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## *BIDDLE® CFL800E*

- **30 ft to 9,000 ft (9 to 3000 m) TDR measurement ranges**
- **Automatic resistance bridge with measurement range up to 300,000 ft (100 km)**
- **Suitable for power, telecom, coaxial, and datacom cables**
- **Dust and waterproof to IP54**
- **Three-year warranty**
- **Uses standard AA cells**

# Hand-Held Cable Fault Locating and Verification Tester

## DESCRIPTION

The Biddle® CFL800E is a multifunction instrument combining several fundamental tests in one practical, field craft test set. Integrated voltage meter, insulation tester, time domain reflectometer and automatic resistance bridge, provide the test functions for basic cable verification and fault locating on twisted pair, quad and coaxial cables.

Traditionally, cable installers and splicers have been able to use time domain reflectometers (TDRs) to find cable features, impedance anomalies and low resistance faults only (<1000 Ω for telecom cable; <200 Ω for power cable). Additional pieces of test equipment have been required to more thoroughly test and verify performance of installed cable. Installers and splicers are then required to carry multiple instruments, learn multiple product interfaces, and make multiple cable connections to handle a single job. The CFL800E provides a more simple, practical approach that can address a wider range of cable verification and cable fault locating issues.

In TDR mode, cable features, low resistance cable faults and open circuits can be located up to 9,000 feet (3 km) away. Advanced features including pulse matching, pulse reflection amplification, and "Tx Null" facility ensure the CFL800E can locate the closest and most elusive faults.

In "BRDGE" mode, the CFL800E will locate high resistance faults (up to 20 MΩ) on a cable with total resistance of 2 kΩ. This equates to 60 miles (100 km) of cable length depending on conductor material and thickness. In addition to the automatic resistance bridge, the CFL800E has a built-in 100 V insulation tester. The insulation test range can be used to identify the existence and nature of cable faults, and to determine which wires within a cable are faulty. Loop resistance measurements can also be obtained while operating in the "BRDGE" mode of the CFL800E. Loop resistance measurements are used to qualify telecommunication cables for many digital services such as ISDN, HDSL or ADSL.

In "METER" mode, the ±250 V dc voltmeter range can be used to verify if a cable has a Telecom Network Voltage (TNV) present, and to measure the value and polarity of this voltage. A dc voltage measurement will also test balance on a cable pair and determine if either tip or ring is shorted or partially shorted to ground.

The CFL800E is a compact, ergonomically designed product, engineered for field use. As such it is housed in a tough, ABS flame-retardant housing and protected from the ingress of dust and moisture to IP54. Additionally, the product comes complete with a multi-purpose test and carry case designed for hands free, neck-strap and toolbelt use.

## APPLICATIONS

### TELEPHONY

The CFL800E is the ideal tool for the Subscriber Loop craftsperson. As a cable verification tool, existing cables can be pre-qualified for digital services such as ISDN, HDSL or ADSL. Signal attenuation and signal cancellation due to reflections, crosstalk, and random electrical noise from the surrounding environment can affect xDSL implementation. Common mode impairments are found on all loops. When a circuit has a problem with its balance to ground, common mode noise can become destructive differential noise. The voltmeter, TDR and bridge functions in the CFL800E can be used to perform balance checks and determine the potential effect on xDSL service.

Detect and remove load coils with the TDR capabilities of the CFL800E. Load coils were introduced on the analog local loop to lessen the effect of attenuation on the voice circuit. Load coils really only benefit voice quality lines since they are only effective for frequencies between 300 Hz and 3000 Hz. While flattening the attenuation in the voice band, load coils drastically increase the attenuation at higher frequencies. Digital technology such as ISDN, HDSL and ADSL all require higher frequencies to operate. Due to this fact, loading coils need to be removed to introduce digital service to a loop.

When cable failure impairs or interrupts service, the CFL800E becomes the first line of defense in uncovering and locating cable faults. Fault locating capabilities integrated into the CFL800E allow field personnel the ability to identify:

- Splice problems such as wet splices or high resistance splices
- Presence of water in cables
- Opens or shorts in the tip, ring and sheath

## OTHER APPLICATIONS

The integrated functions of the CFL800E make it ideal for the demanding applications encountered in CATV, LAN, and aircraft wire testing.

### CATV

The features offered in the CFL800E provide the ability to test cable integrity as well as locate faults and illegal subscribers. Specific cable conditions identified include:

- Bends or crimps in the cable
- Cuts or shorts in the cable
- Taps and splits
- Connectors and splices
- Water ingress
- Cable frays

### LOCAL AREA NETWORKS AND PREMISE WIRING SYSTEMS

When installing or designing LANs and premise wiring systems, proper cable length, cable balance and attenuation specifications are critical for optimum performance. The CFL800E tests and measures:

- Insulation resistance
- Loop resistance on twisted-pair cables
- Line balance
- Cable faults such as opens and shorts
- Defective connectors
- Kinks, bends or frays within a cable

### AIRCRAFT WIRING

The CFL800E performs the necessary tests to ensure the integrity of control and communication cable in aircraft. The unit will determine:

- Location of cable breaks or shorts
- Location of frays, kinks, or bends
- Insulation resistance of cables

## FEATURES AND BENEFITS

**Combined Resistance Bridge and TDR Fault Locator - Just One Box**

Conventional TDRs are only able to identify and locate cable faults that are either open or short circuits, or have a fault resistance below about 1000 Ω. Above this level of fault resistance, TDR technology fails as no significant reflection of the transmitted pulse occurs at the point of fault. The CFL800E contains additional Automatic Resistance Bridge circuitry that enables the product to accurately identify and locate faults with a fault resistance as high as 20 MΩ.

**Automatic Balance Resistance Bridge – Reduces Testing Time**

Conventional resistance bridge measuring instruments require the manual balancing of a galvanometer circuit by the operator, a time consuming, difficult and therefore costly process. The CFL800E contains advance automatic balancing circuitry to eliminate the need for operator balancing, dramatically reducing testing time and eliminating operator error.

**Multiple test functions - Determine how well a local loop can reject common mode noise.**

Signal attenuation and signal cancellation due to reflections, crosstalk, and random electrical noise from the surrounding environment can affect xDSL implementation. Common mode impairments are found on all loops. When a circuit has a problem with its balance to ground, common mode noise can become destructive differential noise. The voltmeter, TDR and bridge functions in the CFL800E can be used to perform balance checks and determine the potential effect on xDSL service.

**Built-in Insulation Tester – Determine if a fault exists and what type**

Normally before the process of cable verification can begin it is necessary for the individual doing the testing to identify whether there is a problem on the cable and to identify the nature and type of the fault. In other words what type of fault is it? Is it between conductors or is it an earth fault? To determine this a separate insulation resistance tester is generally used. With the CFL800E the insulation tester is built in, and thus eliminates the need for additional test instruments to be procured and carried.

**Built-in DC Voltmeter – Determine if the Line is Wet or Dry**

Generally, to ensure operator and network safety prior to commencement of any type of fault diagnosis or location process, it is important to ensure that the line is de-energized and disconnected from the "network." Also, when working on telecom systems the individual doing the fault locating may wish to measure the Telecom Network Voltage (TNV). For both of these applications the CFL800E has a built in DC voltmeter range, again eliminating the need for additional test instruments to be procured and carried.

**"TX Null" - Transmit Pulse Nulling - Eliminates the *"Dead Zone"***

Adjustment of the "TX Null" balance control in TDR mode ensures the swamping associated with the output pulse of the CFL800E is eliminated from the displayed waveform. Elimination of the transmitted pulse allows the reflection caused by a fault on a cable close to the point of test to be displayed. On TDRs without this facility, the transmit pulse obscures near end reflections making close in faults impossible to see.

**Auto Ranging around the Cursor Position**

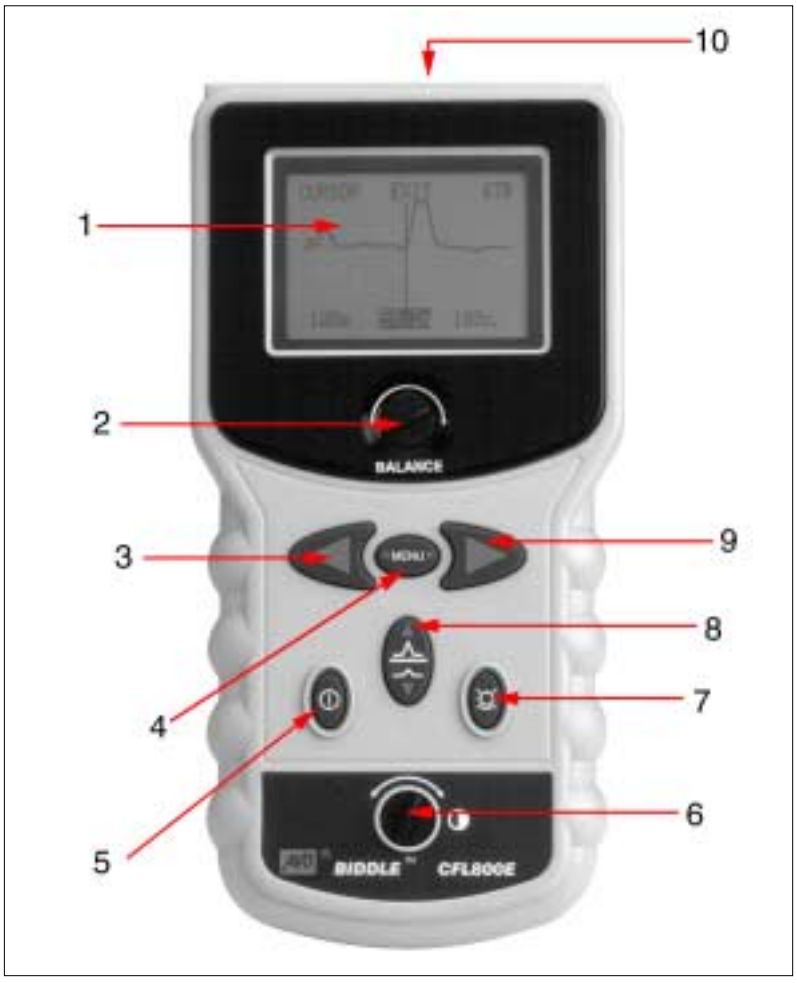
The CFL800E automatically adjusts the range around the cursor position to the lowest range for that position and selects the gain for that range (gain is then user adjustable). This feature ensures that the operator is viewing the fault condition on the lowest possible range (providing the most accurate fault location information).

**Reflection Amplitude Gain Control - Location and Identification**

In TDR mode the pulse detection circuitry gain is automatically set for the measurement range selected by the operator. Increasing amplitude enables weaker signals and distant faults to be identified. Decreasing the amplitude gain setting reduces noise and can assist in fault discrimination. The CFL800E has four selectable gain settings.

## CFL800E USER CONTROLS AND DISPLAY

| No. | Name | Main Menu | Voltmeter | Bridge | TDR |
|---|---|---|---|---|---|
| 1 | Display — 128 x 64 pixel | Shows current settings or measurement results relevant to the selected mode | | | |
| 2 | TX Null — rotating dial | N/A | N/A | N/A | Analog control to minimize output pulse |
| 3 | Cursor Left — Unidirectional push-button | N/A | N/A | Reduce selected value | Moves cursor left/ reduces selected value |
| 4 | Menu — Bidirectional push-button | Moves menu cursor left or right | Selects E to A or E to B or B to C and can select EXIT | Menu left/right control and option selector | Clockwise/counter-clockwise option selector |
| 5 | Power On/Off | Turns the instrument off | | | |
| 6 | Contrast | Analog control to correct the display contrast for extreme lighting conditions | | | |
| 7 | Backlight | Turns the instrument backlight On/Off | | | |
| 8 | Gain — Bidirectional push-button | Proceeds with selected MENU option | Proceeds with EXIT selection | Proceeds with selected MENU option | Increases/decreases Gain setting, confirm EXIT |
| 9 | Cursor Right — Unidirectional push-button | N/A | N/A | Increase selected value | Moves cursor right/ increases selected value |
| 10 | Output Sockets | Labeled E, A, B and C. Designed for the leads supplied with the instrument | | | |
| The The | Battery Cover | This is on the back of the instrument and provides the user with access to the batteries. *(Not Shown)*cover must not be removed while the instrument is on or connected to a cable. instrument must not be operated with the cover open. | | | |



## SPECIFICATIONS

Except where otherwise stated, this specification applies at an ambient temperature of -4° F (20° C).

### TDR

**Ranges**
30 ft, 90 ft, 300 ft, 900 ft, 3000 ft, 9,000 ft
(10 m, 30 m, 100 m, 300 m, 1 km, 3 km)

**Resolution**
1% of range

**Accuracy**
±1% of range ±pixel at 0.67 VF

**Voltage Measuring Range**
+/-250VDC +/-1% +/- 1digit

**Gain**
Set for each range with four user selectable steps

**Velocity Factor**
Variable from 0.30 to 0.99 in steps of 0.01

**Output pulse**
5 V peak to peak into open circuit

**Output Impedance**
100 Ω

**Balance Adjustment (TX Null)**
0 to 120 Ω

**Update Rate**
Once per second for five minutes after last key pressed

### BRIDGE

**Loop and Fault Resistance Ranges**
0 to 190 Ω in steps of 0.1 Ω
190 Ω to 2000 Ω in steps of 1 Ω

**Accuracy of Fault Reading**
±0.2% ±1 digit from 0 Ω to 1 MΩ
±0.2% ±3 digits from 1 MΩ to 5 MΩ
±0.2% ±6 digits from 5 MΩ to 10 MΩ

**Loop Reading**
±0.2% of reading ±1 digit on Ω

**Voltage to Line**
100 V dc nominal

**Current to Line**
100 µA dc nominal

**Insulation Range**
0 to 19 MΩ in steps of 0.01 MΩ
19 MΩ to 200 MΩ in steps of 0.1 MΩ

**Insulation Accuracy**
±0.2% of reading ±1 digit

### GENERAL

**Input Protection**
300 Vdc or 300 Vac ≤ 60 Hz

**Power Down**
Automatic after five minutes inactivity

**Backlight**
One minute when activated

**Batteries**
6 x LR6 (AA) nominal voltage 9 Vdc (alkali)
7.2 V (NiCd)

**Battery Consumption**
TDR Mode: 100 mA nominal, 140 mA with backlight

Bridge Mode: 50 mA nominal, 90 mA with backlight

Hours: 20/30 hours, depending on backlight use

**Safety**
Meets BS EN 61010-1: 1993 (including amendment 2: 1995-06), and
IEC 60950 3rd Edition: 1999-04 and rated for use on TNV-3 circuits.
*If it is to be used in situations where hazardous live voltages may be encountered, an additional blocking filter must be used.*

**EMC**
Complies with electromagnetic compatibility specification (light industrial) BS/EN50081-1-1992 BS/EN50082-1-1992

### MECHANICAL

**Case Dimensions**
9.05 H x 4.5 W x 1.88 D in.
(230 H x 115 W x 48 D mm)

**Instrument Weight**
1.32 lb (0.6 kg)

**Material**
ABS

**Connectors**
Four x 4 mm-safety terminals (E, A, B, and C)

**Lead**
6.5 ft (1.95 m)

**Display**
128 x 64 pixel graphic LCD

### ENVIRONMENTAL

**Operationing Temperature**
5° F to 122° F (-15° C to +50° C)

**Storage Temperature**
-4° F to +158° F (-20° C to +70° C)

## ORDERING INFORMATION

| Item | Cat. No. |
|---|---|
| BIDDLE® CFL800E Hand-Held Cable Fault Locating and Verification Tester | 655800E |
| **Included Accessories:** | |
| TDR bed of nails alligator test lead set | EV6231-653 |
| Bridge bed of nails alligator test lead set | EV6220-708 |
| Test and carry pouch | EV6420-128 |
| User guide | EV6172-512 |
| **Optional Accessories:** | |
| Mains blocking filter | EV6220-669 |