Wired loop principles

The methods of transmitting information from a wired detector to a control panel using wires developed as follows:

1st method – Normally Open Loop (closed circuit = detector triggered):

The disadvantage of this method is that if the loop is open-circuited anywhere, then detectors close-circuiting after the wire break will not be noticed by the control panel. This method is not therefore used in alarm systems today, which leads us on to the 2nd method ……

2nd method – Normally Closed Loop (open circuit = detector triggered)

The control panel constantly checks whether the loop has been open-circuited, the closed circuit condition being the normal non-alarm state. The disadvantages are that cables can be short-circuited in a fault situation, or deliberately by criminal sabotage.

Usually used for fire detectors which don't normally get tampered with, but there is a tiny risk that fire detectors or cabling could short-circuit due to a fault. One advantage is a saving in the use of resistors as they are unnecessary.

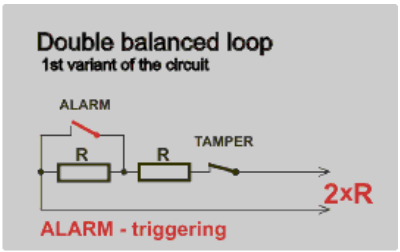
3rd method – Single Balanced Loop

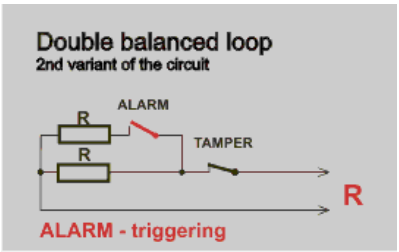
In this method the non-alarm state is defined as a fixed resistance in series with the loop. The specific value depends on the system configuration. If this value changes, it is regarded as detector triggering. Tampering cannot be determined by the control panel in this method. A tolerance has to be defined for this resistance value as the resistance of the wire in the loop is affected by wire length, temperature, terminal resistance and the value accuracy of the termination resistor. A typical tolerance is 30% from the nominal value. To monitor the whole cable length, the resistor is connected to the very end of the cable run, with in-series detector switches open-circuiting the line to signal a tamper or intrusion event.

This method is used mostly for several single-loop detectors in series, such as door contacts, with the terminating resistor located at the most distant detector. This method is simple, but the disadvantage is that having several detectors in series make it impossible to determine which detector was triggered. If this information is essential, then you have to use the double-balanced loop method.

4th method - Double Balanced Loop

Each detector can signal triggering due to intrusion, or a tamper signal. Two values of resistance (R and 2R) signal the two states of standby and detector activation. Short-circuiting or open-circuiting the loop is defined as a tamper/detector-cover-open signal. A tolerance of 30% is applied to the measured resistance to allow for temperature changes etc. If the control panel has enough wired inputs, it is very advantageous to connect each detector to its own dedicated loop to identify the detector. Each loop can then communicate whether the detector was triggered or tampered with. Using several detectors in one loop is not advised.





The values of resistors that are used in JA-6x systems are in the following table:

Input types for COMFORT, MAESTRO PROFI and JA-60K	*JA-60K (TMP terminals)*		*JA-63K (terminals L1 - L4)*			*JA-65K (TMP terminals)*		*JA-65H board inputs (terminals L1 - L16)*		
	standby	*tamper*	*standby*	*trigger*	*tamper*	*standby*	*tamper*	*standby*	*trigger*	*tamper*
single balanced	**2k2**	**0 / ∞**	**2k2**	**0 / ∞**	**-**	**2k2**	**0 / ∞**	**10k**	**0 / ∞**	**-**
double balanced	**-**	**-**	**1k1**	**2k2**	**0 / ∞**	**-**	**-**	**4k7**	**9k4**	**0 / ∞**
value of supplied resistors	**1 x 2k2** (already in terminals)		**8 x 2k2** for picture 1 (4 supplied in terminals)			**1 x 2k2** (ready in terminals)		picture 1: 16x 4k7 + 8x 10k picture 2: 16x 10k (supplied with H module)		

The PROFI MAESTRO systems features NC loops (without resistors), and single balanced and double balanced loops (to monitor tampering too). The COMFORT only has a tamper loop.

The values of resistors used in JA-8x OASIS systems are in the following table:

Input types for OASIS JA-80K control panel	*JA-80K (terminals 01, 02)*			*JA-82K (terminals 01 – 04)*			*JA-83K (terminals 01 – 10)*			*JA-82C board inputs (terminals according to the module position)*		
	standby	*trigger*	*tamper*	*standby*	*trigger*	*tamper*	*standby*	*trigger*	*tamper*	*standby*	*trigger*	*tamper*
double balanced	**1k**	**2-6k**	**1k-6k**	**1k**	**2-6k**	**1k-6k**	**1k**	**2-6k**	**1k-6k**	**1k**	**2-6k**	**1k-6k**

values of supplied resistors	**4 x 1k** (2 supplied on terminals)	**8 x 1k**	**20 x 1k**	**20 x 1k**

The OASIS system is used exclusively with double balanced loops and the resistors are provided for use with method 1 (picture above - sorts of serial resistors). Up to 5 detectors can be used in one loop with NC contacts in series, where each contact has a parallel balancing resistor. Only one tamper resistor is used in the loop.
