



GENERAL DISCUSSION  
of the  
NTDS TYPE E SERIAL INTERFACE

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GET NTDS TYPE E SERIAL INTERFACE DESCRIPTION

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SECTION 1  
NTDS TYPE E SERIAL INTERFACE  
DISCUSSION

1.1 SCOPE

This document contains information discussing the general design philosophy used in implementation of GET NTDS Type E ( Low Level ) Serial Interface Adaptors. This document is intended to assist qualified personnel in the development, operation, installation, and diagnosis of these adaptors. It is not the intent or purpose of this document to define the actual uses or applications of NTDS interfaces. Programming and application examples or outlines and diagrams which may be found in this document are intended only to illustrate the operation of the NTDS interface.

1.2 NTDS TYPE E SERIAL OVERVIEW

The GET NTDS Type E Serial ( LLS ) Interface Adaptors transfer 10 Mb/s binary information using bipolar serial pulse trains on two triaxial cables. A LLS I/O CHANNEL consists of a Source Port and a Sink Port each of which can transact information frames using two types of 4 bit control frames. The signals required for an input transaction occur entirely on the single triaxial cable used for the Sink Port. The signals required for an output transaction occur entirely on the single triaxial cable used for the Source Port. The following description of the operation of a LLS channel is intended only as an aid in explaining the interface operation of the typical NTDS Serial interface and as such does not cover all aspects of NTDS protocols. For a complete description of NTDS information exchange protocols refer to MIL-STD-1397C ( SHIPS ) Military Standard Document.

1.3 NTDS TYPE E SERIAL TRANSACTIONS

Transfers of information between two serial devices is accomplished using 10 Mb/s control and data frame bipolar pulse trains. The transmitting device sends a control frame requesting an eventual word transfer to the receiving equipment. The receiving equipment then sends a control frame granting or denying permission to the requesting device to transmit the data frame. If the transmission request is denied the transmitting device may elect to send another output request control frame. If the control frame indicates that permission has been granted the transmitting device sends the data frame.

1.4 NTDS TYPE E SERIAL TIMING

The encoding scheme used is called Manchester II Split Phase Encoding. In this scheme the transmission clock and data are encoded into each bit. This 10 Mb/s timing has a 100 nanosec period for each bit time. Each bit time is in turn divided into two 50 nanosec pulse periods. A logical 1 is represented by a positive pulse followed by a negative pulse. A logical 0 is a negative pulse followed by a positive pulse.

#### 1.4.1 TYPE E INTERFACE VOLTAGES

At the transmitter end of the coaxial cable the serial data line has an amplitude of +/- .600 Volts. The switching threshold at the receiver end of the coaxial cable is +/- .220 VDC. Additionally, the receiver outputs must remain stable and not switch state for all open input conditions or when the input voltage is between 0.00 and +/- 0.155 VDC. The receiver input circuits must also be able to reject input transient pulses of specific energy levels. With MIL-C-17/134 triaxial cable and 50 Ohm termination the maximum specified cable length is 390 ft. With MIL-C-17/135 triaxial cable and 50 Ohm termination the maximum specified cable length is 980 ft.

#### 1.4.2 CONTROL FRAME FORMAT

There are two types of control frames used in the LLS protocol. The Source Status Control Frame ( SOS ) is used by the Source device to indicate its readiness to transmit Information Frames. The Sink device uses the Sink Status Control Frames ( SIS ) to indicate its readiness to receive. The first bit of these four bit control frames is a logic 1 synchronization bit. The next two bits represent the Data and Function requests and enables, as shown in Figure 1.1. Both bits may be set in any control frame. The fourth control frame bit is the control frame identifier bit. The information frame transmitted as a result of the control frame exchange is identified by the information word identifier bit.

#### 1.4.3 INFORMATION FRAME FORMATS

There are two types of Information Frames ( IF ) used. The Single Word Transfer ( SWT ) Frames are used to transfer single 34 or 35 bit Data or Command/Interrupt ( CIW ) words. The Burst transfer frame is used to send up to 32 Data words in a single transaction. The first bit of each IF is a logic 1 synchronization bit. The next bit is the word identifier ( WI, 0 for Data and 1 for CIW ). The next 32 bits represent the transmitted data, followed by an optional ODD parity bit. For burst frames, up to 31 additional Data words, with optional parity, follow. No CIW words can be sent in Burst frames.

#### 1.5 SERIAL TRANSFERS

A SOURCE device sets its Output Data Enable ( ODA ) line or External Function Enable ( EFA ) line when it is in a condition to transmit a Data or CIW word to the SINK device. The SOURCE device then sends a SOS frame with the ODA or EFA bits set. The SINK device responds to the SOS by transmitting a SIS frame. The SIS indicates the SINK port's ability to accept the data frame offered by the SOURCE device, as determined by the condition of the Output Data Request ( ODR ) or External Function Request ( EFR ) bits. The active request bit indicates to the sourcing device that the SINK device can accept the requested transfer. The SOURCE device, at its convenience, sends the SWT or Burst IF to the SINK device. Note that both ODR and EFR bits may be active at any one time. The SINK device acknowledges the receipt of data and its possible ability to accept another IF by sending another SIS frame.

### 1.5.1 FORCED EXTERNAL FUNCTIONS

Some NTDS devices have the ability of sending Forced CIW and do not require that the EFR bit be set in the SIS frame from the SINK device. The SINK device has no control over the rate at which CIWs with Force are sent. If the SINK device can not accept the CIWs at a high rate, timing restrictions must be made in the computer programming or external data rate buffered devices may have to be used. The GET LLS interface adaptors contain an input FIFO buffers that are designed to accept several consecutive Forced CIWs before the danger of lost data arises.

### 1.6 SYSTEM INTEGRITY FEATURES

The LLS System Integrity Features ( SIF ) are designed to improve system reliability. Using SIF, the user can determine if a LLS interface is improperly connected, disabled, or malfunctioning. The SIF error detection logic is designed to detect communications loss, protocol violations, and data corruption. The SIF monitors are designed to operate simultaneously and without interfering with normal LLS protocol operations. The monitored error conditions include Sink and Source port CF timeouts, IF parity, CF validation, CF and IF framing errors, and CF and IF response errors. No corrective action is specified if a SIF error is detected. However, when a SIF error condition is detected the operator must be notified by appropriate register settings or, if implemented, a status indicator.



FIGURE 2.2

DATA FRAME TIMING

