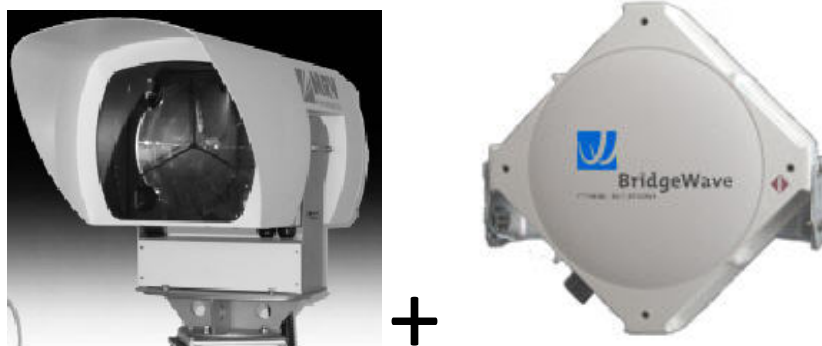


Site Survey Report

Prepared for:



Acme Company Corp.

For the attention of:

Mike Customer

500 Montgomery Sq.
Sometown, OK USA 73501
Tel: 580-123-4756

Document prepared by:

Peter Schoon, Pres.
System Support Solutions, Inc.
Tel: 952 745-1111



Subject: Certified Free-Space Optics Site Survey Report and Installation Considerations

Date: September 22, 2008

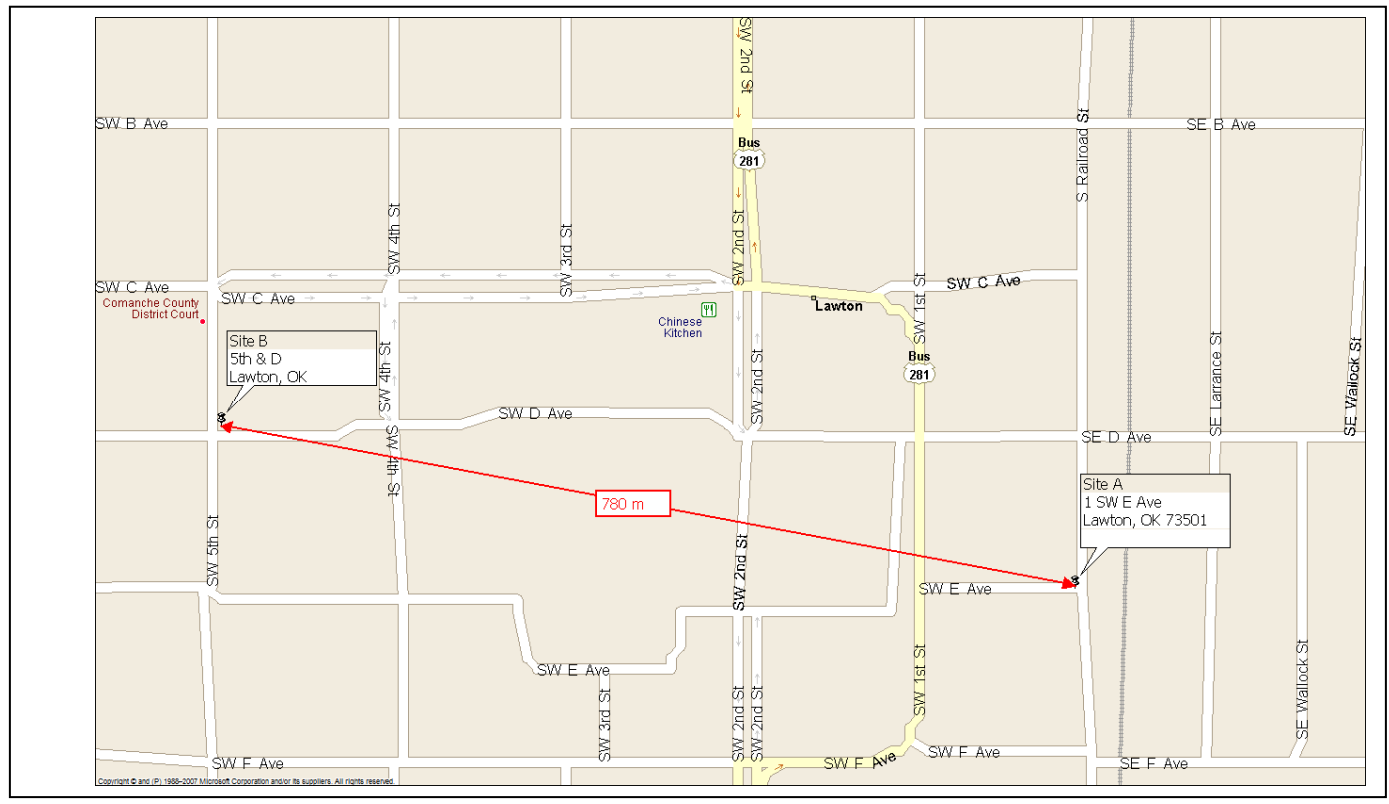
System Support Solutions staff present: Peter Schoon (virtual)

Company Staff Present: Mike Customer

Purpose: LAN Extension for: Data + Voice

Minimum average availability requirement: 100% (redundant path planned)

Map of structure locations, link distance and orientation



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Site A

- Acme Company Corp.
- 1 SW E Ave
- Sometown, OK USA 73501

General Information:

- Building construction type: Concrete
- Height: 2 stories
- Link head location: Vertical sidewall parapet surface
- Orientation: East-West

Line of sight: Absolutely clear with no obstructions

Range and Location:

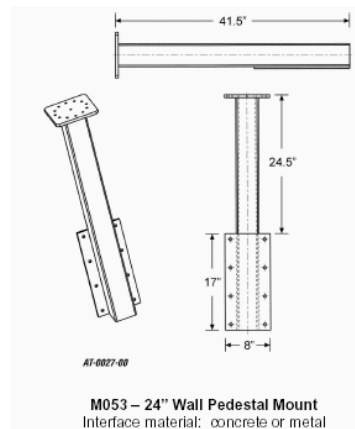
- Coordinates: N34 36.198' w098 23.257'
- Distance: 780 meters
- Number of links: 2
- Additional shelter required: None
- Elevation angle: < 5 degrees

Mounts:

MRV Installation Kit provides a very HD 4" square tubular aluminum Mount designed for attachment with eight (8) 1/2" concrete bolts to a solid masonry surface.

Also included in the Installation Kit:

- Rain tight J-Box with a 6-strand fiber bulkhead
- Two 1.5m liquidite conduit, couplings, fiber and CAT5 patch cables ea. side
- Two Dbl. female RJ45 coupler for 10BaseT CAT5 out-of-band management for both MRV + Bridgewave links each side



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Power Source (Acme Company Corp. to Provide):

The MRV TS5000/G transceivers require a 110VAC weatherproof dual receptacle power outlet located as close to the mount location as possible. The circuit must terminate in a UPS. An alternative to deploying a line wired UPS is to bring the circuit down to a standard receptacle type plug, and plug it into a regular 1500VA or larger UPS, and then just plug the UPS into any reliable circuit outlet. This saves the cost of a dedicated circuit, etc. and yet is perfectly suitable as it provides the transceiver with protected power.



The Bridgewave AR60 transceivers require a 12 AWG two-strand lightning protected copper cable to be run for the 24VDC power interface on the AR60. An indoor rated 110VAC/24VDC power inverter is included with the Bridgewave link. The lightning protector recommended by Bridgewave is the PolyPhaser IS-PSP-24.

Data Cabling (Acme Company Corp. to provide):

A multi-mode fiber optic cable is to be run for the rooftop transceivers. Six (6) strand 850nm mm fiber cable is recommended, 2 for TS500/G, 4 extras for contingencies. The fiber should be terminated with SC connectors. At the rooftop, the fiber run is just plugged into the 6-strand fiber bulkhead found inside the rain tight J-box included with the Installation Kit. The AR60 data interface will be plugged directly into the TS5000/G Fusion redundant port.

Management Cabling (Acme Company Corp. to provide):

Two lightning protected CAT5E cables are required for the TS5000/G and AR60 Management interfaces. They should be terminated with RJ45 connectors. At the rooftop, the CAT5 runs are just plugged into the dual female RJ45 couplers found inside the rain tight J-box included with the Installation Kit. The Installation Kit includes two 2meter Ligitite conduits to route cables from the provided J-Box to the two transceivers.



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Equipment:

MRV Free-Space Optics Primary Link:

- Type of unit: MRV Communications **TS5000/G** link
- Communication protocol: Full Duplex Gigabit Ethernet
- Host Network device: Switch or Router
- Required interface in your switch or router:
 - 1000BaseSX
 - Multi-mode (50 or 62.5 micron core diameter is OK)
 - 850nm
 - Please force full duplex and 1000Mbps (e.g. TS5000/G LAN port does not support any auto negotiation of speed or duplex mode)
 - Please note: use of media converters is NOT recommended for Layer I wireless bridges. Please see Appendix B at the end of this document for media converter issues.



Bridgewave Unlicensed RF Redundant Link:

- Type of unit: Bridgewave AR60 60GHz Unlicensed RF link
- Communication protocol: Full Duplex Gigabit Ethernet
- Host Network device: Switch or Router
- Required interface in your switch or router:
 - 1000BaseSX
 - Multi-mode (50 or 62.5 micron core diameter is OK)
 - 850nm
 - Please note: use of media converters is NOT recommended for Layer I wireless bridges. Please see Appendix B at the end of this document for media converter issues.



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Site B

- Acme Company Corp.
- 5th & D Ave
- Sometown, OK USA 73501

General Information:

- Building construction type: Brick
- Height: 4 story (16 meters)
- Link head location: Vertical sidewall parapet surface
- Orientation: East-West

Line of sight: Absolutely clear with no obstructions

Range and Location:

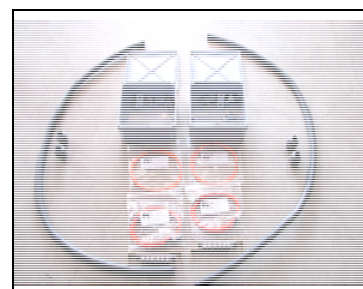
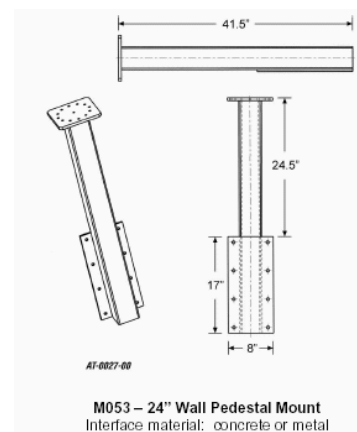
- Coordinates: N34 36.226' W098 23.772'
- Distance: 780 meters
- Number of links: 2
- Additional shelter required: None
- Elevation angle: < 5 degrees

Mounts:

MRV Installation Kit provides a very HD 4" Square tubular aluminum Mount designed for attachment with eight (8) 1/2" concrete bolts to a solid masonry surface.

Also included in the Installation Kit:

- Rain tight J-Box with a 6-strand fiber bulkhead
- Two 1.5m liquidite conduit, couplings, fiber and CAT5 patch cables ea. side
- Two Dbl. female RJ45 coupler for 10BaseT CAT5 out-of-band management for both MRV + Bridgewave links each side





Power Source (Acme Company Corp. to Provide):

The MRV TS5000/G transceivers require a 110VAC weatherproof dual receptacle power outlet located as close to the mount location as possible. The circuit must terminate in a UPS. An alternative to deploying a line wired UPS is to bring the circuit down to a standard receptacle type plug, and plug it into a regular 1500VA or larger UPS, and then just plug the UPS into any reliable circuit outlet. This saves the cost of a dedicated circuit, etc. and yet is perfectly suitable as it provides the transceiver with protected power.



The Bridgewave AR60 transceivers require a 12 AWG two-strand lightning protected copper cable to be run for the 24VDC power interface on the AR60. An indoor rated 110VAC/24VDC power inverter is included with the Bridgewave link. The lightning protector recommended by Bridgewave is the PolyPhaser IS-PSP-24.

Data Cabling (Acme Company Corp. to provide):

A multi-mode fiber optic cable is to be run for the rooftop transceivers. Six (6) strand 850nm mm fiber cable is recommended, 2 for TS500/G, 4 extras for contingencies. The fiber should be terminated with SC connectors. At the rooftop, the fiber run is just plugged into the 6-strand fiber bulkhead found inside the rain tight J-box included with the Installation Kit. The AR60 data interface will be plugged directly into the TS5000/G Fusion redundant port.



Typical TS5000/G + AR60 Mount Example

Management Cabling (Acme Company Corp. to provide):

Two lightning protected CAT5E cables are required for the TS5000/G and AR60 Management interfaces. They should be terminated with RJ45 connectors. At the rooftop, the CAT5 runs are just plugged into the dual female RJ45 couplers found inside the rain tight J-box included with the Installation Kit. The Installation Kit includes two 2meter Liquitite conduits to route cables from the provided J-Box to the two transceivers.



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Equipment:

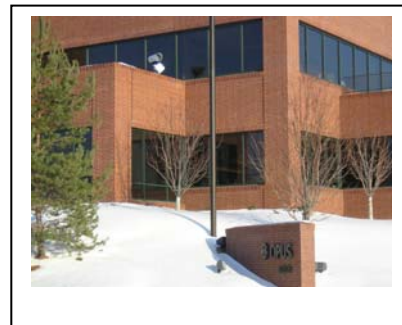
MRV Free-Space Optics Primary Link:

- Type of unit: MRV Communications **TS5000/G** link
- Communication protocol: Full Duplex Gigabit Ethernet
- Host Network device: Switch or Router
- Required interface in your switch or router:
 - 1000BaseSX
 - Multi-mode (50 or 62.5 micron core diameter is OK)
 - 850nm
 - Please force full duplex and 1000Mbps (e.g. TS5000/G LAN port does not support any auto negotiation of speed or duplex mode)
 - Please note: use of media converters is NOT recommended for Layer I wireless bridges. Please see Appendix B at the end of this document for media converter issues.



Bridgewave Unlicensed RF Redundant Link:



- Type of unit: Bridgewave AR60 60GHz Unlicensed RF link
- Communication protocol: Full Duplex Gigabit Ethernet
- Host Network device: Switch or Router
- Required interface in your switch or router:
 - 1000BaseSX
 - Multi-mode (50 or 62.5 micron core diameter is OK)
 - 850nm
 - Please note: use of media converters is NOT recommended for Layer I wireless bridges. Please see Appendix B at the end of this document for media converter issues.



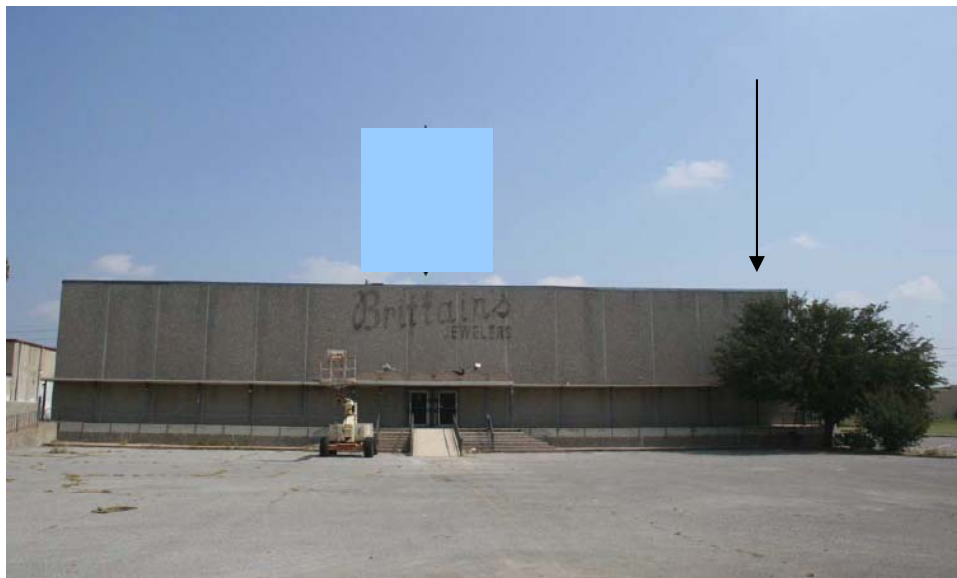
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Visuals:

<p>Site A (Host Site)</p> <p>Acme Company Corp. 500 Montgomery Sq. Sometown, OK USA</p>	
<p>Site A Rooftop line-of-sight view looking at Site B</p>	 <p>Site A rooftop line-of-sight view to Site B. Tree trimming / maintenance is under our control. Power lines are in background.</p>

Site A
Rooftop view of mount location



Site A
Rooftop penetration location



Site B
Street view



Site B (Remote site)
Link head position viewed from street level



Site B transceiver position viewed from the street. Trees are trimmed below sight line.

Site B
Rooftop line-of-sight view looking at
Site A



Site B
Rooftop view of mount location



Site B
Rooftop penetration location





Pre-Installation requirements for Acme Company Corp.:

(Note: when completed, please check-off, sign and fax to 952-473-0260, Attn: Peter Schoon)

- Fiber J-Boxes installed
- Fiber optic cabling installed and properly terminated
- Fiber optic cabling tested and certified (certification of "total loss" is the only means of verification of your fiber's viability. You will incur additional charges from us if there are fiber problems. See important notes below)
- CAT5 management cabling installed and properly terminated
- CAT5 management cabling tested
- 110VAC UPS protected power outlets installed
- Appropriate 1000BaseSX mm 850nm GigE switch interfaces installed
- All keys, permissions, ladders, etc. available onsite

Verified by: _____ Date: _____

Please note:

System Support Solutions, Inc. has been successful in holding link deployment costs to the lowest in the industry due to our simple, streamlined, cost optimized deployment model. However, due to our lean-mean cost structure, we do not have "safety margin" built into our charges, and rely on you to complete the above "task list" in a quality fashion prior to our arrival on-site. Therefore, the following applies to all deployments:

1. If cabling is not installed and certified prior to the deployment, the link(s) will be installed and certified, but end-to-end customer premise equipment (CPE) connectivity (e.g. switch to switch) will be customer responsibility. Often, issues arise that could have been more effectively identified if switch-to-switch connectivity could have been verified while we were on site. In our 6 years of experience, **uncertified fiber commonly precludes successful end-to-end test** over CPE due to excess insertion loss and crimped fiber strands.
Fiber problem diagnosis time on-site is billable and an additional day of on-site time will be billed (\$1,200/day/man) plus actual travel cost increases (up to approximately \$500/man for air re-ticketing + room + car).
2. If site access issues, lack of power in close proximity, or other customer responsibilities cause significant delays, an additional day of on-site time will be billed (\$1,200/day/man) plus actual travel cost increases (up to approximately \$500/man for air re-ticketing + room + car).
3. It is better to reschedule your installation appointment rather than install prior to completion of the above listed customer tasks. If rescheduling becomes necessary, you must advise us of your schedule change a minimum of 5 business days prior to your installation date. You will then normally only be responsible for air re-ticketing costs.



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Appendix A

Cisco Switch “errdisable” and Wireless Link implementation Issue

Problem: During a heavy rain event, but potentially at other times as well, ALL wireless solutions can experience momentary loss of link due to precipitation bursts that may last only a fraction of a second. Ordinarily, this is not a problem as any failed Ethernet frames caught in that moment are just retransmitted. A CRC error may or may not be registered in a management log.

Cisco switches have a feature, “errdisable”, which is intended to place a port into a disabled state in the event that port experiences a physical disruption.

The issue that arises with any wireless link is that there will be physical disruptions, although normally brief and transparent to user experience.

This is not a problem unless the port is thereby disabled by Cisco “errdisable”. In this case, the link will be downed due to disablement of the wireless equipment’s Cisco port by the switch’s “errdisable”.

To mitigate this potential issue, the following is strongly recommended on all Cisco switches:

Configure the Cisco device to not enter “error-disable state” as follows:

- 1.) **# show errdisable detect** (the 'show' command shows how errdisable is currently set.)
- 2.) **(config)# no errdisable detect cause all** (the 'no' command shuts off all forms of errdisable.)
- 3.) You may need to do a **reset** on the Cisco’s Bridgewave port both sides to obtain link
- 4.) You may not obtain successful “Link Up” status on the Cisco units until the link is “Up” and the above items have successfully been implemented.

Alternatively, for link down following an “errdisable” you will need to reset the Cisco switch ports.



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Appendix B



Technical note on Media Converters: 1000BaseTX to 1000BaseSX

Problem: when the existing customer premise switches or routers lack readily available fiber optic ports to accept the fiber connection to the new rooftop wireless transceivers, the solution is sometimes to try to implement media converters.

At the least, this introduces an additional point of failure in the system which is always prudent to avoid. At the worst, it can often times be problematic for the reasons below, and so is **best avoided by implementing fiber ports on the switches or routers**. In the event this cannot be done, consider the following:

If implementing media converters, it is very wise to do a bench test with all components in line prior to an actual deployment. This process has its own considerations. Especially for Free-Space Optics links, BE SURE TO CAREFULLY READ THEM IN THE LINK INSTALLATION MANUAL before turning on the FSO transceivers or you will not only be unsuccessful in obtaining an air link, but may damage the receive diodes due to the short range of a test setup. At the very least, place a sheet of bubble wrap over one or both FSO transceivers' to attenuate the beam.

Classic Dual Layer I device Conflict: Both media converters and the rooftop wireless transceivers are Layer I devices, or Bridges. As such they rely on a connected port to set throughput, protocol and duplex mode. When connecting them together, one of them (either the rooftop wireless transceiver or the media converter) must have a means of obtaining these parameters. Depending on the specific models involved, there may or may not be a means of setting speed and duplex mode.

1. If link is not obtained in a bench test setup or actual deployment, consider the following: **Speed and Duplex mode** must be running at 100 or 1000 Mbps and Full Duplex (dependent on link model). If the media converter has dip switches or other means of setting parameters, try setting them to the appropriate positions. If the media converter does *not* have settings for speed and duplex mode, it sets them based on whatever the 100BaseTX or 1000BaseTX port auto-negotiates with the switch. If the result of the auto-negotiation is incorrect as to speed or more commonly incorrect as to duplex mode, then the fiber side will also run in that same incorrect mode. Set the switch port to the correct speed and duplex mode and the media converter MAY agree and run at it. Also, it may not, in which case it will not be useable.
2. Various **additional features** may be present on some media converters including such things as "missing link", "link state propagation", etc. These are generally non-standards based proprietary features and as such the user is responsible for determining their impact on the link. In most cases they should all be run in the "disable" mode to prevent unexpected results.
3. The result of corrected media converter configurations **may not show up as a link light** on the switch until both sides are successfully running at the appropriate speed and duplex mode (think of the link as if it is a single fiber run to the far side).

This can be a surprisingly difficult issue: you may successfully force the speed and duplex mode, but if there is any other issue however minor (fiber TX/RX improperly transposed, pinched fiber strand anywhere in the fiber runs or fiber patch cables, faulty CAT5 patch cable, "hung" Cisco ports) you may not see a switch link light and assume the dip switch setting change to have been unsuccessful.

4. Some switches and routers (especially higher end Cisco equipment) have a feature referred to as "Error Disable State". While working with media converter issues as above, you will likely "hang" the port if this feature is present. This generally requires restarting the port each side multiple times.

This type of problematic simple issues concatenation can lead to several hours of diagnosis, and is strictly a customer responsibility.