MICRO THERMO TECHNOLOGIES™

Standard Wiring Guide

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1 Introduction

1.1 Using this document

This guide is intended for Micro Thermo Technologies engineering department. It is not a complete user guide, but rather a detailed cable selector guide for MT Alliance nodes and sensors installation.

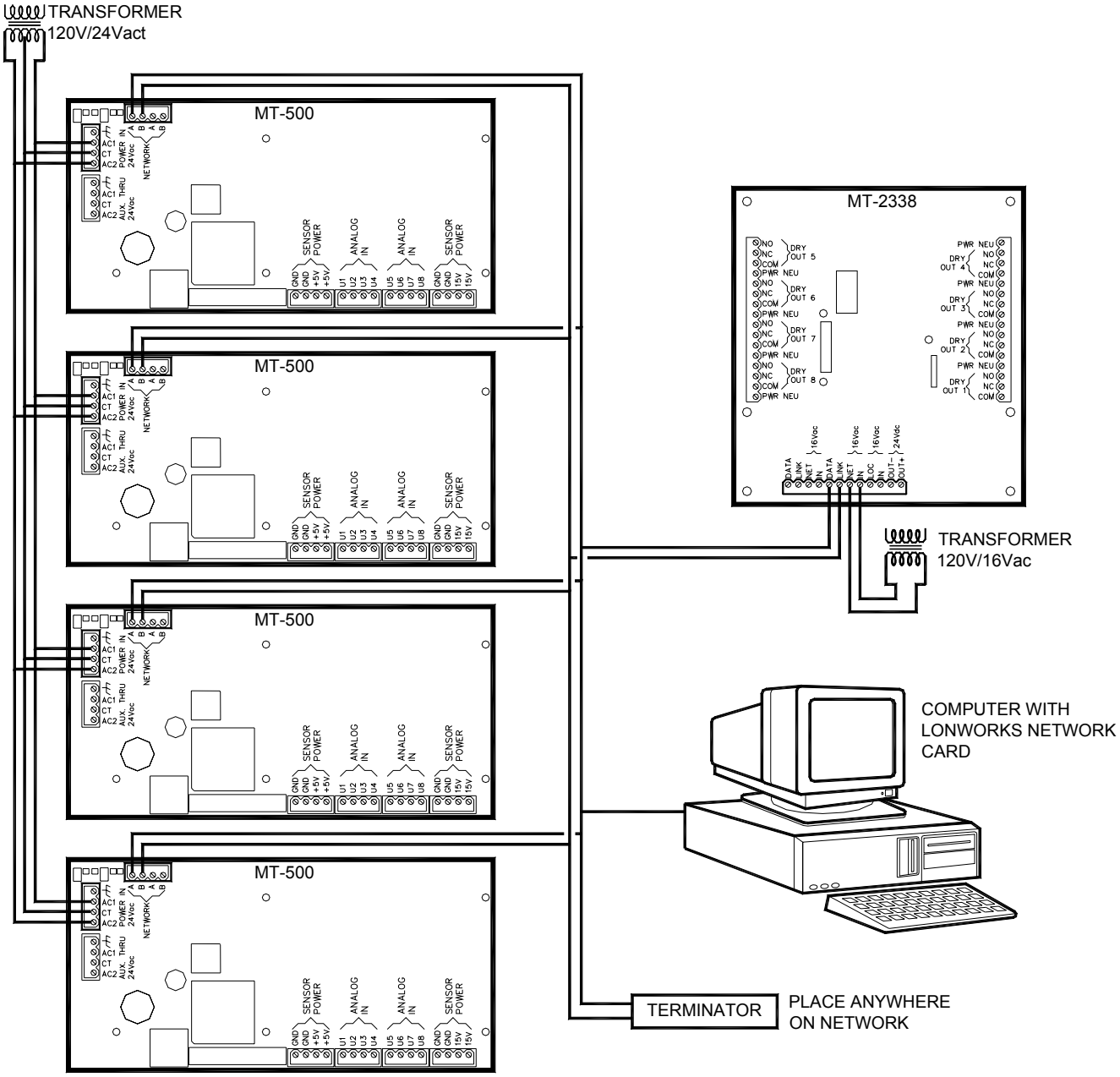
1.2 Conventions used in this document

Bold text is used for emphasis or to highlight MT Alliance terms as found on the interface.

2 System Overview

Figure 1 shows an example of a typical Alliance installation including four MT500 monitoring nodes and one MT-Alarm node. Note that the MT500 contains two DATA connectors. Either one may be used. The same applies to the POWER connectors.

Figure 1 Example of a Free Topology installation



3 Power

3.1 Transformer for sensor node MT500 and MT-Alarm node

Use a 32Vac center tap transformer. Allow 3VA per board. To power the MT-Alarm board, use one phase of the transformer to obtain 16Vac.

Warning! Do not connect boards other than the MT5xx and MT-Alarm on the same transformer.
Do not power the MT-Alarm board with 32Vac

3.2 Cable type

Use MTT no: 600-0040 3-18 shielded (Yellow jacket) or equivalent Belden #8770

Other sizes may be used, see below for details.

3.3 Wiring

You can use a 3-18AWG cable to connect the power to the POWER IN connector on each MT500. Due to wire resistance, a limited number of nodes may be attached on a run of wire. The loss power through the wire is proportional to the current that is drawn from it. The longer the wire, the less nodes it can support. Once the limit is reached, start a new cable run from the transformer. See the following table.

TABLE 1 Number of MT500 per Length of 18AWG Wire using a 32VCT transformer

Length (m)	Length (ft)	Max Number of Nodes
48	156	11
55	182	10
63	208	9
71	234	8
83	273	7
95	312	6
119	391	5
190	625	4
238	781	3
286	937	2

Note: Measuring the 24Vac or 32Vac with a multimeter will not give an accurate reading of the power loss. Measuring the 15V Sensor Power will indicate if the power is adequate. As nodes are added, the 15V Sensor Power will drop. If it drop below 13Vdc, the MT500 will not operate properly. Temperature readings will start to drift. These values were found using MT500 boards. If MT504, MT508 or MT512 boards are used, wire lengths should be shortened according to their respective power draw (see table 4).

TABLE 2 Number of MT500 per Length of 16AWG Wire using a 32VCT transformer

Length (m)	Length (ft)	Max Number of Nodes
76	249	11
88	290	10
100	331	9
114	373	8
132	435	7
152	497	6
189	621	5
303	994	4
379	1243	3
455	1491	2

TABLE 3 Number of MT500 per Length of 22AWG Wire using a 32VCT transformer

Length (m)	Length (ft)	Max Number of Nodes
19	62	11
22	71	10
25	82	9
28	93	8
33	108	7
38	124	6
47	155	5
75	248	4
94	310	3
113	371	2

TABLE 4 Power draw of MT Boards

Node	Power
MT-500	3 va
MT-504	8 va
MT-508	9 va
MT-Comp	5 va
MT-Circuit	9 va

4 Data

4.1 Cable type

Use MTT # 600-0035 2-18 twisted pair unshielded (Orange stripe on yellow jacket) or equivalent Belden #8461. Data cable has to be unshielded

Other sizes may be used, see below for details.

4.2 Wiring

A twisted pair cable ensures communication between the PC and the nodes. The following table shows Echelon approved wire types. For proper system operation, the maximum node-to-node distance as well as the maximum total wire length must be respected. The data link is not polarity sensitive.

When using a shielded twisted pair (note recommended), the cable shield must be grounded on one end using a capacitor and a resistor. A large resistor will bleed off any static electricity in the shield. The capacitor will prevent DC and 50/60 Hz ground paths from being conducted through the shield. Typical values for Rb and Cc are as follows:

Cc = 0.1uF, 10%, Metalized Polyester, ≥ 100V

Rb = 470kΩ. 1/4W, ±5%

The cable shield must be grounded at least once per segment, and preferably at each node. Grounding the shield at every node (using a resistor and capacitor) will assist in suppressing 50/60Hz standing waves.

Figure 2 Shielding of Data Cable

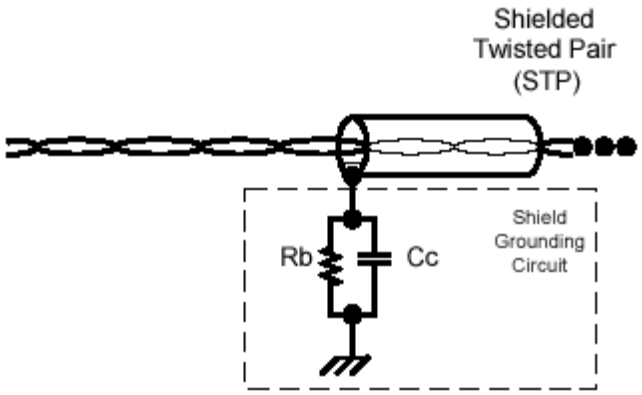


TABLE 5 Echelon Approved FTT-10 LON data wire Types and LON Wiring Specifications

Manufacturer	Size	Free Topology Specifications	
		Maximum Node-to Node Distance (m)	Maximum Total Wire Length
Belden 85102		1640ft (500m)	1640ft (500m)
Belden 8471	16AWG (1.3mm)	1312ft (400m)	1640ft (500m)
Level IV, 22AWG	22AWG (0.65mm)	1312ft (400m)	1640ft (500m)
JY(St)Y 2x2x0.8	20.4AWG (0.8mm)	1050ft (320m)	1640ft (500m)
TIA 568A Category 5	24AWG (0.5mm)	820ft (250m)	1476ft (450m)

4.3 Termination

The network must be terminated in an appropriate fashion. The following table shows the network terminator to use for free topology.

TABLE 6 Network Termination

	Location	Model Number
Free Topology	Place anywhere on network.	FTNT-2 MTT # 950-0035

Warning! If power is accidentally connected to the data network, the terminator and the MT500 board will be damaged.

5 Relay contact output

Use unshielded cable according to the rating of the load (max 3 amp)

Ex : 2-16 for 150 à 200' 0.5 à 1A/solenoid

If 24VAC or 32VAC is required it should come from a separate dedicated transformer

Warning! Pull a dedicated unshielded control cable for AC power. Many states do not accept that AC control power share the same shielded multiconductor cable as the sensor signal wires.

6 Sensor wiring

6.1 Cable type

Generally you can use MTT no: 600-0046 shielded 4-22 (yellow jacket) or 600-0036 shielded 2-18 (grey jacket)

Other sizes may be used, see below for details.

6.2 Thermistor

When the thermistor reads high temperature, the signal loses it's accuracy in the cable. Use the table below for the max allowable length according to the max monitored temperature.

TABLE 7 Max 2 conductor cable length to be used for a temperature reading error of less than 0.1°C

Length vs. wire size at max monitored temperature	16 AWG (feet)	18 AWG (feet)	20 AWG (feet)	22 AWG (feet)	24 AWG (feet)
0°C / 32°F	2000	2000	2000	2000	2000
25°C / 77°F	2000	2000	2000	1000	500
50°C / 122°F	1000	1000	500	400	200
100°C / 212°F	200	100	50	50	20

The thermistor is not polarity sensitive and can be wired either way.

When many thermistors use the same common wire, it shortens the max cable length allowed.

TABLE 8 Max cable length to be used for 3 thermistors using the same common wire reading error of less than 0.1°C

Length vs. wire size at max monitored temperature	18 AWG (feet)	20 AWG (feet)	22 AWG (feet)
0°C / 32°F	2 000	2 000	2 000
25°C / 77°F	1 000	1 000	600
50°C / 122°F	400	200	200
100°C / 212°F	50	10	
0-10V (err <1%)	15 000	10 000	6 000

When a 4 conductor cable is used for 2 or 3 thermistors, use the following color code:

- Black – Commun (SGND) (or Signal 1 return)
- White – Signal 1
- Green – Signal 2
- Red– Signal 3 (or Signal 2 return)
- Shield – Mechanical Ground of the node end only

You do not have to use shielded cable but when you do, you must connect it to the mechanical Ground of the node. Be careful, the earth ground must be made at one point only to avoid a ground loop. We don't use the GKT telephone cable any more because it was brittle and was frequently destroyed by rodents.

A humidity sensor usually needs power to operate. If it does not drain more than 10mA, it can be powered from the MT500 node.

When power is needed for a powered sensor, the following color code should apply

- Red - 15V Humidity power (or 5V Pressure transducer power)
- Green - Humidity 0-10V Signal
- White or yellow – Temperature Signal
- Black GND – Temperat-humid GND
- Shield – Mechanical Ground of the node end only

See sensor specification to make sure to which type of power you need to connect the red wire.

6.3 AD590 and 4-20mA Transmitter

AD590 and 4-20mA Transmitter are the safest type of sensors. They work with any type of cable and any length of cable. In the 4-20mA case, the shunt resistor must be placed at the node input. If the shunt resistor is left at the transmitter terminal, the signal becomes a voltage signal type (255 ohms = 1-5V, 523 ohms = 2-10V) and may not protected enough against EMI and signal loss. Many transmitter of 4-20mA can share the same common, but each of them needs a dedicated transformer. Many AD590 can share the same common but the common wire should be tied to the +12V.

6.4 Voltage transmitter (0-10V)

Voltage transmitter generally comes from a sensor that needs power. The signal itself loses accuracy on long wire length. Especially if the power is generated from the sensor node because both the signal return and the ground power share the same wire and generate some voltage offset. That's why the cable length is limited (see table 8) and a shielded cable is recommended.

6.5 Switches and contacts

A switch is not really a sensor but it can be connected to a node input to proof a state or to send a command. There is no accuracy issue with switches and any type of cable of any length can be used. A dedicated common wire must be used for switches. Don't share the common wire with sensors.

7 Revision History

REV	Description	Revised by	Date
0.2	New guide plan	RL	18-may-05
0.6	Merge version with Wiring Guide for MT products R0.5	RL	02-jun-05
0.7	Reviewed by Victor Trahan	RL/VT	07-jun-05
0.8	Formatting reviewed by Roger Legault	RL	02-mar-07
0.9	Cover page	ER	24-Feb-2015