FIRELINX
WITH CREWSAFE™ CONTINUITY

USER MANUAL

Contents

CM-64
64 Channel Command Module

CM-64 Panel Diagram

Power Button

This turns the Command Module (CM) on. Press and hold this button to power on the CM. Hold the button until the internal lights come on (about 3 seconds). If the CM does not power on, plug in the charging cord into the charging port (Please wait 1 minute for the power to be ready once plugged in). To turn the power off, simply press and release the button.

Arm Key

This is a key slot. Insert the key and turn it clockwise then press the ARM/SAFE button. Turning the key counterclockwise will disarm the system. The key must turn from SAFE to ARM, it cannot be left in the ARM state. The key cannot be removed when in the ARM position.

Figure 1

Fire Button

In Manual Channel Fire mode, pressing the fire button will fire the next firing channel on the selected module. The fire button can also be used to start the time code in an Internal clock show. It is also used to enable the firing of a SMPTE show. See the details below on each show type for details.

Charge LEDs

These LEDs indicate the power status of the CM. The red LED indicates that the battery charger is plugged in and providing power. The green LED indicates that the battery is fully charged.

Control Buttons

These buttons are used to select which screen the CM will display. These are the Home, Menu, Continuity, Wireless Wizard, Module Status, Show, and OPN Interface screens. It also has the ARM/SAFE button, which is used with the Arm key to arm the system.
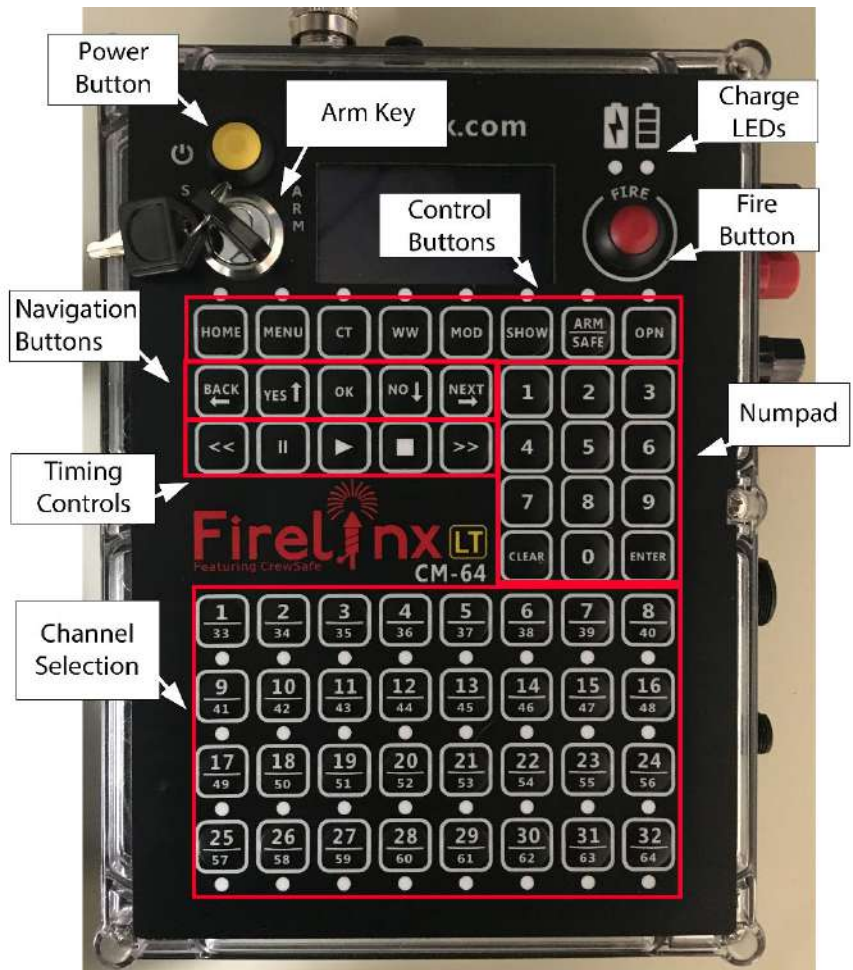
Navigation Buttons

These buttons are used to navigate menus on the CM.

Timing Controls

The pause button can be used for the control of the timing of internally timed shows. In future releases they will be used to control the Audio Module.

Numpad (10-key number pad)

The Numpad is used to navigate menus, make menu selections, change which module is being viewed, etc. When there is a # on the screen, enter a number to select that selection, or select that module. While some numbers, like the module ID, show as "001" the leading zeros do not need to be entered on the pad when entering a module ID.

Channel Selection

The channel selection buttons are used in the SHOW menu and when selecting a caliber or disable function. When firing a manual show, these buttons will select which firing pin will fire next. Note these buttons do not fire the channel, they select the channel. The FIRE button is then pushed to actually fire the selection. Once fired, the selected channel will automatically advance to the next available shot, so that it does not have to be selected before firing. When firing a scripted show, these buttons will activate the caliber/disable functions if they are written into the show file. If a continuity test has been performed, the LEDs under the shots will illuminate to show channels with good continuity.

When in the Calibers/Disables page, these buttons can be used to enable or disable the disables. The Calibers/Disable page can be reached via the SHOW screens or the MENU->1 function.

Mini USB Port

This function is currently not in use. Future functionality will be to allow a tablet device to view and control the CM.

USB Input

The USB port is used to load choreography or software updates. Plug the flash drive with the choreography or updates into this port. Files must be stored in the root directory of the drive. Cannot be used to connect to anything other than a USB memory stick or thumb drive.

Figure 2

2-Wire Ports

These terminals are used for 2-Wire communications between the CM and all the Firing Modules (FM). The color of the terminals is not significant. The polarity of the two wires does not matter when it is plugged into the next unit. The connections can be made in daisy-chain order (one cable in, one cable out) or star order (one cable in, two cables out) or any combination in the network. It does not matter which output terminals are used for input and output, however, we recommend for ease of debugging that you use the single input terminal set on the FM (near the top) for the input, and one or both of the terminal sets near the bottom as outputs. *Note only one connection can be made per set of 2-Wire terminals.

Power Input

This port is used for charging the CM.
Tech Specs of Port: 5.5mm OD 2.0 mm ID such as the Switchcraft S760 center positive, outer negative, 12 volts max 1 Amp.
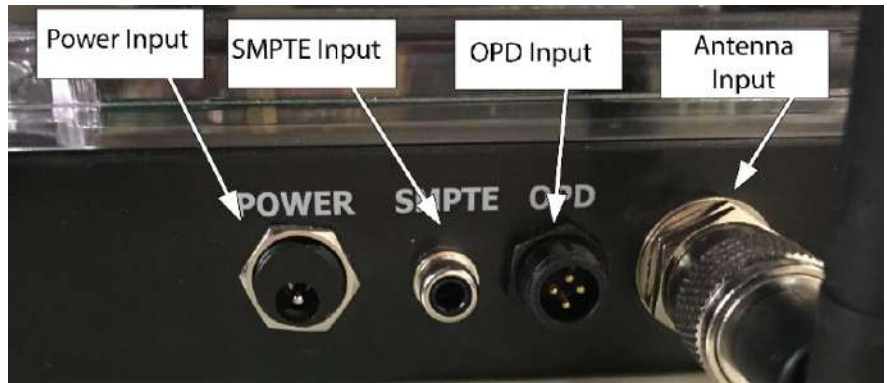

Figure 3

SMPTE Input

For shows running on SMPTE, this port is used to input SMPTE to the CM via RCA cable. SMPTE is then automatically distributed to the other modules on the show network.

OPD Input

For shows where an Operator Presence Device (OPD) is required, this port is used to connect the OPD to the CM.

Antenna Input

For shows that desire wireless communication, screw in the "N" style 3dB radio antenna here. We recommend that the antenna always be installed as a backup communications device even if the 2-Wire communications are connected. For greater signal strength and range, we recommend raising the height of the unit so that the antenna is at least 8 inches (200mm) off the ground.

User Interface

The Graphical User Interface (GUI) is at the top of the FM and CM modules and is an OLED display for better operation in different environments. Different pages of the display are used to control different functions. The HOME, MENU, CT, WW, MOD, SHOW, and OPN buttons take you directly to the associated function page. Once on that page, other functions and displays may be reached. In Figure 4, the MENU screen is shown.

Figure 4

Note that the number icons have circles around them. This represents a button on the 10-key Number Pad (Numpad). Pressing a number on the Numpad will bring up a small entry box. Fill in the number desired and press Enter. The CLEAR button will erase all numbers in the box. Also notice that a line of dots appears at the bottom of the screen. This indicates that another screen is available by pressing the DOWN (NO) arrow button. Figure 5 shows the Continuity Test (CT) screen. Note that when FMs are connected all four sides of the screen have dotted lines, indicating that other functional screens are available in all 4 scroll button directions.

Figure 5

Basic Setup

1. **Turn ON FMs, Name Them, and Place in Field.** In most system setup scenarios, the Firing Modules (FM) will first be turned on and the Name or Module ID set for the position where it will be wired. Press and hold the Power Button until the lights come on. It is recommended that the Radio Channel be checked and tested (if used in the show) and the module Joined to the Command Module (CM) before sending it to the field (see further instructions below). It is, however, perfectly acceptable to do all of this at show setup. If *CrewSafe™* local continuity testing will be used, the show file should be loaded into the CM and given time to download to all the FMs before continuity testing is performed. Continuity testing must still be turned on and off by the Command Module, but it can be shown on the screen of the FM by pressing the CT button.

2. **Turn on the CM System** – On the CM, press the power button and hold until the lights show, then let go of the power button. Lights will turn on, a logo splash screen will appear, and the Home screen will appear.

Figure 6

3. **Loading File** – The top left of the screen will display the name of the current show file loaded next to a folder icon. If the top displays MANUAL with no folder icon, then no show file has been loaded. Only Manual firing will be allowed. To load a show file, insert a USB drive with the show file (.CSV format) in the root directory. Then go to MENU->FILE:(press #key 4 and Enter).
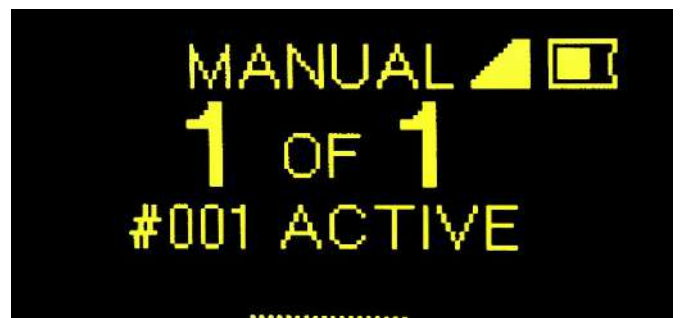
Once in the FILES PAGE, select the proper show file. If there are more than 4 show files on the drive, the top will display PAGE 1/2, 1/3 etc., and the UP and DOWN arrows can be used to scroll between the show file pages. The CM will display the current download progress and the progress of the upload. When the FM displays FILE with a folder icon, that FM has received the full show information. The CM will give a final notification when download to all connected modules is complete.
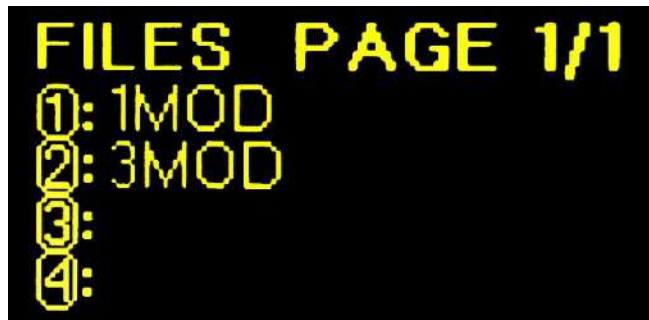
The HOME screen will now show the number of modules detected on the left, and the number of modules in the choreography on the right. It is allowed that the number of modules detected may be larger or smaller than the number in the choreography. It will be larger if you have added some modules to act as repeaters or some were wired for additional manual firing. It may be smaller if you have intentionally elected to remove one from the setup.
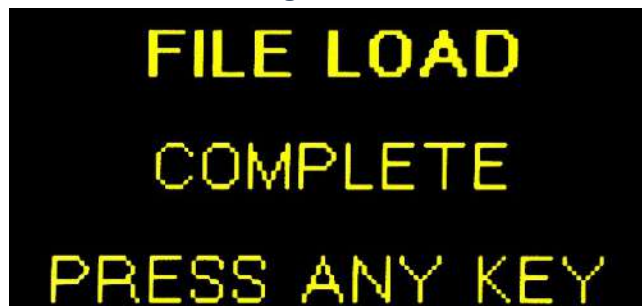
Figure 7

Figure 8

4. **Continuity Test** – Select the CT button to go to the Continuity Test Page. Hit OK to turn continuity test mode ON/OFF. Our proprietary *CrewSafe*™ continuity circuitry allows you to go through your Firing modules to look for errors or to check for continuity while pinning. It can also be checked at the Firing Module by pressing the CT button.

- = means that there is a loaded shot that is currently in the choreography on that pin. The shot is identified, continuity is good, and the shot is ready.
- ? means that there is a loaded shot that is currently NOT in the choreography on that pin. It can still be fired manually.
- X means that there is no shot loaded but this channel is currently in the choreography. This should be corrected, but the show will still run if it is left disconnected. See the "ACCEPT ERRORS" command below.
- * means that there is more resistance than expected on the pin, there might not be enough energy to reliably fire every shot on that line.

When you have completed the continuity testing, go to the main CT menu and hit OK to disable continuity testing. Continuity testing will automatically be disabled when the system is ARMED, however it is wasting battery power if left on when not needed.

5. **Arming System** - To arm the system, first turn the arm key to the arm position, then press the ARM/SAFE button. The Firing Modules will blink Red/Yellow for a few seconds as the capacitor bank is being charged. Once charged, there is no recharge time requirement. All channels may be fired simultaneously. When charging is complete the system will automatically transition to the SHOW page.

6. **Fire Show** – Select the SHOW button (if necessary) to navigate to the Show Page. Here you can fire a manual or scripted show. There are three separate firing pages, as shown below. Use the Left (Back) arrow and Right (Next) arrow keys to switch from one page to another. This can be done while the show is running because all three screens can be firing at the same time. Once the system is armed you can fire the show. Turning the key back to the SAFE position is one of the fastest and easiest ways to SAFE the firing system.

   - **Manual Show** – To fire a manual show, use the navigation buttons to land on the manual firing page. To change the FM that is being selected, use the Numpad to select any FM to fire or use the UP and DOWN arrow keys to go to the Next and Previous module in numerical order. To change the shot that is being fired, use the Channel Selection buttons. Use the FIRE button to fire the shot. On each press of the FIRE button, the system will automatically advance to the next shot and, when appropriate, advance to the next module.

   - **SMPTE Show** – To fire a SMPTE show, use the navigation buttons to land on the SMPTE firing page. Set the cue of the show if necessary, cues will advance automatically for each button press. Once SMPTE has been connected and is playing, the SMPTE time should begin to roll on the CM. If a valid show file has been loaded, pressing the FIRE button will allow the show to fire. The show will not fire unless the FIRE button has been pressed. **It is recommended to have at least 30 seconds of pre-roll**

Figure 7

   before the first cue to ensure that the SMPTE timecode has been captured by all FMs. The SMPTE timecode can be tested pre-show in the MENU->SMPTE function page.

   - **Internal Clock Show** – To fire a show with the internal clock, use the navigation buttons to land on the INTRL firing page. Set the cue of the show if necessary, cues will advance automatically for each button press. If a valid show file has been loaded, use the FIRE button to begin the show. If the show has been running and you need to pause the show, press the PAUSE [|||] button. The FIRE button will restart the show where it was paused. With a Internal Clock show, the show starts at time 00:00.0 at the time the FIRE button is pressed. Note that to fire a SMPTE show and an INTERNAL show at the same time, they must be defined in the choreography as different Cues or Scripts. A choreography file can have any number of defined Cues, each may be one or more timed events in sequence. To change the Cue, simply enter the cue number on the Numpad on the SMPTE or INTRL main page.
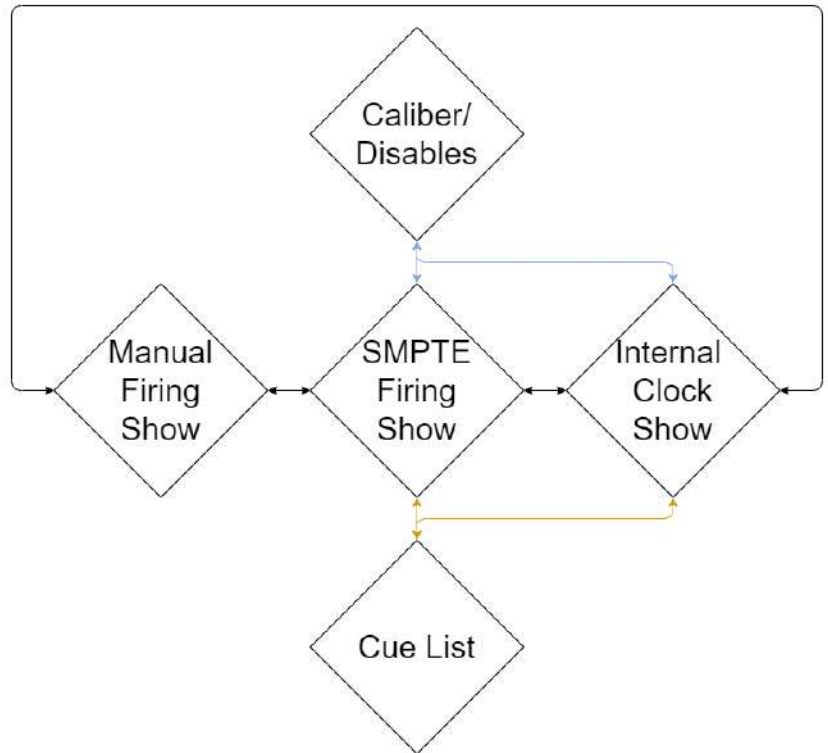
Home Page

Figure 8

1. **File Icon** - This icon displays when there is a file loaded on the CM, with the file name next to it. If there is no folder and MANUAL is displayed, there is no show file loaded. You can fire manually at any time with or without a show loaded. If a file has been loaded and you wish to return to Manual-only mode, see MENU-->FILE section below.
2. **Link Quality Icon** - This icon displays the worst connection to any connected FMs.
3. **Battery Level Icon** - This icon displays the current battery level of the CM.
4. **Connected Module Status** - This displays the number of FMs connected to the CM and how many are defined in the choreography file for the show. The first number is how many FMs are connected to the CM, the second number is how many FMs are defined to be in the show. If there is no show file loaded, they will always be the same number.
5. **Messages** - This area will display the most recent messages that the CM received (i.e. the names of active or offline FMs).
6. **Software Version** - This is a scroll down indicator. Pressing the down arrow will display the current software version installed on the CM or FM.

Menu

To navigate to the desired function, press the icon number and Enter on the Numpad**.**

Figure 9

[1] Caliber/Disables

Calibers are Firelinx's way of disabling a specific set of shots from firing. When creating a show file, a caliber can be assigned to the shot, which is traditionally but not necessarily the size of the shell being fired. If the show has calibers programmed, this page can be used to view or enable/disable the calibers. The available disables will be listed under the CALIBER LIST. When the list displays ENA, those shots can be fired. If the list displays DIS, those shots will not be fired. *If the disables are required to be set as anything other than the caliber of the round, the show file can be edited in any .csv editor (text or spreadsheet) to allow for any disable groupings desired, with indicative names such as "wind", "rain" etc.

Figure 10

[2] RF Channel

If the RF environment is known the user can manually set the RF channel by going to MENU->RF CH:(2). Here the user can enter the RF channel (1-14). The CM will automatically change the RF channel of any currently connected FMs to the new RF channel. FMs not connected at this time can have their RF Channels set manually as well. You may select this function to see to which RF channel the CM is set without making any changes. See the Wireless Wizard (WW) function to have the system determine the best channel automatically.

Figure 11

[3] Join Process

The JOIN process is used to protect the system from outside interference by encrypting all communications. Every FM must be "Joined" with a single CM in order to decrypt the messages. Once an FM is Joined, even another Firelinx CM in the same area cannot connect to that FM. When in the JOIN MODE menu, the menu will display the CM's ID Number. On the FM, hit the MENU button. Scroll down to JOIN MODE and hit ENTER. If the numbers on the CM and FM match up hit YES. If the FM is showing a different number, another CM is on the same RF channel. Press NO, and another CM ID will be displayed. Continue until the correct CM is identified. If this happens, you may want to change the RF channel of your system. Note: The ID is only 256 unique numbers, so it is possible although highly unlikely that two CMs with the same ID could be in the same area at the same time. If this happens, you will be able to tell because the module will not appear to be talking to your CM. Wait a short period and then go through the Join process again. Both CMs would have to be nearby, have the same ID, and both in Join mode at the same time to be mistaken. Even though the CM ID is only 3 digits, the encryption ID is unique. Once joined, no other CM can communicate with your module.

Figure 12

[4] File

If a USB storage device is connected to the CM with .csv show files in the root directory, they will be displayed here. Firelinx can accept Finale Generic .csv files, Firelinx LT .csv files, and the Firelinx generic show file formats. (To get a sample of what the Firelinx generic show file looks like go to www.firelinx.com) or refer to the Appendix. If there are more than 4 show files on the USB press the up and down arrow keys to scroll between the pages. Use the Numpad to select the file to download. If there are FMs connected to the CM during this process, the CM will automatically upload the choreography file to each of the applicable FMs. To remove the show file from the CM, either download a new show file or with no USB inserted go to the File menu. When prompted to switch to a manual show press YES. *Note the maximum number of files that the CM can display is 16 show files to prevent the need to endlessly scroll through the list. If more than 16 files are on the USB drive, please delete some of them or move them to a subdirectory with your laptop or PC.

[5] SMPTE

This menu is used to test or monitor the incoming SMPTE timecode, as well as to adjust the SMPTE frame speed. To change the Frames Per Second (FPS) of the incoming SMPTE stream, press the corresponding numbers on the Numpad and press ENTER to change the timing. If the clock icon is displayed next to the time, the SMPTE is currently detected by the module. If there is no clock icon, the SMPTE is not currently running to the module but it will continue its count of time. The firing system will continue to operate even if the SMPTE signal is temporarily corrupted or the wire is broken. If, when monitoring the incoming SMPTE signal, the clock icon flickers on and off it usually indicates that the SMPTE frame rate is incorrect. Try different frame rates until the SMPTE clock icon is steady for at least 10 seconds. If none of them seem to be steady, choose the best one and the system will adapt to it.

Figure 13

[6] Edit

This option is currently not in use. It will be used to create simple scripts from within the CM without the need for a computer to make a show file.

[7] Update

If a USB storage device is connected to the CM with an update file in the root directory, this is where the update can be installed. The screen will display whether it is a CM, FM or OPN update and the version number. If both exist, FM updates will be performed first, then OPN updates, followed by CM updates. Pressing YES will install the update to the CM. An FM or OPN card must be connected and Joined to the CM to receive its update. All FMs will turn themselves OFF after the update is complete. Once the update is complete, it will return to the MENU screen. Re-run the Update function to install the CM update. To download updates, go to www.firelinx.com/update, download the files and transfer them to a USB flash drive.

[8] Reset

This is used for multiple show environments like a theme park show. Once the show has been completed, when this is pressed the show clock, systems, and shot list will completely reset. The system is now ready to perform the same show again.

[9] Stealth Mode

This function is used to hide the FMs when the LEDs may be bright and distracting during a show. This might occur, for example, in a stage environment where the module may be visible to the audience. When enabled the LEDs will turn off until a change of state. When in stealth mode, if changing from Safe to Armed or Armed to Safe the LEDs will reenable. For example, the modules will be illuminated and colored when the system is being set up, wired, and continuity testing is performed. As the house is opened, the modules may be armed and the transition to Red status observed. Then the lights can be turned off and they will remain off until the system is taken to SAFE mode, and they will turn Green again so that the crew can know they are safe.

Continuity Test

Select the CT button to go to the Continuity Test Page. Hit OK to turn continuity test mode ON/OFF. You can go through your Firing modules to look for errors or to check for continuity while pinning. NFPA regulations require that the field be cleared when continuity is run.

Figure 14

This regulation was accepted because in all previous firing systems it was dangerous to turn on testing. Often only a single component failure is the difference between testing an E-match and firing an E-match. CrewSafe™ is possible because Firelinx takes a "Nine Zeroes Safe" approach to continuity testing. That means the probability of accidentally firing a shell is very low. Use this feature only if the pyrotechnician in charge and the authority having jurisdiction concur that it is safe.

- = means that there is a loaded shot that is currently in the choreography on that pin.
- ? means that there is a loaded shot that is currently NOT in the choreography on that pin.
- X means that there is no shot loaded but it is currently in the choreography on that pin.
- * means that there is more resistance than expected on the pin, there might not be enough energy to reliably fire every shot on that line.
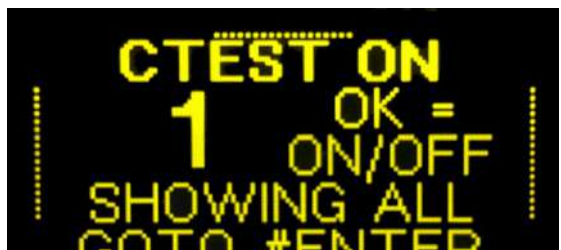

Figure 15

When you have completed the continuity testing, go to the main CT menu and hit ok to disable continuity testing. Pressing the up arrow will bring you to the continuity test menu. Here you can turn the continuity test on and off as well as change the display mode to show all shots, or only show errors. The Show Errors Only function is very helpful, especially in large shows, because it only displays the modules with errors so you don't have to scroll through all of them to check. If everything was good when continuity testing was completed, it makes it a much simpler test to recheck the field near firing time to see if a wire had been broken or come loose.

Wireless Wizard

If the RF space is unknown Firelinx can scan the area and determine the best channel. After pressing the WW button, the CM will be in the Wireless Wizard menu. Pressing OK will start a scan of the RF space and will select the best RF channel for the area. After the area has been scanned the CM will display the suggested RF channel. If the suggested channel is acceptable, pressing OK will change the RF channel of the CM and all connected FMs. If any FMs are off or

Figure 16

not currently connected they will be unaffected by this. FMs can be manually changed to the new channel at any time. Note that the RF environment can change dramatically between an early morning show setup time, and at showtime. It is recommended that the Wireless Wizard be checked again about an hour before show time to see if the recommended channel has changed.

Module Status

This page is used to monitor the status of FMs before, during and after the show. The first page of this menu shows how many modules are currently connected. Individual modules can be selected by using the Numpad or the direction buttons.

The display will show the module name (1), if the module is ok (2), if the CM is synchronized with the module (3), if the module is armed (4), if the module is firing/has fired (5), if the module is connected (6) and the module's battery status (7). The current Link Quality (LQ) is shown lower left (8). The link quality is simply the percentage of RF messages that are making it through to the module. It is quite normal for the LQ to be anywhere from 80% to

Figure 17

100%. Scripted files such as SMPTE and INTERNAL firing will work even if LQ drops into the 50% range. For manual firing, LQ should be as high as possible, we recommend that repeaters be added and/or the modules are raised off the ground if the LQ is lower than 90%. If the choreography file has been successfully loaded, the file icon (9) will be displayed lower right.

OPD (Operator Presence Device)

An Operator Presence Device (OPD) can be utilized in the Firelinx system. When an OPD is plugged into the CM, the OPD will automatically be activated. In order to fire a show, the OPD button must be pressed before the fire button is pressed and throughout the entire show. If the OPD button is released, the show will pause until the OPD button is pressed again, and the fire button is pressed again.

OPN (Open Pyro Network)

An OPN card can be purchased separately and installed onto any CM or FM expanding the abilities of both modules! The CM can receive an ethernet or DMX module allowing the CM to send and receive signals via DMX and ethernet. The FM can receive DMX, Ethernet, and 32 pin expansion cards, allowing DMX and ethernet communication through the FM as well as the ability for 32 additional firing pins to be added to the FM. The OPN-32 card has an industry standard Centronics-36 D-style connector that comes out the front side of the module and attaches to a standard 32 shot slat.

FM-24
24 Channel Firing Module

Buttons and Ports

Power Button

This turns the Firing Module (FM) on. Press and hold this button to power on the FM. Hold the button until the internal lights come on (about 3 seconds). If the FM does not power on, plug in the charging cord into the charging port (Please wait 1 minute for the power to be ready once plugged in). To turn the power off, simply press and release the button.

Repeater Button

This button enables the repeater function on the FM. When firing manually, it is recommended that one FM be enabled as a repeater. This provides the maximum signal strength and more robust timing of the firing signals. If too many modules are designated repeaters, however, the LQ of the system can actually go down. Only the minimum number of repeaters necessary to bridge the gaps between positions should be used.

Figure 18

Navigation Buttons

These buttons are used to navigate menus on the FM.

Continuity Test

This button enables the continuity test viewer on the FM. The continuity test is still controlled by the CM, but this button allows the continuity results for this module to be viewed on the module screen.

Firing Pins

This is where e-matches/squibs can be inserted to fire. They are easily replaceable for cleaning, replacement or upgrade.
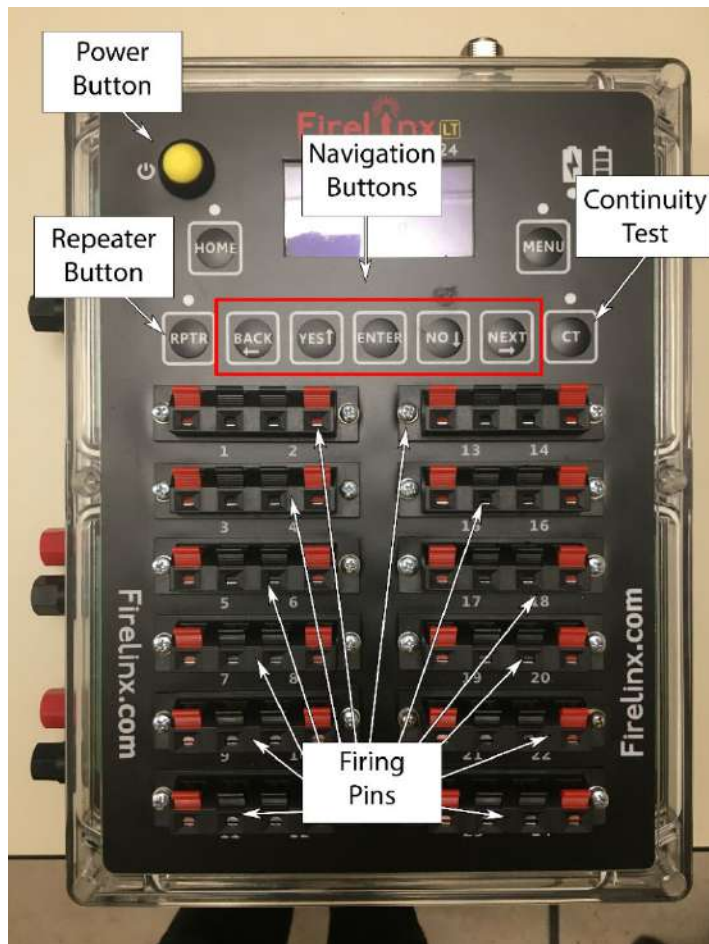
Power Input

This port is used for charging the FM.
Tech Specs of Port: 5.5mm OD 2.0 mm ID such as the Switchcraft S760 center positive, outer negative, 12 volts max 1 Amp.
In an emergency (dead battery), a 12V power supply or high current battery such as lead acid can be connected to this port. It will need to produce at least 2A of current

Figure 19

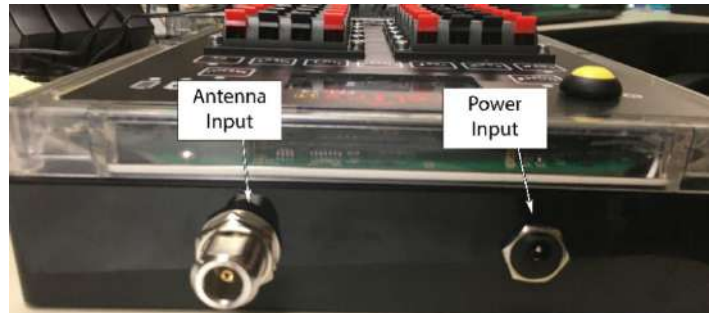during the Arming process, so a standard wall-wart transformer will not be sufficient.

Antenna Input

For shows that require wireless communication, screw in the radio antenna here. We recommend that the antenna always be installed as backup communications even if the 2-Wire system is connected.

For greater signal strength, raise the height of the unit so that the antenna is at least 8 inches off the ground.

2-Wire

These terminals are used for 2-Wire communications between the CM and FMs. FMs can be daisy-chained or connected in a star formation. Standard 22-24Ga scab wire can be used and it does not matter which conductor is
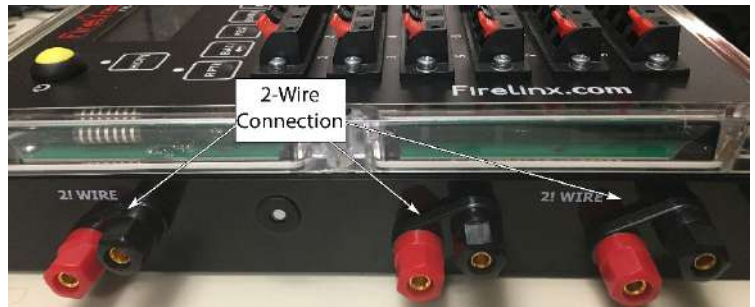

Figure 20

attached to which terminal. We recommend that in order to make it easy to check for mis-wired connections, connect the incoming wire to the single terminal pair, and then connect one or two outgoing wires to the other terminal pairs. Daisy Chain wiring would be one wire in and one wire out, where Star configuration is one wire in and two wires out. Any combination of Daisy-chain and Star is allowed.

Firing Module Basic Setup

1. **Turn on the System** - Press and hold the power button. Lights will turn on and the screen will light up. A logo splash screen will appear and then the Home screen. The system is now ready.

2. **Joining CM** – To join FMs to the CM, on the CM go to MENU->(3): JOIN. On the FM press the MENU key, and use the up and down arrow keys to select JOIN MODE. Press Enter. If the numbers displayed on the CM and FM match, press YES to join them together. If the numbers do not match, then the FM is trying to join a different CM. Press the NO button, and the FM will display the ID of the next CM in the area. Continue until your CM is listed. If no numbers are displayed the CM and FM might not be on the same RF channel. The RF channel can be set manully by selecting the RF Channel option in the MENU. The Wireless Wizard function in the CM can only change the RF Channels of FMs already joined and communicating.

3. **Wiring the FM** – To wire an e-match to the FM, strip both wires from the e-match and insert each into the spring terminals in the respective slot of the FM. The orientation of the wires does not matter, but we recommend that the end of the wire be stripped back about one inch (25mm) and given a U bend to provide better contact with spring terminals. The numbers below the spring terminals correspond to the channel for that slot. If the continuity test has been turned on at the CM, press the CT button to see the continuity test results on the FM screen.

4. **Continuity Test** – Select the CT button to go to the Continuity Test Page. When the CM is in Continuity Test mode and the test is activated the FM's LEDs will change to either Blue, Magenta or Yellow. If the backlight LEDs are Blue, there are no shots detected. If the backlight LEDs are Magenta, the FM is detecting one or more shots loaded. If the backlight LEDs are Yellow, the FM is detecting that the continuity test system has failed an internal safety test and is not sending the test current through the firing pins. If this happens contact Firelinx support through www.firelinx.com. The screen will also display the following icons to show the status of each channel:
   - = means that there is a loaded shot that is currently in the choreography on that pin.
   - ? means that there is a loaded shot that is currently NOT in the choreography on that pin.
   - X means that there is not a shot loaded but is currently in the choreography on that pin.
   - * means that there is more resistance than expected on the pin, there might not be enough energy to reliably fire every shot on that line.

5. **Armed** – If the module's backlight LEDs are RED the module is armed and ready to fire.

Home Page

1. The clock in the top left corner of the screen is displayed when the FM is currently connected and synchronized to the CM.
2. The folder icon displays if there is a file currently downloaded into the FM. If the folder is dashed with an X there is no file currently downloaded. The title of the screen will read MANUAL instead of FILE

Figure 21

3. This icon displays the current signal noise in the area, a high bar will display in a low noise area. If the bar is low move the FM to a different area with a higher bar.
4. This icon displays the current battery level of the FM.
5. This displays the Name ID of the FM. All FMs must have unique Name IDs.
6. This icon displays if the FM is firing a shot due to choreography. This icon will be preserved on the screen until the next ARM cycle, so that the operator can check the "Has Fired" status before, during, and after the show.
7. This displays any messages generated by the FM system, such as if the FM is currently connected or disconnected.

Pressing the down arrow will display the current software version installed on the FM.

Menu

Press the Up and Down arrow keys to select one of the MENU entries.

Figure 22

Name

This section changes the ID for the FM. Use the arrow keys to navigate and change the ID of the FM. Press ENTER to set the ID (An ID of 000 is not allowed).

RF Channel

This section is used to change the RF channel of the FM. Use the up and down arrow keys to change the RF channel and press ENTER to save the change. **Note this will only change the RF channel of this particular FM.**

Join Mode

This is used for Joining the FM to the CM. When the CMs ID displays on the FM press YES to connect them together. If the FM displays a different ID, the FM is trying to join a different CM.

Figure 23

Repeater

This determines if this module will double as a repeater. The repeater modules will re-broadcast their messages to other modules. Repeaters help modules that are not within the range of the CM receive a CM message. The more repeaters there are in a network, the more messages there will be in the airwaves, so if manual firing is to be used, check that only the minimum number of repeaters to cover the area are on. **Note: If using manual firing, it is recommended that ONE module be turned to Repeater status so boost the signal strength in the field.**

Continuity

Once continuity has been enabled from the CM, this screen can be used to determine the continuity of the FM wiring.

- = means that there is a loaded shot that is currently in the choreography on that pin.
- ? means that there is a loaded shot that is currently NOT in the choreography on that pin.
- X means that there is not a shot loaded but is currently in the choreography on that pin.
- * means that there is more resistance than expected on the pin, there might not be enough energy to reliably fire every shot on that line.

Troubleshooting and Maintenance

Changing a wiring terminal block

If a continuity test channel returns OPEN (not wired) but the match and wiring looks good, the next step is often to remove the E-match and put a short length of wire across the two terminals. If it still reports OPEN, then there is a problem with the connector block.

The connector block can be removed by unscrewing the Phillips head screws on either side of the block and pulling the connector block upwards.

You may replace that block with another (contact Firelinx.com for replacements and spares) or if that block was recently changed or otherwise disconnected from the FM, it is likely that the two small connectors between the wiring block and the FM printed circuit board did not get seated properly.

To insert a connector block, replace the two screws and lower them into the slots in the case as the block is lowered towards the internal pins on the PCB. Carefully check that the left and right alignment of the pads and connector pins are correct and hold the connector block straight up from the board (90 degrees) and then slowly seat the pins. If there is resistance, it's probably not aligned correctly. Tighten the screws. We advise that a continuity test be performed on the block channels to ensure that it was seated correctly.

Cleaning the FM

The modules often will come back from the field with dirt and pyro fallout on them. Most can be removed with a soft damp rag. We recommend a toothbrush for cleaning the tops of the terminals and the narrow spacing between the terminals.

Batteries

The Lithium-Polymer (LiPo) internal batteries are 7.4V 5200mAH. They have built-in safety and charging systems, so we recommend replacement every 5 years with an approved Firelinx replacement battery. Use of another battery type voids the warrantee. The batteries should not be stored in an environment over 60 degrees Celsius or 140 degrees Fahrenheit. While the internal batteries should last 8-12 hours in normal use, a second battery pack can be installed. **Note that if a second battery is installed, there will not be room to also install an Open Pyro Network (OPN) bus expansion card.**

Opening the Case

To install an OPN expansion board or install or replace a battery or other component, the case must be opened and this procedure should be followed.

1. Unscrew and remove the 12 spring terminal blocks, as well as the 6 outer case screws.
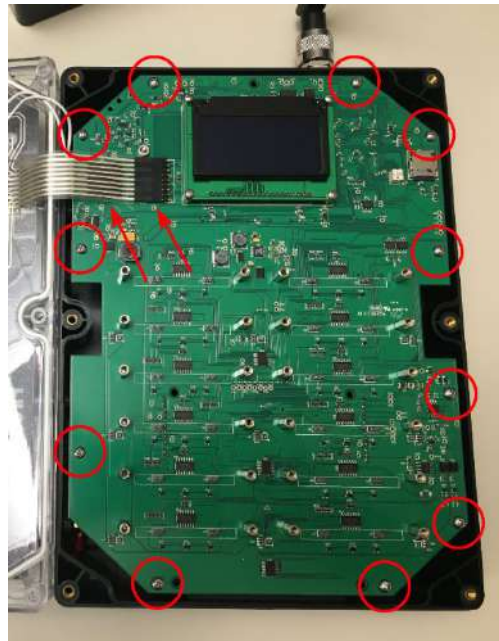

Figure 26

Figure 27

2. Carefully remove the top of the case, and slowly open it like a book to the left side.
3. Next unscrew the 11 outer screws holding the board to the case, and carefully remove the ribbon cables.
4. Open the board
   a. For OPN line up the pins of the OPN board, with the install location on the FM board, install the included standoffs and insert and screw in the OPN board.
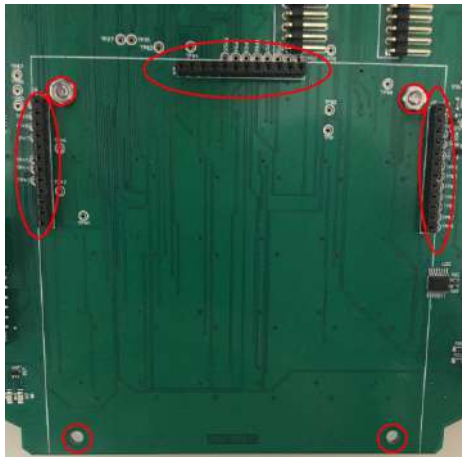   b. To change the battery, unplug the battery from the connector, and then install the new battery.
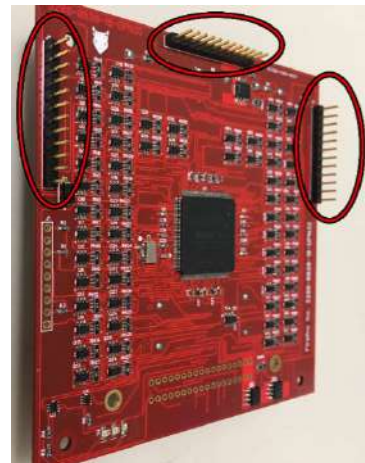

Figure 28

Figure 29

5. Carefully reinstall the board back into the case, and do the above actions in reverse to put the FM back together.

Appendix

Firelinx Simple File Format

#FirelinxShortForm					
Cue	Shot Time	Module	Pin	Caliber	Description
1	10	1	1	2"	1st Shot
1	11	1	2	2"	
1	12	1	3	2"	
1	13	1	4	2"	
1	14	1	5	4"	Dual Fire Start
1	14	1	6	4"	
1	15	1	7	4"	
1	15	1	8	4"	
1	16	1	9	4"	
1	16	1	10	4"	
1	17	1	11	6"	Ripple Fire Start
1	17.1	1	12	6"	
1	17.2	1	13	6"	
1	17.3	1	14	6"	
1	17.4	1	15	6"	

Glossary

- **Button** – On the CM and FM, it is an item that triggers an action if pressed.
- **Caliber** – The diameter of a shell of fireworks. Used in Firelinx to disable certain sized shells from the CM.
- **Capacitors** – Electronic components that store energy. The capacitors are used to store energy to fire a load on the firing pins.
- **Channel**
  - **Firing Channel** – Reference to a firing pin pair. This pair includes a ground and a power line.
  - **RF Channel** –Reference to the radio frequency channel that the message is broadcasted on. The radio channel within the firing modules and the CM need to match when using wireless communication.
- **Choreography** – Show data about what time certain cues fire. This show data needs to be created on a computer and loaded into the CM by the USB port.
- **CM** – The command module for the Firelinx system.
- **Continuity** – A check to make sure that the current squib/e-match(es) are connected properly. A low current is run through the firing pins to make sure that all shots are hooked up properly. The squib/e-match(es) should not be cross-wired and should be attached to the Spring Terminals.
- **DMX** – DMX512 is a USITT standard for transmitting and receiving data for lighting.
- **Firmware** – Software that controls hardware. This is low-level software that is just above the hardware.
- **FM** – The firing modules for the Firelinx system.
- **FPS** – Frames per Second. Used in SMPTE timecode to determine the speed of the time synchronization.

- **Heartbeat** – The time signal that is sent to the modules in the field. This is to both keep them on time and to make sure they have heard from the main unit. If they have not heard back from the CM, the firing modules will cease firing.
- **LED** – A small colored light. The light is used to indicate a signal.
- **Link Quality** – The hardiness and robustness of the radio signal. This number is determined by the strength of the radio signal.
- **Network** – The connection between multiple nodes. In this case, the nodes are the firing modules and the CM. The Firelinx system can support a wireless network and 2 wire communication right out of the box. With an OPN module, the Firelinx system can also communicate via Ethernet and DMX.
- **OLED** – A type of LED that is used in displays to create the picture in the modules.
- **OPD** – Operator Presence Device. An addition to the Firelinx system that is used to make sure that a qualified person is presently operating the show and can be used to ensure that if a safety issue occurs, the operator can quickly stop the show.
- **Open** – In reference to a circuit, it means that two components are not connected. The electronic circuit is not complete and current cannot flow through.
- **OPN** – Open Pyro Network. Used to allow the Firelinx system to use ethernet or DMX protocols of communication, as well as expand the FM by 32 firing pins.
- **Pyro** – A person that controls fireworks.
- **RCA** – A type of connector that is used to transmit audio and video data. In Firelinx it is used to receive timecode data.
- **Short** – In reference to a circuit, it means that two components have no resistance between them. There is a wire between the two connection's ports and current can flow through.
- **SMPTE Timecode** –Used in entertainment show systems to synchronize timing between systems. In Firelinx it is used to synchronize the choreography to the music.
- **Squib/e-match** – An electronic squib/e-match. This is used to take an electronic signal and turn it into a spark. These are connected to the firing channels and fired.
- **USB** - Universal Serial Bus