

MiCOM H34x

Ethernet Switches

H34x/EN GL/B13

Global Documentation

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1. SAFETY & HANDLING

1.1 Introduction

This Safety Section and the relevant equipment documentation provide full information on safe handling, commissioning and testing of this equipment.

The technical data in this Safety Section is typical only, see the technical data section of the relevant equipment documentation for data specific to a particular equipment.



Before carrying out any work on the equipment the user should be familiar with the contents of this Safety Section and the ratings on the equipment's rating label.

Reference should be made to the external connection diagram before the equipment is installed, commissioned or serviced.

1.2 Health and safety

The information in the Safety Section of the equipment documentation is intended to ensure that equipment is properly installed and handled in order to maintain it in a safe condition.

It is assumed that everyone who will be associated with the equipment will be familiar with the contents of this Safety Section.

When electrical equipment is in operation, dangerous voltages will be present in certain parts of the equipment. Failure to observe warning notices, incorrect use, or improper use may endanger personnel and equipment and also cause personal injury or physical damage.

Before working on the equipment it must first be electrically isolated.

Proper and safe operation of the equipment depends on appropriate shipping and handling, proper storage, installation and commissioning, and on careful operation, maintenance and servicing. For this reason only qualified personnel may work on or operate the equipment.





Qualified personnel are individuals who:

- Are familiar with the installation, commissioning, and operation of the equipment and of the system to which it is being connected;
- Are trained in the care and use of safety apparatus in accordance with safety engineering practices;
- Are trained in emergency procedures (first aid).

The equipment documentation gives instructions for its installation, commissioning, and operation. However, the manuals cannot cover all conceivable circumstances or include detailed information on all topics. In the event of questions or specific problems, do not take any action without proper authorization. Contact the appropriate Schneider Electric technical sales office and request the necessary information.

1.3 Symbols

For safety reasons the following symbols which may be used on the equipment or referred to in the equipment documentation, should be understood before it is installed or commissioned.

	
Caution: refer to equipment documentation	Caution: risk of electric shock
	
Protective Conductor (*Earth) terminal	#Functional/Protective Conductor (*Earth) terminal
#Note: This symbol may also be used for a Protective Conductor (Earth) terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.	

*NOTE: THE TERM EARTH USED THROUGHOUT THIS TECHNICAL MANUAL IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

1.4 Installing, commissioning and servicing



Equipment connections

Personnel undertaking installation, commissioning or servicing work for this equipment should be aware of the correct working procedures to ensure safety.

The equipment documentation should be consulted before installing, commissioning, or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

Any disassembly of the equipment may expose parts at hazardous voltage, also electronic parts may be damaged if suitable electrostatic voltage discharge (ESD) precautions are not taken.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

The equipment must be connected in accordance with the appropriate connection diagram.

Protection Class I Equipment

- Before energizing the equipment it must be earthed using the protective conductor terminal, if provided, or the appropriate termination of the supply plug in the case of plug connected equipment.
- The protective conductor (earth) connection must not be removed since the protection against electric shock provided by the equipment would be lost.
- When the protective (earth) conductor terminal (PCT) is also used to terminate cable screens, etc., it is essential that the integrity of the protective (earth) conductor is checked after the addition or removal of such functional earth connections. For M4 stud PCTs the integrity of the protective (earth) connections should be ensured by use of a locknut or similar.

The recommended minimum protective conductor (earth) wire size is 2.5 mm² (3.3 mm² for North America) unless otherwise stated in the technical data section of the equipment documentation, or otherwise required by local or country wiring regulations.

The protective conductor (earth) connection must be low-inductance and as short as possible.

Before energizing the equipment, the following should be checked:

- Voltage rating/polarity (rating label/equipment documentation);
- Protective fuse rating;
- Integrity of the protective conductor (earth) connection (where applicable);
- Voltage rating of external wiring, applicable to the application.



Equipment use

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.



Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.



Insertion of modules and pcb cards

Modules and PCB cards must not be inserted into or withdrawn from the equipment whilst it is energized, since this may result in damage.



Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.



Cleaning

The equipment may be cleaned using a lint free cloth dampened with clean water, when no connections are energized. Contact fingers of test plugs are normally protected by petroleum jelly, which should not be removed.

1.5 De-commissioning and disposal



De-commissioning

The supply input (auxiliary) for the equipment may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the equipment (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to de-commissioning.



Disposal

It is recommended that incineration and disposal to water courses is avoided. The equipment should be disposed of in a safe manner. Any equipment containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of the equipment.

1.6 Technical specifications for safety

Unless otherwise stated in the equipment technical manual, the following data is applicable.

1.6.1 Protective fuse rating

The recommended maximum rating of the external protective fuse for equipments is 16A, high rupture capacity (HRC) Red Spot type NIT, or TIA, or equivalent. The protective fuse should be located as close to the unit as possible.

1.6.2 Protective class

IEC 60255-27: 2005
EN 60255-27: 2005

Class I (unless otherwise specified in the equipment documentation). This equipment requires a protective conductor (earth) connection to ensure user safety.

1.6.3 Installation category

IEC 60255-27: 2005
EN 60255-27: 2005

Installation category III (Overvoltage Category III):
Distribution level, fixed installation.

Equipment in this category is qualification tested at 5 kV peak, 1.2/50 μ s, 500 Ω , 0.5 J, between all supply circuits and earth and also between independent circuits.

1.6.4 Environment

The equipment is intended for indoor installation and use only. If it is required for use in an outdoor environment then it must be mounted in a specific cabinet or housing which will enable it to meet the requirements of IEC 60529 with the classification of degree of protection IP54 (dust and splashing water protected).

Pollution Degree - Pollution Degree 2
Altitude - Operation up to 2000m

Compliance is demonstrated by reference to safety standards.

IEC 60255-27:2005
EN 60255-27: 2005

1.7 Handling of Electronic Equipments

A person's normal movements can easily generate electrostatic potentials of several thousand volts.

Discharge of these voltages into semiconductor devices when handling circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of Schneider Electric products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practical protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken in order to preserve the high reliability and long life for which the equipment has been designed and manufactured.

Before removing a module, ensure that you are the same electrostatic potential as the equipment by touching the case.

1. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
2. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.

3. Place the module on an antistatic surface, or on a conducting surface, which is at the same potential as you.
4. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in IEC 60147-0F and BS5783.

If you are making measurements on the internal electronic circuitry of any equipment in service, it is preferable that you are earthen to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M Ohms. If a wrist strap is not available you should maintain regular contact with the case to prevent the build up of static. Instrumentations which may be used for making measurements should be earthen to the case whenever possible.

Schneider Electric strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in IEC 60147-0F or BS5783.

1.8 Packing and Unpacking

All MiCOM Hxxx devices are packaged separately in their own cartons and shipped inside outer packaging. Use special care when opening the cartons and unpacking the device, and do not use force. In addition, make sure to remove from the inside carton the supporting documents supplied with each individual device and the type identification label.

The design revision level of each module included with the device in its as-delivered condition can be determined from the list of components. This list should be carefully saved.

After unpacking the device, inspect it visually to make sure it is in proper mechanical condition.

If the MiCOM Hxxx device needs to be shipped, both inner and outer packaging must be used. If the original packaging is no longer available, make sure that packaging conforms to ISO 2248 specifications for a drop height $\leq 0.8\text{m}$ conforms to ISO 2248 specifications for a drop height $\leq 0.8\text{m}$.

1.9 Guarantees

The media on which you received Schneider Electric software is guaranteed not to fail executing programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. Schneider Electric will, at its option, repair or replace software media that do not execute programming instructions if Schneider Electric receive notice of such defects during the guaranty period. Schneider Electric does not guarantee that the operation of the software shall be uninterrupted or error free.

A Return Material Authorisation (RMA) number must be obtained from the factory and clearly marked on the package before any equipment acceptance for guarantee work. Schneider Electric will pay the shipping costs of returning to the owner parts, which are covered by warranty.

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Any application where a system failure would create a risk of harm to property or persons (including the risk of bodily injuries and death) should not be reliant solely upon one form of electronic system due to the risk of system failure to avoid damage, injury or death, the user or application designer must take reasonably steps to protect against system failure, including - but not limited - to back-up or shut-down mechanisms, not because end-user system is customised and differs from Schneider Electric testing platforms but also a user or application designer may use Schneider Electric products in combination with other products.

These actions cannot be evaluated or contemplated by Schneider Electric; Thus, the user or application designer is ultimately responsible for verifying and validating the suitability of Schneider Electric products whenever they are incorporated in a system or application, even without limitation of the appropriate design, process and safety levels of such system or application.

2. INTRODUCTION

MiCOM Ethernet range is designed to address the needs of a wide range of electric plant. Emphasis has been placed on strong compliance to standards, scalability, modularity and openness architecture.

These facilitate use in a range of applications from the most basic to the most demanding. They also ensure interoperability with existing components.

Schneider Electric philosophy is to provide a range of Ethernet products like switch that match all general requirements needed in electric substation: power supply, immunity to environmental constraints...

It provides also solutions to specific requirement like for example network redundancy management.

Each of these products can be used independently, or can be integrated to form a PACiS system, a Digital Control System (DCS) SCADA system.

2.1 MiCOM Switches

Driven by the requirements around the world for advanced applications in SCADA, Digital Control Systems, Automation, control and monitoring, Schneider Electric has designed and still develop a complete range of products that communicate via Ethernet links.

The specificity of electric plant leads to constraints that are rarely full-filled by standard Ethernet products : environmental, power supply, redundancy...

This new MiCOM range of Ethernet switch, the MiCOM Hxxx has been specially tailored for the PACiS system. The MiCOM Hxxx range is designed to address the needs of a wide range of installations, from small to large and customer applications.

2.2 MiCOM Ethernet Switch names

Basically the naming of Ethernet devices is composed of its mechanical arrangement and its number of port copper or optical.

- MiCOM H3xx DIN mounting case and power supply

2.3 MiCOM H34x

The MiCOM H34x range is composed of unmanaged switches, extremely easy to install and operate, designed to be implemented in electric plant environment (IEC 61000-4 & 60255-5).

On the media side, MiCOM H34x supports 10BaseT, 100BaseTX and 100BaseFX as specified by the IEEE 802.3 committee. With the full duplex and 100BaseTx or 100BaseFx communications, each port can provide theoretically a full 200 Mbps of data throughput (2 times in duplex the 100Mbps of one link).

The MiCOM H34x is plug and play devices. It can running with the factory setting. To adapt the switch to your application you simply configure using the jumpers the necessary parameters . No supervisory processor is requires to operate properly.

3. FUNCTIONAL DESCRIPTION

The MiCOM H34x is designed to be an Ethernet switch with its own power supply redundancy possible, compatible with the electric plant environment.

3.1 MiCOM H34x Range

The MiCOM H34x range is defined by the kind of Ethernet connection. All equipment of the MiCOM H34x range has 6 Copper connection through RJ45, with speed automatically adjusted from external emitters to 10 or 100 Mbps.

Copper Ethernet link is limited in distance and subject to perturbation. For long distance and higher noise immunity Ethernet optical ports are added to the range. One or two optical port can be added. To increase Ethernet link length the optical port can have a laser emitter in Mono Mode (or single Mode).

Model	Description
MiCOM H 340	Fast Ethernet industrial switch
MiCOM H 342	Fast Ethernet industrial switch Multimode 1300 nm
MiCOM H 344	Fast Ethernet industrial switch Single mode 1300 nm

3.2 MiCOM H34x functional composition

With example of MiCOM H342, the Ethernet switch is composed of the function blocs given below.

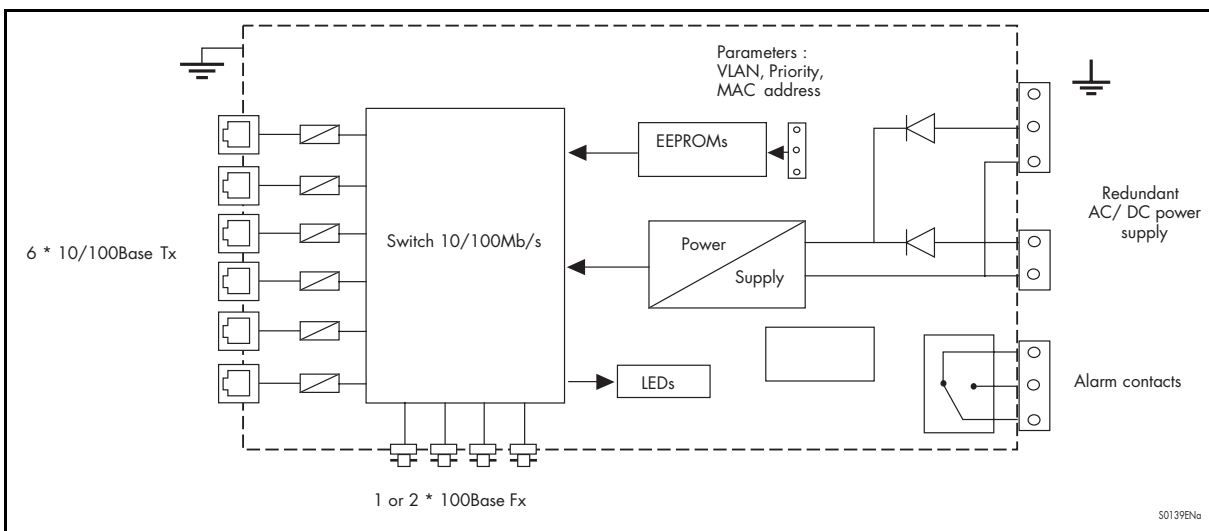


FIGURE 1 : MiCOM H342

The central part is composed by switching component managing up to 8 Ethernet links.

6 copper connection are defined in standard. 2 optional optic connection can be defined in the range.

LEDs and alarm contact are defined in standard to check that product operate correctly.

A inner power supply power the device with redundant DC input that support standard electric plant supply voltages.

3.3 Power management

If there is no cable on a port, most of the circuitry for that port is disabled to save power.

3.4 Ethernet Port Switching Features

MiCOM H34x determines automatically at message reception the speed of its transmission layer 10 or 100 Mbps MiCOM H34x adapts automatically itself to this transmission speed and other transmission parameters like half or full duplex.

3.4.1 10Base Tx and 100Base Tx

The copper ports are full/half duplex and auto-sense the transmission speed. They will auto-negotiate with the connected device to determinate the optimal speed. When the connected device is only capable of transmitting at 10Mbps, the MiCOM H34x follows the 10Mbps.

3.4.2 100Base Fx

The fibber optic ports are full/half duplex at 100Mbps only limited by . An external switch can select "half or full duplex" for the two optical ports.

3.5 Ethernet Management

3.5.1 Address look up (Branding evolution: MAC address range)

For MiCOM Switches Hxxx & SWx products, a range of MAC addresses are allocated.

By Schneider Electric, the new MAC address range is included on the domain from 00:80:F4:7A:43:00 to 00:80:F4:7A:FF:FF values. The Address Base is allocated with 00:80:F4 value.

The old MAC address range was included on the domain from 00:02:84:03:00:00 to 00:02:84:05:FF:FF values. The Address Base was allocated with 00:02:84 value.

Each Ethernet device inserts its unique "MAC address" into each message it send out. The port on the switch used for given MAC address is automatically learned when a frame is received from that address. Once an address is learned, the switch will route messages to only the appropriate port.

Up to 1024 MAC addresses can be stored and monitored at any time.

3.5.2 Buffering

An internal buffer is used for buffering the messages. There are 1024 buffers available. The factory setting mode adaptively allocates buffers up to 512 to a single port based loading.

3.5.3 Back off operation

The MiCOM H34x will drop a packet after 16 collisions (J factory setting).

3.5.4 Back pressure for half duplex

The MiCOM H34x will apply « back pressure » when necessary with half-duplex operation. This «back pressure » will reduce congestion on busy networks (J factory setting).

3.5.5 Broadcast storm protection

Broadcasts and multicasts are limited to 5% of the available bandwidth (J factory setting).

3.5.6 Auto Negotiation and Speed-Sensing

All six or eight RJ45 ports of the MiCOM H34x independently support auto negotiation for speeds in the 10BaseT and 100BaseTx modes. Operation is according to the IEEE 802.3u standard.

3.5.7 Forwarding

MiCOM H34x supports store and forward mode. MiCOM H34x will forward messages with know addresses out only the appropriate port. Messages with unknown addresses, broadcast messages and multicast messages will get forwarded out all ports except the source port. MiCOM H34x will not forward error packets, 802.3x pause frames or local paquets.

3.5.8 Priority tagging

802.1p priority is enabled on all ports. A 6 KB buffer is reserved for priority traffic.

3.5.8.1 Flow control

The MiCOM H34x automatically supports standard flow control frames on both the transmit and receive sides.

On the receive side, if MiCOM H34x receives a pause control frame it will not transmit the next normal frame until the timer, specified in the pause control frame, expires. If another pause frame is received before the current timer expires, the timer will be updated with the new value in the second pause frame. During this period (being flow controlled), only flow control packets from MiCOM H34x will be transmitted.

On the transmit side, MiCOM H34x has intelligent and efficient ways to determine when to invoke flow control. The flow control is based on availability of the system resources, including available buffers, available transmit queues and available receive queues. MiCOM H34x will flow control a port, which just received a packet, if the destination port resource is being used up. MiCOM H34x will issue a flow control frame (XOFF), containing the maximum pause time defined in IEEE standard 802.3x. A hysteresis feature is provided to prevent flow control mechanism from being activated and deactivated too many times.

MiCOM H34x will flow control all ports if the receive queue becomes full.

3.5.9 VLAN Operation

The VLAN's are setup by programming the VLAN Mask Registers in the EEPROM. The perspective of the VLAN is from the input port and which output ports it sees directly through the MiCOM H34x. For example if port 1 only participated in a VLAN with ports 2 and 9 then one would set bits 0 and 7 in register 13 (Port 1 VLAN Mask Register). Note that different ports can be setup independently.

An example of this would be where a router is connected to port 9 and each of the other ports would work autonomously. In this configuration ports 1 through 8 would only set the mask for port 9 and port 9 would set the mask for ports 1 through 8. In this way the router could see all ports and each of the other individual ports would only communicate with the router.

All multicast and broadcast frames adhere to the VLAN configuration. Unicast frame treatment is a function of register 2 bit 0. If this bit is set then unicast frames only see ports within their VLAN. If this bit is cleared unicast frames can traverse VLAN's. VLAN tags can be added or removed on a per port basis.

Further, there are provisions to specify the tag value to be inserted on a per port basis. The table below briefly summarizes VLAN features.

For more detailed settings see the EEPROM register description.

Register(s)	Bit(s)	Global / Port	Description
4-12	2	Port	Insert VLAN Tags – If specified, will add VLAN tags to frames without existing tags
4-12	1	Port	Strip VLAN Tags If specified, will remove VLAN tags from frames if they exist
2	0	Global	VLAN Enforcement – Allows unicast frames to adhere or ignore the VLAN configuration
13-21	7-0	Port	VLAN Mask Registers – Allows configuration of individual VLAN grouping.
22-39	7-0	Port	VLAN Tag Insertion Values – Specifies the VLAN tag to be inserted if enabled

4. TECHNICAL DATA

4.1 MiCOM H34x Range

Ports	10/100BaseTxCo pper	100 BaseFx Multi Mode	100 BaseFx Single Mode
MiCOM H340	6	-	-
MiCOM H342	6	-	2
MiCOM H344	6	-	2

4.2 Ethernet Port Characteristics

4.2.1 10/100BaseTx Port

Connector type	Shielded RJ45 jack
Twisted pair cable	Cat 5
Max cable length with Cat 5	100m

4.2.2 100BaseFx Multi Mode Port

Fibre port connector	ST
Optimal fibber cable	62,5/125 μ m
Center wavelength	1310 nm
TX output power	-19 dBm
RX input sensitivity	-31 dBm
Maximum distance	2000 m
Half or full Duplex	Switch selectable

4.2.3 100BaseFx Single or Mono Mode Port

Fibre port connector	SC
Optimal fibber cable	9/125 or 10/125 μ m
Center wavelength	1310 nm
TX output power	-15 dBm
RX input sensitivity	-34 dBm
Maximum distance	20 000 m
Half or full Duplex	Switch selectable

4.3 General Characteristics

4.3.1 Mechanical

Dimensions	W x H x D = 235 mm x 170 mm x 50 mm
Weight	1.3 Kg
Mounting	DIN Rail EN50022

4.3.2 Auxilliary Power Supply

Required supply voltage	24 V _{AC} or 24 V _{DC} 48 to 115 V _{AC} or 48 to 115 V _{DC} 150 to 250 V _{AC} or 150 to 230 V _{DC}
Power consumption	7,5W

4.3.3 Auxilliary Fault Relay

Connector	1 NC contact potential free
DC voltage	250 Vcc
Continuous current	5 Amps
Switching current	100 Amps / 30 ms
Power breaking with time constant	10 W under 48 Vcc with $\tau = 20$ ms

4.3.4 Ethernet Management

Standards	IEEE802.3, 802.3u, 802.3x, 802.1p
Forwarding mode	Store and forward
Memory bandwidth	2 Gbps
MAC Address	1K
Address learning	Automatic
Address life time	Remove old address after 300s
	Drops after 16 collisions
Back pressure	Automatic for half duplex
Broadcast storm protection	Limits to5% by strap
Illegal frame	Dropped per 802.3
Late collision	Dropped after 512 bit times
Latency	4 μ s measured at 75% load between two ports at 100Mbps

4.4 Environmental Characteristics

4.4.1 Electrical

Type Test Name	Conditions	Type Test Standard
Voltage tolerance	DC -20 to + 20% AC -20 to + 15%	IEC 60255-6
DC Supply interruption	30 & 60% for 100 ms	IEC 61000-4-29
AC Supply interruption	Level A	IEC 61000-4-11
AC Supply interruption Harmonic immunity	Level A	IEC 61000-4-13
Main frequency voltage	Level4	IEC 61000-4-16
Main frequency voltage	Level3	IEC 61000-4-17
Overcurrent protection	Non changeable fuse	

4.4.2 Isolation

Type Test Name	Conditions	Type Test Standard
Isolation between RJ45 ports	1,5 kV _{DC} for 1 minute	
Isolation between RJ45 ports to Aux. power	2 kV – 50 Hz for 1 minute	IEC 60255-5
Isolation between Ethernet port and housing	2 kV – 50 Hz for 1 minute	IEC 60255-5
Isolation between Aux. Power and housing	2 kV – 50 Hz for 1 minute	IEC 60255-5
Isolation between Aux. Power and relay	2 kV – 50 Hz for 1 minute	IEC 60255-5
Dielectric strength	2 kV – 50 Hz for 1 minute	IEC 60255-5
Insulation resistance	100 MΩ at 500 V	IEC 60255-5
Impulse voltage	5 kV common mode 1 kV differential mode	IEC 60255-5

4.4.3 Climatic

Type Test Name	Conditions	Type Test Standard
Damp Heat Test – Operating	Test Ca: +40°C / 48 h / 93% RH	IEC 60068-2-3
Cold Test - Operating	Test Ab: - 40°C / 96 H	IEC 60068-2-1
Cold Test - Storage	Test Ad: -40°C / 96h Powered On at -25°C (for information) Powered On at -40°C (for information)	IEC60068-2-1
Dry Heat Test – Operating	+ 70°C / 24 H	IEC 60068-2-2
Dry Heat Test – Storage	Test Bd: +85°C / 96h Powered On at +70°C	IEC 60068-2-1
Enclosure Protection	IP = 20	IEC 60529

4.4.4 ElectroMagnetic Compatibility

Type Test Name	Conditions	Type Test Standard
Electrostatic discharge	Class 4: 8kV contact / 15 kV air	IEC 60255-22-2 IEC 61000-4-2
Radio frequency impulse	Class 3: 10 V/m – 80 to 1000 MHz & spot tests 35 V/m – 25 to 1000 MHz	IEC 60255-22-3 IEC 61000-4-3 IEEE C37.90.2
Fast transient burst	Class 4: 4kV – 2.5kHz (CM)	IEC 60255-22-4 IEC 61000-4-4 IEEE C37.90.1
Surge Immunity	Class 4: 4kV (CM) – 2kV (DM)	IEC 61000-4-5
High frequency conducted immunity	Class 3: 10 V, 0.15 – 80 MHz	IEC 61000-4-6
Power Frequency Magnetic Field Immunity	Class 5: 100A/m for 1mn 1000A/m for 1s	IEC 61000-4-8
Damped oscillatory magnetic field immunity	Class 5: 100 kHz & 1 MHz – 100A/m	IEC 61000-4-10
Conducted emission	Gr. I, class A and B: from 0.15 to 30 MHz	EN 55022

4.4.5 Mechanical

Type Test Name	Conditions	Type Test Standard
Free Fall Test	2 falls of 5 cm (not powered)	IEC 60068-2-31
Free Fall Packaging Test	25 falls of 50 cm (Packaging)	IEC 60068-2-32
Vibration Response – Powered On	Class 2: Acceleration: 1g from 10 (1) to 150Hz	IEC 60255-21-1
Vibration Response – Not Powered On	Class 2: Acceleration: 2g from 10 (1) to 500Hz	IEC 60255-21-1
Vibration Endurance – Not Powered On	Class 2: Acceleration: 1g from 10 (1) to 500Hz	IEC 80068-2-6
Shocks – Not Powered On	Class 1: 15g, 11 ms	IEC 60255-21-2
Shocks – Powered On	Class 2: 10g, 11 ms	IEC 60255-21-2
Bump Test – Not Powered On	Class 1: 10g, 16ms, 2000/axis	IEC 60255-21-2
Seismic Test – Powered On	Class 2: Acceleration: 2g Displacement: 7,5mm upon axe H Acceleration: 1g Displacement: 3,5mm upon axe V	IEC 60255-21-3

5. HUMAN MACHINE INTERFACE

LEDs on the front panel are used to indicate the state of MiCOM H34x and of the links.

The table below indicates the function of each LED :

LED	Colour	Description	Comments
Power	GREEN OFF	Power is Applied Power is OFF	
Alarm	RED OFF	Optical link down or/and power supply fault No default	
Optical link	YELLOW OFF	Full duplex Half duplex	Not with MiCOM H340
Ports (Tx or Fx)	GREEN GREEN slow blink (~1s) GREEN fast blink OFF	Connected without activity Activity at 10 Mbps Activity at 100 Mbps No connection	

Upon power up the MiCOM H34x will go through a series of self-testing. The 6 "link LED" will flash a few seconds.

6. INSTALLATION

The MiCOM H34x can be easily mounted on a standard DIN Rail in horizontal position only.

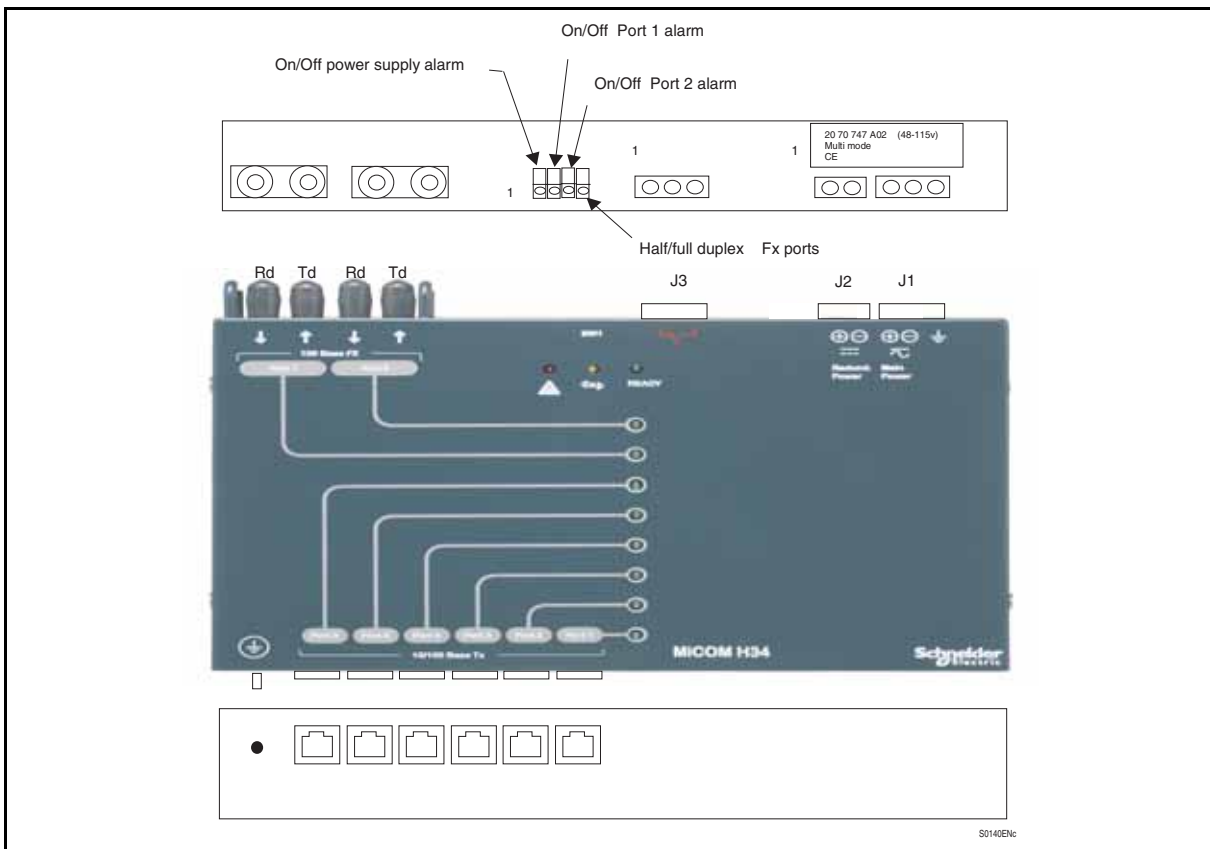


FIGURE 2 : MiCOM H34X MOUNTING

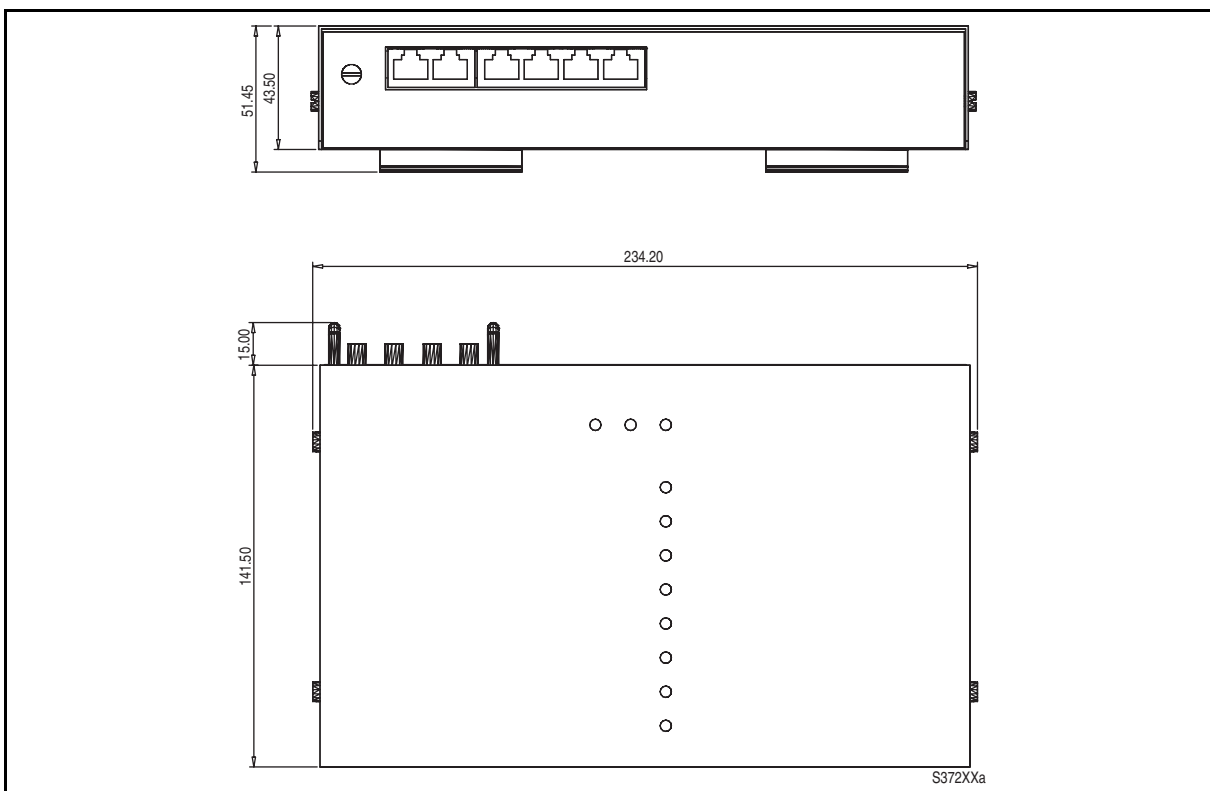


FIGURE 3 : MiCOM H34X DIMENSIONS

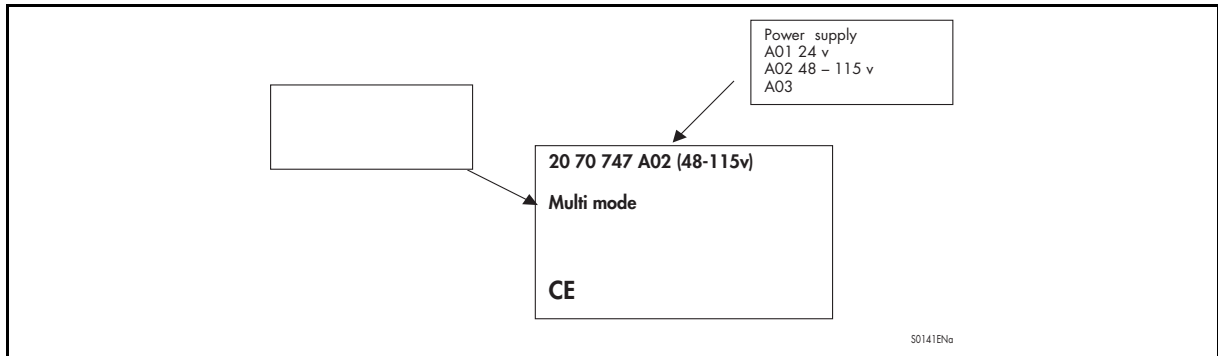
7. HARDWARE

7.1 Power Supply Label

On the upper face of the MiCOM H34x a rectangular label is displayed on top of MiCOM H34x behind Auxiliary Power input J1 J2. This stick is enlarged below.

Two major indications are given with :

- Axx the supported power supply
- Multi or Mono-mode for the kind of optical fibber supported.



8. CONNECTION

8.1 Power Wiring

Connection to the power supply (main and/or redundant) is done with screw type terminals 4 mm². The scheme is identical for AC and DC power.

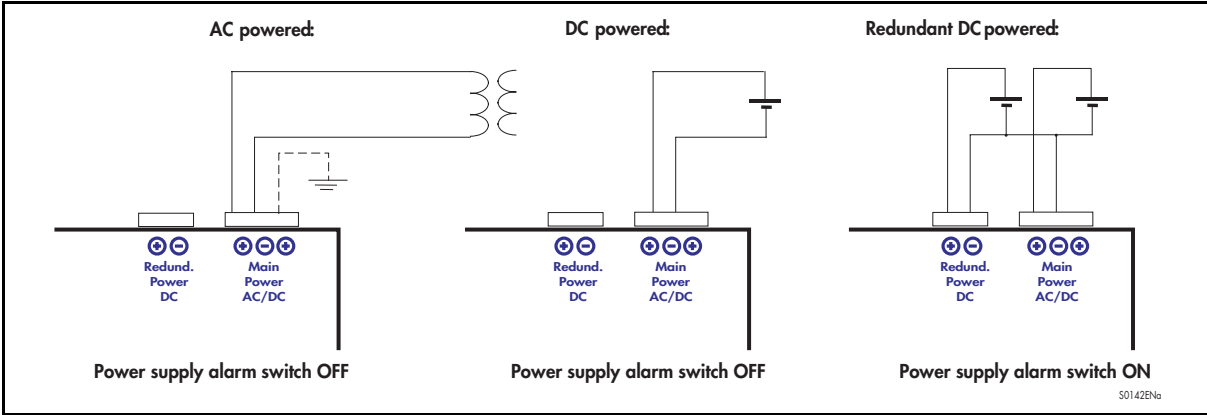


FIGURE 4 : POWER SUPPLY WIRING

8.2 Watch-dog contact

Screw type terminals 4 mm²

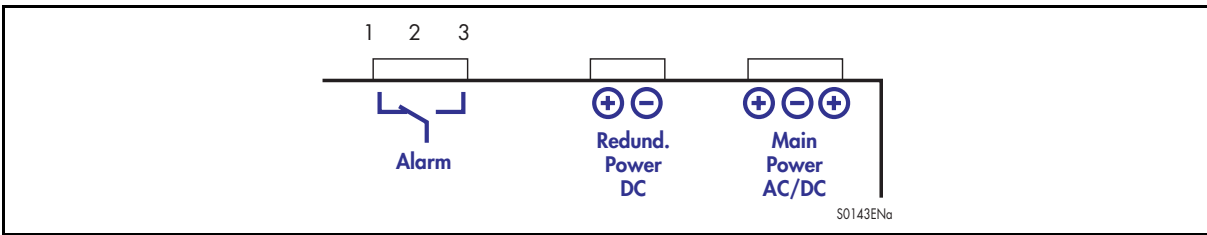


FIGURE 5 : WATCH-DOG WIRING

Default	Power supply	Port 1	Port 2	Contact 1-2	Contact 2-3
Power OFF	X	X	X	ON	OFF
Power 1 & 2 ON	ON	OFF	OFF	OFF	ON
Power 1 OFF	ON	OFF	OFF	ON	OFF
Power 2 OFF	ON	OFF	OFF	ON	ON
Port 1 OK	OFF	ON	OFF	OFF	ON
Port 1 NOK	OFF	ON	OFF	ON	OFF
Port 2 OK	OFF	OFF	ON	OFF	ON
Port 2 NOK	OFF	OFF	ON	ON	OFF

The 3 external jumpers can be on

The contact state is the "AND" of this table

8.3 Ethernet connection

The Ethernet-based communication available in the MiCOM H342 uses either fibre optic media or 4 pair twisted cable.

If equipment's are located at a long distance (>10 m for RS232, >100 m for RS422 and >1000 m for RS485) from the communication equipment or multiplexer or if the cables run through a noisy area, then optical communication should be used to interconnect the IEDs and the communication equipment.

8.3.1 Ethernet cable type

Only the cable insulated category 5 (FTP: Foil Twisted Pair) or insulated (STP - Shielded Twisted Pairs) with RJ45 connectors must be used.

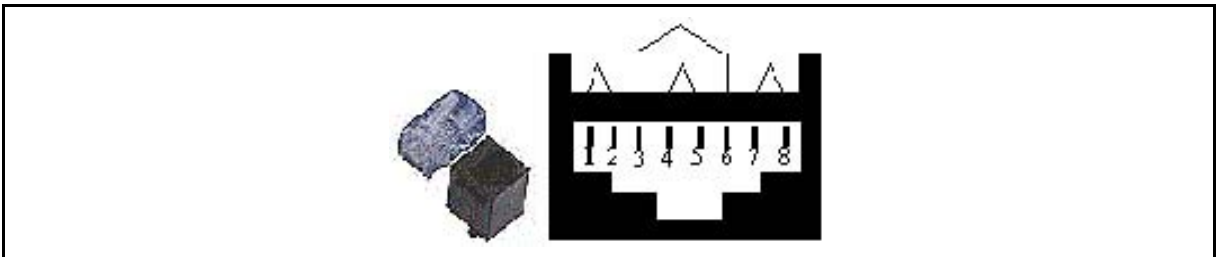


FIGURE 6 : RJ45 CONNECTOR

The norm is:

1 = white / orange

2 = orange

3 = white / green

4 = blue (non used)

5 = white / blue (non used)

6 = green

7 = white / brown (non used)

8 = brown (non used)

The RJ45 connector when seen face on, flat side on bottom, side tab on top, then pin 1 is on the left and pin 8 on the right.

The MiCOM H34x support star or tree network topology.

The maximum cable length for 10/100BaseTx is typically 100 meters.

8.3.2 Ethernet optical fibber

The FO cable are connected to the corresponding FO elements. The connector type for the multi mode fibber mode is ST.

The FO cable are connected to the corresponding FO elements. The connector type for the multi mode fibber mode is SC.

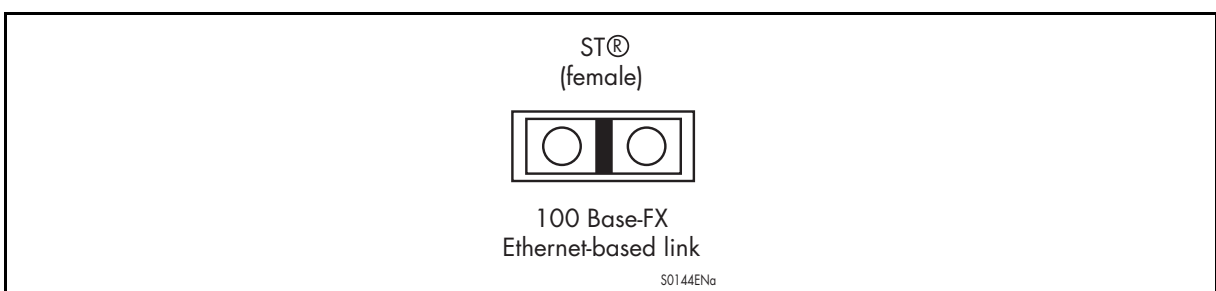


FIGURE 7 : ETHERNET OPTICAL FIBBER

9. SETTINGS

9.1 Internal Jumpers Meaning

Some jumpers are used to:

N°	Open	Closed
W1	No priority reserve	Enable 6KB priority buffer reserved
W2	Enable half duplex back pressure	Disable half duplex back pressure
W3	Max length is 1536 byte	Enable enforce the max frame length for VLAN is 1522
W4	Share buffers up to 512 buffers on a Single port	Enable equal amount of buffers per port (113 buffers)
W5	Unlimited broadcast frames	Enable 5% broadcast frame allowed
W6	Enable flow control	Disable flow control
W7	Continue sending frame regardless of number of collisions	Enable to drop frame after 16 collisions
W8	Enable more aggressive back-off	Enable less aggressive back-off
W9	Enable 802.1p selected by EEPROM	Enable 802.1p field for all port

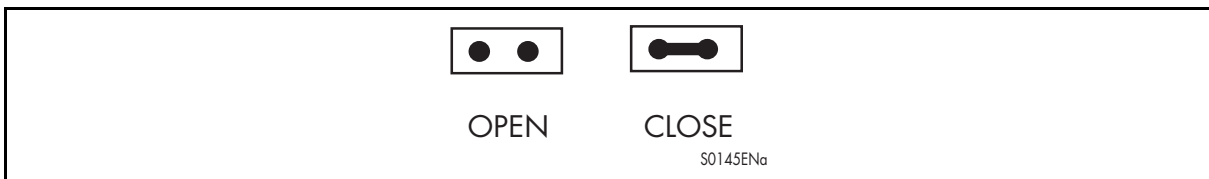


FIGURE 8 : OPEN/CLOSE SWITCH

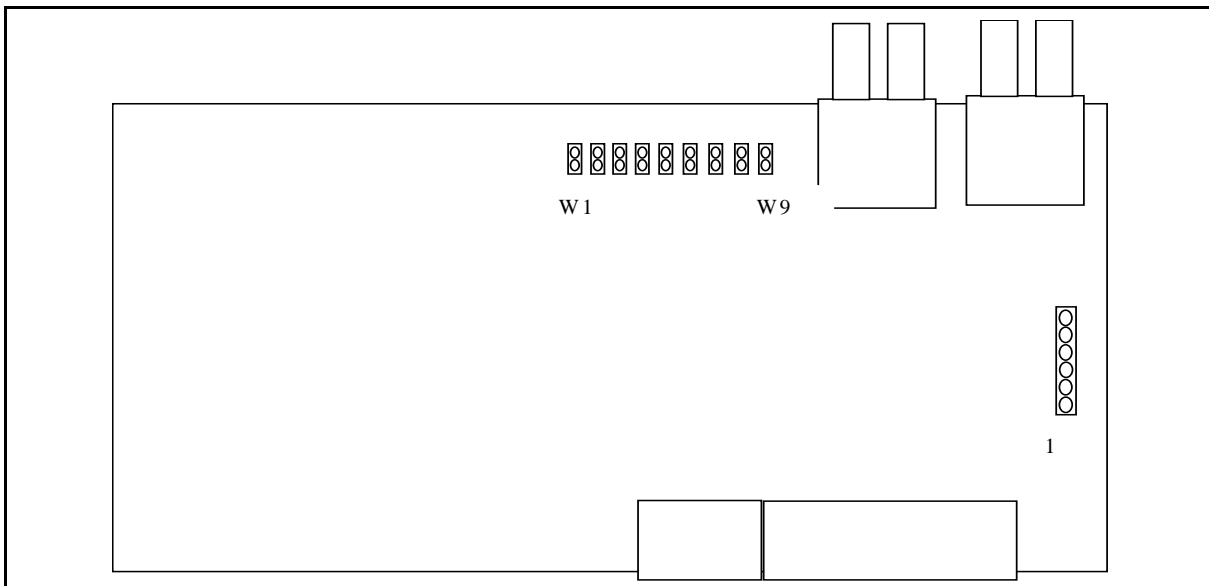


FIGURE 9 : MiCOM H34X VIEW

9.2 External Jumpers

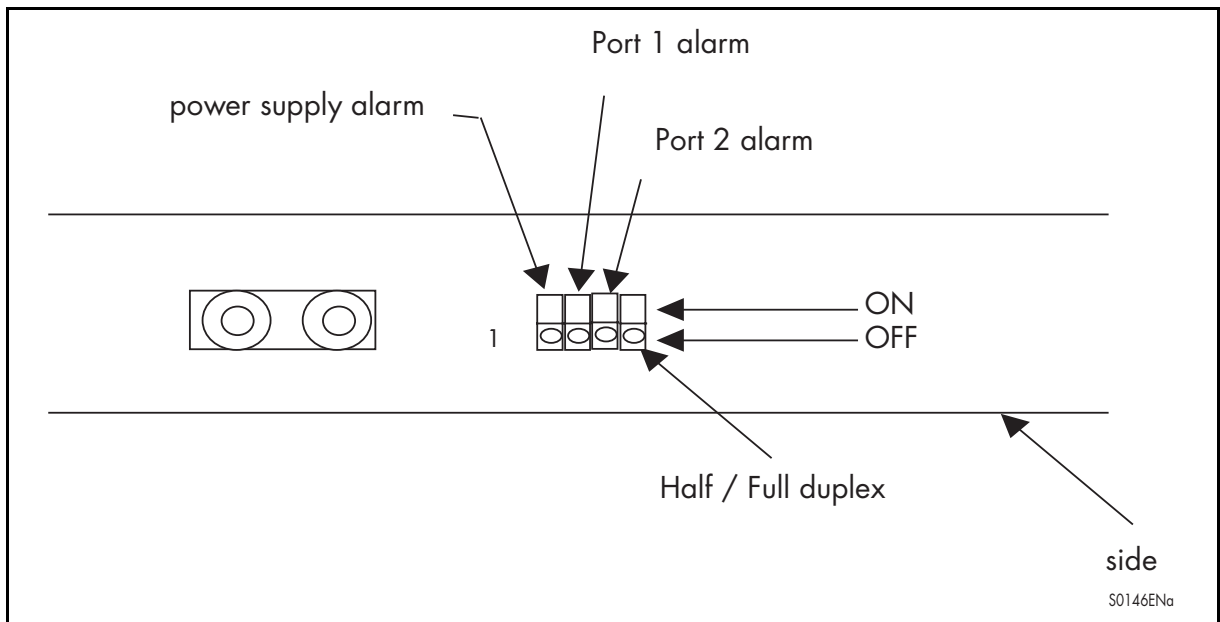


FIGURE 10 : EXTERNAL JUMPERS

N°	Name	Used	Function
1	Power supply alarm	All	If redundant power supply are used
2	Port 1 alarm	MiCOM H342/H344	
3	Port 2 alarm	MiCOM H342/H344	
4	Half/Full duplex	MiCOM H342/H344	Half (off) or Full (on) duplex for the optical link

10. APPLICATIONS

10.1 Fibber Optic budget calculations

Optical power is expressed in Watts. However, the common unit of power measurement is the dBm, defined by the following equation: $\text{Power (dBm)} = 10 \log \text{Power (mW)} / 1 \text{ mW}$.

The fiber optic budget is the difference between the power emitted into the fiber and the sensitivity (minimum amount of power required) of the receiver connected through the fiber optic cable.

$$\text{Link Power Budget} = \text{Transmitter Power (dBm)} - \text{Receiver Sensitivity (dBm)}$$

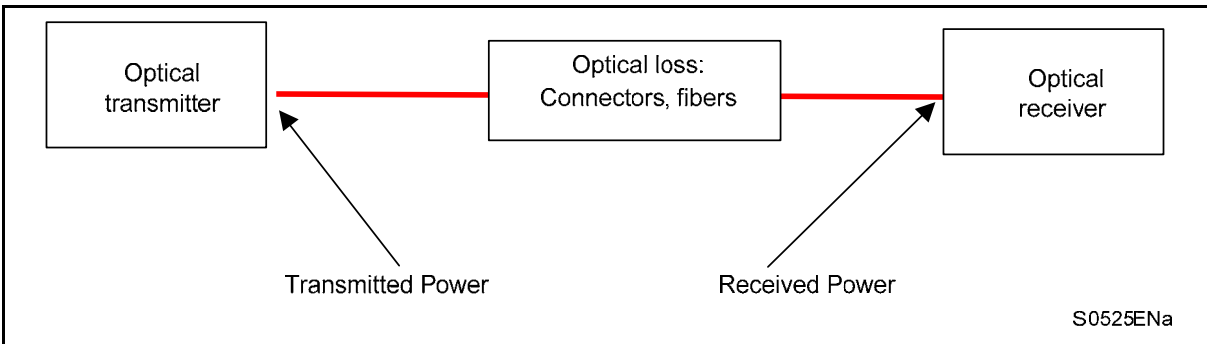


FIGURE 11: FIBER BUDGET

Example:

The following example shows the calculation of the maximum range for various types of fiber.

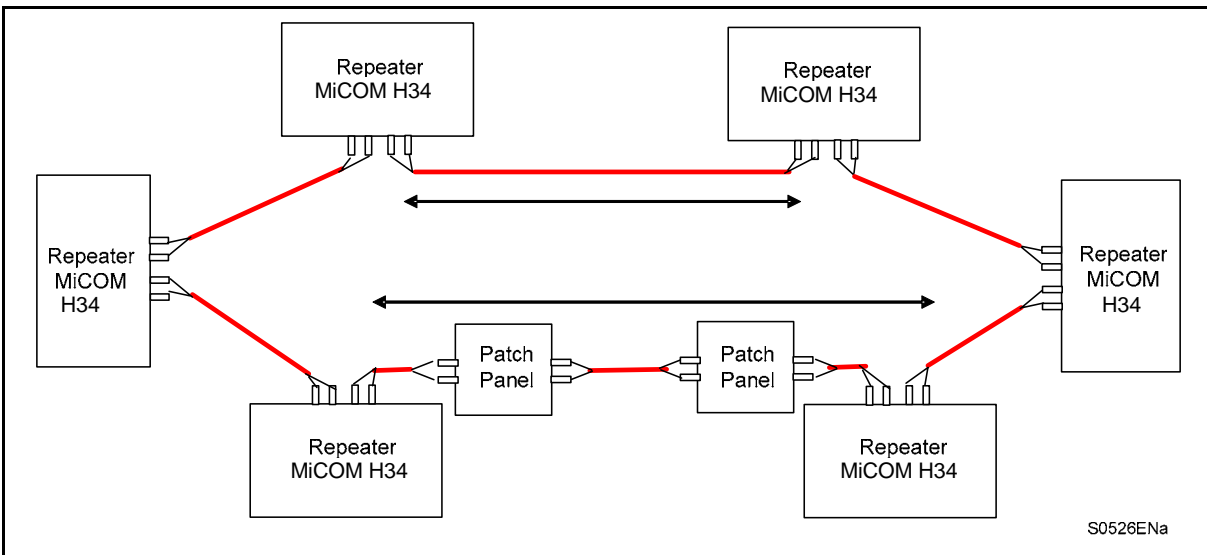


FIGURE 12: FIBER BUDGET EXAMPLE

Fiber type	Multimode	Single mode
	62.5/125 micron	9/125 micron
Power coupled into fiber	-19 dBm	-15 dBm
Sensitivity	-31 dBm	-34 dBm
Link budget	12 dB	19 dB

11. GLOSSARY

11.1 10Base T and 100Base Tx

The copper ports are full/half duplex and auto-sense the transmission speed. They will auto-negotiate with the connected device to determinate the optimal speed. When the connected device is only capable of transmitting at 10Mbps, the MiCOM H34x follows the 10Mbps.

11.2 100Base Fx

The fibber optic ports are full/half duplex at 100Mbps only. An external switch can select "half or full duplex" for the two optical ports.

11.3 Power management

If there is no cable on a port, most of the circuitry for that port is disabled to save power.

11.4 Address look up

Each Ethernet device inserts its unique "MAC address" into each message it send out. The port on the MiCOM H34x used for given MAC address is automatically learned when a frame is received from that address. Once an address is learned, the MiCOM H34x will route messages to only the appropriate port. A time stamp is also placed in memory when a new address is learned. This time stamp is used with the ageing feature, which will remove unused MAC Addresses from table after 300 seconds. The broadcasting messages are transmit in the all ports.

Up to 1024 MAC addresses can be stored and monitored at any time.

11.5 Buffering

An internal buffer is used for buffering the messages. There are 1024 buffers available. The factory setting mode adaptively allocates buffers up to 512 to a single port based loading.

11.6 Back off operation

The MiCOM H34x will drop a packet after 16 collisions (W7).

11.7 Back pressure for half duplex

The MiCOM H34x will apply « back pressure » when necessary with half-duplex operation. This «back pressure » will reduce congestion on busy networks (W2).

11.8 Broadcast storm protection

Broadcasts and multicasts are limited to 5% of the available bandwidth (W5).

11.9 Auto Negotiation and Speed-Sensing

All six or eight RJ45 ports independently support auto negotiation for speeds in the 10BaseT and 100BaseTx modes. Operation is according to the IEEE 802.3u standard.

11.10 Forwarding

The MiCOM H34x support store and forward mode. It will forward messages with know addresses out only the appropriate port. Messages with unknown addresses, broadcast messages and multicast messages will get forwarded out all ports except the source port. The MiCOM H34x will not forward error packets, 802.3x pause frames or local packets.

11.11 Priority tagging

802.1p priority is enabled on all ports. A 6 KB buffer is reserved for priority traffic. You muss used the EEPROM to configure this function

11.12 Flow control

The MiCOM H34x automatically supports standard flow control frames on both the transmit and receive sides.

On the receive side, if the MiCOM H34x receives a pause control frame it will not transmit the next normal frame until the timer, specified in the pause control frame, expires. If another pause frame is received before the current timer expires, the timer will be updated with the new value in the second pause frame. During this period (being flow controlled), only flow control packets from the MiCOM H34x will be transmitted.

On the transmit side, the MiCOM H34x has intelligent and efficient ways to determine when to invoke flow control. The flow control is based on availability of the system resources, including available buffers, available transmit queues and available receive queues. The MiCOM H34x will flow control a port, which just received a packet, if the destination port resource is being used up. The MiCOM H34x will issue a flow control frame (XOFF), containing the maximum pause time defined in IEEE standard 802.3x. A hysteresis feature is provided to prevent flow control mechanism from being activated and deactivated too many times.

The MiCOM H34x will flow control all ports if the receive queue becomes full.

11.13 VLAN Operation

The VLAN's are setup by programming the VLAN Mask Registers in the EEPROM. The perspective of the VLAN is from the input port and which output ports it sees directly through the MiCOM H34x. For example if port 1 only participated in a VLAN with ports 2 and 9 then one would set bits 0 and 7 in register 13 (Port 1 VLAN Mask Register). Note that different ports can be setup independently. An example of this would be where a router is connected to port 9 and each of the other ports would work autonomously. In this configuration ports 1 through 8 would only set the mask for port 9 and port 9 would set the mask for ports 1 through 8. In this way the router could see all ports and each of the other individual ports would only communicate with the router. All multicast and broadcast frames adhere to the VLAN configuration. Unicast frame treatment is a function of register 2 bit 0. If this bit is set then unicast frames only see ports within their VLAN. If this bit is cleared unicast frames can traverse VLAN's. VLAN tags can be added or removed on a per port basis. Further, there are provisions to specify the tag value to be inserted on a per port basis. The table below briefly summarizes VLAN features.

Register(s)	Bit(s)	Global / Port	Description
4-12	2	Port	Insert VLAN Tags – If specified, will add VLAN tags to frames without existing tags
4-12	1	Port	Strip VLAN Tags If specified, will remove VLAN tags from frames if they exist
2	0	Global	VLAN Enforcement – Allows unicast frames to adhere or ignore the VLAN configuration
13-21	7-0	Port	VLAN Mask Registers – Allows configuration of individual VLAN grouping.
22-39	7-0	Port	VLAN Tag Insertion Values – Specifies the VLAN tag to be inserted if enabled



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