MICRO THERMO TECHNOLOGIES

MT Alliance System Architecture Guidelines Manual

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Introduction

Each new router installed brings the following benefits:

- The site total wire length can be increased (e.g.: by 500 meters for Free Topology Transceivers and up to 1 km with an extra physical channel repeater).
- More nodes can be installed (e.g.: 63 for FTT and up to 126 with an extra physical channel repeater).
- More effective usage of available network bandwidth can be achieved because configured routers can filter network messages.
- Nodes can be installed with other transceiver types (e.g.: Radio Frequency or Power line) therefore reducing installation costs.
- Additional fault tolerance, in the event of a short or open circuit, can be accomplished, because a router isolates electrically the two channels.
- Data line noise can be prevented from being propagated on the rest of the network.

Guidelines

Introducing Routers and Channels

A channel is a physical link connecting nodes together and allowing them to communicate together. This can be a twisted pair wire, a fiber optic wire, a radio frequency wave, etc.

A channel can contain up to 126 nodes. A free topology channel can go up to 500 meters of wiring and can contain up to 63 nodes. A physical layer repeater (signal booster) is required to really be able to install 126 nodes. That brings the maximum wire length of a free topology channel to 1 km.

A router is a device containing two Neurons and two transceivers. The transceivers can be of the same type or of different types. A router is installed like any other node (you press a single service pin) but the software in the router cannot be changed. It is a canned node with a static and an unalterable application software.

A router has two sides, one for each transceiver. They are referred as side A and side B. As a network is installed, it must be gradually expanded from the master PC where the LNS database resides. The side of the router connected near the PC is referred as the near side. The other side is called the far side. Side A can be near or far. The same applies for side B.

When the two transceivers are of the same type, connecting the near side to side A or side B does not matter. When the transceivers are of different types, the installer must be careful to connect the near side and the far side to the appropriate side A or B.

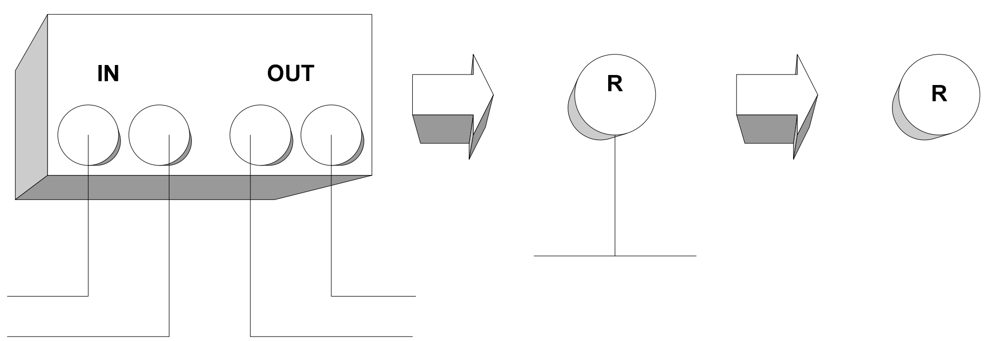
Although there are two categories and four distinct types of routers, the only type supported by the MT Alliance is the configured router.

Supported Architectures

To understand the figures better, the following legend provides descriptions of the architecture types available in a network.:

R-	Refrigeration control and/or monitoring node
H-	HVAC control and/or monitoring node
L-	Lighting control and/or monitoring node
T-	Network Terminator (or Channel terminator)
RTC-	Real time clock node
SCH-	Scheduler node
ALR-	Alarm controller node
REP-	Physical layer repeater

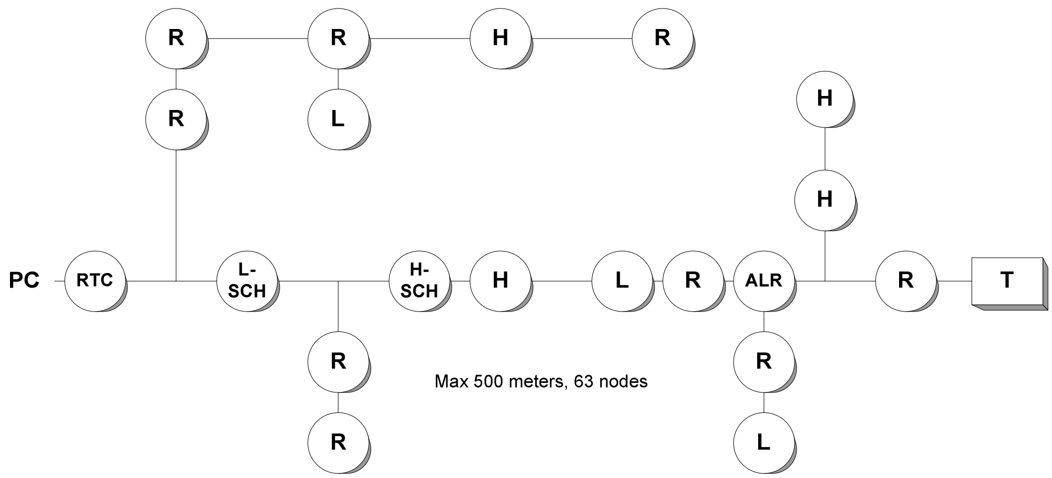
To simplify each figure, the usual twisted pair wiring diagram on the left will be schematically represented by the figure on the right.



A Small Single Channel Free Topology Network

Depicted below is a small single channel free topology network, typical of a small site. It does not have any routers or even physical layer repeaters. A single network terminator (resistor) is required to avoid bad signal transmissions over the line. Nodes of all subsystems are on the same physical channel.

This system is limited to 63 nodes and 500 meters of wiring.

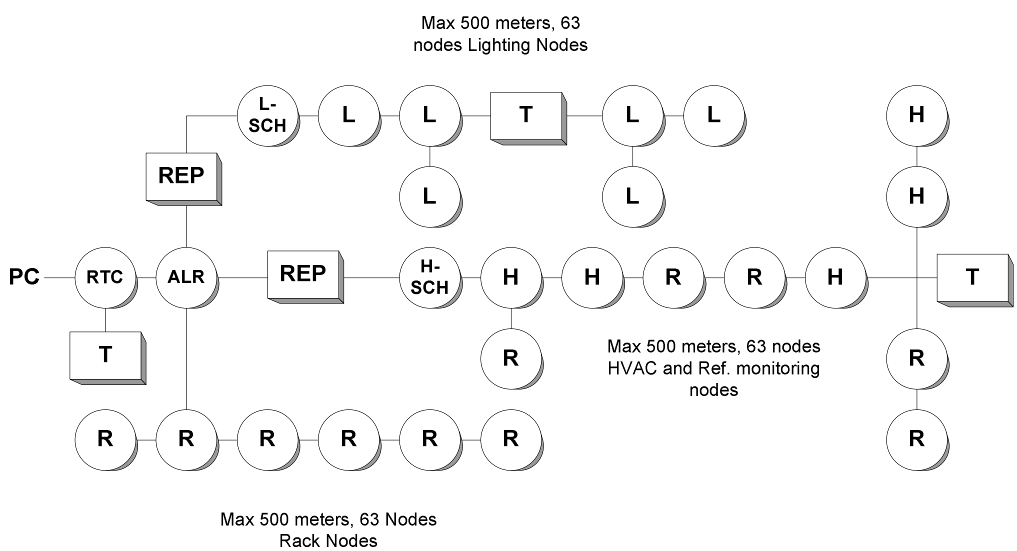


The Biggest Single Channel Free Topology Network

Depicted below is the biggest site you can install without using routers. It is a free topology network that uses physical layer repeaters. A network termination is required on each repeater side (or channel segment). Nodes of all subsystems are installed on the same channel.

The physical layer repeater is a device that contains two transceivers but has no Neuron chip. Its purpose is to act as a signal booster. It physically isolates each channel segment. A short on a channel segment does not affect the other channel segments. Noisy channel segments do affect the other segments however (the noise is also boosted). In a typical installation, as illustrated below, rack nodes, the real-time clock and the alarm node are near the PC in the mechanical room. The light nodes and the light scheduler are all installed on the same segment. The Refrigeration alarm monitoring nodes are usually installed with the HVAC nodes on one side of another repeater. Sometimes they both have their own channel segment (this requires one more repeater than what is shown below).

In the example, there are three channel segments. The maximum wire length is therefore 3 X 500 meters (1.5 km). The maximum number of nodes is always limited to 126 because there is only one subnet. Furthermore, you cannot install more then 63 nodes on each segment. Repeaters in series are not allowed. A maximum of three repeaters with one side connected on the same point is allowed.



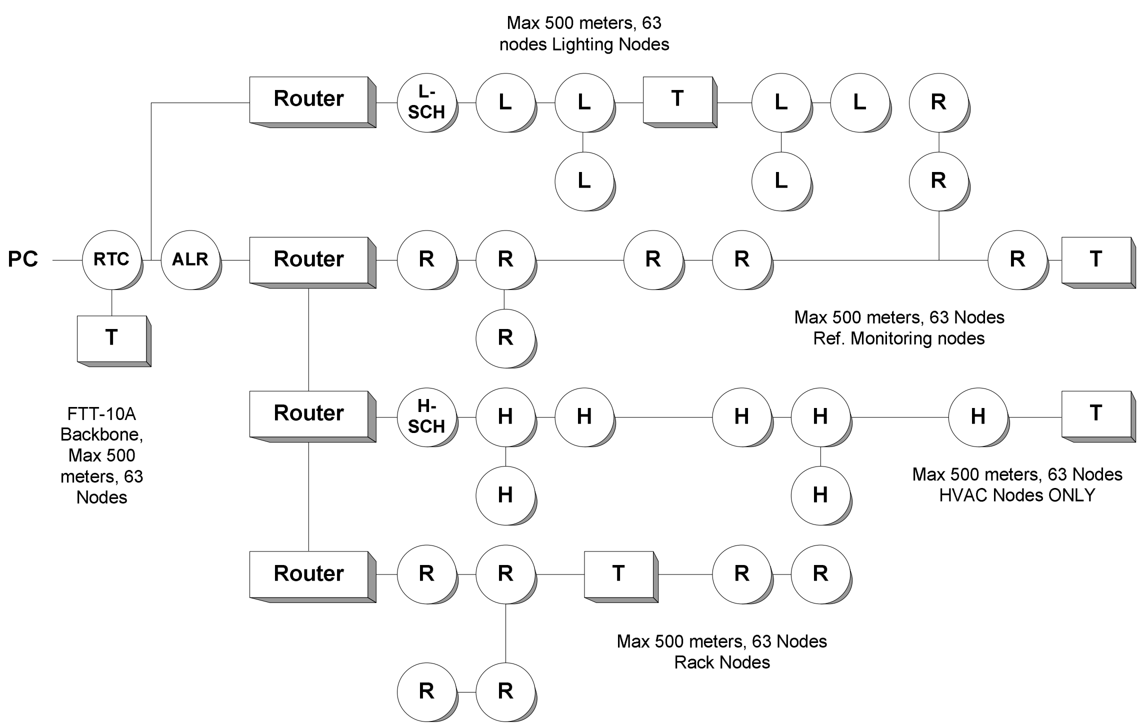
A Router per subsystem for Big Supermarkets

In the example below, free-topology transceivers are used everywhere. The PC is connected on the near side of each router. A network terminator is required on each channel. Each far side creates a new physical channel. Network bandwidth is now optimized. The network scheduler talks to lighting nodes and these messages do not go through any of the other routers. The rack nodes communicate together and their messages do not get to the lighting nodes. The bandwidth on the PC side is heavily used, however since the PC is monitoring points of interest in all channels. If network variable connections exists between say a refrigeration monitoring node that sends defrost temperature data to a rack circuit node, then that particular message will go through Rack router shown below.

The maximum length in the example below is 5 X 500 meters (2.5 km). The maximum number of nodes in the example is now 5 X 63 nodes (315). If you want more HVAC nodes, you can either add a new router or add a physical layer repeater on the HVAC channel.

As shown below, you are not allowed to physically connect channels together. Additional restrictions imposed by the MT Alliance are that you cannot put routers in series on a far side and you cannot add routers between channels on the far side. Although this may seem restrictive, it allows a much more simple installation of the network. All routers are connected to the backbone.

Although not shown in the example below, one physical layer repeater is allowed on the far side of each router yielding the possibility of another 63 nodes per channel.

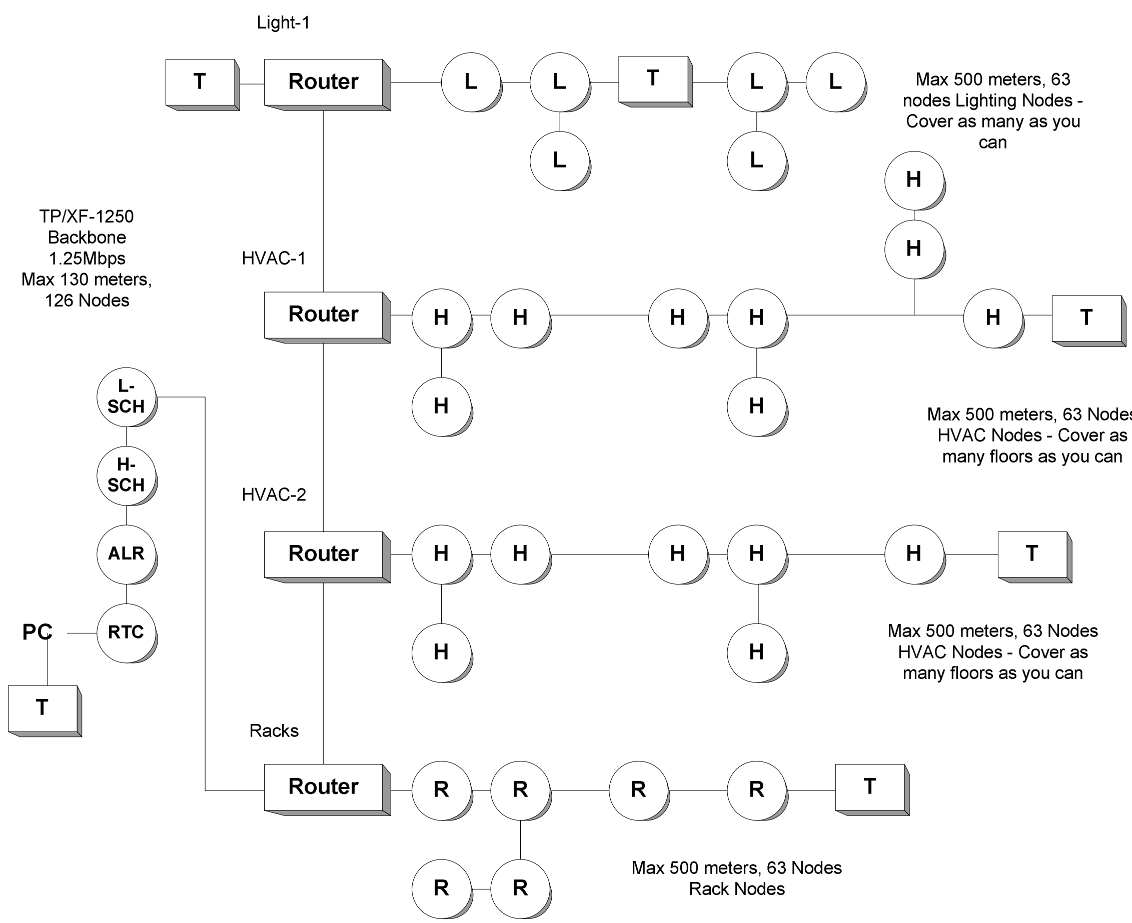


A Building Configuration Using a High Bandwidth Backbone

In the example below, free-topology transceivers are used for channels. However, the backbone now consists of a twisted pair, transformer isolated, 1.25 Mbps wire (TP/XF-1250). This is approximately 16 times more bandwidth than the 78 kbps free-topology transceiver. This bandwidth is achieved by making compromises: the backbone can only be wired as a bus. Furthermore, it needs to be doubly terminated at each end and its total length is limited to 130 meters instead of the usual 500 meters for free topology. There is also a minimum distance between nodes that must be respected. There is also a maximum distance to respect between the node and the bus if the wire is spliced outside of the node.

The architecture shown below is a perfect installation. A router is installed for HVAC nodes and covers 500 meters and possibly a few floors. When there is no more wire available, another HVAC router is installed. The same can be applied for lighting. Ideally, if you control refrigeration racks, you would have one router per rack.

Note that the Real-Time Clock node, the alarm relay node and the scheduler nodes must have a TP/XF-1250 transceiver to be installed on this type of backbone.



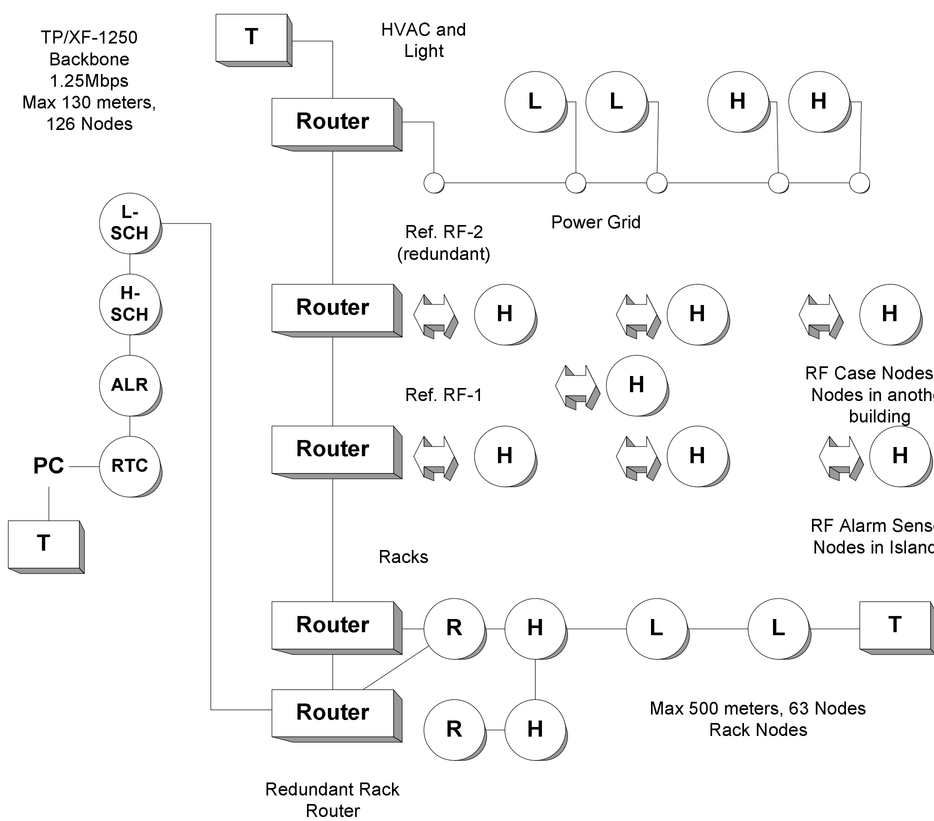
Other Transceiver Types

In the previous example, routers are shown to be able to use different wire types and create a unified system. Among the other interesting transceivers for supermarkets and small buildings, we have Radio Frequency (RF) and power line. Power line transmission allows data to be transported over the 120 Vac or 240 Vac power grids. RF allows node to communicate without the need for a data wire. This can help simplify and reduce the cost of installation.

In the example below, alarm sensor nodes located in island cases use RF transceivers. Some HVAC or lighting nodes are directly connected on the power grid. The primary disadvantage of these two technologies is that the available bandwidth on the channel is usually much smaller than the 78 kbps of the free-topology wire.

One potential problem with RF is coverage. If RF obstacles exist between the router and the nodes, there might be intermittent or permanent connection problems. The solution to this is to allow the use of redundant routers to complete the coverage. A redundant router is a router whose far side as already been defined by another router.

RF can also be used to cross a street or a parking lot and connect to a few RF nodes in another building.



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