

# GBPPR 'Zine



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You big dummy.

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# Universal Emergency Service Number 911 / #1A ESS

## Enhanced 911 Service – Part 1

AT&T PRACTICE  
Standard

AT&T 231-090-288  
Issue 3, December 1989

### UNIVERSAL EMERGENCY SERVICE NUMBER 911 FEATURE ENHANCED 911 SERVICE FEATURE DOCUMENT 1 AND 1A ESS™ SWITCHES

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### 1. INTRODUCTION

#### DEFINITION

**1.01** This document describes the E911 (Enhanced 911) feature capabilities available for 911 service in 2-wire 1 and 1A ESS switches. This document does not provide a detailed description of the B911 (Basic 911) feature. For a detailed description of the B911 feature, refer to Part 6 A(1).

#### REASON FOR REISSUE

**1.02** This practice is reissued for the following reasons:

- (a) To include addendum Issue 4.
- (b) To state that option number 4 must be specified on ESS Form 1303B1 for RI 0112 in order for an interrupted high tone to be returned to the PSAP (public service answering point) attendant if a selective transfer request is invalid.
- (c) To include the Service Code Confirmation Timing and Pulsed Digit Reception Blocking enhancements available in the 1AE8A.07 and later generic programs.

Since this reissue is a major revision, change arrows have been omitted.

#### AVAILABILITY

**1.03** The E911 feature is an optionally loaded feature group available in the 1E5 generic program for the 1 ESS switch and in the 1AE5 generic program for the 1A ESS switch.

#### BACKGROUND

**1.04** The number 911 is the 3-digit telephone number that has been designated for public use throughout the United States to report an emergency and/or request emergency assistance. The number 911 is intended as a nationwide universal telephone number that provides the public with direct access to a PSAP. A PSAP is an agency or facility which is designated and authorized to receive and respond to emergency calls requiring one or more public services such as police, fire, and/or ambulance services. Any one agency or a group of agencies may be designated as a PSAP.

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### ASSIGNMENT

**1.05** The E911 customer premises equipment may be equipped for a maximum of 15 dedicated E911 trunks from the E911 tandem office and may serve up to 15 attendant lines. Refer to Part 2A.

**1.06** For a 1 ESS switch E911 tandem office without a PDSP (peripheral data storage processor), the maximum number of different ESNs (emergence service numbers) assigned per number group is eight. If a PDSP is used with a 1 ESS switch E911 tandem office, the maximum number of different ESNs per number group in the PDSP is 511. For a 1A ESS switch using a 1AE5 generic program, the maximum number of ESNs per number group is eight. In 1AE6 and later generic programs, a 1A ESS switch may have a maximum of 511 ESNs per number group.

**1.07** The maximum number of secondary DNs (directory numbers) associated with a primary PSAP for selective transfer is six. Assigned PSAP DNs must be local DNs.

### 2. USER PERSPECTIVE

#### USER PROFILE

**2.01** Any individual, coin, Centrex/ESSX-1 (centrex tariff restructure), and PBX (Private Branch Exchange) customer station, or any other facility [that can access the DDD (direct distance dialing) network], which is served by an office located in an E911 service area, can be used to originate a 911 call to a PSAP without charge to the calling station. A 911 call may be originated from an individual (nonbusiness) or coin station by going off-hook and dialing the digits 911 after receiving dial tone. A 911 call may be originated without coin deposit from a dial tone first coin station. If coin deposit is required before receiving dial tone, coin return is made after the digits 911 are dialed. Centrex/ESSX-1 and PBX customers must dial the network access digit prior to dialing 911 (i.e., 9 + 911) to obtain access to the message network unless the customer is provided "assume dial 9" service. With "assume dial 9" service, the network access code does not have to be dialed.

**2.02** A municipality providing E911 service may be generally referred to as an E911 customer. Dedicated E911 trunks are required between each office in the E911 service area and the E911 tandem office. Dedicated E911 outgoing trunks are required from the E911 tandem office to each PSAP. The dedicated E911

PSAP trunks are used as one-way trunks and cannot be used to originate calls from a PSAP. Regular customer service can be provided (via lines or trunks) for a PSAP facility to have standard message network originating and terminating service. The E911 network (Figure 1) is intended as a dedicated public emergency service network for emergency calls to PSAPs.

### CUSTOMER PREMISES EQUIPMENT

**2.03** Each PSAP facility requires one or more attendant terminals, which may be regular type telephone sets, CALL DIRECTOR® telephone sets, key telephone sets, attendant consoles, or equivalent equipment. If optional services, such as selective transfer and/or ANI (automatic number identification) display are provided, each PSAP facility requires E911 customer premises equipment as well as attendant terminals to be located on the customer premises. Refer to Figure 2 for a block diagram of an E911 CPS (Customer Premises System) equipped with E911 equipment. The E911 common equipment, contained in the J53060A equipment cabinet, provides interface and control functions for all 911 calls to the PSAP. Attendant station (terminal) equipment may be either 2B ACD (Automatic Call Distribution) attendant positions, key telephone system with key telephone sets or equivalent equipment. In addition to the required common and attendant station equipment, an optional 10A1-50 selector console may be provided for each equipped attendant position. The selector console is required if either selective transfer, fixed transfer, or ANI display services are provided. The ALI (automatic location identification) display is required when the optional ALI service is provided. The voice recorder and teleprinter units are optional customer equipment.

#### A. J53060A Equipment Cabinet

**2.04** The E911 common equipment is housed in the J53060A equipment cabinet which measures approximately 22 inches deep by 31 inches wide by 50 inches high. See Figure 3. The J53060A equipment cabinet contains the following equipment.

- (a) J53060A, L1 Cabinet—Provides framework, assembly, wiring, and equipment arranged for a maximum of 15 attendant lines and 15 CO (central office) trunks.
- (b) J53060AA Basic Carrier—Provides common equipment for four attendant lines and four CO

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trunks. Common modular equipment includes circuit packs for a controller, clocks, memory, touch-tone service, dial tone, MF (multifrequency) receivers, trunk switches, attendant circuits, and a voltage regulator.

(c) J53060AB Supplementary Carrier—Provides optional common equipment to expand the E911 CPS to 15 attendant lines and 15 CO trunks.

(d) J53060BA L2 Rectifier—Optional, required when no external reserve power (e.g., 105E battery plant) is provided.

(e) J53060BA L1 DC Power Supply Unit—The J53060BA unit contains dc-dc converters to supply +5, +12, -12 dc voltages and 10 V ac for the cabinet components via the fuse panel on the basic carrier. The unit also contains the optional J53060BA L3 (KS-21906 L1) holdover battery. The unit provides audible ringback and external alert signaling for the system.

(f) J53060BA L3 Holdover Battery Unit—The optional J53060BA L3 battery unit provides -48V to the system as a reserve battery plant in case of commercial power failure. Battery capability is 11 minutes for a full system. This unit is required when external battery power (e.g. 105E battery plant) is not provided.

(g) AC Power Distribution Box—The ac power distribution box, via the power cord, is connected directly to a dedicated, customer-provided 117 V ac 20A 60-Hz power receptacle. The box provides ac power receptacles for the power supply unit and rectifier. Also, two fused power receptacles are mounted on the box to facilitate use of test equipment.

(h) J53060BA L4 +5V Power Unit—The J53060BA L4 +5V power unit is required when J53060AB L1 supplementary carrier is provided.

(i) Fuse Panel—The fuse panel, mounted to the bottom of the basic carrier, contains the system's fuses and provides circuit protection for the circuit packs. Type 70 self-indicating fuses are used. Mounted on the fuse panel are LED (light emitting diode) indicators monitoring fuse failure, ac power failure, and low voltages. Also mounted on the fuse panel are voltage test points and connectors for a logic probe and service access position.

(j) Maintenance Circuit Pack—The maintenance circuit pack, mounted in the basic carrier, contains LED indicators, maintenance control switches, and fixed/selective transfer speed call switches. The LED indicators indicate the operational status of the CPS. The switches are used to configure the CPS equipment for test modes and to assign fixed transfer/selective transfer speed call codes for the 10A1-50 selector consoles.

**2.05** For a PSAP requiring more than 15 attendant lines and 15 CO trunks, additional equipment cabinets may be provided. For detailed information concerning E911 CPS equipment, refer to Part 6 A(2) through A(4).

**2.06** The E911 CPS equipment design also provides for access leads for optional connections to customer-provided voice recorders and teleprinters.

(a) Voice recordings for 911 calls may be made on a per-trunk basis. Access leads are available to provide connection to voice recording equipment. Start leads are also available to turn on the recorders if start/stop operation is employed. If continuous recorder operation is desired, the start leads are not connected.

(b) A teleprinter may be interconnected to the E911 common equipment to record certain information available for 911 calls. The common equipment is designed to store certain 911 call data. The common equipment may be arranged so that upon disconnect, there will be a teleprinter printout for each call. The output data consists of the trunk number, an ANI number, the attendant position(s) handling the call, and the time of day of receipt of the call, answer, transfer (if applicable), and disconnect.

### B. E911 Attendant Terminal Equipment

**2.07** Either a 2B ACD or a KTS (key telephone system) may be used by an E911 customer. Attendant consoles are used with a 2B ACD. Either CALL DIRECTOR telephone or key telephone sets are used with a key telephone system. For a description of a 2B ACD arrangement, refer to Part 6 A(41). Listed below are key telephone sets that may be used with E911.

- 2565 key telephone set
- 2636 CA CALL DIRECTOR telephone
- 2637 DA CALL DIRECTOR telephone

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- 2830 key telephone set
- 2831 key telephone set
- 2832 key telephone set.

### Controls and Indicators

**2.08** Standard controls and indicators are equipped on attendant consoles, key telephone sets, and CALL DIRECTOR telephone sets used for PSAP attendant terminals. Unique controls and indicators are not required for the attendant terminals since the 10A1-50 selector console provides for the unique E911 control and indicator functions. Refer to other documentation for detailed information concerning controls, indicators, and the method of operation for a specific type of attendant terminal.

### Tones

**2.09** Standard tones (e.g., dial tone, busy tone, reorder tone, audible ringing tone) are provided by the E911 tandem office for attendant transfer calls. Also, interrupted high tone (120 ipm) is provided when selective transfer is attempted but not allowed for a 911 call.

**Note:** For an incoming 911 call, if the PSAP is equipped with a key telephone system, all attendants are alerted via an external common alert (such as a ringer, bell, klaxon, horn, or light) and by a flashing trunk lamp. If the PSAP is equipped with a 2B ACD, an attendant is alerted by a zip tone. Audible is returned to a 911 calling party from the E911 PSAP customer premises equipment.

### C. 10A1-50 Selector Console

**2.10** In addition to the attendant terminals, the 10A1-50 selector console is required for the optional ANI display and selective and/or fixed transfer services. The selector console is an adjunct-type console equipped with an 8-digit LED display and 12 nonlocking keys (pushbuttons). Refer to Figure 4. The selector console, also referred to as the ANI display unit, displays the ANI telephone number of the station from which a 911 call is originated. If the ANI telephone number is not available, then other associated data (indicating the originating local office or call status) is displayed. The pushbuttons permit the attendant to initiate and release call transfers, and to retire E911 CPS system alarms. One selector console is

provided for each equipped attendant position. Even when this unit is employed, all E911 call pickup and release functions are accomplished in the conventional manner using the pickup and control buttons of the attendant terminal equipment provided (i.e., key telephone set, CALL DIRECTOR telephone or ACD console).

### 8-Digit LED Display

**2.11** The 8-digit LED display and 12 nonlocking pushbuttons are located as shown in Figure 5. The 8-digit display consists of three display segments. The first segment is a single digit display used to indicate a digit representing the NPA (numbering plan area) from which a 911 call originated in those cases when the 911 service area includes two or more NPAs. The display digit representing an NPA is called the NPD (numbering plan digit). If the 911 service area has only one NPA, no digit is displayed. Otherwise, the digits 1, 2, and 3 are used to indicate the lowest NPA, second NPA, and highest NPA, respectively. The second and third segments are used to display the ANI TN (telephone number) of the originating station, which includes the office code (NXX) and the telephone extension number (XXXX).

**2.12** In cases where special attention and handling may be required, the displayed digits may be (optionally) flashed off and on to alert the attendant. Examples of such cases are a 911 call originated via a FX (foreign exchange) line serving a station which is not physically located in the 911 service area or a TN which does not have an ESN assigned.

**2.13** If the ANI telephone number of the originating station is not available, a fictitious telephone number (XXX-XXXX) is displayed as follows:

- (a) 911 OTTT—The NPD (numbering plan digit) is not displayed. The digits TTT indicate the local office from which the call originated. This format is displayed when default routing occurs due to the inability to obtain the originating station ANI TN because of an ANI failure and 911 calls from multiparty lines. Such circumstances prohibit ANI identification and result in default routing to an associated PSAP.
- (b) 911-0000—This format is displayed to indicate an anonymous call to the PSAP. An anonymous call is a 7-digit direct dialed call (not 911) to the DN of a PSAP, which is routed to the PSAP via a dedicated E911 trunk. For example, a customer

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direct dials a 7-digit number that is assigned and translated as a PSAP telephone number. ANI identification is not available for such (non-911) calls. Also, the NPD digit is not displayed. A PSAP may be assigned a nondialable number (such as an unassigned NXX code) to preclude such anonymous calls.

(c) 000-0000—This number is displayed if there is an ANI failure between the E911 tandem office and the PSAP.

### Control and Transfer Keys

**2.14** The 12 nonlocking control keys are located as shown in Figure 5. Four control keys are provided as follows:

(a) **ADD**—This key is provided to manually request dial tone for direct dialed manual call transfers. This key is *not* used to initiate either selective or fixed transfers. After operating the **ADD** key and receiving dial tone, the PSAP attendant manually dials any valid DDD number or 2-digit speed calling code (i.e., \*2X, \*3X, or \*4X) for the desired destination using the touch-tone pad equipped on the attendant terminal equipment.

(b) **CANCEL**—This key is used to cancel any type of transfer (selective, fixed, or manually dialed) prior to destination answer. The key is also used, after a call transfer has been answered, to release the called party (destination). In this case, the added party is released, but the originating party and the PSAP attendant remain connected for 2-way conversation.

(c) **ALM**—The **ALM** key is used to turn off an audible alarm which sounds when certain conditions occur in the E911 CPS equipment. Generally, an alarm indicates a malfunction or failure condition in the customer premises equipment.

(d) **RPT ALI**—This key is associated with ALI (Automatic Location Identification) service. The **RPT ALI** (repeat ALI) key is used to regenerate a request for ALI information.

**2.15** Eight transfer keys are equipped to provide for selective and/or fixed call transfer services. Refer to Figure 5. Selective and fixed transfer services are discussed in paragraph 2.21. The eight transfer keys are placarded (designated) according to their use.

Any of the transfer keys may be assigned as either selective or fixed transfer keys.

(a) Selective transfer keys are placarded according to the type of agency (i.e., fire, police, etc.) to which a 911 call may be selectively transferred via the E911 tandem office. With selective transfer, the attendant only needs to determine the type of agency and operate the corresponding transfer key. The call is automatically extended to the correct agency location (secondary PSAP) associated with the originating station. With selective transfer, the attendant does not have to determine the particular agency location which serves the calling party.

(b) Fixed transfer keys are placarded according to the type of agency and the particular agency location (i.e., fire A, fire B, police A). With fixed transfer, the attendant must determine both the type of agency and the particular agency location in order to transfer the call to the correct agency location which serves the originating station location.

### D. ALI Display Unit

**2.16** The ALI display unit is an informer model CM911 receive only CRT (cathode ray tube) display unit. When the ALI feature is provided, each PSAP attendant position may be provided with an ALI display unit, which displays location information (i.e., street address) of the station from which a 911 call is made. The ALI display unit is an integral part of the ALI system, which interfaces with the E911 CPS.

### FEATURE DESCRIPTION

**2.17** The E911 feature provides enhanced 911 service capabilities and optional PSAP customer services for completing and handling 911 calls. With E911 service, a 1 or 1A ESS switch serves as an E911 tandem office for all 911 calls from other local offices in the 911 service area and as a local office for 911 calls originated by customers served by the E911 tandem office. The E911 tandem office may serve one or more PSAPs in the 911 service area. The E911 feature provides the capability for the E911 tandem office to serve several PSAPs existing within the 911 service area. The main characteristic of E911 service is the capability of the E911 tandem office to selectively route a 911 call originated from any station in the 911 service area to the correct primary PSAP that is designated to serve the originating station's location.

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The following services are available with the E911 feature.

- (a) Selective routing
- (b) Default routing
- (c) Alternate routing (for traffic busy PSAPs, for PSAPs on night service, and for PSAPs which have a power failure)
- (d) Central office transfer (selective, fixed, or manual transfer)
- (e) ANI
- (f) ALI/DMS (Data Management System)
- (g) Forced disconnect
- (h) Night service
- (i) Service code confirmation timing (1AE8A.07 and later)
- (j) Pulsed digit reception blocking (1AE8A.07 and later).

**2.18 Selective routing** provides the capability to selectively route a 911 call to the primary PSAP associated with the originating station. Selective routing is based on either the office code, the number group (thousand's group), or the ANI TN of the originating station, rather than the digits dialed. The ANI TN is the billing TN of the originating station, which is used for normal toll or message rate billing. The ANI TN may not be the actual TN of the station. Selective routing is an optional E911 service which may be provided on a per office code, per number group, or per TN basis. Therefore, when selective routing is provided, each station in an E911 service area is associated (either indirectly via the station's office code or number group, or directly via the station TN) with a primary PSAP. Thus, selective routing automatically routes a 911 call to the correct primary PSAP designated to serve the originating station.

**2.19 Default routing** is a standard arrangement with E911 service which provides the capability to automatically route a 911 call to a predesignated (default) PSAP (or some designated location) either when selective routing is not provided or when selective routing is provided but a particular 911 call cannot

be selectively routed for any reason. Default routing is an inherent capability with the E911 feature.

**2.20 Alternate routing** is a standard service available for each PSAP and provides the capability for a traffic busy PSAP, a PSAP on night service, or a PSAP which has a power failure to have 911 calls alternate routed to a predesignated location. With alternate routing, if all trunks to a particular PSAP are traffic busy, or made busy for night service, or the PSAP is out of service due to a power failure, 911 calls normally routed to that particular PSAP are automatically alternate routed to the predesignated DN assigned for that alternate location.

**2.21 Central office transfer** is a standard service available for each PSAP and provides the capability for an established 911 call to a PSAP to be transferred via the E911 tandem office to another PSAP or to some other desired destination by the PSAP attendant. A call transfer is accomplished at the E911 tandem office via a 3-way conference connection, which permits a simultaneous 3-way connection to be established for the calling party, primary (or controlling) PSAP attendant, and the desired destination, which may be another PSAP or some other DN. Three types of central office transfer services (selective, fixed, and manual) are available for a PSAP. Either selective transfer, fixed transfer, or manual transfer, or any combination of these transfer services may be provided for an E911 PSAP.

- (a) **Selective transfer** service allows an established 911 call to be selectively transferred by the E911 tandem office from the primary PSAP to the correct secondary PSAP associated with the calling station ANI TN without the primary PSAP attendant having to determine and manually dial the digits for the correct destination. Each primary PSAP may have up to six secondary PSAPs associated with it for selective transfer. Selective routing is required if the selective transfer option is provided. To initiate selective transfer to the correct secondary PSAP, the PSAP attendant operates a key associated with the particular type (e.g., fire department) of secondary PSAP desired. The E911 tandem office automatically determines the specific secondary PSAP designated (e.g., fire department A) to serve the calling station and selectively transfers the 911 call to that secondary PSAP.

**Note:** A PSAP may be designated as primary or secondary, which refers to the order in which 911 calls are directed for answering. Primary

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PSAPs respond first; secondary PSAPs receive calls on a transfer basis only.

(b) *Fixed transfer* allows an established 911 call to be transferred by the PSAP attendant to another *specific* PSAP (e.g., fire department A) or some other specific destination. Fixed transfer by the operation of a transfer key uses the speed calling feature of the E911 tandem office.

Fixed transfer provides for call transfer to any of a limited number of specific destinations, which may be other PSAPs or some other destinations to which 911 calls may be transferred. With fixed transfer service, the PSAP attendant determines the specific destination desired and operates the particular key associated with the specific (fixed) destination.

(c) With the *manual dial transfer* service, the PSAP attendant determines the specific destination desired and manually dials the number of the destination or associated speed calling code (if speed calling is provided for manual dial transfer).

**2.22 ANI** is an optional service which allows (for 911 calls only) the ANI TN of the calling station to be automatically forwarded to the PSAP and displayed at the answering PSAP attendant position on a special ANI display unit. When the ANI TN of the calling station is available, the display will indicate a NPD (numbering plan digit), which provides an indication of the numbering plan area of the calling station, and the 7-digit ANI TN of the calling station. In cases where the ANI TN is available but the call either cannot be properly routed by the E911 tandem office or the call requires special attention by the PSAP attendant, the ANI TN displayed may be optionally flashed to alert the answering PSAP attendant. In cases where the ANI TN is not available, the display provides an indication of the telephone office from which the call originated. Also, the display will indicate an anonymous call to a PSAP.

**2.23 ALI** is an optional service which provides street address information for 911 calls to PSAPs to be displayed at the answering PSAP. An integral part of the ALI system is a *DMS*. The main functions of the DMS are maintenance of the E911 data base, the processing of telephone company and customer data or inclusion in the E911 data base, and the generation of selective routing update data. *Forced disconnect* is an inherent capability with E911 service and is provided to prevent a calling station, which remains off-hook, from indefinitely holding the connection to a

PSAP. Forced disconnect allows a PSAP attendant to release a 911 call connection even though the calling party has not hung up, thereby preventing a tie up or jamming of dedicated 911 facilities.

**2.24 Night service** is a standard feature available for each PSAP. When night service is in effect for a PSAP, all 911 calls to that PSAP are automatically forwarded to the predesignated (alternate) DN assigned for that PSAP. The alternate DN may be associated with a secondary PSAP or some other alternate location.

**Note:** One predesignated (alternate) DN may be assigned for a particular PSAP. Therefore, if a PSAP is provided with alternate routing for a traffic busy condition, night service, and/or power failure condition, the same predesignated DN is used for alternate routing due to any of these conditions.

**2.25 Service code confirmation timing** is a 1AE8A.07 and later enhancement providing timing after a service code is dialed, e.g., 911, so that inadvertently dialed 911 numbers are not routed to the PSAP. The confirmation timing is variable from 1-4 seconds and results in increased call set up time to the PSAP for true 911 emergency calls.

The delay option is controlled by choosing a value for a 2-bit field in the office options table. Bits 19 and 20 of word 1 of the office options table result in the following delay:

00	— no delay (default)
01	— 1-2 second delay
10	— 2-3 second delay
11	— 3-4 second delay.

**2.26 Pulsed digit reception blocking** is a 1AE8A.07 and later enhancement that rejects dial pulse digits after a DTMF (Dual Tone Multifrequency) digit is received at the central office from a given line. Without pulsed digit reception blocking the flash signals generated during dialing by a customer depressing the switchhook multiple times can be interpreted by the 1A ESS switch as "ones" dial pulse digits and result in misrouted calls. The pulsed digit reception blocking feature is set in the PDRB bit, bit 12 word 1, in the office options table.

**2.27 Demand** for the basic 911 service and various special or "custom" features to improve 911 service capabilities in various localities has increased

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significantly since 911 service was initially introduced. The E911 feature provides certain customers with the initial or basic 911 service. The intent of the background information contained herein is to provide general information concerning 911 service per se and to generally describe, for comparison purposes only, the capabilities of and differences between B911 service and E911 service. This document does not provide detailed information for B911 service. For detailed B911 service information, refer to Part 6 A(1). Part 6 B(1) through B(13) provide additional planning, engineering, and marketing information for 911 service.

**2.28** Close coordination among agencies providing various emergency services is a valuable capability provided by 911 emergency service. Advantages to the public include one universal 3-digit number that is easy to remember and that can be called for any of the various emergency services provided within a given 911 service area. Confusion is avoided, and time is saved since a caller does not have to remember or look up one or more 7-digit directory numbers to report an emergency situation or request emergency services.

**2.29** A 911 service area is established on a municipal basis. PSAPs within the 911 service area are designated by the municipality. PSAPs have previously been referred to as ESBs (emergency service bureaus). As used herein, a municipality may be a city, town, community, county, or a combination of these or other various political entities. The scope of services to be provided and agencies associated with a PSAP are determined by the municipality. For example, a municipality may desire one or more of the following agencies/services to be associated with a 911 service arrangement:

- Ambulance
- Civil Defense
- Drug Abuse
- Emergency Medical Services
- Fire Department
- Forestry
- Highway Patrol
- Hospital
- Poison Control

- Police
- Public Works
- Sheriff
- State Police
- Suicide Prevention
- Weather Warning.

Any agency or combination of agencies may be designated as a PSAP.

**2.30** One or more attendants are located at a PSAP facility to receive and handle emergency calls in accordance with municipal requirements. PSAP attendants may be personnel from one or more of the various agencies, such as the police or fire department, or any other agency designated to receive 911 emergency calls. Depending on municipal requirements and procedures, a PSAP attendant may need to serve 911 emergency calls by:

- (a) Serving as a dispatcher for one or more agencies
- (b) Transferring the call to the proper agency
- (c) Collecting and relaying emergency information to the proper agency.

**2.31** One or more PSAPs may be required for any given municipality or metropolitan area. For example, a small community having only one police and one fire department to serve the entire community may require only one PSAP. However, a larger municipality having several police and/or fire districts may desire to have a PSAP associated with each district since the public within a particular district is generally served by the agencies within (or associated with) that district.

**2.32** Assuming a municipality desiring 911 service is served by one or more 1/1A ESS switch central offices capable of providing either the B911 or E911 services, the choice of 911 service and service options will be made by the telephone company and the municipality, and will be based on an analysis of customer needs at each location and on the availability of facilities in each area. Some of the basic considerations for 911 service include the following:

- (a) Type of 911 services and options desired or required

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- (b) Population and area (including growth potential) of the municipality
- (c) The number of districts (or zones) within the 911 service area which are served by the same agencies or set of agencies
- (d) Telephone office wire center boundaries compared to the districts (zones) or other political subdivisions within the 911 service area.

### A. Basic 911 Service Capabilities

**2.33** With B911 service, a 1 or 1A ESS switch office will route 911 emergency calls to only one PSAP. For discussion purposes, the office that provides B911 telephone service to a PSAP is referred to as the B911 central office. With B911 service, all 911 emergency calls originating within the B911 central office are routed to the same PSAP regardless of incongruities between telephone wire center boundaries and municipal agency districts or other political subdivisions within the 911 service area. Also, all 911 calls received by the B911 central office from other offices via the message network (interoffice or tandem trunks) are routed to the same PSAP. Service provisions available with B911 to provide additional call handling capabilities for PSAP attendants are:

- Forced disconnect
- Switchhook status (optional)
- Called party hold (optional)
- Emergency ringback (optional).

**Note:** Selective routing, default routing, alternate routing, central office transfer, ANI display, ALI/DMS, and night service are not available with B911 service.

**2.34** *Forced disconnect* allows a PSAP attendant to terminate, at any time, any established 911 call regardless of the action of the calling party. Forced disconnect prevents the dedicated facilities (lines or trunks) to the PSAP from being tied up by calling parties who remain off-hook. After a PSAP attendant releases from a 911 call, the dedicated 911 trunk to the PSAP is automatically released and made available for other 911 calls.

**2.35** *Switchhook status* is an optional service which automatically provides a visual indication of the

switchhook status of the originating station on an established 911 call. Visual switchhook status indications are not provided for 911 calls completed via interoffice or tandem (message network) connections. In addition to visual switchhook status indications, tones provided by the B911 central office enable the attendant to determine the 911 call status.

**2.36** *Called party hold* (also referred to as forced hold) allows the PSAP attendant to hold the connection established for a station from which a 911 call was originated, regardless of calling party actions. Called party hold enables the call to be traced to determine the calling party location. Actions by the calling party will not affect the connection being held. The connection is held until the PSAP attendant releases the call. Called party hold cannot be provided for 911 calls completed via interoffice or tandem connections since an incoming trunk cannot be forced held at the B911 central office.

**2.37** *Emergency ringback* allows the PSAP attendant to ring back a calling station regardless of the station switchhook (on-hook or off-hook) status. Emergency ringback cannot be provided for 911 calls completed via interoffice or tandem connections.

### B. Basic 911 Service Arrangements

**2.38** Consider a municipality that desires 911 service for public service agencies which include the police department, fire department, and ambulance service. Assume that since the greatest number of emergency calls (based on previous experience) are police calls, police department personnel will serve as the PSAP attendants. A municipality in which the same three agencies serve the entire municipality (911 service area) may require only one PSAP. For example, if a central dispatch system is used at a PSAP facility for all emergency services provided, then only one PSAP may be required. If only one PSAP is required, selective routing and central office transfer services are not necessary. Therefore, unless ANI display is required, B911 service appears to be adequate for the hypothetical municipality being considered.

**2.39** Figure 6 illustrates a simplified example of a B911 arrangement having one PSAP and using both dedicated (direct) and tandem trunking for 911 calls. For this example, the entire 911 service area was assumed to be served by the same set of agencies without any further district or political subdivisions. Switchhook status, called party hold, and emergency ringback services can only be provided for 911 calls

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originated by lines of the B911 central office (office "C"). Calling line status, called party hold, and emergency ringback **cannot** be provided for incoming 911 calls routed from other offices via the message network to the B911 central office for completion to the PSAP. Also, these services cannot be provided for add-on calls, calls from 51A CPS customer attendants, or calls originated via Centrex/ESSX-1 customer tie trunks. However, a PSAP may be served by more than one central office; therefore, if calling line status, called party hold, and emergency ringback capabilities are desired for 911 calls originating from other offices, dedicated 911 trunks direct to the PSAP from the other offices may be provided.

**2.40** Now, consider a similar municipality except there are two separate districts within the municipality. Refer to Figure 7. Each district (J and K) is independently served by the police and fire agencies within that district. The municipality desires a separate PSAP for each district. Assuming selective routing is either not required or not desired, B911 service can be provided by serving each PSAP (Y and Z) from separate B911 central offices (A and B) with the municipal district "J" boundary. Some stations served by offices "A" and "C" are located in district "K". Since selective routing is not provided with B911, all 911 calls originating in offices "A" and "C" are completed to PSAP "Y". Therefore 911 calls originated from stations served by offices "A" and "C" but located in district "K" are routed to the incorrect PSAP. In this type of situation, a method of handling 911 calls to the incorrect PSAP should be recommended to the municipality. Consider station "X" in district "K". A 911 call from station "X" is routed to PSAP "Y". Depending on municipal requirements, facilities, and procedures, PSAP "Y" attendants could handle the call directly if the station "X" customer location is to be served by the agencies (police, fire, etc.) from district "J". Otherwise, such calls may require transfer service (if available) or the emergency information may be relayed by an attendant at PSAP "Y" to an attendant at PSAP "Z" or handled in some other prescribed manner. For example, if the PSAPs are interconnected via private 2-way tie lines, the 911 call may be transferred via the private tie lines from one PSAP to another PSAP. Otherwise, the answering PSAP attendant could relay the information via either private tie lines or regular dial lines (if provided) or else the calling party may have to disconnect and direct dial the correct agency via the regular message network. This example does not mean that a municipality with two or more public service districts would necessarily have more than one PSAP. The necessary 911 services and options are determined

jointly by the telephone company and the municipality.

### C. Enhanced 911 Service Arrangements

**2.41** Several factors contribute to a more efficient 911 service arrangement by providing E911 service, rather than B911 service, for some 911 service areas. An area having several agencies and requiring several PSAPs in the 911 service area may need E911 service for selective routing due to telephone wire center and political (district) boundary mismatches or for central office transfer service due to PSAP agency associations, or for any of the other services available only with the E911 feature. The population and area, the number of separate districts and agencies, and the hierarchical arrangement of PSAPs within a 911 service area are significant factors in the type of 911 service required.

**2.42** To serve an E911 service area correctly, all telephone wire centers that are wholly or partially within the E911 service area must be part of the E911 arrangement. Thus the collection of telephone wire centers may serve areas outside the E911 service area. For this discussion, it is not important what type of 911 service, if any, is provided for those areas outside the E911 service area. Those areas could be non-911 or B911 service areas.

**2.43** When E911 service is provided, a 1 or 1A ESS switch is used as the E911 tandem office for the E911 network (Figure 1) to route all 911 calls to the correct (primary) PSAP designated to serve the calling station. It should be understood that the E911 tandem office (which must be a 1 or 1A ESS switch) serves as a tandem office for all 911 calls. The office can also serve as a regular class 5 local office. The E911 tandem office serves all PSAPs in the E911 service area. The E911 tandem office routes 911 calls from other offices and from customers served by the E911 tandem office to the PSAPs designated by the municipality to serve the customer stations.

**2.44** The E911 feature was developed primarily to provide routing to the correct PSAP for all 911 calls. Selective routing allows a 911 call originated from a station located in a particular district, zone, town, etc., to be routed to the primary PSAP designated to serve the customer stations in that particular district regardless of wire center boundaries. Thus, selective routing eliminates the problem of wire center boundaries not coinciding with district or other political boundaries.

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2.45 Selective routing may not be necessary for certain E911 service areas. For example, if telephone wire center and political boundaries coincide, selective routing may not be necessary, since in this case, proper routing to the correct PSAP can be accomplished using the default routing capability. However, if selective transfer is provided, selective routing must be provided since selective transfer requires selective routing data. The term "selective routing" refers to the E911 tandem office capability to route the call based on information concerning the calling station (i.e., ANI TN, number group, or office code) rather than the dialed address digits. Selective routing and the completion of a 911 call to a PSAP are separate functions of the E911 tandem office. The selective routing translation data provides a local directory number (DN) or list of local DNs served by the E911 tandem office to which a particular 911 call should be routed. The DN can be any valid local DN which typically leads (translates) to a dedicated outgoing 911 trunk group to a PSAP.

2.46 The services (previously defined) available with the E911 feature include:

- Selective routing (optional)
- Default routing (standard)
- Alternate routing (standard)
- Central office transfer (selective, fixed, and/or manual transfer service) (standard)
- ANI (optional)
- ALI/DMS (optional)
- Forced disconnect (standard)
- Night service (standard).

**Note:** Switchhook status, called party hold, and emergency ringback services available with B911 service are not available with E911 service. The E911 ANI and/or ALI display services generally satisfy the need for these types of services.

2.47 The majority of 911 calls in an E911 network will be from stations served by local offices other than the E911 tandem office. Generally, a 911

call, when both ANI and selective routing are provided, is completed as follows:

- (a) Local office (or E911 tandem office) customer dials 911.
- (b) Local office (or E911 tandem office) obtains ANI TN of originating station.
- (c) Local office seizes a dedicated outgoing 911 trunk (capable of sending ANI) to the E911 tandem office and sends the ANI information to the E911 tandem office.
- (d) The E911 tandem office receives and uses the ANI information as an input for selective routing to obtain the correct emergency service number and DN of the primary PSAP designated for the calling station. If the 911 call was originated by a customer served by the E911 tandem office, the E911 tandem office provides the TN used for selective routing.
- (e) After the DN of the correct primary PSAP is obtained, the E911 tandem office translates the DN to obtain the route index and routes the call via a dedicated outgoing 911 trunk to that PSAP. If ANI display service is provided for that PSAP, the ANI TN of the calling station is transmitted to the PSAP, where the ANI information is displayed at the answering PSAP attendant position.

2.48 To illustrate the advantage of the E911 *selective routing* capability, assume a 911 service area consists of two towns (town "A" and town "B"). Refer to Figure 8. The 911 service area is divided by each type of agency into one or more serving areas. Thus, in Figure 8, the 911 service area, consisting of towns "A" and "B", is subdivided according to police and fire department service districts. In this example, police department "A" has jurisdiction in town "A" and police department "B" has jurisdiction in town "B". For illustrative purposes, three fire departments, "X", "Y", and "Z", serve their respective areas in the 911 service area. Police and fire departments may have coincident boundaries, but in some areas they do not. After all of the boundaries of the selective agencies are drawn, the 911 service area consists of a collection of cells. These cells are termed ESZ (emergency service zones).

2.49 An ESZ is a geographical area in which all residents are served by the same set of selective agencies. For example, in Figure 8, all residents in ESZ 2 are served by police department "A" and fire department "Y". Each ESZ is assigned a distinct number

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called the ESN (emergency service number). Thus an ESN is associated with a particular set of selective agencies which serve a specific geographical area. For this example, assume that selective routing, selective transfer, and ANI are provided. Each set of selective agencies has a primary PSAP (which is assigned the primary ESN) and possibly one or more secondary PSAPs (which are assigned secondary ESNs). Secondary PSAPs are only provided with selective transfer. All telephone numbers assigned for stations located within an ESZ are associated with the primary ESN assigned for that ESZ. Therefore, each station is associated with a primary PSAP (and possibly one or more secondary PSAPs) based on the ANI TN to ESN assignment. Table A lists and indicates these example associations.

**2.50** *Selective transfer* is based on the selective routing capability. Selective transfer allows an established 911 call to be transferred from the primary PSAP to the correct secondary PSAP designated to serve the calling station without the PSAP attendant having to determine which is the correct PSAP, then dialing the correct digits. Consider the 911 service area depicted in Figure 8. Assume police "A" and "B" are designated as the primary PSAPs in their respective towns. The fire departments "X", "Y", and "Z" are designated as secondary PSAPs in each town. This E911 service area has four emergency service zones. Each town has one primary PSAP (police) and two secondary PSAPs (for the fire departments). Refer to Table A. If a 911 emergency call is originated from a station served by police "A" and fire department "Y", the call is *selectively routed* to the designated primary PSAP (police "A"). If a fire is involved, *selective transfer* service allows the call to be transferred automatically by the E911 tandem office (upon attendant request) to the correct secondary PSAP (fire "Y"). The primary PSAP attendant does not have to determine which fire department (secondary PSAP) serves that calling station's location. Thus attendant "look-up" and dialing time is eliminated.

**2.51** In the example E911 service area, every customer station is located within a particular ESZ. Each particular ESZ contains a unique set of public service agencies. Each ESZ has a designated primary PSAP and secondary PSAP. Based on the simple example described, it is apparent that each E911 service area can be unique and that a particular E911 service area could be quite complex. However, a 1 or 1A ESS switch E911 tandem office with the E911 feature is able to provide efficient 911 service even for complex E911 networks.

**2.52** Consider the same E911 service area except fixed transfer is provided in lieu of selective transfer. In this case, fire departments "X", "Y", and "Z" are not designated as secondary PSAPs. For fixed transfer service, a transfer key and speed calling code is assigned for each fire department. If a 911 emergency call is originated from a station served by police "A", the call is selectively routed to the designated primary PSAP (police "A"). If a fire is involved, the attendant determines the correct fire department that serves the calling station location and operates the fixed transfer key associated with that particular fire department.

### INPUT/OUTPUT MESSAGE FORMATS

**2.53** E911 traffic and error data are available in the EN01, EN02, and EN03 output messages at the maintenance terminal. These output messages may be selectively turned off or on at the maintenance terminal using the EMCALL-PRT input message. For a detailed description of these output and input messages, refer to Part 6 B(19) through B(22).

#### EN01 Output Message

**2.54** The EN01 message is an E911 error message containing pertinent data available at the time the error occurred. Following the EN01 message may be TWO2 messages, which are dumps of associated registers. The EN01 message contains a variable number of printed lines. Only the first line is printed if there are no registers associated with the error. If there are registers but no TNNs (trunk network numbers) associated with the error, the first three lines are printed. Four lines are printed if there are any TNNs.

**2.55** The first line is in the form:

EN01 E911 ERR (aaaa) bbb

Where aaaa = the error number

bbb = the error category.

**2.56** The error category and error number can be used to obtain additional information about the particular error. The error category and error number define a particular E911 error. A description of the particular error is contained at the end of the ESMG (error message program) listing. The abbreviations for the error categories are also used in the input message EMCALL-PRT to control the printing of the EN01

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output message and the EN02 E911 ERROR SUMMARY output message. The printing of the EN01 message is automatically turned on for program and translation error categories once a day at approximately 2:30 a.m. A summary of the EN01 errors by error category is printed hourly on the half hour by the EN02 output message.

**2.57** Probable causes for a particular error category are as follows where bbb equals:

- (a) *PRG*—An E911 call has reached an invalid program point. The E911 error description in program ESMG defines the specific invalid point. This type of error can be caused by faulty program logic, nonsensical data, or translation errors.
- (b) *TDA*—Translation data is in error.
- (c) *DGC*—Digit collection errors are probably caused by bad hardware: incoming trunk or MF digit receivers in the E911 tandem office, the outgoing trunk, or MF transmitters in the originating office.
- (d) *ANO*—ANI outpulsing errors are probably caused by hardware problems: outgoing trunk or MF transmitter in the E911 tandem office or equipment problems at the PSAP.
- (e) *PDS*—Peripheral data storage errors are caused by either software or hardware problems associated with the peripheral data storage processor.
- (f) *HDW*—Trunk circuits and/or network connections within the E911 tandem office are at fault. Hardware error messages have probably been printed giving further information about the error.

### EN02 Output Message

**2.58** The EN02 message is an E911 error summary of the errors that have occurred in the past hour. The EN02 output format is in the form:

```
EN02 E911 ERROR SUMMARY
aa/aa/aa bbb c:cc:cc
TOTAL TGN ddd
eee fff gg
...
...
```

The second line printed indicates the month, day, year, the day of week, and the time of day that the EN02

message is loaded into the terminal buffer, not the time of printing. The third line indicates the E911 incoming or outgoing TGN (trunk group number) for which errors are being counted. The fourth and subsequent lines specify the error category, the total error count per particular category, and the TGN error count for a particular error category.

**2.59** The format of the error data is as follows.

eee = The error category:

= PRG—Program

= TDA—Translation

= DGC—Digit collection

= ANO—ANI outpulsing

= PDS—Peripheral data storage

= HDW—Hardware.

fff = The total error count for the particular error category. The count contains the errors which have occurred during the past hour. The maximum count is 63 if no TGN is specified, and 126 if one is specified. If the count reaches maximum, it will stay there and not recycle to zero.

gg = The TGN error count for the particular error category. The count contains the errors which have occurred during the period of time a TGN was specified. At most, this period of time will be the past hour. The TGN counts are zeroed when the EN02 message is printed hourly, when the TGN is changed, and when counting TGN errors are stopped. An EN02 message is printed before the counts are zeroed. The maximum count is 63; if the count reaches the maximum, it will stay there and not recycle to zero.

**Note:** If there are no errors for a particular category, that line is not printed.

**2.60** This message is printed every hour on the half hour if errors have occurred in the previous

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hour. This message can also be printed upon demand by using input message EMCALL-PRT. A total count is given for each error category. If requested (through input message EMCALL-PRT), a TGN count can be given for each error category. The TGN count is a count of errors associated with a particular E911 incoming or outgoing trunk group. The second line of the EN02 message gives the date and the time that the message is loaded into the terminal buffer. Individual E911 errors are represented by the EN01 message. Printing of the EN01 message is controlled by input message EMCALL-PRT.

### EN03 Output Message

**2.61** The EN03 message is an E911 traffic summary message. This is a summary of the E911 traffic over the past hour or over the past day. The EN03 message is printed either every hour on the half hour or once per day at approximately 2:30 a.m., depending on what has been specified by input message EMCALL-PRT. This message can also be printed upon demand by using input message EMCALL-PRT. This is a separate set of counts and is not related to the TC24A, TC24B, and TC24C traffic messages. The EN03 message is not printed if there has been no E911 traffic since the last scheduled printout. A total count is given for each traffic category. If requested (through input message EMCALL-PRT), a TGN count can be given for each traffic category. The TGN count is a count of traffic on a particular E911 incoming or outgoing trunk group.

**2.62** The EN03 format is as follows:

```
EN03 E911 TRAFFIC SUMMARY
aa/aa/aa bbb cc:cc
TOTAL TGN ddd
eee fffff gggggg
...
...
...
```

The second line printed indicates the month, day, year, the day of week, and the time of day that the EN03 message is loaded into the terminal buffer, not the time of printing. The third line indicates the E911 incoming trunk group for which 911 traffic is being counted. The fourth and subsequent lines specify the traffic category, the total traffic count per particular category, and the TGN traffic count for a particular traffic category.

**2.63** The format of the traffic data is as follows:

eee = The traffic category:

- = ITS—Dedicated E911 incoming trunk seizures
- = OGC—Number of originating E911 calls
- = ANC—Valid ANI digits received
- = ANI—ANI information digit indicates ANI failure
- = ANT—ANI time-out occurred while collecting ANI
- = ANF—ANI did not agree with ANI format
- = ANM—ANI information digit indicates multiparty or QZ billing
- = OTS—Seizures of trunks to PSAPs
- = DFT—Number of calls routed to default PSAPs due to system problems
- = OPF—Failures to outpulse ANI to PSAPs.

ffffff = The total traffic count for the particular traffic category. The count contains the traffic which has occurred during the past hour or day, as specified by input message EMCALL-PRT. The maximum count is 131,071 if no TGN is specified, and 262,142 if one is specified. If the count reaches maximum, it will recycle to zero. This is not expected to happen; if it does, changing from daily counts to hourly counts will help.

gggggg = The TGN traffic count for the particular traffic category. The count contains the traffic which has occurred during the period of time in which a TGN was specified. At most, this period of time will be the past hour or

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day. The TGN counts are zeroed when the EN03 message is printed hourly or daily, when the TGN is changed, and when counting TGN traffic is stopped. An EN03 message is printed before the counts are zeroed. The maximum count is 131,071; if the count reaches maximum, it will recycle to zero. This is not expected to happen; if it does, changing from daily counts to hourly counts will help.

**Note:** If there is no traffic for a particular category, that line does not print.

**2.64** The EN03 traffic counts give three types of information: the type of E911 traffic, an indication of the stages of progress achieved by E911 calls, and an indication of traffic overload and errors. Particular traffic counts or combinations of traffic counts may point out that something is wrong and needs to be corrected. More information can be obtained by taking traffic counts on different E911 incoming trunk groups. Also, the EN02 E911 error summary message and the EN01 immediate error message can be correlated with the EN03 message to possibly provide answers to the problems.

### EMCALL-PRT Input Message

**2.65** The EMCALL-PRT message is used to control the following:

- (a) The printing of the EN01 immediate error message and the associated TW02 messages.
- (b) TGN counts (E911 incoming and outgoing trunk groups) that are printed in the EN02 E911 ERROR SUMMARY message and the EN03 E911 TRAFFIC SUMMARY message.
- (c) The printing of the EN02 and EN03 summary messages upon demand.
- (d) The printing of the EN03 E911 TRAFFIC SUMMARY message either daily or hourly.

**2.66** The input message format is EMCALL-PRT aaa bbb. There are four groups of valid input parameters for the fields aaa bbb. Within a group, any parameter aaa can be used with any parameter bbb. By using a slash (/) at the end of the input message instead of a period (.), more than one set of aaa and bbb parameters can be easily specified. More than one

terminal request may be required to accomplish what is desired. There are no restrictions as to the order in which terminal requests are made.

(a) The group 1 parameters are:

aaa = ON0—Turn on printing of the EN01 message.

= ON1—Turn on printing of the EN01 message and one TW02 message. This TW02 will be a dump of the register most closely related to the error.

= ON3—Turn on printing of the EN01 message and up to three TW02 messages. The registers that can be dumped are originating registers, incoming registers, incoming SXS registers, E911 call registers, and outpulsing registers.

= OFF—Turn off printing of EN01 and TW02 messages.

bbb = PRG—Do the above for error category - program.

= TDA—Do the above for error category - translation.

= DGC—Do the above for error category - digit collection.

= ANO—Do the above for error category - ANI outpulsing.

= PDS—Do the above for error category - peripheral data.

= HDW—Do the above for error category - hardware.

= ALL—Do the above for all error categories.

(b) The group 2 parameters are:

aaa = TGN—TGN information is to follow.

bbb = SUM—Apply the specified TGN only to the E911 summary messages--EN02 and EN03. Error and traffic counts will be taken for the specified E911 incoming or outgoing trunk group.

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= ALL—Apply the specified TGN to the E911 immediate error message EN01, in addition to the E911 summary messages explained directly above. Printing of EN01 messages will be restricted to only those that are associated with the specified TGN.

= ()—The parentheses represent any 3-digit E911 incoming or outgoing trunk group number. This specifies a TGN; it will be used according to bbb parameters SUM or ALL. Only the last TGN specified can be in effect at any given time. If a TGN is already in effect and another one is specified, EN02 and EN03 messages are printed and then the TGN counts are zeroed to initialize for the new TGN.

= 000—Remove the influence of the TGN, stop taking TGN error and traffic counts, and stop restricting the printing of EN01 messages to those associated with a particular TGN. EN02 and EN03 messages are printed and then the TGN counts are zeroed.

(c) The group 3 parameters are:

aaa bbb = SUM NOW—Print immediately the EN02 E911 ERROR SUMMARY message and the EN03 E911 TRAFFIC SUMMARY message. Current counts are printed which cover a period of time starting at the last hourly or daily printout. Then TGN counts may cover a period of time (starting from when the particular TGN was input via EMCALL-PRT-TGN) if a TGN was specified after the last scheduled printout. The counts are not zeroed.

(d) The group 4 parameters are:

aaa = TRF—Traffic information is to follow.

bbb = HLY—Print the EN03 E911 TRAFFIC SUMMARY message every hour on the half hour. This message is not printed if all traffic counts were zero for the past hour.

= DLY—Print the EN03 E911 TRAFFIC SUMMARY message once a day at 2:30 a.m. This message is not printed if all traffic counts were zero for the past day.

2.67 The possible system output responses to the EMCALL-PRT input message are:

- OK - The request is done.
- PF - The requested printout is forthcoming.
- NO - The request cannot be done because the requested printouts did not fit into the terminal buffer; or the requested printouts are not necessary because all the data is zero.
- NG - The input parameters are invalid.
- NA - This response should not be received; it means there is a program error in the EMCALL-PRT-code.
- NP - The request cannot be done because the E911 feature is not loaded in the generic program.

2.68 Examples of the uses of the EMCALL-PRT message are provided below:

(a) Assume an initial state for EN01 printing is all error categories printing, category "program" with up to three register dumps, and the other categories with no register dumps:

```
EMCALL-PRT-ON0 ALL/  
ON3 PRG
```

(b) Assume that trouble develops in an ANI trunk group supplying E911 traffic to the office and the result is a large number of EN01 messages of category DGC. After using the messages to determine the problems, it may be desirable to turn off the printing of these messages temporarily until the problem is fixed:

```
EMCALL-PRT-OFF DGC.  
Then, to restore printing.  
EMCALL-PRT-ON0 DGC.
```

(c) Assume that several trunk groups develop trouble at one time. Large numbers of EN01 messages for each trunk group may make it hard to see patterns of errors for a particular office. Restricting the printing of the EN01 messages to those associated with a particular E911 incoming

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trunk group will allow one E911 incoming trunk group at a time to be inspected:

```
EMCALL-PRT-TGN xxx/  
TGN ALL  
where xxx = a 3-digit E911 incoming  
trunk group number.
```

To change to another E911 TGN:

```
EMCALL-PRT-TGN yyy.
```

(d) Each office from which E911 traffic originates can be checked to see whether performance standards are being met by looking at hourly printouts of the EN02 E911 ERROR SUMMARY and EN03 E911 TRAFFIC SUMMARY messages. The TGN counts of these messages provide the capability to gather data on an individual office. For this application, the TGNs that are specified should only affect the summary messages and not restrict the printing of the EN01 messages. This can be accomplished with the following:

```
EMCALL-PRT-TGN xxx/  
TGN SUM/  
TRF HLY.
```

(e) To check the present error and traffic counts without waiting for the scheduled printout of the summary messages, the following message is typed:

```
EMCALL-PRT-SUM NOW.
```

To stop taking TGN counts, the following message is typed:

```
EMCALL-PRT-TGN 000.
```

### A. Interactions

#### Static

**2.69** Not applicable.

#### Dynamic

**2.70** If a PDSP is used to store the selective routing translations, the PIU (peripheral interface unit) interface feature is required. The PDSP provides the correct ESN to the E911 tandem office for a 911 call that is selectively routed. If an anomaly occurs and the PDSP does not provide the ESN, the E911 tandem

office routes the 911 call to the default ESN obtained from the ESCO (emergency service central office) translator.

**2.71** For central office transfer, centrex translations are required for those PSAPs having that service. The dedicated E911 outgoing trunks are marked for the trunk dial transfer feature.

**2.72** The E911 feature affects the services available in a 911 service area previously having B911 service. For example, assume that a 911 service area has B911 service. Each B911 PSAP is directly served by a local office and each B911 PSAP has the optional called party hold, switchhook status, and emergency ringback services. If part of the 911 service area later requires E911 service, the B911 PSAPs can still be part of the E911 network. However, the local offices (which directly served B911 PSAPs) that become local offices in an E911 network route all 911 calls to the E911 tandem office. The E911 tandem office routes all 911 calls in the E911 service area to the assigned PSAP. In this case, a 911 call may be routed to a B911 PSAP; however, the optional called party hold, switchhook status, and emergency ringback services are no longer available for 911 calls routed via the E911 tandem office to a B911 PSAP since tandem trunking is used to complete these 911 calls. Thus, E911 service may have an affect on an existing B911 service area.

### OPERATIONAL LIMITATIONS

**2.73** Nonprefixed speed calling cannot be provided for an E911 PSAP. Prefixed speed calling requires the 2-digit speed calling feature.

**2.74** The maximum number of incoming 911 calls from other offices to the E911 tandem office is limited by the number of trunks incoming from any particular office. The maximum number of locally originated 911 calls at the E911 tandem office is limited by the E911 choke mechanism as discussed in paragraph 3.22.

**2.75** The maximum number of 911 calls that can be completed to an E911 PSAP at any particular time depends on the number of dedicated E911 outgoing trunks to that PSAP. Queueing is not provided for 911 calls. A 911 call to a traffic busy PSAP is either alternate routed to the predesignated CFBL DN for that PSAP if CFBL service is provided, or the 911 call is routed to overflow.

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**2.76** Night service and/or power failure alarm may be provided for an E911 PSAP. A 911 call to an E911 PSAP on night service or experiencing a power failure is alternate routed to the CFBL DN predesignated for that PSAP. If traffic busy, night service and power failure alarm options are provided, all 911 calls that are alternate routed due to either traffic busy, night service, or power failure are routed to the same predesignated CFBL-DN. Separate CFBL DNs are not provided for an E911 PSAP having these service options.

**Note:** Night service and power failure alarm are locally engineered services.

**2.77** The called party hold, emergency ringback, and switchhook status options, which are available with B911 service, are not available with E911 service. The ANI and ALI display services are available in lieu of these services.

**2.78** Any DN assigned in the ESN translator must be a local DN. The DN cannot be a DN in another office; however, the local DN can remote call forward to a DN in another office.

**2.79** In an extremely large E911 service area which requires more than one E911 tandem office, the E911 feature cannot function properly in a multitandem environment. This limitation affects calls that are transferred from a PSAP served by one E911 tandem office to a PSAP served by another E911 tandem office. In this case ANI is not transferred to the secondary PSAP served by another E911 tandem office. For example, consider a transfer call from a PSAP served by one E911 tandem office (E911 T<sub>1</sub>) to a PSAP served by another E911 tandem office (E911 T<sub>2</sub>).

- (a) The PSAP DNs assigned in E911 T<sub>1</sub> for the secondary PSAPs served by E911 T<sub>2</sub> must be dialable, therefore a local office code and DN are assigned. Since the DN assigned in E911 T<sub>2</sub> for the PSAP must be dialable from E911 T<sub>1</sub>, the use of nondialable DNs to preclude anonymous calls is not available.
- (b) To transfer a call, the E911 T<sub>1</sub> PSAP attendant either dials the code for the DN of the PSAP served by E911 T<sub>2</sub>; or if selective transfer is provided, the DN obtained for selective transfer in E911 T<sub>1</sub> remote call forwards to the E911 T<sub>2</sub> PSAP DN.

(c) E911 T<sub>1</sub> recognizes the call as *not* to an E911 T<sub>1</sub> PSAP, thus the call is treated as a regular call to other than an E911 PSAP. No ANI is sent for such calls. The call is routed over the regular message network to the E911 T<sub>2</sub> PSAP DN. This is why the DNs must be dialable.

(d) E911 T<sub>2</sub> receives the call via the message network and translates the received DN as a local DN which leads to an E911 T<sub>2</sub> PSAP. No selective routing is involved and since the call is to the dialable PSAP DN, it is an anonymous call (non-911) to the E911 T<sub>2</sub> PSAP. Thus, if the E911<sub>2</sub> PSAP has ANI display, 911-0000 is displayed.

(e) If a subsequent transfer is required for the call, the E911 T<sub>2</sub> PSAP can use either manual dial or fixed transfer services (if provided) but cannot use selective transfer since no ANI is available and selective routing data is not available in E911 T<sub>2</sub> for this particular call.

### RESTRICTION CAPABILITY

**2.80** Not applicable.

### PLANNING

#### A. E911 Network

**2.81** The telephone company and the E911 customer are responsible for determining the E911 services necessary for a particular E911 service area. However, certain environmental factors may influence which E911 services are necessary and which E911 tandem office arrangement is most desirable. Thus environmental factors influence the E911 network requirements.

- (a) The environmental factors include:
- (1) Population and size of the E911 service area
  - (2) Number, location, and type of telephone offices serving stations located in the E911 service area
  - (3) Number and location of PSAPs to be served
  - (4) Type of customer premises equipment available or to be provided for each PSAP
  - (5) Number of ESZs and characteristics of each ESZ

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- (6) ESZ and telephone wire center boundaries.
- (b) The E911 network, as shown in Figure 1, includes:
- (1) All local offices serving stations located in the E911 service area.
  - (2) Dedicated E911 trunks from each local office to the E911 tandem office.
  - (3) The E911 tandem office, which may also serve as a class 5 local office, can be either a 1A ESS switch, 1 ESS switch with a PDSP for storing the selective routing data, or 1 ESS switch without a PDSP. (When serving as a class 5 office, dedicated E911 intraoffice trunks are not used for 911 calls from customers served directly by the E911 tandem office.)
  - (4) Dedicated outgoing E911 trunks from the E911 tandem office to each PSAP.

**2.82** The environmental factors directly affect the hardware and software requirements at the E911 tandem office. Consider, for example, an E911 service area where all telephone wire center boundaries were congruent with all ESZ boundaries. In such a case, selective routing is not necessary to route 911 calls to the proper PSAP, since all 911 calls from a particular office will route to the same PSAP. Now, consider an E911 service area where many telephone wire center boundaries are not congruent with ESZ boundaries. In such a case, selective routing must be provided to properly route 911 calls from those wire centers with incongruent boundaries to the correct PSAP. The degree and amount of selective routing necessary affects the amount of software and hardware required at the E911 tandem office, and the amount of effort to establish and maintain a data base for selective routing data.

**2.83** Selective routing may be provided on either a per office code (NXX), per number group number, or per TN basis. If selective routing is provided on a per TN basis, additional considerations and special actions are required for the telephone company to implement the feature. A large amount of memory area is required to store TN-to-ESN translation data. When using a 1A ESS switch as an E911 tandem office, the selective routing data is always stored in the 1A ESS switch memory. If adequate memory is not available, additional memory modules must be added to store the selective routing data. However, when a 1

ESS switch is used as an E911 tandem office, two options are available for storing the TN-to-ESN selective routing data. The data may optionally be stored in either the 1 ESS switch memory or in a 3A PDSP (peripheral data storage processor). Use of a 3A PDSP is not available with the 1A ESS switch. Therefore, a 3A PDSP may not be used when E911 service is provided via a 1A ESS switch E911 tandem office. The decision whether to use a 1A ESS switch, 1 ESS switch with a PDSP, or 1 ESS switch without a PDSP is based on both economic and other factors.

**2.84** The EBRCC (E911 Bulk Recent Change) feature is initially available in the 1AE8A.05 generic program for the 1A ESS switch. The EBRCC feature efficiently stores, updates, and manages a very large E911 selective routing data base. The E911 selective routing data base is stored and maintained in an APS (attached processor system). With the EBRCC feature, the APS serves the same purpose for the 1A ESS switch as the PDSP does for the 1 ESS switch. This optional arrangement should be included as part of the E911 tandem office considerations described in paragraphs 2.88 through 2.93 and 3.51. For detailed information concerning the EBRCC feature, refer to Part 6 A(55) and A(56).

### **B. Data Management System/Automatic Location Identification System**

**2.85** The telephone company, with the help of the municipality, is responsible for developing, establishing, and maintaining the selective routing data base. The municipality is responsible for providing information concerning emergency services, emergency agencies, emergency zones (or other political subdivisions), and other data which may be necessary to establish the correct station-to-PSAP (TN-to-ESN) associations. If selective routing is provided on an office code or number group number basis, the task of developing and building the data base may be relatively simple. However, if a data base is required for TN-to-ESN translations on a per TN basis, developing and building the initial data base is a complex and major task. Since the data base should be kept current on a daily basis, the amount of update activity required for recent changes becomes a factor in selecting the type of E911 tandem office to be used. Regardless of where the TN-to-ESN selective routing data is stored, a method or system referred to as a DMS (Data Management System) is necessary to build and maintain the data required for the selective routing data base. The standard DMS available for E911 is described in Part 6 A(42) through A(46).

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**Note:** The initial DMS/ALI standard arrangement has been revised. For detailed information concerning the current DMS/ALI standard arrangement, refer to Part 6 B(31) through B(33).

**2.86** The type of data management system necessary depends on the particular E911 service area, and may be relatively simple or very complex. The data base may be considered as routing tables which define the correct PSAPs associated with each TN. The logic and format of this data in the E911 tandem office (or 3A PDSP) is part of the standard E911 feature; however, to obtain and compile the data is the responsibility of the telephone company. The data is compiled from telephone company customer records and from address information received from the responsible emergency service agencies about the boundaries (service area) of each PSAP.

**2.87** The output of the standard DMS is in a form suitable for inputting to the 1/1A ESS switch memory or to the 3A PDSP when that option is employed. Since the DMS is used to initialize and update the TN-to-ESN data, a complex DMS can represent a major portion of the total cost for E911 service. Refer to Table B for a comparison of the 1 ESS switch, 1A ESS switch, and PDSP attributes for the selective routing data base.

**2.88** The standard DMS available as an option for E911 builds and updates the data base containing subscriber data and is designed to provide all the necessary data for an E911 system. The standard DMS also provides all the necessary data for the ALI system.

**2.89** The ALI system provides street address information for 911 calls to PSAPs. The DMS is an integral part of the ALI system. ALI information is displayed for 911 calls via the ALI display unit located at the PSAP answering attendant position. For detailed information concerning the DMS and ALI, refer to Part 6 A(42) through A(46).

**Note:** The initial DMS/ALI standard arrangement has been revised. For detailed information concerning the current DMS/ALI standard arrangement, refer to Part 6 B(31) through B(33).

### C. E911 Tandem Office Considerations

**2.90** Currently the telephone companies can choose among three arrangements for use as an E911 tandem office. The E911 tandem office may be either a

1A ESS switch, 1 ESS switch with a PDSP, or 1 ESS switch without a PDSP. The use of a PDSP is not available with a 1A ESS switch. If both a 1A ESS switch and a 1 ESS switch are available, the decision must be made whether to use one of these existing systems or to buy a PDSP for use with the 1 ESS switch. Both economic and other factors must be considered when selecting an E911 tandem office. The following paragraphs identify basic considerations essential in the selection of an E911 tandem office arrangement. For more detailed planning information for the E911 network, refer to Part 6 B(18).

### Availability of Candidate E911 Tandem Offices

**2.91** The most important considerations in choosing an E911 tandem office arrangement are the transmission and switching system costs associated with each plan. The recommended E911 transmission plan imposes an overall route mileage limit of 150 miles between any class 5 originating office and any PSAP answering 911 calls from that originating office. If neither a 1A ESS switch nor a 1 ESS switch satisfying this constraint is available during the period that E911 service is required, then E911 service cannot be offered in that area. Electromechanical switching machine replacement plans may affect the availability of candidate E911 tandem offices.

### System Size and Growth Characteristics

**2.92** The selection of an E911 tandem office to serve an E911 network with selective routing is critically dependent upon the size and growth characteristics of the area to be served. The significant items to be forecast is the total number of assigned main stations plus equivalents by central office for the entire E911 service area over the assumed 5-year product life. The memory available in a given candidate E911 tandem office for storing selective routing translations can be a limiting resource. Limited capability in one candidate E911 tandem office may force consideration of using another candidate E911 tandem office. For example, it might be necessary to eliminate those 1A ESS switch candidates facing imminent unduplicated call store exhaust. Economic studies should ideally include the effect of buying the additional equipment required to support the forecasted system growth over the 5-year E911 service life. As a first approximation, the system size at the end of the 5-year growth period can be used to determine the ultimate equipment requirements. After the system size and growth rate have been determined, the complexity of the selective routing translations must be determined. Then the

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memory requirements and associated cost can be calculated.

### Call Volume and Service History

**2.93** The expected additional call volume imposed upon an E911 tandem office should not significantly affect the switching system capacity. The service history of the candidate E911 tandem office is an important consideration for choosing an E911 tandem office. If two candidate offices are fairly equal with respect to costs and capacity, the office with the best service history (i.e., fewest number of service outages) should be chosen.

### Initial Data Base

**2.94** The cost and time of building the initial E911 selective routing data base is an important factor in selecting an E911 candidate office. The 1 ESS switch and 1A ESS switch data bases must be initialized using a TSA (translations data assembly) or TGP (translations growth procedure), both of which take approximately 1 month. 1 and 1A ESS switches do not provide for unassigned line status. The PDSP data base is initialized using PROMATS 9-track tape input, which has an input rate of approximately 18,000 RC messages per hour. The PDSP provides for unassigned line status.

### Daily Updates and Audits

**2.95** The handling of daily updates of the data base is perhaps the single most significant factor (other than overall system cost) to consider when selecting an E911 tandem office. Updates can be entered into the PDSP at the same rate as the initial data base load (approximately 18,000 per hour). Based on experience, 1 ESS switch update rates are approximately 150 E911 type RC updates per hour. 1A ESS switch update estimates have varied from as low as 200 RC messages per hour to about 500 RC messages per hour. The telephone company should use RC update rates consistent with local experience and procedures in assessing the time required to perform daily updates. Another relevant RC concern is the effect of the E911 RC activity on the card writing interval of a 1 ESS switch and filling the RC roll-back area of a 1A ESS switch. The monthly additional card writing expenses due to adding E911 to a 1 ESS switch office occur due to two different reasons: (1) increasing the number of translation mods that must be written during each interval and, (2) reducing the card writing interval. A concern with the 1A ESS switch is filling of the RC

roll-back area, thereby requiring that the contents be copied onto tape. Copying the 1A ESS switch roll-back area onto tape is a simple process which generally takes less than 15 minutes. No audit and/or compare capability is available with either the 1 ESS switch or 1A ESS switch after the RC message input. The PDSP provides for a system audit to periodically insure that every TN is either unassigned or is assigned a valid ESN. In addition, the PDSP has the capability to periodically compare the selective routing data base in the PDSP to the DMS data base by processing a tape prepared by the DMS for this purpose.

### System Costs, Exhaust, and Retrofit Considerations

**2.96** The primary switching system costs associated with E911 are those incurred to store selective routing translations. The right-to-use fees for the E911 feature must also be considered. A large E911 selective routing requirement could potentially cause an office to exhaust its memory capacity. If the switching system is exhausted due to E911, the cost of moving up a processor retrofit or adding an additional switching system must be included in the economic analysis. If a 1 ESS switch office (with or without a PDSP arrangement) is a candidate as an E911 tandem office, the effect of a retrofit to a 1A ESS switch for that office must be considered since a 1A ESS switch will not support a PDSP. In the event that two candidates are available and approximately equal in cost, a 1A ESS switch would be preferred over a 1 ESS switch because of its more modern technology and cheaper memory costs.

### HARDWARE REQUIREMENTS

**Note:** This part contains cost factors and determination of quantities. COEES (Central Office Equipment Engineering System) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

**2.97** The standard customer premises equipment design for an E911 PSAP requiring ANI display and/or central office transfer is the E911 equipment discussed in Part 2. Refer to Part 6 A(2) through A(4) for a detailed description of the E911 PSAP equipment.

**2.98** No special ESS switch hardware is required for the E911 feature. When a 1 ESS switch uses a

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PDSP for selective routing translations, a processor interface frame is required for the PIU feature. For the PIU feature and the related hardware requirements and costs for the processor interface frame, refer to Part 6 A(12) and A(21).

**2.99** The dedicated E911 incoming and outgoing trunks at the E911 tandem office require scan point and SD (signal distributor) point assignments. Refer to Table C for dedicated E911 incoming trunk data and hardware costs. Refer to Table D for dedicated E911 outgoing trunk data and hardware costs. The first three digits of the trunk order code, which correspond to the CPI (circuit program index), are given in the tables. The dedicated incoming E911 trunks use the same type trunk circuits as used for 1 ESS switch CAMA (centralized automatic message accounting) service using the signaling protocol for TSPS (traffic service position system). For complete trunk order codes, trunk uses, and trunk options, refer to Part 6 D(7).

**2.100** The E911 equipment on the customer premises may be equipped to serve a maximum of 15 attendant lines and a maximum of 15 dedicated E911 trunks from the E911 tandem office.

**2.101** The number of dedicated E911 outgoing trunks to a PSAP is traffic engineered by the Business Services Facilities Organization; however, the customer may elect to provide additional outgoing trunks to a PSAP. The customer decides the number of attendant positions to provide at each PSAP based on business services recommendations. A minimum of two dedicated E911 trunks should be equipped for each PSAP. For engineering considerations, refer to Part 6 A(54).

**2.102** A minimum of two dedicated E911 incoming trunks from each local office must be provided. It is recommended that if T<sub>1</sub> carrier is used for a particular trunk group, the individual trunk group members should be spread over different T<sub>1</sub> carrier systems if possible.

**2.103** Traffic data is used for engineering the E911 trunks and determining traffic patterns in an E911 tandem office. Peg and usage counts are compiled for each dedicated E911 incoming trunk group. Peg and overflow counts are compiled for 911 calls originated by customers served by the E911 tandem office. Peg, usage, and overflow counts are compiled for each dedicated E911 outgoing trunk group.

**2.104** The average busy season busy-hour load must be developed for E911 service. After developing the busy-hour load per 1000 main stations served, the busy-hour load offered to a particular dedicated E911 trunk group can be calculated. The Neal-Wilkinson basic trunk capacity tables are used. Refer to Part 6 A(38), A(54), and B(17). Tariff regulations specify that a minimum of P.01 service be provided.

**2.105** Additional MF receivers and MF transmitters may be required at the E911 tandem office for E911 service. When a 1/1A ESS switch is serving as an E911 tandem office, all MF receivers and MF transmitters should be provided per toll criteria. Refer to Part 6 A(39) and A(40). Additional 3-port conference circuits may be required for central office transfer services provided for E911 PSAPs. Touch-tone CDR usage may also be impacted to a minor extent as the result of central office transfer. Each office should be analyzed individually to determine whether or not added capacity is required. Note that a majority of all call transfers will be initiated via speed calling codes.

**2.106** All calls incoming on E911 dedicated trunk groups will require an MF receiver. The quantity of incoming MF digits to be received will depend upon whether the incoming trunks are bylink or nonbylink, and whether the ANI TN is to be transmitted. Unless an office serves a high percentage of 4- and 8-party lines, assume that the ANI TN will be transmitted on all calls. For engineering purposes, assume that all bylink calls will contain ten MF digits (KP, Info digit, ANI TN, ST) with a holding time of 2.6 seconds. Assume that nonbylink calls will contain an additional five MF digits (KP, 911, ST) with a total holding time of 3.3 seconds. Multiply individually the ABS BH bylink and nonbylink calls by the applicable holding time and compute MF receiver CCS for E911 calls using the toll criteria. This quantity should only be added, in total, to the other MF receiver CCS requirements if the E911 busy hour is coincident with the MF receiver group busy hour. If not, some portion of the added CCS should be subtracted to allow for the noncoincidence.

**2.107** MF transmitters are required to outpulse ANI information to PSAPs when an E911 customer has purchased this feature. Ten MF digits are always outpulsed to a PSAP. Therefore, a holding time of 2.3 seconds may be used for initial E911 engineering. Multiply the number of ABS BH E911 calls to all PSAPs by the holding time and compute MF transmitter CCS using toll criteria. As with MF receiver

# DMS-100 Lines Subsystem Overview

## Functional Description

The lines subsystem pertains to the thousands of subscriber lines that reside outside the DMS-100 switch and connect to the switch through Line Cards (LC), which reside within Peripheral Modules (PM). Every line connects to the DMS-100 switch through a LC.

On one end of the lines subsystem are telephones or other subscriber equipment. Coming out of the telephone are two wires, *tip* (ground) and *ring* (-48 VDC), which together form a telephone line. When a subscriber speaks, sound waves are converted by the telephone transmitter into electronic analog signals that travel over the telephone line until they reach a Central Office (CO). At the CO, the line connects to a Line Concentrating Module (LCM) or other appropriate PM that houses the LC associated exclusively with that line.

## Subscriber Lines

A subscriber line consists of a:

- Loop facility connecting the subscriber station equipment directly to the switch, or through a remote terminal.
- Line circuit mounted on a line card in the Line Concentrating Device (LCD).

Subscriber lines may be connected directly to peripherals in the main switch called the *host*, or to remotely located PMs. Remote PMs that are part of the DMS-100 family may be Remote Line Modules (RLM) or Remote Line Concentrating Modules (RLCM). Additional information concerning these remote units is in *Peripheral Modules*, NTP 297-1001-103. Remote PMs may also be part of compatible subscriber carriers such as DMS-1 and SLC-96. Additional information may be found in the *Bell Communication Research Incorporated Technical Reference*, TR-TSY-00008. Subscriber lines may also be connected to a Remote Digital Terminal (RDT) which is a remote facility that multiplexes the signals onto an optical transmission facility. The RDT described in this document is the S/DMS AccessNode Remote Fiber Terminal (RFT).

Each type of LCD accepts a variety of line cards for a range of telecommunication services. The services that are provided, and the sets used, are as follows:

- Plain Old Telephone Service (POTS) line cards use basic telephone sets that provide basic telephone service to residential, coin, and business subscribers.
- Business service line cards use a variety of business sets that are proprietary to the DMS-100 switch. The M5 series of Meridian Business Sets (MBS) are equipped with dedicated keys for activating features. The business services that use these sets require software package NTX106.
- Data line cards use compatible data sets to provide switched data service. This service requires software package NTX250.

The Universal Edge 9000 (UEN) provides concentrated support for up to 512 lines (32-line multi circuit line card x 16 line card slots). Two high-speed, point-to-point serial buses, the Time Division Multiplex (TDM) and Grace Local Area Network (GLAN) buses, provide an interface between the 16 line card slots and the NTKX06AA.

- The GLAN bus carries upstream and downstream signaling.
- The TDM bus carries Pulse Code Modulation (PCM) / data in both the upstream and downstream processes.

**Note:** The term "downstream" indicates the direction of flow from the controlling LGC, LTC, or RCC2 to each line circuit. The term "upstream" indicates the direction from each line circuit to the controlling LGC, LTC, or RCC2.

## **Line Card Description**

Line cards terminate the lines subsystem inside the DMS-100 host office. The lines' analog signals are converted into digital signals by the LC, combined with other lines' signals by the LCM and are sent into the network. The network determines a route for the speech signals and then sends them out to their respective destinations. The routed signals are sent along the telephone line of the person on the other end of the conversation and converted from analog signals back into sound waves by the telephone receiver.

Line card types vary according to the services that use them and the type of equipment in which they are mounted. Line cards are mounted in a LCD that may be located at:

- Host locations
- Remote line locations
- Remote subscriber carrier locations

The "world" line card is a software programmable line card, which means that it can be datafilled for use in any market. The two types of world line card include Type A (NT6X17BA) and Type B (NT6X18BA).

The UE9000 DMS-100 lines are in Line Subgroups (LSG) that have the physical boundary of a single line card. The LSGs are equivalent to XLCM drawers (LSG). In the XLCM, each physical drawer contains two LSGs.

*Table 1* lists the types of line cards used with the DMS-100 switch.

**Table 1** - *Line Card Types*

<b>LC Mounting Equipment</b>	<b>Product Engineering Code</b>	<b>Lines Per Card</b>	<b>Description</b>
DMS-1R RCT	QPP 405	4	Single party.
	QPP 409	2	Universal coin. (Note 1)
	QPP 440	4	Frequency selective signaling.
	QPP 442	2	Post pay coin. (Note 1)
	QPP 445	4	Superimposed signaling.
	QPP 541	4	Frequency selective signaling.
DMS-1 RCU	NT3A10AA/AB/HA/HB	2	Single-party line card in a NT3A06AA/BA Line Card Carrier (LCC).

Note: All Remote Carrier Urban (RCU) line cards are placed in a LCC. Each LCC has a capacity of four line cards, and it is placed in one RCU slot.

Multi-Party Divided Ringing (MPDR) line card in an NT3A19AA LCC

NT3A10AB/AC/HA/HB	2	Frequency Selective Ringing (FSR) line card in a NT3A07AA/BA LCC.
NT3A12AB	2	Two-wire FX, PBX trunk LS/GS line card in a NT3A11AB LCC.
NT3A13AB	2	Two-wire OPS line card in a NT3A11BA LCC.
NT3A13AC	2	Two-wire OPS line card in a NT3A11CA LCC.

	NT7A20AA	1	Four-wire line card in a NT3A11BA/CA LCC.
	NT7A21AA	1	Four-wire line card in a NT3A11BA/CA LCC.
	NT7A22AA	1	Four-wire line card in an NT3A11BA/CA LCC
	NT7A23AA	1	Four-wire line card in an NT3A11BA/CA LCC
	NT7A25AA	1	Enhanced two-wire line card in a NT3A11BA/CA LCC.
	NT7A26AA	1	Enhanced two-wire line card in a NT3A11BA/CA LCC.
	NT7A27AA	1	Enhanced two-wire line card in a NT3A11BA/CA LCC.
	NT7A33AA	1	MBS line card in a NT3A11CA LCC.
-----			
International LCM (ILCM)	NT6X17BA	1	Type A world line card with profile downloading capability. (Note 2)
	NT6X18BA	1	Type B world line card with profile downloading capability. (Note 3)
	NT6X21AA	1	Business set line card. (Note 12)
	NT6X21AB/AC/AD	1	2.8 mile business set line card. (Note 12)
	NT6X21CA	1	Universal Modular P-Phone Line Card (UMPLC). (Note 16)
	NT6X93AA/CA/EA	1	International Type A line card used on analog facilities for single- and two-party flat rate service. (Notes 4 & 5)
	NT6X94AA/CA	1	International Type B line card similar to NT6X93AA/CA but used for four-party flat rate and coin service. (Notes 4 to 6)
	NT6X94AB	1	International Type B line card used for single-party, PBX, and coin subscribers. (Notes 4 to 6)
-----			
LM Drawer	NT2X17AB/AC	1	Type A line card used on analog facilities for single and two-party flat rate service.
	NT2X17AD	1	Type A line card similar to NT2X17AB/AC, used in applications requiring 20 dB idle channel noise.
	NT2X18AC	1	An earlier vintage of NT2X18AE.
	NT2X18AD	1	Type B line card similar to NT2X18AE but equipped with +48 VDC for additional coin features. (Note 7)
	NT2X18AE	1	Type B line card similar to NT2X17AB but used for multiparty flat rate, coin, and ground start service.
-----			
LCM Drawer	NT6X17AA	1	Type A line card used on analog facilities for single and two-party flat rate service.
	NT6X17AB	1	Type A line card similar to NT6X17AA but used where low noise is required. (Note 8)
	NT6X17BA	1	Type A world line card with profile downloading capability. (Note 2)
	NT6X18AA	1	Type B line card similar to NT6X17AA but used for four-party flat rate and coin service.
	NT6X18AB	1	Type B line card similar to NT6X18AA but equipped with +48 VDC for additional coin features. (Note 9)
	NT6X18BA	1	Type B world line card with profile downloading capability. (Note 3)
	NT6X19AA	1	Message waiting line card. (Note 10)
	NT6X21AA	1	Business set line card. (Note 11)
	NT6X21AB/AC	1	2.8 mile business set line card. (Note 11)
	NT6X21BC	1	U.K. business set line card.
	NT6X21CA	1	Universal Modular P-Phone Line Card (UMPLC). (Note 16)
	NT6X33AA	1	General Use Line (GUL) card, providing single-party voice and signaling on an

			analog line.
	NT6X71AA	1	Data line card.
	NT6X71AB	1	Similar to NT6X71AA data line card, with profile downloading capability.
	NT6X71BA	1	Single slot version of the NT6X71AB data line card, with profile downloading capability.
	NT6X76AA/AC	1	Data asynchronous interface line card. (Note 12)
	NT6X99AA	1	Datapath BERT card. (Notes 13 and 14)
-----			
S/DMS	NT4K67AB	1	2-wire station line card.
AccessNode	NT4K68AA	1	2-wire office line card.
	NT4K69AA	2	4-wire special services line card.
	NT4K77AA	2	6/8-wire special services line card.
-----			
LCME	NT6X17AA	1	Type A line card used on analog facilities for single and two-party flat rate service.
	NT6X17AB	1	Type A line card similar to NT6X17AA but used where low noise is required. (Note 8)
	NT6X17BA	1	Type A world line card with profile downloading capability. (Note 2)
	NT6X18AA	1	Type B line card similar to NT6X17AA but used for four-party flat rate and coin service.
	NT6X18AB	1	Type B line card similar to NT6X18AA but equipped with +48 VDC for additional coin features. (Note 9)
	NT6X18BA	1	Type B world line card with profile downloading capability. (Note 3)
	NT6X19AA	1	Message waiting line card. (Note 10)
	NT6X21AA	1	Business set line card. (Note 11)
	NT6X21AB/AC/AD	1	2.8 mile business set line card. (Note 11)
	NT6X21CA	1	Universal Modular P-Phone Line Card (UMPLC). (Note 16)
	NT6X71BA	1	Single slot version of the NT6X71AB data line card, with profile downloading capability.
	NT6X76AA/AC	1	Data asynchronous interface line card. (Note 12)
	NT6X99AA	1	Datapath BERT card. (Notes 13 and 14)
-----			
SLC-96 RCS	SCD 203	2	Single-party.
	SCD 221	2	Multi-party.
	SCD 233	1	Coin. (Note 15)
-----			
Small Remote	NT6X17BA	1	Type A world line card with profile downloading capability. (Note 2)
Unit (SRU)	NT6X21BC	1	U.K. business set line card.
	NT6X71AB	1	Similar to NT6X71AA data line card, with profile downloading capability.
	NT6X76AC	1	Data asynchronous interface line card.
-----			
Universal 9000	NTNP50AA	32	POTS 32 multi-circuit line card.
9000 (UEN)	NTNP44AA	4	ADSL DMT 4+4 line card.
-----			

**Note 1:** RCT coin line circuit cards are restricted to the first two positions in each shelf. All other RCT line cards may be installed in any card position.

**Note 2:** The NT6X17BA World line card can emulate the following cards: NT6X17AC, NT6X93AA, NT6X93BA, NT6X93CA, NT6X93DA, NT6X93EA, and NT6X98AA.

**Note 3:** The NT6X18BA World line card can emulate the following cards: NT6X18AA, NT6X33AA, NT6X94AB, NT6X94BB, NT6X94CA, and NT6X94DA.

**Note 4:** The NT6X93 and NT6X94 International line cards are equipped with a 600-ohm termination, rather than the 900-ohm termination that is in the NT6X17 and NT6X18 series line cards. Further, it uses the A-Law binary coding algorithm for converting analog speech path signals to digital signals, rather than the Mu-Law algorithm that is used in North American line cards.

**Note 5:** International line cards are not used in the RLCM.

**Note 6:** The NT6X94 International line cards require a NT6X95AA metering tone card in slot 0 of the odd ILCM drawer. The tone is output continuously on the +48 VDC bus and supplies a physical ILCM drawer. Because slot 0 is also assigned to the NT6X23AA +48 VDC power converter card, these two cards cannot coexist in a physical line drawer.

**Note 7:** All NT2X18AD Type B line cards that are mounted in a line drawer are associated with a NT2X03AA +48 VDC power converter card that is located in slot 31 in the drawer.

**Note 8:** The NT6X17AB Type A line card responds to diagnostic tests in the same way as the NT6X17AA line card.

**Note 9:** All NT6X18AB Type B line cards that are mounted in a line drawer may be associated with a NT6X23AA +48 VDC power converter card that is located in slots 0 and 16 of the odd numbered (upper) line subgroup in the drawer. A switch on the line card can be operated to control access to the +48 VDC supply.

**Note 10:** All NT6X19AA Message Waiting line cards in a line drawer are associated with a NT6X20AA +150 VDC power converter card mounted in slots 0 and 16 of the odd numbered (upper) line subgroup in the drawer.

**Note 11:** The NT6X21AA Meridian Business Set line card is used on loops that are up to 6,000 feet in length, while the NT6X21AB business set line card is used on loops that are up to 15,000 feet in length.

**Note 12:** The NT6X76AA/AC Asynchronous Interface line card occupies two vertically contiguous slots in the LCM.

**Note 13:** The NT6X99AA BERT card occupies two vertically contiguous slots in the LCM.

**Note 14:** Because of the high volume of messaging between the IBERT and the DMS-100 switch while a BERT test is active, it is recommended that a maximum of one IBERT card be provided for each LCM.

**Note 15:** RCS coin line circuit cards are restricted to the four rightmost line card positions in each shelf when DS-1 line facilities are connected one per group (see *Figure 7*).

**Note 16:** The NT6X21CA UMPLC replaces the NT6X21AC, NT6X21AD, and NT6X21BC line cards.

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-End-

The types of LCD that mount line cards at host locations are:

- Line Module (LM)
- Line Concentrating Module (LCM)

The LCD designed to provide high-density Plain Old Telephone Service (POTS) and Asymmetric Digital Subscriber Loop (ASDL) service is called the Universal Edge 9000 (UEN). The UEN uses Multi-Circuit Line Cards (MCLC).

The UE9000 DMS–100 shelf contains:

- Voice and data domains. The domains are independent in the hardware architecture, which prevents traffic conditions in one domain from degrading the operating capacity in the other domain.
- Shelf infrastructure that overlaps the voice and data domains to provide common resources.

The UE9000 DMS–100 shelf is self–contained and has with the following cards:

- Voice domain common equipment
- Data domain common equipment
- Multi–circuit line
- Shelf interconnect
- DSL

The international version of the LCM, called the ILCM, has the same line card capacity as the LCM, although one card position is used by a metering tone card (see *Table 1*).

The types of LCD that mount line cards that are located remotely from the host are:

- Remote Line Module (RLM)
- Remote Line Concentrating Module (RLCM)
- Enhanced Line Concentrating Module (LCME) with Integrated Services Digital Network (ISDN)
- Remote Concentrator Terminal (RCT)
- Remote Carrier Urban (RCU)
- Remote Soncentrator SLC–96 (RCS)
- Outside Plant Module (OPM)
- Small Remote Unit (SRU) – *United Kingdom market only*

The OPM, a cabinet located outdoors, contains the following equipment:

- LCM
- Battery reserve power equipment
- Temperature control equipment
- Digital cable cross connection terminal

The card capacity of each LCD is shown in *Table 2*.

**Table 2** – *Line Card Capacity by LCD Type*

<b>Line Concentrating Device (LCD)</b>	<b>Capacity</b>
LM	32 cards per drawer 5 drawers per shelf unit 4 shelf units per LM
LCM	32 cards per subgroup 2 subgroups per drawer 5 drawers per shelf unit 2 shelf units per LCM
LCME	30 cards per subgroup 2 subgroups per drawer 4 drawers per shelf unit 2 shelf units per LCME
RFT	48 cards per drawer 2 drawers per shelf 7 shelves per RFT

RLM	32 cards per drawer 5 drawers per shelf 4 shelves per RLM
RLCM	32 cards per line subgroup 2 line subgroups per drawer 5 drawers per shelf 2 shelves per RLCM
RCT	8 cards per shelf 8 shelves per RCT 10 RCTs per group
RCU	2 line circuits per line card 4 shelves per RCU with line cards 12-20 Line Card Carriers (LCC) per shelf 4 line cards per LCC
RCS	16 cards per shelf 4 shelves per RCS
SRU	60 cards per drawer 4 drawers 1 shelf per SRU
UEN	16 cards per shelf 4 shelves per Universal Edge Equipment (UEE) frame
-End-	

## **Locating a Line Card**

The `CKTLOC` command displays in the work area to the right of the menu area. The following headers are displayed with menu item 11, and the location of the line card in the control position is displayed under the headers:

- **Site** – Four character Common Language Location Identifier (CLLI) for the line card location.
- **Flr** – Two character building floor number where the line equipment is mounted.
- **RPos** – One or two letters that identify the row where the line equipment bay is located, followed by one or two digits that identify the position of that bay in the row.
- **Bay\_Id** – Name of the bay on which the line equipment is mounted.
- **Shf** – Shelf number in the bay where the line equipment is installed.
- **Description** – Name of the hardware device in which the line card is installed.
- **Slot** – Drawer number where the line card is installed, and the slot number where the card is placed. The two numbers are separated by a colon.
- **EqPEC** – Product Engineering Code (PEC) of the line card that is in place. When the line card is part of the DMS-100 family the prefix "NT" is deleted. For the WLC, the PEC code and the CARDCODE of the line are displayed. For example, for a WLC datafilled as `WL9002` in table LNINV, the PEC code of `6X17BA` and cardcode of `WL9002` are displayed.

The `CKTLOC` command identifies the physical location of the line card. This identification is not to be confused with the `LEN`, discussed in the "LEN Numbering" section, that identifies the location of a line in memory.

In addition displaying the line card location, the `CKTLOC` command displays the characteristics of the line in the control position. The following header labels for the characteristics are displayed below the `CKTLOC` response data:

- **GRD START** – States the seizure mode of the line, where:
  - ◆ NO is a loop start.
  - ◆ YES is a ground start.
- **2DB LOSS** – Shows the loss (attenuation) pad setting for local-to-local calls (see the note below), where:
  - ◆ NO means a pad not used.
  - ◆ YES means a pad is used.
- **BAL NETWORK** – Shows that one of the following types of balance networks is used on the line to match the loading of the facility (see the note below):
  - ◆ NON LOADED
  - ◆ LOADED
- **MAN OVR SET** – Shows the setting of the manual override bit that controls pad settings and balance network values (see the note below), where:
  - ◆ NO means that either the on-hook or the off-hook balance network test can change the line card loss pad setting, the balance network value, or both.
  - ◆ YES means that only the off-hook balance network test can change the line card loss pad setting, the balance network value, or both.

**Note:** The values displayed are those from the line circuit inventory table LNINV.

The paragraphs that follow along with *Figure 1* and *Figure 2* discuss the `CKTLOC` command entered for a line that terminates in a DMS-1R RCT and a set of lines that terminate in a SLC-96.

When the `CKTLOC` command is entered at the LTP level for a line that terminates in a DMS-1R RCT, the format of the display is consistent with other `CKTLOC` displays, but the interpretation of the `CKTLOC` information is different. As shown in *Figure 1*, there are four Flat Rate (FR) circuits for each DMS-1R RCT line card. The example in *Figure 1* is for a remote subscriber line on a DMS-1R RCT equipped with a QPP405 line card. The `CKTLOC` information that is displayed is interpreted as follows:

- The site identifier `REM1` is the same for the LEN as for the `CKTLOC`.
- The information displayed under the header "`Flr`" indicates that the line card is located on floor 00.
- The display `A` under the header "`RPoS`" indicates the line card is in bay equipment row A.
- The display `RCT 2` under the header "`Bay_Id`" shows the actual labeling of the bay in which the card is located.
- The display under the header "`Shf`" is always 0 because it indicates the location of the lowest mounting plate in the RCT. A full RCT occupies a full bay.
- The display `RCT 02` under the header "`Description`" identifies the third group of ten RCT (the first group is 00) where the characters `02` correspond to the `ff` value in the LEN. The display `5` under the header identifies the sixth RCT in the group (the first is RCT 0) and it corresponds to the `u` value in the LEN.
- The display `05` under the header "`Slot`" and to the left of the colon represents the shelf in the RCT bay, and corresponds to the `dd` value in the LEN format.
- The display `04` under the header "`Slot`" and to the right of the colon identifies the fifth circuit card in the shelf. It includes circuits 17 through 20, of which circuit 18 is the circuit in the control position in this example, and is the `cc` value in the LEN.

**Figure 1**

LTP level-CKTLOC display for RCT line:

```

      CC      MS      IOD      Net      PM      CCS      Lns      Trks      Ext      APPL
LTP
0 Quit_      POST      DELQ  3      BUSYQ 1      PREFIX 621
2 Post_
3           LCC PTY RNG ....LEN..... DN      STA F S LTA TE  RESULT
4           1FR           REM1 02 5 05 18 621 1234 IDL
5 Bsy_
6 RTS_
7 Diag_
8
9 AlmStat_
10 CktLoc
11 Hold
12 Next_ Site Flr RPos Bay_Id Shf Description Slot  EqPEC
13       REM1 00  A  RCT  2  0  RCT 02 5  05:04 QPP405
14
15       GRD START      2DB LOSS  BAL NETWORK  MAN OVR SET
16 Prefix_ NO           NO      NON LOADED      NO
17 LCO_
18 Level_
  UserId
  Time 7:45
```

When the commands `POST` and `CKTLOC` are entered at the LTP level for a set of lines that terminate in a remote concentrator SLC-96 (RCS) the display is in accordance with the example in *Figure 2*.

**Figure 2**

LTP level-CKTLOC display for an RCS line:

```
CC      MS      IOD      Net      PM      CCS      Lns      Trks      Ext      APPL
-----
LTP
0 Quit_      POST      DELQ      3              BUSYQ 1              PREFIX
2 Post_
3
4           LCC PTY RNG.....LEN.....DN      STA F S LTA TE RESULT
5 Bsy_      1FR              REM2 02 0 01 20 621 1234 IDL
6 RTS_
7 Diag_
8
9 AlmStat_
10 CktLoc_
11 Hold
12 Next_      Site Flr  RPos  Bay_Id  Shf  Description      Slot  EqPEC
13           REM2  01  D01  RTS 02   0  RCS 02 0   B  01:15 SCD203
14
15           GRD START  2DB LOSS  BAL NETWORK  MAN OVR SET
16 Prefix_      NO          NO          NON LOADED      NO
17 LCO_
18 Level_
UserId
Time 7:45
```

The CKTLOC information that is displayed in *Figure 2* is interpreted as follows:

- The site identifier REM2 is the same for the LEN as for CKTLOC.
- The information that is displayed under the header "Flr" indicates that the line card is located on floor 01.
- The display D01 under the header "RPos" indicates that the line card is in bay equipment row D and on the second bay in the row (the first bay is 00).
- The display RTS 02 under the header "Bay\_Id" shows the actual labeling of the bay in which the line card is located.
- The display under the header "Shf" is always 0 because it indicates the location of the lowest RCS mounting plate. A full RCS occupies a full bay.
- The display RCS 02 under the header "Description" indicates that line card is part of the third group of RCS terminal (the first card is RCS 00) and the 02 portion corresponds to the value *ff* in the LEN. The card is located in the first module of the group (0) and corresponds to the value *u* in the LEN.
- The letter B identifies the shelf in which the line card is mounted (see *Figure 8*).
- The display 01 under the header "Slot" and to the left of the colon corresponds to the value *dd* in the LEN as identified in the following:
  - ◆ Shelf A is numbered 00
  - ◆ Shelf B is numbered 01
  - ◆ Shelf C is numbered 02
  - ◆ Shelf D is numbered 03

This is a redundant identification of the line card shelf to simplify locating the shelf.

- The display 15 under the header "Slot", and to the right of the colon, identifies the card position for line circuit 20. In this example, circuit 20 corresponds to the value *cc* in the LEN.
- The code SCD203 displayed under the header "EqPEC" identifies the engineering code of the line card.

## **LEN Numbering**

The Line Equipment Number (LEN) is a group of numbers that describe the location of a line in memory sometimes called the logical location. They are preceded by a four character CLLI that identifies the site of a remotely located line, or by the characters *HOST* that identify the line site as the switch location. The first character of the CLLI of the remotely located line is a letter, while the remaining three characters may be letters or numbers.

The LEN is not to be confused with the circuit locate identification that is used to describe the physical location of a circuit line card in a LCD.

The LEN is formatted as: *ff u dd cc*

- *ff* – Is a frame number from 00 through 99. For the S/DMS AccessNode RFT, this value is a number from 0 through 511 representing the group the RFT belongs to at the site.
- *u* – Is a unit number:
  - ◆ From 0 through 9 if the LCD is a DMS–1R RCT, a SLC–96 RCS. For the S/DMS AccessNode RFT, this number represents the unit number within the group.
  - ◆ Either 0 or 1 if the LCD is a LM or a LCM.
  - ◆ From 0 through 3 if the LCD is a UEN, representing the shelf numbering in the Universal Edge Equipment (UEE) frame.
- *dd* – Is a drawer number or line subgroup number from 00 through 19. The following LCDs are numbered differently:
  - ◆ RDT – The drawer is referred to as a shelf having a value from 1 through 31; however, for the S/DMS AccessNode RFT, the shelf value is from 1 through 7.
  - ◆ LCME – The drawer number or line subgroup number has a value from 00 to 15.
  - ◆ SRU – The drawer number or line subgroup number has a value from 00 to 07.
  - ◆ UEN – The individual line cards, each of which are Line Subgroups (LSG), are numbered 00 to 15. Each line subgroup (line card) contains up to 32 lines
- *cc* – Is a circuit number from 00 through 31. For the RDT, the circuit number is the slot number of the line card having a value from 1 through 99; however, for the S/DMS AccessNode RFT, the slot value is from 1 through 96. For the UEN, if the NTNP50AA POTS 32 line card is installed, up to 32 circuits are available. If the NTNP44AA ADSL DMT 4+4 line card is installed, up to four circuits are available.

When circuit numbers 00 through 09 are entered as 0 through 9, the system default interprets the unentered first character as 0 and accepts the abbreviated entry of the circuit number.

If the office has a remotely located LCD, and the LM or the LCM are uniquely numbered by site, the CLLI is required before the LEN. If the LM or LCM numbers are unique to the whole office, then the CLLI is optional.

The remote terminal of a DMS–1 subscriber carrier system is called a Remote Concentrator Terminal (DMS–1R RCT). The DMS–1R RCT is connected to the host network module through a 1.544 Mb/s digital line and a Subscriber Carrier Module (SCM) that provides an interface with the 2.56 Mb/s digital rate speech link of the DMS–100 switch. A single SCM can terminate a maximum of six DMS–1R RCTs.

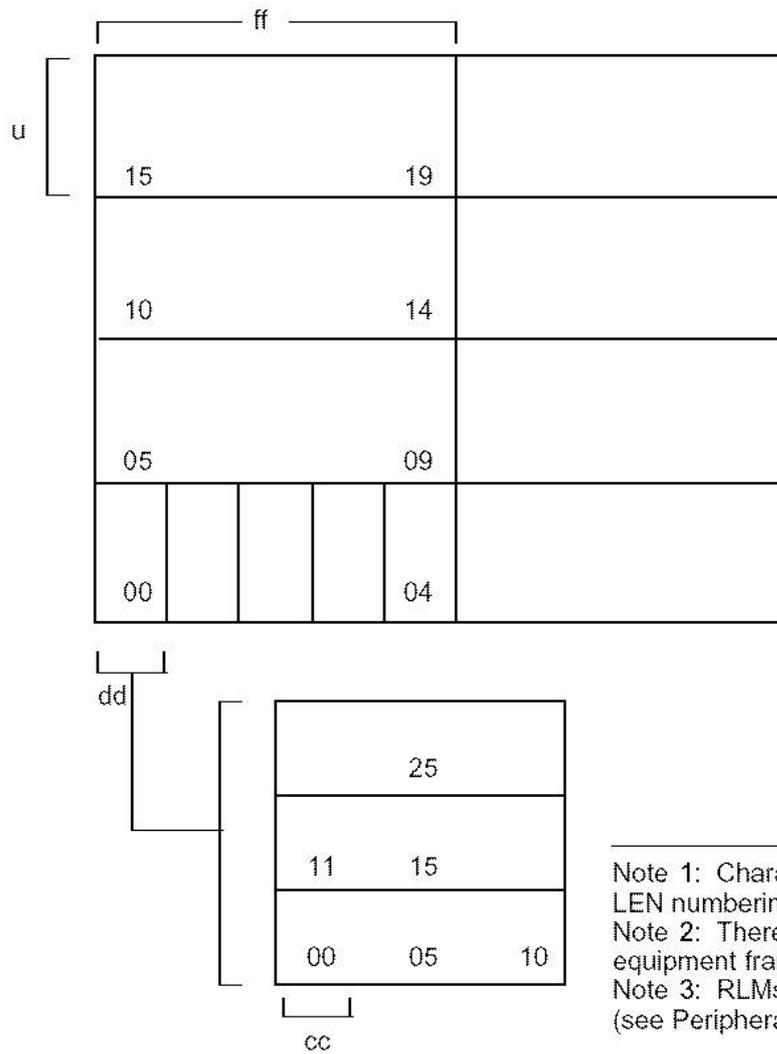
The remote terminal of a SLC-96 subscriber carrier system is called a Remote Concentrator SLC-96 (RCS). The RCS is connected to the host network through a 1.544 Mb/s digital line and a peripheral module called a SMS that provides an interface with the 2.56 Mb/s digital rate speech link of the DMS-100 switch.

Remote locations that are equipped with these types of subscriber carrier terminals mount line cards in shelf slots rather than in drawer slots. However, the shelf number is assigned in the *dd* field of the LEN number to maintain its standard format. *Figure 4* through *Figure 8* show the use of the standard LEN format when used with various LCDs. For all applications except the RCS, the location of the circuit in memory is directly related to the physical location of the line card. The RCS line card that is part of a specific line circuit may be identified using the mapping diagram shown in *Figure 9*. RCS line circuit numbers 24 through 31 are unassigned to simplify the relationship between the logical location and physical location of the line circuit. *Figure 10* shows the arrangement of the shelves and slots in the S/DMS AccessNode RFT which relate to the LEN numbering for RDT lines. *Figure 11* shows the arrangement of the drawers and card slots in the SRU which relate to the LEN numbering for SRU lines.

There is no LEN for a Datapath Loop Extension (DPX) line. The line's logical location is directly identified with the logical location of the associated trunk circuit in the serving office switch.

**Figure 3**

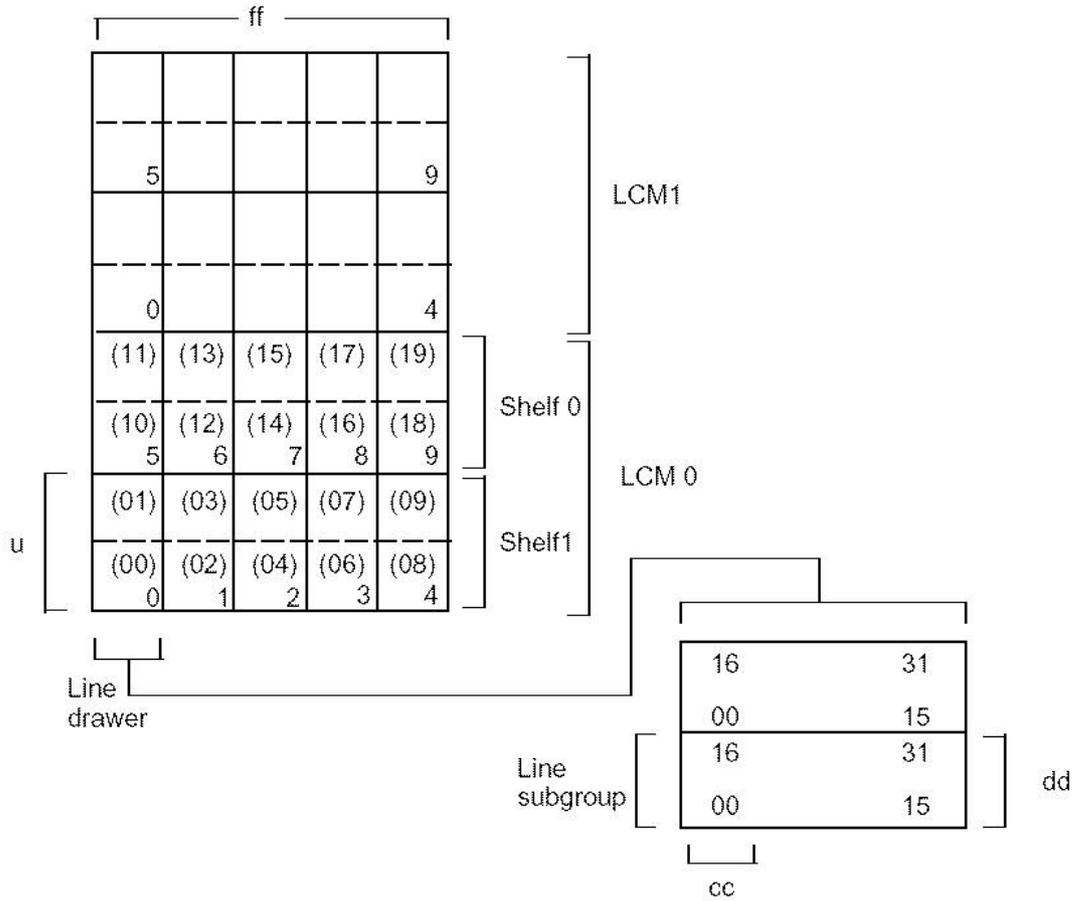
LM and RLM LEN numbering:



- Note 1: Characters ff, u, dd, cc represent LEN numbering data.
- Note 2: There are two LMs in a line module equipment frame.
- Note 3: RLMs are configured differently (see Peripheral Modules, 297-1001-103).

**Figure 4**

LCM and RLCM LEN numbering:



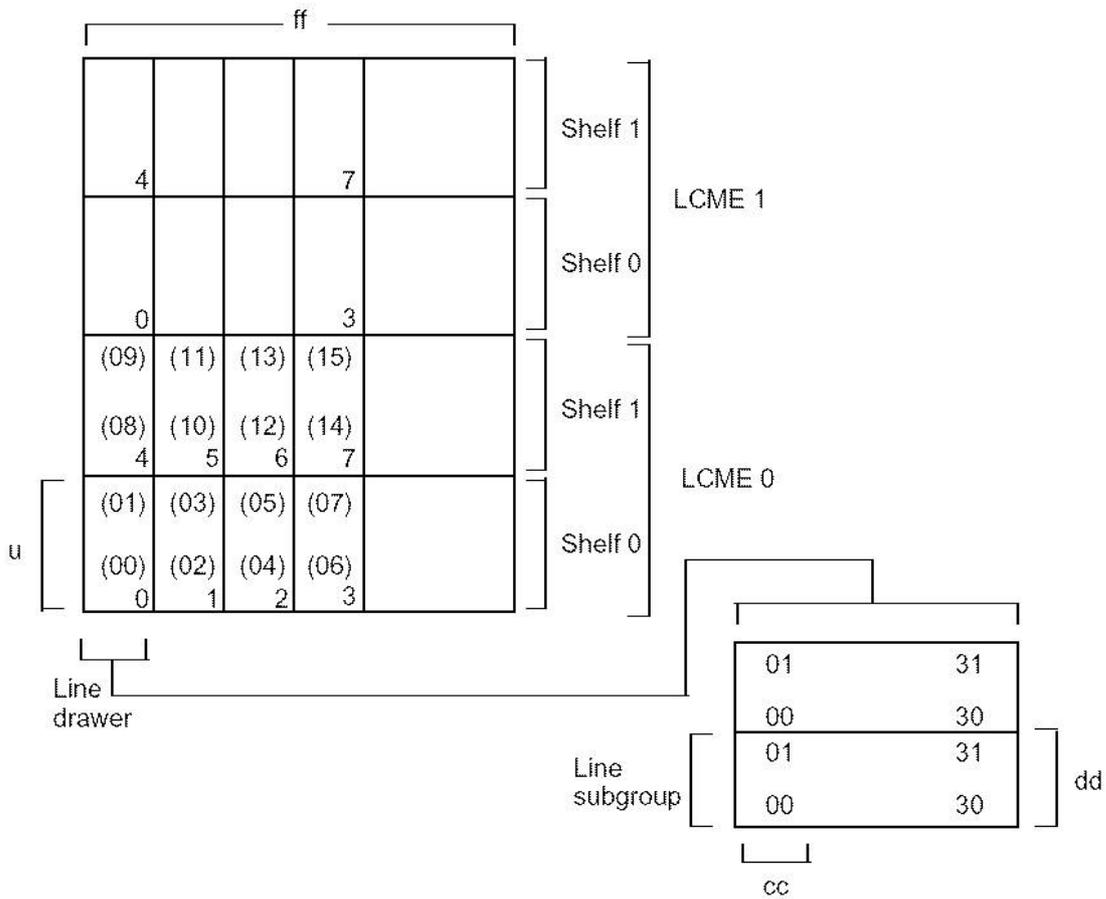
Note 1: Characters ff,u, dd, cc represent LEN numbering data.

Note 2: Line subgroups numbers are in parenthesis.

Note 3: The characters dd represent the logical drawer. There are two logical drawers in each physical drawer.

**Figure 5**

LCME LEN numbering:



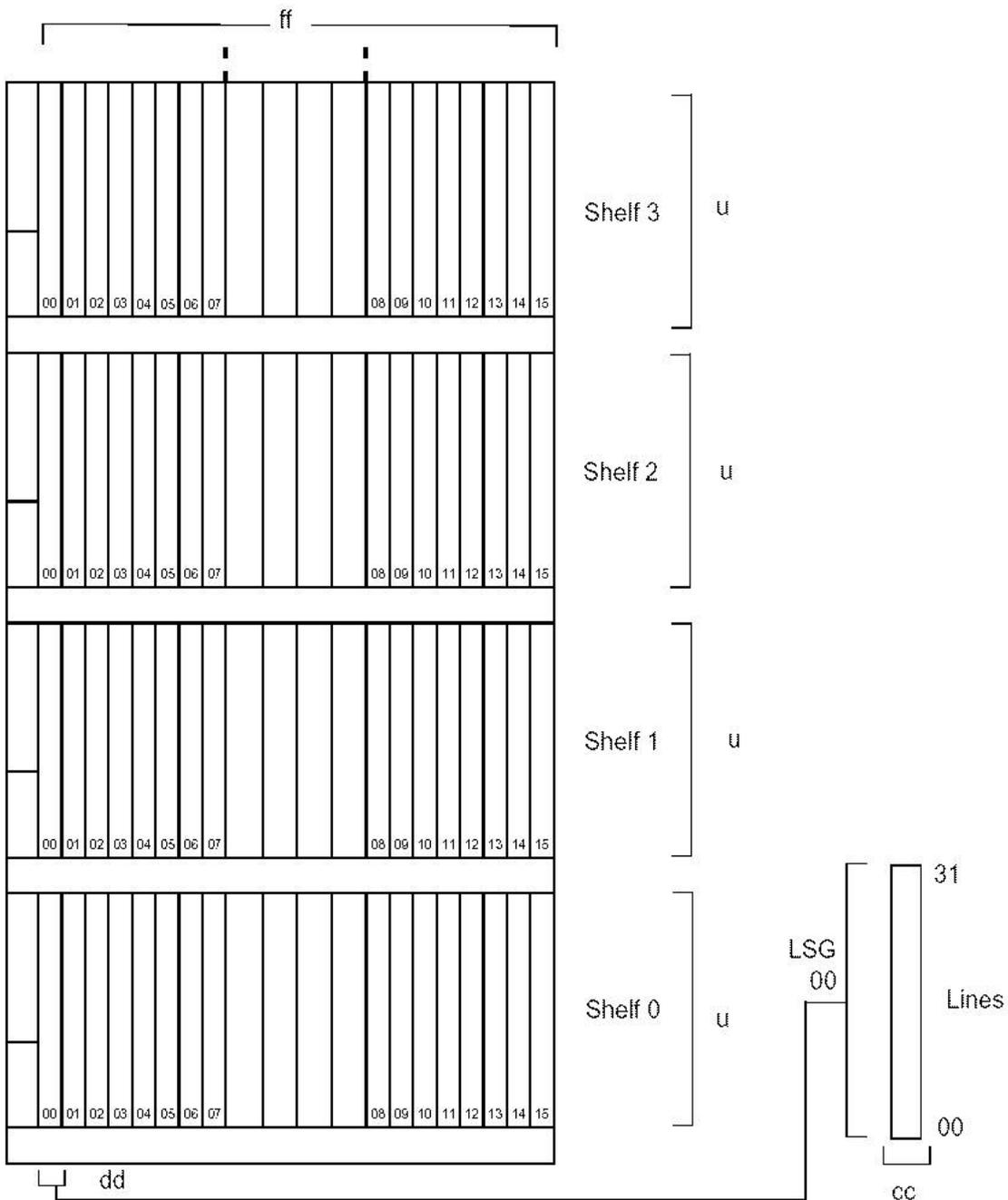
Note 1: Characters ff,u, dd, cc represent LEN numbering data.

Note 2: Line subgroups numbers are in parenthesis.

Note 3: The characters dd represent the logical drawer. There are two logical drawers in each physical drawer.

**Figure 6**

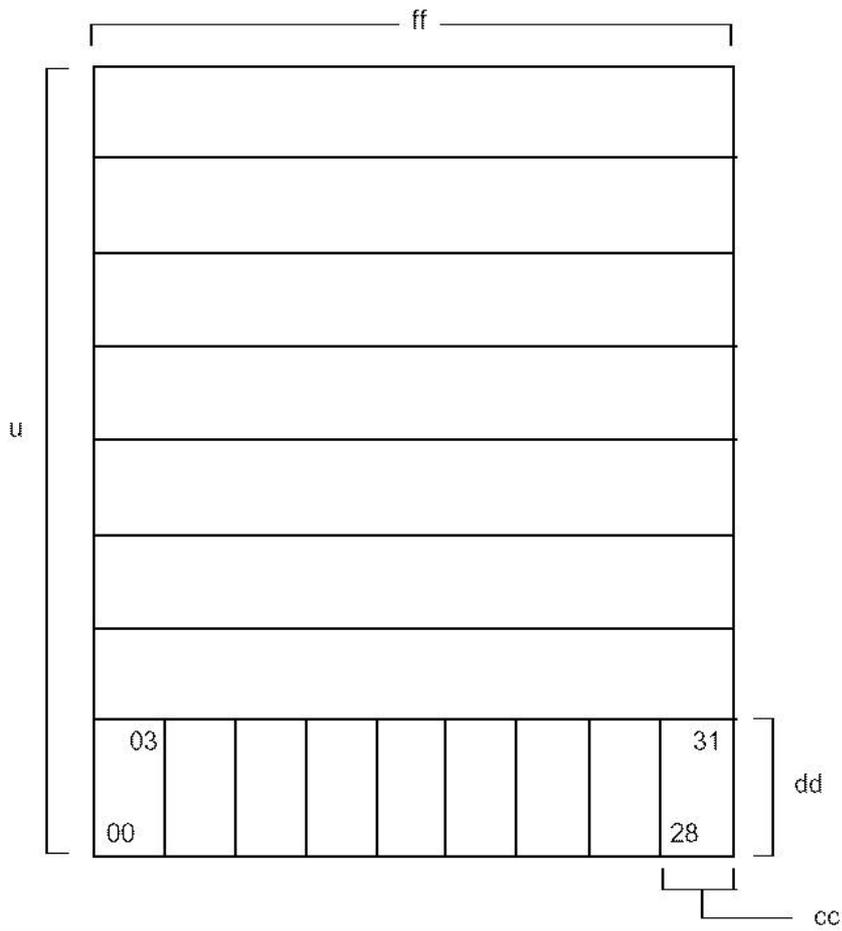
UEN numbering:



- Note 1: Characters ff, u, dd, cc represent LEN numbering data.
- Note 2: The characters dd represent the line subgroup (line card slot number).
- Note 3: The number of circuits in a UEN LSG is dependant upon the number of circuits that the line card supports.
- Note 4: NTNP44 supports a maximum of 4 lines.  
NTNP50 supports a maximum of 32 lines.

**Figure 7**

DMS-1R RCT LEN numbering:



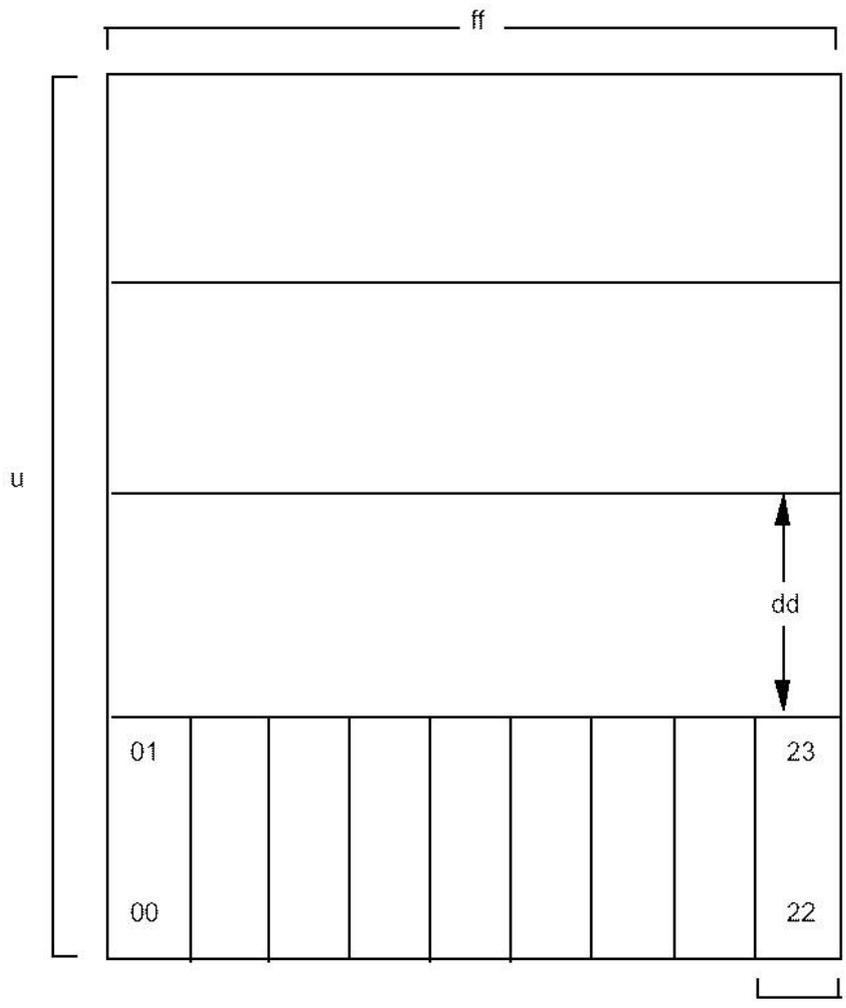
Note 1: Characters ff, u, dd, cc represent LEN numbering data.

Note 2: There are four flat rate (FR) circuits or two coin circuits for each card; each coin circuit is even numbered from 00 through 30.

Note 3: There is a maximum of ten RCTs in a group that is recorded in the ff field.

**Figure 8**

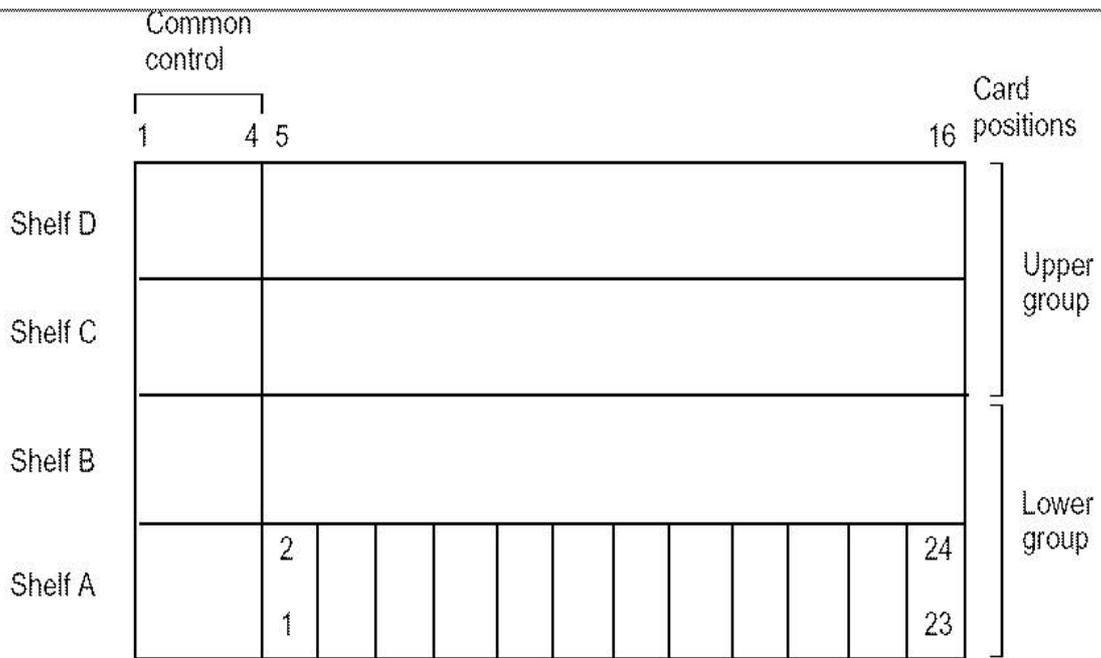
RCS (SLC-96) LEN numbering:



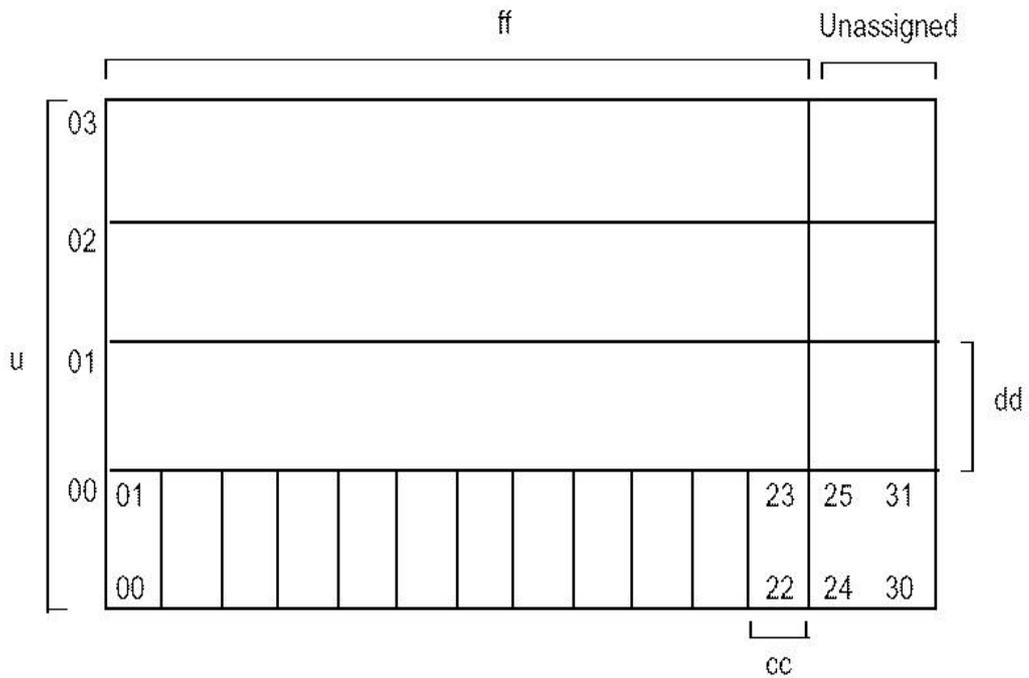
**Note:** Characters ff, u, dd, cc represent LEN numbering data.

**Figure 9**

RCS (SLC-96) line card mapping:



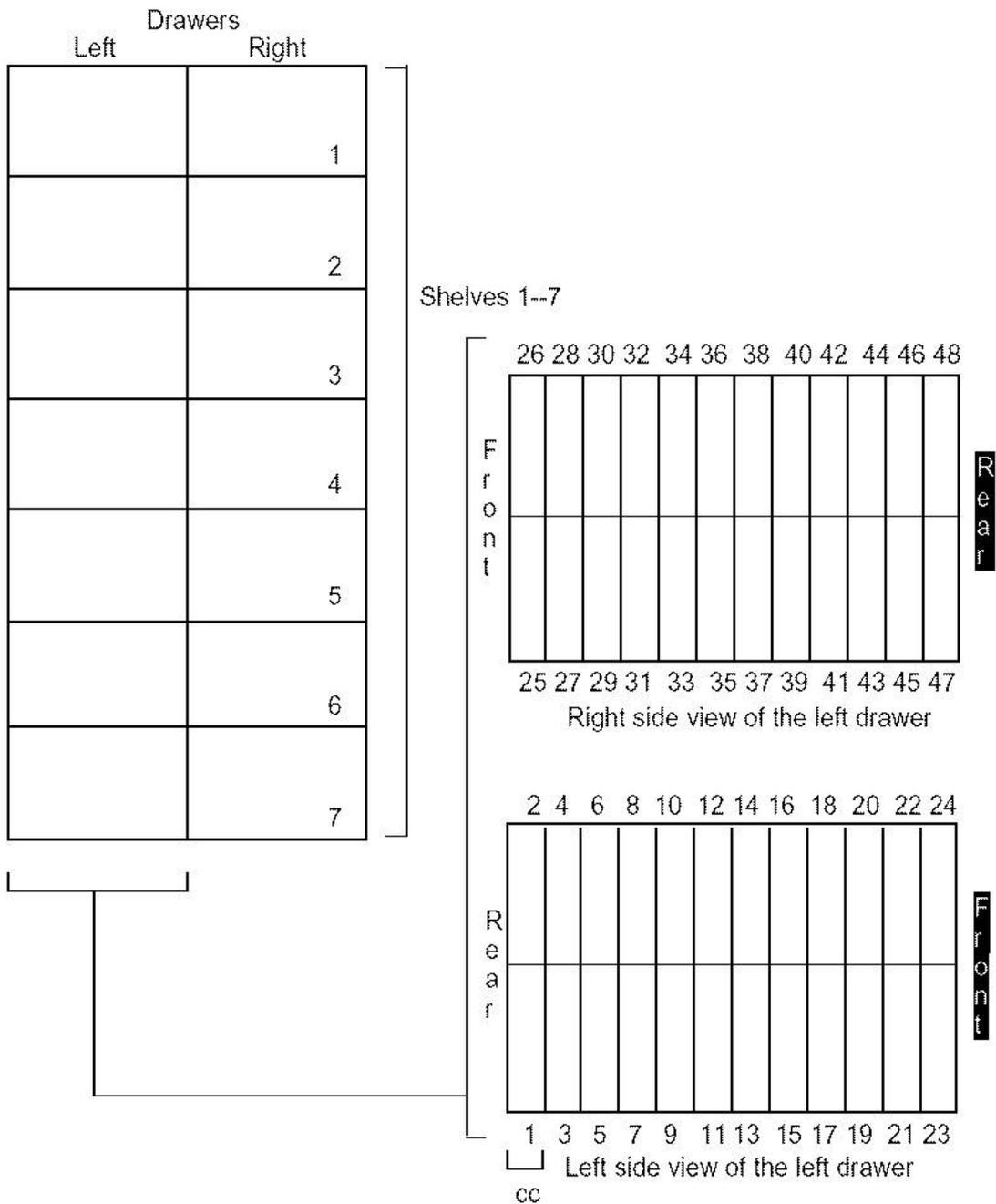
Physical location of 2-circuit type line cards in equipment shelves



**Note:** Characters ff, u, dd, cc represent LEN numbering data.

**Figure 10**

RFT line card mapping:



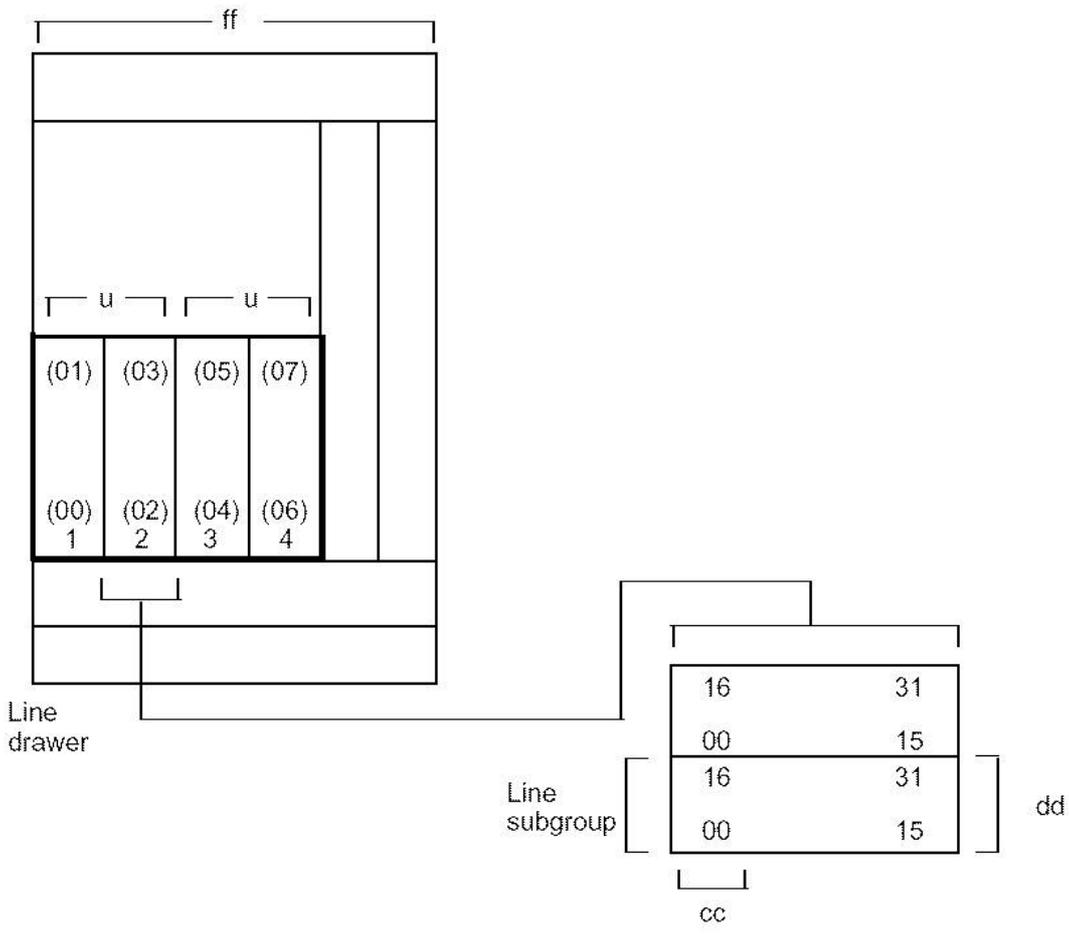
**Note 1:** Characters dd and cc represent the LEN numbering data, which for the RFT indicates the shelf and slot numbers.

**Note 2:** The shelves consist of two drawers, each drawer containing up to 96 line cards.

**Note 3:** The line card numbering arrangement for a drawer on the right side continues the numbering arrangement presented in the left hand drawer, where slots 49 through 72 are visible on the left side of the right line drawer and slots 73 through 96 are visible on the right side of the right line drawer.

**Figure 11**

SRU LEN numbering:



- Note 1: Characters ff, u, dd, cc represent LEN numbering data.
- Note 2: Line subgroups numbers are in parentheses.
- Note 3: The characters dd represent the logical drawer. There are two logical drawers in each physical drawer.

# Bell System Dedicated Plant

## Wiring Access Points

BELL SYSTEM PRACTICES  
AT&TCo Standard

SECTION 460-300-134  
Issue 3, May 1972

### DEDICATED PLANT— WIRING ACCESS POINTS

#### 1. GENERAL

- 1.01** Under the dedicated plant plan, a pair is permanently assigned to a specific residence or non-key business address from a central office. Once dedicated, the pair will remain permanently assigned to a customer's location, whether working or idle.
- 1.02** This section is reissued to add information on the:
- UP-1248 cable closure
  - B and C bond clamps and WE-1 cable tie
  - Restoring previously used *IN* cable pair.
- 1.03** Subscriber drop, block, or buried service wires should not be terminated in an access point; they should be terminated in distribution terminals.
- 1.04** Access points can be distinguished from control points by:
- (a) A green B cable tie placed around the *EXPRESS* cable of a strand-mounted access point (Fig. 2). A red B cable tie identifies a control point (Fig. 4).
  - (b) A marker with a letter *A* on a green background installed on pole- and wall-mounted closures, building cabinets, and buried closures identify access points. Control points are identified by a letter *C* on a red background.
- 1.05** Control points are under administrative control of the engineer of outside plant, and all pair connections in control points are made under engineering work orders.
- 1.06** Access points have been designed so that Telephone Company personnel entering an access point will find the *OUT* cable pairs placed through the rear holes of the wiring brackets, and the method of connecting the *IN* and *OUT* pairs

the same regardless of the type of closure. This has been done to facilitate good housekeeping. The closure should always look neat after the workman leaves the job.

**1.07** When piecing-out cable pairs, do not change colors. Always use wire of the same color and gauge as the cable pair being pieced-out.

**1.08** A talk pair is provided for calling testboard and other locations which will reduce test pick damage to the conductors.

#### 2. DEFINITIONS

**2.01** *Access Points* provide a means of connecting pairs in distribution cables to spare pairs in main or branch feeder cables. Cables entering access points from the central office or a preceding control point are termed *IN* or *EXPRESS* cables (Fig. 1). Cables leaving access points toward subscribers are termed *OUT* cables. Cables which originate in the access point assume the address of the access point, and the cable pair numbers assigned to the pairs in these cables begin at one (1) and continue up to the total number of pairs originating at this location. *EXPRESS* feeder cables leaving access points do not change designations.

**2.02** ♦ *Continuous PIC Sheath Count* provides binder group identification by the use of colored wire ties installed at the time of construction of the access point. Table A lists an example of continuous PIC sheath count in an access point with one or more *IN* and *OUT* cables.

**2.03** A workman visiting the following types of access points will find that the *OUT* cable units have been positioned in the wiring brackets and identified by a continuous PIC sheath count. The access point may have a number of pairs connected or no pairs connected.

- (a) *Strand-Mounted Access Point*—The 1B1 closure (Fig. 2) is used as a strand-mounted access point.

# Bell System Dedicated Plant

## Wiring Access Points

SECTION 460-300-134

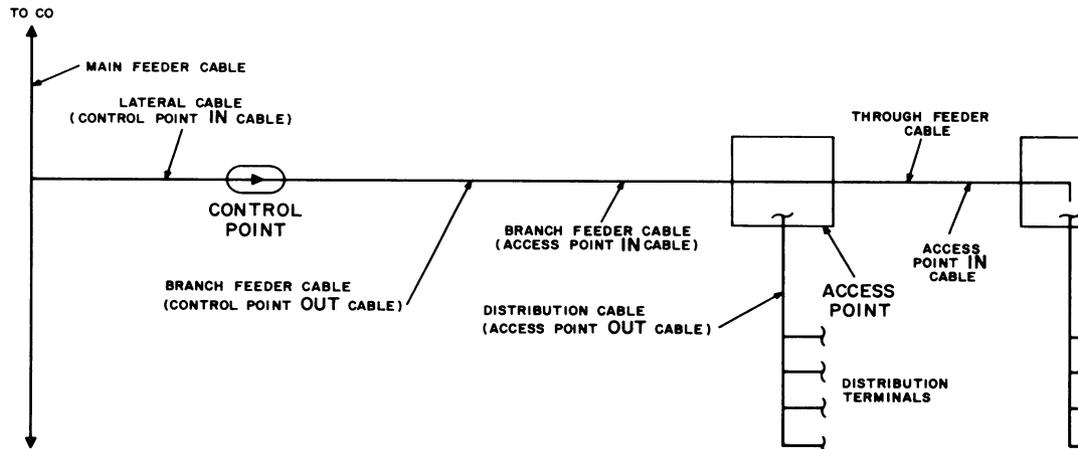


Fig. 1—Simplified Dedicated Plant Distribution System

(b) **Pole- and Wall-Mounted Access Points**—The 5-type closures (Fig. 3) and the 29-type cabinets (Fig. 4) are used to enclose pole- and wall-mounted access points.

(c) **Access Points in Buried Plant**—The L backboard (Fig. 5), the M backboard (Fig. 6), and the N backboard (Fig. 7), used in conjunction with the G, H, UP-1200, and UP-1248 cable closures, respectively, are used for access points in buried plant. The UP-1248 cable closure (Fig. 8) supersedes the UP-1200 cable closure and is used to enclose large PIC cable splices, to house access and control points, and to house CCTV (close circuit television) equipment.

(d) **B or C Bond Clamp (Fig. 9 and 10)**: Used to bond the metallic shield of PIC cables to the ground bracket of the closure (Fig. 11).

(e) **WE-1 Cable Tie (Fig. 11)**: Used to secure the cables to the ground bracket assembly.

### 3. IDENTIFYING SPECIAL CIRCUITS

**3.01** When cable pairs are used for special services, it will be necessary to identify the circuits at the time the pairs are connected by wrapping a red warning marker tape around each B wire connector as shown in Fig. 3.

**3.02** When disconnecting the special service pairs, remove the red warning marker tape from the B wire connectors.

### 4. CONNECTING

**4.01** The procedures for connecting the *IN* and *OUT* cable pairs in an access point are the same in each type of closure and are designed to eliminate unnecessary handling of pairs once they are connected, promote good housekeeping, provide easy identification; therefore, it is important that the procedures outlined in this section be followed.

#### Cable End Location or Locations Fed by Stub Cable

**4.02** Loosen the B cable tie and select the assigned *IN* pair.

**4.03** Cut the assigned *IN* pair as close to the acetate container as possible.

**Note:** If the wrong pair is cut, splice with the same color wire and insert each conductor into a B wire connector and press. Replace the pair within its binder group.

**4.04** Pull the assigned *IN* pair from the binder group and place in the *front* wiring bracket.

# Bell System Dedicated Plant

## Wiring Access Points

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**TABLE A**  
**EXAMPLE OF A CONTINUOUS PIC SHEATH COUNT IN AN ACCESS POINT**

OUT CABLES <sup>1</sup>					IN CABLES <sup>2</sup>				
CABLE NO.	CABLE PIC SHEATH COUNT	BINDER GROUP	CONTS PIC SHEATH COUNT	COLOR OF WIRE ON CONTS GREEN BINDER	CABLE NO.	CABLE PIC SHEATH COUNT	BINDER GROUP	CONTS PIC SHEATH COUNT	COLOR OF WIRE ON CONTS GREEN BINDER
1	1-25	BL-W	1-25	BL-W	1	1-25	BL-W	1-25	BL-W
1	26-50	O-W	26-50	O-W	1	26-50	O-W	26-50	O-W
1	51-75	G-W	51-75	G-W	1	51-75	G-W	51-75	G-W
1	76-100	BR-W	76-100	BR-W	1	76-100	BR-W	76-100	BR-W
2	1-25	BL-W	101-125	S-W	1	101-125	S-W	101-125	S-W
2	26-50	O-W	126-150	BL-R	1	126-150	BL-R	126-150	BL-F
2	51-75	G-W	151-175	O-R	1	151-175	O-R	151-175	O-F
2	76-100	BR-W	176-200	G-R	1	176-200	G-R	176-200	G-F
3	1-25	BL-W	201-225	BR-R	2	1-25	BL-W	201-225	BR-F
3	26-50	O-W	226-250	S-R	2	26-50	O-W	226-250	S-F
4	1-25	BL-W	251-275	BL-BK	2	51-75	G-W	251-275	BL-BK
4	26-50	O-W	276-300	O-BK	2	76-100	BR-W	276-300	O-BK
					2	101-125	S-W	301-325	G-BK
					2	126-150	BL-R	326-350	BR-BK
					2	151-175	O-R	351-375	S-BK
					2	176-200	G-R	376-400	BL-Y

**Notes 1:** *OUT* cable number and pairs are: (1)100-pair, (2)100-pair, (3)50-pair, (4)50-pair.

**2:** *IN* cable number and pairs are: (1)200-pair and (2)200-pair.

hole (Fig. 12) corresponding to the assigned *OUT* cable pair to which it is to be connected. **Do not remove the *OUT* cable pair from the rear hole of the wiring bracket.**

**4.05** Remove the *OUT* cable pair from the single wire tie.

**4.06** Cut the assigned *IN* pair to the same length as the assigned *OUT* pair and connect with a B wire connector. If for any reason the *IN* pair is shorter than the *OUT* pair, piece out the *IN* pair (Part 5). Do not cut the *OUT* pair. Use only a B connector presser or pneumatic presser for crimping the B wire connectors.

**4.07** Tighten the single wire tie on the remaining unconnected pairs of the *OUT* binder groups.

**4.08** Secure the capped spare binder groups the bottom of the closure by tightening t B cable tie.

#### Loop-Through Locations and Strand-Mounted Closure

**4.09** Select the *IN* cable pair from the preferred count and cut the pair at the butt of t cable **away** from the central office side of t closure.

**4.10** Repeat 4.04 and 4.06 for placing a connecting the assigned *IN* cable pair.

#### 5. PIECING-OUT

##### *OUT* Cable Pair

**5.01** If for any reason the *OUT* cable pair too short to reach an assigned wiring bracket hole, piece out the conductor as follows. Use w

Pag

# Bell System Dedicated Plant

## Wiring Access Points

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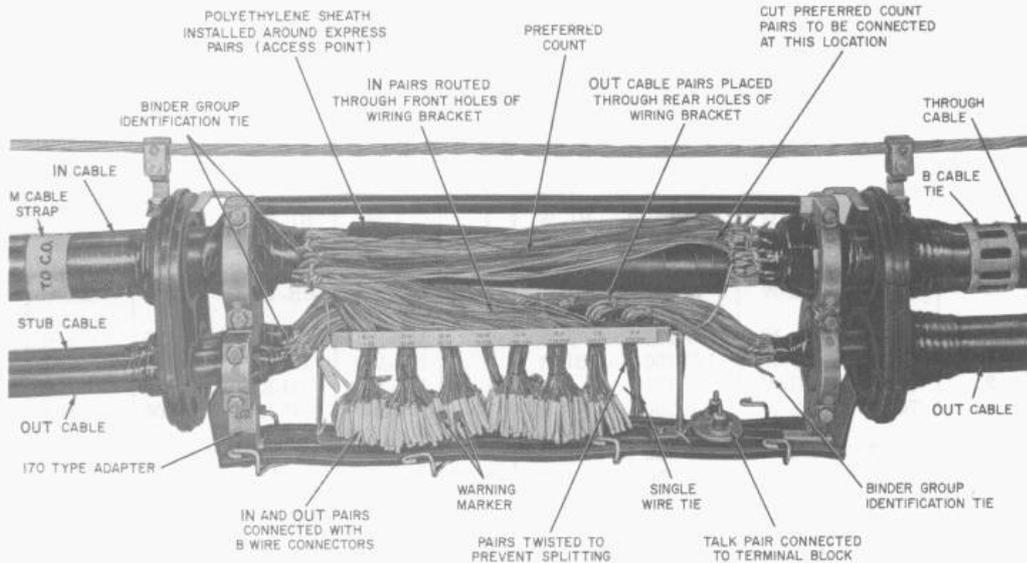


Fig. 2—1B1 Closure

having the same colored insulation and gauge as the cable pair.

- (a) Cut the *OUT* cable pairs even.
- (b) Insert the tip conductor and the like-colored piecing-out wire in a B wire connector and press.
- (c) Insert the ring conductor and the like-colored piecing-out wire in a B wire connector and press.
- (d) Route the *OUT* cable pair through the assigned rear hole of the wiring bracket and apply from four to six tight twists as close to the bottom of the wiring bracket as possible. This prevents pair splitting.
- (e) Cut the piecing-out wire to the same length as the other unconnected pairs of the binder group.

### *IN* Cable Pair

Page 4

5.02 The procedures for piecing-out the *IN* cable pair are identical to the procedures outlined in 5.01, except cross-connecting wire may be used as the piecing-out wire if no wire having the same colored insulation or gauge as the *IN* cable pair is available. **Never use an odd-colored wire.**

5.03 Route the pieced-out wire through the distributing rings, binder group identification tie, and the front hole of the wiring bracket corresponding to the assigned *OUT* cable pair.

5.04 Connect the assigned *IN* cable pair and the *OUT* cable pair using B wire connectors.

### PIECING-OUT AND RESTORING PREVIOUSLY USED *IN* CABLE PAIR WITHIN BINDER GROUP FOR FUTURE USE

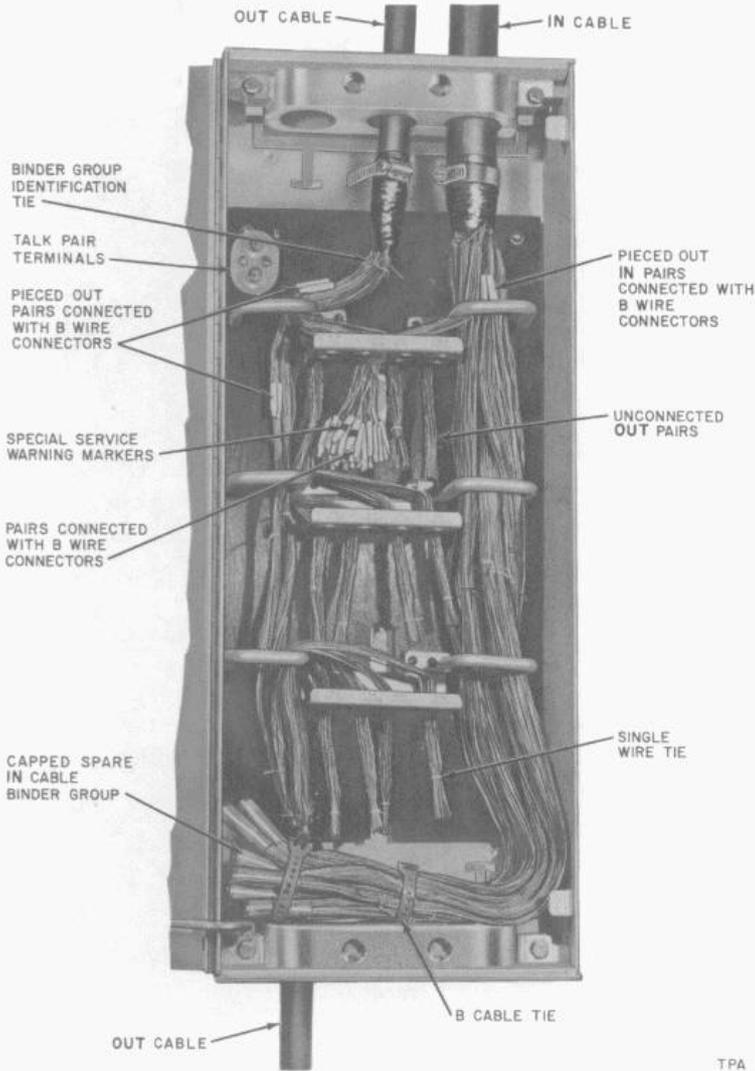
5.05 Remove the disconnected *IN* cable pair from the *front* hole of the wiring bracket.

5.06 Obtain a length of piecing-out wire having the same colored insulation and gauge as the disconnected *IN* cable pair. **If no wire with the same colored insulation or gauge as the *IN***

# Bell System Dedicated Plant

## Wiring Access Points

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TPA 506028

Fig. 3—5-Type Closure (Pole Mounted)

# Bell System Dedicated Plant

## Wiring Access Points

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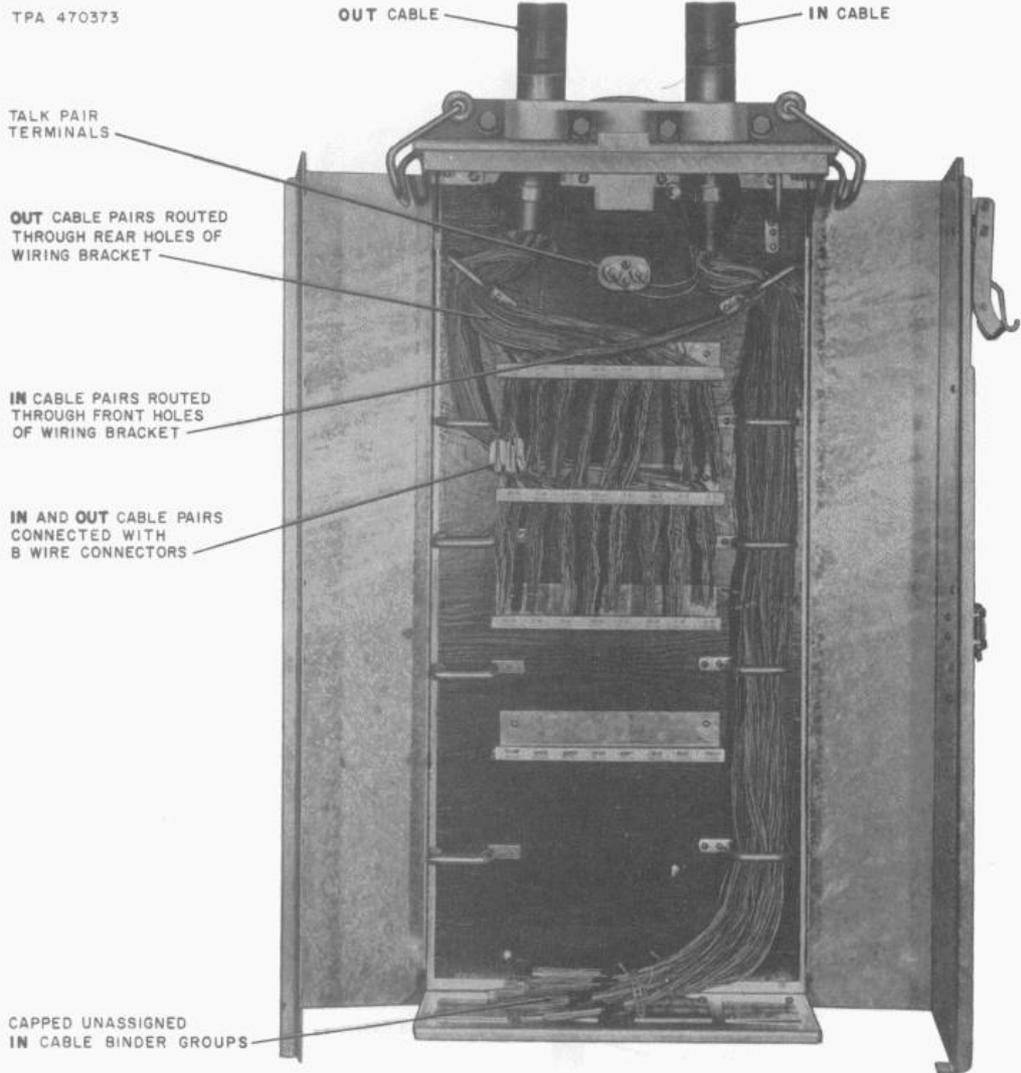


Fig. 4—29-Type Cabinet (Wall Mounted)

# Bell System Dedicated Plant

## Wiring Access Points

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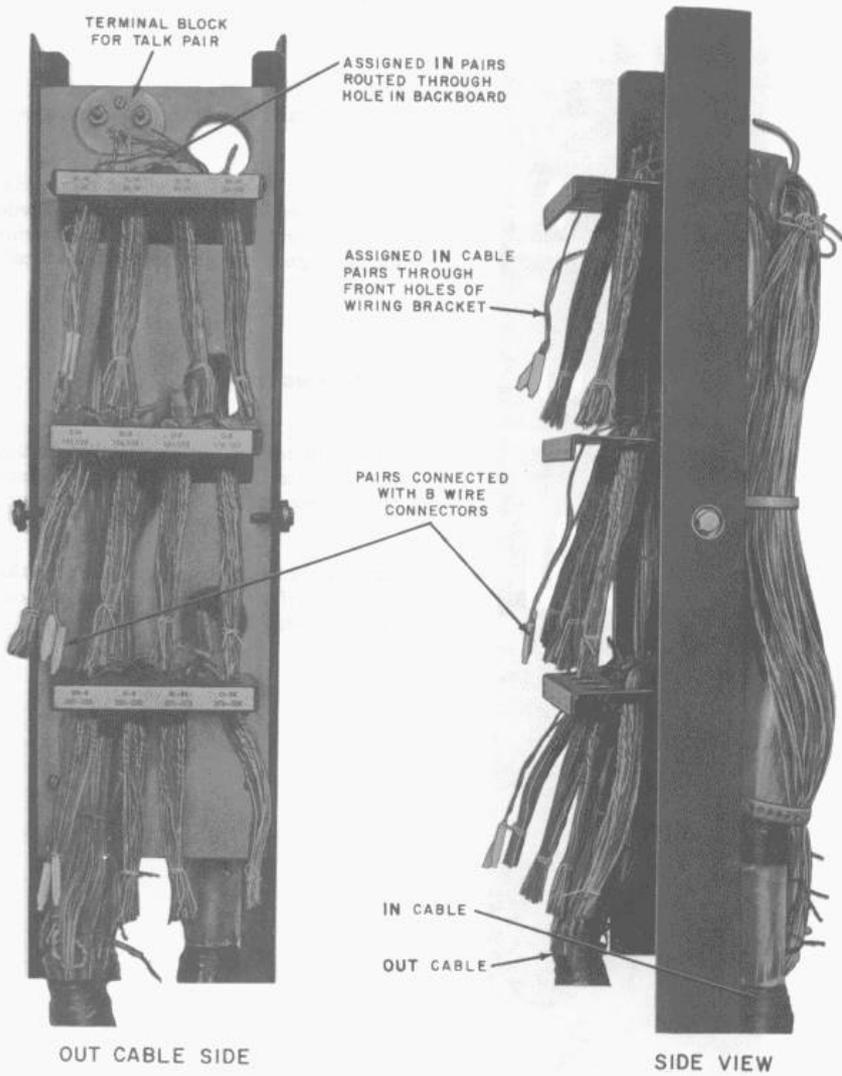


Fig. 5—L-Backboard

# Bell System Dedicated Plant

## Wiring Access Points

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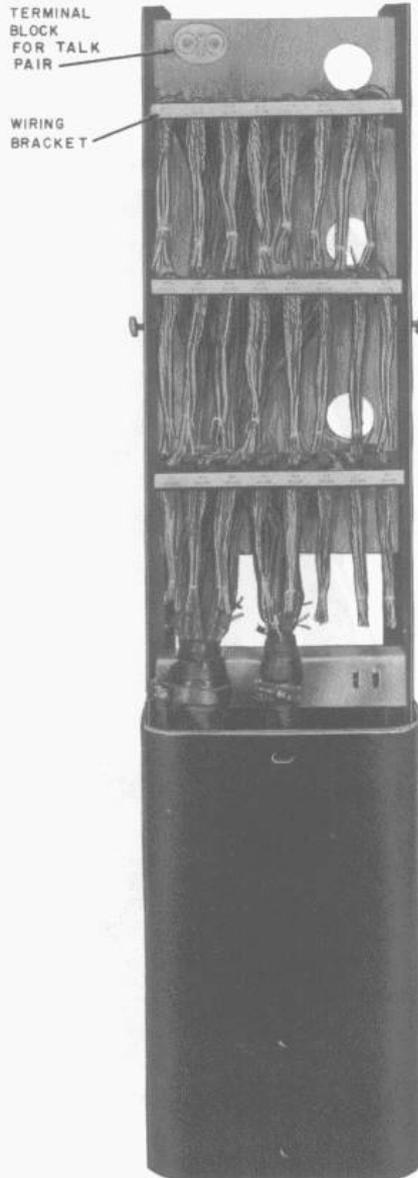


Fig. 6—M-Backboard

*cable pair is available, use cross-connecting wire for piecing out. Do not substitute an odd-colored wire.*

**5.07** Splice the piecing-out wires to the disconnected *IN* cable pair using B wire connectors.

**5.08** Clear ends of pieced-out pair using B wire connectors, then restore the pieced-out pair within its original binder group and secure within the unassigned *IN* cable pairs with a B cable tie.♦

### 6. TALKING CIRCUIT

**6.01** The terminal block, installed at the time of construction, provides the workman with a talking circuit for calling the test desk, etc.

**6.02** Detailed instructions covering the use of specific types of handsets are covered in other sections.

# Bell System Dedicated Plant

## Wiring Access Points

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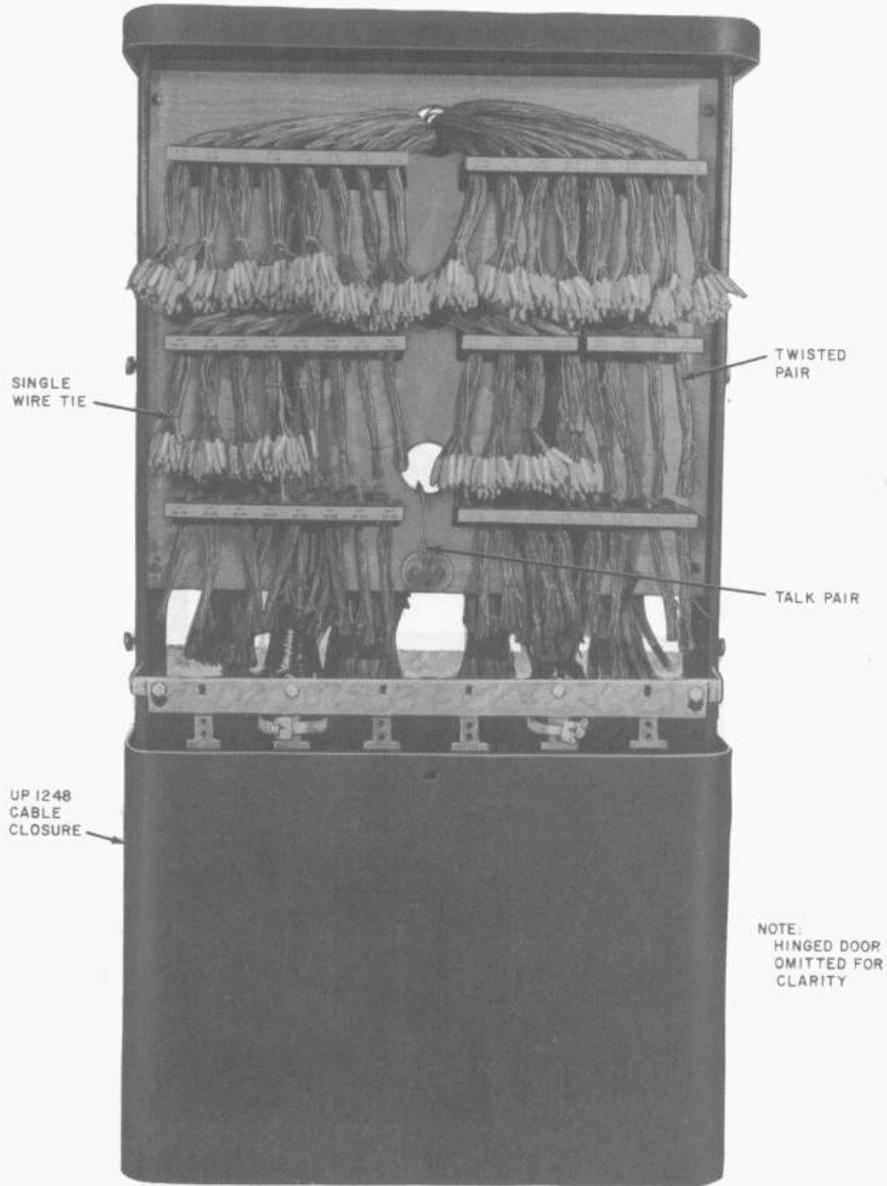


Fig. 7—N-Backboard

# Bell System Dedicated Plant

## Wiring Access Points

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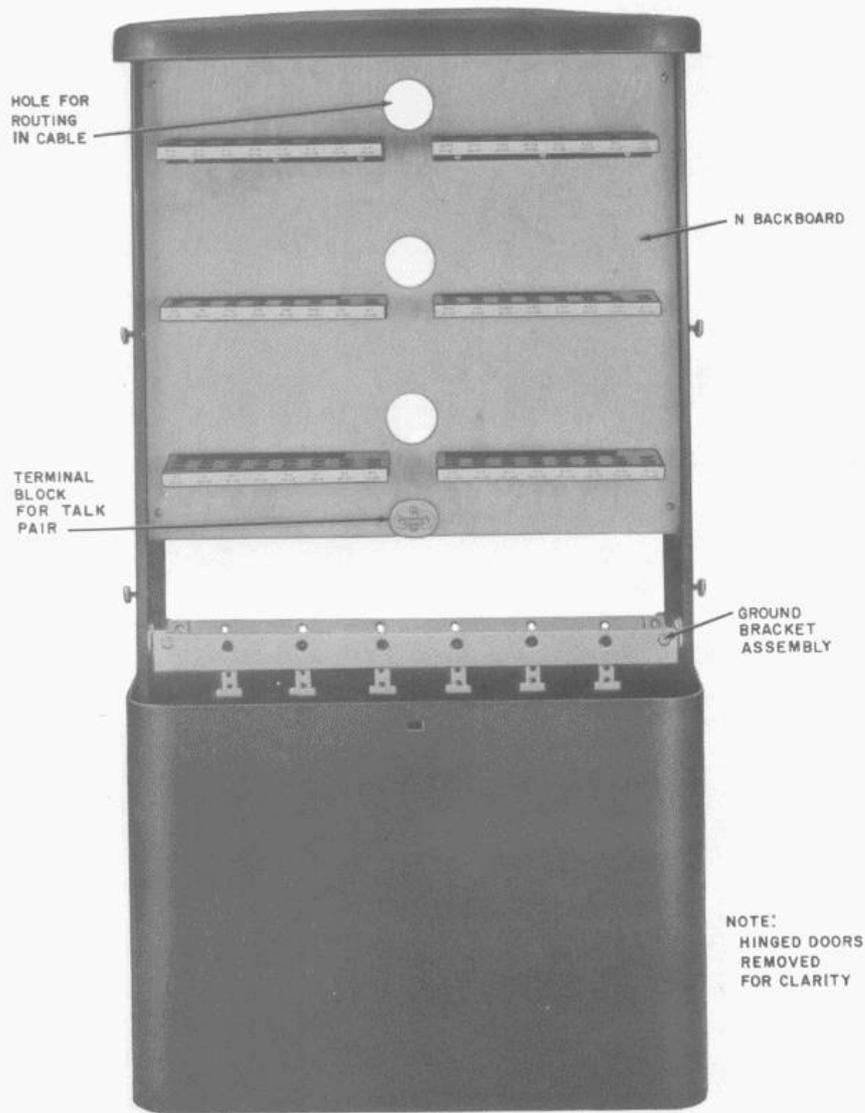
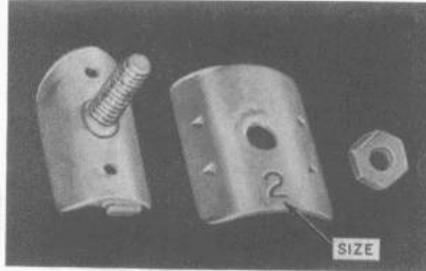


Fig. 8—UP-1248 Cable Closure Equipped With N Backboard

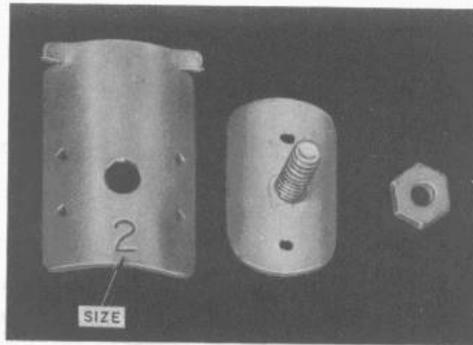
# Bell System Dedicated Plant

## Wiring Access Points

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B BOND CLAMP



C BOND CLAMP

Fig. 9—B and C Bond Clamp

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## Wiring Access Points

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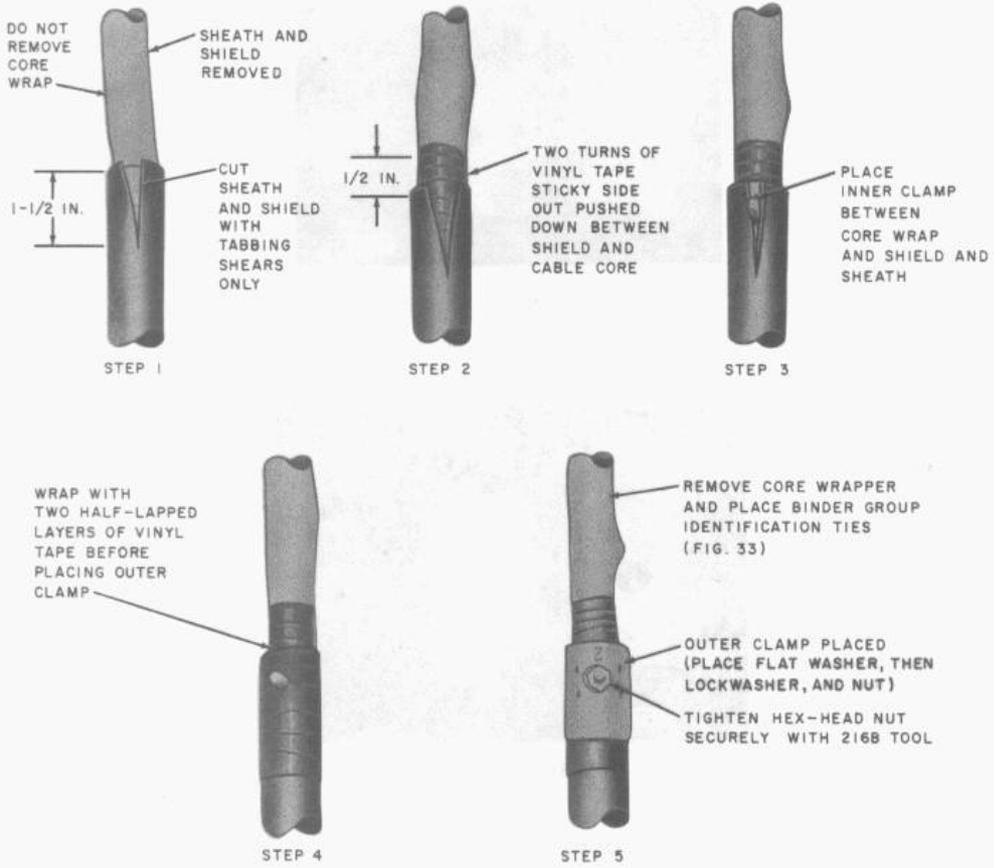


Fig. 10—Placing Bond Clamp

# Bell System Dedicated Plant

## Wiring Access Points

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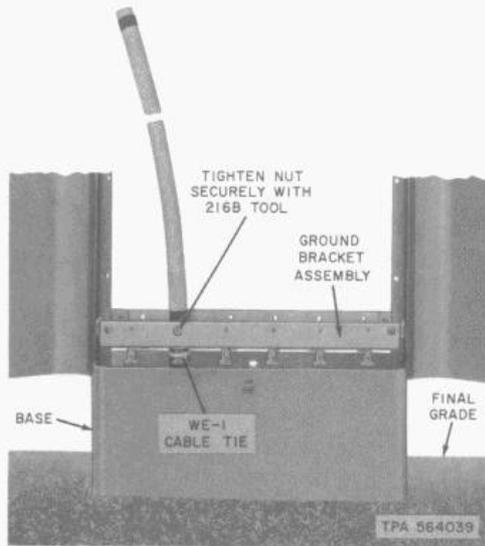


Fig. 11—Cable Installed in Closure

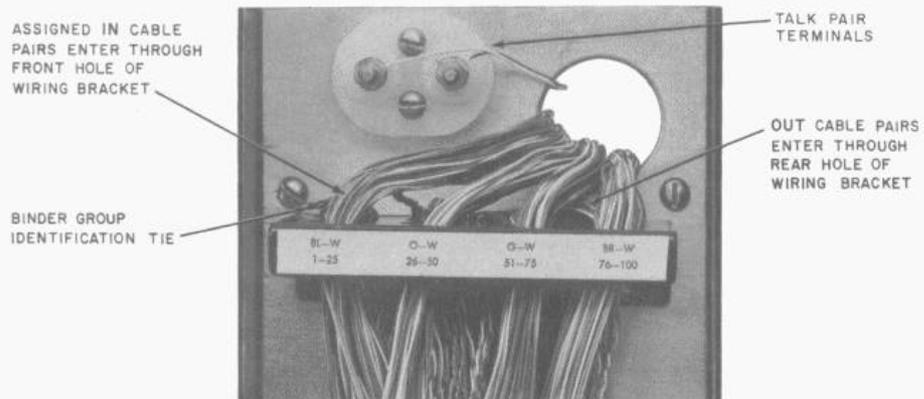


Fig. 12—Assigned *IN* Cable Pair Routed Through Front Holes of Wiring Bracket

# Simple GPS Jammer Using a Satellite Tuner

## Overview

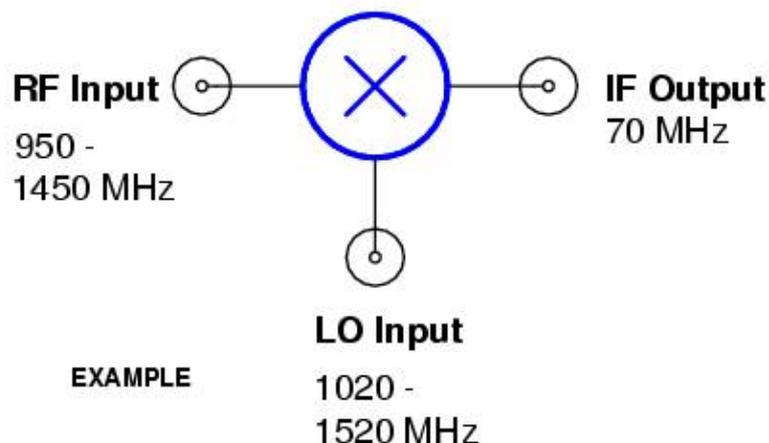
Lets say you just got done increasing the I.Q. of a Mexcrement, Eurosavag, Muslim or \$2600 Magazine subscriber by 9 mm. Now, you should be hailed as a hero, but alas, you will probably be tracked down and thrown in jail. If a vehicle-based GPS tracking system is used to monitor your whereabouts, this contraption may be useful to defeat it.

This GPS jammer is made from the parts of an old C-band analog satellite receiver. These are becoming hard-to-find, but they do show up at Goodwill / thrift stores from time-to-time. Normally, the tuner inside the receiver takes the incoming (downconverted) 950 – 1,450 MHz RF signal from the satellite dish's block converter and heterodynes it down to a lower frequency of 70 MHz. This 70 MHz signal is then further downconverted and finally demodulated for the required video and audio signals.

During the 950 – 1,450 MHz to 70 MHz conversion, the satellite tuner will generate what is called a Local Oscillator (LO) RF signal that is 70 MHz *higher* than the frequency being received. That is, when the tuner is tuned to C-band satellite channel 10, the tuner is actually receiving at 1,250 MHz (satellite downlink frequency of 3,900 MHz). The local oscillator frequency needed to convert the 1,250 MHz signal to 70 MHz is then 1,320 MHz (1,250 + 70 MHz). Most satellite tuners have a little bit of "play" in the local oscillator tuning, and they are capable of generating RF signals outside of their normal range. This means a satellite tuner can be turned into a simple L1 band GPS jammer by using it to generate a RF carrier at around 1,575.42 MHz.

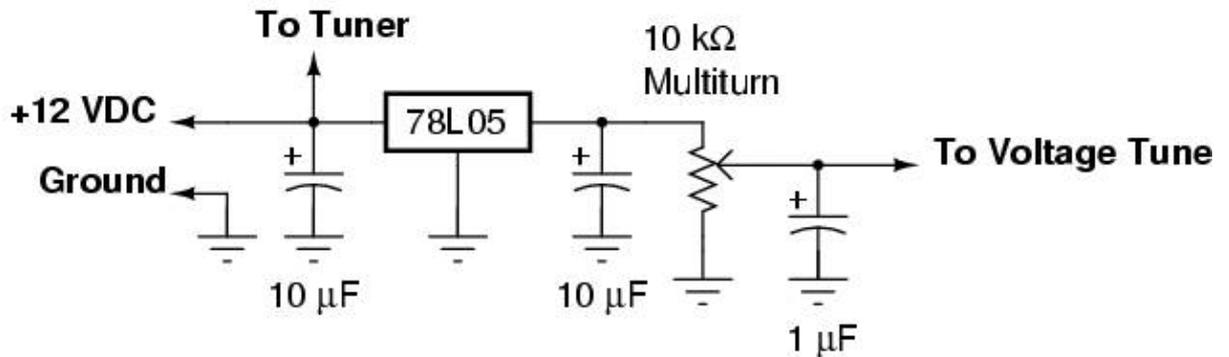
Note that not every satellite tuner works on those exact frequencies. Some use an IF signal of 130 MHz or so and some will tune up to over 2,100 MHz. They will all be quite similar though. Digital tuners can also be used, but their operation and construction makes them much more difficult to work with.

## Satellite Tuner Block Diagram



## Schematic

# **Simple GPS Jammer Using a Satellite Tuner**



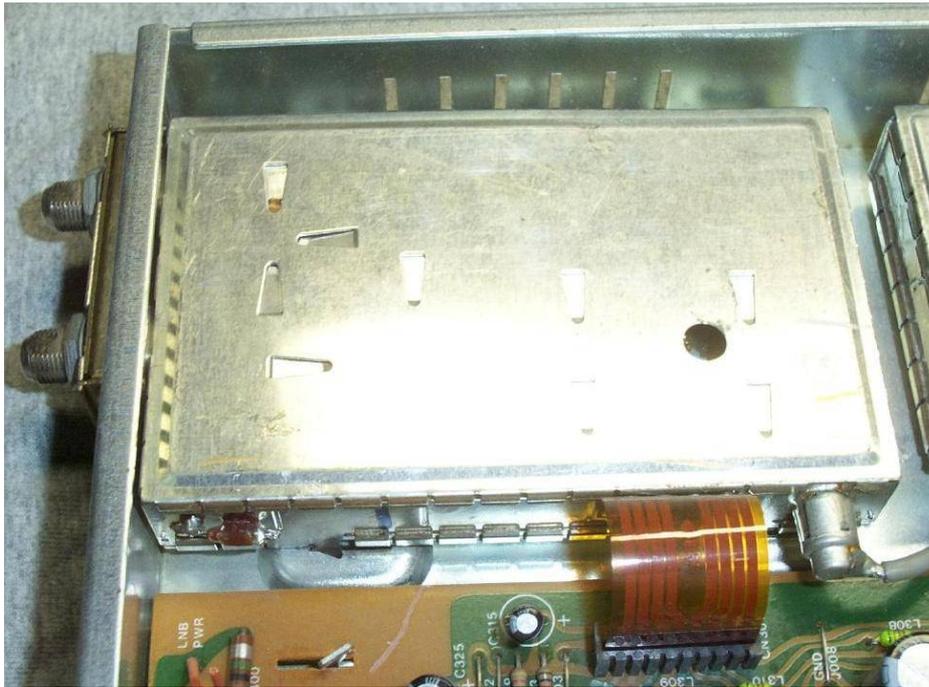
*Adjust pot until local oscillator frequency is around 1,575 MHz.*

*Some tuners may require a voltage higher than +5 VDC for their Voltage Tune line.*

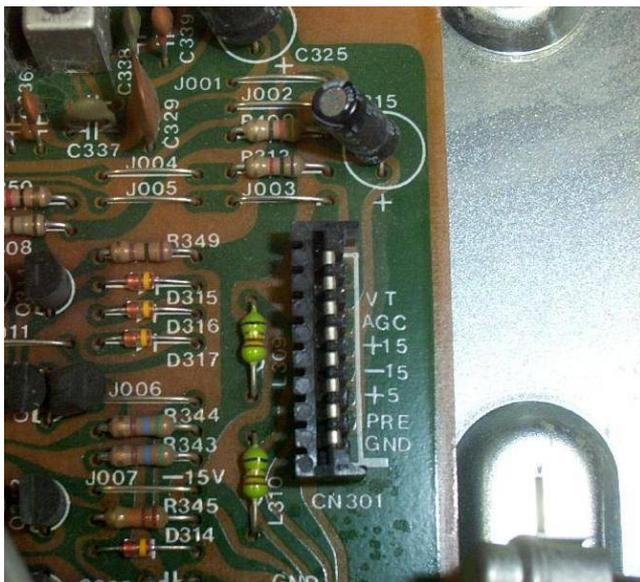
## Pictures



Overview of the satellite receiver used for this project. It is a rack-mount "Standard Satellite Receiver, Agile 24PC". The power supply is on the left, the channel control and demodulator section is in the middle, and the tuner is big silver box on the right.

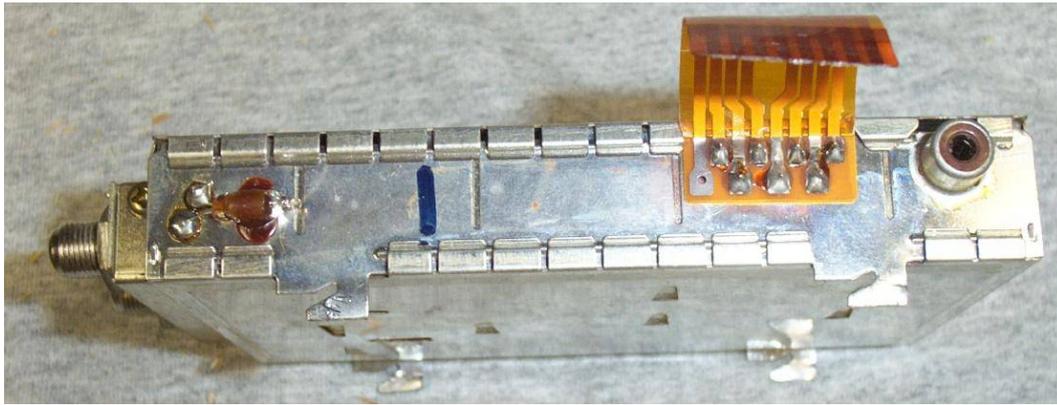


Close up picture of the tuner. The 950 – 1,450 MHz RF input from the block converter goes into the F connector on the left. The other F connector is just a feed-through. The tuner's power and voltage control lines go in via the ribbon cable. The tuner's IF output is via the RCA jack on the right.



Close up of the ribbon cable connections. **VT** is the Voltage Tune line, **AGC** is the Automatic Gain Control, **+15** is +15 VDC, **-15** is -15 VDC, **+5** is +5 VDC, **PRE** is the Prescaler Output, **GND** is Ground.

Only the **+15**, **VT**, and **GND** connections will be needed. The tuner will operate at +12 VDC if +15 VDC isn't available.

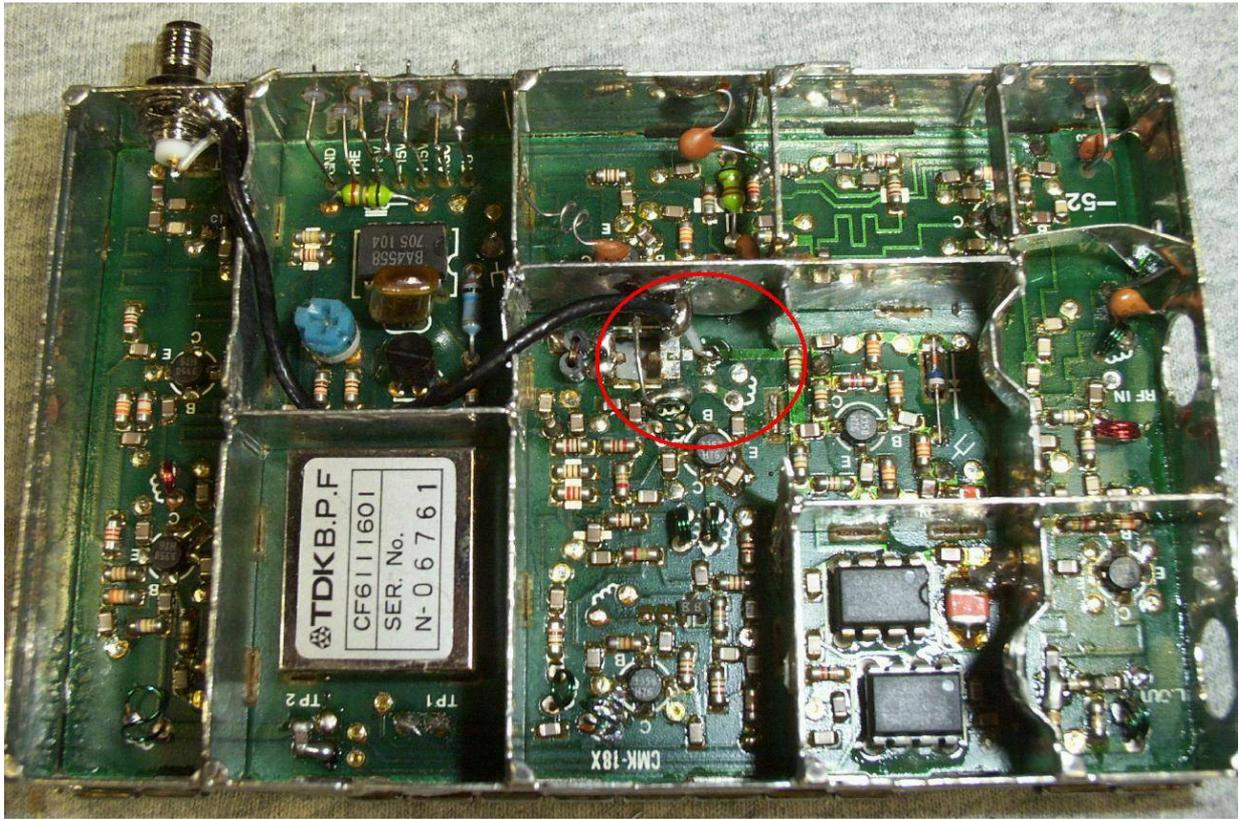


Connection view of the satellite tuner. The little neon light bulb is for dissipating static electricity on the block converter's voltage bias line. The ribbon cable can be unsoldered.

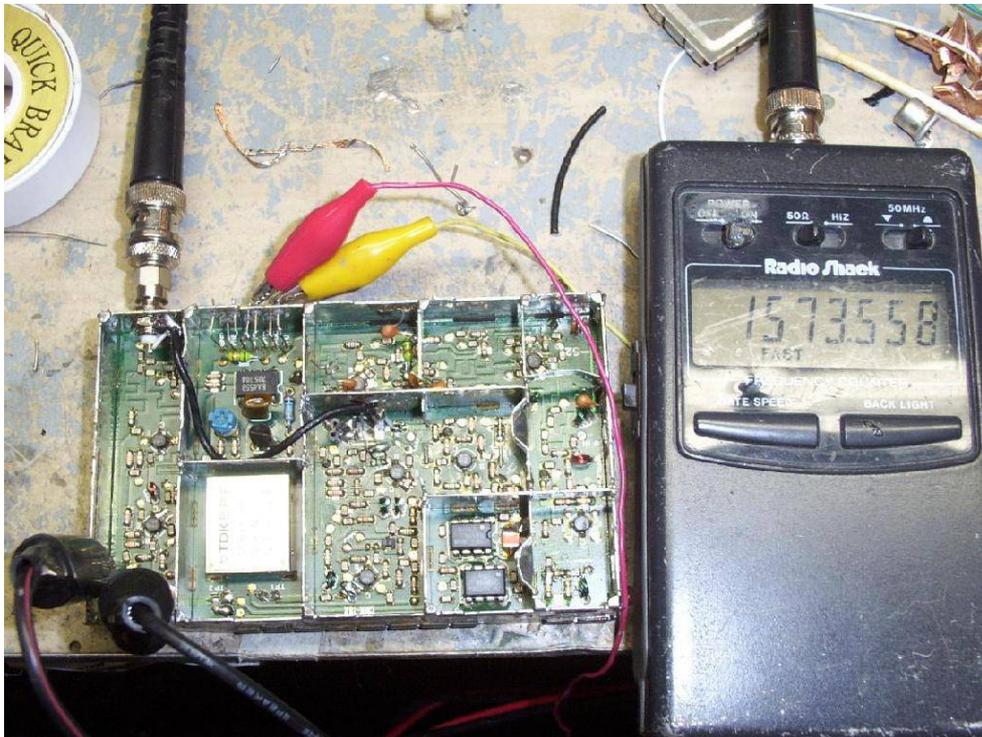


Inside view of an unmodified satellite tuner. 950 – 1,450 MHz RF input is on the left. Under the shielded box are the local oscillator components. Next to that, the section with the two back-to-back diodes is where the RF and LO signals are mixed to form the new 70 MHz IF signal. The box with the "TDK" logo on it is a bandpass filter for the IF. The IF signal is then further amplified and sent to the RCA jack on the bottom right.

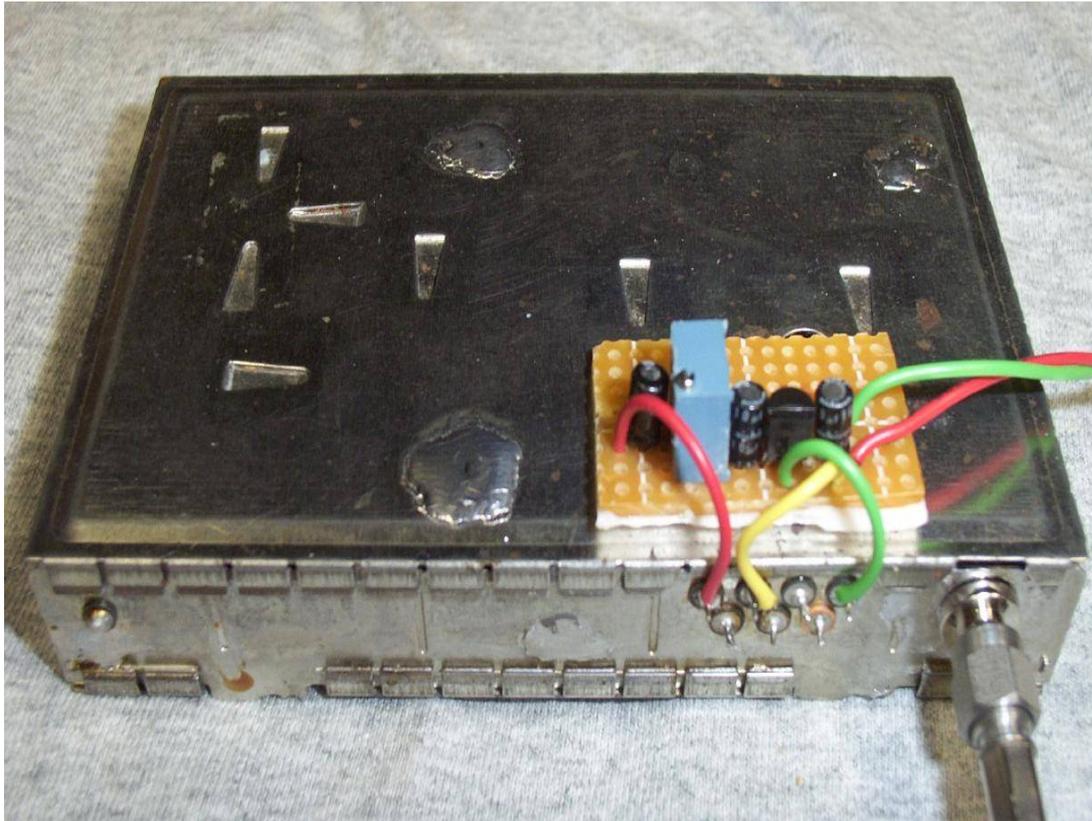
The little red circle around the capacitor is where the LO signal should be tapped. You'll need to remove the capacitor, and run a little piece of coax from the local oscillator line to an external RF connector.



Inside view of a modified satellite tuner. The LO signal is routed via a short piece of RG-196 coax to a SMA connector mounted on the side of the case. The shield has been removed for a better view. The F connectors have been removed to make the case smaller.



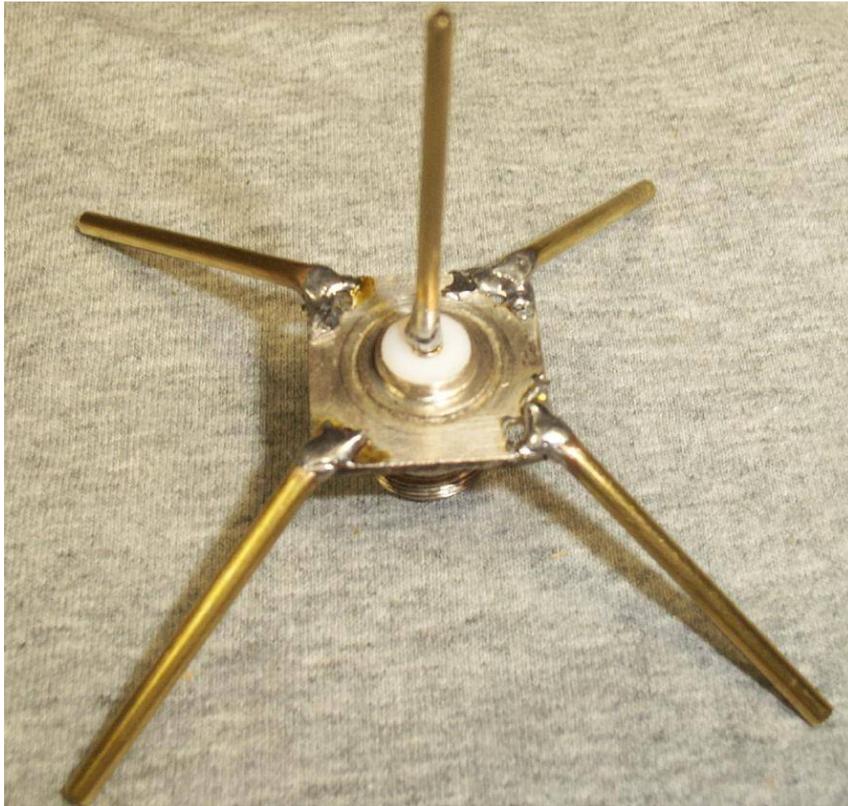
Test setup. The frequency counter is reading "1573.558 MHz". Anywhere near 1,575 MHz is usually good enough to jam GPS signals.



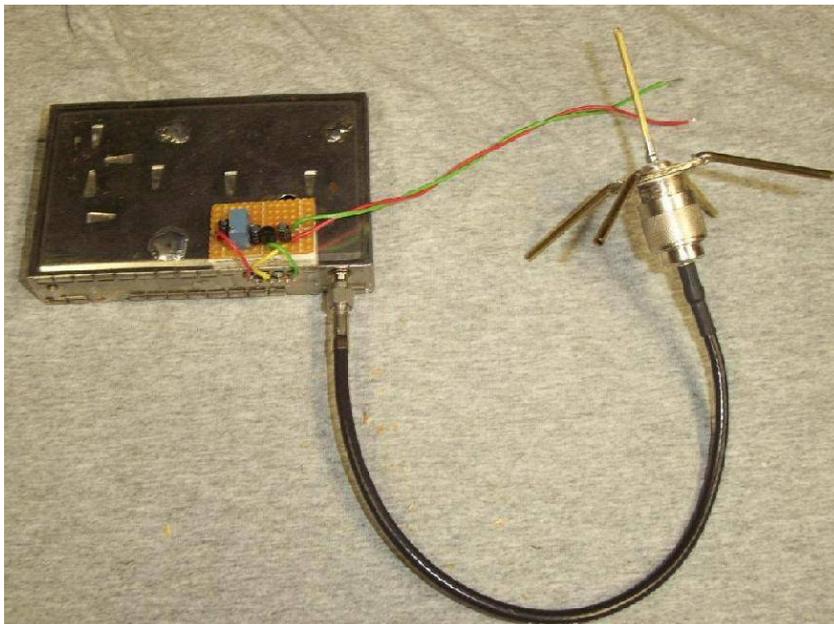
Completed voltage regulator and voltage tune potentiometer control board. +12 VDC power input from a car battery is on the right side. The 78L05 is in the middle and the 10 kohm potentiometer is on the left. The **RED** wire on the tuner is for the **Voltage Tune** line, the **YELLOW** wire is for the **+12 VDC Input**, and the **GREEN** wire is **Ground**.



Test setup showing the completed voltage regulator and potentiometer control board mounted to the tuner with double-sided tape. The frequency counter is reading "1575.46 MHz".



Homebrew GPS (1,575 MHz) ground plane antenna. Each element is made from brass tubing and is about 1/4-wavelength (47 mm) long. Be sure to use a N connector with Teflon dielectric material, otherwise it will melt when you solder it. Bend the ground plane elements at 45° angles when finished.



Oh my God! We're all gonna die!

# Doppler Stethoscope for E.O.D. Applications

## Overview

A doppler stethoscope is used for the non-contact analysis of mechanical vibrations. This is useful for remotely analyzing non-metallic objects such as backpacks or briefcases. The doppler stethoscope detects the *physical motion* of an object, such as the gears of a clock, and is even sensitive enough to detect the motion of flowing electrons. A low-noise audio amplifier amplifies and converts these weak doppler-shifted signals and sends them to a pair of headphones. A common use for a doppler stethoscope is during Explosive Ordnance Disposal (EOD). If some camel-humper leaves his backpack on a bus or train, you can quickly analyze it for any suspicious ticking noises. It can also be used during TSCM sweeps to search for hidden electrical devices in upholstery, ceiling tiles, plants, etc. Hidden mechanical tape recorders can be detected this way.

The basis for this version of a doppler stethoscope is a 10 GHz Gunnplexer from an old Solfan intrusion alarm. These can often be found at ham radio swapfests for as little as \$5. Failing that, you can also find 10 GHz Gunnplexers in old automatic door openers. 24 GHz Gunnplexers will also work, and will be physically much smaller, but those can be difficult to find. The audio amplifier is based around the common TL074 quad op-amp feeding a LM386 headphone driver. Everything runs off eight "AA" batteries or around +12 VDC.

## Operation

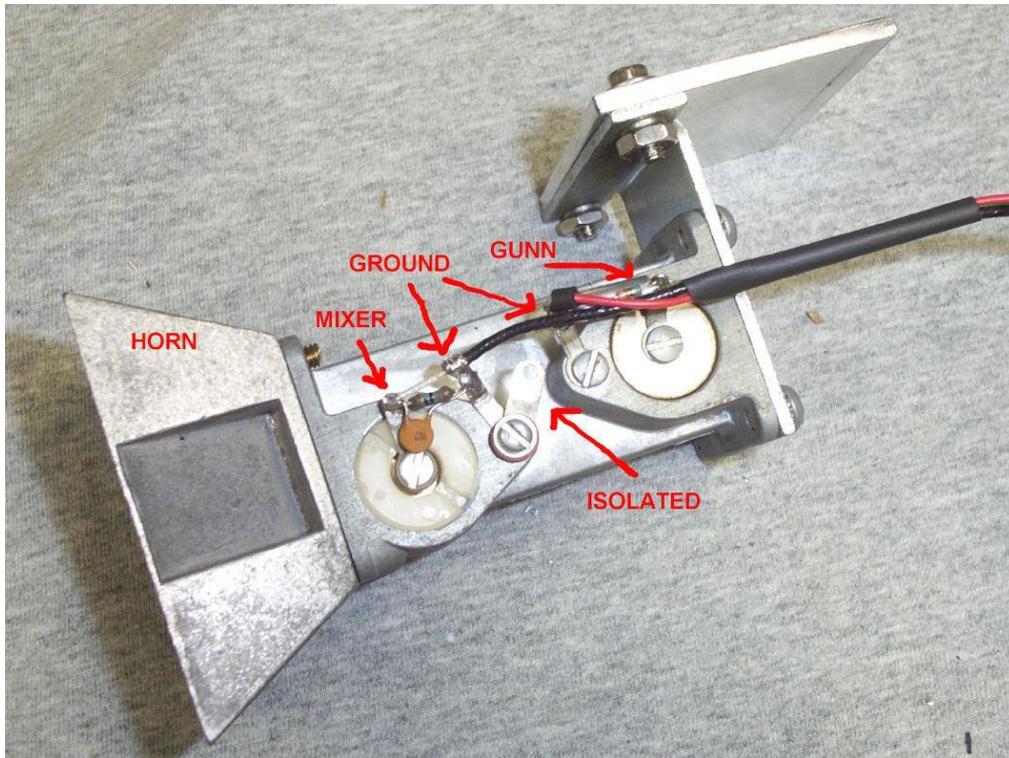
Sweep the stethoscope around the package you wish to check. Be sure to cover every possible angle. The scanning distance from the package should not exceed about one foot, closer is better. You also should rotate the stethoscope 90° and re-sweep the package. You should practice ahead of time. Practice sweeping cellular phones, LCD or LED displays, mechanical clocks, tape recorders, etc. A good practice test is pointing the doppler stethoscope at a fan or even a CD-ROM drive. You'll hear the gears of the CD-ROM drive controlling the door, and then you'll hear the CD start spinning. Also note that you can detect the 60 Hz hum from florescent lights quite easily. External audio filtering may be used to "peak" the signal you are interested in. Occasionally point the doppler stethoscope at the ground to compare what you are hearing with a "clean" signal.

## Construction

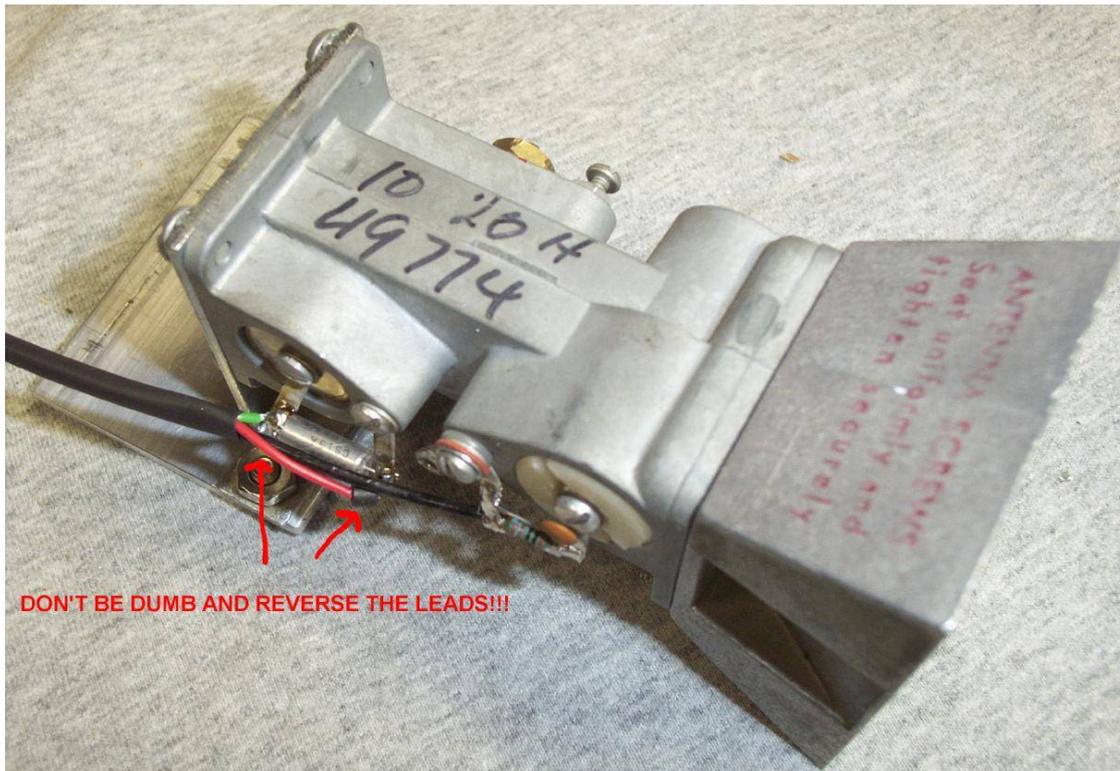
Try to build the Gunnplexer and audio amplifier board into shielded or metal container. The horn antenna should be exposed or covered with a very thin plastic sheet to protect it. The Gunnplexer's die-cast body should be well grounded. Try to use 1% tolerance, metal film resistors in the audio amplifier section. These offer the lowest noise. The LM386 audio driver is only capable of driving low-impedance (8/16/32 ohms) headphones. Avoid high-impedance (600 or higher ohms) headphones. A step-up matching transformer can be used to match high-impedance headphones, if needed. You should also always use fresh batteries. The Gunn diode's bias voltage is quite critical and can be damaged if the voltage is *too low*. Avoid using a single 9 Volt battery or any carbon-zinc batteries. The mixer output signal should be routed using a small piece of coax (RG-174) or shielded wire.

**Bug Alert!** This design is still experimental! You may wish to experiment with the amplifier gain and low pass filtering to suit your particular need. Also, there can be switching noise breakthrough on the 7660 voltage inverter line. To cure this, use a switching regulator which oscillates above 20 kHz.

## Pictures



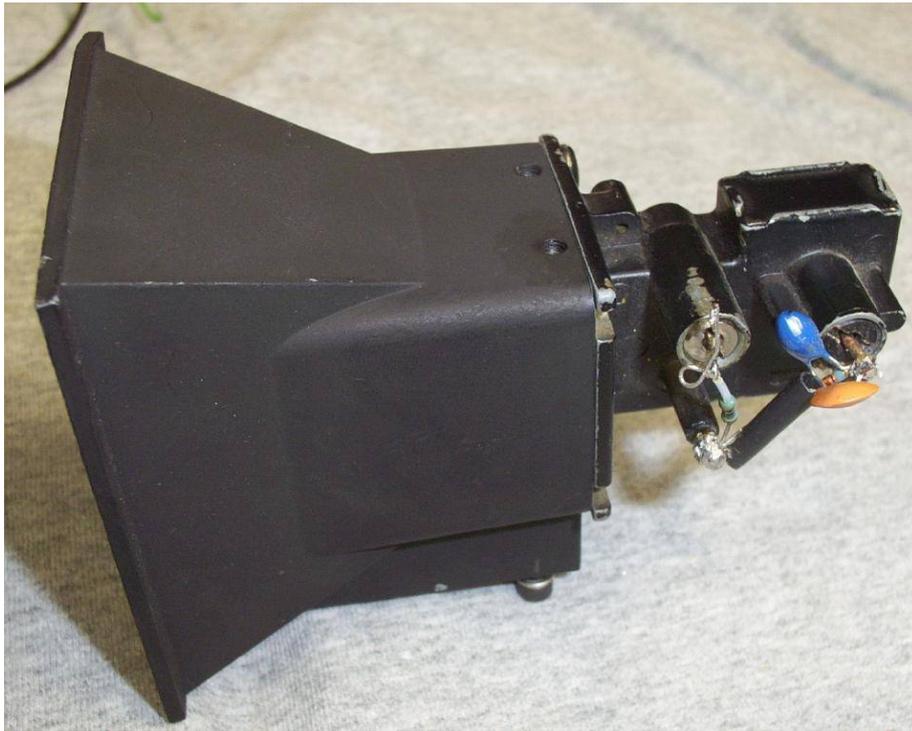
Top view of a Solfan 10 GHz Gunnplexer. There are five solder tabs on this particular version. Starting from the left, is the **Mixer Diode Output**. This should have a parallel 1 kohm resistor / 1000 pF capacitor soldered to ground across it. This acts as a DC return for the bias voltage the Gunnplexer places on the mixer diode. The 1000 pF capacitor shunts any stray RF signals to ground. The two tabs to the right are **Ground** and an **Isolated** tab. The isolated tab isn't used in this application, but is useful for hanging extra components off of. The tab to the right of those is another **Ground** tab, and the last solder tab is for the **Gunn Diode Bias** voltage. This will be around +9 Volts. Both the mixer and Gunn diodes are *extremely* static and shock sensitive, so be careful around them. If they blow – you are basically screwed.



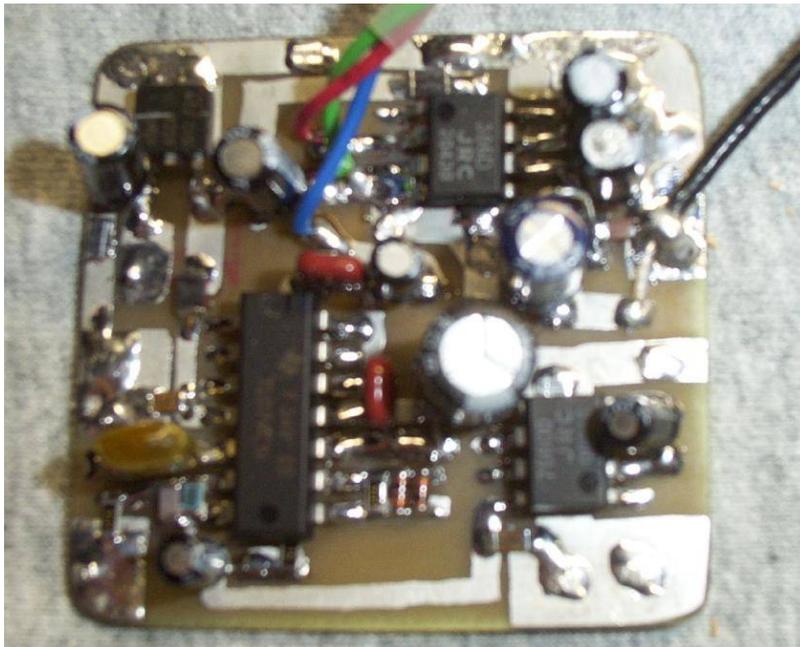
Alternate view. This particular model was retuned back into the ham band (10.2 GHz). The exact frequency isn't important, and will most likely be around 10.525 GHz when you first receive it. The metal mounting plate might vary with the particular Gunnplexer model you use.



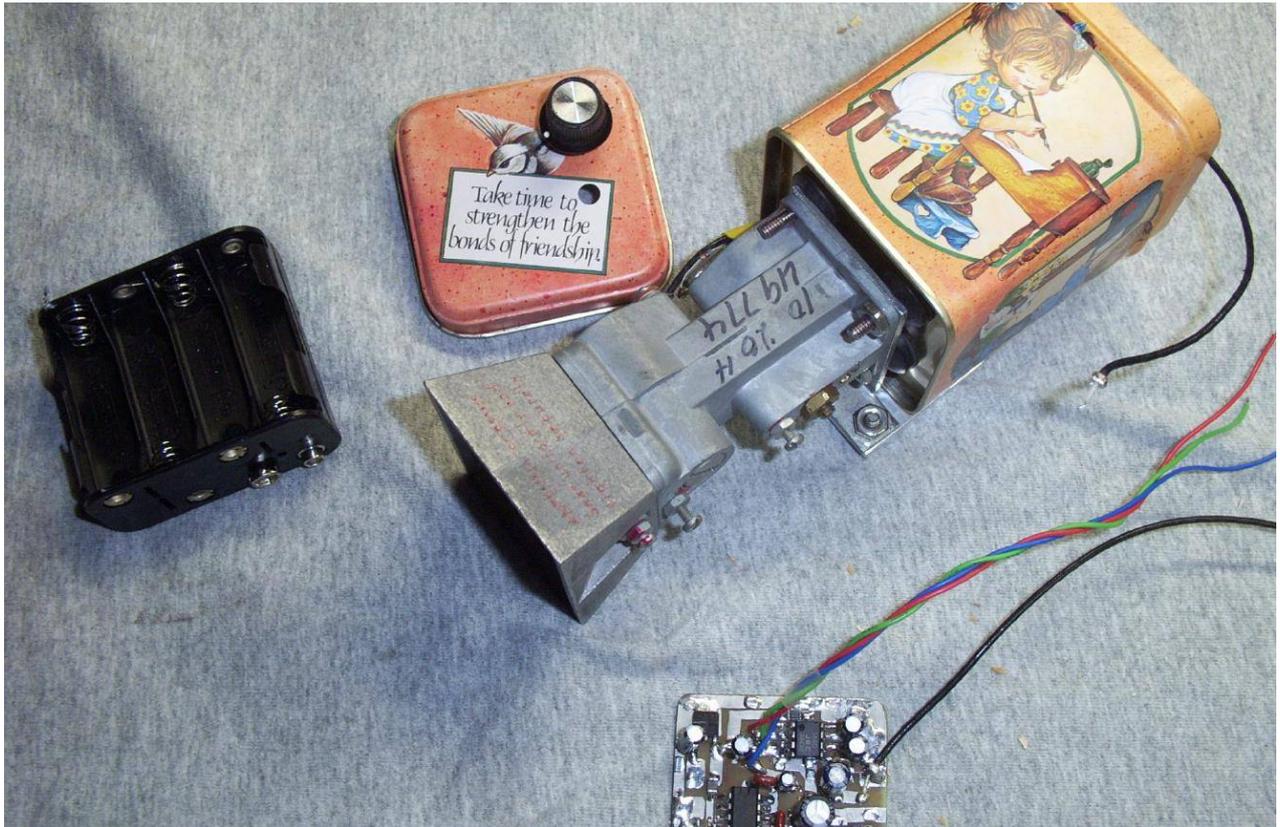
Inside the horn antenna. Be sure to use brass or stainless steel hardware for mounting the horn.



This is an Alpha 10 GHz Gunnplexer from an automatic door opener. The solder posts from left-to-right are: **Mixer Diode Output**, **Ground** (bottom post), and **Gunn Diode Bias**.



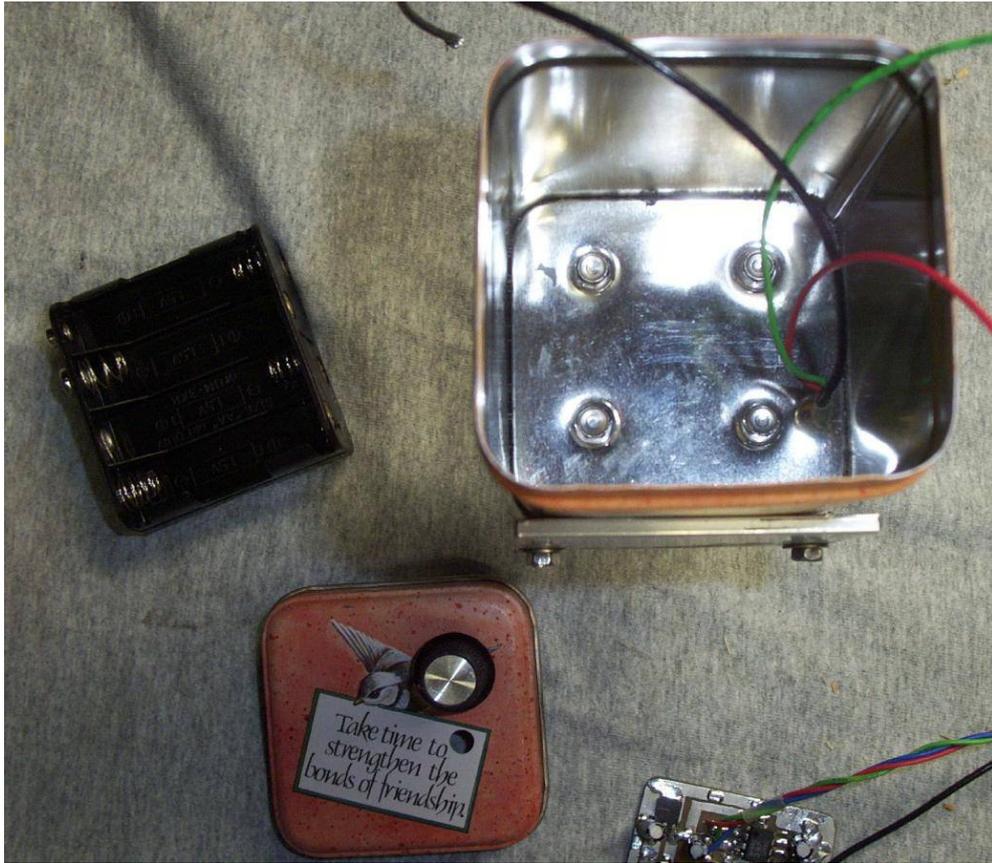
Low-noise amplifier board. Only picture available. The 78M09 is on the upper left. The TL074 is the large IC in the middle. The ICL7660 voltage inverter is on the lower right. LM386 audio driver is above that. Red/Green/Blue wire bundle is for the volume control.



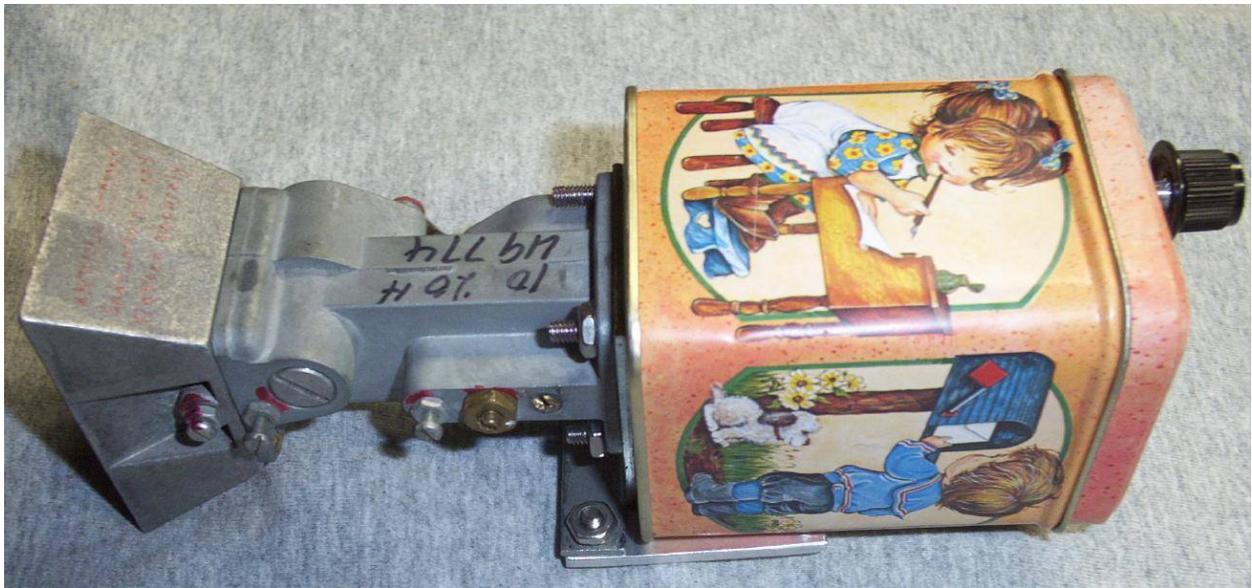
Overall view before final assembly. The low-noise amplifier board is mounted into an old cookie tin. It is mounted to the back of the Gunnplexer via rubber standoffs.



Close up view of the Gunnplexer's connections and mounting hardware. Note the rubber washers. These are actually faucet washers. They make great stand-offs.



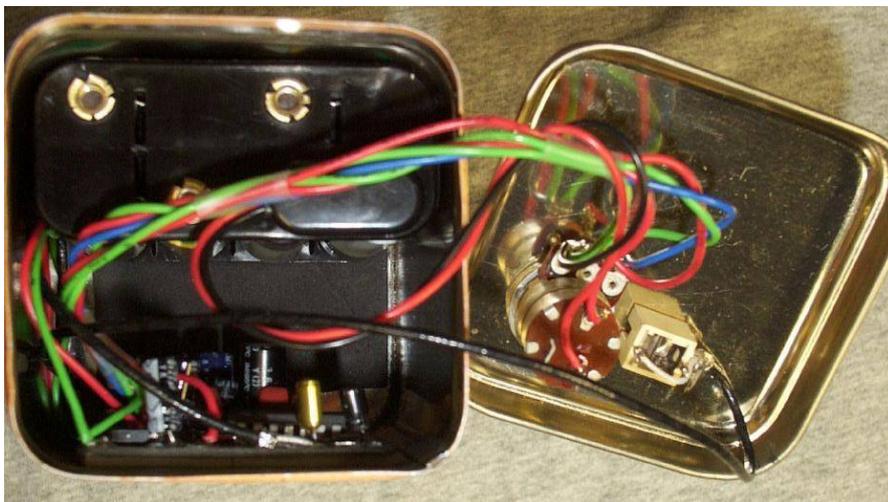
Inside the cookie tin. Battery holder is the black thing on the left.



Completed doppler stethoscope. Volume potentiometer has a built-in on/off control. Try to pick a cookie tin that isn't... ahh... so gay.



Alternate side view.



Inside the cookie tin case on the completed doppler stethoscope. A piece of art foam is on the bottom of the tin to protect the battery pack.

# Doppler Stethoscope - Low Noise Audio Amplifier

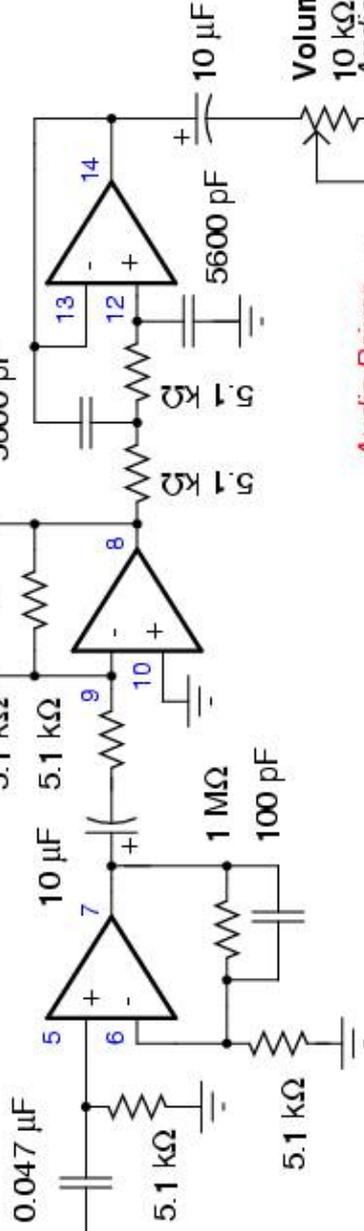
GBPPR  
Open Source  
Defense Electronics

Audio Pre-Amplifier  
G = ~100

Audio Clipper

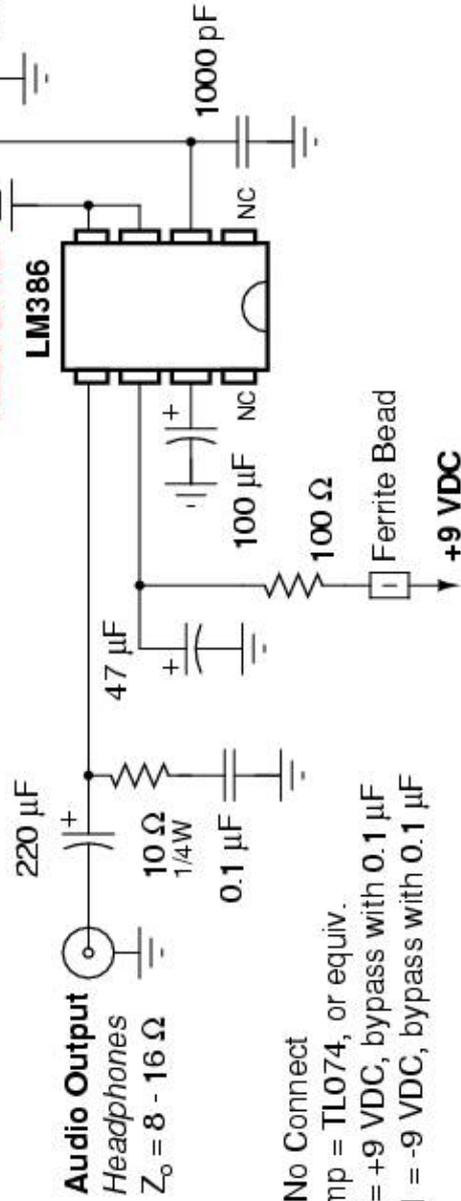
5.5 kHz Low Pass Filter  
 $F_c = 1 / (2\pi RC)$

To  
Gunplexer  
Mixer Diode  
Output



Volume  
10 kΩ  
Audio Taper

Audio Driver



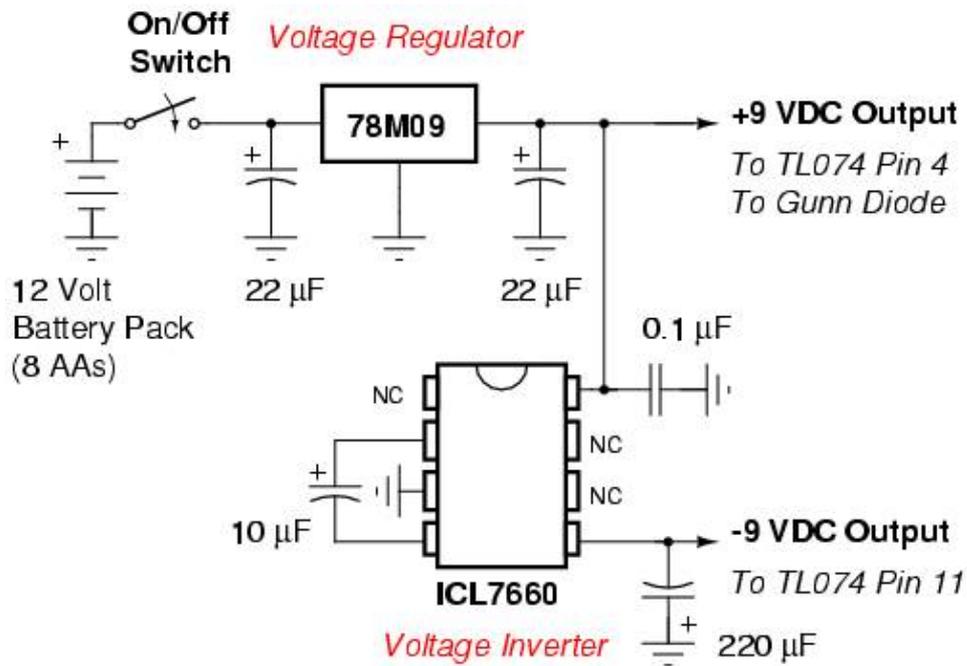
NC = No Connect

Op Amp = TL074, or equiv.

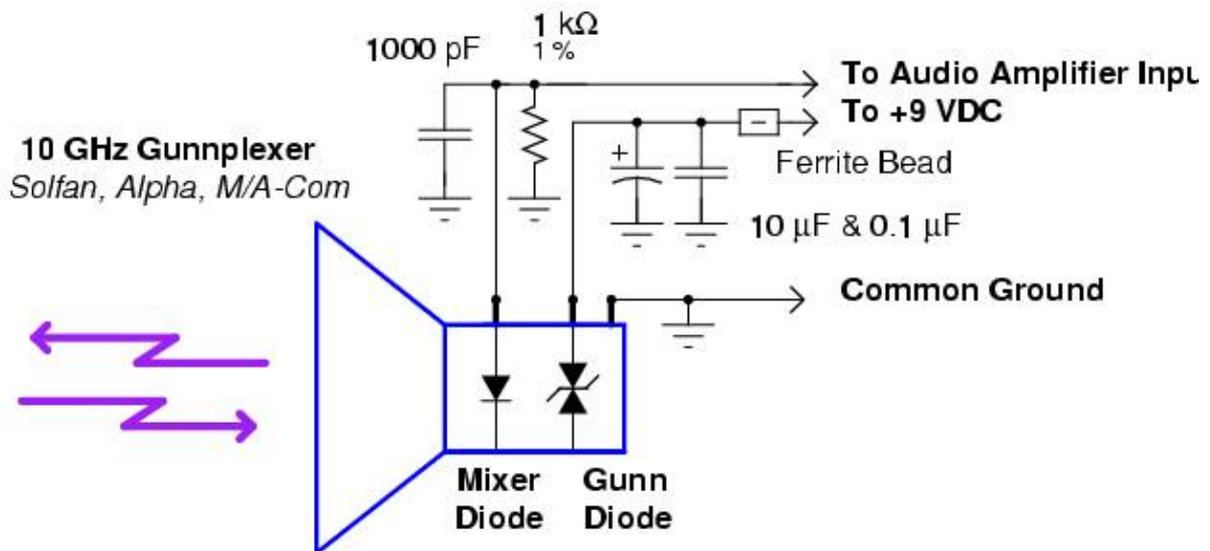
Pin 4 = +9 VDC, bypass with 0.1 µF

Pin 11 = -9 VDC, bypass with 0.1 µF

## Voltage Regulator & Inverter Schematic



## Gunnplexer Connection Schematic



**B DISPOSABLE GLOVES—AT8982**  
**DESCRIPTION AND USE**

**1. GENERAL**

1.01 This section covers the description and use of the B disposable glove—AT8982 provided for the protection of employees when they handle encapsulants, plugging compounds, duct sealing compounds, and cleaning solvents.

1.02 When this section is reissued, the reasons for reissue will be listed in this paragraph.

**2. DESCRIPTION**

2.01 The B disposable glove is a textured plastic glove designed for use on either hand. This glove is furnished only in the large size as shown in Fig. 1.

**3. USE**

3.01 The B disposable glove is to be used to provide protection to the hands for short term exposure to chemical compounds such as encapsulants, plugging compounds, duct sealing compounds, and cleaning solvents.

**4. ORDERING INFORMATION**

4.01 The B disposable gloves are packed in quantities of 100 per box. The box contains a removable center slot for access and convenient glove removal. Order wording is as follows:

(Quantity) pkg.—Glove, Disposable, B pkg  
of 100

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ELECTRIC - Proprietary  
Pursuant to Judge Greene's Order of August 5, 1983,  
beginning on January 1, 1984, AT&T will cease to use  
"Bell" and the Bell symbol, with the exception as set  
forth in that Order. Pursuant thereto, any reference to  
"BELL" and/or the BELL symbol in this document is here-  
by deleted and "expunged"

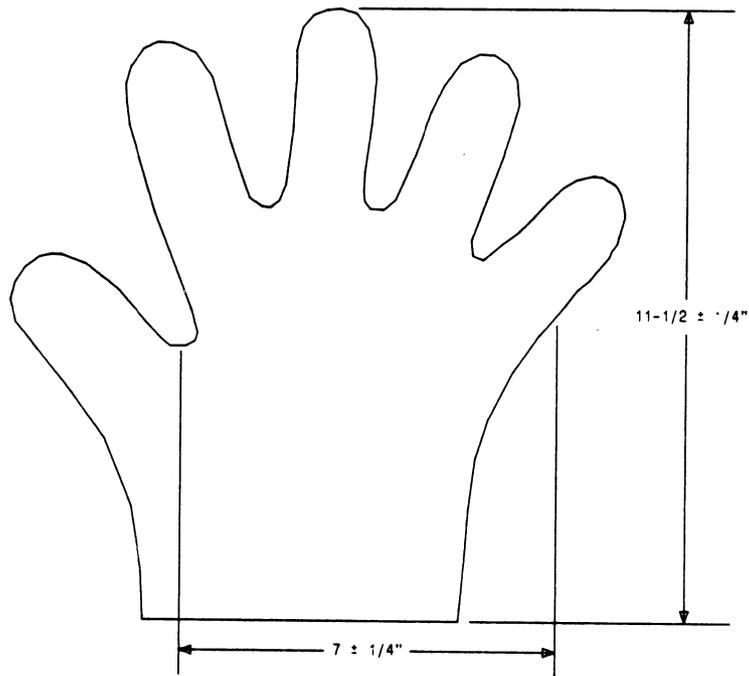


Fig. 1—B Disposable Glove

## **End of Issue #17**



**Any Questions?**

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### **Editorial and Rants**

July 18, 2005 – From: <http://www.praguemonitor.com>

#### **Klaus Says Multiculturalism, Immigration Cause Terrorism**

(PDM staff with CTK) 18 July – The excessive openness of the West to immigrants from other cultural environments facilitates attacks by radical Islamists in western countries, President Vaclav Klaus said in an interview printed Saturday in the daily Mlada fronta Dnes (MfD).

"This [openness] is in any case a suitable soil for these things [attacks] to happen," Klaus said.

He said that multiculturalism is a tragic mistake of western civilisation for which all will pay dearly. Such openness is not the direct cause of terror, but it is terrorism's fundamental cause, Klaus said. He compared multiculturalism to the role Marx's teaching played in the crimes of communism.

He said at the same time that multiculturalism is not an explanation for the recent attacks in London. "Multiculturalism is an ideology that says that you should emigrate and to make claim to your civilisation, your group and ethnic interests" in the new countries, Klaus said.

"Mass emigration has emerged as a false ideology according to which there exists a kind of claim, a general human right to wander anywhere around the world," Klaus said.

He added that this suppresses the civil rights of the original inhabitants.

If people leave for a place, they should fully accept the place, Klaus said. He said there is a hope for remedy in that this demand is shared by more and more countries, and that the naive ideas from about 30 years ago no longer apply.

CTK news edited by the staff of the Prague Daily Monitor, a Monitor CE service.

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Apr 24, 2003 – From [http://www.atimes.com/atimes/Middle\\_East/ED24Ak05.html](http://www.atimes.com/atimes/Middle_East/ED24Ak05.html)

## The Mukhabarat's Shopping List

By Pepe Escobar

BAGHDAD – While the buildup to the war on Iraq was convulsing world capitals, world opinion and the United Nations, the Mukhabarat – the feared Saddam Hussein secret service machine – was still living in its own Thousand and One Nights bubble.

**This is what is revealed by a document found by Asia Times Online, among other files, in a nondescript, abandoned Mukhabarat safe house in the Qadissiya district of the capital. Iraqis who read it and translated it had no reason to doubt its authenticity. The handwritten document details a series of meetings between June 2002 and March 2003 (even when war was already raging in Iraq), probably in the same safehouse, involving Mukhabarat agents and representatives of firms from many Arab countries but also from France, Russia and the Netherlands. The document should constitute additional proof that the secret services indeed operated as a parallel state in Iraq – way beyond the reach of United Nations sanctions and trade embargo. All negotiations were secret. And everything was paid in US dollars, cash.**

All manner of other secrets and not–such–secrets are to be found in what remains of Baghdad. Detailed personal files by Internal Security in Mukhabarat abandoned safe houses in Karada. Compromising files at the torched and looted Ministry of Foreign Affairs. Secret graves in the al–Qarah cemetery of nearly 1,000 political prisoners tortured and mostly hanged at Abu Ghraib prison. And in the basement of another Mukhabarat safe house in Wahda, after a poor torch job, an astonishing room brimming with the latest high–tech surveillance equipment is still practically intact. Possibly much of the equipment was purchased following the meetings detailed at the document found in Qadissiya.

From the Alwaeth firm in Syria, the Mukhabarat negotiated to buy machines to conceal fax numbers. They could be delivered in three days. From an unnamed Egyptian firm, it wanted wireless communication systems for buildings, at US\$55,000, and a more sophisticated system for \$100,000. It also wanted wireless systems from the Iraqi firm, al–Azhal. From an unnamed corporation in Abu Dhabi, the Mukhabarat wanted an array of goods: wireless systems; wireless pinhole cameras with a maximum range of 100 meters (delivery in one month); four–channel AV receivers; pen cameras with a maximum range of 100 meters, connected to video, recording audio and operating on 12V batteries; cameras with a range of 1 kilometers, and upgraded with an outer antenna for 3 kilometers; and night vision goggles with a 1 kilometer range. The goggles could be the most explosive item in the shopping list as Washington had all but accused Syria of selling them to

Iraq. According to the document, the negotiations were actually conducted with this unnamed Abu Dhabi corporation.

From the Dutch firm Haiman, and also from an unnamed Lebanese firm, the Mukhabarat wanted spray to detect fingerprints on paper and wood, and to detect separate fingerprints from different people. Mukhabarat agents questioned Haiman for any new technology and also wanted to know the prices for card-operated security systems.

**From the French firm APX, the Mukhabarat wanted to buy listening devices, portable satellites and private security systems. The document states that the Mukhabarat had "direct contacts with a minister in France" who could help the negotiations.** The document also states the Mukhabarat desire of trying to improve the security systems of Iraqi embassies around the world. Thus the quest for sophisticated listening devices; small microphones; telephone bugs; transmitter pens; laser systems to check camera performance; listening devices to monitor what happens inside a building from the outside; hidden espionage cameras; night cameras to identify people from a distance of 150 meters; and the smallest color cameras available on the market. From the Alsalam company – country of origin non-identified – the Mukhabarat was trying to buy video cameras inside pens and made-in-Russia long-distance cameras, with a range of 2 to 3 kilometers.

In another meeting with an unidentified French firm, the Mukhabarat wanted to purchase equipment to recognize fingertips on glass and wood; machine guns disguised as suitcases; and voice identifying systems that can be matched with databases. It also wanted a spray to identify fingerprints; laser tools to identify fingerprints; a system to identify food poisoning (a key Saddam Hussein obsession); tools to identify explosive materials and give the exact distance between the target and the explosives; and a robot to remove explosives.

From the al-Asriya firm – not identified as Iraqi or foreign – the Mukhabarat wanted to buy three different computer systems for \$199,000 each (with a discount, it could come to \$130,000 each). The systems are called Spread Spectrum (operating between 1,5 and 5 gigahertz). There was an explicit condition for the purchase: the manager of the firm had to send Mukhabarat agents for training out of Iraq – with specialists from Lebanon. And all spare parts should be free. On this particular negotiation, the Mukhabarat was dealing with Muhamad Halewi, a doctor and manager of the Fica firm in Baghdad. And it was also comparing prices with the Abu Dhabi office of a firm called Teltec. The Mukhabarat complains that the prices quoted by the Reeger company – country of origin non-specified – are very high. The document states that if they buy anything from Reeger, training will have to be conducted in Malaysia.

The Mukhabarat was actively comparing prices between Iraqi and Syrian firms. It was negotiating to buy Toyota Camrys at \$20,500 apiece and Mercedes sedans for \$55,000 apiece from the Aldahi dealership in Baghdad, imported from a firm in the United Arab Emirates. From the al-Azar firm, also in Baghdad, it wanted Mercedes vans. From the Jawrah and Hensi corporation in Syria, it received an assurance that the cars could be delivered in two months. And it could also buy on request air-conditioners, Hyundai elevators, copy machines, Panasonic videos and TVs and paper shredders.

One thing is certain: not all Mukhabarat papers were shredded as the Americans arrived at the gates of Baghdad.

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Aug 14, 2005 – From

<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/08/14/wiran14.xml&sSheet=/news/2005/08/14>

## **Iran 'Kept EU Talking' While it Finished Nuclear Plant**

By Colin Freeman

An Iranian foreign policy official has boasted that the regime bought extra time over its stalled negotiations with Europe to complete a uranium conversion plant.

**In comments that will infuriate EU diplomats, Hosein Musavian said that Teheran took advantage of the nine months of talks, which collapsed last week, to finish work at its Isfahan enrichment facility.**

**"Thanks to the negotiations with Europe we gained another year in which we completed the [project] in Isfahan," he told an Iranian television interviewer.**

Mr Musavian also claimed that work on nuclear centrifuges at a plant at Natanz, which was kept secret until Iran's exiled opposition revealed its existence in 2002, progressed during the negotiations.

"We needed six to 12 months to complete the work on the centrifuges," said Mr Musavian, chairman of the Iranian Supreme National Security Council's foreign policy committee. He made his remarks on August 4 – two days before Iran's foreign ministry rejected the European Union offer of incentives to abandon its uranium enrichment programme.

Critics of the regime will see his comments as confirmation that Iran never contemplated giving up its programme, despite top-level diplomacy involving Jack Straw, the Foreign Secretary, and his French and German counterparts.

The US was always pessimistic about the talks' chance of success. Yesterday President George W Bush refused to rule out using military force to press Iran into giving up its nuclear programme, which Washington suspects is a front for weapons-making. "All options are on the table," Mr Bush told Israeli television.

Mr Musavian, whose remarks were translated by the Middle East Research Institute based in Washington, was responding to criticism from Iranian hardliners that Teheran should never have entered into the EU negotiations.

He said that until then, Iran had dealt solely with the UN-backed International Atomic Energy Authority, which had given it a 50-day deadline to suspend uranium enrichment on pain of referral to the UN Security Council.

"The IAEA give us a 50-day extension to suspend the enrichment and all related activities," he said. "But thanks to the negotiations with Europe we gained another year, in which we completed the [project] in Isfahan."

The plant, about 250 miles south of Teheran, carries out an early stage of the cycle for developing nuclear fuel, turning yellowcake into UF<sub>4</sub> and then into UF<sub>6</sub>, a gas essential to enrichment.

"Today, we are in a position of power," Mr Musavian said. "Isfahan is complete and has a stockpile of products." Mr Musavian also said that Iran had further benefited from sweeteners offered by the EU, including the invitation to enter talks on Iran joining the World Trade Organisation.

Iran is facing possible referral to the Security Council after scientists began breaking seals at the Isfahan plant, a precursor to resuming the research it agreed to suspend during the EU talks.

The Foreign Office declined to comment on Mr Musavian's remarks. Last week it said Iran made a "serious mistake" by opting to resume uranium conversion.

Mohamed ElBaradei, the head of the IAEA, is due to report on Iran's renewed nuclear activities on September 3, which could trigger a Security Council referral.

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## VJ Day Remembered

By William F. Sauerwein

August 15th marks the 60th anniversary of the World War II victory over Japan (V–J Day). On this day six decades ago the guns finally fell silent around the world. For a brief period it seemed peace would finally reign. It didn't happen of course but for a few memorable moments boundless joy was the spirit of the day.

While the May 8th victory in Europe (V–E Day) is widely memorialized, V–J Day is sometimes overlooked. Perhaps too many historians focus on the dropping of the atomic bombs on Hiroshima and Nagasaki instead of on the sacrifices of millions of men and women from around the world who faced naked Japanese aggression and defeated it at huge cost in lives and treasure. V–J Day is about the human spirit and the will to win.

While most people are at least familiar with the Nazi and their countless atrocities against the peoples of Europe, far fewer are familiar with widespread Japanese atrocities in China, the Philippines, and throughout Southeast Asia. Japan, like all nations afflicted by the scourges of war has a right to mourn its dead; it also has a responsibility to acknowledge its aggression, an issue it is slowly coming to grips with.

Japanese aggression that culminated in World War II started with a staged bombing of a Japanese–owned railway in Mukden, Manchuria on September 18, 1931 which ultimately led to the creation of the puppet state of Manchukuo. The West protested vigorously yet did nothing else, relying instead on fruitless diplomacy through the virtually powerless League of Nations. Proclaiming themselves the "victims" of Western persecution, Japan left the League in 1934 and abrogated the Washington Naval Limitation Treaty of 1922 that was intended to limit the size of the Japanese Navy. Their departure from the treaties opened the door to subsequent war in Asia.

Japanese ultranationalist groups, like the Black Dragon Society, gained popularity during this time. The right-wing Japanese nationalists viewed themselves as the superior Asian race that descended directly from a sun goddess. They believed it was their duty to free the "inferior Orientals" from the Western Powers.

Ultimately, for a variety of economic and political reasons Japan invaded China in 1937 using advanced weaponry and technology against an inferior Chinese Army that divided its energies between fighting the emerging Communists and the warlords that abounded throughout China. Again the West protested through the offices of the League of Nations, which only encouraged the Japan's aggressive generals and admirals to renew their efforts to subdue the Chinese.

In *The Rape of Nanking*, author Iris Chang graphically describes the most villainous Japanese atrocity. Nanking (now Nanjing, China). When the city was captured in December, 1937 Japanese troops began a deliberate campaign of genocide in which an estimated 260,000 Chinese men, women and children were murdered, including 80,000 Chinese women raped, and mutilated before dying. Chinese POW's were used for bayonet practice and decapitation contests, all of which is documented in Japanese media.

This treatment from the Japanese conquerors became common for POW's and civilian populations alike. They practiced torture, starvation, murder, slave labor and forced women into prostitution for Japanese soldiers. Lesser known are the gruesome human medical "experiments," and their nuclear, biological and chemical (NBC) warfare programs the Japanese perpetrated later in the war. The Japanese were viewed by many as the most hated race in Asia; a hatred that still burns in some quarters today.

With France's defeat in 1940 at the beginning of World War II in Europe, Japan joined the Axis Powers along with Germany, Italy and a handful of lesser states and demanded concessions in French Indochina from the prostrate Vichy French government. The militarily weak United States was ostensibly the only power capable of halting Japan's ambitions. When Japan refused to end its aggression, the United States enacted an oil embargo that the Japanese viewed as the trip wire for war in Asia and the Pacific Rim.

When Japan attacked Pearl Harbor on December 7, 1941 Japan's more enlightened leaders understood they could not defeat the Americans in a long war. Many Japanese leaders, particularly Admiral Isoroku Yamamoto, had been in the United States and knew America's industrial potential. As a result they developed a strategy hamstringing us in the Pacific while Japan seized as much territory as possible in the misplaced belief America was a weak democracy and would sue for peace.

Two years later Japan was on the defensive as American forces slugged their way across the Pacific, Japanese resistance intensified in hopes of forcing a negotiated peace. Japanese leaders thought they understood the American public's influence over the government and hoped our high casualties would cause Americans to lose faith and seek a negotiated peace. In many respects Japan's intransigent strategy of attrition created an environment even more brutal than the genocidal atmosphere in Europe. Adding to the tragedy was Japanese soldiers' penchant for fighting to the death rather than surrendering. In the end most Japanese defenders were exterminated.

When the U.S. Navy decisively defeated the Japanese Navy in Leyte Gulf in October, 1944 it set the stage for Japan's ultimate defeat. More than 260,000 Japanese ground forces stationed in the Philippines were irretrievably cut off from outside support. Despite their predicament they fought on, buying time for home island defense preparations. The battles in the Philippine archipelago also marked the first time Japan used kamikaze attacks against American ships.

My father served in the Philippines with the 1st Cavalry Division and described the tenacity of Japanese resistance his division encountered there. He fought through the bloody urban combat in Manila, which lasted over a month. It began after Gen. Tomoyuki Yamashita ordered his troops into the hills and rogue Japanese naval elements stayed behind in Manila and slaughtered more than 100,000 Filipinos in an orgy of death before Manila was freed.

Meanwhile American naval forces, U.S. Marines and some Army troops invaded pre-war Japanese territory with the invasions of Iwo Jima and Okinawa. Iwo Jima became the bloodiest battle in Marine Corps history, losing about one-third of their strength to casualties. The American forces on Okinawa suffered 30 % casualties, including 34 ships sunk, 368 damaged and 763 aircraft lost.

Intelligence intercepts revealed that Japan would continue the fight, and propaganda called for every man, woman and child to kill Americans. The U.S. government saw no alternative to a direct invasion of Japan, codenamed Operation Downfall and described in Code-Name Downfall by Thomas Allen and Norman Polmar.

This invasion would be the largest amphibious operation in history: including 20 aircraft carriers, 36 escort carriers and 20 battleships. Projected ground forces exceeded 800,000, including 14 divisions and related support personnel. Based on previous casualty figures, it was also expected to be the largest bloodbath in American history.

The first phase, Operation Olympic, called for invading the southern island of Kyushu as a base for future operations. It would be strictly an American operation because British Commonwealth forces were occupied in bitter fighting in Southeast Asia and China was still struggling to regain its vast territory occupied by Japanese forces. At the time the Soviet Union was still doing a balancing act and had refused to enter the war in Asia, even refusing American bombers access to Siberian bases to protect its neutrality.

After four years of war the United States faced a manpower shortage as we struggled to replace combat losses. My mother, then in high school, remembered that the only men remaining in our county were too young, too old, or otherwise unfit for military service. She spoke of rumors about lowering the draft age to seventeen and drafting women for stateside duties. History records they were both options considered and ultimately rejected by Washington planners.

When the war ended in Europe in May 1945 the troops who had won the peace were scheduled for redeployed to the Pacific, creating morale problems among these soldiers. Reports circulated among both the public and the military that some soldiers reported that while transiting through the United States they would go AWOL. Many desperately homesick soldiers complained bitterly about the cumbersome "point system" based on length of service, awards, and combat

campaigns that determined who would redeploy. Those with sufficient "points," many experienced non-commissioned officers, were replaced by recruits, further hindering combat readiness.

To defend against the anticipated American invasion of the home islands the Japanese devised Operation Ketsu-Go (Decisive), the Japanese defense plan. Japanese intelligence correctly anticipated the American landing beaches on Kyushu and the time frame. American intelligence, relying on communication intercepts and aerial photography was blind to Japan's machinations.

Japan carefully conserved its remaining military power for stopping the American invasion. Kyushu hosted 15 Japanese divisions, 7 independent brigades, 3 tank brigades and a population of 2,400,000. Furthermore, the Japanese possessed 10,000 planes, piloted rockets, manned suicide torpedoes and special suicide frogmen for striking our fleet.

The Japanese high command still believed that if American forces suffered enough damage that U.S. public opinion would demand peace. Japan still occupied large segments of China, Korea, Manchuria and much of Southeast Asia with about four million troops. President Harry Truman, attending the Potsdam Conference in Germany, who had only learned of America's closely held atomic secrets when President Franklin D. Roosevelt died and he succeeded him to the Presidency, was told of the successful atomic bomb testing on July, 16, 1945 in New Mexico. At the time little was known of the effects of radiation, or even if the bomb would work. It was seen as another weapon that would reduce American casualties and hasten Japan's desire for peace.

Truman knew the casualty figures from Iwo Jima and Okinawa, and the anticipated 250,000 to 500,000 casualties just during Operation Olympic, the occupation of Kyushu. He further understood the American public's desire for ending the war, and then predicted to last until November, 1946. Peace feelers through Switzerland and the Soviet Union proved either noncommittal, or defiant, framed in the "decisive battle" rhetoric Japan's bombastic generals and admirals preferred.

The first bomb destroyed Hiroshima on August 6th, and killed and estimated 140,000 people in the fireball that consumed the city. The Japanese refused to surrender. Two days later the Soviet Union declared war on Japan and it now faced a two-front war. The second atomic bomb destroyed Nagasaki August 9th and killed an additional 70,000 people.

Still the Japanese did not surrender and conventional bombing missions resumed, while the U.S. prepared another atomic bomb for Japan. Faced with inevitable defeat and probable annihilation Emperor Hirohito accepted American surrender terms on August 15th and for the first time addressed the Japanese people of the radio. Mutinous troops took over the designated radio station and battled loyal troops for several hours before the Emperor's message was transmitted. Many high-ranking officers chose suicide over surrender when Hirohito finally spoke.

Americans rejoiced when they learned of the surrender. My father, destined for Operation Olympic, stated that the troops wildly celebrated their good fortune. When his unit entered Japan they discovered warehouses full of military equipment reserved for the anticipated invasion.

Today, Japanese students do not always learn of their country's aggression during World War II and American students are sometimes exposed to versions of military history that unfairly shade the reasons why America was first to use atomic bombs. Revisionist historians argue that using nuclear weapons was unnecessary because Japan was already defeated. These critics make their arguments from the safety of classrooms and lecture halls. They faced no personal danger and bear no consequences for their actions.

A Pacific Theater veteran who knows better said, "If there had been no Pearl Harbor, there would not have been a Hiroshima. America did not start the war, nor was it the aggressor, yet when attacked we responded. The atomic bomb broke the emperor's will to fight, therefore Japan's will, and ended a bloody war."

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