



MOVING IMAGE TECHNOLOGIES INC

Technical Note R000322

IRC Life Expectancy and Optimization, & Performance Testing

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1. Summary

The **IRC** is the infrared emitter panel which comprises part of MiT's Accessibility Listening Device / Track Playback system. The **IRC** is manufactured using optical components that degrade over time, and will eventually need to be repaired or replaced. This document describes ways to maximize the life of the device, and how to check its current functionality.

2. Background

MiT manufactures a suite of products that support services for hearing and vision-impaired individuals. This group of products includes the **IRC** infrared emitter panel, the **CCR** series of closed caption readers, and the **IRH** audio headset. This product line was originally introduced by Ultra Stereo Labs but was subsequently acquired by MiT in 2022.



MiT Accessibility Suite: IRC, CCR & IRH

The earliest versions of these systems have now been deployed in the field for over a decade. Depending on the operating conditions, some of the early units may be approaching their end of life. The factors that contribute to life expectancy, and how to quantify the performance of the unit, are described in the sections below.

3. Expected Life

The most common failure point of the **IRC** is the 32V power supply. This component failure is easily diagnosed and replaced, and won't be dealt with any further in this note.

The next component of most concern with regard to the life of the **IRC** unit is the infrared LEDs themselves. The output of these LEDs degrades slowly with use. Their output is typically reduced by 50% from the original value after approximately 50,000 hours of use. This equates to between 6 and 11 years, depending on the usage schedule (this 50% value is an arbitrary reference point, their output will

continue to degrade after that). This means that if the **IRC** is being used in a large room for example, where coverage was borderline even when new, or if the optical alignment of the **IRC** wasn't perfect, then after a few years the signal coverage will likely begin to be compromised and the coverage area in the auditorium may be reduced. In this situation it would be better to use a dual **IRC** setup from the start, so there's some overhead to account for the reduction in signal strength over time.

One of the biggest impacts to the life of the **IRC** is the amount of time the LEDs in it are turned on every day – the difference can add up to several years. This and other factors which affect their life are described in section 4.

4. Maximizing IRC Life

This section describes methods for getting the maximum life out of your **IRC** devices.

4.1 Ambient Temperature

The IR LEDs are very sensitive to ambient temperature, overheating of the LEDs can shorten their working life substantially. Cinemas with **IRCs** in hot climates are likely to have a shorter life than ones in colder climates. The **IRC** enclosure has ventilation holes in the top and bottom flanges. Those holes should be checked periodically for dust accumulation, and cleaned out with compressed air or a vacuum cleaner if they become clogged. Additionally, in areas with a hot climate it will be helpful to the working life of the **IRC** if it's located near an HVAC supply register so it gets a steady supply of cool air (but be wary of this in a colder climate where the HVAC unit may be supplying hot air a substantial amount of the time – that could *decrease* the life of the LEDs).

4.2 Powering Off the IRC

One way to be sure of maximizing the life of the **IRC** is to completely power it down every night. This is a brute force method of ensuring longevity. There are pros and cons associated with powering electronics on and off every day. In the specific case of the **IRC**, because we know the life of the IR LEDs is limited, it's a better tradeoff in the long run to power the unit down at night. This may be implemented with the theater automation system controlling an AC power switching device such as the **MiT IS20** series of power managers. There is also a series of networked power control products sold under the name Wattbox, manufactured by SnapAV.

4.3 Turning off the IR Carriers

As the next best alternative that will lengthen the life of the LEDs while leaving the **IRC** power on, is to shut off the IR transmission carriers when the system isn't needed. The **IRC** is similar to an FM radio transmitter sending multiple signals, in this case three separate signals. To accomplish this, the **IRC** has three separate "carriers" which are each modulated with the particular signal to be delivered. There is one carrier for the closed captions, and two other carriers for the two audio channels.

Turning off the carriers reduces the activity of the IR LEDs to near zero, which will lengthen their working life. But if only one or two of the carriers are turned off it won't help, *all three* carriers must be off in order to maximize the LED life. The two audio carriers turn off automatically after about 30 minutes of silence in the audio. So users don't need to do anything about those. The Closed Caption carrier is different, it doesn't turn off automatically.

There are a few different ways to turn off the caption carrier when captions aren't needed. One way is to use the IR Caption Carrier field in the **IRC** GUI on the DCS Configuration page (see Figure 3-2 in the **IRC** user manual). The factory default setting for this variable is **Always On**. With this setting, the caption IR carrier will never turn off as long as the **IRC** is powered. Some users change the configuration of this setting to **On Connection to DCS** (DCS is the Digital Cinema Server). This setting means the caption IR carrier is on whenever the **IRC** is able to communicate with the server. That is, the server and the **IRC** are both powered on, and are connected with a network connection. It doesn't matter if DCP content is running or not... it's only based on whether the **IRC** is able to connect to the DCS on port 4170 (the Auxiliary Content Synchronization Port as defined in SMPTE ST 430-10).

If the IR Carrier variable is set to **On Connection to DCS**, then for the **IRC** IR Carrier to shut off, the user would either have to unplug the network connector from the server, or from the **IRC**, or from the network switch, or alternatively power down the server or the network switch. If the **IRC**, the server, the network switch, and the network cables are all left connected and turned on at night, the **IRC** IR carrier will never turn off in this case, and the expected life will be nearer the shorter estimate given above in Section 3.

To turn the **IRC's** IR Carrier on and off through automation control, the same variables that appear on the DCS Configuration page can also be changed by external commands sent by the server. The following shows the commands and syntax for controlling the IR Caption Carrier:

```
irc.sys.ir_enable|0   Turns off the Caption IR carrier
irc.sys.ir_enable|1   Caption IR carrier is on while connected to Digital Cinema Server
irc.sys.ir_enable|2   Turns the Caption IR carrier on always
```

Note: **IRC** commands are sent to TCP port 10001, delimited by a tab or pipe character, and terminated by a carriage return. Be sure to add a carriage return after the command.

These commands have the same effect as a user manually changing the setting in the IR Caption Carrier field in the **IRC** GUI. At night after the last show, the first command above may be sent to turn off the IR carrier. In the morning, either the second or third command shown above may be sent to the **IRC** to turn the caption carrier back on.

Warning: If the caption carrier is turned on and off by automation, it should be thoroughly tested to ensure the commands are working, so you have captions playing while movie content is playing. We recommend using redundant restart carrier commands to be sure. For example, if you execute the command to turn on the Carrier as part of the daily startup, you could also have a cue to turn it on at the beginning of every show. Then, even if one command gets missed somehow, the unit would continue to get commands to turn on before every show. Failure to restart these carriers will put you out of compliance with the ADA requirements set forth by the Department of Justice. The user of this product remains responsible for periodic testing of the system's ongoing functionality.

Note: If your **IRC** unit has already been in service for a decade or more, substantial aging of the IR LEDs has already occurred, and there will be limited benefit from changing the operation schedule.

5. Testing IRC Performance

A simple check to see if all the LEDs on the **IRC** are working, is to aim your smart phone camera at the **IRC** while it's running content (this is also a simple way to tell if the carriers are really off when they're supposed to be off). If you can see a glow from all the LEDs, that tells you at least one of the carriers is on and the LEDs are working, at least to some extent. Individual LEDs here and there that aren't picked up by the phone camera may be defective. If entire columns of LEDs remain dark, that indicates an LED somewhere in that string is open circuit, or some LED driver circuits are damaged (however this issue is rarely seen on the current model **IRC**).

The **CCR-100** caption reader can be used as a test probe. It has a debug mode that shows the **CCR** battery voltage and two other parameters useful for checking signal reception: the Receive Strength Signal Indicator (RSSI) and the Rx packet count (packets per second). To activate the debug mode on the **CCR**, turn off its power switch for at least 10 seconds, then turn it on while holding the Language button pressed in. This debug mode will persist until the unit is turned off.

In debug mode, the RSSI value may be useful as a *relative* indicator of signal strength, by comparing the value at different areas in the room, closer to and farther away from the **IRC**. But the absolute RSSI value can vary substantially from one unit to the next, so it can't be compared between different **CCRs** or rooms. A better indication of signal integrity is the Rx packet count. Be sure the **IRC** is powered and active, but the Digital Cinema Server (DCS) is not playing content (running timed caption content will cause large fluctuations in the packet count). This way the **IRC** will continuously send the "welcome" message, which will be a stable number of packets. With the welcome message being transmitted, the debug screen packet count is simply the number of good packets received every second.

With the welcome message displayed (that is, with the **IRC** turned on, but not running any content), packets are of a fixed size and rate, so a technician can take a reference packet count near the IR panel, then walk around the room and see if the number drops noticeably. Compare the packet count found close to the **IRC** panel, and again at the seat locations farthest from the **IRC**.

Note: as you move around the room, it takes 2-3 seconds for the Rx packet count on the **CCR** display to be updated. You will need to move, then stop and wait a few seconds, then move again.

The captions and the audio channels may be checked at the same time by carrying a **CCR** to monitor the Rx packet count, while at the same time wearing an **IRH** Headset and listening to the audio channels. The background noise level on the headset will get louder with a weak audio signal. You don't necessarily need audio content playing, but it may be easier to judge the audio quality by playing non-sync audio through the audio processor, which will drive the HI output (of most processors), so the theater tech can more easily hear any changes to the audio playback quality based on their location in the theater.

It's considered normal if the Rx packet count farther away from the **IRC** drops to about half the number measured close to the **IRC** panel. But if you get a number of Rx packets significantly less than half, or if the packet number goes to zero and the red LED on the **CCR** goes on, and/or the audio on the **IRH** headset is noisy, it means you are receiving little or no IR signal at that location. That's an indication of one of the following conditions:

- The aiming of the **IRC** panel is poor.
- Some aspect of the room design is shading a portion of the audience area from the IR signal.
- The IR output from the LEDs in the **IRC** is weak (either due to old age, or some other defect).

6. Correction & Repair

If the testing process with a **CCR** described in Section 5 shows low or zero Rx packets and the red light is on, verify the following things:

- The **IRC** still has power.
- The Caption Carrier is turned on as discussed in Section 4.3 above.
- The front surface of the lens on the **IRC** panel isn't contaminated with anything that would interfere with the IR transmission.
- Check the aiming of the **IRC** panel and adjust it if necessary.

If all those aspects are OK but the signal is still not being received everywhere in the room, the **IRC** may have reached its end of life and need to be replaced. The **IRC** has no field-serviceable components, the entire old or defective unit should be returned to MiT for repair or replacement under our repair-exchange program. Customers will receive credit for any residual value of the parts returned. Contact MiT Customer Service for more information about arranging repairs and replacements.