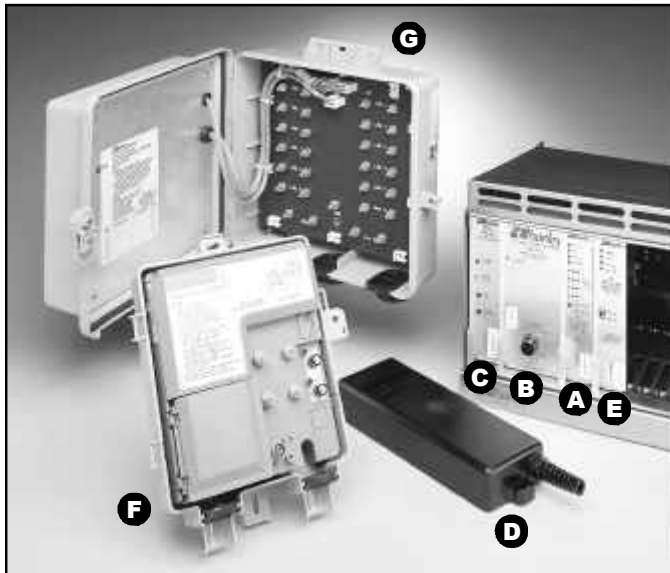


12:1 Multi-Line System™

12 lines over a single twisted pair: Expand customer service to a range of up to 100,000 ft. without the expense of installing new copper



The 12:1 Multi-Line System (or MDLC-12) multiplexes twelve 64 Kbps Clear channel POTS lines into a digital signal and transports this signal over a single twisted pair utilizing low power 2B1Q line coding. These POTS lines are demultiplexed along the DSL using Add/Drop (A/D) Units or at the end using either a Remote Terminal (RT) or a 2 line Add/Drop (A/DE) End Unit.

The 12:1 Multi-Line System transports CLASSSM services from a Central Office (CO) or remote location (i.e. CEV, hut) to the RT at the customer premise. DSL distances may be extended up to 198,000 ft. using the Express Power Line Card, Mid-Span, Local or Back Power options.

System Components

A Central Office Terminal (COT) Line Card

- Provides 12:1 Digital Pair-Gain (DPG)
- 2B1Q line coding
- Mounts in 200 series shelves
- LED indicators for power, alarms and add/drop synchronization
- Uses twisted pair infrastructure
- 4TEL, MLT or GR-909 line testing signatures
- NEBS level 3 compliant

B Power Supply

- Input to power supply is a -48V DC battery
- Powers up to five COT line cards
- 2 power supplies required per shelf for 10 DSLs
- DSL voltages available: $\pm 190V$, $\pm 130V$ or $\pm 100V$ DC

C Alarm Card

- One card per 200 series shelf
- Visual and audible status alarms
- Self-test function

D Pole / Wall / Pedestal Mount Repeater & Isolation Repeater

- Extends DSL distance up to 24,800 ft. on 19 AWG
- Line powered
- LED for sync indication
- Rugged design for use at -40° to $65^{\circ}C$ (-40 to $+149^{\circ}F$)
- Weather-tight housing
- Isolation Repeater required for Back Power configurations

E Express Power Card

- Extends DSL distance
- Application requires one Express Power Card per COT Line Card
- Rugged design for use at -40° to $65^{\circ}C$ (-40° to $+149^{\circ}F$)

F 2 Line Add/Drop (A/D) Unit 2 Line Add/Drop (A/DE) End Unit

- Power and sync LED indicators
- Line powered
- Can be used in Distributed or Hybrid configurations
- Supports up to 200 ohm drop lengths
- Extends DSL distance up to 24,800 ft. on 19 AWG
- Rugged design for use at -40° to $65^{\circ}C$ (-40° to $+149^{\circ}F$)

G Remote Terminal (RT) — RT12

- Drops up to 12 POTS lines
- Supports up to 200 or 400 ohm drop lengths
- Line and Express Power configurations
- Can be used in combination with Point-to-Point or Hybrid configurations
- Sync LED indicator
- Extends DSL distance up to 24,800 ft. on 19 AWG
- Rugged design for use at -40° to $65^{\circ}C$ (-40° to $+149^{\circ}F$)

System Components (continued)

H Remote Terminal Cabinet (RTC) — RTC12 & RTC24

- Line powered
- Drops up to 24 POTS lines
- Supports 200 or 400 ohm drop lengths
- Meets the environmental stressing sections of GR-487-CORE
- Houses up to two Mid-Span / Remote Terminal Power Supplies ($\pm 130V$) per cabinet
- Extends DSL distance up to 24,800 ft. on 19 AWG
- 3 options for extended reach applications:
 - Express Power
 - Local Power (requires BBU for lifeline service)
 - Back Power (requires BBU for lifeline service)
- Rugged design for use at -40° to $65^{\circ}C$ (-40° to $+149^{\circ}F$)
- Cable stubs available upon request



I Remote Terminal Power Supply (not pictured)

- Local and Back Power configurations require one power supply per DSL
- Input power from BBU or 115V AC
- Provides GR-1089 A2 protection
- Double-wide CS-239 size mechanics

J Battery Backup Unit (BBU) (not pictured)

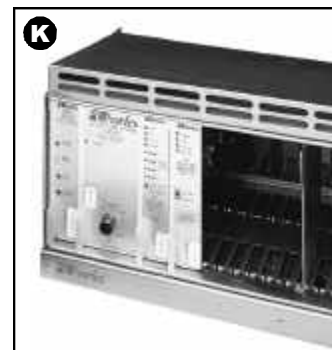
- 28 amp-hours @ 3.5 amps continuous backup service
- Meets the environmental stressing sections of GR-487-CORE
- LED indicators for proper operation, low battery and fault conditions
- Major and minor alarm reporting capabilities
- Analog meters for DC voltage and DC amperage status
- Rugged design for use at -40° to $65^{\circ}C$ (-40° to $+149^{\circ}F$)

K 200 Series Shelf and Baffle

- 23" DML 201 shelf; maximum 120 lines (13 slots, 10 COT line cards); uses 7" of vertical rack space (four rack units)
- 19" DML 205 shelf; maximum 84 lines (10 slots, 7 COT line cards); uses 7" of vertical rack space (four rack units)
- Baffles for 19" and 23" shelves; uses 1.75" of vertical rack space (one rack unit)

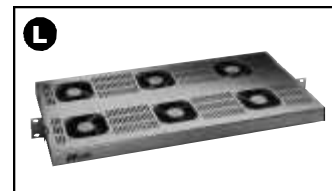
L 200 Series Fan Tray

- Fan trays for 19" and 23" shelves; uses 1.75" of vertical rack space (one rack unit)
- Fan trays feature 172 CFM output and quiet operation



Note:

Refer to DML201 or DML205 practices for recommended rack profile configurations



Electrical Specifications

System Loss in Each Direction of Transmission	3.5 ± 1.0 dB nominal
Frequency Response	With respect to the off hook transmission loss at 1004 Hz from a signal level of 0 dBm0, the loss at 400 Hz is within -0.5 and +3.0 dB, and the loss at 2800 Hz is within -0.5 and +1.0 dB.
Idle Channel Noise at output of COT Line Card	20 dBmC maximum
Channel Crosstalk	With 0 dBm0 single frequency input signals between 200 Hz and 3400 Hz applied to any line, the C-message weighted total output between 200 Hz and 3400 Hz from any other line less than -65 dBm0.
DC Supervisory Range	The Rdc for the COT is 100 ohms. Rdc is the maximum external loop resistance capability of the system.
Return Loss (Ref: 900 ohms +2.16 mF)	ERL > 18 dB; SRL > 10 dB
Ringling Frequency Response	15-35 Hz
Ringling Capacity	5 REN per line, 15 REN simultaneously
DSL Voltage	±190V, A3 safety (preset) ±130V, A2 safety ±100V, A2 safety
DSL Current (DSL ±190V)	47 mA (typical idle)
DSL Current (DSL ±130V)	60 mA (typical idle)
DSL Current (DSL ±100V)	65 mA (typical idle)
Compatibility	Compatible with V.34 modem speeds Replaces analog carrier systems 82A and CM8
Compliances	OSMINE compliant NEBS Level 3 certified (CO equipment) UL approved CSA certified

System Capabilities

Transmission Format	2B1Q, 800 Kbps full duplex
Channelization	12, 64 Kbps Clear channel POTS lines
Range of Digital Subscriber Line	Span Distance: 24 Kft on 19 AWG, 16 Kft on 22 AWG, 12 Kft on 24 AWG or 9 Kft on 26 AWG (per node segment). Attenuation loss of -36 db at 200 KHz per segment.
System Capacity	Up to 8 Nodes (Node: a repeater or an Add/Drop Unit). The maximum number of Add/Drop Units is 6 per system. The maximum number of repeaters is 7 per system.
Configuration Software	Configuration software is a planning tool that uses outside plant records to verify that system configuration, wire gauge and segment distance do not exceed pre-defined power limits.

Ordering Information

Minimum Requirements for a 12 Line System

Required Components:

- 12:1 COT Line Card
- 12:1 Shelf and Baffle
- 12:1 Fan Tray
- 12:1 COT Shelf Power Supply
- 12:1 Remote Terminal (RT) — several types available

Optional Components:

- 12:1 Alarm Card
- 12:1 Repeater
- 12:1 Isolation Repeater
- 12:1 Add/Drop (A/D) Unit
- 12:1 Add/Drop (A/DE) End Unit
- 12:1 Express Power Card
- 12:1 Remote Terminal Cabinet (RTC12), 12 POTS Lines
- 12:1 Remote Terminal Cabinet (RTC24), 24 POTS Lines
- 12:1 Remote Terminal Cabinet Power Supply
- 12:1 Battery Backup Unit (BBU)
- Configuration Software

Charles offers a variety of powering options ($\pm 190V$, $\pm 130V$, $\pm 100V$) as well as a wide array of signatures (4TEL, MLT, GR-398 and GR-909). For details on specific part numbers, contact your Charles sales representative or call (847) 806-6300 for more information.

Also available from Charles Industries:

DuaLine Plus™ (2:1) Digital Multi-Line System with D56K

QuadPOTS™ (4:1) Digital Multi-Line System

8:1 Digital Multi-Line System

High-Speed Voice and Data Link (HVDL 3:1) with TCPAM



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- Training courses available

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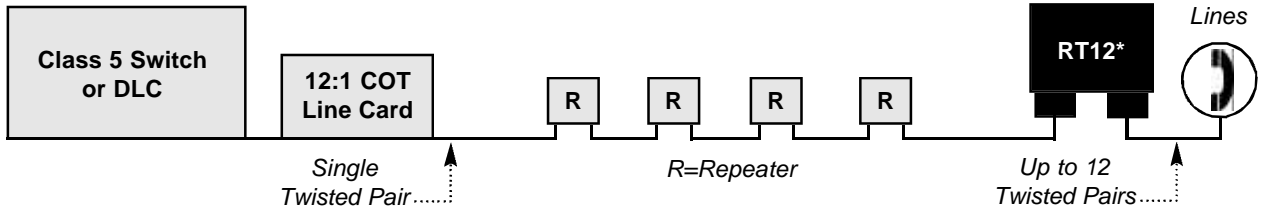
Alchemy™, HVDL 3.1™, 12:1 Multi-Line System™, 8:1 Multi-Line System™, QuadPOTS™, and DuaLine Plus™ are trademarks of Charles Industries, Ltd.

12:1 Multi-Line System™

Line Powered Configurations

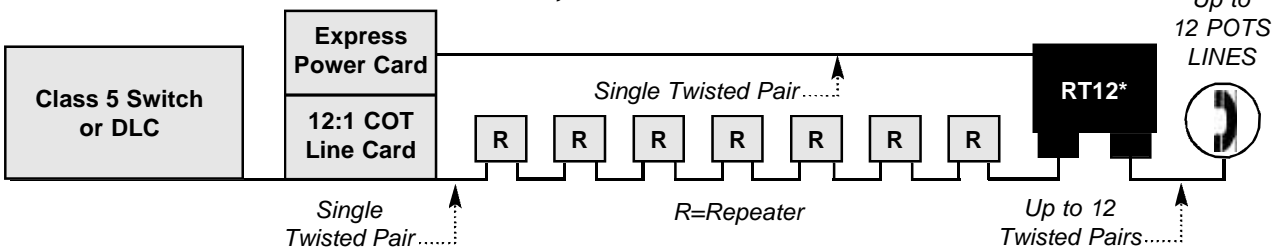
Point-to-Point: Line Power

104,800 ft. on 19 AWG @ 190V



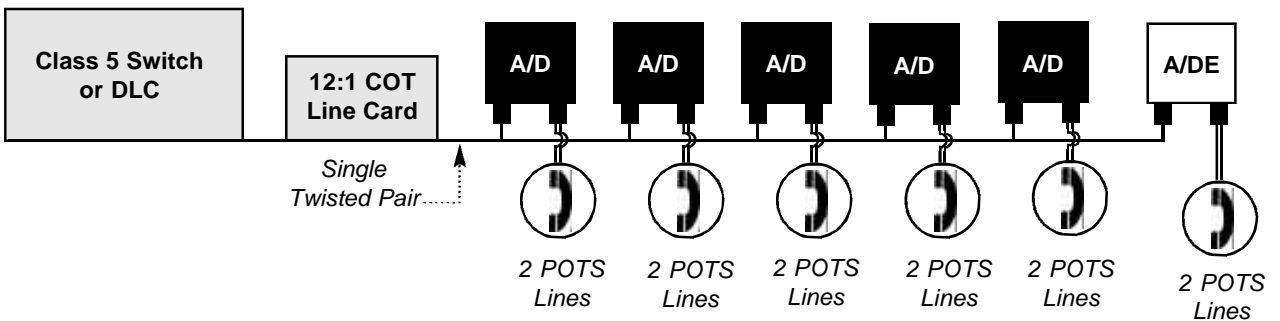
Point-to-Point: Express Power

180,000 ft. on 19 AWG @ 190V



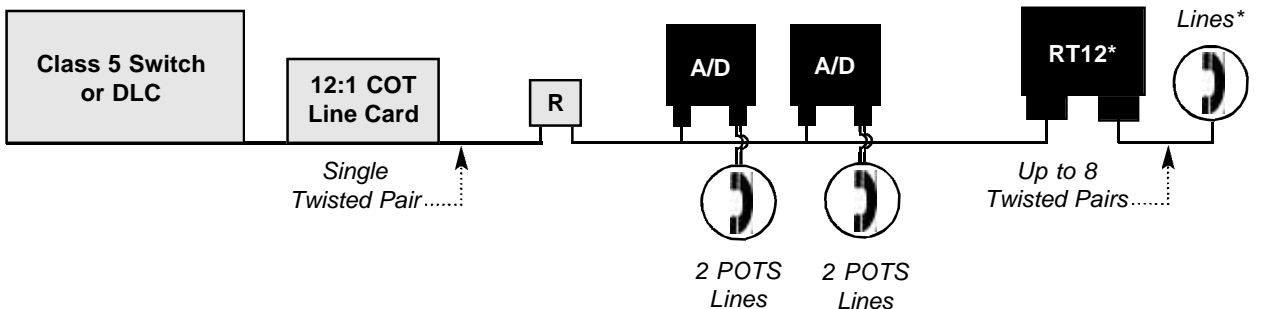
Distributed

132,100 ft. on 19 AWG @ 190V



Hybrid

95,000 ft. on 19 AWG @ 190V



Per Span Distance	19 AWG	22 AWG	24 AWG	26 AWG
Aerial	22,200	15,500	11,650	8,840
Buried	24,800	16,800	12,500	9,200

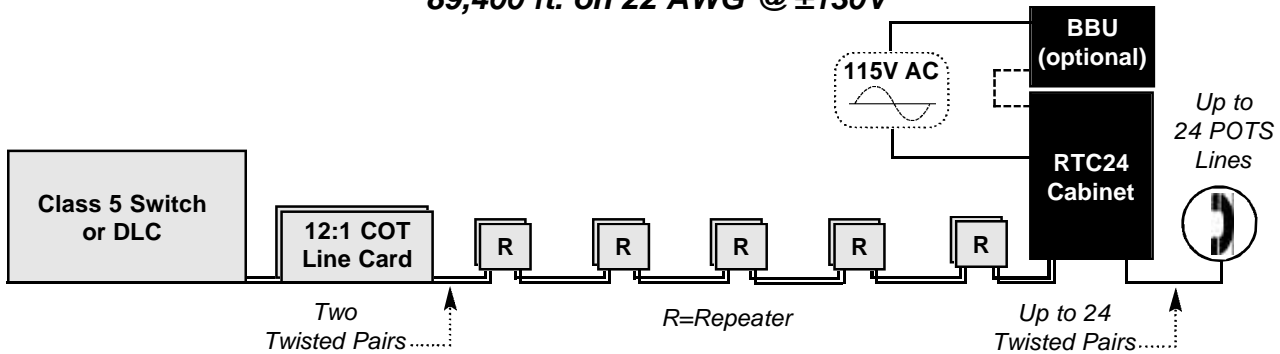
* An RTC12 Remote Terminal Cabinet can substitute for the RT12 Remote Terminal in this configuration.

12:1 Multi-Line System™

Supplemental Powered Configurations

Local Power

89,400 ft. on 22 AWG @ ±130V



Back Power

134,400 ft. on 22 AWG @ ±130V

