IT'S NOT A CONTROLLER, IT'S AN

OptimizIR

Pattern = Normal DB-42/80
Front to back   Forward gain
24.0 dB   15.8 dBi
53°
Beam width
18.125 MHz 25 kHz
Setup   AutoTrk
<< 20 17 15 12 10 6
K1   K2
OptimizIR 2.0 Controller
NORM 180 BI 3/4
RETRACT POWER Power/Tuning
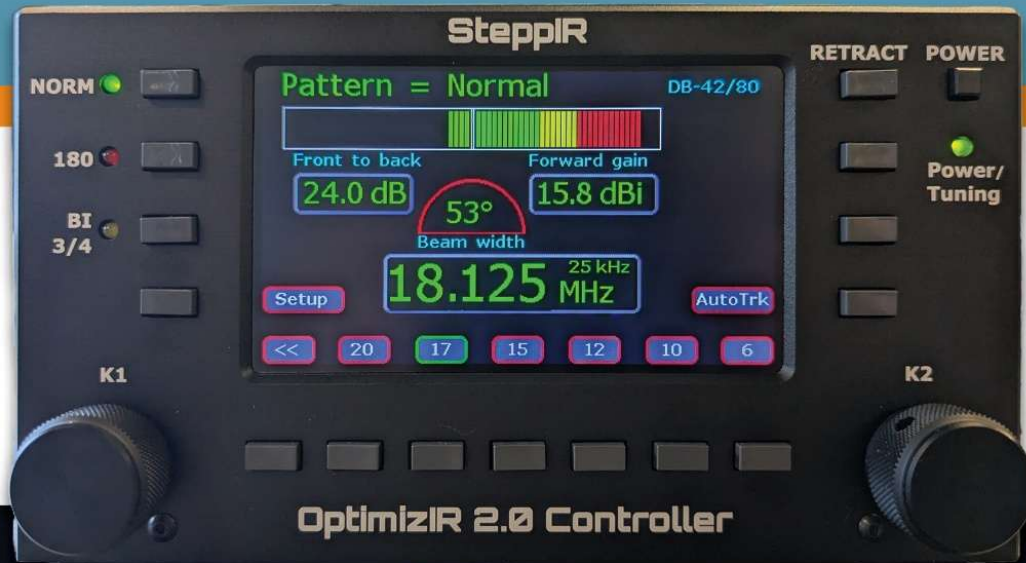
WITH WORLDWIDE REMOTE CAPABILITIES

OPTIMIZIR 2.0 CONTROLLER MANUAL

steppIR
COMMUNICATION SYSTEMS

Table of Contents

Table of Illustrations

Introduction (John Mertel WA7IR)

The OptimizIR 2.0 controller is the latest in SteppIR's innovative line of products that bring enjoyment and high-performance to the amateur radio service. For many, this controller is an upgrade from either the original controller, the SDA 100, or the original OptimizIR. The OptimizIR 2.0 is also being upgraded on a large quantity of new antenna purchases, so this may be the first time these users have had experience with any SteppIR controller. We have created this instruction manual to address the needs of both users.

The OptimizIR 2.0 provides a new way to interact with the SteppIR antenna. We have spent significant time developing this product and have had extensive feedback from customers on the design. We also worked with a team of beta testers to make sure we have a first-class antenna controller to be used seamlessly with your SteppIR antenna.

Many of the features that are standard in the OptimizIR 2.0 controller have been around for a while in our other controllers, available for purchase. The primary difference is that in the OptimizIR series controller, these options are now included as standard features:

- **Transceiver Interface:** This enables automatic adjustment of each antenna element as the radio tunes. Wherever the radio tunes to, the SteppIR faithfully follows!

- **Tuning Relay:** The lock-out relay connects inline between the radio and RF power amplifier via a PTT cable and prevents transmitting high level RF while the SteppIR antenna is being tuned. When operating with over 200 watts, it is prudent to not hit your antenna with that RF while it is in a mismatch.

- **Advanced Lightning Protection (ALP):** Each driver chip/module inside the OptimizIR has an isolation relay ahead of it to help protect against nearby lightning and dead shorts when the antenna is not tuning. The ALP board also offers enhanced troubleshooting parameters.

  OR

  High Performance Driver System: Each driver module has improved temperature stability and protection to prevent damage when stepper motor lines are shorted to one another (is still susceptible to damage when shorted to ground). Additionally, this driver system has improved positional accuracy and increased tuning torque resulting in a better performing antenna.

Other features inherent to all SteppIR Yagis, Dipoles and Verticals:

- **180-Degree Mode:** The **180** mode allows users to electrically "rotate" the antenna 180 degrees opposite from the forward direction beam heading. So, if your antenna is pointing North, with a click of a button you will be beaming South.

- **Bi-Directional (3/4) Mode:** The **BI (3/4)** functions in a similar manner to 180-degree mode, except when enabled, the antenna operates as a hybrid Yagi with forward gain occurring in opposite directions, simultaneously. For Vertical antenna's instead of the

radiator being ¼ wavelength, it is ¾ wavelength on frequencies which its physical size allow.

- **Element Retract Mode:** With Element Retract Mode, users can retract all elements on a SteppIR antenna to the home position. Optionally, the controller will then power down automatically. Retracting elements is an extremely valuable option in cases of inclement weather like high winds, snow, or radial icing. During lightning events, a retracted antenna greatly reduces the conductive area of the antenna. NOTE: The user is not required to retract the antenna, it is there as a feature in case it is needed. There is no problem at all with leaving the antenna extended, even when not in use. It is good practice to retract the antenna when not in use to prevent pre-mature wear on the antenna and reduce the antenna's conductive area.

The OptimizIR 2.0 controller hosts a number of new features – color screen, large display, full PC (personal computer) control, and simplified user interface are what you will first notice when turning on the controller.

With the SDA 100 controller and the Original Controller, the user has always had the ability to create, modify and change the antenna. But the process was not simple, and it was buried inside the setup mode of the antenna software, only to be used by the more motivated SteppIR owner. With the OptimizIR 2.0, we have brought that technology to the "front" of the interface, and embraced the technology of creating and modifying antennas.

New antennas you will see on the OptimizIR are: maximum forward gain, maximum front to rear, and wide beamwidth antennas. Visually you can see what type of antenna is being utilized with the full color bar indicator that is always visible on the controller. Also new to the OptimizIR – every antenna (including DB32 and MonstIR) is included in the firmware, so you can operate multiple antennas (one at a time, you will still need to switch control cable) without having to modify the controller.

In addition, the user can create their own antennas using EZ-NEC or the many other antenna modeling progams, and then upload those models into the OptimizIR 2.0, using the USB port. There are some sites that are creating their own antenna models for SteppIR owners, such as Dan Maguire's Auto-EZ. You can check out Dan's software (available for $79) at www.AC6LA.com. Dan worked very closely with us in the computer modeling of the OptimizIR antennas.

The OptimizIR is the first of a series of new controllers that will make the SteppIR antennas "smart", and give the user the ability to fully employ the advantages of a remotely tunable antenna!

73,
John Mertel

President/CEO

6
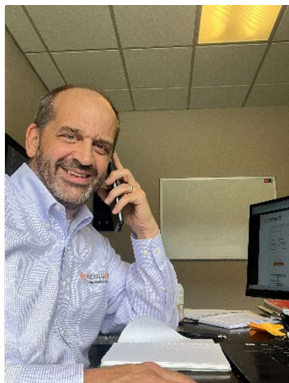
Warning

The OptimizIR 2.0 has voltage present on control cable wires, even when the **POWER** button has been pushed to off. Unplug the power supply and 25-pin D-sub connector before making any connections or cutting or splicing cable wires. The driver chips inside the controller will be damaged if the power and control wires short out.

We highly recommend grounding controller chassis to station ground. An 8-32 ground stud is provided for this purpose. SteppIR recommends a short length of at least ¼" wide tin-copper braid.

Do not transmit while antenna is adjusting when operating with over 200 watts.

Purpose

The OptimizIR 2.0 provides the optimal configuration of antenna hardware based on frequency, antenna model, and desired pattern.

New features include:

1. Ability to change antennas (from vertical to DB42 Yagi) without firmware reload or hardware changes.
2. Remember's last frequency used per band (Manual mode).
3. Frequency adjust knob with selectable step-size (Manual mode).
4. Band buttons for all available bands (Manual mode).
5. Up to 16 patterns per segment, NORM, 180 degrees, BI 3/4, Max-Gain, Max Front-to-back and others defined by the user.
6. Pattern select knobs and pattern buttons.
7. Autotrack mode with frequency step-size adjustment per band.
8. Autotrack mode will only change frequency if band changes.
9. Enhanced Create/Modify mode allows creation of new patterns.
10. Large TFT color display.
11. Tuning relay – standard feature.
12. Transceiver interface – standard feature.
13. ALP driver board OR High Performance Driver System – standard feature.
14. Can be emulated on a PC (personal computer) for remote operation.

Controller Update Release Dates

October 2023: OptimizIR 2.0 shipped to customers with ALP driver board, SDA all-relay, and transceiver interface.

December 2023: OptimizIR 2.0 chassis and cover changed to use stainless steel.

September 2024: Revision 2 of OptimizIR 2.0 shipped with LCD brightness control.

February 2025: All controllers shipped with 36V, 4.44A power supplies.

March 2025: All controllers shipped with High Performance Driver System.

Initial Controller Checkout

Perform following steps in listed order. For this initial controller checkout, the controller cable can be disconnected.

1. Connect power cord from power supply into controller.
2. Plug power cord from universal controller into a 100-240 Vac, 50-60 Hz outlet.
3. Power/Tuning LED should glow amber.
4. Turn on controller by pressing POWER button.
5. **Power/Tuning** LED should now glow green.
6. **NORM** LED should glow green.
7. Verify screen shows "SteppIR" logo for about 6 seconds and then shows the startup screen similar to the front page shown in this manual. The "Check Fault" indicator will be displayed since the antenna control cable is disconnected, that is okay for the moment.
8. Ensure the controller says, "Elements Home". If it doesn't, press the retract button.

Theory

Yagi antennas are basically single frequency devices that work well only over a very narrow range, typically 0.5% change in frequency. Fixed length yagis compensate by using a variety of techniques, all of which result in serious degradation of performance, especially in Front to Rear rejection, and added complexity, size, and weight. Dipoles have a much broader bandwidth but still cannot cover the entire 80m and 40m bands and maintain a low SWR (<1.5:1). Our patented solution is to simply adjust all of the antenna elements to the optimal length for the desired frequency with none of the compromises in performance that all fixed antennas require. This is accomplished remotely using an electronic controller that can even automatically follow the radios' frequency. SteppIR antennas enjoy optimal performance on all frequencies within their specified frequency range (varies by model) = and that includes non-ham radio frequencies as well!

The OptimizIR takes frequency and pattern input, applies those quantities to an antenna model and commands antenna hardware to set element lengths to those values.

Using the OptimizIR 2.0 is as simple as making the controller frequency match the radio frequency using the front panel buttons, and then waiting for the **Power/Tuning** LED to stop flashing. This function is automatic when connected to a radio using the Autotrack feature.

Remember that SWR is not the only factor important for high performance antennas. Minimum SWR does not always align with best antenna performance. Our antennas have better than 1.4:1 SWR in normal operating modes on almost all models, with 6M and 30M being exceptions on some models.

Rain and ice accumulation can influence antenna matching and performance. Either can cause resonant frequency to shift lower by a small amount. Under most circumstances, it can be ignored since our radiating element is protected by fiberglass. Unlike conventional antennas which can receive rain noise, such loading on the SteppIR can be corrected for by simply shifting antenna frequency higher using manual mode. Using **Global Correction** in options menu can be used to correct for performance shift as well.

Operate Mode

Power-On Screen

When controller is first powered on, the SteppIR logo, controller model and copyright information are displayed for about 6 seconds, and then controller enters operate state.

Bootup Screen

The check fault indicator will display if no control cable is connected or if controller detects an error. The controller then displays status screen for Operate mode (first time bootup should result in "Elements Home" position).

Operate Screen

9
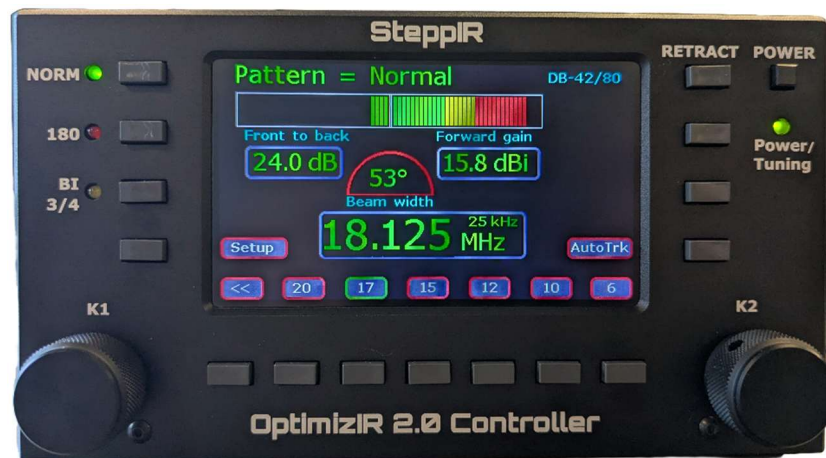
Modes of Operation

Normal Mode

The **NORM** mode is used when manually operating the controller and primary intended use for the ham bands. For Yagi's this mode points the beam heading of the antenna in the forward direction, while for Vertical antenna's this is the ¼ wavelength mode. When in **NORM** mode, tune through bands simply by using frequency band buttons. The controller will simultaneously adjust the length of each element to the chosen frequency band. The display shows what frequency the antenna is tuning to, plus the **Power/Tuning** LED will blink amber/green. Frequencies outside ham bands can also be selected.

When the controller is in **NORM** mode, selectable bands are pre-programed to get the antenna close to the desired frequency. Most SteppIR antennas work very well over a 100 KHz frequency range (minimum) except on 80m. Bandwidth will depend on the antenna model/frequency.

180 Mode

The **180** mode is one of the most popular among SteppIR users. The **180** mode allows the user to electrically "rotate" antenna 180 degrees from the current **NORM** direction beam heading. This is done by simply pressing a button. In 2-1/2 seconds, (shorter on higher frequencies, longer on lower frequencies) transformation is complete. The existing reflector becomes a director and director becomes a reflector. The antenna will now have a completely opposite pattern. With a two element Yagi, the director becomes a reflector. In addition to greatly reducing rotator use, many SteppIR users report the 180 function is an excellent tool for short path / long path operation or for picking up elusive multipliers in the heat of a contest.

BI (3/4) Mode

The **BI 3/4** (BI stands for bi-directional) mode operates in a similar manner to 180 except when enabled, gain occurs in both directions. There is approximately 2 dB less gain than normal, but now gain occurs in both forward and reverse directions. This feature can be very handy for those who are involved with net operation or contests where hearing (or sending) signals from two directions are advantageous. For Vertical antenna's instead of the radiator being ¼ wavelength, it is ¾ wavelength on frequencies which its physical size allow.

Main Screen

The display in the normal operate state depends on the antenna state and which antenna is selected. The screen will contain:

- Currently selected pattern.
- Antenna type.

10

- Bar graph displaying relative signal strength and signal rejection.
- Antenna Performance displayed as Front to Back, Forward Gain, and Beam Width.
- Frequency setting.
- Setup and Autotrack buttons.
- Band Buttons.
- Check Fault Indicator (see Fault Listings).

Screen After First-Time Power-On

There are pushbuttons surrounding the TFT full-color display. The buttons are labeled **NORM**, **180** and **BI 3/4**. **RETRACT** and **POWER** always have the same function. Buttons without labels have on-screen messages. These messages change depending on controller's operating mode.

When a button with an on-screen message is pressed, the color will change indicating selection. For example, if **AutoTrk** button is pressed, it will illuminate green indicating the Autotrack mode is enabled. In the case of Autotrack, it will not illuminate unless the transceiver interface is ON, Refer to setup mode's **"Transceiver Setup"** to configure the controller for automatic frequency tracking.

The **K2 knob** adjusts displayed frequency by step-size displayed in upper right of frequency window. The step-size can be changed by pressing the **K2 knob**. If Autotrack is enabled, frequency will change to radio frequency every time there is an update. This will over-ride any changes made with **K2 knob** or band buttons.

The **K1 knob** will select antenna pattern from available list for selected band.

There are different patterns available for **NORM**, **180**, and **BI 3/4**. For instance, if a maximum front-to-back antenna is desired, select **NORM**, then use **K1 knob** to select Fwd-MaxFB.

Across bottom of display there are band buttons plus a set of "<<" which indicate there are more bands to the left. For example with a DB18, if display shows there are buttons for 20 meter through 6 meter bands, pressing "<<" will shift buttons so 40 meter through 12 meter bands are displayed.

During antenna length changes, both affected band button and **Power/Tuning** LED located below **POWER** button will blink at one second intervals. When tuning is done, band button will have a steady green border.

OptimizIR 2.0 Buttons in Operate Mode
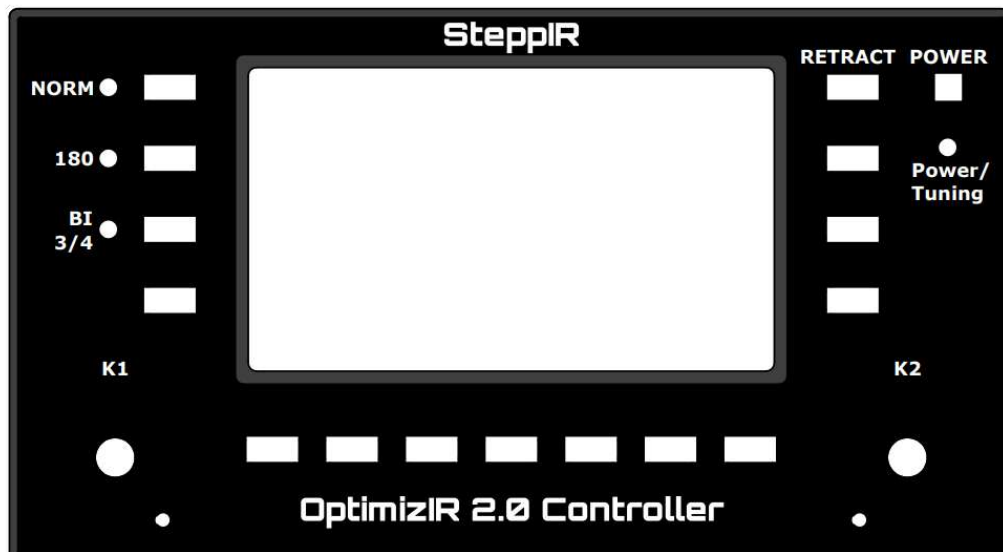
OptimizIR 2.0 Front Panel

The **NORM** button selects the Forward antenna patterns used in conjunction with the **K1 knob**. The LED next to it will light when pressed.

The **180** button selects reverse, opposite of **NORM**, antenna patterns used in conjunction with **K1 knob**. The LED next to it will light when pressed.

The **BI (3/4)** button selects Bidirectional antenna patterns for Yagi's used in conjunction with **K1 knob**. Vertical antennas will utilize a ¾ wavelength radiator. The LED next to it will light when pressed.

The **K1 knob**, **NORM**, **180** and **BI (3/4)** buttons all control selectable patterns. The number of sub-patterns selected with **K1 knob** can be 0 to 16 depending on the antenna and band selected.

The **K2 knob** controls frequency by rotating knob and step-size by pressing the knob. When **K2 knob** is pressed, it cycles through five possible frequency step-sizes of 5 kHz, 10 kHz, 25 kHz, 50 kHz and 100 kHz. Turning **K2 knob** will adjust frequency by step-size.

The antenna will start tuning immediately upon changing frequency. As long as frequency is within band limits (can be changed from setup menu) and antenna is allowed to finish tuning to new frequency, it will be saved as default band frequency. The last used frequency for each band is saved separately so controller will always return to last frequency used on a given band.

For single-element vertical antennas, pattern is omnidirectional. Hence, **180** button is unsupported. When **BI (3/4)** is pushed, the vertical becomes a ¾ wavelength antenna instead of the normal ¼ wavelength on frequencies above 21MHz (BigIR) or 41MHz (SmallIR/StealthIR) where physical dimensions of antenna hardware allow this to occur. Pressing an unsupported direction sets controller to **NORM** and lights the LED.

The **AutoTrk** button toggles controller between Manual mode and Autotrack mode. The on-screen button is green when enabled. In Autotrack mode, controller responds to frequency updates sent from a transceiver or computer to the OptimizIR over the transceiver interface. When under control of radio, antenna will change lengths and will follow radio to any frequency within range of antenna. Frequency spacing during re-tuning depends on band step size.

For proper operation of Autotrack mode, transceiver setup menu parameters must be set to match transceiver type and baud rate settings. To prevent controller from updating each time frequency is changed, Autotrack step-size can be programmed individually for each band in the Autotrack Settings menu.

The manual tune buttons are still active in Autotrack mode, but operation depends on selected radio, step-size and or source of frequency data.

Precautionary Note: When used in Autotrack Mode, some radios send display frequency via serial interface. When radio is in split-mode, frequency change displayed between transmit and receive frequencies may cause frequent and inconvenient antenna tuning. One remedy is to temporarily disable Autotrack mode. Another cure is to set Autotrack step-size to be large enough to encompass transmit and receive frequency difference. The third solution is to set Autotrack to Band Mode to allow automatically tuning only if band changes. When using Autotrack Mode, it is prudent to have a transmitter lockout to make sure there is no RF being generated while antenna is tuning. Although the radio alone (<200 Watts) cannot damage the SteppIR antenna, driving an amplifier and transmitting with high power levels while antenna elements are moving is very stressful and will cause premature aging of the movable contacts in the SteppIR antenna EHU. With SteppIR antennas, it is ALWAYS good practice at any power level to wait for tuning to stop before transmitting.

The **RETRACT** button has two modes of operation. By default, pressing **RETRACT** button will cause antenna elements to be homed. This action is immediately followed by an elements home message. If Setup Options menu item "Power off Retract" is selected, after elements are homed, controller display will switch off and controller will go to sleep.

Setup Mode

Pressing **SETUP** button opens the OptimizIR Setup Menu.
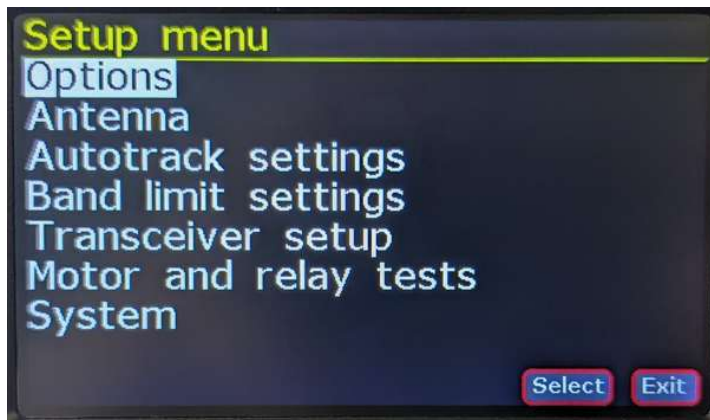
Setup Main Menu

The Setup Menu comprises sub-menus some of which are optional depending on antenna type. Scroll through list of menu items with the **K1 knob**. The items will change rapidly so turn knob slowly.

There are 2 soft keys, **Select** and **Exit**. **Select** will enter a sub-menu and **Exit** will exit sub-menu or setup menu if no sub-menu is selected. Pressing **K2 knob** is same as pressing **Select**.

Press **Setup** once to enter setup mode. Even though soft key for setup is not present when in setup menu, button is still active. Pressing setup button while in setup menu will exit current menu. To select setup options, use **K1 knob** to find desired sub menu and press **Select** or **K2 knob**.

The selections available are 1) Options, 2) Antenna, 3) Autotrack settings 4) Band limit settings 5) Transceiver setup, 6) Motor and relay tests, 7) System.

Options Menu

The **K1 knob** will cycle through possible options. The **K2 knob** is used to change option value. Changes to any options will take effect when pressing **Exit.** After pressing **Exit**, a prompt to save changes will appear. Pressing **Select** will save changes and leave the menu. Pressing **Exit** will leave the menu without saving. When pressing **Select** button, entire display will briefly flash on and off to verify change has been accepted. Change is immediate when **Select** is pressed. Global offset does not change element lengths until **Select** is pressed.

6m Passive Option

This option does not enable 6 meter band. It is used to tell the controller that the antenna has the optional 6 meter passive element Kit. If 6 meter Passive Element Kit is installed on antenna, select "Yes" with **K2 knob.** The lengths for the 6m passive element will be active for the **NORM** and **180** positions in the frequency range of 50 through 51 MHz. On 6 meters with the aluminum element kit installed, the **180** mode will not function on that band and will just behave the same as **NORM**. The **BI 3/4** mode will dramatically reduce the front to back, but the antenna will still have some forward gain. This does not affect any other band.

Remote Driver Option

This option requires optional remote driver board kit. If using the optional remote driver board it must be enabled by selecting "Yes". This tells the controller to use remote CAT-5 port at rear of controller to communicate with driver board instead of board inside controller. The driver board in the controller housing is still required to power the controller and communicate with remote driver board. The OptimizIR 2.0 can be used in normal stand-alone mode just by turning off remote driver option.

RF Driver Link Option

This option requires the remote driver board kit, W(IR)ELESS upgrade kit, and the remote driver option to be enabled. No changes can be made to this option unless the remote driver option is enabled. This tells the controller to connect the remote driver board kit wirelessly. The driver board in the controller housing is still required to power the controller and communicate with the remote driver board.

Power Off Retract

This option determines whether or not controller will automatically power off after elements are retracted when **RETRACT** button on controller front panel is pressed.

Display Metric

This option sets units to be metric or SAE when displaying element lengths. This only affects Create/Modify menu item. Metric units are in millimeters and SAE units are in inches.

Global Correction Factor

This option allows changing element lengths over a range of +/-2.0% and affects element lengths on all bands and modes (**NORM, 180,** and **BI 3/4,** Etc). If a correction factor is only needed on some bands, there is a per-band setting available in **Create/Modify Mode**.

To change correction factor, use **K2 knob** to adjust value of correction factor. The change will not take place until you exit/save your selection by pressing **Exit**, then **Select** when prompted.

In some weather conditions (e.g. ice freezing on fiberglass tubes), it may be necessary to change default lengths for elements by a small correction factor to bring antenna tuning and SWR back into normal range. Any water, snow or ice on elements is going to make elements act electrically longer, moving antenna's resonant frequency down. Since all elements are affected equally simply applying a negative correction factor (making elements shorter) until SWR is low will allow antenna to operate normally. When water, snow or ice is gone, put antenna correction back to original setting. This feature allows the user to use antenna in any weather conditions with no performance degradation, as opposed to fixed element length Yagi's which may be unusable for as long as elements have water, snow or ice on them. It can also be useful in some cases of interaction or low antenna height situations.

Antenna

Select Antenna

Use **K2 knob** to cycle through to find the antenna model connecting to the controller. Pressing **Select** or **K2 knob** will display a prompt to save or cancel. Moving down the menu listing after changing antenna types will prompt you to save or cancel. Pressing **Select** or **K2 knob** will save, and the controller will pause as it changes the antenna type. Pressing **Exit** will discard any unsaved changes to this option.

Selecting an antenna will delete any modified antenna data from the controller. Modifications can be saved to a computer connected via USB cable, and those antenna profiles can be reloaded from the computer at a later time. The procedure for saving and loading profiles is detailed later in this manual.

Calibrate Antenna

Selecting this option causes an antenna calibration to be performed. Whenever the antenna is not acting as it should, activating **Calibrate Antenna** function is recommended before exploring other potential problems. This is the first thing to try if antenna is exhibiting higher than usual SWR or decreased performance. The main reason for "uncalibrated antenna situation" is loss of power while elements are extended. This is because there is a small holding voltage present at all times to keep elements from moving when it is not being tuned. Note that it is not necessary to calibrate for each band.

Calibrating antenna ensures element lengths are accurately reported by controller. The controller does not know where antenna element is unless it is started from a "known" place. Even if elements are fully retracted, controller still retracts full length

16

of tape plus some extra length. The stepper motors will continue to over-step for a short period of time after elements have reached the stop. In doing this, the controller is making sure there is no doubt each element is fully retracted and back to a known starting point. Retraction is performed at low motor power levels and doesn't cause any damage to EHU. The calibration procedure usually remedies most cases of elements being off in their length. The elements are then re-deployed to appropriate length for operating frequency when calibrate was initiated. Calibration can take two minutes or more depending on selected frequency and antenna model and cannot be aborted. A **Calibrate** operation can be executed at any time in any mode. It doesn't matter what frequency the user is on when calibrating. If the controller is at a frequency when calibration has been initiated, then the controller will have the antenna go back to that frequency when calibration has been completed. When calibration is completed, antenna is calibrated at all frequencies.

Upon delivery, the EHU initially has each element fully retracted and controller is set to home. If controller is powered up and it says elements home and antenna control cable is connected with elements physically retracted, system is calibrated and ready to go. Always calibrate when in doubt - it is easy, and doesn't hurt a thing.

Retract Elements

To retract antenna elements, press **RETRACT**, or highlight this option with the **K1 knob**, then press **Select** or **K2 knob**. The **Power/Tuning** LED will flash amber and green. When LED stops flashing, antenna elements are now fully retracted inside EHU. To put antenna back on air, simply press antenna segment desired. Controller will adjust to that segment.

Selecting **RETRACT** causes all antenna elements to be retracted to their home (minimum length) position. Retracting can take two minutes or more depending on selected frequency and antenna model and cannot be aborted. If optional "Power Off Retract" is selected, controller will go to sleep when retraction is done.

Before taking a SteppIR antenna down, always first **RETRACT** elements. To protect antenna and connected equipment during periods of non-use, lightning storms or harsh winter conditions, use **RETRACT** feature. This greatly reduces conductive area of the antenna. In ice storms, retracting elements greatly reduces potential for mechanical damage in case of a catastrophic failure. Don't confuse "retracting" with "calibration". A calibration guarantees each element is brought home and then extended from a known starting point. Retracting assumes proper amount of tape is extended and simply reels same amount to home position and leaves it. When retracting elements, the copper beryllium conductive strip is "safe and sound" inside EHU, leaving only telescoping fiberglass poles extended. These poles are easy to replace so even if the telescoping fiberglass support elements (pole) are damaged, the most valuable part of antenna is safe.

Master Reset

Pressing **Select** or **K2 knob** will prompt a confirmation to reset all saved values in Nov-Ram. Pressing **Select** or **K2 knob** will confirm reset, pressing **Exit** will cancel. The antenna type will not be reset.

Default Lengths

Press **Default Lengths** to reset element lengths. There will be a warning if element length data does not match default data.

Multiple master antennas are necessary because the boom length looks longer electrically as frequency is increased. SteppIR has judiciously broken the frequencies up and modeled a unique antenna for each range. This coupled with a smart software algorithm allows an optimal antenna at every frequency without having to model hundreds of antennas. If an antenna is created anywhere within the frequency range of a master antenna, the new antenna will be scaled by the software algorithm so the user has an antenna with the same performance characteristics throughout that range. To ensure the absolute best performance in the ham bands (any master segment where a ham band occurs) SteppIR modeled the master antenna at a frequency near the center of each ham band. So if the user is changing a model and creates the new antenna near the center of the frequency range, that antenna will then be replicated throughout the entire segment.

Create/Modify

The factory default antennas programmed into the controller have been modeled and field tested to provide very good gain, without sacrificing front-to-rear performance. The **Create/Modify** menu allows the user to change the length of any SteppIR elements for each master antenna segment. This feature can be used to try out custom antenna designs, or to "tune out" potential objects that are causing interaction or SWR problems.

The driven element can be changed up to +/- 5% in length to obtain a better match with no appreciable change in gain or front to back performance. It is always best to just tune the driven element to correct SWR problems. This feature is especially good for those users who experiment with modeling programs such as EZ-NEC. When finished changing respective lengths, the user can save the new antenna to memory. This will override the factory default antenna for any given ham band or frequency range.

If at any point the user desires to go back to the factory default antennas, this can be done by pressing **Default Lengths**.

Computer modeling has dramatically simplified antenna design. With this technology, the average ham can create his/her own antennas and have a very accurate idea how the antenna will perform before it is built.

While the availability of antenna modeling software has been a giant leap forward in antenna design, to fully exploit it you need to be able to modify the elements length with the antenna mounted in its operational position. We are able to change the elements length in the air while on an antenna range and determine very closely our electrical element length. For typical Yagi antennas, the user must just estimate it, thus leading to less than optimum performance. With the SteppIR adjustable antennas, design technology has been advanced one step further. The user can now model and build as many different antennas they want, without ever leaving the ham shack.

Remember that modeling programs output the electrical length of the element, not the physical length. The controller indicates the physical length. The electrical length is from 2 -3.5% longer due to the conductor diameter, mounting hardware and dielectric loading due to the telescoping fiberglass poles. This data is accounted for and programmed into the factory default antennas.

The element names used refer to their location on the boom, not their function. See antenna manual for the location of each element.

The antenna can be created at any frequency within the ham band or general frequency segment. For the very best results, model the new antenna in the middle of the band or frequency segment and set the controller to that frequency before creating the antenna. The frequency coverage range of each of the antennas is broken up into numerous blocks for each mode (**NORM, 180,** and **BI 3/4,** Etc). Each covered by a different antenna model.

Using the "Create/Modify" mode, the user can modify and save any of the master antennas in each of these frequency ranges. The frequency range is identical for the all modes/patterns of the antenna (**NORM, 180,** and **BI 3/4,** Etc). If you select "NO", no changes will be made, and your antenna segment will be just as it was before.

The **K1 knob** is used to select what to adjust, which is highlighted. The **K2 knob** is used to adjust the highlighted value. For blue highlighted items use the buttons on the bottom of the faceplate to change your selection. The software will not allow the user to adjust an element that does not exist. Only elements that are included in the selected antenna will be adjustable. The buttons across the bottom allow the user to save, exit, and make selections for blue highlighted items. The Create/Modify mode enables the user to 1) customize antenna element lengths, 2) change coil tap positions, 3) change relay settings **(not recommended unless re-modeling antenna)**, and 4) control special antenna modes. All changes made in "Create/Modify" mode will immediately update the antenna. However, none of the changes are saved unless "Save" button is pressed. This allows experiments to be conducted without concerns about misconfiguring antenna.

Use the **K1 knob** to select the following items that can be adjusted:

Select Pattern: The **K2 knob** scrolls through a list of all patterns for the selected band, up to 16.

Select Segment: The **K2 knob** will change current segment. Frequency will be set to bottom frequency of the segment. This is useful on bands with more than one segment like 6m, 10m and 80m (and other antennas with loading coils).

Adjust Frequency: The **K2 knob** will adjust through segment range only. It stops at the segment boundary. Pressing the **K2 knob** will change the step-size 10 kHz, 100 kHz, 1 MHz.

Band Correction: The **K2 knob** will scale element lengths (ranging from 0.0% to 9.9%) for the current segment. This is useful for correcting interference, correcting for fiberglass loading when trying a new antenna model, and tuning the antenna after initial installation. This correction factor is applied to all models on the modified segment. This means it should either be used as a tool to find the ideal element lengths when tuning the antenna, or used to scale for interference/loading. Only keep the band correction factor in-place if you are counteracting interference that affects all modes/patterns (**NORM, 180, BI 3/4,** Etc.)

Adjust Element: Adjust the length/position of the highlighted element with the **K2 knob**. Press the **K2 knob** to change step-sizes from 0.1, 1, or 10 units. If using a vertical antenna with loading coil, it is possible to change the coil tap position (1-6) but is not recommended if using a SteppIR antenna model. This feature is useful for troubleshooting issues with the loading coil or custom antenna modeling.

Multi-Element Adjust: This allows the user to select more than one element to adjust at a time. Use buttons to select elements to be adjusted and adjust the length with the **K2 knob**. This is only recommended to be used to adjust the 80/60m Dipole on the DB36 and DB42. For scaling the antenna up/down in frequency use the band correction factor.

Select Relay: This allows the user to select different relays to be active (closed) per segment by pressing the corresponding button below the screen icon. This should NOT be changed if using a SteppIR provided antenna model. It is meant for custom antenna modeling or troubleshooting of the antenna.

Reset Pattern to Default: This will reset current pattern (Direction) to default values. This does not reset saved values to Default. Save must be performed separately to make it permanent.

The **Clear**, **Copy, Save** and **Exit** buttons are active for 1) Select Pattern, 2) Adjust Element, 3) Adjust Frequency, 4) Select Segment and 5) Band Correction settings.

Clear: Press this to remove currently selected pattern from this band. This will not clear Normal or 180.

Copy: This will make a new pattern copied from currently selected pattern. It will allow the user to select a name for the new pattern from a list of names associated with current direction, **Norm**, **180** or **Bl 3/4**.

Save: Will save current pattern to EEPROM memory and will be used for tuning antenna in operate mode.

Exit: Will check if the current pattern was modified and ask if user wants to save changes for the current pattern. It will then restore saved values and exit **Create/Modify** mode.

Any correction factors made using **Global Correction Factor** option will also be applied to the element length in addition to any changes done in **Create/Modify**.

The 80m dipole on the DB36 and DB42 use the end 2 elements to tune the dipole by adjusting the length of the reflector and last director which act as capacity hats. The best way to tune the dipole is by using **Multi-Element Adjust**. The 80 meter dipole has a segment every 100 kHz. To trim the dipole across entire band, segments need to be corrected individually. The vertical coil has more than one segment for a given band, they each must be tuned separately.

A Yagi/Vertical antenna's resonant frequency is determined by the length of its driven element, reflectors, and directors, as well as a variety of other factors. Since every installation is different, the factory default lengths in the controller for each band/frequency are almost guaranteed to need adjustment for your particular installation. Because of this, it is mandatory to tune the length of the elements on all frequencies of operation before application of high power.

In this menu, the operator can scale the antenna up or down in frequency by using the "Band Correction Factor" or adjust the length of the driven element (DVR/DE) until the minimum SWR dip is at least below 1.4-1.3. An antenna analyzer (Vector Network Analyzer) is extremely helpful for this task as it allows the user to plot SWR over a frequency range, at which you can match the SWR dip in the antenna with the frequency which you are tuning in the Create/Modify menu. If you are unable to make a good match by scaling the antenna or adjusting the length of the driven element, you most likely have an issue with your connections or wiring.

SteppIR antenna tunes are broken up into "segments" which we use to create an ideal antenna at a specific frequency. To get the element lengths at frequencies in between segments, the controller utilizes an algorithm to calculate them with the given segment information. The controller can only "store" lengths at the start of each segment, and it calculates the lengths in between. What this means for the end user is that the **antenna can only be tuned once in between each segment.**

Tune the antenna at each segment's recommended tune frequency following the important notes closely.

Important notes:
• Start tuning by first calibrating the antenna.
• You will want to tune starting at the highest frequency (highest segment) and work your way down to lower frequencies (lowest segment).
• Only tune the segments that are relevant to your antenna (Don't go lower than the band your antenna is restricted to).
• Send the antenna to the recommended tune frequency, scan a large span (the SWR dip may be outside of the ham band) with your antenna analyzer and find the minimum SWR. If it is below 1.4:1, but the minimum SWR frequency does not match your controller frequency, then use the band correction factor to scale the antenna up or down in frequency. The band correction factor should only be used as a tool to find the correct element lengths. Once you have found a correction factor that lines up the minimum SWR to the controller frequency, record the element lengths for each element. Set the correction factor back to 0.0% and input the previously recorded lengths into each element. The SWR dip should be back to where it was when you found the correction factor that works for that segment.
• If the SWR dip minimum is above 1.4:1 you will want to change the length of the active driven element (not always DVR on antenna's that have relay switching, reference the antenna manual for the correct active driven element).
Lengthen/shorten the active driven element until you have a SWR minimum below 1.4:1. You will then want to use the band correction factor to scale the antenna as described above.
• Either save periodically by pressing the "Save" button or at the end of tuning all segments when exiting the Create/Modify menu.

SmallIR/StealthIR Tuning Table

Segment	Start	End	Tune Frequency	Ham Band
1	3.40	3.50	3.45	-
2	3.50	3.60	3.55	80m (3.5-4.0)
3	3.60	3.75	3.675	
4	3.75	4.00	3.875	
5	4.00	5.20	4.6	-
6	5.20	6.95	5.368	60m (5.33-5.405)
7	6.95	7.85	7.15	40m (7.0-7.3)
8	7.85	8.85	8.35	-
9	8.85	10.00	9.425	-
10	10.00	11.30	10.125	30m (10.10-10.15)
11	11.30	13.85	12.575	-
12	13.85	15.80	14.175	20m (14.0-14.35)
13	15.80	17.85	16.825	-
14	17.85	20.80	18.118	17m (18.068-
15	20.80	24.60	21.225	15m (21.0-21.45)
16	24.60	27.50	24.94	12m (24.89-24.99)
17	27.50	29.00	28.5	10m (28.0-29.7)
18	29.00	34.50	29.35	
19	34.50	41.00	37.75	-
20	41.00	49.50	45.25	-
21	49.50	51.00	50.5	6m (50-54)
22	51.00	65.00	52.5	

BigIR Tuning Table

Segment	Start	End	Tune Frequency	Ham Band
1	3.40	3.50	3.45	-
2	3.50	3.60	3.55	80m (3.5-4.0)
3	3.60	3.75	3.675	
4	3.75	4.00	3.875	
5	4.00	4.10	4.05	-
6	4.10	5.20	4.65	-
7	5.20	5.30	5.25	-
8	5.30	6.95	5.36	60m (5.33-5.405)
9	6.95	7.85	7.15	40m (7.0-7.3)
10	7.85	8.85	8.35	-
11	8.85	10.00	9.425	-
12	10.00	11.30	10.125	30m (10.10-
13	11.30	13.85	12.575	-
14	13.85	15.80	14.175	20m (14.0-14.35)
15	15.80	17.85	16.825	-
16	17.85	20.80	18.118	17m (18.068-
17	20.80	24.60	21.225	15m (21.0-21.45)
18	24.60	27.50	24.94	12m (24.89-
19	27.50	29.00	28.5	10m (28.0-29.7)
20	29.00	34.50	29.35	
21	34.50	41.00	37.75	-
22	41.00	49.50	45.25	-
23	49.50	51.00	50.5	6m (50-54)
24	51.00	65.00	52.5	

Yagi Tuning Table

Segment	Start	End	Tune Frequency	Ham Band
1	3.40	3.50	3.45	-
2	3.50	3.60	3.55	80m (3.5-4.0)
3	3.60	3.70	3.65	
4	3.70	3.80	3.75	
5	3.80	3.90	3.85	
6	3.90	4.00	3.95	
7	4.00	4.10	4.05	-
8	4.10	4.20	4.15	-
9	4.20	5.20	4.7	-
10	5.20	5.30	5.25	-
11	5.30	5.40	5.35	60m (5.33-5.405)
12	5.40	5.50	5.4	
13	5.50	6.95	6.225	-
14	6.95	7.85	7.15	40m (7.0-7.3)
15	7.85	8.85	8.35	-
16	8.85	10.00	9.425	-
17	10.00	11.30	10.125	30m (10.10-10.15)
18	11.30	12.50	11.9	-
19	12.50	13.85	13.175	-
20	13.85	15.80	14.175	20m (14.0-14.35)
21	15.80	17.85	16.825	-
22	17.85	20.80	18.118	17m (18.068-
23	20.80	24.60	21.225	15m (21.0-21.45)
24	24.60	27.50	24.94	12m (24.89-24.99)
25	27.50	29.00	28.5	10m (28.0-29.7)
26	29.00	34.50	29.35	
27	34.50	41.00	37.75	-
28	41.00	49.50	45.25	-
29	49.50	51.00	50.5	6m (50-54)
30	51.00	65.00	52.5	

Autotrack Settings

Use the **K1 knob** to select the band. Use **K2 knob** to change step size. Press **Exit** to prompt saving changes, press **Select** or **K2 knob** to save changes, or press **Exit** to discard changes. The Autotrack settings determine how much the radio frequency must be changed before antenna will retune when Autotrack has been enabled on front panel. The available settings are 1, 5, 10, 15, 20, 25, 50, 75, 100, 150, 200, 250 kHz.

The 3 basic modes (**NORM**, **180,** and **BI 3/4**) can all still be used while in the Autotrack mode. Special patterns within these modes cannot be used with Autotrack. To use the transceiver interface, the user must put the controller into Autotrack mode so the **Autotrk** indicator lights green. To disable automatic tracking simply select the Autotrack mode so the indicator goes out. Ensure that you have setup your radio type within the **Transceiver Setup** menu.

The band buttons are active when in this mode and will cause the antenna to change frequency until the controller sees another command from the radio. This could take up to 2 seconds. Avoid accidentally hitting the band buttons while using the transceiver interface to control the antenna. The transceiver interface will update the frequency if it is enabled with the radio or computer on overriding the band buttons almost immediately. If using the **RETRACT** button to home the antenna, the controller will override the transceiver interface. If "Power Off Retract" is enabled, it will go through an automatic shut down once the elements are completely home.

Band Limit Settings

To adjust upper and lower frequency limit of a Band, first use **K1 knob** to highlight the desired band. Next press **Select** or **K2 knob** to see the currently set upper and lower limit. Use the **K1 knob** to highlight the desired limit, then use **K2 knob** to adjust limit frequency. Repeat for the other band limit. Then press **Exit**, and once the prompt to save changes shows up, press **Select** or **K2 knob** to save. The display will blink. If **Exit** is pressed on the prompt to save changes, any changes will be discarded. Band Limit is used to set frequency limits used in Autotrack Mode and other band sensitive options. It does not affect how element lengths are calculated or how Create/Modify works.

Transceiver Setup

This feature is used to link a radio, computer, or another SteppIR controller to the OptimizIR. To use the transceiver interface, the rig needs to have computer interfacing capability. Rigs with these options were manufactured from 1990 and beyond. When enabled, the transceiver interface on the SteppIR controller will "listen" to the rig through its computer port, and will automatically re-adjust as the user tunes through the bands.

The user will also need an optional interface cable for the specific rig, which has a 9 pin female D-sub connector on one end that hooks up to the top "Data In / Radio" port on the back of the controller. The other end will go to your rig's interface. There is a second 9 pin
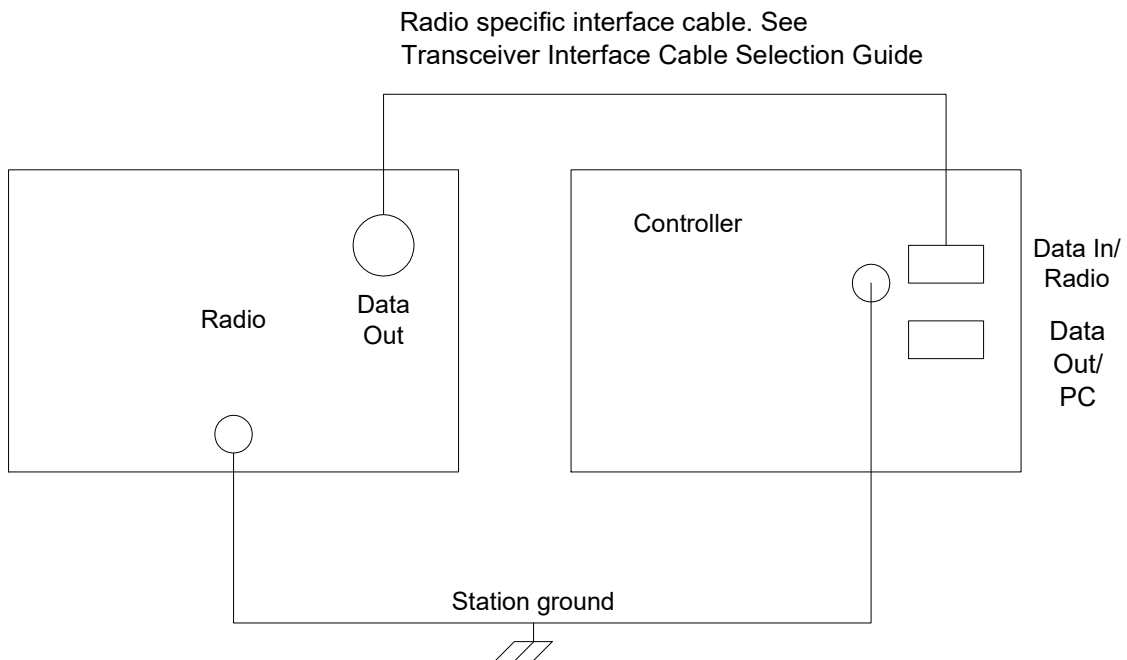
D-sub connector below the first D-sub called "Data Out / PC". This D-sub connector is used if the user desires to stack two SteppIR horizontal antennas or phase vertical antennas. It allows the two controllers to communicate to each other, so when any change in frequency occurs on one controller, the other will follow. It also allows the user to connect the SteppIR directly to a PC. An optional "Y" cable is available from SteppIR that allows the user to run a logging program concurrently with the SteppIR controller. (Not required for ICOM radios).
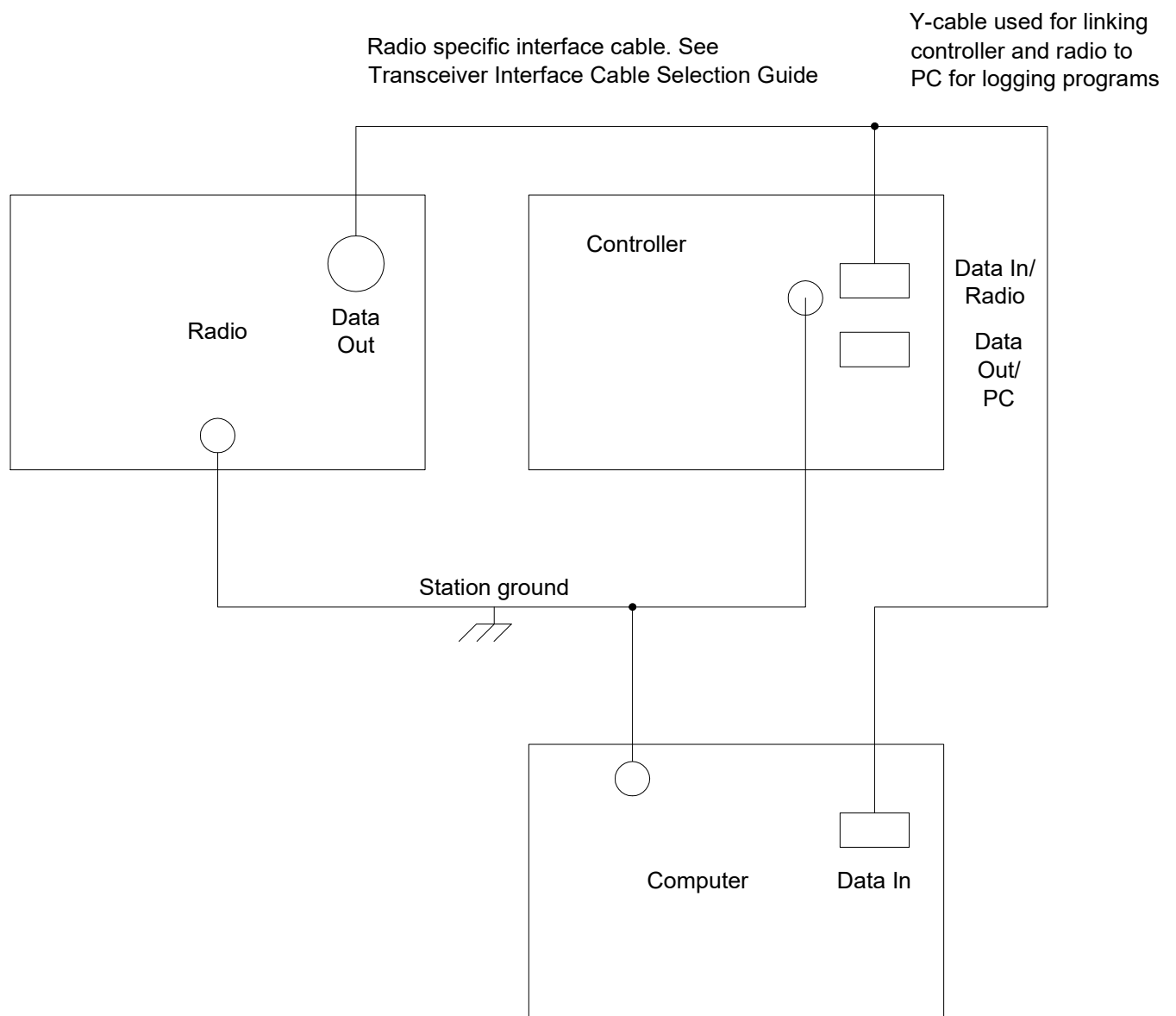
The Transceiver Setup menu allows selection of radio brand and baud rate of the two ports at the rear of controller. The baud rate is the speed in which information is exchanged between the SteppIR controller and the radio. See operating manual for the radio to determine the proper baud rate. This setting must be the same as the setting in your radio, or the interface will not function. Note that ICOM radios require CI-V transceiver mode enabled. The data input and data output ports can be set to different baud rates. Use **K1 knob** to select which item to adjust, adjust the three settings to the desired value with the **K2 knob** and press **Exit** and then **Select** or **K2 knob** to save. Pressing **Exit** a second time will discard any changes. The display will blink indicating settings have been saved. Selecting OFF for radio type will disable the transceiver interface and **AutoTrk** button. The data out port is always active as long as OFF is not selected for a radio type. This port is intended for daisy chaining controllers and computer control.

More than one radio may work for a given radio setting. For example, the Kenwood setting works for Elecraft and the FT9000 setting works for the FT3000 and FT6000. If radio model is not listed, check Transceiver Interface Cable Selection Guide. Finally, some radios require settings to be changed to get their CAT port to work.
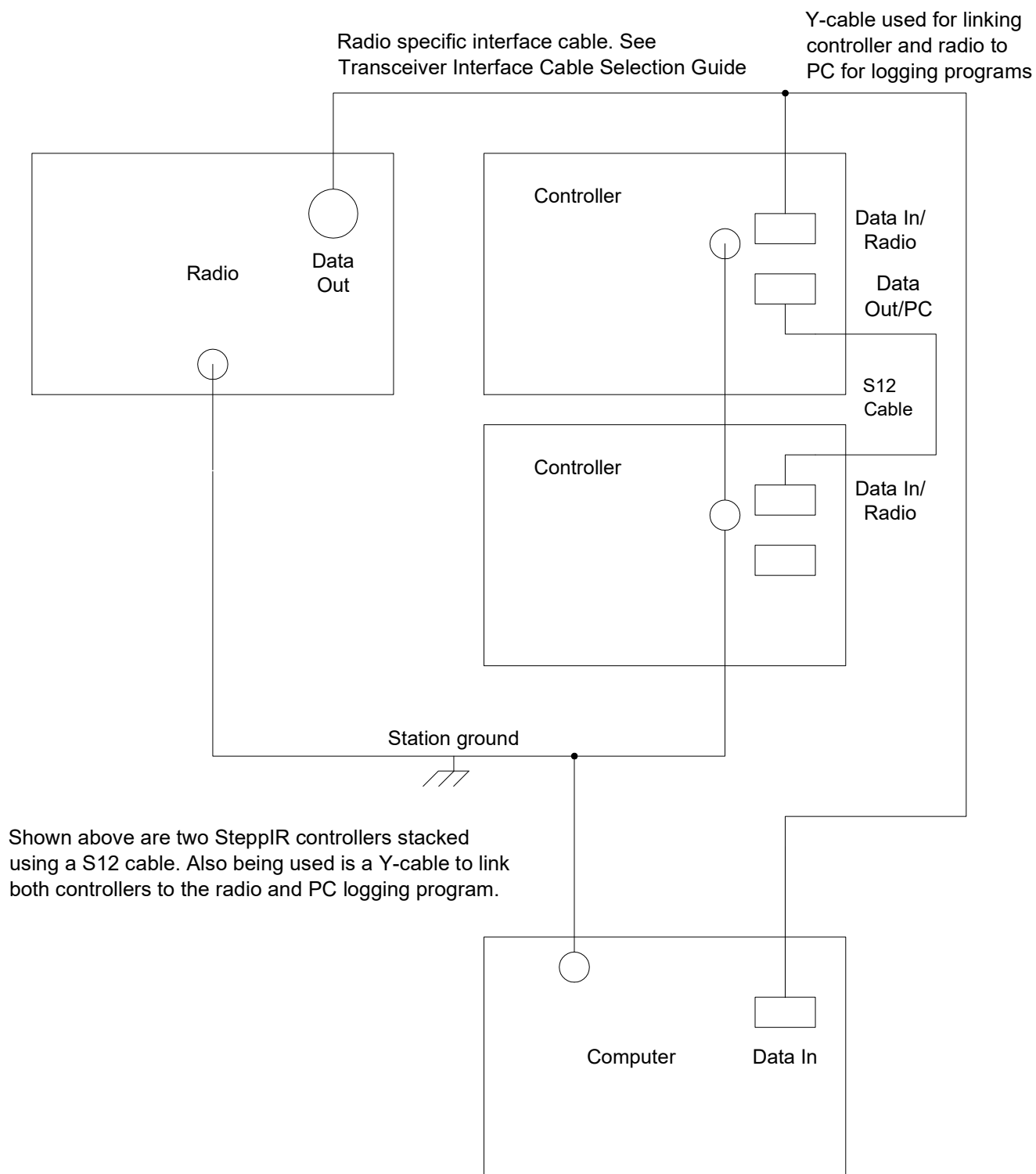
See the Transceiver Interface Users Manual and Transceiver Interface Cable Selection Guide on our Downloads/Manuals page on our website for additional information.
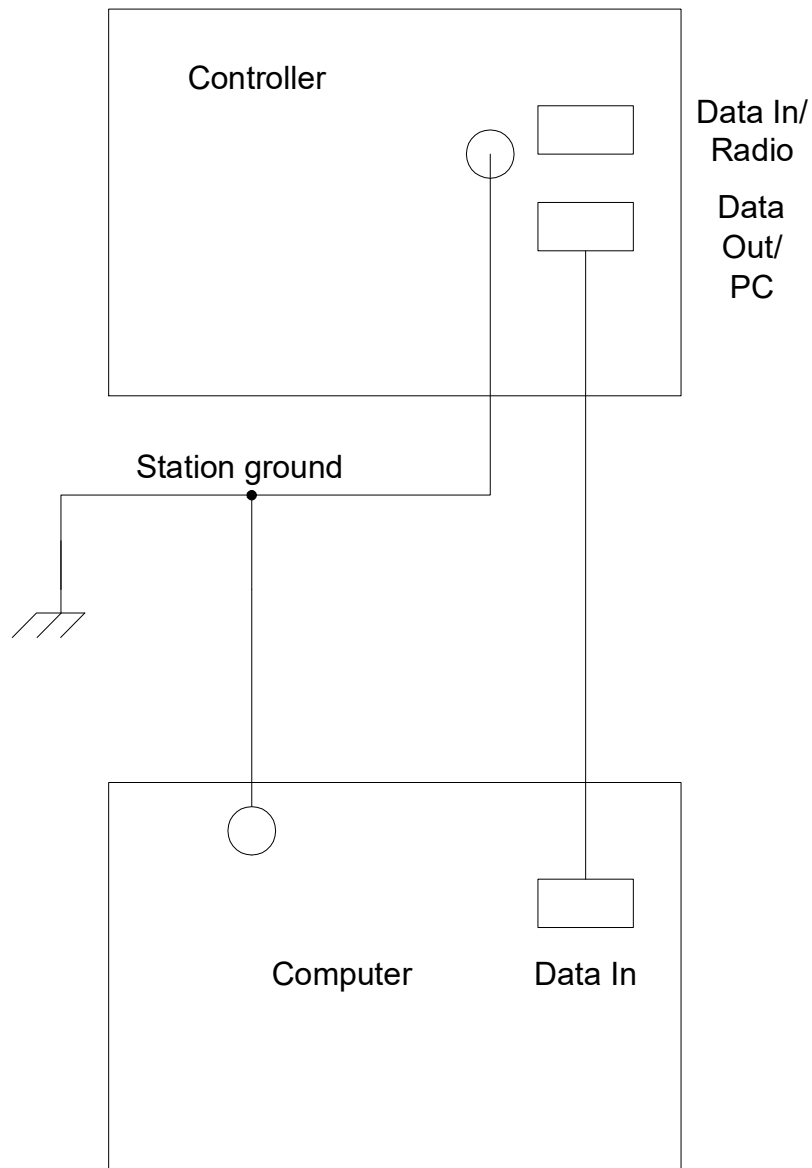
Radio specific interface cable. See
Transceiver Interface Cable Selection Guide

Controller

Data In/
Radio

Radio

Data
Out

Data
Out/
PC

Station ground

Transceiver Interface to Radio

Radio specific interface cable. See
Transceiver Interface Cable Selection Guide

Y-cable used for linking
controller and radio to
PC for logging programs

Radio

Data
Out

Controller

Data In/
Radio

Data
Out/
PC

Station ground

Computer

Data In

Transceiver Interface with Y-cable

Radio specific interface cable. See
Transceiver Interface Cable Selection Guide

Y-cable used for linking
controller and radio to
PC for logging programs

Radio

Data
Out

Controller

Data In/
Radio

Data
Out/PC

S12
Cable

Controller

Data In/
Radio

Station ground

Shown above are two SteppIR controllers stacked
using a S12 cable. Also being used is a Y-cable to link
both controllers to the radio and PC logging program.

Computer

Data In

Controllers Stacked with Y-cable

Controller

Data In/
Radio

Data
Out/
PC

Station ground

Computer   Data In

This configuration shows the controller linked to the PC with a cable.
This can be done if station has many different radios linked to PC.
This will allow user to control everything from the PC

Transceiver Interface to PC only

Motor and Relay Tests

Relays Test

This option will only work with antennas equipped with relays. Testing relays will not change length of elements. It will only activate relay signals. Use the **K2 knob** to scroll through and close relays. Only one relay can be active at a time. The names correspond to relay names on switch box. This mode is provided to allow easy testing of relays on the DB series of antennas. Refer to the antenna's User's Manual for details on how to perform these model-specific tests. This test must be performed on a newly built antenna to ensure it is wired correctly. **Exit** will leave the menu. When exiting this menu, all three relays are opened automatically.

Motors Test

This feature is intended for testing the antenna on the ground for a new install or maintenance. When performing the "Motors Test", none of the 18' telescoping poles should be installed at this point or the user won't see the tape extend out approximately 1" to 4". This test allows verification that each element is indeed the one the controller thinks it is and that it is wired correctly and does not run backwards. If there is copper sticking out at the end of testing any element, the motor for that element is incorrectly wired. The stepper motors will run backwards if you swap the wires on either one of the motor windings.

Before connecting the DB25 connector on the control cable to the controller, plug in the controller and turn it on. The screen should read "Elements Home". If it does not, run the **RETRACT** function. The screen will indicate that it is homing the elements and finish with "Elements Home". It is now safe to connect the DB25 connector on the control cable to the controller.

In the case of the "Remote Driver Board Option", the element can be tested while the antenna is on the ground. With the provided crossover cable that comes with the Remote Driver Board Option, plug the controller into the remote driver board at the base of the tower via the "Remote" CAT 5 plug. Refer to Remote Driver Board section for more information.

WARNING: Do NOT select any of the band buttons at this time. Without the 18' poles installed, if any of the band buttons are selected, the copper tape will come out of all the element housings onto the ground. This could result in damage to the copper tape requiring factory repair. Check to see if there is any copper tape sticking out of any of the element housings. If there is copper sticking out run the "Calibrate" function and this will bring the tape home.

Use the **K1 knob** to select which elements to extend or retract, and use **K2 knob** to send elements in or out. The elements will only feed out about four inches of copper. Pressing **Exit** will leave the menu and automatically retract any elements that were extended.

Note: Always perform the motor test on the ground with the fiberglass elements off. Make sure EHU control cables are positively identified and well-marked (REF, DVR, DIR1, etc.). If the EHU's get mixed up in the connector junction box, very confusing results will occur such as, high SWR, low performance, etc. Mark the cables coming from each EHU with colored electrical tape or labels. Mark them before you tape them along the boom, it is very easy to get two parallel wires mixed up. When the user is on the tower, it will be easy to identify each element control cable.

System

This menu gives access to the controller's fault listing, as well as options for the controller itself, independent of any connected antenna. Use the **K1 knob** to scroll through and highlight the desired sub-menu, then press **Select** or **K2 knob** to enter that menu.

Fault Listing

When there is a controller identifiable problem with the system, a "**Check Fault**" message will appear in the top right corner of the screen. This menu will display more information about the problem. Use the **K1 knob** to scroll through fault codes. It could be as simple as a disconnected control cable to as complex as a problem with antenna or controller.

There are several messages, but they fall into 3 categories:

No Response: Error message can be intermittent and indicate that the controller is having trouble communicating with another device. In the case of the remote driver board, this can be caused by cable and ground issues.

Antenna Cable Open: Indicates one of the antenna elements may not be working. The numbers refer to pins on the DB25 connector on the back of the controller. A damaged driver module can also cause this error, the driver module in question will be associated with the DB25 pins.

Driver Chip Error: This is a fatal error. It must be fixed before the controller can be used. The "U" number refers to the reference designator for the damaged driver module on the driver board.

The first step in fixing a fault will be the Resistance and Voltage Test which can be found on our troubleshooting page. Complete this test in its entirety, only then can SteppIR help troubleshoot the issue with you.

Firmware Update

This screen displays information about the controller's firmware version, as well as which transceiver and driver board firmware it has installed.

To update the controller firmware, obtain the following items:

1. USB Type A to Mini USB B cable (Provided with new controller).
2. Latest firmware version, available from the SteppIR website Download page.

Updating firmware will keep any changes made to the antenna profile on the controller, including any changes in the Create/Modify menu and Auto Track settings.

The firmware update process is:

1. Connect USB Type A to Type B cable from controller back panel to PC.
2. Plug controller in and turn it on.
3. On the controller, navigate to the "Firmware Update" page: Setup > System > Firmware update.
4. Select "Do Firmware Update".
5. Select confirm.
6. After confirming, your PC should register a new drive called IR2. Open the IR2 drive.
7. Drag and drop the .IR2 file downloaded from the SteppIR website into the IR2 drive.
8. Wait for the firmware installation to complete. Your OptimizIR 2.0 will restart.
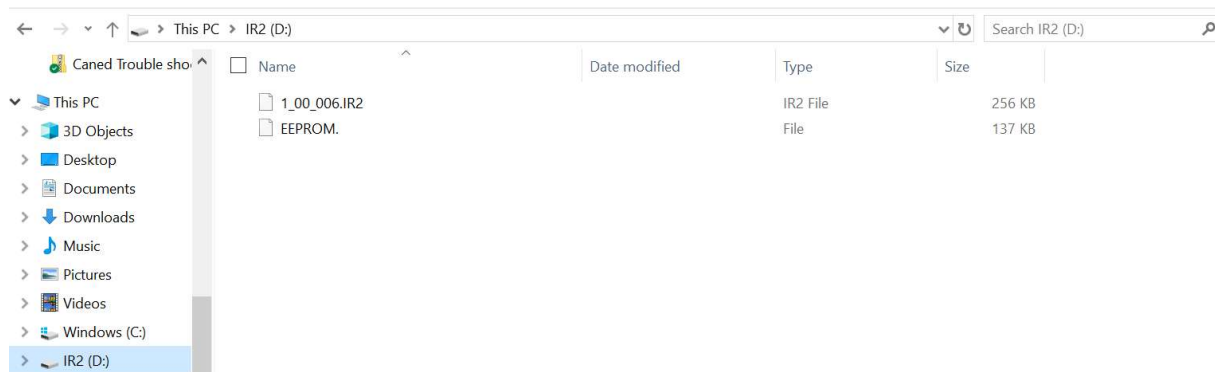
Screen Capture – IR2 Drive Folder

LCD Display Setup

The **K1 knob** scrolls through the changeable items. The **K2 knob** is used to change the value of the highlighted item. Pressing **Select** or **K2 knob** will select the currently highlighted option if it is **LCD Defaults** or **Button Colors**. Care should be taken when changing colors. It is possible to change settings too much and cause a black display. Color adjust will show how it will look before pressing **Select** button. Be careful with the background, some colors cannot be changed.

> **LCD Defaults:** Resets all LCD display settings to factory default. Requires confirmation.
> **Button Colors:** Opens a menu to change how buttons look on your controller. All options range from 0 to 255, cycling through a rainbow of colors. Previews of normal and selected buttons are below the list of options. Use K1 knob to select which option to adjust, use K2 knob to change the value of the highlighted option. Press Exit to display the "save changes" prompt; pressing Select will save changes and pressing Exit will leave the menu without saving.
> **LCD Brightness:** Range is 0 to 32 with 0 being dimmest and 32 being brightest.
> **Background Color:** Range is 0 to 255 cycling through a rainbow of colors.
> **Foreground Color:** Range is 0 to 255 cycling through a rainbow of colors.
> **Text Color:** Range is 0 to 255 cycling through a rainbow of colors.

Loading Antenna Models

Antenna model files can be saved, uploaded, and downloaded to the controller from a connected PC. Using a USB Type A to Mini USB B cable, connecting the controller to the computer will allow access to the IR2 drive from the computer.

Accessing Antenna Files

The IR2 drive will have files for any antenna profiles that have been created on the controller or uploaded from the computer. Files for a specific antenna will be named after that antenna – an antenna file for a DB-42/80 will be named "DB4280.sav".

Master Antenna File – AllAnt
The master antenna file is stored in internal non-volatile memory, and will include "AllAnt" in its name. The options "Antenna select" and "default lengths" use data from this file to load the antenna profile. **THIS FILE SHOULD NEVER BE CHANGED BY THE USER**.

Saved Antenna File
A file created using the "Create/Modify" option on the controller. These files will be named after the antenna they are for and will be .sav file type.

Custom Antenna File
A file created outside of the OptimizIR 2.0 for a SteppIR antenna. These files can be uploaded as .csv files, regardless of their name.

Uploading and Downloading Antenna Files

With access to the IR2 drive, the user can copy any antenna files currently stored on the controller directly to their computer. This is done the same way as any other file is copied or moved from one place on the computer to another – make sure the antenna file being retrieved is stored somewhere outside of the IR2 drive, or it will remain inaccessible once the controller is disconnected.

Antenna files can also be uploaded directly to the controller from the computer. Drag and drop the .sav or .csv file for the antenna into the IR2 file, and it will overwrite the default model for that specified antenna. For changes to take effect, reset the Default Lengths.

Using the Controller for More Than One Antenna

To use the controller for more than one antenna, but not lose the custom settings, do the following:

1. Save current antenna data by dragging and dropping the .sav file from the IR2 drive to a different location on the computer.
2. **RETRACT** antenna elements and reboot the controller with it connected to the other antenna. Be sure to remove DC power before touching the control cable!
3. The controller is now ready for a different antenna.
4. Drag and drop the desired antenna file into the IR2 drive.
   a. Valid file types include .sav files and .csv files.
5. Navigate to the antenna selection menu and choose the new antenna profile.

Grounding the Controller

Make sure the controller is grounded! The ground lug locations are different based on the chassis your controller may have—the location of the lug shown below is for the latest version of the chassis which is made of stainless steel.

To ground the controller, remove the yellow cap on the lug and take off the first nut and star washer. Attach a ring lug to the grounding wire and secure it to the ground lug by placing the ring lug, then star washer, then screwing the nut back on. Tighten with a wrench or socket. The other end of the wire should connect to any suitable ground point, typically a ground bus bar used for station ground.

Ground Lug on OptimizIR 2.0

Tuning Relay

To prevent application of unintended, excessive RF power while the SteppIR antenna is tuning, the OptimizIR controller provides an isolated pair of contacts from a 3.5 mm stereo jack to interrupt the PTT relay signal to a linear amplifier. The provided 3.5 mm stereo plug to two RCA plug cable works well in most cases. Some more modern amplifier relay control schemes are different and may not accommodate an RCA plug. Older amplifiers may use high voltage in their PTT circuit which may be a problem for some transceivers. Please read your amplifier and transceiver manuals carefully. The 3.5 mm plug tip and ring connect to isolated relay contacts inside the controller that interrupt the PTT circuit. The sleeve connection serves as a ground/shield.
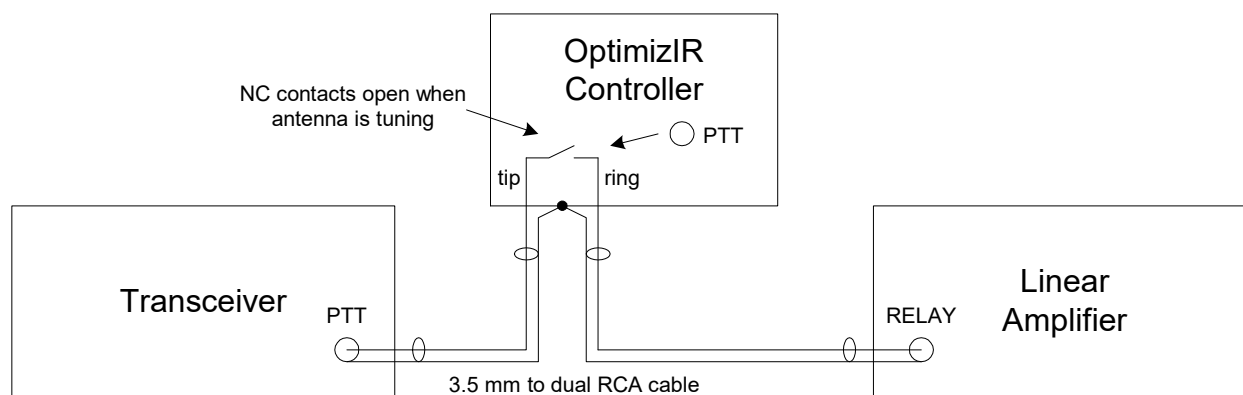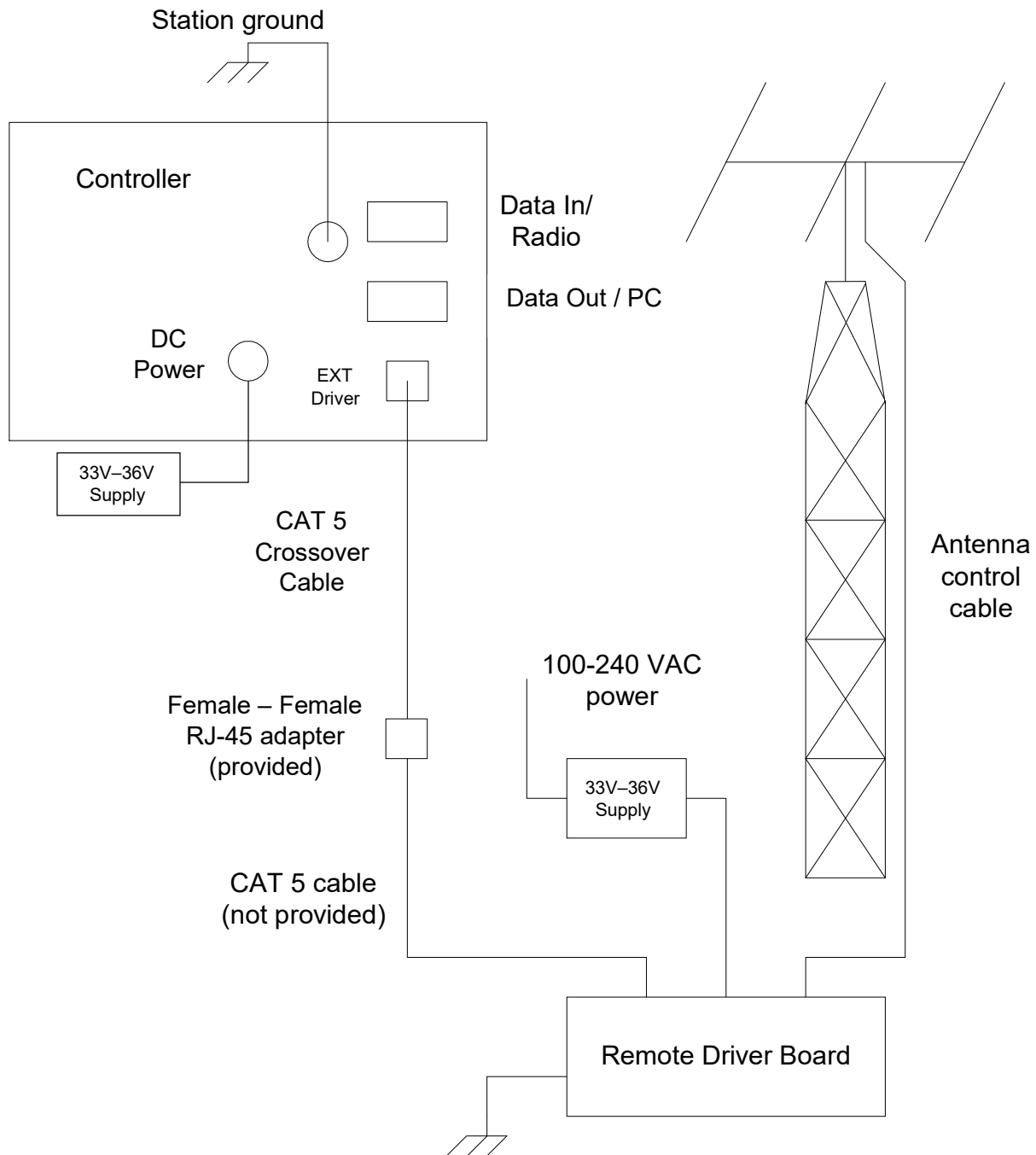

Tuning Relay Wiring

Remote Driver

This feature is for the user that needs to have the tower a considerable distance from the shack and controller. The problem this creates is line loss due to cable lengths over 400 ft. This feature solves that problem by placing another driver board at the base of the tower and connecting it remotely to the controller in the shack by use of CAT 5 cable. Now the user only needs to run the control cable up the tower. This option allows the user to have the shack and the remote driver board up to 900 ft. away from each other without any problem with line loss.

This option allows for more flexibility for antenna placement, but it requires a 100-240V power source at the tower. The capability to talk to the remote driver is built into the controller, but to utilize this feature, an optional kit is required. This kit includes the remote driver board, a 36V power supply used to power the remote board at the tower and a mounting plate for mounting the driver board in a dry location out by the tower. This will also act as a grounding plate and should be connected to good ground.

If you have two power supplies of different voltage/current (33V and 36V, for example), use the HIGHER voltage/current supply for the remote driver board, and keep the lower voltage supply for your controller.

Station ground

Controller

Data In/
Radio

Data Out / PC

DC
Power

EXT
Driver

33V–36V
Supply

CAT 5
Crossover
Cable

Antenna
control
cable

Female – Female
RJ-45 adapter
(provided)

100-240 VAC
power

33V–36V
Supply

CAT 5 cable
(not provided)

Remote Driver Board

Remote Driver Board Wiring

OptimizIR 2.0 Full Control via PC Terminal Emulator

The OptimizIR 2.0 can be **FULLY** controlled from a connected PC (personal computer) using a terminal emulator application. To do this, you will need to have a terminal emulator installed on your computer. A commonly used example is PuTTY, available from putty.org

The emulation setup process is:

1. Plug in your OptimizIR 2.0 to your computer using a USB A to USB Mini B cable.
2. Open your terminal emulator and make sure the connection type is "Serial". By default, the serial line will be set to COM1.
3. Enter the correct COM port. To find the correct COM port:
    a. Open device manager via the start menu on your PC.
    b. Open the drop-down menu for "Ports (COM & UPT)"
    c. Disconnect and reconnect the USB A from your computer – one of the COM ports listed will disappear and reappear. This is the correct COM port to enter.
4. Use the terminal emulator to open a connection to the OptimizIR 2.0 controller.
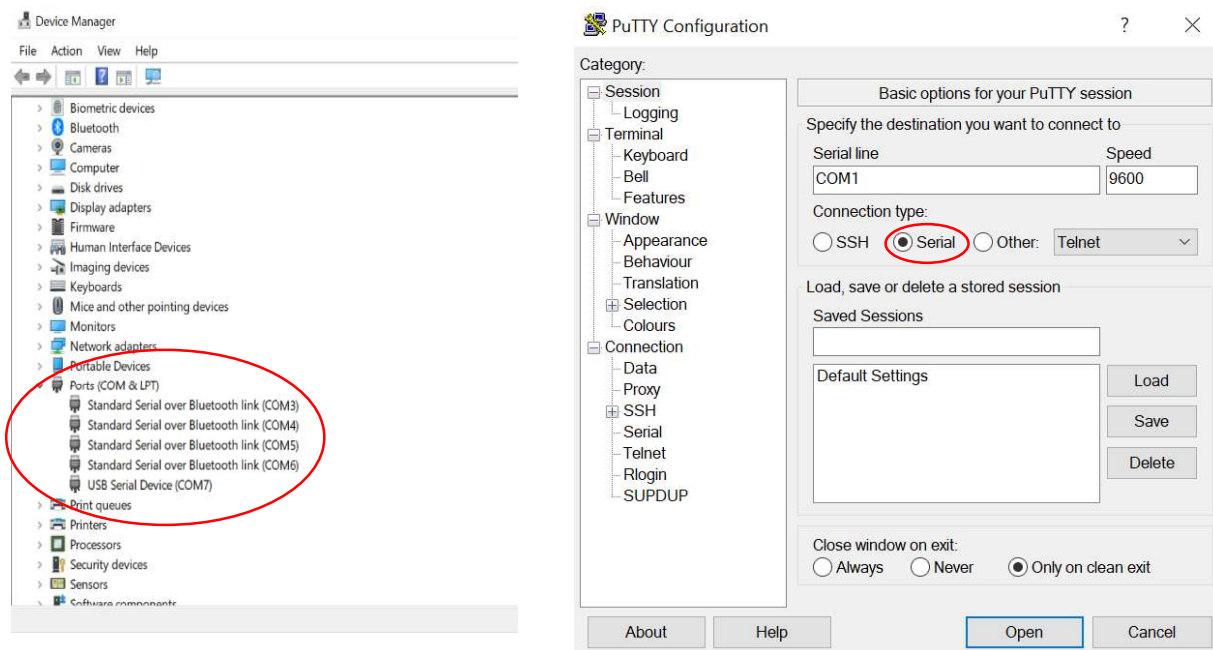
COM and Serial Setup

5. A command prompt window will appear. Press enter on your keyboard to render the OptimizIR 2.0 display. You can use the keys displayed to navigate the menus.
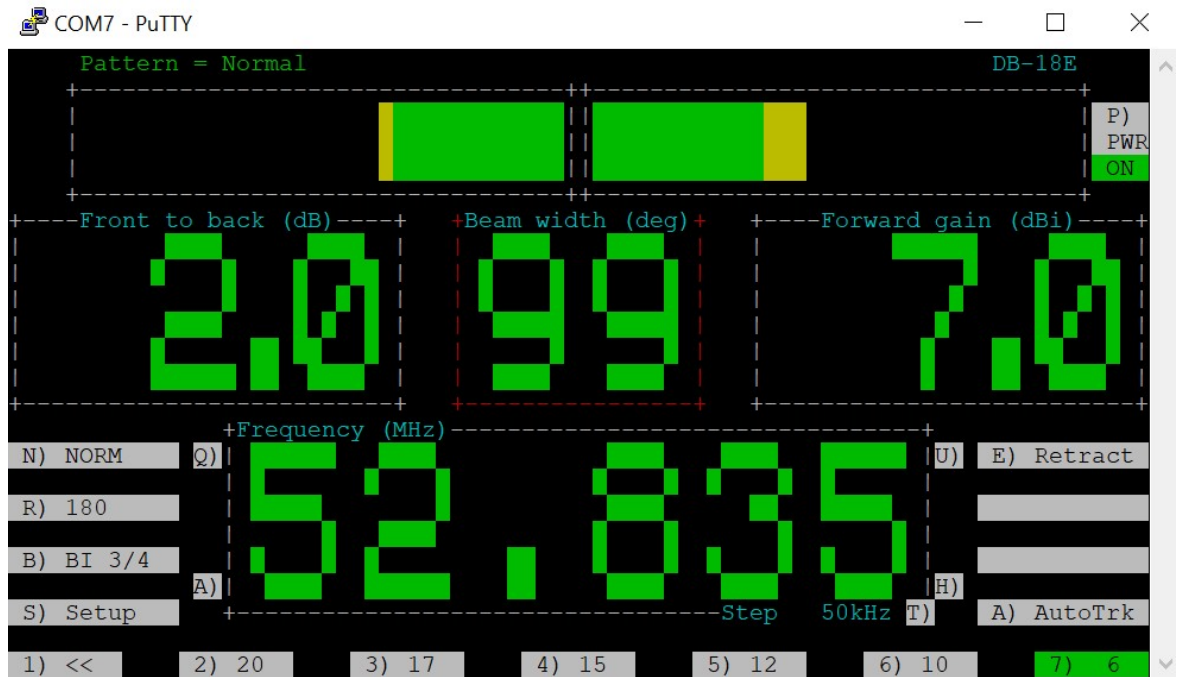
Emulated OptimizIR 2.0 Operate Screen on PC

This emulated OptimizIR 2.0 on your PC has full control of your physical controller. This includes:

- Power on/off
- Create/Modify
- All Modes and Patterns (NORM, 180, BI 3/4, Max Gain, Max F/R, etc.)
- Setup Menu
- Fault Listings
- Firmware Update Mode

This requires a PC to be at the site of the controller to do the terminal emulator control. If you can then remote into this PC you now have **Full Remote Control** of the OptimizIR 2.0 and SteppIR antenna.

CAT Command

The OptimizIR 2.0 can accept CAT protocols from a computer through the USB connection. Please contact SteppIR support for access to CAT protocols if you would like to write your own control software.

Driver Module Replacement

If a driver module fails, they are readily available from SteppIR at https://consumer.steppir.com/shop/. The correct replacement module will depend on when your controller was manufactured:

OptimizIR 2.0's that shipped **before** Mar. 20th, 2025 will need the standard driver modules found here: https://consumer.steppir.com/shop/parts/controllers/driver-chip-module/

Controllers shipped **after** Mar. 20th, 2025 will require the new high performance driver modules found here: https://consumer.steppir.com/shop/parts/controllers/high-performance-driver-module/.

DO NOT MIX OLD AND NEW DRIVER MODULES/BOARDS
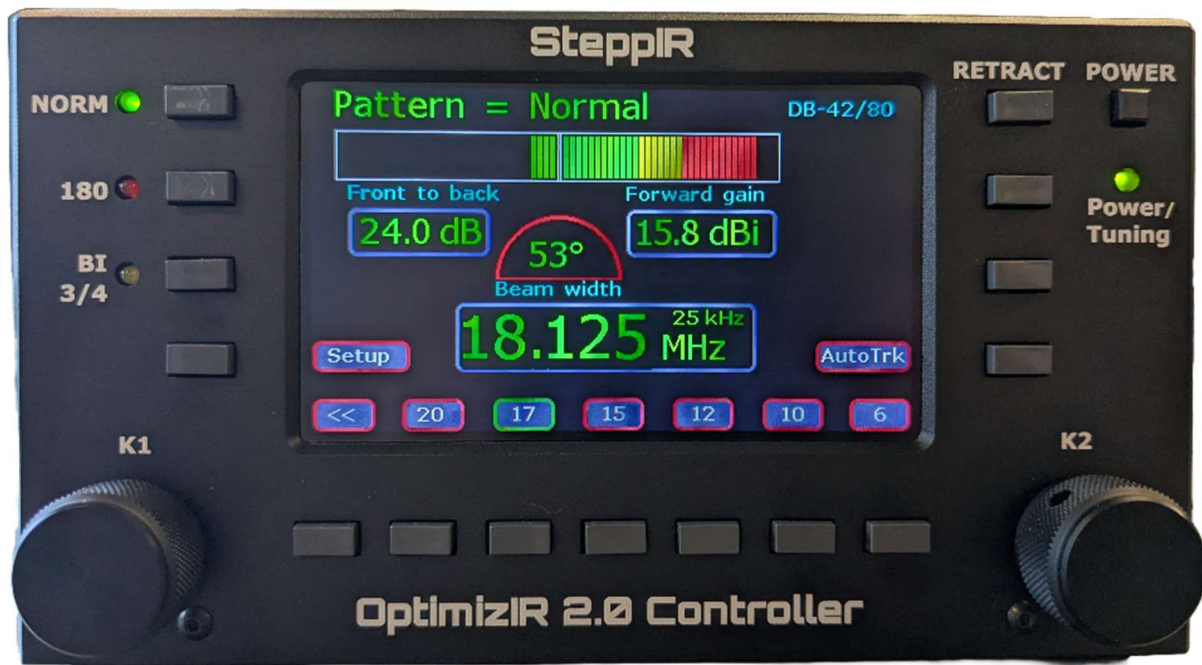
Front View of OptimizIR 2.0
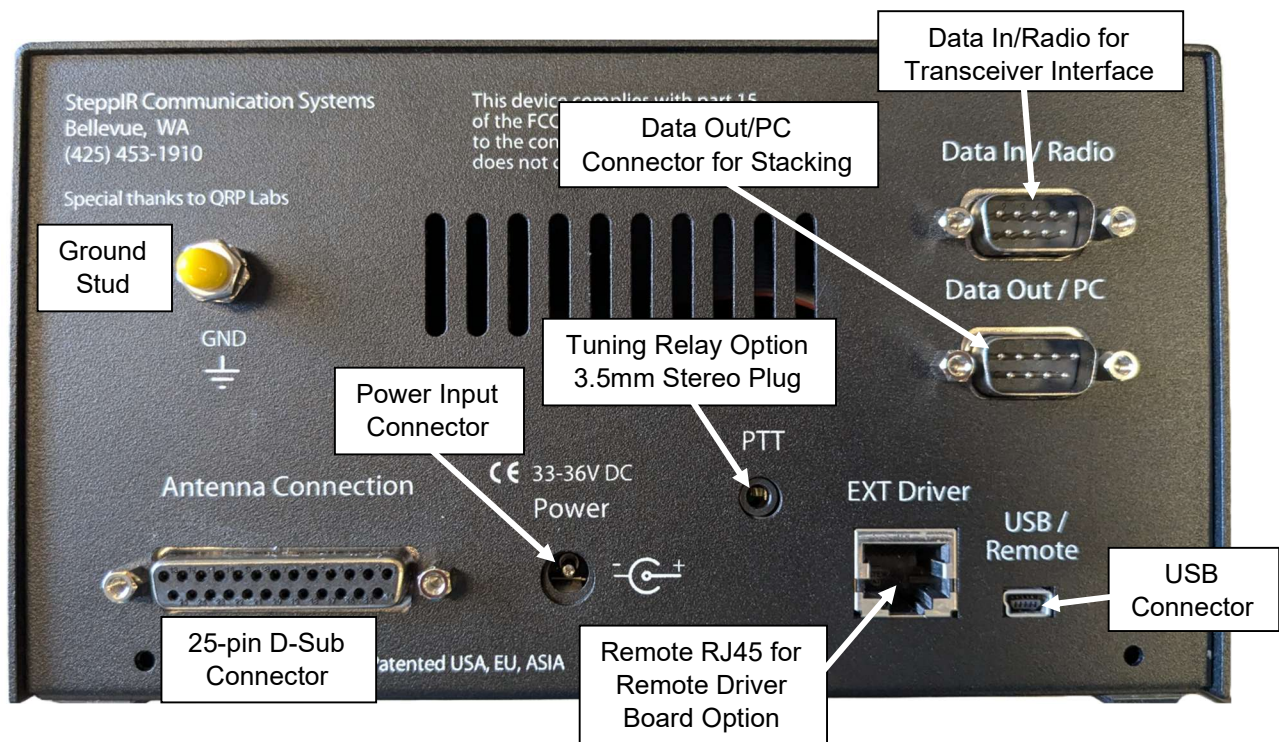
Rear View of OptimizIR 2.0

Customer Support

Tel: 425.453.1910

Email: support@steppir.com

Hours of operation are 9:00AM – 4:30 PM

For troubleshooting tips you can visit our website at consumer.steppir.com

Links to troubleshooting:

Support overview:

https://consumer.steppir.com/support/

Frequently asked questions:

https://consumer.steppir.com/support/faqs/

Troubleshooting tips:

https://consumer.steppir.com/support/troubleshooting/

Manuals and Brochures:

https://consumer.steppir.com/support/files/

Tech Support Videos:

https://consumer.steppir.com/support/tech-support-videos/

RMA Repair form:

https://consumer.steppir.com/support/rma-repair-form/

Bug Report Form:

https://consumer.steppir.com/support/report-a-bug/

STEPPIR COMMUNICATION SYSTEMS
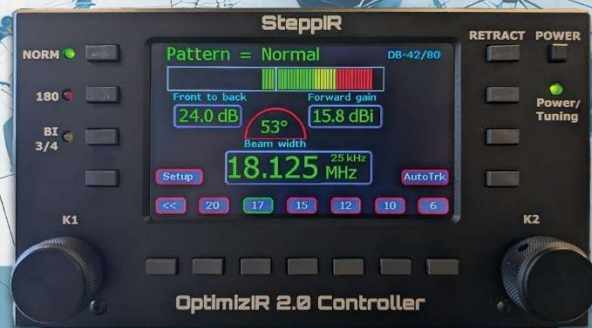
5 YEAR LIMITED PRODUCT WARRANTY

(as of May 22, 2023; Prior to that date warranty is 2 years)

Our products have a limited warranty against manufacturers defects in materials or construction for five (5) years from date of shipment. Do not modify this product or change physical construction without the written consent of Fluidmotion Inc, dba SteppIR Communication Systems.

This limited warranty is automatically void if the following occurs: improper installation, unauthorized modification and physical abuse, customer misuse or damage from weather events or natural disasters that are outside of the stated survivability of the product. For wind damage, proof of winds beyond 100 mph must be presented. Lightning or near-lightning events are not covered under this warranty. Driver chip module replacement is not covered under this warranty. This warranty is not transferrable.

SteppIR Communication System's responsibility is strictly limited to repair or replacement of defective components, at SteppIR's discretion. SteppIR will not be held responsible for any installation or removal costs, costs of any ancillary equipment damage or any other costs incurred as a result of the failure of our products.

OptimizIR 2.0

steppIR
COMMUNICATION SYSTEMS