Aclara RF 3.0 Base Station

Field Guide

Y21060-TUM
Revision A
www.Aclara.com

Disclaimer

The information in this document is subject to change without notice and should not be construed as a commitment by Aclara. Aclara assumes no responsibility for any errors that may appear in this document.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by Aclara. Metrum Cellular, STAR, Synergize, and TWACS are registered trademarks of Aclara Technologies LLC.

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FCC/IC Compliance Statement

This equipment has been tested and approved by Suppliers Declaration of Conformity to be compliant with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in the installation environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reposition or relocate the receiving antenna. (This would have to be done by an installer.)
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician (Aclara) for help.

FCC ID: LLB9985T491

IC: 4546A-9985T491

The antenna must not have a gain greater than:

- 7.1 dBi for 450 – 470 MHz
- 8.7 dBi for 901 – 941 MHz

Caution: Any changes or modification made to this device without the expressed, written approval of Aclara Technologies LLC may void the user's authority to operate this device.

Déclaration de conformité FCC/IC

Cet équipement a été testé et il est conforme aux limites pour un appareil numérique de Classe B, en vertu de l'article 15 des règlements de la FCC. Ces limites sont conçues pour offrir une protection raisonnable contre l'interférence nuisible dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie de fréquences radio et, s'il n'est pas installé ou utilisé conformément aux instructions, il peut causer une interférence nuisible aux communications radio. Il n'existe toutefois aucune garantie que de telles interférences ne se produiront pas dans une installation particulière. Si cet appareil cause des interférences nuisibles à la réception des signaux de radio ou de télévision, ce qui peut être détecté en mettant l'appareil sous et hors tension, l'utilisateur peut tenter de neutraliser l'interférence de l'une ou l'autre des façons suivantes:

- Réorienter ou repositionner l'antenne de réception.
- Augmenter la distance séparant l'équipement du récepteur.
- Brancher l'appareil dans une prise sur un circuit électrique différent de celui sur lequel le récepteur est branché.
- Consultez le revendeur ou un technicien radio/TV expérimenté (Aclara) pour obtenir de l'aide.

FCC ID: LLB9985T491

IC: 4546A-9985T491

L'antenne ne doit pas avoir un gain supérieur à:

- 7.1 dBi for 450–470 MHz
- 8.7 dBi for 901–941 MHz

Mise En Garde: Tout changement ou toute modification à cet appareil sans l'approbation écrite expresse d'Aclara Technologies LLC peut annuler l'autorisation de l'utilisateur d'utiliser cet appareil.

FCC/IC Exposure Statement

Aclara Technologies LLC low power RF devices and their antennas must be fixed-mounted on indoor or outdoor permanent structure(s) providing a separation distance of at least 1.5 meters (about 5 feet) from all persons during normal operation. This device is not designed to operate in conjunction with any other antennas or transmitters.

No other operating instructions for satisfying RF exposure compliance are needed.

Holding the antenna in one's hands while it is transmitting, or standing near a transmitting antenna for a prolonged period of time, could result in RF exposure that exceeds FCC and Health Canada recommendations.

Once the equipment is powered up and operational, it will emit RF energy. Installers, technicians, and the public at large should keep a distance of 1.5 meters (about 5 feet) or more from the plane of the antenna.

This equipment has been tested for exposure of humans to RF energy. It satisfies OSHA, FCC, and Health Canada requirements provided it is installed in a manner described in this manual and operated in accordance with the user guide.

Guide d’exposition aux RF FCC/IC

Les appareils RF de faible puissance d'Aclara Technologies LLC et leurs antennes doivent être montés de manière fixe sur une ou plusieurs structures permanentes intérieures ou extérieures offrant une distance de séparation d'au moins 1,5 mètres de toutes les personnes pendant le fonctionnement normal. Cet appareil n'est pas conçu pour fonctionner avec d'autres antennes ou émetteurs.

Aucune autre instruction d'utilisation pour satisfaire à la conformité en matière d'exposition aux RF n'est nécessaire.

Tenir l'antenne dans ses mains pendant qu'elle transmet, ou se tenir près d'une antenne émettrice pendant une période prolongée, pourrait entraîner une exposition aux RF qui dépasse les recommandations de la FCC et de Santé Canada.

Une fois l’équipement sous tension et opérationnel, il émettra de l’énergie RF. Les installateurs, les techniciens et le grand public doivent garder une distance d'au moins 1,5 mètres par rapport au plan de l'antenne.

Cet équipement a été testé pour l'exposition des humains à l'énergie RF. Il répond aux exigences de l'OSHA, de la FCC et de Santé Canada à condition qu'il soit installé de la manière décrite dans ce manuel et utilisé conformément au guide de l'utilisateur.

Tools and Equipment

In addition to standard hand tools, Aclara recommends having the following tools and equipment available when working on the Base Station:

- Laptop with Ethernet port
- Main board programming interface cable (20 foot Ethernet Cat-6)
- Battery interface cable (3-pin Molex style connector)
- VSWR Analyzer (Bird SiteHawk SK4500 TC or equivalent)
- Digital multi-meter (Fluke Model 1175 or equivalent)
- Dual range non-contact voltage detector (Klein Tools NCVT-2 or equivalent)
- ESD field service kit (DESCO PN 16475)
- Safety glasses, hard hat, and work gloves
- Torpedo level
- SAE socket set with ratchet and extension (11/32” deep well socket and 13mm socket required)
- 10mm socket (battery terminal removal)
- Metric M-20 open wrench (removal of cellular-GPS antenna)
- 0-100 inch-pound insulated torque wrench
- Scotch 3M Super Electric 88 tape
- Scotch 3M #2228 Rubber Mastic tape
- 11.8” or > black UV rated cable ties (local purchase)
- 11.8” stainless steel cable ties (coated for coastal regions—local purchase)
- Novagard G623 silicone compound (seals antenna threads to base)

- 1-13/16” two-nail staples (cable management on wood utility poles)
- Stainless steel cable-tie cutting tool

Safety Guidelines

Only trained personnel should be working on the Base Station.

Disconnect all power before working inside the Base Station enclosure. Aclara recommends using ESD grounding protective measures with the installation instructions of most of our products. Equipment ground or earth ground are acceptable for ESD grounding when this information is not available.

Remove all watches and jewelry prior to working inside the Base Station cabinet.

Do not place any metal conductive tools or hardware on top of the Base Station battery as an electrical shock and/or a Base Station equipment malfunction may occur.

- Always use ESD protective wrist straps when handling ESD sensitive assemblies, such as the PCB assemblies, to help ensure the continued performance of Aclara products.
- Discharge static on yourself by touching a metal object before unpacking or touching PCBs or other Base Station components.
- Handle PCBs by the edge of the board only and avoid touching the circuit board, contacts, or connectors.
- Use ESD safe tools and equipment.

Note: The Front End Module (FEM) can be damaged if the antennas are not connected while the PCB enclosure is powered.

Base Station Main Components

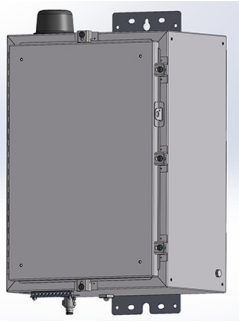
The Base Station includes RF antennas and a protective enclosure containing Base Station electronics and a rechargeable battery.

RF Antenna

A Base Station RF antenna is a separate component connected to the protective Base Station enclosure via coaxial cable. The cable required varies depending on the location of the installation. The antenna bracket should be positioned at least 30 feet above ground level to best communicate with electric endpoints.

Base Station Enclosure

The Base Station is contains four T-Boards/ FEMs. The Base Station cabinet is a lockable cabinet containing the electronics that communicate with the endpoints and the AclaraONE headend network. The electronics are AC-powered with a battery backup to maintain power to the Printed Circuit Boards (PCBs) at all times. Various mounting installation kits are available to secure the Base Station cabinet to a utility pole, roof mount mast, lattice tower, or street light.



Enhanced Base Station

Routine Visual Checks

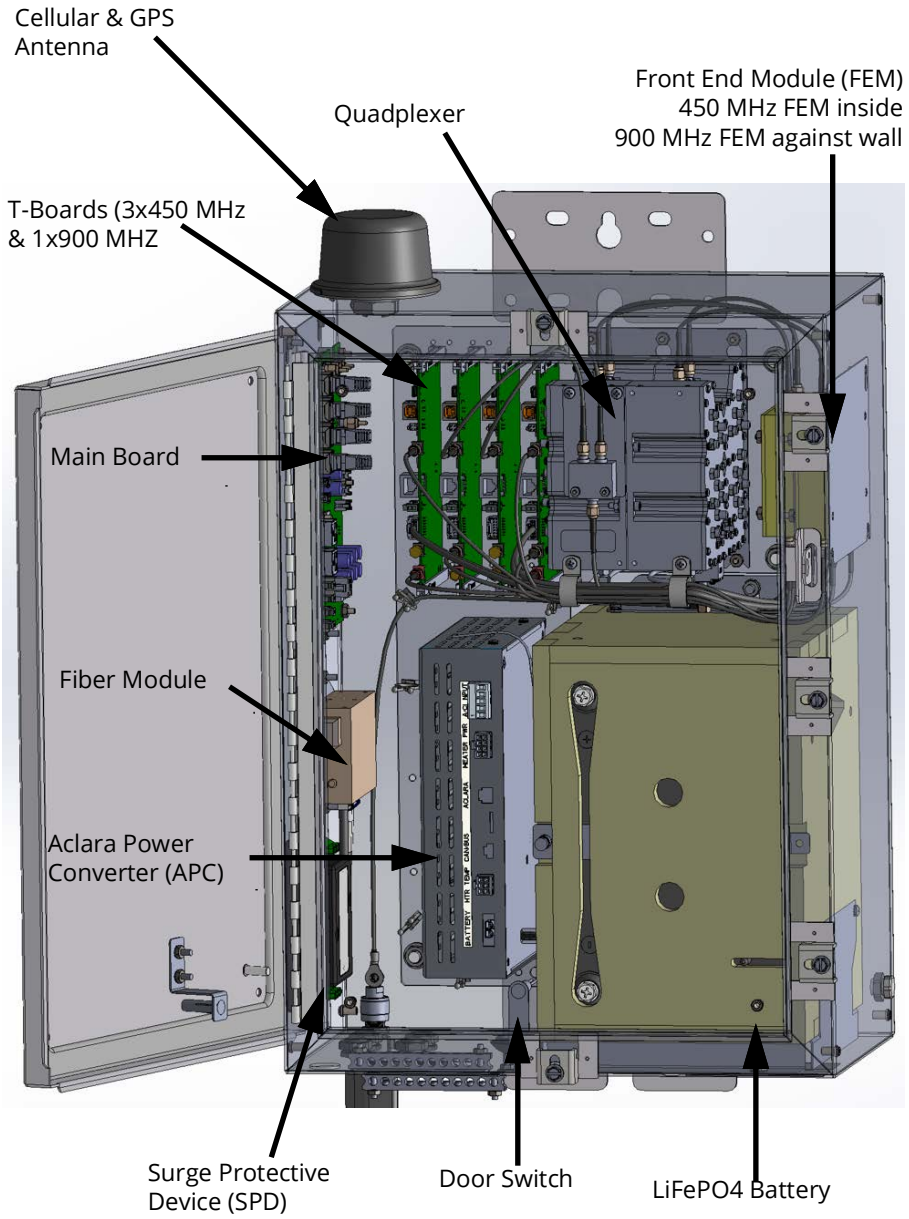
To avoid injury to oneself and damage to the Base Station system, use proper safety techniques when working inside the Base Station enclosure. Do not touch or allow metal objects to touch battery or AC components of the Base Station assembly.

High voltage hazard. To avoid injury and damage to the unit, take care while working inside the protective enclosure. Do not touch or allow foreign objects to touch the AC component.

The following list provides guidelines for performing a thorough visual inspection of the Base station unit and related equipment:

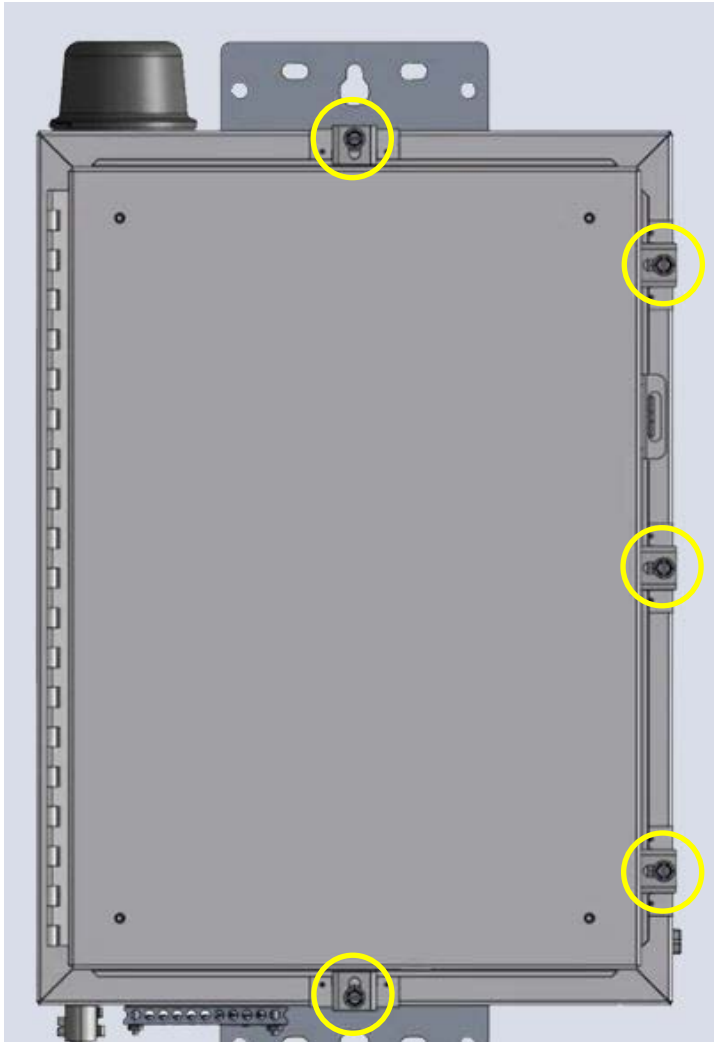
- Cracked, damaged, and/or frayed wires inside or outside of the cabinet
- Loose, corroded, rusted, and/or missing cabinet hardware
- Loose or unsecured cabinet mounting brackets and/or steel bands
- Loose or damaged antennas, connectors, and/or related hardware
- Open, loose, or blown battery fuse and/or other fuse
- Loose or corroded battery terminal connections
- Loose solar panel hardware; damaged or obstructed panel
- Missing or broken cable ties securing antenna cabling

Base Station Interior



Base Station Enclosure Door

1. Open the Base Station enclosure by loosening the 1/4”-20 clamp screws with a socket wrench or slotted screwdriver.



2. Reverse the procedure to secure the enclosure door. Tighten each clamp screw until each clamp is fully seated against the enclosure frame.

Power Disconnect

Disconnect AC power feeding the Base Station before servicing. The following instructions describe how to disconnect the AC power from electronics cabling, but it is critical to know that 120 VAC enters the box via the surge protector and remains live in the box even if you disconnect power into the battery controller. To perform work safely within the enclosure, remove and lockout the AC main power upstream prior to opening the enclosure door.

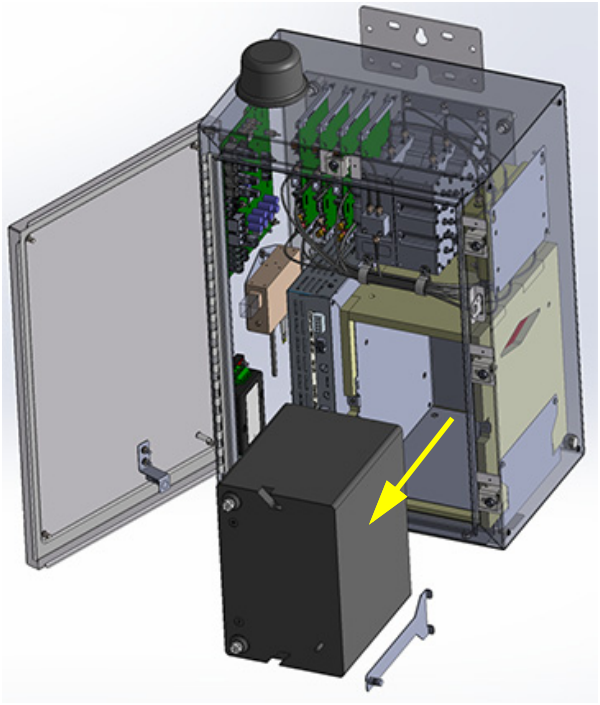
Note: To avoid damaging some components, make all antenna connections before connecting power.

Battery Removal

Use the following procedures when removing or replacing a battery to avoid creating a short circuit or damaging components.

Removal

1. Disconnect the power feeding the Base Station. See page 11..
2. Open the enclosure by loosening the 3/8” slotted hex bolts. See page 10.
3. Disconnect the battery cables from the Aclara Power Converter (APC). The battery cables plug into the port identified as *Battery* on the APC.
4. Disconnect the Batt/Can wires from the APC. The Batt/Can wires plug into the port identified as *Batt/Can* on the APC.
5. Remove the insulation cover.
6. Loosen the captive screw on the battery heater assembly strap using a #2 Phillips screwdriver.
7. Remove the battery heater assembly strap.
8. Slide the battery out of the cabinet.



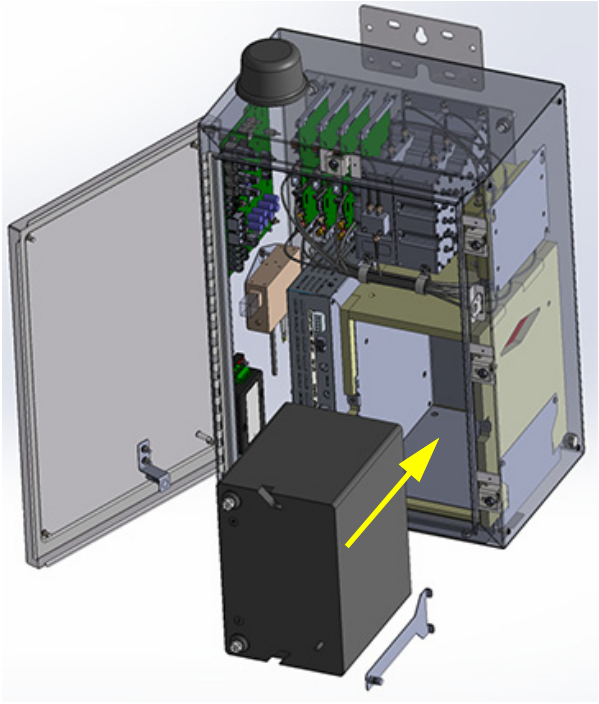
9. Raise the black insulated cover and battery strap away from the positive (+) terminal side of the battery.
10. Remove the black wire from the negative (-) terminal battery post and then the red wire from the positive (+) terminal battery post using a 10mm insulated torque wrench.*

*Batteries must be disposed of according to national and local ordinances.

Battery Installation

Note: To avoid damaging some components, make all antenna connections before connecting power.

1. Connect the red wire to the positive **(+)** terminal.
2. Connect the black wire to the negative **(-)** terminal.
3. Tighten the battery lugs to 60 inch-pounds using a 10mm insulated torque wrench.
4. Slide the battery back into the enclosure.



5. Reinstall the battery heater assembly strap and tighten with a #2 Phillips screwdriver.
6. Reinstall the insulation cover.
7. Plug the Batt/Can wires int the port labeled *Batt/Can* on the APC.
8. Plug the battery cables into the port labeled *Battery* on the APC.
9. .Close the enclosure door by tightening the 3/8” slotted hex bolts.
10. Reconnect the main power connector.

dbSpectra Antenna Cable Removal/ Replacement

1. Disconnect the power feeding the Base Station. See page 11.
2. Open the enclosure by loosening the 1/4”-20 clamp screws. See page 10.
3. Remove any cable ties securing antenna cable.
4. Remove the tape from the RF antenna connectors.
5. Disconnect the antenna cable from the bottom of the Base Station and the antenna base.
6. Connect one end of the new antenna cable to the connector on the bottom of the Base Station cabinet.
7. Route and secure cable as necessary using cable ties or other appropriate fasteners every three feet.
8. Connect the other end of the new antenna cable to the antenna base.

1. Cover the entire connector of each antenna cable connection with a half-lapped layer of electrical tape, beginning just below the shrink wrap and wrapping from bottom to top.
2. Note: This layer should be applied with the adhesive side out for easy removal.
3. Layer half-lapped mastic tape over the electrical tape, wrapping from bottom to top.
4. Wrap another layer of half-lapped electrical tape from bottom to top over the mastic tape.
5. Tie off the top of the wrap with a UV-rated cable tie at the top to prevent unraveling if the adhesive fails.

9. Verify the components are functioning correctly per Bird SiteHawk testing.
10. .Close the enclosure door by tightening the 1/4”-20 clamp screws until each clamp is fully seated against the enclosure frame.
11. Reconnect the main power connector.

Laird RF Antenna Base Removal/ Replacement

1. Disconnect power connector from the PCB enclosure. See page 11.

Note: The Front End Module (FEM) can be damaged if antennas are not connected while the Base Station is powered.

2. Remove tape from RF antenna connector.
3. Disconnect cable connector from RF antenna.
4. Loosen the two bolts from sleeve and remove antenna.
5. Insert new antenna into the sleeve and secure as shown.

Note: One clamp must be placed at center of sleeve, the other at any point below.

6. Connect the cable to the new antenna using the instructions in the following section.

Cellular Antenna Removal/ Replacement

1. Disconnect AC power from the Base Station. See page 11..
2. Open the enclosure by removing the 1/4”-20 clamp screws. See page 10.
3. Remove M-20 nut and washer that secure antenna to Base Station cabinet.
4. Grasp cellular antenna on top of Base Station unit, then turn it to the left to loosen.
5. Remove old antenna.
6. Install new antenna.
7. Tighten antenna by turning it to the right.
8. Verify Commissioning parameters include correct GPS and Cellular values.
9. Force a call from Base Station unit then verify backhaul communications were received at the AclaraONE network.
10. Secure Base Station cabinet door.
11. Restore power to Base Station enclosure.

Printed Circuit Board (PCB) Removal/ Replacement

Disconnect all power before working inside the Base Station enclosure. See page 11. Aclara recommends using ESD grounding guidelines in the installation instructions of most of our products. Equipment ground or earth ground are acceptable for ESD grounding when this information is not available.

Remove all watches and jewelry prior to working inside the Base Station cabinet.

Do not place any metal conductive tools or hardware on top of the Base Station battery as an electrical shock and/or a Base Station equipment malfunction may occur.

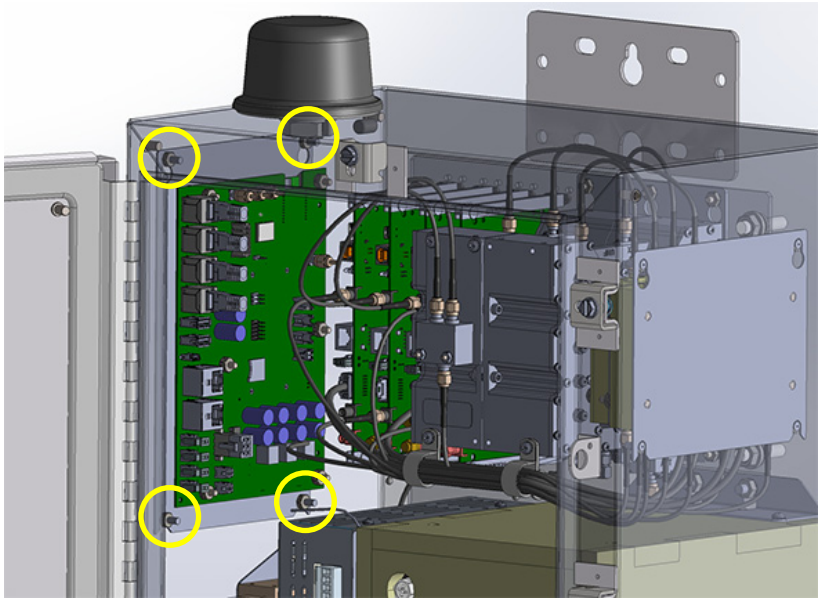
- Use ESD protective wrist straps at all times when handling ESD sensitive assemblies, such as the PCB assemblies, to help ensure the continued performance of Aclara products.
- Discharge static on yourself by touching a metal object before unpacking or touching the PCBs or other Base Station components.
- Handle the PCBs by the edge of the board only and avoid touching the circuit board, contact, or connectors.
- Use ESD-safe tools and equipment.

Main Board Removal/Replacement

1. Disconnect power from the Base Station cabinet. See page 11.
2. Open the Base Station enclosure door. See page 10.
3. Place ESD grounding strap on your wrist and tighten. Then connect the opposite end of the wire to ground lug on the Base Station cabinet.

Note: For more information on proper ESD handling, please refer to *Guidelines for Handling Electrostatic Discharge Sensitive Components (Y20217-TEB)*.

4. Disconnect easily accessible cables connected to the main board.
5. Loosen but do not remove the four #8-32 KEPS nuts holding the main board bracket to the enclosure wall using a deep well, 11/32" socket.



6. Slide the main board bracket subassembly towards the top of the enclosure and remove it from the enclosure.
7. Disconnect remaining cables from the main board.
8. Connect any cables removed from the old board to the new main board.
9. Place the new main board bracket subassembly over the four #8-32 KEPS nuts on the enclosure wall and slide it down.
10. Tighten the four #8-32 KEPS nuts.
11. Connect any cables disconnected in Step 4 to the main board.

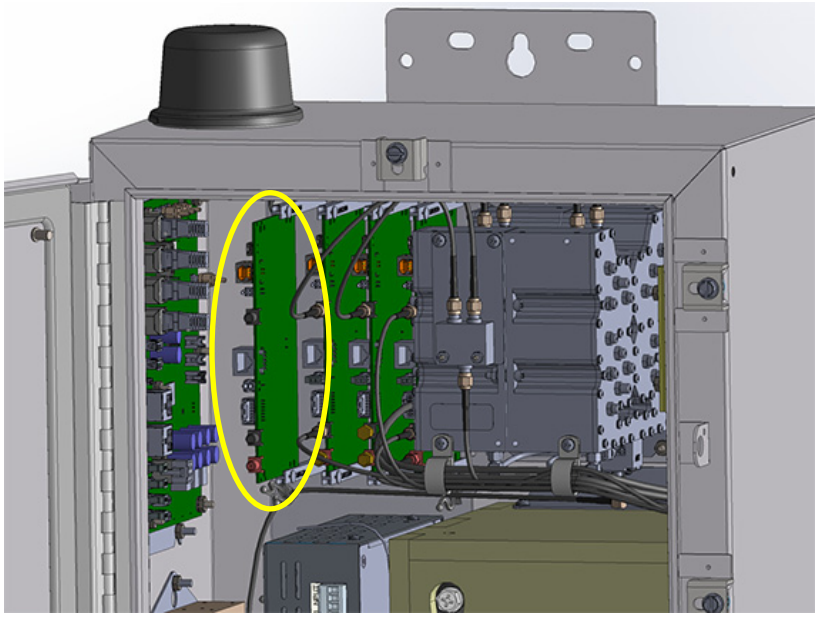
12. Close and secure the Base Station door.
13. Remove the ESD strap from your wrist and the Base Station ground lug.
14. Restore power to the Base Station enclosure.

T-Board Removal/Replacement

1. Disconnect power from the Base Station cabinet. See page 11.
2. Open the Base Station enclosure door. See page 10.
3. Place ESD grounding strap on your wrist and tighten. Then connect opposite end of wire to the ground lug on the Base Station cabinet.

Note: For more information on proper ESD handling, please refer to *Guidelines for Handling Electrostatic Discharge Sensitive Components (Y20217-TEB)*.

4. Disconnect any cables in the way of or connected to the T-Board you are replacing.

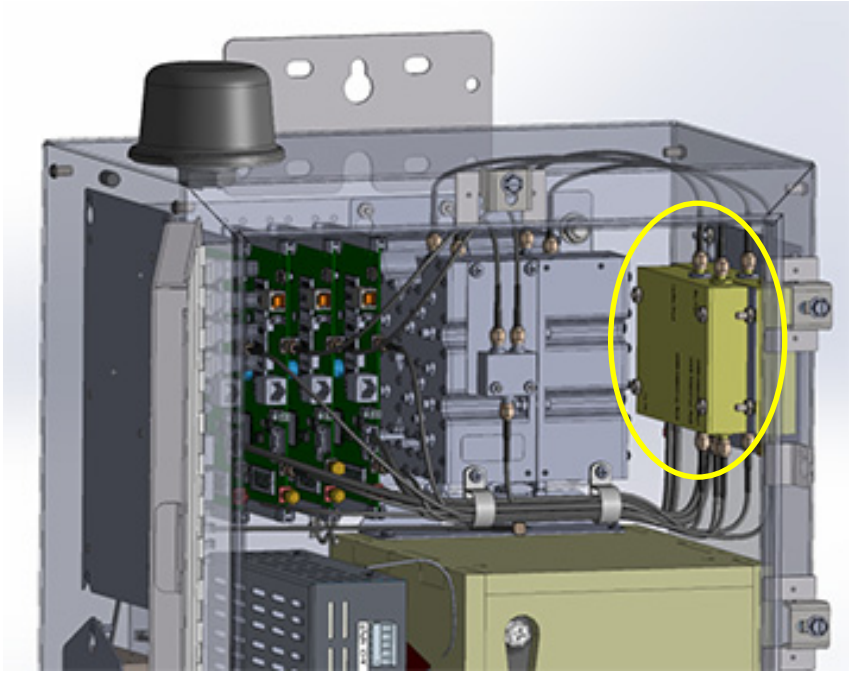


5. Release the card guide locks and remove the T-Board.
6. Reinstall the new T-Board.
7. Reconnect any cables disconnected from the old T-Board in Step 4.
8. Close and secure the Base Station cabinet door.

9. Remove the ESD strap from your wrist and from the Base Station ground lug.
10. Restore power to the Base Station enclosure.

Note: Use the ESD protective bag from the new board to protect the old board when returning it to Aclara.

Front End Module (FEM) Removal/ Replacement

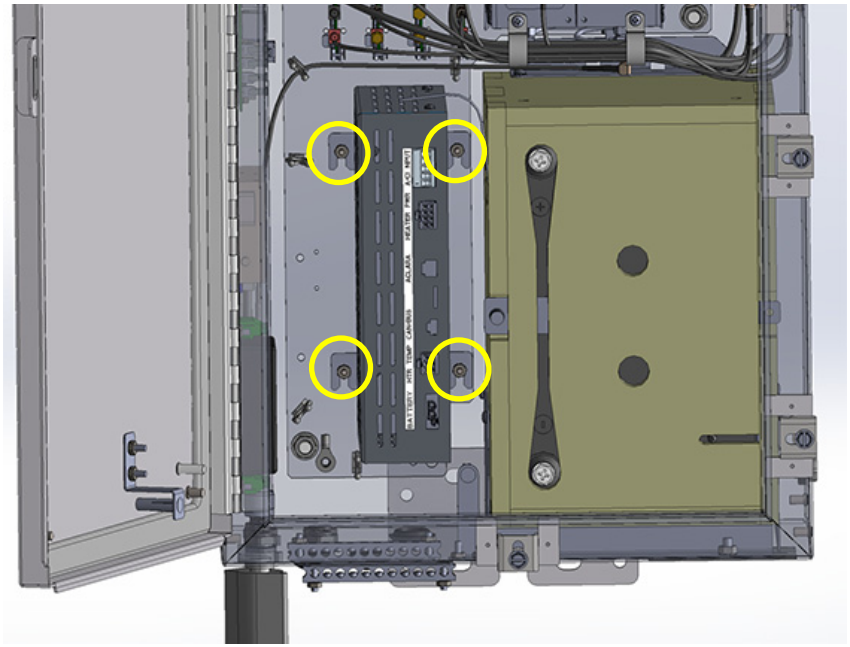


1. Disconnect power from the Base Station cabinet. See page 11.
2. Open Base Station enclosure door. See page 10.
3. Loosen but do not remove the four #8-32 KEPS nuts holding the FEM bracket to the enclosure wall using a deep well, 11/32” socket.
4. Slide the FEM bracket subassembly towards the top of the enclosure and remove it from the enclosure.
5. Disconnect all cables from the FEM for replacement.
6. Remove the #8-32 nuts from the FEM bracket subassembly to access individual FEMs if necessary.
7. Connect any cables removed from the old FEM to the new FEM.

8. Place the new main board bracket subassembly over the four #8-32 KEPS nuts on the enclosure wall and slide it down.
9. Tighten the four #8-32 KEPS nuts.
10. Close and secure the Base Station door.
11. Restore power to the Base Station enclosure.

Aclara Power Converter (APC) Removal/Replacement

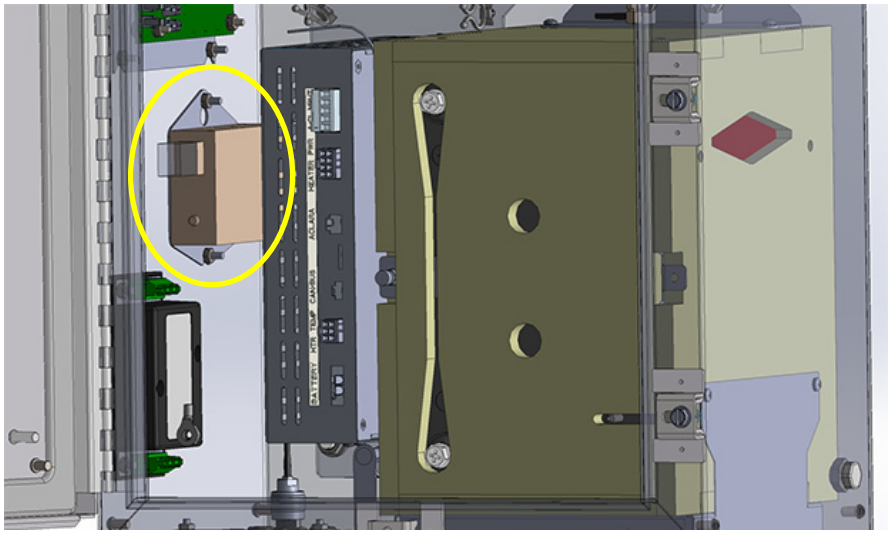
1. Disconnect power from the Base Station cabinet. See page 11.
2. Open the Base Station enclosure door. See page 10.
3. Disconnect all cables from the APC.
4. Loosen but do not remove the four #8-32 KEPS nuts holding the APC to the back panel using a deep well 11/32” socket.



5. Slide the APC towards the top of the enclosure and remove it from the enclosure.
6. Place the new APC over the four #8-32 KEPS nuts on the back panel and slide it down.
7. Tighten the four #8-32 KEPS nuts.
8. Connect any cables removed from the old APC to the new APC.

9. Close and secure the Base Station door.
10. Restore power to the Base Station enclosure.

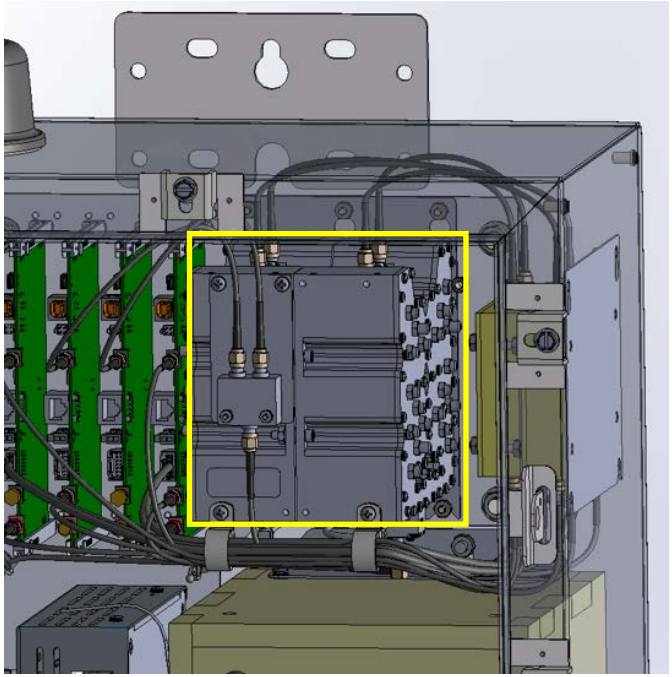
Fiber Module Removal/Replacement



1. Disconnect power from the Base Station cabinet. See page 11.
2. Open the Base Station enclosure door. See page 10.
3. Disconnect the fiber module power cable and Ethernet cable from the main board.
4. Loosen but do not remove the two #8-32 KEPS nuts holding the fiber module assembly to the enclosure wall using a deep well 11/32” socket.
5. Slide the fiber module subassembly towards the top of the enclosure and remove it from the enclosure.
6. Disconnect any remaining cables from the fiber module.
7. Remove the fiber module bracket and four M3 flathead screws from the fiber module using a #1 Phillips screwdriver.
8. Attach the fiber module bracket to the new fiber module using the four M3 flathead screws removed in the previous step.

9. Connect the cables disconnected in Step 6 to the new fiber module.
10. Place the fiber module subassembly on the two #8-32 KEPS nuts on the enclosure wall and slide it towards the bottom of the enclosure.
11. Tighten the two #8-32 KEPS nuts.
12. Connect the fiber module power cable and the Ethernet cable from the main board to the new fiber module.
13. Close and secure the Base Station door.
14. Restore power to the Base Station enclosure.

Quadplexer Removal/Replacement



1. Disconnect power from the Base Station cabinet. See page 11.
2. Open the Base Station enclosure door. See page 10.
3. Remove the splitter bracket from the Quadplexer by removing the #8-32 stainless steel screw with a #2 Phillips screwdriver.
4. Remove the routing clips from the Quadplexer by removing the #8-32 stainless steel screws with a #2 Phillips screwdriver.
5. Loosen but do not remove the five #8-32 KEPS nuts holding the Quadplexer to the back panel using a deep well, 11/32” socket.
6. Slide the Quadplexer towards the top of the enclosure and partially remove it from the enclosure.
7. Disconnect any remaining cables from the Quadplexer.

8. Remove the Quadplexer bracket by removing the #8-32 stainless steel flathead screws with a #2 Phillips screwdriver.
9. Attach the Quadplexer bracket to the new Quadplexer using the #8-32 stainless steel flathead screws and #2 Phillips screwdriver used in the previous step.
10. Connect the cables removed in Step 7 to the new Quadplexer.
11. Place the new Quadplexer over the five #8-32 KPES nuts located on the back panel and slide it toward the bottom of the enclosure.
12. Tighten the five #8-32 KEPS nuts with an 11/32” socket.
13. Attach the routing clips to the Quadplexer using the #8-32 stainless steel screws and a #2 Phillips screwdriver.
14. Attach the splitter bracket to the Quadplexer using the #8-32 stainless steel screws and a #2 Phillips screwdriver.
15. Close and secure the Base Station door.
16. Restore power to the Base Station enclosure.

Base Station Commissioning Hardware Setup Laptop Ethernet Connection

1. Connect the Ethernet cable to laptop and main board.
2. Open a web browser on the laptop.
3. Access the local user interface by typing **https://192.168.8.20:8080** in the web browser's address bar.
4. Select the desired menu option to perform Base Station commissioning.
5. Review the results.
6. Select menu option to log off.
7. Remove the Ethernet cable.

Disconnect from the Base Station

1. Remove the Ethernet cable from the static IP port of the Base Station.
2. Close and lock the Base Station cabinet door.

Investigation Inside the Base Station Enclosure

Note: Use ESD procedures when handling PCBs.

Verify the following:

- PCB LEDs are properly illuminated (refer to specific PCB troubleshooting for LED function description).
- Cable connections are not damaged, intact, and securely tightened.
- Battery terminals are secure and proper voltage is identified.
- VSWR measurement is within specification if having end point communication issues.
- Verify Base Station Commissioning Parameters .

Note: Resetting the Base Station power may clear some problems.

Troubleshooting

It is important to know the battery state-of-charge varies by season and latitude.

Checking the Base Station Battery

With a laptop properly connected to the Static IP Ethernet port of the Base Station, verify the battery is connected, charging, and communicating with the battery controller.

No LEDs Illuminated

If no LEDs are illuminated and the battery state of charge is low, it may indicate a problem. Possible causes may be:

- Loose wire on AC—Call electrician to repair wire connection
- No AC power—Call electrician to repair power source

Base Station Support and Returns

Aclara Contact Information

Aclara Technologies LLC
30400 Solon Road
Solon, Ohio 44139
Phone: 800-892-9008
Email: Aclarasupport@hubbell.com

Aclara Support

For additional questions or support, contact Aclara via email Aclarasupport@hubbell.com or call 1-800-892-9008.

Aclara Returns

To return product, email AclaraRMA@hubbell.com or call 1-800-892-9008.