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## Link Budget Calculations Operator's Guide

MN/MID-LINKB.IOM Revision 1





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# Link Budget Calculations Operator's Guide

Part Number MN/MID-LINKB.IOM

Revision 1  
August 19, 2001

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Registered Company.



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# Network Customer Support

The Network Customer Support Plan identifies the steps to be followed in resolving the Customer's concern.

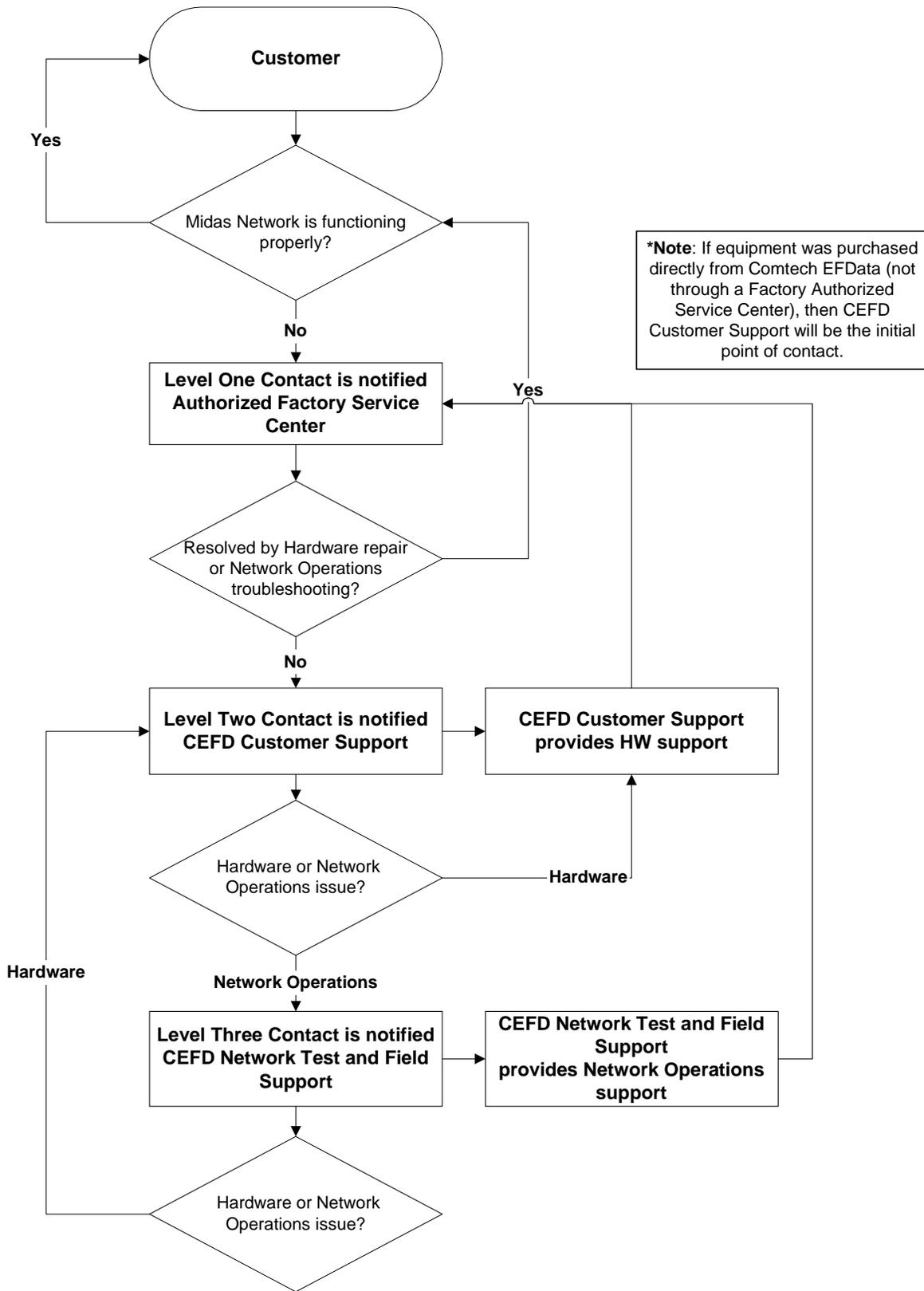
The resolution efforts will follow these levels of contact:

- **Level One Contact** – Factory Authorized Service Center.
- **Level Two Contact** – Comtech EF Data Customer Support.
- **Level Three Contact** – Network Test and Field Support

## Procedural Steps

Step	Procedure
1	The <b>Customer</b> raises a concern with the <b>Level One Contact</b> .
2	The <b>Level One Contact</b> will perform <i>Hardware</i> repairs and <i>Network Operations</i> troubleshooting in accordance with the Comtech EF Data Service Center agreement.
3	If the <b>Level One Contact</b> is unable to resolve the concern, then the <b>Level One Contact</b> will inform the <b>Level Two Contact</b> of the concern in accordance with the instructions found within the attached Comtech EF Data Customer Support Department's document.
4	The <b>Level Two Contact</b> will enter the concern into the Comtech EF Data database and determine whether the concern is a <i>Hardware</i> concern or a <i>Network Operations</i> concern
5	The <b>Level Two Contact</b> will interface with the <b>Level One Contact</b> and provide the appropriate hardware support and enter all correspondence into the Comtech EF Data database.
6	If the <b>Level Two Contact</b> determines that the concern is a <i>Network Operations</i> concern, then the <b>Level Two Contact</b> will inform the <b>Level Three Contact</b> .
7	The <b>Level Three Contact</b> will interface with the <b>Level One Contact</b> and provide the appropriate support and enter all correspondence into the Comtech EF Data database.
8	If the <b>Level Three Contact</b> determines that there is a <i>Hardware</i> failure then the <b>Level Three Contact</b> will inform the <b>Level Two Contact</b> . Go to Step 5.

# Network Support Customer Plan



See the Comtech EF Data website at <http://www.comtechefdata.com> for contact information for a Factory Authorized Service Center. Contact the Factory Authorized Service Center for:

- Product support
- Information on upgrading or returning a product

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data  
Attention: Customer Support Department  
2114 West 7th Street  
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data Number)  
480.333.4357 (Customer Support Desk)  
480.333.2500 FAX

or, E-Mail can be sent to the Customer Support Department at:

[service@comtechefdata.com](mailto:service@comtechefdata.com)

1. To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:
2. Request a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support Department.
3. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
4. To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.
5. Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Contact the Comtech EF Data Network Test and Field Support

- System level Network Operations support
- Information on upgrading Network Operation software
- Reporting comments or suggestions concerning manuals

A Network Test and Field Support representative may be reached at:

Comtech EF Data  
Attention: Network Test and Field Support  
2114 West 7th Street  
Tempe, Arizona 85281 USA

480.225.2200 (Main Comtech EF Data Number)  
480.225.3693 (Network Test and Field Support)  
480.333.2161 FAX

or, E-Mail can be sent to the Network Test and Field Support Department at:

<mailto:midasfss@comtechefdata.com>

Contact us via the web at [www.comtechefdata.com](http://www.comtechefdata.com).

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# Table of Contents

CHAPTER 1. DATA REQUIRED.....	1-1
INTRODUCTION .....	1-1
DATA REQUIRED.....	1-1
Transmit Site .....	1-2
Receive Site .....	1-3
Satellite.....	1-4
Carrier.....	1-5

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## About this Manual

The goal of the link budget is to ensure that the proper amount of power is delivered from the transmitting earth station in order to achieve the required performance specified in the design at the receiving site. Link budgets should be performed prior to the final network design.

# Conventions and References

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## Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing English to Metric conversions.

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## Trademarks

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## Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department: [techpub@comtechefd.com](mailto:techpub@comtechefd.com)

# Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order that it will be an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described.

Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact either:

Comtech EF Data Customer Support Department at: [service@comtechefdata.com](mailto:service@comtechefdata.com)

Comtech EF Data Technical Publications Department at: [techpub@comtechefdata.com](mailto:techpub@comtechefdata.com)

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# 1. Data Required

Introduction	1-1
Data Required	1-1

## Introduction

The goal of the link budget is to ensure that the proper amount of power is delivered from the transmitting earth station in order to achieve the required performance specified in the design at the receiving site. Link budgets should be performed prior to the final network design.

The integrator may select any link analysis tool. Comtech EF Data requests a copy of the link analysis for design review.

## Data Required

Separate Uplink and Downlink budgets are required for the carriers that accurately represent the services offered in this network.

Comtech EF Data requires the following parameters to be shown on each link budget at a minimum:

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## Transmit Site

Parameter	Value	Units
Site latitude		degrees ( E, W)
Site longitude		degrees (N,S)
Site altitude		km
Center Freq		GHz
Rain climatic zone		
Availability, average-year		%
Antenna diameter		m.
Antenna efficiency		%
Adjacent Carrier interference		dB
Adjacent Satellite interference		dB
Cross Polarization interference		dB
HPA C/IM		dB
Number of carriers		

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## Receive Site

Parameter	Value	Units
Site latitude		degrees ( E, W )
Site longitude		degrees ( N, S )
Site altitude		km.
Center Freq		GHz
Rain climatic zone		
Availability , average-year		%
Antenna diameter		m.
Antenna efficiency		%
LNB temp		K
Antenna noise temp		K
Adjacent Carrier interference		dB
Adjacent Satellite interference		dB
Cross Polarization interference		dB

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## Satellite

Parameter	Value	Units
Satellite Name		
Satellite longitude		degrees (E , W )
G/T receive		dB/K
SFD		dBW/m <sup>2</sup>
Attenuator setting		dB
EIRP (saturation)		dBW
Transponder BW		Mhz
Transponder IBO		dB
Transponder OBO		dB
Transponder C/IM		_dB

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## Carrier

Parameter	Value	Units
Req. Eb/No		dB
Info. Rate		Kbps
Overhead		%
FEC		
Reed-Solomon		
Modulation Factor		
BER		

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## METRIC CONVERSIONS

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### Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	$6.214 \times 10^{-6}$	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	$1.578 \times 10^{-5}$	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	$1.893 \times 10^{-4}$	0.3048	—	—
1 yard	91.44	36.0	3.0	—	$5.679 \times 10^{-4}$	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	$6.214 \times 10^{-4}$	—	—	—
1 mile	$1.609 \times 10^5$	$6.336 \times 10^4$	$5.280 \times 10^3$	$1.760 \times 10^3$	—	$1.609 \times 10^3$	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

### Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
$C = (F - 32) * 0.555$
$F = (C * 1.8) + 32$

### Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	$1.0 \times 10^3$	35.27	32.15	2.205	2.679	—



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