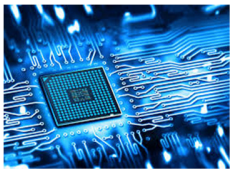
LOUDSPEAKER LINE EARTH SUPERVISION

TDS-025 Issue 01 Ziztel Technical Bulletin



Thank you for your interest in Ziztel - we are a UK based manufacturer of PAGA/MBS and Intercom products. Our systems are mainly designed for use in the Military, Marine, Hazardous Oil, Gas and Petrochemical industries.

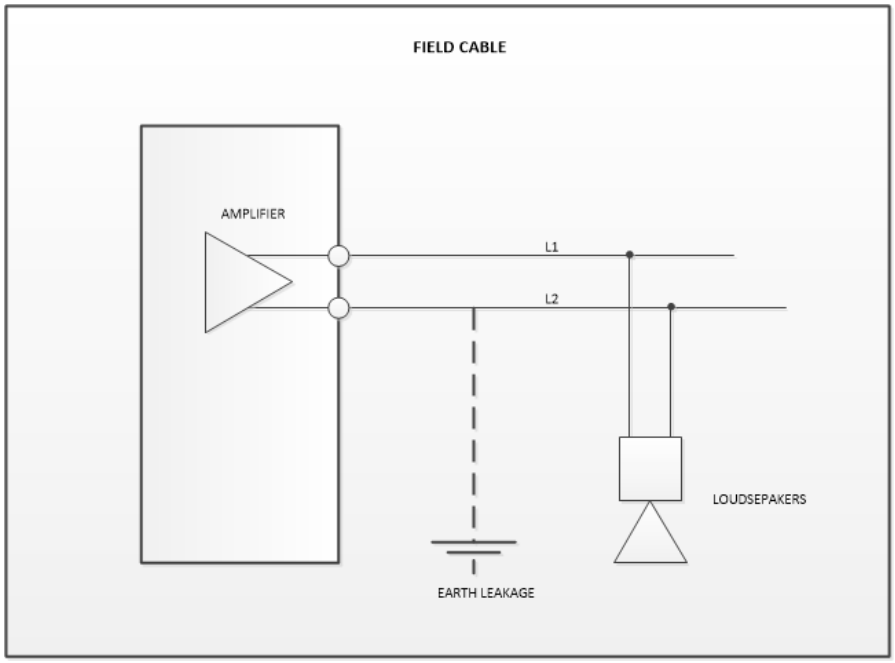
The 350A amplifier module is the kernel of a life safety Public address and General alarm system and includes a supervisory layer that monitors associated critical paths within the package and passing status to the host controller. This paper covers the supervision and set up of the line earth fault monitoring subsystem employed to supervise loudspeaker circuits.

The earth leakage detection hardware is located in the 350A/ 350-500A amplifier module which monitors the loudspeaker line-s connected to the particular amplifier. Earth faults should be investigated and cleared as quickly as possible since they can compromise the security of the entire PAGA/MBS system.

ZIZTEL PAGA SYSTEM FIELD CIRCUIT MONITORING

Introduction

The Ziztel PAGA supervisory system monitors undesirable loudspeaker loop/line earth leakage on an automated basis. The scheme operates in conjunction with the line sensing system used to monitor the connectivity of the loudspeaker circuit field cable conductors. The line sensing system employs a 21kHz pilot tone in conjunction with an end of line device to prove security of critical path connectivity. The 21kHz pilot test is executed for 1 second at 240 second intervals, at all other times a secondary supervisory checks isolation of the loudspeaker field cable conductors to earth.



Earth leakage detection is independent of the loudspeaker circuit topology and operates in the same way for loop, radial, star or 'tree and branch' wired networks. Earth leakage current flow is supervised on both loudspeaker line conductors and the detection circuit can resolve up to 68kOhm between either conductor and dirty earth.

In certain site applications high earth leakage sensitivity is undesirable; for example, applications where moisture presence between conductors and earth cannot be eliminated will cause troublesome earth fault indications.

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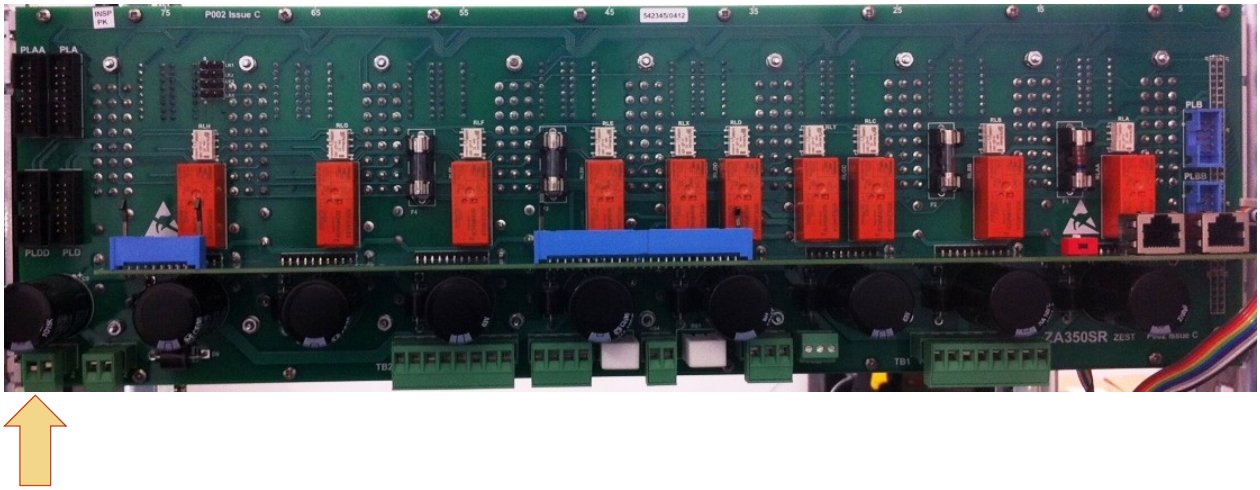
This is the case where loudspeakers are located in a crane cabin which employs exposed slip rings to make the connection between loudspeaker line and devices inside the cabin. Earth leakage sensitivity is reduced by inserting plug link 4 on the 350A amplifier motherboard. With the plug link in place the typical earth leakage sensitivity is reduced to 2kOhm

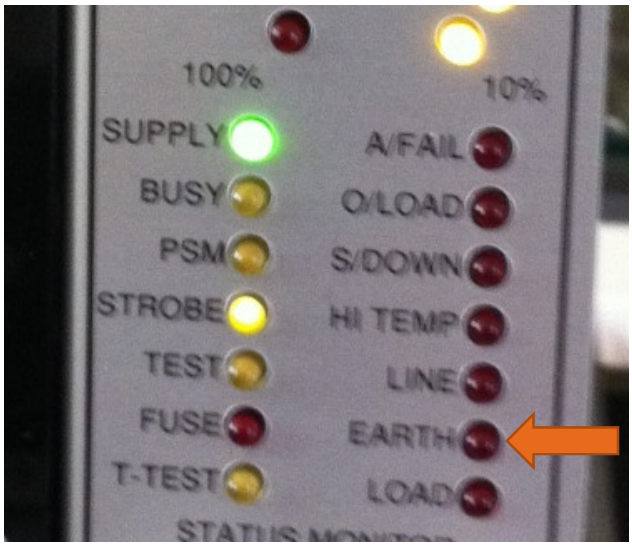
Implementation

An isolated DC supply is configured on each 350A amplifier module. A positive DC voltage is applied to both conductors of the loudspeaker line drive output. The current flow in this circuit is monitored by a supervisory circuit fitted to the 350A motherboard and if this flow exceeds a pre-set level a fault alert is raised. To eliminate line transients causing a ghost earth fault to be latched the monitoring input is timed for nominal 5 seconds during which the earth fault must be continuous before the amplifier registers a valid earth fault condition.

The subrack must be bonded to earth to enable detection of loudspeaker line earth leakage



This connector must be bonded to earth to enable correct operation of the earth leakage line monitoring. The earth bonding lead is a critical part of the line supervisory set up. If the subrack fails to be bonded to earth, then possible earth fault(s) will not be displayed on all amplifiers associated with the unearthed subrack.



Earth red LED illuminates whenever earth fault currents are detected from either loudspeaker line conductor and earth.

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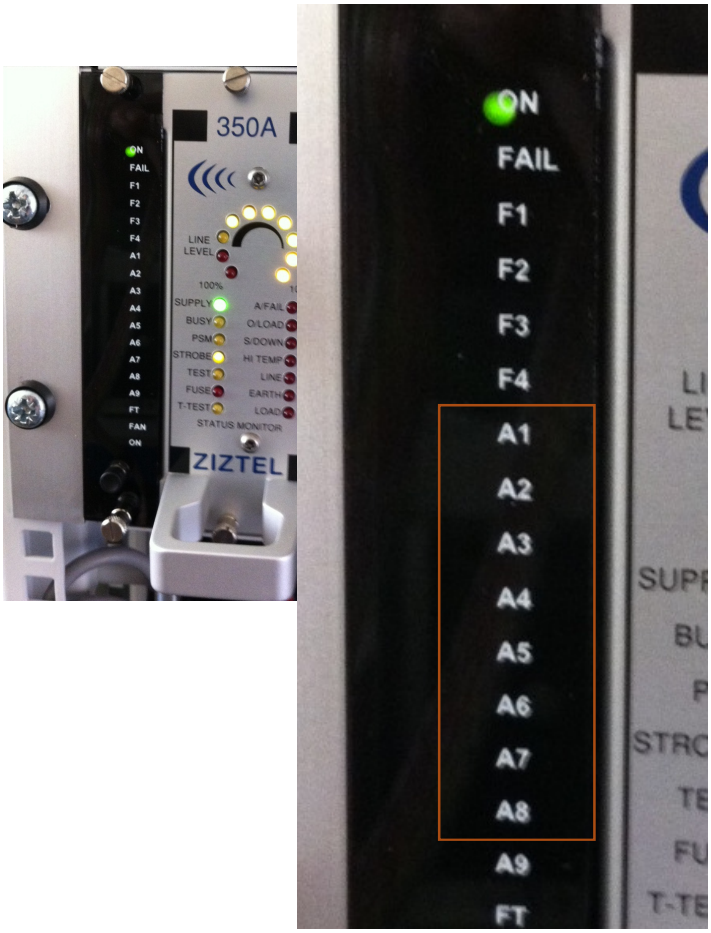
Earth Fault Finding

In the event that a 350A amplifier displays ‘Earth Fault’ the engineer must investigate the report and implement corrective action to clear the fault.

Any amplifier that is displaying an ‘Earth Fault’ condition will transmit a fail status to the host subrack display window where A1 to A8 will indicate respective amplifier trouble.



Sub rack display window.

An Earth or Line fault indication on any on line 350A amplifier results in respective red LED A1 to A8 being illuminated.

An earth fault does not always prevent the amplifier from delivering PAGA to the associated loudspeakers and it is usually several different earth faults that ultimately inhibit broadcast capability.

Typical earth faults are caused by:-

1) Water inside cables/junction boxes tracking either or both field cable conductors to earth
2) Trapped field cable conductor insulation
3) Faulty Loudspeaker(s) which track either or both field cable conductors to earth

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The suspect field circuit should be disconnected from the LTD in the PAGA central rack and a check of the amplifier earth fault LED to see if the fault is cleared. If the earth LED indication persists then the earth fault is within the central rack and could be:

a) A damaged 350A amplifier.
b) A damaged 50-way ribbon cable which connects the LTD003/LTD007 to 'PLC' connector on the subrack.

If the earth fault can be cleared (by pressing the ZX100 reset button) then the earth fault is located in the field.

A multimeter set to Ohms (@ x 10k) is connected between a convenient earth point (e.g. the rack metal frame) and either conductor leg of the outgoing field cable indicates the severity of the earth fault. Progressive isolation of the loudspeaker circuit along its length is carried out until the earth fault is located as displayed by ideally an 'infinity' reading on the meter.

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