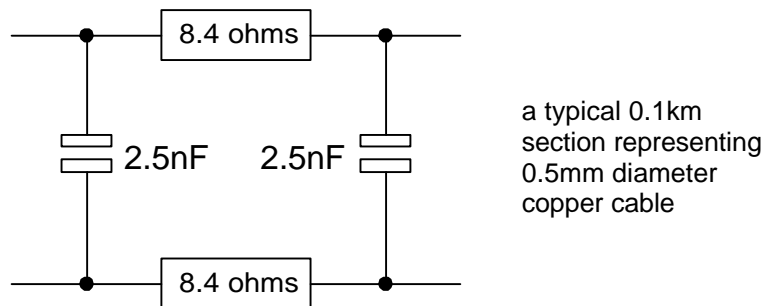


Specification For The MSB Design Artificial Line AL-2

Introduction

An Artificial Line, as the name suggests, is an apparatus that can simulate a real length of telephone cable such as is used in the local loop to route exchange lines to the subscriber via the Public Switched Telephone Network (PSTN).

The British Standard BS6305 defines the form that such a simulation should take, and this describes a 0.1km section of 0.5mm copper conductor as being represented by a series resistor of value 8.4 ohms in each leg with a parallel capacitor of value 2.5nF at each end of the section. Thus different lengths of line are made up of cascaded 0.1km sections.



The MSB Design unit faithfully reproduces this standard and is constructed with components having a tolerance of +/- 1% and a rated voltage of 250v dc; this ensures that the lines are capable of operating with ringing voltages to the full 100v RMS level as well as low level speech signals.

Features

The selection of line segments is achieved in two ways, depending on whether you are using manual or computer control.

In the manual mode selection is simply by means of the front panel switches, which join in different sections of line length. These sections are configured in a binary format; i.e. 0.1km, 0.2km, 0.4km, 0.8km etc., the only deviation from this rule being the addition of an extra 1.6km section to make up the total available length to 7.9km, thus achieving the necessary 7.5km max needed in the various BS tests.

Thus by selecting combinations of the front panel switches any length from 0km to 7.9km can be achieved. Those switches not selected just feed through to the next section, and thus if all switches are in the direct position the line length is a short circuit.

If line lengths of more than 7.9km are required then one or more units can easily be cascaded as required.

Provision is made for the reversal of the input terminals by means of the 'reverse' switch, an occurrence which must be allowed for when designing equipment to be connected to the PSTN as no instructions apply to the polarity of the incoming subscriber lines.

If control is to be handled by computer then the line lengths are selected in much the same way as with manual control except that instead of the front panel switches a software code is sent to the unit to select that particular segment of line. Refer to the section on the Interface for instructions on programming this mode.

Note that in either case the front panel switches are 'OR'd' with the computer input so any selected segment will come into circuit regardless of the source of control.

In the outgoing 'A' line there are a pair of terminals for measuring the loop current, and if this is not required they must be shorted together to make continuity in that line.

The inputs and outputs are available both on a pair of 4mm screw terminals and a line jack. No attempt has been made to provide any connection to pin 3 of the line jacks (normally the ringing line) as the splitting off of this signal is normally achieved after the line end.

Note that even for manual control the power must be switched on to operate the internal relays.

Uses

Clearly the use to which this equipment is put will depend upon the requirements of the operator, but some suggestions are presented as an indication :-

- a) BS6305 test Section A2 - detection of bell tinkle
- b) BS6305 test Section A8 - dial pulse distortion
- c) BS6305 test Section D1 - REN determination
- d) ring detector sensitivity
- e) speech circuit sensitivity
- f) data pulse distortion
- g) line bandwidth effect on signals

etc.

Specification

Line Length	0 to 7.9km in 0.1km increments
Resolution	0.1km
Inputs	1 off pair 4mm screw terminals 1 off line jack
Outputs	1 off pair 4mm screw terminals 1 off line jack
Component Tolerance	+/- 1%
Voltage Rating	250v dc
Interface	Emulates Centronics Printer Port

The unit is housed in a steel / aluminium enclosure, with all switches and connectors on the front and rear panels. It is mains powered, via an IEC connector on the rear panel. Enclosure dimensions are 220mm x 220mm x 70mm.

IMPORTANT

It is essential that this line is only connected to such apparatus that will limit the current to a **maximum of 250mA**.

Care should be taken when ringing voltages and short line lengths are used in combination - direct selected is fine.

Please note that the two white current-monitor terminals must be connected together, either by a link or a current measuring instrument. Without this connection the line will be open-circuit, and no transmission will be possible.

Interface

As indicated earlier, the computer control revolves around the fact that the unit can emulate a Centronics Parallel Printer Port. This means that control can be achieved by addressing the computer's printer port and sending single ASCII characters to select the line length.

The standard Parallel Port pin-out is as follows :-

1	Strobe	2	D0
3	D1	4	D2
5	D3	6	D4
7	D5	8	D6
9	D7	10	ack
11	busy	12	pe
13	-	14	-
15	-	16	-
17	-	18	-
19	0v	20	0v
21	0v	22	0v
23	0v	24	0v
25	0v	26	0v
27	0v	28	0v
29	0v	30	0v
31	-	32	err
33	0v	34	-
35	-	36	slct

Note that the signal pins BUSY(11) and PE(12) are tied low, and the pins ERR(32) and SLCT(36) are pulled high via 3k3 resistors.

The computer, when addressed to print to the port, will place the data on the data lines and then pulse the strobe line to enter the data; the unit then generates an internal acknowledge which is sent out on the ACK line (pin 10). The period of the ACK pulse, and the pause between strobe and ACK are both approx. 33uS.

Programming

The algorithm for program control of the unit is quite straightforward, and is only complicated by the fact that the inclusion of the extra 1.6km section means a deviation in the logical flow at 6.3km.

Basically, to select one 0.1km section you must output the ASCII character 1, to select 0.2km output the character 2, etc. up until 6.3km, when you must add the value 48 to all the ASCII characters from then on.

In addition, to select the reverse switch, you must add 128 to the ASCII values.

Here is a sample program written in the ubiquitous Microsoft BASIC which should give you the idea :-

```
10 input "Enter the required line length ",l
20 if l<=6.3 then lprint chr$(10*l); else lprint
   chr$((10*l)+48);
30 goto 10
```

Note well that the semi-colon after the lprint argument is absolutely necessary or else the CR/LF combination will appear as a line selection instead.

Here is a more comprehensive program fragment written in QuickBASIC which will show the use of the reverse selection :-

```
do
print"Enter the required line length ";
l=0:k$=""
do until k$<>""
  k$=inkey$
loop
  if k$="R" or k$="r" then r=128:lprint chr$(128);:exit do
  if k$="N" or k$="n" then r=0:lprint chr$(0);:exit do
  if asc(k$)<46 or asc(k$)>57 then exit do
  print k$;
  input"",partl
  if k$="." then l=(partl/10) else l=val(k$)+partl
  if l<=6.3 then lprint chr$((10*l)+r); else
  lprint chr$((10*l)+48+r);
loop
```