Bolt Beranek and Newman Inc.

12

Report No. 3612

Site Survey Report for FNWC/ACCAT Interconnection

July 1977

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Defense Advanced Research Projects Agency (DoD)
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Monitored by:
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Under Contract No. N00039-77-C-0239
Contract Period 14 June 1977 to 14 June 1978

Principal Investigator: Robert H. Thomas

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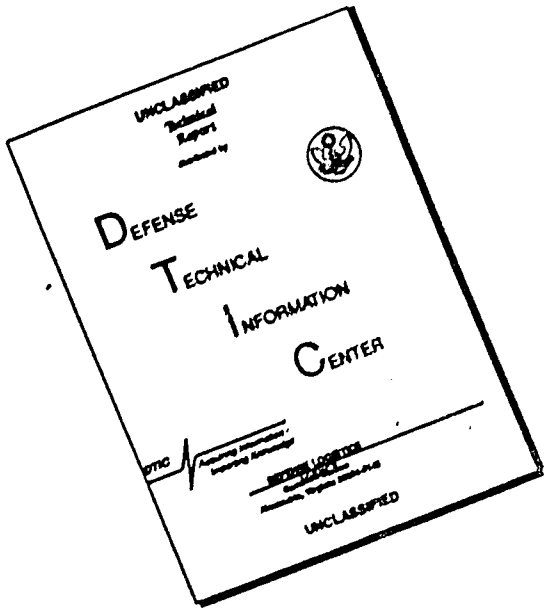

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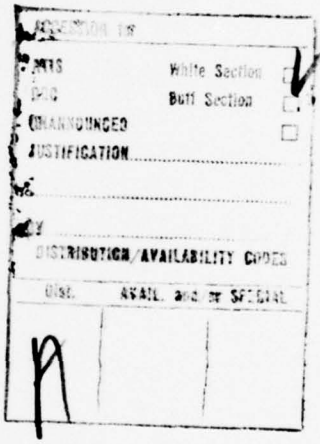

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

ARPANET
Advanced Command Control Architectural Testbed (ACCAT)
Private Line Interface (PLI)
Interface Message Processor (IMP)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Two DEC PDP-11 systems are to be installed at the Fleet Numerical Weather Center (FNWC) to interface FNWC CDC6500 Computers to the ARPANET. One system is to be used to interface two CDC6500 computers that operate in a secure mode to the ACCAT subnet of the ARPANET. The second system is to be used to interface a third CDC6500 that operates in an unclassified mode to the non-secure ARPANET. This report details information required to prepare the FNWC facilities for the installation of the PDP-11 systems.

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Site Survey Report for FNWC/ACCAT Interconnection

This report is an information package dealing with the installation of two Digital Equipment Corporation PDP11/34 systems at FNWC. The first 11/34 system is to be interfaced with two existing, secure, CDC6500 systems and in turn connected to the ARPANET through a private line interface (PLI). The purpose of this system is to interface the secure FNWC CDC6500 systems to the ACCAT facility.

The second 11/34 system is to be interfaced to a CDC6500 system operating in a non-secure environment. This 11/34 will be connected to the ARPANET via a direct connection to an IMP.

This document covers the following topics:

1. Overview of connection scheme.
2. Equipment list for both Digital Equipment Corporation 11/34 systems.
3. Physical configuration for 11/34 systems.
4. Electrical requirements for 11/34 systems.
5. Secure PLI characteristics.
6. Inter-connecting cable list.
7. IMP modification required for non-secure, distant connection.

1. Overview of connection scheme.

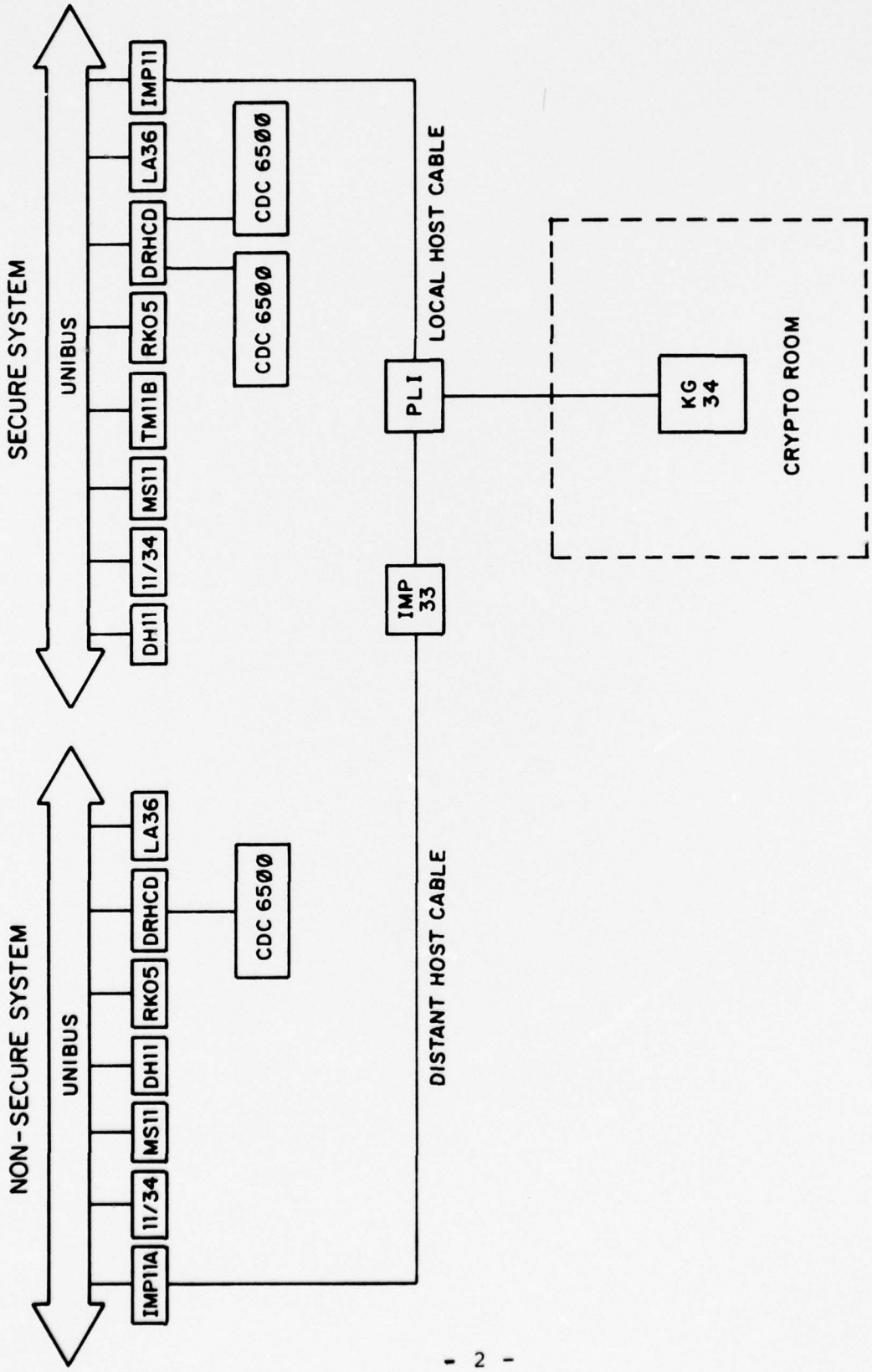

FIGURE 1

OVERVIEW FNWC CONNECTION SCHEME

2. Equipment List for Secure and Non-secure DEC 11/34 Systems

SECURE

1	1	11T34-AE	32K MOS 2-RK05J LA36 115
2	5	MS11-JP	16K MOS MEMORY 11/04-34
3	1	H775-CA	BATT BACKUP 10.5" 11/34
4	1	M7850	PARITY MS11-FP,JP MM11-C
5	1	KY11-LB	11/04-34 PROGRAM CONSOLE
6	1	TMB11-EA	CONT + 1ST 9T TU10W 115V
7	1	LA11-PA	LA180-PA M7258 BC11S-25
8	1	IMP11-A	FULL DUP IMP DHA INTERF,
9	1	DH11-AD	16-CH PROG ASYN MPXR EIA
10	1	DB11-A	UNIBUS REPEATER
11	2	RK05-HA	RK05 DISK UNIT SELECT SW
12	1	H960-DH	CAB WITH 1 EXP BOX,115V/
13	1	DD11-D	2-SU 7-HEX SPC 2-QUAD SP
14	1	DD11-C	1-SU 2-HEX SPC 2-QUAD SP
15	1	LAXX-KG	EIA INT FOR LA36, 9' CAB
16	2	H312-A	NUL MODEM
17	6	RK05K-11	DISK CARTRIDGE-RK03/05 P
18	1	QJ628-CE	RSX11M V3 NO SVC RK05
19	1	DRHCD	CDC6000 INTERFACE

NON-SECURE

1	1	11T34-AE	32K MOS 2-RK05J LA36 115
2	5	MS11-JP	16K MOS MEMORY 11/04-34
3	1	H775-CA	BATT BACKUP 10.5" 11/34
4	1	M7850	PARITY MS11-FP,JP MM11-C
5	1	KY11-LB	11/04-34 PROGRAM CONSOLE
6	1	IMP11-A	FULL DUP IMP DHA INTERF,
7	1	DH11-AD	16-CH PROG ASYN MPXR EIA
8	1	DB11-A	UNIBUS REPEATER
9	2	RK05-HA	RK05 DISK UNIT SELECT SW
10	1	H960-DH	CAB WITH 1 EXP BOX.115V/
11	1	DD11-D	2-SU 7-HEX SPC 2-QUAD SP
12	1	DD11-C	1-SU 2-HEX SPC 2-QUAD SP
13	1	LAXX-KG	EIA INT FOR LA36, 9' CAB
14	6	RK05K-11	DISK CARTRIDGE-RK03/05 P
15	1	QJ628-CE	RSX11M V3 NO SVC RK05
16	1	DRHCD	CDC6000 INTERFACE

3. Physical configuration for 11/34 systems.

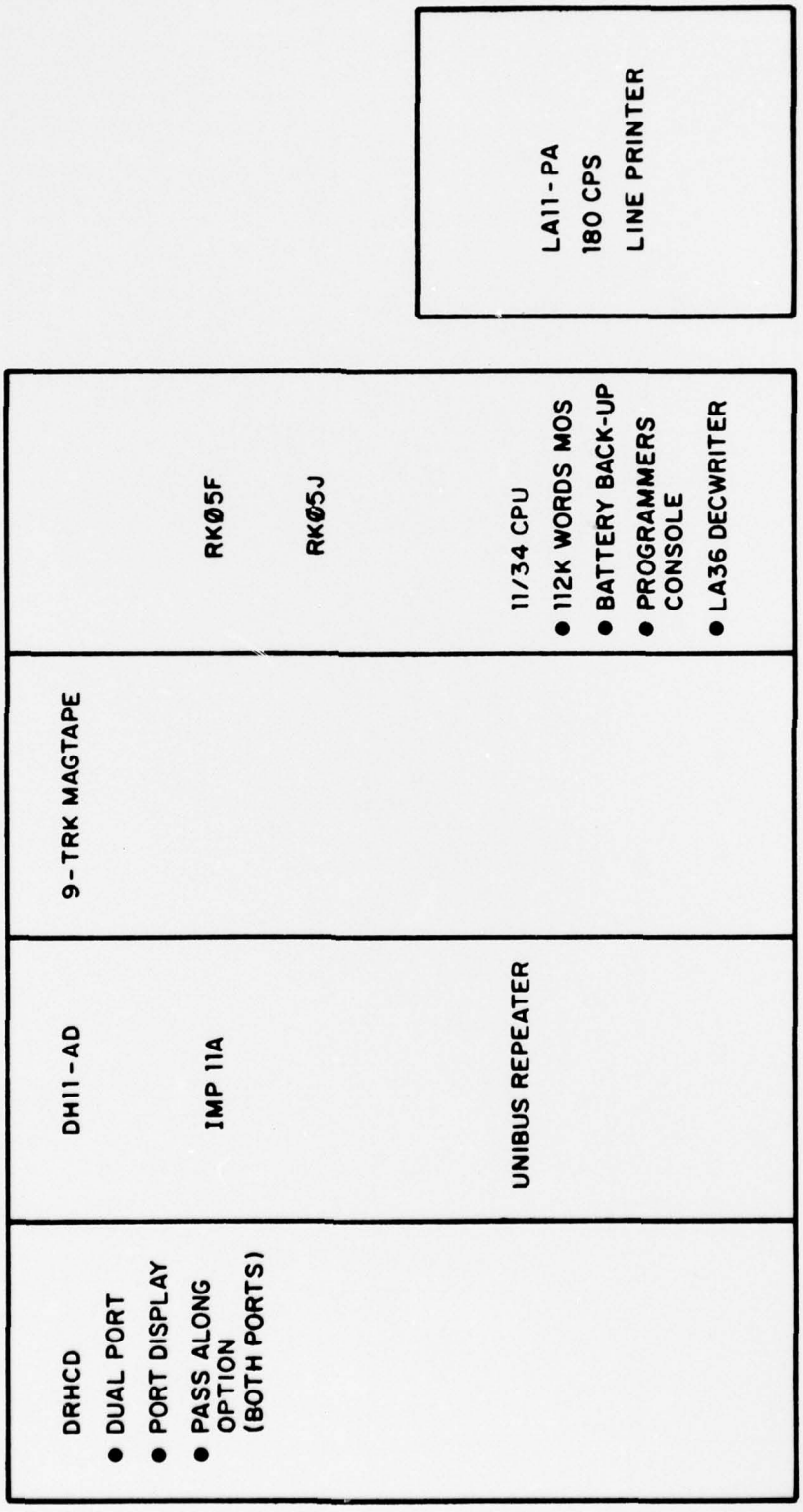

FIGURE 2

PHYSICAL CONFIGURATION

SECURE DEC 11/34 SYSTEM

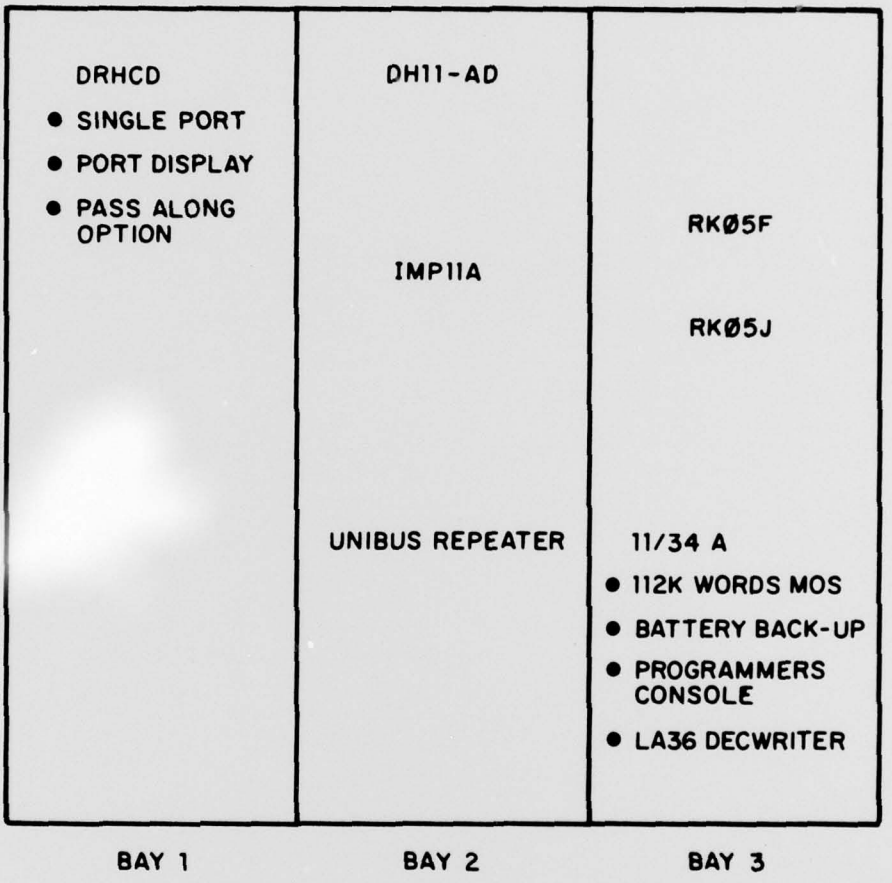

FIGURE 3

PHYSICAL CONFIGURATION

NON-SECURE DEC 11/34 SYSTEM

4. Electrical Requirements

Secure & Non-secure 11/34

Secure 11/34

Cabinet	Voltage/Phase	Breaker	Watts	Receptical
Bay 1	115/Single	30 amp	1100	NEMA L5-30R
Bay 2	115/Single	30 amp	1000	NEMA L5-30R
Bay 3	115/Single	30 amp	1100	NEMA L5-30R
Spare(optional)	115/Single	30 amp	--	NEMA L5-30R

Non-secure 11/34

Cabinet	Voltage/Phase	Breaker	Watts	Receptical
Bay 1	115/Single	30 amp	1000	NEMA L5-30R
Bay 2	115/Single	30 amp	1100	NEMA L5-30R
Bay 3	115/Single	30 amp	1100	NEMA L5-30R
Spare(optional)	115/Single	30 amp	--	NEMA L5-30R

5. Secure PLI Physical Characteristics (Adapted from from BBN Report No. 1822)

The secure Private Line Interface is contained in a TEMPEST-approved rack, approx. 66H x 25W x 29D, as shown in Figure 4. The total weight of the system is between 600 and 700 lbs. The top half contains the Red portion and the bottom half contains the Black portion along with a paper tape reader. The reader can be used to load programs into either half (with the rack doors open). A horizontal bulkhead separates the two halves of the rack; a filter box containing optical isolators, feed through capacitors, and TEMPEST filters is provided in the bulkhead. Each half of the rack contains space to allow an additional Pluribus computer chassis; consequently the rack is considerably larger than the minimum required size for current configurations of the PLI.

A sealed symmetrical powerline filter in the base of the enclosure allows the PLI to operate from a single power source, either Red or Black, at the convenience of the installing site. The enclosure has been designed, tested, and certified for installation in either a TEMPEST-Red or TEMPEST-Black environment, provided that the appropriate signals are contained in conduit as specified below.

The PLI is designed to interface with an externally located KG-34, which must have the following options:

(1) 110 Volt AC power
(2) Low Speed
(3) Message Indicator; no A/S
(4) Data transition on positive clock transitions
(See the KG-34 manuals for strap option
on two KG cards.)
(5) Eight bit MI pattern (two front panel switches).

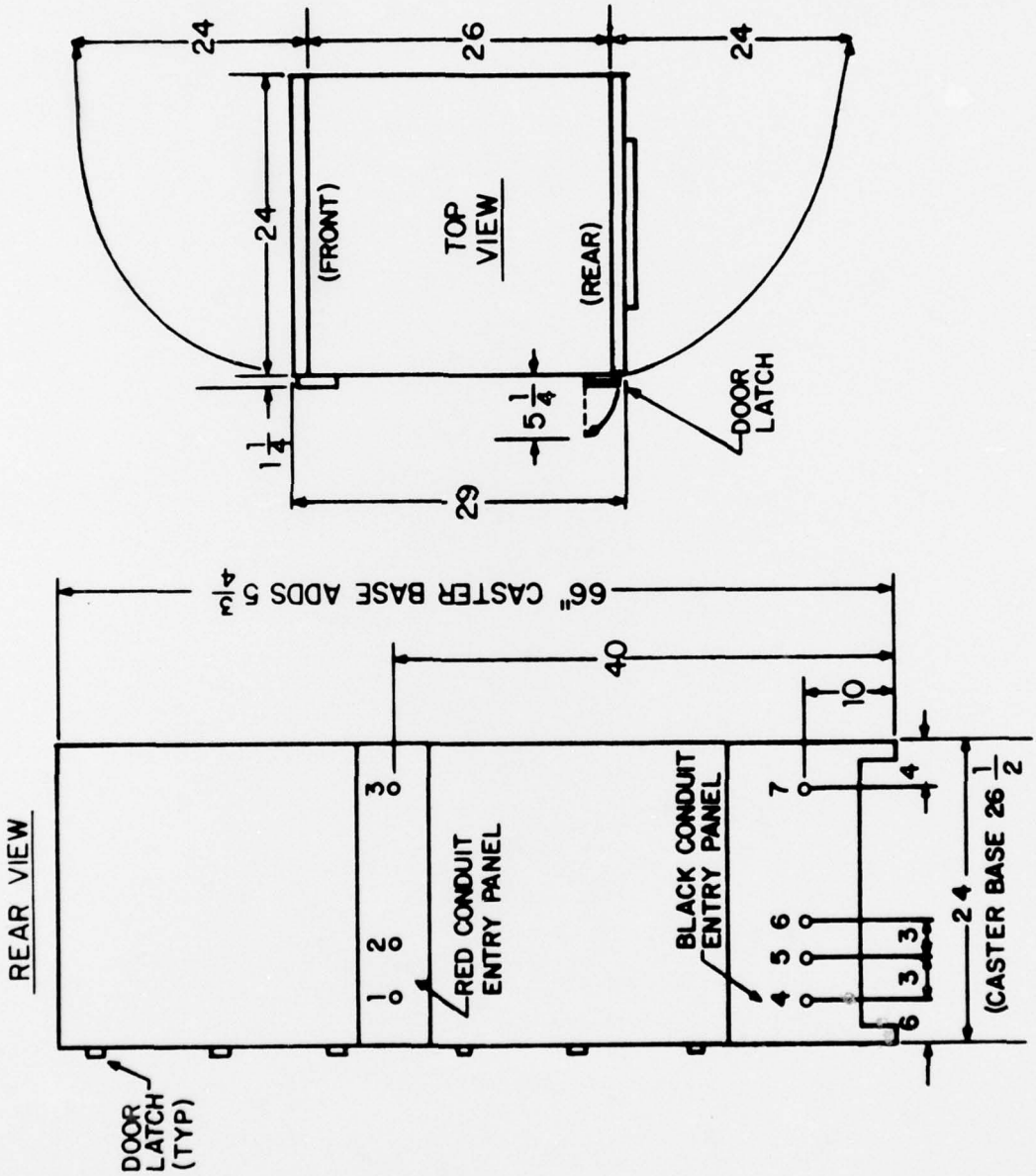

Figure 4. Secure PLI Outline Dimensions

Secure PLI Cable Entry and Conduit

All connections to the PLI are made through one of two (one Red, one Black) plated conduit entry panels at the rear of the enclosure (see Figure 4). The external conduits should be routed in such a way that they do not interfere with the rear doors. All conduit holes are 1 1/8 inch in diameter, as required for normal 3/4" ID conduit bulkhead fittings. The use of RF gasketing material is advisable to ensure TEMPEST integrity.

No conduit, fittings, or gaskets are supplied with the PLI. Connectors for the PLI end are attached to the cables, and connectors are furnished for the other end, to be attached after the cables have been pulled through the installed conduits. The drawings specifying these connections are listed in Table 1. Although all cables to the PLI may be installed in conduit, in a TEMPEST Red environment only the Black signals are required to be in conduit; similarly in a TEMPEST Black installation, only the Red signals are required to be in conduit. Grommets or similar devices should be installed for physical protection of cables where conduit fittings are not used.

AC Power

The AC cord shipped with the PLI is primarily for pre-installation checkout after unpacking. AC power for the PLI should be directly wired from a dedicated 20A 120VAC circuit breaker to the appropriate AC outlet box within the PLI. Entry "3" should be used for RED power, or entry "7" should be used BLACK power, at the convenience of the site. Only one feed should be used, as the in-line power filter in the PLI supplies power to its other half. Input line voltage to the PLI should be maintained above 115VAC to allow for the drop through and powerline filter. A separate convenience outlet should be provided near the PLI for an oscilloscope (not furnished) and the Teletype furnished for diagnostic use. The unused AC conduit entrance must be sealed off in TEMPEST approved fashion.

IMP Connection

The Black half of the PLI acts as a network host and will be connected to the IMP using a local host interface.

Local Host

The HLC interface card is used in the PLI when it is connected as a Local Host to its IMP. Although 30 feet has been specified as the maximum cable distance between Host (PLI) and IMP, distances of several hundred feet are made practical by the use of coaxial cables and special attention to installation ground connections.

Special Considerations

When PLI to KG cables greater than 30 feet are desired, a "bubble" or enlargement in the cable conduit is required (at the KG end). This enlargement is to house 8-Pomona boxes, 2" x 1" x 1" which will contain a resistance circuit to trim the cable characteristics for the required length.

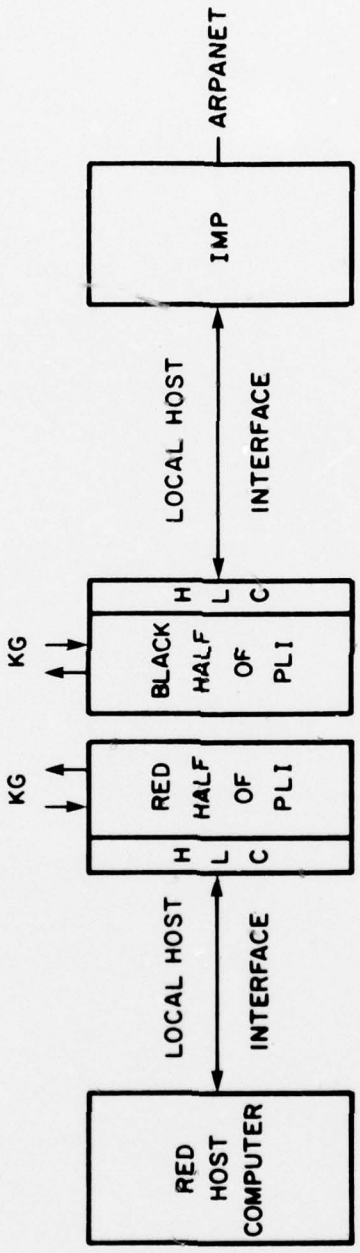

FIGURE 5

PLI INTERFACE CONFIGURATION

SECURE PLI CHARACTERISTICS

Table 1

INTERCONNECTING CABLE LIST

Purpose	Cable #/Mfg.	Length	Desination	PLI Conduit#	PLI Connector
PLI to IMP (local host)	FHSH/BBN	15'	IMP	4	Black J-7
IMP11A to PLI (local host)	FHSA/BBN	80'	IMP11A	1	Red J-7
KG-34 to PLI (low speed signals)	FKGA/BBN	100'	KG TB-4	5	Black J-6
KG-34 to PLI (Black clock & data)	4FBNC-B/BBN	100'	KG TB-1	6	Black J1-J4
KG-34 to PLI (Red clock & data)	4FBNC-B/BBN	100'	KG TB-3	2	Red J1-J4
IMP11A to IMP (DISTANT Host)	DISTANT Host cable/BBN	1000'	IMP	-	-
CDC6500 to DRHCD (12 required total)	52675100/CDC	5'	DRHCD	-	-
CDC6500 to DRHCD (12 required total)	52675001/CDC	70'	DRHCD	-	-

CABLE WIRE LIST
TYPE: FHSH
PLI TO IMP (local)

Cinch Connector DC-37P		Signal Name	Honeywell Connector 013-625-701
1	Center	RFNIB	7
20	Shield	GND	33
2	Center	TYIMB	4
21	Shield	GND	33
3	Center	LIBIT	6
22	Shield	GND	33
4	Center	IMDTA	8
23	Shield	GND	33
5	Center	RFNHB	2
24	Shield	GND	33
6	Center	TYHBX	5
25	Shield	GND	33
7	Center	LHBIT	1
26	Shield	GND	33
8	Center	HSDTA	3
27	Shield	GND	33
9	Center	XMTOT	11
28	Shield	GND	33
10	Center	XMTXM	12
29	Shield	GND	33
11	Center	HMRDY	13
30	Shield	GND	33
12	Center	HRDYT	14
31	Shield	GND	33

Note: Conductor to be used (COAX) Alpha/Belden RG-174/U, covered with Alpha/Belden 1" zipper tubing #ZIP-31-1 BLK/QPL.

Connector Cover - AMPHENOL #17-1373
Disconnect Latches - CANNON D-110278

CABLE WIRE LIST
TYPE: FHSA
IMP11A TO PLI (local)

Cinch Connector DC-37P		Signal Name	DEC Paddle-board M957
1	Center	RFNJB	H1
20	Shield	GND	H2
2	Center	TYIMB	D1
21	Shield	GND	D2
3	Center	LIBIT	E1
22	Shield	GND	E2
4	Center	IMDTA	F1
23	Shield	GND	F2
5	Center	RFNHB	N1
24	Shield	GND	N2
6	Center	TYHBX	P1
25	Shield	GND	P2
7	Center	LHBIT	R1
26	Shield	GND	R2
8	Center	HSDTA	S1
27	Shield	GND	S2
9	Center	XMTOT	L1
28	Shield	GND	C2
10	Center	XMTXM	L2
29	Shield	GND	C2
11	Center	HMRDY	J1
30	Shield	GND	C2
12	Center	HRDYT	J2
31	Shield	GND	C2

Note: Conductor to be used (COAX) Alpha/Belden RG-174/U, covered with Alpha/Belden 1" zipper tubing #ZIP-31-1 BLK/QPL.

Connector Cover - AMPHENOL #17-1373
Disconnect Latches - CANNON D-110278

CABLE WIRE LIST
TYPE: FBNC
KG34 TO PLI (8 total required)

AMPHENOL BNC Male 31-012	to	AMPHENOL BNC Male 31-012

Note: Conductor to be used (COAX) Alpha/Belden RG-62U.

CABLE WIRE LIST
TYPE: DISTANT HOST CABLE
IMP11A TO 516 or 316 IMP

IMP11A (Host)			516 or 316 (IMP)
Signal Name	Pin#	Pin#	Signal Name
IMPMRDY	L1	13	XMTXM
IMPRDYTEST	L2	14	XMTOT
HMRDY	J1	11	IMPGND
HRDYT	J2	12	HRDYT
HSDTA+	S1	23	HSDTA+
HSDTA-	S2	24	HSDTA-
TYHBT+	P1	19	TYHBT+
TYHBT-	P2	20	TYHBT-
RFNHB+	N1	7	RFNHB+
RFNHB-	N2	8	RFNHB-
LHBIT+	R1	21	LHBIT+
LHBIT-	R2	22	LHBIT-
IMPDTA+	F1	3	IMPDTA+
IMPDTA-	F2	4	IMPDTA-
TYIMB+	D1	5	TYIMB+
TYIMB-	D2	6	TYIMB-
RFNIB+	H1	17	RFNIB+
RFNIB-	H2	18	RFNIB-
LIBIT+	E1	15	LIBIT+
LIBIT-	E2	16	LIBIT-
SIGNAL GND	C2	31	SIGNAL GND

Cable shall contain multiple twisted pairs of #20 (or heavier) gauge wire. The characteristic impedance must be approximately 120 Ohms. The wires may be either individually shielded or may have a single shield covering all pairs. The shield is used to carry the host's ground reference and should have very low resistance. There must be at least 10 pairs in the cable, (two spare pair are recommended). A suitable cable is direct burial cable, rea specification PE-23, 19AWG conductors, 12 pair.

516 or 316 DISTANT host connector is MS24266R18B31PN (AMPHENOL 48-16R18-31P) plug with a MS27291-5 clamp and MS24254-20P contacts.

IMP11A IMP connector is M957 DEC Paddle-board or M908 DEC Paddle-board.

7. IMP Modification

The FNWC IMP is not presently equipped to handle a distant host connection.

The IMP will require the installation of a distant host port package. Prerequisites for this installation include having a working DEC 11/34 system available for stand-alone testing, and a distant host cable installed.