CIRCUIT DESCRIPTION

CD-2P021-01
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APPENDIX 1A
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15

OPERATIONS SUPPORT SYSTEMS
COMMON
E2A TELEMETRY SYSTEM
SCC REMOTE
APPLICATION SCHEMATIC

CHANGES

D. Description of Changes

D.1 Connection from MN, MNV, MNR, and MNVR leads to
Office Alarm Circuit removed from FS7 and CAD 6,
14, and 21.

D.2 On no-connect table in Note 105, leads MN, MNV,
MNR, and MNVR added.

D.3 Note 115 changed to read "RESERVED".

D.4 On APP FIG. 4, the quantity of CP37 changed from 3 to 4.

D.5 On Note 116 and 117, deleted words "if equipped."

D.6 On Note 102 in APP FIG. 7, "32 relay outputs" changed
to read "48 relay outputs."

D.7 On Note 118, "Bit 11 to A6" changed to read "B11 to
A6."

D.8 On CAD1, CP designation on PWR lead changed from CP4
to CP48; and "or CP37" designation removed from RTN2
and RTN2A leads.

D.9 On CAD8, "For APP FIG. 1, 6" changed to "for APP FIG. 1,
7" in title.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 4163-AW-RJS

OPERATIONS SUPPORT SYSTEMS
COMMON
E2A TELEMETRY SYSTEM
SCC REMOTE APPLICATION

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The SCC E2A remote described in this CD scans statuses from and outputs commands to TSPS/ETS machines and various ESS machines. Several such remotes are monitored and controlled from E2A centrals at the switching control center (SCC). The SCC centrals and end office E2A remotes are interconnected via a 4-wire private line multipoint data network via the 202T data set.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The SCC is a centralized maintenance system for the support and control of stored program switching systems,

presently including No.1 ESS, 2B/No.3 ESS, No.2 ESS/AIS and TSPS/ETS. It is a centralized work station equipped with two types of E2A centrals. One type of E2A central is embedded in a table-top console called the SCC control and display (C&D) console central. The other E2A central, the critical indicator (CI) central, is a stand-alone unit mounted in an SCC equipment cabinet. It is connected to wall mounted critical indicator panels (CIPs). The E2A CI central is described in CD-1C541-01. There is a CIP for each central office (CO) served by the SCC. Each CIP displays a set of critical indicators which provide current status information on each CO connected to the SCC.

2.02 Up to 16 COs, each equipped with an E2A remote, are connected to the critical indicator (CI) central via a 4-wire private line. The CI central and remote stations are hubbed to a private line with a 202T data set at each station.

2.03 In routine operation, the CI central will sequentially and continually interrogate each connected E2A remote for group reporting of the critical indicators. The indicators represent the gross operating condition of the ESS or TSPS machine and its environment. When one or more critical indicators are reported from a TSPS/ETS machine via an E2A remote, a switching arrangement controlled by SCC personnel will dedicate the E2A central in the C&D console to the particular CO that is malfunctioning and an attempt will be made to correct the trouble remotely from the SCC. When in this configuration, the E2A central in the C&D console will cyclically interrogate the troubled CO via group reporting. The E2A remote for TSPS/ETS, for example, will respond by transmitting 288 statuses, including the 16 critical indicators, to characterize the machine and its environment. The status responses are displayed on the C&D console for analysis by the SCC operator. The above general description also applies to other switching machines such as the No. 2 ESS/AIS, No. 2B/ 3ESS, and 1A ESS with differences in the number of statuses and relay control points. The E2A C&D central is described in CD-1C540-01.

2.04 In addition to their group reporting capabilities, the E2A remotes described in 2.03 have a relay output interface that can be activated from the E2A central in the C&D console. There are keys on the C&D console that can be addressed to the corresponding relay outputs in an E2A remote in the CO. This feature allows the SCC operator to remotely close and open switches in an attempt to correct troubles

without the aid of craftforce. In a properly working C&D central and remote, confirmation of each relay output command will be sent from the remote to the central in the form of a quick reply.

2.05 When powered and standing idle with no alarm indication showing, the E2A remote is ready to respond to interrogation from either the CI or C&D central via the 202T data sets and the 4-wire private line. The E2A can respond to three types of commands.

(a) Group Report Commands (from either CI or C&D central)

(b) Relay Output Commands (from C&D central only)

(c) Status Test Commands (from C&D central only)

2.06 The group report command from the central is a one-word command which causes the remote to send one status reply word for each subgroup in that group. There are three groups and a total of 18 subgroups associated with the TSPS/ETS machine. The CI central

polls one subgroup in group four, while the C&D central polls groups one through three which contain a total of eighteen subgroups.

2.07 The purpose of the group report command is to cause the E2A remote to scan a certain selection of status inputs from the CO and to return the state of those statuses to the central in the form of 16-bit data words. The 288 status points at a TSPS/ETS remote are divided among three groups with a certain number of 16-bit data words or subgroups per group. Each bit in a subgroup or data word corresponds to a monitored status point. Group one has six subgroups, group two has four subgroups, group three has eight subgroups, and group four has one subgroup. Group 4 is the critical indicator group and the 16 status points in the group are a subset (group 1, subgroup 1) of the 288 total status inputs divided between groups 1 through 3. The various remotes that can communicate with the SCC centrals have different numbers of group and subgroups of reportable statuses as shown in Table A. Actual assignments of the number of subgroups per group can be determined from Notes 104B, 110, 204, 205, and 206 of SD-2P021-01.

TABLE A

Correlation of type of SCC remote to number of groups/subgroups reportable for various centrals.

SCC REMOTE	SCC C&D CENTRAL		SCC CI CENTRAL	
	Total Groups	Total Subgroups	Total Groups	Total Subgroups
NO. 2 ESS/AIS	3	14	1	1
2B/NO. 3 ESS	2	9	1	1
TSPS/ETS	3	18	1	1
NO. 1A ESS	*	*	*	*

* This information will become available in a later issue.

2.08 FS1 and FS4 show the 202T data set interface with the basic remote module (BRM). All communications between remote and central are transmitted as frequency shift keyed (FSK) signals on the data facility. The E2A remote data set converts the FSK signals to a bipolar binary signal into the BRM. The signals on the data set interface leads follow the Electronic Industries Association (EIA) standard specified in RS-232C (Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial data Interchange).

2.09 Pin 20 of CP48 at Location AF is the input bipolar received data (RD) lead. The bipolar signals are -8 volts for logic ones and +8 for logic zeroes. These signals are converted to unipolar TTL logic in the interface circuit of CP48 (i.e., +3.5 volts for logic ones and several hundred millivolts for logic zeroes) and exit CP48 on Pin 16. CP48 also has circuits which provide alarm

indications in the event of E2A telemetry failures.

2.10 Fig. 1 shows the basic E2A format. E2A telemetry for the remotes described in this CD operates at a 1200 bits/sec data rate. The word format is composed of 26 bits for an approximate length of 20 milliseconds.

2.11 Included in the E2A remote is a CP34 (cross connect) located in area AG of the BRM. On-site selection of the number of groups and the number of subgroups per group to be reported and the remote address to be used can be made by changing the wire connections in the grid structure of the card. Various other conditions can be selected by wiring terminals together in CP34. Among these are status and test report conditioning as detailed in Notes 118 and 123 of SD-2P021-01. This circuit pack also has a dual momentary action switch mounted on its

front to allow personnel to perform an all ones and all zeros test on the remote.

2.12 Prior to each single word or 3-word command, the central data set sends a 10 millisecond all ones level to the data set on the E2A remote. This is called the start sequence. The purpose of the start sequence is to activate the carrier detect circuits in the receiving remote data set to stabilize them for reception. Similarly, the remote data set sends a start sequence to the central data set prior to each status reply or quick reply.

```
      BIT  0   1   2                              17  18           24  25

 1         1   0   X   X                           X   X            X   X

 START SEQUENCE                  DATA FIELD                  PARITY
 (FIRST WORD                                                 FIELD
  ONLY)

        START                                           CONTINUE BIT
        BIT                                             (0 FOR LAST WORD)

               CONTROL
               BIT
```

Fig. 1 - Basic E2A Word Format

2.13 All E2A remotes in the SCC application consist of a basic remote module (BRM). The BRM has a word control portion (CP1, 2, 3, 5), an expander card (CP7), and EIA data interface card (CP48), and a combined input-output portion (CP6 or CP37). The BRM in the TSPS/ETS and No. 2/AIS SCC remotes output 32 relay commands and report status on four subgroups of group 1 status points. The BRM in the 2B/No. 3 SCC remote outputs 24 relay commands and 3 subgroups of group 1 status points utilizing CP37s. The relay outputting and status reporting capabilities of the No.1A SCC remote will be furnished in a later issue.

2.14 The E2A remote has been designed to expand its group reporting and relay outputting capabilities in a modular fashion. This is done in the TSPS/ETS, No. 2 ESS/AIS, and No. 2B/ 3ESS applications by adding expander modules 3 and 4 in tandem to the BRM. The configuration for the No. 1A ESS application will be furnished in a later issue. Expander module 3 always has a CP12 power converter plus one or more status scanning cards. Expander module 4 has nine areas for status scanning cards and relay command decoder cards. Table B shows the various cards that are deployed in expander module 3 to realize the various expansion objectives of the four SCC remotes described in this CD. Similarly, Table C shows the location of various status scanner and relay command decoder cards in expander module 4.

TABLE B

Correlation between SCC system and CP deployment in Expander Module 3

SCC SYSTEM	CP NAME	STATUS SCANNER	STATUS SCANNER	-48V POWER CONVERTER
	CP LOCATION	EA	EB	EC
No. 2B/ 3ESS	CP NO.	35	35	12
2 ESS/AIS	CP NO.	9	53	12
TSPS/ETS	CP NO.	9	9	12
NO. 1A ESS	CP NO.	*	*	*

*Data will be furnished in a later issue.

TABLE C

Correlation Between SCC System and CP Deployment in Expander Module 4

SCC SYSTEM	CP NAME	STATUS SCANNER	STATUS SCANNER	STATUS SCANNER	STATUS SCANNER	STATUS SCANNER	---	RELAY COMMAND DECODER	RELAY COMMAND DECODER	RELAY COMMAND DECODER
	CP LOCATION	FA	FB	FC	FD	FE	FF	FG	FH	FJ
No.2 ESS/AIS	CP NO.	9	9	9	-	-	-	11	11	-
TSPS/ETS	CP NO.	9	9	9	9	9	-	11	11	11
NO.1A ESS	CP NO.	*	*	*	*	*	*	*	*	*
No. 2B/ 3ESS	CP NO.	9	-	-	-	-	-	-	-	-

*This information will become available in a later issue.

SECTION II - DETAILED DESCRIPTION

1. GROUP REPORT COMMANDS

1.01 FS1, FS2, FS3, CAD1, CAD2, CAD9, CAD10, CAD16, and CAD17 and FS2 show the status point leads that connect to the switching control center (SCC) circuits. The SS leads are status leads that share a common ground between the E2A remote and ESS grounds. Group report commands cause the E2A remote to scan the status points and report the results to the E2A central.

1.02 The group report command from the E2A central follows the format shown in Fig. 2. Bits 1, 2, and 3 identify the word as a group report command emanating from the central. A logic 010 in this field alerts all E2A remotes for an incoming group report. Each E2A remote has a particular 8-bit station address which is selected from decimal 1 through 16. This station address is implemented in the word format by using the binary equivalent of one less than its decimal value. Each remote will respond to

its own unique address and a universal address of 256 (8 logic ones). The mechanics of assigning an E2A remote station address is covered in Note 104, Sheet D1 of SD-2P021-01. Bit 13 is a control bit which is described in 1.04 of Section II. Bits 14 through 17 are the group number field. This bit field tells the addressed E2A remote which status leads to scan and to report in the returned status reply words. To implement the desired group number into the group report command format subtract one from the decimal value of the group and convert the result to binary. For example, in the TSPS/ETS application group 3 status reporting requires a 0010 in the group field of the group report command. Table D shows all of the group number field implementations for the TSPS/ETS application. Bits 18 through 24 are the 7-bit parity field. The parity set in these bits is determined according to the values set in bits one through 17. The parity value is determined and automatically inserted by the E2A central. The procedure by which correct parity is determined is described in Section II, Part 7.

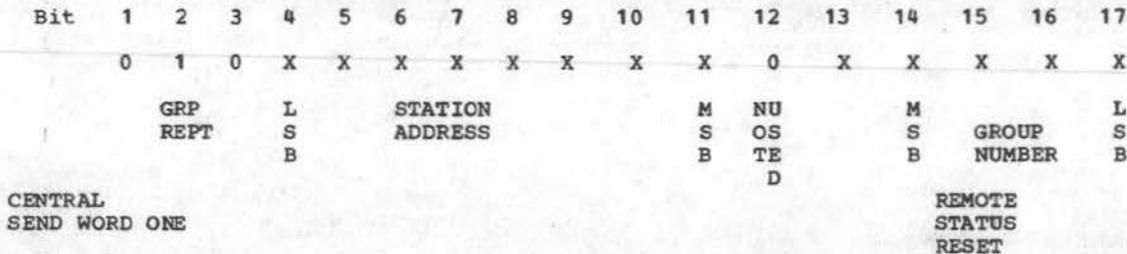| Bit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	0	1	0	X	X	X	X	X	X	X	X	0	X	X	X	X	X
		GRP REPT		L S B		STATION ADDRESS					M S B	NU OS TE D		M S B		GROUP NUMBER	L S B
	CENTRAL SEND WORD ONE													REMOTE STATUS RESET			

Fig. 2 - Group Report Command Format

1.03 Fig. 3 shows the format of the remote status reply word(s). The reply transmitted from an E2A remote in response to a group report command is one or more words corresponding to the number of scans or subgroups. Table D shows the correlation of E2A remote circuit pack locations, group, and subgroup numbers to the TSPS/ETS scan number and status points. A remote status reply word is required to report the data from each 16-bit scan. The E2A remote response for TSPS/ETS, for example, will have six words for group one, four words for group two, and eight words for group three. The C&D central can send group report commands for groups one through three. However, the CI central can only request group four which gives the 16 critical indicators of group one subgroup one (area AA) in the one word response from the remote. This applies to all four ESS machines covered in this CD. Table E shows the correlation of E2A remote circuit pack locations, group and subgroup numbers to the No. 2B/ 3ESS scan number and status points. Table F shows the correlation of E2A remote circuit pack locations, group and subgroup numbers to the No. 2 ESS/AIS scan number and status points. Data on the No. 1A ESS machine will be furnished in a later issue.

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

STATUS INFORMATION BITS

REMOTE SEND

Fig. 3 - Status Reply Format

TABLE D

CORRELATION OF E2A REMOTE CIRCUIT PACKS TO

TSPS/ETS STATUS POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN GRP NUMBER FIELD (BITS 14-17)	TSPS/ETS ESS SCAN NUMBER	E2A REMOTE GROUP NUMBER	E2A REMOTE SUBGROUP NUMBER	TSPS/ETS STATUS POINTS
COMBINED	6	AA		1		1	SS1-1 THRU SS1-16
INPUT/	6	AB		2		2	SS2-1 THRU SS2-16
OUTPUT 1	6	AC		3		3	SS3-1 THRU SS3-16
	6	AD	0000	4	1	4	SS4-1 THRU SS4-16
	9	FA		5		5	SS5-1 THRU SS5-16
	9	FA		6		6	SS6-1 THRU SS6-16
	9	EA		7		1	SS7-1 THRU SS7-16
	9	EA		8		2	SS8-1 THRU SS8-16
	9	EB	0001	9	2	3	SS9-1 THRU SS9-16
STATUS	9	EB		10		4	SS10-1 THRU SS10-16
SCANNER 1	9	FB		11		1	SS11-1 THRU SS11-16
	9	FB		12		2	SS12-1 THRU SS12-16
	9	FC		13		3	SS13-1 THRU SS13-16
	9	FC		14		4	SS14-1 THRU SS14-16
	9	FD	0010	15	3	5	SS15-1 THRU SS15-16
	9	FD		16		6	SS16-1 THRU SS16-16
	9	FE		17		7	SS17-1 THRU SS17-16
	9	FE		18		8	SS18-1 THRU SS18-16
COMBINED INPUT/ OUTPUT 1	6	AA	0011	1 (CRIT. IND. SCAN)	4	1	SS1-1 THRU SS1-16 (CRITICAL INDICATORS)

TABLE E

CORRELATION OF E2A REMOTE CIRCUIT PACKS TO

2E/NO. 3 ESS STATUS POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN GRP NUMBER FIELD (BITS 14 - 17)	2B/NO. 3 ESS SCAN NUMBER	E2A REMOTE GROUP NUMBER	E2A REMOTE SUBGROUP NUMBER	2B/NO. 3 ESS STATUS POINTS REQUESTED
COMBINED	37	AA		1		1	SS1-1 THRU SS1-16
INPUT/	37	AB	0000	2	1	2	SS2-1 THRU SS2-16
OUTPUT 2A	37	AC		3		3	SS3-1 THRU SS3-16
	9	FA		5		5	SS5-1 THRU SS5-16
	9	FA		6		6	SS6-1 THRU SS6-16
	35	EA	0001	7	2	1	SS7-1 THRU SS7-16
				8		2	SS8-1 THRU SS8-16
STATUS	35	EB		9		3	SS9-1 THRU SS9-16
SCANNER 3				10		4	SS10-1 THRU SS10-16
COMBINED	37	AA	0011	1	4	1	SS1-1 THRU SS1-16
INPUT/							(CRITICAL INDICATORS)
OUTPUT 2A				(CRIT. IND. SCAN)			

TABLE F

CORRELATION OF E2A REMOTE CIRCUIT PACKS TO

NO. 2 ESS/AIS STATUS POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN GRP NUMBER FIELD (BITS 14 - 17)	NO. 2 ESS/ AIS SCAN NUMBER	E2A REMOTE GROUP NUMBER	E2A REMOTE SUBGROUP NUMBER	NO. 2 ESS/AIS STATUS POINTS REQUESTED
COMBINED	6	AA		1		1	SS1-1 THRU SS1-16
INPUT/	6	AB		2		2	SS2-1 THRU SS2-16
OUTPUT 1	6	AC	0000	3	1	3	SS3-1 THRU SS3-16
	6	AD		4		4	SS4-1 THRU SS4-16
STATUS	9	FA		5		5	SS5-1 THRU SS5-16
SCANNER 1	9	FA		6		6	SS6-1 THRU SS6-16
	9	EA	0001	7	2	1	SS7-1 THRU SS7-16
				8		2	SS8-1 THRU SS8-16
STATUS	53	EB		9		3	SS9-1 THRU SS9-16
SCANNER 4				10		4	SS10-1 THRU SS10-16
				11		1	SS11-1 THRU SS11-16
STATUS	9	FB	0010	12	3	2	SS12-1 THRU SS12-16
SCANNER 1				13		3	SS13-1 THRU SS13-16
	9	FC		14		4	SS14-1 THRU SS14-16
COMBINED	6	AA	0011	1	4	1	SS1-1 THRU SS1-16
INPUT/							(CRITICAL INDICATORS)
OUTPUT 1				(CRIT. IND. SCAN)			

1.04 FS1, CAD1, CAD9, and CAD16 show FIN and FINR leads connected to J2 of the remote. These leads provide an end of scan pulse to the office circuits when a group report command is sent from the central to the remote with the status reset bit (bit 13) set at logic one. The 150-ms end of scan pulse occurs at the end of the group report. When bit 13 is logic zero, no end of scan pulse will be sent. Note 114 of SD-2P021 gives details concerning the end of scan indication.

2. RELAY OUTPUT COMMANDS

2.01 Relay commands are outputted to the various ESS machines from the E2A remotes via CC leads. These leads are divided into

segments of 16 and called blocks. Each block of 16 CC leads has its own common return lead (RTN1, RTN2, etc.). The SCC remote has five blocks of CC leads thus allowing up to 80 CC relay commands to be outputted. Data in Table G relates the CC leads to CP name, number, location, binary block number in the relay address field of each relay command and decimal block number for the TSPS/ETS machine. Data in Table H relates the CC leads to CP name, number, location, binary block number in the relay address field of each relay command and decimal block number for the No. 2B/ 3ESS machine. Table J gives the same type of information for the No. 2 ESS/AIS machine. Data on the No. 1A ESS machine will be supplied in a later issue.

2.02 The SCC E2A C&D central generates all relay commands that are to be sent to output relays on CP6 or CP11 on the SCC

remote. Initially, these relays will be in the open or break condition as a result of the powering up process. Then, the operation of a key on the C&D central keyboard initiates the actual relay command to effect either a make or break at a SCC remote output relay. The output relay will remain in the effected condition until an opposite command is sent from the central. In all cases, relay commands interrupt the group reporting sequence at the end of the status reply response in progress. After the relay command is sent, a quick reply command verification is returned from the E2A remote to the central. At this point, status reporting for group one resumes regardless of where the interruption took place. Status test commands interrupt group reports the same as relay commands but do not affect output relays in the SCC remote.

TABLE G

CORRELATION OF E2A REMOTE CIRCUIT

PACKS TO TSPS/ETS COMMAND POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN BLOCK NUMBER FIELD (BITS 10-14)	BLOCK NUMBER	TSPS/ETS COMMAND CLOSURE (CC) POINTS
COMBINED INPUT/OUTPUT 1	6	AA	00000	1	CC1-1 THRU CC1-8
	6	AB			CC1-9 THRU CC1-16
	6	AC	10000	2	CC2-1 THRU CC2-8
	6	AD			CC2-9 THRU CC2-16
COMMAND DECODER	11	FG	01000	3	CC3-1 THRU CC3-16
	11	FH	11000	4	CC4-1 THRU CC4-16
	11	FJ	00100	5	CC5-1 THRU CC5-16

TABLE H

CORRELATION OF E2A REMOTE CIRCUIT

PACKS TO No. 2B/ 3ESS COMMAND POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN BLOCK NUMBER FIELD (BITS 10-14)	BLOCK NUMBER	No. 2B/ 3ESS CLOSURE (CC) POINTS
COMBINED INPUT/OUTPUT 2A	37	AA	00000	1	CC1-1 THRU CC1-8
	37	AB			CC1-9 THRU CC1-16
	37	AC	10000	2	CC2-1 THRU CC2-8

TABLE J

CORRELATION OF E2A REMOTE CIRCUIT

PACKS TO NO. 2 ESS/AIS COMMAND POINTS

CP NAME	CP NUMBER	CP LOCATION	LOGIC IN BLOCK NUMBER FIELD (BITS 10-14)	BLOCK NUMBER	No.2 ESS/AIS COMMAND CLOSURE (CC) POINTS
	6	AA	00000	1	CC1-1 THRU CC1-8
COMBINED INPUT/OUTPUT 1	6	AB			CC1-9 THRU CC1-16
	6	AC	10000	2	CC2-1 THRU CC2-8
	6	AD			CC2-9 THRU CC2-16
COMMAND DECODER	11	FG	01000	3	CC3-1 THRU CC3-16
	11	FH	11000	4	CC4-1 THRU CC4-16

2.03 The relay output commands are 3-word commands. The word formats are shown in Fig. 4. The first word as indicated by a logic zero in bit one, is a priming word. This word has the format of a special group report command with the exception that the central address (all ones in bits 5 through 11) and quasi group 32 (all ones in bits 13 through 17) are specified. This priming word alerts each E2A remote to look for its address in the next received word.

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WORD 1	0 CS W1	1 GRP REPT	0 LSB	0	1	1	1	1	1	1	1 MSB	0 NOT USED	1 MSB	1	1	1	1 LSB
						CENTRAL ADDRESS (STA ADRS)								GRP 32			
WORD 2	1 NOT CS W1	0 NOT USED	0	X LSB	X	X	X	X	X	X	X MSB	0 NOT USED	0	1	1	1	1
						STATION ADDRESS								I/O ADRS 16			
WORD 3	1 NOT CS W1	X	0 NOT USED	0	0	X LSB	X RELAY NUMBER	X	X MSB	X LSB	X BLOCK	X NUMBER	X MSB	X	X	X	X

RELAY ADDRESS

OPERATE (1)
OR
RELEASE (0)

NOT USED

Fig. 4 - Relay Output Command

2.04 The second word contains the address of the E2A remote (bits 4 through 11) which is to receive and react to the relay output command. Bit one is a logic one to indicate that the word is not an E2A central first word. Bits 2, 3, 12 and 13 are not used and should be logic zeros. Bits 14 through 17 are logic ones to indicate that the third word will be a relay output command word.

2.05 The third word contains information about the relay to be addressed in the relay output command. Bit one is a logic one to

indicate that it is not a first word transmission. Bit 2 indicates the desired switch operation (logic one for operate, logic zero for release). Bits 6 through 14 contain the relay address field in binary logic minus one. This field is further divided into the relay number (bits 6 through 9) and the block number (bits 10 through 14). The relay address is decoded into relay and block number at the E2A remote to select a particular CC lead. Each CC lead connects to a particular relay in the SCC circuits.

2.06 After reception of the three relay output command words, the E2A remote will transmit a quick reply. The format of the quick reply is shown in Fig. 5. The transmission of a quick reply by an E2A remote indicates an errorless reception of the previous transmission. The E2A remote will not return a quick reply unless all three words of the relay output command have been received without error.

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

REMOTE SEND

Fig. 5 -Quick Reply Format

3. STATUS TEST COMMANDS

3.01 The SCC remote receives status test commands from the central or a Quantec Model 2474 E2A station test set for the purpose of testing the ability of the remote to perform status reporting. This command causes all ones or zeros to be imposed on every status point at each addressed remote in the CO. When a group report command is sent, all the status lamps on the indicator panel at the

central will become either all on or all off. The command is coded as a relay command addressed to one of the two highest numbered relays except that bits 15, 16 and 17 are also ones as shown in Fig. 6. The status test command will remain in effect until a relay command addressed to another relay is sent. It should be noted that bit 6 is the test code with a one for an all ones test and zero for an all zeros test.

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WORD 1	0 CS W1	1 GRP REPORT	0	0 L S B	1	1	1	1	1	1	1 M S B	0 NOT USED	1 M S B	1	1	1	1 L S B
						CENTRAL ADDRESS (STA ADRS)									GRP 32		
WORD 2	1 NOT CS W1	0 NOT USED	0	X L S B	X	X	X	X	X	X	X M S B	0 NOT USED	0	1	1	1	1
						STATION ADDRESS									I/O ADRS 16		
WORD 3	1 NOT CS W1	X	X	X NOT USED	X	X	1 TEST CODE	1	1	1 ALL 1s	1	1	1	1	1	1	1
	OPERATE(1) OR RELEASE(0)																

Fig. 6 - Status Test Command

4. ALARM FEATURES

4.01 The E2A remote alarm interface is shown in FS1, CAD1, CAD6, CAD9, CAD14, CAD16,

and CAD21 of SD-2P021-01. The remote is equipped with four built-in fault detection circuits on CP48 (area AF) that will provide indications of E2A system failure as follows:

2B

(a) REMF - remote failure - a ground on this lead indicates that the remote does not respond to an interrogation from the central within 2 seconds.

(b) CENF - central failure - a ground on this lead indicates that the central has not interrogated the remote for 30 seconds or more.

(c) PWROK - power OK - a ground on this lead indicates that the -48 volt input and the power converter outputs from CP12 are present. High impedance on this lead indicates power failure.

(d) TOK - telemetry OK - a ground on this lead indicates that neither CENF, REMF or power failure have occurred. High impedance on this lead indicates CENF, REMF, or power failure.

4.02 The alarm conditions listed in 4.01 result in an alarm indication (red lamp) on CP48. A momentary action switch cn CP48 is used to reset all of the alarm detection circuits except PWROK. When the switch is released and the failure persists, the lamp alarm will occur again. An SCC switch which is connected to the TAR, TARR leads of the E2A remote will also cause the alarm detection circuits to act in the same way.

4.03 In addition to the lamp indication a TOK failure (REMF, CENF, or power failure) will cause a closure to be placed across the minor alarm leads, MN and MNR and the minor visual alarm leads, MNV and MNVR. The MN and MNR leads will remain shorted until the switch on CP48 is operated to the alarm cutoff (ACO) position. All four leads will open by operating the switch to the RESET position and remain open if the fault has been cleared. If the fault persists, the visual (MNV, MNVR) alarm indication will reoccur. Subsequent audible (MN, MNR) alarm indicators will be masked until the switch is returned to the normal (center-off) position. The CENF, REMF, PWROK, TOK and TAR, TARR leads shown in FS1 are alarm leads that are described in detail in Notes 113 and 115, Sheet D1, of SD-2P021-01. The MN and MNV functions terminate on TSA of the E2A remotes and are described in detail in Note 115, Sheet D1, of SD-2P021-01.

5. KILL TELEMETRY FEATURE

5.01 The KT, KTR leads shown in FS1 represent a kill telemetry feature that the ESS circuits exercise against the E2A remote.

5.02 A closure between the KT and KTR leads will cause the E2A remote to inhibit scanning of all SS leads and will release all output relays on CP6, CP37, and CP11. When the closure is opened, the E2A remote will respond normally. The relays will remain released until operated by subsequent relay output commands from the C&D central.

6. REMOTE TEST FEATURES

6.01 The E2A remote is equipped with a built-in manual test capability which is useful in isolating failures between the E2A remote and the ESS circuits.

6.02 CP34 at location AG is equipped with a three position spring loaded TEST 1-TEST 0 switch. When the E2A remote is in the non-test mode the switch rests in the center position. When the switch is operated and held in the TEST 1 position all ones are superimposed at the status inputs from the ESS circuits. Conversely, when the switch is operated and held in the TEST 0 position all zeros are superimposed at the status inputs. The ones and zeros are transmitted in the status reply response to a group report command from either the C&D central or the CI central. The superimposed test data is replaced by the data from the ESS circuits when the switch is released to the normal (center-off) position.

7. REMOTE POWER REQUIREMENTS

7.01 The E2A remotes used in the SCC application of E2A telemetry obtain power from central office battery circuits. Table K shows the various voltages and currents used and their source for each application.

TABLE K

Power required for each SCC Remote Application

SCC REMOTE APPLICATION	COB		SCC CIRCUITS	
NO. 2 ESS/AIS	-48V,	0.92A	+24V,	58mA
2B/NO. 3 ESS	-48V,	0.90A	+24V,	18mA
TSPS/ETS	-48V,	1.11A	+24V,	162mA
NO. 1A ESS	*		*	

* This information will be furnished in a later issue.

7.02 The -48 volts is used to operate a power converter circuit pack (CP12, location EC) in the remote. The power converter is used to furnish +5, +15, and -15Vdc required by the remote. Also, the power converter supplies +15Vdc and -15Vdc to the 202T data set associated with the E2A remote. The +24Vdc is a user supply voltage (USV) and is connected to the E2A remote at USVA, USVB, USVC, and USVD on TSB in the TSPS/ETS application. The +24 Vdc is then distributed to areas AA, AB, AC, AD, EA, EB, FA, FB, FC, FD, and FE. In the 2B/No. 3ESS application the +24V user supply voltage is connected internally to the CP9 in area FA via USV on

terminal strip B. In the No. 2 ESS/AIS application, the +24V user supply voltage is distributed internally to areas AA, AB, AC, AD, EA, EB, FA, FB, and FC via USV on terminal strip B. These user voltages are used to provide a conditioning voltage to the scanning circuits as explained in Notes 302 and 303 in SD-2P021-01.

8. PARITY BIT COMPUTATION

8.01 The E2A remote has built-in parity generation circuits that will insert correct parity in all transmitted words, and will check for correct parity in all received words.

8.02 To generate parity bits for bits 1 through 17 in any given E2A word format, the following procedure may be followed.

8.03 First, consider bit position vs. parity.

BIT IN POSITION	PARITY
1	0011001
2	1011000
3	0101100
4	0010110
5	0001011
6	1010001
7	1111100
8	0111110
9	0011111
10	1011011
11	1111001
12	1101000
13	0110100
14	0011010
15	0001101
16	1010010
17	0101001
Virtual Bit	0110010

8.04 Next, add the parity codes for each logic 1 in the bit positions 1 through 17 but do not carry. (Note that 0+0=0, 0+1=1, and 1+1=0.)

8.05 Next, add to this total the parity code for the virtual bit (again do not carry).

8.06 The result is the parity code for the desired E2A word. Note that parity for an all zeroes word is simply the parity code for the virtual bit.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01
DESIGNATIONS	WORKING LIMIT
-48Vdc source	-44Vdc to -52Vdc,
+24Vdc source	+21Vdc to +27Vdc,

2. FUNCTIONAL DESIGNATIONS

2.01 TERMINALS

DESIGNATION	MEANING
-48, -48R	Connection to -48V source (c.o. battery)
F GRD (TSB)	Connects to central office frame ground (SD-2P021-01, Note 108)
MN, MNR	Provides an E2A remote minor alarm connection to central office audible alarm circuits (SD-2P021-01, Note 115)
MNV, MNVR	Provides an E2A remote minor alarm connection to central office visual alarm circuits (SD-2P021-01, Note 115)
+15	Supplies +15V power to 202T data set
-15	Supplies -15V power to 202T data set
GRD	Provides data set ground return for +15V and -15V power
F GRD (TSC)	Provides frame ground for data set
USV	Connection to +24V source in SCC circuits, supplies user supply voltage to combined input-output and status scanner cards in equipped locations AA, AB, AC, AD, EA, EB, FA, FB, FC, FD, FE (No. 2ESS/AIS and No. 2B/ 3ESS

USVA — Connection to +24V source in SCC circuits, supplies USV to CP6s in locations AA, AB, AC, AD of BRM in TSPS/ETS application

USVB — Connection to +24V source in SCC circuits, supplies USV to CP9 in location EA of expander module 3 in TSPS/ETS application

USVC — Connection to +24V source in SCC circuits, supplies USV to CP9 in location EB of expander module 3 in TSPS/ETS application

USVD — Connection to +24V source in SCC circuits, supplies USV to CP9s in equipped locations FA, FB, FC, FD, FE in TSPS/ETS application

2.02 LEADS

DESIGNATION	MEANING
SS	Single lead status inputs from ESS machine or TSPS/ETS (SD-2P021-01, Note 109)
CC	Relay outputs from the E2A remote to the ESS machine or TSPS/ETS (SD-2P021-01, Note 111)
KT/KTR	Represents a kill telemetry override to the E2A remote from ESS machine or TSPS/ETS (SD-2P021-01, Note 112)
FIN/FINR	Provides an "end of scan" indication from the E2A remote to ESS machine or TSPS/ETS (SD-2P021-01, Note 114)
TAR/TARR	Provides a telemetry alarm reset to the E2A remote from ESS machine or TSPS/ETS (SD-2P021-01, Note 113)
CENF	Provides an E2A central fail indication to the ESS machine or TSPS/ETS (SD-2P021-01, Note 113)
REMF	Provides an E2A remote fail indication to the ESS machine or TSPS/ETS (SD-2P021-01, Note 113)

PWROK — Provides an indication to the ESS machine or TSPS/ETS that power is OK in E2A remote (SD-2P021-01, Note 113)

TOK — Provides an indication to the ESS machine or TSPS/ETS that neither CENF, REMF, or power failure have occurred (SD-2P021-01, Note 113)

3. FUNCTIONS

3.01 Scans status from No. 2 ESS/AIS, No. 2B/ 3ESS, TSPS/ETS, and No. 1A ESS machines and reports results to the SCC central.

3.02 Outputs relay outputs to the No. 2 ESS/AIS, No. 2B/ 3ESS, TSPS/ETS and No. 1A ESS machines.

3.03 Receives status test commands from the central in order to test the ability of the remote to perform status reporting.

4. CONNECTING CIRCUITS

4.01 No. 2 ESS/AIS

(a) SD-2H009-01, Issue 19B (Maintenance Center Circuit)

(b) SD-2H010-01, Issue 14B (TTY Control Circuit)

4.02 No. 2B/ 3ESS - SD-1C907-01, Issue 2 (System Status Panel Controller).

4.03 TSPS/ETS - SD-1C107-01

4.04 No. 1A ESS (This information will be furnished when available.)

4.05 202T Data Set - SD-1D243-01

4.06 Central Office Alarm System

5. MANUFACTURING TESTING REQUIREMENTS

5.01 Testing requirements are covered in the following specifications:

(a) X-79016 for TSPS/ETS

(b) X-79144 for 2B/No. 3ESS

(c) X-79145 for No. 2 ESS/AIS

5.02 Testing requirements for No. 1A ESS will be furnished when available.

6. ALARM INFORMATION

6.01 See SD-2P021-01, Notes 113 and 115.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 Before disconnecting E2A telemetry remote, SCC C&D console central personnel should be notified that the E2A remote will be out of service. All power to the remote shall be deenergized before circuit packs are removed or inserted.

SECTION IV - REASONS FOR REISSUE

CHANGES

B. Changes in Apparatus (Components)

B.1 Added

APP FIG.'s 8, 9 and 10.

B.2 APP FIG. 1

Superseded	Superseded By
BRM (See note 1), Circuit Module ED-1C964-30, G1, G4 & G7	BRM (see note 1), Circuit Module ED-1C964-30, G1, G2, G4 & G7

B.3 APP FIG. 4

Superseded	Superseded By
CP37 (3 Reqd), Circuit Packs ED-1C964-30, Three G6	CP37 (4 Reqd), Circuit Packs, ED-1C964-30, Four G6

Added

J4, Connector, KS-21133,L1
J5, Connector KS-21133,L1

B.4 APP FIG. 6

Removed

J7, Connector KS-16672,L10
JA, Connector KS-16672,L1
PA, Connector KS-16671,L1

D. Description of Changes

D.1 The following changes have been made to provide for 2B/3ESS Remote (J92621AE).

(a) APP FIG.s 8 and 10 added.

(b) BD2 BLOCK DIAGRAM added.

(c) "Support Information Table," added J92621AE.

(d) CAD 9 through CAD 15 added.

(e) Notes 102, 104(B), 120, 204, 205, 206, and 207 updated.

(f) Note 122 added (part of).

(g) FS2, added information for leads label "See note 116".

(h) APP FIG. 4 added connectors J4 and J5.

D.2 The following changes have been made to modify module wiring to permit EN1B and V1 connections allowed in SC-1C533-01. Non-product affecting change.

(a) FS1, FS2, FS3, CAD3, CAD4, CAD6, CAD7, added option Y, previous wiring made option Z.

(b) Notes 123 and 124 added.

D.3 The following changes have been made to provide for 2ESS/AIS SCC Remote (J92621 AD).

(a) APP FIG. 9 added,

(b) BD3 FS BLOCK DIAGRAM added.

(c) CAD 16 through CAD 22 added.

(d) "Support Information Table", added J92621 AD.

(e) FS2, added "or (CP53)" to "(CP9) or (CP35)EB".

(f) FS2, added +5 lead to 201 EC(CP12). Also added information for leads label. "See note 116."

(g) APP FIG. 6, removed connectors J7, JA, and PA.

(h) On sheet C1 (APP FIG sheet) updated notes 2 and 3.

(i) Notes 102, 104, 118, 120, 204, 206 and 207 updated.

(j) Note 122 added (part of).

D.4 The following changes are made to modify and to simplify the user voltage distribution scheme. Non-product affecting change.

(a) Note 118 (part of) rewritten.

(b) FS3, added GRD lead near 205, also "see note 123".

D.5 The following changes are non-product affecting drawing changes.

(a) GRD lead to "208 EA" was "to GRD BUS",

(b) On GRD lead near -48R lead removed "to GRD BUS" and added 13 EC(CP12).

(c) On -48R lead removed "E6" and added "EC".

(d) FS3 removed or "(CP35)" from "FA(CP9)", "FC(CP9)", "FB(CP9)", "FE FA(CP9)".

(e) Note 113, "CP4" changed to "CP 48".

(f) Note 102, updated information for APP FIG.s 6 and 7.

(g) Note 116, updated.

(h) Note 205, changed See Notes "121, 122" to "120".

(i) Note 206, changed See Notes "121" to "120".

(j) Note 207, added J92621M.

(k) Note 208, updated.

(l) CAD1, CAD2, CAD3, CAD4, CAD5, CAD6, CAD7, and CAD8; updated notations where leads go and notation "For APP FIG.".

D.6 The following changes have been made to clarify data set connections:

(a) FS4, removed P/01 from 202T and in SCC CKT replaced P/01 with J1,

(b) CAD7, CAD15 and CAD22, showed circuit flow for R-T and R1-T1 leads.

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