**INSTRUCTION MANUAL** 651200700E

# *QQQT*

## Quad QPSK/QAM Transcoder

## Stock No. 6189A

c UL us LISTED

MADE IN USA

TRIPLE QT QUAD QPSK/QAM Transcoder

BLONDER TONGUE LABORATORIES, INC.

*The Standard of Quality in TV Signal Distribution*

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(800) 523-6049 • (732) 679-4000 • FAX: (732) 679-4353
www.blondertongue.com

# QPSK/QAM Transcoder Instruction Manual

We recommend that you write the following information in the spaces provided below.

| | |
|---|---|
| Purchase Location Name: | |
| Purchase Location Telephone Number: | |
| Transcoder Digital Address: | |

The information contained herein is subject to change without notice. Revisions may be issued to advise of such changes and/or additions.

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Old Bridge, NJ 08857

Document Number: 651200700

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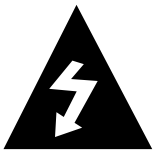
The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert you to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electrical shock to persons.



CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

The exclamation point within an equilateral triangle is intended to alert you to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

**TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER FROM THIS UNIT. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

**WARNING: TO PREVENT SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE**

**NOTE TO CATV INSTALLERS**

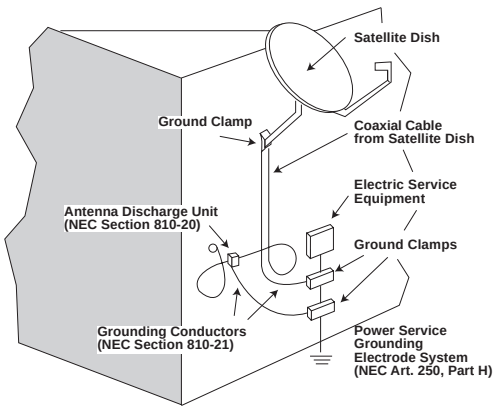
This reminder is provided to call the CATV System Installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

## *Table of Contents*

## *Safety Instructions*


You should always follow these instructions to help ensure against injury to yourself and damage to your equipment.

- Read all safety and operating instructions before you operate the transcoder.
- Retain all safety and operating instructions for future reference.
- Heed all warnings on the transcoder and in the safety and operating instructions.
- Follow all installation, operating, and use instructions.
- Unplug the transcoder from the AC power outlet before cleaning. Use only a damp cloth for cleaning the exterior of the transcoder.
- Do not use accessories or attachments not recommended by Blonder Tongue, as they may cause hazards, and will void the warranty.
- Do not operate the transcoder in high-humidity areas, or expose it to water or moisture.
- Do not place the transcoder on an unstable cart, stand, tripod, bracket, or table. The transcoder may fall, causing serious personal injury and damage to the transcoder. Install the transcoder only in a mounting rack designed for 19" rack-mounted equipment.
- Do not block or cover slots and openings in the transcoder. These are provided for ventilation and protection from overheating. Never place the transcoder near or over a radiator or heat register. Do not place the transcoder in an enclosure such as a cabinet without proper ventilation. Do not mount equipment in the rack space directly above or below the transcoder.
- Operate the transcoder using only the type of power source indicated on the marking label. Unplug the transcoder power cord by gripping the plug, not the cord.
- The transcoder is equipped with a three-wire ground-type plug. This plug will fit only into a ground-type power outlet. If you are unable to insert the plug into the outlet, contact an electrician to replace the outlet. Do not defeat the safety purpose of the ground-type plug.
- Route power supply cords so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit from the unit.
- Be sure that the outdoor components of the antenna system are grounded in accordance with local, federal, and National Electrical Code (NEC) requirements. Pay special attention to NEC Sections 810 and 820. See the example shown in the following diagram:



## *Safety Instructions - continued*

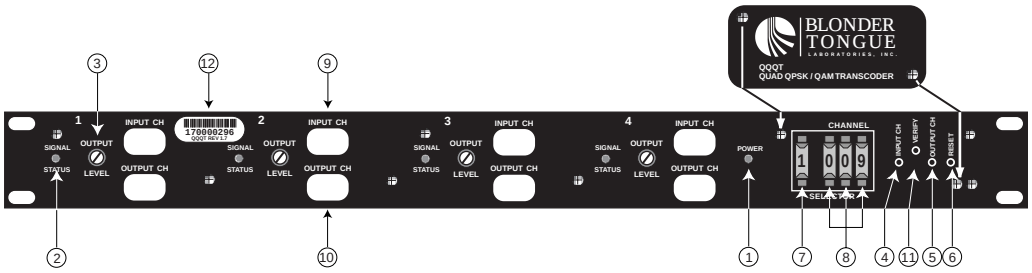
- We strongly recommend using an outlet that contains surge suppression or ground fault protection. For added protection during a lightning storm, or when the transcoder is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the lines between the transcoder and the antenna. This will prevent damage caused by lightning or power line surges.
- Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing the antenna, take extreme care to avoid touching such power lines or circuits, as contact with them can be fatal.
- Do not overload wall outlets or extension cords, as this can result in a risk of fire or electrical shock.
- Never insert objects of any kind into the transcoder through openings, as the objects may touch dangerous voltage points or short out parts. This could cause fire or electrical shock.
- Do not attempt to service the transcoder yourself, as opening or removing covers may expose you to dangerous voltage and will void the warranty. Refer all servicing to authorized service personnel.
- Unplug the transcoder from the wall outlet and refer servicing to authorized service personnel whenever the following occurs:
  - ❒ The power supply cord or plug is damaged;
  - ❒ Liquid has been spilled, or objects have fallen into the transcoder;
  - ❒ The transcoder has been exposed to rain or water;
  - ❒ The transcoder has been dropped or the chassis has been damaged;
  - ❒ The transcoder exhibits a distinct change in performance.
- When replacement parts are required, ensure that the service technician uses replacement parts specified by Blonder Tongue. Unauthorized substitutions may damage the transcoder or cause electrical shock or fire, and will void the warranty.
- Upon completion of any service or repair to the transcoder, ask the service technician to perform safety checks to ensure that the transcoder is in proper operating condition.

## *Introduction*

The QQQT is designed to transcode an existing 30 MHz digital QPSK satellite signal to a 6 MHz QAM signal. The unit is used in conjunction with QAM set-top decoders that are designed to be compatible with EchoStar™ DVB Satellite signals. For convenience of installation, the chassis fits into a standard 19" wide by 1.75" high rack mount.

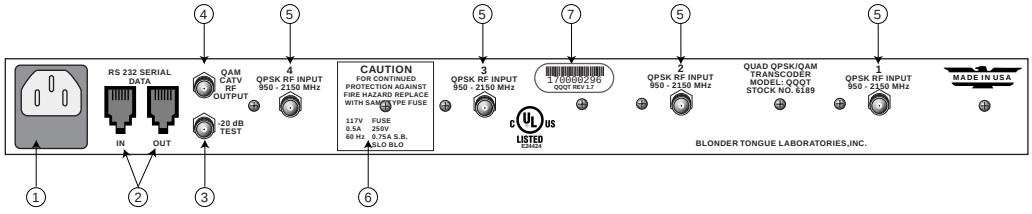
## *The Unit*

### *Front Panel*




1. **Power LED** - Indicates power to the unit
2. **Signal Status LED** - a) A solid green LED indicates locked signal
   b) A non-lit green LED indicates a loss of QPSK signal lock
   c) A flashing green LED indicates the QAM signal was shut off remotely
3. **Output Level** - A POT adjustment to increase or decrease the level of the output gain with a 10 dB range.
4. **Input CH Button** - Used to set the unit input information (transponder)
5. **Output CH Button** - Used to set the unit output information (channel)
6. **Reset Button** - Used to reset the unit input and output information to the previously programmed state
7. **Channel Selector Digit 1** - Thumbwheel switch used to set the unit transcoder number information
8. **Channel Selector Digit 2, 3, & 4** - Thumbwheel switches used to set the input transponder and output channel
9. **Input Channel Label** - To be filled in at installation for reference
10. **Output Channel Label** - To be filled in at installation for reference
11. **Verify LED** - a) A brief solid green LED flash will indicate the unit accepted an input entry
    b) A continuous flashing green LED will indicate an invalid entry
12. **Unit Identification Label** - Each QQQT unit is assigned a unique identification number. This I.D. number is used with the Optional Remote Monitoring & Control Software.

### *Rear Panel*




1. **Power Cord Socket** - The unit power cord plug socket
2. **RS 232 Serial Data Ports** - Used to plug into and daisy chain the QQQT units for remote monitoring and configuration
3. **-20 dB Test Point** - Convenient 75Ω RF point to test output signal
4. **QAM CATV RF Output** - A combined 4 channel QAM output signal
5. **QPSK RF Input** - 4 Independent 75Ω RF connectors for feeding the appropriate QPSK satellite input signal
6. **Fuse** - .75 Amp, 250V, Slo Blo fuse
7. **Unit Identification Label** - Each QQQT unit is assigned a unique identification number. This I.D. number is used with the Optional Remote Monitoring & Control Software.

## *Programming the Unit*

### *Understanding the Switch Functionality*

**Reset**

Depressing the RESET button will reload all of the unit output channels and transponder settings from the unit's memory. The previous programmed state for all 4 transcoder sections is stored in non-volatile memory.

**Channel Selector**

*Stacked LNB Feed*

The first digit (Digit 1) of the Channel Selector thumbwheel switch is used to select the corresponding QQQT transcoder section. Digit 1 numbers 1 to 4 are used for Stacked LNB feed for transcoders 1 to 4 respectively. Digit 2 remains a 0 (zero). (i.e., Select 1 for transcoder 1 with a stacked LNB feed).

***Note: Refer to Appendix A for detailed transponder frequency range.***

*Dual LNB Feed*

The first digit (Digit 1) of the Channel Selector thumbwheel switch is used to select the corresponding QQQT transcoder section. Digit 1 numbers 5 to 8 are used for a Dual LNB feed for transcoders 1 to 4 respectively. Digit 2 remains a 0 (zero). (i.e., Select 5 for transcoder 1 with a dual LNB feed).

***Note: Refer to Appendix A for detailed transponder frequency range.***

*NAS Stacker Feed*

The second digit (Digit 2) is used to indicate a NAS Stacker Feed. Set the Digit 2 switch to 9. The first digit (Digit 1) of the Channel Selector thumbwheel switch is then used to select the corresponding QQQT transcoder section. Digit 1 numbers 1 to 4 are used for NAS Stacker feed for transcoders 1 to 4 respectively. (i.e., Select 1 in Digit 1 and 9 in Digit 2 for a NAS Stacked Feed.)

***Note: Refer to Appendix A for detailed transponder frequency range.***

The last 3 digits (Digits 2, 3 and 4) of the Channel Selector thumbwheel switch are used to select the appropriate satellite transponder or the corresponding output channel. (i.e., Select 05 for transponder 5 and 078 for CATV channel 78).

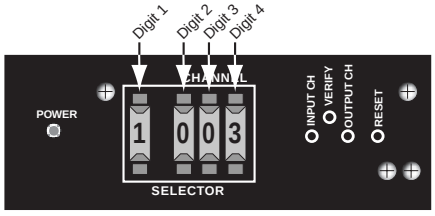
***Note: Refer to Appendix B for CATV Channel Frequency Chart, 121 MHz to 750 MHz, Channels 14-116.***
*Channel 95-99 are not used since the frequency range is not within 121-750 MHz.*

### *Programming the Unit Input*

1. Set the appropriate transcoder section.
2. Set the appropriate satellite transponder section.
   (Adjust the Channel Selector thumbwheel switches as instructed above).
3. Press the INPUT CH button for the QQQT unit to accept your selection.
4. The green VERIFY indicator will light briefly to indicate that the unit accepted your input. If the green VERIFY LED flashes continuously, it indicates an inappropriate transponder number entry was made and was not accepted by the unit. Repeat Steps 1 thru 4 again for each of the 4 transcoder sections.

☛ *Record the input channel transponder information on the white INPUT CH square for future reference.*

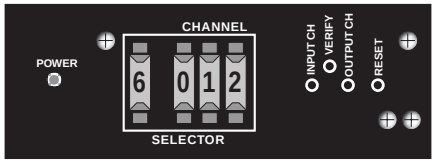
**Stacked LNB Feed**




This example shows Transcoder #1 is tuned to Transponder #3 after depressing the INPUT CH button.

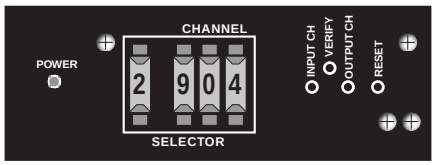
## *Programming the Unit Input - continued*

**Dual LNB Feed**




This example shows Transcoder #2 is tuned to Transponder #12 after depressing the INPUT CH button.

**NAS Stacker Feed**




This example shows Transcoder #2 is tuned to Transponder #4 after depressing the INPUT CH button.

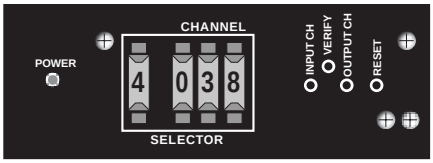
**CAUTION**

***Do not leave the unit set with a zero in Digit 1 of the Channel Selector thumbwheel switch. The verification of this setting will cause the QQQT to be put into a manufacturing test condition that can only be reset by recycling power to the unit.***

## *Programming the Unit Output*

1. Set the appropriate transcoder section.
2. Set the appropriate Output Channel number on the Channel Selector thumbwheel switch. The available channel tuning range is EIA channel 14-116 (the corresponding CATV channel frequency, 121 to 750 MHz, will be automatically set. Refer to Appendix B for details.). Channel 95-99 are not used since the frequency range is not within 121-750 MHz.
3. Press the OUTPUT CH button for the QQQT unit to accept your selection.
4. The green VERIFY indicator will light briefly to indicate that the unit accepted your input. If the green VERIFY LED flashes continuously, it indicates an out of range channel number entry was made and was not accepted by the unit.
   Repeat Steps 1 thru 4 again for each of the 4 sections.

   ☛ *Record the output channel*




This example shows Transcoder #4 is tuned to Output Channel #38 after depressing the OUTPUT CH button.

*Note: When adjusting Output Channel information of the Channel Selector thumbwheel switch, Digit 1 numbers 1-4 are only used to represent the appropriate transcoder section.*

**CAUTION**

***Do not leave the unit set with a zero in digit 1 of the Channel Selector thumbwheel switch. The verification of this setting will cause the QQQT to be put into a manufacturing test condition that can only be reset by recycling power to the unit.***

## *Installing the Transcoder*

### *Installing the Transcoder in a Rack*

**Mounting**

The transcoder is 1.75 inches tall, 19 inches wide, and 19 inches deep.

You can mount the transcoder in a standard EIA, 24 inch (610 mm) deep, enclosed rack. Secure the transcoder front panel to the rack by inserting four machine screws, with cup washers, through the four mounting holes in the front panel.

☛ *Do not block the fan on the side of the transcoder, or any of the unit's ventilation holes.*

ATTENTION!

***Blonder Tongue strongly recommends using a vented blank front panel to aid in air circulation. This part, Stock No. 3988, Model name BFP-19V is available from the Blonder Tongue factory.***

**CAUTION**

***Failure to have at least one empty 1.75" rack space between each transcoder when mounting several QQQT units together will void the manufacturers warranty.***

We recommend that you support the transcoder by some means in addition to the front panel screws. You can use rear rail support brackets or rack slides. Rear rail support brackets are available from Blonder Tongue at a nominal cost. (Order PN 622280100A)

**Power**

60 Hz, 90 to 265 VAC

WARNING!

***For safe and reliable operation, the transcoder requires a proper ground connection for the third prong of the transcoder power cord plug.***

## *Optional Remote Monitoring & Control Software*

An optional Remote Monitoring & Control Software package is available from Blonder Tongue. This custom software application is designed to be used for the ability to monitor and configure a QQQT headend. The software is a program that can be used locally in the direct mode via a null modem cable or remotely in the dial out mode using a standard modem at the headend.

The software features a user friendly graphical interface and is compatible with widely available Windows® 95/98 based computers. It gives the operator the ability to purchase an individual headend license and create a unique file for each independent Triple QT headend. The operator can then access the software to monitor, control and configure the Triple QT units. The QAM output signal can be remotely turned off allowing the operator the ability to "remotely heal" a problem transcoder channel by shutting it down and activating a spare transcoder. The transponder signal from the problem transcoder can be activated on the spare and the output QAM signal placed on any available output channel within the unit range. A Non-modem Starter Kit is included, consisting of 12 Data Cables, 1 Null Modem and Adapter and a QQQT Headend Modem Adapter with the purchase of each Headend Software License. Sample data cable wiring is demonstrated on the rear headend diagram, Appendix D.

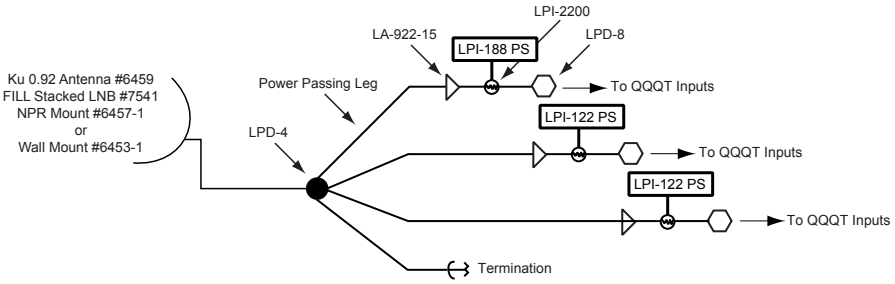
This option can be ordered from Blonder Tongue as Stock No. 2701, Model name QQQT-RMCS.

## *Technical Specifications*

| QPSK Input (4 Input Ports) | Item | Unit |
|---|---|---|
| Input Frequency Range: | 920 - 2150 | MHz |
| Frequency Step: | 1 | MHz |
| Capture Range: | ±5 | MHz |
| Input Level Range: | -65 to -25 | dBm |
| RF Input Impedance: | 75Ω | QPSK |
| Input Feed: | Stacked/Dual LNB | |
| Decoding: | DVB | |
| IF Bandwidth: | 36 | MHz |
| Symbol Rate | 1 to 45 | Msym/sec |
| Code Rate for DVB: | 1/2, 2/3, 3/4, 5/6, 7/8 | Viterbi Auto Recognition |
| I - Q Format: | Normal/Inverted | |
| **QAM RF Output (1 Output Port)** | | |
| Modulation: | 16, 32, 64, 128, 256 | QAM |
| Symbol Rate: | 5, Max. 7 | Msym/sec |
| Bandwidth: | 6 | MHz |
| Spectral Inversion: | Auto Recognition | |
| Carrier Suppression: | 45 | dB |
| Roll Off: | 15 | % |
| S/N: | >40 | dB |
| I - Q Offset: | <1 | Degrees |
| RF Output Impedance: | 75Ω | Combined QAM |
| Frequency Range: | 121 - 750 | MHz |
| Frequency Step: | 1 | MHz |
| Output Level: | +40 | dBmV |
| Spurious: | -60 | dBc |
| Broadband Noise: | -75 | dBc |
| **Power** | | |
| Requirement: | 90 to 265 | VAC |
| Frequency: | 50 to 60 | Hz |
| Power Consumption: | 40 | Watts |
| Operating Temperature: | 0 to 50 | °C |
| **Physical** | | |
| Dimensions: | 19” x 1.75” x 19 (max) inches, (482.6 x 44.4 x 482.6 mm) | W x H x D |
| Operating Temperature: | 32 to 122° F, (0 to 50°C) | |
| Storage Temperature: | -4 to 158°F, (-20 to 70°C) | |
| Humidity: | 0 to 90% RH (non-condensing) | |
| Mounting: | Standard 1 unit high EIA 1.75”, 19” wide rack mount | |
| **Agency Approvals** | | |
| Safety: | UL Listed 1409 | |

## *Stacked LNB Splitter Tree*

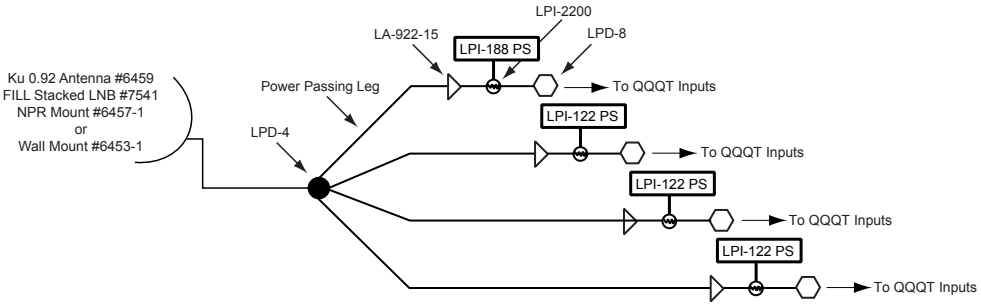
### 119° - 21 Transponders




| Parts List | |
|---|---|
| LPD-4 | #6411 |
| LA-922-15 | #6407 |
| LPD-8 | #6415 |
| LPI-122 PS | #6446 |
| LPI-2200 | #6424 |
| LPI-188 PS | #6430 |

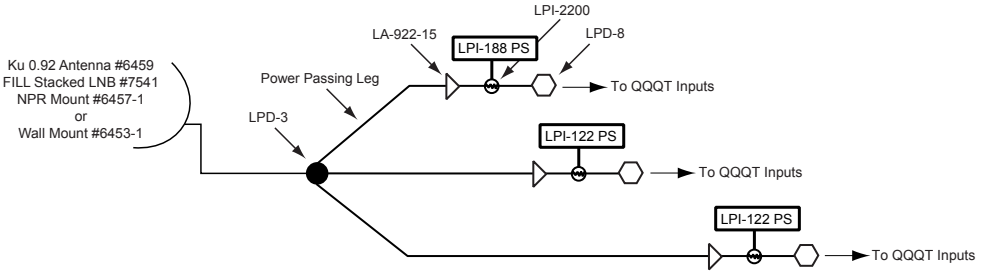
(Transponders 1 thru 21)

### 110° - 29 Transponders




(Transponders 1 thru 27, 29 & 31)

### 61.5° - 19 Transponders

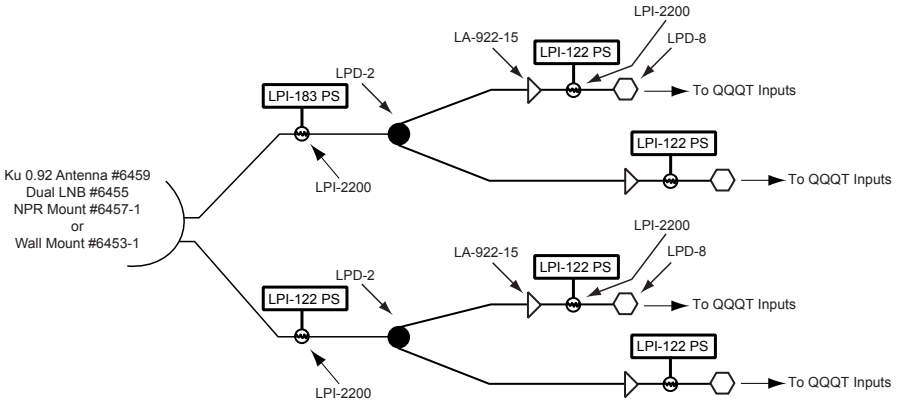



(Transponders 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 26, 27, 28, 29, 30, 31 & 32)

*Drawings are samples for illustration purposes only*

## *Dual LNB Splitter Tree*

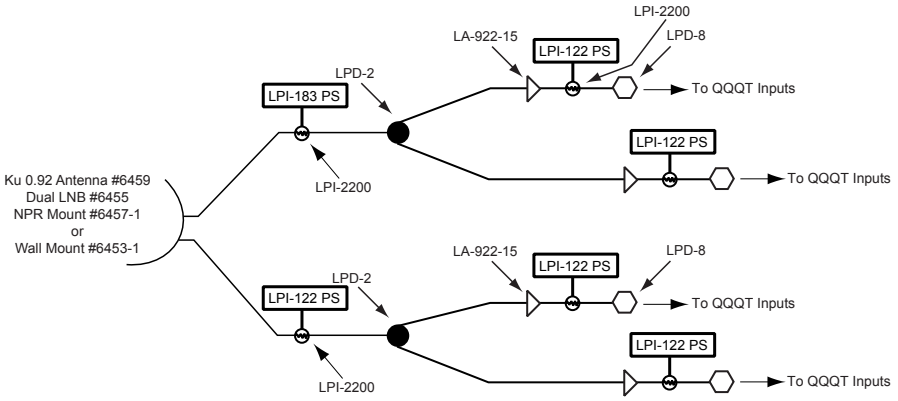
### 119° - 21 Transponders




| Parts List | |
|---|---|
| LPD-4 | #6411 |
| LA-922-15 | #6407 |
| LPD-8 | #6415 |
| LPI-122 PS | #6446 |
| LPI-2200 | #6424 |
| LPI-183 PS | #6447 |

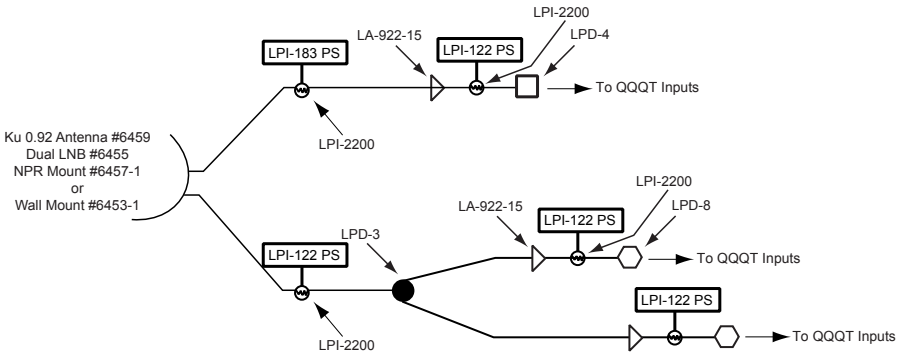
(Transponders 1 thru 21)

### 110° - 29 Transponders




(Transponders 1 thru 27, 29 & 31)

### 61.5° - 19 Transponders




(Transponders 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 26, 27, 28, 29, 30, 31 & 32)

*Drawings are samples for illustration purposes only*

## *Troubleshooting*

### *QAM Signal Level Testing*

Due to the fact that the output channel is a complete high-frequency modulation signal using the full 6 MHz spectrum, a typical spectrum analyzer is unable to read the true amplitude of the signal since it does not have a 6 MHz setting. It is therefore necessary to make measurements at lower frequencies and normalize (compensate) the results with the following table:

| Spectrum Analyzer Bandwidth | Add to Correct to 6 MHz BW |
|---|---|
| 300 KHz | 13 dB |
| 1 MHz | 7.8 dB |
| 3 MHz | 3 dB |

## *Appendix A*

**L-Band Frequencies**

| Transponder No | Dual Feed Frequency (MHz) | Polarity Voltage | Switching Voltage (VDC) (Optimal) | Cal Amp Stacked Frequency (MHz) | NAS Stacked Frequency Inverted Spectrum (MHz) |
|---|---|---|---|---|---|
| 1 | 974.00 | RHCP | 13 | 974.00 | 974.00 |
| 2 | 988.58 | LHCP | 18 | 1563.58 | 1986.42 |
| 3 | 1003.16 | RHCP | 13 | 1003.16 | 1003.16 |
| 4 | 1017.74 | LHCP | 18 | 1592.74 | 1957.26 |
| 5 | 1032.32 | RHCP | 13 | 1032.32 | 1032.32 |
| 6 | 1046.90 | LHCP | 18 | 1621.90 | 1928.10 |
| 7 | 1061.48 | RHCP | 13 | 1061.48 | 1061.48 |
| 8 | 1076.06 | LHCP | 18 | 1651.06 | 1898.94 |
| 9 | 1090.64 | RHCP | 13 | 1090.64 | 1090.64 |
| 10 | 1105.22 | LHCP | 18 | 1680.22 | 1869.78 |
| 11 | 1119.80 | RHCP | 13 | 1119.80 | 1119.80 |
| 12 | 1134.38 | LHCP | 18 | 1709.38 | 1840.62 |
| 13 | 1148.96 | RHCP | 13 | 1148.96 | 1148.96 |
| 14 | 1163.54 | LHCP | 18 | 1738.54 | 1811.46 |
| 15 | 1178.12 | RHCP | 13 | 1178.12 | 1178.12 |
| 16 | 1192.70 | LHCP | 18 | 1767.70 | 1782.30 |
| 17 | 1207.28 | RHCP | 13 | 1207.28 | 1207.28 |
| 18 | 1221.86 | LHCP | 18 | 1796.86 | 1753.14 |
| 19 | 1236.44 | RHCP | 13 | 1236.44 | 1236.44 |
| 20 | 1251.02 | LHCP | 18 | 1826.02 | 1723.98 |
| 21 | 1265.60 | RHCP | 13 | 1265.60 | 1265.60 |
| 22 | 1280.18 | LHCP | 18 | 1855.18 | 1694.82 |
| 23 | 1294.76 | RHCP | 13 | 1294.76 | 1294.76 |
| 24 | 1309.34 | LHCP | 18 | 1884.34 | 1665.66 |
| 25 | 1323.92 | RHCP | 13 | 1323.92 | 1323.92 |
| 26 | 1338.50 | LHCP | 18 | 1913.50 | 1636.50 |
| 27 | 1353.08 | RHCP | 13 | 1353.08 | 1353.08 |
| 28 | 1367.66 | LHCP | 18 | 1942.66 | 1607.34 |
| 29 | 1382.24 | RHCP | 13 | 1382.24 | 1382.24 |
| 30 | 1396.82 | LHCP | 18 | 1971.82 | 1578.18 |
| 31 | 1411.40 | RHCP | 13 | 1411.40 | 1411.40 |
| 32 | 1425.98 | LHCP | 18 | 2000.98 | 1549.02 |

## *Appendix B*

### CATV Channel Frequency Chart
### 121 MHz to 750 MHz

| EIA Chan. | MHz Center Frequency |
|---|---|
| 14 | 123 |
| 15 | 129 |
| 16 | 135 |
| 17 | 141 |
| 18 | 147 |
| 19 | 153 |
| 20 | 159 |
| 21 | 165 |
| 22 | 171 |
| 23 | 219 |
| 24 | 225 |
| 25 | 231 |
| 26 | 237 |
| 27 | 243 |
| 28 | 249 |
| 29 | 255 |
| 30 | 261 |
| 31 | 267 |
| 32 | 273 |
| 33 | 279 |
| 34 | 285 |
| 35 | 291 |
| 36 | 297 |
| 37 | 303 |
| 38 | 309 |
| 39 | 315 |
| 40 | 321 |
| 41 | 327 |
| 42 | 333 |
| 43 | 339 |
| 44 | 345 |
| 45 | 351 |
| 46 | 357 |

| EIA Chan. | MHz Center Frequency |
|---|---|
| 47 | 363 |
| 48 | 369 |
| 49 | 375 |
| 50 | 381 |
| 51 | 387 |
| 52 | 393 |
| 53 | 399 |
| 54 | 405 |
| 55 | 411 |
| 56 | 417 |
| 57 | 423 |
| 58 | 429 |
| 59 | 435 |
| 60 | 441 |
| 61 | 447 |
| 62 | 453 |
| 63 | 459 |
| 64 | 465 |
| 65 | 471 |
| 66 | 477 |
| 67 | 483 |
| 68 | 489 |
| 69 | 495 |
| 70 | 501 |
| 71 | 507 |
| 72 | 513 |
| 73 | 519 |
| 74 | 525 |
| 75 | 531 |
| 76 | 537 |
| 77 | 543 |
| 78 | 549 |
| 79 | 555 |

| EIA Chan. | MHz Center Frequency |
|---|---|
| 80 | 561 |
| 81 | 567 |
| 82 | 573 |
| 83 | 579 |
| 84 | 585 |
| 85 | 591 |
| 86 | 597 |
| 87 | 603 |
| 88 | 609 |
| 89 | 615 |
| 90 | 621 |
| 91 | 627 |
| 92 | 633 |
| 93 | 639 |
| 94 | 645 |
| 100 | 651 |
| 101 | 657 |
| 102 | 663 |
| 103 | 669 |
| 104 | 675 |
| 105 | 681 |
| 106 | 687 |
| 107 | 693 |
| 108 | 699 |
| 109 | 705 |
| 110 | 711 |
| 111 | 717 |
| 112 | 723 |
| 113 | 729 |
| 114 | 735 |
| 115 | 741 |
| 116 | 747 |

## *Appendix C*

### dish™ 500 Stacked LNB Application Example
### 450 MHz System

**Echostar 5 - 110° W**

| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
|---|---|---|---|---|
| QQQT1 | 1 | 974.00 | 42 | 333 |
| | 2 | 1563.58 | 41 | 327 |
| | 3 | 1003.16 | 40 | 321 |
| | 4 | 1592.74 | 39 | 315 |
| QQQT2 | 5 | 1032.32 | 38 | 309 |
| | 6 | 1621.90 | 37 | 303 |
| | 7 | 1061.48 | 36 | 297 |
| | 8 | 1651.06 | 35 | 291 |
| QQQT3 | 9 | 1090.64 | 34 | 285 |
| | 10 | 1680.22 | 33 | 279 |
| | 11 | 1119.80 | 32 | 273 |
| | 12 | 1709.38 | 31 | 267 |
| QQQT4 | 13 | 1148.96 | 30 | 261 |
| | 14 | 1738.54 | 29 | 255 |
| | 15 | 1178.12 | 28 | 249 |
| | 16 | 1767.70 | 27 | 243 |
| QQQT5 | 17 | 1207.28 | 26 | 237 |
| | 18 | 1796.86 | 25 | 231 |
| | 19 | 1236.44 | 24 | 225 |
| | 20 | 1826.02 | 23 | 219 |
| QQQT6 | 21 | 1265.60 | 22 | 171 |
| | 22 | 1855.18 | 21 | 165 |
| | 23 | 1294.76 | 20 | 159 |
| | 24 | 1884.34 | 19 | 153 |
| QQQT7 | 25 | 1323.92 | 18 | 147 |
| | 26 | 1913.50 | 17 | 141 |
| | 27 | 1353.08 | 16 | 135 |
| | 29 | 1382.24 | 15 | 129 |
| 13 | 31 | 1411.40 | 14 | 123 |
| | Spare Transcoder | | | |

110° Total: 29

**Echostar 1 & 2 - 119° W**

| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
|---|---|---|---|---|
| QQQT8 | 1 | 974.00 | 62 | 453 |
| | 2 | 1563.58 | 61 | 447 |
| | 3 | 1003.16 | 60 | 441 |
| | 4 | 1592.74 | 59 | 435 |
| QQQT9 | 5 | 1032.32 | 58 | 429 |
| | 6 | 1621.90 | 57 | 423 |
| | 7 | 1061.48 | 56 | 417 |
| | 8 | 1651.06 | 55 | 411 |
| QQQT10 | 9 | 1090.64 | 54 | 405 |
| | 10 | 1680.22 | 53 | 399 |
| | 11 | 1119.80 | 52 | 393 |
| | 12 | 1709.38 | 51 | 387 |
| QQQT11 | 13 | 1148.96 | 50 | 381 |
| | 14 | 1738.54 | 49 | 375 |
| | 15 | 1178.12 | 48 | 369 |
| | 16 | 1767.70 | 47 | 363 |
| QQQT12 | 17 | 1207.28 | 46 | 357 |
| | 18 | 1796.86 | 45 | 351 |
| | 19 | 1236.44 | 44 | 345 |
| | 20 | 1826.02 | 43 | 339 |
| 13 | 21 | 1265.60 | 42 | 333 |
| | Spare Transcoder | | | |

119° Total: 21

* This value is automatically set by the QQQT unit when an Input Transponder or Output Channel entry is made.

## *Appendix C - continued*

### dish™ 500 Stacked LNB Application Example
### 550 MHz System

**Echostar 5 - 110° W**

| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
|---|---|---|---|---|
| QQQT1 | 1 | *974.00* | 57 | *423* |
| | 2 | *1563.58* | 56 | *417* |
| | 3 | *1003.16* | 55 | *411* |
| | 4 | *1592.74* | 54 | *405* |
| QQQT2 | 5 | *1032.32* | 53 | *399* |
| | 6 | *1621.90* | 52 | *393* |
| | 7 | *1061.48* | 51 | *387* |
| | 8 | *1651.06* | 50 | *381* |
| QQQT3 | 9 | *1090.64* | 49 | *375* |
| | 10 | *1680.22* | 48 | *369* |
| | 11 | *1119.80* | 47 | *363* |
| | 12 | *1709.38* | 46 | *357* |
| QQQT4 | 13 | *1148.96* | 45 | *351* |
| | 14 | *1738.54* | 44 | *345* |
| | 15 | *1178.12* | 43 | *339* |
| | 16 | *1767.70* | 42 | *333* |
| QQQT5 | 17 | *1207.28* | 41 | *327* |
| | 18 | *1796.86* | 40 | *321* |
| | 19 | *1236.44* | 39 | *315* |
| | 20 | *1826.02* | 38 | *309* |
| QQQT6 | 21 | *1265.60* | 37 | *303* |
| | 22 | *1855.18* | 36 | *297* |
| | 23 | *1294.76* | 35 | *291* |
| | 24 | *1884.34* | 34 | *285* |
| QQQT7 | 25 | *1323.92* | 33 | *279* |
| | 26 | *1913.50* | 32 | *273* |
| | 27 | *1353.08* | 31 | *267* |
| | 29 | *1382.24* | 30 | *261* |
| 13 | 31 | *1411.40* | 29 | *255* |
| | Spare Transcoder | | | |

110° Total: 29

**Echostar 1 & 2 - 119° W**

| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
|---|---|---|---|---|
| QQQT8 | 1 | *974.00* | 78 | *549* |
| | 2 | *1563.58* | 77 | *543* |
| | 3 | *1003.16* | 76 | *537* |
| | 4 | *1592.74* | 75 | *531* |
| QQQT9 | 5 | *1032.32* | 74 | *525* |
| | 6 | *1621.90* | 73 | *519* |
| | 7 | *1061.48* | 72 | *513* |
| | 8 | *1651.06* | 71 | *507* |
| QQQT10 | 9 | *1090.64* | 70 | *501* |
| | 10 | *1680.22* | 69 | *495* |
| | 11 | *1119.80* | 68 | *489* |
| | 12 | *1709.38* | 67 | *483* |
| QQQT11 | 13 | *1148.96* | 66 | *477* |
| | 14 | *1738.54* | 65 | *471* |
| | 15 | *1178.12* | 64 | *465* |
| | 16 | *1767.70* | 63 | *459* |
| QQQT12 | 17 | *1207.28* | 62 | *453* |
| | 18 | *1796.86* | 61 | *447* |
| | 19 | *1236.44* | 60 | *441* |
| | 20 | *1826.02* | 59 | *435* |
| 13 | 21 | *1265.60* | 58 | *429* |
| | Spare Transcoder | | | |

119° Total: 21

Note: EchoStar recommends Transponder 1 from 119° W be set at Output Channel 78 - 549 MHz.

* This value is automatically set by the QQQT unit when an Input Transponder or Output Channel entry is made.

## *Appendix C - continued*

### dish™ 500 Stacked LNB Application Example
### 750 MHz System

| | Echostar 5 - 110° W | | | |
|---|---|---|---|---|
| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
| QQQT1 | 1 | 974.00 | 116 | 747 |
| | 2 | 1563.58 | 115 | 741 |
| | 3 | 1003.16 | 114 | 735 |
| | 4 | 1592.74 | 113 | 729 |
| | 5 | 1032.32 | 112 | 723 |
| QQQT2 | 6 | 1621.90 | 111 | 717 |
| | 7 | 1061.48 | 110 | 711 |
| | 8 | 1651.06 | 109 | 705 |
| | 9 | 1090.64 | 108 | 699 |
| QQQT3 | 10 | 1680.22 | 107 | 693 |
| | 11 | 1119.80 | 106 | 687 |
| | 12 | 1709.38 | 105 | 681 |
| | 13 | 1148.96 | 104 | 675 |
| QQQT4 | 14 | 1738.54 | 103 | 669 |
| | 15 | 1178.12 | 102 | 663 |
| | 16 | 1767.70 | 101 | 657 |
| | 17 | 1207.28 | 100 | 651 |
| QQQT5 | 18 | 1796.86 | 94 | 645 |
| | 19 | 1236.44 | 93 | 639 |
| | 20 | 1826.02 | 92 | 633 |
| | 21 | 1265.60 | 91 | 627 |
| QQQT6 | 22 | 1855.18 | 90 | 621 |
| | 23 | 1294.76 | 89 | 615 |
| | 24 | 1884.34 | 88 | 609 |
| | 25 | 1323.92 | 87 | 603 |
| QQQT7 | 26 | 1913.50 | 86 | 597 |
| | 27 | 1353.08 | 85 | 591 |
| | 29 | 1382.24 | 84 | 585 |
| 13 | 31 | 1411.40 | 83 | 579 |
| | Spare Transcoder | | | |

110° Total: 29

| | Echostar 1 & 2 - 119° W | | | |
|---|---|---|---|---|
| | Transponder | Stacked Frequency* | Output Channel | Center Frequency* |
| | 1 | 974.00 | 78 | 549 |
| QQQT8 | 2 | 1563.58 | 79 | 555 |
| | 3 | 1003.16 | 80 | 561 |
| | 4 | 1592.74 | 81 | 567 |
| | 5 | 1032.32 | 77 | 543 |
| QQQT9 | 6 | 1621.90 | 76 | 537 |
| | 7 | 1061.48 | 75 | 531 |
| | 8 | 1651.06 | 74 | 525 |
| | 9 | 1090.64 | 73 | 519 |
| QQQT10 | 10 | 1680.22 | 72 | 513 |
| | 11 | 1119.80 | 71 | 507 |
| | 12 | 1709.38 | 70 | 501 |
| | 13 | 1148.96 | 69 | 495 |
| QQQT11 | 14 | 1738.54 | 68 | 489 |
| | 15 | 1178.12 | 67 | 483 |
| | 16 | 1767.70 | 66 | 477 |
| | 17 | 1207.28 | 65 | 471 |
| QQQT12 | 18 | 1796.86 | 64 | 465 |
| | 19 | 1236.44 | 63 | 459 |
| | 20 | 1826.02 | 62 | 453 |
| 13 | 21 | 1265.60 | 82 | 573 |
| | Spare Transcoder | | | |

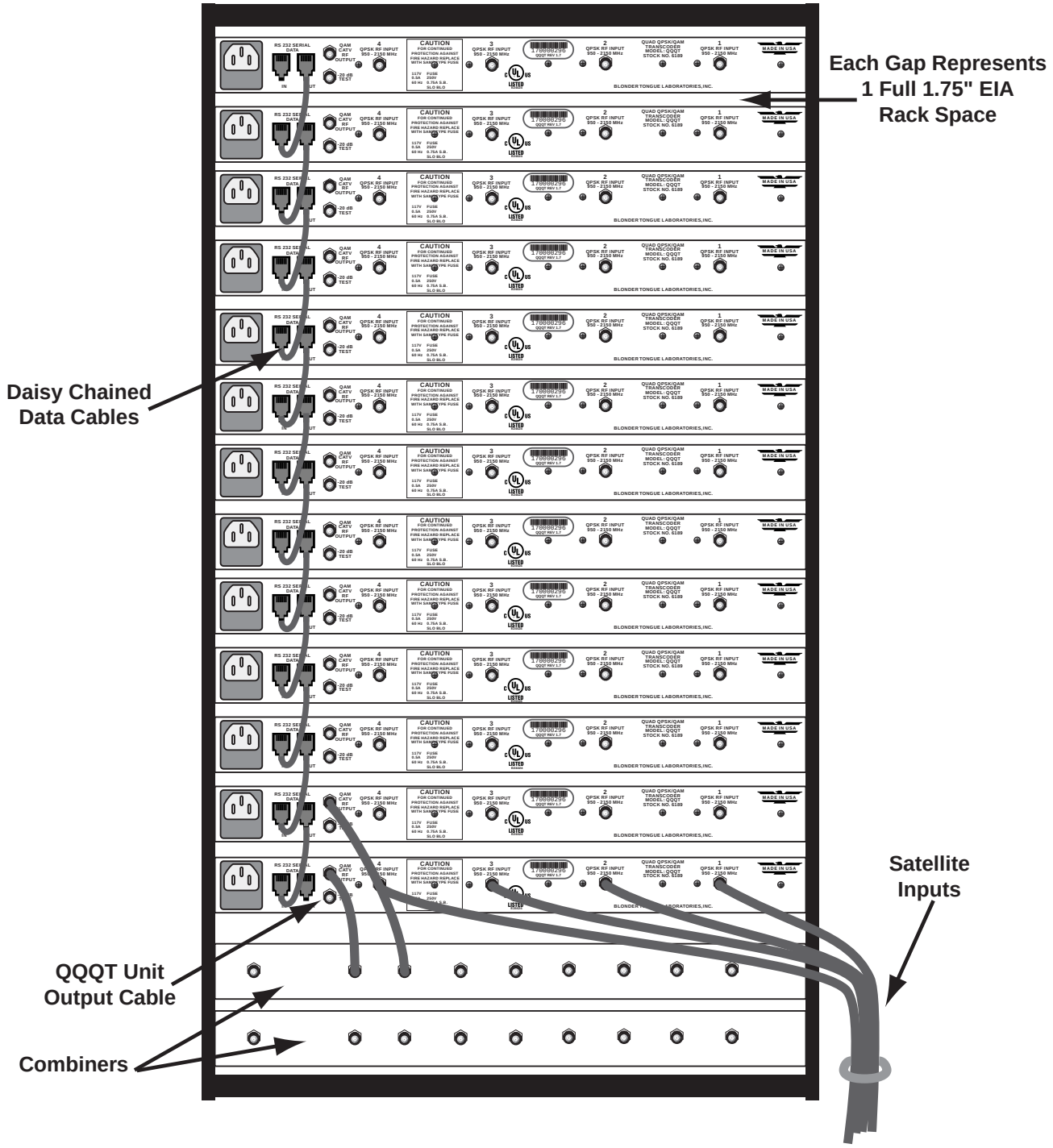
119° Total: 21

Note: EchoStar recommends Transponder 1 from 119° W be set at Output Channel 78 - 549 MHz.

* This value is automatically set by the QQQT unit when an Input Transponder or Output Channel entry is made.

## *Appendix D*

### Rear Headend Diagram




*Drawings are samples for illustration purposes only and are not to scale*

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