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STANDARD ENGINEERING INSTALLATION PACKAGE, FIRING RANGE CONTROL--ETC(U)
APR 79

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SEIP 019

LEVEL II

STANDARD ENGINEERING INSTALLATION PACKAGE

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VOICE OF THE ARMY

FIRING RANGE CONTROL SWITCHBOARD

6 APRIL 1979

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HEADQUARTERS
U. S. ARMY COMMUNICATIONS COMMAND
FORT HUACHUCA, ARIZONA 85613

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line circuits

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This Standard Engineering Installation Package (SEIP) provides guidance for detailed planning, engineering, installing, and testing of a typical firing range control switchboard. Document includes installation specifications and instructions, engineering installation drawings, and operational test procedures.

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DEPARTMENT OF THE ARMY
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No. 019

6 April 1979

Standard Engineering Installation Package
FIRING RANGE CONTROL SWITCHBOARD

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SECTION 1. GENERAL

1.1 PURPOSE. The purpose of this Standard Engineering Installation Package (SEIP) is to provide preengineered guidance for the installation of a firing range control switchboard.

1.2 SCOPE. This SEIP provides detailed planning, engineering, installing, and testing criteria for a typical firing range control switchboard facility consisting of a Stromberg-Carlson two-position switchboard and associated equipment. The SEIP is applicable to all United States Army Communications Command (USACC) engineering-installation (E-I) activities involved in the planning and implementation of firing range control switchboards. It may be used by other Department of Defense activities and US Government agencies.

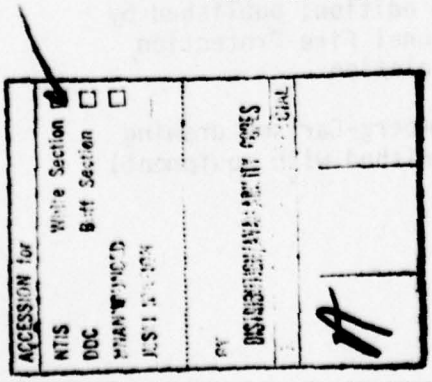
1.3 SYSTEM DESCRIPTION. The facility provided under this SEIP consists of a two-position, manual switchboard; a five-vertical, single-sided, wall-type combined distributing frame (CDF); 60 convertible line circuits; 2 power rectifiers; and a 48-volt battery. Switchboard positions used for this application will generally be derived from excess equipment supplies and may be of other nomenclatures such as Automatic Electric Company. The same rule applies to associated equipment.

1.4 EQUIPMENT FUNCTION. The firing range control switchboard, together with the associated field phones and connecting wires, provides communication between various locations on the firing range. Either magneto or common battery circuits can be accommodated. Access is also provided to post telephone service.

1.5 APPLICABLE DOCUMENTS.

a. Government documents.

MIL-STD-188-124	Grounding, Bonding, and Shielding
USAF T.O. 31-10 Series	Standard Installation Practices
CCR 702-1-2	USACC Quality Assurance Program for Engineering, Installation, and Acceptance of Communications-Electronics Equipment and Systems



CCCR 34-2	Preparation of Engineering Installation Packages and Standard Engineering Installation Packages
CCCR 702-1	USACEEIA Quality Assurance and Testing Program
CCCR 702-2	USACEEIA Preparation of Documentation for Test and Evaluation of Communications-Electronics Materiel
CCCR 702-3	USACEEIA Role of the Test Director
CCCR 702-4	USACEEIA Quality Assurance During On-Site Installation
CCCR 702-7	USACEEIA Quality Assurance Corrective Actions
CCCP 105-3	USACEI Bn, Communications-Electronics Installation Planning and Implementation Guide
CCCP 105-9	Transient Voltage Suppressor Installation
DCAC 370-160-3	Site Survey Data Book for Communications Facilities
FM 11-487-4	Installation Practices: Communications Systems Grounding, Bonding, and Shielding

b. Non-Government documents.

NFPA No. 70-1978	National Electrical Code, 1978 edition; published by National Fire Protection Association
Drawing S-10045	Stromberg-Carlson drawing (furnished with equipment)

1.6 COMMENTS ON PUBLICATION.

a. Users of this publication are invited to submit recommendations for its improvement. Comments should be keyed to the drawing, page, paragraph, and line of the text for which the change is recommended. A mailing card for convenience is bound with this SEIP. Comments should be sent directly to the Commander, US Army Communications-Electronics Engineering Installation Agency, ATTN: CCC-CED-SEP, Fort Huachuca, Arizona 85613.

b. Requests for USACEEIA regulations and forms should be addressed to the Commander, USACEEIA, ATTN: CCC-SPT-RM, Fort Huachuca, Arizona 85613.

SECTION 2. SITE SURVEY AND DATA CHECKLIST

2.1 SITE SURVEY CRITERIA. The site survey shall be conducted in accordance with applicable portions of CCCR 34-2, Preparation of Engineering Installation Packages and Standard Engineering Installation Packages, and criteria set forth in DCAC 370-160-3, Site Survey Data Book for Communications Facilities.

2.2 EQUIPMENT CHARACTERISTICS. The major items of equipment to be installed and their characteristics are listed in table 2-1.

Table 2-1. Equipment Characteristics

Item	Number of units	Characteristics
Switchboard	2	Manual, two-position
Relay rack	4	Rack, mounting, power board, 23" x 7'6" Rack, mounting, power supply, 23" x 7'6" Rack, mounting, line converters, 27-1/2" x 7'6" Rack, for future equipment, 27-1/2" x 7'6"
Power board	1	Lorain Model 1232A-L1
Rectifier	2	Single phase, 120 V ac, 48 V, 30 A dc
Battery	1	24-cell, 48-V dc, 170 ampere-hours
Combined distributing frame	1	Wall-mounted, 5 verticals, type FW-9
Convertible line circuit plate	15	Circuit can function as either magneto or common battery circuit by use of strapping options
Ring and tone generator	2	Provide ringing current; one active, one spare

SECTION 3. INSTALLATION SPECIFICATIONS AND INSTRUCTIONS

3.1 INTRODUCTION. This section provides standard engineering and installation guidance for the installation of a two-position, manual, firing range control switchboard.

3.2 GENERAL INSTRUCTIONS. The equipment will be installed in accordance with established criteria, the engineering drawings and instructions, and referenced drawings and publications deemed necessary by the responsible engineering activity. Installation personnel must be familiar with the T.O. 31-10 Series, Standard Installation Practices, as applicable, to ensure that the facility is installed in accordance with standard installation procedures.

3.2.1 Cabling shall be in accordance with applicable T.O.

3.2.2 Tag all cables using bill of materials (BOM) item 93 in accordance with applicable T.O.

3.2.3 Measure cable runs to ensure that sufficient cable is cut.

3.2.4 Stencil equipment and terminal blocks in accordance with applicable T.O.

3.2.5 Install relay racks, power equipment rack, and battery rack in accordance with drawing STD-TL-0007.

3.2.6 Install combined distributing frame (CDF) in accordance with drawing STD-TL-0007. Mount terminal blocks and protectors in accordance with drawing STD-TL-0012.

3.2.7 Mount power board, rectifiers, ringing generators, and other components of the power rack in accordance with drawing STD-TL-0009.

3.2.8 Mount convertible line circuit plates in accordance with drawing STD-TL-0009.

3.2.9 Install switchboard positions and cable turning section in location shown on drawing STD-TL-0007. Refer to drawing STD-TL-0008 for face equipment layout.

3.2.10 All switchboard and power cable is furnished in bulk and shall be cut and formed on the job by the installer. Refer to drawings STD-TL-0010/STD-TL-0011 and cable running list (table 3-1) of this SEIP for cable and wiring information.

3.2.11 Grounding, bonding, and shielding shall be accomplished in accordance with drawing STD-TL-0013 and applicable parts of MIL-STD-188-124.

3.2.12 Safety equipment shall be placed close to the battery.

3.3 CHANGES IN SCOPE. The installation team shall not do any work requested by local post, camp, or station personnel, unless such work is covered by this specification.

3.4 CHANGES TO SPECIFICATIONS.

3.4.1 Minor Changes. The installation team chief is authorized to make minor changes to the requirements and instructions contained in this specification without prior approval of the project engineer. These changes shall be documented by the team chief. A minor change is one that does not--

a. Alter the specified floor plan or major item of equipment.

b. Violate a mandatory standard.

c. Alter the intended operational capability or procedures.

d. Alter the intent or end result of the required testing.

3.4.2 Major Changes. A major change is one that alters or violates the conditions stated in paragraphs a through d above. The installation team shall not make major changes to the requirements and instructions contained in this specification without prior approval of the project engineer. Requests for approval of major changes may be made by telephone; however, a follow-up message or letter is required. The changes shall be documented by the team chief, and the document that authorized the change shall be included in the documentation.

3.5 NOTES TO THE INSTALLER.

3.5.1 The installation team chief will notify the local USACC contact when the CDF has been installed, so that local personnel can mount the protectors and connect the outside plant cable.

3.5.2 The installation team chief will request from the local USACC contact the number of magneto and common battery circuits, so that the correct wiring option may be accomplished on the convertible line circuits.

Table 3-1. Cable Running List

Run desig*	Cable No.	Cable Cond	Cable AWG	Circuit ref	From	To	Lead desig
A-1	1	30	#22	S-10045	Switchboard, dial circuit 1-5	CDF 1J, circuit 1-5	T, R
J-1	1	80	#22	S-10045	Relay rack #2, convertible lines 1-40	CDF 2J, circuit 1-40	T, R
	2	40	#22	S-10045	Relay rack #2, convertible lines 41-60	CDF 2H, circuit 41-60	T, R
E-1	1	150	#22	S-10045	Relay rack #2, circuit 1-30	Switchboard position 1; panel 1, circuit 1-10; panel 2, circuit 11-20; panel 3, circuit 21-30	T, R, S, LL, BL
	2	150	#22	S-10045	Relay rack #2, circuit 31-60	Switchboard position 1; panel 1, circuit 31-40; panel 2, circuit 41-50; panel 3, circuit 51-60	T, R, S, LL, BL
E-3	1	30	#22		Switchboard panel 1, 1-10 outdial to line	CDF, 4	T, R
S-1	1	1	#2	1232A-L1	Power board, 50-A fuse #1 in	Rectifier #1 (-) terminal	(-)
S-2	1	1	#1/0	1232A-L1	Power board, 50-A fuse #1 out	Battery cell #24 (-)	(-)
S-3	1	1	#2	1232A-L1	Power board, rtn bar insulator	Rectifier #1 (+) terminal	(+)

*designation.

Table 3-1. Cable Running List (Continued)

Run desig	Cable No.	Cable Cond	Cable AWG	Circuit ref	From	To	Lead desig
S-4	1	1	#1/0	1232A-L1	Power board, rtn bar insulator	Battery cell #1 (+)	(+)
S-5	1	1	#1/0	1232A-L1	Power board, 50-A fuse #2 out	Battery cell #24 (-)	(-)
S-6	1	1	#1/0	1232A-L1	Power board, rtn bus bar	Battery cell #1 (+)	(+)
S-7	1	1	#1/0	1232A-L1	Power board, 50-A fuse #2 in	Meter shunt (-)	(-)
S-8	1	1	#1/0	1232A-L1	Power board, meter shunt	CEMF panel in (-)	(-)
S-9	1	1	#1/0	1232A-L1	Power board, CEMF panel out	-48 V load bar (-)	(-)
S-10	1	1	#2	1232A-L1	Power board, -48 V load bar	Fuse panel #1	(-)
S-11	1	1	#2	1232A-L1	Power board, -48 V load bar	Fuse panel #2	(-)
S-12	1	1	#4-#10	1232A-L1	Power board, fuse panel #1, fuse #1	Switchboard position #1	(-)
S-13	1	1	#4-#10	1232A-L1	Power board, gnd rtn bus bar	Switchboard position #1	(+)
S-14	1	1	#4-#10	1232A-L1	Power board, fuse panel #1, fuse #2	Switchboard position #2	(-)
S-15	1	1	#4-#10	1232A-L1	Power board, gnd rtn bus bar	Switchboard position #2	(+)

Table 3-1. Cable Running List (Continued)

Run desig	Cable No.	Cable Cond	Cable AWG	Circuit ref	From	To	Lead desig
S-16	1	1	#4-#10	1232A-L1	Power board, fuse panel #1, fuse #4	Relay rack #2 fuse panel	(-)
S-17	1	1	#4-#10	1232A-L1	Power board, gnd rtn bus bar	Relay rack #2 fuse panel	(+)
S-18	1	1	#4-#10	1232A-L1	Power board, fuse panel #1, fuse #5	Relay rack #3 fuse panel	(-)
S-19	1	1	#4-#10	1232A-L1	Power board, gnd rtn bus bar	Relay rack #3 fuse panel	(+)
S-20	1	1	#14	1232A-L1	Power board, fuse panel #1, fuse #6	Ringing generator #1	(-)
S-21	1	1	#14	1232A-L1	Power board, gnd rtn bus bar	Ringing generator #1	(+)
S-22	1	1	#14	1232A-L1	Power board, fuse panel #1, fuse #7	Ringing generator #2	(-)
S-23	1	1	#14	1232A-L1	Power board, gnd rtn bus bar	Ringing generator #2	(+)
S-24			#4	1232A-L1	Power board, gnd rtn bus bar	CDF ground bar	(+)
S-25			#2	1232A-L1	Power board, 50-A fuse #1 in	Rectifier #2 (-) terminal	(-)
S-26			#2	1232A-L1	Power board, rtn bar insulator	Rectifier #2 (+) terminal	(+)

Table 3-1. Cable Running List (Continued)

Run desig	Cable No.	Cable Cond	Cable AWG	Circuit ref	From	To	Lead desig
S-27	1	2	#20	S-10015	RR #2 fuse panel, fuse #1	Convertible line circuit 1-10	(-)/ (+)
S-27	2	2	#20	S-10015	RR #2 fuse panel, fuse #2	Convertible line circuit 11-20	(-)/ (+)
S-27	3	2	#20	S-10015	RR #2 fuse panel, fuse #3	Convertible line circuit 21-30	(-)/ (+)
S-27	4	2	#20	S-10015	RR #2 fuse panel, fuse #4	Convertible line circuit 31-40	(-)/ (+)
S-27	5	2	#20	S-10015	RR #2 fuse panel, fuse #5	Convertible line circuit 41-50	(-)/ (+)
S-27	6	2	#20	S-10015	RR #2 fuse panel, fuse #6	Convertible line circuit 51-60	(-)/ (+)
R-1		1	#18	1232A-L1	Power board alarm panel	Relay rack #2 fuse panel	FA
R-2		1	#18	1232A-L1	Power board alarm panel	Relay rack #3 fuse panel	FA
R-3		1	#18	1232A-L1	Power board alarm panel	Rectifier-charger #1	RFA
R-4		1	#18	1232A-L1	Power board alarm panel	Rectifier-charger #1	Hi/lo volt

Table 3-1. Cable Running List (Continued)

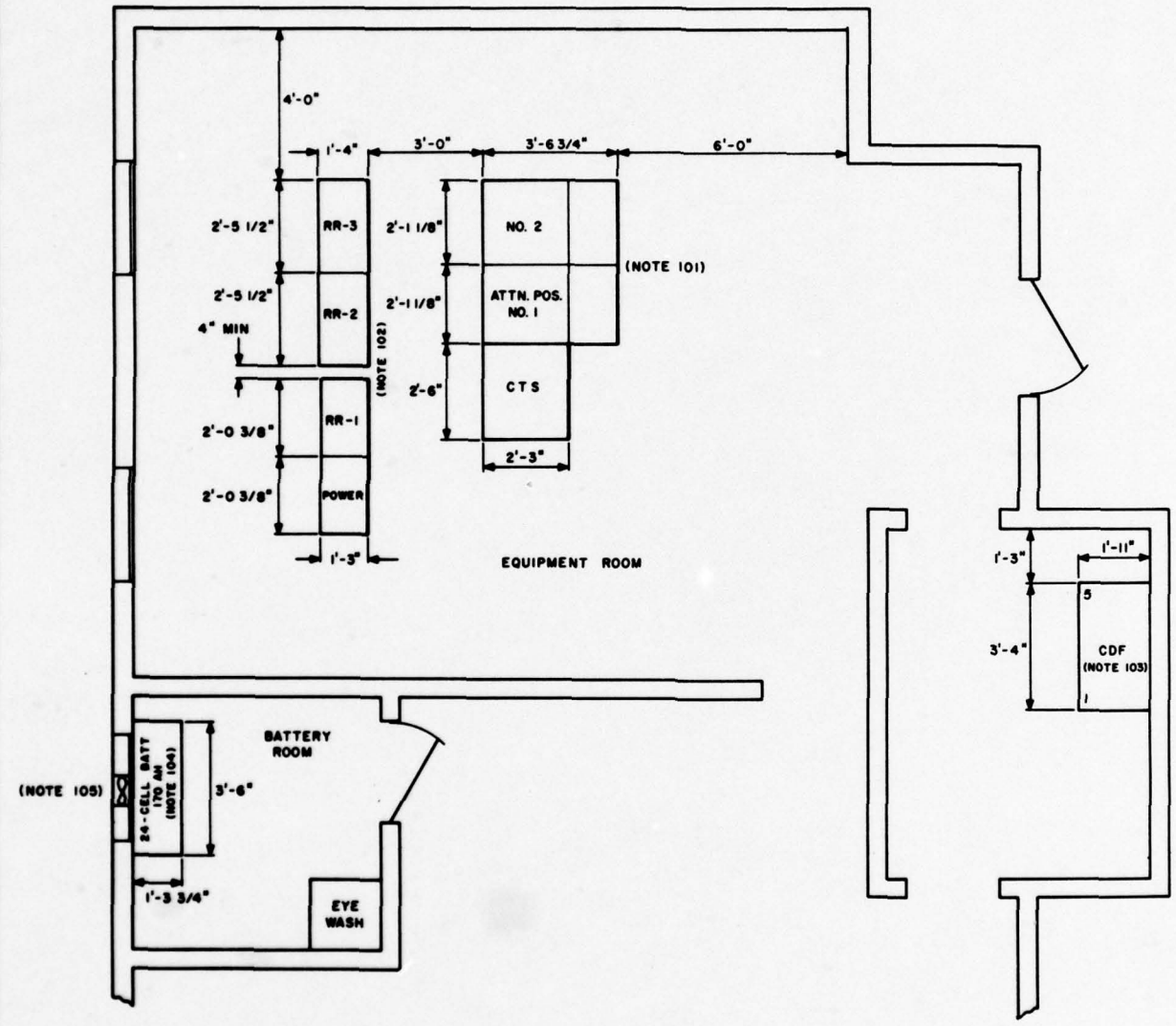
Run desig	Cable No.	Cable Cond	Cable AWG	Circuit ref	From	To	Lead desig
R-5		1	#18	1232A-L1	Power board alarm panel	Switchboard positions #1 and #2 fuse alarm	FA
R-6		2	#14	1232A-L1	Power board ringing generator #1	Switchboard positions #1 and #2 terminal block	20 Hz
R-7		2	#14	1232A-L1	Power board ringing generator #2	Switchboard positions #1 and #2 terminal block	20 Hz
R-8		1	#18	1232A-L1	Power board alarm panel	Rectifier-charger #2	RFA
R-9		1	#18	1232A-L1	Power board alarm panel	Rectifier-charger #2	Hi/lo volt

SECTION 4. ENGINEERING INSTALLATION DRAWINGS

4.1 GENERAL. The drawings included as a part of this SEIP and manufacturers' drawings furnished with the equipment provide guidance for equipment installation. Drawing STD-TL-0011, sheet 2, provides typical connections applicable to this document. The floor plan drawing is typical and will be modified to fit a particular site by the responsible engineering agency. The following drawings are included:

STD-TL-0007 - Floor Plan
STD-TL-0008 - Switchboard Face Layout
STD-TL-0009 - Rack Face Layouts
STD-TL-0010 - Dc Power Distribution
STD-TL-0011 - Cabling/Wiring Diagram
STD-TL-0012 - Combined Distributing Frame
STD-TL-0013 - Grounding Plan

4.2 MODIFICATION OF INSTALLATION DRAWINGS. The engineering drawings may be modified during and after the installation of a project to reflect changes. Copies of modified drawings should be retained at each site and should also be forwarded to the responsible area office of the C-E engineers for corrective action. On-site options, such as the strapping on convertible line circuit plates, are not recorded on permanent drawings. Drawing changes will be marked with colored pencils as follows: red for additions, blue for engineers' notes, and yellow for deletions.


4'-0"
1'-4"
3'-0"
3'-6 3/4"
6'-0"
2'-5 1/2"
RR-3
2'-5 1/2"
RR-2
4" MIN
2'-0 3/8"
RR-1
2'-0 3/8"
POWER
1'-3"
(NOTE 102)
2'-1 1/8"
NO. 2
(NOTE 101)
2'-1 1/8"
ATTN. POS. NO. 1
2'-6"
CTS
2'-3"
EQUIPMENT ROOM
1'-3"
1'-11"
3'-4"
CDF (NOTE 103)
BATTERY ROOM
(NOTE 105)
24-CELL BATT 170 AH (NOTE 104)
3'-6"
1'-3 3/4"
EYE WASH

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED

NOTES:

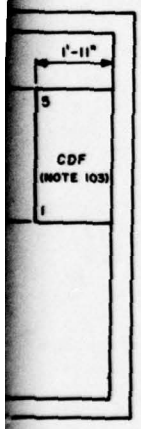
101. REFER TO DRAWING STD-TL-0008 FOR SWITCHBOARD RACK FACE LAYOUT.

102. REFER TO DRAWING STD-TL-0009 FOR POWER BOARD AND RELAY RACK FACE LAYOUTS.

103. REFER TO DRAWING STD-TL-0012 FOR COMBINED DISTRIBUTION FRAME LAYOUT.

104. REFER TO DRAWING STD-TL-0010 FOR BATTERY AND RACK INSTALLATION.

105. BATTERY ROOM EXHAUST FAN WILL BE PROVIDED BY THE FACILITIES ENGINEER.



2

ITEM	AEL	DESCRIPTION	NSN	UI	QTY
		LIST OF MATERIALS			

IDENT NO. STD-TL-0007	ORGANIZATION US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY
DESIGN BY H. RULAU — DATE 15 JAN 79	FIRING RANGE CONTROL SWITCHBOARD FLOOR PLAN
DRAWN BY S. D. H. — 15 JAN 79	
CHECKED BY F NYERS — 15 JAN 79	
APPROVAL [signature] — ACTIVITY CCC-CED-SEP	SIZE D — FSCM NO. 50470 — DRAWING NO.
PROJECT	SCALE 1/2"=1'-0" — SHEET 1 OF 1

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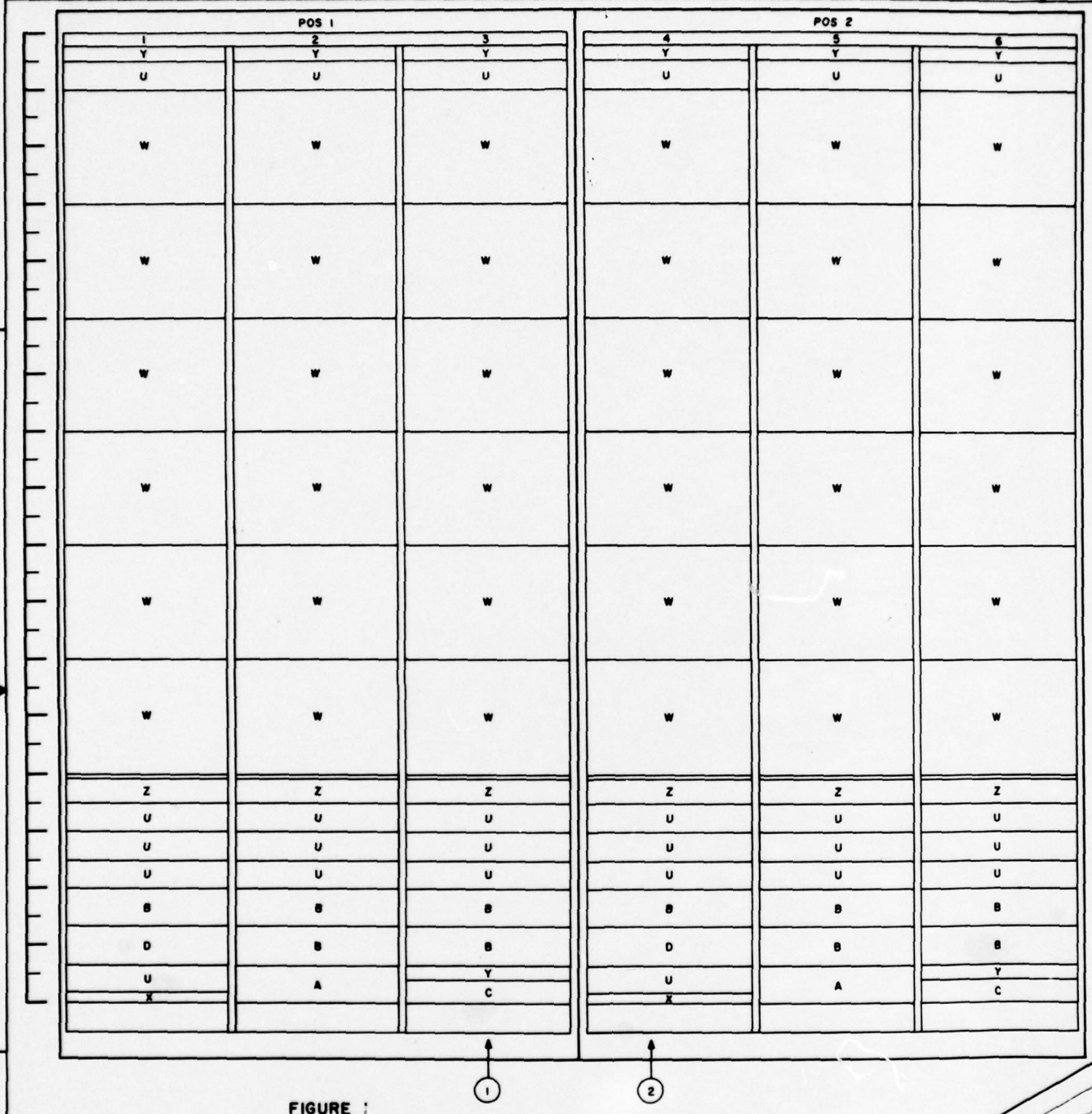
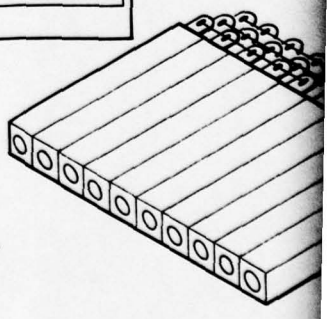


FIGURE :
SWITCHBOARD POSITIONS 1 AND 2



DETAIL A
TYPICAL CONFERENCE JACK
STRAPS CUT FOR TWO 5 PARTY
CONFERENCE CALLS

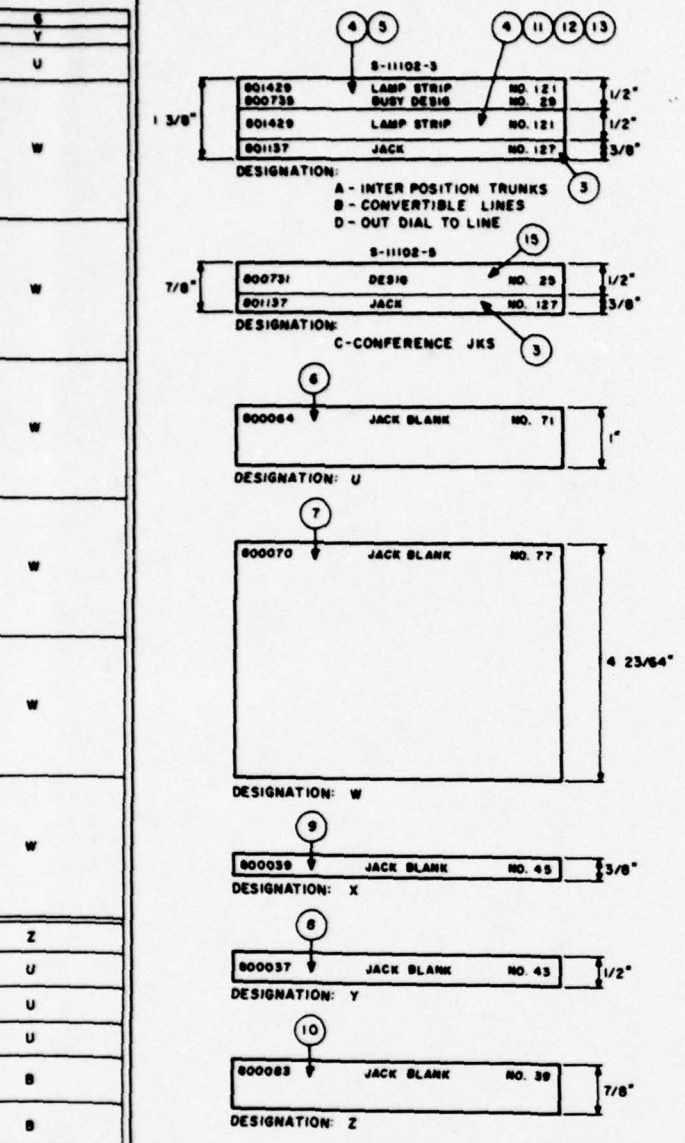
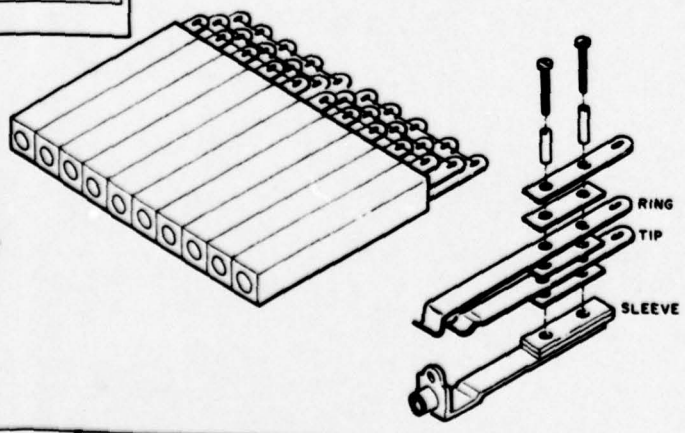


FIGURE 2
SWITCHBOARD COMPONENTS



ZONE	REV	DESCRIPTION	DATE	APPROVED

NOTES:

101. BOM ITEM 1 COMES COMPLETE WITH CHAIR AND OPERATOR'S HEADSET.

102. THE CABLE TURNING SECTION (BOM ITEM 14) IS INSTALLED TO THE LEFT OF SWITCHBOARD POSITION NO 1.

103. ALL CIRCUITS EXCEPT CONFERENCE CIRCUITS ARE MULTIPLED BETWEEN SWITCHBOARD POSITIONS 1 AND 2.

ITEM	AEL	DESCRIPTION	NSN	UI	QTY
15	14975D	DESIGNATION STRIP NO 25, STROMBERG-CARLSON 800731-000	NSAR	EA	2
14	01031L	CABLE TURNING SECTION, LEFT END, STROMBERG-CARLSON	5805-00-309-3766	EA	1
13	03835G	LAMP LINE, 48V, AECO D-94005-A	6240-00-153-6515	EA	280
12	03848H	LAMP BUSY, 48V, STROMBERG-CARLSON	6240-00-269-0960	EA	280
11	16591Q	LAMP CAP, 27-A, STROMBERG-CARLSON 801392-000	NSAR	EA	280
10	21184K	JACK BLANK NO. 39, STROMBERG-CARLSON 800033-000	NSAR	EA	6
9	20944A	JACK BLANK NO. 45, STROMBERG-CARLSON 800039-000	NSAR	EA	2
8	14620A	JACK BLANK NO. 43, STROMBERG-CARLSON 800037-000	5805-01-017-4385	EA	8
7	10970C	JACK BLANK NO. 77, STROMBERG-CARLSON 800070-000	5805-01-017-4378	EA	36
6	10971D	JACK BLANK NO. 71, STROMBERG-CARLSON 800064-000	5805-01-017-4379	EA	26
5	01036B	DESIGNATION STRIP, #29, STROMBERG-CARLSON 800735-000	5805-00-323-7329	EA	14
4	12351K	LAMP HOLDER ASSEMBLY, INCOMING, 121-89 MOUNTING, STROMBERG-CARLSON 801429-000	6250-00-643-4654	EA	28
3	20657Z	JACK STRIP #127, #89 MOUNTING, STROMBERG-CARLSON 801137-000	5935-00-665-7348	EA	16
2	11435F	CABINET ASSEMBLY, INTERMEDIATE ATTENDANT POSITION, STROMBERG-CARLSON 492042-000	5805-00-600-5905	EA	1
1	01200A	CABINET ASSEMBLY, ATTENDANT POSITION 1, STROMBERG-CARLSON 492041-000	5805-00-600-5904	EA	1

LIST OF MATERIALS

IDENT NO: STD-TL-0008

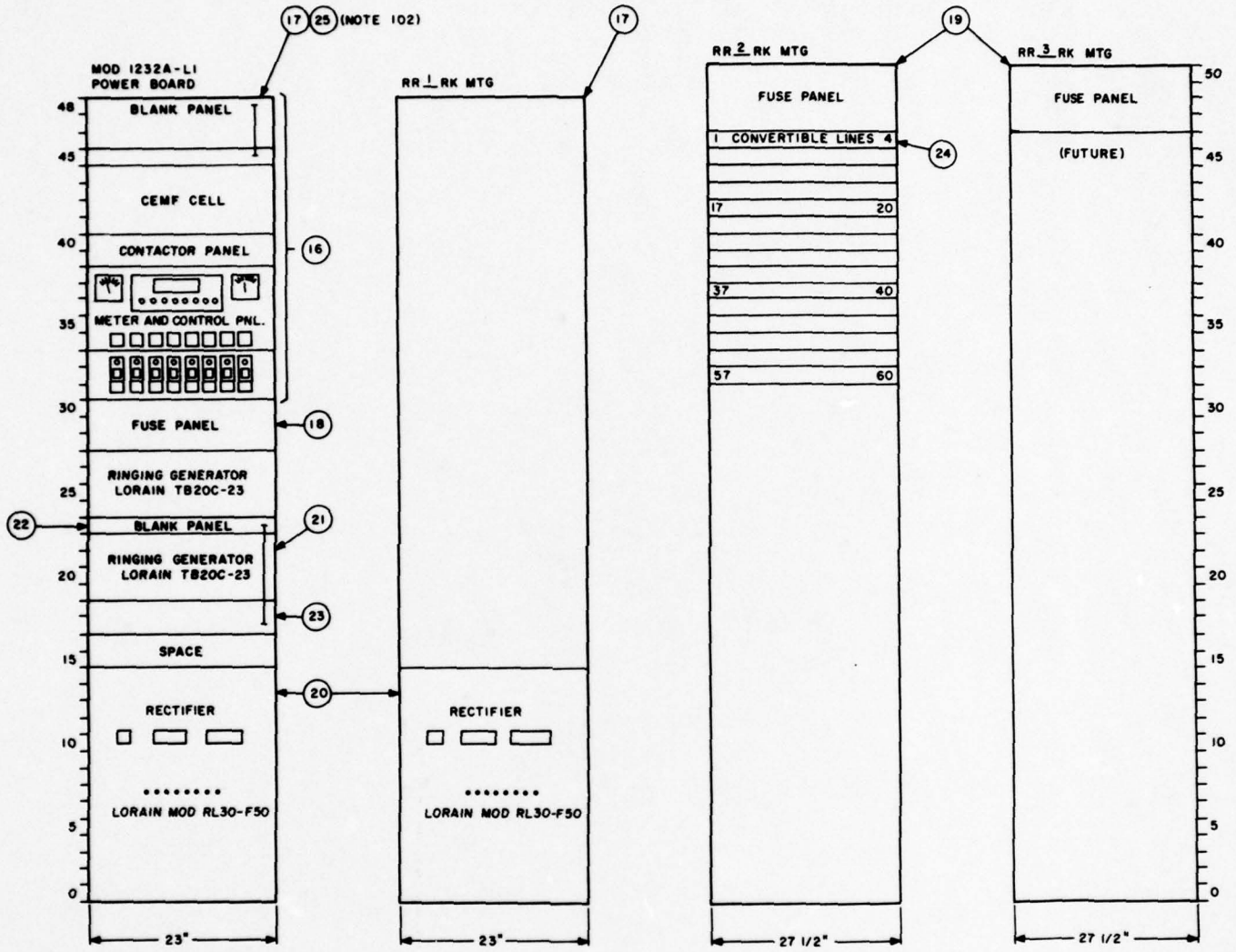
ORGANIZATION: US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY

DESIGN BY	H. RULAU	DATE 15/1/79
DRAWN BY	S. D. H.	15/1/79
CHECKED BY	F. MYERS	15/1/79
APPROVAL		ACTIVITY CCC-CED-SEA
PROJECT		

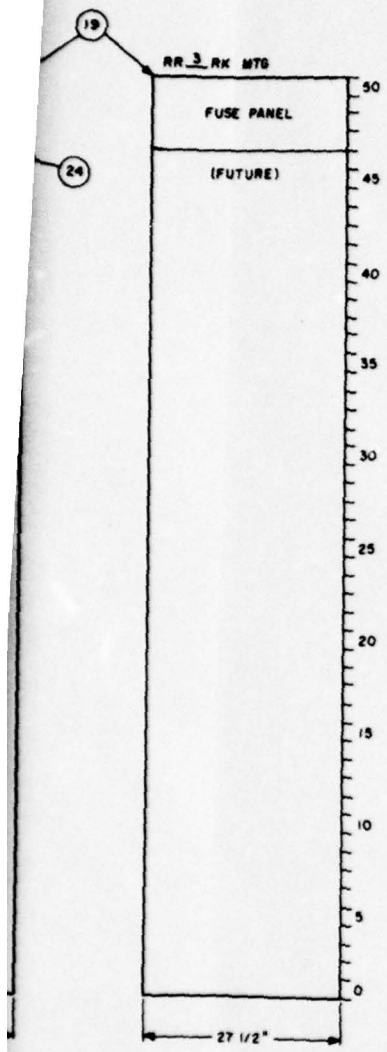
FIRING RANGE CONTROL SWITCHBOARD
SWITCHBOARD FACE LAYOUT

SIZE D | FSCM NO 50470 | DRAWING NO

SCALE NONE | SHEET 1 OF 1


MOD 1232A-L1
POWER BOARD
17 25 (NOTE 102)
BLANK PANEL
CEMF CELL
CONTACTOR PANEL
METER AND CONTROL PNL.
16
FUSE PANEL
18
RINGING GENERATOR
LORAIN TB20C-23
22
BLANK PANEL
21
RINGING GENERATOR
LORAIN TB20C-23
23
SPACE
20
RECTIFIER
LORAIN MOD RL30-F50
23"
RR 1 RK MTG
17
RECTIFIER
LORAIN MOD RL30-F50
23"
RR 2 RK MTG
19
FUSE PANEL
1 CONVERTIBLE LINES 4
24
17 20
37 40
57 60
27 1/2"
RR 3 RK MTG
FUSE PANEL
(FUTURE)
27 1/2"
48
45
40
35
30
25
20
15
10
5
0
50

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED



NOTES:

101. BOLT-DOWN AND BOLT-TOGETHER INSTRUCTIONS WILL BE DETERMINED ON A SITE-BY-SITE BASIS AND PROVIDED IN THE SITE EIP.

102. INSTALL PROTECTIVE SCREENING (BOM ITEM 25) ON REAR OF POWER BOARD.

ITEM	AEL	DESCRIPTION	NSN	UI	QTY
25	21847B	PROTECTIVE SCREENING, 23" X 48" LORAIN 4141-407	NSNR	EA	1
24	01433J	CIRCUIT PLATE, CONVERTIBLE LINE, 4 CIRCUITS PER PLATE, STROMBERG CARLSON 484985-00	5805-00-533-3920	EA	15
23	20961F	PANEL, BLANK, 23" X 3 1/2", LORAIN 3532-112	NSNR	EA	1
22	20942W	PANEL BLANK, 23" X 1 3/4", LORAIN 3531-106	NSNR	EA	1
21	16873J	RINGING GENERATOR, 20 HERTZ LORAIN T820C23	NSNR	EA	2
20	24126C	RECTIFIER-CHARGER, 48-V Dc, 30A, 23" RACK MOUNTING, LORAIN RL30F50	NSNR	EA	2
19	24124A	RELAY RACK, 27 1/2" X 7'6", STROMBER CARLSON 303739-255 W/FUSE PANEL 492005-000	NSNR	EA	2
18	24129F	FUSE PANEL, (4) 0-30A AND (4) 31-60A, LORAIN 4317-010	NSNR	EA	1
17	20953W	RELAY RACK, 23" X 7'6", LORAIN 4124-011	NSNR	EA	2
16	23960B	POWER BOARD, 48 VDC, 50A, LORAIN 1232A2-LIST 1	NSNR	EA	1

LIST OF MATERIALS

IDENT NO: STD-TL-0009

ORGANIZATION: US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY

		DATE
DESIGN BY	H.RULAU	15 JAN 79
DRAWN BY	S D H.	15 JAN 79
CHECKED BY	F. MYERS	15 JAN 79
APPROVAL		ACTIVITY CCC-CED-EP
PROJECT		

FIRING RANGE CONTROL SWITCHBOARD RACK FACE LAYOUTS

SIZE: D | FSCM NO: 50470 | DRAWING NO:

SCALE: NONE | SHEET 1 OF 1

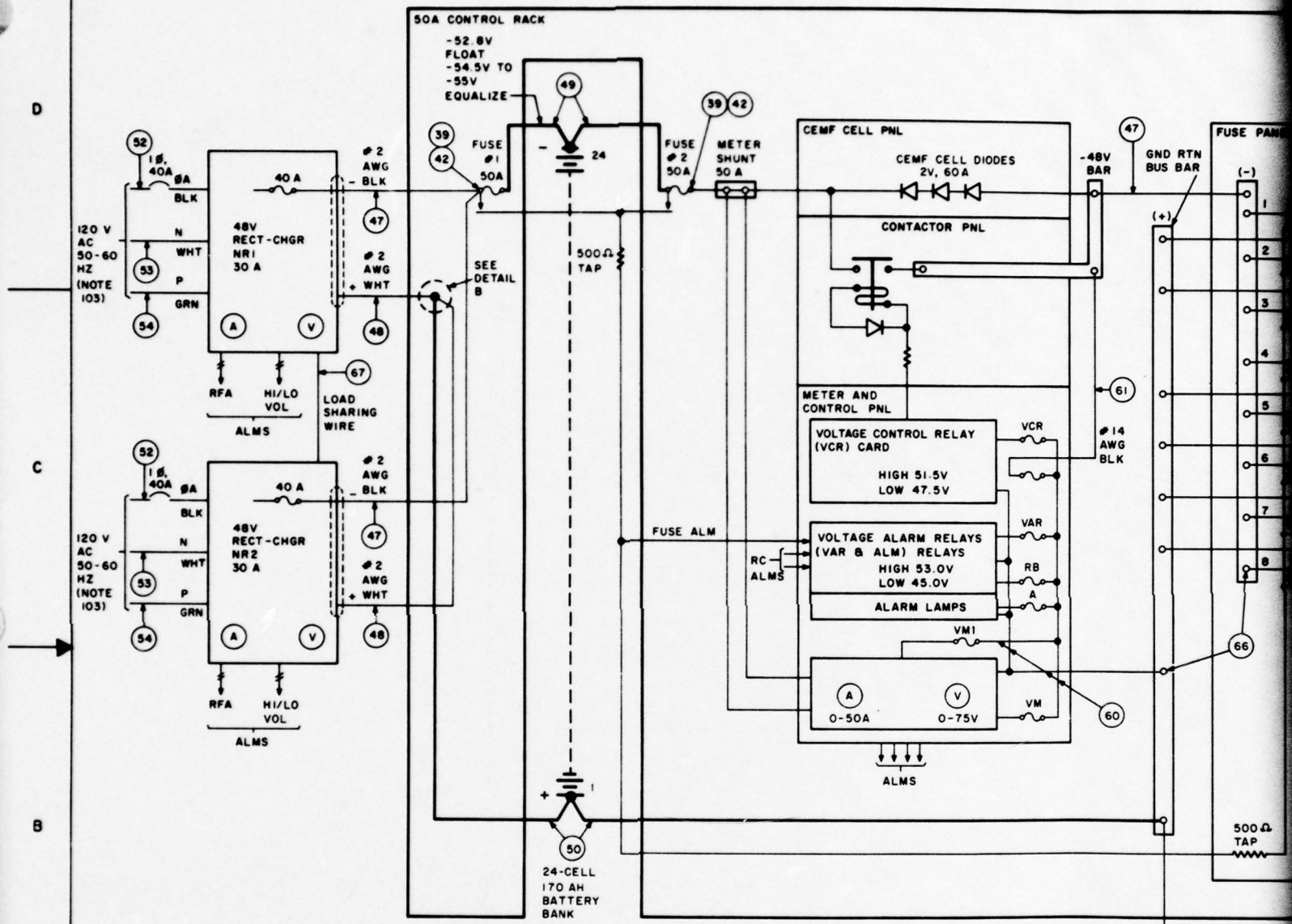


FIGURE 1

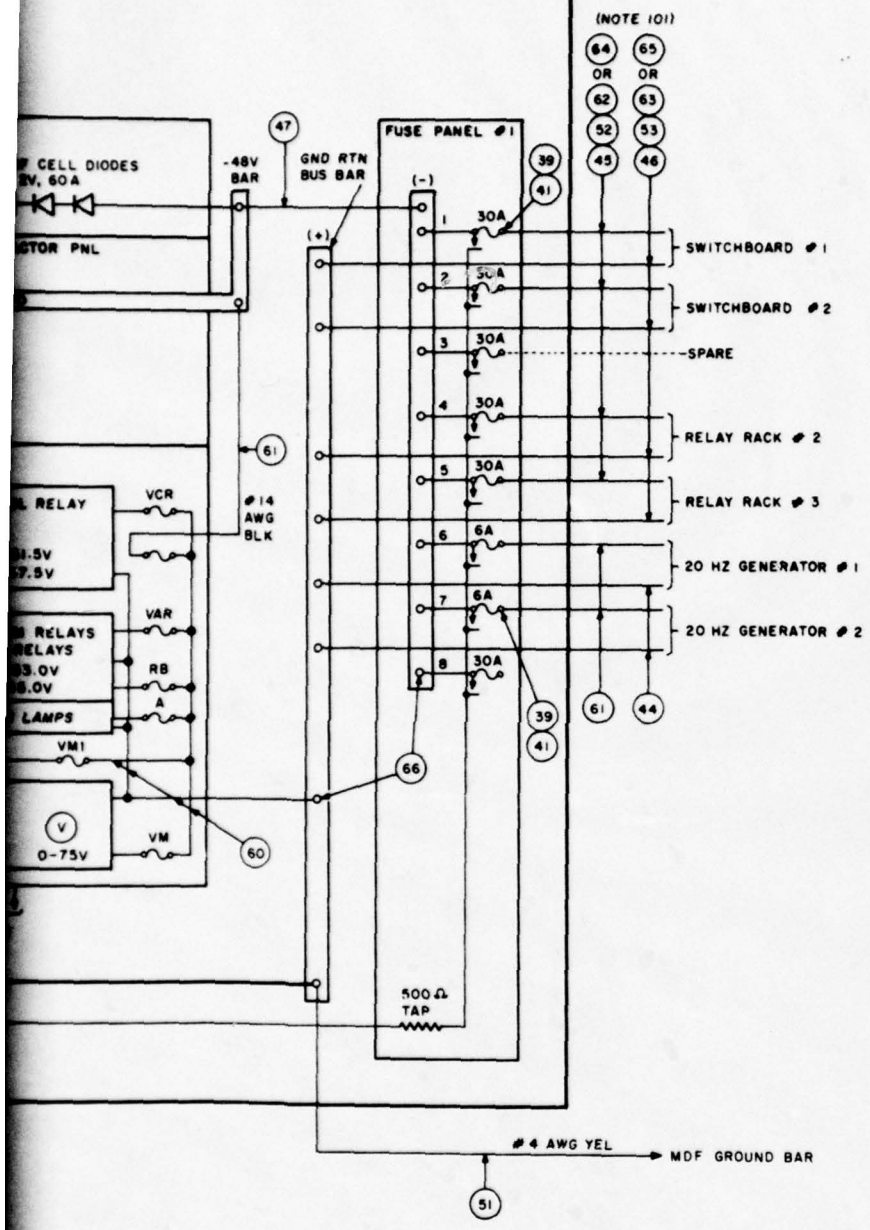
DC POWER DISTRIBUTION DIAGRAM

TABLE 1

DC DISTRIBUTION WIRE SIZE

LOOP-FT	WIRE SIZE AWG	DROP
0-50	ø10	0.75V
51-100	ø8	0.94V
101-150	ø6	0.89V
151-250	ø4	0.93V

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED



NOTES:

101. DETERMINE WIRE SIZE FOR THE DC POWER DISTRIBUTION TO THE SWITCHBOARD AND RELAY RACKS IAW TABLE 1. CALCULATIONS ARE BASED ON LIMITING THE VOLTAGE DROP TO LESS THAN 1 VOLT AT 15 AMPERES.

102. BATTERY SAFETY KIT (BOM ITEM 43) CONSISTS OF RUBBER GLOVES, APRON, AND GOGGLES USED FOR INITIAL INSTALLATION AND SUBSEQUENT BATTERY MAINTENANCE.

103. AC CIRCUITS SHALL BE EQUIPPED WITH TRANSIENT VOLTAGE SUPPRESSORS. REFER TO USACEEIA PHAMPLET 105-9, TRANSIENT VOLTAGE SUPPRESSOR INSTALLATION.

ITEM	AEL	DESCRIPTION	NSN	UI	QTY
67	09472X	WIRE, #18 AWG, SOL, RED, INS, 600V	6145-00-583-3759	FT	10
66	21708F	LUG KIT, #14-4 AWG, LORAIN #4835-523	NSNR	EA	A/R
65	03501C	WIRE, ELEC, TW, STRAN, #6 AWG, WHT, INS, 600V	6145-00-184-3877	FT	A/R
64	03518M	WIRE, ELEC, TW, STRAN, #6 AWG, BLK, INS, 600V	6145-00-184-5489	FT	A/R
63	03507W	WIRE, SINGLE COND, #10 AWG, WHT, SOL, INS, 600V	6145-00-184-5346	FT	A/R
62	03538G	WIRE, SINGLE COND, #10 AWG, BLK, SOL, INS, 600V	6145-00-191-2575	FT	A/R
61	03540K	WIRE, ELEC, TW, SOL #14 BLK	6145-00-191-2577	FT	A/R
60	23309A	WIRE, ELEC, TW, STRAN #18, BLU	NSNR	FT	A/R
59	241258	TERMINAL LUG, #4-3/0, GOULD L07-086041	NSNR	EA	9
58	08658A	WASHER, FLAT, STEEL 3/8"	5310-00-087-7493	EA	2
57	00586C	WASHER, LOCK, SPLIT 3/8"	5310-00-637-9541	EA	2
56	14086N	BOLT, HEX, 3/8-16 X 1"	5306-00-917-4637	EA	2
55	19269L	INSULATOR, STANDOFF	5970-00-501-3971	EA	1
54	09013P	WIRE, ELEC, TW, SOLID #8, GRN	NSNR	FT	A/R
53	06535A	WIRE, ELEC, TW, SOLID #8, WHT	6145-00-256-1199	FT	A/R
52	03570N	WIRE, ELEC, TW, SOLID #8, BLK	6145-00-256-1201	FT	A/R
51	21653E	WIRE, ELEC, TW, STRAN #4, YEL	NSNR	FT	A/R
50	06532K	WIRE, ELEC, TW, STRAN #1/0, WHT	NSNR	FT	A/R
49	03524D	WIRE, ELEC, TW, STRAN #1/0, BLK	6145-00-184-5498	FT	A/R
48	03499A	WIRE, ELEC, TW, STRAN #2, WHT	6145-00-184-3875	FT	A/R
47	03516G	WIRE, ELEC, TW, STRAN #2, BLK	6145-00-184-5487	FT	A/R
46	03500B	WIRE, ELEC, TW, STRAN #4, WHT	6145-00-184-3876	FT	A/R
45	03517H	WIRE, ELEC, TW, STRAN #4, BLK	6145-00-184-5488	FT	A/R
44	03503E	WIRE, ELEC, TW, STRAN #14, WHT	6145-00-184-3881	FT	A/R
43	22410C	KIT, EMERGENCY BATTERY, SAFETY	NSNR	EA	1
42	21697E	FUSE, ONE-TIME CARTRIDGE, NON, 50A, 250V LORAIN #2483-523	NSNR	EA	8
41	21698F	FUSE, ONE-TIME CARTRIDGE, NON, 30A, 250V LORAIN #2483-515	NSNR	EA	10
40	21699G	FUSE, ONE-TIME CARTRIDGE, NON, 6A, 250V LORAIN #2483-505	NSNR	EA	10
39	18043Q	FUSE, ALARM TYPE, 1-1/3A, 250V, LORAIN #2486-208	NSNR	EA	20
38	21855W	ELECTROLYTE, 5 GAL, GOULD X07-103593	NSNR	EA	A/R
37	21796E	ELECTROLYTE, 15 GAL, GOULD X07-103594	NSNR	EA	A/R
36	18188Y	BATTERY PRE-VENTS, GOULD 3-104881	NSNR	EA	A/R
35	19497Y	BATTERY RACK, 2-TIER, GOULD S07-078145	NSNR	EA	1
34	18919Z	BATTERY, LEAD-CALCIUM, 24-CELL, 170AH WITH INTERCELL/INTERTIER CONNECTOR KITS FOR 2-TIER RACK, GOULD 2MCX-170	NSNR	EA	1

LIST OF MATERIALS

IDENT NO. STD-TL-0010

ORGANIZATION: US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY

DESIGN BY	H. RULAU	DATE 15 JAN 79
DRAWN BY	S.D.H.	15 JAN 79
CHECKED BY	F. MYERS	15 JAN 79

FIRING RANGE CONTROL SWITCHBOARD DC POWER DISTRIBUTION

APPROVAL / ACTIVITY: CCC-CED-SEP

PROJECT

SIZE D | FSCM NO. 50470 | DRAWING NO.

SCALE NONE | SHEET 1 OF 2

DIAGRAM

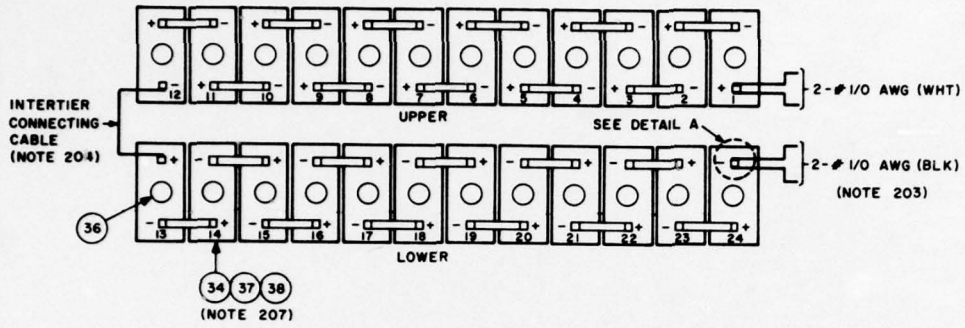
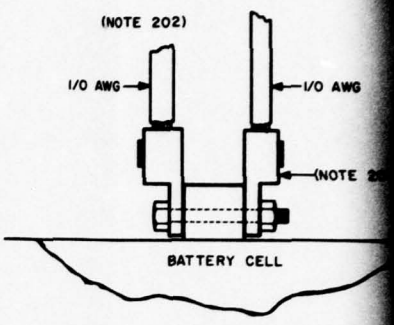


FIGURE 2

BATTERY INTERCONNECTION DIAGRAM



DETAIL A

BATTERY POST CONNECTOR INSTALLATION

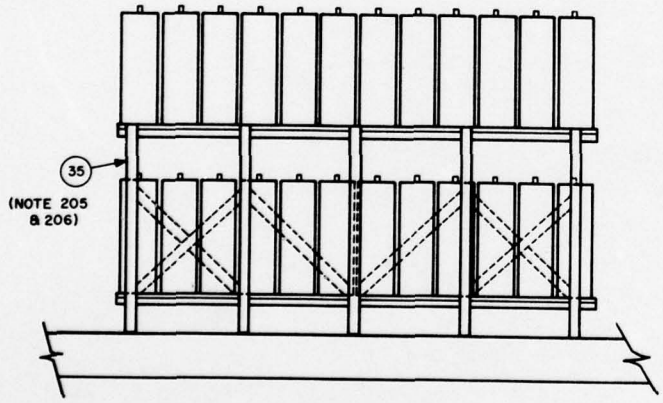


FIGURE 3

BATTERY & RACK INSTALLATION

ZONE 0 - NO DAMAGE.

ZONE 1 - MINOR DAMAGE: DISTANT EARTHQUAKES MAY CAUSE DAMAGE TO STRUCTURE WITH FUNDAMENTAL PERIODS GREATER THAN 1.0 SECOND: CORRESPONDS TO INTENSITIES V AND VI OF THE M.M *SCALE.

ZONE 2 - MODERATE DAMAGE: CORRESPONDS TO INTENSITY VII OF THE M.M. *SCALE.

ZONE 3 - MAJOR DAMAGE: CORRESPONDS TO INTENSITY VIII AND HIGHER OF THE M.M. *SCALE.

ZONE 4 - THOSE AREAS WITHIN ZONE NO. 3 DETERMINED BY THE PROXIMITY TO CERTAIN MAJOR FAULT SYSTEMS.

* MODIFIED MERCALLI INTENSITY SCALE OF 1931

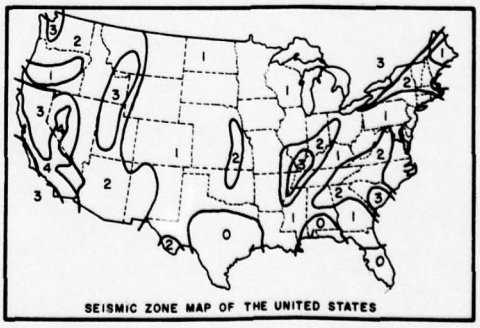




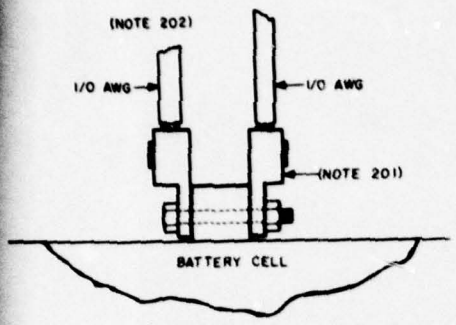
FIGURE 4

SEISMIC RISK MAPS OF THE UNI

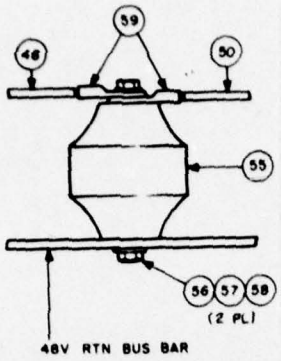
REPRODUCED FROM THE 1976 EDITION OF THE
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INTERNATIONAL CONFERENCE OF BUILDING OF

BRUNING 40-21 35687

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED



DETAIL A
BATTERY POST CONNECTOR INSTALLATION



DETAIL B
RECTIFIER - BATTERY RETURN CONDUCTOR (+) CONNECTION

GENERAL NOTES:

1. BATTERY BANK INSTALLATION STEPS:
   - A. INVENTORY MATERIAL AND EQUIPMENT AND INSPECT FOR DAMAGE.
   - B. LAY OUT EQUIPMENT FLOOR AND ESTABLISH REFERENCE WORKING LINES AND LOCATION POINTS.
   - C. ASSEMBLE THE BATTERY RACK AND ANCHOR TO THE FLOOR. THE FLOOR SPACE FOR THE BATTERY BANK SHOULD BE LEVEL. IF THIS IS NOT THE CASE, USE STEEL FLAT WASHERS UNDER THE BATTERY RACK LEGS TO LEVEL THE BATTERY RACK PRIOR TO INSTALLING THE CELLS.
   - D. BEFORE PROCEEDING WITH THE UNPACKING, HANDLING, INSTALLATION, AND OPERATION OF THE LEAD-ACID CELLS, REVIEW THE SAFETY PRECAUTIONS LISTED IN THE MANUFACTURER'S MANUAL.
   - E. EXAMINE ALL CELLS FOR CONCEALED DAMAGE.
   - F. PLACE CELLS ON BATTERY RACK AND INSTALL CELL TERMINAL HARDWARE.
   - G. ELECTROLYTE IS SHIPPED IN CONCENTRATED FORM AND MUST BE DILUTED WITH DISTILLED WATER PRIOR TO USE IN THE CELLS. USE OF CONCENTRATED (HIGH SPECIFIC GRAVITY) ACID WILL DAMAGE THE CELLS. INITIAL FILLING OF CELLS SHALL BE DONE WITH ELECTROLYTE HAVING A SPECIFIC GRAVITY BETWEEN 1.203 AND 1.206.
   - H. PRIOR TO REMOVING BATTERY CAPS, PREPARE ENOUGH ELECTROLYTE TO FILL SEVERAL CELLS. SINCE ADDITION OF CONCENTRATED SULFURIC ACID TO WATER GENERATES HEAT, THE ELECTROLYTE MUST BE PREPARED IN ADVANCE TO ALLOW TIME FOR COOLING. THE ELECTROLYTE SHOULD NOT BE HOTTER THAN 90° F WHEN POURED INTO THE CELLS.

     CAUTION: ALWAYS POUR ACID INTO WATER--NEVER WATER INTO ACID. POUR ACID SLOWLY, SINCE FAST POURING WILL GENERATE ENOUGH HEAT TO INDUCE VIOLENT BOILING. WEAR RUBBER GLOVES, RUBBER APRON, AND GOGGLES WHILE PREPARING ELECTROLYTE AND FILLING CELLS.

   - I. AFTER UNPACKING THE DIFFUSER VENT CAPS AND PREPARING CELLS FOR RECEIPT OF ELECTROLYTE, FILL THE CELLS WITH ELECTROLYTE TO THE MIDDLE LEVEL MARKED ON THE PLASTIC JAR. (THIS WILL ALLOW SOME SPACE FOR SLIGHT ADJUSTMENTS IN SPECIFIC GRAVITY LATER.)
   - J. CHECK THE SPECIFIC GRAVITY AT ROOM TEMPERATURE AND ADJUST TO 1.205 IF NECESSARY.
2. INSTALLERS MUST TAKE SPECIAL CARE NOT TO CUT OR ABRADE THE DC CABLE INSULATION DURING INSTALLATION.

NOTES:

201. THE TERMINAL LUGS FOR THE FOUR #1/0 AWG BATTERY-TO-POWER BOARD CABLES ARE FURNISHED WITH THE BATTERY INTERCONNECTION KIT.

202. CONNECT THE WHITE LEAD TO THE POSITIVE TERMINAL LUG AND THE BLACK LEAD TO THE NEGATIVE TERMINAL LUG.

203. TO PREVENT DAMAGE TO THE BATTERY CELL POSTS, INSTALL THE #1/0 AWG CABLES SO THAT THEIR WEIGHT IS NOT SUPPORTED BY THE CELLS. IN ADDITION, FORM THE CABLES SO THAT THERE IS NO SIGNIFICANT STRESS IN ANY DIRECTION ON THE POSTS.

204. THE INTERTIER CONNECTING CABLES ARE PART OF THE BATTERY INTERCONNECTION KIT.

205. REFER TO SEISMIC RISK MAP (FIGURE 4) TO DETERMINE EARTHQUAKE BRACING REQUIREMENTS FOR BATTERY RACKS. ADD REQUIREMENTS TO BOM ITEM 35 WHEN ORDERING. BOM ITEM 35 IS DESIGNED TO WITHSTAND THE USUAL REQUIREMENTS OF ZONE 0. ADD -333 SUFFIX TO PART NUMBER FOR ZONE 1. ADD -666 FOR ZONES 2,3, and 4.

206. WHERE SPACE PERMITS, A TWO-STEP BATTERY RACK (GOULD S07-078185) CAN BE SUBSTITUTED FOR BOM ITEM 35. THE WIDTH OF THE TWO-STEP RACK IS 24-3/4".

207. BOM ITEM 34 COMES COMPLETE WITH PRE-VENTS (BOM ITEM 36) AND IS SHIPPED WET WITH ELECTROLYTE (BOM ITEMS 37 AND 38) FOR CONUS SITES. FOR OCONUS SITES, BATTERY SHOULD BE SHIPPED DRY AND ELECTROLYTE ORDERED SEPARATELY.

...DE.

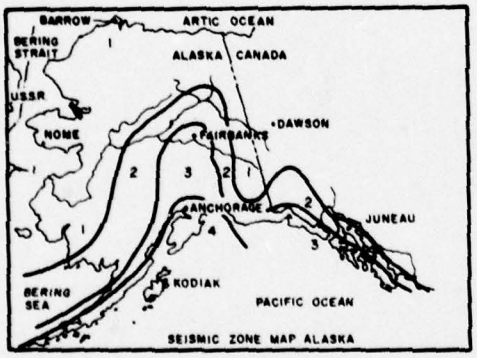
...MAGE: DISTANT EARTHQUAKES MAY ...MAGE TO STRUCTURE WITH FUNDAMENTAL ... GREATER THAN 1.0 SECOND. CORRESPONDS ...ITIES V AND VI OF THE M.M. °SCALE.

...E DAMAGE: CORRESPONDS TO INTENSITY ...THE M.M. °SCALE.

...AMAGE: CORRESPONDS TO INTENSITY ... HIGHER OF THE M.M. °SCALE.

...REAS WITHIN ZONE NO. 3 DETERMINED ... PROXIMITY TO CERTAIN MAJOR FAULT ...

...LLI INTENSITY SCALE OF 1931





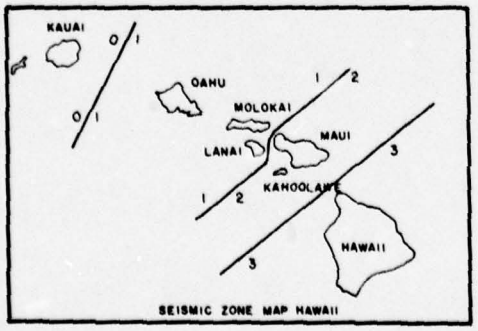


FIGURE 4
SEISMIC RISK MAPS OF THE UNITED STATES

REPRODUCED FROM THE 1976 EDITION OF THE UNIFORM BUILDING CODE, COPYRIGHT 1976, WITH PERMISSION OF THE PUBLISHERS, INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS.

IDENT NO	SIZE	FSCM NO	DRAWING NO
STD-TL-0010	D	50470	
DRAWN BY S.D.H.	SCALE NONE		SHEET 2 OF 2
APPROVED Kent Jobe			

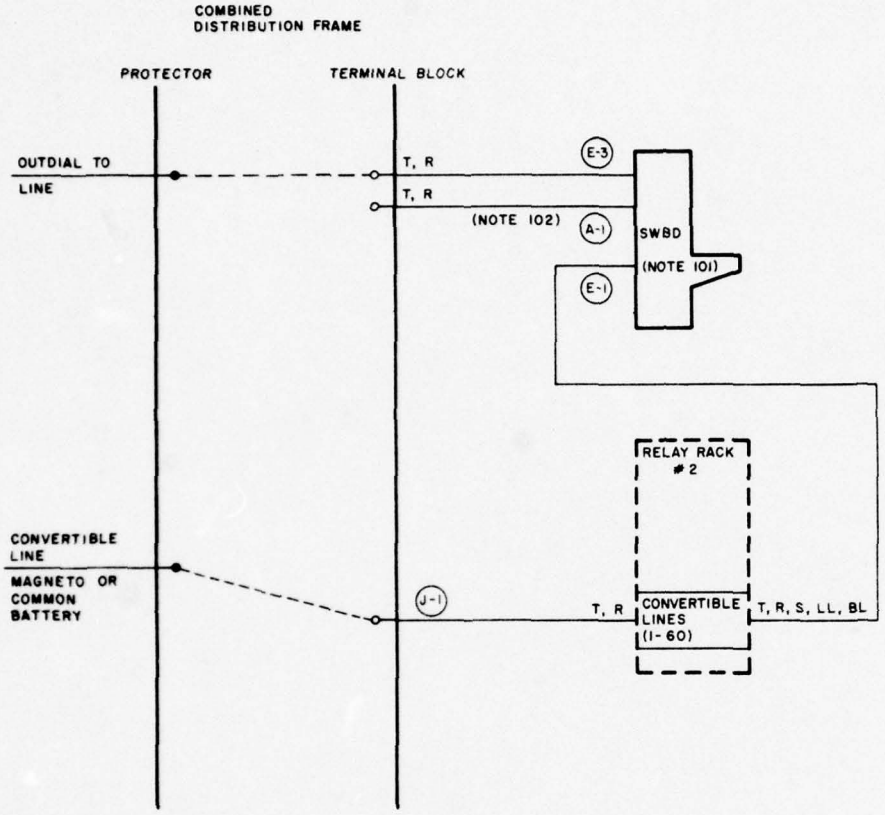


FIGURE 1
TRUNKING SCHEMATIC

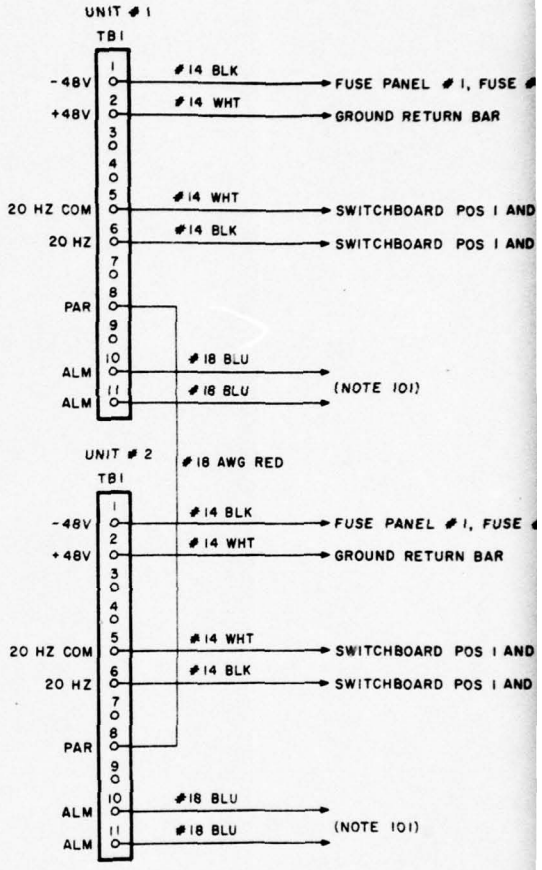


FIGURE 2
RINGING GENERATORS
TERMINAL BLOCK CONNECTIONS

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED

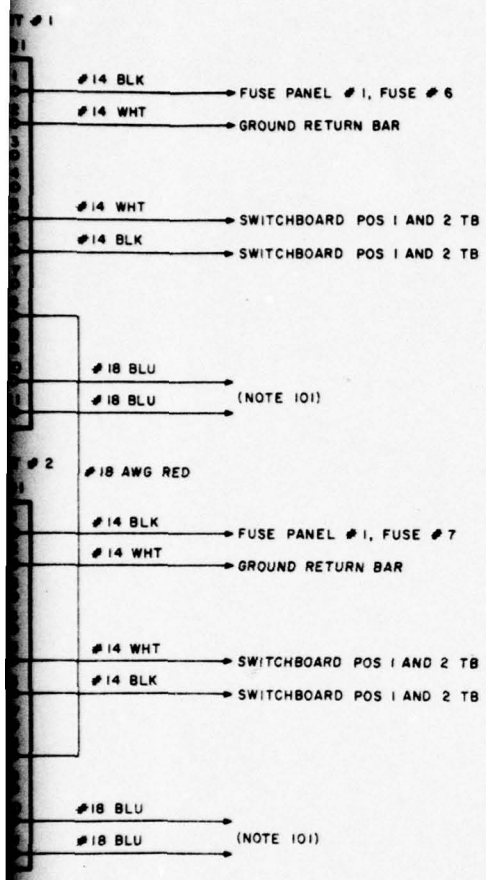


FIGURE 2
RINGING GENERATORS
INAL BLOCK CONNECTIONS

LEGEND:

(A-1) CABLE RUN DESIGNATION

T - TIP

R - RING

S - SLEEVE

LL - LINE LAMP

BL - BUSY LAMP

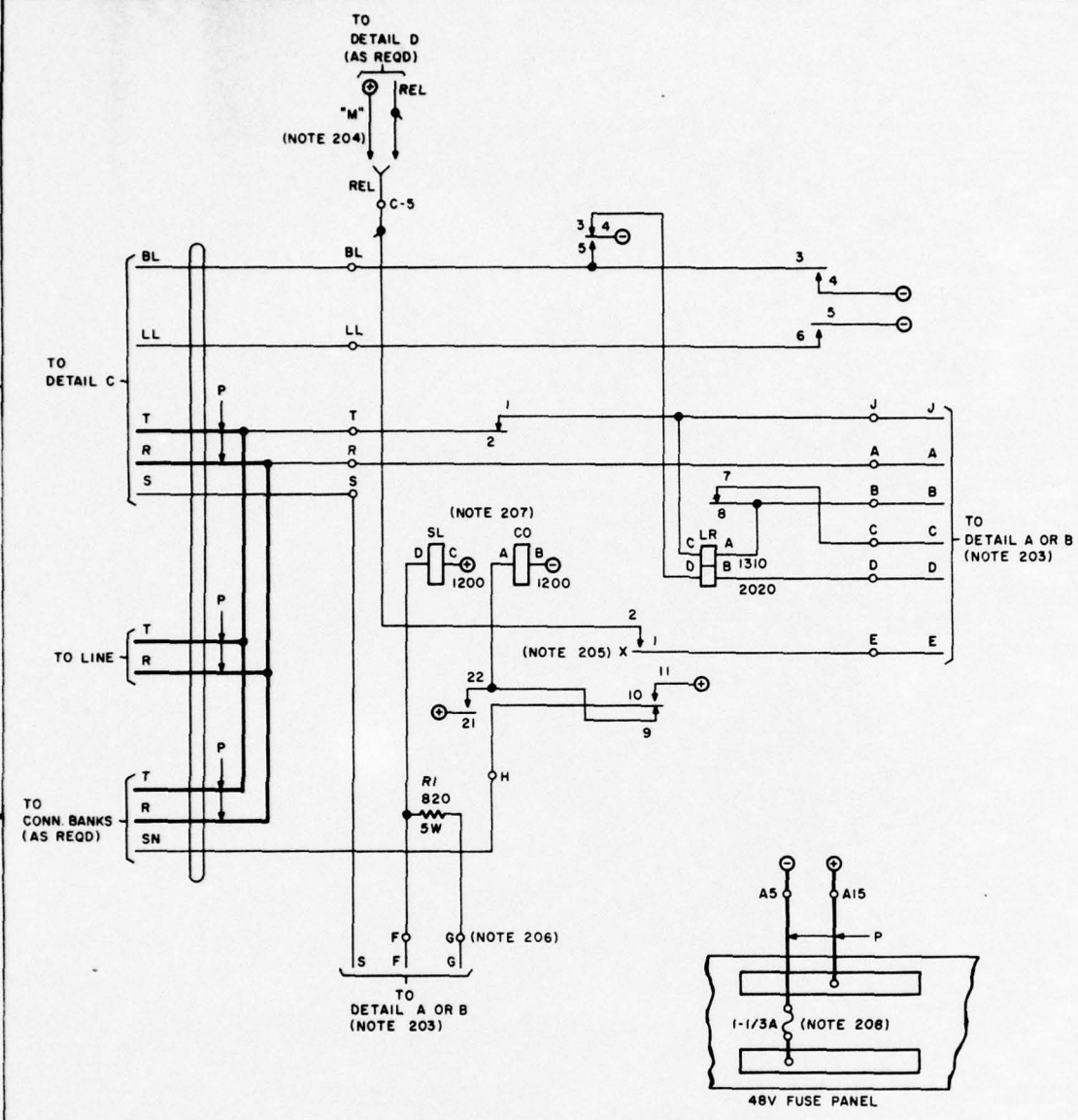
NOTES:

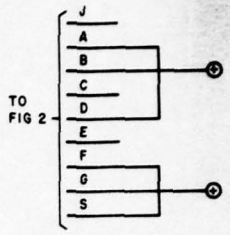
101. EXTERNAL ALARMS TO SITE ALARM DISPLAY TO BE DETERMINED ON A SITE-BY-SITE BASIS AND INCLUDED IN THE SITE EIP.

102. REFER TO TABLE 3-1 FOR THE CABLE RUNNING LIST.

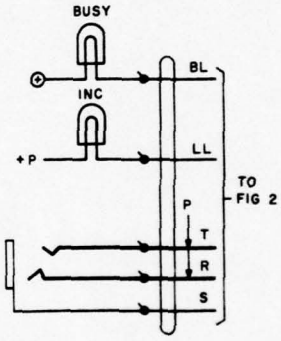
ITEM	AEL	DESCRIPTION	NSN	UI	QTY
		LIST OF MATERIALS			

IDENT NO. STD-TL-0011	ORGANIZATION US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY
DESIGN BY H. RULAU — DATE 15 JAN 79	FIRING RANGE CONTROL SWITCHBOARD CABLING/WIRING DIAGRAM
DRAWN BY S.D.H. — 15 JAN 79	
CHECKED BY F. MYERS — 15 JAN 79	
APPROVAL — ACTIVITY ECC-CED-SEP	SIZE D — FSCM NO. 50470 — DRAWING NO.
PROJECT	SCALE NONE — SHEET 1 OF 2





DETAIL A
COMMON BATTERY LINE CIRCUIT



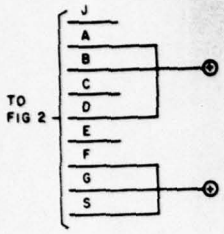
DETAIL C
DIAL TRUNK CIRCUIT

FIGURE 2
LINE CIRCUIT SCHEMATIC
CONVERTIBLE LINE CIRCUIT PLATE
(NOTE 201)

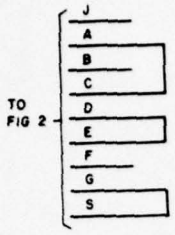
TABLE I
TERMINAL DESIGNATION

CIRCUIT	T	R	S	LL	BL	A	B OR K	C	D OR L	E
1	A-1	A-6	A-11	A-16	A-21	A-12	A-2	A-7	A-17	
2	A-3	A-8	A-13	A-18	A-23	A-14	A-4	A-9	A-19	
3	C-1	C-6	C-11	C-16	C-21	C-12	C-2	C-7	C-17	
4	C-3	C-8	C-13	C-18	C-23	C-14	C-4	C-9	C-19	

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED



DETAIL A
COMMON BATTERY LINE CIRCUIT



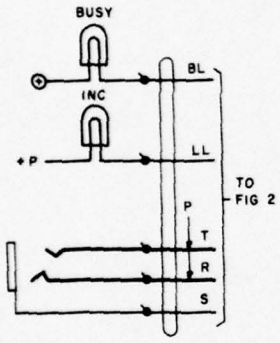
DETAIL B
MAGNETO LINE CIRCUIT

LEGEND:

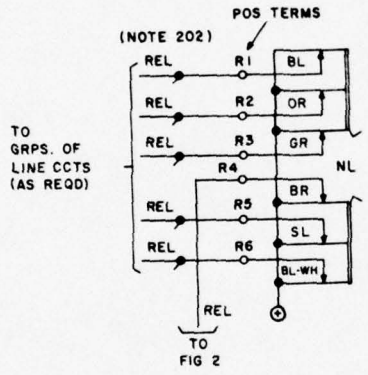
- INSTALLER'S CABLE
- TERMINAL ON TERMINAL BLOCK OR JACK OF CIRCUIT PLATE
- TERMINAL DESIGNATION AT CONNECTING RACK TERMINAL BLOCK OR SWITCHBOARD EQUIPMENT

NOTES:

201. THIS IS A TYPICAL DIAGRAM. REFER TO MANUFACTURER'S DRAWINGS FOR SPECIFIC INSTALLATION INSTRUCTIONS.
202. USE ONE "REL" LEAD PER LINE CIRCUIT OR LESS.
203. USE DETAIL A FOR COMMON BATTERY LINE CIRCUIT OPERATION. USE DETAIL B FOR MAGNETO LINE CIRCUIT OPERATION.
204. USE "M" WIRING IF DETAIL D IS NOT EQUIPPED.
205. "X" CONTACTS OPERATE FIRST.
206. SEE TABLE I FOR TERMINAL NUMBERING.
207. RELAYS SL AND CO ARE "C" TYPE.
208. USE ONE 1-1/3 AMP FUSE FOR 10 CIRCUITS OR LESS.



DETAIL C
DIAL TRUNK CIRCUIT



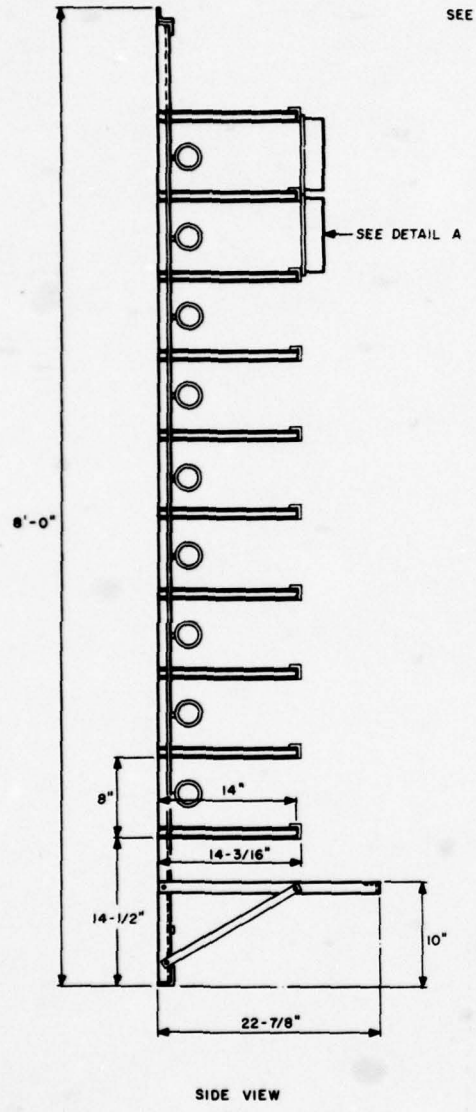
DETAIL D
COMMON RELEASE CIRCUIT

TABLE I
TERMINAL DESIGNATION

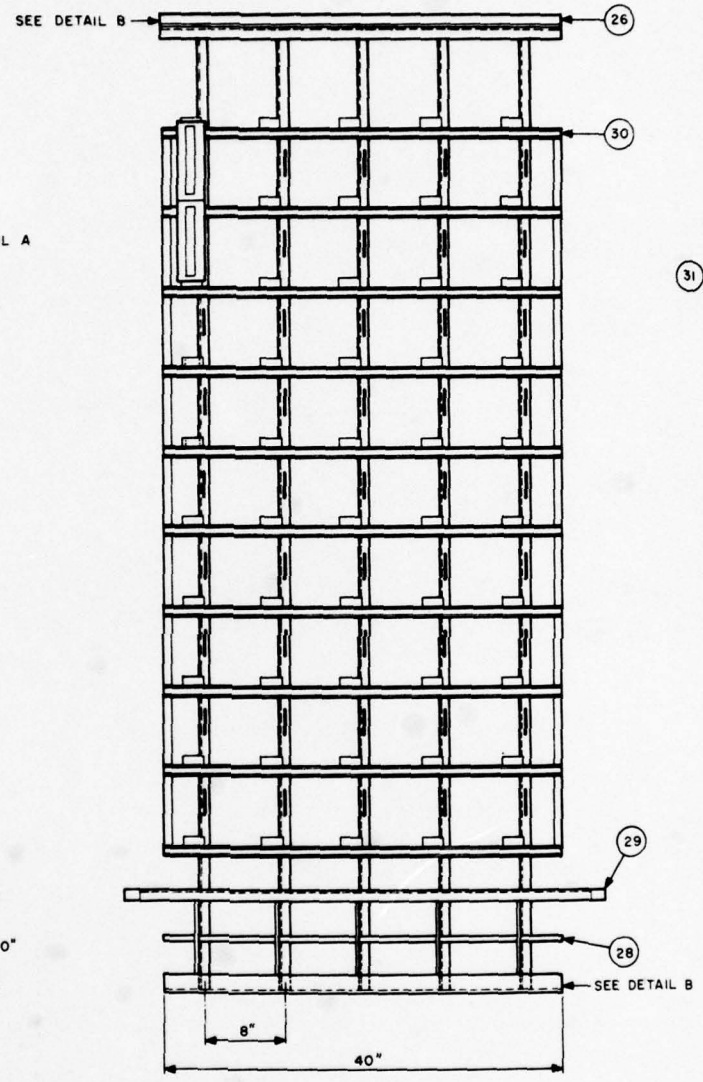
R	S	LL	BL	A	B OR K	C	D OR L	E OR M	F	G	H	J
A-6	A-11	A-16	A-21	A-12	A-2	A-7	A-17	A-22	A-25	A-30	A-26	A-27
A-8	A-13	A-18	A-23	A-14	A-4	A-9	A-19	A-24	A-10	A-20	A-28	A-29
C-6	C-11	C-16	C-21	C-12	C-2	C-7	C-17	C-22	C-25	C-30	C-26	C-27
C-8	C-13	C-18	C-23	C-14	C-4	C-9	C-19	C-24	C-10	C-20	C-28	C-29

2

IDENT NO	SIZE	FSCM NO	DRAWING NO
STD-TL-0011	D	50470	
DRAWN BY S.D.H.	SCALE NONE		SHEET 2 OF 2
APPROVED			



SIDE VIEW



FRONT VIEW

FIGURE 1

WALL/FLOOR MOUNTED
COMBINED DISTRIBUTION FRAME
(NOTE 101)

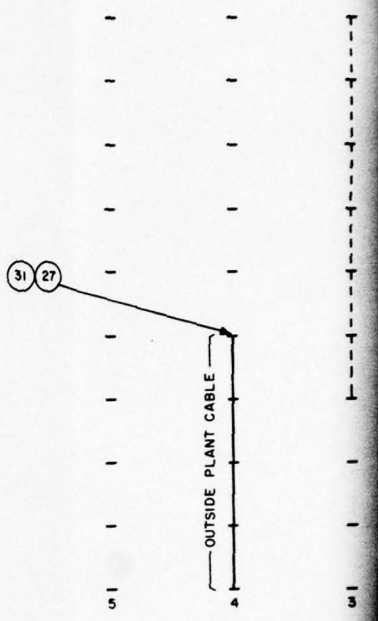
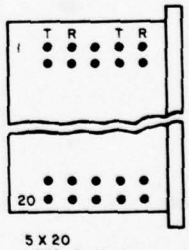


FIGURE 2

TERMINAL BLOCK



5 X 20
VERT 2, H-J,
1, J

DETAIL A

TYPICAL TERMINAL
BLOCK STENCILING

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED

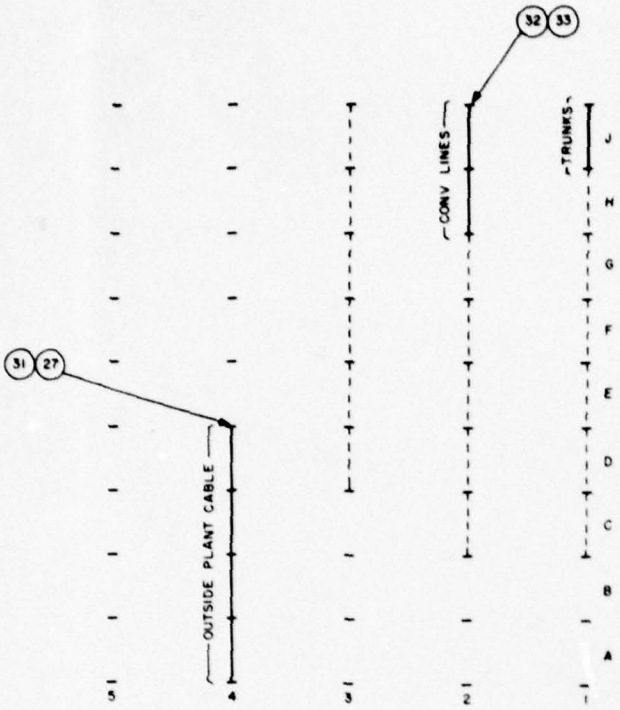


FIGURE 2
TERMINAL BLOCK LAYOUT

LEGEND:

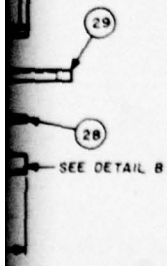
——— INSTALLED/WIRED TERMINAL BLOCK

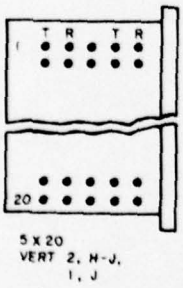
- - - - INSTALLED/UNWIRED TERMINAL BLOCK

NOTES:

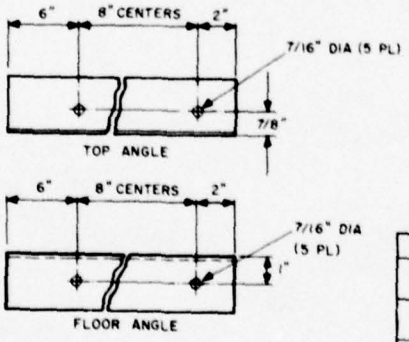
101. ASSEMBLE FRAME (BOM ITEMS 26-30) IN ACCORDANCE WITH MANUFACTURER'S LITERATURE FURNISHED WITH THESE ITEMS.

102. FIVE 5/16 X 3" LAG SCREWS ARE FURNISHED WITH FRAME. ADDITIONAL MOUNTING HARDWARE (I.E., EXPANSION SHIELDS, BOLTS, WASHERS) REQUIRED, IF ANY, WILL BE SPECIFIED IN THE SITE EIP.





DETAIL A
TYPICAL TERMINAL BLOCK STENCILING



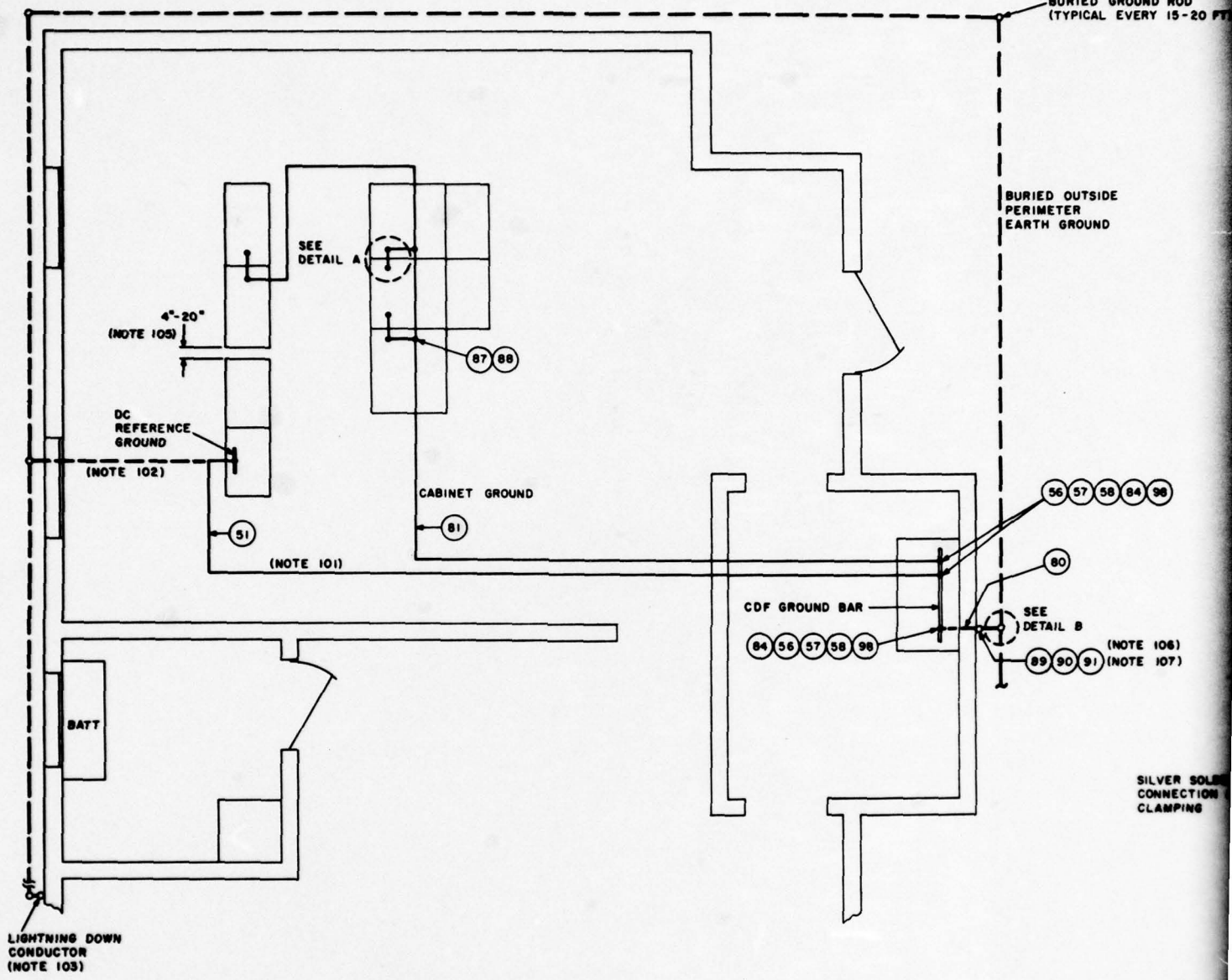
DETAIL B
FRAME BOLTDOWN ANCHOR LOCATIONS
(NOTE 102)

2

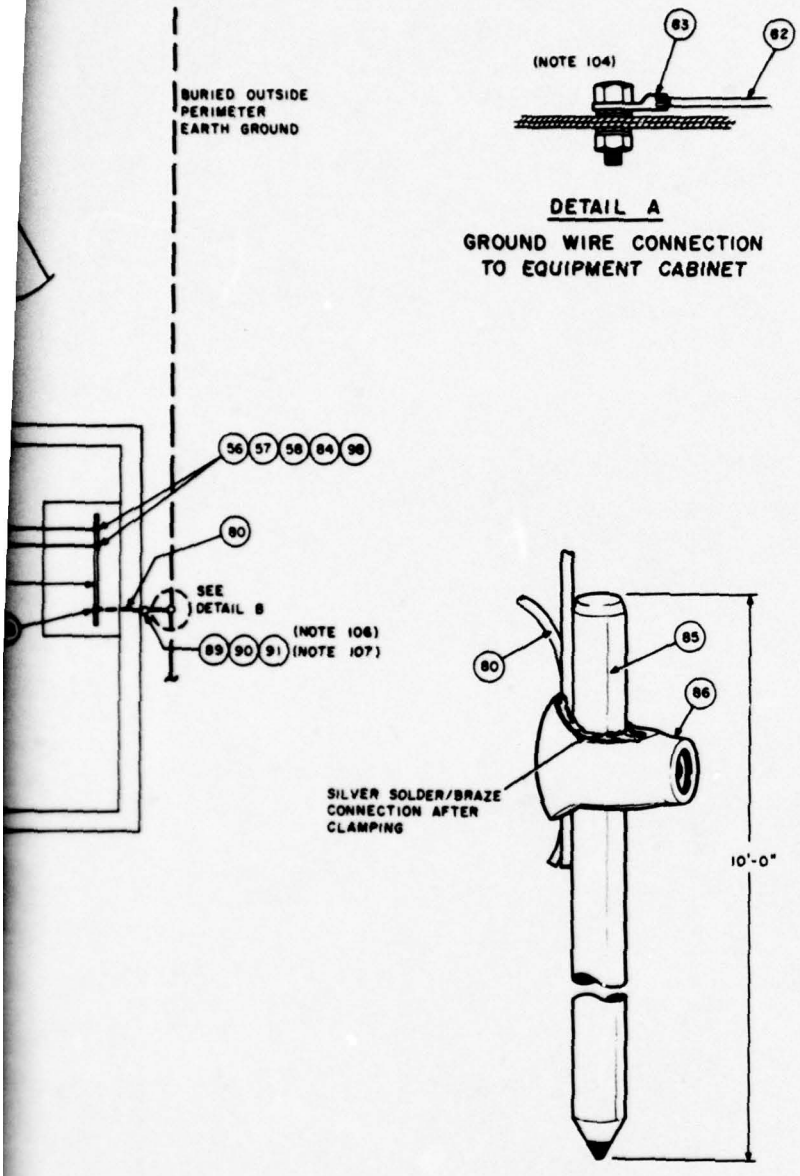
ITEM	AEL	DESCRIPTION	NSN	UI	QTY
33	19467L	BRACKET, TERMINAL MOUNTING, COOK 0361303	NSNR	EA	23
32	24133J	BLOCK, TERMINAL, 5 X 20, WIREWRAP BOTH SIDES COOK 5000 NO 130-3805	NSNR	EA	20
31	07020R	PROTECTOR, 100 PAIR, COOK 688-6800, E/W 6800 MODULE	NSNR	EA	1
30	24132K	FRAME, END GUARD RAIL SET, COOK 001-8794-22	NSNR	EA	1
29	24131L	FRAME, GUARD RAIL ASSEMBLY, COOK 001-8794-15	NSNR	EA	1
28	14950A	FRAME, GROUND BAR ASSEMBLY, COOK 023-4765	NSNR	EA	1
27	24130M	FRAME, PROTECTION MOUNTING BAR, COOK 23-3373	NSNR	EA	1
26	14231L	FRAME, MDF TYPE FW-9, 5-VERTICAL, COOK 001-8794-05	NSNR	EA	1

LIST OF MATERIALS

IDENT NO: STD-TL-0012	ORGANIZATION: US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY
DESIGN BY: H. RULAU — DATE: 15 JAN 79	FIRING RANGE CONTROL SWITCHBOARD COMBINED DISTRIBUTING FRAME
DRAWN BY: S.D.H. — 15 JAN 79	
CHECKED BY: F. MYERS — 15 JAN 79	
APPROVAL: [illegible] — ACTIVITY: CCC-EED-WSP	SIZE: D — FSCM NO: 50470 — DRAWING NO:
PROJECT	SCALE: NONE — SHEET 1 OF 1


BURIED GROUND ROD
(TYPICAL EVERY 15-20 FT)
BURIED OUTSIDE
PERIMETER
EARTH GROUND
SEE
DETAIL A
4"-20"
(NOTE 105)
87
88
DC
REFERENCE
GROUND
(NOTE 102)
CABINET GROUND
81
51
(NOTE 101)
56
57
58
84
98
80
CDF GROUND BAR
SEE
DETAIL B
84
56
57
58
98
89
90
91
(NOTE 106)
(NOTE 107)
BATT
LIGHTNING DOWN
CONDUCTOR
(NOTE 103)
SILVER SOLDE
CONNECTION
CLAMPING

REVISION				
ZONE	REV	DESCRIPTION	DATE	APPROVED



DETAIL A

GROUND WIRE CONNECTION TO EQUIPMENT CABINET

DETAIL B

GROUND ROD CONNECTION

NOTES:

101. INSTALL THE GROUND CONDUCTORS ON THE OVERHEAD CABLE LADDER.

102. CONNECT THE DC REFERENCE GROUND CONDUCTOR TO THE OUTSIDE PERIMETER GROUND IN A DIRECT MANNER USING THE SHORTEST PRACTICAL DISTANCE. THE CONNECTION SHOWN BY DASHED LINE IS THE PREFERRED METHOD WHEN THE POWER RACKS ARE LOCATED NEAR THE OUTSIDE PERIMETER GROUND. CONNECTION TO THE COF GROUND BAR (SHOWN BY SOLID LINE) IS USED WHEN THE POWER RACKS ARE NOT LOCATED NEAR THE OUTSIDE WALL OR WHERE AN OUTSIDE CONNECTION IS NOT DESIRABLE OR PRACTICAL. DO NOT CONNECT THE DC REFERENCE GROUND TO THE OVERHEAD CABINET GROUND CONDUCTOR.

103. GROUND THE BATTERY RACK ONLY IF LOCATED WITHIN 6 FEET OF A LIGHTNING DOWN CONDUCTOR.

104. THE MOUNTING HARDWARE FOR THE TERMINAL LUG IS INSTALLED DURING BOLTDOWN AND BOLT TOGETHER.

105. ELECTRICAL ISOLATION BETWEEN THE DC POWER RACKS AND TELEPHONE EQUIPMENT IS DESIRABLE TO KEEP ANY ELECTRICAL NOISE ON DC EQUIPMENT ENCLOSURES FROM BEING CONDUCTED TO COMMUNICATIONS EQUIPMENT.

106. INSTALL GROUND WIRE IN PLASTIC CONDUIT OUTSIDE BUILDING FROM EXIT POINT TO APPROXIMATELY 6" BELOW GROUND LEVEL.

107. SEAL GROUND WIRE EXIT HOLE AND TOP OF CONDUIT WITH DUCT SEALER, ITEM 92, AFTER INSTALLATION.

ITEM	AEL	DESCRIPTION	NSN	UI	QTY
98	09237L	NUT, HEX, 3/8-16	5310-00-691-0254	EA	4
92	04108E	SEALER, DUCT, 5 LB BAG, DUX-SEAL	8030-00-281-2337	EA	1
91	06314Z	EXPANSION SHIELD W/SCREW 1/4 X 1" LG	5340-00-961-7301	EA	2
90	12165J	STRAP, RETAINING, 1/2", T & B 4159	5340-00-924-1683	EA	2
89	10219A	CONDUIT, PLASTIC, 1/2" TYPE A, 10' LG W/COUPLING	5975-00-275-1960	EA	1
88	21636Z	INSULATOR CAP, T & B CT2C	NSNR	EA	3
87	21637A	CONNECTOR, CABLE TAP, T & B CT2	NSNR	EA	3
86	11061N	CLAMP, GROUND ROD, COPPERWELD ABH34	5999-00-643-7501	EA	1
85	21508D	GROUND ROD, COPPERWELD, 3/4" X 10' LG	5975-00-878-4868	EA	1
84	20399E	TERMINAL LUG, #4-2/0, T & B 71010	5940-00-243-0405	EA	4
83	21719F	TERMINAL LUG, #8, T & B RD 367	NSNR	EA	3
82	09009Z	WIRE, ELEC, TW STRANDED, #8 AWG, 600V, YELLOW	NSNR	FT	A/R
81	21822W	WIRE, ELEC, TW STRANDED, #2 AWG, 600V, YELLOW	NSNR	FT	A/R
80	24146A	WIRE, ELEC, TW STRANDED, #1/0 AWG, 600V YELLOW	NSNR	FT	A/R
58	08658A	WASHER, FLAT, STEEL, 3/8"	5310-00-087-7493	EA	8
57	00586C	WASHER, LOCK, SPLIT, 3/8"	5310-00-637-9541	EA	8
56	14086N	BOLT, HEX, 3/8-16 X 1"	5306-00-917-4637	EA	4
51	21653E	WIRE, ELEC, TW STRANDED, #4 YEL	NSNR	FT	A/R

LIST OF MATERIALS

IDENT NO. STD-TL-0013

ORGANIZATION: US ARMY COMMUNICATIONS-ELECTRONICS ENGINEERING INSTALLATION AGENCY

DESIGN BY	H. RULAU	DATE 15 JAN 79
DRAWN BY	S. D. H.	15 JAN 79
CHECKED BY	F. MYERS	15 JAN 79

FIRING RANGE CONTROL SWITCHBOARD GROUNDING PLAN

APPROVAL / PROJECT: ACTIVITY CCC-CED-SE

SIZE D | FSCM NO. 50470 | DRAWING NO.

SCALE NONE | SHEET 1 OF 1

2

SECTION 5. BILL OF MATERIALS

5.1 GENERAL. The BOM provided herein (figure 5-1) illustrates the essential materials required for the installation of a two-position manual switchboard and associated items described in paragraph 1.3. They are for a typical installation and should be modified by the responsible engineering activity to fit a particular site. Cable racks, related hardware, and battery rack bracing shall be determined on a site-by-site basis.

5.2 BILL OF MATERIALS. The BOM contains USACC standard authorized materials which are to be used in the preparation of individual Engineering Installation Packages (EIPs). Requests for significant changes to the BOM will be submitted to Headquarters, USACEEIA, ATTN: CCC-CED-SEP, with justification for approval. Identification of items is primarily by National Stock Number (NSN), Management Control Number (MCN), and Authorized Equipment List (AEL) number. When military identification numbers are not available, the manufacturer's part description and number (or catalog number) with approximate cost is provided. The number in parentheses in the Stock Number column is the AEL number.

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-22; the proponent agency is the United States Army Communications Command.

LOCATION	UNIT IDENT CODE			
SEIP 019				
TELER NUMBER	DATE		PAGE NO	NO. OF PAGES
FIRING RANGE CONTROL SWITCHBOARD			1	9

ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
1	5805-00-600-5904 (01200A)	Cabinet Assembly, Attendant Position 1, Stromberg-Carlson 492041-000	EA	1		
2	5805-00-600-5905 (11435F)	Cabinet Assembly, Intermediate Attendant Position, Stromberg-Carlson 4920242-000	EA	1		
3	5935-00-665-7348 (20657Z)	Jack Strip #127, #89 Mounting, Stromberg-Carlson 801137-000	EA	16		
4	6205-00-643-4654 (12351K)	Lamp Holder Assembly, Incoming 121-89 Mounting, Stromberg-Carlson 801429-000	EA	28		
5	5805-00-323-7329 (01036B)	Designation Strip, #29, Stromberg-Carlson 800735-000	EA	14		
6	5805-01-017-4379 (10971D)	Jack Blank #71, Stromberg-Carlson 800064-000	EA	26		
7	5805-01-017-4378 (10970C)	Jack Blank #77, Stromberg-Carlson 800070-000	EA	36		
8	5805-01-017-4385 (14620A)	Jack Blank #43, Stromberg-Carlson 800037-000	EA	8		
9	NSNR (20944A)	Jack Blank #45, Stromberg-Carlson 800039-000	EA	2		
10	NSNR (21184K)	Jack Blank #39, Stromberg-Carlson 800033-000	EA	6		
11	NSNR (16591Q)	Lamp Cap, 27 A, Stromberg-Carlson 801392-000	EA	280		
12	6240-00-269-0960 (03848W)	Lamp Busy, 48 V, Stromberg-Carlson	EA	280		

DA FORM 1 APR 70 3071-R EDITION OF 1 AUG 72 IS OBSOLETE.

Figure 5-1. Bill of Materials.

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-23; the proponent agency is the United States Army Communications Command.

LOCATION: SEIP 019			UNIT IDENT CODE			
TELER NUMBER: FIRING RANGE CONTROL SWITCHBOARD			DATE		PAGE NO. 2	NO. OF PAGES 9
ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
13	6240-00-153-6515 (03835G)	Lamp Line, 48 V, AECO D-94005-A	EA	280		
14	5805-00-309-3766 (01031L)	Cable Turning Section, Left End, Stromberg-Carlson	EA	1		
15	NSNR (14975D)	Designation Strip, #25, Stromberg-Carlson 800731-000	EA	2		
16	NSNR (23960B)	Power Board, 48 V dc, 50 A, Lorain 1232A2-List 1	EA	1		
17	NSNR (20953W)	Relay Rack, 23" X 7'-6", Lorain 4124-011	EA	2		
18	NSNR (24129F)	Fuse Panel, (4) 0-30 A and (4) 31-60 A, Lorain 4317-010	EA	1		
19	NSNR (24124A)	Relay Rack, 27-1/2" X 7'-6", Stromberg-Carlson 303739-255, E/W 2 Fuse Panels E-20034, 492005-000	EA	2		
20	NSNR (24126C)	Rectifier-Charger, 48 V dc, 30 A, 23" Rack Mounting Lorain RL30F50	EA	2		
21	NSNR (16873J)	Ringing Generator, 20 Hz, Lorain TB20C23	EA	2		
22	NSNR (20942W)	Panel, Blank, 23" X 1-3/4", Lorain 3531-106	EA	1		
23	NSNR (20961F)	Panel, Blank, 23" X 3-1/2", Lorain 3532-112	EA	1		
24	5805-00-533-3920 (01143J)	Circuit Plate, Convertible Line, 4 Circuits per Plate, Stromberg-Carlson 484985-000	EA	15		

DA FORM 1 APR 70 3071-R EDITION OF 1 AUG 75 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-23; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELCO NUMBER	FIRING RANGE CONTROL SWITCHBOARD		DATE		PAGE NO 3	NO OF PAGES 9
ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
25	NSNR (21847B)	Protective Screening, 23" X 48", Lorain 4141-407	EA	1		
26	NSNR (14231L)	Frame, MDF Type FW-9, 5-Vertical, Cook 001-8794-05	EA	1		
27	NSNR (24130M)	Frame, Protection Mounting Bar, Cook 23-3373	EA	1		
28	NSNR (14950A)	Frame, Ground Bar Assembly, Cook 023-4765	EA	1		
29	NSNR (24131L)	Frame, Guard Rail Assembly, Cook 001-8794-15	EA	1		
30	NSNR (24132K)	Frame, End Guard Rail Set, Cook 001-8794-22	EA	1		
31	NSNR (07020R)	Protector, 100-Pair, Cook 688-6800, E/W 6800 Module	EA	1		
32	NSNR (24133J)	Block, Terminal, 5 X 20, Wirewrap Both Sides, Cook Type 5000, 130-3805	EA	20		
33	NSNR (19467L)	Bracket, Terminal Mounting, Cook 036-1303	EA	23		
34	NSNR (18919Z)	Battery Bank, Lead/Calcium-Acid, 24-Cell, 170 Ah, With 23 Intercell Connector Kits For 1/2" Spacing, 1 Kit Intertier Connectors for Two-Tier Rack, Four #1/0 Lead-Plated Copper Terminal Lugs, Lifting Strap, Thermometer, Hydrometer, Hydrometer Holder, Cell Numeral Set, Seal Nut Wrench, Non-Corrosive Grease, and Four Customer Instruction Manuals; Gould 2 MCX-170	EA	1		
35	NSNR (19497Y)	Battery Rack, 2-Tier, Gould S07-078145	EA	1		

DA FORM 1 APR 79 3071-R EDITION OF 1 AUG 72 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-72; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELER NUMBER	FIRING RANGE CONTROL SWITCHBOARD		DATE		PAGE NO. 4	NO. OF PAGES
ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
36	NSNR (18188Y)	Battery Pre-Vents, Gould 3-104881	EA	A/R		
37	NSNR (21796E)	Electrolyte, 15 Gal, Gould X07-103594	EA	A/R		
38	NSNR (21855W)	Electrolyte, 5 Gal, Gould X07-103593	EA	A/R		
39	NSNR (18043Q)	Fuse, Alarm Type, 1-1/3 A, 250 V, Lorain 2486-208	EA	20		
40	NSNR (21699G)	Fuse, One-Time Cartridge, NON 6 A, 250 V, Lorain 2483-505	EA	10		
41	NSNR (21698F)	Fuse, One-Time Cartridge, NON 30 A, 250 V, Lorain 2483-515	EA	10		
42	NSNR (21697E)	Fuse, One-Time Cartridge, NON 50 A, 250 V, Lorain 2483-523	EA	8		
43	NSNR (22410C)	Kit, Emergency Battery Safety	EA	1		
44	6145-00-184-3881 (03503E)	Wire, Elec, TW, Stran, #14 AWG, Wht	FT	A/R		
45	6145-00-184-5488 (03517H)	Wire, Elec, TW, Stran, #4 AWG, Blk	FT	A/R		
46	6145-00-184-3876 (03500B)	Wire, Elec, TW, Stran, #4 AWG, Wht	FT	A/R		
47	6145-00-184-5487 (03516G)	Wire, Elec, TW, Stran, #2 AWG, Blk	FT	A/R		
48	6145-00-184-3875 (03499A)	Wire, Elec, TW, Stran, #2 AWG, Wht	FT	A/R		

DA FORM 1 APR 76 3071-R EDITION OF 1 AUG 72 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT -- BILL OF MATERIALS

For use of this form, see AR 108-22; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELER NUMBER	FIRING RANGE CONTROL SWITCHBOARD		DATE		PAGE NO. 5	NO. OF PAGES 5

ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
49	6145-00-184-5498 (03524D)	Wire, Elec, TW, Stran, #1/0 AWG, Blk	FT	A/R		
50	NSNR (06532K)	Wire, Elec, TW, Stran, #1/0 AWG, Wht	FT	A/R		
51	NSNR (21653E)	Wire, Elec, TW, Stran, #4 AWG, Yel	FT	A/R		
52	6145-00-256-1201 (03570N)	Wire, TW, Solid, #8 AWG, Blk	FT	A/R		
53	6145-00-256-7199 (06535A)	Wire, TW, Solid, #8 AWG, Wht	FT	A/R		
54	NSNR (09013P)	Wire, Elec, TW, Solid, #8 AWG, Grn	FT	A/R		
55	5970-00-501-3971 (19269L)	Insulator, Standoff	EA	1		
56	5306-00-917-4637 (14086N)	Bolt, Hex, 3/8-16 X 1", PN 526831-000	EA	6		
57	5310-00-637-9541 (00586C)	Washer, Lock, Split, 3/8"	EA	10		
58	5310-00-087-7493 (08658A)	Washer, Flat, Steel, 3/8"	EA	10		
59	NSNR (24125B)	Terminal Lug, #4-3/0, Gould L07-086041	EA	9		
60	NSNR (23309A)	Wire, Elec, TW, Solid, #18 AWG, Blu	FT	A/R		
61	6145-00-191-2577 (03540K)	Wire, Elec, TW, Solid, #14 AWG, Blk	FT	A/R		

DA FORM 1 APR 79 3071-R EDITION OF 1 AUG 72 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-23; the proponent agency is the United States Army Communications Command.

LOCATION	UNIT IDENT CODE		
SEIP 019			
TELER NUMBER: FIRING RANGE CONTROL SWITCHBOARD	DATE	PAGE NO 6	NO OF PAGES 9

ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
62	6145-00-191-2575 (03538G)	Wire, Single Cond, #10 AWG, Blk, Sol, Ins, 600 V	FT	A/R		
63	6145-00-184-5346 (03507W)	Wire, Single Cond, #10 AWG, Wht, Sol, Ins, 600 V	FT	A/R		
64	6145-00-184-5489 (03518W)	Wire, Elec, TW, Stran, #6 AWG, Blk, Ins, 600 V	FT	A/R		
65	6145-00-184-3877 (03501C)	Wire, Elec, TW, Stran, #6 AWG, Wht, Ins, 600 V	FT	A/R		
66	NSNR (21708F)	Lug Kit, #14-4 AWG, Lorain 4835-523	EA	A/R		
67	6145-00-583-3759 (09472X)	Wire, Single Cond, #18 AWG, Sol, Red, Ins, 600 V	FT	10		
68	6145-00-823-2281 (03767E)	Cable, Telephone, 2-Conductor, #22 AWG	FT	A/R		
69	6145-00-823-2280 (03766D)	Cable, Telephone, 4-Conductor, #22 AWG	FT	A/R		
70	6145-00-557-7301 (03663Z)	Cable, 16-Pair, #22 AWG	FT	A/R		
71	6145-00-557-7297 (03661K)	Cable, 6-Pair, #22 AWG	FT	A/R		
72	6145-00-557-7300 (03662J)	Cable, 11-Pair, #22 AWG	FT	A/R		
73	6145-00-557-7295 (03658F)	Cable, 25-Pair, #22 AWG	FT	A/R		

DA FORM 1 APR 76 3071-R — EDITION OF 1 AUG 73 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-23; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELER NUMBER	FIRING RANGE CONTROL SWITCHBOARD		DATE		PAGE NO 7	NO OF PAGES 9
ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
74	6145-00-557-3841 (03648G)	Cable, 40-Pair, #22 AWG	FT	A/R		
75	6145-00-557-3839 (03646E)	Cable, 51-Pair, #22 AWG	FT	A/R		
76	6145-00-557-3845 (03651J)	Cable, 76-Pair, #22 AWG	FT	A/R		
77	6145-00-G30-0905 (03721C)	Wire, Cross-Connect, 2-Conductor, #22 AWG, White/Red	FT	A/R		
78	6145-00-125-5289 (03358C)	Wire, 2-Conductor, #20 AWG, Black/Red	FT	A/R		
79	5805-00-078-5242 (00917E)	Kit, DCO Installation	EA	1		
80	NSNR (24146A)	Wire, Elec, TW, Stran, #1/0 AWG, 600 V, Yel	FT	A/R		
81	NSNR (21822W)	Wire, Elec, TW, Stran, #2 AWG, 600 V, Yel	FT	A/R		
82	NSNR (09009Z)	Wire, Elec, TW, Stran, #8 AWG, 600 V, Yel	FT	A/R		
83	NSNR (21719F)	Terminal Lug, #8, T&B RD 367	EA	3		
84	5940-00-243-0405 (20399E)	Terminal Lug, #4-2/0, T&B 71010	EA	4		
85	5975-00-878-4868 (21508D)	Ground Rod, Copperweld, 3/4" X 10' Lg	EA	1		

DA FORM 1 APR 78 3071-R EDITION OF 1 AUG 73 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-23; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELER NUMBER	FIRING RANGE CONTROL SWITCHBOARD		DATE		PAGE NO. 8	NO. OF PAGES 9

ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
86	5999-00-643-7501 (11061N)	Clamp, Ground Rod, Copperweld ABH34	EA	1		
87	NSNR (21637A)	Connector, Cable Tap, T&B CT2	EA	3		
88	NSNR (21636Z)	Insulator Cap, T&B CT2C	EA	3		
89	5975-00-275-1960 (10219A)	Conduit, Plastic, 1/2", Type A, 10' Lg W/Coupling	EA	1		
90	5340-00-924-1683 (12165J)	Strap, Retaining, 1/2", T&B 4159	EA	2		
91	5340-00-961-7301 (06314Z)	Expansion Shield W/Screw, 1/4 X 1" Lg	EA	2		
92	8030-00-281-2337 (04108E)	Sealer, Duct, 5-Lb Bag, Dux-Seal	EA	1		
93	9905-00-353-3869 (07147L)	Tag, Cable Marker, 360 Tags/Pkg	PG	1		
94	6305-00-503-3321 (06707H)	Fuse, Alarm, 1-1/3 A, Stromberg-Carlson 38789-000	EA	50		
95	5303-00-639-7970 (13953E)	Screw, Machine, 12-24 X 3/4"	EA	50		
96	5305-00-022-7798 (00230J)	Bolt, 3/8-16 X 1-1/2"	EA	16		
97	5340-00-754-4560 (00740C)	Expansion Shield, 3/8"	EA	16		

DA FORM 1 APR 79 3071-R EDITION OF 1 AUG 73 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

TELECOMMUNICATIONS DEVELOPMENT PROJECT – BILL OF MATERIALS

For use of this form, see AR 105-22; the proponent agency is the United States Army Communications Command.

LOCATION			UNIT IDENT CODE			
SEIP 019						
TELER NUMBER			DATE		PAGE NO.	NO. OF PAGES
FIRING RANGE CONTROL SWITCHBOARD					9	
ITEM NO.	STOCK NUMBER	NOMENCLATURE	UNIT	TOTAL REQ FOR PROJECT	AVAILABLE IN COMMAND	REQUIRED
98	5310-00-691-0254 (09237L)	Nut, Hex, 3/8-16	EA	4		

DA FORM 1 APR 78 3071-R EDITION OF 1 AUG 72 IS OBSOLETE.

Figure 5-1. Bill of Materials (Continued).

SECTION 6. QUALITY ASSURANCE PROCEDURES

6.1 GENERAL. The quality assurance (QA) criteria defined in CCR 702-1-2, chapter 5, will be applied to this project. The QA procedures in this section will be used to determine the acceptability of the installation and the functional performance as defined in sections 1 and 3.

6.2 INSPECTION RESPONSIBILITIES.

6.2.1 Installation Agency. The installation agency is responsible for quality control (QC) inspections in accordance with CCR 702-1-2, the Air Force T.O. 31-10 series, and this SEIP. QC inspections will be performed to ensure compliance with equipment, subsystems, and system level requirements. A QC representative (QCR) shall be identified, prior to start of installation, to serve as a point of contact for the QC effort. The QCR is responsible for the timely accomplishment of the following actions:

a. Completion of checklist, USACEEIA FM 112-R, figure 6-1, during QC inspections in accordance with CCR 702-1-2.

b. Preparation of QC reports, using approved installation agency forms.

c. Ensuring coordination and provision of test equipment required.

d. Performance of shakedown tests and maintenance of daily log of results, using approved installation agency forms.

e. Ensuring that a written statement of readiness is issued to the applicable USACEEIA-QA element 20 days prior to the estimated completion date of shakedown tests. The statement shall verify that the installation is ready for acceptance testing.

f. Coordination with the installation team leader for identifying one installer who will assist in the final QA inspection and acceptance test.

g. Ensuring that QC discrepancies are corrected and that installation rework is performed, if test results are not satisfactory.

h. Coordinating the availability of QC inspection records and related installation documents for the QA representative/test director, identified as the quality assurance representative (QAR).

6.2.2 Testing Agency. The testing agency is responsible for periodic in-process QA checks, final QA inspection, and acceptance testing in accordance with provisions of USACEEIA Regulation 702-3. QA inspections will be performed to monitor the QC effort and to ensure that the installation meets the required performance parameters at the equipment, subsystem, and system levels, as applicable. A QAR will be identified, prior to start of installation, to serve as a point of contact for the QA and test effort and to ensure that the following actions are taken in a timely manner:

a. Establish a QA program that monitors the QC and installation efforts to ensure compliance with stated requirements.

b. Record the information required by figure 6-2, pertaining to cognizant agency, command, and facility points of contact.

c. Review QC and installation records and perform periodic in-process QA inspections, if deemed necessary because of the size and complexity of the installation, and report discrepancies to the responsible agency. Recommendations for corrective action will be included in any discrepancy reports.

d. Perform a final QA inspection in accordance with CCR 702-1-2.

e. Conduct functional performance tests in accordance with section 7 to determine if the installed equipment, subsystem, or system meets the required performance parameters. If the results of any portion of the acceptance test are not satisfactory, corrective action will be taken immediately by on-site personnel, if possible. If discrepancies are resolved, the QAR may retest to verify the results and continue the acceptance test. If discrepancies cannot be corrected immediately, the QAR may reject the equipment, subsystem, or system or attempt to complete the test with exceptions. Exceptions will be noted in the final test and acceptance report.

f. Record and analyze test results, prepare a final test and acceptance report, and make distribution in accordance with CCCR 702-2.

6.2.3 Operating Agency. The operating agency is responsible for providing support during installation and test. An operations and maintenance (O&M) representative shall be identified, prior to start of installation, to serve as the point of contact for the project and to ensure that the following actions are taken in a timely manner:

a. Provide administrative supplies and typing support.

b. Assist in resolution of discrepancies.

c. Make operation and maintenance personnel available to assist on an as-required basis.

d. Provide a representative to witness the acceptance test and sign the Technical Acceptance Recommendation (TAR).

6.3 DOCUMENTATION.

6.3.1 Quality Control Documentation. The installation QC will be documented using a QC checklist similar to figure 6-1 and the approved installation agency report forms. A QC inspection log will be maintained on a daily basis during inspection periods. The daily log may be in any format unless installation agency policy dictates otherwise.

6.3.2 Quality Assurance Documentation. QA inspections will be documented using a QA checklist similar to figure 6-1; the sample cognizant agency, command, and facility points of contact form, figure 6-2; and the QA checklist, figure 6-3. The final QA inspection shall be documented utilizing the TAR forms shown in section 8. The Test and Acceptance Report shall be in accordance with CCCR 702-2. A QA inspection log will be maintained on a daily basis during inspection periods. The daily log may be in any format unless testing agency policy dictates otherwise.

6.4 QUALITY ASSURANCE PLAN. The inspection responsibilities assigned in this section constitute the QA plan and establish an independent evaluation loop. The evaluation loop consists of the installation agency QC effort and the testing agency QA and test effort. Acceptance of the installation by the O&M command is contingent upon the successful demonstration, during acceptance testing, that the installed equipment meets required performance parameters. A coordinated effort during the installation effort between the installation, testing, and operating agency personnel is required to assure that the highest standards of quality are maintained in accordance with QA procedures.

6.4.1 QA inspections and tests may be interrupted at any point if disrupted by a hardware malfunction. They also may be interrupted at a compatible breaking point to permit scheduled duty breaks. Any inspection that is interrupted because of a hardware malfunction shall be restarted at a point determined by the QAR.

6.4.2 Spare equipment may be substituted for malfunctioning equipment with the approval of the QAR. Any equipment that has been replaced shall be repaired and reinspected.

6.4.3 During acceptance tests, any piece of equipment (including items such as cables and conduits) may not be changed or adjusted without the approval of the QAR.

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 1 OF 11 PAGES DATE (Day, Mo, Year)
SITE	LOCATION
PROJECT NAME	TASK NO.

REFERENCED T.O. FOR QUALITY OBSERVATIONS FOLLOW MAIN PARAGRAPHS	YES	NO	NA
A. Drawings and Specifications (AFTO 31-10-3, 31-10-9, 31-10-27, 31-10-29)			
1. Are floor plan drawings available?			
2. Are equipment location drawings available?			
3. Are face layout drawings of equipment in bays available?			
4. Are drawings for distribution frame block assignments available?			
5. Are pin connections on terminal blocks shown on drawings?			
6. Is stenciling of terminal blocks shown on drawings?			
7. Are drawings of power distribution equipment available?			
8. Are wire sizes indicated on drawings?			
9. Are schematic diagrams of circuit types to be installed included in drawings?			
10. Are drawings of site grounding systems available?			
11. Are drawings showing arrangement of cable racks, ducts, and trenches available?			
12. Do specifications contain list of reference material required by installers?			
13. Do specifications contain cable running list for power distribution?			
14. Do specifications contain cable running list for signal cabling?			

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Figure 6-1. QA Inspection Checklist - Installation.

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 2 OF 11 PAGES		
	YES	NO	NA
15. Do specifications contain cable running list for RF cabling?			
16. Do specifications contain detailed information on grounding?			
17. Do specifications contain details on all special instructions for installers?			
18. Do drawings reference all applicable items on BOM?			
B. Tools and Equipment (AFTO 31-10-29)			
1. Is equipment damaged or unserviceable?			
2. Are all installation materials on hand and serviceable?			
3. Are all tools necessary for completion of the job on hand?			
4. Is all test equipment needed for test and checkout of installation available?			
C. General Safety Practice (AFTO 31-10-29)			
1. Are goggles being worn when drilling and grinding?			
2. Are sharp edges left on frame or duct work?			
3. Are all hand tools properly used?			
4. Are electric power tools properly grounded?			
D. Floor Plan Layout (AFTO 31-10-9, 31-10-29)			
1. Are equipment layout plans in accordance with drawings?			
2. Was layout plan completed before equipment was moved into area?			
E. Erecting and Mounting (AFTO 31-10-29)			
1. Is equipment laid out in accordance with floor plan drawing?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 3 OF 11 PAGES		
	YES	NO	NA
2. Are equipment bays level and plumbed within tolerances?			
3. Has proper spacing been provided between equipment racks?			
4. Are base angles of frames secured to floor in proper location?			
5. Are all cabinets flush mounted and plumbed?			
6. Has finish of equipment, cabinets, and racks been touched up?			
7. Are bolts and screws free from stripped threads and defaced heads?			
8. Have sufficient clearances been provided between apparatus for heat dissipation?			
9. Are terminal blocks aligned on distribution frames?			
10. Has equipment been installed in cabinets or racks in accordance with face layouts?			
11. Are all nuts and bolts securely tightened?			
12. Are exposed or cut ends of metal filed smooth and painted?			
13. Have lock and flat washers been used?			
14. Is the C-E equipment BOM available at the facility?			
15. Has the C-E equipment been inventoried and discrepancies posted?			
16. Is all required C-E equipment at the site?			
17. Is all C-E equipment installed?			
F. Cable Racks (AFTO 31-10-6)			
1. Location of cable racks:			
a. Are cable racks located in accordance with cable plan drawing?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 4 OF 11 PAGES		
	YES	NO	NA
b. Does height of cable racks conform to height above floor as indicated on cable plan drawing?			
c. Are cable racks located so that clearance is provided for installation and maintenance of ultimate equipment?			
d. Are cable racks located so cables are not subject to damage or exposure or other detrimental conditions?			
2. Assembly of cable racks:			
a. Are long sections of cable racks used where possible?			
b. Have clamping details been altered other than where necessary to avoid interference?			
c. Are open ends of cable racks properly closed?			
d. Are vertical cable racks properly terminated on floors?			
3. Support of cable racks:			
a. Are cable racks properly supported and fastened?			
b. Are cable racks installed so that no excessive load or binding is imposed on the equipment?			
c. Are horizontal cable racks supported on approximately 5 feet centers but not to exceed 6 feet?			
d. Has support been provided within 3 feet of free end of cable rack?			
e. Are cable racks braced where necessary to prevent sway?			
G. Running Cable (AFTO 31-10-13)			
1. Are cable runs made in accordance with cable running list?			
2. Are cables twisted or crossed on cable rack?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 5 OF 11 PAGES		
	YES	NO	NA
3. Do cables at turns or bends conform to the bending radii and position?			
4. Is protection provided where cable sheaths contact rough or sharp edges or metal?			
5. Are cables which are turned off over side of cable racks formed with minimum allowable radii?			
6. Are cables turned off rack horizontally and then up?			
7. Do cables to the distribution frame enter on the vertical side?			
8. Are cables serving the horizontal side of a distribution frame secured to the transverse arms near the vertical upright?			
9. Are cable tags properly prepared and in accordance with the cable running list?			
10. Are cable tags secured at each end of cable run?			
11. Have cable tags been removed upon completion of verification and termination?			
12. Are cable butts located as near as practicable to the point where the first wires turn out?			
13. Are cable butts properly treated?			
14. Is insulation of wires undamaged at butt location?			
15. Are unused and spare wires protected at butt location?			
H. Securing Cable (AFTO 31-10-2, 31-10-13)			
1. Is starting stitch properly made and placed?			
2. Is required Kansas City stitch properly made?			
3. Are first and succeeding layers of cable properly secured?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 6 OF 11 PAGES		
	YES	NO	NA
4. Are cables secured at every cable rack cross strap?			
5. When cable butt is between securing devices, are cables secured together with an appropriate stitch?			
6. Are lock stitches properly made and spaced?			
7. Are splices in twine properly made?			
I. Sewed Forms (AFTO 31-10-13)			
1. Is proper size twine used for the diameter of the form?			
2. Are proper number of strands used?			
3. Are stitches properly spaced?			
J. Butting and Stripping (AFTO 31-10-13)			
1. Are proper tools used for butting and stripping of cable?			
2. Are cable butts properly dressed?			
3. Is proper distance maintained from cable butt to fanning strip?			
K. Fanned Forms (AFTO 31-10-2)			
1. Are cables fanned and connected to the left side of vertical mounted terminal blocks and to the bottom of horizontal terminal blocks?			
2. Are conductors in fanned forms twisted and bunched?			
3. Are fanned forms straight and taut from butt location to fanning strip?			
4. Is length of skinners correct?			
5. Has color code been properly followed?			
6. Are spare wires disposed of properly?			
L. Stenciling (AFTO 31-10-27, 31-10-29)			
1. Is equipment correctly identified and stenciled in accordance with floor plan drawings?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 7 OF 11 PAGES		
	YES	NO	NA
2. Are designations located correctly?			
3. Are correct size designations used on particular types of apparatus or equipment?			
M. Strapping (AFTO 31-10-16)			
1. Are straps properly placed?			
2. Is correct type of strap wire used?			
3. Does insulation extend to terminal?			
4. Are straps placed so as not to interfere with operation of apparatus?			
5. Is removal of apparatus blocked?			
6. Are designations of apparatus obscured?			
N. Connecting and Soldering (AFTO 31-10-7)			
1. Is soldering clamp used when connecting wires?			
2. Are connections made on terminal blocks in proper manner?			
3. Is all soldering done with standard rosin core solder?			
4. Are connections secure and free of foreign substances?			
5. Has all unsightly flux and excess globules of solder been removed?			
6. Is insulation on skinners burnt or otherwise damaged?			
7. Do skinners on connected terminals exceed 1/16 in?			
8. Are all conductors given a continuity test after connection is made?			
O. Wrapped Connections (AFTO 31-10-7)			
1. Are wrapped connections applied only on suitable terminals?			
2. Are connections essentially straight and free of angular bends or crimps?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 8 OF 11 PAGES		
	YES	NO	NA
3. Are the required number of turns in contact with the terminal in accordance with criteria for gauge of wire used?			
4. Are wrapped connectors soldered where applicable?			
P. Cross Connections (AFTO 31-10-11)			
1. Are jumpers properly routed at distribution frame?			
2. Do jumpers have sufficient slack after connection?			
3. Are conductors twisted between fanning strip and terminal?			
4. Does twist remain in conductors beyond rear of fanning strip?			
5. Are jumpers properly dressed?			
6. Has excess solder been removed from terminals?			
Q. Equipment and Signal Grounds (AFTO 31-10-24, 31-10-29)			
Are equipment and signal grounds installed in accordance with applicable codes and standards and in accordance with installation drawings?			
R. Conduit (AFTO 31-10-12)			
1. Are burrs removed from conduit after cutting?			
2. Is bending radii of conduit adequate?			
3. Are there more than four 90-degree bends in a single conduit run?			
4. Does number of conductors in conduit conform?			
5. Are conduits supported at intervals not exceeding 6 feet?			
6. Have all fittings been tightened after installation?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 9 OF 11 PAGES		
	YES	NO	NA
S. Ducts (RF Shieldings) (AFTO 31-10-12, 31-10-13)			
1. Are hangers for overhead ducts mounted first?			
2. Is proper type mallet used in assembly?			
3. Are flange sections cleaned before installation?			
T. Coaxial Cables (AFTO 31-10-14)			
1. Is cable inspected for possible damage prior to installation?			
2. Where required, is cable sewed in same manner as signal cable?			
3. Is butting and stripping done in same manner as signal cable?			
4. Do cable tags remain on coaxial cable from antenna to RF patch or equipment?			
5. Is support spacing of cables installed as prescribed (3 ft for cable 1-5/8 in or smaller and 5 ft for cables 1-11/16 in or greater)?			
6. Does bending radii of cables meet prescribed standards of the T.O.?			
U. Waveguides and Antennas (AFTO 31R-10-5, CEEIA PAM 105-3)			
1. Are waveguides stored in a horizontal manner and away from heavy objects?			
2. Are waveguides inspected for possible damage prior to installation?			
3. Are waveguides cleaned in the proper manner prior to installation?			
4. Are hangers installed every 5 feet as prescribed?			
5. Do waveguide bends conform to T.O. criteria?			
6. Are antennas and reflectors mounted as prescribed heights?			
7. Are antennas oriented to the prescribed azimuth?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 10 OF 11 PAGES		
	YES	NO	NA
V. Outside Plant Inspection (AFTO 31R-10-5, 31-10-5, 31-10-3, 31-10-10, 31-10-21, 31-10-24, 31-10-28)			
1. Are antenna tower locations proper?			
2. Are footings or pads prepared prior to concrete pour?			
3. Have concrete pours for footings and pads been accomplished in accordance with specified criteria?			
4. Has proper cure time been achieved prior to mounting steel?			
5. Is the tower constructed in accordance with the specified criteria, drawings, etc?			
6. Are the antenna supports, anchors, pedestals, etc., properly installed in accordance with established criteria?			
7. Are supporting structures, guy wires, tower lighting kits (when required), termination boxes, and baluns included and properly installed in accordance with established criteria?			
8. Are antennas properly mounted and aligned?			
9. Were antenna reflectors properly aligned prior to mounting the feed horn?			
10. Are antenna curtains for rhombic and log periodics properly installed?			
11. Are transmission lines, coaxial cables, waveguides, etc., properly installed?			
12. Has tower and supporting structure been painted in accordance with established criteria?			
13. Are waveguides, cable runs, etc., properly installed and protected?			
W. Power Buildings (AFTO 31-10-3, 31-10-29)			
1. Are power buildings and pads properly located and installed?			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

QUALITY ASSURANCE INSPECTION CHECKLIST - INSTALLATION (CCCR 702-2)	PAGE 11 OF 11 PAGES		
	YES	NO	NA
2. Are generators and power distribution panels properly located and installed?			
3. Are oil pans properly installed?			
4. Are generators properly vented from the buildings?			
5. Has all required wiring been installed?			
6. Are fuel tanks installed above ground; if so, are they located at the proper distance from generator building?			
7. If fuel tanks were installed underground, was it accomplished in accordance with established procedures?			
8. Is safety equipment located in generator building?			
X. Installation Drawings (AFTO 31-10-29)			
Have drawings been reviewed to assure "as built" accuracy?			
TEST ENGINEER/QUALITY ASSURANCE REPRESENTATIVE (QAR)			

Figure 6-1. QA Inspection Checklist - Installation (Continued).

COGNIZANT AGENCY, COMMAND, AND
FACILITY QA POINTS OF CONTACT
(CCCR 702-2)

	Individual POC	Bldg. No.	Rm. No.	Phone No.	Name of Agency
Installation:					
Team Leader					
Assistant Team Leader					
Quality Control					
Quality Assurance Agency:					
Representative					
Testing Activity					
Operating Agency:					
Representative					
Site Commander					

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Figure 6-2. QA Points of Contact.

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR 702-2)		PAGE 1 OF 7 PAGES DATE (Day, Mo, Year)
SITE	LOCATION	QUALITY CONTROL REPRESENTATIVE (QCR)
PROJECT NAME		TASK NO.

	YES	NO	NA
A. General Safety Practice			
1. Are goggles being worn when using grinding machines?			
2. Are sharp edges left on frame or duct work?			
3. Are all hand tools properly used?			
4. Are electric power tools properly grounded?			
5. Are ground wires securely attached?			
B. Floor Plan Layout			
1. Are layout plans in accordance with drawings?			
2. Was layout plan completed before equipment was moved into area?			
C. Erecting and Mounting			
1. Is equipment laid out in accordance with floor plan drawing?			
2. Are equipment bays leveled and plumbed within tolerances?			
3. Has proper spacing been provided between equipment racks?			
4. Are base angles of frames secured to floor in proper location?			
5. Are all cabinets flush mounted and plumbed?			
6. Has finish of equipment, cabinets, and racks been touched up?			
7. Are bolts and screws free from stripped threads and defaced heads?			

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Figure 6-3. QC Checklist - Installation.

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 2 OF 7 PAGES		
	YES	NO	NA
8. Have sufficient clearances been provided between apparatus for heat dissipation?			
9. Are terminal blocks aligned on distributing frames?			
10. Has equipment been installed in cabinets or racks in accordance with face layouts?			
11. Are all nuts and bolts securely tightened?			
12. Are exposed or cut ends of metal filed smooth and painted?			
D. Cable Racks			
1. Location of cable racks:			
a. Are cable racks located in accordance with cable plan drawing?			
b. Does height of cable racks conform to height above floor as indicated on cable plan drawing?			
c. Are cable racks located so that clearance is provided for installation and maintenance of ultimate equipment?			
d. Are cables located so they are not subject to damage due to exposure or other detrimental conditions?			
2. Assembly of cable racks:			
a. Are long sections of cable racks used where possible?			
b. Have clamping details been altered other than where necessary to avoid interference?			
c. Are open ends of cable racks properly closed?			
d. Are vertical cable racks properly terminated on floors?			
3. Support of cable racks:			
a. Are cable racks properly supported and fastened?			
b. Are cable racks installed so that no excessive load or binding is imposed on the equipment?			

Figure 6-3. QC Checklist - Installation (Continued).

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 3 OF 7 PAGES		
	YES	NO	NA
c. Are horizontal cable racks supported on approximately 5 feet centers but not to exceed 6 feet?			
d. Has support been provided within 3 feet or free end of cable rack?			
e. Are cable racks braced where necessary to prevent sway?			
E. Running Cable			
1. Are cable runs made in accordance with cable running list?			
2. Are oval shaped switchboard cables placed on edge?			
3. Are cables twisted or crossed on cable rack?			
4. Do cables conform to the bending radii and position at turns or bends?			
5. Is protection provided where cable sheaths contact rough or sharp edges or metal?			
6. Are cables turned off over side of cable racks formed with minimum allowable radii?			
7. Are cables turned off rack horizontally and then up?			
8. Do cables to the distributing frame enter on the vertical side?			
9. Are cables serving the horizonal side of a distributing frame secured to the transverse arms near the vertical upright?			
10. Are cable tags properly prepared and in accordance with the cable running list?			
11. Are cable tags secured at each end of cable run?			
12. Have cable tags been removed upon completion of verification and termination?			
13. Are cable butts located as near as practicable to the point where the first wires turn out?			
14. Are cable butts properly treated?			

Figure 6-3. QC Checklist - Installation (Continued).

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 4 OF 7 PAGES		
	YES	NO	NA
15. Is insulation of wires undamaged at butt location?			
16. Are unused and spare wires protected at butt location?			
F. Securing Cable			
1. Is starting stitch properly made and placed?			
2. Is required Kansas City stitch properly made?			
3. Are first and succeeding layers of cable properly secured?			
4. Are cables secured at every cable rack cross strap?			
5. When cable butt is between securing devices, are cables secured together with an appropriate stitch?			
6. Are lock stitches properly made and spaced?			
7. Are splices in twine properly made?			
G. Sewed Forms			
1. Is proper size twine used for the diameter of the form?			
2. Are proper number of strands used?			
3. Are stitches properly spaced?			
H. Butting and Stripping			
1. Are proper tools used for butting and stripping of cable?			
2. Are cable butts properly dressed?			
3. Is proper distance maintained from cable butt to fanning strip?			
I. Fanned Forms			
1. Are cables fanned and connected to the left side of vertical mounted terminal blocks and to the bottom of horizontal terminal blocks?			
2. Are conductors in fanned forms not twisted and bunched?			

Figure 6-3. QC Checklist - Installation (Continued).

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 5 OF 7 PAGES		
	YES	NO	NA
3. Are fanned forms straight and taut from butt location to fanning strip?			
4. Is length of skinners correct?			
5. Has color code been properly followed?			
6. Are spare wires disposed of properly?			
J. Stenciling			
1. Is equipment correctly identified and stenciled in accordance with floor plan drawings?			
2. Are designations correctly located?			
3. Are corrected size designations used on particular types of apparatus or equipment?			
K. Strapping			
1. Are straps properly placed?			
2. Is correct type of strap wire used?			
3. Does insulation extend to terminal?			
4. Are straps placed so as to not interfere with operation of apparatus?			
5. Is removal of apparatus not blocked?			
6. Are designations not obscured?			
L. Connecting and Soldering			
1. Is soldering clamp used when connecting wires?			
2. Are connections made on terminal in proper manner?			
3. Is all soldering done with standard resin core solder?			
4. Are connections secure and free of foreign substances?			
5. Have all unsightly flux and excess globules of solder been removed?			
6. Is insulation on skinners not burnt or otherwise damaged			

Figure 6-3. QC Checklist - Installation (Continued).

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 6 OF 7 PAGES		
	YES	NO	NA
7. Do skinners on connected terminals not exceed 1/16 in?			
8. Are all conductors given a continuity test after connection is made?			
M. *Transistor Soldering Techniques*			
1. Is caution exercised to assure that excessive heat does not destroy transistors?			
2. Are safeguards in effect to prevent leakage current at the end of an electrical soldering iron from destroying transistors?			
N. Wrapped Connections			
1. Are wrapped connections applied only on suitable terminals?			
2. Are connections essentially straight and free of angular bends or cramps?			
3. Are the required number of turns in contact with the terminal in accordance with criteria for gauge of wire used?			
4. Are wrapped connectors soldered where applicable?			
O. Cross Connections			
1. Are jumpers properly routed at distribution frame?			
2. Do jumpers have sufficient slack after connection?			
3. Are conductors not twisted between fanning strip and terminal?			
4. Does twist remain in conductors beyond rear of fanning strip?			
5. Are jumpers properly dressed?			
6. Has excess solder been removed from terminals?			

Figure 6-3. QC Checklist - Installation (Continued).

QUALITY CONTROL CHECKLIST - INSTALLATION (CCCR-702-2)	PAGE 7 OF 7 PAGES		
	YES	NO	NA
P. Equipment and Signal Grounds			
Are equipment and signal ground installed in accordance with applicable codes and standards and in accordance with installation drawings?			
Q. Conduit			
1. Are burrs removed from conduit after cutting?			
2. Is bending radii in accordance with AFTO 31-10-12?			
3. Are there no more than four 90 degree bends in a single conduit run?			
4. Does number of conductors in conduit conform to AFTO 31-10-12?			
5. Are conduits supported at proper intervals?			
6. Have all fittings been tightened after installation?			
R. Ducts (RF Shieldings)			
1. Are hangers for overhead ducts mounted first?			
2. Is proper type mallet used in assembly?			
3. Are flange sections cleaned before installation?			
S. Coaxial Cables			
Is cable inspected for possible damage prior to installation?			

Figure 6-3. QC Checklist - Installation (Continued).

SECTION 7. ACCEPTANCE TEST PLAN AND PROCEDURES

7.1 GENERAL. This section contains the test procedures and states the special conditions that apply to shakedown and acceptance tests for installing a firing range control switchboard (FRCS). On-site tests shall be performed to determine if the FRCS facility--

a. Has been installed correctly.

b. Performs according to the technical requirements of this SEIP and related documents.

c. Is operationally suitable for the intended application.

7.2 QUALITY CONTROL INSPECTION. Prior to conducting the applicable shakedown and acceptance tests, the system shall be inspected by use of USACEEIA FM 111-R, Quality Control Checklist - Installation (figure 6-3), as applicable.

7.3 TECHNICAL ACCEPTANCE RECOMMENDATION (TAR). Based on the QA inspections, QC reports, and acceptance test results, the test director will determine the acceptability of the work effort (see figure 8-1, USACEEIA FM 98-R, Technical Acceptance Recommendation). If the circumstances warrant, the test director will attempt to coordinate the findings with the test agency and other responsible agencies, as appropriate. The test director will prepare and distribute the TAR according to the requirements in section 8. Preparation of the TAR will be accomplished on-site, immediately following acceptance tests.

7.4 TEST REPORT. The test agency will prepare and distribute a test report in accordance with CCCR 702-2, paragraph 6.2b. The report may be amended by the respective engineering installation package (EIP) and related tasking documents, when applicable. Copies of the completed TAR will be included.

7.5 TEST CRITERIA. The tests of appendixes A and B shall be conducted as described and the results documented on the applicable forms in these appendixes. When any of these tests fail to meet requirements, the test director will determine which portion(s) of the test was affected and which portion(s) of the equipment or facility is to be retested. All deficiencies will be corrected; or, if not corrected, the deficiencies will be reported in the Technical Acceptance Recommendation report (USACEEIA FM 98-R, figure 8-1).

7.6 TEST EQUIPMENT. The following test equipment or equivalents shall be required to perform the shakedown and acceptance tests:

a. Multimeter, AN/USM-223.

b. Circuit verifier, CMC-7640.

c. Insulated alligator clips (2 ea).

d. Test oscillator, HP-236A.

e. Current flow test set, TS 1775/U.

f. Volt-ohmmeter, Simpson 260.

g. Transmission measuring set, HP-3555B.

7.7 TEST PLAN ORGANIZATION.

7.7.1 The shakedown tests of appendix A shall be conducted by the installation agency to verify that the equipment was installed properly and that it is ready for acceptance tests. Test results and corrective action taken shall be documented on the test sheets.

7.7.2 The acceptance tests of appendix B shall be conducted to ascertain proper operation of the equipment. The operations and maintenance (O&M) command representative should be present throughout the acceptance tests to verify the operability of the equipment.

SECTION 8. COMPLETION CERTIFICATION

8.1 GENERAL. The results of the QA inspections and acceptance tests specified in sections 6 and 7 will be documented on-site by the QAR/test director using USACEEIA FM 98-R, Technical Acceptance Recommendation (figure 8-1). The purpose of this technical document is to record the significant project information to include the scope of the effort, results and conclusions of the requisite inspections and tests, exceptions to the technical requirements, and recommendations regarding acceptance with or without exceptions or rejection of the work effort. The Technical Acceptance Recommendation (TAR) also allows other participants to indicate agreement or disagreement with the inspection and test assessments, and for the user to state a willingness to technically accept the installed system.

8.2 DISTRIBUTION. A copy of the TAR will be provided to the signing participants and the operating agency. The original copy will be maintained in the test agency project files, but copies will be reproduced and included as part of the test report.

8.3 WAIVERS. Waivers to include command approvals for individual installations will be recorded in the TAR and copies attached for the purpose of clarifying deviations from this SEIP and the individual engineering installation package (EIP).

8.4 TAR PREPARATION INSTRUCTIONS

a. Entries on the data sheets are to be typed whenever possible to ensure legibility and provide a quality, fully legible product when reproduced. If a typewriter is not available, the forms may be completed by printing with black ink in block letters to ensure legibility. The instructions for completion of this form follow on a block-by-block basis.

b. Pages are to be sequentially numbered to show both the individual page number and the total number of pages constituting the completed TAR. Additionally, each page will be identified by the date, project, and contract number in the appropriate blocks.

c. Instructions for completion of the TAR are delineated in the following subparagraphs and will be completed in accordance with these instructions:

(1) DATE: Enter the day, month, and year of completion for this action (e.g., 1/1/79 as the first day of the first month of 1979).

(2) PROJECT/CONTRACT NUMBER: Enter the appropriate project or contract number. If this is a subproject or part of a subproject, provide all necessary information (i.e., IIP milestone number(s) and subproject number(s), as well as subdivision(s) to same).

(3) TITLE: Enter the project name or title.

(4) LOCATION: Enter the geographic location where the project was installed.

(5) FACILITY: Enter the name of the facility and other pertinent identifying information.

(6) TEST DIRECTOR: Enter the name, title, and grade of the test director or QAR assigned to this project.

(7) OPERATING AGENCY: Enter the name, symbol, and complete mailing address of the organization having O&M responsibility for this project, system, or equipment installation.

(8) ENGINEERING AGENCY: Enter the name, symbol, and complete mailing address of the organization having engineering cognizance and responsibility.

(9) INSTALLATION AGENCY: Enter the name, symbol, and complete mailing address of the organization having been tasked to install the TAR materiel.

(10) TESTING AGENCY: Enter the name, symbol, and complete mailing address of the QA and testing organization tasked for this project.

(11) PROJECT DESCRIPTION: Enter a brief and concise description of the project to which the TAR applies.

(12) MAJOR EQUIPMENT INSTALLED/RELOCATED: List the major items of equipment installed or relocated in accordance with the project requirements. Enter the BOM line item number, materiel description, assigned part number or National Stock Number, and the quantity of each major item.

(13) DOCUMENTATION: Enter the document identification (i.e., drawing number, technical manual number, etc.), title, and the quantity of each document provided to the operating unit as part of the project.

(14) EXCEPTIONS:

(a) Upon completion of installation and testing, any exceptions to the project requirements that require corrective action will be listed. Include complete identification of each missing item. Exceptions must be based on the specified requirements of the project, supportable through the test results or other valid documentation, fully described, and precisely identified.

(b) The appropriate exception block must be annotated, and separate sheets should be used for each category of exception.

(c) The test director will also enter the suggested action agency for each exception, recognizing that the test director may not always be in a position to determine the final action agency.

(d) For facilities that are becoming partially operational, identify installation agency actions remaining for project completion. In this situation, the Materiel Acceptance Record will show the tests that have been made, but will be identified as a partial record. A final Materiel Acceptance Record will be prepared after installation and testing of all remaining project equipment.

(15) REMARKS: The REMARKS section may be used to provide any additional information on or in support of a recommendation, commendation, or criticism in relation to the project installation, engineering, or testing. Entries may include:

(a) Shortcomings that do not require corrective action (not considered an exception).

(b) Recommendations for improving projects of a similar nature.

(c) Identification of support items that have not been accomplished, and a description of any activity in progress by the operating agency to satisfy the requirement.

(d) A description of test results with the performing agency and date(s) accomplished.

(e) A statement to the effect that the installation agency will forward final "as-built" drawings when completed.

(f) A description of the ac power system with identification of source and backup capability.

(g) A statement to indicate that a list of excess material was provided the operating command for final disposition or to identify material that was excess to the project.

(16) CERTIFICATION: Enter the signatures and certification that the project was installed, tested, and accepted for operation with or without exceptions as applicable.

TECHNICAL ACCEPTANCE RECOMMENDATION (SUMMARY) (CCCR 702-2)		PAGE 1 OF 6 PAGES
		DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION
FACILITY		TEST DIRECTOR
OPERATING AGENCY	ENGINEERING AGENCY	
INSTALLATION AGENCY	TESTING AGENCY	

PROJECT DESCRIPTION

This Technical Acceptance Recommendation is executed by the on-site representatives of the installation, test, and operating agencies. It does not constitute official acceptance of the project but does certify that the MAJOR ITEMS INSTALLED AND DOCUMENTATION PROVIDED are as stated herein. This document further certifies that the project has been installed and performs satisfactorily in accordance with the requirements listed under REFERENCES, except as noted under EXCEPTIONS and REMARKS. Upon execution of this Technical Acceptance Recommendation, USACEEIA considers this project complete, except for such follow-on action as may be necessary to clear the EXCEPTIONS stated herein.

USACEEIA FM 98-R
1 Jan 79 Replaces HQ USACEEIA CCC-TED-QA FM 98 which is obsolete

Figure 8-1. Technical Acceptance Recommendation.

TECHNICAL ACCEPTANCE RECOMMENDATION (INSTALLED EQUIPMENT) (CCCR 702-2)		PAGE 2 OF 6 PAGES DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION
MAJOR EQUIPMENT INSTALLED/RELOCATED		

BOM ITEM NO.	DESCRIPTION	PART NUMBER/NSN	QUANTITY

Figure 8-1. Technical Acceptance Recommendation (Continued).

TECHNICAL ACCEPTANCE RECOMMENDATION (DOCUMENTATION) (CCCR 702-2)		PAGE 3 OF 6 PAGES DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION
PROJECT DOCUMENTATION PROVIDED		

REFERENCE DOCUMENTATION	TITLE	NO. OF COPIES

Figure 8-1. Technical Acceptance Recommendation (Continued).

TECHNICAL ACCEPTANCE RECOMMENDATION (EXCEPTIONS) (CCCR 702-2)		PAGE 4 OF 6 PAGES DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION

EXCEPTIONS ENGINEERING ☐ INSTALLATION ☐ OTHER ☐	SUGGESTED ACTION AGENCY

Figure 8-1. Technical Acceptance Recommendation (Continued).

TECHNICAL ACCEPTANCE RECOMMENDATIONS (REMARKS) (CCCR 702-2)		PAGE 5 OF 6 PAGES
		DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION
REMARKS:		

Figure 8-1. Technical Acceptance Recommendation (Continued).

TECHNICAL ACCEPTANCE RECOMMENDATION (CERTIFICATION)		PAGE 6 OF 6 PAGES DATE (DAY, MO, YEAR)
PROJECT/CONTRACT NUMBER	TITLE	LOCATION

CERTIFICATION

Acceptance tests and Quality Assurance Inspections are complete for equipment installed under this project.

WITHOUT EXCEPTIONS ☐ WITH NOTED EXCEPTIONS ☐

INSTALLATION AGENCY	SIGNATURE AND TITLE PRINTED
OPERATING AGENCY	SIGNATURE AND TITLE PRINTED
TEST AGENCY	SIGNATURE AND TITLE PRINTED

ACCEPTANCE

Equipment herein certified successfully installed and tested, is accepted for operation.

OPERATING COMMAND	SIGNATURE TITLE

Figure 8-1. Technical Acceptance Recommendation (Continued).

APPENDIX A

SHAKEDOWN TESTS

1. CONTINUITY OF CABLES.

1.1 Objective. To ensure that no shorts, opens, or crosses exist in the newly installed cables.

1.2 Test Equipment Required.

a. Circuit verifier, CMC-7640.

b. Multimeter, AN/USM-223.

c. Volt-ohmmeter, Simpson 260.

1.3 Tests. (NOTE: Do not attempt to buzz through equipment.)

a. Using a circuit verifier, check each wire installed--except those with ac and dc power--for shorts, opens, grounds, reversals, and split pairs.

b. Using a voltmeter, measure for proper dc voltage on power cables.

c. Enter the test results on figure A-1, USACEEIA FM 116-1-R.

2. ATTENDANT'S CABINET.

2.1 Objective. To ensure proper operation of the attendant's cabinet.

2.2 Tests. Inspect and test all equipment, apparatus, and wiring forming a part of the switchboard, and make all necessary adjustments and corrections of defects. All circuits should be tested for proper operation under simulated working conditions. All apparatus defects should be corrected, and all apparatus and wiring should be in normal condition before final operating tests are made. Circuit descriptions and instructions covering the method of operation for each circuit are usually furnished with the drawings and specifications for each type of switchboard.

a. Check buzzers and bells for distinctness of audible signal and for loose adjustment screws and locknuts.

b. Test cords for cutouts and noise and inspect for excessively worn braid covering. Check switchboard cords that are arranged in accordance with some particular color scheme for conformance with that scheme.

c. Inspect cord terminals at the cord shelf for loose and insecure connections.

d. Inspect cord weights for proper operation of the pulley rollers and for proper clearance from the floor.

e. Check foot rails for stability, and test those made of metal for insulation from ground.

f. Inspect and test jacks to be sure that plugs will enter properly and that contacts with full-sized plugs do not cut out when the plugs are manipulated in the jacks. Check the sleeves of all jacks with a jack gage.

g. Inspect keys for proper operation, including sequence of break and make contacts.

h. Test lamps for proper brilliance at normal voltage.

i. Inspect lamp caps for broken or excessively chipped lenses.

j. Inspect plugs closely for mechanical defects such as loose or bent tips. Check all used plugs with a plug gage. Test the dead collar of 3-conductor plugs for insulation from the tip and ring.

k. Enter the test results on figure A-2, USACEEIA FM 116-2-R.

3. BATTERY.

3.1 Objective. To ensure that each cell of the battery is functioning properly.

3.2 Test Equipment Required.

a. Hydrometer (furnished with battery).

b. Volt-ohmmeter, Simpson 260.

3.3 Tests. Measure the specific gravity and voltage of each cell and total voltage of battery. The specific gravity should be 1.215

at 77° F. The voltage should be 2.0 to 2.1 V dc per cell. Enter the test results on figure A-3, USACEEIA FM 116-3-R.

4. BATTERY FUSE POSTS.

4.1 Objective. To ensure that battery fuse posts are clear of grounds.

4.2 Test Equipment Required. Volt-ohmmeter, Simpson 260.

4.3 Test. With all keys, plugs, and switches at normal and all operators' sets disconnected, use a volt-ohmmeter to determine whether all battery fuse posts are clear of grounds before fuse wire is connected. If ground is detected, the cause should be located and corrected. A 1-A fuse wire connected to one post on the battery bus bar and looped to all circuit battery posts should be used in place of the regular fuses until all defects and adjustments to the circuits have been corrected. If the fuse wire blows, place individual fuse wires across each battery fuse post to isolate the circuit that is causing the trouble. Enter the test results on figure A-4, USACEEIA FM 116-4-R.

5. KEYS.

5.1 Objective. To ensure proper sequence of break and make contacts.

5.2 Test Equipment Required. None.

5.3 Test. Keys that are designed and constructed to permit side thrusts of the key handles may transmit motion to the contact springs; therefore, they must be tested for proper contact by exerting reasonable side thrust in both the operated and nonoperated positions. Combined ringing and listening keys and double ringing keys that are operated by the same key lever should be tested for break of ringing key contact because of the unrestrained rebound of the listening key or one of the ringing keys. If the rebound of the key lever causes a momentary break in the normally closed contact of the ringing key, a loud click will be heard in a receiver connected across the tip and ring of the cord associated with the ringing key. The receiver may be connected with the cord under test by using a single unmounted test jack or by connection through a spare outgoing trunk multiple jack. Trouble detected in this manner is generally caused by insufficient tension or insufficient follow on the inside or normally closed contact spring of the ringing key. Enter the test results on figure A-5, USACEEIA FM 116-5-R.

SHAKEDOWN TEST 1. CABLE CONTINUITY TEST (SEIP 019)			
Cable run	Accept	Reject	Remarks
USACEEIA FM 116-1-R 31 JAN 79			

Figure A-1. Shakedown Test 1. Cable Continuity Test.

SHAKEDOWN TEST 2. ATTENDANT'S CABINET TESTS (SEIP 019)			
Test para	Accept	Reject	Remarks
USACEEIA FM 116-2-R 31 JAN 79			

Figure A-2. Shakedown Test 2. Attendant's Cabinet Tests.

SHAKEDOWN TEST 3. BATTERY TESTS (SEIP 019)				
Cell No.	Readings		Accept	Reject
	Specific gravity	Voltage		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
USACEEIA FM 116-3-R 31 JAN 79				

Figure A-3. Shakedown Test 3. Battery Tests.

SHAKEDOWN TEST 4. BATTERY FUSE POST TEST (SEIP 019)			
Fuse post	Accept	Reject	Remarks
USACEEIA FM 116-4-R 31 JAN 79			

Figure A-4. Shakedown Test 4. Battery Fuse Post Test.

SHAKEDOWN TEST 5. KEY TEST (SEIP 019)			
Key	Accept	Reject	Remarks
USACEEIA FM 116-5-R 31 JAN 79			

Figure A-5. Shakedown Test 5. Key Test.

APPENDIX B

ACCEPTANCE TESTS

1. FINAL QUALITY ASSURANCE.

1.1 Objective. To ensure that quality control (QC) and shakedown tests have been performed.

1.2 Test Equipment Required. None.

1.3 Visual Checks.

a. Review the installation agency's QC checklist and the QC reports to verify that QC was performed.

b. Spot check or, if necessary, inspect all items on the QC checklist to verify that the equipment was installed properly and drawings have been corrected.

c. Review results of shakedown test to verify that the required tests were performed and discrepancies were corrected.

2. ACCEPTANCE TESTS.

2.1 Objective. To ensure that the installed equipment will perform satisfactorily.

2.2 Tests. Perform the fuse and alarm, switchboard multiple, line circuit, cord circuit, and convertible line circuit tests described in the following paragraphs.

2.3 Test Equipment Required.

a. Current flow test set, TS 1775/U.

b. Circuit verifier, CMC-7640.

c. Test oscillator, HP-236A.

d. Transmission measuring set, HP-3555B.

3. FUSE AND ALARM TESTS Test all fuses and alarms to ensure that they are installed and operating properly.

a. Install a blown fuse on each panel and check that a visual and audible alarm are activated with that associated fuse. Replace with a good fuse and reset all alarms.

b. Connect one end of the test cord to the equipment side of the fuse and touch the other end to the alarm bus. To further check the audible alarm, remove the alarm lamp with the lamp cap extractor and the lamp extractor. Perform the same procedure as above. This checks the audible alarm through the resistor that is in parallel with the lamp.

c. Check the fuse alarms on the fuses located on the master rack fuse panel by placing the prod end of the test lamp simultaneously on the alarm terminal contact areas and the indicator spring of the mounted fuse. Appropriate audible and visual alarms should operate. Repeat this procedure for each fuse on the master rack fuse panel.

d. Check that indicator alarm type fuses are correctly mounted. If the fuses are incorrectly mounted, the audible or visual alarm will not operate.

e. Enter the test results on figure B-1, USACEEIA FM 117-1-R.

4. SWITCHBOARD MULTIPLE TESTS. Switchboard multiple wiring must be tested for continuity. Continuity tests must be made at each appearance of a number. Also, an overall test from the distributing point to the last appearance in the switchboard is required. In addition, multiple wiring should be tested for shorts, crosses, and grounds, preferably with a volt-ohmmeter. Enter the test results on figure B-2, USACEEIA FM 117-2-R.

4.1 Continuity Test. Insert one test plug into the first jack of the multiple under test and insert the other test plug into the last jack of the multiple. Operate the T, R, and S keys in sequence. The buzzer should operate as each key is pressed. If the buzzer fails to operate when the T key is pressed, an open tip is indicated. Similarly, if the buzzer fails to operate when the R or S key is pressed, an open ring or sleeve, respectively, is indicated. Since reverses will appear as opens on this test, all failures must be retested by the method outlined in paragraph 4.2, to establish whether the troubles are opens or reverses.

4.2 Test for Reverses. Insert the test plugs in the first and last jacks of the multiple under test as indicated in paragraph 4.1. Press the T, R, and S keys separately as in testing for an open. If the buzzer does not operate when the T and R keys are pressed separately, press the T and R keys simultaneously. If the buzzer operates, a reverse between the tip and ring is indicated. Tests for reverse between the tip and sleeve or between the ring and sleeve are made in a similar manner, except that the

T and S keys are used to test for a reverse of tip and sleeve, and the R and S keys are used to test for a reverse between the ring and sleeve.

4.3 Test for Crosses. Insert one test plug in any jack of the multiple under test. Insert the other test plug in any jack of the multiple with which a cross is suspected. If no cross is present, the buzzer will not operate when any test key is pressed or when any two or all three keys are pressed. If a cross is present, the buzzer will operate under the following conditions:

Cross between tip and tip - T key pressed.
Cross between ring and ring - R key pressed.
Cross between sleeve and sleeve - S key pressed.
Cross between tip and ring - T and R keys pressed.
Cross between tip and sleeve - T and S keys pressed.
Cross between ring and sleeve - R and S keys pressed.

5. LINE CIRCUIT TESTS. Make operating tests for line and cutoff relays by using the current flow test set. Adjust set for maximum loop condition. These tests may be made at the line jack except where cutoff jacks are used. Enter the test results on figure B-3, USACEEIA FM 117-3-R.

6. CORD CIRCUIT TESTS.

6.1 Continuity. Continuity tests should be made with a circuit verifier.

6.2 Battery Polarity and Voltage. Each circuit should be checked at one or more points to ensure that the proper battery potential is present. Enter the results on figure B-4, USACEEIA FM 117-4-R.

6.3 Lamp Caps. All supervisory lamp caps should be checked for insulation from battery. Enter the results on figure B-4.

6.4 Busy Test. Before making the busy test, it is necessary to arrange a busy line. Do this by inserting the plug of a cord circuit on an adjacent position into a multiple jack of a line circuit, thus making the line circuit busy. Then connect the operator's set to the position under test and operate the talk key of a cord circuit and touch the tip of either the answering or calling cord of that circuit to the sleeve of the busy line. A distinct click should be heard in the receiver of the operator's set. This test must be made on each cord circuit of the switchboards. Enter the test results on figure B-4.

6.5 Ringing. This test may be made to any available line equipped with a subset, which can be heard from the position under test. When the cord circuits under test have the audible ring feature, connect a test receiver across the tip and ring of the cord associated with the cord being tested. Plug the cord to be tested into the test line and operate the ringing key for about one-half second. The test-line bell should sound, and ringing induction should be heard in the test receiver. Enter the test results on figure B-4.

6.6 Crosstalk.

a. This test is used to measure the amount of induced signal from a switchboard cord circuit to other cord circuits of the same position. A suitable test oscillator and transmission measuring set such as an HP-236A telephone test oscillator and HP-3555B transmission and noise measuring set are required. The test oscillator should be capable of an output level of 0 dBm at 1000 Hz and 600 ohms. The transmission measuring set should be capable of detecting signals of -70 dBm (flat weighted) or 18.5 dBrn (C-message weighted) at 1000 Hz and 600 ohms. Both sets should be equipped with Western Electric Company (WECO) style 309 and 310 jacks for convenience. Arrange the equipment as shown in figure B-5.

b. Set the test oscillator for an output level of 0 dBm at 1000 Hz. Set the transmission measuring set for a 600-ohm terminated input using C-message noise weighting if available, or flat weighting if the measuring set does not have a C-message capability. Adjust the transmission measuring set-range switch for a reading and record the measured level on figure B-4. Measure all cord circuits at the same position. Each circuit should measure less than -60 dBm (flat weighted) or 28.5 dBrn (C-message weighted).

7. CONVERTIBLE LINE CIRCUIT TESTS. Check that the circuits function properly with the intended subscriber sets on both incoming and outgoing calls. Enter the test results on figure B-6, USACEEIA FM 117-5-R.

ACCEPTANCE TEST 1. FUSE AND ALARM TESTS (SEIP 019)		
Fuse position	Alarm status	Remarks
USACEEIA FM 117-1-R 31 JAN 79		

Figure B-1. Acceptance Test 1. Fuse and Alarm Tests.

ACCEPTANCE TEST 2. SWITCHBOARD MULTIPLE TESTS (SEIP 019)		
Multiple	Key results	Remarks
USACEEIA FM 117-2-R 31 JAN 79		

Figure B-2. Acceptance Test 2. Switchboard Multiple Tests.

ACCEPTANCE TEST 3. LINE CIRCUIT TESTS (SEIP 019)		
Jack position	Relay status	Remarks
USACEEIA FM 117-3-R 31 JAN 79		

Figure B-3. Acceptance Test 3. Line Circuit Tests.

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ACCEPTANCE TEST 4. CORD CIRCUIT TESTS (SEIP 019)					
Circuit	Potential	Lamp	Busy	Ring	Remarks

Crosstalk			
Cord circuit	Cord circuit	Level	Remarks

USACEEIA FM 117-4-R
31 JAN 79

Figure B-4. Acceptance Test 4. Cord Circuit Tests.

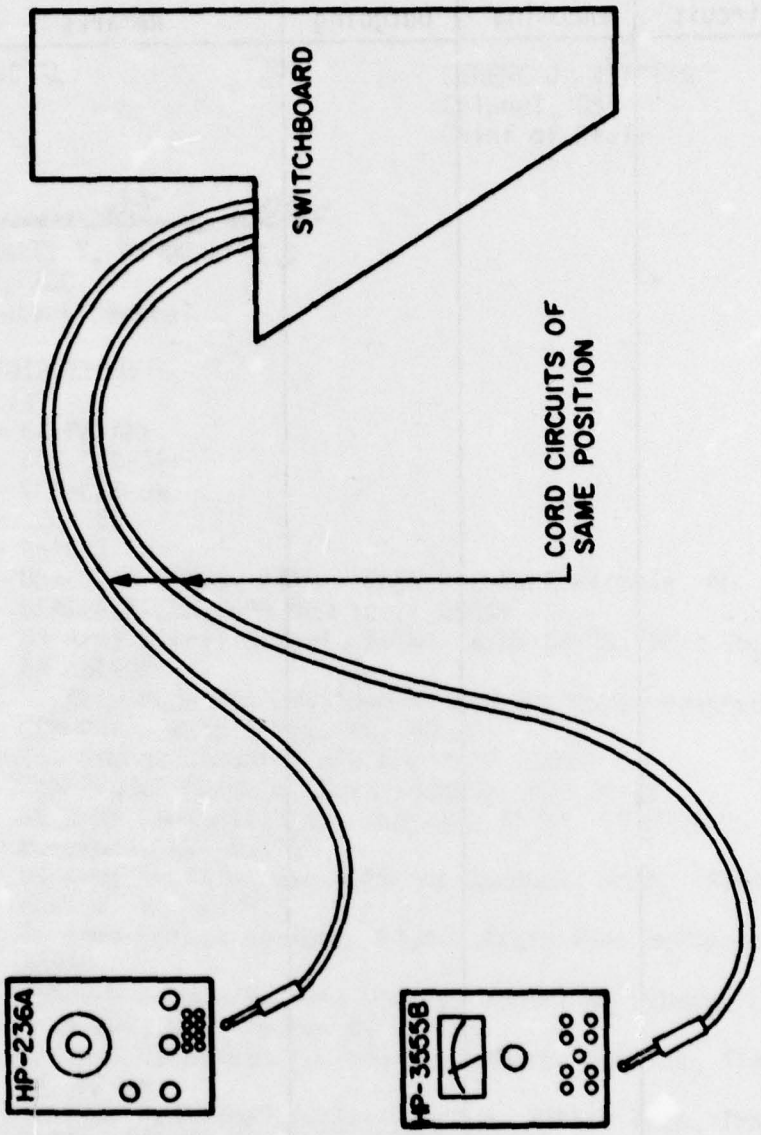


Figure B-5. Crosstalk Test Setup.

ACCEPTANCE TEST 5. CONVERTIBLE LINE CIRCUIT TESTS (SEIP 019)			
Circuit	Circuit results		Remarks
	Incoming	Outgoing	
USACEEIA FM 117-5-R 31 JAN 79			

Figure B-6. Acceptance Test 5. Convertible Line Circuit Tests.

6 April 1979 SEIP 019

(CC-OPS)

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