PRIVATE LINE TELEPHONE SERVICE
SAC PRIMARY ALERTING SYSTEM
DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the general operation and operating features of the Primary Alerting System (PAS) for the Strategic Air Command.

1.02 ▶This section is reissued to include information on the operation of Klaxon horns used at certain Air Bases, and to cover the remote operation of these horns in conjunction with the establishment of an alert.◀

1.03 The Primary Alerting System is a voice alerting network designed specifically for alerting the Strategic Air Command striking force quartered at Bases throughout the world. The system is a network of 4-wire circuits connecting the Strategic Air Command main control point (SAC) at Offutt Air Force Base with each of the Numbered Air Force Headquarters (NAFHq) and their associated Air Force Bases and Missile Complexes. (See Fig. 1.) Each Base Command Post in the PAS is connected directly to the Strategic Air Command control point by a 4-wire circuit. ▶This direct circuit to a Base is known as the "front door circuit". Each base is also connected by another 4-wire circuit to the Numbered Air Force Headquarters with which it is associated, and each NAFHq is similarly connected to SAC. The circuit from SAC via a NAFHq to a Base is known as the "back door circuit". An alternate circuit is provided from SAC to each NAFHq to back up the regular circuit. NAFHq has the capability of manually or automatically selecting either the regular or the back up circuit from SAC. The SAC-to-NAFHq portion of the back door circuit, whether working on the regular or back up layout, is known as the "backbone circuit".◀

1.04 ▶As shown in Fig. 1, three types of Base installations are encountered. Bases which handle aircraft operations usually have a single command post which, in the Air Force administrative organization, is at the "Wing" level. Both the front door and back door circuits terminate directly in the Wing Command Post with two-way service provided on both circuits. Provision is made, however, for a second location to be served from the same terminal equipment. Bases which handle Intercontinental Ballistic Missile operations are usually provided with both the "Wing" Level Command Post and an Alternate Command Post. The "Wing" Level Command Post in this case is called the "Missile Complex Command Post". There is also a series of Launch Control Center installations scattered around the missile complex. At missile Bases, the front door circuit is terminated at the Missile Complex Command Post with receive-only service extended to the Alternate Command Post and to each Launch Control Center. The back door circuit is diverse routed to the Alternate Command Post. A 4-wire, 4-way bridge is installed in the Alternate Command Post to extend 2-way

back door service to both command posts. Receive-only service is also provided from the back door circuit to each Launch Control Center. On both the front door and back door circuits, the Launch Control Centers can be arranged to monitor both directions of transmission, or to monitor only the transmissions from SAC or NAFHq. In some cases, PAS service is provided at locations not normally occupied by SAC. These locations, often called Satellite or Force Dispersal Bases by the Air Force, may include Bases occupied by other Air Force Commands (TAC, ADC), or Naval or Marine Corps Air Stations. Termination arrangements are essentially the same as for a Wing Command Post. PAS messages may also be coupled to facilities furnished by the customer.◀

1.05 An alert can be initiated by SAC directly to all NAFHqs and Bases or from any NAFHq to its associated Bases. In the case of a SAC alert, each Base will also receive the alert through its own NAFHq. ▶The Klaxon horns at the Bases can be sounded remotely from SAC or NAFHq, or controlled locally by Base personnel.◀

1.06 All PAS circuits are available for point-to-point message use during nonalert periods. Each receiving line at a Base is equipped with a loudspeaker (modified for a minimum volume setting), a recorder, and a telephone handset. At each NAFHq, the receiving lines from SAC are similarly equipped. ▶Point-to-point service is automatically pre-empted when an alert is initiated.◀

1.07 ▶Each 4-wire line in the PAS is equipped for continuous continuity checking. SAC transmits a continuity check pulse to NAFHq (backbone circuit) or to the Base (front door circuit), and NAFHq transmits check pulses on its back door circuit to each of its associated Bases. In both cases, the outgoing pulse is transmitted from a common generator through the alert bridges to all lines. The continuity check pulses are repeated at NAFHq and the Bases on a loop-back arrangement to a check pulse receiver at their source (NAFHq repeats back to SAC and the Base repeats front door pulses back to SAC and back door pulses to NAFHq). Individual receivers are provided on each line at SAC and NAFHq so that a continuity test is made on each line. The Base local channels are checked by a continuous flow of direct current through the Station Connecting Circuit, local wiring, and the Station Circuit. Interruption or a short circuit of the local channel current blocks the line continuity check pulse in the Base pulse repeater. ***Any loss of check pulses for more than 20 seconds will result in a visual and audible alarm at the check pulse source (SAC or NAFHq).*** When the customer's attendant operates an alarm cutoff key, the alarm will be transferred to the telephone company equipment room. Provision is made to protect the PAS from noise simulating the continuity check pulse. The input to the check pulse receivers is equipped with a gate circuit that can either pass or block pulses from the line. The check pulse generator controls the receivers so that they will accept check pulses only when they are gated open by the generator. The generator sends a check pulse once every three seconds (unless an alert or horn signal is being sent) and opens the receiver gates for the next two seconds. A noise pulse coming in on a line during the third second (when the generator is holding the gates closed) will override the generator and block the corresponding receiver gate closed during the next check pulse transmission cycle. This will cause the affected receiver to ignore the next legitimate check pulse. Unless one check pulse gets through to the receiver every 20 seconds, the receiver actuates the continuity failure alarm for its line. Thus, an occasional noise pulse has no effect; but a series of them, by arriving during the third second of successive three-second cycles, will maintain the gate blockade and actuate the continuity failure alarm. The continuity failure alarm may be tested by operating the CONT CHK key on the console which interrupts the continuity check (slow pulse) generator.◀

1.08 The pulses required for the continuity check, as well as pulses for signaling and control functions, are transmitted over each line by 43A1 Voice Frequency Telegraph Carrier channel units. This carrier equipment operates in a frequency slot near the upper end of the voice band. ▶43A1 carrier transmits pulses by frequency-shift keying its midband carrier frequency up or down 35 Hz. As used in the PAS, however, the 43A1 unit only transmits tone during a pulse. The oscillator plate voltage is removed so that no tone is transmitted during idle periods between pulses. Filters are provided in the PAS circuits to prevent the 43A1 tones from passing through the telephone sets or loudspeakers and being audible to the attendants. Filters are also provided to prevent voice signals from interfering with 43A1 tones. As shown in Fig. 2, a midband frequency of 2635 Hz is used from SAC to each NAFHq and Base, and from

each NAFHq to its Wing, Missile Complex, and Alternate Command Posts. A midband frequency of 2465 Hz is used from Wing Command Posts to SAC and NAFHq, from Missile Complex Command Posts to NAFHq, and from NAFHq to SAC. The Alternate Command Posts send 2805 Hz to NAFHq. Because of the action of the 4-way bridge in the Alternate Command Post, the 2805-Hz tone appears on the receiver leg of the back door circuit at the Missile Complex Command Post. Also, the 2465-Hz tone appears on the Alternate Command Post receive leg. In both cases, the extraneous tone is filtered out and ignored. Under emergency conditions, it may be necessary to patch a PAS circuit to a dial-up make-good circuit or some other type of message network trunk. To avoid interference with 2600-Hz signaling equipment, Option "Q" must be changed to Option "N". This option requires a change of filters and 43A1 networks so that 2125 Hz is used instead of 2635 Hz, and 1955 Hz instead of 2465 Hz.◀

1.09 Three forms of pulses are used for various functions and are designated as "slow", "fast", and "long" pulses. (See Fig. 2.) Slow pulses, used for all continuity checking, are pulses of 270-milliseconds duration transmitted at a rate of one every three seconds. Fast pulses, used to perform functions at the start of an alert and for the acknowledgment of an alert, are 100-millisecond pulses at a 5-pulses-per-second rate. ▶Long pulses of 1.5-seconds duration are used during nonalert periods for call-in signaling from the Bases to SAC or NAFHq. A fast pulse followed immediately by a long pulse is transmitted from SAC or NAFHq to the Bases to actuate the Klaxon horns by remote control. The fast-long pulse combination is referred to as the "horn signal". Point-to-point signaling during nonalert periods in the direction from SAC or NAFHq to a Base, or SAC to NAFHq, is by voice over the loudspeaker.◀

2. ESTABLISHING PAS ALERT (RED TELEPHONES)

2.01 An alert may be established either from SAC to all NAFHqs and Bases or from any NAFHq to its associated Bases. ▶At SAC and at each NAFHq, the Senior Controller console is equipped with ALERT and KLX keys and two red "alert" handsets which are connected to the input of an "alert" bridge by hybrids.◀ The transmitting side of each outgoing circuit is permanently connected to the output of this bridge. Sidetone for the red alert instruments is provided from one of the bridge outputs. ▶Detailed equipment functional layouts are shown in Section 310-500-500.◀

2.02 The transmitting sides of the gray telephone sets (used for nonalert, point-to-point communications) are connected to each circuit at the bridge output legs. A 60-dB loss between bridge output legs prevents interference between circuits in the nonalert condition. The gray telephone sets are automatically disconnected from the bridge output legs in the alert condition.

2.03 To initiate an alert condition, the attendant at the Senior Controller console (also called the "First Position") at either SAC or a NAFHq selects a red instrument and operates the nonlocking ALERT key. This performs the following functions:

(a) A distinctive (900+1400-Hz warble) alert warning tone is connected to the input of the bridge as long as the key is held operated. This warning will be heard by all parties using any of the circuits for point-to-point use and at all receiving loudspeaker locations.

(b) A 3-second fast pulse control signal is transmitted from the originating location.

(c) An acknowledgment (ACK) lamp for each point will be lighted at the initiating console and each of its multipled consoles, and at the consoles at each NAFHq receiving the alert.

(d) All equipment required for point-to-point use of the circuits at SAC and NAFHq is disconnected from the bridge or otherwise deactivated.

(e) An ALERT busy lamp will light at each SAC and NAFHq attendant position.

2.04 The above situation is established with the operation and release of the ALERT key. ▶An alert can also be established by operating the KLX key as described in Part 3.◀ On release of the key, the verbal alert message is transmitted and an acknowledgment is requested. Each point receiving the message can acknowledge by operating a nonlocking ACK key. Operation of the ACK key will send out a 3-second fast pulse signal from the Base to SAC or NAFHq or from NAFHq to SAC. Receipt of this signal will extinguish the acknowledgment lamp associated with the Base or NAFHq. ▶Where a second location is served from

the same Base terminating equipment, the ACK keys are interlocked and both must be operated to send out the fast pulse acknowledgment signal.◀

2.05 ▶Provision is made for the First Position attendant at SAC or NAFHq to answer call-in signals and to receive voice messages over the red telephone set during an alert. This connection ("T" Option) is made by bridging the receiving line at the output of the Telephone Set Connector Circuit at SAC or NAFHq. This permits the selection of an incoming line as in the nonalert condition (see 4.02), except that only the receive side of the line is picked up and connected to the red telephone set instead of the gray set. The line connection capability of all other positions is disabled ("V" Option) during alerts. Also, the fast pulse generator blocks the First Position attendant from making a line selection during the 3-second interval when the fast pulse alert signal or horn signal is being transmitted.◀

2.06 An alert condition is retired by the operation of the ALERT RLS key at SAC and NAFHq. Operation of this key will restore the gray telephone circuits to the nonalert condition and make all lines available for point-to-point message service.

2.07 At each NAFHq Senior Controller console, a nonlocking SAC cutoff key (SAC CO) is provided to permit disconnecting the SAC backbone circuit from the input to the NAFHq alert bridge. This permits the NAFHq Controller to initiate or relay an alert in case the SAC backbone circuit is noisy or otherwise in trouble. Operation of this key does not remove the loudspeaker from the SAC circuit; therefore, supervision of the incoming circuit is maintained.

2.08 A switching arrangement has been provided at each NAFHq to transfer the input of the alert bridge to a back up backbone circuit from SAC in case the circuit in use fails. ▶The transfer may be done manually by the attendant at NAFHq, automatically by nonreceipt of alert pulses (fast pulses) on one of the backbone circuits, or by nonreceipt of one slow pulse during an alert after the alert pulses have been received. Under normal conditions, alert pulses will be received on both the regular and the alternate backbone lines. The automatic transfer circuit will be activated and will switch the regular backbone line to the NAFHq alert bridge (if it is not already so switched). Receipt of alert pulses on only one line, however, will cause that line to be switched to the bridge and the automatic transfer circuit will assume that the other line has failed. Loss of a single slow (continuity check) pulse after an alert has been initiated is also assumed to indicate a line failure, and the automatic transfer circuit will switch the bridge to whichever backbone line last received a slow pulse. A manual switch can be made during an alert; but if an attempt is made to switch to a failed line while the other line is still good, the next slow pulse will cause the automatic circuit to override the manual switch. The automatic circuit is deactivated by the ALERT RLS key.◀

3. ▶ACTUATION OF THE KLAXON HORNS

3.01 Certain Bases are provided with an audible alerting system of Klaxon horns. When actuated, this alerting system blows the horns through three cycles of 30 seconds on and 15 seconds off.

3.02 SAC can remotely actuate the Klaxon horns by momentarily depressing the KLX key on the First Position console. When the key is depressed, the lamp (KLX lamp) in the key is lighted. The KLX key triggers the fast and long pulse generators to send a horn signal. Since the first segment of the horn signal is identical to the alert signal, operation of the KLX key also initiates the alert condition as described in 2.03. If an alert has been started just prior to sending the horn signal, the generators wait until the fast pulse generator has finished sending the fast pulse alert signal and then send the horn signal. The KLX lamp is extinguished at the completion of the horn signal transmission.

Each NAFHq can originate a Klaxon horn signal (and an alert) by a KLX key at the NAFHq First Position console. The NAFHq horn signal is sent on the back door PAS circuits to the Bases associated with the NAFHq. The signal generation process at NAFHq is the same as at SAC. After a horn signal has been transmitted from SAC or NAFHq, a timing circuit in the long pulse generator prevents the transmission of a second horn signal for about 1.5 seconds. When an alert signal is initiated from the KLX key, a timed alert warning tone is transmitted for three seconds coincident with the 3-second fast pulse segment of the horn signal.

3.03 If the horn signal is originated by SAC, the receipt of the signal at NAFHq will start

the KLX lamp on the NAFHq console flashing (approximately 120 flashes per minute). The SAC horn signal is automatically repeated by the SAC Connector Circuit at NAFHq to the Base back door circuits. The NAFHq KLX lamp will continue flashing until released by the NAFHq attendant operating the ACK (acknowledgment) key. Failure to operate the key will block the transmission of any subsequent horn signals from SAC to the Base back door circuits.

3.04 Each Base has the capability of disabling the remote horn control by momentarily operating the KLX RCO (Klaxon remote cutoff) key at the Base. Operating this key also lights the KLX RCO lamp. Remote operation is restored by momentarily reoperating the KLX RCO key. If a horn signal is received while the Klaxon remote control is cut off, the KLX lamp at the Base begins flashing (approximately 120 flashes per minute).

The flashing lamp is released when the Base ACK key is operated. Base attendants can actuate the Klaxon horn alerting system locally by operating the KLX key at the Base. Except for the KLX lamp, local operation of the horns is not affected by the KLX RCO key. If the horn remote control has not been cut off, the KLX lamp at the Base will track the Klaxon horn operation and will be lighted while the horns are blowing. If the remote control is cut off, the KLX lamp will continue to monitor the line and will flash if a remote control horn signal is received.

3.05 At the Bases, the fast pulse segment of the horn signal (or of an alert signal) is recognized by the fast pulse receiver. The fast pulse receiver will start the recorder, activate a local audible signal (buzzer) if one is provided, and connect the receive leg of the 43A1 unit to the long pulse receiver. The arrangement whereby the long pulse receiver is connected to the receive leg only upon receipt of a fast pulse is a feature provided to protect the long pulse receiver from line noise. Excessive line noise may cause false keying in the 43A1 unit, which can simulate a long pulse. Additional protection is provided by a timing circuit in the long pulse receiver. A long pulse must last between 0.75 and 5 seconds in order to activate the Klaxons. Receipt of a horn signal or operation of the local KLX key at a Base activates a motor driven timer. This timer generates the 30 seconds on, 15 seconds off, timing function and operates the Klaxon horns by power relays. Once activated, the timer proceeds through the full 3-cycle pattern.◀

4. NONALERT POINT-TO-POINT SERVICE (GRAY TELEPHONES)

4.01 Four types of point-to-point service are available on the network during nonalert periods. These calls are operated as follows:

A. Calls from an Air Force Base Wing Command Post or Missile Complex Command Post to SAC or NAFHq

4.02 Operation of the nonlocking CALL key associated with a back door or front door circuit at a Base will transmit the long pulse line signal. This signal will operate a flashing lamp at all multiple positions at NAFHq or SAC. ▶Operation of the TEL key in any SAC or NAFHq position will connect the gray telephone to the Base or NAFHq line selected by that TEL key and will change the lamp in that position from a flash (call-in) condition to a flutter (talk) condition. The lamps in all other positions change to a steady (busy) condition, and the other positions are excluded from picking up the line. The attendant at SAC or NAFHq may disconnect from the line by operating the TEL RLS (telephone release) key. Alternatively, operation of another TEL key to pick up another line releases any previous connection in that position.◀

B. Calls from SAC or NAFHq to a Wing Command Post or Missile Complex Command Post

4.03 The attendant connects the position gray telephone to the circuit desired by operation of the circuit TEL key. The associated lamp at that position will flutter to indicate a talk condition. Lamps for that circuit in all multiple positions will show a steady light to indicate a busy condition. Signaling to the Base is by voice through the Base loudspeaker. At the end of the call, the position telephone at SAC or NAFHq is disconnected from the circuit by operating the position TEL RLS key, or by operation of the TEL key for another circuit.

C. Calls between SAC and NAFHq

4.04 Signaling from SAC to a NAFHq is by voice over the associated loudspeaker at the NAFHq location. Signaling from NAFHq to SAC is accomplished by operation of the TEL key associated

with the SAC (backbone) circuit followed by operation of the CALL SAC key. The position circuit lamp will flutter and the other positions will show busy (steady).

4.05 The signal (a long pulse), when received by SAC, will show a flashing light in all positions. When answered at any position by operation of the appropriate TEL key, that position light will flutter. All other position lights will indicate busy by a steady light. At the end of a call, the telephone set is disconnected by operation of the TEL RLS key, or another TEL key for some other circuit.

D. Conference Call from a Base to SAC and NAFHq

4.06 A Base may, if desired, transmit simultaneously to SAC and its associated NAFHq. A nonlocking LINE GRP (line grouping) key is provided with the handset associated with each (front door and back door) circuit. To use the conference arrangement, the attendant must remove either handset from its cradle and momentarily operate its associated LINE GRP key. SAC and NAFHq are then signaled as described in 4.02. Returning the handset to its cradle restores the normal (ungrouped) operation.

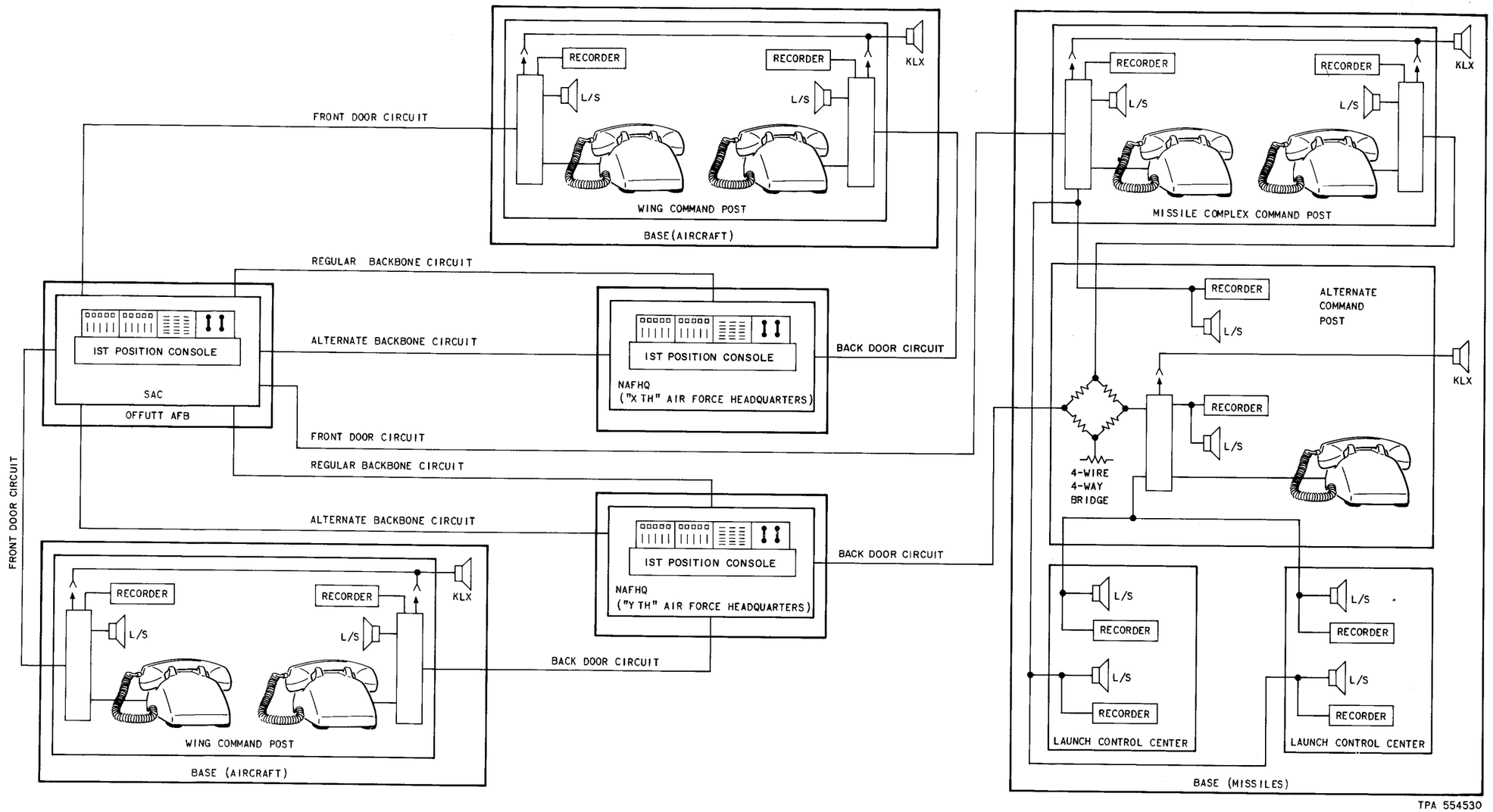

Fig. 1—PAS CIRCUIT LAYOUT

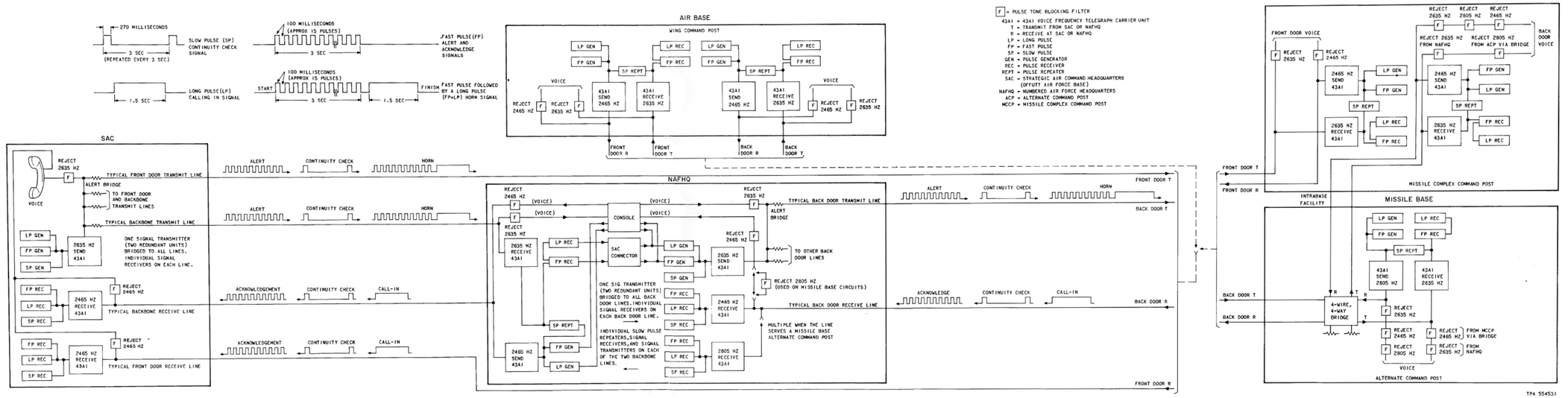

Fig. 2—PAS SIGNALING