

¹[#]²⁺³⁴ **PowerHelp! How To Use PowerLink**

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¹\$ PowerHelp! How To Use PowerLink

²# POWERHELP

³+ HELP:001

⁴K Main Program;Contents;Help

⁵\$⁶#⁷+⁸K **PowerLink Menu Items**

This section describes the various items found in PowerLink's menu bar on top of the screen.

File **Configuration** **Utilities** **Help**

⁵\$ PowerLink Menu Items

⁶# MENT

⁷+ HELP:002

⁸K Menu;File;Configuration;Help;Utilities

§⁹#¹⁰+¹¹κ¹² **Operating Bands**

{ bml OPBAND.BMP }

PowerLink covers the major satellite communication operating band for a maximum flexibility. The frequency attribution for PowerLink is as follows:

<u>BAND</u>	<u>FREQUENCY (Ghz)</u>
L	1-2
S	2-4
C	4-6
X	8-12
Ku	12-14
K	18-27
Ka	27-40

The user can use specific uplink and downlink frequencies by selecting the "Manual Parameters" option in the main section of the program. By doing so, the frequency box becomes enabled and the user can manually enter the frequencies in the frequency boxes.

⁹\$ Operating Bands

¹⁰# OPBAN

¹¹+ HELP:003

¹²κ Frequency Band;Operating Band;Frequency;Frequency Box;L-Band;S-Band;C-Band;Ku-Band;X-Band;Ka-Band

§¹³#¹⁴+¹⁵κ¹⁶ **Satellite Used**

This section allows the user to select, edit or create a satellite data file.

Parameters - Allows the user to change various satellite parameters.

New Satellite - Allows the use to create a new satellite file (*.SAT).

Satellite Selection - Allows the user select a satellite data file from the satellite data bank.

¹³\$ Satellite Used

¹⁴# SATUS

¹⁵+ HELP:004

¹⁶κ Satellite Used;Parameters;New Satellite;Satellite Selection;Satellite Parameters

§¹⁷#¹⁸+¹⁹κ²⁰ **Link Model**

This section allows the user to select a simplex or duplex link calculation. This parameter tells PowerLink the kind of results required by the user. This parameter will affect the link budget calculation and the analysis routines. The "DB" and "DQ" result codes will be added in a duplex analysis to identify the best Duplex BPSK or Duplex QPSK solution.

¹⁷\$ Link Model

¹⁸# LINKMOD

¹⁹+ HELP:005

²⁰κ Link Model;Simplex;Duplex;Result Codes;B;Q;DB;DQ

§²¹#²²+²³κ²⁴

Station Information

{ bml STAT.BMP}

This section of the main program allows the user to load, save or modify parameters for a ground station to be used in the link calculations.

Load Button - Allows the user to load a saved station file (*.SGT)

Save Button - Allows the user to save the current settings in a station file (*.SGT)

Print Station - Allows the user to print the current station settings.

Map Button - Allows the user to select the station coordinates by pointing the station location on a map. Remember that these coordinates are only APPROXIMATIONS of the actual location. The map service is provided to give the user approximate coordinates in cases where the actual location is unknown. The user can select which map is to be displayed by choosing the "Map Display" option in the configuration menu.

Changing Station Parameters - The user can change one or more station parameters by clicking on the station grid box. A parameter window will pop-up giving the user access to all the station parameters. Once all the changes have been made, click on the "Done" button.

²¹\$ Station Information

²²# STATINFO

²³+ HELP:006

²⁴κ Station Information;Load;Save;Link Calculations;Print;Map;Coordinates;Station Parameters

§²⁵#²⁶+²⁷κ²⁸ **Link Information**

{ bml LINKINFO.BMP }

This section of PowerLink allows the user to configure the link he requires, and provides information on the link parameters that PowerLink will use. This includes the following:

Manual Parameters - This check box allows the user to select a manual mode of entry for certain parameters. Depending on the required data rate, selected coding, link availability and modulation, PowerLink automatically computes the required C/No for your link. The automatic parameter selection follows the Eb/No chart provided in the Utilities menu. If the user selects the "Manual Parameters" option, the user is now able to manually input the uplink frequency, downlink frequency, and C/No required.

{ bml CNOREQ.BMP }

Change Button - This option is only available when the Manual Parameters option is selected. The user is then able to enter a desired data rate, Eb/No, equipment imperfection (NOT A LINK MARGIN), and FEC coding rate.

Calculate Effects of Rain - This check box enables the user to determine if the effects of rain will be included in the rain calculations. If this option is disabled, the link availability box will no longer be accessible, and rain attenuations and thermal noise increase will have a zero value in the detailed link results.

C/No Required - This read-only box shows the threshold C/No required by the system to sustain the user's defined link.

Transponder Operating Point - These values show the operating point of the satellite amplifier. These values vary whether the satellite uses a Solid-State Power Amplifier (SSPA), Travelling Wave Tube Amplifier (TWTA), or a Klystron Power Amplifier (KPA). Knowledge of these parameters is essential in order to compute acceptable input and output back-offs (IPBO, OPBO). The values for the operating point can be modified in the "Satellite Parameters" function. Each frequency band has a specific transponder operating point.

²⁵ \$ Link Information

²⁶ # LINKINFO

²⁷ + HELP:007

²⁸ κ Link Information; Manual Parameters; C/No Required; Uplink Frequency; Downlink Frequency; Eb/No; Change Button; Rain; Thermal Noise Increase; Operating Point; IPBO; OPBO; TWTA; KPA; SSPA

§²⁹#³⁰+³¹κ³²**Data Rate Required**

This parameter is the actual required information data rate to be communicated. This parameter should not include redundant bits added from FEC coding. This parameter directly affects C/No required and transponder bandwidth requirements. Due to frequency jitter, modulation ripples and other parameters, the equivalence ratio for PowerLink is preset at 1.4 Hz per bit per second (bps). This factor is used in the computation of the total bandwidth requirement.

²⁹\$ Data Rate Required

³⁰# DRAREQ

³¹+ HELP:008

³²κ Data Rate Required;Frequency Jitter;Modulation Ripples;Bandwidth Requirements;Equivalence Ratio

§³³#³⁴+³⁵κ³⁶**Coding**

Forward Error Correction (FEC) coding allows the user to add redundant information to the transferred data. This additional information is used to increase the probability of error detection or correction at the receive site. This entails that a same bit error rate performance can be achieved using less power. Although power requirements are reduced, the added redundant information increase the bandwidth of the signal, increasing the transponder bandwidth requirement.

In automatic mode, the user can choose one of three FEC coding modes: uncoded, 1/2 coded, and 3/4 coded. In "manual parameters" mode, the user must enter the FEC coding rate as a fraction, and the associated Eb/No for the desired bit error rate (BER). The automatic parameters used by PowerLink can be retrieved by consulting the Eb/No chart in the "Utilities" menu.

³³\$ Coding

³⁴# CODING

³⁵+ HELP:009

³⁶κ Forward Error Correction;FEC;Redundant Information;Power Requirements;Bandwidth Requirements;Coding Rate

§³⁷#³⁸+³⁹κ⁴⁰**Modulation**

The modulation technique used by PowerLink is limited to Binary Phase Shift Keying (BPSK) and Quaternary Phase Shift Keying (QPSK). In manual mode, BPSK modulation is assumed. No other modulation scheme is presently supported by PowerLink.

³⁷ \$ Modulation

³⁸ # MODUL

³⁹ + HELP:010

⁴⁰ κ Modulation;BPSK;QPSK

§⁴¹#⁴²+⁴³κ⁴⁴**Bit Error Rate**

The bit error rate (BER) figure describes the rate of transmission errors that will not be detected at the receiving end. The value is expressed in factors of 10. For example, a BER of 10-6 means that no more than 1 bit per 1 000 000 bits will go undetected. This parameter is set by the user and is usually part of any link requirement. A standard of 10-6 is usually an accepted standard.

⁴¹\$ Bit Error Rate

⁴²# BER

⁴³+ HELP:011

⁴⁴κ Bit Error Rate;BER;Errors;Detection

§⁴⁵ #⁴⁶ +⁴⁷ K⁴⁸ **Compute A Single Link Budget**

{bml SINGRES.BMP}

This option allows the user to compute a single link budget from the station, satellite and link parameters entered. The following information is directly provided:

Amplifier Requirements - This parameter defines the point of operation of the transmit station's power amplifier. This is particularly important in choosing appropriate satcom equipment.

Transponder Requirements - This section is divided in two sections: power and bandwidth. these parameters describe the bandwidth and power requirements at the satellite transponder in order to sustain the required link.

Bandwidth Requirement - This parameter is given as a percentage figure relatively to the total useable bandwidth of the satellite transponder.

Power Requirement - This parameter is given under two formats: as a satellite input and output back-off, or as a percentage figure of total useable power at the satellite transponder. This percentage figure is calculated in relation with the transponder operating point.

View Detailed - This option gives the user detailed information on the various link parameters, calculated values and end results. This feature is particularly important for link engineers. This detailed display can easily be printed out by choosing the "Print Detailed" option.

⁴⁵\$ Compute A Single Link Budget

⁴⁶# SING

⁴⁷+ HELP:012

⁴⁸K Compute;Link Budget;Amplifier Requirements;Transponder Requirements;Bandwidth Requirements;Power Requirements;Operating Point;View Detailed

§⁴⁹#⁵⁰+⁵¹κ⁵² **Analysis Routines**

This portion of the program is specific to PowerLink. It allows the user to run an automated series of link budget in order to determine the best antenna combination for a given system.

{bml antchos.bmp}

PowerLink will use the antennas selected by the user to run a series of link budgets using the three preset FEC coding rates and the two modulation schemes for each antenna combination. The results of these calculations are then displayed in a graphical and tabular format. The best BPSK solution is identified with a "B" in the code column, and the best QPSK solution is identified by a "Q". When a duplex link mode is selected, the overall best solution is identified with "DB" and "DQ" for duplex BPSK and QPSK.

{bml GRIDRES.BMP}

PowerLink uses a standard set of antenna values for the analysis routines. The values for C-band and Ku-band antennas are given as per Andrew Canada catalog #35. Values for antenna at L,S,X and Ka-band were extrapolated from the C and Ku-band data using PowerLink's own antenna gain determination utility. These values are approximations only! The user is cautioned as to the exactitude of these values.

The antenna parameters can be modified directly from PowerLink by using the "Custom" button. By saving the new values as "default", the user OVERWRITES the previous data file.

⁴⁹\$ Analysis Routines

⁵⁰# ANAL

⁵¹+ HELP:013

⁵²κ Analysis;FEC;Coding;Antennas;Link Budget;B;Q;DB;DQ;BPSK;QPSK;Parameters;Custom;Default;Antenna Gain

§⁵³#⁵⁴+⁵⁵κ⁵⁶ **Rain Model**

PowerLink uses the CRANE model to compute increase in thermal noise at the receive station, and uplink and downlink rain attenuation. A Climactic Zone map is included in the Utilities menu to determine sustained rain levels at specific location. These rain levels are computed from the climactic zone code and required link availability selected by the user. Rain levels can be imputed manually by choosing "Use User's Rain Rates" in the Configuration menu.

⁵³\$ Rain Model

⁵⁴# RAINMODEL

⁵⁵+ HELP:014

⁵⁶κ Rain Model;Crane Model;Thermal Noise;Rain Attenuation;Climactic Zone;Rain Levels;Use User's Rain Rates

§⁵⁷ #⁵⁸ +⁵⁹ κ⁶⁰ **How To Register This Copy Of PowerLink**

PowerLink is distributed by ERE Info Corporation. For registration information, please call (418) 648-6299.

To register PowerLink, choose the "Register" option at the start of the program. Enter your name AS IT APPEARS ON YOUR REGISTRATION FORM. Please note that the program is caps sensitive. Enter the registration code given on your registration form by clicking on the corresponding numbers on the validation grid. Once all the information is entered, click the "done" button to complete the registration. From then on, the "analysis" option will be available, and the "annoyance factor" interlude will be removed.

⁵⁷ § How To Register This Copy Of PowerLink

⁵⁸ # REGI

⁵⁹ + HELP:016

⁶⁰ κ Register;ERE Info Corp;Registration Information;Name;Registration Code;Annoyance Factor

§⁶¹#⁶²+⁶³κ⁶⁴**The Origin of PowerLink**

PowerLink was originally developed by Polaris Engineering for the Department of National Defence of Canada in response to a lack of an adequate tool to perform satellite link calculations.

Over 1000 hours of work, 143 recompiled beta versions, 23 bugfixes and 300 diet cola cans came into the conception of this program.

PowerLink was developed in the spirit of "user-friendliness" for satcom engineers. It is a well known fact that each engineering firm usually has their own "in-house" link budget program, made by some link guru who is usually the only one to truly understand his program. These software usually offer a disappointing user interface and lack in flexibility and output quality. PowerLink offers an easy to use interface with a maximum built in flexibility. PowerLink also offers "Report-Ready" outputs in a tabular or graphical format. Small things that make a big difference. PowerLink was developed to meet YOUR needs.

⁶¹§ The Origin of PowerLink

⁶²# ORIG

⁶³+ HELP:017

⁶⁴κ Origin of PowerLink;Polaris Engineering

§⁶⁵#⁶⁶+⁶⁷κ⁶⁸**PowerLink Customer Support**

There are many ways to get support for PowerLink. First and foremost, ERE Info Corporation can answer questions that you may have that this help file might not have covered.

ERE Info Corporation - (418) 648-6299

You can also contact Polaris Engineering to get engineering information on how PowerLink works, as long as these questions do not jeopardize the intellectual property of PowerLink.

Polaris Engineering:

Internet: benoit.durand@synapse.org

CompuServe: 74140,3534

Please report any anomalies to ERE Info Corporation. If there is a problem, we will correct the situation and send you an updated package at no extra charge.

⁶⁵\$ PowerLink Customer Support

⁶⁶# CUSTSUP

⁶⁷+ HELP:020

⁶⁸κ ERE Info Corp;Polaris Engineering;Customer Support;Fault Reporting;Anomalies;CompuServe;Internet;Custom Programming

^{§69#70+71K72}File

The file section allows the user to perform basic I/O functions.

Open Base Station - Allows the user to open a station file (*.SGT) as the base station to use for the link calculations.

Open Remote Station - Performs the same task as Open Base Station but uses the station file as the remote station to be used in the link calculations.

Save Base Station - Saves the current setting of the base station in a station file.

Save Remote Station - Save the current settings of the remote station in a station file.

Print System information - prints out the various parameters for the base station, remote station, satellite parameters and required link information. This information is printed in "Report-Ready" format.

Exit - Exits PowerLink and returns the user to the Windows environment.

⁶⁹\$ File

⁷⁰# MENUFILE

⁷¹+ HELP:021

⁷²K File;I/O Functions;Open;Save;Print;Exit

§⁷³#⁷⁴+⁷⁵κ⁷⁶ Configuration

This menu allows the user to set operating parameters of PowerLink.

Map Display - This menu allows the user to select which map should be displayed when the "Map" button is pressed in the station information section. PowerLink comes with two standard maps: Canada and United States. Other map display are available through ERE Info Corp.

Rain Rate Determination - This option allows the user to decide which parameter to use in the rain attenuation calculations. By choosing "Use Standard Rain Rates from Selected Availability", PowerLink will compute the rain level that the link must sustain in order to meet the availability selected by the user. These rain levels are computed from the climactic region entered for a specific site and the link availability. The user can also enter his/her own rain rates by selecting "Use User's Rain Rates". By selecting this option, PowerLink assumes that the user has a good knowledge of the climactic zone where the station is located and that the value entered will meet the user's required availability.

Save Configuration - This option will save the settings of "Map Display", "Rain Rate Determination", "Operating Band" and "Satellite Used". This is done in order to provide the user with a personalized interface.

⁷³\$ Configuration

⁷⁴# MENUCONF

⁷⁵+ HELP:022

⁷⁶κ Configuration;Map;Map Display;Rain Rate;Save Configuration

§⁷⁷ #⁷⁸ +⁷⁹ κ⁸⁰ **Utilities**

This section of PowerLink offers additional satellite communication utilities.

Determine Antenna Gains - This section allows the user to compute the approximate transmit and receive gains of an antenna given its diameter and efficiency, or to find the tx and rx gains at a certain operating band given gains at a different band. Please note these results are relatively accurate, but remain approximations. They are provided for engineers who wish to work in a less common operating band (L,S,X or Ka), and are not provided with antenna parameters.

{bml ANTGAIN.BMP}

Standard Eb/No Curves - These curves are provided as reference only. Values extrapolated from the practical curve are used by PowerLink in automatic mode. These curves are the typical curves for a NEC IDR/IBS modem.

Pointing Information - This option provides Azimuth, Elevation and Polarization (for linear systems). Feed polarization information may vary by a factor of 90° depending on the polarization used by the user's system. PowerLink gives a reference rotation factor from which the feed polarization can be derived.

{bml pointif.bmp}

Climactic Zone Map - This option allows the user to determine the climactic zone to use for the rain rate determination of a station. By clicking at a specific location on the map, PowerLink will describe the selected region. Unlike "Map Display", this parameter is not automatically routed to the station parameters section.

⁷⁷ \$ Utilities

⁷⁸ # MENUTIL

⁷⁹ + HELP:023

⁸⁰ κ Utilities;Antenna Gain;Eb/No Curves;Pointing Information;Climactic Zone Map

⁸¹\$⁸²+⁸³⁸⁴**Help**

What are you doing here?!? It should be easy enough for you to navigate through the topics without needing help on help! What's next? Help on Help on Help? Sheesh! Get outa here! <GRIN FROM THE PROGRAMMER>

⁸¹\$ Help

⁸²# MENUHELP

⁸³+ HELP:024

⁸⁴K Help

§⁸⁵#⁸⁶+⁸⁷κ⁸⁸ Parameters

The satellite parameter section allows the user to change the various satellite parameters used in the link calculations. The user can create, modify or save these parameters in a satellite data file (*.SAT).

{bml SATPARCH.BMP}

Operating Band - This section allows the user to modify satellite parameters in the various band of operations. The band selection in this mode does not affect the selected band in the main program. It only allows the user to navigate within the satellite data file in order to modify the various parameters.

Satellite Location - This tells PowerLink the location of the satellite to be used.

Satellite Name - Each satellite can be individually named in each band. It is recommended that the nomenclature "Skynet C-Band" or "GStar Ku-band" be used to identify both the satellite and the operating band.

Satellite Category - This text box, like "Satellite Name" gives additional information on the satellite system. Typical values for this field would be "military", "commercial", "private", etc. It is only used for informational purposes.

Satellite Transponder Bandwidth - This figure should represent the total useable bandwidth of the transponder used. This parameter is used in determining bandwidth requirements. If the required link requires a bandwidth greater than the total useable bandwidth of the transponder, the link will be considered as exceeding the satellite's capabilities.

Satellite Amplifier Operating Point - These values represent the operating point of the amplifier used by the satellite transponder. This operating point is then considered as the 100% power value for this transponder. The values are entered as input back-off (IPBO) and output back-off (OPBO) in db. If a link requires an OPBO smaller than the amplifier's OPBO, the link will be considered as exceeding the satellite's capabilities.

Satellite Transmission Parameters - These parameters are satellite specific and describe the level of various interference sources. These values can be ignored by removing the check mark beside a specific parameter. By saving the satellite data file, PowerLink saves the setting of these check boxes as well.

Restore Defaults - This option will restore the saved values for the satellite file in use.

⁸⁵\$ Parameters

⁸⁶# SATPAR

⁸⁷+ HELP:026

⁸⁸κ Parameters;Operating Band;Location;Name;Category;Transponder;Operating Point;Transmission Parameters;Defaults;Save

Save - Saves the satellite parameters to the satellite file.

⁸⁹\$⁹⁰#⁹¹+ **Changing Station Parameters**

{ bml satpar.BMP}

**This section allows the user to Change one or all the station parameters.
Press the "Done" button when all the changes are completed**

⁸⁹\$ Changing Station Parameters

⁹⁰# CHANGESTATION

⁹¹+ HELP:032