

TECHNICAL INFORMATION

FOR

EMS-1

SELECTOR MODULE

Approved: *Albrecht*

Issue: 1 2-10-79

2 7-30-79

3 12-15-79

4 5-15-80

5 1/28/82

Issue 5 of I-2120 Selector Module Technical Information applies to equipment with the following or later KS issues.

500160	Backplane	KS 15	600100	Matrix	KS 13
500170	MDA	KS 6	600120	Selector	KS 27
500171	SDA	KS 14	600129	Sel Test	KS 9
500172	Dial Tone	KS 4			
500173	Timing	KS 3			

KS issues can advance without reissue of this instruction when basic data is not affected. The KS issue number often changes for reasons that do not affect the circuit or its operation.

Issue 3 of I-2120 applies to all previous EMS-1 Selector equipment.

Issue 4 of I-2120 applies to Selector issues KS 20 thru 26.

EMS-1 SELECTOR MODULE

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EMS-1

SELECTOR MODULE

DESCRIPTION

- 1.0 The EMS-1 Selector may be used for Local First, Local or Toll Intermediate, Incoming EAS or Toll (SX or Loop Dialing) applications in existing Step-by-Step and XY Systems. This module can be added individually to your present system or in combination with other EMS-1 Modules. It may also be used with EMS-1 Lines and Connectors as a complete Switching System.

Major components of the EMS-1 Selector Equipment consist of the basic Selector Card, Plug-on Digit Treatment Card, Selector Test Card, and the DTA.

The basic Selector Card, when equipped with either the Single Digit or Multi-Digit Treatment Plug-on, receives and translates subscriber dialing and selects the appropriate level and Matrix outlet.

This Circuit may be added to either 3-Wire (Loop Supv.) or 4-Wire (4th Wire Supv.) Systems. The Selector, in conjunction with its associated Matrix Card(s), has the capability of up to 160 outlets for 3-Wire Systems and 120 outlets for 4-Wire Systems. Level size is flexible from one to 40 outlets per level selected by strapping. Different size levels can be assigned in the same shelf. When equipped with the Multi-Digit Treatment Card, assignment of up to 14 levels is possible.

1.1 FEATURES

STANDARD FEATURES include but are not limited to: • Absence of Ground or Battery Searching • Simplex or Loop Dialing • 1900 ohm Loop operation • Busy Key • Level Overflow leads • LED Status Display on faceplate to monitor Out of Service • Selector Busy • Cut Through • Busy Tone returned and Fuse Alarm. A Selector Test Card is provided with each Selector Module. The Test Card enables calls to be traced and to test each Selector to each outlet. Status is displayed numerically on the Test Card faceplate.

Connectorized Module for ease of installation.

1.2 OPTIONAL FEATURES AVAILABLE AS PLUG-ON MODULES

SINGLE DIGIT ABSORPTION — The Single Digit Treatment Card enables the following functions: Absorb and Unlock • Reuse of Digits after Unlocking • Level Blocking (returns 120 IPM Busy Tone) • 10 Level Selection, and Class of Service restriction of one level.

MULTI-DIGIT ABSORPTION — The Multi-Digit Treatment Card with digit translation enables the following functions: • Absorb repeatedly (before or after unlocking) • Absorb and Unlock • Reuse of Digits after Unlocking • Level Blocking (returns 120 IPM Busy Tone) • 14 Levels (Levels 11 through 14 are accessed by intercept or, two, three, or four Digit Translation Codes) • Capability of up to four translated codes • Class of Service Restriction of up to three Levels.

DIAL TONE — For first Selector application.

TROUBLE TIMING OPTIONS — Release Selector after one, two, or four minutes (Selectable) if dialing has not occurred. Used only with Lockout Line Circuits.

FUSE FAILURE BUSY — Buses out Selector with blown fuse, used in Absence of Ground Searching Systems. Use with complete EMS-1 Exchange.

1.3 SPECIFICATIONS - SELECTOR MODULE

GENERAL

Supply Voltage -	44-56 VDC	Temp. Range - (Room Ambient)	+10° TO +120 F
Supply Current			
Idle -	25 mA	Humidity Maximum -	20-90%
Busy -	80 mA	(non condensing)	
Subscriber Loop -	1900 ohm	Surge Voltage Protection -	1500V
Pulsing Speed -	6-16 PPS		

TRANSMISSION

Insertion Loss -	.1dB max.	Harmonic Dist. -	0.15% max.
Crosstalk Loss -	96dB min.	Echo Return Loss -	25dB min.
Long Balance - (1 K Hz at 0dB)	70dB min.	Sing Return Loss -	15dB min.

MECHANICAL

Selector Card Wt. - (with options)	2.5 lbs.	Module Height	
		3 Matrix Cards -	17.5 in.
		5 Matrix Cards -	20.5 in.
Test Card Wt. -	1.7 lbs.	Module Depth -	12.8 in.
Matrix Card Wt. -	11 lbs.		
Module (Cages) Wt. -	16 lbs.		

Specifications subject to change without notice.

1.4 WARRANTY

ITEC, Inc. unconditionally warrants these units to be free of defect in material or workmanship for five years from date of shipment. Any units found defective during the first year will be repaired or replaced at no charge when returned prepaid to our Huntsville facility. During the remaining four years of the warranty, a handling fee will be charged for this service. Any abuse or improper installation will void this warranty.

A Return Material Authorization Number (RMA) must be obtained from the Customer Service Department (205-881-5759) prior to shipment:

The following information should be included with the shipment:

Ship via UPS or Parcel Post to:

ITEC, Inc.
P.O. Box 4147
520 Green Cove Road
Huntsville, Alabama 35802

Adherence to this procedure will facilitate the prompt repair and return of your material.

EMS-1

SELECTORS

1.5 Ordering Information

ORDERING INFORMATION					
#1 Selector and Matrix Card Module			800020		
#2 Selectors	#3 Options	#5 Matrix Cards 3W OUTLETS 4W			
-1, 1 ea. 600120 Sel.	-11, 500170 MDA (14 Levels)	-31, 1 ea. 600100	32	24	
-2, 2 ea. 600120 Sel.	-12, 500171 SDA (10 Levels)	-32, 2 ea. 600100	64	48	
-3, 3 ea. 600120 Sel.	-13, 500172 Dial Tone	-33, 3 ea. 600100	96	72	
-4, 4 ea. 600120 Sel.	-14, 500173 Trouble Timing	-34, 4 ea. 600100	128	96	
-5, 5 ea. 600120 Sel.	-15, 500097 Fuse Failure Busy	-35, 5 ea. 600100	160	120	
-6, 6 ea. 600120 Sel.	#4 Matrix Cage	#6 DTA			
-7, 7 ea. 600120 Sel.	-23, 500045-3 Holds 3 Cards -24, 500045-4 Holds 4 Cards -25, 500045-5 Holds 5 Cards	-40, 500183, 3-Wire DTA Blocks			
-8, 8 ea. 600120 Sel.		-41, 500184, 4-Wire DTA Blocks			
-9, 9 ea. 600120 Sel.					
-10, 10 ea. 600120 Sel.					

NOTES

- #1 BASIC MODULE — The Selector and Matrix Card Module, #800020, consists of one Selector Cage with Back Plane #500044-22, one Selector Test Card #600129, and one Matrix Card Cage #500045. The dash numbers, as shown in the example below, denote how the Module can be equipped.
- #2 QUANTITY OF SELECTORS — Order one basic Module for each ten Selectors or fraction thereof.
EXAMPLE: If 22 Selectors are required, order two each 800020-10 and one each 800020-2.
- #3 OPTIONS — Order dash number as required.
EXAMPLE: -11 (MDA), -13 (Dial Tone).
- #4 MATRIX CAGE — Order dash number 23 if accommodations for three Matrix Cards is required. Order dash 24 for four Matrix Cards, and dash 25 for five Matrix Cards.
- #5 MATRIX CARDS — Order Matrix Cards as required for 3- or 4-Wire Systems per the number of outlets needed.
EXAMPLE: -33 for three Matrix Cards.
- #6 DTA — Order DTA dash number 40 or 41 as required where new DTA is being established. Each DTA consists of one DTA Block and two connectorized Matrix Cables #652004, for each Matrix Card ordered. Mounting Hardware #500037, is provided for mounting the DTA in a 23-inch Rack. Order Grading Blocks and Cable from page 8 if dash 40 or 41 is not ordered. See page 9 for typical Selector/DTA arrangements.
- ** GENERAL — Reference notes #5 and #6 above. Order equipment for 4-Wire operation ONLY for Systems actually utilizing 4th Wire Supervision Control.

EXAMPLE

Note Number	#1	#2	#3	#4	#5	#6
Basic Module and Dash Number	800020	-10	-11 -13	-23	-33	-40

CABLES
SELECTOR, GRADING, OGT AND IDF

ORDERING INFORMATION	
Female Connector One End (Tinned)	Female Connector Both Ends
651025, 1 ea. 25 Feet, 25 Pair	652025, 1 ea. 25 Feet, 25 Pair
651050, 1 ea. 50 Feet, 25 Pair	652050, 1 ea. 50 Feet, 25 Pair
651075, 1 ea. 75 Feet, 25 Pair	652075, 1 ea. 75 Feet, 25 Pair
651100, 1 ea. 100 Feet, 25 Pair	652100, 1 ea. 100 Feet, 25 Pair
651125, 1 ea. 125 Feet, 25 Pair	652125, 1 ea. 125 Feet, 25 Pair
651150, 1 ea. 150 Feet, 25 Pair	652150, 1 ea. 150 Feet, 25 Pair
651200, 1 ea. 200 Feet, 25 Pair	652200, 1 ea. 200 Feet, 25 Pair

NOTES

DTA — When the ITEC DTA dash 40 or 41 is ordered, 4-foot Connectorized Cables will be supplied to connect the DTA to the Matrix Cards.

OGT — Order OGT Cables for OGT Block to succeeding equipment as required.

GRADING — On additions where Grading Blocks are to be mounted in existing Selector Shelves or existing DTA are going to be half tapped, order two Cables per Matrix Card as required.

SELECTORS — Order one Cable per #800020 Module to IDF as required.

TERMINAL BLOCKS
SELECTOR, GRADING, OGT AND IDF

ORDERING INFORMATION	
#1 IDF Blocks	#3 OGT/Grading Blocks
100248, 1 ea. 10 × 25 Connectorized	100232, 1 ea. 6 × 64, 3W Connectorized 100230, 1 ea. 6 × 64, 3W Wire Wrap 100233, 1 ea. 8 × 60, 4W Connectorized 100231, 1 ea. 8 × 60, 4W Wire Wrap
100249, 1 ea. 10 × 26 Wire Wrap	
#2 Mounting Assy. for OGT Blocks	
500036, 1 ea. OGT Blk. Mtg. Assy.	

NOTES

#1 IDF — Order IDF Blocks as required. Each Block will accommodate 5 modules (50 Selectors T,R,S,4W,LR).

#2 The IDF Terminal Blocks specified above are adjustable for 7, 7.5, or 8 inch mounting.

#3 MOUNTING ASSEMBLY — Order as required for mounting OGT Blocks in 23-inch Relay Rack.

#4 (A) OGT BLOCKS — When the ITEC DTA dash 40 or 41 is used, OGT Blocks will be required. Each Block will handle 128 Circuits for 3-Wire Systems and 120 Circuits for 4-Wire Systems. Order Mounting Assembly per note #2 above.

(B) GRADING BLOCKS — On additions where Grading Blocks are to be mounted in existing Selector Shelves, order Grading Blocks as required.

2.0 ENGINEERING & INSTALLATION NOTES

2.1 APPLICATION OF EMS-1 SELECTORS

EMS-1 selectors can be applied in virtually any Strowger SXS or XY application. It can be 3 wire with loop supervision or 4 wire with EC, HS, B, etc. supervision. The 4th wire can also be used to forward control signals (class of service mark) to succeeding equipment. It will receive either loop or simplex pulsing (strapping option). It can function as a full MDA or simple selector.

The EMS-1 selector can translate 2 or 3 digit codes (4 digit if one can be absorbed) and assign the translated code to any level. It is able to do this because it does not process the call until it receives a complete digit or code. It does not store and repeat digits, as it is a selector rather than a mini-register sender.

There are very few applications the EMS-1 selector cannot fill. If you have a special application requirement, ITEC customer service personnel will be happy to provide assistance.

2.2 MOUNTING OF MODULES

All EMS-1 equipment is mounted in 23" relay racks. The tables below provide mounting space requirements and relay rack information.

Relay racks for selector modules use Cable standoffs to support installers cable. Relay racks used for DTA bays will be provided with cable channel on each side.

See Figures 1 & 2 for typical Shelf & DTA mounting arrangements.

The -40 or -41 DTA Option provides one DTA section for each matrix card. The DTA uses plug ended 25 pair cables and it is mounted in the 500037 mounting assembly.

Refer to page 2-14 and to ordering information for additional information. Also see item 2.3.

T E S T C A R D											V A C A N T
	S E L E C T O R										
	1	2	3	4	5	6	7	8	9	10	
Matrix Card #1											
Matrix Card #2											
Matrix Card #3											
Matrix Card #4											
Matrix Card #5											

Figure 1. Shelf Layout

2.3 MOUNTING OF DTA

The DTA panel consists of a 500037 mounting bar assembly, including jumper retainers, and one DTA panel for each equipped Matrix card. See sketch on page 2-14.

The installer must assemble and mount the DTA panels on the relay rack. The location of the DTA panels is important because of the connectorized cable lengths.

In all cases the top mounting bar of the uppermost DTA mounts in the bottom hole of the 1 3/4" mounting space. For installations using -23 and/or -24 (3 or 4 matrix cards respectively) mount the top mounting bar in the 4th hole from the top of the bay (bottom of 2nd mounting space). For installations using -25 (5 matrix cards) mount the top mounting bar in the 12th hole from the top of the bay (bottom of 6th mounting space).

The associated selector cages will mount starting with the 2nd mounting space directly under the fuse panel.

TABLE 1. MOUNTING REQUIREMENTS

The Chart below shows the Mounting Requirements for EMS-1 Modules and Associated Equipment:

RELAY RACK HEIGHT	7'6"		9'0"		11'6" x 11'8"	
Number 1.75 Inch Mtg. Spaces	47		57		73	
Mounting Space Requirements	Number Modules	1.75 Mtg. Spaces	Number Modules	1.75 Mtg. Spaces	Number Units	1.75 Mtg. Spaces
800010 Line/Linefinder Module 14 Mtg. Spaces (24.50 In.)	3	42	4	56	5	70
800020 Selector Module						
-23 Matrix Cage 10 Mtg. Spaces (17.50 In.)	4	40	5	50	7	70
-24 Matrix Cage 11 Mtg. Spaces (19.25 In.)	4	44	5	55	6	66
-25 Matrix Cage 12 Mtg. Spaces (21.00 In.)	3	36	4	48	6	72
800030 Connector Module						
-23 Matrix Cage 10 Mtg. Spaces (17.50 In.)	4	40	5	50	7	70
-24 Matrix Cage 11 Mtg. Spaces (19.25 In.)	4	44	5	55	6	66
DTA Bay Block 5 Mtg. Spaces (8.75 In.)	8	40	10	50	14	70
OGT Block 3 Mtg. Spaces (5.25 In.)	1	3	1	3	1	3
600149 Filtered Fuse Panel 1 Mtg. Space (1.75 In.)	1	1	1	1	1	1

Figure 2.

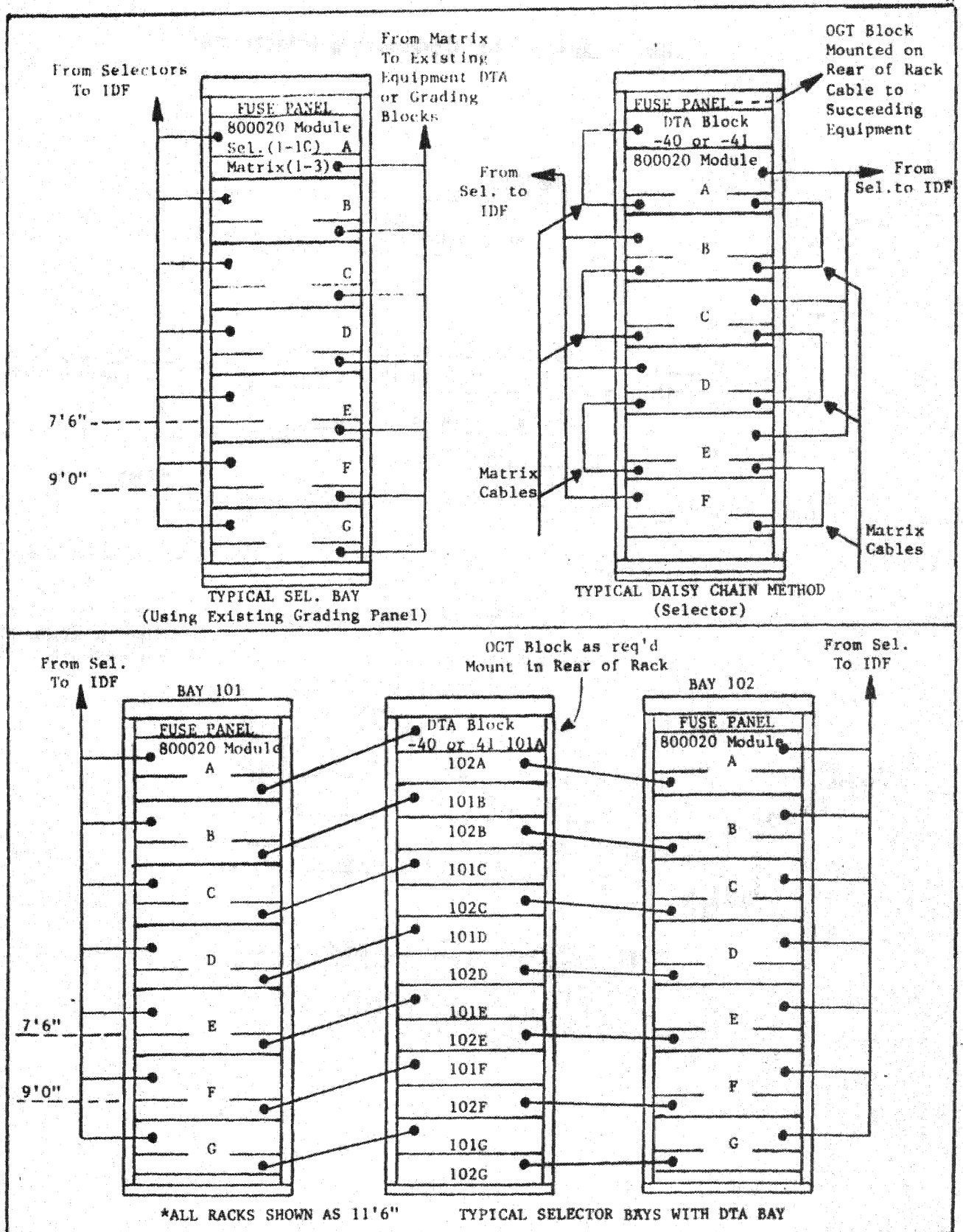
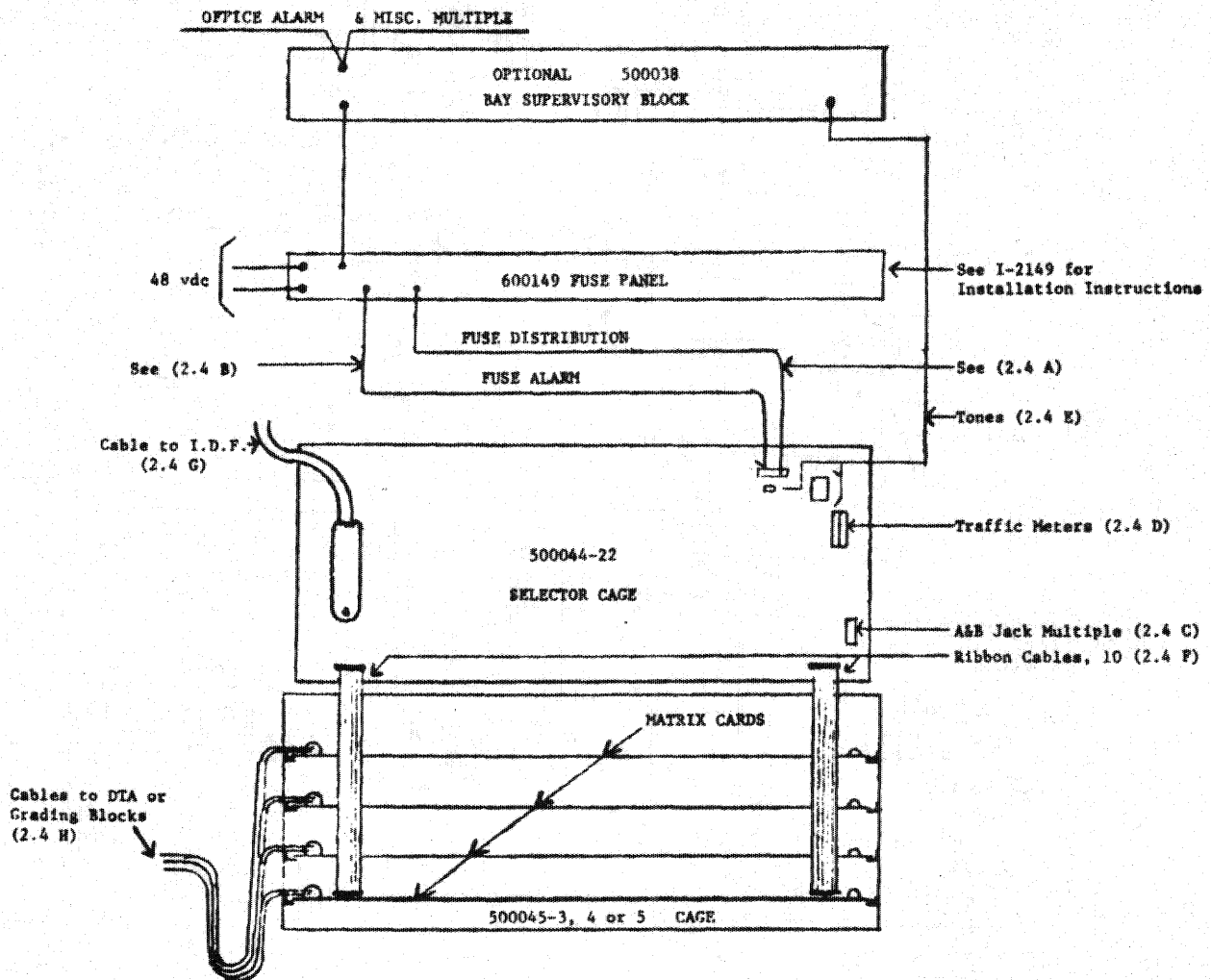


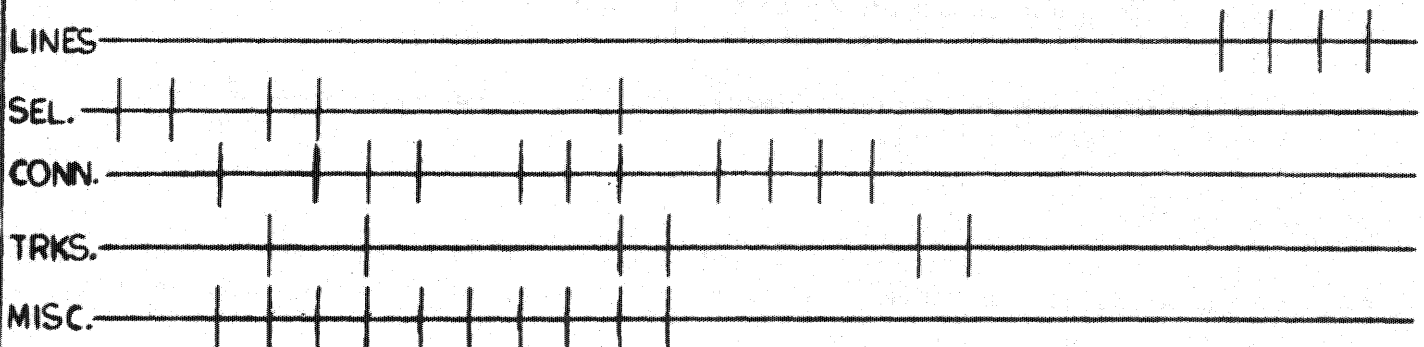
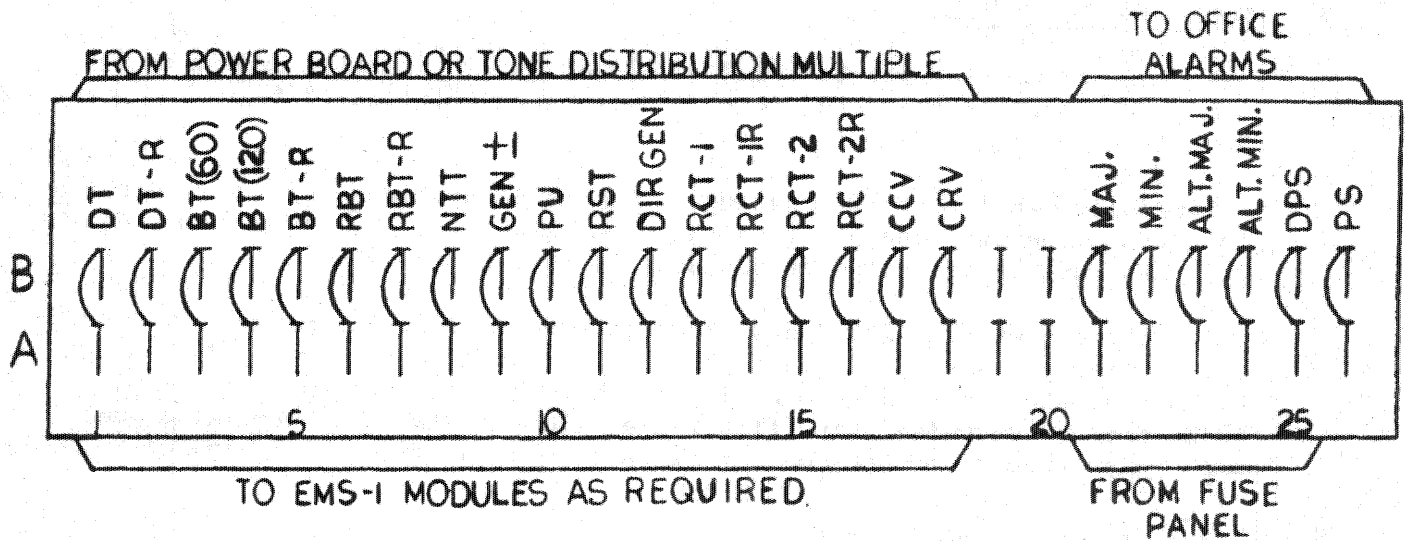
Figure 3. Installers Cabling

(See Figure 6. for Connecting Information)



- NOTES: 1. The number in parenthesis indicates the text paragraph that explains the associate wiring.
2. All wiring to the Fuse Panel must be formed from the left side of the relay rack to allow the Fuse Panel to swing to one side for access from the Front of the bay.

Figure 4.



SUPERVISORY BLOCK LAYOUT

ISSUE	DATE	ENGR	PAGE	
1	1-21-82	CEM	1 OF 2	500038

2.4 CABLING & WIRING - Refer to Figures 2, 3, 4, 5, and 6 for detailed information.

A. POWER WIRING & FUSING

Each selector module must be fused by a single 5 amp fuse on a bay fuse panel. Each selector and the test circuit have individual 3/8 amp fuses on the unit.

The installer shall use 20 gauge wire (paired if available) for battery and ground from the bay fuse panel to the selector backplane. If the proper wire bit is not available the power connections must be soldered.

It is recommended that EMS-1 equipment be powered with filtered battery when it is installed as an addition to Step or XY equipment. One row filter of the appropriate size can be used if all EMS-1 can be powered from the same feeder cable, otherwise, bay filtering similar to SXS or XY connector and trunk bays should be provided. A filtered fuse panel is available from ITEC.

B. FUSE ALARM

Should be wired to the bay fuse alarm in a manner that will cause the bay lamp to light and to activate the office alarm system. It may be necessary to strap out the 500 ohm resistor on the Selector Cage.

A blown fuse on a selector will provide a 500 ohm battery on the FA pin. Reference instruction I-2149 for information on the filtered fuse panel.

C. A & B TEST JACKS

The A & B test jacks can be wired through the office as required. In new installations it is recommended that both A & B be multiplied throughout the office.

The "B" jack can be attached to the finder test line in any line shelf by operating the toggle switch on the finder test card.

D. METER LEADS

The backplane has 14 pins marked Level Busy. Each represents a selector level as strapped on the selector digit treatment card. The installer shall cable with 24 gauge bulk cable to the IDF for cross connecting, or direct to the selector overflow meters per job requirements.

PC/TM1 & TM2 traffic monitoring leads are to be wired to meters or scanner as required. They record selector cut through and level usage. Refer to strapping section for detailed information.

E. BUSY TONE AND DIAL TONE

The installer shall wire 120 IPM busy tone to all selector modules and dial tone to all first selector modules. Determine if the installation requires return leads to the tone source (balanced feed) or if the tone source is grounded, ground the tone return at the equipment and connect the shield to the return. DO NOT CONNECT THE SOURCE END OF THE TONE SHIELD.

Use shielded pair for balanced tones and shielded single for unbalanced tones. Unbalanced tones can use a twisted pair with one end of the mate grounded. When grounding the shield, it is important that the shields be connected together and grounded at one point only to prevent ground loops. Tone wiring should be 22 gauge or larger.

The office multiple is connected to the wire wrap pins near the edge of the backplane that are designated. The other two pins must be strapped to connect the tones to the selectors. If return leads are not used, strap ground (GND pin) to the return leads from the selector for busy tone, and dial tone if used. The row of pins on the left are from the selectors. Refer to Figure 6.

F. RIBBON CABLES - SELECTOR TO MATRIX CARDS

Each selector must be connected to the matrix card equipped in the module. Use that 26 conductor ribbon cables supplied with the matrix cage. Care must be used to insure the ribbon cable connectors are mated properly when plugging them on the backplane and matrix card connectors. Install all ribbon cables even if all selector positions are not equipped.

G. TIP, RING, SLEEVE, 4TH WIRE SUPERVISION & LEVEL RESTRICT LEADS TO SELECTOR

The leads are all contained in the 25 pair connector on the backplane. Use a 25 pair connectorized cable to extend these leads to the IDF for cross-connecting to trunks or line finders or to the DTA (OGT block) of a preceeding selector stage.

The IDF terminal block layout pin assignments and lead colors are presented below.

**TABLE 2. PIN & COLOR ASSIGNMENTS
FOR
25 PAIR CABLE FROM SELECTOR BACKPLANE**

SELECTOR	LEAD									
	TIP		RING		SLEEVE		4TH		LEV. RESTR	
	COLOR	PIN	COLOR	PIN	COLOR	PIN	COLOR	PIN	COLOR	PIN
1	WH-BL	26	BL-WH	1	WH-OR	27	ORN-WH	2	V-BL	46
2	WH-GR	28	GR-WH	3	WH-BR	29	BR-WH	4	BL-V	21
3	WH-SL	30	SL-WH	5	R-BL	31	BL-R	6	V-OR	47
4	R-OR	32	OR-R	7	R-GR	33	GR-R	8	OR-V	22
5	R-BR	34	BR-R	9	R-SL	35	SL-R	10	V-GR	48
6	BK-BL	36	BL-BK	11	BK-OR	37	OR-BK	12	GR-V	23
7	BK-GR	38	GR-BK	13	BK-BR	39	BR-BK	14	V-BR	49
8	BK-SL	40	SL-BK	15	Y-BL	41	BL-Y	16	BR-V	24
9	Y-OR	42	OR-Y	17	Y-GR	43	GR-Y	18	V-SL	50
10	Y-BR	44	BR-Y	19	Y-SL	45	SL-Y	20	SL-V	25

IDF TERMINAL BLOCK LAYOUT FOR SELECTOR MODULE 25 PAIR CABLE

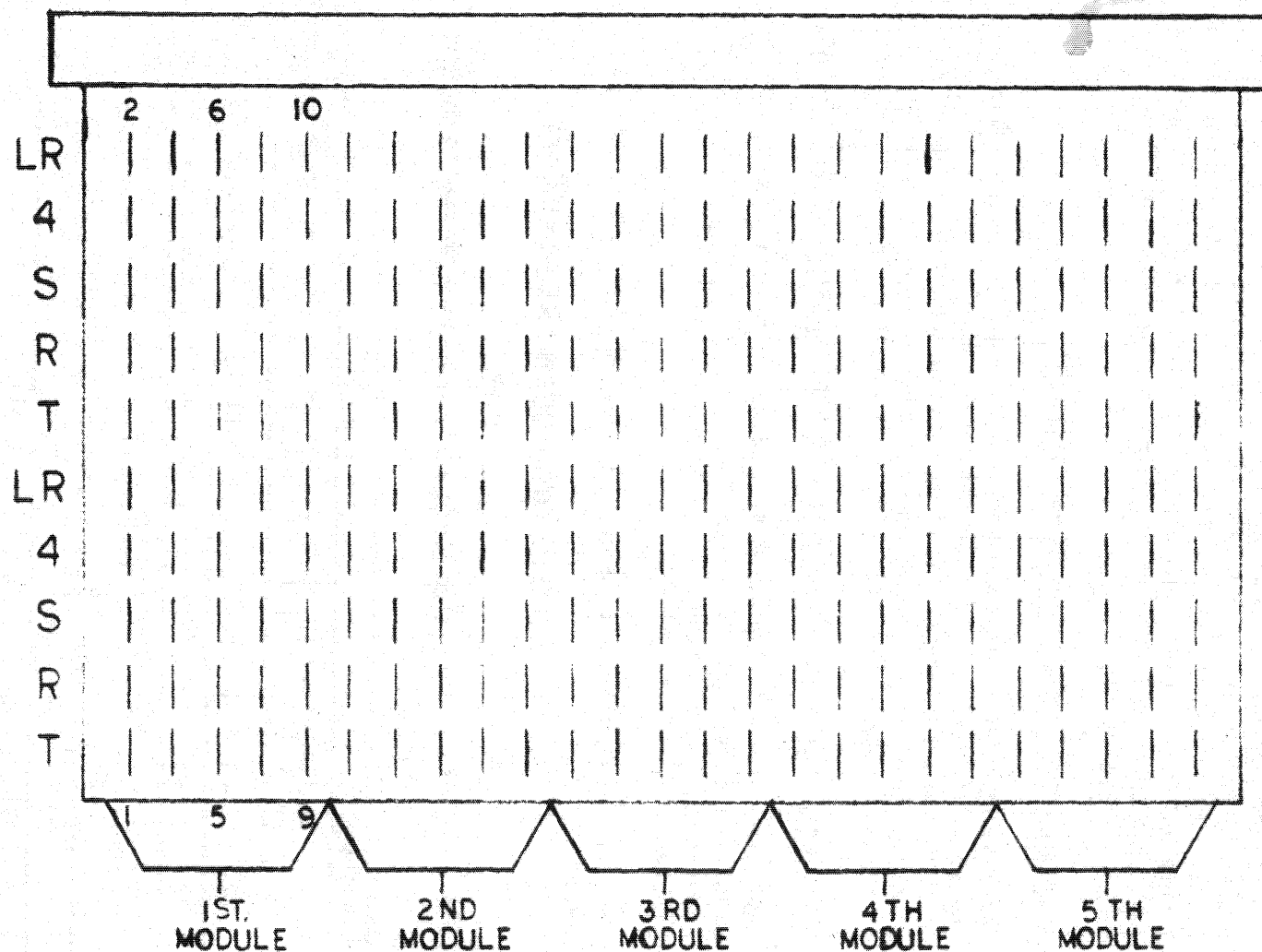


Figure 5.

H. MATRIX CARD OUTLET CABLES

The Matrix Card Outlet Cables are 25 pair connectorized cables. Two cables are required for each matrix card. In 3 wire installation each cable carries 16 outlets. In 4 wire installations, each cable carries 12 outlets. The cable near the front of the matrix card is for outlets 1-16 or 1-12, the cable near the rear of card is 17-32 or 13-24.

Note: Be sure matrix cards are strapped for their installed position prior to installation.

Matrix cables can be ordered connectorized on both ends or just the matrix card end. The charts below give pin assignments and color code information for terminating the non connectorized end. (See next page)

Pins 25 & 50 with Slate-Violet pair are not used.

Enough slack should be left in the matrix cables to allow a card to be pulled out the front of the cage to unplug the cables, if necessary for maintenance.

TABLE 3. 3 WIRE MATRIX OUTLET CABLE COLOR CODE

LEAD DES 3-WIRE	WIRE COLOR	PIN NO.
T1	WHT-BLU	26
R1	BLU-WHT	1
S1	WHT-ORN	27
S2	ORN-WHT	2
T2	WHT-GRN	28
R2	GRN-WHT	3
T3	WHT-BRN	29
R3	BRN-WHT	4
S3	WHT-SL	30
S4	SL-WHT	5
T4	RED-BLU	31
R4	BLU-RED	6
T5	RED-ORN	32
R5	ORN-RED	7
S5	RED-GRN	33
S6	GRN-RED	8
T6	RED-BRN	34
R6	BRN-RED	9
T7	RED-SL	35
R7	SL-RED	10
S7	BLK-BLU	36
S8	BLU-BLK	11
T8	BLK-ORN	37
R8	ORN-BLK	12

LEAD DES 3-WIRE	WIRE COLOR	PIN NO.
T9	BLK-GRN	38
R9	GRN-BLK	13
S9	BLK-BRN	39
S10	BRN-BLK	14
T10	BLK-SL	40
R10	SL-BLK	15
T11	YEL-BLU	41
R11	BLU-YEL	16
S11	YEL-ORN	42
S12	ORN-YEL	17
T12	YEL-GRN	43
R12	GRN-YEL	18
T13	YEL-BRN	44
R13	BRN-YEL	19
S13	YEL-SL	45
S14	SL-YEL	20
T14	VIO-BLU	46
R14	BLU-VIO	21
T15	VIO-ORN	47
R15	ORN-VIO	22
S15	VIO-GRN	48
S16	GRN-VIO	23
T16	VIO-BRN	49
R16	BRN-VIO	24

TABLE 4. 4 WIRE MATRIX OUTLET CABLE COLOR CODE

LEAD DES 4-WIRE	WIRE COLOR	PIN NO.
T1	WHT-BLU	26
R1	BLU-WHT	1
S1	WHT-ORN	27
4W1	ORN-WHT	2
T2	WHT-GRN	28
R2	GRN-WHT	3
S2	WHT-BRN	29
4W2	BRN-WHT	4
T3	WHT-SL	30
R3	SL-WHT	5
S3	RED-BLU	31
4W3	BLU-RED	6
T4	RED-ORN	32
R4	ORN-RED	7
S4	RED-GRN	33
4W4	GRN-RED	8
T5	RED-BRN	34
R5	BRN-RED	9
S5	RED-SL	35
4W5	SL-RED	10
T6	BLK-BLU	36
R6	BLU-BLK	11
S6	BLK-ORN	37
4W6	ORN-BLK	12

LEAD DES 4-WIRE	WIRE COLOR	PIN NO.
T7	BLK-GRN	38
R7	GRN-BLK	13
S7	BLK-BRN	39
4W7	BRN-BLK	14
T8	BLK-SL	40
R8	SL-BLK	15
S8	YEL-BLU	41
4W8	BLU-YEL	16
T9	YEL-ORN	42
R9	ORN-YEL	17
S9	YEL-GRN	43
4W9	GRN-YEL	18
T10	YEL-BRN	44
R10	BRN-YEL	19
S10	YEL-SL	45
4W10	SL-YEL	20
T11	VIO-BLU	46
R11	BLU-VIO	21
S11	VIO-ORN	47
4W11	ORN-VIO	22
T12	VIO-GRN	48
R12	GRN-VIO	23
S12	VIO-BRN	49
4W12	BRN-VIO	24

SPECIAL NOTES

1. When the -40 or -41 option (DTA) is ordered, 5 ft. long cables with connectors on both ends are provided. One end of the cable has a hold down screw in the connector, and the other end does not. Install the connector with the hold down screw onto the DTA card. The Matrix card connector does not have a screw attachment.
2. When connectorized cables are customer furnished they must have plastic covers when installed onto Matrix cards.
3. When installing Matrix cards, insure that all relay covers are firmly seated.
4. EMS-1 Selectors can be absence-of-ground or battery searching operation by strap option. When used in absence-of-ground systems, all unused outlets must have the sleeve grounded.

2.5 GRADING AND TRAFFIC

- A. EMS-1 equipment has traffic characteristics that are nearly identical to those of existing SXS Switching systems. The one major difference is the EMS-1 selector capability of up to 40 outlet availability in selected levels.

For more complete information on EMS-1 traffic capacity, refer to ITEC Traffic Calculations Instruction I-2000.

- B. Selector grading principles and patterns that have been used with SXS or XY can be applied to EMS-1. The only differences are the ability to vary the size of levels in EMS-1 and the mechanical configuration.

The selector outlet cables are 25 pair connectorized cables that plug into the matrix cards. (Refer to section for wiring information.)

The following methods of grading can be used. Refer to Figures on page

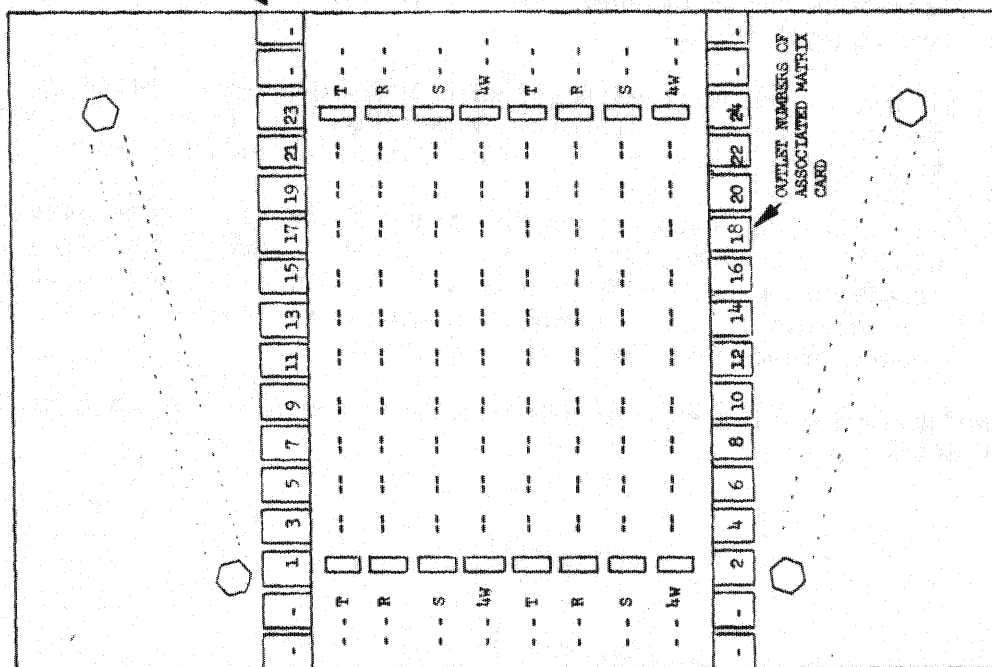
1. For small additions to offices not equipped with a DTA, a grading block, connectorized 100232 for 3 wire or 100233 for 4 wire or wire wrap 100230 for 3 wire or 100231 for 4 wire, can be mounted on an existing selector shelf and graded in the same manner as a bank block.
2. For small additions to offices equipped with a DTA, the matrix cables can be terminated on an OGT block and treated similarly to a tie cable, terminated on a grading block as an extension of the grading multiple, or connected to an additional grading block.
3. Large additions should use an EMS-1 DTA bay equipped with -40 or -41 DTA blocks which allow grading to be done in the standard DTA fashion.

All jumpers to the OGT blocks are run on the rear of the bay. The matrix cables are connectorized on both ends as the DTA grading blocks are connectorized.

A bay can be split with selector modules in the bottom and the DTA in the top. Refer to ordering information (section) and mounting information (section) for additional information.

4. Installations such as 5th selectors where all levels have a small number of outlets and are not expected to grow significantly (such as access to connectors), can use a daisy chain method of multiplying the outlets together using connectorized cables. Matrix cards have connectors on both ends to allow this.
- C. The following Figures show the makeup of the EMS-1 DTA blocks and the method of mounting.

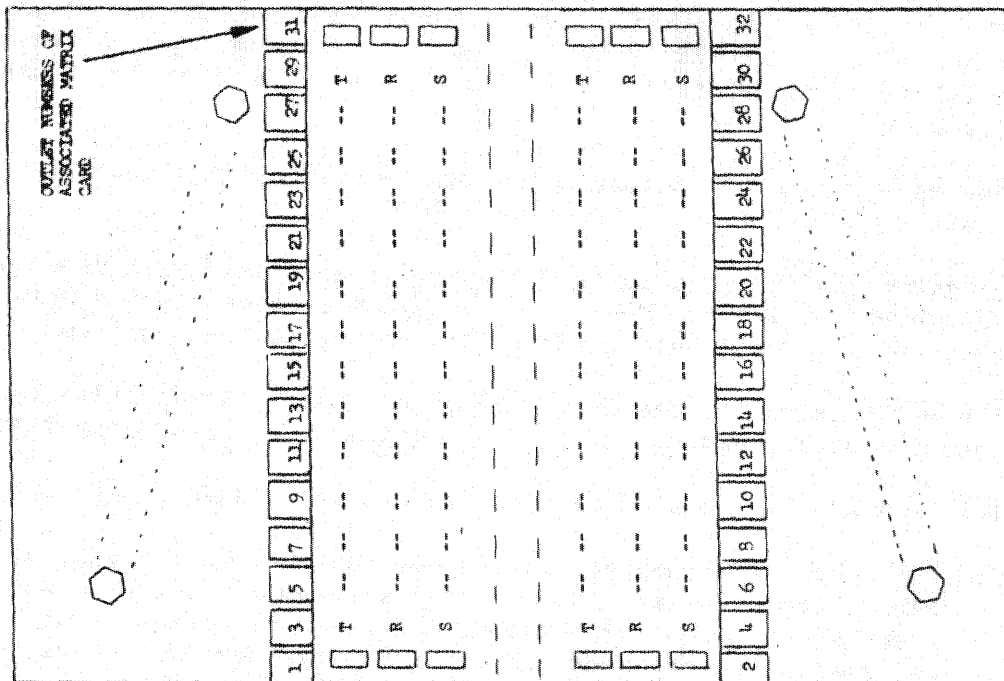
4 WIRE DTA
BLACK
(-41)
FRONT VIEW



PART # 500184

TWO VACANT ROWS
ON EACH SIDE

3 WIRE DTA
BLACK
(-40)
FRONT VIEW



TWO ROWS
VACANT

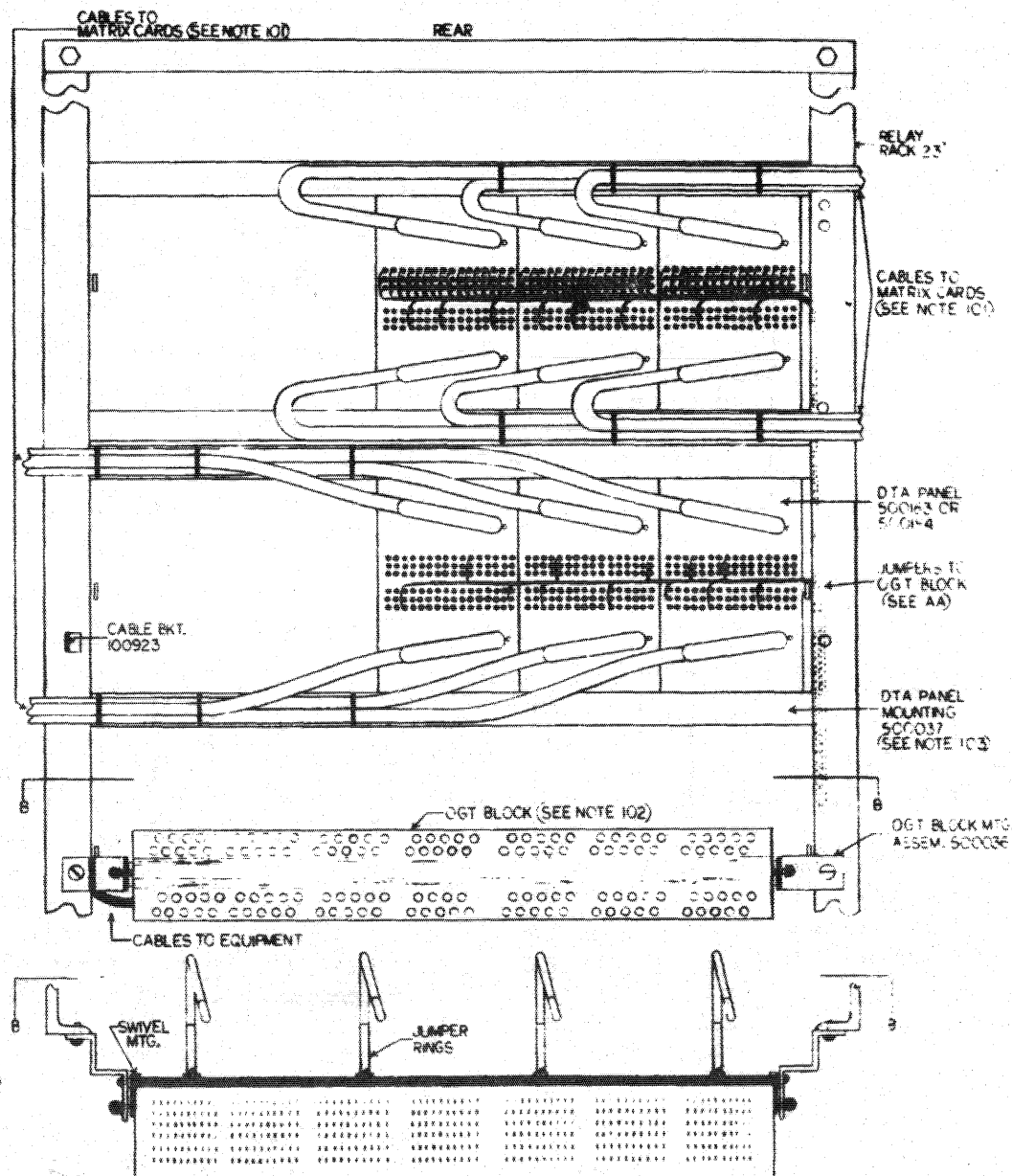
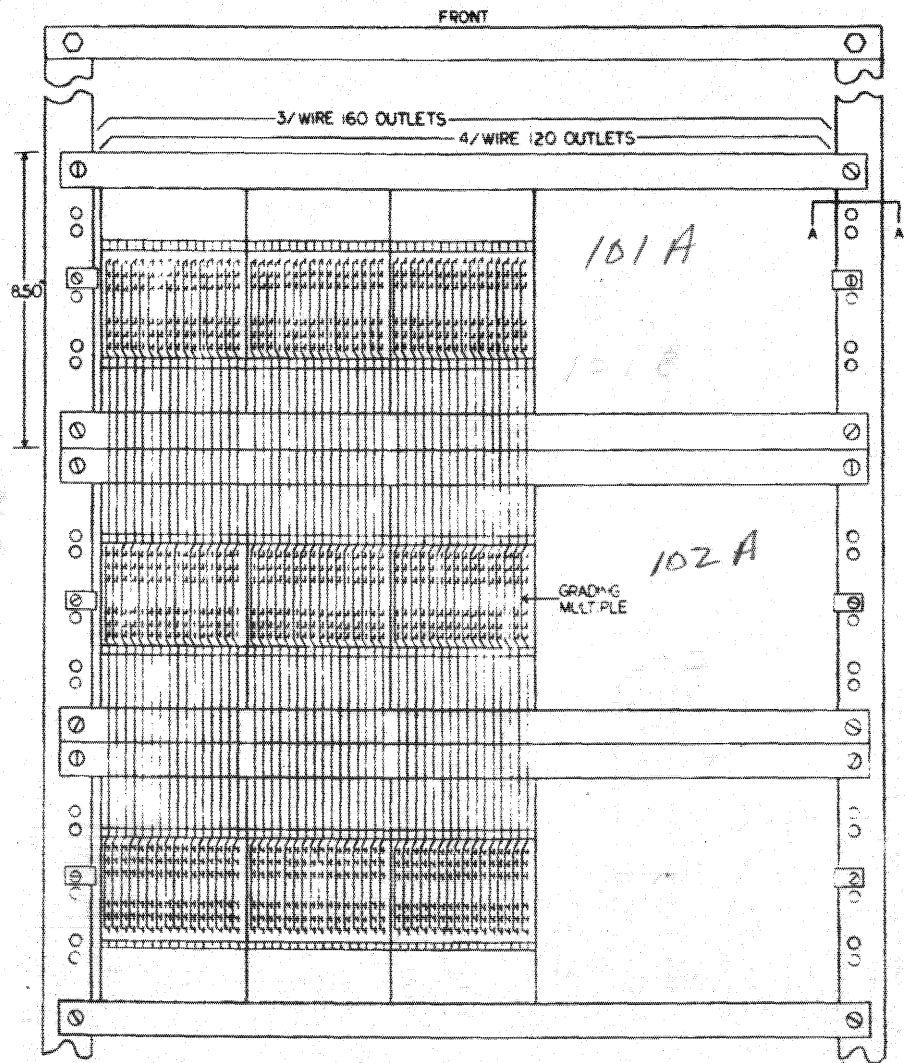
PART # 500183

Figure 7.

TOP PLUG Front on MTX
Cord

Important Note: Refer to Page 6 for mounting locations of DTA Panels

101 A



NOTE 101: MATRIX CABLES 652005. CONNECTOR END WITH SCREW CONNECTS TO THE DTA PANEL. CONNECTOR END WITHOUT SCREW CONNECTS TO THE SELECTOR MATRIX CARD. SEE PAGE 7 FOR CABLING TO MATRIX CARDS.

NOTE 102: OGT BLOCK TO BE LOCATED ABOVE, BELOW, OR BETWEEN DTA PANELS TO ALLOW ACCESS TO DTA PANELS WITH JUMPERS. INSTALLER TO DRILL AS REQUIRED.

NOTE 103: SEE I-2120, PAGE 6, FOR MOUNTING SPACING.

Figure 8. DTA Layout

TABLE 5.

MATRIX OUTLET NUMBERS BY DTA BLOCK LOCATION

DTA OUTLET	OUTLET MARKING ON DTA PANEL 500183 (3 WIRE)																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
BLOCK 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
BLOCK 2	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
BLOCK 3	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
BLOCK 4	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
BLOCK 5	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160

DTA OUTLET	OUTLET MARKING ON DTA PANEL 500184 (4 WIRE)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BLOCK 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BLOCK 2	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
BLOCK 3	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
BLOCK 4	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
BLOCK 5	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120

The charts on this page identify selector matrix outlet appearances on DTA blocks. All DTA blocks in a bay are numbered the same (1-32 or 1-24).

To find the appearance of a known outlet number such as 83 find 83 on the chart. It is on block 3 and will be stamped on the block as 19. Conversely, to identify an outlet appearance on a DTA block look below the number stamped such as 20, the 2nd outlet 52, the third outlet 84, etc.

3.0 Strapping

- 3.1 General EMS-1 selector equipment is very flexible and therefore must be programed to function as desired in each installation by use of strapping. This section explains the configuration of the equipment and how to strap for digit treatment, etc.

Strapping can be done with wire wrap or using strapping clips ITEC PN 270087-000000 for adjacent pins. Strapping put on by wire wrap should be done with a hand gun to prevent static damage to the logic from electric guns.

- 3.2 Matrix Configuration: The matrix consists of 1, 2, 3, 4, or 5 relay cards. Each card can have either 24 outlets of T R S & 4th wire supv. or 32 outlets of T, R, & S. The Matrix card is controlled by the selector and the outlets that form a level are determined by strapping on the selector card. The matrix card must be strapped as explained below for its position number in the shelf.

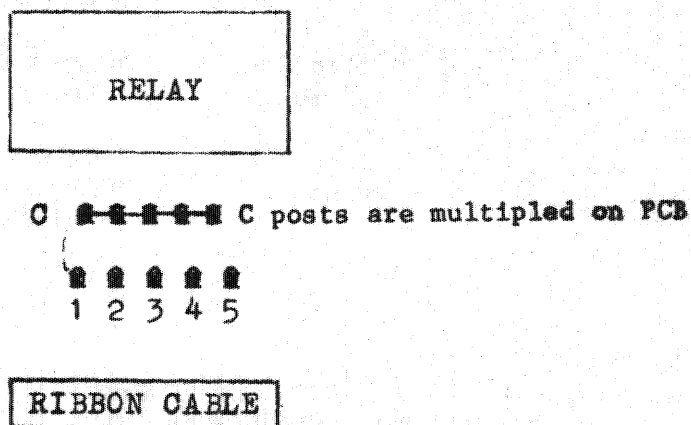
See sections titled "Group Size Selections" and Charts 1 & 2 for information on outlet group assignments by matrix card. Battery and ground for the matrix card is supplied by the associated selector.

- 3.3 Matrix Strapping: Each matrix card has ten independent groups of eight relays; each group is associated with a selector. From one to five matrix cards may be associated with a cage of selectors. Each matrix card must be strapped to respond to signals from the control cards (selectors) as matrix card number 1, 2, 3, 4, or 5. Thus, there are ten groups of strapping posts; each associated with a group of relays. All groups of posts on any one matrix card must be strapped the same so that the entire matrix card with its common outlets will be addressed in the same fashion by each of the selectors.

Thus, for a three matrix card system, Strap C (common) to 1 (ten places) on the top card, C to 2 (ten places) on the next card down, and C to 3 (ten places) on the third card down from the top. Additional cards would be strapped similarly as 4 and 5. Do not skip numbers (i.e. 1, 2, 4 won't work.)

C posts - 10 places - Strap to 1, 2, 3, 4, or 5 to indicate which matrix card this is.

Figure 10.



3.4 NOT USED

3.5 SELECTOR STRAPPING

The 600120 Selector must be strapped for the application in which it is to be used. See the strapping location drawing on page

2.5.1 3W-4W Three Wire or Four Wire

Strap for T, R & S or T, R, S & 4th operation.

Strap 4 places for 3 wire operation.

Strap 5 places for 4 wire operation.

3.5.2 L-S Loop or Simplex Dialing

Loop (L) straps are part of the PCB Artwork and do not require straps unless they have been cut. Simplex (S) straps are installed after cutting L straps for simplex operation.

3.5.3 MS Matrix Size - Strap pin MS to 1, 2, 3, 4 or 5 to correspond to the number of matrix cards equipped in the module.

3.5.4 BS Battery Search - Strap when installed in battery searching exchanges or in all EMS-1 exchanges.

3.5.5 AOG Absence of Ground Search - Strap when installed in absence of ground searching systems.

3.5.6 Traffic Lead Outputs

Traffic recording outputs from the selector are provided with two outputs that can provide selector cut-through information and/or level selective recording. (Such as separating two levels using a common trunk). Scanners can be attached to the selector sleeve for total circuit busy time.

Each selector has separate outputs on the backplane to allow individual scanner connections or be multiplied to a meter by the installer.

The following straps are provided on the selector to allow field selection of the outputs on PC/TM1 and TM2 pins.

	<u>STRAP</u>	<u>PROVIDES</u>
a.	1 to 2	150 ms pulse on PC/TM1 lead when selector cuts through to dialed level.
b.	1 to 2 & 50 ms	50 ms pulse on PC/TM1 lead when selector cuts through to dialed level.
c.	1 to 2 & Cont.	Provides 120 ohm continuous ground on PC/TM1 lead after selector cut-through for duration of call.

STRAPPROVIDES

- | | | |
|----|-------------------|--|
| d. | 3 to 4 | Provides 800 ohm continuous ground on TM2 lead after cut-through, for duration of call, only when the level dialed is strapped for Level Marking on the digit treatment option card. |
| e. | 3 to 2 | Provides 150 ms pulse on PC/TM1 lead after cut-through only when the level dialed is strapped for Level Marking on the digit treatment option card. |
| f. | 3 to 2 &
50 ms | Same as e. above except pulse is 50 ms. |
| g. | 1 to 4 | Provides continuous 800 ohm ground on TM2 lead after selector cuts through to the dialed level. Use only if e. or f. above are used. |
| h. | 50 | Reduces overflow meter (level busy) output pulse from 150 ms to 50 ms. |

3.5.7

Sleeve Test Battery

- 2.3 Strap when 500 ohm battery is required on the idle sleeve to
(500) the preceding equipment for idle circuit test. Strap for all EMS-1 exchanges.
- 1-2-3 Strap when 350 ohm battery is required on the idle sleeve for
(350) battery testing systems.

Special - When the equipment accessing the EMS-1 selector requires a value of battery on the sleeve other than 500 or 800 ohms contact ITEC Engineering Department for instructions.

3.6 Group Size Selection - Single & Multi Digit Options

Rather than confine the user to ten levels of ten outlets each, the EMS-1 selector allows up to 14 variable size levels. The first step is to determine the number of outlets required for the smallest level. Larger levels will consist of multiples of this outlet group size. There are 16 groups for SDA and 32 groups for MDA of from one to ten outlets each (strap selectable). All groups have the same number of outlets except the last group, which will usually have fewer because the total number of outlets (determined by the number of matrix cards equipped) is frequently not a direct multiple of the group size. For example: Two levels of five outlets, 3 levels of ten outlets, and one level of fifteen outlets are required. The outlet group size will be five, with the five outlet levels consisting of one group each, the ten outlet levels two groups each, and the fifteen outlet level three groups.

If one level is much smaller than the others, the user may select a larger group size and leave unused a few outlets in the small level. For example: Six levels of ten outlets each, and one level of two could be accomplished with the six levels each consisting of five groups of two outlets, plus one level consisting of one group of two outlets, or it could be done with the six levels each consisting of one group of ten outlets plus one level with one group of ten outlets in which eight are not used.

Still another example involves the same six levels of ten plus one level of three. Here, the larger levels of ten are not evenly divisible by three, so that if the smallest group were three outlets, four such groups of three, for a total of twelve outlets, would be required for each of the larger levels. Thus, each of the six levels of ten would have two unused outlets for a total of twelve unused in order to save seven outlets in the short level. This approach might still be used, however, if it were desirable to provide two spare outlets for each of the larger levels to accommodate future growth or utilize 12 outlet availability.

Another consideration in assigning group size is fitting all the levels efficiently into the available matrix cards. Since each such card provides 24 four wire or 32 three wire outlets, one could consider in the last two examples using a group size of ten and placing the two or three outlet level last. (Levels need not be arranged in sequence by access digit(s) and levels may be formed by non-contiguous groups). By placing the small level last, we may use two matrix cards to provide 64 three wire outlets. Six levels of ten would use the first sixty outlets. The last four outlets would form a short level of four outlets with one or two unused outlets.

Note that the quantity of OUTLET GROUPS and hence the highest OUTLET GROUP number is limited by the quantity of outlets equipped, as determined by the quantity of matrix cards. Each card provides 24 four wire or 32 three wire outlets. Therefore, the highest whole OUTLET GROUP number = (quantity of matrix cards time 24 or 32) divided by OUTLET GROUP SIZE. The remainder is the quantity of outlets in the next higher numbered OUTLET GROUP. If the remainder is zero, there is no partial OUTLET GROUP.

The following charts show the matrix card a group will appear in for each group size. Keep in mind that only 24 groups are available on the SDA selector while the MDA has 32 groups.

MATRIX CARD OUTLET GROUP LOCATIONS

**GROUP
SIZE**

1	1 ————— 32																															
2	1 ————— 16										17 ————— 32																					
3	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	2	2	2	2	2	2	3	3	3	
4	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	2	2	2	2	2	2	2	3	3	3
5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27					
7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23									
8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20												
9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19													
10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																

**GROUP
SIZE**

1	1 ————— 24																																		
2	1 ————— 12											13 ————— 24																							
3	1 ————— 12											13 ————— 24											25 ————— 32												
4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20															
7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17																		
8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																				
9	1	2	3	4	5	6	7	8	9	10	11	12	13	14																					
10	1	2	3	4	5	6	7	8	9	10	11	12																							

3-6

3.7 DIGIT TREATMENT STRAPPING

Each selector must have either an SDA or MDA digit treatment option card, which is strapped to program the selector to the office numbering plan.

The SDA option (500171) can be used in most applications. The MDA option (500170) must be utilized when complex 1st selector digit treatments with conflicting codes are encountered or if more than 10 levels or more than 24 groups are needed.

Strapping is done by wire wrapping with insulated 24 gauge wire. Use a hand wrap tool to prevent possible damage from electric tools that may present damaging transients to the electronics. After strapping, turn the selector upside down and tap to dislodge any loose pieces of wire or plating that may be present from the wire wrapping operation.

It is recommended that different color wire be used for different functions when strapping, ie, Intercept, AR, Normal.

- A. Group Size Strap - Every selector must have the group size strapped. Strap COM to the number corresponding to the group size desired. One or more groups constitute a level. Refer to sections 3.6 (Group size selection) for additional information on group size.

B. SDA (500171) Strapping

The SDA option card has one digit counter that can be reused after dialing an "A" (absorb & unlock) or "AR" (absorb repeatedly) digit. When an "A" digit is dialed the next digit will be normal and must be strapped to a level, blocked or intercepted.

Following is an explanation of the strapping posts appearing on the SDA option.

Digit Dialed - Pins 1 to 0 correspond to the dialed number. Example: if a 2 is dialed an output will appear on pin 2.

Level Busy - Pins 1 to 10 are inputs that cause a ground to be placed on the appropriate level overflow lead (from the selector) for the level strapped. Example: If pin 1 is strapped to digit output 1 it would be for level 1 overflow meter.

Outlet groups - Pins 1 to 24 are inputs that control the matrix card selections. Example: If the outlet group size is 5 and it is desired to have 15 outlet availability for level 1, outlet group pins 1, 2, & 3 would be strapped together. (Then strapped to dialed digit 1 and level busy 1).

AR - Strap any digit dialed that is to be absorbed repeatedly to one of the AR posts. If more than 4 are required, they can be double strapped.

A - Strap any digit dialed that is to absorb and unlock to one of the "A" posts. If more than 4 are required they can be double strapped.

Block Before A - A dialed number strapped to block before "A" will cause busy tone (120 IPM) to be returned before an "A" digit is dialed.

Block After A - A dialed number strapped to block after "A" will cause busy tone (120 IPM) to be returned if an "A" digit has been previously dialed.

Level Restrict - Level Restrict is enabled when the LR lead from the finder is grounded. For a level such as CAMA (Level 1) strap 1 to A1, strap A0 to the appropriate outlet group (normally 1), and strap R to Block or to the outlet group being used for intercept.

To connect unused digits to intercept, multiple all unused digits and connect to the outlet group that has been assigned to the intercept VSL trunks.

When strapping the coin number (normally 9) to a working level that is accessed direct, do per the following example:

If the 4XXX group is also 9XXX, strap 4 to the proper outlet group and 9 to the same group. If, however, 9 or 4 is an "A" digit, strap the "A" digit to an "A" post and connect it with a diode to the outlet group. For example:

Office Code 289 - 9 is absorb & unlock - 289-9XXX are coin numbers using the 4XXX group of local flat rate numbers - An EAS trunk group is accessed by the 45 from the same 5th selectors, to handle the conflict;

Strap 4 to the proper outlet group.

Strap 9 to A.

Strap A to 4 with a diode to prevent 4 from absorbing and unlocking.

It is recommended that the following Figure of the strapping layout be used to plan the required strapping. The last page in this booklet can be filled in to record the office digit treatment.

4 or 5 Digit Dialing - When it is necessary to permit 4 or 5 digit dialing, as well as 7 digit, care must be taken to prevent conflicts. Consider the 4 or 5 digit dialing as additional codes when planning the strapping.

Selected Level Metering - If it is desired to meter a dialed code (or connect a scanner) the dialed digit is strapped to the Level Marking post 1 and then from marking post - to the outlet group. Each time the number is dialed it will cause an output on TM1 or TM2 as strapped on the selector. Refer to paragraph 3.5.6 for additional information. It is possible to separate access codes where 2 codes access the same trunk group.

Figure 12.

A - ABSORB & UNLOCK
 AR - ABSORB REPEATEDLY
 B - BLOCKED (120 IPM BT)
 C - INTERCEPT
 N - NORMAL
 NR - RESTRICTED

	BEFORE UNLOCKING	AFTER UNLOCKING
0		
9		
8		
7		
6		
5		
4		
3		
2		
1		

DIALED
DIGIT

0 ●
 9 ●
 8 ●
 7 ●
 6 ●
 5 ●
 4 ●
 3 ●
 2 ●
 1 ●

LEVEL
RESTRICT

● R
 ● AO
 ● AI

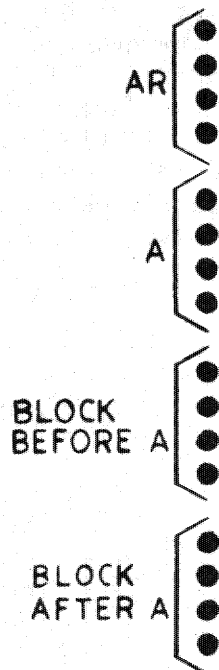
● LO
 ● LI

LEVEL
OVERFLOW
METERS

10 ●
 9 ●
 8 ●
 7 ●
 6 ●
 5 ●
 4 ●
 3 ●
 2 ●
 1 ●

OUTLET
GROUPS

● 24
 ● 23
 ● 22
 ● 21
 ● 20
 ● 19
 ● 18
 ● 17
 ● 16
 ● 15
 ● 14
 ● 13
 ● 12
 ● 11
 ● 10
 ● 9
 ● 8
 ● 7
 ● 6
 ● 5
 ● 4
 ● 3
 ● 2
 ● 1



● 1
 ● 2
 ● 3
 ● 4
 ● 5
 ● 6
 ● 7
 ● 8
 ● 9
 ● 10
 ● COM

OUTLET
GROUP
SIZE

SDA OPTION 500171



ISSUE:

DATE:

ENGR:

PAGE:

OF

C. MDA (500170) STRAPPING

The MDA option card has the capability of handling complex or conflicting office numbering codes. It also can access up to 14 levels by use of the 4 translation gates. The MDA card has 32 outlet groups which allow more flexibility in level size.

Following is an explanation of the strapping posts on the MDA card.

Digit Dialed: A-1-0, B-1-0, C-1-0.

DIGIT A is the first digit counted in response to the subscriber dial pulses. An output appears on only one DIGIT A pin corresponding to the dialed number. Each pin may be strapped so that when that digit is dialed it will: cut through to a level, block, absorb repeatedly, absorb and unlock, be one digit of a multi-digit code, or be conditionally restricted. DIGIT B and DIGIT C are the second and third digit and may be strapped similarly. To cut through to a level on the first digit, simply strap the appropriate DIGIT A to one or more OUTLET GROUPS.

Connecting any DIGIT A pin to AR (Absorb Repeatedly) resets the DIGIT A counter when that number is dialed, so that the next dialed digit also appears on DIGIT A. If the next dialed digit is the same, or another AR digit, the counter will reset again. Similarly, if a DIGIT B number is strapped to AR and that number is dialed as the second digit, the DIGIT B counter will be reset. DIGIT C behaves the same way.

Connecting any DIGIT A, B, or C pin to BLOCK causes the subscriber to immediately receive 120 IPM busy and halts further call processing.

Leaving any DIGIT A pin unconnected causes an absorb and unlock function: No action is taken, and the next dialed digit appears on DIGIT B. Similarly, leaving any DIGIT B pin unconnected causes the next dialed digit to appear on DIGIT C. If absorb and unlock functions are not desired, unused pins must be connected to some active function, such as BLOCK, AR, INTERCEPT LEVEL, etc. Note that if it is possible (because of previous absorb and unlock digits) to reach DIGIT C, then all pins must be connected to some function since there is no digit D to follow an absorb and unlock on DIGIT C. If a call is not processed when digit C is used the selector returns 120 IPM busy tone.

EXAMPLE:

<u>DIGIT A</u>	<u>DIGIT B</u>	<u>DIGIT C</u>
1 - Level 1	1 - A*	1 - A*
2 - Level 2 (792)	2 - Block	2 - Level 8 (467-2xxx)
3 - Block or intercept	3 - Block	3 - Level 9 (467-3xxx)
4 - A (No Connection)	4 - A	4 - Block
5 - Block or intercept	5 - Level 5 (745)	5 - Block
6 - Level 6	6 - AR	6 - Block
7 - AR	7 - A	7 - Block
8 - Block or intercept	8 - Level 4 (48X)	8 - Block
9 - A*	9 - Block	9 - Block
0 - Level 10	0 - Block	0 - Block

* See Multi digit translation strapping.

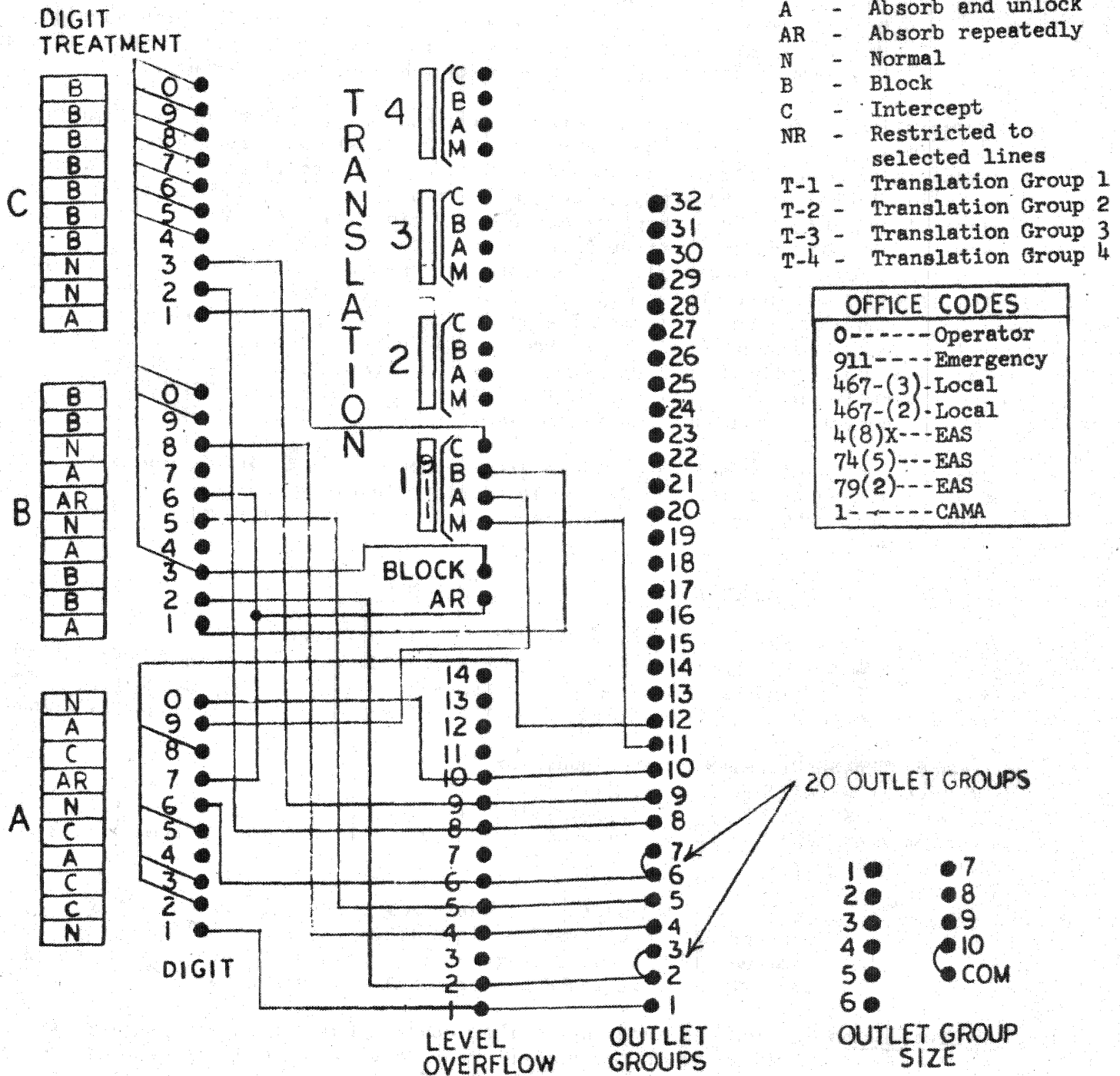
First digits 1, 2, 6, 0 cut through to levels.

Figure 13.

500170 MDA OPTION STRAPPING EXAMPLE

LEVEL RESTRICT

CI CO BI BO AI AO R



- A - Absorb and unlock
- AR - Absorb repeatedly
- N - Normal
- B - Block
- C - Intercept
- NR - Restricted to selected lines
- T-1 - Translation Group 1
- T-2 - Translation Group 2
- T-3 - Translation Group 3
- T-4 - Translation Group 4

OFFICE CODES	
0-----	Operator
911----	Emergency
467-(3)-	Local
467-(2)-	Local
4(8)X---	EAS
74(5)---	EAS
79(2)---	EAS
1-----	CAMA

First digits 3, 5, 7, 8 are blocked or connected to intercept level.

First digit 4 unlocks the B digit, which then will cut through if the second digit is other than 1, 6 or 7. Level 4 is thus reached by dialing 48. Level 5 is reached by dialing 745. Any level may be assigned to any cut through as convenient. All digits marked block may be strapped to a level accessing vacant level intercept trunks.

Leaving DIGIT B pin 7 open will cause unlock of DIGIT C if 41, 47 or 467 is dialed. Then one or more DIGIT C pins could be connected to levels for 3 or 4 digit cut through. The unused DIGIT C pins should then be connected to BLOCK, or to a small intercept level. (Note that the last OUTLET GROUP-usually shorter-may be used for intercept.)

Translation - Multi-digit conflicts may be resolved by using the TRANSLATION functions. There are four such circuits (1, 2, 3, 4) each capable of translating a two or three digit code. Connect an appropriate DIGIT A pin to a TRANSLATION A pin, an appropriate DIGIT B pin to a TRANSLATION B pin in the same circuit group and an appropriate DIGIT C pin to a TRANSLATION C pin in the same group. No action is taken unless all three TRANSLATION pin A, B, C in a group detect a dialed digit. Therefore, strapping to TRANSLATION is similar to leaving a pin unconnected; the next digit is unlocked. If all three TRANSLATION pins in a group do detect dialed digits, an output will appear on pin M (Mark) in that same TRANSLATION group. This pin M is connected to a level for cut through when its three digit code is dialed. If TRANSLATION of only two digits is required, the unused A, B, or C input in the TRANSLATION group may be connected to a used pin in the same group (A to B or B to C).

Example: All valid codes are single digit except 43, 411, 467-2, and 911. Connect appropriate DIGIT A pins to appropriate levels for single digit cut through, to BLOCK, or to AR, as illustrated in the previous example. Strap the following:

CODE	DIGIT A	DIGIT B	DIGIT C
43	4 to TRANSLATION-1-A	5 to TRANSLATION-1-B&C	
411	4 to TRANSLATION-2-A	1 to TRANSLATION-2-B	1 to TRANSLATION-2-C
911	9 to TRANSLATION-3-A	1 to TRANSLATION-3-B	1 to TRANSLATION-3-C
467-2	4 to TRANSLATION-4-A	7 to TRANSLATION-4-B	2 to TRANSLATION-4-C

Connect TRANSLATION-1-M to the level for 43.

Connect TRANSLATION-2-M to the level for 411.

Connect TRANSLATION-3-M to the level for 911.

Connect TRANSLATION-4-M to the level for 467-2. Note: 6 was AR therefore B counter was reset.

Level Busy - Pins 1-14 are inputs that cause a ground to be placed on the appropriate level overflow lead (from the selector) for the level strapped if all outlets are busy. Example, if pin 1 is strapped to DIGIT A 1, it would be for level 1 overflow meter.

Outlet Groups - Pins 1-32 are inputs that control the matrix card selections. Example, if the outlet group size is 5 and it is desired to have 15 outlet availability for level 1, outlet groups 1, 2, & 3 would be strapped together. (Then strapped to A digit 1 and level busy 1).

Block - A digit A, B or C output strapped to block will cause the selector to return 120 IPM busy tone.

AR - Strap any digit dialed that is to be absorbed repeatedly to the AR posts. Multiple if more than 1.

Level Restrict

Some systems provide a ground mark to the selector if the accessing call is to be restricted from connection to particular levels. If this Level Restriction ground is not applied, the call is allowed to connect to those levels.

To use the conditional LEVEL RESTRICT function, strap the DIGIT pin or TRANSLATION-M pin to LEVEL RESTRICT input AI, BI, or CI, instead of directly to OUTLET GROUPS pin (s). Then strap from the corresponding LEVEL RESTRICT output AO, BO, or CO to the appropriate OUTLET GROUP pin (s). Each different level to be restricted (up to three) is passed through a different LEVEL RESTRICT input/output pair AI/AO, BI/BO, or CI/CO. LEVEL RESTRICT R is connected to either BLOCK or an intercept level to dispose of the call if a restricted level is dialed while the Level Restriction ground is present.

Example: Restrict paystations from dialing 1. DIGIT A pin 1 is connected to LEVEL RESTRICT AI. AO is connected to LEVEL OVERFLOW pin 1 and OUTLET GROUPS pin 1 & 2. R is connected to BLOCK. When a paystation accesses this selector, the finder applies ground to the Level Restriction lead. If the paystation dials a first digit 1, the call is connected to 120 IPM busy tone. If, however, an ordinary unrestricted station is connected to this selector, the Level Restriction ground is not present. First digit 1 will pass unrestricted from LEVEL RESTRICT pin AI to pin AO, and thence to level, causing cut through. To connect unused digits to intercept, multiple all unused digits and connect to the outlet group that has been assigned to the intercept VSL trunks.

4 or 5 Digit Dialing - When it is necessary to permit 4 or 5 digit dialing, as well as 7 digit, care must be taken to prevent conflicts. Consider the 4 or 5 digit dialing as additional codes when planning the strapping.

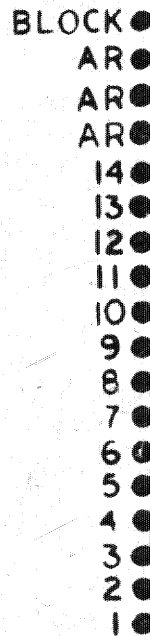
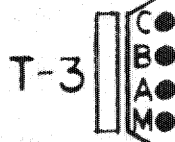
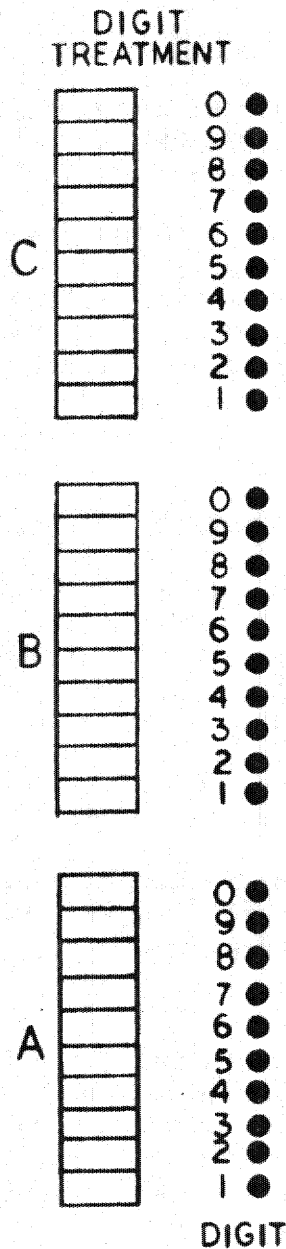
Selected Level Metering

If it is desired to meter a dialed code (or connect a scanner), the dialed digit is strapped to the Level Marking post 1 and then from marking post 0 to the outlet group. Each time the number is dialed, it will cause an output on TM1 or TM2 as strapped on the selector. Refer to paragraph 3.5.6 for additional information. It is possible to separate access codes where 2 codes access the same trunk group.

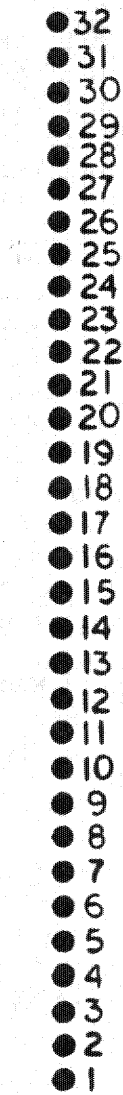
Figure 14.

LEVEL RESTRICT

CI BO BR CO CR AO AR AI BI

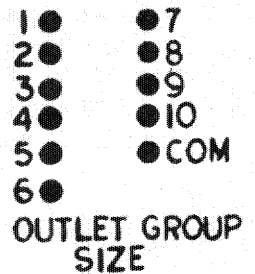


LEVEL BUSY



OUTLET GROUPS

A - ABSORB & UNLOC
AR - ABSORB REPEATEDLY
N - NORMAL
B - BLOCK
C - INTERCEPT
NR - RESTRICTED TO SELECTED LINES
T-1 = TRANSLATION GROUP 1
T-2 = TRANSLATION GROUP 2
T-3 = TRANSLATION GROUP 3
T-4 = TRANSLATION GROUP 4



MDA OPTION 500170

LJ LO

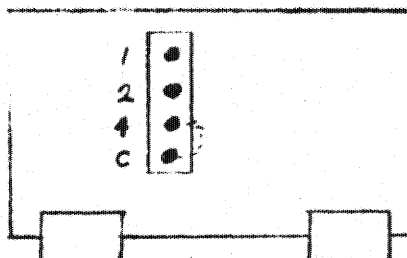


ISSUE:	DATE:	ENGR:	PAGE:
			OF

3.8 TROUBLE TIMING OPTION STRAPPING

The 500173 timing plug on option can be strapped to provide time out of a selector in 1, 2 or 4 minutes after seizure if dialing does not occur. Standard strapping is for 4 minute time out.

Figure 15.



3.9 DIAL TONE OPTION STRAPPING

The dial tone option card is strappable for different dial tone levels.

It must be strapped to provide an acceptable level of dial tone for the exchange in which it is being used. It is advisable to strap one selector and check dial tone level before strapping the entire group.

Lowest level - Strap C to B and G to F.

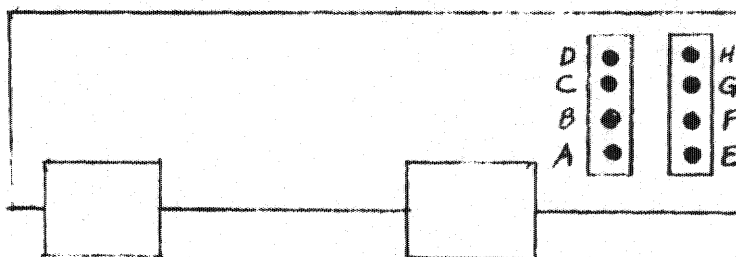
Medium level - Strap C to D and G to H.

Loudest level - Strap A to B, C to D, E to F and G to H.

The lowest level is sufficient in most systems.

Dial tone options prior to KS issue 4, PCB Rev. 3, were not strappable and had a fixed tone level.

Figure 16.



3.10 FUSE FAILURE BUSY OPTIONS

The fuse failure busy option is used only when EMS-1 selectors are added to absence of ground searching exchanges. It grounds the sleeve when a fuse blows. No strapping is required regardless of whether it is equipped or not.

Highway Department, Chicago, Ill.

Dear Sir:

I have the honor to acknowledge the receipt of your letter of the 10th inst.

and in reply to inform you that the same has been forwarded to the proper authorities.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

Enclosed for you are two copies of the report of the committee on the subject of the proposed

change in the location of the highway leading from the city to the lake.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

I have the honor to acknowledge the receipt of your letter of the 10th inst.

and in reply to inform you that the same has been forwarded to the proper authorities.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

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and in reply to inform you that the same has been forwarded to the proper authorities.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

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and in reply to inform you that the same has been forwarded to the proper authorities.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

I have the honor to acknowledge the receipt of your letter of the 10th inst.

and in reply to inform you that the same has been forwarded to the proper authorities.

I am, Sir, very respectfully,
Yours very truly,
J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

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Chief Engineer

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J. J. [Signature]

Chief Engineer

Highway Department, Chicago, Ill.

I have the honor to acknowledge the receipt of your letter of the 10th inst.

and in reply to inform you that the same has been forwarded to the proper authorities.

4.0 TESTING (Also reference instructions I-3014 and I-3015)

The EMS-1 selector can be tested much the same as any electromechanical selector. The technician has the advantage, however, of having LED displays and the selector test card to indicate the call progress and the outlet accessed. Also, the selector test card allows a specific outlet to be accessed by forcing (if idle) without dialing.

A. Seizure - SZ & BY LED's illuminated

A standard hand test telephone (butt in) with a 310 plug can be plugged into the jack on the face plate to seize the selector.

Verify that the SZ & BY LED's light and dial tone can be heard if a first selector.

B. Dialing - SZ & BY LED's

Before dialing, the selector test card should be set on the selector being tested by operating the STEP switch until the number of the selector being tested is displayed on the test card face plate.

During the dialing, the SZ LED will follow pulsing and the BY LED will remain lighted. If an "A" or "AR" digit is dialled, no other LED's will light nor will the selector test card indicate outlet selected.

C. Cut Through - CT LED lights, SZ & BY LED's extinguish

When a digit is dialled that is strapped for cut through to a level, the CT LED will light indicating an outlet has been found, and the test card will display the number of the selected outlet. The SZ and BY LED's will extinguish.

If the CT LED only flashes and the test card outlet chosen display drops back to 000, it indicates an open Tip, Ring, or Sleeve to the succeeding equipment. Check that the outlet indicated on the test card is in fact connected to a succeeding circuit. If it is, verify that the TR & S are good to the DTA connections of the matrix card connectorized cable. If good at that point, verify that the flat cable connecting the selector to the matrix card is plugged on correctly at all points. Dial all codes in the office to verify digit treatment strapping.

D. Busy - SZ, BY & BT LED's illuminated

Dial a digit connected to block or a level with all outlets busy. The BT LED should light and busy tone should be returned.

E. Outlet Forcing from Test Card

The force feature of the selector test card is used to force a selector to cut through on a specific outlet, unless that outlet is busy.

To use, select the outlet with the push button switches and select the selector to be tested with the "STEP" switch.

Plug a hand test telephone into the selector. Operate the "FORCE" switch and the selector will respond as if it were dialled. It will connect to the chosen outlet and a call can be completed if desired.

This feature facilitates outlet testing and is especially valuable on new installations where each outlet should be accessed by each selector. To do this, set the test card on the first selector to be tested and the outlet chosen on 001. Plug a test phone into the selector test jack to seize the selector. Operate the FORCE switch and the selector should cut through. The display on the test card should be the same as the outlet selected.

If the selector chooses outlet 001, push the button on the outlet selected switch to select outlet 002. This will release outlet 001 and returns the selector to normal so that operation of the force switch will cause it to select outlet 002. If an outlet is busy or fails, it is necessary to release and re seize the selector before proceeding. Therefore, it is possible to test every outlet with only one selector seizure and without dialling a digit.

F. Call Tracing

Forward tracing is accomplished by operating the "STEP" switch on the selector test card to the selector to be traced and observing the outlet the call is on. Reference the grading card on the front of the matrix cage to find the location of the succeeding circuit and continue the call trace to that circuit.

Backward tracing requires that grading be checked to determine what selector shelves the circuit to be back traced appear in. When that and the outlet for each shelf is known, operate the STEP switch to monitor the outlet connected to each selector until the outlet connected to the circuit being back traced is displayed.

G. Trouble Timing Option

Trouble timing can be strapped for 1, 2, or 4 minute disconnect. To test, plug a hand test telephone into the jack on the selector face plate and seize the selector. After the proper time the BY LED will extinguish.

G. Fuse Failure Busy Option & Fuse Alarms

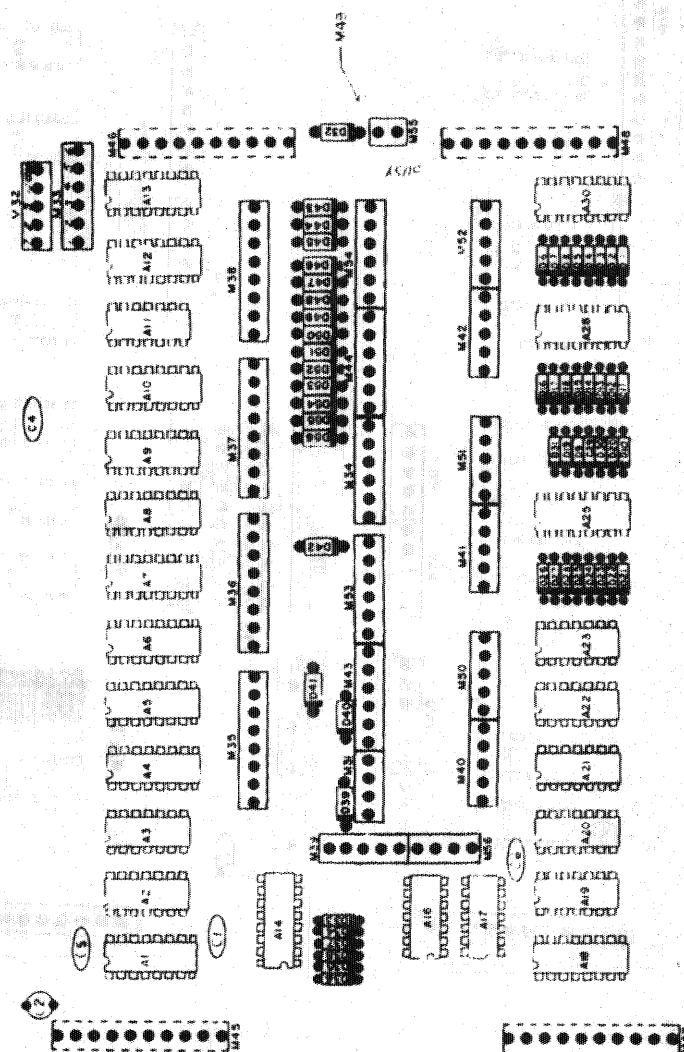
Fuse failure busy option is used with absence of ground searching systems to ground the sleeve of a circuit that has blown a fuse. If the fuse blows while the circuit is busy, it delays the ground return to allow the call in process to release.

Insert a blown fuse and reinsert the selector. Observe that the BY and FA LED's are illuminated. Also observe that the bay fuse alarm is illuminated and the office alarm is displaying a minor alarm.

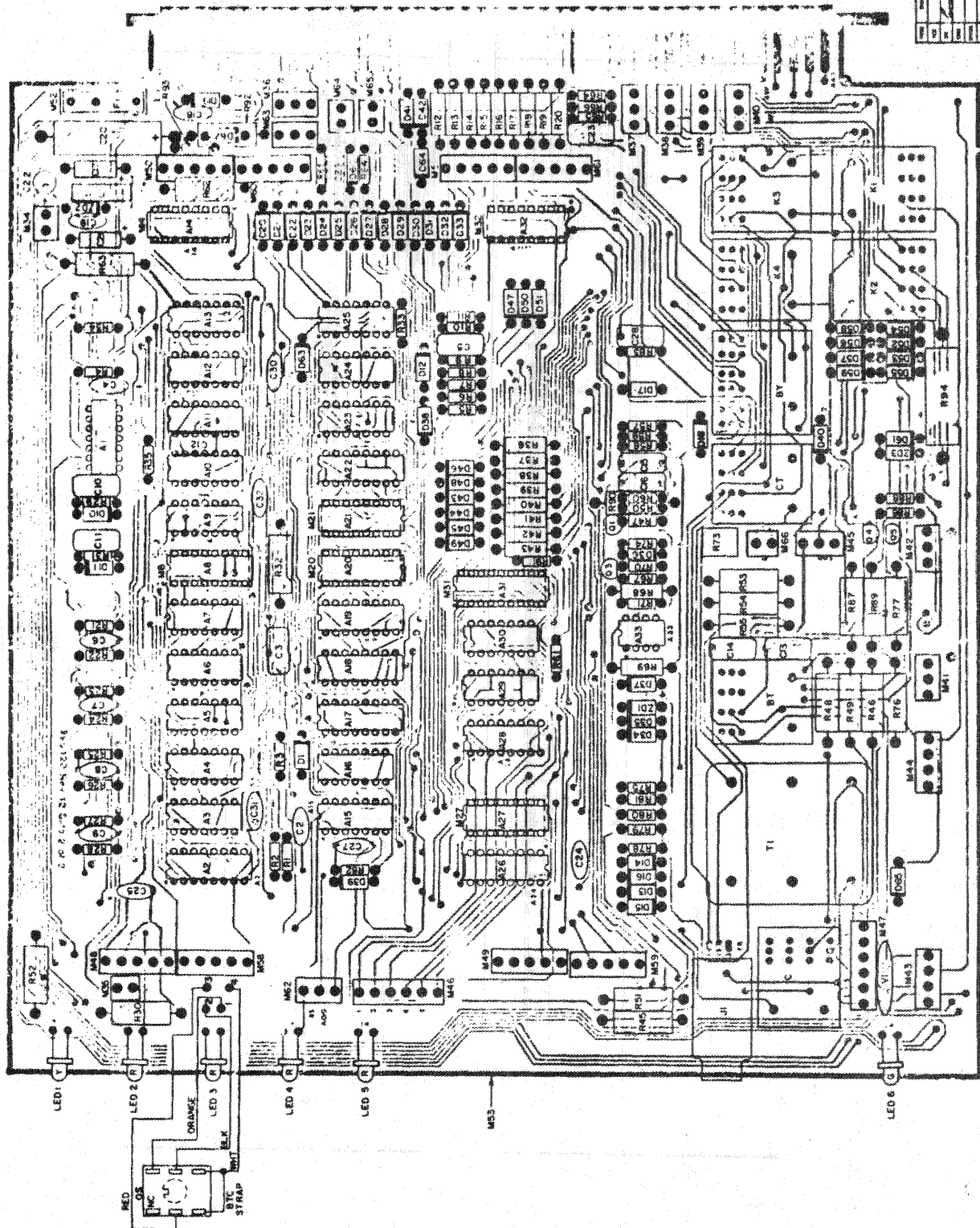
H. Repair of Faulty Circuits

If a circuit does not test good, and all strapping and wiring has been verified to be correct, the circuit should be returned to ITEC for repair.

NAME	COMPANY & TYPE	 ITT COMMERCIAL AIRCRAFT DIV.	MULTIPLE DIGIT ABSORBING OPTION	A 500170 100-500-00
ADDRESS				
CITY				
STATE				
ZIP				
DATE <u>7/1/84</u>		D <u>7/1/84</u>		



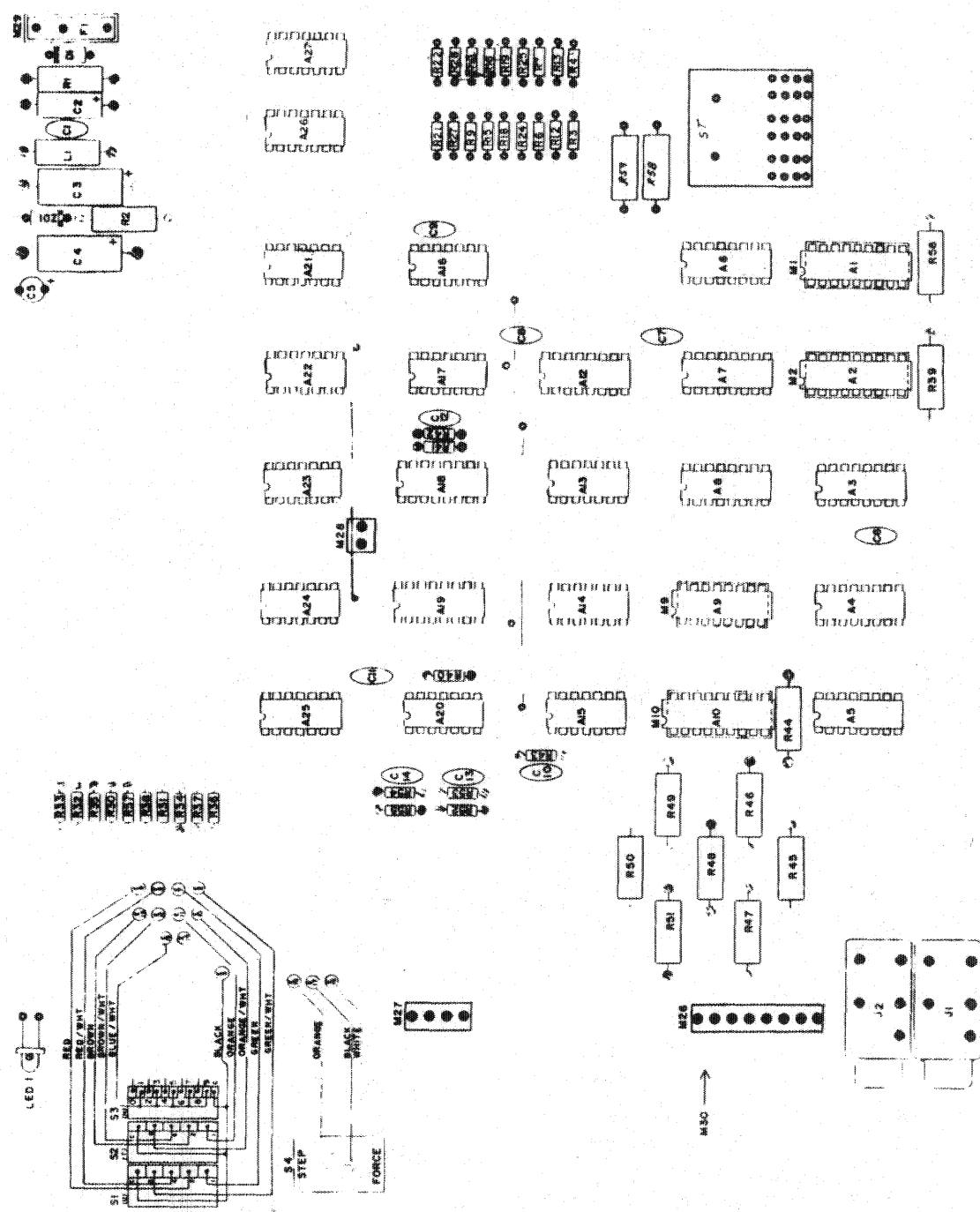
ISSUE	C.O. NO.	DATE	APPROVA.
1	1543	2-27-79	
2	1545	4-1-79	
3	1559	6-27-79	
4	1614	7-16-79	
5	1625	7-17-79	
6	1626	11-8-79	
7	1620	1-21-80	
8	1621	2-18-80	
9	1657	3-28-80	
10	1719	7-18-80	
11	1841	3-12-81	
12	1841	5-26-81	



ITBC		EMS - 1
SELECTOR		
AG00120		
REDHAWK 3-12-81		

1. RELEASED 5-23-79
 2. 4-1
 3. 12-19-78
 4. 12-19-78
 5. 8-13-78

		EMS-1 SELECTOR TEST
APPROVAL: ALABAMA 1980 DATE: 5-23-79 BY: [Signature]		A600129



TESTING PROCEDURES FOR SELECTOR MODULE 800020

This procedure is intended for use by the Installer as a guide to functional tests that must be performed.

This section may be removed from the Technical Information booklet and used as an Installer's checkoff attesting that all tests have been performed.

1. The test procedure for selectors is similar for local 1st, incoming or intermediate stages. As such, all are treated as a group in this instruction. The Installer shall delete any test on incoming or intermediate selectors that apply only to local 1st. Verify power wiring to be correct and free of foreign potentials, and fuse alarm operation, prior to fusing the Module.
2. It is good practice to check the correctness of cabling and jumpering from the selector DTA by shorting the T & R of each outlet (trunk) on the DTA and observing ground return on the sleeve with a test lamp. This test can detect wiring problems prior to testing of outlet (trunk) choices from the selectors.
3. Seize and dial all selectors, with and without resistance, 1900 ohm to verify ability to register pulses. Observe LED's for proper indication. Check all 1st Selectors for Dial tone.

Selector LED functions are:

OS - Out of Service - indicates the OS switch is operated

SZ - Seize - Same as dialing or A relay.

BY - Busy - Same as hold or B relay.

CT - Cut through - Indicates the selector is cut through to an outlet. Note: The CT LED will come on momentarily and go off if the outlet is bad, indicating a problem with the Tip, ring or sleeve connections to the succeeding stage. Also, the test card will momentarily indicate the outlet number the selector attempted to access. Check Selector strapping, ribbon cables and wiring on DTA and to succeeding stage.

BT - Busy tone - indicates all outlets are busy in the level dialed.

FA - Fuse alarm - indicates the fuse on the circuit card is blown.

4. Dial all working codes in each selector. Pay particular attention to A, AR, B or intercepted digits for proper operation. Observe that each working code cuts through and holds the succeeding equipment. Verify that selector test card displays the proper outlet for the code dialed.
5. Operate all OS switches, observe that all OS LEDs illuminate and check sleeves on backplane for ground. (Pin A30).

6. Busy all outlets of one level and dial that level to check for presence of 120 IPM busy tone.
7. Check for trouble time out. Seize each Selector with a butt-in. After the time that the timing option is strapped for (1, 2 or 4 minutes) has lapsed, the Selector BY LED should extinguish, the SZ will remain on however. If the selector is accessed via a finder, the selector will drop out the call to lock out.
8. Test each selector for ability to be "forced" to an outlet by the selector test card "force feature". See I-2120 page 35 for operating details.
9. In systems that use absence of ground on the sleeve to indicate idle, check that all unused outlets have ground strapped to the sleeve at the DTA.
10. Test all outlets of all levels from all selectors. Use force feature on selector test card. See I-2120 page 35 for more detail.

11. Selectors - Traffic Lead Outputs

Traffic recording outputs from the selector are provided with two outputs that can provide selector cut-through information and/or level selective recording. (Such as separating two levels using a common trunk). Scanners can be attached to the selector sleeve for total circuit busy time. Each selector has separate outputs on the backplane to allow individual scanner connections or be multiplied to a meter by the installer.

The following straps are provided on the selector to allow field selection of the outputs on PC/TM1 and TM2 pins.

	<u>STRAP</u>	<u>PROVIDES</u>
a.	1 to 2	150 ms pulse on PC/TM1 lead when selector cuts through to dialed level.
b.	1 to 2 & 50 MS	50 ms pulse on PC/TM1 lead when selector cuts through to dialed level.
c.	1 to 2 & Cont.	Provides 120 Ohm continuous ground on PC/TM1 lead after selector cut-through for the duration of call.
d.	3 to 4	Provides 800 ohm continuous ground on TM2 lead after cut through, for duration of call only when the level dialed strapped for Level Marking on the digit.

- | | | |
|----|----------------|---|
| e. | 3 to 2 | Provides 150 ms pulse on PC/TM1 lead after cut-through only when the level dialed is strapped for Level Marking on the digit treatment option card. |
| f. | 3 to 2 & 50 MS | Same as e above except pulse is 50 ms. |
| g. | 1 to 4 | Provides continuous 800 ohm ground on TM2 lead after selector cuts through to the dialed level. Use only if e or f above are used. |
| h. | 50 | Reduces overflow meter (level busy) output pulse from 150 ms to 50 ms. |

12. All grading cards filled out.

13. Two sets of job drawings marked as installed.

The Installer in charge shall sign and submit this form to ITEC attesting to having performed all tests listed.

I certify that all applicable tests herein have been performed and all deficiencies corrected.

Installer in Charge

DATE

I verify that all tests herein have been performed by the Installer in charge.

C.O.E. Supervisor or
Acceptance Test Person

DATE

DIGIT TREATMENT ASSIGNMENTS

The tables below are to record the digit treatment that is strapped into the MDA or SDA plug ons of the EMS-1 Selector per job requirements.

A - Absorb and unlock

NR - Restricted to selected lines

AR - Absorb repeatedly

T1 - Translation Group 1

N - Normal

T2 - Translation Group 2

B - Block

T3 - Translation Group 3

C - Intercept

T4 - Translation Group 4

MDA (-11 500170)

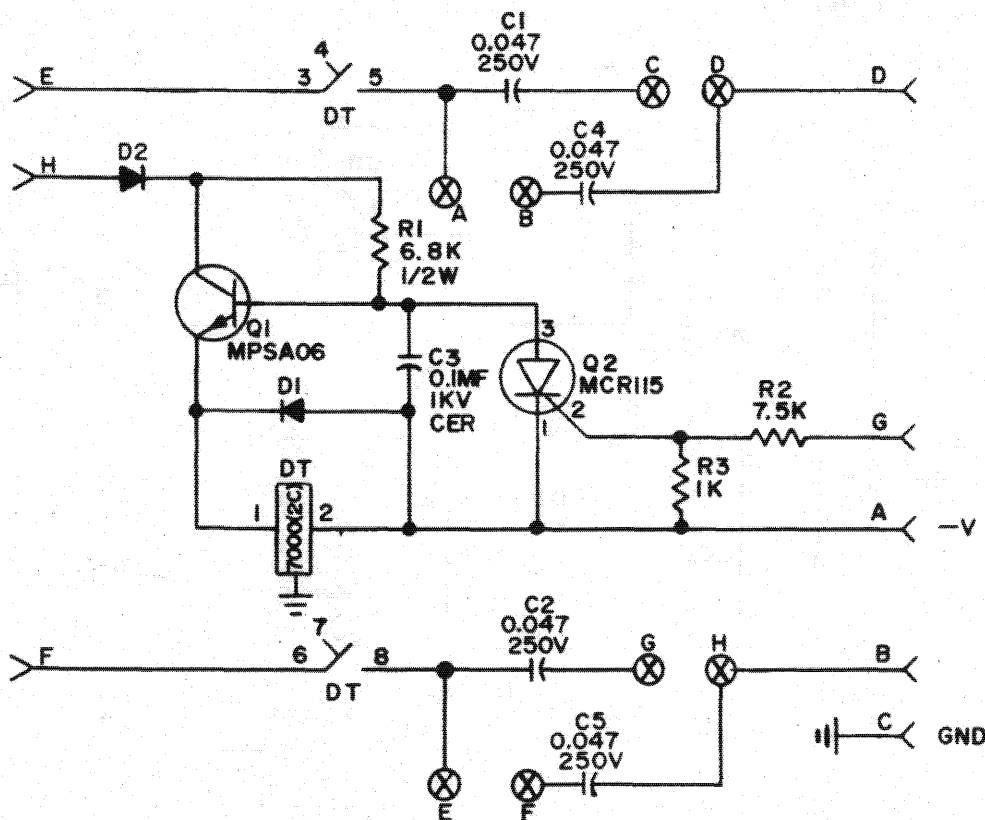
No. Dialed	1	2	3	4	5	6	7	8	9	0
A DIGIT										
B DIGIT										
C DIGIT										

Translation of 2 and 3 digit codes

Code Dialed				
Translation Group	1	2	3	4
Outlets Assigned				

SDA (-12 500171)

No. Dialed	1	2	3	4	5	6	7	8	9	0
Before unlock										
After unlock										



REV
2

CHANGES

ISSUE:1 RELEASED 1-26-79

ECO-1459: DECREASES DIAL TONE INSERTION LEVEL TO BE COMPATIBLE WITH S.C. AND ITT STEP OFFICES.

ISSUE:2 8-23-79

ECO-1601: TO ALLOW FIELD SELECTABLE DIAL TONE LEVEL. TO PREVENT DESTRUCTION OF Q1 IF PLUGGED ON BACKWARDS.

ISSUE:3 5-22-80

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE 1/4 WATT, 5%
ALL RESISTOR VALUES IN OHMS

2. FOR TONE LEVEL ADJUSTMENT, INSTALL STRAPS BETWEEN POSTS AS FOLLOWS:

LOUD = A-B, C-D, E-F & G-H
MEDIUM = C-D & G-H
LOW = C-B & G-F

TITLE	SIGNATURE & DATE
TCR	
DR	<i>[Signature]</i>
CHE	
ENGR	<i>[Signature]</i>
ENGR	
APPD	<i>[Signature]</i> 1/31/79
WFC	



ITEC
HUNTSVILLE, ALABAMA 35892

**DIAL TONE
OPTION**

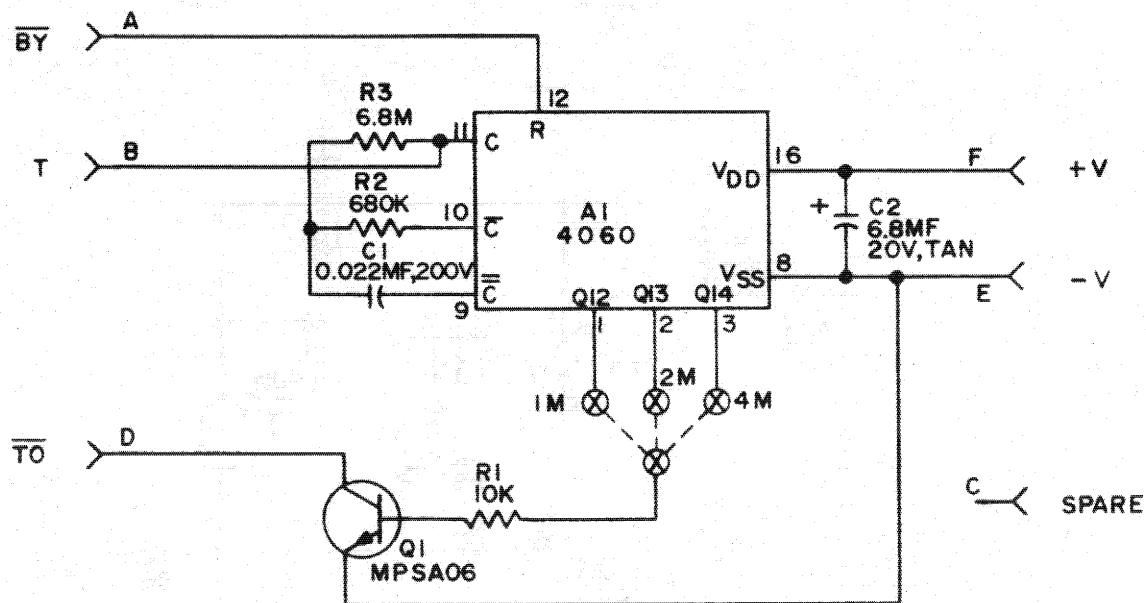
B

THIS DRAWING OR SPECIFICATION IS THE PROPERTY OF ITEC. COPIES ARE ISSUED IN STRICT CONFIDENCE AND SHALL NOT BE REPRODUCED OR COPIED, OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.

SCALE

C500172


DWG. BASE NO. REV. CLASS



CHANGES		APPD.
ISSUE: 1	RELEASED 1-26-79	<i>[Signature]</i>
ECO-1403: TO PRODUCE CORRECTLY FIXED OUTPUTS.		<i>[Signature]</i>
ISSUE: 2	6-6-79	

NOTE:

- UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE $\frac{1}{2}$ W. $\pm 5\%$
ALL RESISTOR VALUES IN OHMS

TITLE	SIGNATURE & DATE	 ITEC HUNTSVILLE, ALABAMA 35892	TROUBLE TIMING OPTION
TCR			
DR	<i>[Signature]</i>		
CHK			
ENGR	<i>[Signature]</i>		
ENGR		THIS DRAWING OR SPECIFICATION IS THE PROPERTY OF ITEC. COPIES ARE LOANED IN STRICT CONFIDENCE AND SHALL NOT BE REPRODUCED OR COPIED, OR USED AS THE BASIS FOR THE MANUFACTURE OF ANY EQUIPMENT WITHOUT PERMISSION.	C500173
APPD	<i>[Signature]</i>		
MFG			
OWG	SCALE	REF.	DWG. BASE NO. SUB CLASS

INSTALLERS WIRING EMS-I SELECTOR BACKPLANE

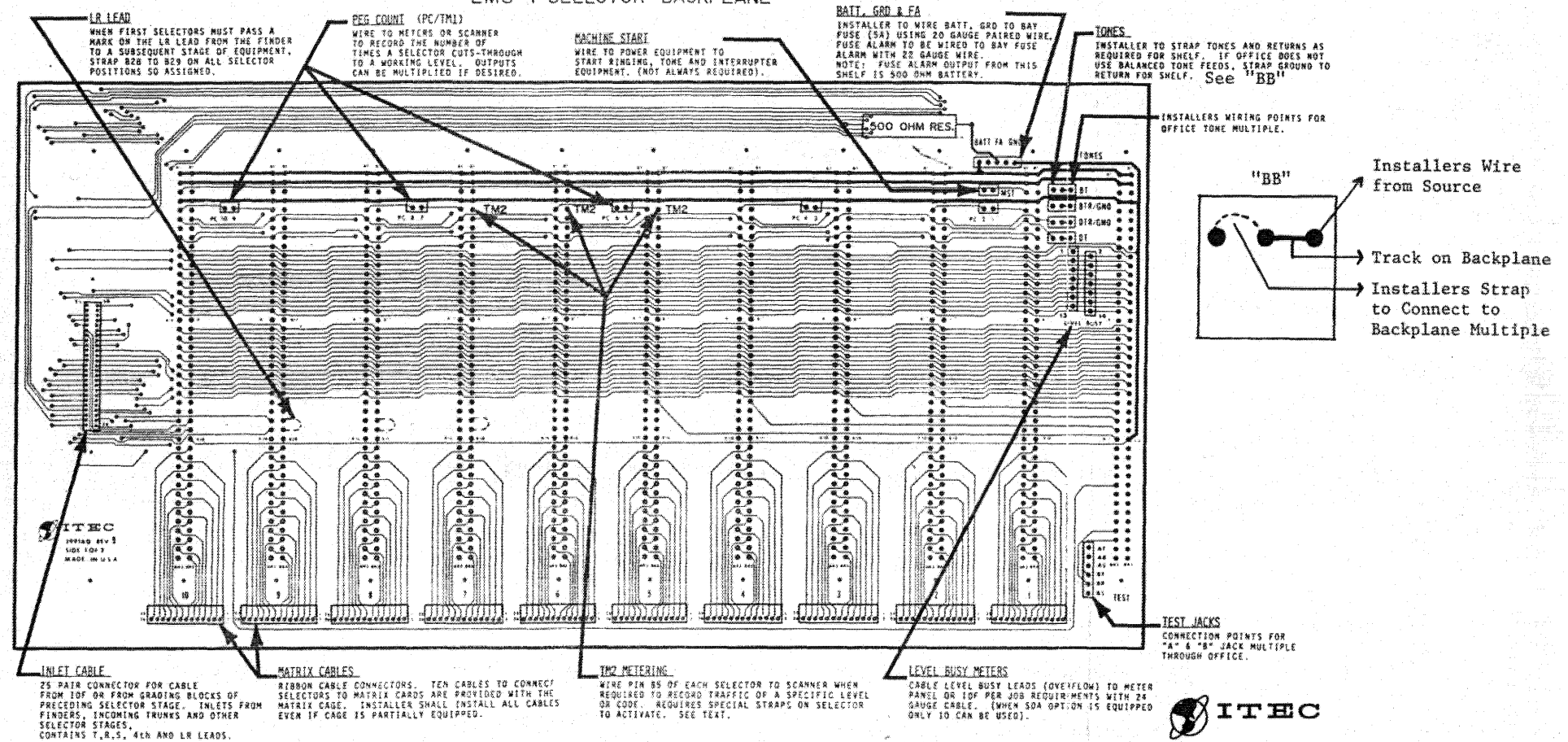
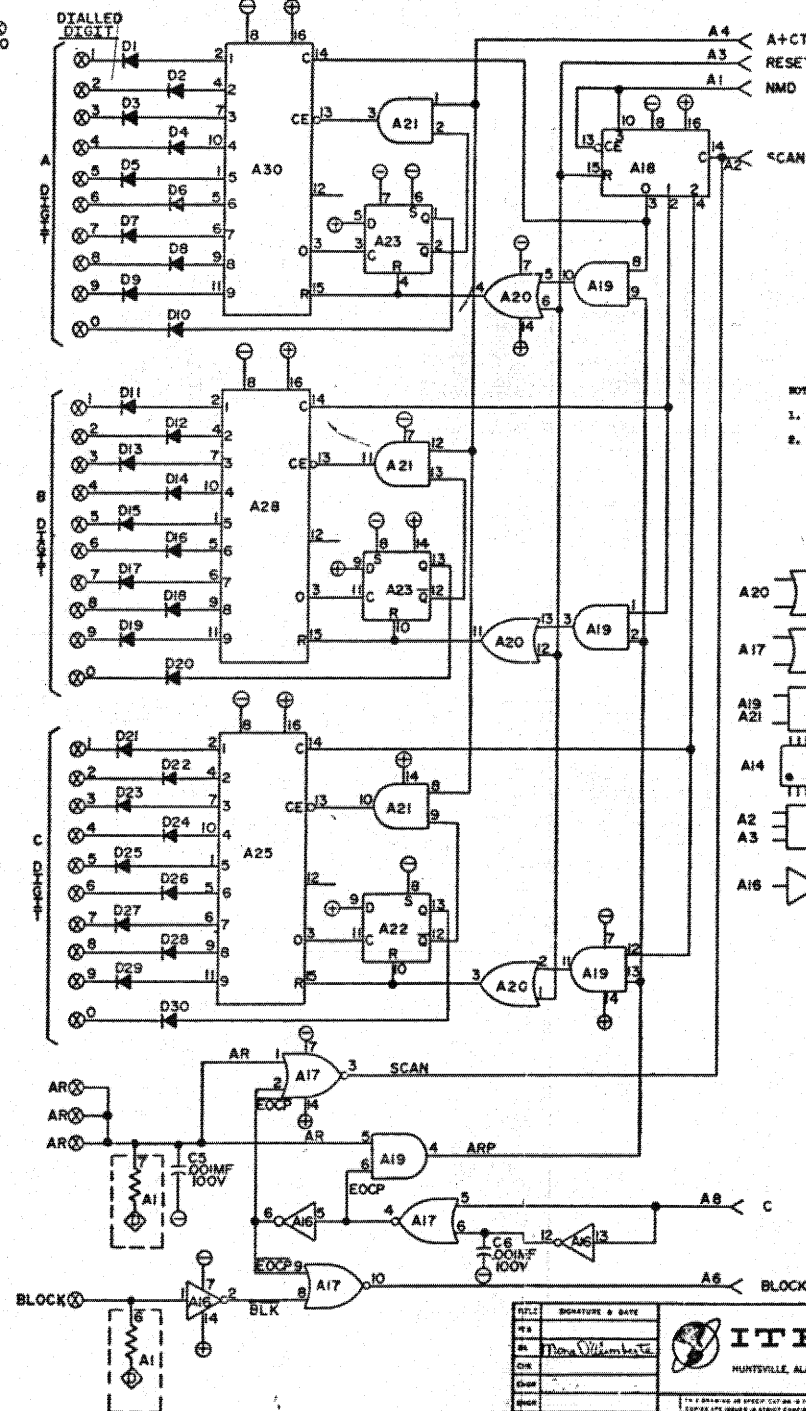
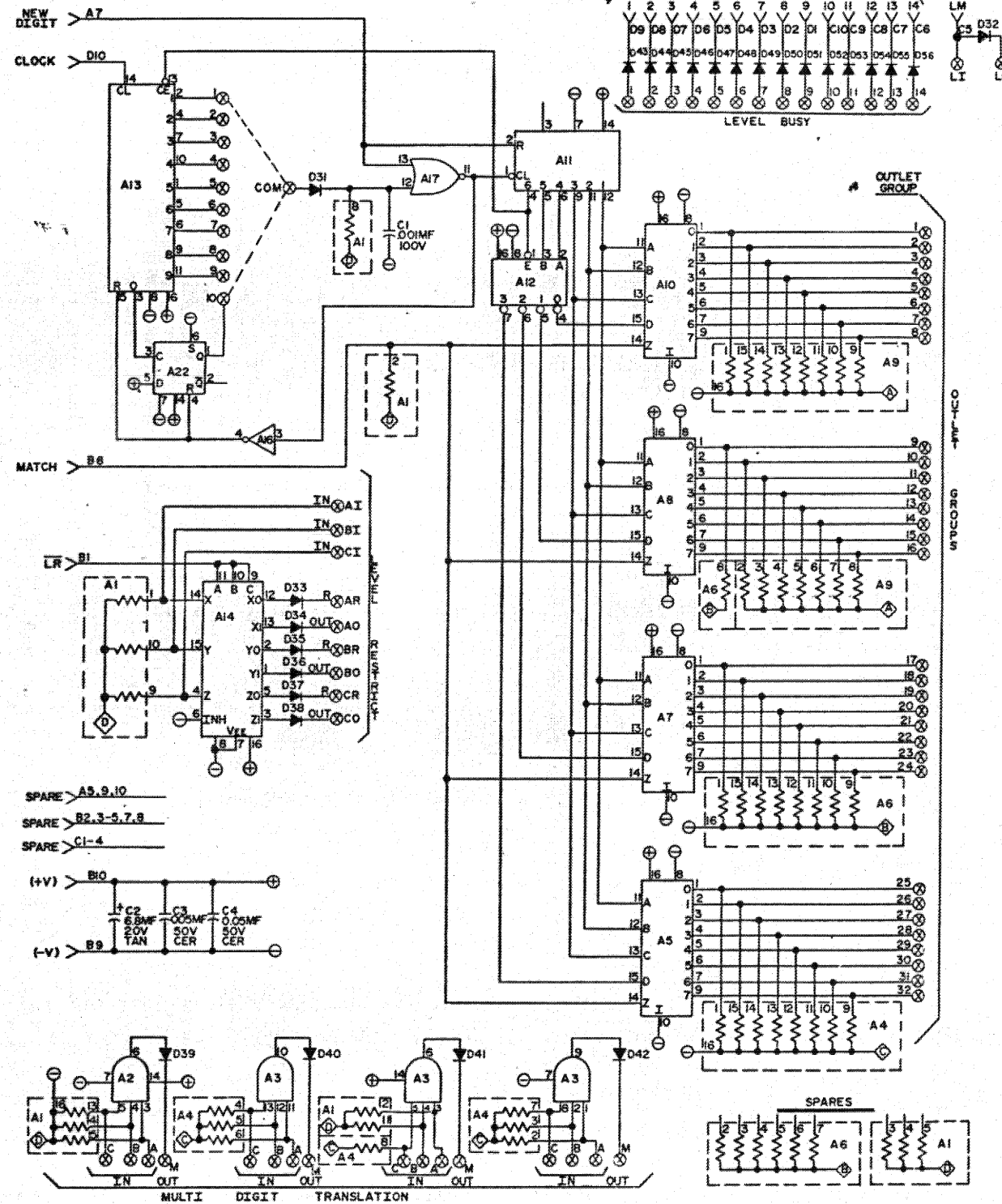


Figure 6.



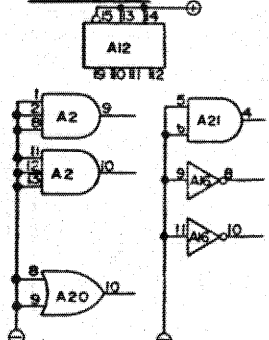
CHANGES	APPROVAL
ISSUE 1 RELEASED 2-6-79	
ISSUE 2 5-4-79	
ISSUE 3 6-16-80	
ISSUE 4 2-7-81	

- NOTES:
1. ALL TYPINGS ARE 100%.
 2. RESISTOR VALUES A1, A5, A6, & A9 CORRESPOND TO (15) WTE, 25, 1/8 WATT RESISTORS.

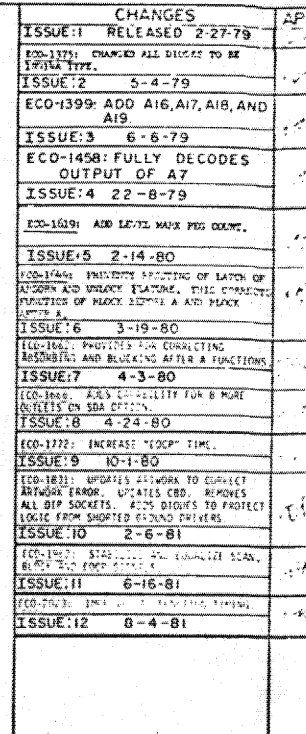
CMOS INVENTORY


A20	A13, A25	A10, A8	A28	A30
A17	A12	A11	A10, A8	A7, A5
A19	A21	A16	A22	A23
A14	A10, A8	A7, A5	A22	A23
A2	A3	A16	A22	A23
A16	A10, A8	A7, A5	A22	A23

SPARES



SIGNATURE & DATE		ITEC HUNTSVILLE, ALABAMA 35892	MULTI DIGIT ABSORBING OPTION
DESIGNED BY: <i>Don Williams</i> CHECKED BY: <i>Don Williams</i> DATE: <i>2-6-79</i>			
Dwg. No. <i>5-7</i> Scale: <i>1/8"</i>		C500170 Dwg. Date: <i>2-6-79</i>	



TITLE	SIGNATURE & DATE	 ITEC HUNTSVILLE, ALABAMA 35892	SINGLE DIGIT ABSORBING OPTION
MR			
DR	<i>[Signature]</i>		
COR			
ENGR			
ENGR			
APPRO			
NOT			

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SHEET 1 OF 1

