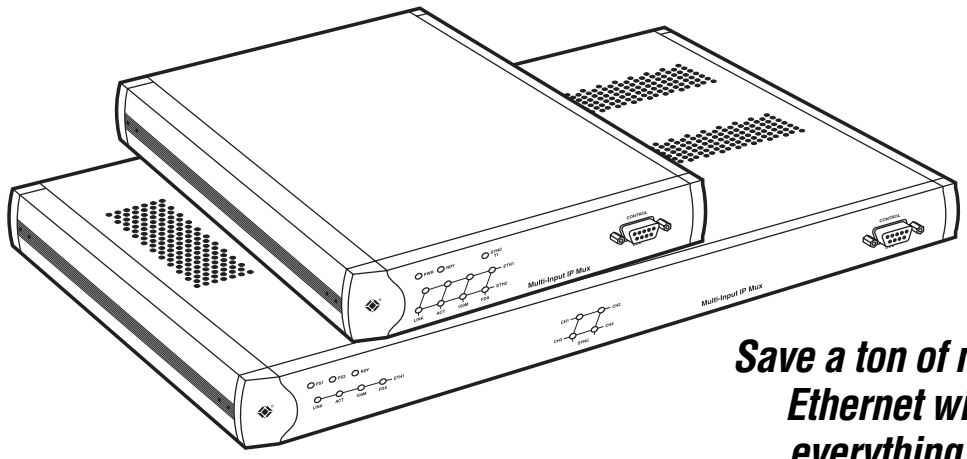
BLACK BOX® NETWORK SERVICES

MULTI-INPUT IP MUXES



Save a ton of money—migrate to Ethernet without upgrading everything in your system!

Key Features

- ***Inexpensively migrate to Ethernet.***
- ***Get more out of your legacy equipment without costly, across-the-board upgrades.***
- ***Use TDMoIP technology, which is much more versatile than VoIP.***
- ***Models available for T1, E1, FXS, and FXO.***
- ***Robust QoS support.***
- ***Full-featured network monitoring.***
- ***Three clocking methods.***

Our Multi-Input IP Muxes extend T1, E1, or Foreign Exchange Station/Foreign Exchange Office (FXS/FXO) services transparently over widely deployed IP networks. A Multi-Input IP Mux on the forwarding end takes a data stream at its T1, E1, or analog voice interface, divides it into fixed-size packets, and assigns an IP header to each packet. The packets are then sent to the Multi-Input IP Mux on the receiving end, where the headers are removed, the data stream is reconstructed, and the clock is regenerated before the data stream is sent to its destination.

Multi-Input IP Muxes also offer large buffers to compensate for network delays. They can be used to extend T1, E1, or POTS circuits over IP networks for metropolitan area network applications. All muxes feature a 10-/100-Mbps Ethernet port that operates at half- or full-duplex. This connectivity enables carriers and enterprises to migrate to Ethernet without discarding investments in legacy equipment, especially expensive PBXs.

Two models are available for T1, four for E1, and one model each for FXS or FXO connectivity.

All signals are GO at start-up.

You can configure and monitor Multi-Input IP Muxes locally via an ASCII terminal or remotely via Telnet. Upon startup, the muxes perform an internal built-in test (BIT), and the results of the test are visible at the local terminal. Multi-Input IP Muxes also feature end-to-end alarm generation and Alarm Indication Signal (AIS) indication.

Incredible packet-pushin' action.

With Multi-Input IP Muxes, packets are configurable! Plus these muxes can compensate for packet-delay variation (jitter) up to 300 msec in the network. High-performance buffering and forwarding techniques can reduce an end-to-end processing delay to as low as 3 msec.

The muxes' Quality of Service (QoS) support also enables you to give TDMoIP packets a higher priority when they're sent to network switches and routers. Models with a User Port feature an internal Layer 2 Ethernet switch that's transparent to LAN bridging. It enables rate limiting, VLAN tagging, and priority labeling according to 802.1p&Q.

Three o'clock rock of reliability.

Choose between internal, loopback, or adaptive clocking. These three methods maintain reliable synchronization between TDM devices. What's more, these muxes support standard IP features like PING, ARP, and next hop.

Which network environments benefit most from TDMoIP?

Actually, many network environments do. But how one environment benefits can greatly differ from how another one does. Here are several examples:

- **Utility companies** can use TDMoIP to achieve transparent connectivity between sites for legacy services.
- **Cellular operators** can reduce 2G access costs with TDMoIP while building IP networks for 3G migration.
- **Incumbent carriers** can use TDMoIP to maintain their investment in existing equipment and provide full legacy functionality over the packet-switched network. In turn, operational costs are reduced.
- **Metropolitan carriers** can optimize Ethernet for multiservice transport with TDMoIP.
- **Enterprises** can use TDMoIP to reduce network expenses by running all traffic over Ethernet.

Technically Speaking

TDMoIP is simpler and less expensive than VoIP, and it's a superior alternative in many other ways—especially in applications where the existing PBX functionality is all you need.

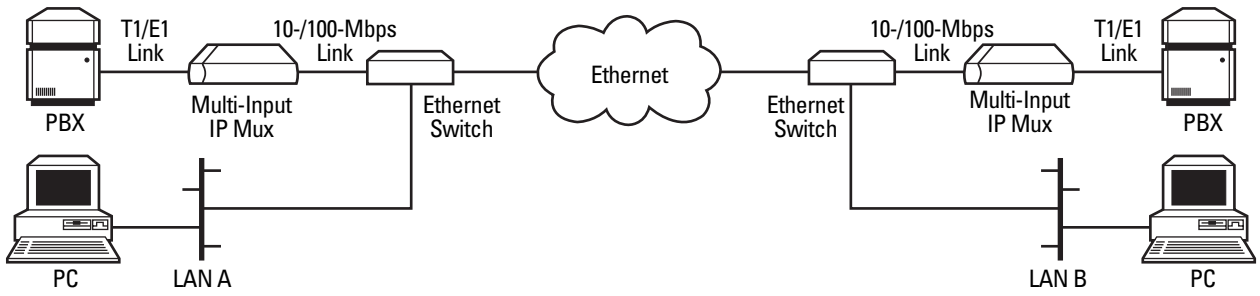
If voice communication is your chief concern, TDMoIP provides higher voice quality with much lower latency than VoIP. In addition, TDMoIP can support all applications that run over T1 circuits—not just voice—and that's something VoIP just can't do. Also, unlike VoIP, TDMoIP can provide traditional leased-line services over IP, and it's transparent to protocols and signaling.

Compared to VoIP, TDMoIP also has an evolutionary, not revolutionary, approach to migrating to IP or Ethernet. That way, your investment protection is maximized and you can get the most use out of legacy equipment. Last but not least, TDMoIP supports installed PBXs with no loss of functionality.

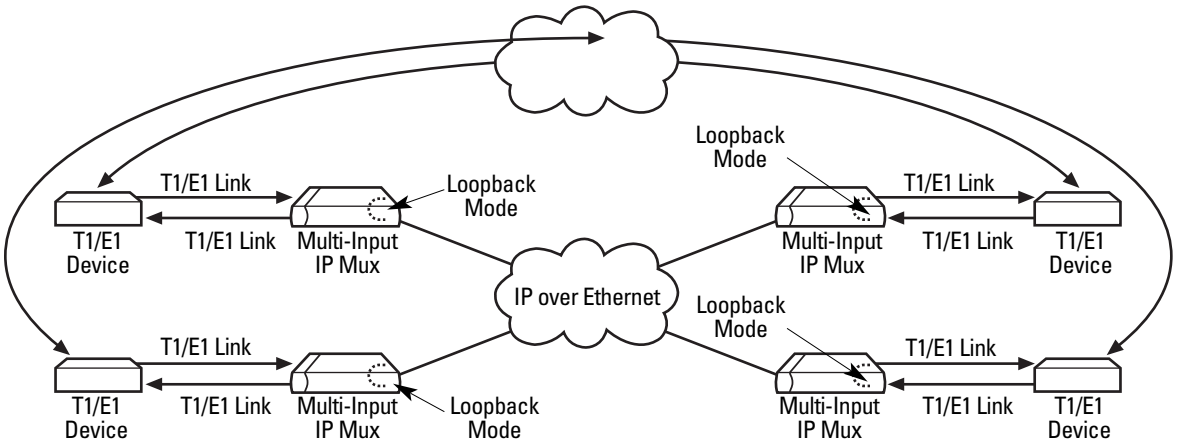
The chart **below** summarizes the key differences between TDMoIP and VoIP.

TDMoIP (TDM Transport over IP)	VoIP (IP Telephony)
Simple and evolutionary • Uses standard protocols, such as T1, E1, and IP. • Low cost of ownership.	**Complex and revolutionary** • Uses new and evolving protocols, like H.323, MGCP, and SIP. • Its complexity requires the retraining of IT staff.
Supports existing PBXs • That means a significant cost savings to you! • Little disruption to business.	**Forklift upgrade required (who wants to reinvent telephony?)** • You have to deal with costly upgrades and replacements. • Compatibility issues are also a problem.
Transparent to signaling and protocols • No loss of PBX functionality. • Superior voice quality. • Much lower latency.	**Translates between signaling formats** • Limited support for existing PBX features. • Long call setup times.
Configurable packet size • Minimizes delay. • Minimizes overhead.	**Packets depend on codec samples** • Longer delays as sample is recorded. • Overhead is required on each voice session.
Enables data, voice, and video extension • Bandwidth can handle a variety of applications.	**Primarily voice** • You've paid for all those upgrades, and you're mostly limited to a single type of application!
DS0-level bundling and cross-connect features	**Voice switching per call**

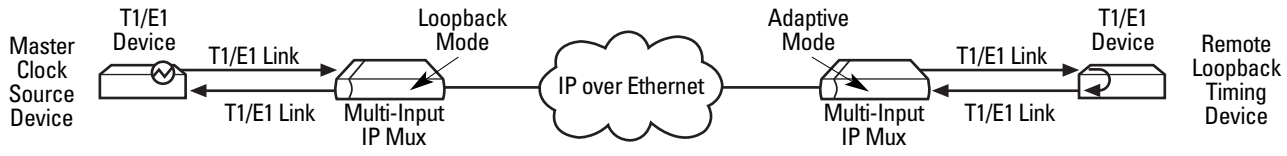
There are many applications for Multi-Input IP Muxes. Here are just a few.



Multiplex voice and data over an Ethernet trunk.



When the edges of the network are synchronized according to an external network clock source, all Multi-Input IP Muxes should be configured for loopback clocking to enable any-to-any connectivity.



When a common clock is not available on all the ends of the network, one Multi-Input IP Mux is configured to work in loopback mode while the other works in adaptive mode.

Why Buy From Black Box? Exceptional Value. Exceptional Tech Support. Period.

Recognize these situations?

- You wait more than 30 minutes to get through to a vendor's tech support.
- The so-called "tech" can't help you or gives you the wrong answer.
- You don't have a purchase order number and the tech refuses to help you.
- It's 9 p.m. and you need help, but your vendor's tech support line is closed.

According to a survey by Data Communications magazine, 90% of network managers surveyed say that getting the technical support they need is extremely important when choosing a vendor. But even though network managers pay anywhere from 10 to 20% of their overall purchase price for a basic service and support contract, the technical support and service they receive falls short of their expectations—and certainly isn't worth what they paid.

At Black Box, we guarantee the best value and the best support. You can even consult our Technical Support Experts before you buy if you need help selecting just the right component for your application.

Don't waste time and money—call Black Box today.

Specifications

Diagnostics: FXS and FXO models: Remote analog loopback, 1-kHz tone injection, activity status

Framing:
T1 models: Unframed, SF, ESF;
E1 models: Unframed, CRC4 with or without MF, CAS with or without MF

Line Code:
T1 models: AMI, B8ZS, B7ZS;
E1 models: HDB3

Line Impedance:
T1 models: Balanced: 100 ohms;
E1 models:
Balanced: 120 ohms (RJ-45 connector);
Unbalanced: 75 ohms (mini BNC F connectors)

Modulation Method:
FXS and FXO models: PCM (per ITU-T G.711 and AT&T® 43801), µ-Law or A-Law

Speed (Maximum):
Control interface: 57.6 kbps;
Ethernet interface: 10 or 100 Mbps, half- or full-duplex;
T1 interface: 1.544 Mbps;
E1 interface: 2.048 Mbps

Standards: Ethernet: IEEE 802.3, 802.3u, 802.1 p&Q;
T1: ANSI T1.403; AT&T TR-62411; ITU-T G.703, G.704, G.824

CE Approval: Yes

Connectors:
T1 models: (1) RJ-48C T1 port, (1) RJ-45 Ethernet network port; MT1051A: Also includes (1) RJ-45 Ethernet user port;
E1 models: (1) RJ-48C E1 port, (1) RJ-45 Ethernet network port; MT1051A-E1: Also includes (1) RJ-45 Ethernet user port;
E1 coax models: (2) mini BNC coax F, (1) RJ-45 Ethernet network port; MT1051A-E1-CX also includes (1) RJ-45 Ethernet user port (mini BNC to BNC adapter cables included);
FXS and FXO models: (4) RJ-11 FXS or FXO ports, (1) RJ-45 Ethernet network port;
All models: (1) DB9 F control port, RS-232 (DCE)

Operating Environment:
Temperature: 32 to 122°F (0 to 50°C);
Humidity: Up to 90% noncondensing

Power:
Autosensing 100 to 240 VAC, 60 to 50 Hz;
Consumption:
T1 and E1 models: 4 W or 10 W (with Ethernet switch);
FXS and FXO models: 25 W or 32 W (with Ethernet switch)

Size: T1 and E1 models: 1.75"H (1U) x 8.4"W x 9.7"D (4.4 x 21.3 x 24.6 cm);
FXS and FXO models: 1.75"H (1U) x 17"W x 9.7"D (4.4 x 43.2 x 24.6 cm)

Weight:
T1 and E1 models: 2.7 lb. (1.2 kg);
FXS and FXO models: 5.1 lb. (2.3 kg)

Ordering Information

ITEM	CODE
Multi-Input IP Muxes	
T1	
with Ethernet Network Port	MT1050A
with Ethernet Network Port + Ethernet User Port	MT1051A
E1	
with Ethernet Network Port	MT1050A-E1
with Ethernet Network Port + Ethernet User Port	MT1051A-E1
with Ethernet Network Port + Coax	MT1050A-E1-CX
with Ethernet Network Port + Ethernet User Port + Coax	MT1051A-E1-CX
FXS Ports + Ethernet Network Port	MT1052A
FXO Ports + Ethernet Network Port	MT1053A
To rackmount your mux, order…	
Multi-Input IP Mux Rackmount Kit	RM1050
For Ethernet connections:	
Category 5 Patch Cable, 100-MHz, 4-Pair, Straight-Pinned, PVC, Beige, 10-ft. (3-m)	EVMSL05
For T1/E1 connections:	
T1 Cable, Straight-Pinned, 10-ft. (3-m)	ETNMS01
For E1 coax connections:	
Coax Cable, RG59 PVC (CL2), 10-ft. (3-m)	ETN59-BNC
For FXS/FXO connections:	
RJ-11 (4-Wire) Modular Cable, Straight-Pinned, 7-ft. (2.1-m)	EL04MS-07
For the control interface:	
DB9 Extension Cable (with EMI/RFI Hoods), 10-ft. (3-m)	EDN12H-0010-MM