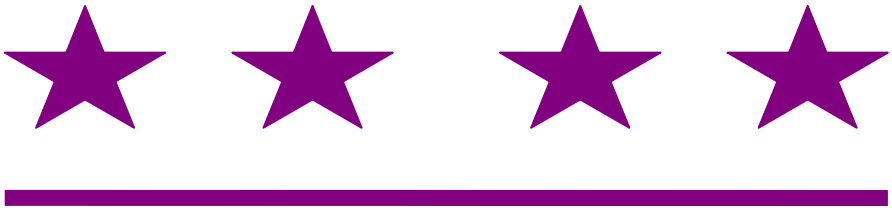
TDC



Theater Deployable Communications

Standards Document

13 January 2004

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1. INTRODUCTION

The purpose of this document is to delineate the standards that all contractors/vendors shall use in integrating TDC transit-case modules and kits. The following definitions are used throughout this document.

Modules. TDC modules are equipment end items that are intended to be used/operated within their transit cases. Examples include the Basic Access Module (BAM) and Red Data Module (RDM).

Kits. Most TDC kits are items of loose equipment not operated within the transit case, but rather in conjunction with other modules or equipment. Examples include the Voice Kits and the Data Kits.

The Theater Deployable Communications (TDC) Program Management Office (PMO) must approve all variations to this document.

2. PACKAGING, MARKING, AND LABELING

2.1 Packaging

2.1.1 Modules

2.1.1.1 Transit Case

TDC modules are housed in ECS Composites transit cases. The standard transit case color is black. Each transit case includes an integral slide out 19-inch rack, pressure relief valve, nut bars, and handles/latches appropriate for its size and weight. Each transit case cover will be equipped with handles to facilitate movement of the modules through doorways. At a minimum, one set of handles must be positioned above the module center of gravity. There are no wheels or casters on the transit cases and they are designed to stack on top of and mechanically interlock with like cases. Transit cases shall include storage pouches within the covers (end bells) to contain cables, manuals etc that are transported and used with the modules.

Transit cases that operate primarily inside are designed to protect the equipment from direct exposure to environmental conditions; e. g, rain, snow, ice, and dust likely to be encountered during worldwide military transit. Transit cases that reside primarily outside must be able to protect the equipment during worldwide military transit and operate with direct exposure to environmental conditions; e. g, rain, snow, ice, and dust.

Typical transit case size information are listed in Table 1 below:

Table 1: Typical Transit Case Sizes (Modules)

	Rack Units
TDC	4U
	8U
	11U
	13U
	20U

The specific sizes associated with each module are identified in the appropriate Baseline Requirements Document (BRD).

2.1.1.2 Weight

The weight of each module, including all internally carried cables, manuals, etc shall not exceed 261 pounds.

2.1.2 Kits

2.1.2.1 Packing Case

TDC kits are housed in ECS Rotomold packing cases. The standard color is black. The case includes a pressure relief valve and handles/latches appropriate for its size and weight. The case also includes a foam-packing cushion suitable for its contents when appropriate. There are no wheels or casters; they are designed to stack on top of and mechanically interlock to like cases. The cases with their covers in place are designed to protect the equipment inside from direct exposure to environmental conditions; e.g., rain, snow, ice, and dust likely to be encountered during worldwide military transit.

Table 2: Typical Packing Case Sizes (Kits)

	W x D x H	ECS Part Number
TDC	22.47 x 34.50 x 9.34	11915
	22.47 x 32.50 x 22.50	32245
	22.47 x 32.50 x 22.50	32290
	22.47 x 32.50 x 22.50	32292
	32.00 x 37.00 x 23.75	32467
	22.47 x 32.50 x 22.50	32541
	22.47 x 32.50 x 22.50	32542
	22.47 x 32.50 x 22.50	32543
	22.47 x 32.50 x 31.00	32549
	22.47 x 32.50 x 22.50	32585

The specific sizes associated with each kit are identified in the appropriate Baseline Requirements Document (BRD).

2.1.2.2 Weight

The weight of the kit, including all cables, manuals, etc shall not exceed 174 pounds.

2.2 Marking and Labeling

Each module and kit transit/packing case will be marked to provide the users information about the contents without having to open the cases. The standard label/marking material is white vinyl material, elevation .004 inches, shiny white backing, shiny black copy, and black border 1/8 inch wide.

Labels and marking tape may be procured from:

Lustre-Cal Nameplate Corporation
PO Box 429
110 E Turner Road
Lodi, CA 95240
1-800-435-2235
1-209-334-2610 (fax)

2.2.1 Modules

2.2.1.1 Module Marking

A two-inch wide color-coded diagonally striped tape surrounding the transit case visually identifies each module. The diagonal strip is 1 inch wide. The stripe is angled from the right to left on the tape at a 45-degree angle. On the module, the tape is applied above the lower set of handles. Table 3 defines the color combinations for each type of TDC module.

The module tape dimensions are depicted in Figure 1 below:

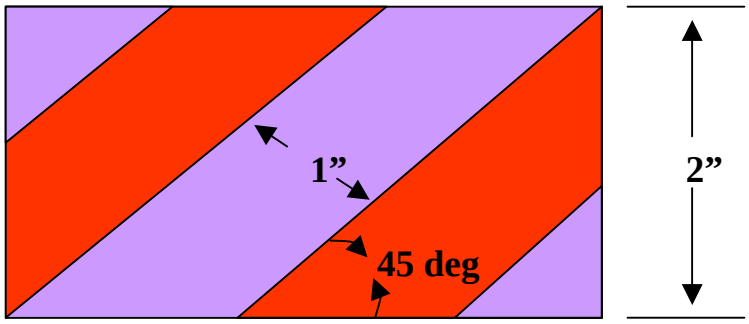

Figure 1: Module Tape Dimensions

Module color code standards are listed in Table 3 below:

Table 3: Module Color Codes

Component	Module	Color Code
LMST		Red and Yellow
ICAP	Basic Access Module	White and Buff
	Crypto Module	Red and Purple
	Crypto Interface Module	Red and White
	FCC-100 (Satellite)	White and Blue
	FCC-100 (Tactical)	Orange and White
	Laser Module	Yellow and Buff
	Large/Legacy Voice Module	White and Gray
	Message Terminal Module	Blue and Orange
	Microwave Module	Yellow and Orange
	P-Mux 400 Module	White and Purple
	P-Mux 800 Module (Base and Expansion)	Orange and Purple
	Radio Frequency Module v2	Purple and Gray
	Radio Frequency Module v3	Purple and Black
	Red Data Module	Red and Gray
	Red Hub Module	Red and Black
	Red Router Module	Red and Gray
	Secure Voice Module	Red and Buff
	STE-R Module	Blue and Buff
	TSSR Interface Unit	Yellow and White
	FTSAT Baseband Module	White and Green
NCC-D		Gray and Blue

2.2.1.2 Module Labeling

Each module has a nameplate permanently affixed to its body (not its covers) listing the module name, serial number, and supplier's CAGE code. Each removable cover and cable is also suitably marked to identify it as part of a specific module. A warning or information label is prominently affixed to the module body to inform the installer of the module's power requirements (voltage and frequency).

Permanent marking is prominently placed on the module body to indicate fully loaded weight, cubic feet, center of gravity and top of case. The center of gravity label will not overlap any other label on the module. However, it may overlap the marking tape if necessary.

Table 4 provides a general summary of the labels necessary on all transit cases except the small transit cases (4U). Labeling examples can be located in Figures 2 and 3.

A summary of the labeling necessary on small transit cases is provided in Table 5. Small transit case labeling examples can be found in Figures 4 and 5.

Table 4: Module Labeling

Location on Transit Case	**Contents**	**Label Size Type Size**
Front Cover (removable)	FRONT	1.60" high by 5" long 1" high letters
Back Cover (removable)	BACK	1.60" high by 5" long 1" high letters
Top, Both Sides	BACK (with arrows)	1.60" high by 5" long 1" high letters
Top	TOP	1.60" high by 2.75" long 1" high letters
Both sides	TOP (with arrows)	1.60" high by 5" long 1" high letters
Top, Both Sides	Name, serial number, CAGE code, program identifier "TDC-ICAP"	3" high by 5" long
Top, Both Sides, Front/Back Cover	CAUTION XXX pounds maximum XX.X cubic feet maximum	3" high by 5" long Caution – yellow background with 1/2" high letters Weight and cube – 1/4" high letters
Top, Both Sides	THIS EQUIPMENT OPERATES ON 120/240 VAC, 50-60 HZ	1.5" high by 5" long 3/8" letters
Top, Both Sides, Front/Back Cover	Writing Surface	3" high by 5" long .10" high all around border
Top, Both Sides*	A or B	2" high by 1.5" long
Top, Both Sides**	CCI	5/8" high by 1.5" long
As appropriate	CENTER OF GRAVITY	Symbol 1.5" diameter circle

* Required only on all RFM Modules

**Required on all modules containing COMSEC Controlled Items

Table 5 provides a summary of the labels necessary for small (4U) transit cases.

Table 5: Small Module Labeling

Location on Transit Case	**Contents**	**Label Size Type Size**
Front Cover (removable)	FRONT	1.60” high by 5” long 1” high letters
Back Cover (removable)	BACK	1.60” high by 5” long 1” high letters
Top, Both Sides	BACK (with arrows)	1.60” high by 5” long 1” high letters
Top	TOP	1.60” high by 2.75” long 1” high letters
Top, Front/Back Covers	Name, serial number, CAGE code, program identifier “TDC-ICAP”	3” high by 5” long
Top	CAUTION XXX pounds maximum XX.X cubic feet maximum	3” high by 5” long Caution – yellow background with 1/2” high letters Weight and cube – 1/4” high letters
Top	THIS EQUIPMENT OPERATES ON 120/240 VAC, 50-60 HZ	1.5” high by 5” long 3/8” letters
Top, Both Sides, Front/Back Cover*	Writing Surface	2.5” high by 4.75” long .10” high all around border
As appropriate	CENTER OF GRAVITY	Symbol 1.5” diameter circle

* Note that the writing surface is reduced on the small transit case

Figures 2 and 3 are general transit case labeling examples.

Figure 2: General Module Transit Case Labeling (Side View)

Figure 3: General Transit Case Labeling (End View)

Figures 4 and 5 are small transit case (4U) labeling examples.

Figure 4: Small Transit Case Labeling (Side/Top View)

Figure 5: Small Transit Case Labeling (End View)

2.2.2 Kits

2.2.2.1 Kit Marking

Kits can be packaged in many ways, therefore they do not have color-coded tape surrounding the packing case.

2.2.2.2 Kit Labeling

Each kit has a nameplate permanently affixed to its body listing the kit name and serial number. Each removable cover, cable, and part is also suitably marked to identify it as part of a specific kit.

Permanent marking is prominently placed on the packing case to indicate fully loaded weight, cubic feet, center of gravity and top of case. The center of gravity label will not overlap any other label on the module.

Table 6 provides a summary of the labels necessary for all kits.

Table 6: Kit Labeling

Location on Transit Case	**Contents**	**Label Size Type Size**
Top	TOP	1.60” high by 2.75” long 1” high letters
Both Sides	TOP (with arrows)	1.60” high by 5” long 1” high letters
Top, Front/Back, Both Sides	Name, Serial number, CAGE code, program identifier “TDC-ICAP” (one label per kit)	3” high by 5” long
Top, Both Sides	CAUTION X man lift XXX pounds maximum XX.X cubic feet maximum	3” high by 5” long Caution – yellow background with 1/2” high letters Weight and cube – 1/4” high letters
Top, Both Sides*	THIS EQUIPMENT OPERATES ON 120/240 VAC, 50-60 HZ	1.5” high by 5” long 3/8” letters
Top, four Sides	Writing Surface	3” high by 5” long .10” high all around border

* As appropriate

Figures 6, 7 and 8 are labeling examples of a kit packing case.

Figure 6: Kit Packing Case (Top View)

Figure 7: Kit Packing Case (Front & Back View)

Figure 8: Kit Packing Case (Side View)

3. POWER/FIBER CABLING STANDARD

3.1 Power Standard

Each module is designed to operate from 100 to 130 VAC and 200 to 240 VAC, 50 to 60 Hz, single phase, three-wire power. No DC power is provided to any module from an external source. Each module contains a Marway power conditioner (part number 411355) to minimize line variation and transients. The prime power connector is an IEC 60320 C20 power inlet with detachable cord. Separate breakers are provided on the power conditioner for each prime component.

3.2 Fiber Optic Cabling Standard

Fiber Optic cable should provide extended temperature characteristics from -55°C (-67°F) to +85°C (+185°F), Crush Resistance, Impact Resistance, Flex Resistance and use Polyurethane jacket material (high abrasion and UV resistance). See Figure 9 for a Fiber Optic cable example.

Fiber optic cabling and devices should meet the following standards:

- All 10BaseFL internal/external cable and devices must support 850 nm wavelength
- All 100BaseFX and 1000BaseSX internal fiber optic cable and devices may support 50 or 62.5-micron fiber with a 1300 nm wavelength
- All 100BaseFX and 1000BaseSX external fiber optic cable and devices will support 50-micron cable with a 1300 nm wavelength

Figure 9: Fiber Optic Cable Example

4. SIGNAL INTERFACES

TDC modules do not have a common distribution or signal entry panel. Specific requirements are identified in the appropriate Module Requirements Documents. There are, however, common interfaces among all the modules – these shall be implemented as follows:

4.1 Data Interfaces

4.1.1 10BaseT/100BaseTX/1000BaseT

All 10BaseT/100BaseTX/1000BaseT ports must be in accordance with the eight wire IEEE 802.3 10BaseT/100BaseTX/1000BaseT standards. The connector is an RJ 45 modular jack. All inactive jacks on the I/O DF are physically covered. All Power over Ethernet (POE) ports must support the IEEE 802.3af standard. Connector pin assignments are shown in Table 7. Straight-Through and Crossover cable assignments are shown in Tables 8 and 9.

Table 7: 10BaseT/100BaseTX/1000BaseT

Pin	Signal	Pin	Signal	Pin	Signal
1	TP0+	4	TP2+	7	TP3+
2	TP0-	5	TP2-	8	TP3-
3	TP1+	6	TP1-		

Table 8: Straight-Through Cable

Connector 1	Connector 2
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Table 9: Crossover Cable

Connector 1	Connector 2
1	3
2	6
3	1
4	7
5	8
6	2
7	4
8	5

4.1.2 100BaseFX

The 100BaseFX interface provides high-speed connectivity to the data network. The connector is a multimode fiber-optic cable with ST-type connector as shown in Figure 10. The ST fiber optic connector must be stainless steel or ceramic with an optical loss not greater than 9dB. Protective covers are provided for all fiber connectors and cables. All fiber Ethernet connectors or cables not in use are covered to shield them from dust or damage, minimizing the potential for optical signal attenuation or data loss.

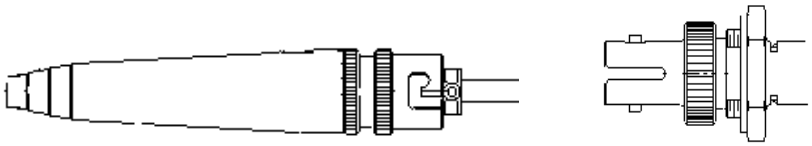

Figure 10: ST Fiber Optic Jack

4.1.3 1000BaseSX

The 1000BaseSX interface provides high-speed connectivity to the data network. The connector is a multimode fiber-optic cable with ST-type connector as shown in Figure 10. The ST fiber optic connector must be stainless steel or ceramic with an optical loss not greater than 9dB. Protective covers are provided for all fiber connectors and cables. All fiber Ethernet connectors or cables not in use are covered to shield them from dust or damage, minimizing the potential for optical signal attenuation or data loss.

4.1.4 IP Switch/Router and Circuit Switch Admin

The IP Ethernet Switch and Voice Switch administration ports are in accordance with the DB-9 RS-232 standards using hyper-terminal. Each admin connector is a DB-9F with pin assignments as shown in Table 10. When possible, all conductors must be connected.

Table 10: Admin Connector

Pin	Signal	Pin	Signal	Pin	Signal
1	Data Carrier Detect	4	Data Terminal Ready	7	Request to Send
2	Received Data	5	Signal Ground	8	Clear to Send
3	Transmitted Data	6	Data Set Ready	9	Ring Indicator

4.1.5 Ethernet AUI Port

The AUI interface connector is a DB15 (F) type connector with pin assignments as shown in the following table.

Table 11: Ethernet AUI Port Connector

Pin	Ethernet Circuit	Signal	**I/O**
Shell	PG	Protective Ground	–
1	CI-S	Control In Circuit Shield	–
2	CI-A	Control In Circuit A	I
3	DO-A	Data Out Circuit A	O
4	-	NC	–
5	DI-A	Data In Circuit A	I
6	VC	Voltage Common	–
7	-	NC	–
8	-	NC	–
9	CI-B	Control In Circuit B	I
10	DO-B	Data Out Circuit B	O
11	-	NC	–
12	DI-B	Data In Circuit B	I
13	VP	Voltage Plus	–
14	-	NC	–
15	-	NC	–

4.1.6 Serial Router Ports

Interface connectors are DB–25 (F) type. Pin assignments are in accordance with EIA–530 as shown in the following table.

Table 12: EIA–530 Synchronous Serial Data Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	O
2	Transmit Data	O	15	Transmit Clock	I
3	Receive Data	I	16	Receive Data Return	I
4	Request to Send	O	17	Receive Clock	–
5	Clear to Send	I	18	NC	–
6	Data Set Ready	I	19	Request to Send Return	O
7	Signal Ground	–	20	Terminal Ready	O
8	Receiver Ready (DCD)	I	21	NC	–
9	Receive Clock Return	–	22	Data Set Ready Return	I
10	Receiver Ready Return	I	23	Terminal Ready Return	O
11	Terminal Timing	O	24	Terminal Timing Return	O
12	Transmit Clock Return	I	25	NC	–
13	Clear to Send Return	I			

Note: I/O direction is with respect to the router.

4.2 Voice Network Connections

4.2.1 Voice Network Backbone Connection

The DS1 backbone signals are 1.544 Mbps serial data and can be formatted as either ISDN PRI or T-1 trunks. The two backbone connections are made on the distribution frame with four ST, fiber optic connector jacks (two transmits and two receives).

4.2.2 2-Wire Analog/ISDN BRI "U"/ISDN BRI "S"/T-1

Analog Subscriber

The 2-wire analog ports have the following features and characteristics:

a. 2-Wire loop start interface compatible with EIA RS-470 instruments.
b. Support for dual tone multi-frequency (DTMF) or pulse (rotary) dialing in accordance with EIA RS-470.
c. All phone ports are fused with lightning surge protectors.
d. RJ-11 connectors – Ring (pin3); Tip (pin 4); Zone connectors A, B, C and D.

Digital Subscriber

ISDN 2B+D Basic Rate Interface (BRI)

2-Wire "U- Interface"

2B1Q line waveform in accordance with ANSI T1.601-1992.
Independent B-channel signaling (either B-channel may be independently dialed)
RJ-11 connectors - Ring (pin3); Tip (pin 4); Zone connectors A, B, C and D.

All phone ports are fused with lightening surge protection.

The connectors are RJ-11 modular jacks. Pin assignments are in accordance with the six wire RJ-11C and RJ-11W as shown in Table 13. All inactive configurable RJ-11 jacks are covered.

Table 13: 2-Wire Analog and BRI

Pin	Signal	Pin	Signal	Pin	Signal
1	Not used	3	Ring	5	Not used
2	Not used	4	Tip	6	Not used

4-Wire “S-Interface”

AMI, 100% duty cycle in accordance with ANSI T1.605-1991; ITU/CCITT I.430 standards
Independent B-channel signaling (either B-channel may be independently dialed).
RJ-45 connectors – RX (pins 3 and 6), TX (pins 4 and 5) All ports are fused with lightening surge protection. The connectors are RJ-45 modular jacks. Pin assignments are in accordance with the eight wire ANSI/EIA/TIA 568A as shown in Table 14. All inactive configurable RJ-45 jacks are covered.

Table 14: 4-Wire BRI-S

Pin	Signal	Pin	Signal	Pin	Signal
1	Power	4	TX	7	Power
2	Power	5	TX	8	Power
3	RX	6	RX		

T1 Interface

The connectors are RJ-45 modular jacks. Pin assignments are in accordance with the eight-wire ANSI/EIA/TIA 568A as shown in Table 15. All inactive configurable RJ-45 jacks are covered.

Table 15: T1 Interface

Pin	Signal	Pin	Signal	Pin	Signal
1	Not Used	4	TX	7	Not Used
2	Not Used	5	TX	8	Not Used
3	RX	6	RX		

4.2.3 Remote Voice

The remote voice connectors are Telco-50 pin receptacles. The remote voice connectors provide up to 24 each 2-wire analog and/or digital connections (POTS, ISDN-BRI, etc.). Pin assignments are shown in the following table.

Table 16: Telco-50 Remote Voice Connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	Ring	26	Tip	13	Ring	38	Tip
2	Ring	27	Tip	14	Ring	39	Tip
3	Ring	28	Tip	15	Ring	40	Tip
4	Ring	29	Tip	16	Ring	41	Tip
5	Ring	30	Tip	17	Ring	42	Tip
6	Ring	31	Tip	18	Ring	43	Tip
7	Ring	32	Tip	19	Ring	44	Tip
8	Ring	33	Tip	20	Ring	45	Tip
9	Ring	34	Tip	21	Ring	46	Tip
10	Ring	35	Tip	22	Ring	47	Tip
11	Ring	36	Tip	23	Ring	48	Tip
12	Ring	37	Tip	24	Ring	49	Tip
				25	Unused	50	Unused

4.3 Crypto Connections

4.3.1 KIV–7HSB Plain Text — Red Interface

The KIV-7HSB Red Interface connector is a DB–25 (F) type. Pin assignments are shown in Table 17. The KIV-7HSB Red interface emulates a DCE.

Table 17: KIV–7HS Plain Text Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	I
2	Transmit Data	I	15	Transmit Timing	O
3	Receive Data	O	16	Receive Data Return	O
4	NC	–	17	Receive Timing	–
5	NC	–	18	NC	–
6	NC	–	19	NC	–
7	Signal Ground	–	20	NC	–
8	NC	–	21	NC	–
9	Receive Timing Return	–	22	NC	–
10	NC	–	23	Resync	I
11	Terminal Timing Return	I	24	Terminal Timing	I
12	Transmit Timing Return	O	25	NC	–
13	NC	–			

Note: I/O direction is with respect to the KIV-7HS.

4.3.2 KIV–7HSB Cipher Text — Black Interface

The KIV-7HSB Black interface connector is a DB–25 (F) type. Pin assignments are shown in Table 18. The KIV-7HSB Black interface emulates a DTE.

Table 18: KIV–7HS Cipher Text Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	O
2	Transmit Data	O	15	Transmit Timing	I
3	Receive Data	I	16	Receive Data Return	I
4	Request to Send	O	17	Receive Timing	–
5	Clear to Send	I	18	NC	–
6	Data Set Ready	I	19	Request to Send Return	O
7	Signal Ground	–	20	Terminal Ready	O
8	Data Carrier Detect	I	21	NC	–
9	Receive Timing Return	–	22	Data Set Ready Return	I
10	Data Carrier Detect Return	I	23	Terminal Ready Return	O
11	Terminal Timing Return	O	24	Terminal Timing	O
12	Transmit Timing Return	I	25	NC	–
13	Clear to Send Return	I			

4.3.3 KIV–19A Plain Text — Red Interface

The KIV-19A Red interface connector is a DB–25 (F) type. Pin assignments are shown in Table 19.

Table 19: KIV–19A Plain Text Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Plain Text (-)	I
2	Transmit Plain Text (+)	I	15	Red Station Clock (+)	O
3	Receive Plain Text (+)	O	16	Receive Plain Text (-)	O
4	Resync (-)	I	17	Receive Plain Text Clock (+)	O
5	NC	–	18	NC	–
6	NC	–	19	Resync (+)	I
7	Ground	–	20	NC	–
8	NC	–	21	NC	–
9	Receive Plain Text Clock (-)	O	22	NC	–
10	NC	–	23	NC	–
11	NC	–	24	NC	–
12	Red Station Clock (-)	O	25	NC	–
13	NC	–			

4.3.4 KIV–19A Cipher Text — Black Interface

The KIV-19A Black interface connector is a DB–25 (F) type. Pin assignments are shown in Table 20.

Table 20: KIV–19A Cipher Text Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Tx Data Out (-)	O
2	Tx Data In (+)	O	15	Tx Clock Out (+)	I
3	Rx Data Out (+)	I	16	Rx Data Out (-)	I
4	NC	–	17	Rx Clock Out (+)	I
5	NC	–	18	NC	–
6	NC	–	19	NC	–
7	Signal Return	–	20	NC	–
8	NC	–	21	NC	–
9	Rx Clock Out (-)	I	22	NC	–
10	NC	–	23	NC	–
11	Tx Clock In (-)	O	24	Tx Clock In (+)	O
12	Tx Clock Out (-)	I	25	NC	–
13	NC	–			

4.3.5 Resynchronization Function

All TDC equipment that utilizes Crypto must make used of the resynchronization functionality for internally and externally connected equipment.

4.3.6 Phase (Clock) Selection Switch

A Phase Select switch for each KIV-19A must be provided to invert the clocking when necessary. This will allow the proper phase relationship to be maintained in the internal signal Buffered Transmit Plain Text Clock and Buffered Transmit Plain Text Data.

5. SAFETY, GROUNDING AND LIGHTNING PROTECTION

5.1 Safety

The equipment design criteria for the equipment is in accordance with Best Commercial Practice, including NFPA-70, National Electric Code and Title 29, Code of Federal Regulations, Chapter XVII, Part 1910, "Occupational Safety Health Standards" and the requirements identified below.

5.1.1 Electrical Safety

All modules are designed to eliminate the hazard to personnel of inadvertent lethal voltage contact.

All electrical conductors carrying voltages in excess of 70 volts are insulated to prevent contact or covered by a protective barrier.

All removable protective barriers are interlocked or clearly marked with a warning label indicating the voltage potential that will be encountered behind the barrier. If warning labels are used, the warning remains visible after the cover has been removed.

5.1.2 Mechanical Safety

Sharp surfaces have protective covers or other suitable features to minimize injury where personnel are likely to be exposed to such surfaces.

5.2 Grounding and Lightning Protection

The equipment design ensures that all non current-carrying conductors ground all non current-carrying metal parts.

The ground wire is terminated at both ends and is of the same or larger size and current rating as the largest companion cable conductors or the sum of all paralleled conductors.

The ground wire will carry no current at any time other than during a ground fault. Lightning protection shall be provided on all external antennas.

6. MAINTAINABILITY

All modules accommodate a two level maintenance concept: organizational (Air Force personnel) and depot (contractor personnel). Removal and replacement of an LRU is defined as organizational level maintenance and any needed repair of the LRU is defined as depot level maintenance. An LRU is defined as the lowest element of the module which can be isolated to be faulty through inspection; built-in test; technical manuals; spares substitution; or other diagnostic aid approved by the Government for organizational level maintenance, exclusive of expendables such as fuses, lamps, and LEDs.

All equipment is packaged and integrated to simplify maintenance in the field. Access to equipment to change fuses and replace boards is unrestricted.

The equipment is designed to operate 24 hours per day, seven (7) days a week.

6.1 Mean Time to Repair

The mean time to repair at the organization level of any module is 30 minutes or less. Ninety-five percent (95%) of the repairs can be completed in less than 60 minutes.

6.2 Preventive Maintenance

The duration of preventative maintenance actions such as corrosion control, cleaning filters, etc. will not exceed 30 minutes and shall not interrupt customer service.

7. ENVIRONMENTAL REQUIREMENTS

7.1 Temperature

During storage and transport, each module and kit (in their carrying case) can withstand exposure to temperatures from -40°C (-40°F) to +60°C (+140°F). During operation, all modules and kits can withstand exposure to temperatures from 0°C (+32°F) to +40°C (+104°F). Any module or part thereof that is intended to operate outdoors operates over the temperature range of -20°C (-4°F) to +50°C (+122°F).

7.2 Relative Humidity

All modules and kits can withstand exposure to a relative humidity of 10% to 90%, non-condensing.

7.3 Altitude

During storage and transport, modules and kits can withstand exposure to altitudes from 100 ft. below mean sea level (BMSL) to 40,000 ft. above mean sea level (AMSL). During operation, modules and kits can withstand exposure to altitudes from 100 feet BMSL to 10,000 feet AMSL.

7.4 Shock and Vibration

Modules and kits (in their carrying cases) are protected from shocks induced during handling, setup and teardown. Modules and kits operate without degradation following exposure to the non-operating shock environment of described by Method 516.5, Procedure VI (Bench Handling) of MIL-STD-810F. Modules and kits are designed to withstand the vibration encountered while being transported by commercial and military airlift, sealift and vehicular (over unimproved roads) systems. Transit cases shall have shock protection built in between the case and the rack. Kits shall have “cushions” contoured for the contents when appropriate. Modification of this requirement is at the discretion of the TDC PMO.

7.5 Sand and Dust

During storage and transport, modules and kits (in their carrying cases) are protected when exposed to sand and dust in accordance with the best commercial practices for close proximity to operating aircraft. During operation with the covers removed, the modules and kits are designed in accordance with the best commercial practices. Screens, filters, etc. are not required since they are removed during operational deployments to properly operate and visually monitor the equipment.

8. DOCUMENTATION

8.1 Module Baseline Requirements Documents

Each module has an associated Module Baseline Requirements Document (BRD) detailing its requirements and configuration. All Module BRDs are subject to Government approval prior to implementation.

Each BRD complies with the following outline:

1. Scope
2. Applicable Documents
3. Requirements
    - 3.1 Module Definition
    - 3.2 Performance Requirements
        - 3.2.1 Electrical Interface Requirements (External)
        - 3.2.2 Electrical Interface Requirements (Internal)
        - 3.2.3 Functional Requirements
        - 3.2.4 Physical Characteristics
        - 3.2.5 Cables and Accessories
        - 3.2.6 Reliability
        - 3.2.7 Maintainability
        - 3.2.8 Environmental Conditions
    - 3.3 Designs and Construction
        - 3.3.1 Material parts and Processes
        - 3.3.2 Safety
    - 3.4 Logistics
4. Quality Assurance Provision
    - 4.1 General
    - 4.2 Responsibility for Inspection
    - 4.3 Product Qualification Test
    - 4.4 Production Acceptance Test
    - 4.5 Verification Cross-Reference Matrix
5. Preparation for Delivery
6 Baseline Configuration
    - 6.1 Equipment Listing
    - 6.2 Elevation Drawings
    - 6.3 Cable Diagrams
    - 6.4 Interconnection Diagrams

8.2 Production Qualification Test (PQT)

Each first article module undergoes a Production Qualification Test in accordance with contractor/vendor prepared, Government-approved test plan/procedures. Subsequent to the test, the contractor prepares a test report documenting the results of the Production Qualification Test conducted. The specific requirements to be tested are identified in the Module Baseline Requirement Document Verification Cross Reference Matrix. The Government determined the success or failure of tests. The contractor keeps test logs to record all events that have occurred during the formal tests, including, but not limited to, test failure/completion, corrective actions taken, and equipment/procedural modifications. Requests for change in testing, substitutions of test equipment, or any other exceptions to the approved test program must be submitted to the Government for concurrence prior to the start of formal tests. All changes are noted in the contractor's test logs and in the official test record. The contractor conducts re-tests of previously completed formal testing when the Government judges that correction of the deficiency or any other modification affects the results of prior testing.

8.3 Production Acceptance Test (PAT)

Each module, with the exception of the first article, undergoes production acceptance testing in accordance with contractor/vendor prepared, Government-approved Acceptance Test Procedures. The specific requirements to be tested during production acceptance testing are identified in the Module Baseline Requirement Document Verification Cross Reference Matrix.

8.4 Kit Baseline Requirements Documents

Each kit has an associated Baseline Requirements Document detailing its requirements and configuration. All BRDs are subject to Government approval prior to implementation.

8.5 Commercial Manuals/Documentation

All modules and kits are shipped with all associated/applicable hard/soft copy commercial documentation.