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REV1.0 Black Box Optical Test Set Instruction Manual
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Printed in USA

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INSTRUCTION GUIDE

for the

BLACK BOX

Dual Wavelength Optical Fiber Test Set w/ Data Storage

INTRODUCTION



The fiberoptic power meter can best be described as the workhorse of the fiber industry. It is to fiber what the voltmeter is to electronics. If a technician with a limited budget could have only one piece of optical test equipment, it should be the fiberoptic power meter.

The **Black Box** optical power meter redefines quality and durability. This full-featured instrument incorporates impact absorbing end bumpers, weather resistant membrane switches, a durable powder coat finish, and four (4) NIST traceable calibrated wavelengths. Equipped with a universal receptacle to accept a variety of connector styles, the unit features 0.01 dB resolution over the full dynamic range, four non-volatile independent zero references, an easy to read super-twist graphic display, and an emergency quick charge mode to charge batteries in less than an hour!

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FEATURES



METER:

- 2mm Ge detector
- Autoranging +3dBm to -60dBm
- Resolution of 0.01 dB over entire range
- Four individual non-volatile references
- Four wavelengths (850, 1300, 1550 NIST traceable)
- Absolute (dBm) and Relative (dB) modes
- Large *graphic* character and analog type bar display
- Very fast responding dual processor design
- 100% *digital calibration*, no tuneable parts to degrade
- 4-AA field replaceable NiCad, Alkaline, or AC power
- Emergency quick charge mode
- Extra rugged packaging

SOURCE:

- Pocket size handheld design
- Stabilized source circuitry
- Extremely rugged aluminum packaging
- 9V battery operation



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SPECIFICATIONS



METER:

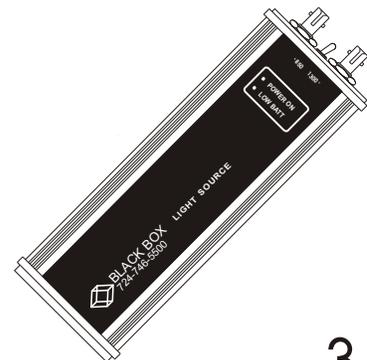
- | | |
|-------------------------|------------------------------|
| Calibration Wavelengths | 850nM, 1300nM, 1550nM, 780nM |
| Range (1300nM, 1550nM) | +3dBm to -60dBm |
| Range (850nM, 780nM) | +8dBm to -55dBm |
| Display Resolution | 0.01dB |

SOURCE:

- | | |
|------------------|------------------------------|
| Wavelength | 850nM, 1300nM |
| Power (out, min) | -20dBm into 62.5/125uM fiber |
| Stability | .1 dB/ 8hr., .5dB over temp. |

GENERAL:

- | | |
|-----------------------|---------------------------|
| Operating Temperature | 0C to 50C |
| Storage Temperature | -10C to 60C |
| Humidity (non-cond.) | 10% - 90% |
| Battery Life | 8 hrs. to 10 hrs. typical |
| Trickle Charge Time | 12 hrs. to 14 hrs. |
| Quick Charge Time | 60 min. typical |

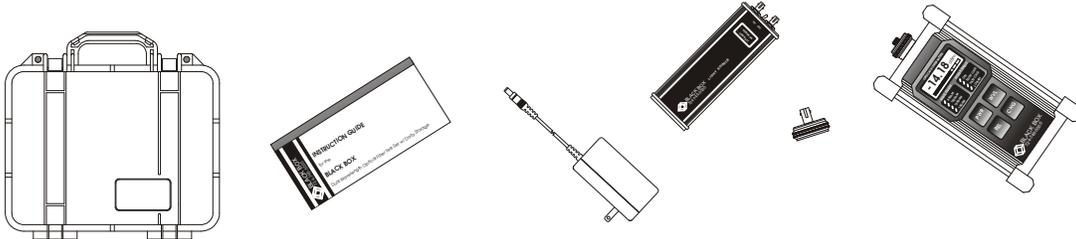


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INCLUDED EQUIPMENT



Included with each **Black Box** fiberoptic test set is a waterproof carry case, a power meter, a dual wavelength LED light source, an AC power pack, an ST connector adaptor cap, and an instruction manual.



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GENERAL USE FRONT PANEL TOUR



GRAPHIC DISPLAY:

Shows current absolute or relative power level along with an analog representation of input power.

WAVELENGTH INDICATOR:

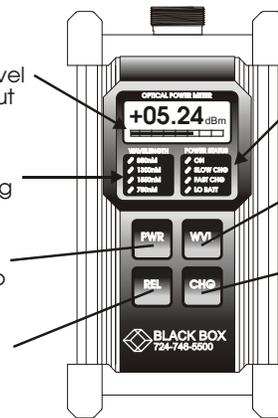
Shows current calibrated wavelength setting for absolute measurements.

PWR (POWER BUTTON):

Turns unit on and off. This will not affect zero references stored in memory.

REL (RELATIVE/ABSOLUTE BUTTON):

Cycles between absolute (dBm) mode, relative (dB) mode, and absolute (watts) mode.



POWER STATUS:

Indicates meter power status, battery charge mode and battery condition.

WVL (WAVELENGTH SELECT BUTTON):

Selects one of the four calibration wavelengths for absolute readings.

CHG (QUICK CHARGE BUTTON):

Initiates quick charging of NiCad batteries. SEE POWER SECTION BEFORE USING THIS FEATURE!

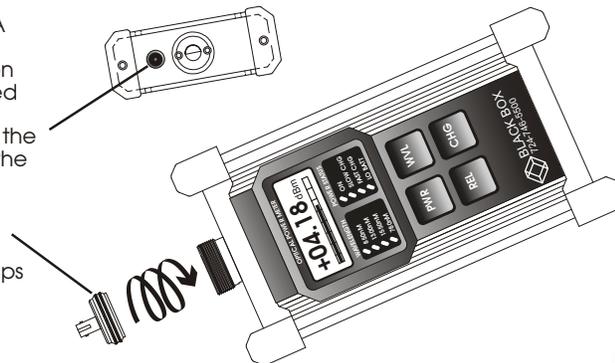
5

GENERAL USE GETTING STARTED



The **Black Box** Power Meter is shipped with 4-AA type rechargeable Nickel Cadmium batteries. Although charged partially during lab inspection and calibration, the batteries should be charged fully before field use. This is accomplished by simply connecting the included AC adapter to the charging socket at the top of the unit (refer to the POWER section for important details).

Next, the appropriate connector adaptor cap must be screwed onto the optical head. The **Black Box** optical head will accept adaptor caps which allow connection to ST or SC connector styles.



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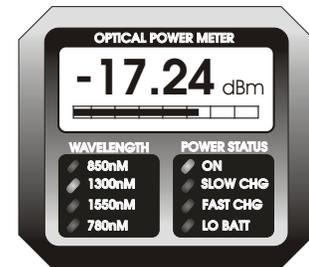
GENERAL USE ABSOLUTE MODE



Depressing the PWR button will turn on the meter. Although the ON led will light instantly, the display will take a few seconds to respond while the meter automatically calibrates and recalls internal status information. Upon power-up, the display will appear similar to the drawing on the right.

Note that the meter display shown is reading -17.24 dBm at 1300nm. In our example, the meter is in absolute mode. This means that the display is currently telling the user that if 1300nm light is being measured, the current power level is 17.24 decibels less than 1 milliwatt of light. In other words, the power level being read is -17.24 dBm.

Absolute measurements tell the user exactly how much optical power is hitting the detector at the top of the unit. This information is useful when checking to see if a system is injecting enough power into the fiber to be seen by its receiver. It is important to remember to select the proper wavelength for your system by depressing the WVL button until the proper value is selected, otherwise, readings will be inaccurate.



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GENERAL USE RELATIVE MODE



In the previous example, the meter was reading -17.24 dBm. By depressing the REL button, the meter would appear as shown to the right. The meter is still reading the same power but is now displaying the deviations in power from the -17.24 dBm level. Since the power has not yet changed in our example, the reading is 00.00 dB. Note that the units of measurement are dB or decibels as opposed to dBm which means decibels as referenced to a milliwatt.

If the power were to drop to -20.24 dBm, the display would read -3.00 dB. This is because relative mode shows only the change in power. In relative mode, a negative number means the signal level has dropped while positive numbers indicate increases.

Note the small numeric display and "analog meter" at the bottom of the screen. The small display is not averaged and therefore fast responding for splice/connector tuning. The "analog meter" section shows up to 1 dB variations (zero center) in real-time with a sliding pointer. Due to the advanced digital averaging technique used, the large display takes more time to stabilize at low power levels. The small display essentially sacrifices some stability for speed.



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GENERAL USE RELATIVE MODE (cont.)



Again, when the REL button is pressed, the current power level (or zero reference) is stored in memory and all subsequent readings are compared to that number. The deviations are then displayed.

The relative mode is generally used for loss testing of cables. By connecting a light source to the meter and taking a zero reference, then re-connecting the source and meter across the link to be tested, the displayed number will actually be the loss of the cable! The TESTING section will describe the loss test in more detail.

Finally, to switch back to absolute mode, simply hit the REL button again. Note, however, that the **Black Box** meter is more advanced than many other meters and is actually capable of storing up to four separate references. This time saving feature allows references for different wavelengths to be taken at one time when testing, but also makes the **Black Box** meter operation slightly different than less advanced units. Because each wavelength now has independent references, the user must not forget to check the mode (relative or absolute) when switching wavelengths. Also, the **Black Box** meter will remember references in excess of 30 years even with the power off and batteries removed. This powerful feature allows the unit to be turned off when moving from the reference site to the test site, drastically saving battery life! This means, however, that you should be aware of what mode the meter is in, even if the unit has not been used for months.

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GENERAL USE DATA STORAGE



Data storage on the Black Box TS1300A meters is very simple, but first, the data **Logging Mode** must be selected in the Main Menu upon startup. The options are **Rel** or **Abs** indicating the type of data that will be stored, Relative (dB) or Absolute (dBm). Once selected, the data storage display will only be available in this mode. Note that data points cannot be stored when in Watts (W) mode.

All data is entered and edited through keypresses on the side panel buttons. The **+** button increments the current location, the **-** button decrements the current location, and **Enter** will take the current power data and store it at the desired memory location. Note that pressing and holding the **+/-** buttons will accelerate through locations.



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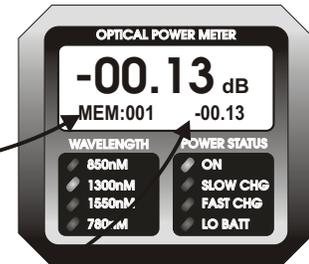
GENERAL USE DATA STORAGE



To the left is an example of how the display might look when the **Logging Mode** is set to **Abs** and the meter taking measurements. As can be seen, the normal analog bar in the lower portion of the display is replaced by data storage information.

This portion of the display shows the current memory location that any saved data will go to. In this example, if the user were to depress the **Enter** button, the data would be stored in location 001 of 999 available for the 1300nm wavelength. Note that each wavelength has its own set of 999 memory locations.

This portion of the display shows the number currently stored at the above noted location. This number is updated as soon as **Enter** is depressed. Depressing **Enter** may automatically increment the memory location depending upon the **Auto-Inc** setting in the Main Menu. Note that all data is stored in non-volatile memory and will not be lost, even until batteries are removed, until cleared in the Main Menu or saved over.



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GENERAL USE DATA STORAGE



Once testing is completed, stored data can be uploaded to the included Black Box TS1300A™ software for saving or printing on a PC compatible system with the included serial cable. To transfer data, make certain the TS1300A™ software is installed and correctly configured to use your serial port.

Power up the meter and enter the Main Menu. Next select **<Upload>** but do not depress **<Enter>**. Next, click on the Download button in the TS1300A™ software to see the window to the right. Once, **Start** is clicked, the PC will wait approximately 20 seconds for data to arrive from the meter. At this time, depress the **Enter** button on the meter and data transfer should begin. Location numbers should begin cycling on both the meter and the PC to indicate a correct data transfer. The entire process takes approximately 1 ¼ minutes to complete.



Please consult the Black Box TS1300A™ software help menus for information regarding its proper installation, setup, and usage.

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TESTING



As mentioned earlier, there are two types of testing which can be performed with the TS1300A power meter, absolute and relative. Since absolute measurements were discussed earlier, emphasis will be placed on relative loss testing.

As always, clean all optical surfaces with alcohol wipes or the equivalent before testing. Also, screw the appropriate adapter cap on the meter before testing.

Loss testing specifically determines the amount of light which will be absorbed or scattered in a fiber link at a particular wavelength. Since these losses are wavelength dependent, it is necessary to have both a source and meter which can test the same wavelengths used in the final system.

Loss testing requires a power meter, a source, a connector coupling, and patch cords. Also found in the Black Box Light Source/Power Meter Kit is an in-depth testing procedure manual. Please refer to this manual for the proper set up of CCMQJs to test in accordance with the latest EIA/TIA criteria.

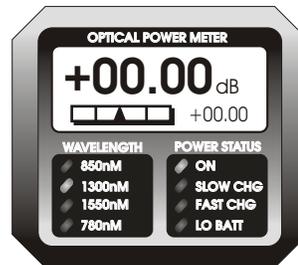
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TESTING OPERATION MODES



To verify that the optical power meter is in absolute (dBm) mode. Depress the REL button until the power level display indicates dBm as a unit of measure.

Reference the optical power level by depressing the REL button on the power meter. The display should indicate (+) or (-) 00.00dB as shown, below.



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POWER BASICS

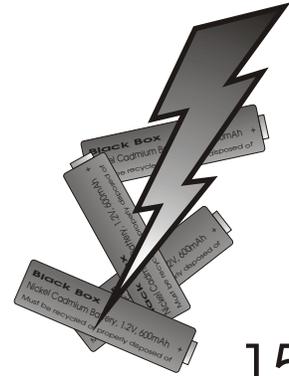


The **Black Box** power meter can be powered by AC wall pack, Nickel Cadmium batteries, or Alkaline batteries.

The unit uses 4 AA size cells (NiCd cells should be 800mAh type or better) which are mounted in the lower half of the meter enclosure. Although the included rechargeable cells rarely need changing under normal usage, they are easily replaced. To change the batteries, simply use a small flat blade screwdriver to loosen the two mounting screws which hold the bottom bumper in place. Next, gently pull the bumper off, and pull the exposed tab. Making note of which slot the holder is in, remove the battery holder. When installing new cells, make sure that they are seated well. Next, inspect the battery jumper to make sure it is selecting the type of battery installed.

WARNING: IF ALKALINE CELLS ARE USED, THE JUMPER MUST BE IN THE ALK POSITION!!

The jumper (J1) prevents the charging of alkaline cells. Although some protection exists, the charging of alkaline cells will create an explosion or fire hazard.



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POWER MODES



The **Black Box** meter power supply operates two different ways. If alkaline batteries are installed, the unit will draw its power from the batteries unless the AC power pack is connected. When the wall pack is connected, current will be drawn from the pack instead. Assuming that the battery board jumper is correctly set, no charging of the cells will take place.

If Nickel Cadmium rechargeable cells are installed, the internal power manager will behave differently. Battery only operation is the same as in the alkaline configuration but when the AC wall pack is connected, power is handled differently.

When first connected in NiCad mode, power from the AC wall pack is sent not only to the meter circuitry, but to the batteries as well. This is referred to as slow charge or trickle charging and is indicated by the SLOW CHG led on the front panel. Slow charging the batteries will generally take between 12 and 15 hours and provides a full, deep charge. Slow charging is by far the most popular method for recharging batteries due to its simplicity and depth of charge. It is also recommended by **Black Box** for general use. Sometimes, however, situations arise which require immediate use. In these cases, **Black Box** power meter owners can utilize the fast charge feature.

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POWER FAST CHARGE



Fast charging will not take place unless the NiCad position is selected on the battery board jumper, Nickel Cadmium batteries are installed, the AC wall pack is plugged in, the installed batteries are not completely dead, and the CHG button is pressed. Once fast charging is initiated, the batteries will charge until a "peak" charge has been reached or approximately one hour has passed. While charging, the SLOW CHG and FAST CHG leds will light and the enclosure may warm by a few degrees.

Special circumstances will impact fast charging. First, as mentioned, very dead batteries will need to be slow charged for a few minutes before the fast charger will turn on. This is to prevent damage to the cells. Secondly, after fast charging is finished, it cannot be re-initiated unless the AC power is removed and connected again. This reduces the likelihood of overcharging. Next, if the unit is very hot or very cold, bring the unit to within the recommended operating temperature before fast charging. The fast charger utilizes battery temperature fluctuations to determine peak charge and temperature extremes defeat the sensing circuitry. Finally, next to the jumper on the battery board, a 1A fuse protects the internal circuitry against short circuits. If the fuse is blown, the unit will not charge.

Fast charging will only charge batteries to about an 80% level before switching to slow charge to top the charge off. Overcharging or excessive fast charging may reduce battery life.

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■ TROUBLESHOOTING



METER DOES NOT TURN ON

- Check battery orientation and make sure installed fully (not popped up).
- Batteries extremely drained, slow charge for 5 min. and try again.

METER DOES NOT FAST CHARGE

- Blown Fuse.
- Battery board jumper not set correctly.
- Batteries extremely drained, slow charge for 5 min. and try again.
- Batteries fully charged (if FAST CHG led lights momentarily then turns off).
- Batteries installed incorrectly or dislocated from holder.

UNREADABLE DISPLAY

- Temperature out of recommended range.

POOR RUN TIME

- Old or aging batteries.
- Batteries not of AA 600mAh type.
- Batteries are too hot or cold or exposed to damaging conditions.

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■ TROUBLESHOOTING (CONT.)



INCORRECT OR UNSTABLE READINGS

- Adapter cap loose.
- Light unstable or modulating at less than 20Hz.
- Detector endface dirty or scratched.
- Fiber core size greater than 100uM.
- Connector not secured in adapter cap.
- Fiberoptic cable is moving or bending.

SOURCE DOES NOT TURN ON

- 9V battery is dead
- 9V battery installed backwards (battery should easily fit in holder)

IMPORTANT NOTICE!!!

The **Black Box** optical power meter and light source contain no user serviceable parts. Do not remove top bumper or otherwise remove circuitry from the enclosure. Doing so will not only alter unit calibration but will also void warranty!

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■ WARRANTY



These Black Box products are warranted for a period of two years from the date of purchase against defects in materials or workmanship. The obligation of Black Box is limited to the repair or replacement of the warranted product, only after such product is found to be defective by Black Box.

Damage caused by neglect, abuse, accidental or abnormal conditions, or improper installation (if applicable) are not covered by this warranty. *Unauthorized repairs or alterations to these warranted Black Box products will cause this warranty to be null and void.*

Black Box will not assume responsibility for loss of time, inconvenience, loss of use of these Black Box products, property damage caused by these Black Box products, or any other consequential or incidental damages.

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FEATURES Data Storage Features



The TS1300A™ power meter incorporates the following features:

DATA STORAGE- Data storage in relative or absolute mode depending upon menu selection. Storage accomplished by hitting Enter key and memory location selected with +/- keys on the side of the unit.

AUTOSENSE BACKLIGHT- The backlight will turn itself off to conserve battery life after a menu selected period of time if no keys are pressed or if the unit is not moved. As soon as a key is pressed or the unit is moved, the light will turn on.

AUTO POWER OFF- The meter checks the WV, REL, Enter, +, - buttons for activity. If they are not pressed after a menu selected period of time, the unit will automatically shut down to conserve battery life. Keep in mind that if this happens, the meter still remembers the last mode of operation and any references taken.

ENHANCED RELATIVE MODE- The relative (dB) mode of the model TS1300A includes an unaveraged +/-1dB tuning bar and mini-display to allow for splice and connector optimization.

WATTS MODE- The TS1300A allows the user to read power levels in watts. This mode is selected with the REL button. By depressing the REL button, the meter will cycle between dBm, dB, and watts modes.

2a

GETTING STARTED MAIN MENU



Upon power up, the Black Box meters will ask the user to depress the **Enter** button to view the main menu. If **Enter** is not pressed, the unit will go directly to measurement mode. The Main Menu allows the user to configure options such as backlight and auto power off times, relative or absolute data storage, and to clear or upload stored data. Options are selected by using the side panel + and - buttons and the item is changed or selected by depressing the **Enter** key. When ready to leave the Main Menu, select the **<Exit>** option and depress the **Enter** button.



Backlight	Backlight timer settings: Off, 1min, 5min, 10min, Always On
Auto-Off	Auto power off timer settings: Off, 5min, 10min, 30min
Auto-Inc	Auto increment data storage location after hitting Enter: On, Off
Logging Mode	Logged data type (meter will only store in this mode): Rel, Abs
<Clear Data>	Clear all 999x4 data locations when Enter is hit
<Upload>	Upload all 999x4 data locations to TS1300Atm Software when Enter is hit
<Exit>	Exit to measurement mode when Enter is hit

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