

Optoelectronics

Model 6940 Collector/Terminator Three Port Unbalanced Optoelectronic Node 870 MHz with 65/86 MHz Split

Description

The Model 6940 Collector/Terminator Node is a three port unbalanced node of the Prisma® Model 6940 Node family, specially designed for the collector / terminator architecture.

In the forward path, the high gain optical receiver in both the collector node and the terminator node accepts 1310 and 1550 nm wavelength optical inputs and provides forward RF output to the launch amplifier module. The launch amplifier has three unbalanced forward RF outputs, one of which has a 5 dB higher level than the other two.

In the reverse path, the launch amplifier in both the collector node and the terminator node has three reverse RF inputs fed from the HFC plant. The three RF inputs to the terminator node are combined and amplified in the launch amplifier and routed to an RF output port. The RF output is routed to the collector node through an operator-installed, hard-line coaxial cable. The collector node combines this RF signal with its three reverse input signals. The combined reverse signals from both the terminator and collector node are amplified and routed to the collector node's reverse transmitter for optical transmission to the headend or hubsite.

The Model 6940 Collector/Terminator Node utilizes a standard Model 6940 Node housing. The housing incorporates many features that enhance ease of use and reliability, such as a separate AC powering port, optional redundant power supply, and extended ports to allow for easy heat shrink weather protection.

The Model 6940 Collector/Terminator Node can also be configured with a Scientific-Atlanta status monitoring transponder. The transponder, in conjunction with ROSA® / TNCS or other compatible element management system, enables remote monitoring of critical node related parameters, and remote control of each optional reverse path switch for ingress troubleshooting.



Features

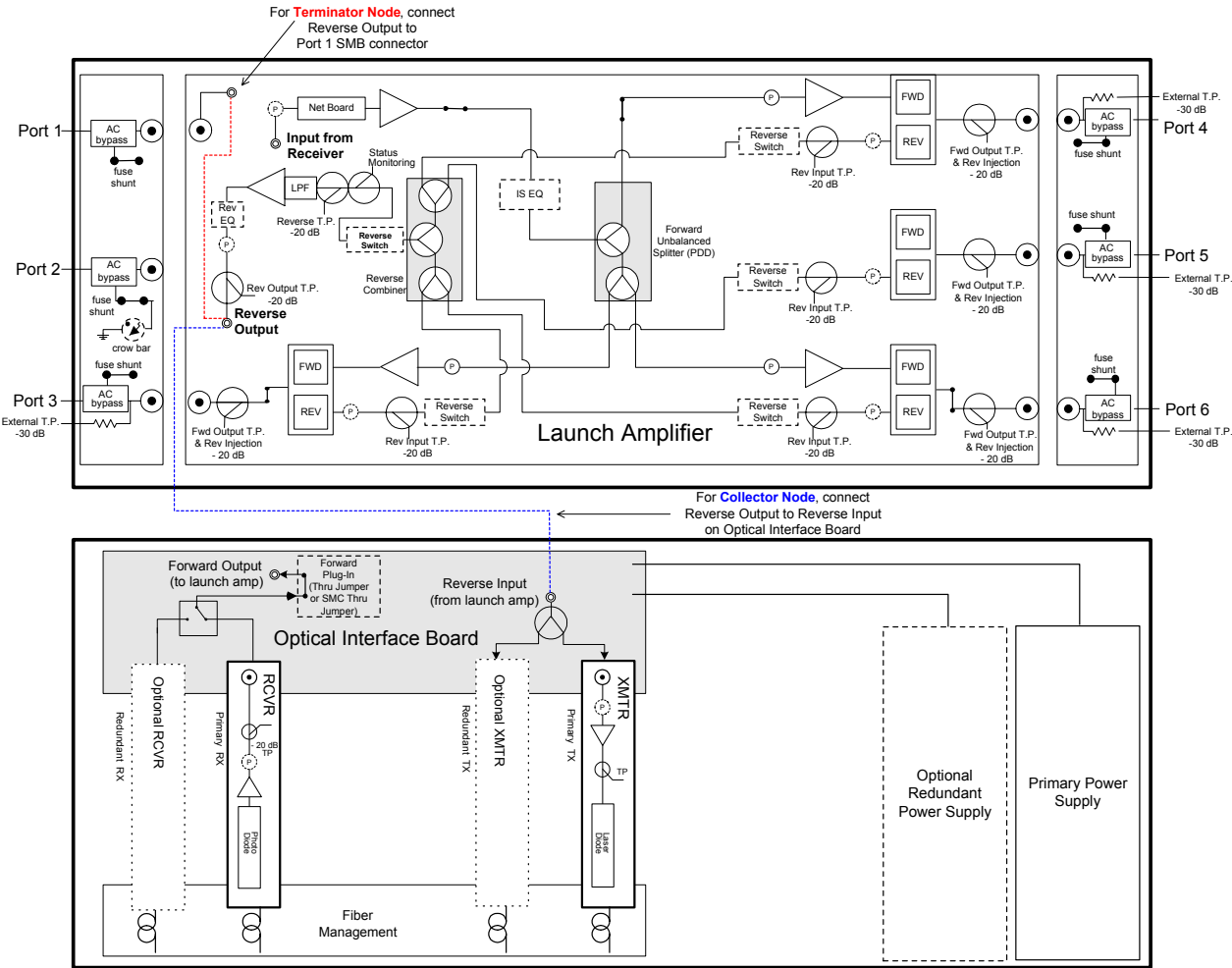
- 1 GHz RF platform
- One high level and two low level forward RF outputs
- Reverse transmitter in the collector node transmits reverse signals originating in the RF plant feeding both the collector node and the terminator node
- Collector node easily converted to terminator node and vice-versa
- 15 amperes continuous power passing
- Screwless seizures for ease of connector installation
- 40-90 V AC high-efficiency switch mode power supply
- Optional power supply redundancy
- Local test points and LED indicators on optical receivers and transmitters simplify installation and maintenance
- Optional status monitoring and control (status monitoring transponder and TNCS or other compatible element management system required)
- Plug-in pads provide individual level control for each port for forward and reverse paths
- Optional 3-state reverse switch (on/off/-6 dB) allows each reverse input to be isolated for noise and ingress troubleshooting (status monitoring transponder and ROSA / TNCS required)
- Fiber management tray provides convenient fiber and connector storage for up to 6 connector pairs

Model 6940 Collector/Terminator Node - 5-65/86-870 MHz

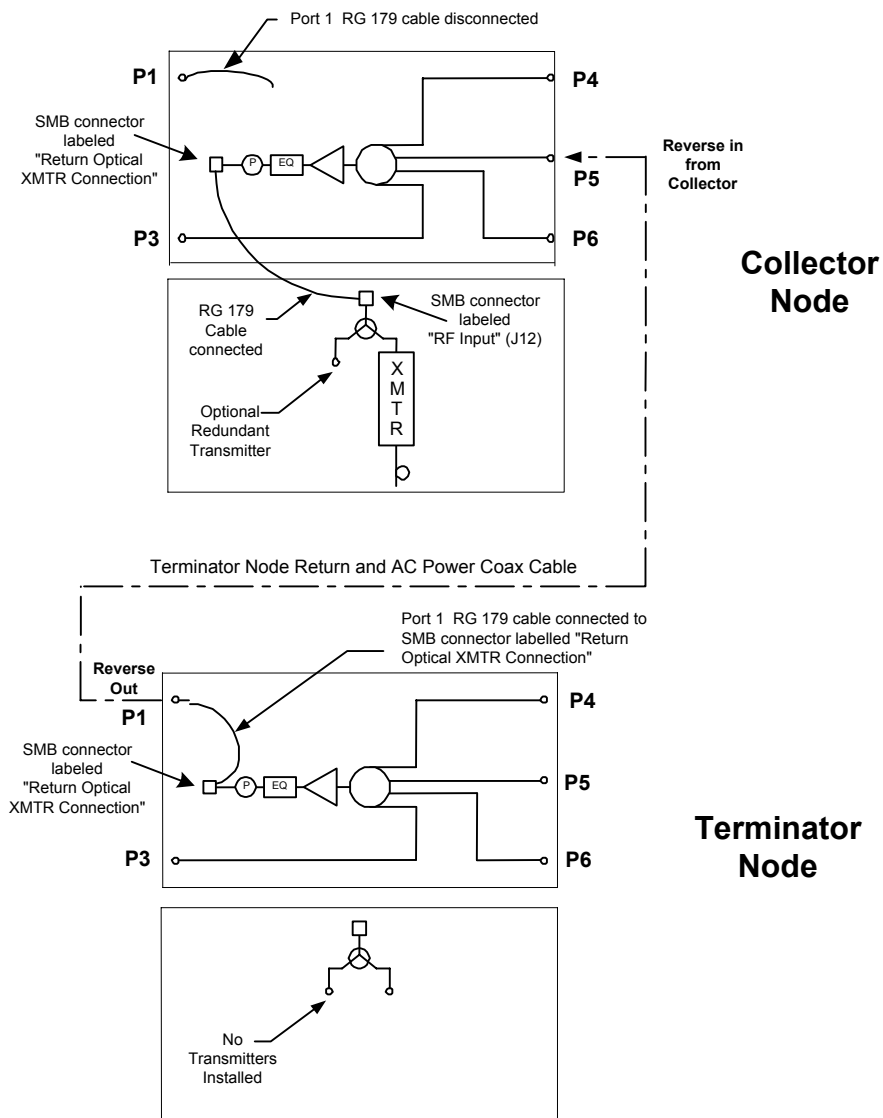
- 1310 nm analog reverse transmitters with either Fabry-Perot or DFB lasers

Model 6940 Collector/Terminator Node - 5-65/86-870 MHz

Block Diagram



Configuration Diagram



A Terminator node can easily be converted into a Collector node by:

- (1) adding a reverse optical transmitter
- (2) disconnecting Port 1's RG 179 cable from the launch amplifier's reverse output SMB connector
- (3) installing a RG 179 cable between the launch amplifier's reverse output SMB connector and the optical interface board's reverse input SMB connector

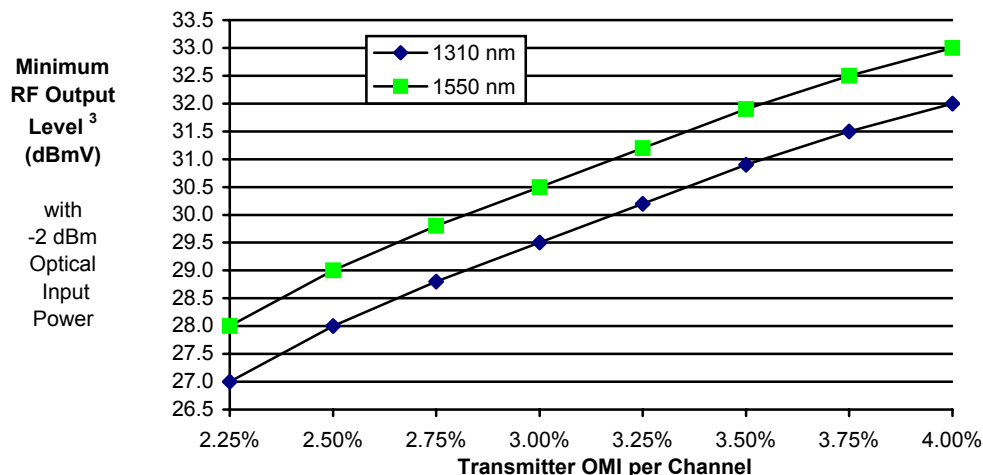
A Collector node can easily be converted into a Terminator node by:

- (1) removing the RG 179 cable that connects the launch amplifier's reverse RF output to the optical interface board's reverse input
- (2) connecting Port 1's RG 179 cable to the launch amplifier's reverse output SMB connector
- (3) removing the reverse optical transmitter

Optical Section Specifications

Optical Section - Forward Receiver Module	Units	6940 High Gain Receiver	Notes
Wavelength	nm	1310 and 1550	
Optical Input Range	dBm	-3 to +1	
Pass Band	MHz	52-870	
Frequency Response	dB	± 0.75	1
Tilt (± 1.5 dB)	dB	0	
Optical Input Test Point (± 20 %)	V DC	1V / mW	2
RF Output Test Point (± 1.0 dB)	dB	- 20	
RF Output Level @ -2 dBm Optical Input	dBmv	See Chart Below	3
Output Return Loss	dB	10	

**Receiver RF Output Level Vs Transmitter OMI
(using High Gain Receiver)**



Notes for Optical Section Specifications:

1. For forward receiver module only. Does not include frequency response contributions from forward optical transmitter.
2. Referenced to optical input power in milliwatts at 1310 nm.
3. Typical receiver RF output level for the stated transmitter percent Optical Modulation Index (OMI) per channel, with receiver optical input power of -2 dBm. To determine RF output levels at other optical input power, add (or subtract) 2 dB in RF level for each 1 dB increase (or decrease) in receiver optical input power.

For reverse optical transmitter and link performance, see the "Analog Reverse Optical Transmitters for Model 6940/6944 and GainMaker[®] Optoelectronic Stations" data sheet or the "Model 6940/44 bdr Digital Reverse" data sheet(s).

Unless otherwise noted, the above specifications reflect typical station performance at stated reference levels in the recommended Operating configuration (s). Unless otherwise noted, specifications are based on measurements made in accordance with NCTA Recommended Practices for Measurements on Cable Television Systems using standard frequency assignments and are referenced to 20°C (68°F).

RF Section Specifications

General Station Performance	Units	Forward	Reverse	Notes
Passband	MHz	86-870	5-65	
Amplifier Type	--	PHD	Push Pull	
Frequency Response	dB	±0.85	±0.75	
Return Loss	dB	16	16	
Hum Modulation @ 12A	dB	65	65	
Hum Modulation @ 15A	dB	65 (86-750 MHz) 60 (751-870 MHz)	65	
Internal RF Test Points (± 1 dB)	dB	-20	-20	
External RF Test Points (± 1.5 dB)	dB	-30	-30	

Launch Amplifier Performance - Forward	Units	Forward High Gain Port	Forward Low Gain Ports	Notes
Operational Gain (minimum)	dB	29	24	4
Frequency Response	dB	±0.5	±0.5	
Internal Tilt (±1.5 dB)	dB	16.5	16.5	1,3
Noise Figure @...	dB	11	11	2
870 MHz		11.5	11.5	
750 MHz		12.5	12.5	
650 MHz		13.5	13.5	
550 MHz		19	19	
86 MHz				
Reference Output Levels @...	dBmV	56.5	51.5	
870 MHz		50	45	
550 MHz		41	36	
86 MHz				
Reference Output Tilt (86-870 MHz)	dB	15.5	15.5	1,9
78 NTSC Channels (CW)				
Composite Triple Beat	dB	59	69	6
Cross Modulation	dB	57	65	6
Composite Second Order (high side)	dB	64	69	6

Forward Insertion Loss Optical Interface Board and Plug-Ins (Loss from optical receiver RF output to launch amplifier RF input)	Units	With Standard Jumper Board Installed	With Status Monitoring Jumper Board Installed	Notes
Receiver position 1 and 2	dB	1.5	2.7	12

Unless otherwise noted, the above specifications reflect typical station performance at stated reference levels in the recommended Operating configuration (s). Unless otherwise noted, specifications are based on measurements made in accordance with NCTA Recommended Practices for Measurements on Cable Television Systems using standard frequency assignments and are referenced to 20°C (68°F).

RF Section Specifications, continued

Launch Amplifier Performance - Reverse	Units	Collector Node	Terminator Node	Notes
Operational Gain (minimum)	dB	18	17.5	7,10
Frequency Response	dB	± 0.5	± 0.5	10
Noise Figure	dB	14	14	8,10
Reference Output Levels @ 5 and 65 MHz	dBmV	35	35	5
6 NTSC Channels (CW)				
Composite Triple Beat	dB	78	78	
Cross Modulation	dB	71	71	
Composite Second Order	dB	73	73	

Station Performance - Reverse (Station port input to optical transmitter input)	Units	6940 C/T Reverse	Notes
Amplifier Type	- -	Push Pull	
Operational Gain (minimum)	dB	14	11

Station Delay Characteristics				
Forward (Chrominance to Luminance Delay)		Reverse (Group Delay in 1.5 MHz BW)		
Frequency (MHz)	Delay (nS)	Frequency (MHz)	Delay (ns)	
			Collector	Terminator
91.25 - 94.83	5	5.0 - 6.5	39	58
97.25 - 100.83	3	6.5 - 8.0	17	25
103.25 - 106.83	2	8.0 - 9.5	8	15
112.25 - 116.68	2	60.5 - 62.0	10	10
		62.0 - 63.5	12	12
		63.5 - 65.0	17	17

Notes for RF Section Specifications:

- Reference output tilt and internal tilt are both "Linear" tilt.
- Launch amplifier forward noise figure with 0 dB input pad and factory installed 7.5 dB ISEQ.
- Forward internal tilt specified with factory installed 7.5 dB ISEQ.
- Launch amplifier forward gain from RF input to station output port, with 0 dB input pad and 7.5 dB ISEQ.
- Reverse output reference level at reverse output of RF launch amplifier.
- Station performance can be determined by combining optic performance and launch amplifier performance.
- Launch amplifier reverse gain from station reverse input(s) to launch amplifier RF output, with 0 dB reverse input pad, 0 dB reverse output pad, and 0 dB reverse EQ.
- Reverse noise figure at station input port with 0 dB reverse input pad, 0 dB reverse output pad and 0 dB reverse EQ.
- Reference output tilt is specified as "linear tilt" (as opposed to traditional "cable tilt").
- All reverse specifications are with reverse switch installed.
- Station reverse gain from station reverse input ports to reverse transmitter input with node in Collector mode. With 0 dB reverse input pad, 0 dB reverse output pad, and 0 dB reverse EQ in launch amplifier. Station gain equals launch amplifier gain for node in Terminator mode.
- Subtract this loss from the launch amplifier forward operational gain to determine forward station gain (gain from optical receiver output to station output).

Unless otherwise noted, the above specifications reflect typical station performance at stated reference levels in the recommended Operating configuration (s). Unless otherwise noted, specifications are based on measurements made in accordance with NCTA Recommended Practices for Measurements on Cable Television Systems using standard frequency assignments and are referenced to 20°C (68°F).

Specifications, continued

Electrical	Units				Notes
Max. AC Through Current (continuous)	Amps	15			
Max. AC Through Current (surge)	Amps	25			
Component DC Power Consumption (typical)		@ +24 V DC	@ +15 V DC	@ -6 V DC	1
Launch Amplifier with 5 PHD hybrids	Amps	1.8	-	-	
Optical Interface Board	Amps	0.22	-	-	
6940/44 Status Monitoring Transponder	Amps	0.15	-	-	
6940/44 High Gain Optical Receiver	Amps	0.35	0.01	0.035	
6940/44 Optical Transmitter-Standard Gain FP	Amps	0.14	-	0.07	
6940/44 Optical Transmitter-Standard Gain DFB	Amps	0.14	-	0.09	
6940/44 Reverse Switch	Amps	0.02	-	-	
Power Supply DC Current Rating	Amps	4.5	0.5	1.5	1
Power Supply Operating Efficiency	%	85			
AC Input Low Voltage Cutoff	V AC	33			
Minimum Restart Voltage	V AC	41			

Station Powering Data													
6940 C/T Station	I _{DC} (Amps at 24 V DC)		AC Voltage										
			90	85	80	75	70	65	60	55	50	45	41
Collector Node (1 High Gain RX & 1 DFB or FP TX)	2.51	AC Current (A)	1.1	1.2	1.2	1.2	1.2	1.2	1.4	1.5	1.6	1.7	1.9
		Power (W)	73	73	73	72	72	72	72	72	72	73	74
Terminator Node (1 High Gain RX)	2.37	AC Current (A)	1.1	1.1	1.1	1.1	1.1	1.1	1.4	1.4	1.5	1.6	1.8
		Power (W)	68	68	68	67	67	67	67	67	67	67	69

Data is based on stations configured for 2-way operation. AC currents specified are based on measurements made with typical CATV type ferro-resonant AC power supply (quasi-square wave), and standard version DC power supply (pn 590902).

Note:

- The total DC power consumption of installed components should not exceed the power supply DC current rating.

Environmental	Units	
Operating Temperature Range	degrees	-40°C to 60°C (-40°F to 140°F)
Relative Humidity Range	percent	5% to 95%

Mechanical	
Housing Dimensions	Weight
51.3 cm L x 27.4 cm H x 27.4 cm D (20.2 in. L x 10.8 in. H x 10.8 in. D)	Station with 1 RX, 1 TX, 2 power supplies: 16.8 kg (37 lbs)

Ordering Information

The **Prisma® Node Ordering Matrix** provides ordering information for configured nodes. This page contains ordering information for required and optional accessories that may not be included as part of a configured node. Please consult with Sales or Access Networks Applications Engineering to determine the best configuration for your particular need.

The following **Required Accessories** must be ordered separately (not included via Prisma Node Ordering Matrix):

Required Accessories for Model 6940 Node	Part Number
Plug-in Pads (attenuators) 1 required per Forward Fiber Optic Receiver Output 1 required per each Reverse RF Input used 1 required per Reverse Fiber Optic Transmitter	See Pad (attenuator) part number table
Plug-in Forward Equalizer - Available in 1.5 dB steps from 0 to 15 dB at 870 MHz 1 required	See EQ/Inverse EQ part number table

The following **Optional Accessories** may be ordered separately:

Optical Transmitters, Receivers and Related Parts	Part Number
Note: Transmitters and Receivers include coax cable for connection to launch amplifier	
6940/44 - High Gain Optical Receiver with SC/APC connector	590926
6940/44 - High Gain Optical Receiver with SC/UPC connector	590927
6940 - 1310 nm FP Optical Transmitter -Standard Gain, with SC/APC connector	590930
6940 - 1310 nm FP Optical Transmitter -Standard Gain, with SC/UPC connector	590931
6940 - 1310 nm DFB Optical Transmitter -Standard Gain, with SC/APC connector	590934
6940 - 1310 nm DFB Optical Transmitter -Standard Gain, with SC/UPC connector	590935
6940 - 1550 nm DFB Optical Transmitter -Standard Gain, with SC/APC connector	4005116
6940 - 1550 nm DFB Optical Transmitter -Standard Gain, with SC/UPC connector	4005118
SC/APC (green) Bulkhead Mating Adaptor (mounts in fiber handling tray), (qty 10)	4006328
SC/UPC (blue) Bulkhead Mating Adaptor (mounts in fiber handling tray), (qty 10)	4006329
Plug-In Modules for 6940 Collector/Terminator Node Optical Interface Board	
Standard Thru Jumper	717946
SMC Thru Jumper (same as above but includes coupler for status monitoring RF)	590955
Plug-In Modules for Launch Amplifier	
6940/44 – Reverse Switch (one may be ordered for each reverse input port or common path)	590956
Related Equipment	
6940/44 – Standard DC Power Supply 40 - 90 V AC	590902
6940/44 – Crowbar Surge Protector (qty. 10)	4007717
Redundant Control Module - Required for redundant optical receiver operation when Status Monitoring Transponder is <i>not</i> used	741509
Status Monitoring Transponder	See Transponder Data Sheet
75 Ohm Transmitter Terminator (used when no TX in redundant slot)	591133
75 Ohm SMB Terminator (for female SMB connector termination)	591134
SMB to F Test Cable Assembly	590961
6940/44 – RF Test Probe	562580

Ordering Information, continued

Equalizers / Inverse Equalizers

870 MHz Linear Forward Equalizers	Part Number
0 dB EQ (jumper)	717929
1.5 dB	590986
3.0 dB	590987
4.5 dB	590988
6.0 dB	590989
7.5 dB	590990
9.0 dB	590991
10.5 dB	590992
12.0 dB	590993
13.5 dB	590994
15.0 dB	590995

870 MHz Inverse Equalizer	Part Number
1.5 dB	591010
3.0 dB	591011
4.5 dB	591012
6.0 dB	591013
7.5 dB	591014
9.0 dB	591015
10.5 dB	591016

65 MHz Reverse Equalizers	Part Number
0 dB	591084
1 dB	591085
2 dB	591086
3 dB	591087
4 dB	591088
5 dB	591089
6 dB	591090
7 dB	591091
8 dB	591092
9 dB	591093
10 dB	591094
11 dB	591095
12 dB	591096

Pads (attenuators)

Pad Value (dB)	Part Number	Pad Value (dB)	Part Number
0	279500	0.5	565231
1	279501	1.5	565232
2	279502	2.5	565233
3	279503	3.5	565234
4	279504	4.5	565235
5	279505	5.5	565236
6	279506	6.5	565237
7	279507	7.5	565238
8	279508	8.5	565239
9	279509	9.5	565240
10	279510	10.5	565241
11	279511	11.5	565242
12	279512	12.5	565243
13	279513	13.5	565244
14	504151	14.5	565245
15	504152	15.5	565246
16	504153	16.5	565247
17	504154	17.5	565248
18	504155	18.5	565249
19	504156	19.5	565250
20	504157	20.5	565251
75 ohm terminator	279524		