

Model #	Serial #	Part #

6.2 DLPRO WEEKLY SCHEDULE RECORD

Program Schedule for _____ **Year** _____ **to** _____

	Schedule	SUN	MON	TUES	WED	THUR	FRI	SAT
1	ON Time							
	OFF Time							
2	ON Time							
	OFF Time							
3	ON Time							
	OFF Time							
4	ON Time							
	OFF Time							
5	ON Time							
	OFF Time							
6	ON Time							
	OFF Time							

6.3 DLPRO HOLIDAY/NO SCHOOL RECORD

Group #	Name	First Day	Last Day

6.4 DLPRO EXCEPTION DAYS RECORD

Group Number:		
Exception Date	**Time Interval ON**	**Time Interval OFF**

LANG

Name: _____ **Location:** _____
Port Number: _____ **IP Address:** _____

Group

6.5 GROUP CONFIGURATION RECORD

	Group Number: _____ Name/Location: _____		Group Number: _____ Name/Location: _____		Group Number: _____ Name/Location: _____	
	RF ID	Name/Location	RF ID	Name/Location	RF ID	Name/Location
Clock 1						
Clock 2						
Clock 3						
Clock 4						
Clock 5						
Clock 6						
Clock 7						
Clock 8						
Clock 9						
Clock 10						
Clock 11						
Clock 12						
Clock 13						
Clock 14						
Clock 15						
Clock 16						
Clock 17						
Clock 18						
Clock 19						
Clock 20						

Section 7

Appendix

TC-3000 Quick Reference

ELTEC's TC-3000 networkable, programmable time-based digital controller operates relay outputs and internal DC flasher based upon a user programmed schedule. The integral 900MHz spread spectrum radio provides communication to central host software through the Local Area Network Gateway (LANG-3000) for configuration, programming and monitoring.

Features:

- 6-22VDC or 85-264VAC at 47-440Hz
- Integral DC Flasher 50W per Channel
- Form C Relay 16A at 28VDC or 120VAC
- 1W 900 Mhz Spread Spectrum Radio
- SMA Antenna Connection
- Connection via Circular Pin Connector

Quick Setup (See reverse side for programming functions.)

♦ **Hardware Installation.** (Wiring illustrated below.)
  › Mount TC-3000 in cabinet.
  › Connect relay/flasher outputs as required.
  › Connect antenna cable.
  › Connect power leads and turn power on.
  › Test Manual Flash using function [A] 31, turn off using [A] 32.

♦ **Radio Testing.**
  › Press [A] 54 on LANG to get radio MAC ID.
  › Press [A] 57 on TC-3000 and enter LANG MAC ID.
  › Initiate radio test by pressing [*] 21 on TC-3000.
    › RSSI values display for local & remote radio end points
    › RSSI values from 0-255. (lower values equate to better signal)
  › Turn off radion tes by pressing [*] 21 on TC-3000.
  › Test remote control ON/OFF functionality from LANG

♦ **System Configuration.**
  › Connect to LANG via DLPRO Host Console.
  › Configure clocks and download programs.
  › Synchronize time with host console.
  › Test manual control and monitoring functionality.
  › Refer to System 3000 Manual for additional details.

FRI 05-17-13
11:32:02

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

TC-3000 Programming Prompts

ELTEC
800-227-1734
903-938-1901

[A] ATTENTION
[B] ENTER
[C] CANCEL

11 Set Time	87 View/Edit 7-Day Schedule
21 Set Date	90 Factory Reset
31 Manual Flash ON	91 Daylight Saving Time
32 Manual Flash OFF	98 Restart Unit
33 Clear Override	99 Firmware Version
36 Set Override Duration	*02 Display Transmit Power
54 Get Radio Address (MAC ID)	*04 Set Transmit Power %Max
57 View/Edit LANG Radio Address	*12 Display/Adjust Clock Cal Byte
65 Clear Holidays	*14 Auto Config Radio Transceiver
67 View/Edit Holidays	*18 View Flasher Status
75 Clear Exceptions	
77 View/Edit Exceptions	[A] Key: Backup
78 New Exception	[D] Key: Move Forward/Skip Fields

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CPC Pin #1–**Black**–Line (120/240 VAC)
CPC Pin #2–**White**–Neutral (120/240 VAC)
CPC Pin #3–**Green**–Chassis Ground
CPC Pin #4–**Red**–Relay 1 Common
CPC Pin #5–**Yellow**–Relay 1 Normally Closed
CPC Pin #6–**Brown**–Manual Switch (Ground Activation)
CPC Pin #7–**Violet**–Solar Panel+ (PV+)
CPC Pin #8–**Orange**–LED 1 Ground
CPC Pin #9–**Blue**–LED 2 Ground
CPC Pin #10–**White/Yellow**–Relay 1 Normally Open
CPC Pin #11–**White/Red**–12 VDC Positive
CPC Pin #12–**White/Black**–12 VDC Negative

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Programming Functions

Function/Command

Control Keys Within Commands

[A] Key: Back up
[D] Key: Move Forward/Skip Fields
[C] Key: Cancel (Exits Command & Returns to Main Screen)

[A] Attention Function Descriptions

SET TIME [A] 11: Allows input of the current time for standalone installations or any instance when system communication is not available and it is necessary to establish the current local time for the clock. During normal system operation, the TC-3000 keeps time with an internal real-time clock (RTC) and updates its time when synchronized using DLPRO.

SET DATE [A] 21: Allows input of the current date for standalone installations or any instance when system communication is not available and it is necessary to establish the current local time for the clock. During normal system operation, date is kept based upon internal calendar.

MANUAL FLASH ON [A] 31: Turns on the internal flasher and closes Relay 1 for the length of time set by the Override Duration function ([A] 36).

MANUAL FLASH OFF [A] 32: Turns off the internal flasher and opens Relay 1. If the current programmed state of the clock is ON, the Manual OFF will override the state or turn OFF the flasher only for the length of time set by the Override Duration function ([A] 36).

CLEAR OVERRIDE [A] 33: Clears the current override (Manual ON or Manual OFF) and returns the clock to the current programmed state.

SET OVERRIDE DURATION [A] 36: Establishes the length of time that a manual operation overrides the programmed state of the clock. The duration is programmed in h: mm format (0:01 to 9:59).

GET RADIO ADDRESS (MAC ID) [A] 54: Queries the internal spread spectrum radio transceiver for its physical address (MAC ID). Each radio MAC address is a unique identifier assigned by the radio manufacturer and cannot be changed. This function allows the MAC ID to be viewed so that the address can be programmed into the LANGS associated TC-3000's to enable radio communications. When command is initiated the address is displayed for thirty seconds.

VIEW/EDIT LANG RADIO ADDRESS [A] 57: Displays the current programmed LANG MAC ID and allow the user to input or edit the address. This address associates the clock to its network gateway to enable radio communication between the clock and LANG.

CLEAR HOLIDAYS [A] 65: Deletes all currently programmed holiday schedules from time clock memory.

VIEW/EDIT HOLIDAYS [A] 67: Allows viewing or editing of existing programmed holidays or entering of new holiday schedules.

CLEAR EXCEPTIONS [A] 75: Deletes all currently programmed exceptions from time clock memory.

VIEW/EDIT EXCEPTIONS [A] 77: Allows viewing or editing of existing programmed exceptions.

NEW EXCEPTION [A] 78: Allows entering new exceptions.

VIEW/EDIT 7-DAY SCHEDULE [A] 87: Allows viewing or editing of existing programmed schedule or entering of additional ON/OFF times.

RESTORE FACTORY DEFUALTS [A] 90: Clears all clock schedules

DAYLIGHT SAVING TIME [A] 91: Select DST parameters and set observation of DST to ON or OFF.

12/24 HOUR CLOCK [A] 94: Allows the selection for time to be input and displayed as either a 12-hour clock with AM and PM or a 24-hour clock. When command is initiated it prompts the user to change to the alternate of the current setting.

RESET/RESTART UNIT [A] 98: Performs a soft reboot of the clock firmware and reloads the radio settings based upon program values. A reset should be performed after changing any radio settings.

SHOW FIRMWARE VERSION [A] 99: Display firmware revision number.

[*] Star Function Descriptions

DISPLAY TRANSMIT POWER [*] 02: Allows user to view the current setting of radio transmit power (1-100%)

SET LOCAL TRANSMIT POWER %Max [*] 04: Allows user to set the radio transmit power (1-100%)

AUTO CONFIG RADIO TRANSCEIVER [*] 14: Runs the radio configuration routine to apply appropriate settings to the spread spectrum radio transceiver.

TOGGLE RADIO RANGE TESTING [*] 21: Allows user to enable the radio testing mode which intermittently transmits data between the TC-3000 and its LANG-3000 to determine the RSSI and display it on the LCD.

LANG-3000 Quick Reference

ELTEC's LANG-3000 IP Addressable programmable gateway provides the communication between DLPRO Host Console Software and TC -3000 time clocks for configuration, programming and monitoring of time-based operations. The LANG-3000 can function as a clock, operating relay outputs and internal DC flasher based upon a user programmed schedule. The integral network device server and 900Mhz spread spectrum radio provides machine to machine (M2M) connectivity to field installed devices.

Features

- 6-22VDC or 85-264VAC at 47-440Hz
- Integral DC Flasher 50W per Channel
- Form C Relay 16A at 28VDC or 120VAC
- XPORT IP-Addressable Device Server
- 1W 900 Mhz Spread Spectrum Radio
- Type N, Female Antenna Connection
- Connection via Circular Pin Connector

```
FRI 05-17-13
      11:32:02
```

```
1  2  3  A
4  5  6  B
7  8  9  C
*  0  #  D
```

LANG-3000 Programming Prompts

ELTEC
800-227-1734
903-938-1901

[A] ATTENTION
[B] ENTER
[C] CANCEL

11 Set Time	77 View/Edit Exceptions
21 Set Date	78 New Exception
26 Send Holidays	87 View/Edit 7-Day Schedule
27 Send 7-Day Schedule	90 Factory Reset
30 Select Active TC-3000	91 Daylight Saving Time
31 Manual Flash ON	98 Restart Unit
32 Manual Flash OFF	99 Firmware Version
33 Clear Override	*01 Disable Ethernet Port
36 Set Override Duration	*02 Display Transmit Power
51 Enter/Edit Group Number	*04 Set Transmit Power %Max
54 Get Radio Address (MAC ID)	*12 Display/Adjust Clock Cal Byte
57 View/Edit Radio Addresses	*14 Auto Config Radio Transceiver
63 RSSI (Signal Strength)	*18 View Flasher Status
65 Clear Holidays	*21 Toggle Radio Range Testing
67 View/Edit Holidays	[A] Key: Backup
75 Clear Exceptions	[D] Key: Move Forward/Skip Fields

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Quick Setup (See reverse side for programming functions.)

♦ **Configure Network Interface.**
› Connect to LANG via web browser
» Crossover cable and power cord provided (DLPRO 3000 software kit).
» Input default LANG IP 10.0.0.100 (verify with function [A] 53).
» Click OK when prompted for name & password.
› Select **Network** Settings from left side bar.
» Input IP address, gateway, subnet mask, DNS server and click OK.
› Select **Connection** Settings from left side bar.
» Under "Endpoint Configuration," input the Local and Remote Port numbers (64xxx) and click OK.
› Select **Apply Settings**.

♦ **Hardware Installation.** (Wiring illustrated below.)
› Mount LANG-3000 in cabinet.
› Connect relay/flasher outputs as required.
› Connect network interface cable to RJ45 jack.
› Connect antenna cable.
› Connect power leads and turn power on.

♦ **System Configuration.**
› Connect to LANG via DLPRO Host Console (+ sign on LCD when connected).
› Configure clocks and download programs.
› Refer to System 3000 Manual for additional details.

♦ **Radio Testing.**
› Press [A] 54 on LANG to get radio MAC ID.
› Press [A] 57 on TC-3000 and enter LANG MAC ID.
› Initiate radio test by pressing [*] 21 on TC-3000.

CPC Pin #1 – **Black** – Line (120/240 VAC)
CPC Pin #2 – **White** – Neutral (120/240 VAC)
CPC Pin #3 – **Green** – Chassis Ground
CPC Pin #4 – **Red** – Relay 1 Common
CPC Pin #5 – **Yellow** – Relay 1 Normally Closed
CPC Pin #6 – **Brown** – Manual Switch (Ground Activation)
CPC Pin #7 – **Violet** – Solar Panel+ (PV+)
CPC Pin #8 – **Orange** – LED 1 Ground
CPC Pin #9 – **Blue** – LED 2 Ground
CPC Pin #10 – **White/Yellow** – Relay 1 Normally Open
CPC Pin #11 – **White/Red** – 12 VDC Positive
CPC Pin #12 – **White/Black** – 12 VDC Negative

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Programming Functions

Function/Command

Control Keys Within Commands

[A] Key: Back up
[D] Key: Move Forward/Skip Fields
[C] Key: Cancel (Exits Command & Returns to Main Screen)

[A] Attention Function Descriptions

SET TIME [A] 11: Allows input of the current time for standalone installations or any instance when system communication is not available and it is necessary to establish the current local time for the LANG. During normal system operation, the LANG keeps time with an internal real-time clock (RTC) and updates its time with the host computer.

SET DATE [A] 21: Allows input of the current date for standalone installations or any instance when system communication is not available and it is necessary to establish the current local time for the LANG. During normal system operation, keeps its date based upon internal calendar and verifies and updates its date with the host computer.

SEND HOLIDAYS [A] 26: Sends the Holiday Schedule to the current Active TC-3000 or Group. Function [A] 30 is used to select the Active clock, or select all clocks in the current group.

SEND 7-DAY SCHEDULE [A] 27: Sends the schedule to the current Active TC-3000 or Group. Function [A] 30 is used to select the Active clock, or select all clocks in the current group.

SELECT ACTIVE TC-3000 [A] 30: Sets the active clock or allows selection of all clocks in the group. The current active clock(s) selected responds to remote manual functions or configuration initiated by the LANG.

MANUAL FLASH ON [A] 31: Turns on the internal flasher and closes Relay 1 on the current Active Group TC-3000 for the length of time set by the Override Duration function ([A] 36).

MANUAL FLASH OFF [A] 32: Turns off the internal flasher and opens Relay 1 on the current Active Group TC-3000. If the current programmed state of the clock is ON, the Manual OFF will override the state or turn OFF the flasher only for the length of time set by the Override Duration function ([A] 36).

CLEAR OVERRIDE [A] 33: Clears the current override (Manual ON or Manual OFF) and returns the clock to the current programmed state.

SELECT GROUP [A] 51: Sets the current group of clocks to establish LANG communication for manual control or sending schedules. Each LANG can control up to six distinct groups. Once the group is selected the active clock(s) must be selected with the [A] 30 command.

GET GATEWAY IP ADDRESS [A] 53: Queries the internal device server for the configuration information. Upon command initiation, the IP Address is displayed for thirty seconds.

GET LANG RADIO ADDRESS (MAC ID) [A] 54: Queries the internal spread spectrum radio transceiver for its physical address (MAC ID). Each radio MAC address is a unique identifier assigned by the radio manufacturer and cannot be changed. This function allows the MAC ID to be viewed so that the address can be programmed into the clock's associated network gateway (LANG-3000) to enable radio communications and to define the clock as a member of a specific group. When command is initiated the address is displayed for thirty seconds.

VIEW/EDIT RADIO ADDRESS [A] 57: Displays the programmed TC-3000 RF ID's for the current group and allow the user to input or edit the addresses. This addresses associates the LANG to the clocks in each of its groups to enable radio communication.

CLEAR HOLIDAYS [A] 65: Deletes all currently programmed holiday schedules from time clock memory of the current active clock(s).

VIEW/EDIT HOLIDAYS [A] 67: Allows viewing or editing of existing programmed holidays or entering of new holiday schedules for the current selected group.

CLEAR EXCEPTIONS [A] 75: Deletes all currently programmed exceptions from time clock memory of the current active clock(s).

VIEW/EDIT EXCEPTIONS [A] 77: Allows viewing or editing of existing programmed exceptions of the current selected group.

CREATE NEW EXCEPTIONS [A] 78: Enter new exceptions for the current selected group.

VIEW/EDIT 7-DAY SCHEDULE [A] 87: Allows viewing or editing of existing programmed schedule or entering of additional schedule times of the current selected group.

RESTORE FACTORY DEFUALTS [A] 90: Clears all clock schedules.

12/24 HOUR CLOCK [A] 94: Allows the selection for time to be input and displayed as either a 12-hour clock with AM and PM or a 24-hour clock. When command is initiated it prompts the user to change to the alternate of the current setting.

RESET/RESTART UNIT [A] 98: Performs a soft reboot of the clock firmware. And reloads the radio settings based upon program values. A reset should be performed after changing any radio settings.

SHOW FIRMWARE VERSION [A] 99: Display firmware revision number.

[*] Star Function Descriptions

DISPLAY TRANSMIT POWER [*] 02: Allows user to view the current setting of radio transmit power (a hex value dependent on % power set with *04. Max value varies unit to unit).

SET LANG TRANSMIT POWER %MAX [*] 04: Allows user to set the radio transmit power (1-100%)

SET CLOCK TRANSMIT POWER %MAX [*] 06: Allows user to set the radio transmit power (1-100%) on the current active clock(s).

AUTO CONFIG RADIO TRANSCEIVER [*] 14: Runs the radio configuration routine to apply appropriate settings to the spread spectrum radio transceiver.

TOGGLE RADIO RANGE TESTING [*] 21: Allows user to enable the radio testing mode which intermittently transmits data between the TC-3000 and its LANG-3000 to determine the RSSI and display it on the LCD.

LANG AS CLOCK TOGGLE [*] 57: allows the selection for the LANG to function as a clock. When enabled, this feature automatically configures the LANG as the first clock in group one.

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7.1 KEYPAD DESCRIPTION

The System 3000 products utilize a 16-key telephone style keypad. Display assisted programming is a guide through the programming process by use of the 'ATTENTION' [A]key or 'ASTERISK' [*] key along with a set of numbers. The decal on front of the 3000 provides the entry sequence required to initiate commands.

The [A] key is the 'ATTENTION' key. It is to alert the 3000 that there will be a "Call" command. When a command is entered, the display will assist the user in responding by providing a key word for each required entry. The user needs only to key in the required data and press B. The display will advance to the next required entry, or return to TIME with DAY/DATE and alternating STATUS display when all required information for that command has been entered. Below is a list of the keys and their functions.

7.2 KEY FUNCTIONS

[A] ATTENTION: It is used to "Call" commands. [A] used in conjunction with another key or set of keys will "call" a command and cue for specific information to be entered in a certain sequence.

[B] ENTER: Pressing this key will cause the 3000 to accept information displayed.

[C] CANCEL: When a mistake is made, this key will allow user to escape. Display returns to scrolling.
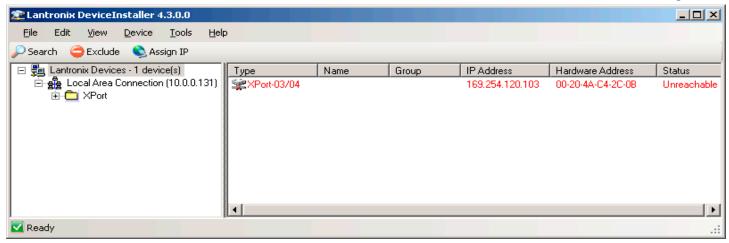
[D] EXECUTE: When [D] is pressed it will execute the command that was entered.

[*] SET PARAMETER: Asterisk or Star functions access operational parameters. [*] used in conjunction with defined numeric keys will access operational parameter settings and cue for specific information to be entered.

7.3 Installing LANTRONIX Software and Configuring the LANG-3000

Insert the DLPRO disk into the CD ROM and navigate to the drive using Windows Explorer or My Computer. Double-click to open the 'INSTALL Support Files' folder. Double-click on the Lantronix_4.3.0.0.exe file to begin the installation. The language selection window will pop up with a default language of English, click OK to continue. The Device Installer window will open and indicate that two programs must be installed (Microsoft .NET Framework 4 & Device Installer). Keep the default selections and click on the INSTALL button to begin the installation. The Microsoft .NET Framework 4 setup window will open, click in the box to accept the license agreement and click install to start the installation. The installation progress bar will display as the .NET Framework program is installed to the system (this portion of the installation will take several minutes).

Figure 7.1

When the installation complete window displays, click the Finish button. The Lantronix Device Installer Setup Wizard will open, accept the default installation directory and click on Next. Click next again at the Confirm Install window and the Installation Progress window will display until the installation is complete. Click on the Close button of the Installation Complete window and click OK when the Installation Successful window is displayed.

Figure 7.2

After the Lantronix Device Installer has been successfully installed, configuration of the LANG is accomplished by connecting the LANG to the network with a standard patch cable or directly to the computer with the provided crossover cable. When the LANG is connected, start Device Installer by navigating to Programs from the Start Button. The initial screen will display as shown in Figure 7.1. In the left window, the tree showing the Lantronix devices will display the computers IP address.

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In the right window, the LANG should display as an XPORT Device. Double-click on the XPORT Device to select it and the XPORT Device Details screen will open (Figure 7.2). Click the Web Configuration tab then click on the 'GO' icon, the round green button with the image of the house on it, located to the left of the address field (Figure 7.3). This will open a 'Connect to xxx.xxx.xxx' window and ask for a user name and password. Leave the user and password fields blank and click OK. The web installer window will open allowing configuration settings to be selected for the XPORT device server. Two settings need to be configured to allow the LANG to connect to the host console, the IP settings of the Network configuration and the Connection tabs (Figure 7.4). All other settings should be left as they are.

Figure 7.3
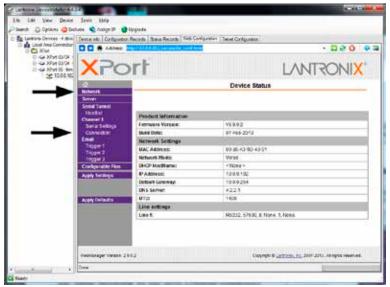
In the Network tab, select the radio button next to 'Use the following IP Configuration' and fill in the IP Address, Subnet Mask, and Default Gateway. Once the appropriate information has been entered, click the OK button at the bottom of the screen and wait for (Done!) to be displayed next to the OK button.

In the Connection tab, the user assigns a unique port for the particular LANG during configuration (recommended Host port addresses to be within the range of 64100–64999). A Host Address of 10.0.0.100 and Port 64100 may be listed. This is ELTEC's default testing address and port.

Figure 7.4

Once the Port information is entered, click the OK button at the bottom of the screen and wait for (DONE!) to be displayed.

Click the Apply Settings (Figure 2.6) tab in the left column. A progress bar will display in the main window. Wait for the configuration update to complete.

Once the configuration settings have been applied the LANG is now ready to be deployed in the field.

7.4 RF Signal Strength Test Function *21

The radio test below yields numbers that represent radio signal strength. It is important to keep in mind that the numbers displayed during testing should change every 3-4 seconds. This is more important than the actual value of the numbers and means the exchange of RF messages is taking place with few, if any, retries.

Clock Testing

Testing RF signal strength (RSSI) between a clock and a target LANG or a target clock:

1. Make sure clock has power an connect the coax to the antenna port on the clock.
2. Press *04 and set the power to 100%.
3. *02 to verify power setting.
4. Press [A]54 and record the clock's RF ID.
5. Press [A]57 and enter the RF ID of the target LANG or target clock.
6. [A]98 to reset the clock.
7. Press *21 to initiate the following repeated test sequence:
    a. Clock sends the target a RF message and awaits a reply.
    b. Upon receipt of reply, the clock displays RSSI pair (Example 127-098). The first number is outbound strength, that is, how strong the clock-to-target transmission was. The second is the strength of the reply. Note that RSSI is a measure of signal loss, thus lower is better.
    c. Three seconds after receipt of the reply the clock starts over at 7a., or
    d. If no reply is received after 200 tries (each try takes 50mS), the clock displays dashed lines and then starts over at 7a.

Out of 8 transmissions, record the lowest set of numbers on the test form next to the clocks RFID. Pressing *21 again toggles off the testing sequence.

LANG Testing

Testing RSSI between a LANG and any number of target clocks:

1. Make sure LANG has power and connect coax to the antenna port on the LANG.
2. Press *04 to set the power to 100%.
3. *02 to verify power setting.
4. Press [A]54 and record the LANG's RF ID.
5. Press [A]57 and enter the RF ID(s) of the target clock(s). Press C to escape after entering the last clock.
6. [A]98 to reset the LANG.
7. Press [A]30 and press the number (1-20) of the target clock. Press B to accept.
8. *21 to run the test. Testing is identical in sequence and format as in clock testing (see 7a.–7d. above).

Section 8

Glossary and Troubleshooting

8.1 GLOSSARY

ARGOSOFT – SMTP software used to alert system status via E-mail.

AUTO IP – Similar to DHCP, it is a network protocol used by a network client to obtain an IP Address from a configuration server.

BOOTP – BOOT Protocol is a network protocol used by a network client to obtain an IP Address from a configuration server.

CPC – Circular Plastic Connector

DHCP – Dynamic Host Configuration Protocol is a more advanced protocol to obtain an IP Address and has superseded the use of BOOTP. Most DHCP servers also function as BOOTP servers.

DLPRO – Data Link PROfessional. Software that runs on a host computer, providing the user interface for system configuration, administration and control. This software allows communication with up to two hundred fifty six (256) network gateways.

DNS – Domain Name Server. Translates domain names meaningful to humans into the numerical identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide.

DST – Daylight Saving Time

DEFAULT GATEWAY – is the node on the computer network that the network software uses when an IP Address does not match any other routes in the routing table.

FHSS – Frequency-Hopping Spread Spectrum

GATEWAY – The link between two computer programs allowing them to share information, and bypass certain protocols on a host computer.

HOST LIST – Window in the Lantronix software that displays Host Address and Port configuration screen, (titled Hostlist Settings).

HOST PORT – Private port assigned to establish communication between LANG and DLPRO host console.

IP ADDRESS – is a numerical label that is assigned to any device participating in a computer network that uses the Internet Protocol for communication.

LANG – Local Area Network Gateway

LCD – Liquid Crystal Display

MAC ID – Media Access Control Identification

M2M – Machine to Machine

NVRAM – Non-Volatile Memory

NAMED EXCEPTIONS – a shortcut feature that allows users to assign names to known exception times such as Early Dismissal, Late Start, Teacher In-service, and Home Football Games; by clicking on a name and copying it to appropriate date the exception is entered into system.

OVERRIDE DURATION – Time duration that a manual on/off operation overrides current program state.

RF ID – Radio Frequency Identification

RF STATUS – Radio Frequency Status. A window in the DLPRO program that displays real time communication information.

RFVPN – Radio Frequency Virtual Private Network

RSSI – Radio Signal Strength Indicator

RTCC – Real Time Clock Calendar

RTCC DEVIATION – The time difference between the DLPRO and clock.

SMTP – Simple Mail Transfer Protocol

STATIC IP – Hard set address for Ethernet adapter via computer workstation.

SUBNET MASK – is a logically visible subdivision of an IP network.

TCP – Transmission Control Protocol

VDN – Virtual Device Networking

VPN – Virtual Private Network

XPORT – is a compact, integrated solution to web enables virtually any device with serial capability. It can quickly and easily offer serial to Ethernet networking capability as a standard feature — so equipment can be accessed and controlled over the Internet.

8.2 TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	COMMENTS
8.2-1 Cannot connect to the LANG	DLPRO not configured right	In DLPRO the HOST PORT needs to be the same as Lantronix port, Refer to section 3.2
	Firewall blocking connection.	Check firewall settings on host computer.
		Check firewall settings on router.
	Lantronix is not configured right	Click on Icon or go to Start/ All programs/ Lantronix, check settings. Refer to Chapter 2.0
	Port forwarding not configured right.	Check port configuration on router located on the LAN of the host computer.
8.2-2 Fly-out windows will not function in DLPRO program.	Windows 7 users	Insert DLPRO CD search for mscomct2.ocx. Copy to Windows/ SysWOW64 reboot computer
	All other later versions of Windows	Insert DLPRO CD search for mscomct2.ocx. Copy to Windows/ system32 reboot computer
8.2-3 Buttons on the right of panel don't work in Groups of DLPRO	Group information was not configured properly	Click on a Group, the right side buttons will be active and information introduced to each section. Refer to section 3.4
8.2-4 Cannot find the RF ID?	Information was not transferred from system units	Each Clock has an identifier on the front above the touchpad that is the RF ID also called MAC ID. Refer to section 3.4
8.2-5 When clicking on show clocks in a group all units are not visible	Group is large and cannot display all units on the monitor	In the Group window at top right are two gray scroll buttons; click on either button to scroll through all clocks in that Group.
8.2-6 In Lantronix a Host address and port are already listed	Testing address and port for ELTEC's Technicians	The Host Address of 10.0.0.183 and port 64100 are used by ELTEC for troubleshooting purposes.
8.2-7 Time and/or date is not correct in DLPRO clock view.	Units have not been synced to system	Synchronization of clocks is reset via DLPRO program. Refer to section 4.5