MARS-ALE Application Note

**RS-232 Computer Control Interface
for LDG Electronics DTS-4/DTS-6
Desktop Coaxial Switches**

**Version 1.02
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Revision Requirements: The support for this application note requires MARS-ALE build B001A8g3 and above where both computer control for radio internal antenna port selection and external antenna port selection devices was integrated.

SCOPE: The scope of this document pertains to an RS-232 level converter interface in support of the LDG Electronics Inc. DTS-4 and DTS-6 coaxial antenna switches.

OVERVIEW

For flexible and comprehensive ALE operations, the MARS-ALE tool has implemented the support of automatic antenna selection. Beginning with build B001A8g3, a class was added in support of antenna selection devices. B001A8g3 provides for MARS-ALE supported make/model computer controlled radios which provide internally switched antenna ports. Also the LDG Electronics AT200PC computer controlled automatic antenna tuner which supports two antenna ports and the LDG external DTS-4 and DTS-6 coaxial switches.

Support is also planned for integration beginning with B001A8g4 of RS-232 and Parallel Printer port signaling lines for use with user provided interfacing to D.C. switched antenna selection devices and other RS-232 antenna selection devices such as the ACOM 2000SW.

SCOPE

The scope of this document pertains to a proven design for an RS-232 level converter interface in support of the LDG Electronics Inc. DTS-4 and DTS-6 coaxial antenna switches.

LDG COAXIAL ANTENNA SWITCHES

The LDG DTS-4 and DTS-6 devices offer the following main characteristics of interest for ALE operations:

- DTS-4 has 4 antenna ports
- DTS-6 has 6 antenna ports
- TTL serial port
- Frequency range: 1.8 – 54 MHz
- RF power rating: 1500 watts to 30Mhz, 1000 watts to 54Mhz
- Isolation: >50 db
- Loss: <1 db measured on 14 MHz.
- Power requirements: 11 – 15 volts DC at 100mA maximum

These switches provide the capability for computer interfacing; however there is no direct, standard RS-232 interface port, but rather a standard TTL port. The port parameters are 2400 baud (8 data bits, No Parity, 1 Stop Bit) which is fast enough for the application and less likely to suffer from data loss or erroneous data hits as no hardware hand shaking is being used.

Figure 1.

These electronically switched devices (refer to Figure 1) feature a human interface with push buttons and LED's indicators for the selected port (1 to 4 antenna with DTS-4 pictured above and 6 antenna ports with DTS-6). The TTL level Control (Cntrl) Port (refer to Figure 2) designed for use with the LDG optional DTS-4R and DTS-6R remote control units, is a standard 3.5mm (1/8 inch) 3-conductor jack. It is the TTL level control port that is normally used with the remote control units that MARS-ALE is being interfaced with for control. The wiring for the Cntl port uses shield as ground, the ring for signals from the DTS switch to the PC (or DTS-xR remote) and the tip for signals from the PC (or DTS-xR remote)to the DTS-x switch.

As the Cntrl port is a standard TTL interface, it requires an external level converter to interface the TTL 5 volt levels to the RS-232C standard 12 volt levels. LDG does not provide an optional RS-232 interface for PC control of the DTS-x switches. However one can be built at little cost or purchased from someone willing to make them for not much more, it's the labor involved that will add to the cost of an off the shelf unit.

This document shall provide the details of a proven interface (the first such known to LDG) that can be user built without much effort. However, one source now exists to purchase these interfaces, with additional sources to likely follow over time, Appendix A of this document lists the vendors of hardware required for this application as made known to the MARS-ALE SDT.

Figure 2.

As seen in Figure 2, there are three small connectors on the rear of a DTS-x switch, from right to left, D.C. power, the "Cntl" port for use with the DTS-xR remote and "Radio Sense", which for MARS-ALE use; must NOT be used as detailed for use in the MARS-ALE documentation. However, the Radio Sense port, when wired to a point on the HF radio that provides an appropriate D.C. signal when the HF radio is powered on, in conjunction with the Radio Sense being enabled, will control the grounding and un-grounding of all antenna ports. The DTS-xR units also have a Radio Sense port that allows the radio to be interfaced to it or to the main switch. For MARS-ALE purposes, communications between the units regarding this port is being emulated by the software, thus the actual hardware interfacing of that port should not be used.

NOTE: The interface cabling between a DTS-x switch Cntl port and either an DTS-xR remote or PC interface should not be inserted or removed while power is being applied to the devices.

In their documentation, LDG states that the DTS-x and DTS-xR units have been tested with up to 150 feet of remote cable between them and that for the long cable tests, the cable was 150 feet of Alpha 2400C being 24 AWG (7/32) with shield and drain. LDG states in their documentation that longer lengths could be achieved with the same wire but that actual maximum length was not tested. The interface described herein was tested with 100 feet of 24 AWG wire between the interface and the DTS-x switch and found to work. Also tested was a 50 foot RS-232 cable, at the 2400 baud being used, a good quality cable run of 150 feet should be usable. The LDG manual states "With these long cable lengths possible, the user can place the DTS-4 in a weather resistant enclosure for mounting outside", however this was not tested with the interface described herein and the MARS-ALE software.

MARS-ALE RS-232 DTS-4/DTS-6 CONTROL PORT INTERFACE

The interface (detailed in Figure 4) herein is based on the on the Toshiba TLP504A device, a photo−transistor optically coupled to a gallium arsenide infrared emitting diode.

TLP504A offers two isolated channels in a eight lead plastic DIP package (see Figure 3), with ratings of:

- Collector−emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
- Rank GB: 100% (min.)
- Isolation voltage: 2500 Vrms (min.)

Other such compatible devices can likely be substituted, however only the TLP504A was using in development and testing. For more details see the TLP504A datasheet at:

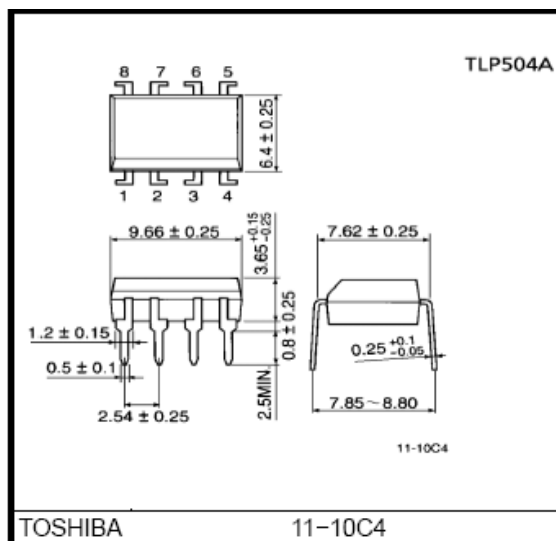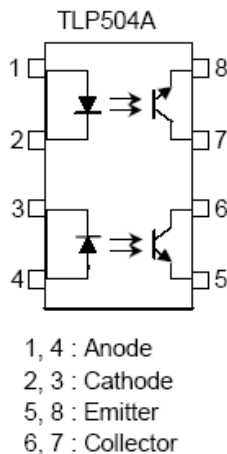http://www.semicon.toshiba.co.jp/td/en/Opto/Photocoupler/en_20020925_TLP504A_datasheet.pdf

Figure 3.

The TPL504A depicted as device U1 in Figure 4, provides complete isolation between the DTS-x switch and the PC RS-232 port on the computer. There is no potential of ground loops or issues with voltage levels of current draw as the two hardware systems never electronically come in contact, all they share is the world of digital 1's and 0's that gate the two photo transistors.

There are a total of 3 diodes, 4 resistors and 1 TLP504A in this circuit. This is a simple, effective and low cost design. There freedom of how to physically implement this design is up to you. The completed and tested interfaces depicted in Figure 4 can be fit into a DB9 connector housing with some care, as the DB9 is the standard connector used on today's PC serial ports and USB to RS-232 serial adapters, it makes for the most compact assembly of the interface. The examples of such workmanship by Holland Electronics (KC2CNB) can be seen in Picture 1, of the units used for development and testing of DTS-x support for MARS-ALE.
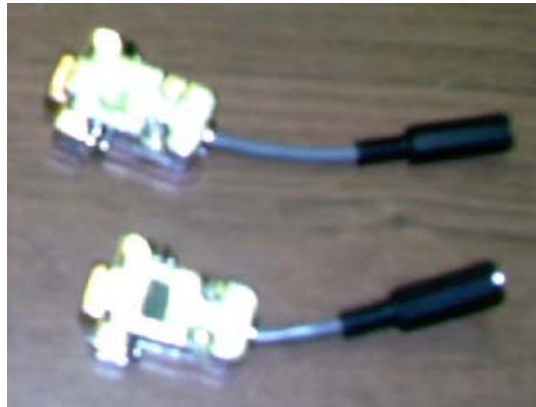
Picture 1.

As the DTS-x switches have a 3.5mm female port, the computer interface can be wired for directly plugging into the switch using a 3.5mm plug as depicted in Figure 4 or with a female jack where a standard male-to-male 3.5mm cable can be used between the DTS-x switch and the computer interface. However, what can NOT be done with this interface is to create a Y-cabling situation to have the DTS-x switch and DTS-xR remote and PC interface all connected together. A different interface is required if all three are to be used together that has yet to be developed.

There is no PCB artwork being provided for this project. A piece of perf board or just wiring from pin to pin on the device and to the connector and cabling and the proper use of insulation is all that is needed, along with cable strain relief. Particular care should be taken to prevent shorting to a metal or metallic painted connector housing should the goal be to place the circuit I a DB9 housing.

The wattage ratings of the resistors are 1/8 watt or less actually as current draw is very low. There is no external D.C. power required to power the unit either. The user can, for purposes of future software that may require such, insert a miniature switch at the junction of D1, D2 and R4, where such a switch would be used to select between D1 or D2 being in the circuit at any one time to provide selection of the RTS or DTR lines, such selection is not required for proper MARS-ALE operation at this time.
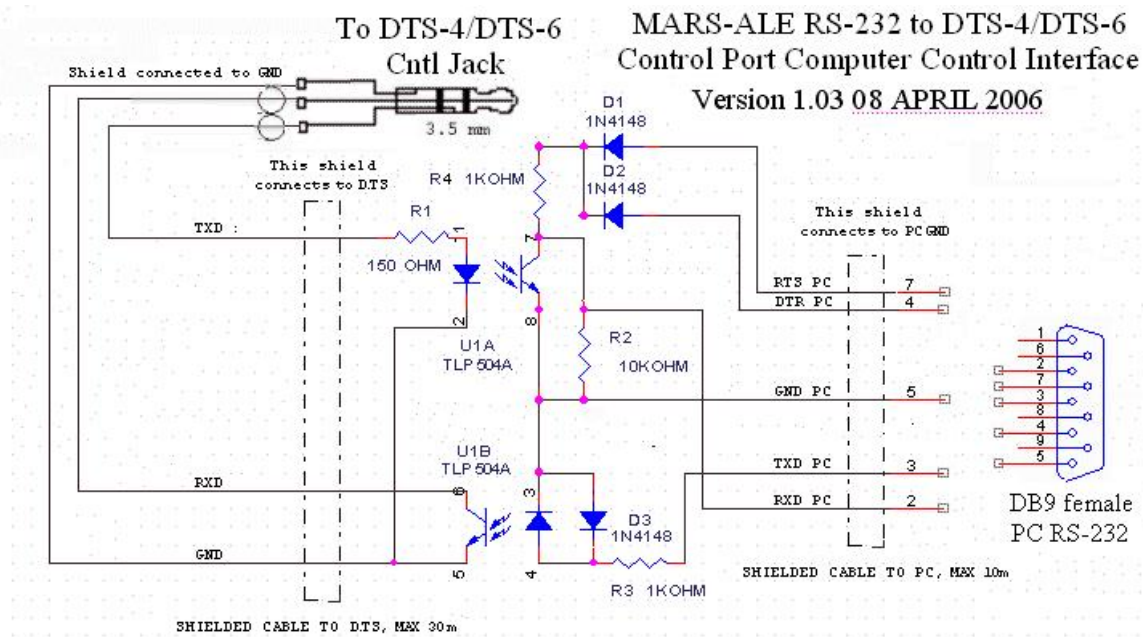
Figure 4.

Appendix A

Hardware Sources

DTS-x Coaxial Switches:

LDG Electronics, Inc., 1445 Parran Rd., P.O. Box 48, St. Leonard, MD 20685

Phone: 410-586-2177
Fax: 410-586-8475
E-mail: ldg@ldgelectronics.com
Web: http://www.ldgelectronics.com/index.html

RS-232 Interface for DTS-x Coaxial Switches:

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