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MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)

INDIVIDUAL WEAPON SYSTEMS (IWS)

INTERFACE CONTROL DOCUMENT (ICD)

FOR THE

TACTICAL ENGAGEMENT SIMULATION SYSTEM (TESS)

And DATA COMMUNICATION INTERFACE UNIT (DCIU)

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1.0 SCOPE

1.1. Identification

This ICD defines the hardware interface and the message set used to interface the man-worn Tactical Engagement Simulation Systems (TESS) to the Initial-Homestation Instrumentation Training System (I-HITS) Common Player Unit (CPU).

1.2. Document Overview

The document describes all aspects of the TESS/DCIU interface including electrical, mechanical, and functional characteristics, as well as, message protocols and formats.

Unless otherwise specified, all numbers in this document are decimal.

1.3. Definitions

The following definitions are used throughout this document. Acronyms are defined in Section 4.

Data Communication Interface Unit (DCIU) – The DCIU is the Range Data Measurement System (RDMS) device that controls message traffic to and from the TESS and to and from the Exercise Control (EXCON) facility via the radio frequency (RF) or air interface.

Tactical Engagement Simulation System (TESS) – A term referring to any one, or, collectively, all of the man-worn engagement simulation systems with which the DCIU can interface.

RS-232 (CMOS) – A type of asynchronous serial communication used between two devices. In this ICD all RS-232 communications take place at 9600 Baud using 1 start bit, 8 data bits, 1 stop bit, and no parity bit(s). This RS-232 communication scheme uses only the following signaling: (1) transmit data, (2) receive data, and (3) signal ground. RS-232 (CMOS) utilizes 0.0 VDC to 0.4 VDC to represent logic 0 and 2.4 VDC to 5.0 VDC to represent logic 1.

Player ID (PID) – the player ID can take one of three forms in the message formats used in this ICD. See the individual messages for which exact format is to be used. The “true PID” refers to an MCC-97 PID in the range 1-3300 with no additional coding applied and expressed as an unsigned 16-bit integer. See Table V-7 for a description of the true PID. The “ammo-coded PID” refers to the MCC-97 PID in the range 1-26400 which is the PID and ammo code in a single unsigned 16-bit integer. See Table V-7 for a description of the ammo-coded PID.

1.4. Special Note

None.

2.0 APPLICABLE DOCUMENTS

2.1. Government Documents.

2.1.1. SPECIFICATIONS

PRF-PT-00434	Multiple Integrated Laser Engagement System Individual Weapon System (IWS)
290065 RCS MILES ICD Version D July 7 2005	Interface Control Document (ICD) for the Interfaces Between the Range Communication System (RCS) Range Data Measurement Subsystem (RDMS) Data Communication Interface Unit (DCIU) and Four Tactical Engagement Simulation Systems (TESS)
290066 RCS RDMS Tables Attachments ICD Rev C 29 April 2005	Interface Control Document for the Interfaces between the Range Communication System (RCS) Range Data Measurement Subsystem (RDMS) Tables Attachment for the National Training Center – Instrumentation System (NTC-IS)

2.1.2. STANDARDS

MIL-DTL-31000C	Technical Data Package
MIL PRF 49506	Logistics Management Information

2.1.3. Non-Government Documents.

The following documents of the exact issue shown form a part of this design to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification the contents of the specification shall be considered a superseding requirement.

2.1.4. OTHER PUBLICATIONS

EIA-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange, August 1969
EIA-232-D	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange

3.0 DCIU TO TESS INTERFACE

The DCIU instrumentation connects to the TESS through a 5-pin LEMO connector. The diagram of this interface is shown in Figure 3.0-1.

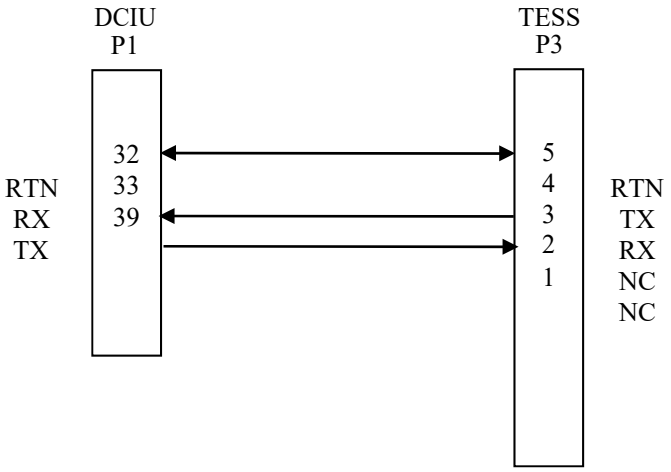

Figure 3.0-1 DCIU to TESS - Instrumentation Electrical Interface

3.1. General Message Characteristics

3.1.1. General Message Structure

From a message structure standpoint, all of the interfaces between a TESS device and the DCIU, in either direction, are formatted the same. The general format is shown in Figure 3.1.1-1 below.

Field Title	Size in Bytes	Field Description
Sync Byte	1 byte	Hex value = BB. Used to indicate to the DCIU and TESS devices that the incoming message is communication between the DCIU and TESS.
Message ID	1 byte	Hex value = 00 to FF. Identifies a unique message type.
Message Length in Bytes	1 byte	Hex value = 05 to FF. Indicates to the receiver on the interface the total length of the incoming message. The Message Length includes the Sync and Checksum bytes.
Data Block	Variable length From 0 to 250 bytes	The payload portion of the message. The Data Block definition varies according to the message type. (See Sections 5 and 6 for each specific Data Block definition.
Checksum	2 bytes	The Checksum is computed by adding the bytes starting with the sync byte and ending with the last byte in the Data Block. The most significant byte is always sent first.

Figure 3.1.1-1 General Message Format

Currently, a single byte of 00 or FF (hex) is sent before each message so that a device, especially the man worn units, may have time to wake-up from sleep mode to receive the full message. Since this wake-up byte is not part of the general message structure, it should be ignored. In the future, multiple wake-up bytes may be sent.

3.1.2. Checksum Calculation

The Checksum bytes in each message are used only to determine if the message was transmitted and received without errors. It does not provide a means whereby the receiver may repair a message that is determined to contain one or more errors.

The Checksum is a byte-wise sum of the bytes in the message from and including the Sync Byte through and including the last byte in the Data Block. As an example, consider the hypothetical Event Message (19 Bytes before the Checksum bytes are added) shown below where each byte value is expressed in hexadecimal:

Byte	**Value in Hex**
1	BB
2	33
3	15
4	00
5	F1
6	0A
7	11
8	00
9	23
10	82
Byte	**Value in Hex**
11	29
12	65
13	21

14	01
15	28
16	0A
17	32
18	27
19	03

The byte-wise sum of the 19 bytes gives 03F2 (hex). In this case Byte 20 of the message would be set to 03 (hex) and Byte 21 would be set to F2 (hex). The receiver obviously can perform the addition and compare the result to the two byte Checksum, or start the byte-wise addition with the Checksum value and simply subtract each byte and compare the result to 0.

3.1.3. Message Usage

Section 7 contains a summary of message usage and message response. Note also that the message titles have a consistent naming convention that always begins with the messages destination designator. In this ICD, the designator "DCI_" in a message title denotes messages that have the DCIU as their destination (for example, DCI_BIT_REQUEST being the TESS device's request for the DCIU to report its BIT results back to the TESS). Similarly, the designator "TES_" denotes messages whose destination is the TESS device (for example, TES_POSITION_REPORT being the DCIU's report of the current DCIU position back to the TESS device).

3.2. IWS Interface

This section describes the interface between the TESS IWS Man-Worn Vest and the DCIU.

The TESS - DCIU interface is an integral two-way digital data link supported by the RS-232D protocol. This interface transmits real-time TESS control data from the DCIU to the TESS via DCIU – TESS serial link, and receives TESS event and status data at the DCIU via TESS – DCIU serial link. Messages passed from the DCIU to the TESS contain initialization data, Area Weapons Effects (AWE) results, and operational commands. Messages passed from IWS to the DCIU contain TESS event and status data.

3.2.1. Physical and Electrical Interface Characteristics

The interface signals are summarized in Table 3.2.1-1 below. In this table, CMOS logic refers to positive true logic levels at CMOS voltages where a logical 0 or low is represented by a voltage level of 0V to 0.4V and a logical 1 or high is represented by a voltage level of 2.4 V to 5.0V.

Signal	Type	Function
TESS – DCIU (RS-232)	CMOS	Used by the TESS & DCIU for 9600 Baud transmission of data from the TESS to the DCIU.
DCIU – TESS (RS-232)	CMOS	Used by the TESS & DCIU for 9600 Baud transmission of data from the DCIU to the TESS.
Signal Return	CMOS	RS-232D Ground

Table 3.2.1-1 TESS – DCIU Interface Signal Description

3.2.2. Communication Protocol

The TESS – DCIU serial data interface utilizes RS-232D CMOS signaling. The interface operates at a transfer rate of 9600 Baud and in full duplex mode. The serial protocol used has 1 start bit, 1 stop bit, and 8 data bits. No parity is used on this interface.

3.2.3. Message Protocols and Timing

Both devices (TESS and DCIU) can initiate a transfer at any time and therefore both the DCIU and TESS shall be continually ready to accept that transfer and process the message contents. There shall be no other hand shaking or control required (either signaling or timing) on the TESS to DCIU transfers.

Except as noted in the specific message descriptions in Section 5 and 6, both sides of the interface shall utilize a form of ack / nack protocol to indicate to the sender that a message has been received correctly and is useable. In general the receiver of an unsolicited message shall indicate acceptable reception to the sender by returning to the sender either a TES_ACKNOWLEDGE Message or the expected reply to the message. Both sides of this interface shall utilize the checksum and message length mechanisms to determine whether a message has been correctly received. In the event that the checksum or message length is incorrect for a given message, the receiving unit shall ignore the message. The sending unit will re-send the message since no response had been received. The timeout sequence is described in the Initialization & Timeout Sections following.

3.2.3.1. Power On

The TESS and DCIU shall be capable of being powered on in either order, that is TESS first followed by DCIU or, DCIU first followed by TESS. It shall also be possible to power off and re-power on either unit after the initialization sequence is complete while the opposite unit remains powered on. An example of this is when the DCIU battery pack is replaced. After power is applied, each unit shall perform its normal boot up sequence, including power on self-test or built-in test. The results of these tests shall be stored for use should it be requested through a subsequent BIT request message by either device.

3.2.3.2. Initialization Sequence

After the power on sequence is completed, each device shall immediately enter the initialization sequence. The TESS initialization consists of simply preparing to receive a message from the DCIU. The DCIU shall complete its initialization sequence by preparing to receive a message from the TESS without further indication to the TESS.

While the following message sequences are not considered to be part of the initialization sequence since they may occur at any time, they are described here to explain the sequence that is required for the DCIU and TESS to be "exercise" ready. The following procedures shall be followed after initialization of the TESS and DCIU:

1) The DCIU sends a TES_UNIT_CONFIGURATION_REQUEST Message to the TESS and waits for a response.
2) The DCIU processes the DCI_UNIT_CONFIGURATION_REPORT from the TESS.
3) The DCIU listens for broadcast exercise data from EXCON.
4) EXCON broadcasts to the DCIU on the air interface with the appropriate exercise data, and the DCIU shall continue to listen for broadcast messages from EXCON until it succeeds.
5) Upon receiving the broadcast data, the DCIU will forward local time to the TESS with the TES_SET_TIME message.

3.2.3.3. Timeout Sequence

The DCIU and TESS shall use a time out value of 10 seconds when expecting a response message after transmitting a message. The typical time out sequence for the DCIU is shown below:

1) DCIU sends a message to the TESS.
2) DCIU waits up to 10 seconds for the TES_ACKNOWLEDGE or response message from the TESS.
3) If no response is received in 10 seconds, the DCIU sends the original message again to the TESS.
4) DCIU repeats steps 2 and 3, for a maximum three times or until a successful response or TES_ACKNOWLEDGE is received.

5) At this time, the DCIU declares a TESS failure, and periodically sends a TES_PING_REQUEST message or a TES_UNIT_CONFIGURATION _REQUEST message to the TESS until a response is received. When a response is received, the initialization sequence described previously is executed.

The TESS shall perform the following time out processing:

1) TESS sends a message to the DCIU.
2) TESS waits up to 10 seconds for the TES_ACKNOWLEDGE or response message from the DCIU.
3) If no response is received in 10 seconds, the TESS sends the original message again to the DCIU.
4) TESS repeats steps 2 and 3, for a maximum of up to three times or until a successful response or TES_ACKNOWLEDGE is received.
5) If after three times the TESS has not received a successful TES_ACKNOWLEDGE or response message, the TESS shall record an indication that communication is lost with the DCIU (for display on the console display).
6) The TESS will continually transmit a DCI_PING_REQUEST until a response is received from the DCIU.

4.0 NOTES

4.1. Acronyms and Abbreviations

AAC	Anti-Aircraft
AGES	Air Ground Engagement System
APICM	Anti-Personnel Improved Conventional Munitions
ASCII	American Standard Code for Information Interchange
ASE	Aircraft Survivability Equipment
ASET	Aircraft Survivability Equipment Trainer
AWE	Area Weapons Effects
BCD	Binary Coded Decimal
BIT	Built-In Test
BLUFOR	Blue Force
CIS	Core Instrumentation Subsystem
CMOS	Complementary-symmetry metal-oxide semiconductor logic
DCI	Digital/Data Communication Interface
DCIU	Data Communication Interface Unit
DFV	MILES XXI PDD or Direct Fire Vest
DPICM	Dual Purpose Improved Conventional Munitions
EXCON	Exercise Control
GPS	Global Positioning System
HE	High Explosive
HMMWV	High-Mobility, Multi-Purpose Wheeled Vehicle
HUTT	Hull to Turret Transmitter
ICD	Interface Control Document
IF	Indirect Fire
I-HITS	Initial-Homestation Instrumentation Training System
IWS	Individual Weapon System
LSbit \ LSb	Least Significant Bit
MES	Mine Effects Simulator
MILES	Multiple Integrated Laser Engagement System
MLRS	Multiple Launcher Rocket System
MLR	Multiple Rocket Launcher
MSbit / MSb	Most Significant Bit
NBC	Nuclear, Biological and Chemical
OC	Observer-Controller
OPFOR	Opposing Force
RDMS	Range Data Measurement Subsystem
RF	Radio Frequency
TES	Tactical Engagement Simulation
TESS	Tactical Engagement Simulation System
UTC	Universal Coordinated Time
WGS-84	World Geodetic System of 1984
XX	When used in a message description, “XX” indicates that a data byte can have numerous values.
XXXX	When used in a message description, “XXXX” indicates that a data word, 2 bytes, can have numerous values.
XX..XX	When used in a message description, “XX..XX” indicates that multiple data bytes, more than 2 bytes, can have numerous values.

5.0 TESS to DCIU INTERFACE MESSAGE DESCRIPTIONS

Refer to Section 7 for a summary of the valid message usages and message responses.

All numbers in this section shall be interpreted at decimal unless otherwise specified.

5.1. DCI_ACKNOWLEDGE [40]

Name: DCI_ACKNOWLEDGE

Direction: TESS to DCIU

Description: The TESS sends a DCI_ACKNOWLEDGE to the DCIU after it has received one of the messages shown in Section 9. The single data byte contains the ID of the message that was received by the TESS.

Use: This message is used during initialization and normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	40	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by TESS
5-6	XXXX	Checksum	Addition of bytes 1 through 4 Byte 5 - Most significant byte Byte 6 - Least significant byte

5.2. DCI_BIT_REQUEST [54]

Name: DCI_BIT_REQUEST

Direction: TESS to DCIU

Description: The TESS uses the DCI_BIT_REQUEST to request the DCIU to execute a BIT operation and report the results for display on the TESS console display. Upon the completion of the BIT, the DCIU reports back its BIT operation results in a TES_PING_REQUEST.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	54	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	0114	Checksum	Addition of bytes 1 through 3 Byte 4 - Most significant byte Byte 5 - Least significant byte

5.3. DCI_EVENT_REPORT [33]

Name: DCI_EVENT_REPORT

Direction: TESS to DCIU

Description: The TESS reports the recorded event when it occurs.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	33	Message ID	Identifies message type
3	15	Size	Total message length in bytes
4-5	XXXX	Event Number	Index indicating the number of the event report. • 16-bit unsigned integer • Byte 4 - Most significant byte • Byte 5 - Least significant byte
6	XX	Event Code	Varies according to event report type. See Table V-2
7	XX	Event SubCode	Varies according to event report type. See Table V-2
8	XX	Zone of Impact	Varies according to event report type. See Table V-2
9-12	XX..XX	Position	Unused for the man-worn TESS.
13-14	XXXX	Player ID	Varies according to event report type. See Table V-2 Byte 13 - Most significant byte Byte 14 - Least significant byte
15-18	XX..XX	Time	Time of the event in BCD referenced to UTC Byte 15 – Day of Week / Tenths Least significant nibble – tenths of second - range: 0 – 9 Most significant nibble – Day of Week – defined values below 0 – Unknown – DOW is not known at this time 1 – Sunday 2 – Monday 3 – Tuesday 4 – Wednesday 5 – Thursday 6 – Friday 7 – Saturday Byte 16 - hours in BCD - range: 0 to 23, decimal Byte 17 - minutes in BCD - range: 0 to 59, decimal Byte 18 - seconds in BCD - range: 0 to 59 decimal
19	XX	HUTT Position	• For TESS interfaces: value = 0 •
20-21	XXXX	Checksum	Addition of bytes 1 through 19 Byte 20 - Most significant byte Byte 21 - Least significant byte

5.4. DCI_MISSED_EVENTS_REPORT [2C]

Name: DCI_MISSED_EVENTS_REPORT

Direction: TESS to DCIU

Description: The TESS sends all of the events indexed by the TES_REQUEST_MISSED_EVENTS message in the format defined in the DCI_EVENT_REPORT [33]. The data blocks (16 bytes each) of up to fifteen (15) event reports that were missed by the DCIU are grouped into the data block of this message.

Use: The TESS sends DCI_MISSED_EVENT_REPORT messages in normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	2C	Message ID	Identifies message type
3	XX	Size	Total message length in bytes – variable length message
4 to 16(M-N) +19	XX..XX	Data	Data bytes 4 through 19 of event report number N through event report number M
16(M-N) +20 to 16 (M-N) +21	XXXX	Checksum	Addition of bytes 1 through 16(M-N)+19 Byte 16(M-N)+20 - Most significant byte Byte 16(M-N)+21 - Least significant byte

Note:

The TESS will always respond to a TES_REQUEST_MISSED_EVENTS with a DCI_MISSED_EVENTS_REPORT. The TESS will examine the requested event range and return all valid events that fall within the requested range. If no valid events fall within the requested range, the last event stored in memory will be sent.

5.5. DCI_PING_REQUEST [62]

Name: DCI_PING_REQUEST

Direction: TESS to DCIU

Description: The TESS uses the DCI_PING_REQUEST message to report changes in the Kill and/or BIT status and to test communication with the DCIU. The TESS may also use the DCI_PING_REQUEST message as a heart beat polling message if desired. The DCIU will respond with the TES_PING_RESPONSE message, which contains the BIT results from the DCIU. Using the DCI_PING_REQUEST does not cause BIT to be executed in the DCIU; it only causes the last BIT result to be reported.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	62	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	BIT Status	Current TESS BIT Status. See Table V-2, BIT Results event
5	XX	Kill Status	Current TESS Kill Status. See Table V-9
6-7	XXXX	Checksum	Addition of bytes 1 through 5 Byte 6 - Most significant byte Byte 7 - Least significant byte

5.6. DCI_PING_RESPONSE [64]

Name: DCI_PING_RESPONSE

Direction: TESS to DCIU

Description: This message is sent in response to a TES_PING_REQUEST message. It returns the most recent BIT and Kill status. It does not specifically execute BIT to get this result it; it only reports the last result it had.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	64	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	BIT Status	Current TESS BIT Status. See Table V-2, BIT Results event
5	XX	Kill Status	Current TESS Kill Status. See Table V-9
6-7	XXXX	Checksum	Addition of bytes 1 through 5 Byte 6 - Most significant byte Byte 7 - Least significant byte

5.7. DCI_POSITION_REQUEST [58]

Name: DCI_POSITION_REQUEST

Direction: TESS to DCIU

Description: The TESS requests the current position data from the DCIU for processing purposes and for archiving with locally stored event records. The DCIU will answer this request with a TES_POSITION_REPORT.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	58	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	0118	Checksum	Addition of bytes 1 through 3 Byte 4 - Most significant byte Byte 5 - Least significant byte

5.8. DCI_STATUS_REQUEST [6F]

Name: DCI_STATUS_REQUEST

Direction: TESS to DCIU

Description: The TESS uses the DCI_STATUS_REQUEST to request the DCIU to report the current GPS Tracking Status and EXCON Link Status to the TESS unit. The DCIU reports back the current status in the TES_STATUS message.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	6F	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	012F	Checksum	Addition of bytes 1 through 3 Byte 4 - Most significant byte Byte 5 - Least significant byte

5.9. DCI_TIME_REQUEST [5D]

Name: DCI_TIME_REQUEST

Direction: TESS to DCIU

Description: The TESS uses the DCI_TIME_REQUEST to request the DCIU to report the current GPS-based time to the TESS unit. The DCIU reports back the current GPS time in the TES_SET_TIME message.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	5D	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	011D	Checksum	Addition of bytes 1 through 3 Byte 4 - Most significant byte Byte 5 - Least significant byte

5.10. DCI_UNIT_CONFIGURATION_REPORT [56]

Name: DCI_UNIT_CONFIGURATION_REPORT

Direction: TESS to DCIU

Description: The TESS reports its configuration (TESS type, platform type, and TESS player ID) in response to a TES_UNIT_CONFIGURATION_REQUEST message from the DCIU.

Use: The message is used at initialization.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	56	Message ID	Identifies message type
3	09	Size	Total message length in bytes
4	XX	Unit Configuration	Unit configuration – Zero for the IWS TESS
5	XX	Vehicle Type	Vehicle Type – Zero for the IWS TESS
6-7	XXXX	Player ID	TESS MCC-97 Ammo-Coded PID, See Table V-7 • 16-bit unsigned integer • Range: 1 – 26,400 • Byte 6 – Most Significant byte • Byte 7 – Least Significant byte
8-9	XXXX	Checksum	Addition of bytes 1 through 7 Byte 8 - Most significant byte Byte 9 - Least significant byte

6.0 DCIU to TESS INTERFACE MESSAGE DESCRIPTIONS

Refer to Section 9 for a summary of the valid message usages and message responses.

All numbers in this section shall be interpreted at decimal unless otherwise specified.

6.1. TES_ACKNOWLEDGE [5E]

Name: TES_ACKNOWLEDGE

Direction: DCIU to TESS

Description: The DCIU sends a TES_ACKNOWLEDGE to the TESS after it has received one of the messages shown in Section 9. The single data byte contains the ID of the message that was received by the DCIU.

Use: The DCIU sends a TES_ACKNOWLEDGE to the TESS during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	5E	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by TESS
5-6	XXXX	Checksum	Addition of bytes 1 through 4 Byte 5 - Most significant byte Byte 6 - Least significant byte

6.2. TES_CASUALTY_CARD_CONTROL [6D]

Name: TES_CASUALTY_CARD_CONTROL

Direction: DCIU to TESS

Description: By sending the TES_CASUALTY_CARD_CONTROL message to the TESS, the DCIU commands the TESS to enable or disable the displaying of casualty card data on the TESS display. When enabling casualty card display, this message will also contain the number of display lines associated with each display category.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	6D	Message ID	Identifies message type
3	0A	Size	Total message length in bytes
4	XX	Casualty Card Enable	0 = Casualty Card String Displays Disabled. 1 = Casualty Card String Displays Enabled.
5	XX	Injury Lines	Number of display lines associated with the injury description. Range of values: 0-10.
6	XX	Action Lines	Number of display lines associated with the player actions description. Range of values: 0-10.
7	XX	Medic Lines	Number of display lines associated with the medic actions description. Range of values: 0-10.
8	XX	OC Codes Lines	Number of display lines associated with the OC Codes . Range of values: 0-10.
9-10	XXXX	Checksum	Addition of bytes 1 through 8 Byte 9 - Most significant byte Byte 10 - Least significant byte

6.3. TES_CASUALTY_CARD_DATA [6E]

Name: TES_CASUALTY_CARD_DATA

Direction: DCIU to TESS

Description: By sending the TES_ CASUALTY_CARD_DATA message to the TESS, the DCIU transferrs the casualty card display strings, one line at a time, 16 characters per line.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	6E	Message ID	Identifies message type
3	17	Size	Total message length in bytes
4	XX	Display Category	00 = Injury description. 01 = Actions description. 02 = Medic description. 03 = OC Codes description.
5	XX	Line Number Currently Being Transferred	The line number transferred with the current message. Range of values: 1-10.
6-21	XX..XX	Character Data	16 ASCII characters to be displayed.
22-23	XXXX	Checksum	Addition of bytes 1 through 21 Byte 22 - Most significant byte Byte 23 - Least significant byte

6.4. TES_CIS_DIRECT_FIRE_EVENT_COMMAND [59]

Name: TES_CIS_DIRECT_FIRE_EVENT_COMMAND

Direction: DCIU to TESS

Description: By sending the TES_CIS_DIRECT_FIRE_EVENT_COMMAND message to the TESS (via the DCIU), the CIS can cause an individual TESS to perform the same processing it would normally perform as though that TESS was triggered by an actual direct fire event in the field. Upon receipt of one of these messages, the TESS shall perform the appropriate processing (possibly including activation of cues) and then generate a standard DCI_EVENT_REPORT message, store it, and send it to the DCIU.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	59	Message ID	Identifies message type
3	0A	Size	Total message length in bytes
4	XX	Event Code	Event Code – Varies according to event report type. See Table V-2.
5	XX	Event SubCode	Event SubCode – Varies according to event report type. See Table V-2.
6	XX	Zone of Impact	Zone of Impact – Varies according to event report type. See Table V-2.
7-8	XXXX	Player ID	Player ID – Varies according to the event report type. See Table V-2.
9-10	XXXX	Checksum	Addition of bytes 1 through 8 Byte 9 - Most significant byte Byte 10 - Least significant byte

6.5. TES_CIS_EVENT_COMMAND [33]

Name: TES_CIS_EVENT_COMMAND

Direction: DCIU to TESS

Description: A TES_CIS_EVENT_COMMAND is sent to the TESS. The TESS responds to the command by sending a DCI_ACKNOWLEDGE message to the DCIU. TES_CIS_EVENT_COMMAND messages are initiated by the CIS and forwarded through the DCIU to the TESS. The TESS also stores the event and reports it back to the DCIU after it is acted upon.

Use: These messages are used in normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	33	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	Event Code	Identifies TES_CIS_EVENT_COMMAND type. See Table 8-3 for descriptions. Valid values (hex) are as follows: 00 – Initialize 01 – BIT 02 – Reset 03 – Resurrect 04 – Miss 05 – Hit 06 – Kill 07 – Mobility Kill (for vehicles only) 08 – Firepower Kill (for vehicles only) 09 – Communications Kill (for vehicles only) 0A – Reserved 0B – Reserved 0C – Chemical Contamination 0D – Reserved 0E – Reserved 0F – Chemical De-Contamination
5	XX	Event SubCode	Varies according to event code type. Event Code (hex) — Event SubCode 00, 02, 03, 0F — 00 01 — The DCIU loads this field with its own DCIU BIT result value. See Table V-6 04-09, 0C — Indirect Fire Weapon Type See Table V-4

Byte #	Hex	Field	Description
6-7	XXXX	Checksum	Addition of bytes 1 through 5 Byte 6 - Most significant byte Byte 7 - Least significant byte

Table 8-3 TES_CIS_EVENT_COMMAND Descriptions

Code (hex)	Command Type	Description
00	Initialize	The DCIU commands the TESS to initialize. The TESS is made alive if dead, chemical de-contamination occurs if required, its event memory is cleared, a nuclear sickness level is determined, and BIT is not executed as a result of this command. An initialization event is reported to the DCIU.
01	BIT	The DCIU commands the TESS to perform BIT. The single data byte contains the results of the DCIU self-test. The results of the TESS BIT are displayed at the TESS together with the DCIU BIT results. BIT Event Reports are generated by the TESS.
02	Reset	The DCIU commands the TESS to reset. The TESS is given a full ammunition count and is made alive if dead. No new nuclear sickness level is determined, event memory is not cleared, chemical de-contamination occurs if required, and BIT is not executed as a result of this command. A reset event is reported to the DCIU. When executed, the TESS zeros the ammo fired counts.
03	Resurrect	The DCIU commands the TESS to resurrect. The TESS is made alive again, if dead. The ammunition count is not changed, no new nuclear sickness level is determined, event memory is not cleared, chemical contamination status is unchanged, and a BIT is not executed as a result of this command. The TESS reports a resurrect event to the DCIU.
04	Miss	The DCIU causes execution of standard miss actions in the TESS. The TESS records a miss event and reports it to the DCIU.
05	Hit	The DCIU causes execution of standard hit actions in the TESS. The TESS records a hit event and reports it to the DCIU.
06	Kill	The DCIU causes execution of standard kill actions in the TESS. The TESS records a kill event and reports it to the DCIU.
07	Mobility Kill	The DCIU causes execution of standard mobility kill actions in the TESS. The TESS records a mobility kill event and reports it to the DCIU. The TESS will treat this command as a catastrophic kill.
08	Firepower Kill	The DCIU causes execution of standard firepower kill actions in the TESS. The TESS records a firepower kill event and reports it to the DCIU. The TESS will treat this command as a catastrophic kill.
09	Communications Kill	The DCIU causes execution of standard communications kill actions in the TESS. The TESS records a communications kill event and reports it to the DCIU. The TESS will treat this command as a catastrophic kill.
0C	Chemical Contamination	The DCIU causes execution of standard chemical contamination actions in the TESS. The TESS records a chemical contamination event and reports it to the DCIU.
0F	Chemical De-Contamination	The DCIU causes execution of standard chemical de-contamination actions in the TESS. The TESS records a chemical contamination event and reports it to the DCIU.

6.6. TES_PING_REQUEST [66]

Name: TES_PING_REQUEST

Direction: DCIU to TESS

Description: The DCIU uses the TES_PING_REQUEST message to notify the TESS of changes in the DCIU BIT Status and to test the communication interface with the TES. It may do so at any time and in fact can use the TES_PING_REQUEST message as a heart beat polling message if desired. The TESS will respond with the DCI_PING_RESPONSE message that contains the basic BIT and Kill status from the TES. Note that using the TES_PING_REQUEST does not cause BIT to be executed in the TESS; it only causes the last BIT result to be reported.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	66	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	BIT Status	BIT Status of the DCIU. See Table V-6.
5-6	XXXX	Checksum	Addition of bytes 1 through 4 Byte 5 - Most significant byte Byte 6 - Least significant byte

6.7. TES_PING_RESPONSE [68]

Name: TES_PING_RESPONSE

Direction: DCIU to TESS

Description: The DCIU issues the TES_PING_RESPONSE message in response to the TES_DCI_PING_REQUEST message. It returns the BIT status and DCIU status. Note that the DCIU does not execute BIT.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	68	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	BIT Status	BIT Status of the DCIU. See Table V-6.
5-6	XXXX	Checksum	Addition of bytes 1 through 4 Byte 5 - Most significant byte Byte 6 - Least significant byte

6.8. TES_POSITION_REPORT [57]

Name: TES_POSITION_REPORT

Direction: DCIU to TESS

Description: The GPS-based position data are reported to the TESS using the TES_POSITION_REPORT message. The DCIU obtains position from GPS, in terms of a world wide WGS-84 latitude and longitude system, and sends that to the TESS in response to the DCI_POSITION_REQUEST message. The TES_POSITION_REPORT is also used to report to the TESS the current quality of fix and the GPS time in UTC to the nearest one second. No conversion is done by the DCIU from the "raw" or ASCII formats except zero filling to keep the fields a fixed length. All conversion is left to the TESS device to carry out depending on its use of the data (display, event storage, time setting, etc.) The accuracy of the time field dependent on the amount of time it takes the DCIU to create and deliver the message to the TESS and for the TESS to read and process the message.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	57	Message ID	Identifies message type
3	26	Size	Total message length in bytes
4-9	XX..XX	Time of Fix	GPS time of the position fix in NMEA UTC format (ASCII characters HHMMSS to the nearest 1 second), zero filled.
10-19	XX..XX	Latitude	NMEA formatted latitude as DDMM.MMMMa, where DD = whole degrees, MM.MMMM = minutes of a degree to 1/10,000ths of a Minute, a = N for North or S for South. • Will be zero filled if degrees are less than 10 • All values are ASCII characters
20-30	XX..XX	Longitude	NMEA formatted Longitude as DDDMM.MMMMa, where DDD = whole degrees, MM.MMMM = minutes of a degree to 1/10,000ths of a Minute, a = E for East or W for West ;\ • Will be zero filled if degrees are less than 100 • All values are ASCII characters
31-35	XX..XX	Altitude	NEMA formatted altitude in meters above or below sea level as, SMMMMM, where S is an optional sign character only present if minus ("-") MMMMM = meters in altitude • Will be zero filled as appropriate (ex: -00052). • All values are ASCII characters

Byte #	Hex	Field	Description
36	XX	Type of Fix	Type of Fix; valid values are as follows: 0 – No Solution (hex value 0) '1' – Non-differential – standard positioning service (ASCII 1) '2' – Differential – standard positioning service (ASCII 2) '3' – Non –differential – precise positioning service (ASCII 3)
37-38	XXXX	Checksum	Addition of bytes 1 through 36 Byte 37 - Most significant byte Byte 38 - Least significant byte

6.9. TES_REQUEST_MISSED_EVENTS [2C]

Name: TES_REQUEST_MISSED_EVENTS

Direction: DCIU to TESS

Description: A request for missed events is sent to the TESS after the DCIU has detected that it has not received some event reports. The DCIU examines the event number field within the event reports to determine if it has missed event(s). The TESS responds to a TES_REQUEST_MISSED_EVENTS message with DCI_MISSED_EVENTS_REPORT. The DCIU can only request a maximum of fifteen (15) events at one time. TESS report of missed events is limited to last 500 events.

Use: This message is used in normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	2C	Message ID	Identifies message type
3	09	Size	Total message length in bytes
4-7	XX..XX	Missed Event Numbers	First and last requested missed event numbers. The last minus the first event numbers must be less than 15. Byte 4-5 – First Event Number • 16-bit unsigned integer • Byte 4 - Most significant byte of first event missed • Byte 5 - Least significant byte of first event missed Byte 6-7 – Last Event Number • 16-bit unsigned integer • Byte 4 - Most significant byte of last event missed. • Byte 5 - Least significant byte of last event missed.
8-9	XXXX	Checksum	Addition of bytes 1 through 7 Byte 8 - Most significant byte Byte 9 - Least significant byte

6.10. TES_SET_TIME [03]

Name: TES_SET_TIME

Direction: DCIU to TESS

Description: This message is sent in response to the DCI_TIME_REQUEST message. The first TES_SET_TIME message will be automatically sent when local time has been received from EXCON. When setting the Real Time Clock (RTC), it is recommended that the TESS apply an experientially determined offset to the time provided to compensate for the small processing and interface delays for the greatest accuracy.

Use: The message is used at initialization and during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	03	Message ID	Identifies message type
3	0D	Size	Total message length in bytes
4	XX	Day of Week	Day of week. Valid values are as follows: 1 - Sunday 2 - Monday 3 - Tuesday 4 - Wednesday 5 - Thursday 6 - Friday 7 - Saturday
5-10	XX..XX	Date & Time	UTC Time Byte 5 – hour; range: 0 - 23 Byte 6 – minute; range: 0 - 59 Byte 7 – second; range: 0 - 59 Byte 8 – day; range: 1 - 31 Byte 9 – month; range: 1 (January) - 12 (December) Byte 10 – year; range: 0 - 99
11	XX	Time Zone Offset	Local time minus Universal Time in half-hours units. This data field adjusts when day light savings time changes. Range: -23 to 23
12-13	XXXX	Checksum	Addition of bytes 1 through 11 Byte 12 - Most significant byte Byte 13 - Least significant byte

6.11. TES_STATUS [6F]

Name: TES_STATUS

Direction: DCIU to TESS

Description: The DCIU reports its status using this message. It is sent in response to a DCI_STATUS_REQUEST message from the TESS.

Use: This message is used during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	6F	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	DCIU Status	This byte is constructed by the DCIU OR'ing together the following data bits (Hex): 01 = Not used 02 = EXCON Link Receive OK 04 = EXCON Link Transmit OK 08 = GPS Tracking OK 10 = Not used 20 = Not used 40 = Not used 80 = Not used
5-6	XXXX	Checksum	Addition of bytes 1 through 4 Byte 5 - Most significant byte Byte 6 - Least significant byte

6.12. TES_UNIT_CONFIGURATION_REQUEST [28]

Name: TES_UNIT_CONFIGURATION_REQUEST

Direction: DCIU to TESS

Description: The DCIU requests the configuration of the TESS. The TESS reports back its configuration in a DCIU_UNIT_CONFIGURATION_REPORT.

Use: This message is used at initialization and during normal operation.

Format:

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between DCIU and TESS
2	28	Message ID	Identifies message type
3	08	Size	Total message length in bytes
4	XX	GPS Data Update Interval	For the TESS, this field must be 0.
5	XX	Altitude Update Interval	For the TESS, this field must be 0.
6	XX	Heading Update Interval	For the TESS, this field must be 0.
7-8	XXXX	Checksum	Addition of bytes 1 through 6 Byte 7 - Most significant byte Byte 8 - Least significant byte

7.0 MESSAGES AND RESPONSES

7.1.1. DCIU → TESS Messages

DCIU Message	TESS Response	Notes
TES_ACKNOWLEDGE	None	TES terminates retry timer on previous transmission.
TES_CASUALTY_CARD_CONTROL	DCI_ACKNOWLEDGE	
TES_CASUALTY_CARD_DATA	DCI_ACKNOWLEDGE	
TES_CIS_DIRECT_FIRE_EVENT_COMMAND	DCI_ACKNOWLEDGE	An associated Event Report will follow.
TES_CIS_EVENT_COMMAND	DCI_ACKNOWLEDGE	An associated Event Report will follow
TES_PING_REQUEST	DCI_PING_RESPONSE	
TES_PING_RESPONSE	None	Generated in a response to a DCI_PING_REQUEST.
TES_POSITION_REPORT	None	Generated in a response to a DCI_POSITION_REQUEST
TES_REQUEST_MISSED_EVENTS	DCI_MISSED_EVENTS_REPORT	
TES_SET_TIME	DCI_ACKNOWLEDGE	Sets internal RTC. A TIME Event will be generated after the Ack
TES_STATUS	None	Generated in response to a DCI_STATUS_REQUEST
TES_UNIT_CONFIGURATION_REQUEST	DCI_UNIT_CONFIGURATION_REPORT	

7.1.2. TESS → DCIU Messages

TESS Message	DCIU Response	Notes
DCI_ACKNOWLEDGE	None	DCIU terminates retry timer on previous transmission.
DCI_BIT_REQUEST	TES_ACKNOWLEDGE	A TES_PING_REQUEST will be generated when the DCIU has completed the BIT.
DCI_EVENT_REPORT	TES_ACKNOWLEDGE	
DCI_MISSED_EVENTS_REPORT	None	Generated in a response to a TES_REQUEST_MISSED_EVENTS
DCI_PING_REQUEST	TES_PING_RESPONSE	
DCI_PING_RESPONSE	None	Generated in a response to a TES_PING_REQUEST
DCI_POSITION_REQUEST	TES_POSITION_REPORT	
DCI_STATUS_REQUEST	TES_STATUS	
DCI_TIME_REQUEST	TES_ACKNOWLEDGE	
DCI_UNIT_CONNFIGURATION_REPORT	None	Generated in a response to a TES_CONFIGURATION_REQUEST

8.0 MESSAGE DATA TABLES

8.1.1. EVENT REPORT TABLE V-2

The following table contains the format for each of the event reports.

Table V-2: Event Report – Variable Fields

Event Name	Event Code Byte 6 (Hex)	Event Sub code Byte 7 (Hex)	Zone of Impact Byte 8 (Hex)	Position Bytes 9 – 12 (Hex)	Player ID Bytes 13 – 14 (Hex)
Resurrection	01	00	00	XXXXXXXX	BBBB – CIS Initiated 0000 - otherwise
Description: The TESS was resurrected by the DCIU. Rounds were not reset.					
Reset	02	00	00	XXXXXXXX	BBBB – CIS Initiated 0000 - otherwise
Description: The TESS was reset by the DCIU. Rounds were reset.					
Observer Controller (OC) Resurrection	04	1E	00	XXXXXXXX	0000
Description: The TESS was optically resurrected by either the controller gun or by the reset command using the TESS controller key. Rounds were not reset.					
Cheat Kill	05	00	00	XXXXXXXX	0000
Description: The TESS detected the user cheating.					
Power On	08	00 – Alive 01 – Dead	00	XXXXXXXX	0000
Description: The TESS was powered on. This message is sent in Un-instrumented Mode. The event subcode indicates player status after Power On					
Miss	0E	MILES Weapon Code – See Table V-3.	00	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A miss by the indicated player was recorded in the TESS.					

Event Name	Event Code Byte 6 (Hex)	Event Sub code Byte 7 (Hex)	Zone of Impact Byte 8 (Hex)	Position Bytes 9 – 12 (Hex)	Player ID Bytes 13 – 14 (Hex)
Hit	0F	MILES Weapon Code – See Table V-3.	Bit 0 = zone 1 Bit 1 = zone 2 Bit 2 = zone 3 Bit 3 = zone 4 Bit 4-7 = 0 Bit 0 = LSbit	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A hit by the indicated player was recorded in the TESS.					
Kill	10	MILES Weapon Code – See Table V-3.	00 Bit 0 = zone 1 Bit 1 = zone 2 Bit 2 = zone 3 Bit 3 = zone 4 Bit 4-7 = 0 Bit 0 = LSbit	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A kill by the indicated player was recorded in the TESS. Also used by ITAS.					
Mobility Kill	11	MILES Weapon Code – See Table V-3.	Bit 0 = zone 1 Bit 1 = zone 2 Bit 2 = zone 3 Bit 3 = zone 4 Bit 4-7 = 0 Bit 0 = LSbit	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A mobility kill by the indicated player was recorded in the TESS.					
Firepower Kill	12	MILES Weapon Code – See Table V-3.	Bit 0 = zone 1 Bit 1 = zone 2 Bit 2 = zone 3 Bit 3 = zone 4 Bit 4-7 = 0 Bit 0 = LSbit	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A firepower kill by the indicated player was recorded in the TESS					
Communications Kill	13	MILES Weapon Code – See Table V-3.	Bit 0 = zone 1 Bit 1 = zone 2 Bit 2 = zone 3 Bit 3 = zone 4 Bit 4-7 = 0 Bit 0 = LSbit	XXXXXXXX	**MCC-97 Ammo-coded PID (see Table V-7)
Description: A communications kill by the indicated player was recorded in the TESS.					

Event Name	Event Code Byte 6 (Hex)	Event Sub code Byte 7 (Hex)	Zone of Impact Byte 8 (Hex)	Position Bytes 9 – 12 (Hex)	Player ID Bytes 13 – 14 (Hex)
Low Battery Warning	14	00 - low battery 01 - battery OK	00	XXXXXXXX	0000
Description: The TESS battery status has changed.					
BIT Results	21	00 - no failures. 01 – failures detected.	00	XXXXXXXX	0000
Description: This event is returned upon completion of BIT.					
PMI Battery Low	27	00	00	XXXXXXXX	0000
Description: The protective mask interface reported a low battery condition.					
Initialization	29	00	00	XXXXXXXX	BBBB
Description: The TESS was initialized by an Initialize Event Command.					
Chemical Contamination	2D	IF Weapon Type, See Table V-4	00	XXXXXXXX	BBBB
Description: A chemical contamination command by the DCIU was recorded in the TESS.					
NBC Mask Off	32	00	00	XXXXXXXX	0000
Description: The NBC protective mask was removed.					
NBC Mask On	34	00	00	XXXXXXXX	0000
Description: The NBC pressure system was enabled at the time indicated.					
Room Illuminator	3E	00	00	XXXXXXXX	Room number. A value of FFFF indicates a timeout has occurred after room illuminators are no longer detected.
Description: The TESS detected the presence or loss of a Room Illuminator or IR Tracker.					
Optical Reset	52	00	00	XXXXXXXX	0000
Description: The TESS was optically reset. Rounds were reset to load set at initialization.					

** If the PID is not decoded properly or is missing (MILES I), a default of "0000" is used.
"XXXX" indicates an unused field.

8.1.2. MILES WEAPON CODES TABLE V-3

The following table contains the MILES weapon code definitions.

Table V-3: MILES Weapon Code Definitions

Event Sub code (Hex)	MILES Weapon
00	Universal Kill (Controller Gun), Continuous 00 for weapon boresighting
01	Missile: Maverick (various Aircraft), AGES Hellfire, TWGSS TOW
02	Missile: Hellfire (AH64, AH58)
03	Missile: AT-3 Sagger (BMP1, BRDM-1, HIND-D, Man), [MILES I: AT-8 Songster (T-80)
04	Mortar: 60mm (Man), 81mm, 107mm (4.2 in.), 120mm, 160mm, 240mm (Various GV, Man)
05	Mine: M15 Track Cutter [MILES I: Gun AA: 23m (Radar Mode) (ASETIV)]
06	Weapon X
07	Missile: TOW ATGW (M2, M3, AH6, AH64, AH1S, LAV-25, M113, M901, HMMWV, Man), Shillelagh (M551), AT4 Spigot (Man), [MILES I: AT-5 Spandrel ATGW (BMP2, BRDM, Hind-D)], AT6 Spiral ATGW (HIND-D)] AT-8 Songster (T-80), Predator TOW IIB
08	Missile ATGW: M47 Dragon (Man), AT-5 Spandrel (BMP2, BMP2C, GRDM2, HIND-E) Rocket AT: RPG-16 (Man), NTC BRDM-2
09	Flame Thrower: M202 (Man), JAVELIN
0A	Mine: M21 AT (man) Main Gun: 125mm (T72, T80)
0B	Mine: M81A1 Claymore AP (Man), M16
0C	Main Gun: 105mm (M1, M60 variants)
0D	Howitzer: 152mm (M1973), 122mm (M1974), 155mm (M109), 100mm (M1944) Rocket: 122mm BM21 (truck)
0E	Rocket: 2.75in (AH-64, AH-1S), 57mm Rocket (HIND-D, HIND-E) Main Gun: 73mm (BMP1)
0F	Rocket: 66 mm M72 LAW (Man), 70mm Viper (Man), AT-4
10	Main Gun: 120mm (M1A1, M1A2 Tank)
11	Rifle (Recoilless): 90mm (Man)
12	Howitzer: 203mm (8-inch) (M110A2), 105mm (M102, M108), 122 mm, 155mm (M109A2, M198)
13	Grenade: 40mm Mark 19 AGS, 40mm M203 Grenade (HMMWV, Man)
14	Bomb, Cluster: Rockeye (Various Aircraft), SMAW
15	Gun: 30mm GAU-8 Avenger (Various Aircraft), AH-64
16	Gun, AA: 23mm (ZSU-23/4 or ASET IV in Visual Mode) Main Gun: 25mm (M2A2, M3A2, LAV-25)
17	Gun, AA: 20mm Vulcan (M163, M167, AH-1S) Main Gun: 30mm (BMP2, BMP2C, HIND-D)
18	Machine Gun .50 cal (12.7mm): M2, M85, etc. (Various GV, RW, Man)
19	Missile (SAM): Chaparral (M548, M730), SA-9 Gaskin (BRDM-2 Chassis), SA-13 Gopher (BRDM-2 Chassis), [MILES I: Stinger (AH-58, OH-58D)], ASET IV
1A	Missile (SAM): Stinger (AH-58, OH-58D, HMMWV, Man), [MILES I: SA-9 Gaskin (ASETIV RF/IR), SA-13 Gopher (ASETIV)]

Event Sub code (Hex)	MILES Weapon
1B	Rifle: .22 cal (5.56mm) M16 Machine Gun .30 cal (7.62mm): M60, M240, Coax, etc. (Various GV, Man) Missile: Hellfire, AT-3 Sagger, TOW, Shillelagh, AT-5 Spandrel, AT-6 Spiral, AT-8 Songster, M47 Dragon (man-worn kill codes are transmitted by these missiles after they transmit MILES codes 02, 03, 07, or 08. The DFV reports an Event Sub code 1B when killed by these missiles. All other TESS report Events sub codes 02, 03, 07, or 08 and do not report 1B.)
1C	Heavy Miss: 105mm, 152mm, 73mm, Viper (LAW) etc.
1D	Light Miss: Rifle, Machine Gun, 20mm, etc.
1E	Optical Resurrect (Controller Gun), Light spare miss, Reset for aircraft systems
1F	Heavy Spare Miss
20	IFS Actuation
21	Missile (SAM): SA-14 Gremlin (Man)
22	Gun AA: 23mm (ZSU-23/4 Radar Mode)
23	Controller gun/Utility code assessment
24	Optical Reset (Smart Controller Gun), Resurrect for aircraft systems

8.1.3. INDIRECT FIRE WEAPONS TABLE V-4

The following table contains indirect fire weapon types.

Table V-4: Indirect Fire Weapon Types

Event Sub code (Hex)	Weapon Type	A/V Cue Generated
Artillery / Mortar		
0	Reserved	No
1	M720-PD, 60 mm HE	Yes
2	M821-PD, 81 mm HE	Yes
3	M1-PD, 105 mm HE	Yes
4	M1-VT, 105 mm HE	Yes
5	M444, 105 mm APICM	Yes
6	M107-PD, 155 mm HE	Yes
7	M107-VT, 155 mm HE	Yes
8	M4449A1, 155 mm APICM	Yes
9	M483A1, 155 mm DPICM	Yes
0A	M106-PD, 8 inch HE	Yes
0B	M106-VT, 8 inch HE	Yes
0C	M404, 8 inch APICM	Yes
0D	M509A1, 8 inch DPICM	Yes
0E	M26, MLRS DPICM	Yes
0F	MK49, 5 inch 38 HE	Yes
10	MK56, 5 inch AAC	Yes
11	MK61, 5 inch HE	Yes
12	MK41, 5 inch 54 AAC	Yes
13	MK25, 8 inch HE	Yes
14	MK13, 16 inch HE	Yes
15	MG76-PD, 76 mm HE	Yes
16	VO82-PD, 82 mm HE	Yes
17	OF843A-PD, 120 mm HE	Yes
18	OF843A-VT, 120 mm HE	Yes
19	OF24-PD, 122 mm HE	Yes
1A	OF24-VT, 122 mm HE	Yes
1B	F864-PD, 240 mm HE	Yes
1C	F864-VT, 240 mm HE	Yes
1D	OF482-PD, 130 mm HE	Yes
1E	OF482-VT, 130 mm HE	Yes
1F	OF25-PD, 152 mm HE	Yes
20	OF25-VT, 152 mm HE	Yes
21	XDP540, 152 mm DPICM	Yes

Event Sub code (Hex)	Weapon Type	A/V Cue Generated
22	F620-PD, 203 mm HE	Yes
23	F620-VT, 203 mm HE	Yes
24	XDP620, 203 mm DIPCM	Yes
25	9M22YF-PD, 132 mm MRL HE	Yes
26	9M22KX, 122 mm MRL HE	Yes
27	9M27F-PD, 220 mm MRL DIPCM	Yes
28	9M27KX, 220 mm MRL DPICM	Yes
29	FROG-PD, 540 mm ROCKET	Yes
2A	CONV042	Yes
2B	IED	Yes
C8	CONV200	Yes
42	M329A1 PD, 107mm, HE Mortar (Blue)	Yes
43	M329A1 VT, 107mm, HE Mortar (Blue)	Yes
44	M933 PD, 120mm, HE Mortar (Blue)	Yes
45	F853 PD, 160mm, HE Mortar (Red)	Yes
RF Mine		
C9	MINE	Yes
CA	MINE-2	No
CB	MINE-3	Yes
CC	MINE-4	No
CD	MINE-5	Yes
Chemical		
CE	CHEMA1 (blister)	No
CF	CHEMB1 (nerve I)	Yes
D0	CHEMB2 (nerve U)	No
D1	CHEMC1 (blood I)	Yes
D2	CHEMC2 (blood U)	No
D3	CHEMD1 (choking I)	Yes
D4	CHEMD2 (choking U)	No
D5	CHEME1	No
D6	CHEME2	No
D7	CHEMF1	No
D8	CHEMF2	No
D9	CHEMG1	No
DA	CHEMG2	No
DB	CHEMH1	No

Event Sub code (Hex)	Weapon Type	A/V Cue Generated
DC	CHEMH2	No
TESS	CHEMI1	No
DE	CHEMI2	No
DF	CHEMJ1	No
E0	CHEMJ2	No
Nuclear		
E1	W10 Y-1	Yes
E2	W10 Y-2	Yes
E3	W15 Y-1	Yes
E4	W15 Y-2	Yes
E5	W20 Y-1	Yes
E6	W20 Y-2	Yes
E7	W30 Y-1	Yes
E8	W30 Y-2	Yes
E9	W30 Y-3	Yes
EA	W40 Y-1	Yes
EB	W40 Y-2	Yes
EC	W50 Y-1	Yes
ED	W50 Y-2	Yes
EE	W50 Y-3	Yes
EF	NUC7	No
F0	NUC8	No
F1	NUC9	No
F2	NUC10	No
F3	EXP	No
MES		
F4	AT-MES	Yes
F5	AP-MES	Yes
F6-FE	Spares	No
FF	Power On Kill	No

8.1.4. DCIU BIT DEFINITIONS TABLE V-6

The following table contains the bit definitions indicating DCIU BIT failures.

Table V-6: DCIU BIT Definitions

DCIU	
Bit Number	**Cause***
7 (MSb)	Not used
6	Not used
5	Not used
4	Battery Low
3	Not used
2	Radio Failure
1	GPS Failure
0 (LSb)	Controller Failure

A “1” in a bit position indicates the corresponding unit failed.

8.1.5. MCC-97 AMMO-CODED PIDS TABLE V-7

The following table contains the MILES ammo-coded PIDs.

Table V-7: MCC-97 Ammo-Coded PIDS

	BLUFOR			OPFOR		
Index Number	**Range Start**	**Range End**	**Ammo Code**	**Range Start**	**Range End**	**Ammo Code**
0	2	3300	A	1	3299	E
1	3302	6600	B	3301	6599	F
2	6602	9900	C	6601	9899	G
3	9902	13200	D	9901	13199	H
4	13202	16500	I	13201	16499	M
5	16502	19800	J	16501	19799	N
6	19802	23100	K	19801	23099	O
7	23102	26400	L	23101	26399	P

To decode an MCC-97 Ammo-coded PID in the range 1 to 26,400 to actual PID, ammo type code, and friend or foe indication use the following steps:

1. Divide Ammo-coded PID by 3300, ignoring the fractional result, to get the index number, "i".
2. Multiply the index number by 3300 and subtract that result from the Ammo-coded PID to get the true PID in the range 1-3300.
3. If the True PID is even then the PID is for a friendly (BLUFOR) player, otherwise it is for a foe (OPFOR).
4. Based on the friend or foe setting and the index "i" determine the appropriate ammo code.

For example if the ammo-coded PID returned in an event message is 21,433, then the steps and decoded values are as follows:

1. 21,433 / 3300 = 6.4948; keeping only the integer portion, the index "i" is therefore 6.
2. 6 x 3300 = 19,800 and 21,433 – 19800 = 1,633, therefore the *true PID is 1633*.
3. Since the PID is odd, this PID is associated with an *OPFOR* player.
4. Using the index "i" and the OPFOR ammo codes, the *ammo code is "O"* associated with this ammo-coded PID or the seventh OPFOR ammo type.

8.1.6. KILL STATUS DEFINITIONS TABLE V-9

The following table contains kill status definitions.

Table V-9: Kill Status Definitions

Kill Status Definitions		
Bit Number	**Cause***	
7 (MSb)	Not Used	
6	Not Used	
5	Chemical Contamination (not a kill - status only)	
4	Cumulative Damage (not a kill - status only)	
3	Catastrophic Kill	
2	Firepower Kill	
1	Mobility Kill	
0 (LSb)	Communications Kill	

* A “1” in a bit position indicates the corresponding kill reason.