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Ka Components
Ka Kit Hardware

Ka Kit Components List:
- Ka Feed Assembly which includes:
  - 50W Wavestream Ka SSPA
  - Ka LNB
  - LHCP and RHCP polarizer with emitter
- Transit Case for Ka Feed Assembly or Ku Feed Assembly (Ku feed shown)
- Base Support plate
- Ku Waveguide covers
- Threaded bolts
- Attaching hardware
- Installation cables

The Ka feed contains both the Solid State Power Amplifier (SSPA) and the Low Noise Block Down Converter (LNB) mounted on a single assembly. The Ka frequency band, like X band, utilizes circular polarization.

The ruggedized Pelican transit case is designed to accommodate both the Ku and Ka feed assembly. The case comes equipped with handles for lifting as well as wheels and an extendable handle similar to a suitcase.

The base support plate is required to provide a means to attach the Ka feed assembly. The plate, once installed, does not interfere with the Ku feed assembly and is not necessary to remove.

The waveguide covers are used to prevent dust and debris from entering the Ku waveguide when not in use.

There are 2” threaded bolts installed on the Ka feed while there are 3” bolts provided with the additional hardware. Use of the different length studs will vary between STTs.

The installation cables are used to route the L-Band signal, M&C, and 120 VAC from the Ku HPA to the Ka SSPA.
Overview:

- **Low Noise Block Downconverter (LNB)**
  LNB downconverts incoming Ka-band frequency to L-Band
  LNB requires 10 MHz reference (from the A1A3 GPS) and 17 VDC
  (from the A1A5 IFSP) to operate.

- **Polarizer and Emitter**
  Manually selectable between RHCP (Right Hand Circular
  Polarization) and LHCP (Left Hand Circular Polarization)
Circular Polarization

Overview:

• Circular Polarization is utilized in Ka Band configuration.

• The polarizer and emitter are manually selectable between Left Hand Circular Polarization (LHCP) and Right Hand Circular Polarization (RHCP) at the Ka feed assembly. Selection or adjustment to the polarizer must be performed with the uplink power disabled to prevent radiating personnel and damaging equipment.

• Pictured above is the LHCP label that lines up with the arrow to signify which polarization is currently being utilized. Operators should inspect to determine if there is a RHCP label as many of the feed assemblies were only labeled with the LHCP identifier. If this is found to be the case, be sure to place the RHCP label a quarter turn away from the LHCP label.
Low Noise Blocker (LNB)

Specifications:
- Gain: 60 dB
- Maximum Input Power: -20 dBm
- Reference Frequency: 10 MHz @ +/-5 dBm
- Operating Voltage: +15 to +24 VDC
- Max Current: 500 milliamps

Model Number:
- 294225-01
  - Input: 20.20 – 21.20 GHz
  - Output: 1.0 – 2.0 GHz
- Translation Frequency:
  - 19.2 GHz
Solid State Power Amplifier (1)

Overview:

Wavestream 50W Ka-Band Grid Amplifier

- The Solid State Power Amplifier (SSPA) is a type of High Power Amplifier (HPA) that utilizes transistors arranged in a grid array to amplify Ka-Band signal to the satellite. The array consists of several hundred transistors, which together form in-waveguide amplification.

- The SSPA has an integrated Block Upconverter (BUC) for frequency up-conversion to Ka-Band of the L-Band output from the IF Signal Processor.

- BUC receives 10 MHz via the IF Signal Processor from the GPS Unit (A1A3) to operate.

Specifications:

- Gain
  - 60 dB +/-5dB
- Output Power
  - Rated at 50 W
- Input Frequency
  - 1.0 - 2.0 GHz
• Output Frequency
  — 30.0 – 31.0 GHz
• Translation Frequency
  — 29.0 GHz
• Operating Temperature
  — -58 to 140 °F(-50 to 60 °C)
• Power
  — 120 VAC, Single Phase, 2 Wire, 50-60 Hz, 6.5 A Max
Controls and Indicators:

1. RF Sample (J5)  - (Not Used in STT)
2. AC Input (J3)   - 120 VAC from Inverter #1 (A1A8)
3. RF Input (J1)   - 1.0 – 2.0 GHz and 10 MHz reference input from IFSP
4. RF Output (J2)  - 30.0 – 31.0 GHz output to diplexer, polarizer, and Emitter.

Note:
When lifting the feed assembly, ensure to use the proper handles. Never use the waveguide to lift or support the weight of the feed assembly.
Solid State Power Amplifier (3)

Controls and Indicators:

Cooling Fans:
- Operate at temperatures above 55 °F (12.7 °C).
- Airflow is from the bottom and sides then out through the fans.
- The fans are variable speed so may operate at full speed or slow speed as needed. Individual fans will turn on as temperature increases.
- The fans are the only serviceable parts of SSPA.
Ka Feed Assembly
Installation
Prior to feed plate removal, antenna must be positioned to allow access to the feed plate assembly.

**Deploy Antenna:**

1. At A2A9 AC/DC Indicator Switch (1), toggles the rocker switch to ON position and release.

2. At Inverter #2 (A2A12), place the ON/OFF Switch to ON (2). Inverter will display “STAND BY”.

3. Start the DC Inverter by pressing the ON/OFF Button (3).
4. At A2A10 PDU, place the ON/OFF Switch (1) to ON.

5. At A1A7 PDU, place the ON/OFF Switch (1) to ON.
6. At A1A4 ACU, press the POWER key to the up (On) position.
   - Wait momentarily, for the ACU to complete the boot up process.

7. At this time, confirm there are no overhead obstructions that may be exposed to the antenna.
8. At ACU Main Menu screen, verify ACU has booted up properly by observing LCD displays proper values.

9. Press the More key until the ACU Main Menu Screen displays Stow and Deploy (Stow and Deploy Screen).
Ku Feed Removal (5)

10. Press the Deploy soft key, and then press Execute. Press the Esc key once to return to the ACU Main Menu screen.

11. Press the More key until the ACU Main Menu Screen displays Standby

12. Once the antenna has deployed enough to allow sufficient access to remove the feed assembly, press the Execute soft key to place the ACU (and antenna) in Standby mode.

13. After the antenna is positioned to prepare the Ku feed assembly for removal, power down the equipment.
Ku Feed Removal (6)

- **CAUTION:** Use caution when working around feed window. Damage to the feed window may interfere with system operation.
- **CAUTION:** Do not sit or stand on the boom assembly to avoid possible damage to the waveguide.
- **CAUTION:** Use caution when working around feed window. Damage to the feed window may interfere with system operation.
- **CAUTION:** Do not remove the focal plate from the feed boom assembly. The focal plate is necessary for maintaining alignment for both the Ka feed and Ku feed.
14. At feed plate assembly, disconnect cable W5 P15 from feed plate assembly connector J15.

15. Disconnect cable WS2102 P1 from feed plate assembly connector J18.

**Note:**
Ensure that when disconnecting the cable for the polarizer to twist the connector end and not the cable. If necessary, use soft grip pliers to aid in removing the cable.
16. Using a 7/64 in. hex key and 1/4in to 5/16in. combination wrench remove the 4 screws, 4 lock washers, 4 flat washers and 4 nuts that attach flexible waveguide to rigid waveguide.

17. Remove rubber gasket from waveguide. Retain gasket for use.
18. On the feed plate assembly, rotate locking screws counter-clockwise from threaded inserts (Feedplate Locking Screws).

19. Using handles, lift feed plate assembly from pins and place the feed assembly on a flat surface.

20. Secure waveguide covers from the Ka kit and attach onto the open Ku waveguides on the feed boom and the Ku feed.
Ka Bottom Support Plate
Installation (1)

1. To ensure the bottom support plate sits flush, remove the bumper.

2. Using a 3/32 inch hex key, Remove two screws, lock washers, and washers attaching bumper guard to feed.

3. Position the bottom support plate beneath the feed.

4. The clearance between the focal plate and the feed will vary between trailers. Determine from the different sized carriage bolts and hex head bolts provided in the kit which hardware will best encompasses the focal plate, the clearance between the focal plate and feed, and the bottom support plate.

5. Install four bolts, four washers, four lock washers, and four nuts attaching support plate to bottom of feed.
6. Tighten using a 7/16 inch open-end wrench and 3/8 inch drive ratchet and 7/16 inch socket.

**Note:**
It is recommended that the hardware remain loose enough to allow the support plate to be able to be shifted to properly align with the Ka feed assembly. After the feed assembly is installed and aligned, finish tightening the hardware to secure the base support plate.
1. Lift the Ka Feed Assembly by the handles from the Ka storage kit.

2. Remove the four 2” threaded studs, washers, and nuts from Ka Feed Assembly. Retain the threaded studs, washers, and nuts for use.
Ka Feed Assembly Installation (2)

3. Lift the Ka Feed Assembly by the handles onto the antenna focal plate.
4. Use the guide pins of the antenna focal plate to properly place in position.
Ka Feed Assembly Installation (3)

5. Align hold down bar over threaded inserts on focal plate.

6. Install two screws, lock washers, and washers that attach hold down bar to focal plate. Tighten using a 3/8 inch hex key.
Ka Feed Assembly Installation (4)

7. Determine whether the 2" or 3" threaded bolts better fit with that particular feed assembly. Most often, a combination of the different length bolts are used.

8. Arrange the eyebolts over each alignment hole of the bottom support plate.

9. Install the threaded bolts, nuts, and washers as in the above picture. Ensure the bolts extend slightly beyond the bottom support plate.
10. Attach the remaining washers and nuts to secure the Ka Feed Plate Assembly to the bottom support plate.

11. Adjust the threaded bolts until as close to flush as possible with the base support plate to prevent contact when stowing the antenna.

12. Tighten nuts using 9/16” open-end wrench.
13. Place the ON/OFF switch to the OFF position (1).

14. Disconnect cable W7002 to Ku HPA AC Input (2).

15. Disconnect cable W4001 to the Ku HPA J5 (3).


17. Connect cable 294250-120 P1 to existing cable W7002.

18. Connect cable 298576 P1 to existing cable W4001.

19. Connect cable 204039-96 P1 to existing cable WS1002.

20. Use cable ties as necessary to secure Ka cables to feedboom.
21. Connect cable W2101 to LNB IF/REC OUT (1).

22. Connect cable 204039-96 P2 to J1 RF/REF IN (2) on SSPA.

23. Connect cable 294250-120 P2 to connector J3 (3) on SSPA
24. Connect cable 298576 P2 to connector J4 M&C I/O (1) on SSPA. Ensure the Ethernet cable makes a solid connection.

25. Connect cable W5 P15 to Pol Dummy Plug (2) on SSPA.
Ka Band Polarization Selection (1)

1. Determine from the SAA (Satellite Access Authorization) whether LHCP or RHCP is required for the mission.
2. Loosen the two hex screws securing the clamp at the feed emitter.
3. Grasp the brass locking connector.
4. Turn the locking connector counter-clockwise to loosen the polarizer and emitter.
5. Slide the locking connector off the fastener.
6. Remove the polarizer and emitter from the recessed waveguide of the diplexer.

7. Ensure the O-ring is present.
8. Align the LHCP or RHCP labels to the selection arrow.

9. Turn the locking connector clockwise to tighten. Do not over tighten or cross-thread. Ensure connection is sealed.

10. Tighten the hex screws and secure the clamp to the polarizer and emitter.
1. Perform power up sequence for all the equipment of the STT.
2. Power up the laptop and login.
3. If not already done, be sure to close down the M&C software and any corresponding DOS windows on the laptop by following the usual File >> Close or File >> Exit procedures.
4. Determine if the laptop is a CF-29, or lower, model Panasonic Toughbook.
5. For these model Toughbooks, open my computer icon and C:/ drive.
6. Navigate to C:\Program Files\ILC\MaxView\MComm\Configs.
7. Delete all the files in this folder.
8. Navigate to C:\Program Files\ILC\Maxview\Broker\Configs.
9. Delete all the files in this folder.

Note: MaxView Software Version 3-24-09 and later will update CF-29 model files automatically (Steps 6-9).

Refer to slide
The following processes are consistent for all model Toughbooks for updating the M&C software.

1. Insert Ka CD into CD ROM drive.

2. From the Windows taskbar, click Start >> My Computer, and select the CD/DVD drive.

3. Double-click the Setup.bat file to begin the installation process.
4. From the STTSetup screen, fill in the required information.

5. Click either the JNN or BnCPN Model.

6. If the STT is a V1, Click either Radyne DMD-2050 or DMD-20 (firmware specific). If the STT is a V2, the FDMA option will be grayed out.

7. Click either Linkway 2100 or Linkway S2.

8. Click OK. A reboot notification will be displayed, click OK to proceed and the computer will reboot. Once the computer finishes rebooting, log in to the computer to begin the software installation.
9. STTUpdate progress screen and a Shortcut to SecondRun screen will appear showing the files that are being updated.

**Note:**
The time duration of the software installation varies between the different models of Panasonic Toughbooks (CF-29 and CF-30).
10. After the M&C software loads, click the RF View button to open the RF View Screen.

**Note:**
At this point, the operator should check connectivity between all of the devices. The only physical component that changed was the SSPA. If unable to communicate with the SSPA, verify power is applied and all cables are installed securely.


13. Input the satellite information according to the cut sheet or Satellite Access Authorization. (If there is no SAA, input frequencies in the Ka downlink range)

14. Ensure LNB LO frequency is set to 19.2 GHz for Ka operation and Beacon Frequency is within the Ka band downlink range 20.2 – 21.2 GHz.

15. Set the Bandwidth to 280 KHz (bottom option on pull-down menu).

16. Navigate to Load Satellite Position button, select a position, and click to save.

**Note:**

If there is a “band conflict” fault, verify a frequency was entered in the Ka downlink range and that the dummy plug for the polarizer is installed. A “band conflict” will disable movement of the antenna.
17. Navigate back to the RF View screen.

18. Click the TDMA Modem button and verify that the MaxView software can communicate with the TDMA modem. If it does not function, check the property settings of the HyperTerminal connection.

19. Click the Router button and verify that the MaxView software can communicate with the AES Router. Check the property settings of the hyperterminal connection if it does not function.
The ACU will select the correct LO frequency of the LNB based upon the frequency range of the beacon frequency. Ensure the ACU is programmed to operate on the Ka LNB local oscillator frequency.

1. On the ACU front panel, navigate from the Main menu to the Setup menu by pressing the More button.

2. At the Setup menu, press more until RF is displayed.

3. Select RF.

4. Press More to navigate to the BDC LO frequency.

5. Ensure the BDC LO frequency for Band 7 & 8 is set to 19.2 GHz.

6. Press More to navigate to the RF Bandwidth.

7. Ensure the Band Range for Band 7 & 8 is set to a range of 20.2 GHz - 21.2 GHz.

8. Once the Ka LNB is operating, the ACU will display 85.0 – 89.0 at polarization. This value is a result of the polarization cable that is jumpered for Ka Feed Assembly operation.
Ku Feed Assembly Installation
Ka Feed Assembly Removal (1)

Removal:

1. Perform power up procedures.

2. Deploy the antenna until the Ka Feed Assembly has enough clearance to allow removal.

3. Once the antenna is deployed, power down the terminal.
4. Disconnect cable 294250-120 P1 from cable W7002.

5. Reconnect cable W7002 to Ku HPA AC Input and turn on HPA power switch.

6. Disconnect cable 298576 P1 from cable W4001 J3.

7. Reconnect cable W4001 to the Ku HPA J5.


10. Remove the cable ties that secure the Ka cables to feedboom.
11. Disconnect cable W2101 from LNB IF/REC OUT (1).

12. Disconnect cable 204039-96 P2 from J1 RF/REF IN (2) on SSPA.

13. Disconnect cable 294250-120 P2 from connector J3 (3) on SSPA.
14. Disconnect cable 298576 P2 from connector J4 M&C I/O (1) on SSPA. Loosen and remove the protective sleeve. Disconnect the Ethernet connection.

15. Disconnect cable W5 P15 from Pol Dummy Plug (2) on SSPA.
16. Remove the nuts securing the Ka Feed Assembly to the bottom support plate, ensuring to retain hardware for future use.

17. Support the Ka Feed Assembly by the handles to prevent the possible damage to the equipment.

18. Remove the screws that attach the hold down bar to the antenna focal plate.
19. Lift the Ka Feed Assembly by the handles off the antenna focal plate.

20. Lift and place the Ka Feed Assembly by the handles into the Ka storage kit.

**Note:**
Ensure the waveguide is not used as a handle.
Ku Feed Assembly Installation (1)

1. Using handles, position feedplate assembly on pins (front & back) and ensure that the feedplate assembly locking screws are positioned over threaded inserts (both sides).
2. Secure feed plate by rotating locking screws clockwise.

3. Remove protective covers from waveguide ends.

4. Position flexible waveguide on fixed waveguide assembly leading to the HPA.
5. Install screws, washers, and nuts that attach flexible waveguide assembly to the fixed waveguide.

6. Ensure rubber O-ring is in the correct position.

7. Tighten using 7/64 in. hex key, ¼ in. to 5/6 in. combination wrench (1/4 in. end) or ¼ in. open-end wrench.
Ku M&C Software Installation (1)

**Installation:**
1. Perform system power up in accordance with STT Operation power up procedures.

2. If not already done, be sure to close down the M&C software and any corresponding DOS windows on the laptop by following the usual File >> Close or File >> Exit procedures.

3. From the left side of the laptop, open the CD drive, place the STT Ku Reset CD into the CD bay, and close the CD bay.

4. From the Windows taskbar, click Start >> My Computer.

5. Double-click on the DVD drive.

6. Double-click the Setup.bat file to begin the installation process.
7. From the STT Setup screen, fill in the information regarding the STT trailer and serial number.

8. Click either the JNN or BnCPN Mode.

9. Click either Radyne DMD-2050 or DMD-20 (firmware specific).

10. Click either Linkway 2100 or Linkway S2 and click OK.

11. A reboot notification will be displayed, click OK to proceed. Once the computer finishes rebooting, login in to the computer.
12. STT Update progress screen and a Shortcut to SecondRun screen will appear showing the files that are being updated. This process will take a few minutes to complete.
13. After the M&C software loads, click the RF View button to open the RF View Screen.

14. Click the TDMA Modem button and verify that the MaxView software can communicate with the TDMA modem. If it does not function, check the property settings of the HyperTerminal connection.

15. Click the Router button and verify that the MaxView software can communicate with the AES Router. Check the property settings of the Hyperterminal connection if it does not function.
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