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Douglas County - NV
Karen Ellison - Recorder
Page: 1 Of 206 Fee: 0.00
BK-0411 PG- 4561 RPTT: 0.00

Assessor's Parcel Number: N/A

Date: APRIL 25, 2011

Recording Requested By:

Name: TAMMY JAMES, COMMUNICATIONS MANAGER

Address:

City/State/Zip:

Real Property Transfer Tax: $ N/A

CONTRACT #2011.075
(Title of Document)

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APPROVED APRIL 7, 2011 ITEM #11
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COMMUNICATIONS
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BK- 0411
PG- 4562
04/25/2011

FILED
No. 2011.075
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BY

INDEPENDENT CONTRACT BETWEEN DOUGLAS COUNTY, NEVADA AND SIERRA ELECTRONICS FOR TURN-KEY IMPLEMENTATION OF THE MULTI-COUNTY ETHERNET MICROWAVE SYSTEM*

*Note that the project is also referred to as the "Four County Ethernet Microwave Project". The words "Four County "and "Multi County" are used interchangeably in this Independent Contract.

This contract is dated this 18th day of APRIL, 2011, and is made by and between DOUGLAS COUNTY, NEVADA (hereinafter "COUNTY"), and SIERRA ELECTRONICS, whose address is 690 Glendale Ave. Suite 9B, Sparks, Nevada 89431 (hereinafter " SIERRA").

RECITALS

A. COUNTY desires to retain the services of SIERRA to provide a Turn-key Implementation of the Multi-County Ethernet Microwave System, as described in the attached documents:

- Project Team of Four County Microwave Project Request for Proposal (RFP)
- Vendor Response Section of the Four County Microwave Project Request for Proposal
- The SIERRA Response to the Request for Proposal "Multi-County Ethernet Microwave System" (RFP)
- SIERRA document "Project Four County Microwave System PTP LINKPlanner Proposal" dated February 15, 2011
- SIERRA document "Cost Proposal, Number JSEQ1611-05, Dated March 14, 2011

This project is funded by the 2007 Public Safety Interoperable Communications (PSIC) Grant Titled "Multi County Ethernet Microwave Interconnect."

B. SIERRA is a qualified professional firm capable of providing the certain professional services that the COUNTY seeks.

NOW, THEREFORE, in consideration of the recitals and mutual promises contained herein, COUNTY does hereby engage SIERRA, and SIERRA agrees, to perform the services set forth herein in accordance with the following terms and conditions:

1. **Description of Services.** SIERRA shall provide the services and equipment as listed in the Attachments. The implementation of the System as presented in the Attachment "Project Four County Microwave System PTP LINKPlanner Proposal" dated February 15, 2011 and associated "Cost Proposal, Number JSEQ1611-05", March 14, 2011

2. **Schedule and Term.** The schedule for performing said services as described in the attached as Exhibit 1:

SIERRA shall commence work under this contract within fifteen (15) days of executed contract and shall complete all work under this contract no later than November 1, 2011. The elapsed time estimate is comprised of:

- Federal Communications Commission (FCC) license completion - 90 days from contract acceptance
- After the FCC license is completed the equipment will be ordered and staged in SIERRA's shop. SIERRA estimates this to be a 60-90 day process.
- Installation of high-level sights will be started upon completion of staging with 2 installation teams. It is estimated that each site will take approximately one week of effort. The installation is to be completed in 8-10 weeks.
- Upon installation completion, SIERRA will perform a system optimization and will work with the Project Team in completion of the Acceptance Test Plan (Exhibit 5). This process should take approx 6 weeks.

3. **Compensation.** Total compensation to SIERRA for providing the services set forth in the attachments and described shall not exceed **nine hundred sixty-six thousand twenty-five and 45/100 Dollars ($968,025.45)**. This is the total amount as presented in SIERRA's revised response to the RFP and as defined in SIERRA'S document "Cost Proposal, Number JSEQ1611-05", Dated March 14, 2011.

Note that the first Item "FINAL DETAILED SYSTEM DESIGN" listed in the document "Cost Proposal, Number JSEQ1611-05" was completed under a separate agreement for a total fee of $50,000.00 and that amount is subtracted from the total amount of this Independent Contract, as indicated above.

4. **Payment Schedule.** For Milestones A,B & C: once SIERRA submits that a corresponding milestone has been successfully completed, SIERRA and the COUNTY project managers will sign-off on the milestone completion form within ten (10) business days. If a deliverable is rejected for any reason, the COUNTY will provide a written description of the deficiencies to SIERRA within ten (10) business days. If the COUNTY fails to accept or reject the deliverable within ten (10) business days, then SIERRA will be paid the full contract price for the milestone. The Milestone identified as D is subject to forty-five (45) days of the Acceptance Test Plan (ATP) as defined, and attached as Exhibit 5, of this Independent Contract. Payment to SIERRA for Milestone D will occur thirty (30) days following the signed approval by the COUNTY Project Manager that the ATP was successfully completed.

COUNTY shall make milestone payments within thirty (30) days of receiving a billing statement in proportion to the satisfactory completion of SIERRA's services pursuant to the following milestone schedule:

Milestone (based on total Contract Price)	%
A. Due upon award of contract	30%
B. Upon delivery of equipment to Sierra's shop	15%
C. Upon installation of all equipment	30%
D. Upon system acceptance by Four County Project Team	25%

5. **Standard of Performance:**

a. Services shall be performed by SIERRA in accordance with generally accepted professional practices and principles and in a manner consistent with the level of care and skill ordinarily exercised under similar conditions by members of SIERRA's profession currently practicing in Nevada. By delivery of completed work, SIERRA certifies that the work conforms to the requirements of this Independent Contract and all applicable Federal, State and local laws and the professional standards of care in Nevada.

b. Previous to this Independent Contract, SIERRA was responsible for making an independent evaluation and judgment of all conditions affecting performance of the work, including, without limitation, site condition, existing facilities, seismic, geographic, climatic conditions, applicable Federal, State and local laws and regulations, and all other contingencies or design considerations. Data, calculations, opinions, reports, investigations and other similar information provided by COUNTY relating to site, local or other conditions, was and is not warranted or guaranteed, expressly or implied, by COUNTY.

c. SIERRA's responsibilities under this section shall not be delegated. SIERRA shall be responsible to COUNTY for acts, errors or omissions of SIERRA's subcontractors.

d. Whenever the scope of work requires or permits review, approval, conditional approval or disapproval by COUNTY, it is understood that such review, approval, conditional approval or disapproval is solely for the purposes of administering this Independent Contract and determining whether SIERRA is entitled to payment for such work, and shall not be construed as a waiver of any breach or acceptance by COUNTY of any responsibility, professional or otherwise, for the work, and shall not relieve SIERRA of responsibility for complying with the standard of performance or laws, regulations, industry standards, or from liabilities for damages caused by negligent acts, errors, omissions, noncompliance with industry standards or the willful misconduct of SIERRA.

6. **Independent Contractor.** It is agreed that SIERRA is an independent contractor, and all persons working for or under the direction of SIERRA are SIERRA's agents, servants and employees, and said persons shall not be deemed agents, servants or employees of COUNTY.

7. **Ownership of Data and Documents.** SIERRA agrees that all COUNTY and other participating Counties or agencies, records, specifications, data, maps, graphics, writings, recordings and other tangible materials regardless of form or format, electronically transmitted documents and files provided by the COUNTY to SIERRA shall be the property of COUNTY, or the originating County or Agency. The COUNTY agrees that all SIERRA software, lists, processes, know-how, designs, formulae, algorithms, databases, methods of operation, business methods or plans provided by SIERRA to the COUNTY shall remain the property of SIERRA.

8. **Subcontractor:**

a. SIERRA will perform the work personally or through SIERRA's employees. SIERRA may subcontract work only upon prior approval of the COUNTY. If subcontracting of work is permitted, SIERRA shall pay subcontractor within a commercially reasonable time period. Use of the term subcontractor in any other provisions of this Independent Contract shall not be construed to imply authorization for SIERRA to use subcontractors for performance of any service under this Independent Contract.

b. COUNTY is an intended beneficiary of any work performed by the subcontractor for purposes of establishing a duty of care between the subcontractor and COUNTY.

9. **Insurance.**

a. Commercial General Liability/Automobile Liability Insurance:

SIERRA shall obtain and maintain Commercial General Liability insurance and Automobile Liability insurance in the amount of One Million Dollars ($1,000,000) per occurrence. If a general aggregate limit is used, either the general aggregate limit shall apply separately to this contract or the general aggregate limit shall be twice the required occurrence limit. SIERRA's insurance coverage shall be written on an occurrence basis.

b. Workers' Compensation Insurance:

SIERRA shall obtain and maintain statutory Workers' Compensation insurance and Employer's Liability insurance in the amount of One Million Dollars ($1,000,000) per accident.

c. Acceptability of Insurers: Insurance is to be placed with insurers with a current *Best Rating* of A:VII unless otherwise acceptable to COUNTY.

d. Verification of Coverage: Original Certificates of Insurance with endorsements shall be received and approved by COUNTY before work commences, and insurance must be in effect for the duration of the contract. The absence of insurance or a reduction of stated limits shall cause all work on the project to cease. Any delays shall not increase costs to COUNTY or increase the duration of the project.

e. Other Insurance Provisions:

(1) The COUNTY , its officers, officials, employees and volunteers are to be covered as additional insured by Endorsement CG 20 10 11 85 or other endorsement approved by COUNTY's Risk Manager for Commercial General and Automobile Liability coverage.

(2) For any claims related to this project for which SIERRA has liability under this Independent Contract, SIERRA's insurance coverage shall be primary and any insurance or self-insurance maintained by COUNTY, its officers, officials, employees and volunteers shall not contribute to it.

(3) Each certificate of insurance required shall be endorsed that insurer shall endeavor to provide a thirty (30) day notice to COUNTY in the event of cancellation non-renewal of the stipulated insurance coverage.

(4) In the event SIERRA employs subcontractors as part of the work covered by this Independent Contract, it shall be the responsibility of SIERRA to ensure that all subcontractors comply with the same insurance requirements that are stated in this Independent Contract.

(5) Approval of the insurance by COUNTY or acceptance of the Certificate of Insurance by COUNTY shall not relieve or decrease the extent to which SIERRA may be held responsible for payment of damages resulting from SIERRA's services or operation pursuant to this Independent Contract, nor shall it be deemed a waiver of COUNTY's rights to insurance coverage hereunder.

(6) If, for any reason, SIERRA fails to maintain insurance coverage that is required pursuant to this contract, the same shall be deemed a material breach of contract. COUNTY, at its sole option, may terminate this contract and obtain damages from SIERRA resulting from said breach.

10. **Indemnification.** To the fullest extent permitted by law, SIERRA shall indemnify, defend (with competent counsel reasonably acceptable to the Douglas County District Attorney) and hold harmless COUNTY and its directors, officers, employees and volunteers from and against all third party liabilities (including, without limitation, all claims, lawsuits, losses, damages, penalties, fines and judgments, associated investigation and administrative expenses, and defense costs, including, but not limited to, reasonable attorneys' fees, court costs, and costs of alternative dispute resolution) for personal injury, property damage, or intellectual property infringement related to the negligent acts or omissions, reckless or willful misconduct of SIERRA, or the acts or omissions of an employee, agent or subcontractor of SIERRA. The provisions of this paragraph survive completion of the services or the termination of this Independent Contract. The provisions of this section are not limited by the provisions of Section 9 relating to insurance.

11. **Applicable Laws and Attorneys' Fees**. This Independent Contract shall be construed and enforced pursuant to the laws of the State of Nevada. Should a dispute arise that

cannot be settled through negotiation for breach of this Independent Contract or to enforce any provision herein, the parties agree to a mutually agreeable mediator administered through the American Arbitration Association under its Commercial Mediation Rules before escorting to arbitration, litigation or other dispute.

Should any legal action be brought by a party for breach of this Independent Contract or to enforce any provision herein, the prevailing party of such action shall be entitled to reasonable attorneys' fees, court costs and such other costs as may be fixed by the court. Reasonable attorneys' fees of the COUNTY Attorney's Office, if private counsel is not used, shall be based on comparable fees of private attorneys practicing in Douglas County Nevada. The parties agree that if dispute results in litigation, litigation will be filed in the Ninth Judicial District Court of the State of Nevada

12. **Nondiscrimination.** SIERRA shall afford equal employment opportunities for all persons without discrimination because of race, color, religion, sex, sexual orientation, political affiliation, national origin, ancestry, age, marital status, or physical or mental disability.

13. **Amendment.** This Independent Contract may only be amended in writing and signed by authorized representatives of both parties.

14. **Termination.** COUNTY may terminate this Independent Contract at any time by providing thirty (30) days advance written notice to SIERRA. Should COUNTY terminate pursuant to said notice, COUNTY shall pay SIERRA for SIERRA's services rendered to the date of cancellation based on percentage of completion of scope of basic services, including actual reimbursable expenses. In no event shall said fees exceed the maximum compensation established in this Independent Contract.

15. **Attachments or Exhibits.** Except as expressly referenced herein, no portion of any terms or conditions included in any attachments or exhibits shall be a part of this Independent Contract, and they shall have no force or effect. If the attachments or exhibits to this Independent Contract, if any, are inconsistent with this Independent Contract, this Independent Contract shall control.

16. **Order of Precedence**. In the event of any inconsistency between the various documents comprising this Independent Contract, the order of descending precedence shall be as follows: (1) this Independent Contract; (2) Project Four County Microwave System PTP LINKPlanner Proposal Report dated February 15, 2011; (3) SIERRA Cost Proposal "JSEQ1611-05"; (4) SIERRA's Response to the RFP; (5) Multi-County Ethernet Microwave Request For Proposal.

17. **Entire Independent Contract.** This Independent Contract contains the entire understanding between the parties with respect to the subject matter herein. There are no representations, agreements or understandings (whether oral or written) between or among the parties relating to the subject matter of this Independent Contract which are not fully expressed herein. This Independent Contract may not be amended or modified unless so done in writing signed by authorized representatives of both Parties. The pre-printed terms and conditions of any

COUNTY purchase order or any other terms and conditions of a COUNTY purchase order which may conflict in any way with the terms and conditions of this Independent Contract shall be void, even if issued subsequent to the effective date of this Independent Contract, and shall not be deemed to constitute a change to this Independent Contract.

18. **Force Majeure**. Neither party shall be deemed to be in default of any provision of this Independent Contract or be liable for any delay, failure in performance or interruption of service resulting from protests, strikes, legal impossibility, failure of public transportation, civil or military authority, act of public enemy, accidents, fires, explosions, emergencies or acts of God, including, without limitation, earthquakes, floods, winds, wildfire, or storms, or any other cause beyond its reasonable control. In such an event the intervening cause must not be through the fault of the Party asserting such an excuse, and the excused Party is obligated to promptly perform in accordance with the terms of this Independent Contract after the intervening cause ceases.

19. **Public Records.** SIERRA expressly agrees that all documents ever submitted, filed, or deposited with the COUNTY by SIERRA, unless designated as confidential by a specific statute of the State of Nevada, shall be treated as public records pursuant to NRS ch. 239 and shall be available for inspection and copying by any person, as defined in NRS ch. 239, or any governmental entity. SIERRA expressly and indefinitely waives all of its rights to bring, including but not limited to, by way of complaint, interpleader, intervention, or any third party practice, any claims, demands, suits, actions, judgments, or executions, for damages or any other relief, in any administrative or judicial forum, against COUNTY or any of its officers or employees, in either their official or individual capacity, for violations of or infringement of the copyright laws of the United States or of any other nation.

20. **Notices.** Any notice required to be given to SIERRA shall be deemed to be duly and properly given if mailed to SIERRA, postage prepaid, addressed to:

Jarry Walton
SIERRA Electronics
690 E Glendale Ave Suite 9B
Sparks, NV, 89431

or personally delivered to SIERRA at such address or at such other addresses as SIERRA may designate in writing to COUNTY.

Any notice required to be given COUNTY shall be deemed to be duly and properly given if mailed to COUNTY, postage prepaid, addressed to:

Douglas County Manager
Post Office Box 218
Minden, Nevada 89423

or personally delivered to COUNTY at such address or at such other addresses as COUNTY may designate in writing to SIERRA.

21. **Limitation of Liability**. In no event shall SIERRA be liable for any indirect, incidental, consequential or special damages regardless of the legal theory under which such damages are incurred. For purposes of this Independent Contract, "special damages" shall not include third party indemnification claims for monetary losses such as past and future medical expenses, loss of past and future earnings, burial costs, loss of use of property, costs of repair or replacement, costs of obtaining domestic services, loss of employment and loss of business or employment opportunities. Except for SIERRA's indemnification obligations under Section 10, SIERRA's total liability for any and all damages whatsoever arising out of or in any way related to this Independent Contract from any cause shall not exceed the amounts paid by the COUNTY under this Independent Contract.

22. **No Appropriation of Funds.** All payments and services provided under this Independent Contract are contingent upon the availability of the necessary public funding. In the event that the COUNTY does not receive the funding necessary to perform in accord with the terms of this Independent Contract, this Independent Contract shall automatically terminate and all fees due and owing shall be paid.

23. **Authority To Execute And Implement.** Each person who signs this Independent Contract warrants and represents that he has the legal capacity to enter into this Independent Contract and if signing in a representative capacity, has the actual authority to bind the principal for which he signs and that his signature has the effect of binding the principal. Each person signing this Independent Contract hereby certifies that he is authorized by his respective governing body to enter into the terms and conditions set forth herein.

IN WITNESS WHEREOF, this Independent Contract is executed by COUNTY and by SIERRA on the date first written above.

Douglas County, Nevada

By: _____
Michael A. Olson, Chairman

By: _____
Tod Carlini,
Director of Emergency Management

" SIERRA":
SIERRA ELECTRONICS, CORPORATION

By: _____
Jarry Walton, President

880168379
Taxpayer I.D. Number

Sierra Electronics

Multi-County Microwave System

Acceptance Test Plan

Date: 04/14-2011

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Document Status History

Version	Date	Author / Consult	Summary
1.0	03-15-2011	M Cote	Document Creation / Draft
1.1	03/15/2011	M Cote, P Belton	Revised, modify ATP procedures
1.2	03/16/2011	M Cote	Revised, modify ATP procedures Revised ATP Scope of Test
1.3	03/16/2011	M Cote, J Walton, P Belton, J Springer	Internal Review / Accepted
1.4	04/14/2011	M Cote, J Walton, P Belton, J Springer Galena Group	Review ATP, Address comments Modify ATP to reflect said issues ATP Conditionally Approved
1.4			Approved
1.4			Completion / Certified

Notes:

04/14/2011 - ADD: Addendum - 1, Response to the ATP (Ver. 1.3) review.

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1. Overview

Sierra Electronics submits the following Acceptance Test Plan (ATP) document for the newly deployed Multi-County Ethernet Microwave system. The process would be performed in two (2) phases. Each phase has multiple levels of acceptance test procedures. The purpose of the ATP is to perform systematic testing and measurements which are consistent with accepted industry practices.

Based on the result of the testing, the overall "Pass / Fail" of each ATP test will be indicated after each test procedure. The final ATP test period will be completed over 45 days from the date of installation completion. ATP testing periods are outlined in the testing definitions.

2. Test Objective

The objective of the ATP is to verify that the "Multi-County Ethernet Microwave System" meets or exceeds the design parameters as outlined in the RFP response and the subsequent system evaluations which have been performed.

3. General Assumptions and Preparations

This document assumes that all installation task and optimizations have been completed as related to each phase of the ATP.

A pre-requisite to completion of the ATP is the assignment of a system administrator, ATP monitor and completion of an IP assignment plan and data flow matrix.

The data matrix addresses bandwidth assignment and the prioritizing of said usage. This issue may be addressed after completion of the microwave network by the various county departments responsible for said assignment.

Network parameters unique to each end user CEN (Customer Enterprise Network) are not defined and are beyond the scope of this ATP (dependent upon final system use determinations).

It is understood that the ATP may be subject to modification. The identification / resolution of radio frequency interference issues may impact the ATP and would be addressed as a separate issue.

Resolution of documented deficiencies beyond the control of Sierra Electronics shall be resolved by agreement between Sierra Electronics and Douglas County and shall not impede the ATP and project completion.

4. Scope of Test

The first phase would be performed at each microwave site location. This testing is composed of a Site Equipment Installation Acceptance Audit, Accessibility Test and Data Performance Measurements Test.

The second phase of the ATP involves System Acceptance Tests. These tests will verify the system operation and reliability.

Functional tests encompass accessibility, network routing, PTP application management and LAN application management.

Reliability tests will be performed over a 45 day period and would involve system monitoring of both the microwave and LAN networks.

5. Test Acceptance

Whenever an ATP task has been completed, the assigned ATP monitor will acknowledge completion of said task by signing the associated ATP task document.

Upon completion of all ATP task, the assigned ATP monitor will acknowledge system acceptance by signing the attached "System Acceptance" document.

The successful completion of all acceptance tests constitutes the acceptance of the hardware and software provided by Sierra Electronics.

6. Test Issues and Deficiency Management

If deficiencies are found during the testing, both the deficiencies and the resolutions to the deficiencies shall be documented and agreed upon.

If the documented deficiencies do not prevent productive operational use of the system, as determined by Douglas County, then the test will be deemed completed.

Sierra Electronics will, however, remain responsible for the resolution of said deficiencies and the agreed upon solution.

7. Phase-1 ATP Test

The first phase would be performed at each microwave site location. This testing is composed of a Site Equipment Installation Acceptance Audit, Accessibility Test and Data Performance Measurements Test.

Site Installation Acceptance – Part I

ATP-01 Site Inventory and Identification

ATP-02 Site Installation Acceptance Audit

Optimization Acceptance Test – Part II

ATP-03 Site Battery Backup Test / Power Down Test
ATP-04 Site PTP Accessibility Test
ATP-05 Site PTP-800 Performance Measurements / Test
ATP-06 Site Network Switch Accessibility Test
ATP-07 Site IP-223 Accessibility Test
ATP-08 Site IP-223 Operational Test

8. Phase-2 ATP Test

The second phase of the ATP involves System Acceptance Tests.

Functional tests encompass accessibility, network routing, PTP application management and LAN application management.

Reliability tests will be performed over a 45 day period and would involve system monitoring of both the microwave and LAN networks.

System Function Test – Part 1

ATP-09 Control Points (4) – PTP Accessibility Test
ATP-10 Control Points (4) – Switch Accessibility Test
ATP-11 Control Points (4) – IP223 Accessibility Test
ATP-12 Control Points (4) – IP223 Operational Test

System Function Test – Part 2

ATP-13 Control Points (4) – Secondary Link Path Test (each site)

System Function Test – Part 3

ATP-14 PTP Management Software Accessibility Test
ATP-15 Network Management Software Accessibility Test

System Reliability Test – Part 1

ATP-16 PTP Microwave Reliability Test
ATP-17 LAN Network Reliability Test

9. Glossary

Acronym	Meaning / Description
ATP	Acceptance Test Plan / This document
ATP-01	Acceptance Test Procedure 01 (Task 01 to 17)
CEN	Customer Enterprise Network / End user owned network
PTP	Point to Point / Per hop microwave network
VOIP	Voice over IP

ATP-01 Site Inventory and Identification

Date:	
Site:	**Location:**
GPS:	

Inventory

Manufacture	Model	S/N	Type	MAC Address

Identification				
Equipment	**S/N**	**Type**	**Drop / Link**	**IP Address**

ATP Task 01 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-02 Site Installation Acceptance Audit

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Equipment cabinets or racks installed to site spec, secured to floor, cable tray and adjacent racks			
Equipment installed in cabinets or racks to design spec – Network switch, IDU, IP-223, DC power supply system, AC Inverter etc.			
Install AC distribution strip			
Install equipment cabinet / rack ground bar			
Wire ground bar to system ground (R56 standard)			
Install surge protectors			
Wire ground to equipment, surge protectors, AC strip			
IDU and Network switch wired to AC Inverter			
IP-223 wired to 12v DC bus			
Antenna/Microwave Dish installed to design spec (ODU)			
All Dish hardware secure and tight			
Coaxial / Cat-5 jumpers installed to spec			
Building entry ports sealed			
All hardware secure and tight			
Dress and secure all cables / Wires			
Equipment labels installed			

Notes / Discrepancies
Note: Installation shall meet industry accepted practices and standards. Installation shall conform to or exceed accepted site standards.
Note: Motorola R56 standards apply unless noted.

ATP Task 02 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-03 Site Battery Backup Test / Eq Power Down Test

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Measure DC supply voltage = Measure Battery Voltage =			(Reference Only)
Remove AC from equipment rack, equipment should remain powered on			Pass / Fail Test
While running on battery, measure equipment current draw and note			(Reference Only) Current draw :
Calculate battery run time Battery AH's / current draw x .7 = run time (hrs)			(Reference only) Run time calculated:
Re-power system from AC Has system powered up from AC			Pass / Fail Test
Are Batteries charging? Measure Battery Voltage=			(Reference Only)
Power Down PTP microwave radios Wait 60 seconds Re-power PTP radios Confirm power-up of PTP Radios			Pass / Fail Test
Power down Network Switch Wait 60 seconds Re-power Network Switch Confirm power-up of Network Sw			Pass / Fail Test
Power down IP-223 Wait 60 seconds Re-power IP-223 Confirm power-up of IP-223			Pass / Fail Test

Notes / Discrepancies
This test confirms that the equipment will switch to batteries and continue to run during an interruption of commercial AC power and then switch back to AC power.
Run time battery capacity is tested for statistical reference.
Confirm equipment re-powers up after shutdown (loss of supply voltage)

ATP Task 03 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-04 PTP 800 Accessibility Test

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to IDU-1 Enter local PTP-1 IP Address Connectivity successfully obtained			Pass / Fail Test Local Site:
Enter far end link PTP address Connectivity successfully obtained			Pass / Fail Test Far end Site:
Enter PTP address of control point PTP at end of path loop Connectivity successfully obtained			Pass / Fail Test Far end Site:
Connect computer directly to IDU-2 Enter local PTP-2 IP Address Connectivity successfully obtained			Pass / Fail Test Far end Site:
Enter far end PTP address Connectivity successfully obtained			Pass / Fail Test Far end Site:
Enter PTP address of control point PTP at end of path loop Connectivity successfully obtained			Pass / Fail Test Far end Site:

Notes / Discrepancies
This test confirms local Ethernet accessibility to site PTP microwave equipment and their associated microwave links. Further testing accesses control point PTP links further down the microwave path.

ATP Task 04 - Acceptance			
Date	Name	Title	Signature

ATP-05 PTP 800 Performance / Measurement Test

Date:	Sites Link End-End:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect test computer to PTP microwave (link end 1)			Test setup procedure PTP Site:
Log on to PTP Clear PTP statistical log and performance counters			Test setup procedure
Connect test computer to PTP microwave (link end 2)			Test setup procedure PTP Site:
Log on to PTP Clear PTP statistical log and performance counters			Test setup procedure
Run BER (BERT) test app. (over microwave link)			Pass / Fail Test (10-4 min BER)
Log on to PTP link end 1 Review Bit Error Ratio			Pass / Fail Test (10-4 min BER)
Record Bandwidth / Throughput			Pass / Fail (200mb)
Log on to PTP link end 2 Review Bit Error Ratio			Pass / Fail Test (10-4 min BER)
Log on to PTP link end 1 Review Wireless Link availability			Pass / Fail Test (99.99 to 99.999 %)
Log on to PTP link end 2 Review Wireless Link availability			Pass / Fail Test (99.99 to 99.999 %)
Log on to PTP link end 1 Review RSSI signal levels			(Reference only) Path fade margin =
Log on to PTP link end 2 Review RSSI signal levels			(Reference only) Path fade margin =
Record Bandwidth / Throughput			Pass / Fail (200mb)

Notes / Discrepancies
This procedure test BER over a PTP microwave link (ref RFP). PTP Statistical data is also reviewed
Path fade margins are noted for reference. ACM out (Sq point) – signal level = path fade margin
Link availability referenced to final microwave link path study documents.
Bandwidth / Throughput - statistical data.

ATP Task 05 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-06 Site Network Switch Accessibility Test

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to network switch Enter local switch IP Address. Connectivity successfully obtained			Pass / Fail Test Local Site:
Enter far end Control Point Switch IP Address (Primary path) Connectivity successfully obtained			Pass / Fail Test Far end Site:
Enter far end Control Point Switch IP Address (Secondary path) Connectivity successfully obtained			Pass / Fail Test Far end Site:

Notes / Discrepancies
This test confirms local Ethernet accessibility to site network switch equipment. Further testing accesses the control point network switch equipment by using each microwave link path.

ATP Task 06 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-07 Site IP-223 Accessibility Test

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to network switch Enter local switch IP Address.			Test setup procedure
Enter IP Address of locally connected IP-223 Connectivity successfully obtained			Pass / Fail Test Far end Site:

Notes / Discrepancies
This test confirms local Ethernet accessibility to site IP-223 VOIP equipment.

ATP Task 07 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-08 Site IP-223 Operational Test

Date:	Site:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect Test IP-2002 controller directly to the network switch			Test setup procedure
Verify line 1 Tx audio from IP-2002 to IP-223 line 1 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-223 line 2 Rx			Pass / Fail Test
Verify line 1 Tx audio from IP-223 to IP-2002 line 1 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-223 to IP-2002 line 2 Rx			Pass / Fail Test
Install IP-223 Line 1 to Line 2 loop adapter			Test setup procedure Leave loop adapter installed
Connect Test IP-2002 controller directly to the network switch			Test setup procedure
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
Optional Test			
Connect Test IP-2002 controller directly to the network switch at a control point			Test setup procedure Also see ATP-12
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test

Notes / Discrepancies
This test confirms local VOIP control of the site IP-223 VOIP equipment. An optional test confirms remote access control of the IP-223 from a network control point (ATP-12 performs same test).

ATP Task 08 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-09 PTP Control Point Accessibility Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to Network Switch at Control Point			Test setup procedure Control Point:
Enter PTP 1 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 2 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 3 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 4 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 5 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 6 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 7 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 8 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 9 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 10 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 11 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 12 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 13 address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 14 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 15 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 16 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 17 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 18 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 19 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 20 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 21 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 22 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 23 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:

ATP-09 PTP Control Point Accessibility Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Enter PTP 24 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 25 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 26 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 27 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 28 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 29 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 30 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 31 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:
Enter PTP 32 IP Address Connectivity successfully obtained			Pass / Fail Test PTP Site:

Notes / Discrepancies
This test confirms Control Point accessibility to every sites PTP microwave equipment.

ATP Task 09 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-10 Network Switch Control Point Accessibility Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to Network Switch at Control Point			Test setup procedure Control Point:
Enter Network Switch 1 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Switch 2 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Switch 3 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Switch 4 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Switch 5 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Switch 6 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Switch 7 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Switch 8 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Switch 9 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Sw 10 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Sw 11 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Sw 12 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Sw 13 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site
Enter Network Sw 14 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site:
Enter Network Sw 15 IP Address Connectivity successfully obtained			Pass / Fail Test Network Switch Site

Notes / Discrepancies
This test confirms Control Point accessibility to every sites Network Switch equipment.

ATP Task 10 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-11 IP-223 Control Point Accessibility Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to Network Switch at Control Point Shut down secondary PTP MW			Test setup procedure Control Point:
Enter IP-223 1 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 2 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 3 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 4 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 5 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 6 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 7 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 8 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 9 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 10 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 11 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 12 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 13 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 14 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 15 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:

Notes / Discrepancies
This test confirms Control Point accessibility to every sites IP223 VOIP equipment. (using primary network path connectivity)

ATP Task 11 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-12 IP-223 Control Point Operational Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect Test IP-2002 controller directly to the Network Switch at Control Point			Test setup procedure Control Point:
Enter IP-223 1 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 2 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 3 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 4 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 5 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 6 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test

ATP-12 IP-223 Control Point Operational Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 7 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 8 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 9 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 10 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 11 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 12 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test

ATP-12 IP-223 Control Point Operational Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Enter IP-223 13 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 14 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test
Enter IP-223 15 IP Address			Test setup procedure IP-223 Site:
Verify line 1 Tx audio from IP-2002 to IP-2002 line 2 Rx			Pass / Fail Test
Verify line 2 Tx audio from IP-2002 to IP-2002 line 1 Rx			Pass / Fail Test
OPT: Monitor at secondary Control Point for multi-cast transmission			Pass / Fail Test

Notes / Discrepancies
This test confirms Control Point operational test to every sites IP223 VOIP equipment.

ATP Task 12 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-13 Secondary Link Accessibility Test

Date:	Control Point:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Connect computer directly to Network Switch at Control Point Shut down primary PTP MW			Test setup procedure Control Point:
Enter IP-223 1 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 2 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 3 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 4 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 5 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 6 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 7 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 8 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 9 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 10 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 11 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 12 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 13 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 14 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:
Enter IP-223 15 IP Address Connectivity successfully obtained			Pass / Fail Test IP-223 Site:

Notes / Discrepancies
This test confirms Control Point accessibility to every sites IP223 VOIP equipment using secondary network / microwave path connectivity.

ATP Task 13 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-14 PTP Management Software Accessibility Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App			Test setup procedure
PTP 1 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 2 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 3 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 4 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 5 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 6 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 7 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 8 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 9 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 10 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 11 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 12 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 13 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 14 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 15 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 16 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 17 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 18 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 19 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 20 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 21 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 22 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 23 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 24 Connectivity successfully obtained			Pass / Fail Test PTP Site:

ATP-14 PTP Management Software Accessibility Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
PTP 25 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 26 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 27 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 28 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 29 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 30 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 31 Connectivity successfully obtained			Pass / Fail Test PTP Site:
PTP 32 Connectivity successfully obtained			Pass / Fail Test PTP Site:

Notes / Discrepancies
This procedure confirms Control Point Server PTP management application software can access every sites PTP microwave equipment for statistical analysis and control.

ATP Task 14 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-15 Network Management Software Accessibility Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App			Test setup procedure
Network Switch 1 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 2 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 3 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 4 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 5 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 6 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 7 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 8 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 9 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 10 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 11 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 12 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 13 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 14 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:
Network Switch 15 Connectivity successfully obtained			Pass / Fail Test Network Sw. Site:

Notes / Discrepancies
This procedure confirms Control Point Server Network management application software can access every sites Network Switch equipment for statistical analysis and control.

ATP Task 15 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 1			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 1			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 2			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 2			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 3			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 3			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 4			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 4			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 5			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 5			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 6			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 6			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 7			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 7			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 8			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 8			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 9			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 9			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 10			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 10			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 11			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 11			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 12			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 12			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 13			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 13			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 14			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 14			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 15			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 15			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 16			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 16			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 17			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 17			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 18			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 18			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 19			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 19			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 20			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 20			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 21			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 21			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 22			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 22			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 23			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 23			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 24			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 24			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 25			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 25			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 26			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 26			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 27			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 27			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 28			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 28			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 29			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 29			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 30			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 30			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-16 PTP Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Wireless Mgr App PTP 31			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 31			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Wireless Mgr App PTP 32			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to PTP 32			Test setup procedure PTP Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

Notes / Discrepancies
This procedure logs and measures the PTP microwave performance over a 45 day period. Review alarm status, PTP status, PTP system statistics and counters and diagnostic plotter. Down load diagnostic data.
System Statistics and counters: Tx power, Rx Power, Vector error, Link Loss, Tx Data Rate, Rx Data Rate, Aggregated Data Rate, Byte Error Ratio, Code Word Error Ratio and Wireless Link Availability.

ATP Task 16 - Acceptance			
Date	**Name**	**Title**	**Signature**

ATP-17 Network Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Network Mgr App Network Switch 1			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 1			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 2			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 2			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 3			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 3			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 4			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 4			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 5			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 5			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 6			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 6			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-17 Network Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Network Mgr App Network Switch 7			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 7			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 8			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 8			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 9			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 9			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 10			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 10			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 11			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 11			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 12			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 12			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

ATP-17 Network Reliability Test

Date:	Control Point Server:

Task / Test	Completed	Pass/Fail	Note / Discrepancy
Log on to Server: Network Mgr App Network Switch 13			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 13			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 14			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 14			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Server: Network Mgr App Network Switch 15			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test
Log on to Network Switch 15			Test setup procedure Network Sw. Site:
Verify no alarms or anomalies have occurred during the test period			Pass / Fail Test

Notes / Discrepancies
This procedure logs and measures the Network Switch performance over a 45 day period. Review alarm status and system statistical performance data.

ATP Task 17 - Acceptance			
Date	Name	Title	Signature

System Acceptance Certificate

Customer Name: ***Douglas County, Nevada / Galena Group Inc (Consultant)***

Project Name: **Multi-County Ethernet Microwave System**

This System Acceptance Certificate memorializes the occurrence of System Acceptance. Sierra Electronics and Douglas County acknowledge that:

1. The Acceptance Tests set forth in the Acceptance Test Plan have been successfully completed within the scope of the ATP.

2. The System is accepted.

Douglas County Representative:	Sierra Electronics Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

FINAL PROJECT ACCEPTANCE:

Sierra Electronics has provided and Douglas County has received all deliverables, and Sierra Electronics has performed all other work required for Final Project Acceptance.

Douglas County Representative:	Sierra Electronics Representative:
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

Addendum - 1

April 14, 2011

ATP 1.3 reviewed by Sierra Electronics and the Galena Group.

Following is the response to concerns and issues as identified by the Galena Group.

1. Need to add real life scenarios for test methodologies. (sec 1 paragraph 1)

ATP test are documented after section 9 and reflect real time performance methodologies. (no ATP modification made)

2. Vague. Needs to specifically address and delineate those parameters and refer back to source document. (sec 2, paragraph 1)

The RFP and RFP response outline design objectives and included manufacturer specifications (source). This ATP test document addresses concerns within and beyond the scope of the RFP and reflects concurrent practices and measurements. (no ATP modification made)

3. *"Data flow matrix". What is this? (sec 3, paragraph 2)*

The data matrix addresses bandwidth assignment and the prioritizing of said usage. This issue may be addressed after completion of the microwave network by the various county departments responsible for said assignment. (**statement added to RFP**)

4. *"Radio frequency issues may impact the ATP". Does this mean the installed system, may be considered ready for use even though there are unresolved RF issues? (sec 3, paragraph 4)*

Section 3, paragraph 4 address this issues. (no ATP modification made)

5. *"Data performance measurement test". Where defined? (sec 4, paragraph 1)*

ATP test (after section 9) outline and or define said test. (no ATP modification made)

6. *"Function test ...", "Reliability Test ...". Confirm these are both part of the second phase and not parallel approved. (sec 4, paragraphs 3 and 4)*

Both statements are part of phase 2 ATP testing. (no ATP modification made)

7. *"Upon Completion ...". Upon "successful" completion of all conjoined ATP tasks. (sec 5, paragraph 2)*

See final certificate statement. (no ATP modification made)

8. *"Phase-2 ATP Test". No bandwidth or throughput test included. (section 8)*

Said test performed under ATP-05. ADD recorded measurements to ATP-05. (**modification added to RFP**)

9. *"ATP-01". Do we need to capture a MAC address? (ATP-01)*

"MAC address field added to ATP-01. (**modification added to RFP**)

10. *"ATP-04". What type of connections, static IP? (ATP-04, task 1)*

All equipment uses a unique fixed IP. (no ATP modification made)

11. *"ATP-04". Are the IP's suppose to be the same for hot swaps? (ATP-04, task 4)*

The test reflects the 2 PTP microwave radios for each link into the site. Each radio has a unique address. There is no redundant "hot swap" equipment. (no ATP modification made)

12. *"ATP-05". No performance measurements. It assumes the BER is sufficient. (ATP-05)*

Additional performance measurements added under item #8. (no ATP modification made)

13. *"ATP-05". Review Byte error ratio. (ATP-05, task 6 and 7)*

Typo corrected " Review Bit Error Ratio". (**modification made to RFP**)

14. *"ATP-06". Who's switch? If theirs, we need to test throughput from the local equipment (county owned) to their network to ensure performance. Not really concerned about this but a hole in the process and responsibility. (ATP-06, task 1)*

ATP test reflects microwave network switch. County testing addresses in section 3, paragraph 3. Sierra Electronics will work with (assist) various county agencies to perform county test over the microwave network and address their concerns. (no ATP modification made)

15. *"ATP-08". By what standard? (ATP-08, task 2)*

Industry standard is typically 0-dbm. 0-dbm in / 0-dbm out. See ATP-08 note, re: task is to test control operability. (no ATP modification made)

16. *"ATP-14". Is there a demo or support document on this application. (ATP-15, Notes)*

No OEM demo available. Sierra Electronics will provide OEM brochures. See attached files (3). Support documents include manuals and training. (no ATP modification made)

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Galena Group, Inc.
Information Technology / Communications Consulting

Project Team of Four County Microwave Project Request for Proposal (RFP)

Prepared By
Galena Group, Inc.

Galena Group, Inc.
Information Technology / Communications Consulting
8600 Technology Way Suite 110 Reno, NV 89521

Tel: 775 852-4545
Fax: 775 852-4002
www.GalenaGroup.com

April 30, 2010

Dear Vendor;

The Project Team of the Multi-County Microwave Project (Project) previously sought information and qualifications for vendors which may be capable of offering the products and services that would meet the goals of the Project. As a part of that first step, the Project Team identified Vendors that it felt had significant experience with similar microwave implementations, as needed by the Project. These vendors also demonstrated other criteria that the Project Team felt was necessary to successfully complete this project. Your firm was one of those selected for the second step in this process.

The purpose of the Project is to implement an IP Ethernet Microwave backbone connecting approximately 20 repeater sites and 1 County Facility within each of the following jurisdictions in the State of Nevada:

- Carson City
- Storey County
- Lyon County
- Douglas County

It is the Project Team's intention to implement a data transmission system that incorporates very high reliability, security, and significant throughput. The Project Team has contracted with the Galena Group, Inc. (GGI), as Project Manager, to assist in the review and selection of the vendor offerings. This Request for Proposal (RFP) does not guarantee the Project Team will enter into a contract with any Vendor.

Responses, including one (1) original plus four (4) copies (total of 5) and one (1) electronic copy on CD, are due no later than the end of the business day **June 22, 2010.**

In order to receive electronic copies of this RFP and vendor response questionnaire, Vendors must download the documents from a secure area of the Galena Group Inc. (http://www.galenagroup.com) website. Please submit a request via email to Stu@GalenaGroup.com for your firms username and password. The Username and password will be required to obtain a copy of this Request For Proposal.

Questions regarding this RFP can be directed to Stu@galenagroup.com no later than June 14, 2010. Responses to questions received will be distributed via email to all Vendors and will be posted online.

Throughout this process, all correspondence is to be directed through the Galena Group, Inc. and not directly to the Project Team, unless specifically requested. Please contact Gwen Brandenburg or Stu Cronan with any questions at (775) 852-4545 or Stu@galenagroup.com. We look forward to receiving your responses. Please feel free to contact us with any questions or to receive any clarification.

Sincerely,

Stuart Cronan
Galena Group, Inc.

SECTION I : EXECUTIVE SUMMARY

The Project Team invites your company to submit a written proposal to provide a ***turnkey*** Multi County, IP Microwave infrastructure which includes the following:

- Required System Hardware
- Installation, Training and Integration
- Proven reliable design / Acceptance Testing

This Request for Proposal (RFP) largely outlines the scope of the requirements and provides guidelines for submission of your proposal. Vendors should demonstrate how their proposed systems are capable of fully meeting the functional and technical objectives of the Project Team. If only partial descriptions are provided, the Project Team will assume that the vendor can meet all of the elements of the requirement or feature. These proposals will be carefully evaluated by the Project Team on a variety of qualitative and quantitative criteria. As a result, vendors must follow the rules for preparation and adhere to the proposal format in order to ensure a fair and objective analysis of each proposal. Proposal responses should be complete and not unnecessarily lengthy.

The Project Team reserves the right to select any portion of a proposal or to select portions of proposals from opposing vendors. Failure to comply with any portion of this RFP may result in rejection of a proposal.

SECTION II: PROJECT BACKGROUND

Galena Group, Inc. (GGI) is performing as project manager for the Multi- County Ethernet Microwave Project. The project purpose is to implement a Public safety grade, IP Ethernet Microwave backbone connecting approximately 20 repeater sites and 1 County Facility within each of the following jurisdictions in the State of Nevada:

- Carson City
- Storey County
- Lyon County
- Douglas County

It is the Project Team's intention to implement a robust data transmission system that incorporates very high reliability, security, and significant throughput. This Request for Proposal (RFP) does not guarantee the Counties will enter into a contract with any Vendor.

SECTION III: RULES OF PREPARATION

Vendor Inquiries

The Project Team's coordinator for this project is the Galena Group, Inc. Questions or comments concerning this RFP are to be directed to:

Stuart Cronan
Galena Group, Inc.
Stu@galenagroup.com
(775) 852-4545 Voice
(775) 852-4002 Fax

Questions regarding this RFP may be submitted up to June 14th 2010. Responses will be posted on line (www.GalenaGroup.com Under the "Secure Client Access" tab) and distributed to all participating vendors. Facsimile is acceptable. **In order to be included in the distribution list for these responses, Vendors must send an email to Stu@galenagroup.com with the one (1) email address they would like added to the list.**

Pre-Proposal Conference
There will be a conference of all interested parties:

Date: **Wednesday, May 26th 2010, 9:00 AM (PDT) until 12:00 Noon**
Location: **To Be Determined**

Attendance at this meeting is mandatory, It is expected that many relevant questions will be asked and answered during this conference.

In order to have an efficient Pre-Proposal Conference, we request that any inquiries to be answered at the Pre-Proposal Conference be forwarded to the Galena Group, Inc. at least five (5) business days prior to the conference. This will allow the Project Team the opportunity to prepare a more complete and detailed response.

Vendors may submit inquiries or request clarifications verbally at the Pre-Proposal Conference. However, if the proper person is not available to answer questions at the time or if specific research is required, a written response will be distributed to all vendors.

Site Visits
At each vendor's option, and in conjunction with the Pre-Proposal Conference, the project team may arrange for site visits for interested Vendors. The site visits will be dependent upon weather and other factors. Not all sites may be accessible at the time of the Pre-Proposal Conference. It is expected that it will take up to 3 working days to visit the majority of the sites. These site visits may augment, but do not replace the need for "On-site, tour and review of each radio site" as indicated in the "Detailed System Design" section of this document.

Submission of Proposals

Please prepare and submit one (1) original plus four (4) copies (total of 5) and one (1) electronic copy on CD, of the Proposal. Proposals should be sealed and clearly marked "Multi-County Microwave Proposal" and be submitted no later than **5:00 PM on June 22 2010:**

Attention: Stuart Cronan
Galena Group Inc.
8600 Technology Way, Suite 110
Reno, Nevada 89521

Proposals received after the above date and time will not be accepted. Evaluation is expected to be completed within 60 working days after the due date.

Cost of Proposal Preparation

The Project Team will not pay vendor costs incurred in the proposal preparation, printing, demonstration or negotiation process. All vendor costs shall be borne by the proposing vendor.

Evaluation Criteria

Evaluation of the proposals is expected to be completed 60 working days after they are received. The Project Team will analyze the proposals on a variety of qualitative and quantitative criteria.

Contact with Project Team Members or other County Employees

Contact with Project Team or Project Team representatives is prohibited in order to ensure a fair and objective evaluation. As a result, all contact regarding this process should be addressed to the Galena Group, Inc. Vendors that contact other members of the Project Team risk elimination from any further participation in subsequent processes.

Prior Use

The Project Team reserves the right to use any and all components and material furnished under this RFP prior to the final acceptance of the system. Such use shall not constitute acceptance of the system or any part thereof by the Project Team.

Proprietary Information

Any information contained in a proposal that is considered proprietary by the Vendor shall be clearly marked as such. Information not marked as proprietary will be considered public or generally available commercial or technical data. Per Nevada Revised Statute, Project Team has final authority as to whether information contained in a proposal response is to be treated as confidential.

Turnkey Requirements

This specification shall require the successful Vendor to supply a fully operational data transmission infrastructure , installed and operating at the facilities of the Project Team. The successful Vendor will be responsible for the complete definition, delivery, integration and implementation of the system. If multiple Vendors wish to jointly propose a solution, the Vendor who will be assuming complete responsibility for system integration must be clearly specified in the proposal.

Detailed System Design

Each vendor is required to provide detailed budgetary estimates for hardware, software and services. The successful vendor, or vendors, will proceed under contract to complete a Detailed System Design [DSD].

DSD is critical for the Project Team to gain a good understanding of the proposed solution. The DSD process will be conducted at a location, to be determined, in the region. The Project Team expect this process to take multiple days of onsite vendor time and will conclude when the selected vendor delivers a purchase contract, licensing agreement, payment schedule and detailed implementation plan, acceptable to the Project Team

Therefore, it is very important for vendors to include firm fixed pricing to conduct a thorough DSD. At a minimum, the Project Team expects the following:

- On-site, tour and review of each radio site.
- Vendor project management to document any requested changes or modifications.
- Path analysis for each discrete path and, as needed, alternative path design based on proposed frequencies and equipment.
- Delivery and evaluation of sample installation and documentation materials.
- Vendor managed interface design (e.g. remote site radio system audio and transmit/receive control) sessions. Each session will develop all specifications along with testing and implementation plans.

Vendors are required to submit a complete DSD document at the conclusion of the process for Project Team review and comment. DSD document changes will be returned to the vendor for revisions until a document satisfactory to the Project Team is complete. A detailed draft implementation plan and final adjusted costs will also be required. These documents, plus others required to administer a final purchase contract, must be in form suitable as contractual attachments.

Award of Contract

It is anticipated that, following the completion of the negotiation process and DSD, a contract will be awarded to the successful Vendor. No work is to begin, nor is the Project Team liable for any costs whatsoever, other than agreed DSD costs, until a contract has been duly signed and certified by all appropriate parties.

Successful Vendor shall be required to obtain appropriate business licenses, depending on where work is being performed.

Rejection of Proposal

Notwithstanding the above, the Project Team reserves the right to reject any and all proposals at its sole discretion. However, the Project Team may select components or services from opposing vendors.

Complete Proposal

Proposals will not be considered if they do not include:

1. A cover letter signed by an Officer of the Vendor
2. Complete details of all costs, products and services.

SECTION IV: SYSTEM OVERVIEW

The following is an excerpt from the 2007 Public Safety Interoperable Communications (PSIC) Grant Titled "Multi County Ethernet Microwave Interconnect":

"The proposed solution is to build an IP Ethernet Microwave backbone connecting 20 repeater sites and 1 building within each jurisdiction using Ethernet Microwave that provides advanced technology and will deliver IP traffic throughout the network with the ability for conventional T-1's as needed at a low cost per megabyte.

This will provide an interconnect between 5 law enforcement agencies, 9 fire/EMS agencies, 2 tribal public safety agencies and 4 emergency management departments. The types of services to be provided via this network are unlimited and only restricted by the bandwidth. Examples would be law enforcement intelligence data, GIS data sharing for planning, Hazmat information, public safety resource status, 911 call transfers and dispatch center interconnect and other technology needs. What makes this innovative is that it can support any network such as: VHF, UHF, 700 MHz, 800 MHz, VoIP data, Broadband and Narrowband along with other data technology to include the new 700 Broadband."

The Grant also mentions the benefit to potential applications such as Computer Aided Dispatch (CAD) to CAD interfaces, support for IP based radio gateways, multiple levels of network security and support for Next Generation 911.

The Grant specifically mentions the use of 4.9 GHz microwave as applicable. However the use of this band is not mandatory, however, the Project Team has indicated a strong preference for an FCC Licensed solution.

List of Identified Sites Within Each Jurisdiction:

STOREY COUNTY REPEATER SITES					
REPEATER NAME	**CITY**	**STATE**	**LAT**	**LONG**	**ELEVATION**
Pond Peak	Wadsworth	NV	39-39-6.0 N	119-27-47.0 W	2443.2m
Ophir Peak	Virginia City	NV	39-19-10.7 N	119-40-11.6 W	2360m
Como	Dayton	NV	39-11-52.0 N	119-28-50.0 W	2475m

DOUGLAS COUNTY TOWER SITES					
Leviathan Mtn	Topaz	NV	38-41-00.6 N	119-36-42.6 W	2882m
East Peak	S Lake Tahoe	NV	38-56-33.4 N	119-54-26.2 W	2802m
Station 12	Douglas Co	NV	39-06-00.7 N	119-46-16.7 W	1465m
1625 8th St.	Minden	NV	38-57-22.0 N	119-45-59.0 W	1468m
CARSON CITY TOWER SITES					
Snow Valley Peak	Carson	NV	39-09-14.7 N	119-52-58.7 W	
Duck Hill	Carson	NV	39-12-49.8 N	119-46-13.6 W	1738m
LYON COUNTY TOWER SITES					
Eagle Ridge	Silver Springs	NV	39-29-04 N	119-17-59 W	2065m
Rawe Peak	Como	NV	39-29-04 N	119-29-20 W	1945m
Pinegrove	Yerington	NV	38-41-05N	119-29-20 W	1560m
Pond Peak	Wadsworth	NV	39-39-06 N	119-27-47 W	2448m
Bald Mountain	Hawthorne	NV	38-47-04 N	118-50-04 W	2798m

PRIMARY SITE INFORMATION*

* Each location (Indoor or Outdoor) and type of antenna (Parabolic, flat panel etc.) is to be determined by the selected vendor as part of their engineering study before final contract.

The following pages list additional information on the main locations to be used as the basis of your response to this RFP. Other locations, either as alternative sites or to be used to provide path continuity should be presented by the proposing vendor as they see fit.

Storey County:

- Primary Storey County location: Storey County Data Center, 141 North C street, Virginia City, Nevada 89440

- Pond Peak in Wadsworth, Nevada. The elevation for this site is 2443 meters. The existing tower is 15 meters tall. The associated microwave radio equipment rack may be housed within the existing building.

- Ophir Peak in Virginia City, Nevada. The elevation for this site is 2360 meters. The tower is 30 meters in height. The building is Government owned.

- Como Mountain in Dayton, Nevada. The elevation for this site is 2475 meters. The tower is 10 meters in height. This is an existing Government building.

Douglas County:

- Primary Douglas County location: (JLEC) 1625 8th Street in Minden, Nevada. The elevation for this site is 1468 meters. The tower is a 22.7 meter monopole. This is an existing Government building. The building is occupied and has multiple uses.

- Leviathan Peak in Alpine County, California. The elevation for this site is 2697 meters. The existing tower is of lattice construction and is 17 meters tall. We will add two parabolic antennas and the associated feedlines to the tower. This is an existing Government building.

- East Peak in the Heavenly Ski Resort just south of Stateline, Nevada. The elevation for this site is 2887 meters. Currently, the radio equipment is housed within the Ski Patrol building on East Peak. Privately owned structure.

- Station 12 is located at 3620 Sunridge Drive in Carson City, Nevada. The elevation for this site is 1502 meters. The tower is a 10 meter monopole. This is a Government owned building.

Carson City, Nevada:

- Primary Carson City Location: Carson City Court House 885 E Musser Street, Carson City, NV 89701

- Snow Valley Peak near Carson City, Nevada. The elevation for this site is 2808 meters. The tower is 12 meters in height. This is an existing Government building.

- Duck Hill north of Carson City, Nevada. 250 Conestoga Drive (Sugarloaf #8737) Carson City, NV The elevation for this site is 1738 meters. The tower is 30.5 meters in height. The ASR for this facility is 1025028. Privately owned, preexisting building.

Lyon County, Nevada:

- Primary Lyon County location, 27 Nevin Way, Yerington, NV 89447; or 27 S. Main St. Yerington, NV, 89447

- Eagle Ridge 4.0 miles on bearing 270 from the town of Silver Springs, Nevada. The elevation for this site is 2065 meters. The tower is 30.5 meters in height. The ASR for this facility is 1030145. Private structure

- Rawe Peak, near Como, Nevada. The elevation for this site is 1945 meters. The tower is 14 meters in height.

- Pinegrove Mountain near Yerington, Nevada. The elevation for this site is 1560 meters.

- Pond Peak in Wadsworth, Nevada. The elevation for this site is 2443 meters. The existing tower is 15 meters tall.

- Bald Mountain, Northeast of Hawthorne, Nevada. The elevation for this site is 2798 meters.

SECTION V: VENDOR RESPONSE SECTION

The following pages include questions and response items to be filled out by Vendors wishing to participate in this RFP process. In order to be evaluated and considered, Vendors must respond to each of the questions contained in this section. In order to ensure a fair and objective comparison, all responses should be completed in the form of this document or its copy. ***In addition to the vendor response section, all vendors must include a proposed project implementation schedule and a complete, detailed cost estimate.***

The Detailed Cost Estimate will be organized so that the Project Team can determine the cost of each individual site, each component, (line item pricing) and the price of services such as site preparation, training and project management.

Design Assumptions

The minimum required throughput (bandwidth) is 45 Megabits per hop. The Project Team requests that you provide higher bandwidths or the option for higher bandwidth, in your design. Please indicate where higher bandwidth will require additional hardware such as antenna size or higher transmit power. Please indicate the full incremental cost for higher bandwidth.

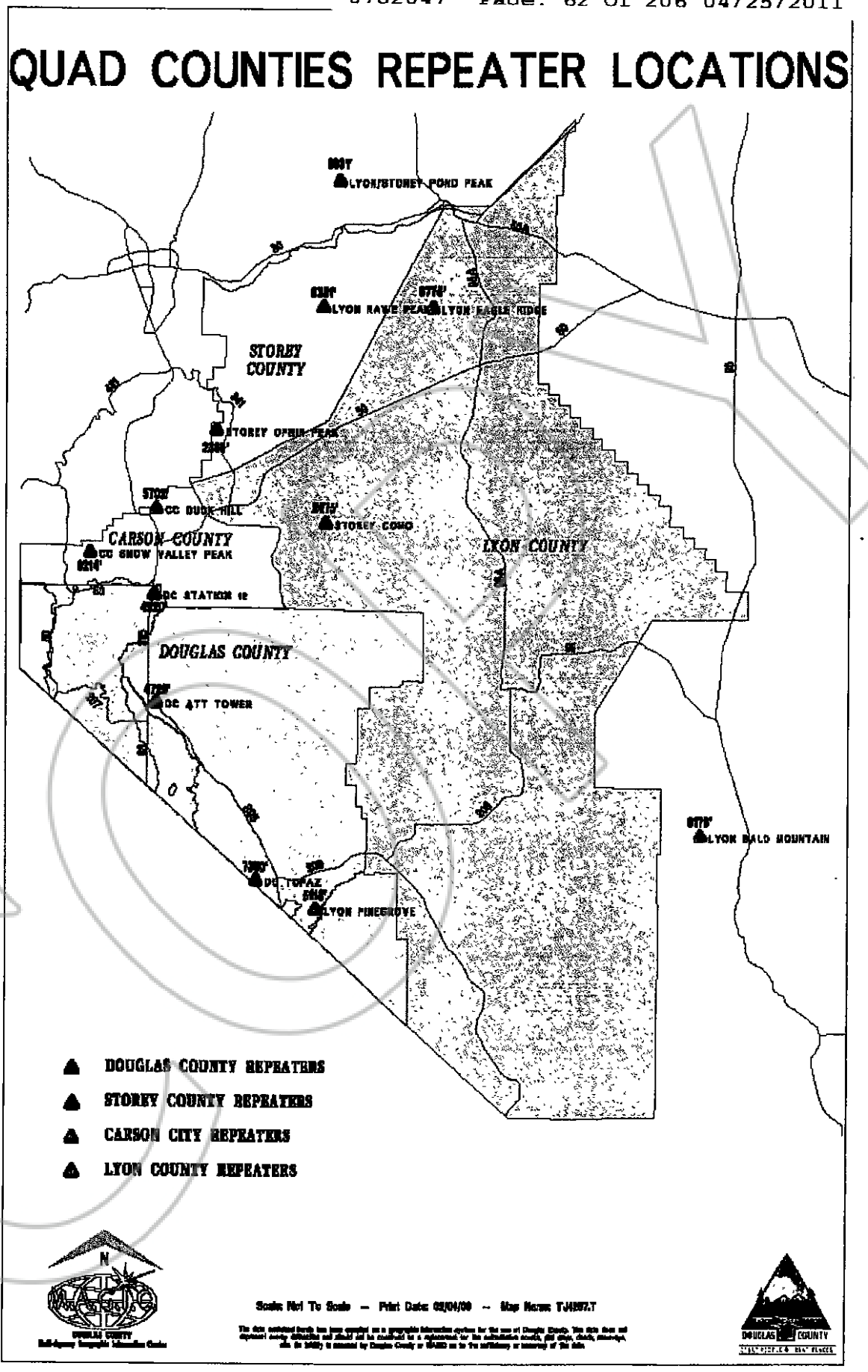
Also, please assume as many as two antennas on tower/pole or structure, at each site, and the associated feedlines (as needed) to the building structure. The exception to "two antennas" may be the primary location, unless your design calls for an additional hop for increased reliability or to provide design connectivity. The associated microwave radio equipment may be rack mounted will be housed within the existing building, **or** may be tower mounted, outdoor equipment. Assume the need for a minimum of 2 or more analog audio channels (drop & insert) and associated radio control (e.g. E&M or PTT) requirement at each location.

The specific frequencies to be used, antenna size and height on towers or poles will be determined by the selected radio system vendor through their engineering and design. Assume that there will be no additional ground work or renovations to the site location.

It is expected that the vendor will provide all design and engineering services to develop a final Detailed Design including, but not limited to:

- All frequency coordination and interference studies
- FCC Licensing
- Microwave path analysis for the vendor's design and any design alternatives
- Full descriptions and pricing for all multiplexing equipment needed
- Path reliability including fade margins and associated Bit Error Rates.

The adjacent Map presents the majority of designated radio sites



Sierra Electronics is proposing an 11GHz FCC licensed microwave data network. Major components include Motorola PTP-800 microwave, Extreme Networks data network infrastructure and Telex IP radio repeater control.

Fourteen (14) Remote tower sites and four (4) primary locations are all being served by at least two microwave links providing a system architecture of high dependability and redundancy.

Our system architecture consists of three rings. This provides a system where a failure at any one site will allow data flow to continue uninterrupted to the other sites.

An additional microwave site has been added to allow two (2) links into the primary site at Virginia City. We feel it is imperative to provide two links into all locations for public safety grade communications.

The system design is built with the planning of the four counties to connect their radio systems together. This could provide back up via dispatch centers and multi cast roaming across the network.

SYSTEM INTRODUCTION

RFP RESPONSE

LINK PLANNER REPORT

MOTOROLA ADVANTAGE

SPECIFICATION DOCUMENTATION

COST PROPOSAL

Summary Vendor Information

(If subcontractors are involved, complete one page for each vendor)

Company Name:	Sierra Electronics	
Local Address:	690 E. Glendale Ave. Suite 9B Sparks, NV 89431	*Established: 1964*
Headquarters Address:	690 E. Glendale Ave. Suite 9B Sparks, NV 89431	*Established: 1964*
Sales Office:	690 E. Glendale Ave. Suite 9B Sparks, NV 89431	*Established: 1990*
Local Service Center:	690 E. Glendale Ave. Suite 9B Sparks, NV 89431	*Established: 1964*
Contact Representative:	*Name: Jarry Walton* *Title: President*	*Name: Jeff Springer* *Title: Government Representative*
	Phone: 775-359-1121	*Phone: 775-359-1121*

VENDOR RESPONSE SECTION

	Mobile: 775-846-0834	*Mobile 775-846-6904*
Financial Information: *(Attach Complete Financial* *Statements for Past Two Years)*	*Gross Annual Revenue:* *2008 -$5,738,000* *2009 -$4,471,310*	*Profit as a % of Sales:* *2008 -* *2009 -*
	Assets: *2008 -* *2009 -*	*Debt:* *2008 -* *2009 -*
Financial Information:	*Bank Reference:* *Name: Bank of America* *Address: 2895 N McCarran Blvd.* *Sparks, NV 89431* *Phone: 888-852-5000 x 5016*	*Bank Contact Representative:* *Sandy Mcgrath* *Dun & Bradstreet #:826798238*
Other:	*Years of Experience:*	*46*
	Total Company Employees:	*23*
	Office Assigned to County:	*Sparks*
	# Local Office Employees:	*20*
	# Nevada References with Same Product:	

VENDOR RESPONSE SECTION

	# References with Same Product:	*5*
	# References with Similar Product(s):	
Legal Claims/Disputes:	*Has your company been the subject of any claim or legal action from any current or previous client? ____No*	*(If yes, attach a detailed explanation regarding this matter)*

Last Change In:	*Date:*	*Current Individual:*
Ownership	*1976*	*Kenneth & Barbara Berry, Jarry Walton*
President	*2004*	*Jarry Walton*
CFO	*n/a*	*n/a*
VP Technical support	*2004* *1989*	*Paul Belton* *Mike Cote*
VP customer Support	*1995*	*Jeff Springer*
Auditor	*2005*	*Cupit, Milligan, Ogden & Williams*

VENDOR RESPONSE SECTION

Banker	*1997*	*Bank of America*

The gray boxes following each question are for your response. If you are using MSWORD the box will expand as needed. If you are not using MSWORD, please use additional pages to respond to each question as needed. Please clearly indicate the question to which you are responding.

Please describe the firms experience and length of time manufacturing similar equipment as being proposed.

Motorola's comprehensive portfolio of reliable and cost-effective wireless broadband solutions together with our WLANsolutions provide and extend coverage both indoors and outdoors. The Motorola Wireless Broadband portfolio offers high-speed, high-reliable Point-to-Point, Point-to-Multipoint, Mesh, Wi-Fi and WiMAX networks that support data, voice and video communications, enabling a broad range of fixed and mobile applications for public and private systems. With Motorola's innovative software solutions, customers can design, deploy and manage broadband networks, maximizing uptime and reliability while lowering installation costs. Motorola has been committed to Wireless Broadband for more then 10 years and committed to public safety networks for over 45 years. Motorola has the most extensive IP portfolio on the market today, with Point to Point Microwave, Point to Multipoint and Mesh networks and has delivered outstanding systems for over 5 years now.

Have any of your customers canceled a contract before, during or after installation of any public system?

VENDOR RESPONSE SECTION

No

Has your company ever failed to complete a contract?

No

Please describe your 5 year product development plan. Also, describe any plans for major upgrades, revisions, or new releases of any equipment . *If you cannot describe your 5 year product development plan, please explain why.*

This information can be provided upon signature of a non-disclosure agreement.

References - Please provide a list of references for at least 5 similar sites which use similar hardware configurations. *Sets of references should also be provided for each subcontractor.*

Agency:	*MHO NETWORKS*	*System Description:*
Contact:	*MICHAEL KRIECH*	Colorado regional service provider utilizing PTP 500 and 600 to extend reach into NLoS and challenging environments and to support growing enterprise demand for VoIP Services
Address:	*DENVER, CO*	

VENDOR RESPONSE SECTION

Phone:	*720-985-4732*	
Population Served:	*COLORADO REGION*	

Agency:	*POLK COUNTY*	*System Description:*
Contact:	*BEN HOLYCROSS*	Lease line replacement and extension of high throughput broadband for public safety agencies, including fire, EMS, emergency management, and law enforcement as well as public works and other county agenciesof the county; An array of data, voice and video applications supported
Address:	*POLK COUNTY, FL*	2,010 sq. miles with population of 581,000; Population 581,000 mix of urban and rural; 4th largest county in Florida
Phone:		
Population Served:	*POLK COUNTY*	
Agency:	*UNITED STATES COAST GUARD*	*System Description:*
Contact:	*LT. RHETT ROTHBERK*	Needed secure video surveillance deployments to protect nation's ports and waterways.
Address:	*MIAMI, FL*	Waterways 20 miles out from coastline -- Port of Miami
Phone:	*757-686-4265*	
Population Served:	*PORT OF MIAMI*	

Agency:	*CITY OF DALLAS*	*System Description:*

VENDOR RESPONSE SECTION

Contact:	*ZAIDA BASORA*	Deployment of PTP technology across City of Dallas for reliable backhaul of 60 video surveillance systems. High traffic areas were located in high interference and obstructed environments and demanded NLoS capabilities
Address:	*DALLAS,TX*	Cameras deployed as part of a major video surveillance effort tied to City's "Safe-Light, Dallas Stops on Red" traffic safety program and photo enforcement solution
Phone:	*214-948-4423*	
Population Served:	*DALLAS TEXAS*	
Agency:	*NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)*	*System Description:*
Contact:	*DOMINI LANDUCCI*	Enabling live video streaming appliactions from ocean floor to land based location
Address:	*KEY LARGO, FL*	Aquarius - the world's only operational undersea lab, National Undersea Research Center (NURC); International Space station astronaut training facilit
Phone:	*305-451-0244*	
Population Served:	*NOAA RESEARCH KEY LARGO*	

System Design

Please attach an Ethernet microwave system design that includes high reliability (possibly through alternate paths), throughput of no less than 45Mbs per hop. Please use the site information as provided on pages 10 through 11 in the first portion of this RFP. Please assume:

The minimum required throughput (bandwidth) is 45 Megabits per hop. The Project Team requests that you provide higher bandwidths or the option for higher bandwidth, in your design. Please indicate where higher bandwidth will require additional hardware such as antenna size or higher transmit power. Please indicate the full incremental cost for higher bandwidth.

As many as two antennas on tower/pole or structure, at each site, and the associated feedlines (as needed) to the building structure. The exception to "two antennas" may be the primary location, unless your design calls for an additional hop for increased reliability or to provide design connectivity. The associated microwave radio equipment may be rack mounted will be housed within the existing building, **or** may be tower mounted, outdoor equipment. Assume the need for a minimum of 2 or more analog audio channels (drop & insert) and associated radio control (e.g. E&M or PTT) requirement at each location.

The specific frequencies to be used, antenna size and height on towers or poles will be determined by the selected radio system vendor through their engineering and design. Assume that there will be no additional ground work or renovations to the site location.

It is expected that the vendor will provide all design and engineering services to develop a final Detailed Design including, but not limited to:

- All frequency coordination and interference studies
- FCC Licensing
- Microwave path analysis for the vendor's design and any design alternatives
- Full descriptions and pricing for all multiplexing equipment needed
- Path reliability including fade margins and associated Bit Error Rates

Proposed Cost

Based on your proposed design, please provide complete costing information. Please provide line item pricing including all hardware, software, and services (include ALL engineering, design, installation and hardware costs)

System Features

Service

The proposer shall certify that spare parts will be maintained for a period of not less than seven years after the final installation of the system. Please describe the period of time that the proposed hardware will be supported. Please describe the period of time that the products will be supported after they are no longer sold or produced.

Motorola provides for spare parts availability for a period of not less that 3 years from the final date of manufacture.

The product proposed is the latest technology offered by Motorola and should exceed 7 years after installation.

Proposed Equipment

The proposer shall include with the proposal a complete material list of all equipment proposed (including pricing on each line item) and descriptive literature on each piece of equipment. Included in this proposal shall be drawings and block diagrams of the equipment supplied.

See Attachments

Instruction Books

Please describe your firm's standard offering of technical documentation. The Project Team requests that, at a minimum, the successful proposer must supply one complete set of schematic diagrams and current instruction books with fully keyed descriptive parts lists for each location plus one additional set.

VENDOR RESPONSE SECTION

OEM documentation will be provided as required to include technical and operational guides for each site.

Design

The equipment shall be designed for continuous-duty service in a fixed environment; be of the latest design consistent with the present state-of the-art; be of all solid-state design; and be engineered for a service life of not less than 10 years. Please describe how the proposed system design will meet this criteria.

All OEM equipment furnished is of latest current design.

Frequencies and Emission Types

Please describe the proposed frequencies and emission designation or type of emission for this equipment. The design may include a mix of frequencies and emission types (licensed is preferred) so long as the design provides the requested level of reliability on any one segment (hop) and provides one seamless integrated system.

All sites are utilizing 11GHz licensed frequencies. See detailed manufactures specifications attached.

VENDOR RESPONSE SECTION

Type-Acceptance Number

The proposer shall furnish the US FCC type-acceptance number for any proposed radio equipment.

ETSI/FCC EN 302 217-2-2

Bit Rate

Please indicate the maximum bit rate per link (hop). (Please indicate the suggested maximum hop distance for each indicated bit rate)

See detailed manufactures specifications attached for user data through puts per configuration.

Full Duplex

Please verify that the proposed equipment is FULL DUPLEX and is capable of simultaneous transmission without any impact on data rates.

FDD

See detailed link planner specifications attached for individual PTP-800 links.

VENDOR RESPONSE SECTION

Operating Environment

Please describe the proposed equipment's environmental requirements. (The Project Team expects that the equipment shall meet all performance objectives over a temperature range of -30 to +50 degrees Celsius at a relative humidity of up to 95 percent (non-condensing) and up to an altitude of 10,000 feet above mean sea level.)

-33 degrees Celsius to +55 degrees Celsius

Power Requirements

Please describe. The Project Team requests that the proposer shall provide all power supplies, inverters, regulators and so forth required to operate the system from the selected primary power source. Please describe the configuration of power fuse panels and power consumed at each location.

Power consumed is maximum of 600 watts and dependent upon final configuration.

Connections

Please describe the proposed system's:

- Electrical power connections
- Interconnecting any auxiliary equipment such as order wire and multiplexing
- Lightning protection for all cabling not designated coax or waveguide
- Requirements for removal of active modules
- Cabling, including accessibility for testing and/or reconfiguration.

VENDOR RESPONSE SECTION

AC 120 Volts primary power per pre-bid meeting. Surge protector for primary power.

Path and System Reliability

Please describe the proposed system's reliability, such as the use of hot standby protection, multiple paths and/or any other method of achieving system reliability. This is a primary consideration.

The Project Team's expectation is that the system shall be designed with as high reliability as reasonably obtainable. The expected reliability should be no less than 99.999 percent or have an outage time in excess of 5.15 minutes per year (based on a 24-hour day).

Please describe the proposed system's expected system reliability performance characteristics.

See Link Planner attachment for the individual links. ALL LOCATIONS include a least two links (paths). Projected reliability exceeds 99.999 percent.

Acceptance Test Plan

Please describe your proposed acceptance test plan (ATP) and methodology for the proposed equipment and system. Note that, at a minimum you should be able to demonstrate, over a 45 day period:

Bit error rate of better than 10^{-4} on every segment of the system
Reliability of better than 99.999%*
Data throughput equal to the minimum designed for that segment of the system.

VENDOR RESPONSE SECTION

*a bit error rate greater than 10^{-4} or an error rate (per hop) requiring retransmissions shall be defined as a system failure.

Performance evaluation to meet manufactures specifications.

Expansion Features

Please describe the proposed system's expansion features.

System is expandable for both bandwidth and future locations (links).

Data Interfaces

Please detail the extent of reconfiguration required to accommodate alternative data rates/interfaces.

Software / Firmware upgrades

Security

What is your approach to secure transmission, including any inherent capability in your system ?

AES 128 encryption or optional upgrade to 256.

VENDOR RESPONSE SECTION

Quality of Service (QoS)

Does your proposed system allow for defining QoS for certain applications (e.g. VoIP) as an integral part of the design? How do you propose the implementation and administration of QoS on this system?

See attached link planner for QOS standards per link.

Reframing Requirements

Please describe the proposed system's regenerative design and reconstructed data, including clock and digital service channel drops at each terminal and (if part of the design) repeater location, or how this is accomplished.

Automatically incorporated within the network switching equipment. (user programmable)

Digital and Data Service Channels

Please describe the proposed system's transportation of digital service channels and data service channels.

Automatically incorporated within the network switching equipment. (user programmable)

Multiplexing System

VENDOR RESPONSE SECTION

Please describe the proposed system's multiplexing system. For example, please describe "drop and insert" of audio and data channels and the flexibility to reconfigure a site's channel usage. (E.g. Add a duplex radio channel) How is this accomplished.

We are quoting Telex IP223 equipment that will allow for the control of two base stations utilizing multicast Technology to allow control of repeaters from any or all of the four primary control sites.

System Administration

Describe how routine system administration is handled. Please include a description of the knowledge, skill and ability required by the administrator. For this proposed system, what is your estimate of the amount of time needed to properly administer the system.

All network system administration may be done remotely. (DSL, Internet or dial-up)

After initial installation weekly maintenance will be minimal approximately 1 to 2 hours unless addressing extraneous occurrences.

System Maintenance

Please fully describe how the proposed system is designed to facilitate maintenance in the field.

All network system administration may be done remotely. (DSL, Internet or dial-up)

Or accessed locally from any site.

VENDOR RESPONSE SECTION

Management Tools

Management tool application, please describe.

OEM and open sources applications available.

Alarm System

Please describe the proposed system alarms for centralized alarming of a fault condition. What is monitored and how is this accomplished?

All network equipment provides alarm/failure conditions (programmable) and can report via email, internet, etc.

Please fully describe your system's remote access capabilities.

Via the internet or dial-up

LAN and T1 monitoring Capability

T1/E1 monitoring

Inclusive in network switch.

VENDOR RESPONSE SECTION

Protocol support for system monitor and control (e.g. SNMP)
Please describe.

Provided by OEM

Antenna alignment capability/software tools please describe.

Provided by OEM, internal software application.

Future software/firmware upgrades. Please describe how this is accomplished.

Upgrades can be accomplished remotely via the network and or may require an on-site firmware/software.

Indoor Equipment
Please describe the specific details of the proposed indoor equipment mounting, including equipment cabinets, AC power distribution strips, grounding system, etc.

Equipment shall be installed into open frame racks including AC surge protected power strip, copper grounding buss and appropriate shelves/hardware.

VENDOR RESPONSE SECTION

Outdoor Equipment

Please describe the specific details of the proposed outdoor equipment mounting, including weather resistance, sun radiation protection, cabling, maintenance of operational temperatures, humidity and altitude, size, etc.

See attached manufactures specification sheets.

Mounting Systems

Many of the locations may have antenna restrictions for height, aesthetics, and/or attachment to building. Please describe the minimum requirements for each of the proposed antenna type mounts.

To be determined at follow up site visit.

Pressurized Feed Horn

The Project Team would prefer a system that does not require the use of pressurized waveguide or feed horn, however, if it is included as part of the proposed system, please describe.

No pressurized equipment is being proposed.

Additional information:

Please describe, as applicable (or indicate where it has already been described), the following:

1. Number of Ethernet ports and their speed
2. TDM Mux type
3. Number of TDM ports
4. Connector(s) (Number and type, such as RJ45)
5. Line coding (e.g. AMI)
6. Framing modes
7. Timing source options (e.g. internal clock source)
8. Transmission standards compliance (e.g. g.703)
9. Other

See Extreme Summit X-450A data sheet attached.

Maintenance Services

This item requires vendors to identify the proposed maintenance services to be provided during warranty and after warranty periods. Prime contractors must be responsible for subcontractors.

System Maintenance - During Warranty Period

What is the length of the warranty and when does warranty commence?

The standard warranty is 1 year with and option for a 5 year extended warranty with all risks advanced replacement program. The warranty begins upon installation completion.

VENDOR RESPONSE SECTION

Is warranty service provided 24 hours a day, 7 days a week? Y/N [Y]

What is the guaranteed response time: Telephone __1 Hr_____
On-Site ___4 Hr_____

Is there a cost associated with maintenance during the warranty period? Y/N [Y]

Please explain, in full detail, the warranty services provided, what is covered, what is not covered and any additional costs:

The first year of maintenance is included at no charge. The five year extended plan would result in additional charges.

Please see the cost proposal for the extended warranty plan pricing.

Please describe the location of the maintenance technicians that would be responsible for this system during warranty.

Sierra Electronics technicians assigned to maintain the system proposed are homed out of the Sparks Nevada office.

VENDOR RESPONSE SECTION

System Maintenance - After Warranty Period

Please describe what maintenance services are required with the proposed configuration.

We recommend at a minimum of an annual preventive maintenance.

Is extended maintenance service provided 24 hours a day, 7 days a week? Y/N [Y]

What is the guaranteed response time: Telephone __1 Hr_____
On-Site ___4 Hrs_____

Please describe the location of the maintenance technicians that would be responsible for this system should we purchase additional maintenance services.

Sierra Electronics technicians assigned to maintain the system proposed are home out of the Sparks Nevada office.

VENDOR RESPONSE SECTION

Will we have the ability to chose a third party maintenance company to provide maintenance services after the initial warrantee period?

Yes

What is your hourly rate for time and material (T&M) services and would T&M services be offered after the initial warrantee period?

Time and material service rate would be $96 per hour from the hours of 8 am – 5 pm.

After hours service is available for customers with maintenance contracts.

Please provide your projected ten year cost associated with the routine maintenance of the proposed system

Due to the extreme environmental conditions of the mountain top sites it is recommended that preventative maintenance be performed on an annual basis. If done at existing prevailing rates this would be $1,500 per site.

VENDOR RESPONSE SECTION

Training

System Technical Training

How many hours of on-site and off-site technical training are provided for system support?

Off-Site __8____ *On-Site* __8____ *Total Hours:* _16_____ *# Personnel:* __4____

Comments:

This training is included in purchase price additional is available and listed in the cost proposal.

Additional information

Please provide your estimated 5 year operational cost for the proposed design. Please include your estimate of required FTE's for administration, maintenance and operations

Operational costs will be determined upon final system design and site leases completed are determined.

Please identify ANY limitation and/or cost on expansion of the system or number of users, (such as software or usage licensing).

The system is upgradeable via field flash upgrades for thru put. The only limitation forseen is in fcc licence availability and or site space issues.

Project Team of Four County Microwave Project

System Design

June 2010

MOTOROLA

Contents;

Glossary

ACM	Adaptive Coding/Modulation
AES	Advanced Encryption Standard
AMOD	Adaptive Coding Modulation
ANSI	American National Standards Institute
ARQ	Automatic Repeat reQuest
BPSK	Bi Phase Shift Keyed
CAPEX	Capital Expenditure
CCDP	Co Channel Dual Polarisation
CES	Circuit Emulations Service
CMU	Compact Modem Unit
EIRP	Equivalent Isotropic Radiated Power
ERP	Equivalent Radiated Power
ETSI	European Telecommunications Standards Institution
FCC	Federal Communications Commission
FDD	Frequency Division Duplex
FEC	Forward Error Correction
FIPS	Federal Information Processing Standard
GOS	Grade of Service
GUI	Graphical User Interface
iDFS	Intelligent Dynamic Frequency Selection
IP	Internet Protocol
GOS	Grade of Service
GPS	Global Positioning System
LTE	Long Term Evolution
LOS	Line of Sight
LPU	Lightening Protection Unit
MAC	Media Access Control
Mbps	Mega bits per second
MDI/MDIX	Medium Dependant Interface/MDI Crossover
MIB	Management Information Base
MIMO	Multiple in Multiple out
MTBF	Mean Time Between Failure
MPLS	Multi Protocol Label Switching
NGN	Next Generation Networks
NLOS	Non Line of Sight
ODU	OutDoor Unit
OFDM	Orthogonal Frequency Division Multiplex
OPEX	Operating Expenditure
PBB-TE	Provider Backbone Bridge – Traffic Engineering
PDH	Pleisiosynchronous Digital Hierarchy
PIDU	Powered InDoor Unit
POP	Point Of Presence
PTP	Point to Point
QoS	Quality of Service
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keyed
R-APS	Ring – Automatic Protection Switching
RPL	Ring Protection Link

Rx	Receive
RF	Radio Frequency
SRTM	Shuttle Radar Topography Mission
SDH	Synchronous Digital Hierarchy
SME	Small to Medium Enterprise
SNMP	Simple Network Management Protocol
STP	Spanning tree Protocol
TDD	Time Division Duplex
TDM	Time Division Multiplex
Tx	Transmit
WEP	Wired Equivalent Privacy
WiMAX	Worldwide interoperability for Wideband Access
XPIC	Cross Polar Interference Cancellation

1 System Overview

Motorola is pleased to present a high level design for an IP Ethernet Microwave backbone network which will meet the "Project Team's" noted requirements. This entails connecting approximately 20 repeater sites and 1 County Facility within each of the following jurisdictions in the State of Nevada:

- Carson City
- Storey County
- Lyon County
- Douglas County

The proposed Microwave RF network would consist of Motorola's licensed PTP800 radios. The Motorola PTP800 is a High-Capacity; Carrier-Grade Wireless Ethernet Bridge specifically designed to satisfy the demanding requirements of Next Generation Networks. The Motorola PTP 800 Series Point-to-Point Wireless Ethernet Bridges operate in all the licensed bands from 6 to 38GHz and provide industry leading maximum throughput rates up to 368 Mbps. Channel bandwidths are user-configured from 7 up to a maximum of 56 MHz.

Using the specific site information that was provided within the Project Team's RFP, the following Microwave network topology (Figure 1 and 2) was designed using Motorola's PTP LinkPlanner tool. Using this tool, a detailed link-by-link path design report for each interconnected site has been provided with our submission by way of a separate document (Four County PeB 6-8-2010clb.pdf). This referenced document provides the Project Team with requested detailed information in regards to link availability, expected throughput, required dish mounting parameters, etc. for each link in the proposed network.

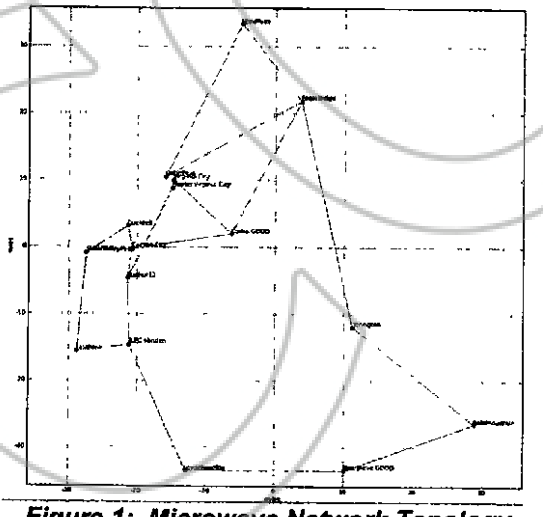


Figure 1: Microwave Network Topology

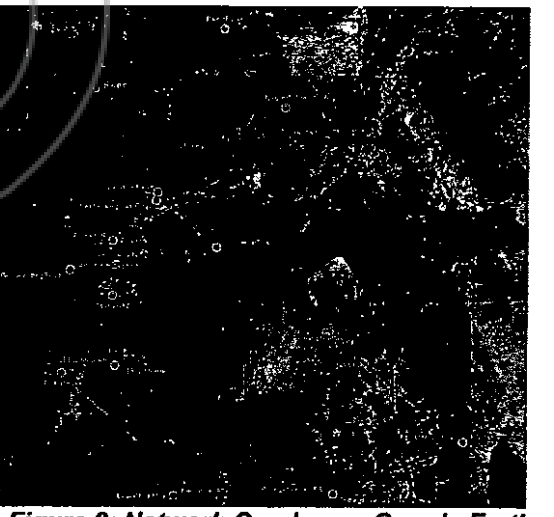


Figure 2: Network Overlay on Google Earth

As can be seen from the figures above, the proposed Microwave Network Topology consists of a grouping of interconnected rings, offering a very resilient and fault tolerant backbone design. This configuration offers the respective counties high confidence in the overall voice system's availability for their mission critical Public Safety and Public Service needs. By leveraging Motorola's strong and growing relationship with Extreme Networks and the simple addition of an Extreme Summit Switch, various levels of Ring protection and Traffic Engineering can be realized as your Microwave network grows and/or changes.

Extreme's Ethernet Automatic Protection Switching (EAPS) protocol allows the IP network to provide the level of resiliency and uptime that users expect from their traditional voice network. EAPS is superior to Spanning Tree or Rapid Spanning Tree protocols and offers sub-second (less than 50 milliseconds) recovery that delivers consistent failover regardless of the number of VLANs, network nodes or network topology. Since EAPS allows the network to recover almost transparently, VoIP calls do not drop and digital video feeds do not freeze or pixelize in most situations.

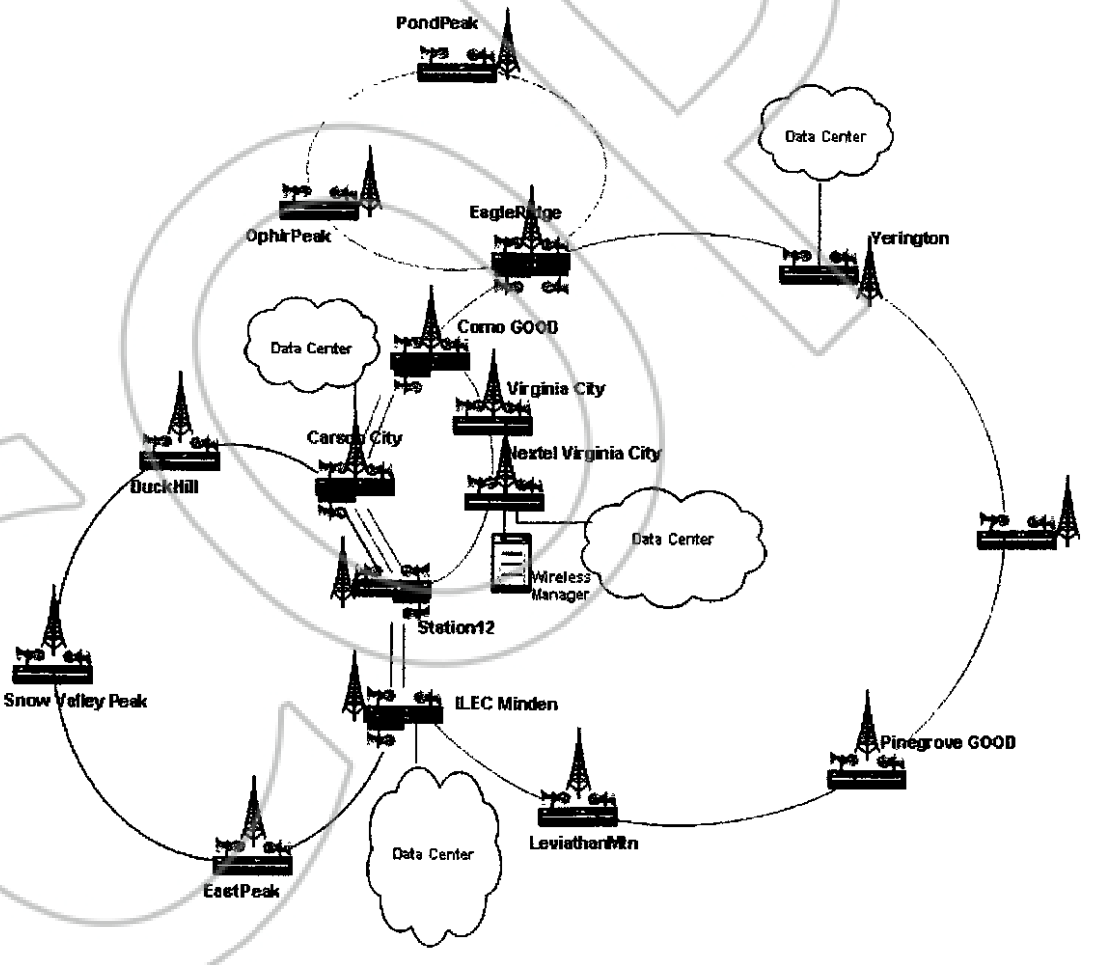


Figure 3: Proposed Logical Microwave Loop(s) Interconnections

The RFP additionally calls out the requirements of connecting and backhauling both the audio and control lines of two Quantar repeaters at each site. Audio connectivity would be made by way of a 4-wire connection per repeater, while control connectivity would be made by way of an E&M connection per repeater. By leveraging Motorola's strong and longstanding relationship with RAD, a simple addition of a RAD IPmux-1E at each repeater site will easily achieve the need to convert the voice and control signals into IP packets.

The IPmux-1E is a TDMoIP gateway for transporting E1/T1, ISDN BRI, and FXS/FXO/E&M services over IP and Ethernet-based networks. IPmux-1E converts the data stream from the user ports to packets for transmission over the packet-switched network. The addressing scheme of these packets is IP. These packets are transmitted via the IPmux-1E Ethernet port to the network. Another remote (or centralized) TDMoIP device converts the IP packets back to analog traffic.

Figure 4 below provides a simple block diagram view of a typical remote site's interconnections with the provided communications equipment from this bid response.

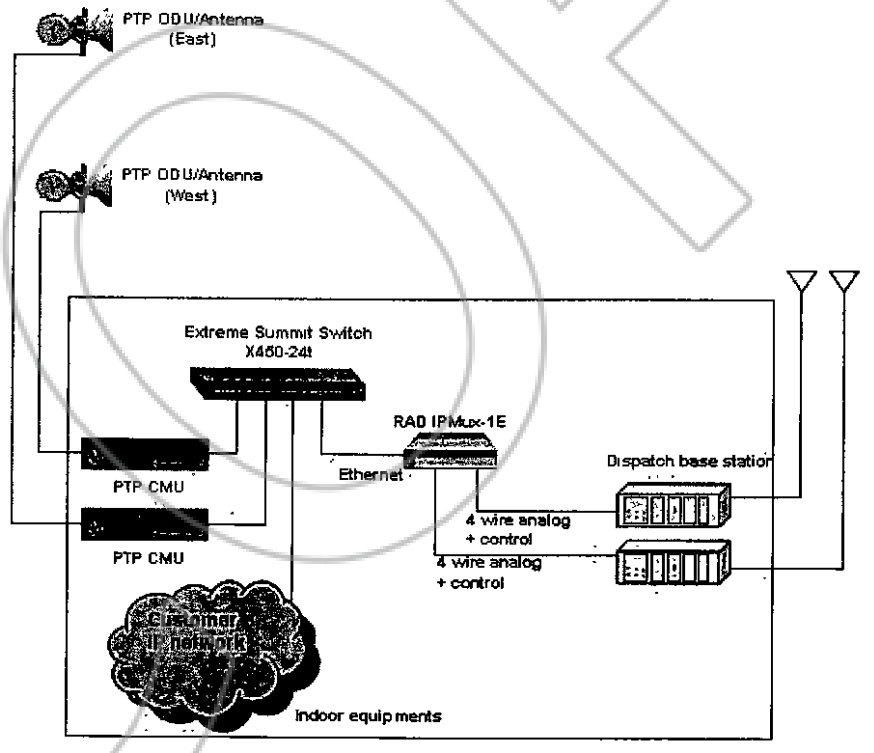


Figure 4: Typical Remote Site Interconnection

As was alluded to in the description above, as the analog voice circuits from each repeater site are backhauled to their respective Primary county facility, similar TDMoIP gateway equipment would be required at these Prime sites to convert the aggregated IP traffic back to analog voice and control. The RAD Megaplex-2100 achieves this with a simple chassis mounted solution, allowing for modular growth as additional channels become required.

Figure 5 below provides a simple block diagram view of a typical Primary site's interconnections with the provided communications equipment from this bid response.

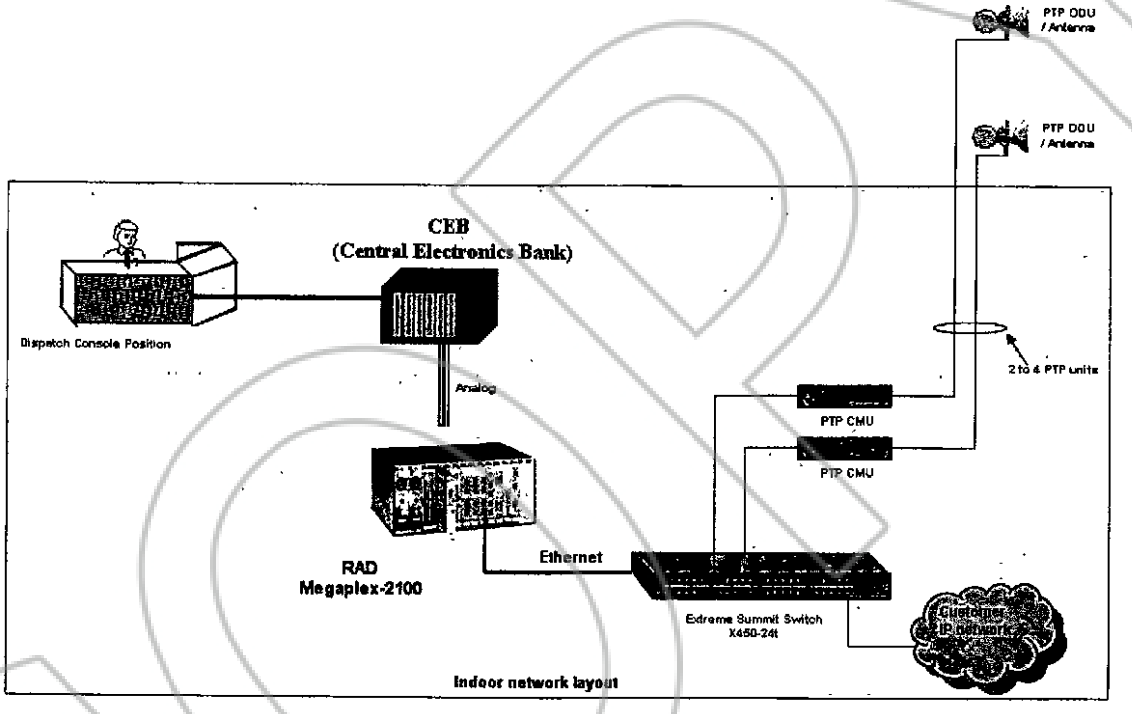


Figure 5: Typical Primary Site Interconnection

2 Introduction to Motorola PTP Portfolio

Motorola delivers the market leading Ethernet microwave links for operation in the licensed (2.6GHz and 6-38 GHz) and license exempt (4.9, 5.4 & 5.8 GHz) frequency bands.

All Motorola's PTP products are optimized to deliver highly efficient and cost effective solutions for IP connectivity.

Motorola Microwave Product Specifications (PTP500/600/800)

	PTP500	PTP600	PTP800 Available 4Q09
Applications	Medium capacity Line of Sight and Non Line of Sight links away from Metro areas.	Medium to high capacity Line of Sight and Non Line of Sight links away from Metro areas	High capacity Line of Sight links
Frequency Bands GHz	5.470 – 5.725 5.725 – 5.875	2.496-2.690 4.400-4.600 4.710-4.940 4.710-5.000 4.940-4.990 5.470–5.725 5.725–5.850 5.825 – 5.925	6, 7, 8, 11, 13, 15, 18, 23, 26, 28, 32, 38
Spectrum	License Exempt	License Exempt and Licensed	Licensed
Max Capacity (Full Duplex)	Lite: 25Mbps Full: 50Mbps	Lite: 75Mbps Full: 150Mbps	Upgradeable from 5 to 368Mbps
Channel Bandwidths	5, 10, 15 MHz	5, 10, 20, 30 MHz	7, 14, 28, 56 MHz 10, 20, 30, 40, 50MHz
Antennas	Integrated and connectorised	Integrated and connectorised	Split mount/ zero footprint
Features	Hybrid Native IP/TDM OFDM MIMO Adaptive Coding Modulation Intelligent Dynamic Frequency Control Dynamic assignment of TDD capacity Full Outdoor Mount	Hybrid Native IP/TDM Dual Radio Payload OFDM ACM iDFS Dynamic TDD Full Outdoor	Native IP Single Carrier Adaptive Coding Modulation Split Mount Pay as You Grow

The PTP500 and PTP600 products for license exempt bands are ideal for use in NGN's especially for connection of remote or difficult to reach nodes, the products have incorporated a number of features that ensure high link availability even in license

exempt bands. These products have often been used to connect spurs in areas where license exempt spectrum is less likely to become congested. It is possible to use these products in dense urban areas provided a frequency plan is executed at a network level.

The PTP800 is Motorola's latest state of the art single carrier product for use in licensed bands. This native IP product provides the very highest IP throughput capacity and is suitable for deploying anywhere in a network. The product provides carrier level grade of service using Adaptive Coding/Modulation to maximize spectrum efficiency and link availability.

One of Motorola's main design aims has been to minimize the total costs of ownership for these products. The small footprint enables minimal cost installation in a variety of configurations; the Motorola LINKPlanner tool ensures that links can be rapidly and accurately designed whilst the configuration file output from LINKPlanner identifies all PTP parts which are required to complete the planned hop which Motorola ship in a single consignment.

2.1 Benefits of Motorola PTP Solutions

IP Centric Solutions

All of Motorola's PTP products are optimized for Next Generation IP centric Networks.

Advantages of IP networks over TDM are;

1. IP networks are much more future proof; networks are migrating towards all IP and "Old World" TDM equipment will very soon become obsolete.
2. IP systems are more able to dynamically vary the amount of bandwidth delivered to each particular connection so that large amounts of data can be delivered to several places very quickly without affecting concurrent narrowband services. "Old World" TDM (SDH/PDH) systems were designed to carry narrow band switched circuit services (voice) and are not good at delivering data (such as multimedia) since they use narrow band pipes.
3. IP is able to exploit statistical multiplexing, because data is delivered in packets along lots of different routes you can deliver more of them compared to a TDM system that only delivers data along switched circuits.
4. IP systems can also make good use of small switches distributed in the network so that data can be delivered along different paths across a network or even between nodes rather than trunked to a larger more centralised switch. This can provide a more robust self healing network, less vulnerable to failures in one particular hop. This should eliminate any perceived need for protected links or XPIC.
5. IP is an international, industry driven standard protocol which means that it is easier for industry to design a new service that is compatible with any IP network. The same also applies to equipment designed to work on IP networks.

Native IP

All Motorola's PTP products implement Native IP. This means that the Ethernet frames are carried over the airside rather than encapsulating them within a TDM (PDH/SDH) structure as some other traditional PTP suppliers do.

The advantages of native IP are;

1. Native IP has a lower latency than IP over a TDM (SDH/PDH) link.
2. Native IP makes better use of the additional capacity made available by Adaptive Coding/Modulation; native IP can more easily exploit increases in capacity than a TDM system. As more capacity becomes available on the link then gradually more packets can be transmitted whereas with a TDM system additional circuits need to be switched in.

Pay as You Grow

With Motorola's "Pay as you Grow" capability, Point to Point equipment can be installed with an entry level throughput CAP key of 10Mbps and as demand grows additional CAP keys can be purchased and installed remotely by the network manager to buy capacity in line with demand, up to the maximum CAP of 400Mbps. In this way the user's CAPEX is optimised. The CAP key upgrade does not require a visit to site provided the link RF plan has been designed in the first place to support the higher capacity.

Adaptive Coding Modulation

ACM has been implemented since launch of the very first product and enables extremely high Grade of Service to be achieved even in license exempt bands. Adaptive Coding Modulation; selects the highest possible throughput that can be supported by the selected channel and trains up or down depending on the quality of the channel. This ensures that spectrum is used most efficiently and commonly maintains availability at 99.999% even in the harshest conditions. A traditional product would only operate at the fixed modulation rate that maintains a specified availability whereas for a large proportion of the time the channel could have provided a throughput several times higher.

High MTBF

The team has many years experience in designing and manufacturing state of the art microwave equipment like this resulting in an MTBF for existing equipments of over 100 years. Mean Time to Failure for the radio transceiver is well over 100years.

Dynamic TDD

The Licensed exempt PTP500 and 600 both have TDD which allows throughput to be asymmetrically assigned to up and down links or to be dynamically variable, with throughput adjusted dynamically depending upon the load. With PTP500 up to 75% of the throughput can be in any one direction and with the PTP600 this figure is 66%.

MIMO

License exempt band product have MIMO with Polarization and optional space diversity to provide high throughput and maximum spectral efficiency with the best possible resilience to fading, this enables operation in Non Line of Sight deployments.

Intelligent Dynamic Frequency Selection (iDFS)

License exempt band product enabling the radio to continuously monitor use of all available frequency channels and choose the one that will support the highest possible throughput. Monitors interference across all channels and dynamically selects the channel that will provide the best throughput.

Non Line Of Sight operation

License exempt band products can be deployed in difficult to reach locations. This is possible since the amount of Fresnel Zone obscuration is not controlled in unregulated frequency bands; this provides an opportunity for Motorola's MIMO implementation to exploit the multi-paths. An advantage of lightly licensed bands is that it is permitted for a link to be established with obscuration of the Line Of Sight path (Fresnel Zone) whereas this is not permitted in licensed bands due to the impact on other licensed users. This aspect together with the interference mitigation techniques above have allowed Motorola's products to be used effectively in many networks for cost-effective connection of difficult to reach sites and still provide a very high availability.

LINKPlanner and Frequency Planner tools

Motorola's proprietary LINKPlanner tool can be downloaded from their website and used to plan hops using any of Motorola's PTP Radios. The tool is intuitive to use with a minimal amount of training. Topographical information assembled by the Shuttle Radar Topography Mission (SRTM) is accessed via the internet and used by LINKPlanner to estimate throughput and availability.

Easy to install and maintain

One of the main design goals for all of the Motorola PTP products has been to ensure they can be easily planned, ordered and installed with a minimum of training and effort. The LINKPlanner generates a list of components required for the deployment and these items are delivered by Motorola in a single consolidated shipment. Installation for the license exempt band products is facilitated by an audible tone that indicates when the antennas are aligned, A simple voltage indicator provides the same function for the PTP800 licensed band product.

3 Motorola PTP for Private and Carrier Solutions

Motorola's family of PTP products are optimised to deliver IP connectivity in the most efficient and cost effective way. They are designed to be applied to carrier networks in the following situations;

1) **Next Generation Network;** Connecting nodes in an all IP network with flat mesh type architecture and distributed switching.
2) **2G/3G Network;** Extending data capacity with a backhaul data overlay network and extending reach of the network into areas where it wasn't previously economically viable to provide high bandwidth due to the cost of backhaul.
3) **Fixed Carrier Networks;** providing high capacity IP links to high value clients such as SME's, larger business' or Municipal establishments and business parks. Motorola's PTP is a valuable solution for de-risking development of new markets that aren't initially viable using wireline trunks.

Network operators are currently seeing a huge growth in data traffic, 300% growth in packet data traffic has been reported in the 12 months to mid 2008 whilst TDM voice traffic remained static. This growth in data traffic is reported to be accelerating and is largely due to;

- Expansion of broadband access
- All inclusive data contracts
- Increased use of thin client user terminals (eg iPhone) which make use of network based rather than local applications.
- IP TV and other downloaded multimedia content.

It will be challenging to evolve a legacy backhaul network equipment to serve the longer term demand created by such explosive growth which is best served by a much more radical approach.

Motorola's PTP portfolio has been designed from the outset to serve the demand of the new world where backhaul capacity is measured in multiples of 10's of Mbps whereas traditional backhaul links were designed to be scaleable in multiples of T1 or E1.

An important point to note when planning a network to deliver IP services is that it must be sized to deliver the peak download rate right out to the network edge, whereas with traditional TDM networks they would be designed to deliver at the average traffic throughput rate. Subscribers of IP services expect to be able to achieve connectivity at the headline Maximum Information Rate, the node he is connected to needs to be able to provide network connectivity at that peak rate rather than the average or Committed Information Rate. Traditional methods for planning backhaul capacity need to be modified to be cognisant of this and the demands of serving a Peak Information Rate

Whilst incumbent microwave suppliers will stress their capability to evolve capacity of their installed links to meet demand, it can be more cost-effective to leave narrowband capacity TDM links in place and carry all data on a new data overlay network using the latest and most cost effective IP centric products. Legacy TDM links can then be phased

out as narrowband voice traffic migrates onto the IP network. In this way the network operator maximises the effectiveness of his capital investment by ensuring it has the best fit with the future business plan.

3.1 Solutions for Next Generation Networks

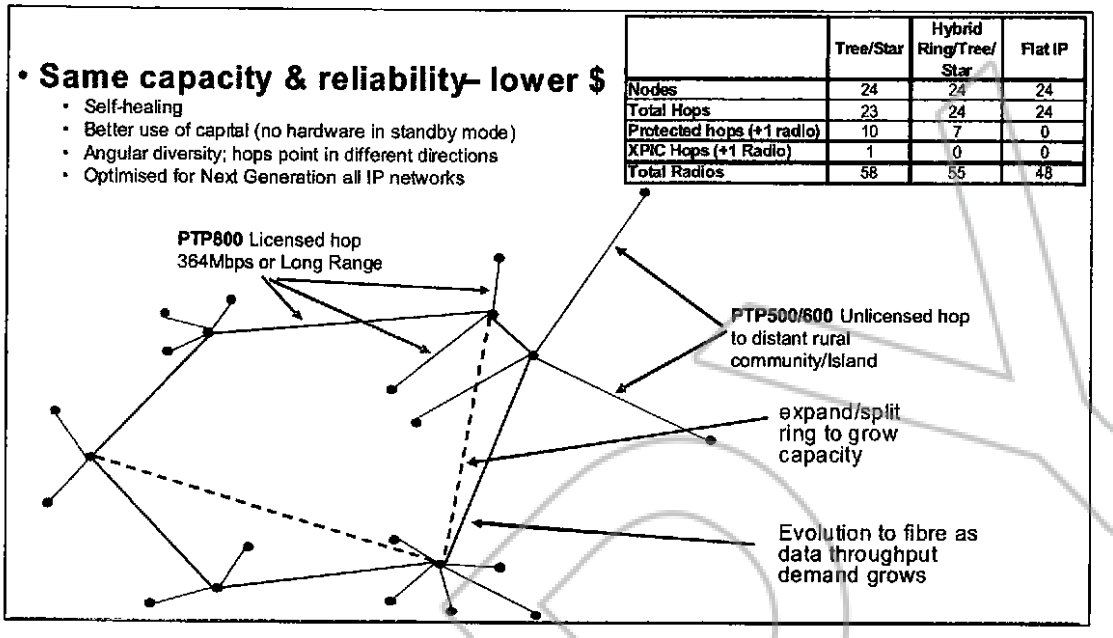
A Next Generation Network is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband QoS enabled transport technologies. Such a network is characterised by;

- Consolidation of several dedicated or overlay networks into one core transport network.
- A converged network transporting narrowband and broadband services.
- Distributed switching at the very edge of the network.
- Flat non hierarchical architecture.
- Mesh type structure

Advantages of a Next Generation Architecture are;

- Support for converged services
- Scalable bandwidth providing multimedia, narrowband and the option of High Definition voice.
- Robust, self healing network
- Scalable network easily expanded
- A platform to exploit new open technologies
- Reduced cost of market entry.
- Increased flexibility.

Motorola's PtP products have been designed specifically to provide transport for these networks which will dominate the telecoms world within a very short time.



	Tree/Star	Hybrid Ring/Tree/ Star	Flat IP
Nodes	24	24	24
Total Hops	23	24	24
Protected hops (+1 radio)	10	7	0
XPIC Hops (+1 Radio)	1	0	0
Total Radios	58	55	48

A Next Generation Network is characterised by a flat architecture with switching distributed throughout the network.

SDH and PDH Transmission links using Time Division technologies were used in legacy networks to backhaul narrowband traffic to a large and expensive Central Office switch. These links were high value, carrying aggregated traffic and using traditional and complex technology. Protection of the traffic path was necessary using redundant microwave equipment and it was often necessary to use dual polarisation on a hop because so much traffic was aggregated in a single direction and spectrum became congested.

Both protection and dual polarisation require a second pair of radios for each hop, thus adding to CAPEX and OPEX.

An advantage of an NGN is that traffic can be distributed through the mesh; less traffic is concentrated in any one direction and can be rerouted at many different nodes in the network by the distributed switching. Traffic is re-routed through the mesh in the event of a failure and the network becomes self healing. The net effect is that CAPEX and OPEX is significantly reduced.

The resulting IP network is much better at delivering mixed services of data (multimedia) and voice since bandwidth is much more easily directed where it is required.

It should also be noted that State of the Art microwave radios have very high MTBF reducing the probability of a failure.

The result is a network design that is more able to meet the future market requirements, optimised to deliver the latest services and more able to succeed in what will be a very competitive market for service providers.

The PTP500 and 600 license exempt band products would be used for challenging links in possibly suburban and rural areas where there is little congestion of the license exempt spectrum. These products can be rapidly deployed without licence and without the need for special structures. In due course, as subscribers are connected and generating revenue then the license exempt link could be upgraded for a higher capacity licensed band product or for wireline and the licence exempt band product redeployed elsewhere.

The PTP800 licensed band product uses state of the art technology and would be used in metro areas or for other applications where the infrastructure is available for mounting the equipment or investment in new infrastructure can be justified. The Pay as you grow capability can be used to manage CAPEX enabling the throughput to be remotely upgraded from 10 to 368Mbps without visiting site, provided the hop has been designed to support the higher data rate.

3.2 Solutions for Existing Mobile Network Operators

2G and 3G mobile networks were originally designed to carry narrow band voice traffic and hence a huge amount of TDM PDH microwave equipment was deployed.

It has been reported that the amount of data traffic has grown by 300% in the 12 months to mid 2009. This has been driven by take up of thin client terminals (iPhone) and all inclusive data contracts.

Growth in demand in relation to connecting nodes of evolving mobile technology is illustrated in the following table;

Mobile Technology	TDM Capacity Required	IP Peak Capacity Required
GSM	2 x E1	
WCDMA	2-3 x E1	
HSPA 3.6 Introduction	3-4 x E1	
HSPA 7.2	5 x E1	10Mbps
HSPA 14.4		20Mbps
LTE Initial Deployment		50-100Mbps

There will be a tendency by incumbent microwave vendors to retain their clients by up-selling capacity upgrades for existing or previously supplied equipment.

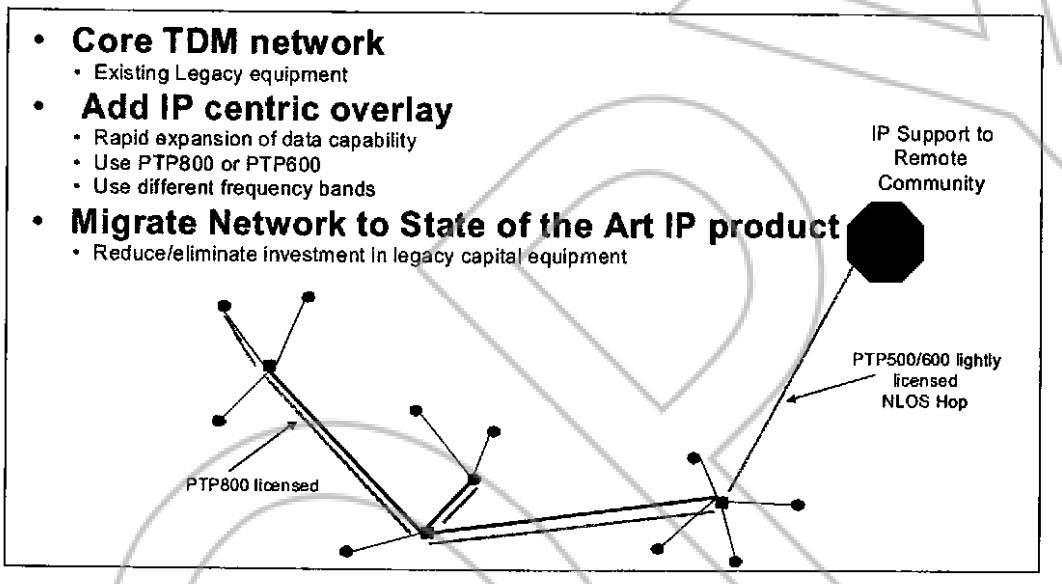
It would be challenging to upgrade equipment designed to transport for example 2xE1 narrowband traffic to deliver broadband IP services at rates of over 10Mbps, especially since it is unlikely that the hop was designed to support this throughput. It is more likely that the hop would have to be redesigned, possibly using an alternative frequency, larger antennas and a new spectrum license obtained.

An alternative approach would be to take broadband IP data away from the TDM backhaul network and start building a purpose designed data overlay NGN taking advantage of the latest state of the art equipment specifically designed for this application.

This creates a much more future proof solution for the client ensuring that his capital investment can be exploited fully by his future business.

It is likely that existing mobile network will at some stage be considering an investment in 4th generation technology such as WiMAX or LTE, in which case the backhaul will be fully capable of exploiting the advantages of that NGN technology.

TDM backhaul will eventually be decommissioned as narrowband TDM traffic transitions over to the packet switched network.



Motorola's PTP500 and PTP600 license exempt band products can be configured to transport pure IP traffic of for a hybrid mode of operation supporting IP traffic and 1xE1 or 2xE1 respectively. This capability could be used to add broadband capability to an existing site and at the same time decommission the legacy TDM microwave thus saving on license fees and OPEX.

Motorola's portfolio of flexible PTP microwave products with their Pay as You Grow Capability will enable the service provider to deploy nodes in areas where it would not previously have been viable to provide a service. An entry level hop can be quickly deployed possibly utilising a License Exempt band product with NLOS to the POP. The link can then be upgraded with PTP800 licensed band product once usage has proven the business case and the additional capital expenditure can be justified.

3.3 Solutions for Fixed Carrier Networks

A fixed network service provider will generally have an extensive fibre or cable core serving his main subscriber bases. His objective is to attract as much traffic as possible onto his core network to optimise payback of this investment.

Motorola's PTP microwave solutions provide a cost effective and responsive way to satisfy new demand and capture new clients.

Broadband Access to High Value Clients

The critical parameter a network provider has to consider when extending his market penetration is "cost per home passed". This parameter reflects the fact that services must pass or be available to a potential customer before he can start marketing his services to them.

A network that is solely based on wireline technology would require a huge investment to provide the wireline infrastructure up to the prospective customer's premises before marketing can begin. If that prospect is not captured then the investment would be wasted.

Motorola's Microwave PtP is the most effective solution to extend the served market of a fixed network provider and to attract clients away from other providers. Commercial clients are the most valuable for a provider to capture. With Motorola's fast and easy to plan and deploy PtP solutions, services can now be marketed to every high value client within the range of the microwave solution to their Point of Presence (POP), which could be many 10's of km.

A client can be approached; a link planned and deployed rapidly connecting him to the POP in some cases within just a few days.

A license exempt band product could be deployed in a NLOS situation to provide an ideal IP connection with throughput dynamically optimised for the channel conditions at any time. The easy and fast to use Motorola LINKPlanner tool can allow the link to be planned and throughput estimated virtually in real-time. Timescales for deployment of this type of connection can be just a few days since there is no delay caused by applying for a license. This gives the network provider a powerful tool for capturing new clients from other providers. This license exempt band link could be replaced with licensed band in due course or even fibre if justified by the business case. In these instances the Motorola microwave link can be redeployed and used to capture the next client.

In some cases it may be possible to provide a licensed band hop to the client from the outset depending on availability and height of roof space at his premises. In these cases the rate determining step is establishing the new service will be the time taken for approval of the licence application. In the UK this can be currently 4-6 weeks although in the future it is planned to be on-line and much faster. In some cases the service provider will already own his own national license and so will not need to apply to the regulator for a license. This licensed link would provide a safer GOS than using license exempt band but if bandwidth demand grows so such an extent that the microwave capacity is exceeded then fibre can be planned and deployed.

In both cases, Motorola's microwave solutions with fast and easy to use planning tools and installation procedures are valuable weapons in the fixed service provider's armoury helping expand market share and compete with the best possible technology.

Broadband Access to Suburban and Rural clients

There is a large unmet demand for broadband access in remote and rural communities where clients are demanding the same high level of services experienced by clients in metro and sub-urban areas.

In these cases there may be a local/remote exchange or an E1 to line interface MUX in a local community installation. These local nodes would likely be connected by a PDH microwave hop designed to support narrow band services of little more than 1 x E1/T1. Support for broadband services would require the backhaul capacity to be expanded to 10Mbps or multiples thereof.

Whilst incumbent microwave suppliers might wish retain their account by selling an evolution solution for existing product this may not be a viable or cost-effective solution for the network provider. It would be unusual for an E1 hop to have been designed to support a high enough capacity for a broadband high bandwidth connection.

In most cases a significant amount of re-planning and installation work will be required which obviates any perceived advantages in upgrading or extending existing legacy equipment, replacing the link with a Motorola microwave product would give the advantage of exploiting latest state of the art technology and competitive pricing.

In some cases a Motorola PTP link can be quickly deployed with a minimum of investment to remote rural communities to test the market and once subscribers are signed up and generating revenue then a further investment might be justified in replacing the microwave hop with fibre.

Motorola's strategy is to provide tools to facilitate rapid and de-skilled hop planning, easy installation maintenance and support, streamlined ordering, delivery and installation to help the service provider succeed in a busy competitive market place.

4 PTP800 Product Description

The Motorola PTP800 is a High-Capacity; Carrier-Grade Wireless Ethernet Bridge specifically designed to satisfy the demanding requirements of Next Generation Networks.

The Motorola PTP 800 Series Point-to-Point Wireless Ethernet Bridges operate in all the licensed bands from 6 to 38GHz and provide industry leading maximum throughput rates up to 368 Mbps. Channel bandwidths are user-configured from 7 up to a maximum of 56 MHz.

Key features of the PTP800 are;

- Maximum full duplex throughput 368Mbps
- Native IP for maximum data throughput capability
- Pay as You Grow to optimise CAPEX
- Adaptive Coding Modulation maximising spectral efficiency and throughput
- Easy de-skilled planning using Motorola LINKPlanner
- Small Compact Indoor Unit
- Easy install minimising OPEX
- High MTBF
- Low Latency
- High modulation rate capability of 256QAM
- High bandwidth capability of 56MHz

Typical Applications for PTP800 Licensed band PTP products;

- High availability links for carrier networks, especially Next Generation Networks
- High availability links for 4G networks such as WiMAX and LTE.
- Data overlay networks to relieve data traffic from TDM/Switched Circuit networks such as 2G/3G or fixed legacy networks.
- Provide Enterprise connections in areas where license exempt spectrum is congested or where a high Grade of Service is required.

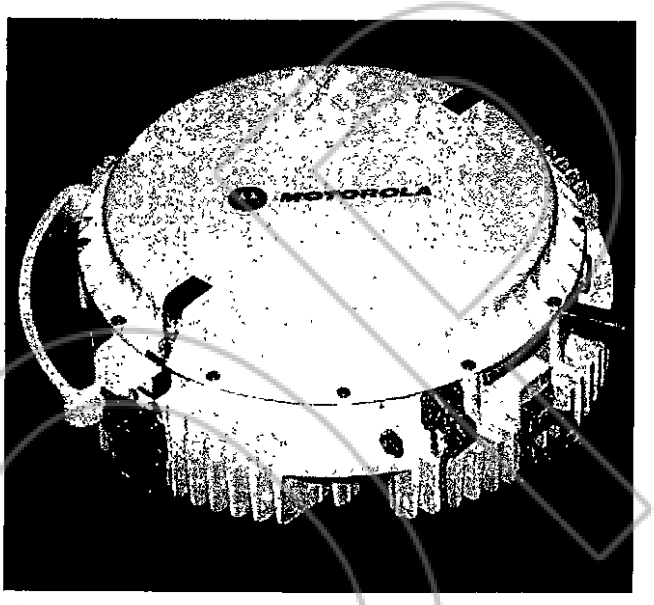
An entry level product is available with throughput capped to 10Mbps; this can be upgraded to a maximum cap of 400Mbps by purchasing a capacity upgrade key and downloading it to the receiver remotely. Capacity of the link can then be upgraded to support the maximum throughput rate of 368Mbps full duplex provided that the RF channel can support it. This "Pay as You Grow" capability means that Capital Expenditure is optimised since the carrier only pays for capacity that is generating revenue.

Automatic Dynamic Adaptive Modulation enables PTP800 Series transceivers to negotiate the highest mutually sustainable data rate, then dynamically "up shift" and "down shift" the rate as radio path conditions change. This capability helps PTP800 bridges deliver the highest spectral efficiency and maximum throughput possible for the radio path. Effectively this means that the fade margin allowance of traditional PTP

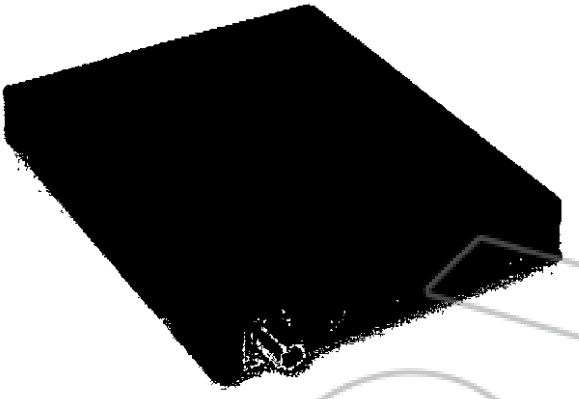
equipments is exploited to carry traffic and that although a link is designed to support a certain amount of throughput for eg 99.999% GOS, it will in fact support a higher throughput for 99.99% of the time and provide performance that exceeds user's expectations. Motorola's implementation provides for 8 Modulation/Code rate states ensuring smooth hitless transitions and optimum instantaneous throughput.

Modulation rates can be varied from 4 through 16, 32, 64 up to a maximum of 256QAM. A full range of bandwidths can be supported for ETSI and ANSI markets from 7MHz to a maximum of 56MHz.

Installation of the PTP800 is quick and easy due to the split-mount architecture, which comprises an outdoor unit (ODU) and a small footprint compact modem unit (CMU).

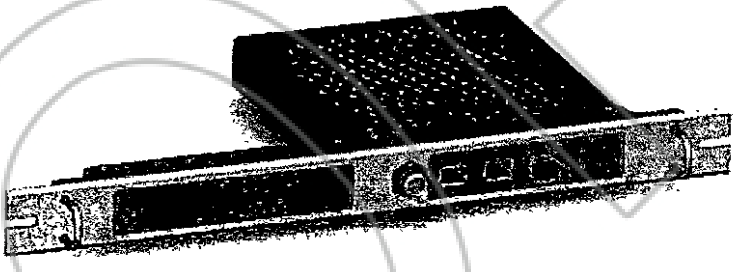


PTP800 Outdoor Unit



PTP800 Compact Indoor Unit

The Compact Indoor Modem Unit can be mounted in a variety of ways and doesn't require rack mounting. Motorola can supply a 1U rack mount panel with capacity for 2 modems in cases where this is required.



PTP800 Compact Modem Unit in 1U rack Mount Panel

Alignment of the antenna is facilitated by connecting a simple voltmeter to the ODU and adjusting the antenna until the voltage is peaked.

4.1 PTP800 Feature Roll Out Schedule

The PTP800 has a planned roll out of features described in the following table;

Feature	Current release	Rel 02-00 March/10	Frequency Releases May-Sept/10	Rel 03-00 Oct/10	PTP805 4Q/11
Support licensed bands – 6 to 38 GHz	18, 23, 26, 11 (ETSI) 11, 18, 23 (FCC)	L6, 7, 38 (ETSI) L6 (FCC) 18GHz Brazil	May 13, 15(ETSI) July 8GHz (ETSI) July 38GHz (FCC) Sept U6, 28GHz (ETSI)	Oct 8GHz Nov 32GHz ETSI Nov 26GHz FCC	All within 6 months
Channel widths (MHz)	7 to 56	7 to 56	7 to 56	7 to 56	7 to 56
Throughput (full duplex -1518 byte/frame)	368	368	368	368	368
Ultra-low latency @368Mbps/64 -byte frame	<100µs	<100µs	<100µs	<100µs	<100µs
FIPS-197 128/256 -bit AES encryption opt	•	•	•	•	•
Modulation QPSK to 256 QAM	4-256QAM Fixed	4-256QAM ACMOD	4-256QAM ACMOD	4-256QAM ACMOD	4-256QAM ACMOD
Protection	1+0	1+0	1+0	1+0, 1+1 HSB Ext Switch	1+0, 1+1, 2+0, SD
Compact model unit – indoor/outdoor inst	Split	Split	Split	Split, Outdoor enclosure available	Split
Support T1/E1	Pseudo-Wire	Pseudo-Wire	Pseudo-Wire	Pseudo-Wire	Pseudo-Wire
Integrated Carrier Ethernet Switch Support (4 ports)					•
XPIC					•
Network freq/time synch 1588v2					•

Frequency bands and sub-bands are planned to be available as follows;

Admin	Band	Frequency (GHz)	ERC (CEPT)	ITU-R	T/R (MHz)	Channel Spacing (MHz)	Release
ETSI	18	17.7 – 19.7	Rec 12.03E	F595-6	1010	55, 27.5, 13.75	Now
				F595-9 An3	1008	7	
	23	21.2 – 23.6	T/R 13.02E An A	F637.3 An 3	1008	56, 28, 14, 7	
				F637.3 An 3	1232	56, 28, 14, 7	
	26	24.5 – 26.5	13.02 An B	F748-4 An 1	1008	56, 28, 14, 7	
	11	10.7 – 11.7	Rec 12.06 Fig1	F387 fig1	530	40	
			Rec 12 06 Fig2	F387 fig2	490	40	
	L6	5.925 – 6.425		F383-8 Fig 1	252.04	29.65	March 2010
				F383-8 An 1	240	40, 20, 10	
	7	7.125 – 7.9	None	F385 & An 5	161	28, 14, 7	
		7.425 – 7.725		F385 An 1	154	28, 14, 7	
		7.435 – 7.750		F385 An II	160	20, 10	
		7.110 – 7.750		F385 An III	196	28	
		7.425 – 7.900		F385 An IV	245	28, 14, 7	
	38	37 – 39.5	T/R 12.01	F749-2 An 1	1260	56, 28, 14, 7	
	13	12.75 – 13.3	12.02E	F497.7	266	56, 28, 14, 7	May 2010
	15	14.5 – 15.35			420	56, 28, 14, 7	
		14.4 – 15.35			490	28, 14, 7	
		14.5 – 15.35	12.07E		728	28, 14, 7	
	U6	6.425 – 7.125	14.02E An 1	F385 10	340	40	Sept 2010
	8	8.275 – 8.500	None	F386 An 2	119	14, 7	July 2010
		7.9 – 8.4		F386 An 3	266	28	
		8.025 – 8.500		F386 An 5	208	28, 14, 7	
				F386 An 6	311.32	29.65	
		8.2 – 8.5		F386 An 7	151.614	11.662	
	28	27.5 – 29.5	13.02 An C	F748-4 An 2	1008	56, 28, 14, 7	Sept 2010
	32	31.8 – 33.4	Rec 01.02	F1520-2 An 1	812	56, 28, 14, 7	Nov 2010
FCC	11	10.7 – 11.7			490 (500)	40, 30, 10	Now
	18	17.7 – 19.7		F595-9 An 2	1560	50, 40, 30, 20, 10	
	23	21.2 – 23.6		F637.3 An 4	1200	50, 40, 30, 20, 10	
	L6	5.925 – 6.425			252.04	30, 10	March 2010
	26	24.25 – 25.25		F748-4 An 3	800	40	Nov 2010
	38	38.6 - 40		F749-2 An 3	700	50	July 2010

4.2 Lightening Protection Unit (PTP800)

An LPU is available for the PTP800. Details and installation instructions will be available soon.

4.3 Protection Solutions for PTP800

Many protection options will become possible as the PTP800 product evolves. Possible protection solutions are as follows;

1. Physical layer protection; (1+1), (2+0)
2. Network Layer Ring/mesh protection.

Rapid shut down/switchover was an important parameter in legacy PDH/SDH networks where outages during protection switching would significantly interrupt services due to the nature of TDM networks. Packet switched networks are inherently more tolerant of outages such as this; using high level protocols, retries and congestion mechanisms to minimise any impact.

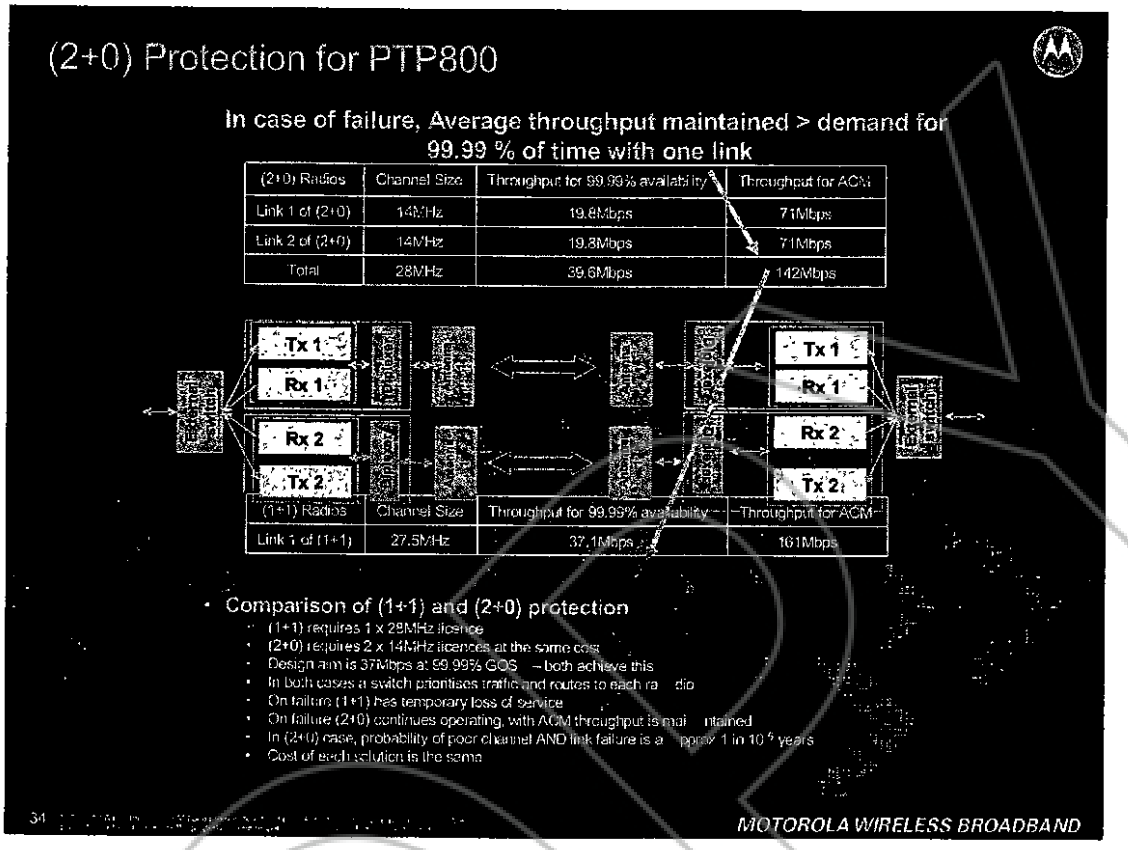
4.3.1 Physical Layer Protection

Switching at the MAC and physical layer is fast but requires dedicated hardware. Solutions for protecting microwave hops require 2 radio paths in the same direction, one path providing a back-up in case of failure. Possible solutions and availability are as follows;

1. (1+1) protection where switchover is provided by an external switch
2. (1+1) where the radios communicate with a rapid interface to ensure rapid switch over
3. (2+0) where 2 radio pairs are operational and the link still operates in the event of failure although at a reduced throughput.

4.3.1.1 (2+0) using an external switch (Available end 4Q09)

In this solution 2 radios are installed operating over the same link at different frequencies and traffic is shared between the 2 links. The channel bandwidth for each can be half that required to support the designed data rate. The radio modem ethernet ports are connected to a standard switch and if one hop fails it routes traffic in order of priority to the operational link, this means that the connectivity is maintained albeit at a reduced rate and high priority traffic is maintained. This configuration has an advantage in that all the capital equipment deployed is being used to transport revenue generating traffic, rather than being in standby mode. The dual radios can either be deployed using different antennas or can be coupled into a single antenna, in which case the link budget and hence throughput would be affected by 3dB coupling loss at each end.



4.3.1.2 (1+1) using external switch (Available end 4Q09)

2 radios can be installed to operate along the same path but tuned to different frequency channels. The modem Ethernet port is connected to a standard switch with Trunk Protection applied to the 2 ports. Failure of a link is sensed by the radio modem and the ethernet port is disconnected. This disconnection is sensed by the switch and traffic is switched from one radio to the other. An obvious limitation is that 2 radios are operational all the time and 2 radio spectrum licenses would be required. It is possible to have the standby radio in mute and activate it manually via the remote management interface. Alternatively the radio failure will also be flagged to the management system which could activate the standby link automatically; recovery of the link in this case would take fractions of a second.

4.3.1.3 (1+1) with external switch/rapid switchover (Available end 2Q10)

The traditional protection configuration is to install 2 complete radio systems on the same hop sharing an antenna with 1 radio in "hot standby" mode. The 2 radio heads would be coupled together into a single antenna using an RF coupler, the impact of this is to introduce a loss of either 3dB into each end of transmit/receive chains or less than 1dB at each end into the "active" link and 6dB into the "standby" link. Either way the result is to substantially impact the link budget and hence throughput that the link can sustain. An additional consideration is that the equipment cost is double for the 2 transceivers and one of the transceivers is effectively wasted capital investment since it isn't being used to support revenue generating traffic.

4.3.2 Network Layer Protection (Available now)

Packet switching networks are inherently resilient to link failures. Switching takes account for topology changes such as a link failure and re-computes switching tables accordingly using a shortest path algorithm. When all switching tables of the network are recomputed and have converged, all paths that were using a failed link are switched through other links. However, convergence is fairly slow and takes a fraction of a second. Part of the reason for this is that routing protocols use timers to detect link failure with coarse granularity (1 second). Second, all switches in the network have to be notified of the failure. Propagating notification messages is done in an order of magnitude of tens of milliseconds. Finally switching tables have to be recomputed before paths are switched. Re-computing switching tables implies using CPU intensive shortest path algorithms which can take a time of several hundred milliseconds in large networks.

Different forms of Network Layer protection are;

1. Ring protection using Spanning Tree Protocol (STP) Ring, in this case the core/trunk network is arranged as a ring and in the standard STP algorithms is used to calculate a new path around the ring in case of failure.
2. Mesh protection using STP, this is similar to above except the network topology is arranged in a Mesh providing multiple alternative paths through the network. This will be the preferred solution for Next Generation Networks.
3. Protection using IP/MPLS based switching; IP rerouting is slow but does not rely on any specific topology and is implemented in every router. MPLS, which is implemented between the IP and MAC layers, supports switching mechanisms that provide a trade-off between repair speed and deployment cost. The fastest MPLS switching mechanism; Fast Reroute relies on pre-planning and requires that a backup path is computed and advertised before a link failure can be repaired. MPLS Fast Reroute is faster than IP rerouting but slower than MAC or physical layer rerouting.
4. Provider Backbone Bridge – Traffic Engineering (PBB-TE) based Path protection is provided by configuring one work and one protect path for each backbone service instance. In case of work path failure (as indicated by loss of 802.1ag continuity check messages) the source bridge redirect the traffic onto the preconfigured protection path within 50 ms.
5. G.8032 Ethernet Ring Protection; In this solution a Ring Protection Link (RPL) is created along the ring's path and a single RPL owner node blocks the ring from forming a loop. Control messages called Ring Automatic Protection Switching (R-APS) traverse the ring to detect failures and repair the ring. When an RPL node detects a failure then R-APS signal fail messages are sent and the RPL owner node unblocks the RPL port to restore the ring to operational status.

All of these protection mechanisms are provided by switching elements in a packet switched network, protection of a traffic route is simply a function of network design and configuration, Motorola's PTP products are all compatible with these.

4.3.3 Summary of Protection Options

Network Layer Protection (All available now)

Ring/Mesh	Spanning Tree Protocol (STP)	
Ring/Mesh	Internet Protocol/Multi protocol Label Switching	
Backbone	Provider Backbone Bridge – Traffic Engineering	50msecs
Ethernet Ring	G.8032 Ethernet Ring Protection Link	

Physical Layer Protection

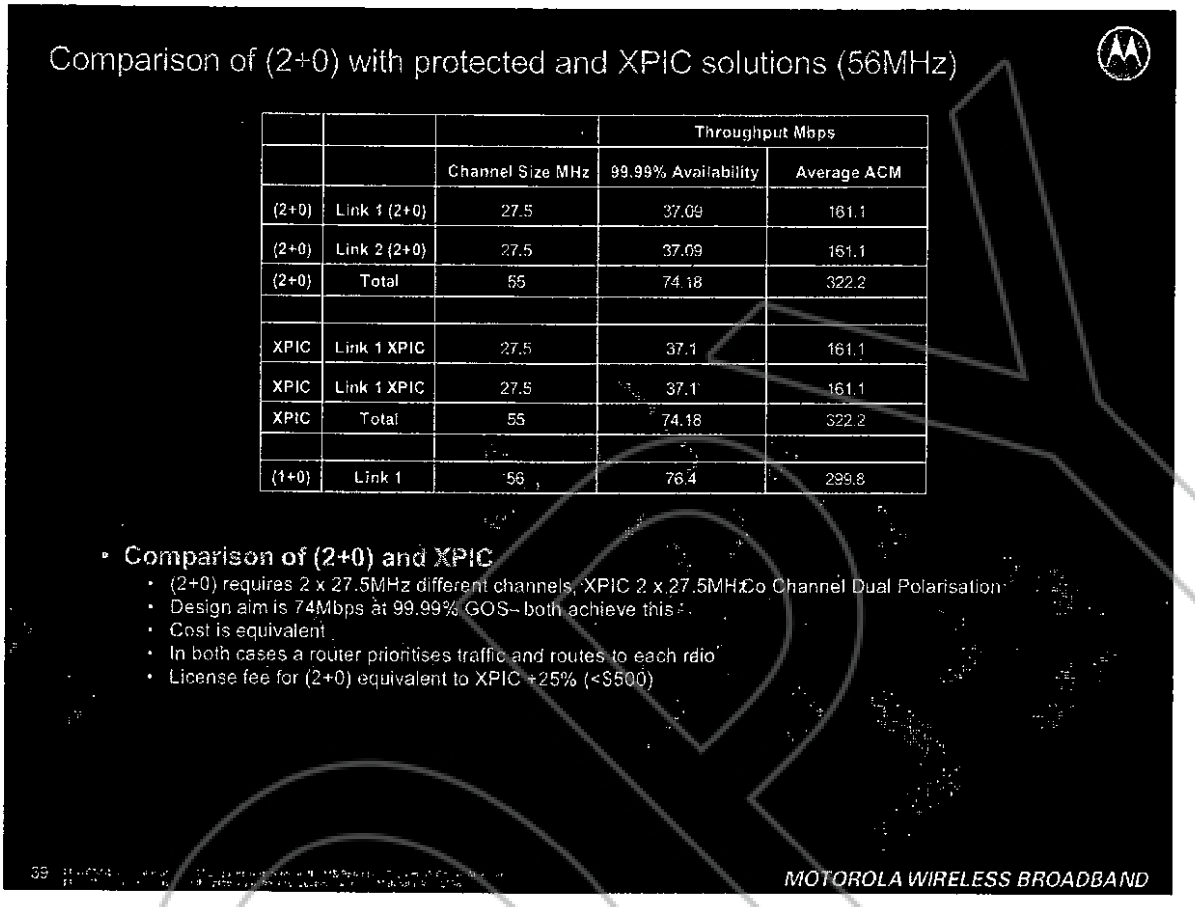
(2+0) (now)	Protected switch ports, Traffic prioritised 802.1p	Both radios powered up, max throughput, graceful degradation, no high priority traffic lost
(1+1) (now)	Protected switch ports, manual or EMS switching	Requires both radios to be on
(1+1) (4Q09)	Protected ports, hot standby	1 radio in hot standby

4.4 XPIC for PTP800

A Co Channel Dual Polarisation capability will be available for the PTP800 in 4Q11.

Until that time Motorola can suggest that a (2+0) configuration will offer comparable performance;

- 2 radios are installed on the same hop on separate RF channels
- Traffic is routed through either hop by a switch/router
- The hop would be designed to carry half of the traffic at the required GOS on each hop.
- The aggregate throughput is equivalent to that achieved using XPIC
- Although 2 channels are used, they are only used on 1 polarisation and can be re-used elsewhere on the alternative polarisation
- Spectrum Licence fee for (2+0) would be largely equivalent compared to XPIC except for example in UK where (2+0) would cost approximately 25% more, this would be in the order of $400.



4.5 Estimated Range vs Throughput for PTP800

The ranges that can be supported for a particular LOS link are a function of the quality of the channel and the gain of the radio system.

Quality of the channel will depend upon;

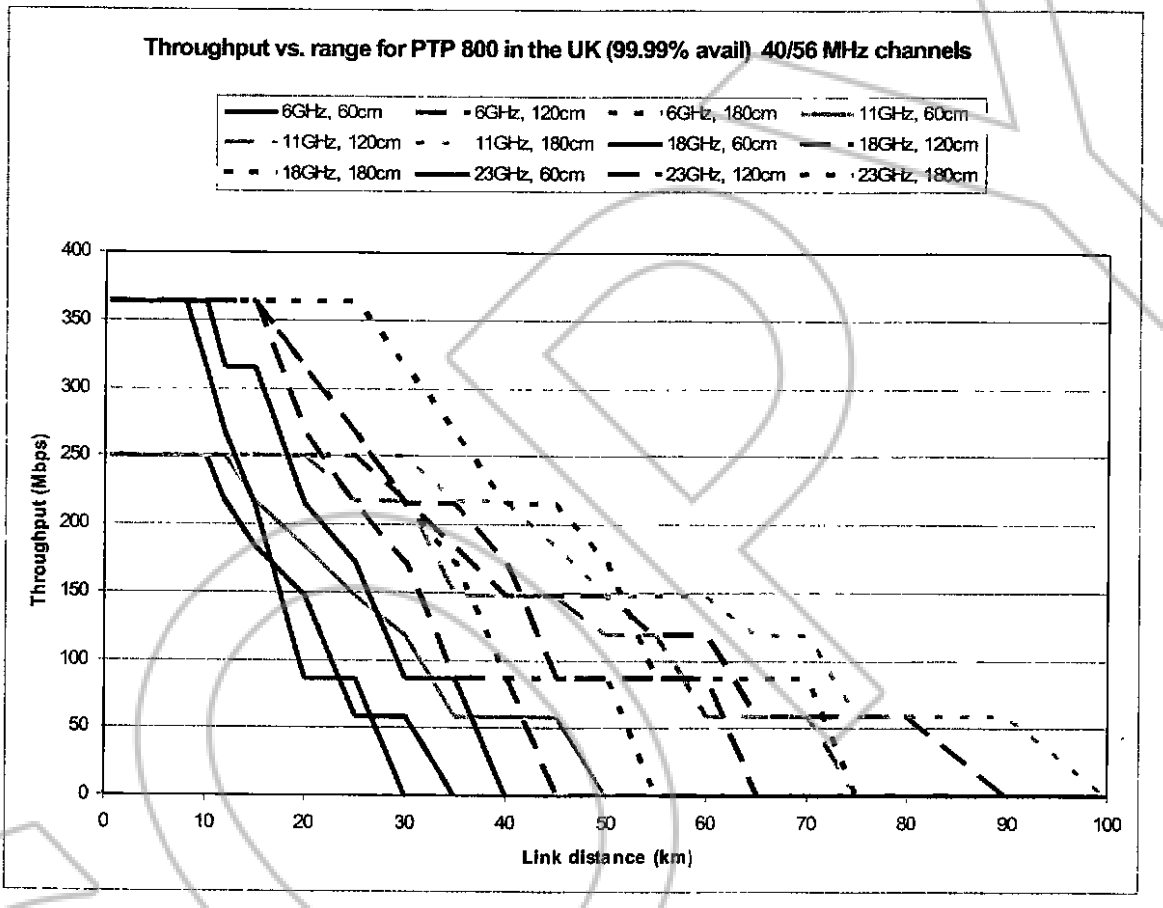
1. Height of the antenna on either end.
2. Degree of Fresnel zone obscuration
3. Geographical area; dictating climactic conditions including rain.
4. Terrain or water that may cause reflections and refractions
5. Frequency chosen; generally lower frequencies will support higher bandwidths at longer ranges.

Gain of the system is a function of;

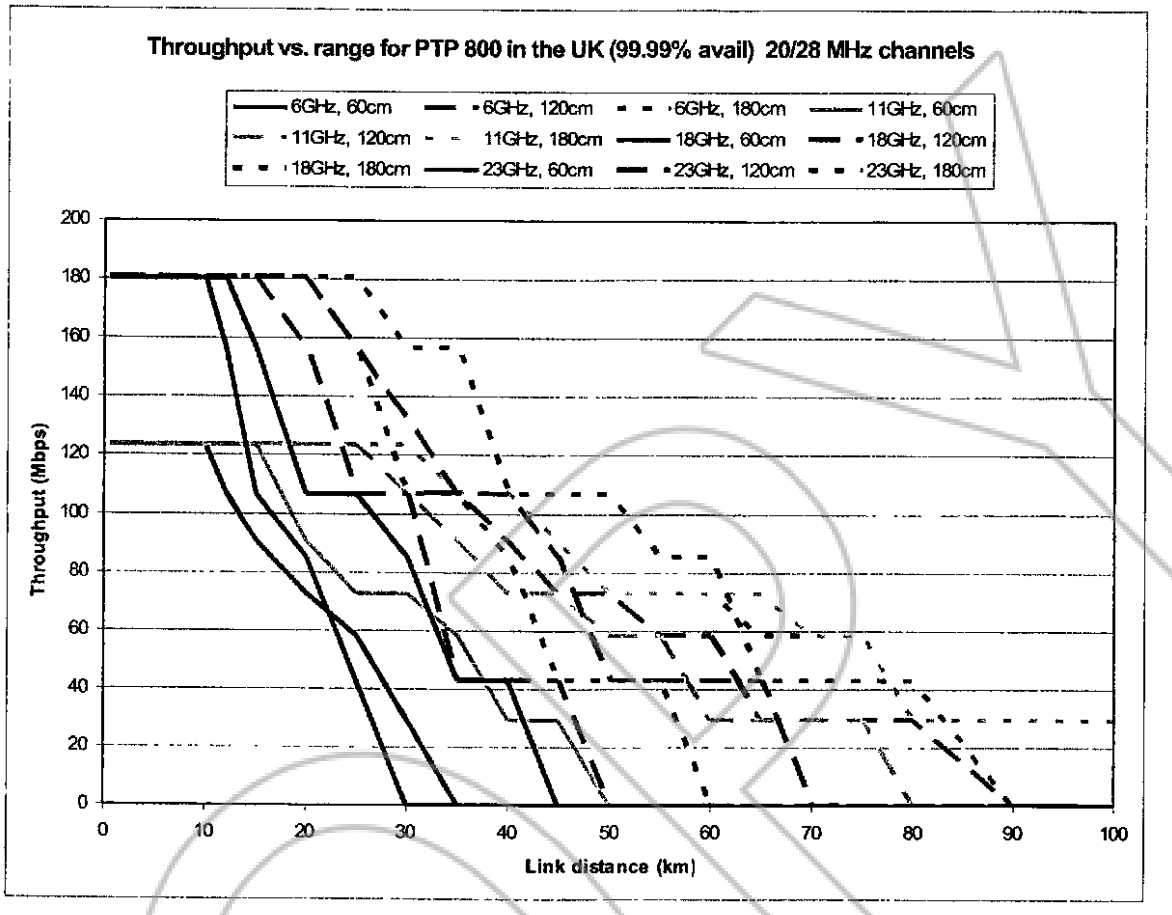
1. Receiver Sensitivity
2. Transmit Power
3. Antenna gains (effectively the size of antenna)
4. Losses of any connecting cables/waveguide and couplers

The loss of the channel is estimated using the ETSI standard ITU-R P.530-10. This provides an estimate of the probability of experiencing different levels of loss and it is from this that the Grade of Service for the link is estimated.

The following graph shows estimated throughput at different frequencies for a range of common antenna sizes using a 40/56MHz Channel;



The following graph shows estimated throughput at different frequencies for a range of common antenna sizes using a 20/28MHz Channel;



4.6 MTBF for PTP800

The PTP800 comprises of 2 discrete components;

- The Outdoor Unit (ODU)
- Compact Modem Unit (indoors Unit)

The ODU has been in series production for a number of years and the recent generation of products has an MTBF 0f 137 years.

The following model has been used to accumulate field in-service hours:

- Assume that 2% are held as spares and never deployed
- Allow 2 months following delivery for installation before assuming that an ODU is in service
- At the end of Feb 2009 there were 123,303 ODUs estimated as being in field service.
- Accumulated time to the end of Feb 2009 was 1,631,614,752 Hrs (186,257 Yrs)
- As of that time there have been 2,426 field failures
- MTBF = (186,257 yrs / 2,426 failures) = 76.8 years mean time before failure (MTBF)

- The two largest failure mechanisms were identified and corrective actions have been fully put into place – without reoccurrence of those failure modes.
- These two failure modes accounted for 1,067 of the 2,426 failures, leaving 1,545 from all other causes.
- The MTBF of the remaining causes is 147,956 yrs /1,545 failures = 137 years MTBF for current products.

The PTP800 indoor unit the (CMU) has recently started shipping and we are now aggregating field performance to compile reliability figures. However, we have shipped over 60,000 of our license exempt band products which are of a similar design and complexity and achieve an MTBF of 158 years. We fully expect to achieve a figure at least as good as this for the PTP800 CMU.

4.7 Timing Synchronisation

There is often a requirement for a node in a network to receive clock and time synchronisation, this has traditionally been achieved by synchronising the node's frequency reference with the incoming TDM transmission system's clock.

This presents a new challenge in Next Generation Networks where all transmission uses IP.

The most comprehensive and versatile method for providing timing, and the method recommended by Motorola PTP group, is to install a GPS timing reference receiver at the node site interfacing directly with the node.

Requirements are generally;

Technology	Freq Acc'y	Time Acc'y
GSM (TDM)	50pbb	4-18 µs
WCDMA (3G) FDD	16pbb	16pbb
WCDMA (3G) TDD	16pbb	± 2.5 µs
WiMAX	20pbb	± 1 µs
LTE TDD	50ppb	3 µs
LTE FDD	50ppb	??
Pure IP Backhaul	none	

Different methods of providing synchronisation are as follows;

Method	Freq Acc'y	Time Acc'y	Pro's	Cons
GPS Timing Rx	$1x10^{-12}$	<10ns	Provides both time and clock. Global and versatile,	Needs line of sight to satellites. Problems in urban canyons
Synchronous Ethernet	50ppb		Independent from network load	Frequency only All network elements must support syncE

Adaptive Clock recovery	<16ppb (Depending on integration time)		Requires accurate clock in the network	Frequency accuracy dependant on network design and disrupted by re-routing heavy traffic
Packet based synch (1588v2)		<1 µs	Time and frequency	Performance disrupted by network traffic.

GPS

A GPS Timing Receiver is located at each cellsite with antenna positioned to allow a maximum view of the horizon (>50% view recommended). Time synchronisation can be achieved when only 1 satellite is being received whilst reception of at least four GPS satellite transmissions is required for the GPS receiver to obtain a solution to generate an accurate frequency reference.

This solution provides time and frequency completely independently from the network and GPS receivers are ever becoming smaller, lower cost and more reliable.

GPS provides reliable clock and time reference in most applications but is difficult to use in urban canyons, subways and in-building applications.

Synchronous Ethernet

Synchronous Ethernet is a method for synchronizing clocks in a packet switched network. Recovered clocks can be used as an RF carrier frequency reference for cellsites that do not require time alignment of their RF transmissions (e.g. GSM).

This method uses the ethernet clock signal to transport a frequency reference from a master reference clock throughout the network. This method of synchronisation is analogous to the use of E1/T1 clock signals in a legacy network.

Synchronous Ethernet must be implemented at each node of the network to be effective, the ethernet port accepting the incoming signal carrying the reference clock must be designated as the master port, the other ports will be designated as "slave" ports and transmit a clock synchronized with the master port.

Motorola's Synchronous Ethernet implementation will be introduce in 4Q11 for PTP800 and will include clock recover mechanisms to lock the slave clock to the master clock and correct for any delay introduced by the link.

The IEEE1588v2

The 15788v2 packet based switch standard defines a means to transfer precise timing information from a master clock in the network to slave clocks distributed throughout a switched packet network.

Accuracy of IEEE1588v2 time distribution is heavily dependant on network design and management. Timing accuracy is degraded as the number of switches or routers increases and due to imbalances in up/down bound traffic loading and other factors.

1588v2 provides a means of distributing timing information through network backhaul and is potentially useful for in-building and subway locations where GPS Satellites are not visible.

Performance is however limited by the network implementation, management and traffic loading.

1588v2 can be transported by any network but accuracy of the transferred references will be degraded by each hop and node. These degradations can be minimized by implementing correction techniques within each element that estimates or measures the delay that they introduce and adding this to the transferred time reference packets.

PTP800 can be deployed in a 1588v2 network from launch and techniques to minimise degradation in transfer of the references will be implemented by 4Q11.

Adaptive Clock recovery

This method is commonly used on Pseudowire solutions where a TDM stream is encapsulated into packets and transported over the network. The clock is recovered from the reconstructed TDM frames and successively adapted to the incoming clock using a filter algorithm.

Availability

Networks that use Motorola's PTP800 product can support these different solutions in the following timescales;

Method	Availability
GPS Timing Rx	Now
Synchronous Ethernet	4Q11
Packet based synch (1588v2)	4Q11
Adaptive Clock recovery	Now using external pseudowire

4.8 Motorola LINKPlanner

Link planning is the process by which the propagation characteristics of the RF channel between transmit and receive site, are predicted using standard models. The performance of the radios is then predicted so that grade of service and throughput can be estimated.

Motorola provide a free-issue PTP LINKPlanner tool to support all PTP products. The tool is intuitive to use and versatile enough to predict performance in LOS and NLOS situations.

An additional capability to enable network level RF planning to be carried out, estimating inter-link interference and developing frequency channel plans, will be made available in due course.

The LINKPlanner tool can be downloaded from here;

http://motorola.wirelessbroadbandsupport.com/software/ptp/

The tool supports all Motorola legacy and current License Exempt product;

- PTP200/300/400/500/600/800

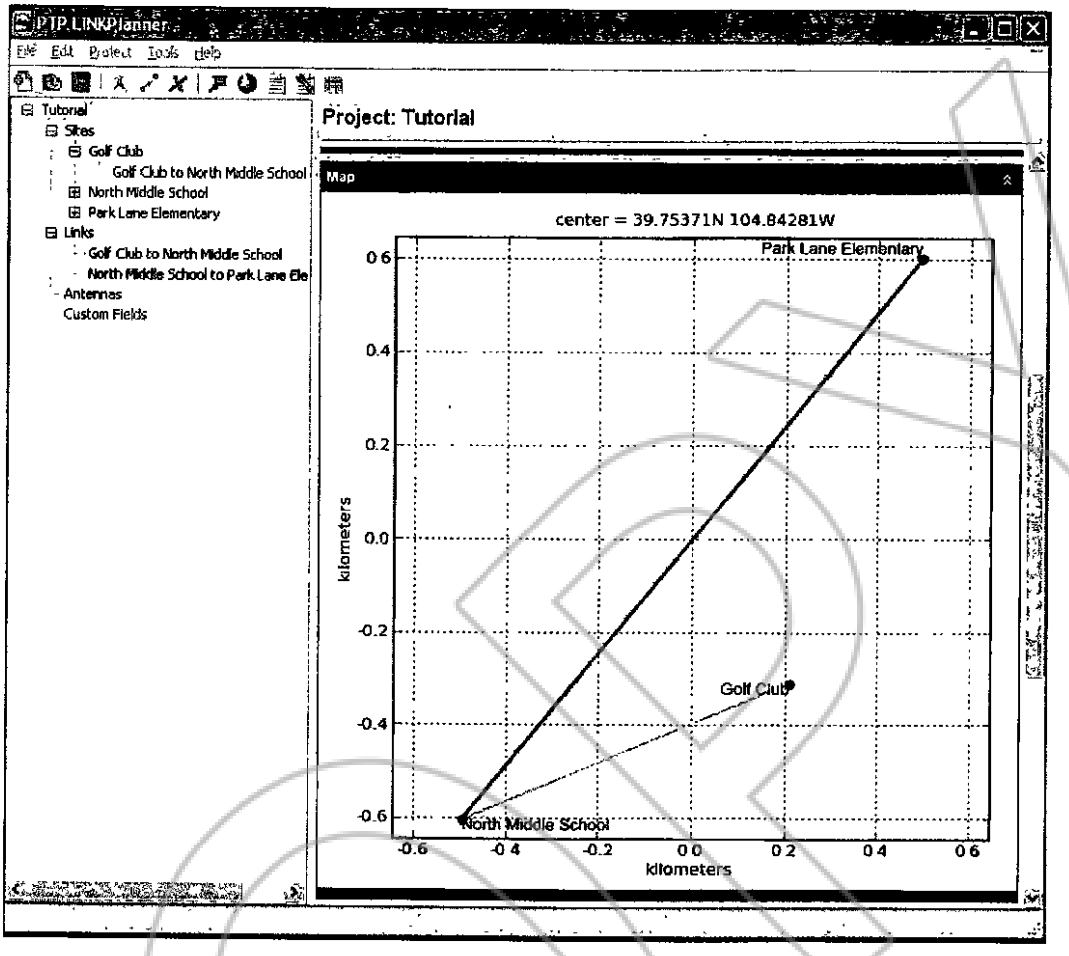
The tool is under continuous development and releases are made available to coincide with the roadmaps for all product.

The tool works in the following way.

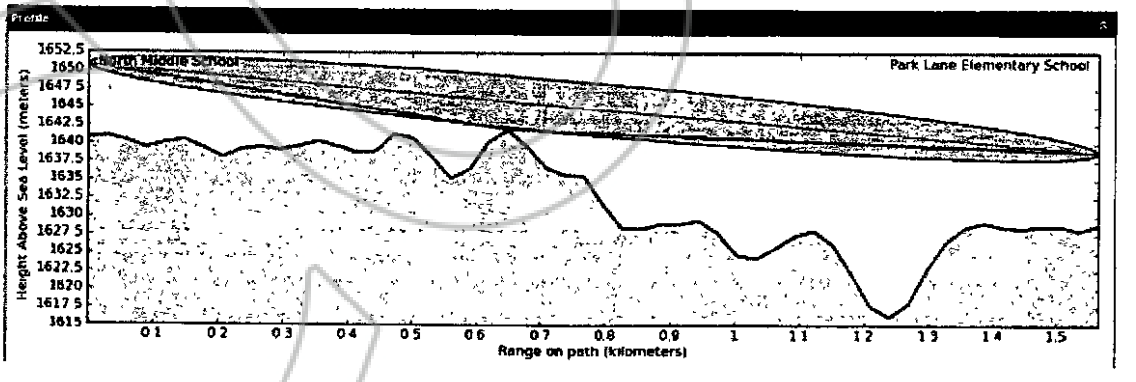
1. Latitude, longitude and height above terrain are entered for each end of the link.
2. Configuration data for the radios is entered; Model number, antenna gain, ERP and cable loss.
3. License restrictions such as ETSI region, (which limits maximum ERP) are entered by the user.
4. Terrain data is accessed from a Shuttle Radar Topography Mission data base.
5. Any man made obstacles are entered manually by the user.
6. The link planner models the RF channel and estimates the % of time the radio is expected to occupy each Code Rate/Modulation combination.
7. Overall throughput is calculated.
8. Configuration details such as antenna gain and height and position can then be altered to obtain the required link performance.

The PTP LINKPlanner is an application that runs on Windows or Macintosh. It performs the calculations defined in ITU recommendations ITU-R P.526-9 and ITU-R P.530-10 to predict NLoS and LoS paths for anywhere in the world. Climatic conditions as defined in the ITU recommendations are automatically selected by the tool depending on the latitude and longitude of the Tx/Rx site.

The following example shows the LINKPlanner user interface for the "Tutorial" project, which models a PTP network linking three sites:



The tool generates a link profile showing the extent of the Fresnel zone and any areas where this is obstructed;



Percentage of time that each Code/Modulation rate combination is estimated and shown in the following table;

Performance Details

Common details

Mode:	256QAM	64QAM	64QAM	16QAM	16QAM	256QAM	64QAM	64QAM	16QAM	16QAM	QPSK	QPSK	BPSK
Code rate:	0.81	0.92	0.76	0.87	0.63	0.81	0.92	0.75	0.87	0.63	0.87	0.63	0.63
Payloads:	Dual	Dual	Dual	Dual	Dual	Single	Single	Single	Single	Single	Single	Single	Single
Max Aggregate IP Throughput (Mbps):	278.77	234.87	191.03	149.32	107.34	139.39	117.43	95.98	74.65	53.67	37.33	26.83	13.41
Max IP Throughput Each Way (Mbps):	139.39	117.44	95.97	74.66	53.67	69.69	58.72	47.98	37.33	26.83	18.66	13.41	6.71

Performance to North Middle School

Fade Margin (dB):	4.00	4.00	10.12	14.05	18.92	8.00	8.00	12.83	17.86	21.48	23.88	28.00	33.32
Mode Availability (%):	99.9838	99.9838	99.9728	99.9735	99.9735	0.0264	0.0264	0.0264	0.0264	99.9999	99.9999	99.9999	99.9999
Receive time in Mode (%):	99.9838	0.0000	1.1090	0.0007	0.0000	0.0264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Performance to Park Lane Elementary School

Fade Margin (dB):	22.22	22.22	28.34	32.27	37.14	27.12	27.12	31.06	36.08	39.70	42.10	46.18	51.54
Mode Availability (%):	99.9735	99.9735	99.9735	99.9735	99.9735	0.0264	0.0264	0.0264	0.0264	99.9999	99.9999	99.9999	100.0000
Receive time in Mode (%):	99.9735	0.0000	0.0000	0.0000	0.0000	0.0264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Finally the links can be viewed superimposed on a Google Earth 3D view of the terrain and Google Earth Streetview can be used to more closely examine the actual paths.

The LINKPlanner generates a list of parts that can then be transferred to a purchase order.

The LINKPlanner tool has been a key enabler for Motorola customers, ensuring that engineers and technicians can easily plan and deploy links with a minimum of training.

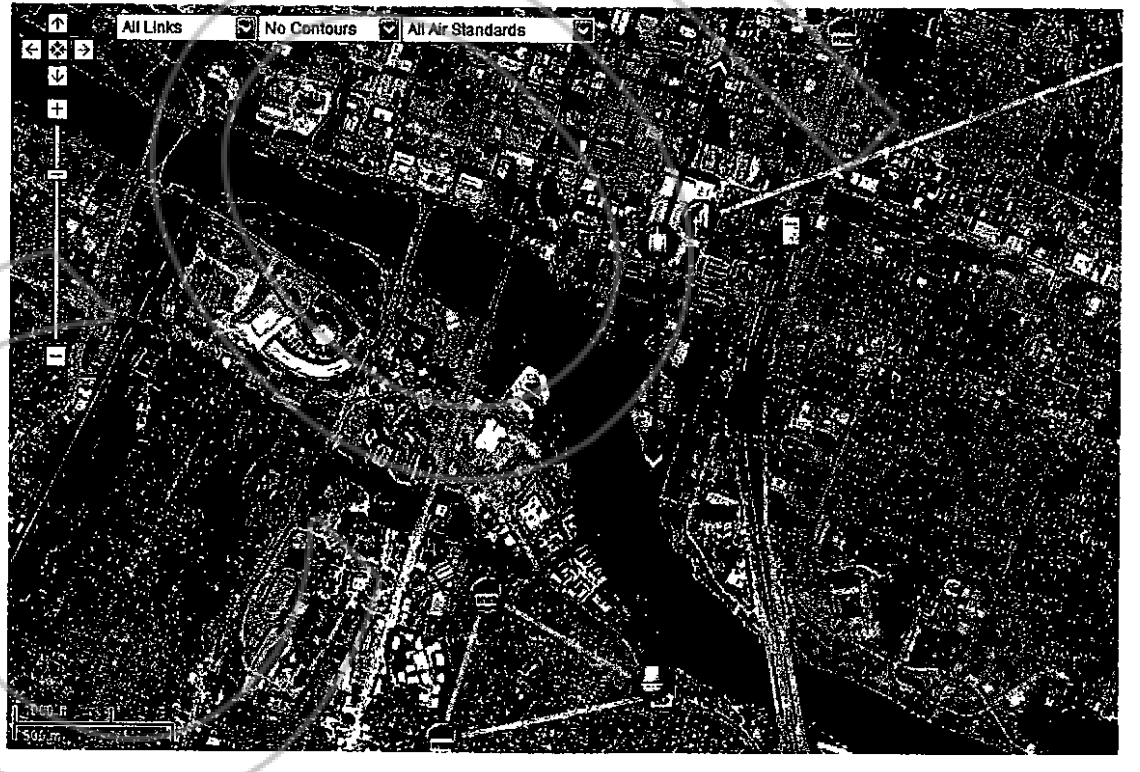
4.9 Radio Element Manager: One Point Wireless Manager

Motorola's One Point Wireless Manager is a powerful, flexible and scalable wireless network deployment and management solution for Motorola's wireless broadband networks.

The One Point Wireless Manager is part of Motorola's comprehensive Suite of integrated software solutions which make the design, deployment and management of wireless networks more visual, more complete and more efficient. With the software suite, you can design, deploy and manage your Motorola wireless broadband networks from inception through ongoing operation and expansion.

The solution combines sophisticated Google map-driven network mapping with advanced deployment, configuration and management functionalities to bring total network control to a more visual, more effective level.

In addition to One Point Wireless Manager, the suite interfaces with the PTP LINKPlanner application to streamline the process of designing and verifying the network:



As an acknowledged leader in integrated wireless technologies, Motorola offers nearly 80 years of unsurpassed expertise in designing, deploying and managing wireless

networks around the world. Our solutions are empowering stronger, more effective networks for a broad range of customers, including municipal public safety and public works departments, schools and educational institutions, medical centres and healthcare systems, and commercial networks for service providers of all sizes.

One Point Wireless Manager provides a single consolidated deployment and management application that delivers integrated network control while reducing training time and costs. The solution automatically incorporates complex relationships between network layers, and makes use of Google maps technology for the visualization of network devices and connectivity on both macro and micro levels. You can instantly view total network coverage and link performance data in real time from a single computer console.

Key features and benefits include:

FEATURE	DESCRIPTION
Sophisticated & Powerful Element Management System	Concentrates element information for the indoor and outdoor wireless networks into a single tool.
Network Performance Visualization	Overlays network elements with Google map satellite images to display a wide range of element information such as link quality, alarms, range, etc., which enables a user to view a complex set of information quickly and easily.
Consolidated Wireless Network Control	Through a single application have visibility and control of indoor and outdoor access, mesh and backhaul network layers.
Scalability	Supports growing networks to accommodate more users, larger geographic areas and new applications.
Template-based Configuration	To reduce time and errors, and accelerate the deployment/change process user- defined templates are used for configuring mesh devices on the network.
Auto Discovery	To enable faster implementation and reduce costs and errors new Mesh equipment is automatically discovered and quickly provisioned via templates.
Network Monitoring	Uses real-time polling to determine the current status of all elements for quick resolution of problems that impact performance and customer satisfaction.
Activity Scheduling	Save time by automating tasks per a particular schedule.
User Configuration Groups	Provides the ability to establish device groups according to the operator's own definition.
Detailed Audit Trails	Captures all of the activity for a particular device.
Historical Analysis	Uses snapshots of the network to show a representation of how the network changes over a period of time to pinpoint network usage, trouble spots or areas in need of additional coverage.
Security	Provides client security (WEP to WPA2) as well as intra-mesh AES-level security through Motorola's Secure Mesh.
Consistency Checking.	Operator can select a policy to either accept or reject a change about a device depending upon its consistency with the Wireless Manager
Advanced Reporting	Allows users to employ a pre-defined or custom report to view a complete health check on the network.
Device Database	Stores all device information in a central database so a device can be easily cloned if it is need of replacement.
North-bound Interface	Supports integration with third party network management systems, such as HP OpenView, via SNMP v3.

- Wireless Manager Software
- Red Hat Enterprise
- Linux ES v4.0 or Windows
- Server 2003 Enterprise
- Edition Service Pack 2
- Java Runtime Library 1.6x
- MySQL 5.0.40 or later
- A minimum of 2GB RAM, 4GB recommended

4.10 Support for Generic Radio Element Manager Solutions

One Point Wireless Manager is Motorola's in-house Wireless Element manager system which is the optimal solution for networks that use a mixture of Motorola wireless access products.

The radios can all be remotely managed in a stand alone mode using their integrated webserver which can be accessed over the IP network. All monitoring, set-up and diagnostic features can be accessed in this way.

Another solution for network deployments is to interface the microwave network to the higher level management or a proprietary Wireless Element Manager system. Motorola's PTP products support two Management Information Base (MIB) formats for these applications;

- MIB-II; standard definitions that are supported by any proprietary management system.
- Proprietary MIB; a Motorola specific definition that allows more complex diagnostic and set-up operations to be performed.

The PTP800 hosts a webserver which can be used locally or remotely to configure the link and monitor performance statistics and alarms.

The unit also implements SNMP v1/v2c/v3 which allows for remote monitoring and acknowledgement of alarms and provides for security.

Both private MIB and enterprise MIB are implemented;

- MIB-II, RFC-1213
- Managed objects for Bridges MIB, RFC-1493
- Interfaces group MIB; RFC-2233 MIB
- PTP proprietary MIB

MIB-II Features supported are;

- sysDescr
  - "A textual description of the entity. This value should include the full name and version identification of the system's hardware type, software operating-system, and networking software. It is mandatory that this only contain printable ASCII characters."
- sysObjectID

- "The vendor's authoritative identification of the network management subsystem contained in the entity. This value is allocated within the SMI enterprises subtree (1.3.6.1.4.1) and provides an easy and unambiguous means for determining `what kind of box' is being managed. For example, if vendor `Flintstones, Inc.' was assigned the subtree 1.3.6.1.4.1.4242, it could assign the identifier 1.3.6.1.4.1.4242.1.1 to its `Fred Router'."

- sysUpTime
  - "The time (in hundredths of a second) since the network management portion of the system was last re-initialized."
- sysContact
  - "The textual identification of the contact person for this managed node, together with information on how to contact this person."
- sysName
  - "An administratively-assigned name for this managed node. By convention, this is the node's fully-qualified domain name."
- sysLocation
  - "The physical location of this node (e.g., `telephone closet, 3rd floor')."
- sysServices
  - "A value which indicates the set of services that this entity primarily offers."
- sysORLastChange
  - "The value of sysUpTime at the time of the most recent change in state or value of any instance of sysORID."

There are two ethernet interfaces; the ethernet connector and the wireless link each of which have the following assigned attributes;

- ifDescr
  - "A textual string containing information about the interface. This string should include the name of the manufacturer, the product name and the version of the hardware interface."
- ifType
  - The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.
- ifMtu
  - "The size of the largest datagram which can be sent/received on the interface, specified in octets. For interfaces that are used for transmitting network datagrams, this is the size of the largest network datagram that can be sent on the interface."
- ifSpeed
  - "An estimate of the interface's current bandwidth in bits per second. For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should contain the nominal bandwidth"
- ifPhysAddress
  - "The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length."

- ifAdminStatus
  - "The desired state of the interface. The testing(3) state indicates that no operational packets can be passed."
- ifOperStatus
  - The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
- ifLastChange
  - The value of sysUpTime at the time the interface entered its current operational state. If the current state was entered prior to the last re-initialization of the local network management subsystem, then this object contains a zero value.
- ifInOctets
  - The total number of octets received on the interface, including framing characters.
- fInUcastPkts
  - The number of subnetwork-unicast packets delivered to a higher-layer protocol.
- ifInNUcastPkts
  The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
- ifInDiscards
  - The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
- ifInErrors
  - The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
- ifInUnknownProtos
  - The number of packets received via the interface which were discarded because of an unknown or unsupported protocol.
- ifOutOctets
  - The total number of octets transmitted out of the interface, including framing characters.
- ifOutUcastPkts
  - The total number of octets transmitted out of the interface, including framing characters.
- ifOutNUcastPkts
  - The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.
- ifOutDiscards
  - The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.
- ifOutErrors
  - The number of outbound packets that could not be transmitted because of errors.
- ifOutQLen

- The length of the output packet queue (in packets).

- ifSpecific
  - A reference to MIB definitions specific to the particular media being used to realize the interface. For example, if the interface is realized by an ethernet, then the value of this object refers to a document defining objects specific to ethernet. If this information is not present, its value should be set to the OBJECT IDENTIFIER (0 0), which is a syntatically valid object identifier, and any conformant implementation of ASN.1 and BER must be able to generate and recognize this value.

5 PTP Abbreviated Product Specifications

5.1 PTP500 Abbreviated Product Specification

Radio Technology

RF band	5.470–5.725 GHz* 5.725–5.875 GHz*
Channel size	Configurable to 5, 10 or 15 MHz
Channel selection	*intelligent* Dynamic Frequency Selection (*i*-DFS) or manual intervention; automatic selection on start-up and continual adaptation to avoid interference
Transmit power	Varies with modulation mode and settings from -18 dBm to 27 dBm
System gain Integrated:	Varies with modulation mode; up to 167 dB using 23 dBi integrated antenna**
System Gain Connectorised:	Varies with modulation mode and antenna type**
Receiver sensitivity Adaptive,	varying between -94 dBm and -69 dBm
Modulation Dynamic;	adapting between BPSK single and 64 QAM dual
Error correction	FEC
Duplex scheme 5.4 GHz:	Symmetric Fixed TDD; same frequency Tx/Rx
5.8 GHz: Symmetric Fixed TDD;	same or split frequency Tx/Rx where regulations permit
Antenna: type/gain/B/W Integrated:	Integrated flat plate 23 dBi / 8°
Connectorised:	Operation with a separately-purchased single and dual polar antennas via 2 x N-type (f) connectors (check local regulations prior to purchase)
Range	Up to 155 miles (250 km)***
Security and encryption	Proprietary scrambling mechanism; optional FIPS-197 compliant 128/256-bit AES Encryption

* Regulatory conditions for RF bands may vary by geographic location and should be confirmed prior to system purchase
** Gain, maximum transmit power and effective radiated power may vary based on regulatory domain
*** In all cases the range limit is set by the latest software release

Ethernet Bridging

Protocol	IEEE 802.3
User data throughput **Lite**:	Dynamically variable up to 52Mbps aggregate at Ethernet port; 5 MHz Channel – Up to 17 Mbps 10 MHz Channel – Up to 35 Mbps 15 MHz Channel – Up to 52 Mbps
User data throughput **Full**:	Dynamically variable up to aggregate 105Mbps at Ethernet port 5 MHz Channel – Up to 35 Mbps 10 MHz Channel – Up to 70 Mbps 15 MHz Channel – Up to 105 Mbps
Latency	<3 ms average each direction
QoS	802.1p (2 levels)
Interface	10 / 100 Base T (RJ-45) – auto MDI/MDIX

Management & Installation

LED indicators	Power status, Ethernet link status and activity
System management	Web or SNMP v1/v2c using MIBII and a proprietary PTP MIB; WMS
Installation	Built-in audio tone and voltage output indicates optimised link alignment
Connection Distance between outdoor unit and primary network connection:	up to 330' (100 meters)
Lightning protection Built into the ODU;	An external PTP Lightning Protection Unit (PTP-LPU) end device is required near the base of the tower or wall at the cable entrance point leading to the network

Physical

Dimensions Integrated Outdoor Unit (ODU):	Width 14.5" (370 mm), Height 14.5" (370 mm), Depth 3.75" (95 mm)
Connectorised ODU	Width 12.2" (309 mm), Height 12.2" (309 mm), Depth 4.1" (105 mm)
Powered Indoor Unit (PIDU Plus):	Width 9.75" (250 mm), Height 1.5" (40 mm), Depth 3" (80 mm)
Weight Integrated ODU:	11.8 lbs (5.35 kg) including bracket
Connectorised ODU:	10.4 lbs (4.7 kg) including bracket
PIDU Plus:	1.9 lbs (864 g)
Wind speed	survival 202 mph (325 kph)
Power supply	Integrated with Indoor Unit
Power source	90–240 VAC, 50–60 Hz / 36-60V DC; redundant powering configurations supported
Power consumption	50 W max

Environmental & Regulatory

Operating temperature	-40°F (-40°C) to +140°F (+60°C)
Protection and safety	UL60950; IEC60950; EN60950; CSA-C22.2 No. 60950
Radio 5.8 GHz:	USA CFR 47 Part 15.247, Canada IC RSS-210 Issue 7, Europe EN 302 502, Eire ComReg 03/42, UK IR2007
5.4 GHz:	Europe EN 301 893, Canada IC RSS-210 Issue 7
EMC	USA CFR 47 Part 15 Class B, Canada CSA Std C108.8 1993 Class B, Europe EN 55022 CISPR 22
Safety	Europe EN 301 489-4

5.2 PTP600 Abbreviated Product Specification

Radio Technology

RF Bands	2.496-2.690 GHz 4.400-4.600 GHz 4.710-4.940 GHz 4.710-5.000 GHz 4.940-4.990 GHz 5.470–5.725 GHz* 5.725–5.850 GHz*
Channel size	5, 10, 20, 30 MHz (Depending upon Frequency band chosen)
Channel selection/dynamic frequency control	By *intelligent* Dynamic Frequency Selection (i-DFS) or manual intervention; automatic selection on start-up and continual adaptation to avoid interference; 10 MHz step size for WiMAX compatibility
Transmit power	Varies with modulation mode and settings from -7 dBm to 25 dBm
System gain Integrated	Varies with modulation mode; up to 162 dB using 23 dBi integrated antenna**
Connectorised:	Varies with modulation mode and antenna type**
Receiver sensitivity	Adaptive, varying between -91 dBm and -58 dBm
Modulation Dynamic;	Modulation Dynamic; adapting between BPSK single and 256 QAM dual
Error correction	FEC, ARQ
Duplex scheme TDD ratio:	Dynamic or Fixed; same or split frequency Tx/Rx
Antenna:	type/gain/B/W Integrated: Integrated flat plate 23 dBi / 7°
Connectorised:	Approved to operate with flat plate up to 28 dBi or parabolic dish up to 37.7 dBi; connected via 2 x N-type female
Range	Up to 124 miles (200 km)***
Security and encryption	Proprietary scrambling mechanism; optional FIPS-197 compliant 128- and 256-Bit AES Encryption

* Regulatory conditions for RF bands should be confirmed prior to system purchase
** Gain and maximum transmit power may vary based on regulatory domain
*** In all cases the range limit is set by the latest software release

Ethernet Bridging & T1/E1

Protocol IEEE 802.3	IEEE 802.3
User data throughput Integrated and Connectorised	Dynamically variable up to 300 Mbps at the Ethernet (aggregate)
Integrated and Connectorised Lite:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate)
Latency	<1 ms each direction typical
Interface	10 / 100 / 1000 Base T (RJ-45) – auto MDI/MDIX, 1000 Base SX option
T1/E1 Interface	G703/G704 G823/G824
Integrated and Connectorised:	Provides dual T1/E1 ports
Integrated and Connectorised Lite:	Provides a single T1/E1 port

Management & Installation

LED indicators	Power status, Ethernet link status and activity
System management	Web or SNMP using MIBII, WiMAX and private MIB; WMS
Installation	Built-in audio tone indicates optimised alignment
Connection Distance between outdoor unit and primary network connection:	up to 330' (100 meters) (300m if power and data feeds separated)

Physical

Dimensions Integrated Outdoor Unit (ODU):	Width 14.5" (370 mm), Height 14.5" (370 mm), Depth 3.75" (95 mm)
Connectorised ODU:	Width 12.2" (309 mm), Height 12.2" (309 mm), Depth 4.1" (105 mm)
Powered Indoor Unit (PIDU Plus):	Width 9.75" (250 mm), Height 1.5" (40 mm), Depth 3" (80 mm)
Weight Integrated ODU:	12.1 lbs (5.5 kg) including bracket
Connectorised ODU:	9.1 lbs (4.3 kg) including bracket
PIDU Plus:	1.9 lbs (864 g)
Wind speed	150 mph (242 kph)
Power supply	Integrated with Indoor Unit
Power source	90–240 VAC, 50–60 Hz / 36-60V DC; redundant powering configurations supported
Power consumption	55 W max

Environmental & Regulatory

Operating temperature	-40°F (-40°C) to +140°F (+60°C), including solar radiation
Protection and safety	UL60950; IEC60950; EN60950; CSA-C22.2 No. 60950
Radio 5.8 GHz:	FCC Part 15, sub-part C 15.247, Eire ComReg 03/42, UK Approval to IR2007
5.4 GHz:	EN 301 893
EMC	USA–FCC Part 15, Class B; Europe–EN 301 489-4

5.3 PTP800 Abbreviated Product Specification

Short form specification for initial product launch; 11, 18, 23 and 26GHz bands is as follows;

Radio Technology

RF bands at launch* FCC; 11 GHz Band: 18 GHz Band: 23 GHz Band: ETSI; 18GHz Band 23GHz Band 26GHz Band	 10.7 – 11.7 GHz 17.7 – 19.7 GHz 21.2 – 23.6 GHz 17.7 – 19.7GHz 21.2 – 23.6GHz 24.25 – 26.5GHz
Channel sizes	Configurable from 7 to 56 MHz
Transmit power	Maximum transmit power up to 25.5 dBm
Receiver sensitivity	-89 dBm at QPSK
Modulation	Fixed or dynamic, adapting between QPSK and 256 QAM
Error correction	Low Density Parity Check (LDPC) code and Reed Solomon (RS) code
Duplex scheme	FDD
Security and encryption	Optional FIPS-197 compliant 128/256-Bit AES Encryption

* Regulatory conditions for RF bands may vary by geographic location and should be confirmed prior to system purchase.

Ethernet Bridging

Protocol	IEEE 802.3 802.1p/1Q (served by 8 queues) 802.1ad (Q-in-Q) Layer3 QoS – MPLS EXP, IPv4/v6 DSCP
Frame size	Up to 9600 bytes
User data throughput	5.7 to 368 Mbps at the Ethernet (full duplex)
Latency	<100 µs @368 Mbps with 64 bytes
User traffic interface	100 / 1000 Base T (RJ-45) – auto MDI/MDIX, 1000 Base SX option

Management & Installation

Network management	In-band and out-of-band
Protocol	SNMP v1/v2c/v3
EMS	Web GUI management, Motorola One Point Wireless Suite
Out-of-band interface	10 / 100 Base T (RJ-45)
Installation ODU	BNC output assistance for link alignment
Connection	IF cable between outdoor unit (ODU) and compact modem unit (CMU), Up to 200m using LMR-400 Up to 300m using LMR-600

Physical

Physical configuration Split mount	Compact Modem Unit (CMU) and Outdoor Unit (ODU)
Dimensions Outdoor Unit (ODU):	Diameter 10.5" (26.7 cm), Depth 3.5" (8.9 cm)
Compact Modem Unit (CMU):	Width 7.1" (18.0 cm), Height 1.4" (3.5 cm), Depth 8.7" (22.0 cm)
Weight Outdoor Unit (ODU):	10.1 lbs (4.6 kg)
Compact Modem Unit (CMU):	2.4 lbs (1.1 kg)
Wind speed survival Outdoor Unit (ODU):	150 mph (242 kph)
Power source	-48V DC (-40.5V DC to -60V DC)
Power consumption	80 W (max), ODU + CMU

Environmental & Regulatory

Operating temperature Outdoor Unit:	-27° F (-33° C) to +131° F (+55° C) – EN 300 019-1-4
Compact Modem Unit:	-27° F (-33° C) to +131° F (+55° C) – EN 300 019-1-3
Humidity Outdoor Unit:	Up to 100%
Compact Modem Unit:	Up to 95%, non-condensing
Safety	UL 60960; IEC 60950; EN 60950; CSA 22.2 No. 60950
EMC USA:	FCC Part 15, Class B Europe: EN 301 489

MOTOROLA POINT-TO-POINT WIRELESS SOLUTIONS

Project Four County Microwave System

PTP LINKPlanner Proposal Report

15 February 2011

Mike Cote
Organisation: Sierra Electronics
Phone: 775-359-1121
Email: MikeC@SierraElectronics.com

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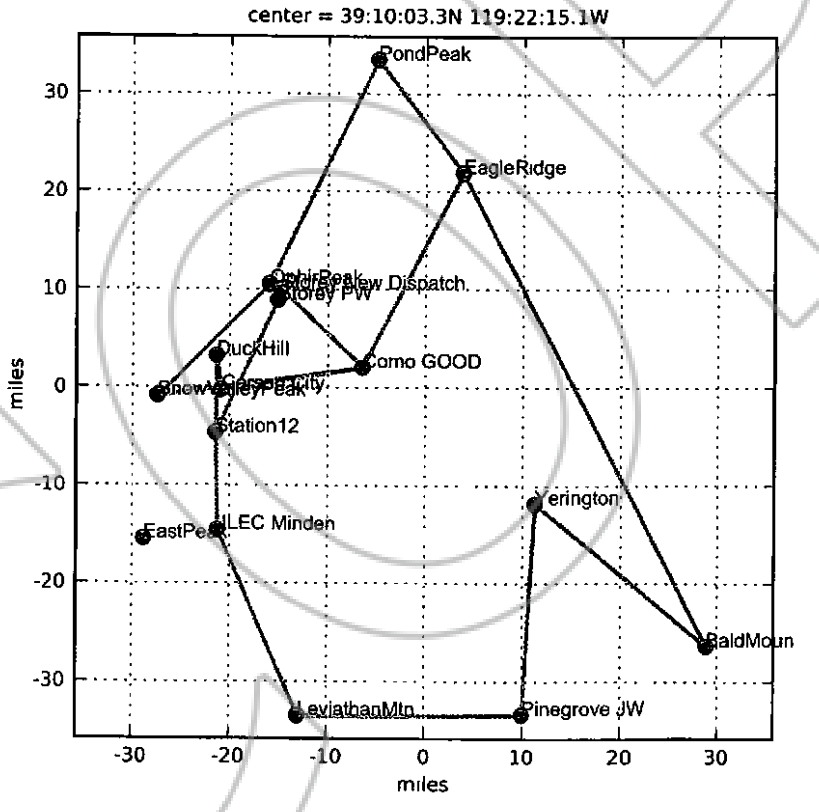

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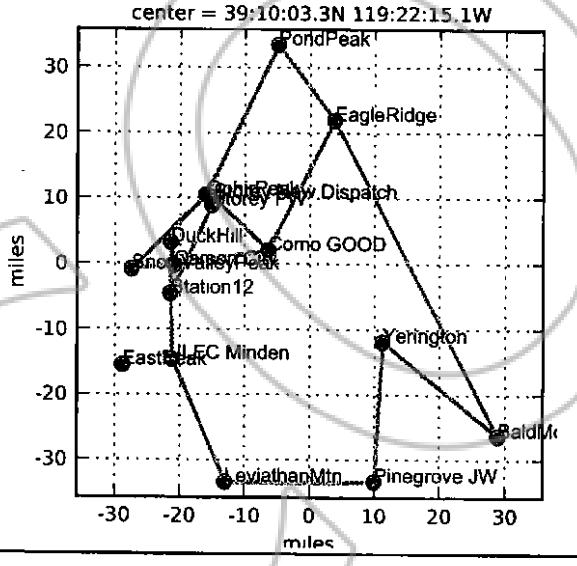
1. Project Summary

Project: Four County Microwave System

Description: Four County Interop Project

General Information	
Customer Name	Four County Microwave System
Company Name	Sierra Electronics
Address	Jarry Walton 690 East Glendale Ave. Suite 9B Sparks, NV 89431
Phone	775-359-1121
Cell Phone	
Email	paulb@sierraelectronics.com

Network Map



Link name	Product	Local antenna	Remote antenna	Max aggregate IP throughput (Mbps)
06- PondPeak to EagleRidge	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 4ft HP Antenna 85010089004	400.00

(continued)

Link name	Product	Local antenna	Remote antenna	Max aggregate IP throughput (Mbps)
13- Station12 to JLEC Minden	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
01- JLEC Minden to LeviathanMtn	PTP11800	Motorola 4ft HP Antenna 85010089004	Motorola 4ft HP Antenna 85010089004	400.00
16- Como GOOD to EagleRidge	PTP11800	Motorola 4ft HP Antenna 85010089004	Motorola 4ft HP Antenna 85010089004	400.00
07- PondPeak to OphirPeak	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 4ft HP Antenna 85010089004	400.00
04- Yerington to BaldMountain	PTP11800	Motorola 4ft HP Antenna 85010089004	Motorola 4ft HP Antenna 85010089004	400.00
11- Carson City to DuckHill	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
10- Carson City to Como GOOD	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 4ft HP Antenna 85010089004	400.00
05- EagleRidge to BaldMountain	PTP11800	Motorola 6ft HP Antenna 85010089005	Motorola 6ft HP Antenna 85010089005	400.00
08- SnowValleyPeak to OphirPeak	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
12- DuckHill to Station12	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
02- Pinegrove JW to LeviathanMtn	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
03- Pinegrove JW to Yerington	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
15 -Storey FD to Como GOOD	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
14- Station12 to Storey PW	PTP11800	Motorola 2.6ft HP Antenna 85010089003	Motorola 2.6ft HP Antenna 85010089003	400.00
09- SnowValleyPeak to Como GOOD	PTP11800	Motorola 4ft HP Antenna 85010089004	Motorola 4ft HP Antenna 85010089004	400.00

Part Number	Qty	Description
01010208001	13	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	13	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
01010208003	1	ODU-A 11GHz, TR 490 & 500, Lo, B6 (10855.0 - 11045.0 MHz), Rectangular WG, Neg Pol
01010208004	1	ODU-A 11GHz, TR 490 & 500, Hi, B6 (11355.0 - 11545.0 MHz), Rectangular WG, Neg Pol
01010208005	2	ODU-A 11GHz, TR 490 & 500, Lo, B7(11010.0 - 11200.0 MHz), Rectangular WG, Neg Pol
01010208006	2	ODU-A 11GHz, TR 490 & 500, Hi, B7 (11510.0 - 11700.0 MHz), Rectangular WG, Neg Pol
30010194001	16	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	19	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
85010089004	11	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
85010089005	2	6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	32	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	32	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	32	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	32	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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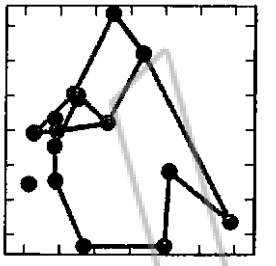
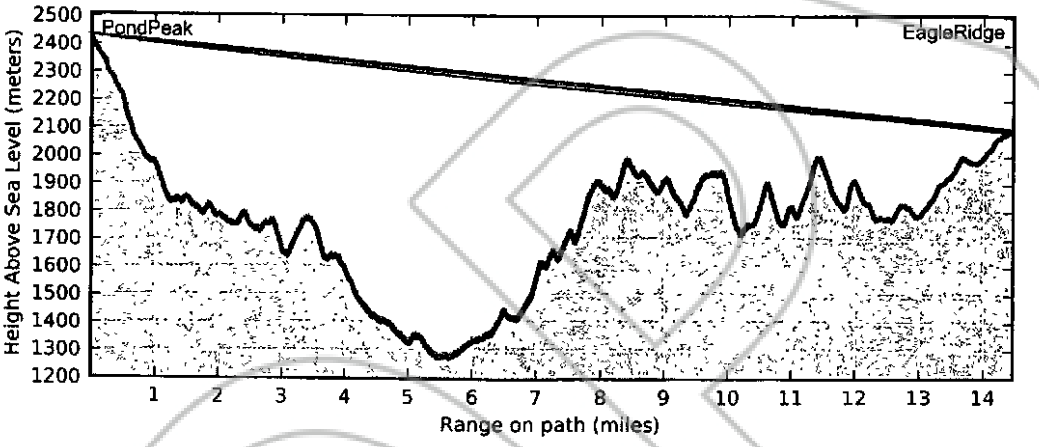
06- PondPeak to EagleRidge



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 10 m



	Performance to PondPeak	Performance to EagleRidge
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99994 % for 45.0 Mbps	99.99995 % for 45.0 Mbps

Link Summary			
Link Length	14.463 mi.	System Gain	168.99 dB
Band	11 GHz	System Gain Margin	28.01 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99994 %
Bandwidth	40 MHz	Annual Link Unavailability	20 secs/year
Total Path Loss	140.97 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-302.13 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	291.14 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.36e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	5.82e-005	Diffraction Loss	ITU-R P.526-10
Path inclination	14.52 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	18.92 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	140.77 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.20 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	1	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
85010089004	1	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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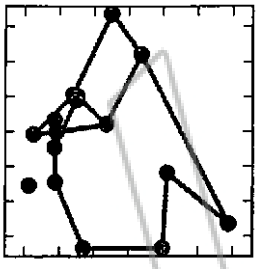
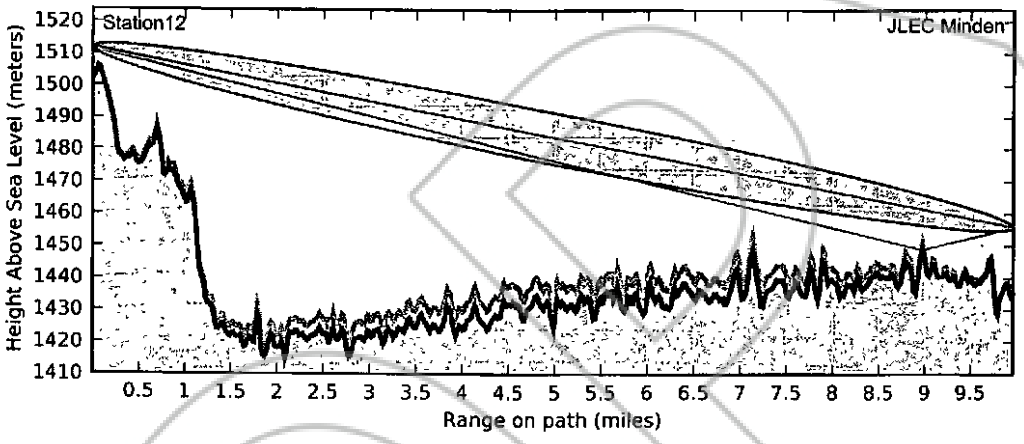
13- Station12 to JLEC Minden



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 20 m



	Performance to Station12	Performance to JLEC Minden
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99995 % for 45.0 Mbps	99.99994 % for 45.0 Mbps

Link Summary			
Link Length	9.959 mi.	System Gain	165.88 dB
Band	11 GHz	System Gain Margin	28.16 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99994 %
Bandwidth	40 MHz	Annual Link Unavailability	18 secs/year
Total Path Loss	137.71 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-332.96 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	386.54 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	1.03e-004	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	2.27e-004	Diffraction Loss	ITU-R P.526-10
Path Inclination	3.49 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	23.00 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	137.53 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.18 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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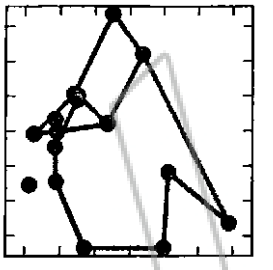
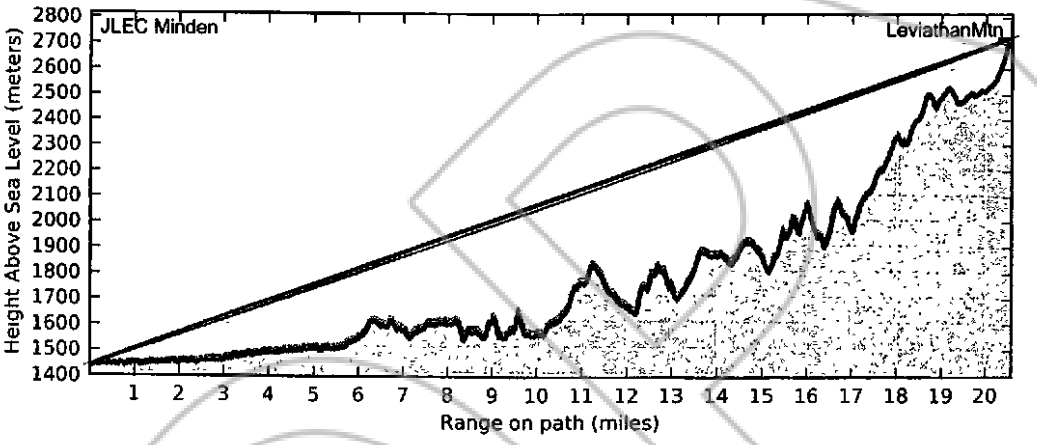
01- JLEC Minden to LeviathanMtn



Equipment: Motorola PTP11800

Motorola 4ft HP Antenna 85010089004 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 3 m



	Performance to JLEC Minden	Performance to LeviathanMtn
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99970 % for 45.0 Mbps	99.99973 % for 45.0 Mbps

Link Summary			
Link Length	20.591 mi.	System Gain	172.44 dB
Band	11 GHz	System Gain Margin	28.29 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99970 %
Bandwidth	40 MHz	Annual Link Unavailability	1.6 mins/year
Total Path Loss	144.15 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-333.87 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	423.11 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.97e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	2.78e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	38.58 mr	Propagation	ITU-R P 530-12
0.01% Rain rate	22.54 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	143.84 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.31 dB		

Part Number	Qty	Description
01010208003	1	ODU-A 11GHz, TR 490 & 500, Lo, B6 (10855.0 - 11045.0 MHz), Rectangular WG, Neg Pol
01010208004	1	ODU-A 11GHz, TR 490 & 500, Hi, B6 (11355.0 - 11545.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089004	2	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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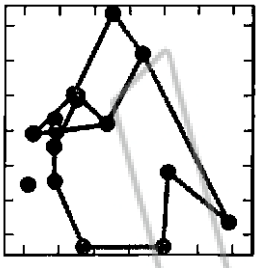
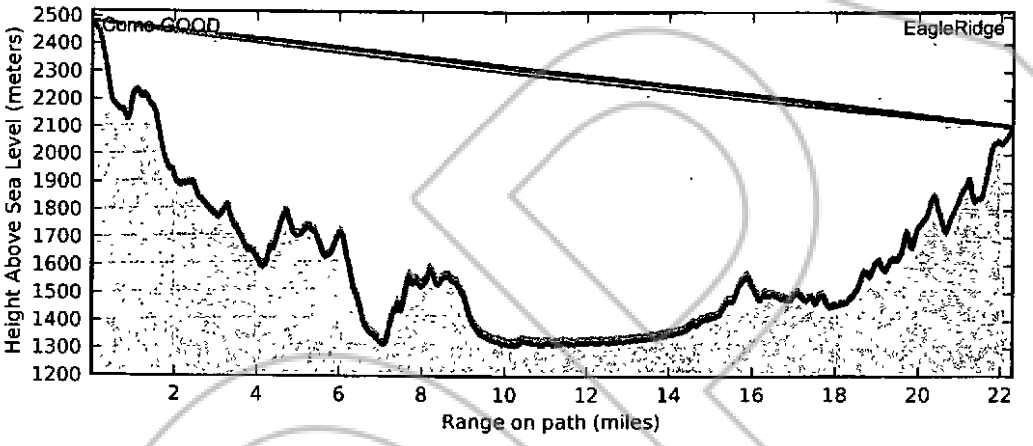
16- Como GOOD to EagleRidge



Equipment: Motorola PTP11800

Motorola 4ft HP Antenna 85010089004 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 18 m



	Performance to Como GOOD	Performance to EagleRidge
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99979 % for 45.0 Mbps	99.99977 % for 45.0 Mbps

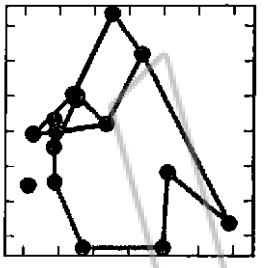
Link Summary			
Link Length	22.305 mi.	System Gain	172.06 dB
Band	11 GHz	System Gain Margin	27.21 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99977 %
Bandwidth	40 MHz	Annual Link Unavailability	1.2 mins/year
Total Path Loss	144.84 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-310.75 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	320.80 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.54e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	3.10e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	10.59 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	19.57 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	144.53 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.31 dB		

Part Number	Qty.	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089004	2	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

MOTOROLA

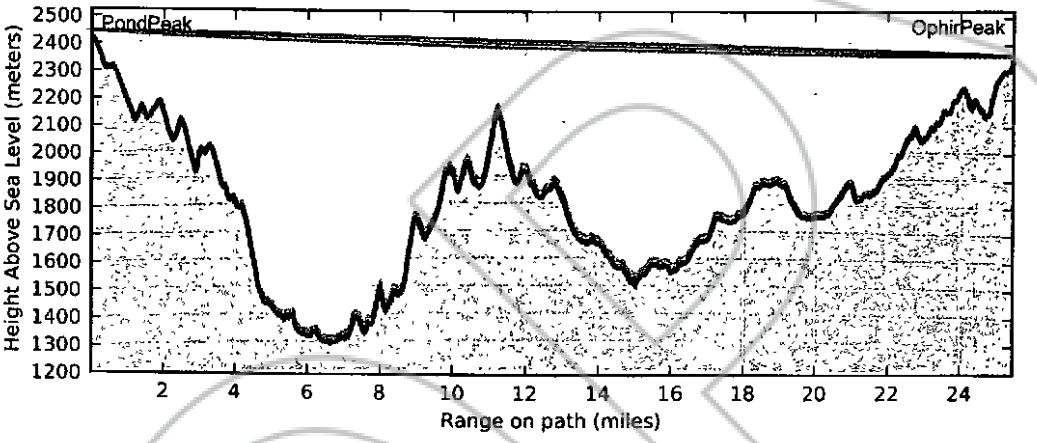
07- PondPeak to OphirPeak



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 20 m

Motorola 4ft HP Antenna 85010089004 @ 15 m



	Performance to PondPeak	Performance to OphirPeak
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99949 % for 45.0 Mbps	99.99938 % for 45.0 Mbps

Link Summary			
Link Length	25.455 mi.	System Gain	169.76 dB
Band	11 GHz	System Gain Margin	23.74 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99938 %
Bandwidth	40 MHz	Annual Link Unavailability	3.3 mins/year
Total Path Loss	146.02 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-309.08 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	322.39 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.41e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	1.03e-003	Diffraction Loss	ITU-R P.526-10
Path inclination	2.07 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	20.79 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	145.68 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.34 dB		

Part Number	Qty	Description
01010208005	1	ODU-A 11GHz, TR 490 & 500, Lo, B7(11010.0 - 11200.0 MHz), Rectangular WG, Neg Pol
01010208006	1	ODU-A 11GHz, TR 490 & 500, Hi, B7 (11510.0 - 11700.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	1	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
85010089004	1	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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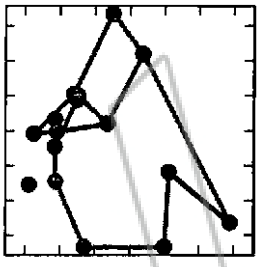
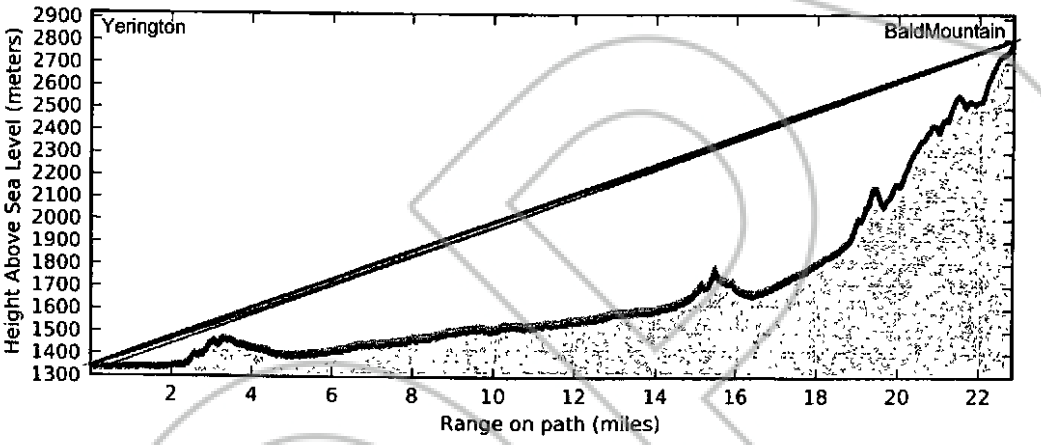
04- Yerington to BaldMountain



Equipment: Motorola PTP11800

Motorola 4ft HP Antenna 85010089004 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 10 m



	Performance to Yerington	Performance to BaldMountain
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99983 % for 45.0 Mbps	99.99981 % for 45.0 Mbps

Link Summary

Link Length	22.853 mi.	System Gain	172.04 dB
Band	11 GHz	System Gain Margin	26.95 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99981 %
Bandwidth	40 MHz	Annual Link Unavailability	1.0 mins/year
Total Path Loss	145.09 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-310.02 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	387.76 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	8.77e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	4.01e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	39.67 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	18.36 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	144.74 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.34 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089004	2	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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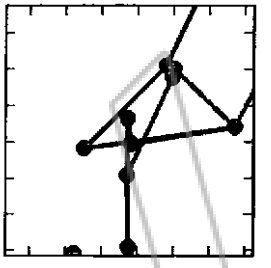
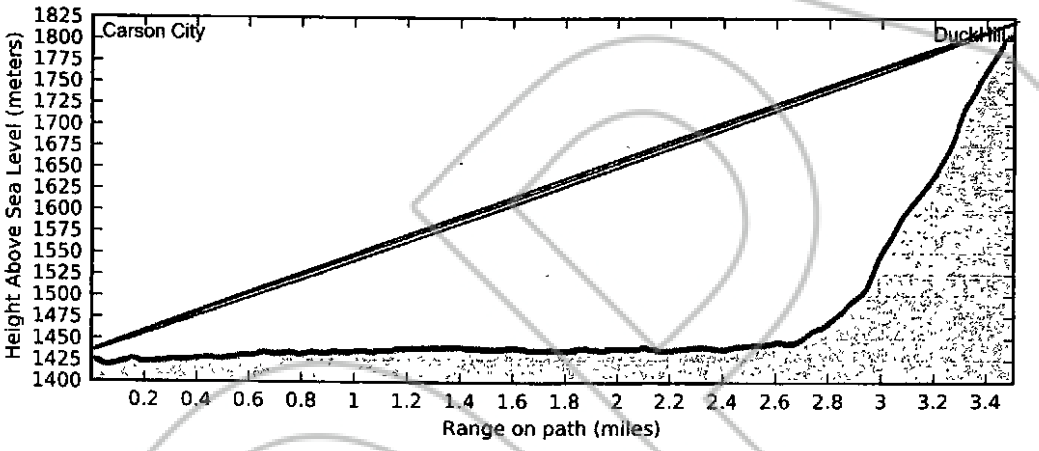
11- Carson City to DuckHill



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 20 m



	Performance to Carson City	Performance to DuckHill
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	100.00000 % for 45.0 Mbps	100.00000 % for 45.0 Mbps

Link Summary			
Link Length	3.505 mi.	System Gain	165.90 dB
Band	11 GHz	System Gain Margin	37.38 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	100.00000 %
Bandwidth	40 MHz	Annual Link Unavailability	0 secs/year
Total Path Loss	128.52 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-326.00 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	365.29 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	1.00e-004	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	5.72e-007	Diffraction Loss	ITU-R P.526-10
Path inclination	68.28 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	22.87 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	128.46 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.06 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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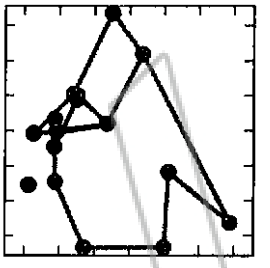
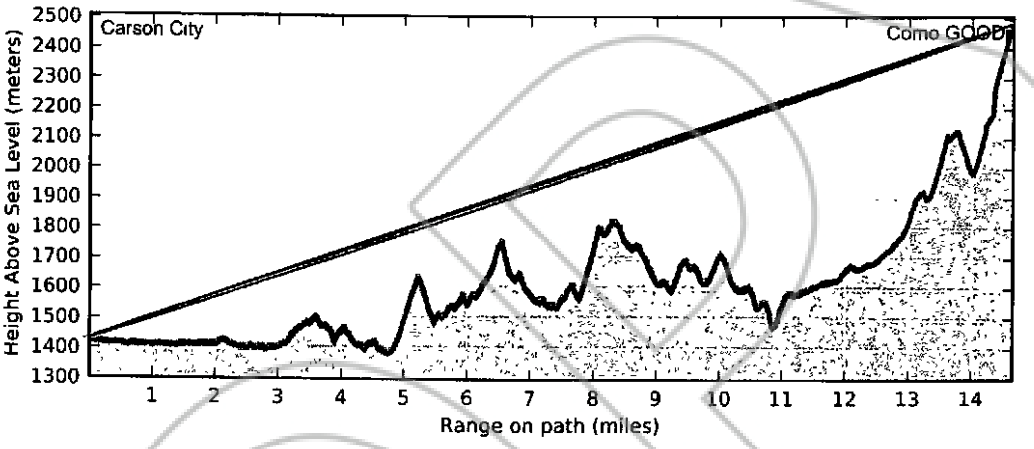
10- Carson City to Como GOOD



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 10 m



	Performance to Carson City	Performance to Como GOOD
Mean IP	200 0 Mbps	200.0 Mbps
IP Availability	99.99988 % for 45.0 Mbps	99.99986 % for 45.0 Mbps

Link Summary

Link Length	14.657 mi.	System Gain	168.95 dB
Band	11 GHz	System Gain Margin	27.83 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99986 %
Bandwidth	40 MHz	Annual Link Unavailability	44 secs/year
Total Path Loss	141.12 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-322.68 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	369.02 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.77e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	8.15e-005	Diffraction Loss	ITU-R P.526-10
Path inclination	44.54 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	21.76 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	140.89 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.23 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	1	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
85010089004	1	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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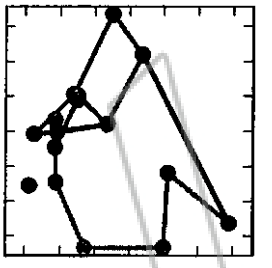
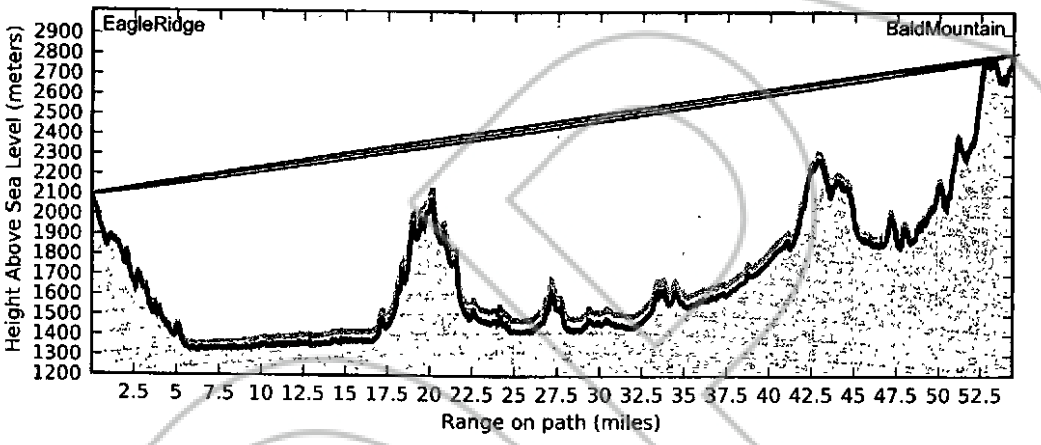
05- EagleRidge to BaldMountain



Equipment: Motorola PTP11800

Motorola 6ft HP Antenna 85010089005 @ 10 m

Motorola 6ft HP Antenna 85010089005 @ 10 m



	Performance to EagleRidge	Performance to BaldMountain
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99951 % for 45.0 Mbps	99.99944 % for 45.0 Mbps

Link Summary			
Link Length	54.415 mi.	System Gain	180.06 dB
Band	11 GHz	System Gain Margin	27.06 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99944 %
Bandwidth	40 MHz	Annual Link Unavailability	2.9 mins/year
Total Path Loss	153.00 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-309.46 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	317.83 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.49e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	6.87e-003	Diffraction Loss	ITU-R P.526-10
Path inclination	8.10 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	18.11 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	152.28 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.72 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089005	2	6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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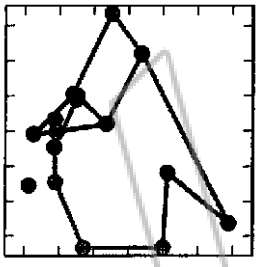
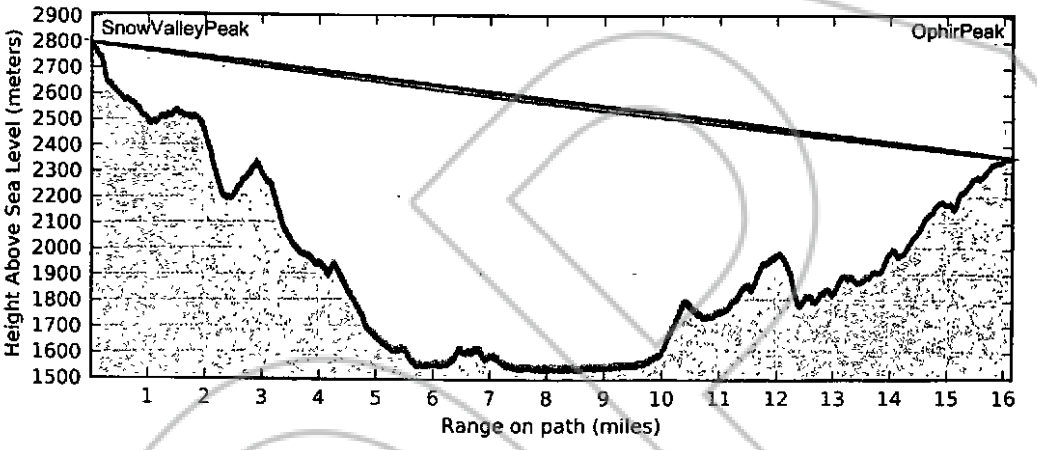
08- SnowValleyPeak to OphirPeak



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 10 m



	Performance to SnowValleyPeak	Performance to OphirPeak
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99971 % for 45.0 Mbps	99.99977 % for 45.0 Mbps

Link Summary			
Link Length	16.152 mi.	System Gain	167.90 dB
Band	11 GHz	System Gain Margin	25.97 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99971 %
Bandwidth	40 MHz	Annual Link Unavailability	1.5 mins/year
Total Path Loss	141.93 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-324.22 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	358.51 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.99e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	4.58e-005	Diffraction Loss	ITU-R P.526-10
Path inclination	17.13 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	22.92 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	141.73 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.20 dB		

Part Number	Qty	Description
01010208005	1	ODU-A 11GHz, TR 490 & 500, Lo, B7(11010.0 - 11200.0 MHz), Rectangular WG, Neg Pol
01010208006	1	ODU-A 11GHz, TR 490 & 500, Hi, B7 (11510.0 - 11700.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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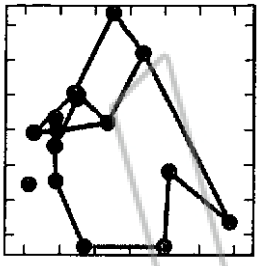
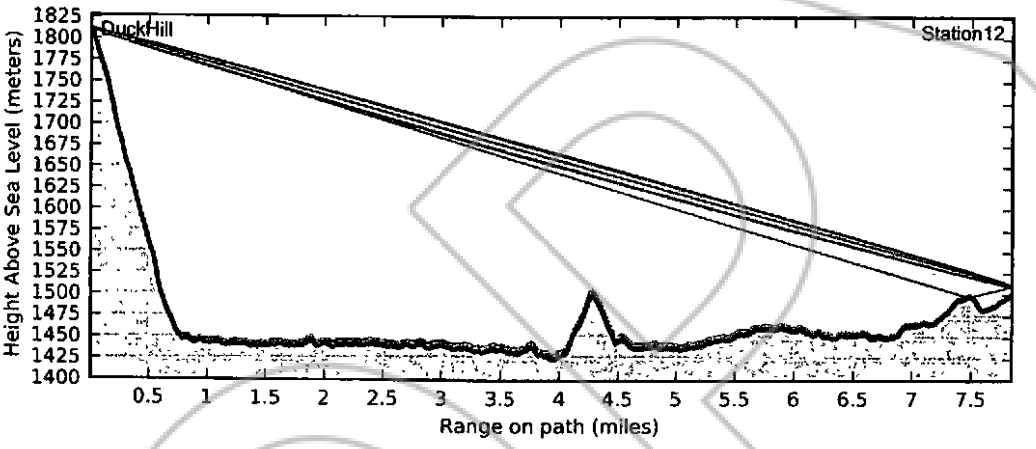
12- DuckHill to Station12



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m Motorola 2.6ft HP Antenna 85010089003 @ 10 m



	Performance to DuckHill	Performance to Station12
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99999 % for 45.0 Mbps	99.99999 % for 45.0 Mbps

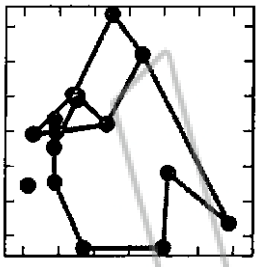
Link Summary			
Link Length	7.852 mi.	System Gain	167.26 dB
Band	11 GHz	System Gain Margin	31.66 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99999 %
Bandwidth	40 MHz	Annual Link Unavailability	3 secs/year
Total Path Loss	135.60 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-327.50 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	369.43 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	1.01e-004	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	1.78e-005	Diffraction Loss	ITU-R P.526-10
Path inclination	23.74 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	22.93 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	135.46 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.14 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

MOTOROLA

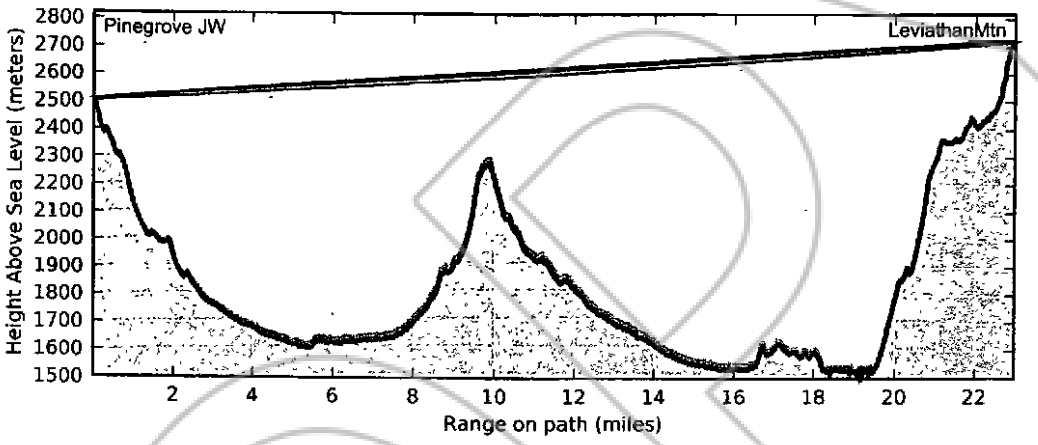
02- Pinegrove JW to LeviathanMtn



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 3 m



	Performance to Pinegrove JW	Performance to LeviathanMtn
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99947 % for 45.0 Mbps	99.99937 % for 45.0 Mbps

Link Summary			
Link Length	22.991 mi.	System Gain	167.26 dB
Band	11 GHz	System Gain Margin	22.18 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99937 %
Bandwidth	40 MHz	Annual Link Unavailability	3.3 mins/year
Total Path Loss	145.08 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-323.43 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	462.47 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	8.93e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	2.44e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	5.80 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	20.28 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	144.80 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.29 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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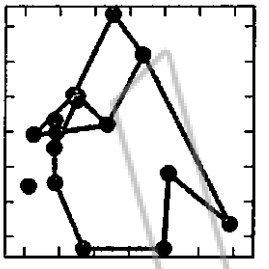
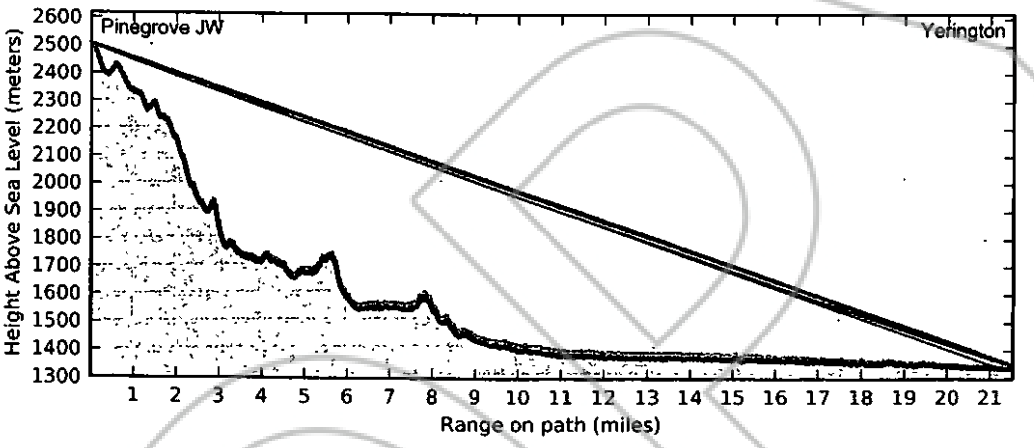
03- Pinegrove JW to Yerington



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 10 m



	Performance to Pinegrove JW	Performance to Yerington
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99963 % for 45.0 Mbps	99.99969 % for 45.0 Mbps

Link Summary			
Link Length	21.539 mi.	System Gain	167.38 dB
Band	11 GHz	System Gain Margin	22.81 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99963 %
Bandwidth	40 MHz	Annual Link Unavailability	2.0 mins/year
Total Path Loss	144.57 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-315.46 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	435.55 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	8.67e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	3.85e-004	Diffraction Loss	ITU-R P.526-10
Path Inclination	33.49 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	18.64 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	144.23 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.34 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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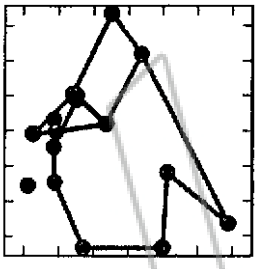
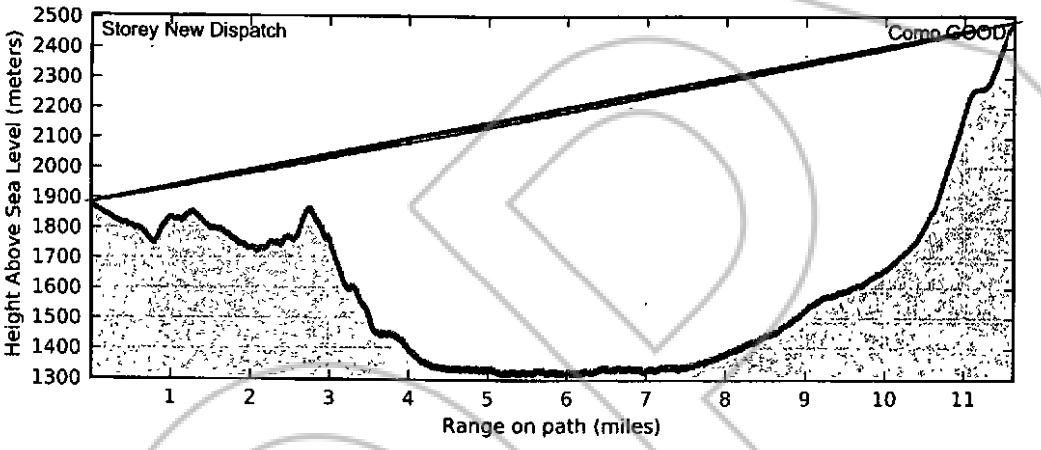
15 -Storey FD to Como GOOD



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 10 m



	Performance to Storey New Dispatch	Performance to Como GOOD
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99995 % for 45.0 Mbps	99.99994 % for 45.0 Mbps

Link Summary			
Link Length	11.633 mi.	System Gain	167.26 dB
Band	11 GHz	System Gain Margin	28.21 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99994 %
Bandwidth	40 MHz	Annual Link Unavailability	19 secs/year
Total Path Loss	139.05 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-318.27 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	356.54 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.61e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	2.16e-005	Diffraction Loss	ITU-R P.526-10
Path Inclination	31.96 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	21.23 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	138.88 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.17 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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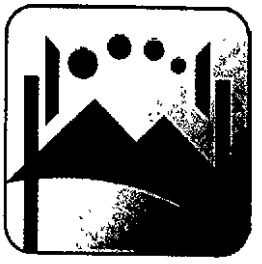
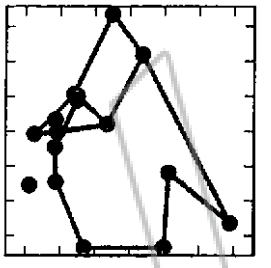


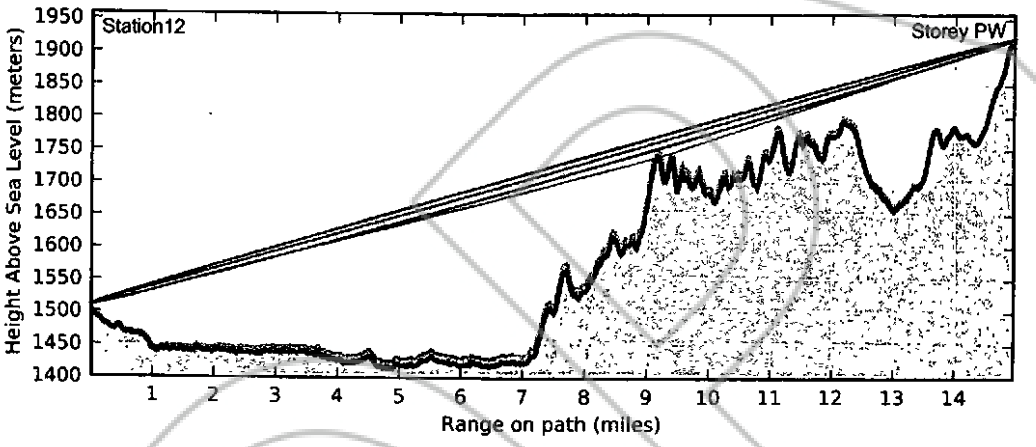
14- Station12 to Storey PW



Equipment: Motorola PTP11800

Motorola 2.6ft HP Antenna 85010089003 @ 10 m

Motorola 2.6ft HP Antenna 85010089003 @ 10 m



	Performance to Station12	Performance to Storey PW
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99981 % for 45.0 Mbps	99.99977 % for 45.0 Mbps

Link Summary			
Link Length	14.953 mi.	System Gain	167.26 dB
Band	11 GHz	System Gain Margin	25.95 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99977 %
Bandwidth	40 MHz	Annual Link Unavailability	1.2 mins/year
Total Path Loss	141.31 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-324.22 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	364.91 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.92e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	1.87e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	17.07 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	22.45 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	141.06 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.25 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089003	2	2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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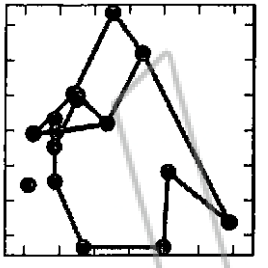
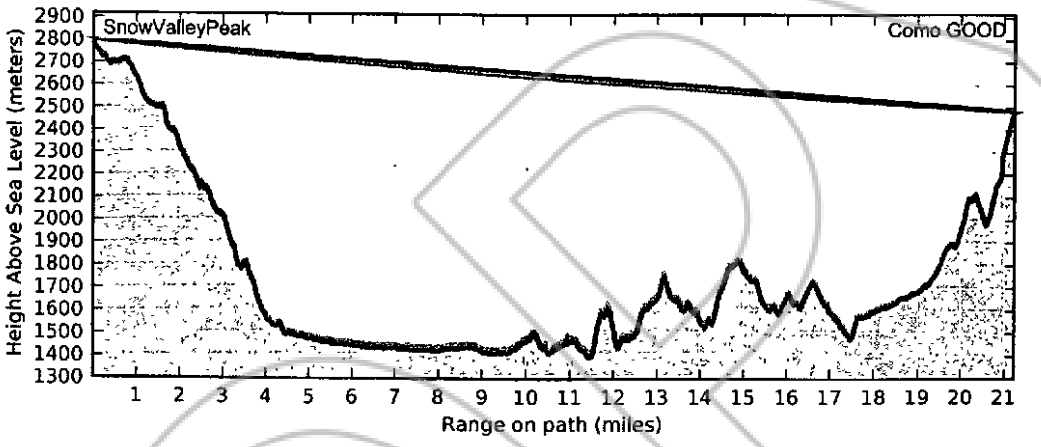
09- SnowValleyPeak to Como GOOD



Equipment: Motorola PTP11800

Motorola 4ft HP Antenna 85010089004 @ 10 m

Motorola 4ft HP Antenna 85010089004 @ 10 m



	Performance to SnowValleyPeak	Performance to Como GOOD
Mean IP	200.0 Mbps	200.0 Mbps
IP Availability	99.99912 % for 200.0 Mbps	99.99900 % for 200.0 Mbps

Link Summary

Link Length	21.241 mi.	System Gain	173.44 dB
Band	11 GHz	System Gain Margin	29.07 dB
Regulation	FCC	Mean Aggregate Data Rate	400.0 Mbps
Modulation	Adaptive	Annual Link Availability	99.99973 %
Bandwidth	40 MHz	Annual Link Unavailability	1.4 mins/year
Total Path Loss	144.37 dB		

Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-324.48 N units/km	Link Type	Line-of-Sight
Area roughness 110x110km	368.52 metre	Excess Path Loss	0.00 dB
Geoclimatic factor	9.90e-005	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Fade Occurrence Factor (Po)	1.47e-004	Diffraction Loss	ITU-R P.526-10
Path inclination	9.23 mr	Propagation	ITU-R P.530-12
0.01% Rain rate	22.26 mm/hr	Rain Rate	ITU-R P.837-5
Free Space Path Loss	144.11 dB	Refractivity Index	ITU-R P.453-9
Gaseous Absorption Loss	0.26 dB		

Part Number	Qty	Description
01010208001	1	ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol
01010208002	1	ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol
30010194001	1	50 Ohm Braided Coaxial Cable - 75 meter
85010089004	2	4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface
WB3480	2	PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps
WB3544	2	PTP800 Modem Capacity CAP - 200 Mbps (per Unit)
WB3616	2	Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)
WB3657	2	LPU END KIT PTP800 (1 kit required per Coaxial cable)

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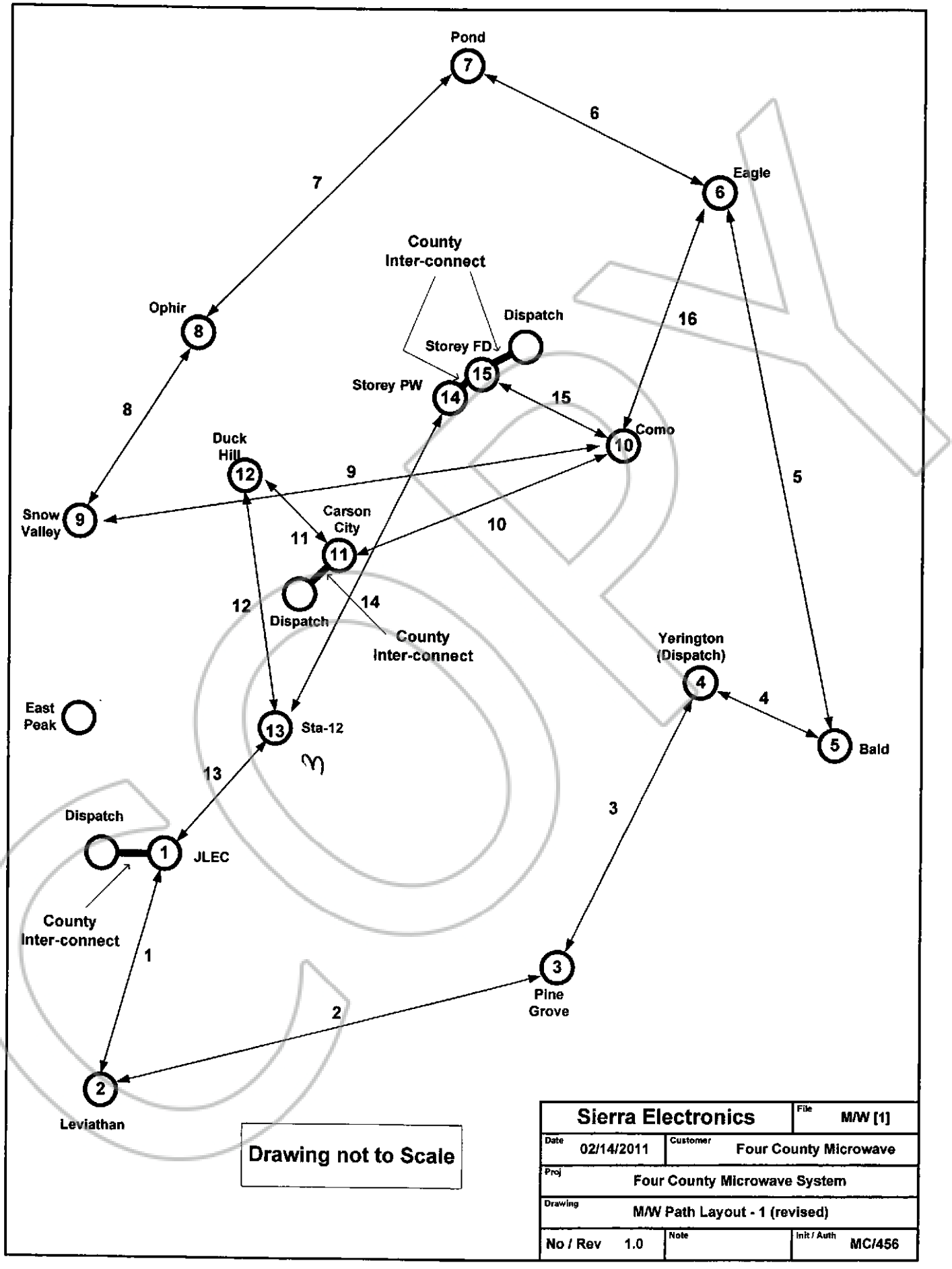
Pond
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6
Eagle
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County
Inter-connect
Ophir
8
Dispatch
Storey FD
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Storey PW
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Duck
Hill
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Snow
Valley
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Carson
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Dispatch
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County
Inter-connect
Yerington
(Dispatch)
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Sta-12
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Bald
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JLEC
County
Inter-connect
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Grove
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Leviathan
Drawing not to Scale
Sierra Electronics
File
M/W [1]
Date
02/14/2011
Customer
Four County Microwave
Proj
Four County Microwave System
Drawing
M/W Path Layout - 1 (revised)
No / Rev
1.0
Note
Init / Auth
MC/456

Sierra Electronics
690 EAST GLENDALE AVE. ST 9B SPARKS,NV 89431
PHONE (800) 874-7515 FAX (775) 358-9309

COST PROPOSAL

Number JSEQ1611-03

Date Feb 15, 2011

Sold To	Ship To
FOUR COUNTY MICROWAVE PROJECT	FOUR COUNTY MICROWAVE PROJECT

Line	Qty	Description	Unit Price	Ext. Price
1	1	FINAL DETAILED SYSTEM DESIGN Includes On site, tour and review of each radio site Document any changes or modifications to original proposal Microwave path analysis for the design and design alternatives Determine any civil work required for each site Full descriptions and pricing for equipment needed Path reliability including fade margins and associated bit error rates	$50,000.00	$50,000.00
2				
3		**POND PEAK TO EAGLE RIDGE LINK**		
4	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
5	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
6	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
7	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
8	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
9	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
10	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
11	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
12	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
13	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
14	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
15	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00 X
16	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
17		LINK TOTAL		$40,276.00

Line	Qty	Description		Unit Price	Ext Price
18					
19		**STATION 12 TO JLEC MINDEN LINK**			
20	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol		$2,808.00	$2,808.00
21	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol		$2,808 00	$2,808 00
22	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter		$400.00	$800 00
23	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface		$1,710.00	$3,420.00
24	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps		$2,190.00	$4,380.00
25	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)		$2,250.00	$4,500.00
26	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)		$250.00	$500.00
27	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)		$350.00	$700.00
28	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR		$2,250.00	$4,500.00
29	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	*	$1,200.00	$2,400.00
30	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	*	$1,000.00	$1,000.00
31	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING		$11,500.00	$11,500.00
32		LINK TOTAL			$39,316.00
33					
34		**JLEC MINDEN TO LEVIATHAN MTN LINK**			
35	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol		$2,808.00	$2,808.00
36	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol		$2,808.00	$2,808.00
37	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter		$400.00	$800.00
38	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface		$2,670.00	$5,340.00
39	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps		$2,190.00	$4,380.00
40	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)		$2,250.00	$4,500.00
41	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)		$250.00	$500.00
42	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)		$350.00	$700.00
43	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR		$2,250.00	$4,500.00
44	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only		$1,200.00	$2,400.00

Line	Qty	Description	Unit Price	Ext. Price
45	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
46	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
47		LINK TOTAL		$41,236.00
48				
49		**COMO TO EAGLE RIDGE LINK**		
50	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
51	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
52	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
53	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11 70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
54	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
55	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
56	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
57	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
58	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
59	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
60	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
61	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
62		LINK TOTAL		$41,236.00
63				
64		**POND PEAK TO OPHIR PEAK LINK**		
65	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
66	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
67	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
68	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
69	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
70	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
71	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
72	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00

Line	Qty	Description		
73	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
74	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
75	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
76	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
77	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
78		LINK TOTAL		$40,276.00
79				
80		**YERINGTON TO BALD MOUNTAIN LINK**		
81	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
82	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
83	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
84	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
85	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
86	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
87	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
88	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
89	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
90	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
91	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
92	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
93		LINK TOTAL		$41,236.00
94				
95		**CARSON CITY TO DUCKHILL LINK**		
96	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
97	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
98	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00

Line	Qty	Description	Unit Price	Ext. Price
99	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
100	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
101	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
102	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
103	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
104	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
105	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
106	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
107	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
108		LINK TOTAL		$39,316.00
109				
110		**CARSON CITY TO COMO LINK**		
111	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
112	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
113	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
114	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
115	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
116	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
117	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
118	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
119	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
120	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
121	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
122	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
123	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
124		LINK TOTAL		$40,276.00
125				
126		**EAGLE RIDGE TO BALD MOUNTAIN LINK**		

Line	Qty	Description	Unit Price	Ext. Price
127	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
128	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
129	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
130	2	PART NUMBER 85010089005 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$5,540.00	$11,080.00
131	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
132	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
133	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
134	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
135	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
136	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
137	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
138	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
139		LINK TOTAL		$46,976.00
140				
141		**SNOW VALLEY TO OPHIR LINK**		
142	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
143	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
144	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
145	2	PART NUMBER 85010089003 2 6' HP Antenna, 10 70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
146	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
147	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250 00	$4,500.00
148	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
149	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
150	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
151	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
152	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
153	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00

Line	Qty	Description	Unit Price	Ext. Price
154		LINK TOTAL		$39,316.00
155				
156		**DUCK HILL TO STATION 12 LINK**		
157	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
158	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
159	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
160	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
161	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
162	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
163	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250 00	$500.00
164	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
165	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
166	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
167	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
168	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
169		LINK TOTAL		$39,316.00
170				
171		**PINEGROVE TO LEVIATHAN LINK**		
172	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
173	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
174	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
175	2	PART NUMBER 85010089003 2 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
176	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
177	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
178	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
179	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
180	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC	$2,250.00	$4,500.00

Line	Qty	Description	Unit Price	Ext. Price
		STRIP, TWR HDWR		
181	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
182	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
183	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
184		LINK TOTAL		$39,316.00
185				
186		**PINEGROVE TO YERINGTON LINK**		
187	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
188	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
189	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
190	2	PART NUMBER 85010089003 2 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
191	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
192	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
193	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
194	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
195	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
196	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
197	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
198	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
199		LINK TOTAL		$39,316.00
200				
201		**STOREY DISPATCH TO COMO LINK**		
202	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
203	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
204	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
205	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
206	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
207	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00

Line	Qty	Description	Unit Price	Ext. Price
208	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
209	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
210	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
211	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
212	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
213	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
214		LINK TOTAL		$39,316.00
215				
216		**STATION 12 TO STOREY PW LINK**		
217	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
218	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
219	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
220	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
221	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
222	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
223	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
224	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
225	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
226	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
227	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
228	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
229		LINK TOTAL		$39,316.00
230				
231		**SNOWVALLEY TO COMO LINK**		
232	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
233	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00

Line	Qty	Description	Unit Price	Ext. Price
234	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
235	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
236	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
237	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
238	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
239	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
240	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
241	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
242	1	PART NUMBER WB3659 FCC M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
243	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
244		LINK TOTAL		$41,236.00
245				
246		**LINK SITE CONTROL HARDWARE**		
247	15	PART NUMBER 16151 EXTREME SUMMIT X450A-24T	$6,495.00	$97,425.00
248	15	PART NUMBER 10060 EXTREME POWER CORD	$15.00	$225.00
249	10	PART NUMBER IP-223 ETHERNET RADIO CONTROL MODULE IP-223, REMOTE PANEL, ETHERNET	$2,021.00	$20,210.00
250				
251		**BATTERY BACK UP**		
252	13	PART NUMBER SE-BAT2 SITE TWO BATTERY BACK UP SYSTEM	$2,964.65	$38,540.45
253				
254				
255		**MAIN CONTROL FACILITY INTERFACE**		
256	1	PART NUMBER SE-L3PROGRAMMING NETWORK MANAGEMENT LEVEL 3 PROGRAMMING OF SYSTEM	$50,000 00	$50,000.00
257				
258		**SOLAR UPGRADE**		
259	1	SNOW VALLEY SOLAR SYSTEM	$41,500.00	$41,500.00
260				
261		MICROWAVE SYSTEM TOTAL		$945,176.45
262				
263		**SPARES EQUIPMENT PACKAGE**		
264	6	PART NUMBER 0101020800? ODU-A 11GHz, Rectangular WG, Neg Pol	$2,808.00	$16,848.00

Line	Qty	Description	Unit Price	Ext. Price
265	6	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$13,140.00
266	6	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$13,500.00
267	6	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$7,200.00
268	1	PART NUMBER 16151 EXTREME SUMMIT X450A-24T	$6,495.00	$6,495.00
269	1	PART NUMBER 10060 EXTREME POWER CORD	$15.00	$15.00
270	1	PART NUMBER IP-223 ETHERNET RADIO CONTROL MODULE IP-223, REMOTE PANEL, ETHERNET	$2,021.00	$2,021.00
271	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
272	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
273	1	PART NUMBER 85010089005 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$5,540.00	$5,540.00
274				
275		**MICROWAVE MAINTENANCE CONTRACT** **INCLUDES ANNUAL PREVENTIVE MAINTENANCE CHECK**		
276	1	FIRST YEAR AFTER ACCEPTANCE	$0.00	$0.00
277	1	SECOND YEAR	$37,500.00	$37,500.00
278	1	THIRD YEAR	$38,660.00	$38,660.00
279	1	FOURTH YEAR	$39,855.00	$39,855.00
280	1	FIFTH YEAR	$41,090.00	$41,090.00
281				
282		GRAND TOTAL		$1,173,130.45

SubTotal	$1,173,130.45
Tax	$0.00
Shipping	$0.00
Total	**$1,173,130.45**

Nevada Microwave & Tower
P.O. Box 805
Minden, NV. 89423
Office (775]-782-5231
Fax (775)-782-5239
Mobile (775)-426-8261
towerdog@charter.net
NV Lic# 56959 & 56960
UT Lic# 7049206-5551

2 Oct. 2010

To: Hazen Adams
Re: Rawe Pk. Repeater Tower
IT Department
Lyon County
27 So. Main St.
Yerington, Nv 89447
Phone 775-463-6510

Scope of Work

- **Provide & install 80' self support tower, foundation, and antennas.**
- **Antenna & coax to be provided by Lyon Co.**
- **Any cost beyond SOW shall be @ cost + 25%.**
- **Quote valid for 60 days**
- **Lead time for tower is 5 - 7 weeks.**

Excavation, foundation, concrete.	**$34,465.00**
Tower cost	**$17,340.00**
Tower installation, cost includes All Terrain hydra crane	**$14,710.00**
Antenna installation	**$10,270.00**
Total	**$76,785.00**

NM&T warranties its antenna/coax system workmanship for 5 years. This shall exclude any acts of God, sabotage, work performed on system by other contractors after NM&T LLC has completed the system installation, or an insufficiently and or improperly designed/ engineered antenna system by the customer or its affiliates.

Thank you
Curtis Haack
Nevada Microwave & Tower
Website: www.nmandt.com

TESSCO

Everything needed to design, build, run, maintain or use **wireless**

QUOTATION

Prepared by: April McKeegan-Garcia
mckeegana@tessco.com
DATE: 1/31/2011
775-689-5571 FAX: 775-689-557

Click on above image or visit us at: http://www.TESSCO.com
Price for the entire quote, valid for this calendar month only

Quotation number: 2248343-011811
BILL TO: 2248343-0000

Douglas County
PO Box 218
Minden, NV 89423-0218

SHIP TO: 2248343-0000

Douglas County 911 Comms.
1615 8th Street
Minden, NV 89423-0218

Page: 1
Date: 01/18/11

Telephone: 775-782-9990
Name: Ron Warren
RFQ #:

US Dollars

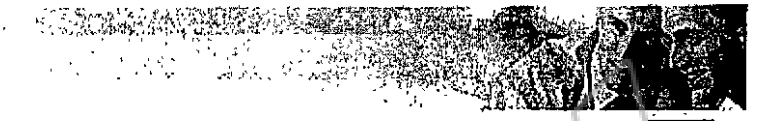
SKU #	Unit of measure	Description	Buyer's guide page no.	Manufacturer part number	Tax	Order qty	Unit price	Extended price
346017	1 EA	Step Bolt Kit-60-ft Pole		SBDEP60	Y	1	248.90	248.90
413993	1 EA	12' Co-Location Platform	552	MT-196	Y	1	1844.01	1,844.01
412971	1 EA	3 Sec Univ Ring Mount Sys	552	MC-RM1030-3	Y	1	641.98	641.98
423517	1 EA	2" to 5" Crossover Clamp	564	WSCO200	Y	3	99.33	297.99
440531	1 EA	Plain Pipe, 2-3/8" x 48"	561	WSHS248	Y	3	24.60	73.80

Any changes made to this quote as a whole could affect pricing. Quotes are valid for this calendar month only. Please call to confirm current pricing.

Ship via: 5 Day Estimated weight: 1491 lbs
Terms: N 30 INVOICE DATE
Based on Pricing level at time of request.
To confirm price and availability, build a Worksheet on www.tessco.com <http://www.tessco.com> for your current, everyday lowest total cost.

Destination & handling:	398.19
NV Sales tax:	0.00
Total:	3,504.87

TESSCO



Everything needed to design, build, run, maintain or use **wireless**

QUOTATION

Prepared by: April McKeegan-Garcia
mckeegana@tessco.com

DATE: 1/31/2011

775-689-5571 FAX: 775-689-557

Click on above image or visit us at: http://www.TESSCO.com

Price for the entire quote, valid for this calendar month only

Quotation number: 2248343-011411
BILL TO: 2248343-0000

Douglas County
PO Box 218
Minden, NV 89423-0218

SHIP TO: 2248343-0000

Douglas County 911 Comms.
1615 8th Street
Minden, NV 89423-0218

Page: 1
Date: 01/18/11

Telephone: 775-782-9990
Name: Ron Warren
RFQ #: TOWER

US Dollars

SKU #	Unit of measure	Description	Buyer's guide page no.	Manufacturer part number	Tax	Order qty	Unit price	Extended price
		DROP SHIP FROM VENDOR						
370411	1 EA	*60-ft Heavy Monopole	628	DEP60HA	Y	1	7771.00	7,771.00
355312	1 EA	*Pole Safety Cable Kit		R-TT100TSP	Y	1	532.00	532.00
		Non-Cancellable Non-Returnable clause must appear on customer purchase order prior to processing.						
		. Any changes made to this quote as a whole could affect pricing. Quotes are valid for this calendar month only. Please call to confirm current pricing.						

Ship via: 5 Day Estimated weight: 3028 lbs
Terms: N 30 INVOICE DATE
Based on Pricing level at time of request.
To confirm price and availability, build a Worksheet on www.tessco.com <http://www.tessco.com> for your current, everyday lowest total cost.

Destination & handling:	5,671.00
NV Sales tax:	0.00
Total:	13,974.00

"Utilities Specialists" Plow Cat • Backhoe
CURTIS & SONS CONSTRUCTION, INC.

(775) 782-2728
(775) 782-8439 Fax
NV License # 0036247
CA License # 751460
P.O. Box 2911
Minden, NV 89423

Proposal

Date: 01/14/11
Submitted To: Douglas County Communications
Attention: Ron Warren
Location: Sunridge Dr.

Description: Remove 30' tower, install 60' tower.

Remove coax and antennas from existing 30' monopole. Excavate existing buried coax piping and pull box to clear area for new pole location. Auger new hole 19' deep, 3' diameter for new 60' monopole. Set new monopole according to specifications. Run existing coax, and re-install existing antennas to new pole.

During new pole installation service from existing antennas will be affected for approximately 4 days.

Lump Sum Quote: $21,173.00

All material is guaranteed to be as specified. All work to be completed in a substantial workmanlike manner according to specifications submitted, per standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders, and will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents or delay beyond our control. Owner to carry fire, tornado and other necessary insurance. Our workers are fully covered by Workmen's Compensation Insurance.

Authorized Signature: David Curtis V.P. **Date:** 1/14/11

ACCEPTANCE OF PROPOSAL: The above process, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified.

Acceptance of Proposal Signature: _____ **Date:** __/__/__

Sierra Electronics
690 EAST GLENDALE AVE. ST 9B SPARKS,NV 89431
PHONE (800) 874-7515 FAX (775) 358-9309

COST PROPOSAL

Number JSEQ1611-05

Date Mar 14, 2011

Sold To	Ship To
FOUR COUNTY MICROWAVE PROJECT	FOUR COUNTY MICROWAVE PROJECT

Line	Qty	Description	Unit Price	Ext. Price
1	1	FINAL DETAILED SYSTEM DESIGN Includes On site, tour and review of each radio site Document any changes or modifications to original proposal Microwave path analysis for the design and design alternatives Determine any civil work required for each site Full descriptions and pricing for equipment needed Path reliability including fade margins and associated bit error rates	$50,000.00	$50,000.00
2				
3		**POND PEAK TO EAGLE RIDGE LINK**		
4	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
5	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
6	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
7	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
8	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
9	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
10	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
11	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
12	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
13	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
14	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
15	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
16	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
17		LINK TOTAL		$40,276.00

Line	Qty	Description	Unit Price	Ext. Price
18				
19		**STATION 12 TO JLEC MINDEN LINK**		
20	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
21	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
22	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
23	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
24	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
25	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
26	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
27	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
28	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
29	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
30	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
31	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
32		LINK TOTAL		$39,316.00
33				
34		**JLEC MINDEN TO LEVIATHAN MTN LINK**		
35	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
36	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
37	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
38	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
39	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
40	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
41	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
42	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
43	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
44	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00

Line	Qty	Description	Unit Price	Ext. Price
45	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
46	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
47		LINK TOTAL		$41,236.00
48				
49		**COMO TO EAGLE RIDGE LINK**		
50	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
51	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
52	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
53	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
54	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
55	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
56	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
57	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
58	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
59	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
60	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
61	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
62		LINK TOTAL		$41,236.00
63				
64		**POND PEAK TO OPHIR PEAK LINK**		
65	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
66	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
67	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
68	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
69	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
70	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
71	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
72	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00

Line	Qty	Description	Unit Price	Ext. Price
73	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
74	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
75	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
76	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
77	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
78		LINK TOTAL		$40,276.00
79				
80		**YERINGTON TO BALD MOUNTAIN LINK**		
81	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
82	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
83	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
84	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
85	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
86	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
87	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
88	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
89	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
90	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
91	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
92	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
93		LINK TOTAL		$41,236.00
94				
95		**CARSON CITY TO DUCKHILL LINK**		
96	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
97	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
98	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00

Line	Qty	Description	Unit Price	Ext. Price
99	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
100	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
101	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
102	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
103	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
104	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
105	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
106	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
107	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
108		LINK TOTAL		$39,316.00
109				
110		**CARSON CITY TO COMO LINK**		
111	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
112	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
113	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
114	1	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$1,710.00
115	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
116	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
117	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
118	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
119	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
120	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
121	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200 00	$2,400.00
122	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
123	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
124		LINK TOTAL		$40,276.00
125				
126		**EAGLE RIDGE TO BALD MOUNTAIN LINK**		

Line	Qty	Description	Unit Price	Ext Price
127	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
128	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
129	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
130	2	PART NUMBER 85010089005 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$5,540.00	$11,080.00
131	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
132	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
133	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
134	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
135	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
136	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
137	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
138	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
139		LINK TOTAL		$46,976.00
140				
141		**SNOW VALLEY TO OPHIR LINK**		
142	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
143	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
144	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
145	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
146	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
147	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
148	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
149	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
150	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
151	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
152	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
153	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00

Line	Qty	Description	Unit Price	Ext. Price
154		LINK TOTAL		$39,316.00
155				
156		**DUCK HILL TO STATION 12 LINK**		
157	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
158	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
159	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
160	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
161	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
162	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
163	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
164	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
165	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
166	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
167	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
168	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
169		LINK TOTAL		$39,316.00
170				
171		**PINEGROVE TO LEVIATHAN LINK**		
172	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
173	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
174	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
175	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
176	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
177	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
178	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
179	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
180	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC	$2,250.00	$4,500.00

Line	Qty	Description	Unit Price	Ext. Price
		STRIP, TWR HDWR		
181	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
182	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
183	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
184		LINK TOTAL		$39,316.00
185				
186		**PINEGROVE TO YERINGTON LINK**		
187	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
188	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
189	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
190	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
191	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
192	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
193	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
194	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
195	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
196	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
197	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
198	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
199		LINK TOTAL		$39,316.00
200				
201		**STOREY DISPATCH TO COMO LINK**		
202	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
203	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
204	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
205	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
206	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
207	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00

Line	Qty	Description	Unit Price	Ext. Price
208	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
209	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
210	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
211	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
212	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
213	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
214		LINK TOTAL		$39,316.00
215				
216		**STATION 12 TO STOREY PW LINK**		
217	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
218	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
219	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
220	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
221	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
222	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
223	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
224	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
225	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
226	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
227	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
228	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
229		LINK TOTAL		$39,316.00
230				
231		**SNOWVALLEY TO COMO LINK**		
232	1	PART NUMBER 01010208001 ODU-A 11GHz, TR 490 & 500, Lo, B5 (10700.0 - 10890.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00
233	1	PART NUMBER 01010208002 ODU-A 11GHz, TR 490 & 500, Hi, B5 (11200.0 - 11390.0 MHz), Rectangular WG, Neg Pol	$2,808.00	$2,808.00

Line	Qty	Description	Unit Price	Ext. Price
234	2	PART NUMBER 30010194001 50 Ohm Braided Coaxial Cable - 75 meter	$400.00	$800.00
235	2	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$5,340.00
236	2	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$4,380.00
237	2	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$4,500.00
238	2	PART NUMBER WB3616 Coaxial Cable Installation Assembly Kit (W/O LPU End Kit)	$250.00	$500.00
239	2	PART NUMBER WB3657 LPU END KIT PTP800 (1 kit required per Coaxial cable)	$350.00	$700.00
240	2	PART NUMBER SE-HDWR SITE INSTALLATION HARDWARE KIT - MOUNT, EQ RACK, GRD KIT, AC STRIP, TWR HDWR	$2,250.00	$4,500.00
241	2	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$2,400.00
242	1	PART NUMBER WB3659 M/W FREQ COORDINATION SERVICE	$1,000.00	$1,000.00
243	1	PART NUMBER SE-LABOR LINK INSTALLATION, OPTIMIZATION, TESTING	$11,500.00	$11,500.00
244		LINK TOTAL		$41,236.00
245				
246		**LINK SITE CONTROL HARDWARE**		
247	15	PART NUMBER 16151 EXTREME SUMMIT X450A-24T	$6,495.00	$97,425.00
248	15	PART NUMBER 10060 EXTREME POWER CORD	$15.00	$225.00
249	10	PART NUMBER IP-223 ETHERNET RADIO CONTROL MODULE IP-223, REMOTE PANEL, ETHERNET	$2,021.00	$20,210.00
250				
251		**BATTERY BACK UP**		
252	13	PART NUMBER SE-BAT2 SITE TWO BATTERY BACK UP SYSTEM	$2,964.65	$38,540.45
253				
254				
255		**MAIN CONTROL FACILITY INTERFACE**		
256	1	PART NUMBER SE-L3PROGRAMMING NETWORK MANAGEMENT LEVEL 3 PROGRAMMING OF SYSTEM	$50,000.00	$50,000.00
257				
258		**SOLAR UPGRADE**		
259	1	SNOW VALLEY SOLAR SYSTEM	$41,500.00	$41,500.00
260				
261		MICROWAVE SYSTEM TOTAL		$945,176.45
262				
263		**SPARES EQUIPMENT PACKAGE**		
264	6	PART NUMBER 0101020800? ODU-A 11GHz, Rectangular WG, Neg Pol	$2,808.00	$16,848.00

Line	Qty	Description	Unit Price	Ext. Price
265	6	PART NUMBER WB3480 PTP800 Modem 1000/100BaseT with Capacity CAP 10 Mbps	$2,190.00	$13,140.00
266	6	PART NUMBER WB3544 PTP800 Modem Capacity CAP - 200 Mbps (per Unit)	$2,250.00	$13,500.00
267	6	PART NUMBER WB3555 PTP 800 Series AES License Key 128bit - End only	$1,200.00	$7,200.00
268	1	PART NUMBER 16151 EXTREME SUMMIT X450A-24T	$6,495.00	$6,495.00
269	1	PART NUMBER 10060 EXTREME POWER CORD	$15.00	$15.00
270	1	PART NUMBER IP-223 ETHERNET RADIO CONTROL MODULE IP-223, REMOTE PANEL, ETHERNET	$2,021.00	$2,021.00
271	2	PART NUMBER 85010089003 2.6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$1,710.00	$3,420.00
272	1	PART NUMBER 85010089004 4' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$2,670.00	$2,670.00
273	1	PART NUMBER 85010089005 6' HP Antenna, 10.70 ~ 11.70 GHz, Single Pol, Mot Interface	$5,540.00	$5,540.00
274				
275		**SYSTEM TRAINING**		
276	1	DAY LAN SYSTEM ADMINISTRATION TRAINING	$1,000.00	$1,000.00
277	1	DAY MICROWAVE SYSTEM FAMILIARIZATION AND TRAINING	$1,000.00	$1,000.00
278				
279		GRAND TOTAL		$1,018,025.45

SubTotal	$1,018,025.45
Tax	$0.00
Shipping	$0.00
Total	**$1,018,025.45**

Client#: 100239 SIERRELEC

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 11/11/10

PRODUCER
Tahoe City Comml Lines Unit
Wells Fargo Ins Svcs USA, Inc.
P.O. Box 7679
Tahoe City, CA 96145

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Berry Enterprises, Inc.
DBA: Sierra Electronics & KDJ Co., LLC
690 E. Glendale
Sparks, NV 89432

INSURERS AFFORDING COVERAGE	NAIC #
INSURER A: Unigard Insurance Company	25747
INSURER B: Tower Insurance Company of New York	
INSURER C:	
INSURER D:	
INSURER E:	

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COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A		GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE X OCCUR X PD Ded:1,000 GEN'L AGGREGATE LIMIT APPLIES PER: POLICY PRO-JECT LOC	CM012854	11/15/10	11/15/11	EACH OCCURRENCE	$1,000,000
						DAMAGE TO RENTED PREMISES (Ea occurrence)	$500,000
						MED EXP (Any one person)	$1,000
						PERSONAL & ADV INJURY	$1,000,000
						GENERAL AGGREGATE	$2,000,000
						PRODUCTS - COMP/OP AGG	$2,000,000
A		AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS	CM012854	11/15/10	11/15/11	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
						BODILY INJURY (Per person)	$
						BODILY INJURY (Per accident)	$
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT	$
						OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
A		EXCESS/UMBRELLA LIABILITY X OCCUR CLAIMS MADE DEDUCTIBLE X RETENTION $ 10,000	CU013928	11/15/10	11/15/11	EACH OCCURRENCE	$3,000,000
						AGGREGATE	$3,000,000
							$
							$
							$
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below	WCN0000999	12/01/10	12/01/11	X WC STATUTORY LIMITS OTHER	
						E.L. EACH ACCIDENT	$1,000,000
						E.L. DISEASE - EA EMPLOYEE	$1,000,000
						E.L. DISEASE - POLICY LIMIT	$1,000,000
		OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS
As Respects work performed in Douglas, Storey, Carson and Lyon Counties,NV.

CERTIFICATE HOLDER

Douglas County, NV
P.O. Box 218
Minden, NV 89423

CANCELLATION Ten Day Notice for Non-Payment of Premium

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

CERTIFIED COPY

The document to which this certificate is attached is a full, true and correct copy of the original on file and on record in my office.

DATE: April 25, 2011

TRACY Clerk of the 9th Judicial District Court of the State of Nevada, In and for the County of Douglas.

By Deputy