

# SYSTEM **X**

## Series Matrix X

*M3216AX*

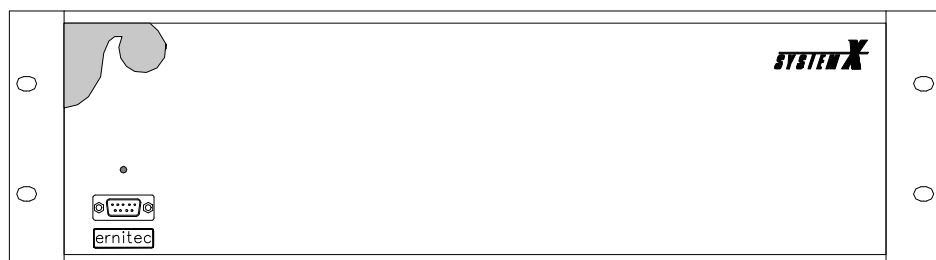
*M3216XX*

*M3208AX*

*M1608AX*

*Installation*

*Manual*





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## Introduction

The Series **Matrix X** consists of a number of video matrix units controlled via LONWORKS®:

- **M3216AX**: 32 video inputs / 16 video outputs with loop facilities on both video inputs and outputs for easy expansion.
- **M3208AX**: 32 video inputs / 8 video outputs with loop facilities on both video inputs and outputs for easy expansion.
- **M1608AX**: 16 video inputs / 8 video outputs.
- **M3216XX**: Used as a cost saving expansion unit in combination with the M3216AX only. In an expanded system not all matrix units have cameras or monitors connected. At these location(s) the M3216XX unit is used which consequently is equipped with video loop connectors only; no BNC- video connectors are available.

By interconnecting several Matrix X units the number of video inputs and/or outputs is increased.

The video input terminations can be programmed to 75  $\Omega$  or high impedance (Hi-Z).

All settings are selected remotely using the **S111SX Node Manager** - no settings are possible on the unit itself, except selection of video standard; either PAL/CCIR (factory default) or NTSC/RS-170.

Daily operation is carried out via the keyboards Series **K111xX**.

### Validity

This manual cover the Matrix X types M3216AX, M3216XX, M3208AX and M1608AX, serial number MxxxxX-0100, where "xxxx" represents the typenumber, or higher.

The described *Remote Site* functionality is available with the *Node Manager V.2.0* or higher.

### Compatibility

The Matrix X is compatible with any SYSTEM X component.

Any device outputting a standard 1 V<sub>pp</sub> video signal may be connected to the video inputs.

### Approvals

All electronic equipment can emit, or be sensitive to, induced electromagnetic noise, which can be conducted the connected wires or transmitted as electromagnetic fields.

Electromagnetic noise can cause malfunction or damage to the equipment.

The Matrix X is **CE**-certified and approved in accordance with the EU-directives regarding Electromagnetic Compatibility, the EMC-directive, and Low Voltage safety, the LVD-directive with respect to the EN 50081-1 (EMC, emission), the EN 50130-4 (EMC, immunity) and the EN 60950 (LVD, safety) standards.

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**WARNING: To fulfil the above regulations make sure to carefully follow the installation instructions in this manual.**

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### Trademarks

Echelon®, LON® and LONWORKS® are trademarks of Echelon Corporation registered in the United States of America and other countries.

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## Installation

Carefully follow the instructions in order not to cause mal-function, damage to the equipment or humans. Incorrect installation will void the warranty and repairs will consequently be invoiced according to current scale charges.

All connections are shown on the figures at the fold-out page at the back of this manual.

After all connections have been made installation is completed by switching on the mains supply. Finally should the *Service Pin* be activated, however, prior to pressing the *Service Pin* make sure the *S111SX Node Manager* is running and connected to the LON<sup>®</sup> network. Please note, that it is of outmost importance to keep track of the order in which the various *System X* units are activated e.g. by carefully noting the exact time the *Service Pin* is activated. This information is crucial when identification and configuration of each unit is carried out later using the *S111SX Node Manager*.

### Unpacking the unit

Check that the carton box contains the following items:

- A Matrix X of the correct type (M3216AX, M3216XX, M3208AX or M1608AX).
- A connector/mounting kit, consisting of:
  - 2 pcs. rack mounting ears.*
  - 2 pcs. 9-pin D-SUB connectors.*
  - 1 pc. LON<sup>®</sup> connector and cable clamp.*
  - Various screws and washers.*
- Installation manual (this manual).

Carefully check for any sign of damage. Any such damage or parts missing should be reported to your supplier prior to installation.

### Mains installation

The Matrix X must be used with a 3-wire mains connection (2W+PE @ min. 0,75 mm<sup>2</sup>, PE=yellow/green, N=blue).

The unit adapts itself to the actual mains voltage; no adjustments are needed.

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**WARNING: If permanently connected to mains, a readily accessible disconnect device (mains switch) shall be incorporated in the building installation wiring.**

**If pluggable connection to mains has been made, the socket-outlet shall be present near the equipment and shall be easily accessible.**

**Mains connection requires installation by an instructed person.**

**The unit is designed for continous operation.**

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### Mains fuse

A replaceable fuse is located at the power supply board.

- Designator: F1
- Rating: F2,5AH, 250V

## LON® connection

All SYSTEM X components (nodes) are connected together in a common LONWORKS® communication network.

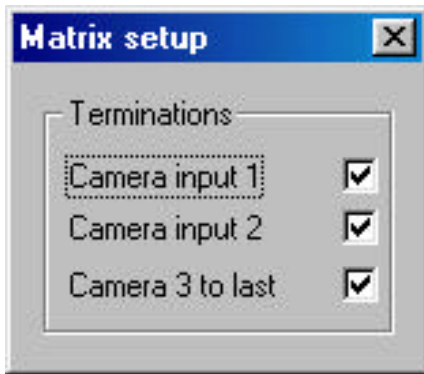
Refer to the drawings at the fold-out page at the end of this manual. Connection is polarity insensitive. A detailed description of cabling, network topology, termination etc is included in the *LON® Installation* section located later in this instruction.

Note: If you have no previous experience with LON®, study the *LON® Installation* section carefully!

## Video connections

Refer to the drawings at the fold-out page at the end of this manual.

The video input terminations can be programmed to 75 Ω or high impedance (Hi-Z) using the *S11SX Node Manager* as shown below:



The relevant video signal standard; either PAL/CCIR (factory default) or NTSC/RS-170, is selected by means of internal jumper(s); refer to the *Video standard selection* section.

## Video expansion

Expansion of video inputs and/or outputs is carried out by combining several *Matrix X* units and looping the video connections. For optimum video performance inter-connect the units as shown on the fold-out page drawings.

On the *M3216AX/XX* and the *M3208AX* video looping is established by inter-connecting the video loop connectors with the special **XLOOP** cables, available in three different lengths; 350 mm, 675 mm and 1100 mm. Refer to the fold-out page drawings for instructions and selection of the appropriate cable.

Note: *XLOOP* cables are not included and should be ordered separately from your supplier.

The **M3216XX** is a unit designed as a video expansion unit to be used in combination with the *M3216AX* only. It is equipped with video loop connectors only; no BNC- video connectors are available.

The *M1608AX* is not equipped with video loop connectors. Video expansion must therefore be made by inter-connecting the BNC video inputs/outputs using BNC dual straight "Y" -adaptors as described below.

### Video input expansion

- *M3216AX/3208AX*: Connect a XLOOP cable from the LOOP MON connector on the first unit to the neighbouring LOOP MON connector on the unit above or below. Further units are interconnected in the same way.  
Connect cameras 1-32 to the video inputs on first unit, cameras 33-65 to the second unit a.s.o. Video input terminations should be activated on all units; i.e. set to 75  $\Omega$ . Connect the monitors to the video outputs on one of the units; when three or more units are used to the unit in the middle for optimum performance.
- *M1608AX*: Connect each video output on the first unit with the corresponding output on the second unit using BNC dual straight "Y" -adaptors. Further units are interconnected in the same way.  
Connect cameras 1-16 to the video inputs on first unit, cameras 17-32 to the second unit a.s.o. Video input terminations should be activated on all units; i.e. set to 75  $\Omega$ . Connect the monitors to the unused "leg" on the "Y" -adaptors fitted on the first or last unit.

### Video output expansion

- *M3216AX*: Connect a XLOOP cable from the *LOOP CAM. 1-16* connector on the first unit to the neighbouring *LOOP CAM. 1-16* connector on the next unit. Furthermore connect a XLOOP cable from the *LOOP CAM. 17-32* connector on the first unit to the neighbouring *LOOP CAM. 17-32* connector on the next unit. For further expansion with more monitor outputs, i.e. more than 32, additional units are added in the same way.  
Connect cameras 1-32 to the video inputs on first unit only, and activate the video input terminations, i.e. set them to 75  $\Omega$ , on the last unit only.  
Connect the monitors 1-16 to the video outputs on the first unit and monitors 17-32 to the second unit a.s.o.
- *M3208AX*: Connect a XLOOP cable from the *LOOP CAM. 1-16* connector on the first unit to the neighbouring *LOOP CAM. 1-16* connector on the next unit. Furthermore connect a XLOOP cable from the *LOOP CAM. 17-32* connector on the first unit to the neighbouring *LOOP CAM. 17-32* connector on the next unit. For further expansion with more monitor outputs, i.e. more than 16, additional units are added in the same way.  
Connect cameras 1-32 to the video inputs on first unit only, and activate the video input terminations, i.e. set them to 75  $\Omega$ , on the last unit only.  
Connect the monitors 1-8 to the video outputs on the first unit and monitors 9-16 to the second unit a.s.o.

Note: M3216AX units and M3208AX units can freely be combined. By combining e.g. a M3216AX and a M3208AX unit a 24 video output matrix is made.  
By combining two M3216AX's and one M3208AX unit a matrix with 40 video outputs is formed.

- *M1608AX*: Fit BNC dual straight "Y" -adaptors on the video inputs on the first unit and connect the cameras to one of the "legs". Connect the other leg to the corresponding video inputs on the second unit. Further units are interconnected in the same way.  
Activate the video input terminations, i.e. set them to 75  $\Omega$ , on the last unit only.  
Connect the monitors 1-8 to the video outputs on the first unit, monitors 9-16 to the second unit a.s.o..

## Video input- and output expansion

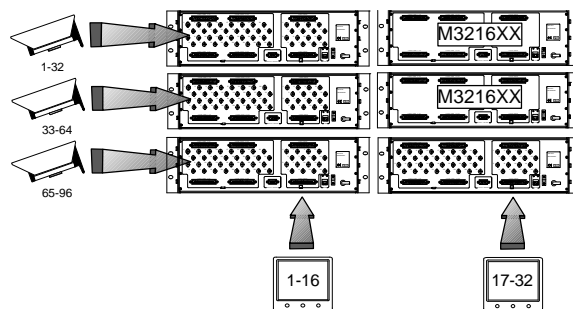
Simply follow and combine the instructions given in the above two sections.

For optimum video performance connect the cameras, monitors and XLOOP cables as shown on the fold-out page drawings.

Note that the LOOP MON connectors should be interconnected with XLOOP cables on units with the same monitor range setting; e.g. all monitor 1-16 units should have their LOOP MON connectors interconnected, all monitor 17-32 units should have their LOOP MON connectors interconnected a.s.o. Do not make any LOOP MON connections from e.g. a monitor 1-16 unit to a monitor 17-32 unit. Refer to the example of a 96 input / 48 output matrix on the fold-out page.

### Video input- and output expansion using the M3216XX

The M3216XX is identical to the M3216AX, except for not being equipped with BNC-connectors for video inputs and outputs. In an expanded system not all matrix units have cameras or monitors connected and the M3216XX can consequently be used at these positions as shown on the figure.



## Remote Sites

It is possible to interconnect two, or more, individual matrix systems, so-called *Sites*, each consisting of a single or multiple Matrix X units (i.e. an expanded matrix system).

This will enable display and control of cameras connected to one site on the monitors connected to another site.

Using several, distributed matrix systems; i.e. Sites, will often reduce and simplify the cabling needed, compared to a single, central matrix.

Also the Ernitec *SYSTEM 1000M* matrix can be used as a remote system, meaning that from a System X it is possible to view and operate cameras connected to the remote *SYSTEM 1000M*. The *1151SX-REMOTE* protocol conversion box must be used as interface between the LON® Network and a serial port on the *SYSTEM 1000M*.

In general, a number of video links must be established between the Sites. In other words, a number of monitor outputs on one site are connected to a corresponding number of video inputs on another site.

The minimum number of video links is one only; however, the more video links available, the more *different* Remote Site cameras may be displayed at the local site monitors simultaneously. Obviously, there is no idea in having more video links from the Remote Site than local site monitors. In other words, if the local site has eight monitor outputs there is no need to establish more than eight video links from the remote site.

One Site may be connected to and surveilled from several other sites and by establishing two sets of video links between two sites, one in each direction, each site can view cameras from the other site.

It is not possible to “daisy-chain” sites; i.e. view remote cameras connected to a third site via a second site.

## Other connections

The 9-pin DSUB connectors on the front and the rear of the matrix are reserved for internal use and for future applications.



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## First time start

After all connections have been made installation is completed by switching on the mains supply.

Make sure the *S111SX Node Manager* software is running and the PC-interface is connected to the LON<sup>®</sup> network.

Activate the *Service Pin* using a small screw-driver or equivalent, refer to the fold-out page drawing for exact location of the *Service Pin*.

Please note, that it is of **outmost importance** to keep track of the order in which the various *System X* units are activated e.g. by carefully noting the exact time the *Service Pin* is activated. This information is crucial when identification and configuration of each unit is carried out later using the *S111SX Node Manager*.

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Note: Strictly follow the above instructions to avoid possible configuration problems.

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The *Service Pin* may be activated later also if reconfiguration of the network is needed, however, always make sure the *S111SX Node Manager* software is on-line prior to pressing the *Service Pin*.

## LED indicators

A green LED is placed at the front and an yellow LED at the rear panel.

### Front panel indicator

The green LED indicates the status of the matrix:

- Steadily flashing once every second: Normal operation.
- Constantly on or off: Fault situation; disconnect from mains supply and re-connect again.
- Flashing erratic: Download of new settings in progress.

### Rear panel indicator

The yellow LED indicates the LON<sup>®</sup> network status:

- Off indicates normal operation; the unit is configured and running.
- Flashing and on indicates that the unit isn't configured; run the *S111SX Node Manager* and press the *Service Pin*.

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Note: The LON<sup>®</sup> LED flashes shortly when the *Service Pin* is activated - this is not a fault condition.

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## Video standard selection

By enabling a two-pole pinheader; i.e. shorting the two terminals with a "jumper", located on the main board the NTSC/RS-170 video standard is selected. The M3216AX features two main PCB's each having a pinheader. Top PCB is handling video outputs 9-16, bottom PCB video outputs 1-8.

Factory default setting is PAL/CCIR; i.e. no jumper installed. Installing/removal of the jumper must be followed by a matrix re-boot.

Refer to the fold-out page drawing for exact location of the pinheader.

# LON<sup>®</sup> Installation

Note: If you have no previous experience with LON<sup>®</sup> installation, study this section carefully!

All SYSTEM X components (nodes) are connected together in a common LONWORKS<sup>®</sup> communication network.

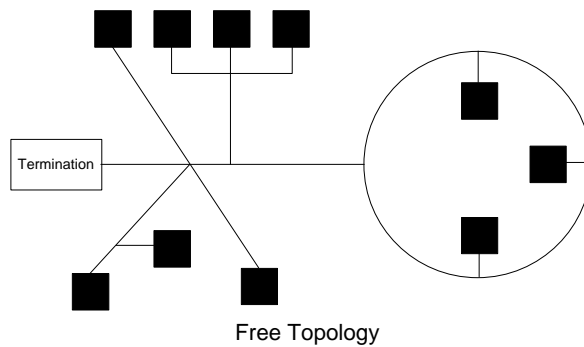
The network is polarity insensitive and therefore either of the two twisted pair wires can be connected to either of the LON<sup>®</sup> connectors on the SYSTEM X components.

Due to the risk of cross-talk/interference, it is recommended not to run LON<sup>®</sup> Network cables close to high voltage cable, or cables carrying video signals.

Note: In countries where the CE approval is mandatory, LON<sup>®</sup> cables with an overall screen must be used in order to comply with EMC/EMI standard EN 50130-4. The cable screen should be connected to the cable clamp next to the LON<sup>®</sup> connector.

## Selection of network Topology

In a **free topology network**, there are no demands as to how the cables are routed between the nodes. It can be point-to-point, bus, star, tree, or a mixture.

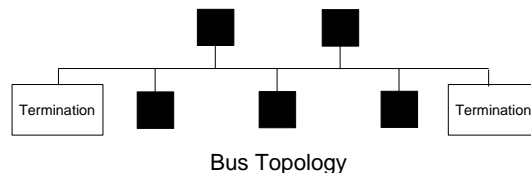


When using free topology, the maximum cable length in one segment is approx. 500 meters, and is calculated adding together all cables used. The maximum number of nodes in one segment is 64. If more than 500 meters, or more than 64 nodes, is required, two or more network segments can be made, using a repeater between each segment.

## Bus Topology

In a bus topology network, all nodes are connected on a bus. Cable stubs can be used to connect the individual nodes to the bus, as long as the length of the stub is maximum 3 meters.

The advantage of bus topology, is that the cable length can be longer than when using free topology. This can be useful e.g. when making network connection to remote PTZ cameras.



The maximum number of nodes on one bus is 64. Maximum length of the network bus depends on the type of cable used. If more nodes, and/or longer cable length, is required, two or more network segments can be made, using a repeater between each segment.

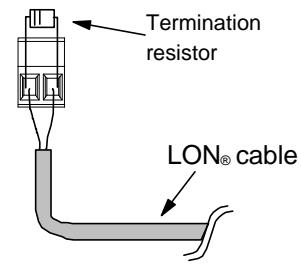
## Termination

Each network segment require termination for proper data transmission performance. The type of termination varies depending on whether Free topology or Bus topology is used.

In a free topology network segment, only one termination is required and may be placed anywhere on the network. The termination resistor should be a 52  $\Omega$ , 1/4W type.

In a bus topology networksegment, two terminations are required, one at each end of the bus. The termination resistors should each be a 105  $\Omega$ , 1/4W type.

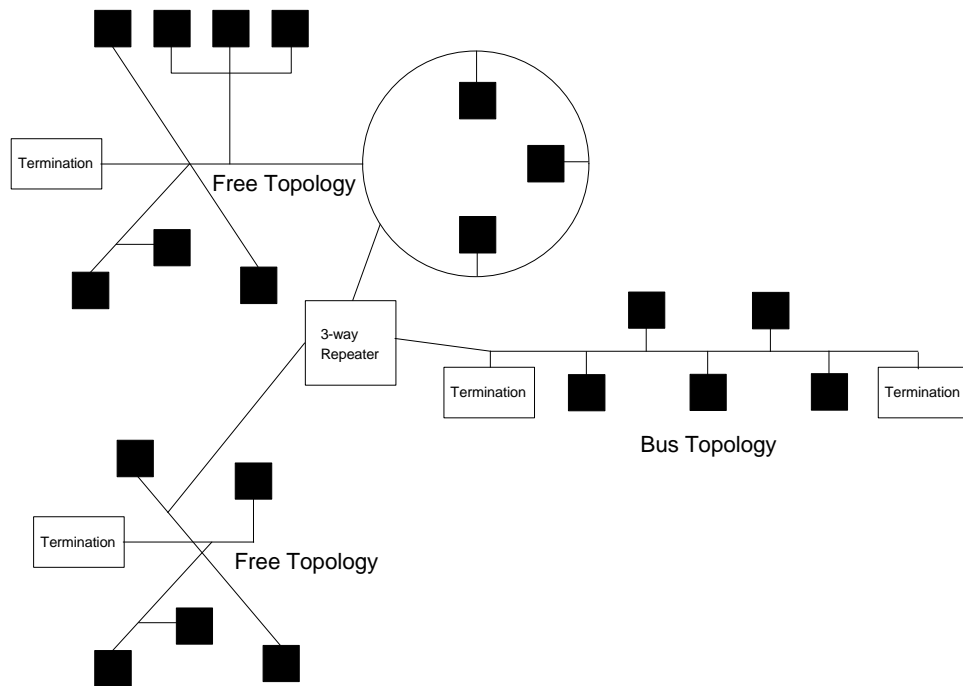
Termination resistors, which are included with the SYSTEM X keyboard, are easily fitted using the LON<sup>®</sup> connectors on the SYSTEM X units as shown on the figure.



## Repeater

If the maximum numbers of nodes (max. 64) or total cable distance are exceeded, a repeater can be added to interconnect two or more network segments.

A repeater can also be used to convert from a free topology network to a bus topology network. This can be useful when e.g. making network connection to remote PTZ cameras. Information on suppliers of suitable repeaters and converters can be obtained from your supplier. *Note that only one Repeater should be placed in series between any two nodes in a segment.*



## LON® Network Cables

The following five cables/cable types have been validated by Echelon®, but other cables may be used provided they have specifications similar to the ones listed below:

Validated Cables and Cable Types	AWG	Diameter	Shield <sup>4)</sup>	Examples
TIA/EIA 568A <sup>1)</sup> Category 5 cable	24AWG	0,5mm	Available	Belden 1624 <sup>5)</sup> Belden 1633A <sup>5)</sup> Belden 1668A <sup>5)</sup>
Belden 8471 (PVC jacket) or equivalent	16AWG	1,3mm	No	-
Belden 85102 (Tefzel jacket) or equivalent	16AWG	1,3mm	No	-
Level IV <sup>2)</sup> cable	22AWG	0,65mm	Available	Anixter 9F220154 <sup>5)</sup>
J-Y(St)Y <sup>3)</sup> 2x2x0.8	20,4AWG	0,8mm	Yes	Anixter 4QJB2 <sup>5)</sup> Coferro J-Y(St)Y <sup>5)</sup> Waschek 240208 <sup>5)</sup> Eupen J-Y(St)Y Lg <sup>5)</sup>

<sup>1)</sup> Any cable that meets the TIA/EIA 568A standard, is suitable for LON® Networks.

<sup>2)</sup> Standard originally specified by the National Electrical Manufacturers Association (NEMA).

<sup>3)</sup> The J-Y(St)Y cable is normally only available in Europe.

<sup>4)</sup> In order to comply with EMC/EMI standard EN 50130-4, shielded cable must be used.

<sup>5)</sup> With shield.

A list of cable suppliers can be found in e.g. the *K111DX Keyboard X* manual.

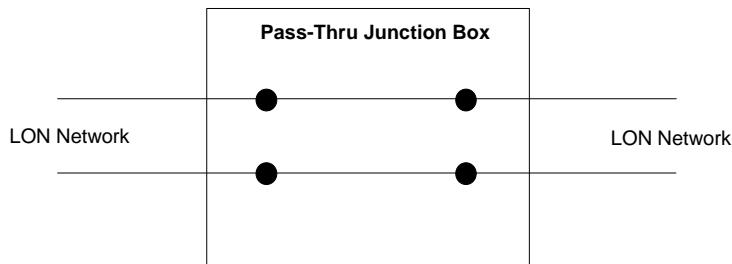
## LON® Network Cable Lengths

Cable type	Free Topology	Bus Topology
	Max. Node-to-Node/Total Length	Max. Total Length
TIA/EIA 568A Category 5	250/450 meters	900 meters
Belden 8471	400/500 meters	2700 meters
Belden 85102	500/500 meters	2700 meters
Level IV	400/500 meters	1400 meters
J-Y(St)Y 2x2x0,8	320/500 meters	900 meters

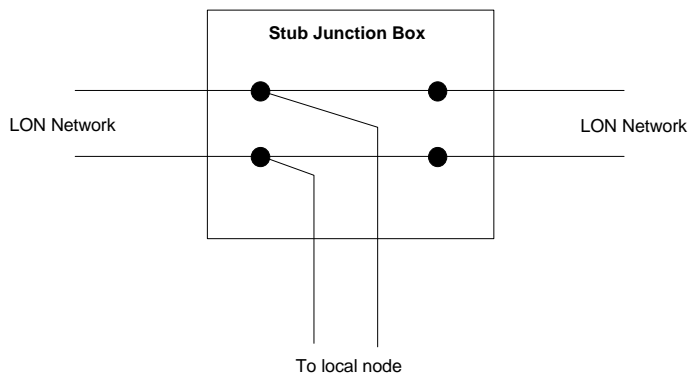
## Junction Boxes

When splicing/terminating cables in the LON<sup>®</sup> Network installation, the following methods are normally used:

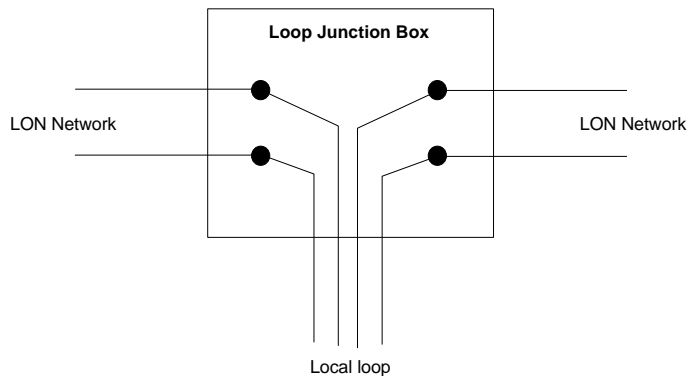
A **Pass-Thru Junction Box** is used to splice two cables. No SYSTEM X nodes or connectors are provided at a pass-thru junction box.




A **Stub Junction Box** is used to splice two cables and provide a stub for servicing a local SYSTEM X node.



A local **Loop Junction Box** is used to terminate two cables, and provide a wiring loop for servicing one, or more, local SYSTEM X nodes.



## Specifications

	M3216AX	M3216XX	M3208AX	M1608AX	Note
Video inputs (BNC)	32	0	32	16	1 V <sub>pp</sub> , 75 Ω
Video outputs (BNC)	16	0	8	8	1 V <sub>pp</sub> , 75 Ω
Video loop out (XLOOP)	Yes	Yes	Yes	No	For expansion.
Video bandwidth	10 Hz - 12 MHz				-3 dB
Crosstalk, input-to-input	<-60 dB				@ 4,43 MHz
Noise	<-75 dB				Weighted
Chrominance delay	<6 nsec.				
K-rating	<0,4%				2T Pulse/Bar
Differential phase	<0,8°				
Differential gain	<1,0%				
Luminance non-linearity	<1,5%				
Comms interface	LONWORKS® TP/FT Free- or Bus-topology				78 kbps FTT-10
Nominal Mains voltage	230/115 VAC, 50/60 Hz				Auto-selected
Current consumption	105 / 210 mA		75 mA / 150 mA		@ 230/115 VAC
Dimensions H/W/D	132,5/426/214 (19" -3HU)			88,5/426/214 (19" -2HU)	D=excl. connectors. W excl. "rack ears" .
Approvals EMC/LVD	EN 50081-1, EN 50130-4 / EN 60950				



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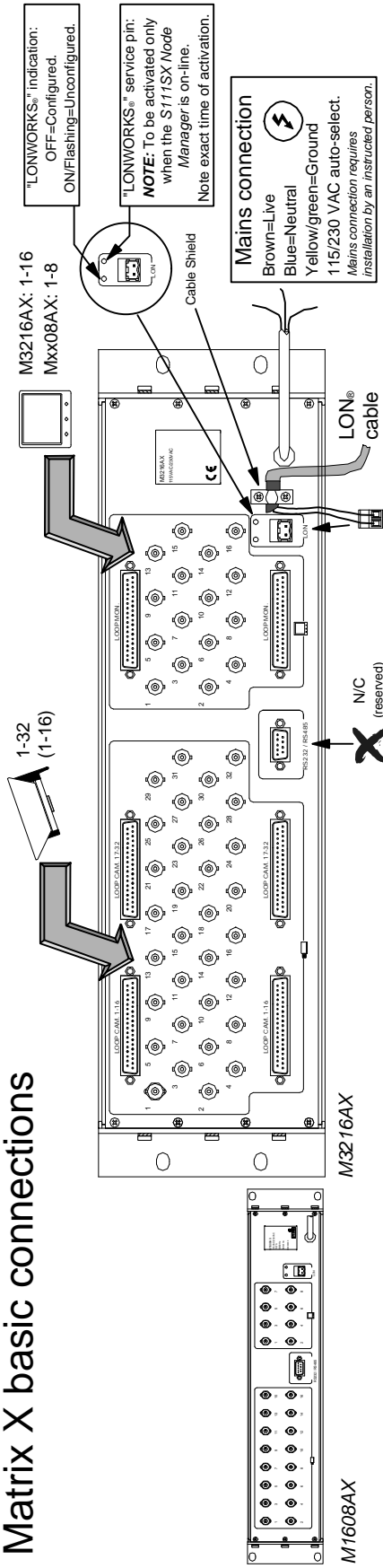
MIDDLE EAST OFFICE: ERNITEC ME, HAMRA-MAKDESI STR., YOUNIS CENTER-5th FLOOR, OFFICE NO. 503

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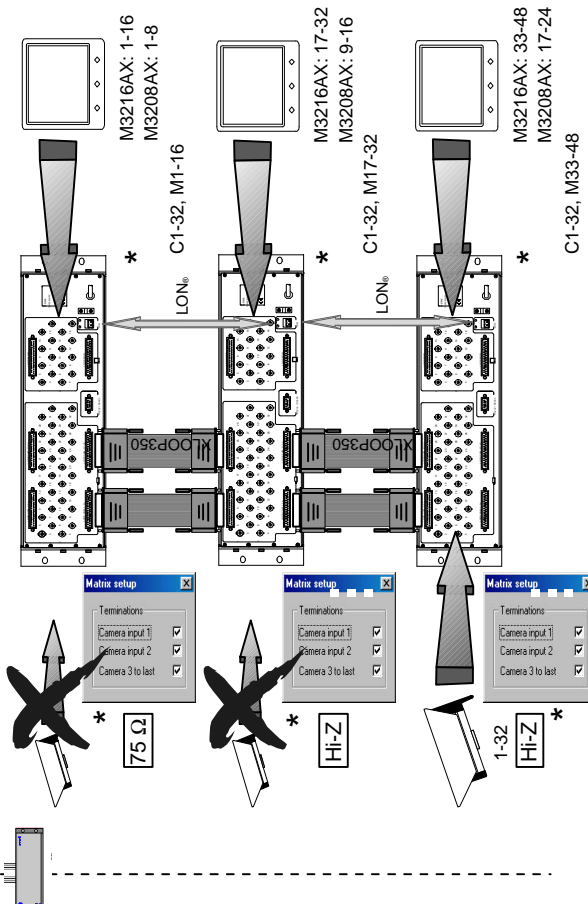
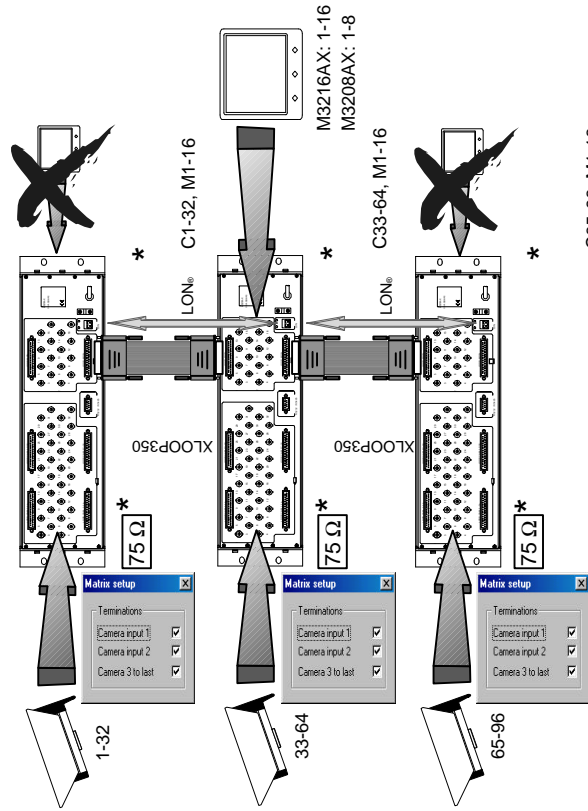
HOME PAGE: <http://www.ernitecme.com>, E-MAIL: [malek\\_kabrit@ernitecme.com](mailto:malek_kabrit@ernitecme.com)

# Matrix X basic connections



# Video input expansion

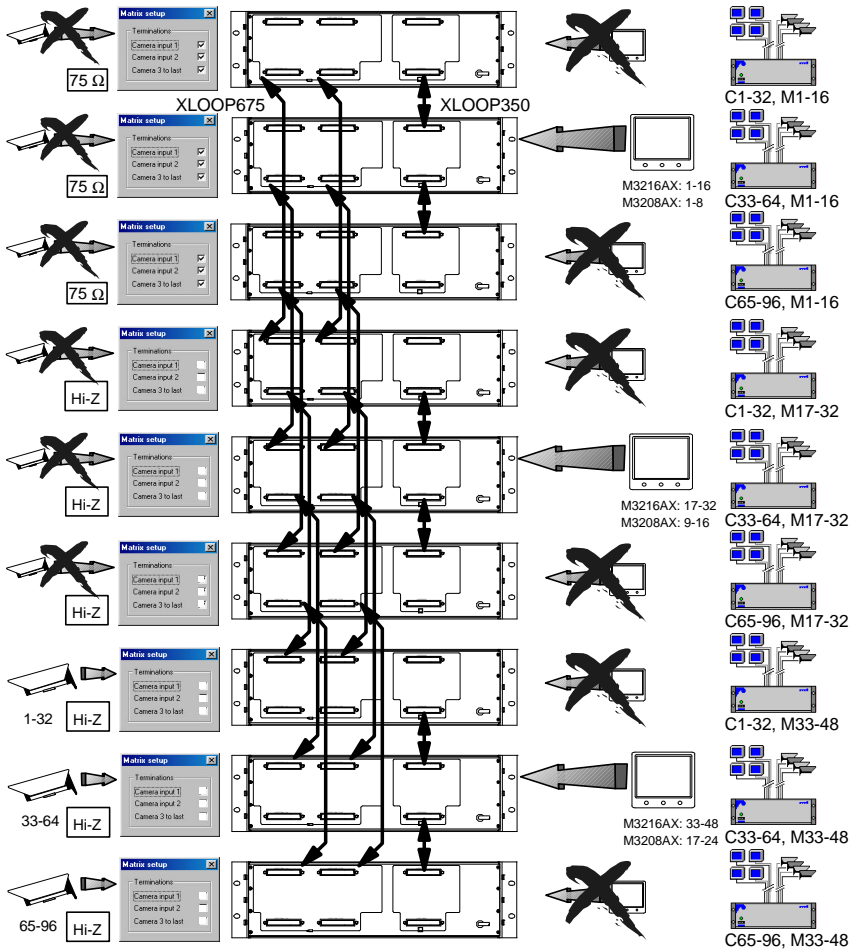
# Video output expansion



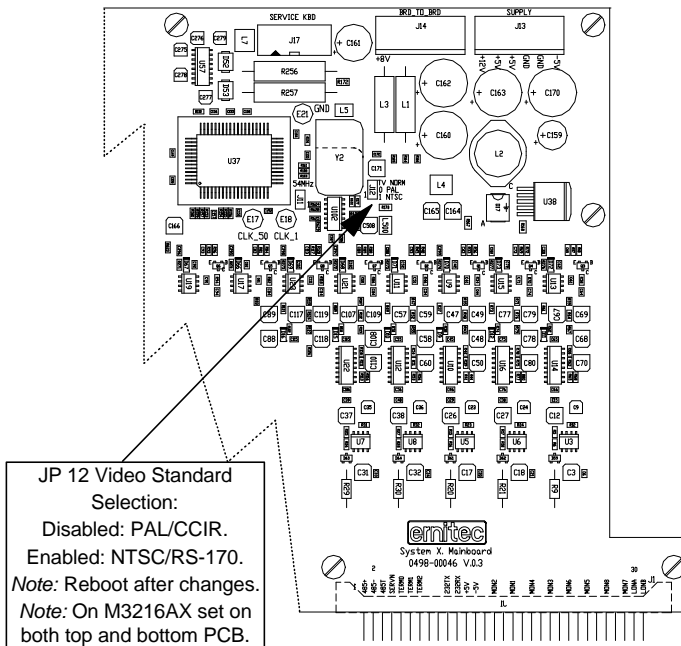
\*Set with the S111SX NodeManager



## Video input & output expansion Example: 96 input / 48 output matrix



## Video Standard Selection

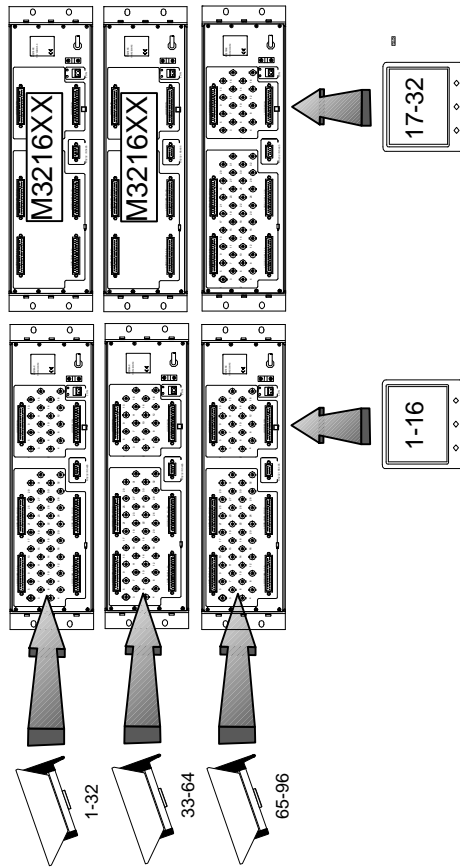




# Video input & output expansion using the M3216XX

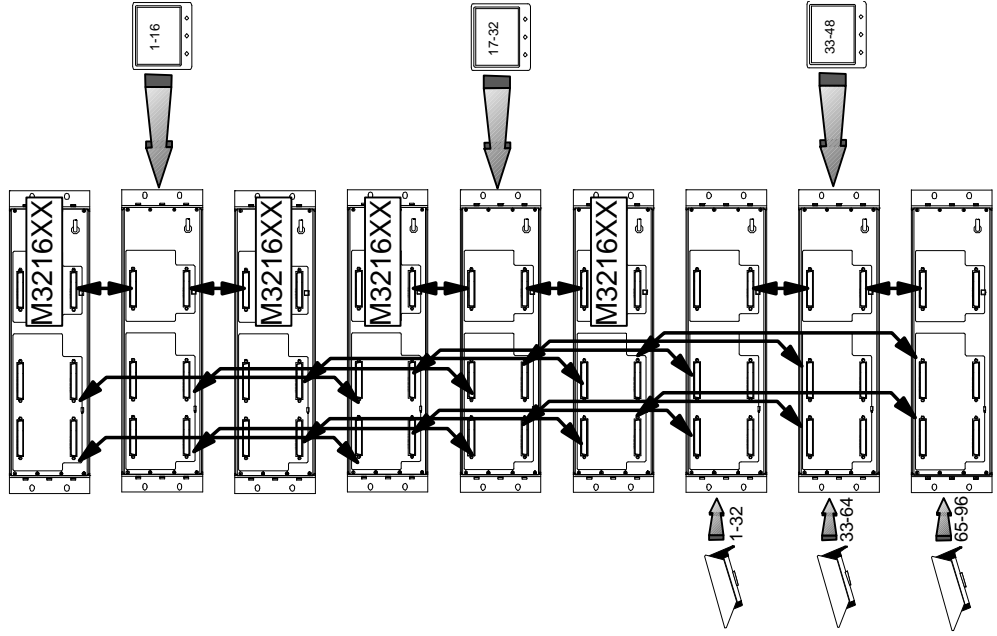
## Basic principle

Example: 96 input / 32 output matrix

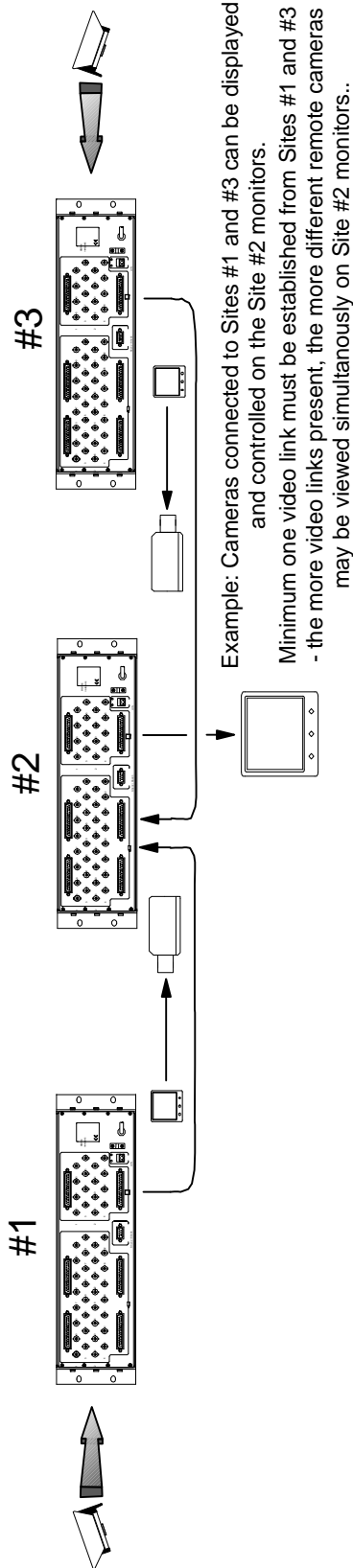


## Recommended configuration

Example: 96 input / 48 output matrix



# Remote Sites



## Remote Site with SYSTEM 1000M

Example: Cameras connected to the SYSTEM 1000M can be viewed and PTZ-controlled from the Matrix X. Two video links are established for simultaneous view of two different remote cameras.

