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Omnitron Systems Technology, Inc.

FlexCenter[™] 10

Flexible Workgroup Ethernet Hub

User Manual

27 Mauchly #201, Irvine, CA 92618 (714) 250-6510 Fax: (714) 250-6514

Safety Considerations

Warning

The operating description in this Instruction Manual is for use by qualified personnel only. To avoid electrical shock, do not perform any servicing of this unit other than that contained in the operating instructions, unless you are qualified and certified to do so by Omnitron Systems Technology, Inc.

Caution

All user-required operations can be performed without opening the unit. Never attempt to open or remove the cover or tamper with the unit or tamper with the power supply module.

Warranty

This **OST** product is warranted to the original purchaser against defects in material and workmanship for a period of **TWO YEARS** from the date of shipment. This warranty period may be extended to **LIFETIME** by the original purchaser if the product is **REGISTERED** with **OST** within 90 days from the date of shipment. TO REGISTER, PLEASE COMPLETE AND MAIL OR FAX BACK THE REGISTRATION CARD. During the warranty period, **OST** will, at its option, repair or replace a product which is proven to be defective.

For warranty service/repair, the product must be sent to an **OST** designated repair facility, shipment prepaid by the Buyer. **OST** will pay postage/shipping charges to return the product to Buyer (using **OST**'s standard shipping method).

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate use and/or maintenance of the equipment by Buyer, Buyer-supplied equipment, Buyer-supplied interfacing, unauthorized modifications or tampering with equipment (including removal of equipment cover by personnel not specifically authorized and certified by Omnitron), misuse, operating outside the environmental specification of the product (including but not limited to voltage, ambient temperature, radiation, unusual dust, etc.), or improper site preparation or maintenance.

No other warranty is expressed or implied. Omnitron specifically disclaims the implied warranties of merchantability and fitness for any particular purpose.

Exclusive Remedies

The remedies provided herein are the Buyer's sole and exclusive remedies. Omnitron shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any legal theory.

FCC Warning

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Any changes or modifications not expressly approved by the manufacturer could void the user authority to operate the equipment.

Form:040-04100-002 9/03

I	Protocol:	IE
I	Interface Connectors:	
	Hub:	U
	10FL Module:	Fi
	10B2 Module:	C
I	Cable Types:	
	10Base-T UTP:	C
	MM fiber:	50
	SM fiber:	9/

10Base-2 Coax: Supported Distances: 10Base-T UTP: MM 850 nm fiber: MM 1300 nm fiber: SM 1300 nm fiber: Coax: Indicators:

> Hub: Power: Collision: Jabber: UTP Link / Receive:

UTP Partition 10FL Module: Fiber Link: Fiber Receive: 10B2 Module: Coax Link: Coax Receive: Coax Partition

- Switches: Hub: UTP Crossover: 10B2 Module: Coax Termination:
- Dimensions / Weight:
- Power:
- Environmental: Temperature: Humidity:

EEE 802.3, 10Base-T, 10Base-FL, 10Base-2 ITP: (12/24) RJ45 pins 1-2, 3-6 active iber: (1) ST coax: (1) BNC

Categories 3, 4, 5 (EIA/TIA 568) 50/125, 62.5/125, 100/140 um 9/125 um 50 ohm, RG-58A/U, RG-58C/U, RG-58/U or equivalent

100 m / 328 ft. 2 km / 1.2 mi. / 6,560 ft. 2 km / 1.2 mi. / 6,560 ft. 2 km / 1.2 mi. / 6,560 ft. 185 m / 606 ft.

LED (1), Yellow, power applied LED (1), Yellow, collision detected LED (1), Red, jabber condition LED (12/24), Green: device present - solid data received - blinking LED (12/24), Red, port partitioned

LED (1), Green, device detected LED (1), Green, data received

LED (1), Green, device detected LED (1), Green, data received LED (12/24), Red, port partitioned

Straight / Crossed

50 Ohm In / Out W:19.0"xD:7.0"xH:1.75" / 7 lb. 110 / 230 VAC, 50 / 60 Hz

0 to 40 degrees C 0-90% (non-condensing)

TECHNICAL SUPPORT

If you encounter problems in installing this product, contact Omnitron Technical Support:

Phone:	(714) 250-6510	
Fax:	(714) 250-6514	
Address:	Omnitron Systems Technology, Inc.	
	27 Mauchly, #201	
	Irvine, CA 92618 USA	
Email:	support@omnitron-systems.com	
URL:	www.omnitron-systems.com	

Application 6. Multiple fiber backbone

This case depicts three 10Base-T hubs interconnected using two fiber segments. The collision rule is met (4-3-0) while restricting each fiber segment to 500 m. A detailed calculation reveals (not provided here) that a total budget of 3,250 m of fiber is available which would allow for instance for one of the fibers to be at 2 km while the other could be 1,250 m.



Application 7. Switched fiber backbone

This application depicts a switched fiber backbone with the FlexCenter hubs and the FlexPoint 10FL/T converters providing the fiber connectivity. Each "branch" segment radiating from the switch is a separate "collision domain" and the collision rules apply to each one independent of any other. Each one of the branching LANs meets the collision rule (3-2-0).



FlexCenter 10 Flexible Workgroup Ethernet Hub User Manual

GENERAL DESCRIPTION

The FlexCenter 10 is a 12/24 port 10Base-T flexible workgroup Ethernet hub repeater. It features two optional interface modules capable of uplink interface to multimode and single-mode fiber or coax devices or hubs.

This User's Manual describes the following models:

<u>Description</u>
12 Port 10Base-T hub, rack-mountable.
12 Port 10Base-T hub, stackable.
24 Port 10Base-T hub, rack-mountable.
24 Port 10Base-T hub, stackable.

The following modules are supported by the FlexCenter 10:

Model	Description
4110	10Base-FL Fiber uplink module, multimode, 850nm.
4111	10Base-FL Fiber uplink module, single-mode, 1300nm.
4112	10Base-FL Fiber uplink module, multimode, 1300nm.
4120	10Base-2 Coax uplink module.

The FlexCeiver's 12/24 RJ45 ports provide 10Base-T interface to category 3 or higher unshielded twisted pair (UTP) wiring. Its fiber interface modules provide 10Base-FL multimode and single-mode ST connectivity options for a variety of applications. Its coax interface module provides BNC 10Base-2 interface capability.

Being a smart repeater, the FlexCenter monitors and reports port activity. It detects operational devices connected and displays their connection via a per port green "Activity" LED. When sensing received data, the "Activity" LED starts blinking. If a port violates transmission rules, it is disconnected automatically (partitioned) and a red "Partition" LED displays the error status. The port is reconnected only after normal behavior is restored; at that time the LED is turned off.

The hub detects and corrects polarity reversals in UTP wiring. It also detects and displays collisions using a yellow "Collision" LED. Jabber conditions are displayed using a red "Jabber" LED.

The FlexCenter features a special uplink RJ45 connector. This uplink connector is equipped with a cross-over switch that can switch between the receiving and transmitting wire pairs. This feature eliminates the need for a "Crossed Cable" which is otherwise required when connecting between hubs.

The fiber modules feature ST fiber connections and provide "Link" activity LED, "Receiving" LED and a "Partition" LED.

The coax module features a coax BNC connector and provides "Receiving" and "Partitioned" LED displays. It also provides a switch selectable termination element which eliminates the need for an external termination resistor when connecting at the end of a coax line.

CONTROLS AND INDICATORS

FlexCenter 10 Mainframe:

Port 1 Control Switch

<u>Position</u>	Description
Left	Straight, use when connecting port 1 to a PC or workstation.
Right	Crossed-Over, use when connecting port 1 to another hub.

Common LEDs Display

Function	Color/State	Description
Power	Yellow / ON	Power applied
Jabber	Red / ON	Jabber condition detected
Collision	Yellow / ON	Collision condition detected

Per Port LEDs Display

Function	Color/State	<u>Description</u>
Link	Green / ON	Operational device detected at the far end of
		the UTP.
Rx	Green / Blink	Received data on UTP line.
Par	Red / ON	Port partitioned due to illegal behavior.

FlexCenter 10FL Fiber Modules:

LEDs Display

Function	Color/State	Description
Link	Green / ON	Operational device detected at the far end of
		the UTP.
Rx	Green / Blink	Received data on UTP line.
Par	Red / ON	Port partitioned due to illegal behavior.



Application 5. Single fiber backbone

In this case, two buildings are connected using a 2 km fiber. The LAN in building A is interconnected via UTP and the LAN in building B is interconnected via coax. The collision rule is met (5-4-1) with a fiber distance limit at 500 m. A detailed calculation (not provided here) reveals that the 2 km fiber may be used.



Application 2. Midsize workgroup with fiber workstations

In this case two hubs are connected via uplink cables to a third hub. Six workstations are connected via fiber to the hubs. The longest collision path is between two stations connected to each of the lower hubs. In this case there are 4 segments, 3 repeaters and 0 shared segments (4-3-0). Therefore, limiting the fiber runs to 400 m satisfies the collision rule's requirements.



Application 3. Midsize workgroup with coax segments

In this case the FlexCenter provides the central connection point among the coax and UTP segments. Note that the coax lines are terminated by the hub's coax modules. The longest collision path is between any two stations: 2 segments, 1 repeater and 2 shared segments (2-1-2); the collision criteria is met.

	FlexCenter10
Terminator ds41003	Coax

Application 4. Shared and dedicated coax backbones

In these two cases, three wiring closets are connected via a coax backbone. In the first case, a coax is daisy-chained among the hubs. The maximum length of the coax segment is 185 m (606 ft.) and the collision rule is met (3-2-1). In the second case, by using two point to point coax segments the distance of each segment can reach 185 m (606 ft.). The collision rule is met (4-3-2).

FlexCenter 10B2 Coax Module:

Termination Switch

Position	Description
Left	Termination In; use when at the end of a coax line (an external termina-
	tor <u>MUST NOT</u> be connected.
Right	Termination Out; use when in any position except at the end of a coax
	line.

LEDs Display

Function Link	<u>Color/State</u> Green / ON	Description Operational device detected at the far end of
		the UTP.
Rx	Green / Blink	Received data on UTP line.
Par	Red / ON	Port partitioned due to illegal behavior.

SITE PREPARATION

The following are minimal physical location preparations needed:

- a. Power A power outlet should be available within 5 feet of the unit.
- b. Cabling The following cabling should be used:
 - 10Base-T / UTP Ideally the site should be cabled with category 5 wiring but a category 3 or better is acceptable to maximize performance (100 ohms, 24 AWG solid copper).
 - 2. 10Base-2 / coax Use an RG-58A/U, RG58C/U, RG58U or equivalent (50 ohms, BNC connector).
 - 10Base-FL / Fiber Use 50/125, 62.5/125 or 100/140 micron multimode fiber or 9/125 micron single-mode fiber.

UNPACKING

- a. Visual Inspection before unpacking, a visual inspection should be conducted in order to detect any physical damage to the equipment. Any evidence of damage should be noted and reported immediately.
- b. Unpacking place shipping container on a flat surface, cut straps or tape, open top. Take out each item carefully and place securely on a clean flat surface. Return all packing material into container (foam, boxes etc.), close and store away for future reuse.
- c. Inspection Inspect each item for any apparent damage. Any evidence of damage should be noted and reported immediately.

INVENTORY

Review content; the following items should be included:

- (1) FlexCenter 10 unit.
- (1) Power cord.
- (1) User's Manual (this document).

In rack-mounted versions (models 4100 and 4102), the rack mounting hardware may be an integral part of the FlexCenter's chassis or it may be included separately:

(1) Mounting ears kit.

Please note any missing items or discrepancies and report them immediately.

INSTALLATION

Cabling and Power-Up

- a. Plug the power cord into the FlexCenter10 and the other side to the appropriate AC wall outlet. The unit power light should turn ON.
- b. Plug any Ethernet 10Base-T workstations into the RJ45 connectors. The corresponding Link LED should turn ON.
- c. Connect port 1 to a workstation or another hub. When connecting to a workstation set the Cross-Over switch to its left (Straight) position (factory setting). When connecting to another hub set the switch to the right (Crossed) position. When the device at the far end has become active, the port 1 Link LED should come ON.
- d. Connect any fiber uplink cables to a fiber workstation, converter or another fiber hub. Connect the Transmit (Tx) fiber of the FlexCenter to a Receive (Rx) fiber on the connected device. Connect the Receive (Rx) fiber of the FlexCenter to a transmit (Tx) fiber on the connected device.
- e. Connect any coax uplink cables. When connecting in the middle of a coax cable, use a "T" connector and set the Termination switch to the right (Termination Out) position (factory setting). When connecting the FlexCenter at the end of the coax line, connect the cable directly to the BNC connector and set the Termination switch to the left (Termination In) position.

APPLICATIONS

The 5-4-3 Collision Rule

Collisions are an inherent part of Ethernet. Since a sending station may transmit at any time, its transmission may collide with transmissions from other stations. When a collision is detected, the sending station backs off, waits awhile and attempts to retransmit again. This retransmission process is very efficient when performed by hardware. In a large network, if the delay between two stations is too long, a collision may occur without the sending station's hardware detecting it Typically, a software function detects the loss of the sent data and initiates a retransmission process. This retransmission process is very inefficient when performed by the IEEE 802.3 standard as a set of criteria that when followed, will ensure the detection of collisions by hardware. The following paragraphs summarizes the main criteria points.

The main criterion dictates that two stations (DTEs) should not be separated by more than 5 segments and 4 repeaters. When in the maximum configuration the following restrictions apply: (a) No more than 3 of the segments should be of shared (e.g. coax) type. (b) No fiber segment should exceed 500 m.

When two stations are separated by 4 segments and 3 repeaters the following restrictions apply: (a) Inter-repeater fiber segments should not exceed 1000 m. (b) Station to repeater segments should not exceed 400 m. There are no restrictions on using shared segments.

The 5-4-3 rule is an approximation. In large networks, or when specific distances are required, the reader is encouraged to use the IEEE 802.3 detailed calculation guidelines (not described here) or consult Omnitron's application engineering staff to assist in proper network design.

Application 1. Small workgroup

This application depicts a basic 10Base-T two-hub configuration. The hubs are connected via a straight-through UTP patch cable with one hub selecting the "crossed uplink" switch position. The 5-4-3 rule is met since only 3 segments, 2 repeaters and 0 shared media segments are used (3-2-0).

