Tables

1. GENERAL

1.01 This manual is issued to provide information on the physical and functional features, operation, and specifications of Telecommunications Techniques Corporation's T-BERD 209 T-Carrier Analyzer.

1.02 This is the third issue of this manual. The second issue of this manual added information on the RS-232 Printer/Remote Control/Timing Slips Interface Option. This issue of the manual adds information on Auxiliary Functions.

1.03 The T-BERD 209 T-Carrier Analyzer is a portable test set designed for use during routine maintenance, installation, acceptance testing, and fault isolation of T1 and T1C transmission systems. Rugged, yet lightweight, the T-BERD 209 is packaged in a drawn aluminum case that allows storage for a power cord and accessory cables. Removing the T-BERD 209's cover reveals a front control panel that consists of a combination of multi-position rocker switches with adjacent LED indicators, color-coded alarm and status indicators, and a vacuum fluourescent display.

1.04 The T-BERD 209 is eminently suited for both central office and customer premise testing. In the central office, the T-BERD 209 may be used to generate and receive test patterns for out-of-service monitoring as well as to monitor T1 or T1C circuits without service interruption. At the customer premise, the instrument may be used to detect and isolate both customer-owned equipment problems and problems emanating from the span line; the T-BERD 209 may also be used to perform the tests required for initial circuit installation. With the T-BERD 209, no CSU is required for span line testing.

1.05 The T-BERD 209 features simplex current, signal level, timing slip, and recovered clock frequency measurements. Line buildout is selectable, and loopback codes are both generated and detected. The T-BERD 209 operates with D4, ESF (Extended Superframe), and SLC-96 framing patterns and is DACS (Digital Access Crossconnect Switches) compatible. An unframed mode permits compatibility with traditional KS-type test sets. Error measurements include logic, bipolar, and frame errors as well as associated error rate, errored second, and percent error-free seconds calculations. Signal loss and alarm conditions are continuously displayed, and a record of alarm conditions is maintained. An optional performance analysis package (per CCITT Recommendation G.821) provides severely errored second, degraded minute, unavailability, and availability measurements. An optional printer interface allows all test results to be output to a standard RS-232 printer; an optional printer/remote control interface additionally provides remote testing capabilities.

2. FUNCTIONAL DESCRIPTION

2.01 This section describes the T-BERD 209 T-Carrier Analyzer's various measurement capabilities. Also included are descriptions of the T-BERD 209's front panel switches, indicators, displays, and connectors; its side panel DIP switches and connectors; and the built-in reference card.

Operating Modes

2.02 The T-BERD 209 provides in-depth testing capabilities for T1 and T1C circuits. T1 modes include: (1) Unframed, for compatibility with existing test equipment on circuits where framing is not required; (2) Framed, for testing circuits which include multiplexers and Digital Access and Crossconnect Switches through which only framed data will pass; and (3) Test Loopback and Line Loopback, which simulate a CSU's loopback features and are useful when installing or troubleshooting T1 spans. T1 framing modes include D4, ESF, and SLC-96 data formats. There are two T1C modes, T1C and T1C TLB, which can be used for T1C link testing. An Auxiliary mode allows operating parameters to be set for which dedicated switches are not provided. A self-test mode is also provided.

Front Panel Switches, Indicators, and Connectors

2.03 The T-BERD 209 is operated through a variety of switches on its front panel and on the right side panel. The front panel features a combination of multi-position rocker switches, pushbutton switches, and LED indicators. Most of the multi-position switches feature adjacent LED indicators which are illuminated to indicate the current setting of the switch, and several of the pushbutton switches contain LED indicators within the switches that are illuminated under certain conditions. All of these features are described in subsequent paragraphs.

B. In-Warranty Service

6.08 Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in paragraph 6.12 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Customer Service Department. The RA number should then appear on all paperwork and be clearly marked on the outside of the equipment container.

6.09 After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

C. Out-of-Warranty Service

6.10 The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge of $75.00 applied to each request for out-of-warranty service. The $75.00 minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started, and a hard copy of the purchase order must be received by TTC before the repaired equipment may be shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

D. Equipment Return Instructions

6.11 To all equipment returned for repair, the customer should attach a tag that includes the following information.

(1) Owner's name and address.

(2) A list of the equipment being returned and the applicable serial number(s).

(3) A detailed description of the problem or service requested.

(4) The name and telephone number of the person to contact regarding questions about the repair.

(5) The Return Authorization (RA) number.

6.12 If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC-issued RA number of the outside of the package and ship it prepaid and insured to TTC.

7. SPECIFICATIONS

7.01 This section contains the specifications for the T-BERD 209 T-Carrier Analyzer.

7.02 Physical Characteristics.

- Size: 6"H x 13.5"W x 4.5"D (15.3 cm x 34.4 cm x 11.4 cm) including cover.
- Weight: 9.7 pounds (4.4 kg).

7.03 Operational Requirements.

- Operating Temperature Range: 32°F to 122°F (0°C to 50°C).
- Storage Temperature Range: -4°F to 158°F (-20°C to 70°C).
- Power: 115 VAC ±10%, 60 Hz.
- Fuse: 500 mA, 250V Metric (5mm X 20mm) Slow-blow; Littlefuse #218.500 or equivalent.

7.04 Input Specifications.

- Input Connectors: WECO 310 jack, bantam jack, and 15-pin network interface D connector.
- Input Frequency: T1—1544000 Hz ± 5000 Hz.
  T1C— 3152000 Hz ± 5000 Hz.
- Input Impedance: BRIDGE—1000 ohms or greater.
  TERM—100 ohms ±5%.
  DSX-MON—100 ohms ±5%.
- Operating Range: BRIDGE—+6 dBdsx to -24 dBdsx for T1, +6 dBdsx to -6 dBdsx for T1C. Automatic line buildout compensates for cable loss characteristics.

TERM— +6 dBdsx to -24 dBdsx for T1, +6 dBdsx to -6 dBdsx for T1C. Automatic line buildout compensates for cable loss characteristics.
DSX-MON— +6 dBdsx to -24 dBdsx for T1 or T1C. No automatic line buildout provided; flat loss compensation only.

7.05 Output Specifications.

- Output Connectors: Selectable line buildout in T1 of 0 dB, -7.5 dB, and -15 dB is provided on WECO 310 jack, bantam jack, and 15-pin network interface D connector. Three additional DSX-level 310 jack outputs are provided.
- Output Line Buildout Tolerance: ±1 dB attenuation at 772 kHz.
- Pulse Shape: With output terminated in 100 ohm resistive load and 0 dB line buildout selected, the T-BERD 209 meets pulse shape specifications given in CCITT Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and PUB62508; and AT&T PUB62411.
- Internal Oscillator Accuracy: ±5 ppm.
- Jitter Attenuation: Per Figure A-2 of AT&T PUB62411, October 1985 Revision.
- Line Codes: Bipolar (pseudoternary); switch-selectable AMI or B8ZS.

7.06 Front Panel Switches.

- Modes: T1, T1 D4, T1 ESF, T1 SLC, T1C, T1C TLB, T1 TLB, T1 LLB, SELF TST, AUX.
- Patterns: Fixed -ALL ONES, 1:1, 1:7, 3 IN 24, user-programmable 3-to 24-bit repeating pattern.
  Pseudorandom—T1-QRSS, T1C-QRSS, 2^{15}-1, 2^{20}-1, 2^{23}-1.
- Results: LOGIC—Bit errors, asynchronous errored seconds, bit error rate, error-free seconds, percent error-free seconds, synchronized errored seconds, out-of sync seconds, and pattern slips.
  BPV & FRAME—Violations, BPV seconds, BPV rate, frame errors, frame error rate, CRC errors, CRC errored seconds, CRC severely errored seconds, frame loss count, frame loss seconds, frame errored seconds, frame severely errored seconds.
  SIGNAL & TIME—Received frequency, received level (dBm), received level (dBdsx), simplex current, signal loss seconds, alarmed seconds, test length, test seconds, seconds until test end, elapsed time, clock time (with Printer Interface option), date (with Printer Interface option).
  Performance Analysis Option—Severely errored seconds, percent severely errored seconds, degraded minutes, percent degraded minutes, unavailable seconds, percent availability, consecutive severely errored seconds.
- Test Lengths: Timed or continuous.
- Timed Test Length: 1 minute to 200 hours, 59 minutes, in 15-seconds intervals. Factory setting is 15 minutes.
- Transmit Timing Selection: External, internal, recovered.
- Transmit Codes: AMI, B8ZS.
- Error Insert: BPV—single or constant 10^n rate.
  Logic—single or constant 10^n rate.
- Receive Input: Bridge, Terminate, DSX-Monitor.
- Transmit Output Level: 0 dB, -7.5 dB, -15 dB.

7.07 Front Panel Indicators.

- Alarm Indicators: Signal Loss, Signal Loss History, Pattern Loss, Pattern Loss History, Frame Loss, Frame Loss History, Excess Zeros, Excess Zeros History, Yellow Alarm, Yellow Alarm History, All Ones, All Ones History, Power Loss History.
- Loop Code Indicators: Loop Up Detect, Loop Down Detect, TLB Detect, LLB Detect, Pre-Existing Loop, Loop Up Send, Loop Down Send.
- Error Insert Indicators: BPV Error Insert, Logic Error Insert.
- Status Indicators: T1 Pulses, T1C Pulses, Pattern Sync, B8ZS Detect, Display Hold.

7.08 Alarm Criteria.

- Signal Loss: 150 milliseconds without input pulses after valid frequency and level are detected.
- Pattern Sync Loss: 250 errors detected in 1000 or fewer bits.
- Frame Sync Loss: D4—2 out of 5 Ft bits in error.
  ESF—2 out of 5 frame bits in error.
  SLC—2 out of 5 Ft bits in error.
- Excess Zeros: 16 consecutive zeros in T1; 34 consecutive zeros in T1C.
- Yellow Alarm: D4—Bit 2 is a 0 for 255 consecutive channels.
  ESF—256 bits ±16 bits of a repetitive "1111111100000000" pattern received.
  SLC—Bit 2 is a 0 for 255 consecutive channels.
- All Ones: 1024 consecutive ones (1's) in unframed T1 or T1C signals; 128 consecutive ones (1's) for T1 framed modes.

7.09 Pattern Definition.

- ALL ONES: All Marks.
- 1:1 Alternating Mark and Space.
- 1:7 :One Mark and seven Spaces.
- 3 IN 24: 1000 1000 1000 0000 0000 0000.
- T1-QRSS: QRSS pattern (2^{20}-1 with zero suppression).
- 2^{15}-1: 2^{15}-1 bit pseudorandom.
- 2^{20}-1 and T1C-QRSS: 2^{20}-1 bit pseudorandom.
- 2^{23}-1: 2^{23}-1 bit pseudorandom.
- pgmpat-name: User defined pattern; factory setting is USER for a 1:3 pattern

7.10 Pattern Sync Detection Criteria.

- Fixed Patterns: 30 consecutive error-free bits.
- Pseudorandom Patterns: 30 + n consecutive error-free bits for a pattern length of 2^n-1. For QRSS, n = 20.

7.11 Loop Code Generation Patterns. The generated codes may be sent unframed or, when framing is selected, they may be sent either embedded between the framing bits or overwritten by the framing bits.

- CSU Loop Codes:Loop Up—repetitive "10000". Loop Down—repetitive "100."
- Facility Loop Codes: Loop Up—repetitive "1100". Loop Down—repetitive "1110".
- Programmable: 3- to 8-bit repeating code independently settable for Loop Up and Loop Down.

7.12 Loop Detect Criteria.

- Loop Up (CSU): DIP Switch 9 must be in the up (CSU) position and at least 187 error-free bits of a repetitive "10000" pattern must be received.
- Loop Down (CSU): DIP Switch 9 must be in the up (CSU) position and at least 185 error-free bits of a repetitive "100" pattern must be received.
- Loop Up (FACILITY): DIP Switch 9 must be in the down (FACILITY) position and at least 186 error-free bits of a repetitive "1100" pattern must be received.
- Loop Down (FACILITY): DIP Switch 9 must be in the down (FACILITY) position and at least 186 error-free bits of a repetitive "1110" pattern must be received.
- TLB: The voltage on Pin 8 of the 15-pin network interface D connector is positive with respect to Pin 7 and 15 mA or more current is detected between Pins 7 and 8.
- LLB: The voltage on Pin 7 or the 15-pin network interface D connector is positive with respect to Pin 8 and 15 mA or more current is detected between Pins 7 and 8.

7.13 Frequency Measurement.

- Accuracy: ±5 ppm.
- Resolution: 1 Hz.
- T1 Range: 1544000 Hz ± 5000 Hz
- T1C Range: 3152000 Hz ± 5000 Hz.

7.14 Level Measurement Capability. The designation dBdsx is a voltage measurement; a 3-volt base-to-peak signal is defined as 0 dBdsx. Measurements for dBm are available only when all ones is detected.

- dBdsx Level Range: +6 dBdsx to -35 dBdsx.
- dBdsx Level Accuracy: ±1 dB between +6 dBdsx and -10 Bdsx; ±2 dB between -10 dBdsx and -20 dBdsx; ±3 dB between -20 dBdsx and -35 dBdsx.
- dBdsx Resolution: 1 dB.
- dBm Level Range: ±23 dBm to -19 dBm.
- dBm Level Accuracy: ±1 dB between +23 dBm and +7 dBm; ±2 dB between +7 dBm and -3 dBm; ±3 dB between -3 dBm and -19 dBm.
- dBm Resolution: 1dB.
- Vp-p: This result is a voltage conversion of the dBdsx result.

7.15 Simplex Current Measurement.

- Range: 10 mA to 180 mA.
- Resolution: 1 mA.
- Accuracy: ±5%.
- Simplex Voltage Drop: 8.5 volts (nominal) at 60 mA.

7.16 External Clock BNC Input.

- Input Configuration: AC coupled. Outer conductor is signal ground; inner conductor is signal.
- AC Input Impedance: 50 ohms ±10 %.
- Sine-Wave Clock Waveform: 7 volts peak-to-peak minimum; 20 volts peak-to-peak maximum; 1.0 MHz minimum; 50% ±2% duty cycle.
- Square-wave Clock Waveform: 1 volt peak-to-peak minimum; 20 volts peak-to-peak maximum; 1.0 MHz minimum; 50% ±2% duty cycle.

7.17 Front Panel 15-Pin Female D-Subminiature Connector.

- Connector Pin Configuration: See Table 7.

Table 7
Front Panel Connector Pin Configuration

Pin Number	Name
1	TRANSMIT TIP
2, 4, 12	SIGNAL GROUND
3	RECEIVE TIP
5	NO CONNECTION
6	NO CONNECTION
7, 8	TLB, LLB DETECT
9	TRANSMIT RING
10	NO CONNECTION
11	RECEIVE RING
13	RESERVED FOR FUTURE USE
14	RESERVED FOR FUTURE USE

7.18 Optional RS-232 Printer or Printer/Remote Control Connection.

- Connector Pin Configuration: See Table 8.
- Character Format: 7 data bits (ASCII coding). Even, odd or no parity. 2 transmitted stop bits. Accepts 1 or more received stop bits.
- Baud Rates: 300, 1200, 2400, 4800.
- Terminator: CR, CRLF.
- Print Width: 20-column, 80-column.
- Connector Configuration: DCE.
- Connector: 25 pin female D-subminiature.

7.19 Grounding.

- Chassis and signal grounds isolated by 100 ohm, ½ watt resistor.
- Bantam and 310 jack sleeves connected to chassis ground.
- Power cord center ground pin connected to chassis ground.
- 25-pin D connector: Pin 1 to chassis ground. Pin 7 to signal ground.
- 15-pin D connector: Pins 2, 4, and 12 to signal ground.

Table 8
RS-232 Pin Configuration

PROT GND (Pin 1):	Connected to chassis ground.
TX DATA (Pin 2):	The T-BERD 209 receives data on this lead.
RCV DATA (Pin 3):	Data is transmitted by the T-BERD 209 on this lead.
RTS (Pin 4):	This lead is terminated by the T-BERD 209.
CTS (Pin 5):	This lead is driven to the ON state by the T-BERD 209 whenever it is ready to receive a command. This lead may be ignored by the controller if, before issuing commands, it waits for the return of a prompt character from the T-BERD signifying the completion of the previous command.
DSR (Pin 6):	This lead is driven to the ON state by the T-BERD 209 whenever it has power applied.
SIGNAL GROUND (Pin 7):	Connected to signal ground.
RLSD (Pin 8):	This lead is driven to the ON state by the T-BERD 209 whenever it has power applied.
SEC CTS (Pin 13) and SEC RCV DATA (Pin 16):	These leads provide + 12 (RS-232 ON) and -12 (RS-232 OFF) respectively, for use in strapping signaling leads ON and OFF.
DTR (Pin 20):	Data is output from the T-BERD 209 only when this line is held in the ON condition by the receiving device.

7.20 Optional Timing Slips Input.

- Input Connector: WECO 310 jack.
- Input Frequency: T1-1544.00 Hz ± 100 Hz.
- Input Impedance: 100 ohms ± 5%
- Operating Range: +6 dBdsx to -24 dBdsx.
- Attenuation Type: Resistive.

7.21 Optional Timing Slips Results.

- Timing Slip Resolution : 1 frame slip.
- Timing Slip Range: 9999 frame slips.
- Bar Graph Resolution: 16 bit slips.
- Bar Graph Range: ± 192 bit slips.
- Wheel Resolution: 1 bit slip.
- Timing Slip Printout Resolution: 1 frame slip.
- Timing Slip Print Range: 9999 frame slips.
- Bit Slip Printout Resolution: 1 bit slip.
- Bit Slip Printout Range: ± 192 bit slips.
- Slip Analysis Seconds Resolution: 1 second.
- Slip Analysis Seconds Range: 99999999 seconds.

8. OPTIONS AND ACCESSORIES

8.01 This section describes the various options and accessories that are available for use with the T-BERD 209.

Options

A. Performance Analysis Option

8.02 The Performance Analysis option (Option 001) is a factory-installed package which offers the user the following additional analysis results (based on specifications contained in CCITT Recommendation G.821): percent availability, unavailable seconds, degraded minutes, percent degraded minutes, severely errored seconds, and percent severely errored seconds. These results are discussed in more detail in the following paragraphs. Appendix A provides a general discussion of the CCITT specifications.

8.03 The Performance Analysis option splits total test time into two parts: (1) time for which the connection is deemed available; and (2) time for which the connection is deemed unavailable. When a test starts, it is considered to be available time. This period of available time terminates when the bit error rate (BER) in each second is worse than 1×10^{-3} for a period of 10 consecutive seconds. These 10 consecutive seconds are then considered to be unavailable time. During available time, the detection of the tenth consecutive severely errored second causes the count of unavailable seconds to be incremented by 10 and the number of available seconds to be decremented by 10. The period of unavailable time continues until 10 consecutive seconds with a BER better than 1×10^{-3} are detected. These 10 seconds are then considered to be a part of available time. Upon the detection of the tenth consecutive second with a BER better than 1×10^{-3}, the number of available seconds would increment by 10 and the unavailable seconds count would decrement by 10. A signal loss second and a pattern synchronization loss second are each considered to be a second with a BER worse than 1×10^{-3}.

8.04 The percent availability result is the ratio, expressed as a percentage, of the number of available seconds to the number of total test seconds. Available seconds are measured in the same manner as for the unavailable seconds result. Percent availability decreases when a period of unavailable time begins. If no unavailable seconds are counted during a test, the percent availability is "100.00%". If all test seconds are unavailable seconds, the result is "0.00%". Once unavailable seconds have been detected, the highest value that percent availability can have is "> 99.99%". At the other end of the scale, if at least 1 available second is counted, the minimum value is " < 0.01%". For all values of percent availability, the result format is "XX.YY%".

8.05 The degraded minutes result is the number of minutes during which the bit error rate is worse than 1×10^{-6}. The 1-minute intervals are derived by removing unavailable seconds and severely errored seconds from the total test time and then consecutively grouping the remaining seconds into blocks of 60.

8.06 The percent degraded minutes result is the ratio, expressed as a percentage, of degraded minutes to the number of available minutes. If no degraded minute is counted during a test, the percent degraded minutes is "0.00%". If all test minutes are degraded minutes, the result is "100.00%". Once a non-degraded minute has been detected, the highest value percent degraded minutes can have is " > 99.99%". At the other end of the scale, if at least 1 degraded minute is counted, the minimum value is " < 0.01%". For all values of percent degraded minutes, the result format is "XX.YY%".

8.07 The severely errored seconds result is the count of the number of seconds during which a bit error rate worse than 1×10^{-3} occurs within the available time. Signal loss

seconds and pattern synchronization loss seconds are considered as seconds with a bit error rate worse than 1 x 10⁻³. When unavailable time is declared, 10 seconds are subtracted from the severely errored seconds count.

8.08 The percent severely errored seconds result is the ratio, expressed as a percentage, of severely errored seconds to the number of available seconds. If no severely errored seconds are counted during a test, the percent severely errored seconds is "0.00%". If all test seconds are severely errored seconds, the result is "100.00%". Once a non-severely errored second has been detected, the highest value that percent severely errored seconds can have is " > 99.99%". At the other end of the scale, if at least 1 severely errored second is counted, the minimum value is " < 0.00%". For all values of percent severely errored seconds, the result format is "XX.YY%".

B. RS-232 Printer Interface Option (Model 30505-02)

8.09 The optional RS-232 Printer Control Interface installs in the front of the T-BERD 209 and allows the T-BERD to be connected to printers. This option is described in detail in Section 5.

C. RS-232 Printer/Remote Control Interface Option (Model 30505-01)

8.10 The optional RS-232 Printer/Remote Control Interface installs in the front of the T-BERD 209 and allows the T-BERD to be connected to printers, controllers, or terminals which have an RS-232 interface. This option is described in detail in Section 5.

D. RS-232 Printer/Remote/Slips Interface Option (Model 30554)

8.11 The optional RS-232 Printer/Remote/Slips Interface installs in the front of the T-BERD 209 and allows the T-BERD to be connected to printers, controllers, or terminals which have an RS-232 interface. The interface additionally features timing slip analysis capabilities. This option is described in detail in Section 5.

Accessories

8.12 Various accessories are offered for use with the T-BERD 209; these accessories are described in the following paragraphs. Contact TTC's Customer Service Department for ordering information.

A. Rack Mount (Model 10685)

8.13 The Rack Mount allows the T-BERD 209 to be mounted in a standard 19" equipment rack. The assembly requires 7" of vertical rack space. To install the T-BERD 209 in the rack mount, use the following procedure.

(1) Loosen but do not remove the four #6 screws that secure the rack mount's rear bracket to the rack mount tray. Slide the rear bracket to the back of the rack mount tray.

(2) Remove the T-BERD 209's cover. It is not necessary to remove the T-BERD's feet or handles.

(3) Lower the T-BERD through the top of the rack mount until it sits on the rack mount tray. Slide the T-BERD forward so that its front panel (including the handles) protrudes through the opening in the front of the rack mount. The strikes on the sides of the T-BERD will prevent it from being pulled through the opening. Ensure that the pull-out reference card is accessible and that it may be hinged down over the edge of the rack mount.

(4) Once the T-BERD is properly seated in the rack mount, slide the rack mount's rear bracket firmly against the T-BERD so that the T-BERD's four rear feet protrude through the designated holes in the bracket.

(5) Tighten the four #6 screws that were loosened in Step 1 to secure the T-BERD 209 in the rack mount.

B. Cables

8.14 The following is a list of the accessory cables that are available from TTC for use with the T-BERD 209.

Model	Description
10199	15-pin D to 15-pin D (10')
10420	310 plug to 310 plug (10')
10558	310 plug to alligator clips (10')
10559	310 plug to bantam plug (10')
10615	Bantam plug to bantam plug (10')
10648	Bantam plug to alligator clips (10')
10686	15-pin D to RJ45 (10')
40606	15-pin D to RJ48 (10')