

**NO. 12 SERVICE OBSERVING DESK
AMA AND CAMA SERVICE OBSERVING CIRCUITS**

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1. GENERAL

1.01 This section covers general descriptive information on the automatic message accounting (AMA) and the centralized automatic message accounting (CAMA) service observing circuits and how each is used with the No. 12 service observing desk (covered in Section 961.501.01).

1.02 This section is issued to facilitate the use of material originally contained in Section 961.501.01, Issue 2 and Addendum 1, which is now divided into subsections. (See Section 961.501.01.)

1.03 Arrangements are available for observing on customer direct distance dialing (DDD) traffic. Since this traffic is switched and charged automatically without operators to recognize unusual conditions or to assist in case of trouble, the importance of service observing as a check on the quality of DDD service is increased.

1.04 Since DDD traffic represents a small portion of customer-dialed calls, observing is done at a point of concentration, that is, on trunks carrying DDD traffic. Observations are made on both home area customer dialing (HACD) and foreign area customer dialing (FACD). When charging information on HACD and FACD calls is recorded locally, the calls constitute AMA traffic. Observations on this traffic can be made on all FACD calls and those HACD calls that are above a billing index which will be specified locally. When charging information on HACD and FACD calls is recorded at a central switching point, the calls constitute CAMA traffic.

1.05 Facilities for observing on AMA and CAMA traffic are provided on the basis of type of system. Facilities are available for observing on CAMA traffic in crossbar tandem, No. 4A or 4M toll crossbar and step-by-step intertoll offices, on both AMA and CAMA traffic

in No. 5 crossbar offices, and on AMA traffic in No. 1 step-by-step offices with modified automatic ticketing.

1.06 Identification of the calling customer is required in CAMA operation, and is obtained in all CAMA offices either by an operator or by automatic number identification (ANI). With operator identification, the observing circuits enable observation of the keying by the CAMA operator of the calling number into the sender for the AMA record, as well as observation of transmission and supervisory indications on the call. Where ANI is available, an information digit follows the pulsing of the called number, except in No. 5 crossbar offices (see 3.31), and precedes the pulsing of the calling number. This information digit appears in the ninth digit position of the second indicator (see Fig. 1B) as one out of six possible numbers. The numbers 0, 1, 2 designate ANI calls not observed, and the numbers 3, 4, 5 identify similar conditions for ANI calls which are observed at the originating office. The detailed information provided by the information digit is as follows.

CONDITION	INFORMATION DIGIT DISPLAYED FOR CALLS	
	Observed at Originating Office	Not Observed at Originating Office
Automatic identification followed by either a good calling number or insufficient or mutilated digits, after which the sender calls in the CAMA position to complete the call.	3	0
Operator identification in cases of calls from multiparty lines where it is necessary for an operator to assist in identifying the calling number.	4	1
Identification failure to encounter ANI equipment failure, necessitating the CAMA operator's assistance.	5	2

2. AMA SERVICE OBSERVING CIRCUITS

A. No. 5 Crossbar Office With AMA

2.01 Arrangements are available for observing on AMA traffic only in a No. 5 crossbar office. These arrangements are adaptable for observing on either AMA (see following paragraphs) or CAMA (see 3.01 through 3.42) traffic, or on both (see 4.01 through 4.20).

2.02 AMA observations can be made on calls by individual or 2-party customers handled over outgoing AMA trunks, intermarker group trunks, and AMA junctors.

2.03 The AMA service observing circuits are connected to the service observing desk by a separate set of conductors, although common conductors can be used when observing on both AMA and CAMA trunks.

2.04 A block diagram of AMA observing is shown in Fig. 2.

Equipment Elements

2.05 For observing on AMA traffic only in an office or building, an AMA service observing circuit, a trunk selection and control circuit, a service observing register and MF pulsing circuit, and service observing register connector circuits (one per marker) are required. For observing on local dial traffic in the same office with AMA traffic, a local dial observing circuit (see Section 961.501.05) is required in addition to the preceding arrangement, and may use cable conductors to the desk in common with the AMA observing circuit.

2.06 A maximum of 180 AMA trunks and junctors in an office can be observed on with the preceding arrangements. These AMA trunks and junctors can be located on a maximum of 30 trunk link frames with a maximum of six trunks per frame.

2.07 With the arrangements described in 2.05 for observing on AMA traffic, the trunks and junctors can be located in several AMA offices in the same building (a wire center). The number of completing markers in these offices can be a total of 30.

2.08 The AMA trunks and junctors can carry both FACD and HACD traffic. FACD traffic generally consists of ten digits, and HACD

traffic of seven digits. A stations digit can also be sent on both kinds of traffic.

2.09 The trunk selection and control circuit performs the following functions: trunk selection and connection, control, loop identification and reduction, class selection and control, transmission, and amplification. This circuit includes an optional voice-frequency amplifier, which is required if the cable loss between the observed office and observing desk is between 3.0 and 13.5 db at 1000 cycles. This is a plug-in amplifier located in the transmission path of the service observing circuit.

2.10 A high-impedance monitoring connection is provided in the tip and ring conductors of the service observing circuits that connect to the observed trunks. This connection prevents the service observing circuits from interfering with the commercial connection.

2.11 No pulse converters are required for observing on No. 5 crossbar offices aside from the conversion performed in the service observing register, although any type of pulsing can be observed on. The called number is obtained from the marker as various combinations of two-out-of-five leads grounded, and is stored in the service observing register until sent to the service observing desk as MF pulses.

2.12 The service observing equipment for AMA observing is connected to the incoming trunk and distribution circuit (at the service observing desk) by six conductors.

2.13 Three types of keys, located on the cable-turning section of the desk, are used to control the type and number of observations: the class selection (SW1) key, the loop-reduction (SW) key, and the out-of-service (OS) key.

2.14 The class selection (SW1) key is required for observing on AMA traffic. One key is required per trunk selection and control circuit. The key has three positions: one position selects foreign area AMA traffic; the second position selects home and foreign area AMA traffic; the third position is reserved for CAMA traffic.

2.15 The loop-reduction (SW) key is an optional feature providing flexibility in selection of observations. One key is required per set of conductors from the trunk selection and

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control circuit. This feature is discussed in Section 961.501.01. This key is a 3-position key, and the loop-reduction arrangements of the trunk selection and control circuit permit exclusion of a maximum of 96 trunks and junctors in either operating position (A or B). On AMA observations, for example, one position could exclude trunks and junctors carrying long-haul foreign area traffic, and the other, trunks and junctors carrying short-haul foreign area traffic.

2.16 The out-of-service (OS) key is always required. One key is required per set of conductors from the trunk selection and control circuit for AMA observing. When the conductors used for AMA observing are also used for observing on local dial, a separate out-of-service key is required for local dial. With the latter arrangement, the local dial out-of-service key must be turned to the out-of-service position for observations to be made on AMA traffic.

2.17 In addition to these keys mounted on the cable-turning section, each position is supplied with a class exclusion key for each class the position is to observe on. Separate class exclusion keys and TRK lamps are provided for AMA, CAMA, and local dial observations when common conductors are used, as well as when separate conductors are used.

2.18 For observations of AMA traffic only in an office or wire center, the trunk selection and control circuit, an AMA observing circuit, and associated equipment are mounted on approximately two relay rack bays.

Method of Operation

2.19 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

2.20 The class of observation is selected by the class selection key before the trunk is put into service. The position of this key causes all markers in the observed office to select the one class or type of class of call for presentation to the incoming trunk and distribution circuit at the desk. The key can be reset at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

2.21 When observing on AMA traffic only, the type of AMA traffic (FACD or FACD and HACD) is selected by the class selection key.

2.22 If loop reduction is used, the loop-reduction key or keys can be reset at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

2.23 The AMA observing circuits are put into service by operating the respective out-of-service keys to the in-service position. An observation is initiated only when the observing circuit is idle and a position at the desk is occupied and idle.

2.24 The in-service indication prepares the observing circuit to receive a position-idle indication by heating the electron tubes and holding the class selection and loop-reduction relays operated. The test for false battery and ground within the service observing circuit is terminated when a call is offered. (See 2.40.)

2.25 When the marker seizes a trunk arranged for service observing, the marker indicates to the trunk selection and control circuit that an observation can be made. Other markers on other frames in the office may give a similar indication. The trunk selection circuit will indicate to the marker on the lowest frame that a position is idle.

2.26 The marker signals the observing circuit and the trunk selection portion of the trunk selection and control circuit which sends a seizure signal to the desk. For certain calls that are not to be observed, such as tandem or test calls, the marker sends a nonobserve signal to the trunk selection portion of the trunk selection and control circuit which withholds the seizure signal from the desk. The observing circuit then recycles, releases the trunk and the trunk selection portion of the trunk selection and control circuit, and if an idle position is still available, is prepared to select another trunk.

2.27 The seizure signal competes with similar signals from other offices. One call is accepted and the rest rejected by the incoming trunk and distribution circuit at the desk. The service observing circuits carrying the rejected calls recycle and wait for another idle position.

All calls for which a seizure signal is sent receive a service observing mark on the AMA tape. Information so marked constitutes a service observing AMA record which can be checked with observed data for irregularities. The service observing AMA record includes the calling number, called number, date of call, and on completed calls, the exact start time and duration. On uncompleted calls, only an initial entry is made.

2.28 The observing circuit receiving a call-accepted signal locks itself, the control portion of the trunk selection and control circuit, and the trunk to be observed to the desk position, and releases the trunk selection portion of the trunk selection and control circuit. The trunk must be selected for observation in 0.3 to 0.6 second, or be released.

2.29 When a call is connected to the desk, the connection is held until released by the observer.

2.30 After the trunk has been connected, the control portion of the trunk selection and control circuit and the observing circuit receive a signal to start identifying the observed trunk. The loop number is sent to the desk by PCI pulsing. These pulses light one of the tens and one of the units lamps at the desk. Customer disconnect does not interfere with loop identification. The service observing circuit can not be released during loop identification.

2.31 After the tens and units lamps are lighted, the hundreds group identification for AMA observations is given by the TRK lamp which lights steadily for trunks 0 through 99, and flashes for trunks 100 through 179.

2.32 If circuit trouble prevents the loop identification from being completed, the pulsing circuit will be held 4 to 7 seconds before being released, and the IF lamp lights. The call can be observed on, despite identification failure.

2.33 On AMA calls, the called number is recorded by the service observing register. The called number is recorded when the marker passes the number to the out sender. When the sender releases, the service observing register starts MF outputting to the desk.

2.34 If more than 11 digits are received at the desk for the called number, or if more than two MF frequencies are received for one digit of the called number, distinctive signals are sent to the observer. If too few digits are sent, the sender times out. In some of these cases, an overflow tone is received by the customer and observer.

2.35 If the call encounters difficulty going through the AMA office or through the distant office, distinctive signals and/or tone are sent to the observer, and tone is received by the customer.

2.36 Signals indicating various steps in the progress of the call and supervisory signals are sent to the desk. These are shown in sequence in Fig. 3.

2.37 The observation is released by the operation of the release and stand-by (RLS-STBY) key at the desk to the release or stand-by position. When the observation is completed and the observing circuit is released, any lighted lamps are extinguished. The service observing circuit restores to normal and is prepared to accept a new call.

2.38 When a call is abandoned, as much information as possible is obtained. Loop identification is always sent. If a call is abandoned before the sender is released, the called number is sent to the desk. If a call is abandoned after the sender has released, all supervisory signals and transmissions are cut off immediately.

2.39 For AMA observations on other than intermarker trunks, a hold-forward feature is provided whereby the observed trunk is held 4 to 7 seconds after the calling customer has hung up or abandoned the call. This interval gives the observer time to identify signals on fast hang-ups. The observed trunk can be released before or during this interval by operating the RLS-STBY key, but is automatically released at the end of the timed interval.

Alarm Facilities

2.40 When the observing circuit is put into service, a continuous test for false battery or ground is maintained on the observing lead multiple wiring on the trunk connector relays, and for false ground on the connector relay

windings, the service observing register relay windings, and the associated multiple wiring on the connector relay contacts, except during an observation. If trouble develops, the service observing circuit goes out of service, the audible office alarm is given, and the alarm lamp is lighted at the equipment location. An alarm key may be operated, cutting off the audible alarm and keeping the alarm lamp lit. When the trouble is cleared, the alarm key is released, the lamp is extinguished, and the service observing circuit is ready for operation.

B. No. 1 Step-by-Step (MAT) Office With AMA

2.41 Service observing equipment is available for observing the DDD traffic originated by individual and 2-party lines in No. 1 step-by-step (modified automatic ticketing) offices with AMA features.

2.42 The local dial observing circuit (see Section 961.501.05) is adapted to provide for service observing on AMA trunks by means of a service observing loop or trunk connector circuit and a front supervision control circuit, which is an optional part of the local dial observing circuit. Where both customer line observing and AMA trunk observing are desired, separate observing circuits must be provided.

2.43 Digits dialed by the customer after reaching the AMA trunk and indications of forward supervision are obtained and recorded on double pen register tapes (see Fig. 5) at the observing desk. Detailed AMA records are also made for all observed AMA calls.

2.44 A block diagram of AMA service observing a No. 1 step-by-step office (MAT) is shown in Fig. 4.

Equipment Elements

2.45 The outgoing AMA trunks to be observed are connected to the service observing trunk circuit by means of a plug-ended cord with a shoe at one end which clamps onto special service observing terminals at the distributing frame. A double plug at the other end of the cord is plugged into a jack box at the top of the distributing frame. The jack boxes may be multiplied along the frame in a full or graded multiple, as required.

2.46 A maximum of 100 of these loop connectors can be associated with a common service observing circuit, but only one trunk can be cut through to the observing circuit at any time.

2.47 Loop identification features will be required, if not already provided, in all positions selected for this type of observing.

2.48 One out-of-service key is furnished for each AMA observing trunk terminated at the observing desk. This key is located in the cable-turning section.

2.49 Loop-reduction features are not provided with these facilities.

2.50 The class exclusion feature is combined with that for local dial and controlled by the local dial class exclusion key. If spare class exclusion facilities are available in the selected positions, separate class exclusion may be assigned for this type of observing.

Method of Operation

2.51 The method of operation for these facilities is similar to that described for the local dial observing circuit. (See Section 961.501.05.)

2.52 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

2.53 Trunk connector circuits or loop connectors are patched to the outgoing AMA trunks at the distributing frame terminals using standard plug-ended cord with shoe and jack-box arrangements. The loop acts to connect the AMA trunk to the observing circuit at the time the trunk is seized by the step-by-step selector in the progress of the call. Identification of the connected loop will be sent to the service observing desk.

2.54 Until the observer releases the connection, the observing connection will remain on the same trunk, and any dialing, conversation, and supervision on subsequent calls using this trunk will be transmitted to the service observing desk.

2.55 The digits dialed by the customer after reaching the AMA trunk, and any calling station supervision, are recorded on one pen of a double pen register at the observer's position. All forward supervisory indications, including called station answer, called station disconnect, busy, reorder, and no-circuit, are recorded on the second pen. An example of a typical pen register tape for an AMA observation is shown in Fig. 5.

3. CAMA SERVICE OBSERVING CIRCUITS

A. No. 5 Crossbar Office With CAMA

3.01 Service observing arrangements are available for observing on a No. 5 crossbar that is arranged for handling CAMA traffic.

3.02 CAMA observations can be made on calls by customers in other offices handled over interoffice or intertoll incoming CAMA trunks, on calls by a 4-party or multiparty customers in the same No. 5 crossbar office completed over CAMA junctors, and on calls by 4-party or multiparty customers in other marker groups in the same building completed over intermarker group CAMA trunks.

3.03 The CAMA observing circuits are connected to the service observing desk by a separate set of conductors or, where combined AMA and CAMA facilities are used (see 4.02 and 4.03), by common sets of conductors. The CAMA service observing circuit, unlike the combined AMA and CAMA or AMA only service observing circuits (see 2.05 and 4.03), cannot use cable conductor in common with the local dial service observing circuits.

3.04 A block diagram of CAMA service observing is shown in Fig. 6.

Equipment Elements

3.05 Leads from the CAMA trunks and junctors are cabled directly to the trunk selection and control circuit. Trunks and junctors so connected can be observed on automatically under control of the trunk selection and control circuit. No patching facilities are required.

3.06 There are no loop connectors in the observing circuits for the No. 5 crossbar system. However, for purposes of uniformity,

trunk identification is referred to as loop identification, and trunk reduction as loop reduction.

3.07 For observing on CAMA traffic only in an office, a CAMA service observing circuit, a trunk selection and control circuit, a service observing register and MF pulsing circuit, and service observing register connector circuits (one per marker) are required.

3.08 A maximum of 100 CAMA trunks and junctors can be observed on with the preceding arrangements. These CAMA trunks and junctors can be located on a maximum of 20 trunk link frames with a maximum of five trunks per frame.

3.09 CAMA trunks and junctors carry both FACD and HACD traffic. FACD traffic generally consists of ten digits, and HACD traffic of seven digits.

3.10 The trunk selection and control circuit performs the following functions: trunk selection and connection, control, loop identification and reduction, class selection and control, transmission, and amplification. This circuit includes an optional voice-frequency amplifier, which is required if the cable loss between the observed office and observing desk is between 3.0 and 13.5 db at 1000 cycles. This is a plug-in amplifier located in the transmission path of the service observing circuit.

3.11 A high-impedance monitoring connection is provided in the tip and ring conductors of the service observing circuits that connect to the observed trunks. This connection prevents the service observing circuits from interfering with the commercial connection.

3.12 No pulse converters are required for observing on No. 5 crossbar offices aside from the conversion performed in the service observing register, although any type of pulsing can be observed on. The called number is obtained from the marker as various combinations of two-out-of-five leads grounded, and is stored in the service observing register until sent to the service observing desk as MF pulses. The calling number is sent to the desk as MF pulses by the CAMA operator.

3.13 The service observing equipment for CAMA observing is connected to the incoming trunk and distribution circuit (at the service observing bureau) by six conductors.

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3.14 Two types of keys, located on the cable-turning section of the desk, are used to control the type and number of observations: the loop-reduction (SW) key and the out-of-service (OS) key.

3.15 The loop-reduction (SW) key is an optional feature providing flexibility in selection of observations. One SW key is required per set of conductors from the trunk selection and control circuit. This feature is discussed in Section 961.501.01. This key is a 3-position key, and the loop-reduction arrangements of the trunk selection and control circuit permit exclusion of a maximum of 96 trunks and junctors in either operating position (A or B).

3.16 The out-of-service key is always required. One key is required per set of conductors from the trunk selection and control circuit for CAMA observing.

3.17 In addition to these keys mounted on the cable-turning section, each position is supplied with a class exclusion key for each class the position is to observe on. Separate class exclusion keys and TRK lamps are provided for CAMA and local dial observations when common conductors are used, as well as when separate conductors are used.

3.18 For observations on CAMA traffic in one office, the trunk selection and control circuit, a CAMA observing circuit, and associated equipment are mounted on approximately one and one-half relay rack bays.

Method of Operation

3.19 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

3.20 When arrangements are made to observe on CAMA traffic only, a class selection (SW1) key is not needed.

3.21 If loop reduction is used, the loop-reduction key or keys can be reset at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

3.22 The CAMA observing circuits are put in service by operating the respective out-of-service keys to the in-service position. An ob-

serva-tion is initiated only when the observing circuit is idle and a position at the desk is occupied by an observer.

3.23 The in-service indication prepares the observing circuit to receive a position-idle indication by heating the electron tubes and holding loop-reduction relays operated. The test for false battery and ground within the service observing circuit is terminated when a call is offered. (See 3.42.)

3.24 When the marker seizes a trunk arranged for service observing, the marker indicates to the trunk selection and control circuit that an observation can be made. Other markers on other frames in the office may give a similar indication. In this case the circuit will select the lowest-numbered frame.

3.25 The marker signals the observing circuit and trunk selection portion of the trunk selection and control circuit which sends a seizure signal to the desk. For certain calls that are not to be observed, such as tandem or test calls, the marker sends a nonobserve signal to the trunk selection portion of the trunk selection and control circuit which withholds the seizure signal from the desk. The observing circuit then recycles, releases the trunk selection and control circuit and the trunk, and, if an idle position is still available, is prepared to select another trunk.

3.26 The seizure signal competes with similar signals from other offices. One call is accepted and the rest rejected by the incoming trunk and distribution circuit at the desk. The service observing circuits carrying the rejected calls recycle and wait for another idle position. All calls for which a seizure signal is sent receive a service observing mark on the AMA tape. Information so marked constitutes a service observing AMA record which can be checked with observed data for irregularities. The service observing AMA record includes the calling number, called number, date of call, and on completed calls, the start time and duration. On uncompleted calls, only an initial entry is made.

3.27 The observing circuit receiving a call-accepted signal locks itself, the control portion of the trunk selection and control circuit, and the trunk to be observed to the desk position, and releases the trunk selection portion of the

trunk selection and control circuit. The trunk must be selected for observation in 0.3 to 0.6 second, or be released.

3.28 When a call is connected to the desk, the connection is held until released by the observer.

3.29 After the trunk has been connected, the control portion of the trunk selection and control circuit and the observing circuit receive a signal to start identifying the observed trunk. The loop number is sent to the desk by PCI pulsing. These pulses light one of the tens and one of the units lamps at the desk. Customer disconnect does not interfere with loop identification. The service observing circuit cannot be released during loop identification.

3.30 If circuit trouble prevents the loop identification from being completed, the pulsing circuit will be held 4 to 7 seconds before being released, and the IF lamp lights. The call can be observed on despite identification failure.

3.31 When the originating local office is arranged for ANI of the calling number, the No. 5 crossbar CAMA incoming trunk circuit signals the originating office when the sender is ready to receive the calling number. The originating office then proceeds to transmit the calling number, preceded by an information digit (see 1.06), through the CAMA incoming trunk circuit into the sender on a MF basis. These digits are transmitted to the desk and then displayed on the calling number display of the service observing desk. (See Fig. 1B.) In case of failure to identify the calling number, the information digit transmitted to the sender will inform it of the situation; if the ANI equipment fails to output or to complete outputting the calling number, the sender will time out. In these cases, the sender will then call for a CAMA position.

3.32 When the originating office is not arranged for ANI, the CAMA sender calls for a CAMA position after loop identification. When an idle position is found and attached to the sender, the CAMA operator obtains the calling number from the customer and keys it by MF pulsing into the sender and to the desk. The observer can hear the calling number given to the CAMA operator and see it displayed on the calling number display panel.

3.33 While keying the calling number, if the CAMA operator should depress two keys at once, partially depress a key, send too many digits (before a transverter is connected) or too few digits, or if circuit trouble should simulate any of these errors, the CAMA position is re-ordered by the sender. The CAMA operator operates a register reset key, wiping out the digits in the register and at the observing desk, and keys the number again. The sender records the error, and if a second error is made on the same call, the customer is usually sent an overflow tone heard by the observer. (See signal chart, Fig. 7.) A first error, consisting of an eighth digit being sent after a transverter is connected, causes an overflow tone, which is heard by the observer, to be sent to the customer.

3.34 If the operator realizes that she has keyed a wrong digit, or if in keying for the second time she realizes before completing keying that she has made one of the preceding errors, she can operate the register reset to wipe out the numbers keyed, and rekey the number. If the register reset key is operated before seven digits have been keyed, no record of the error is made by the sender.

3.35 After the calling number is sent to the desk and displayed, the MF receiver is signaled to accept the called number. The called number is recorded by the service observing register when the marker passes the number to the CAMA sender. When the sender releases, the service observing register starts MF outputting the called number to the desk.

3.36 If more than 11 digits are received at the desk for the called number, or if more than two MF frequencies are received for one digit of the called number, distinctive signals are sent to the observer. If too few digits are sent, the sender times out. In some cases, an overflow tone is received by the customer and observer.

3.37 Before the CAMA sender releases itself and the CAMA position, the sender receives a signal from the AMA equipment indicating that the information sent is satisfactory. If the information sent to the AMA equipment is not satisfactory, the sender reorders the position. The CAMA operator operates a register reset key, wiping out the number registered, and

keys the number again. If the information is still unsatisfactory, the CAMA operator can operate the position disconnect key, releasing the position and sending the customer and observer distinctive signals to identify these operations.

3.38 If the call encounters difficulty going through the AMA or CAMA office or through the distant office, distinctive signals and/or tone are sent to the observer, and tone is received by the customer.

3.39 Signals to indicate various steps in the progress of the call and supervisory signals are sent to the observing desk. These are shown in sequence in Fig. 7.

3.40 The observation is released by the operation of the release and stand-by (RLS-STBY) key at the observing desk position to the release or stand-by position. When the observation is completed and the observing circuit is released, any lighted lamps are extinguished. The service observing circuit restores to normal and is prepared to accept a new call.

3.41 When a call is abandoned, as much information as possible is obtained. Loop identification is always sent. If a call is abandoned before the sender is released, the called number is sent to the desk. When a CAMA call is abandoned during the keying of the calling number, the desk receives the called number and a partial or complete calling number, depending on how much of the number has been keyed when the call is abandoned. If a call is abandoned after the sender has released, all supervisory signals and transmission are cut off immediately.

Alarm Facilities

3.42 When the observing circuit is put into service, a continuous test for false battery or ground is maintained on the observing lead multiple wiring on the trunk connector relays, and for false ground on the connector relay windings, the service observing register relay windings, and the associated multiple wiring on the connector relay contacts, except during an observation. If trouble develops, the service observing circuit goes out of service, the audible office alarm is given, and the alarm lamp is lighted at the equipment location. An alarm key is operated, cutting off the audible alarm

and keeping the alarm lamp lit. When the trouble is cleared, the alarm key is released, the lamp is extinguished, and the service observing circuit is ready for operation.

B. Crossbar Tandem Office With CAMA

3.43 A service observing circuit is available, for observing on interoffice or intertoll trunks with PCI, DP, or MF pulsing, incoming to crossbar tandem offices arranged for CAMA. (See 3.49.)

3.44 The calling number can be obtained either by a CAMA operator in one of a maximum of three CAMA operator teams, or by ANI. When the calling number is obtained by the CAMA operator, it is then keyed into the sender by ground pulsing (grounding two-out-of-five leads), by MF pulsing which is converted to ground pulsing, or by MF pulsing directly into the sender. However, it is always transmitted by MF pulses to the observing desk.

3.45 A block diagram of CAMA service observing in a crossbar tandem office is shown in Fig. 8.

Equipment Elements

3.46 The incoming trunks to be observed are wired to the patching facilities on the equipment bay where they terminate in multicontact sockets. A maximum of 200 trunks can be wired to these patching facilities. The number of trunks may be expanded to 700 by adding adjacent bays.

3.47 The loop connectors of the service observing circuit also terminate in multi-contact sockets on the patching bay. A maximum of 50 loop connectors can be provided for each service observing circuit. Thus, each service observing circuit can be connected to 50 incoming trunks. A maximum of three service observing circuits can be provided in a crossbar tandem office. Connection between a loop connector and an incoming trunk is made with a patch cord. The CAMA patching facilities are similar to those used for intertoll observing. (See figure in Section 961.501.02.)

3.48 Two types of loop connectors are available for use with the crossbar tandem CAMA observing circuit. One type is used with

PCI or MF pulsing trunks, and the other with DP trunks. The DP connector is a high-speed, high-impedance connector, and is suitable for both bylink and start-dial operation. The DP connectors are grouped separately from the PCI or MF connectors on the patching panel.

3.49 PCI pulsing CAMA trunks and equipment are capable of handling a maximum of eight digits for HACD calls only. Both DP and MF CAMA trunks and equipment are capable of handling 11 digits, and thus, can handle both FACD and HACD calls.

3.50 A high-impedance monitoring connection is provided in the tip and ring conductors of the service observing circuit that connect to the incoming trunk. This connection prevents the service observing circuit from interfering with the commercial connection.

3.51 A PCI pulse monitor circuit is required for observing on trunks with PCI pulsing. This is a high-impedance circuit for detecting and repeating the PCI pulses of the called number on the AMA trunk. A PCI/MF pulse converter must also be provided to translate the digits received from the PCI pulse monitoring circuit to MF pulses. The called number is sent to the service observing desk in MF pulses.

3.52 A DP monitoring circuit, included within the service observing circuit, is required for observing on DP trunks when the dial pulsing is on a direct loop basis into the register or sender. This circuit provides a high-impedance, AC insensitive circuit for monitoring directly on the loop leads of the incoming trunk. When dial pulsing is repeated in the observed trunk to the register or sender, the seizure detector in the loop connector serves as a DP detector circuit. A DP/MF pulse converter is required to translate the digits received from the DP monitoring circuit or the DP detector circuit into MF pulses. The called number is sent to the desk in MF pulses.

3.53 A ground pulse to MF converter is required when the CAMA operator keys the calling number by ground pulsing (two-out-of-five leads are grounded for each digit). This same converter is also required in those installations where MF pulses from a CAMA position are converted to ground pulses before being

passed to the sender. This converter is not required where the CAMA operator MF pulses directly into the sender.

3.54 A PCI pulsing arrangement, included within the service observing circuit, is provided for loop identification. One pulsing unit is used in common by a maximum of three CAMA service observing circuits in a crossbar tandem office.

3.55 A loop-reduction circuit may be provided on an optional basis. This feature is discussed in Section 961.501.01.

3.56 The service observing circuit is connected to the service observing desk by six conductors.

3.57 If the trunk conductor loss between the observed office and the service observing desk is between 3.0 and 13.5 db at 1000 cycles, a voice-frequency amplifier is required in the observing trunk circuit. This is a plug-in type amplifier.

3.58 The CAMA service observing circuit and associated equipment are mounted on a relay rack bay in the crossbar tandem office. One service observing circuit and all other equipment, except the PCI/MF converter, the PCI monitoring circuit, and the DP/MF converter, occupy approximately one relay rack bay. The latter three circuits are mounted on a miscellaneous basis.

Method of Operation

3.59 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

3.60 If loop reduction is desired, the loop-reduction key can be set at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

3.61 The CAMA observing circuit is put into service by operating the CAMA out-of-service key to the in-service position. The observing circuit advances to a waiting-call condition, and the loop multiple test is made. (See 3.86.) Any call which is in progress at the time the observing circuit is placed in service is not connected.

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3.62 When a call comes to the crossbar tandem office over a trunk that is patched for observing, the corresponding loop connector is seized and the observing circuit sends a seizure signal to the desk.

3.63 The two types of loop connectors, PCI and DP, are arranged in separate chain circuits. If more than one of the same type of loop connector is seized simultaneously, preference is given to the lowest-numbered connector. If loop connectors of different types are seized simultaneously, preference is generally given to the DP connector, which is faster. All other connectors are released.

3.64 The two types of loop connectors carry indications for a total of four types of operation: operation for PCI loop connector; operation for DP loop connector arranged for bylink; operation for DP loop connector arranged for start-dial on a loop basis; operation for DP loop connector arranged for start-dial on a repeated basis. Each of these indications gives the observing circuit a distinctive mark to prepare the observing circuit for receiving a type of operation.

3.65 The CAMA observing circuits in a crossbar tandem office are arranged in a chain circuit. If more than one observing circuit requests connection to the desk simultaneously, preference is given to the lowest-numbered observing circuit.

3.66 The seizure signal from the service observing circuit in the crossbar tandem office competes with similar signals from other observing circuits. One CAMA call is accepted per available position by the incoming trunk and distribution circuit at the desk, and the rest are rejected. The observing circuits carrying the rejected calls recycle and wait for another idle position. All calls which are observed receive a service observing mark on the AMA tape. Information so marked constitutes a service observing AMA record which can be checked with observed data for irregularities. The service observing AMA record includes the calling number, called number, date of call, and on completed calls, the exact starting time and duration. On uncompleted calls, only an initial entry is made.

3.67 The observing circuit, upon receiving a call-accepted signal from the service observing desk, acts to lock the observed trunk to

the desk position. The call to be observed must be accepted for observation in approximately 0.4 to 0.8 second, or it will be rejected.

3.68 When a call is connected to the desk, the connection is held until released by the observer.

3.69 After the call is accepted for observation, the trunk being observed is identified. The number of the corresponding loop connector is sent to the desk by PCI pulsing. These pulses light one of the tens and one of the units lamps at the desk. Customer disconnect does not interfere with loop identification. The service observing circuit cannot be released during loop identification.

3.70 If circuit trouble prevents the loop identification from being completed, the pulsing circuit is held 4 to 7 seconds before being released and the IF lamp lights. The call can be observed on despite identification failure.

3.71 The called number is sent to the desk at the same time that trunk identification is being made. When the trunk being observed on is a PCI pulsing trunk, a PCI monitoring circuit and a PCI/MF converter are attached to the service observing circuit. The monitoring circuit detects the PCI pulses of the called number and repeats them to a PCI/MF converter. The converter sends corresponding MF pulses to the service observing desk.

3.72 When the trunk being observed is a DP trunk, the called number is obtained by one of several methods, depending on the type of dial pulsing. In bylink operation, the DP trunk routes the first three digits into the bylink register. A DP detector in the connector circuit repeats the pulses to a DP/MF converter. While the converter is storing the first two digits, the observing desk must send a call-accepted signal or the observing circuit will release the call. When the call-accepted signal is received, the converter begins to transmit MF pulses corresponding to the stored digits, and then transmits MF pulses corresponding to subsequently received digits to the desk. The bylink register must be attached to the trunk before dialing begins, and the DP sender must be attached to the trunk before the end of pulsing for the third digit. If both of these conditions are not met, the

trunk returns overflow tone to the customer. The overflow tone is audible to the observer, and any digits dialed are displayed at the desk.

3.73 In start-dial operation, the DP sender must be attached and send a signal to the originating end before dialing can begin. When the dial pulsing is on a loop basis, the pulses are picked up by an AC insensitive monitoring circuit which passes the pulses into a DP/MF converter. Corresponding MF pulses are sent to the desk.

3.74 In start-dial operation, when the dial pulsing is on a repeated basis, the dial pulsing can be on an E and M lead basis, or the trunk can repeat the pulses into the sender. In either case, a detector in the loop connector picks up the pulses and directs them into a DP/MF converter. The corresponding MF pulses are sent to the desk.

3.75 If more than two MF frequencies are received at the desk for one digit of the called number, a distinctive signal is sent to the observer. If too few digits are received for the called number, a reorder tone is sent to the customer and observer.

3.76 After the called number is sent to the desk, a signal is sent to the MF receiver to prepare it for receiving the calling number. The DP/MF converter or the PCI/MF converter is released and the GP/MF converter is connected for reception of the calling number.

3.77 When the originating local office is arranged for ANI of the calling number, the crossbar tandem incoming trunk circuit signals the originating office when the sender is ready to receive the calling number. The originating office then proceeds to transmit the calling number, preceded by an information digit (see 1.06), through the CAMA incoming trunk circuit into the sender on a MF basis. These digits are transmitted to the desk and then displayed on the calling number display panel of the service observing desk. (See Fig. 1B.) In case of failure to identify the calling number, the information digit transmitted to the sender will inform it of the situation; if the ANI equipment fails to outpulse or to complete outpulsing the calling number, the sender will time out. In these cases, the sender will then call for a CAMA position.

3.78 When the originating office is not arranged for ANI, the sender calls for a CAMA position during or after the pulsing of the called number. Identification for a maximum of three CAMA operator teams can be provided.

3.79 When an idle CAMA position is found, it is attached to the CAMA sender. The CAMA operator then obtains the calling number from the customer and keys it. The observer hears the number given to the CAMA operator. The GP/MF converter transmits the corresponding MF pulses to the desk.

3.80 Before the CAMA sender releases itself and the CAMA position, the sender receives a signal from the AMA equipment indicating that the information sent is satisfactory. If the information sent to the AMA equipment is not satisfactory, the sender reorders the position. The CAMA operator operates a register reset key, wiping out the digits in the register and at the observing desk, and keys the number again. If the information is still unsatisfactory, the operator can operate the position disconnect key, releasing the position and sending the customer and observer a reorder tone.

3.81 If, while keying the calling number, the CAMA operator should depress two keys at once, partially depress a key, send too many or too few digits, or if circuit trouble should simulate any of these errors, the CAMA position is reordered by the sender. The register reset key is operated, wiping out the digits registered, and the number is rekeyed. The sender records the error, and if a second error is made on the same call, the call is usually routed to overflow. (See signal chart, Fig. 9.)

3.82 If the operator realizes that she has keyed a wrong digit, or if in keying for the second time she realizes before completing keying that she has made one of the preceding errors, she can operate the register reset to wipe out the numbers keyed and rekey the number. If the register reset key is operated before seven digits have been keyed, no record of the error is made by the sender.

3.83 Signals to indicate various steps in the progress of the call and supervisory signals are sent to the observing desk. These are shown in sequence in Fig. 9.

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3.84 The observation is released by the operation of the release and stand-by (RLS-STBY) key at the observing desk position to the release or stand-by position. When the observation is completed and the circuit is released, any lighted lamps are extinguished. The service observing circuit restores to normal and is prepared to accept a new call.

3.85 When a call is abandoned, as much information as possible is obtained. Loop identification is always sent. If a call on a PCI pulsing trunk is abandoned before the called number is outpulsed by the originating sender, a series of zeros (0) is displayed. If a call on a DP trunk is abandoned before the sender is attached to the incoming trunk, the called number is not displayed, except in bylink operation where any partial dialing is displayed. When a call on a PCI pulsing trunk is abandoned while the sender is attached, the called number is displayed and disconnect is not indicated until the sender releases. If a call on a DP trunk is abandoned during the called number pulsing, any digits stored in the DP/MF converter are sent to the desk. If a call is abandoned while the calling number is being keyed, the desk receives a partial or complete calling number, depending on how much of the number has been keyed when the call is abandoned.

Alarm Facilities

3.86 A test is made for battery and ground on all leads (except the mark leads) that will be extended to the observed trunk circuits by the operation of the loop connector. The test is made each time the observing circuit advances to a waiting-call condition and prevents the false condition from being extended into, or interfering with, the observed trunk circuits. If the test fails, the audible office alarm is given, the alarm lamp at the equipment location is lighted, and the observing circuit is made inoperative. An alarm key is operated, cutting off the audible alarm and keeping the alarm lamp lit. When the trouble is cleared, the alarm key is released, the lamp is extinguished, and the observing circuit is ready for operation.

C. No. 4A or 4M Crossbar Office With CAMA

3.87 A service observing circuit is available for observing on MF or DP interoffice or

intertoll trunks incoming to the No. 4A or 4M crossbar offices that are arranged for CAMA.

3.88 The calling number is obtained by a CAMA operator or ANI equipment, and MF pulsed into the sender. The called number is obtained either as MF pulses from the originating office directly into the sender, or as dial pulses from the originating office into the bylink register which transmits the digits as MF pulses to the sender. No special conversion equipment is necessary. The service observing circuit receives all digit information in the form of MF pulses as they arrive at the sender.

3.89 A block diagram of CAMA service observing in a No. 4A or 4M crossbar office is shown in Fig. 10.

Equipment Elements

3.90 The incoming trunks to be observed are wired to a patching bay where they terminate in multicontact sockets. A maximum of 200 trunks can be wired to the patching bay. However, by arranging supplementary bays on either side of the patching bay and wiring out CAMA trunks to these supplementary bays, one service observing circuit may have access to as many as 700 CAMA trunks.

3.91 The loop connectors of the service observing circuit also terminate in multicontact sockets on the patching bay. A maximum of 50 loop connectors can be provided for each service observing circuit. Thus, each service observing circuit can be connected to any 50 of the 200 to 700 incoming trunks at one time. A maximum of three service observing circuits can be provided in a No. 4A or 4M crossbar office. Connection between a loop connector and an incoming trunk is made with a patch cord. The CAMA patching facilities are similar in appearance to the patching facilities used for intertoll observing. (See figure in Section 961.501.02.)

3.92 One type of loop connector is suitable for use with either MF or DP trunks.

3.93 MF and DP trunks and equipment are capable of handling a maximum of ten digits, and therefore, are capable of serving both FACD and HACD calls.

3.94 A high-impedance monitoring connection is provided in the tip and ring conductors of the service observing circuit that connect to the incoming trunk. This method of connection prevents the service observing circuit from interfering with the commercial connection

3.95 A PCI pulsing arrangement, included within the service observing circuit, is provided for loop identification. One pulsing unit is used in common by a maximum of three CAMA service observing circuits in a No. 4A or 4M crossbar office.

3.96 A loop-reduction circuit may be provided on an optional basis. This feature is discussed in Section 961.501.01.

3.97 The service observing circuit is connected to the service observing desk by six conductors.

3.98 If the service observing desk is located in another building, a voice-frequency amplifier is required on the MF pulsing channel of the observing trunk circuit.

3.99 One CAMA service observing circuit and associated equipment are mounted on one relay rack bay in the No. 4A or 4M crossbar office.

Method of Operation

3.100 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

3.101 If loop reduction is desired, the loop-reduction key can be set at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

3.102 The CAMA observing circuit is put into service by operating the CAMA out-of-service key to the in-service position. The observing circuit advances to a waiting-call condition and the loop multiple test is made. (See 3.124.) Any call in progress at the time the observing circuit is placed in service is not connected.

3.103 When a call comes to the No. 4A or 4M crossbar office over a trunk that is patched for observing, and the service observing circuit and a suitable service observing desk position are idle, the corresponding loop connec-

tor is seized, and the observing circuit sends a seizure signal to the desk.

3.104 If more than one loop connector is seized simultaneously, preference is given to the lowest-numbered connector. All other connectors are locked out.

3.105 The CAMA observing circuits in a No. 4A or 4M crossbar office are arranged in a chain circuit. If more than one service observing circuit requests connection to the desk simultaneously, preference is given to the lowest-numbered observing circuit.

3.106 The seizure signal from the No. 4A or 4M crossbar office service observing circuit competes with seizure signals from other observing circuits. One CAMA call is accepted per available position by the incoming trunk and distribution circuit at the desk, and the rest are rejected. The observing circuits carrying the rejected calls recycle and wait for another idle position. All observed calls receive a service observing mark on the AMA tape. Information so marked constitutes a service observing AMA record which can be checked with observed data for irregularities. The service observing AMA record includes the calling number, called number, date of call, and on completed calls, the exact starting time and duration of conversation. On uncompleted calls, only an initial entry is made.

3.107 The observing circuit, upon receiving a call-accepted signal from the service observing desk, acts to lock the observed trunk to the desk position. If the call to be observed is not accepted in approximately 0.4 to 0.8 second, the observation is rejected.

3.108 When a call is connected to the desk, the connection is held until released by the observer.

3.109 After the call is accepted for observation, the trunk being observed is identified. The number of the corresponding loop connector is sent to the desk by PCI pulsing. These pulses light one of the tens and one of the units loop identification lamps at the desk. Calling customer disconnect will not interfere with loop identification. The service observing circuit cannot be released during loop identification.

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3.110 If circuit trouble prevents the loop identification from being completed, the identification pulsing circuit is held 4 to 7 seconds before being released, and the IF lamp at the desk lights. The call can be observed despite identification failure.

3.111 The called number may be sent to the desk at the same time that the loop identification is being made. When the trunk being observed on is an MF pulsing trunk, the called number as received by the CAMA sender is sent directly to the service observing desk.

3.112 When the trunk being observed is a DP trunk, a fast bylink register takes dial pulsing in a minimum time after seizure without signaling attachment to the originating office. The called number is obtained in the following way. The DP trunk routes all ten (or seven, as the case may be) digits into a bylink register from which they are MF outpulsed to the sender. If a register is not available in time to take the first digit, the trunk returns a reorder tone to the customer and the observer. After each digit, while waiting for the next digit or the sender, the register time-out interval is 5 to 7.7 seconds. If the register times out, an overflow signal is sent to the trunk which sends a reorder tone to the calling customer and the observer. In the event that the register link does not cut through successfully, a reorder tone is returned to the customer and observer. Upon receiving a sender attachment signal, the register will MF outpulse all received digits to the sender and the observing desk.

3.113 If more than two MF frequencies are received for one digit of the called number, an overflow tone is sent to the customer and observer, and a distinctive lamp signal is provided at the desk. If too few digits are received for the called number, a reorder tone is sent to the customer and observer (See Fig. 11.)

3.114 After the called number is sent to the desk, a start signal is sent to the MF receiver to prepare it for receiving the calling number.

3.115 When the originating local office is arranged for automatic number identification (ANI) of the calling number, the No. 4 toll CAMA incoming trunk circuit signals the originating office when the sender is ready to

receive the calling number. The originating office then proceeds to transmit the calling number, preceded by an information digit (see 1.06) through the CAMA incoming trunk circuit into the sender on an MF basis. These digits are transmitted to the desk, and then displayed on the calling number display panel of the service observing desk. (See Fig. 1B.) In case of the failure to identify the calling number, the information digit transmitted to the sender will inform it of the situation; if the ANI equipment fails to outpulse or to complete outpulsing the calling number, the sender will time out. In these cases, the sender will then call for a CAMA position.

3.116 When the originating office is not arranged for ANI, the sender calls for a CAMA position during or after the pulsing of the called number.

3.117 When an idle CAMA position is found, it is attached to the CAMA sender. The CAMA operator then obtains the calling number from the customer and keys it into the sender. The observer can hear the number given to the CAMA operator and see it displayed on the calling number display panel.

3.118 Before the CAMA sender releases itself and the CAMA position, the sender receives a signal from the AMA equipment indicating that the information sent is satisfactory. If the information sent to the AMA equipment is not satisfactory, the sender sends a reorder signal to the position. The CAMA operator operates a register reset key, wiping out the calling number digits in the sender and at the observing desk, and keys the number again. If the information is still unsatisfactory, the operator can operate the position disconnect key, releasing the position and sending the customer and observer a reorder tone, and operating a distinctive lamp signal at the desk. Indications of the operation of the reset key and disconnect key are given to the service observer.

3.119 If, while keying the calling number, the CAMA operator should depress two keys at once, partially depress a key, send too many or too few digits, or if circuit trouble should simulate any of these errors, the sender sends a reorder signal to the position. The register reset key is operated, wiping out the digits regis-

tered, and the number is rekeyed. The sender records the error, and if a second error is made on the same call, the call is routed to overflow. (See signal chart, Fig. 11.)

3.120 If the operator realizes she has keyed a wrong digit, or if in keying for the second time she realizes before completing keying that she has made one of the preceding errors, she can operate the register reset key to wipe out the numbers keyed and rekey the number. If the register reset key is operated before seven digits have been keyed, no record of the error is made by the sender.

3.121 Signals to indicate various steps in the progress of the call and supervisory signals are sent to the observing desk. These are shown in sequence in Fig. 11.

3.122 The observation is released by the operation of the release and stand-by (RLS-STBY) key at the observing desk position to the release or stand-by position. When the observation is completed and the RLS-STBY key operated, any lighted lamps are extinguished. The service observing circuit restores to normal and is prepared to accept a new call.

3.123 When a call is abandoned, as much information as possible is obtained. Loop identification is always sent to the desk. If a call on a DP trunk is abandoned before the sender is attached to the incoming trunk, no digits will be received at the desk. On an MF trunk, when a call is abandoned, there will be a partial or complete display on the panel at the desk, depending on the number of digits received before abandoning the call.

Alarm Facilities

3.124 A test is made for battery and ground on all leads (except the mark leads) that will be extended to the observed trunk circuits by the operation of the loop connector. The test is made each time the observing circuit advances to a waiting-call condition and prevents false conditions from being extended into, or interfering with, the observed trunk circuits. If the test fails, the audible office alarm is given, the alarm lamp at the equipment location is lighted, and the observing circuit is made inoperative. An alarm key may be operated, cutting off the audible alarm and keeping the alarm lamp lit.

When the trouble is cleared, the alarm key is released, the lamp is extinguished, and the observing circuit is ready for operation.

D. Step-by-Step Intertoll Office With CAMA

3.125 A service observing circuit is available for observing on MF or DP interoffice or intertoll trunks incoming to the step-by-step offices arranged for CAMA.

3.126 The calling number is obtained by a CAMA operator or by ANI equipment, and MF pulsed into the sender. The called number is obtained either as MF pulses from the originating office directly into the sender, or as dial pulses from the originating office into the bylink register which transmits the digits as MF pulses to the sender. The service observing circuit receives all digit information in the form of MF pulses as they arrive at the sender; therefore, no special conversion equipment is necessary.

3.127 A block diagram of CAMA service observing in a step-by-step intertoll office is shown in Fig. 12.

Equipment Elements

3.128 The incoming trunks to be observed are wired to a patching bay where they terminate in multicontact sockets. A maximum of 120 trunks can be wired to the patching facilities. However, by arranging supplementary bays on either side of the patching facilities bay and wiring out CAMA trunks to these supplementary bays, one service observing circuit may have access to as many as 420 CAMA trunks (150 on each supplementary bay).

3.129 The loop connectors of the service observing circuit also terminate in multicontact sockets on the patching bay. A maximum of 30 loop connectors can be provided for each service observing circuit. Thus, each service observing circuit can be connected at one time to any 30 of a maximum of 420 incoming trunks. One CAMA service observing circuit is provided in a step-by-step CAMA office. Connection between a loop connector and an incoming trunk is made with a patch cord. The CAMA patching facilities are similar to those used for intertoll observing.

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- 3.130** One type of loop connector is suitable for use with either MF or DP trunks.
- 3.131** MF or dial pulsing trunks and equipment are capable of handling a maximum of ten digits, and therefore, are capable of serving both FACD and HACD calls.
- 3.132** A high-impedance monitoring connection is provided in the tip and ring conductors of the service observing circuits that connect to the incoming trunk. This method of connection prevents the service observing circuit from interfering with the commercial connection.
- 3.133** A PCI pulsing arrangement, included within the service observing circuit, is provided for loop identification.
- 3.134** A loop-reduction circuit may be provided on an optional basis. This feature is discussed in Section 961.501.01.
- 3.135** The service observing circuit is connected to the service observing desk by a 6-conductor trunk.
- 3.136** Where the service observing desk is not located in the same building as the service observing trunk, a plug-in type voice-frequency amplifier is required in the MF pulsing transmission path to offset the trunk conductor loss at 1000 cycles up to a maximum of 13.5 db, and a second voice-frequency amplifier is required in the talking transmission path.
- 3.137** One CAMA observing circuit and its associated equipment are mounted on one relay rack bay in the step-by-step intertoll office with CAMA.

Method of Operation

- 3.138** The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.
- 3.139** If loop reduction is desired, the loop-reduction key can be set at any time, but the setting is effective only after the out-of-service key has been operated and restored.
- 3.140** The CAMA observing circuit is put in service by operating the CAMA out-of-service key to the in-service position. The observing circuit advances to a waiting-call condition

and the loop multiple test is made. (See 3.162.) Any call in progress at the time the observing circuit is placed in service is not connected.

3.141 When a call comes to the step-by-step CAMA office over a trunk that is patched for observing, and when the service observing circuit and a suitable service observing desk position are idle, the corresponding loop connector is seized, and the observing circuit sends a seizure signal to the desk.

3.142 When an observation is made on an MF pulsing incoming CAMA trunk, the CAMA sender may be ready to receive the MF pulses of the called number before the desk position circuit is ready to receive the called number MF pulses. This can happen only if there are two idle positions at the desk and one position accepts a call from some other observing circuit, leaving the second idle position to be served by this observing circuit. The call-accepted signal could then be delayed until after the MF pulsing of the called number is started. It is too late then to observe on this call, and a distinctive signal is sent to the observer and the call may be released.

3.143 If more than one loop connector is seized simultaneously, preference is given to the lowest-numbered connector. All other connectors are locked out.

3.144 The seizure signal from the step-by-step intertoll office CAMA service observing circuit competes with seizure signals from other observing circuits. One CAMA call is accepted per available position by the incoming trunk and distribution circuit at the desk, and the rest are rejected. The observing circuits carrying the rejected calls recycle and wait for another idle position. All observed calls receive a service observing mark on the AMA tape. Information so marked constitutes a service observing AMA record. This mark causes a special accounting ticket to be printed. Later, this ticket can be checked with observed data for irregularities. The service observing AMA record includes the calling number, called number, date of call, and on completed calls, the starting time and duration of conversation. On uncompleted calls, only an initial entry is made; this includes calling number, called number, date, and hour.

- 3.145** The observing circuit, upon receiving a call-accepted signal from the service observing desk, acts to lock the observed trunk to the desk position. If the call to be observed is not accepted in approximately 0.4 to 0.8 second, the observation is rejected.
- 3.146** When a call is connected to the desk, the connection is held until released by the observer.
- 3.147** After the call is accepted for observation, the trunk being observed is identified. The number of the corresponding loop connector is sent to the desk by PCI pulsing. These pulses light one of the tens and one of the units loop identification lamps at the desk. Calling customer disconnect will not interfere with the loop identification. The service observing circuit cannot be released during loop identification. Once loop identification has been started, it continues even though the customer may abandon the call.
- 3.148** If circuit trouble prevents the loop identification from being completed, the identification pulsing circuit is held 4 to 7 seconds before being released, and the IF lamp at the desk lights. The call can be observed despite identification failure.
- 3.149** The called number may be sent to the desk at the same time that the loop identification is being made. When the trunk being observed on is an MF pulsing trunk, the called number as received by the CAMA sender is sent directly to the service observing desk.
- 3.150** When the trunk being observed is a DP trunk, a fast bylink register takes dial pulsing in a minimum time after seizure without signaling attachment to the originating office. The called number is obtained in the following manner. The DP trunk routes all ten (or seven, as the case may be) digits into a bylink register, from which they are MF outpulsed to the sender. If a register is not available in time to take the first digit, the trunk returns a reorder tone to the customer and the observer. After each digit, while waiting for the next digit or for the sender, the register time-out is 5 to 7.7 seconds. If the register times out, an overflow signal is sent to the trunk which sends a reorder tone to the calling customer and the observer. In the event that the register link does not cut through successfully, a reorder tone is returned to the customer and the observer. Upon receiving a sender-attached signal, the register will MF outpulse all received digits to the sender and the observing desk.
- 3.151** If more than two MF frequencies are received for one digit of the called number, an overflow tone is sent to the customer and observer, and a distinctive lamp signal is provided at the desk. If too few digits are received for the called number, a reorder tone is sent to the customer and the observer. (See Fig. 13.)
- 3.152** After the called number is sent to the desk, a start signal is sent to the MF receiver to prepare it for receiving the calling number. In cases where the call-accepted signal is delayed until after the MF pulsing of the called number is started, it is too late then to observe on this call, and a flashing lamp (240 ipm) signal is sent to the desk, so that the call may be replaced.
- 3.153** Where the originating local office is arranged for ANI of the calling number, the step-by-step CAMA incoming trunk circuit signals the originating office when the sender is ready to receive the calling number. The originating office proceeds to transmit the calling number, preceded by an information digit (see 1.06), through the CAMA incoming trunk circuit into the sender on an MF basis. These digits are transmitted to the desk and then displayed on the calling number display panel of the service observing desk. (See Fig. 1B.) In case of failure to identify the calling number, the information digit transmitted to the sender will inform it of the situation; if the ANI equipment fails to outpulse or to complete outpulsing the calling number, the sender will time out. In these cases, the sender will then call for a CAMA position.
- 3.154** When the originating office is not arranged for ANI, the sender calls for a CAMA position during or after the pulsing of the called number.
- 3.155** When an idle CAMA position is found, it is attached to the CAMA sender. The CAMA operator then obtains the calling number from the customer and keys it into the sender. The observer can hear the number given to the CAMA operator and see it displayed on the calling number display panel.

3.156 Before the CAMA sender releases itself and the CAMA position, the sender receives a signal from the AMA equipment indicating that the information sent is satisfactory. If the information sent to the AMA equipment is not satisfactory, the sender sends a reorder signal to the position. The CAMA operator operates a register reset key, wiping out the calling number digits in the sender and at the observing desk, and keys the number again. If the information is still unsatisfactory, the operator can operate the position disconnect key, releasing the position and sending the customer and observer a reorder tone, and operating a distinctive lamp signal at the desk. Indications of the operation of the reset key and disconnect key are given to the service observer.

3.157 If while keying the calling number, the CAMA operator should depress two keys at once, partially depress a key, send too many or too few digits, or if circuit trouble should simulate any of these errors, the sender sends a reorder signal to the position. The register reset key is operated, wiping out the digits registered, and the number is rekeyed. The sender records the error, and if a second error is made on the same call, an overflow tone is sent to the customer and to the observer. (See signal chart, Fig. 13.)

3.158 If the operator realizes that she has keyed a wrong digit or if in keying for the second time, she realizes before completing keying that she has made one of the preceding errors, she can operate the register reset key to wipe out the numbers keyed and rekey the number. If the register reset key is operated before seven digits have been keyed, no record of the error is made by the sender.

3.159 Signals to indicate various steps in the progress of the call and supervisory signals are sent to the observing desk. These are shown in sequence in Fig. 13.

3.160 The observation is released by the operation of the release and stand-by (RLS-STBY) key at the observing desk position to the release or stand-by position. When the observation is completed and the RLS-STBY key operated, any lighted lamps are extinguished. The service observing circuit restores to normal and is prepared to accept a new call.

3.161 When a call is abandoned, as much information as possible is obtained. Loop identification is always sent to the desk. If a call on a DP trunk is abandoned before the sender is attached to the incoming trunk, no digits will be received at the desk. On an MF trunk, when a call is abandoned, there will be a partial or complete display on the panel at the desk, depending on the number of digits received before abandoning the call.

Alarm Facilities

3.162 A test is made for battery and ground of all leads (except the mark leads) that will be extended to the observed trunk circuits by the operation of the loop connector. The test is made each time the observing circuit advances to a waiting call condition and prevents false conditions from being extended into, or interfering with, the observed trunk circuits. If the test fails, the audible office alarm is given, the alarm lamp at the equipment location is lighted, and the observing circuit is made inoperative. An alarm key may be operated, cutting off the audible alarm and keeping the alarm lamp lit. When the trouble is cleared, the alarm key is released, the lamp is extinguished, and the observing circuit is ready for operation.

4. COMBINED AMA AND CAMA SERVICE OBSERVING CIRCUITS FOR NO. 5 CROSSBAR OFFICE

4.01 The service observing arrangements for observing on a No. 5 crossbar office arranged for handling AMA (see 2.01 through 2.40) or CAMA (see 3.01 through 3.42) traffic, are also adapted, for observing on both using some equipment in common (see following paragraphs).

4.02 The AMA and CAMA observing circuits can be connected to the service observing desk by a set of common conductors. This arrangement permits observing on either an AMA or a CAMA call, depending on the setting of the class selection key at the desk. The AMA and CAMA observing circuits can also be connected by separate sets of conductors. This arrangement enables an observation on an AMA call while an observation is being made on a CAMA call at the same desk, but not at the same position.

4.03 The common or separate conductors used for observing on AMA and CAMA traffic can also be used for observing on local dial, providing that local dial facilities are located in the same originating office and that observations are being made at the same desk. The class of observation made over a set of conductors depends on the setting of the keys at the desk.

4.04 A block diagram of the combined AMA and CAMA service observing in a No. 5 crossbar office is shown in Fig. 14.

A. Equipment Elements

4.05 For observing on both AMA and CAMA traffic in an office, an AMA service observing circuit, a CAMA service observing circuit, a trunk selection and control circuit, a service observing register and MF pulsing circuit, and service observing register connector circuits (one per marker) are required. For observing on local dial traffic in the same office with AMA or AMA and CAMA traffic, a local dial observing circuit is required in addition to the appropriate preceding arrangement.

4.06 Both the AMA and CAMA trunks and junctors carry FACD and HACD traffic. FACD traffic generally consists of ten digits, and HACD traffic of seven digits. A stations digit can also be sent on both kinds of traffic.

4.07 When both AMA and CAMA traffic are observed in an office, six or 12 conductors are used, depending on whether arrangements are made for common or separate conductors. As common conductors necessarily limit the number of observations on each class, the effect on service observing quotas must be considered.

4.08 Three types of keys, located on the cable-turning section of the desk, are used to control the type and number of observations: the class selection (SW1) key, the loop-reduction (SW) key, and the out-of-service (OS) key.

4.09 The class selection (SW1) key is required for observing on AMA traffic, and also for observing on CAMA traffic when common conductors are used for AMA and CAMA observing. One key is required per trunk selection and control circuit. The key has three positions: one position selects foreign area AMA traffic; the second position selects home' and

foreign area AMA traffic; the third position selects CAMA traffic. The CAMA position of the key is not used when separate conductors are used for AMA and CAMA observing.

4.10 The loop-reduction (SW) key is an optional feature providing flexibility in selection of observations. One key is required per set of conductors from the trunk selection and control circuit. This feature is discussed in Section 961.501.01. This key is a 3-position key, and the loop-reduction arrangements of the trunk selection and control circuit permit exclusion of a maximum of 96 trunks and junctors in either operating position (A or B). On AMA observations, for example, one position could exclude trunks and junctors carrying long-haul foreign area traffic, and the other, trunks and junctors carrying short-haul foreign area traffic.

4.11 The out-of-service (OS) key is always required. One key is required per set of conductors from the trunk selection and control circuit for AMA and CAMA observing. When the conductors used for AMA and CAMA observing are also used for observing on local dial, a separate out-of-service key is required for local dial. With the latter arrangement, the local dial out-of-service key must be turned to the out-of-service position for observations to be made on the AMA and CAMA traffic.

4.12 In addition to these keys mounted on the cable-turning section, each position is supplied with a class exclusion key for each class the position is to observe on. Separate class exclusion keys and trunk lamps are provided for AMA, CAMA, and local dial observations when common conductors, as well as when separate conductors, are used.

4.13 The trunk selection and control circuit, an AMA observing circuit, a CAMA observing circuit, and associated equipment are mounted on approximately two and one-half relay rack bays, and are located on a miscellaneous basis in the observed office or wire center.

B. Method of Operation

4.14 The general method of operation of the multiline call-distributing circuits is given in Section 961.501.01.

4.15 The method of operation described here refers to an AMA and CAMA observing circuit composed of a trunk selection and control circuit, an AMA observing circuit, and a CAMA observing circuit. The circuit uses common cable conductors for AMA and CAMA observing from the observed office to the observing office. Except where otherwise noted, the description for an AMA observing circuit alone (see 2.01 through 2.40) or a CAMA observing circuit alone (see 3.01 through 3.42) is also applicable to arrangements for combined AMA and CAMA observing using separate or common conductors.

4.16 The class of observation is selected by the class selection key before the trunk is put into service. The position of this key causes all markers in the observed office to select the one class or type of class of call for presentation to the incoming trunk and distribution circuit at the desk. The key can be reset at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

4.17 When observing on AMA and CAMA traffic over separate conductors, each is presented as a class to the incoming trunk and distribution circuit. Under these conditions, the class selection key selects only one of two types of AMA traffic. Both AMA and CAMA traffic in an office can be observed at the same time, but observations on both classes cannot be started simultaneously. Only one class can be observed on until the trunk identification, calling number (CAMA only), and called number have been sent to the desk; then an observation on the other class can begin.

4.18 If loop reduction is used, the loop-reduction key or keys can be reset at any time, but the new setting is effective only after the out-of-service key has been operated and restored.

4.19 The AMA and CAMA observing circuits are put in service by operating the respective out-of-service keys to the in-service position. An observation is initiated only when the observing circuit is idle and a position at the desk is occupied and idle.

C. Alarm Facilities

4.20 The alarm facilities are the same as those used for the AMA or CAMA service observing circuits (see 2.40 or 3.42) in a No. 5 crossbar office.

5. POSITION CIRCUIT

5.01 The call-distributing service observing circuits for AMA and CAMA and all other classes of service observing are brought into the service observing desk through the incoming trunk and distribution circuit. (See Section 961.501.01.) This circuit connects the service observing circuit to the position circuit of the desk. (See Section 961.501.01.)

A. Equipment Elements for AMA and CAMA Classes

5.02 Digit-recording circuits and lamps are required to display the called and calling numbers. For AMA or CAMA observing, three indicator strips are required to display an 11-digit called number. For CAMA observing, a second group indicator, consisting of at least two indicator strips, is required to display a 7-digit calling number. When ANI is available, a third indicator strip is required to display the information digit. (See Fig. 1B.)

5.03 Toll supervisory lamps designated FSV and RSV are used for AMA and CAMA observing. The functions of these lamps are shown on the signal charts for each type of observing.

5.04 Dial progress lamps designated S, R, and F are used in group 1 indicator for AMA observing. For CAMA observing, dial progress lamps designated S, R, F, and K are used in group 1 indicator, and lamps designated S, D, R, and W are used in group 2 indicator (calling number display). An F lamp is used in group 2 indicator for ANI. The functions of these lamps are shown on the signal charts for each type of observing.

5.05 Certain figures of the position circuit for loop identification and recording are required and are connected to the position through the position and loop identification sequence figure. Loop identification lamps and an IF lamp are required. A loop identification timing circuit is required to control the IF lamp.

5.06 A figure for trunk lamp control is required if more than 100 AMA trunks are observed on, or if CAMA team identification is provided for crossbar tandem CAMA observing.

5.07 A double pen register is required in each position arranged for No. 1 step-by-step AMA offices. One pen records the called number and the calling station disconnect. The other pen records any supervisory indication, for example, called-station answer, disconnect, no circuit, line busy, reorder, etc. (See Fig. 5.)

5.08 At each position arranged for No. 1 step-by-step AMA offices, a pen cutoff (PCO) key is provided to disconnect the pen register if it chatters during a nondialing period.

5.09 The position circuit requires one set of options for observing on AMA, CAMA, No. 5 crossbar intertoll, crossbar tandem intertoll and/or step-by-step intertoll trunks, and another set for observing on step-by-step intertoll trunks.

6. MAINTENANCE FEATURES FOR SERVICE OBSERVING AND ASSOCIATED CIRCUITS

A. No. 5 Crossbar AMA and CAMA Offices

6.01 The service observing circuit which observes on outgoing AMA trunk and junctor circuits from No. 5 crossbar offices arranged for AMA, the service observing circuit that observes on incoming CAMA trunk and junctor circuits to No. 5 crossbar offices arranged for CAMA, the associated trunk selection and control circuit, the service observing register and MF pulsing circuit, and the service observing register connector circuit are tested from the sender test frame in a No. 5 crossbar office to a No. 12 service observing desk position.

6.02 A talking path is required and established between the testmen at the frame in a No. 5 crossbar office and a No. 12 desk position as shown in a figure of Section 961.501.01.

B. No. 1 Step-by-Step AMA Offices

6.03 The position and telephone circuits, as employed for No. 1 step-by-step AMA observing, can be tested on an operational basis from from the No. 1 step-by-step AMA office to

the No. 12 service observing desk, with a testman at each respective location.

6.04 A talking trunk is required and is established between these two points via the intraoffice trunk, as shown in a figure of Section 961.501.01.

C. Crossbar Tandem CAMA Offices

6.05 The service observing circuit which observes on incoming CAMA trunk circuits to crossbar tandem offices arranged for CAMA, the associated PCI pulse monitoring circuit, the PCI/MF converter, the DP/MF converter, and the GP/MF converter are tested from the crossbar tandem automatic test frame in a crossbar tandem office to a No. 12 service observing desk position.

6.06 A talking path is required and established between the testmen at the frame in a crossbar tandem office and a No. 12 desk position, as shown in a figure of Section 961.501.01.

D. No. 4A or 4M Crossbar CAMA Office

6.07 The service observing circuit which observes on incoming CAMA trunk circuits to No. 4A or 4M crossbar offices arranged for CAMA is tested from the No. 4A or 4M crossbar trunk test frame in a No. 4A or 4M crossbar office to a No. 12 service observing desk position.

6.08 A talking path is required and established between testmen at the frame in a No. 4A or 4M crossbar office and a No. 12 desk position, as shown in a figure of Section 961.501.01.

E. Step-by-Step Intertoll CAMA

6.09 The service observing circuit which observes on incoming CAMA trunk circuits to the step-by-step intertoll offices arranged for CAMA is tested by means of a portable step-by-step CAMA test set, which is connected by means of a patch cord to a trouble ticketer and test frame and then to the No. 12 service observing desk position.

6.10 A talking path is required and established between testmen at the portable test set in a step-by-step intertoll CAMA office and a No. 12 desk position, as shown in a figure of Section 961.501.01.

NO. 5 CROSSBAR OFFICE WITH AMA

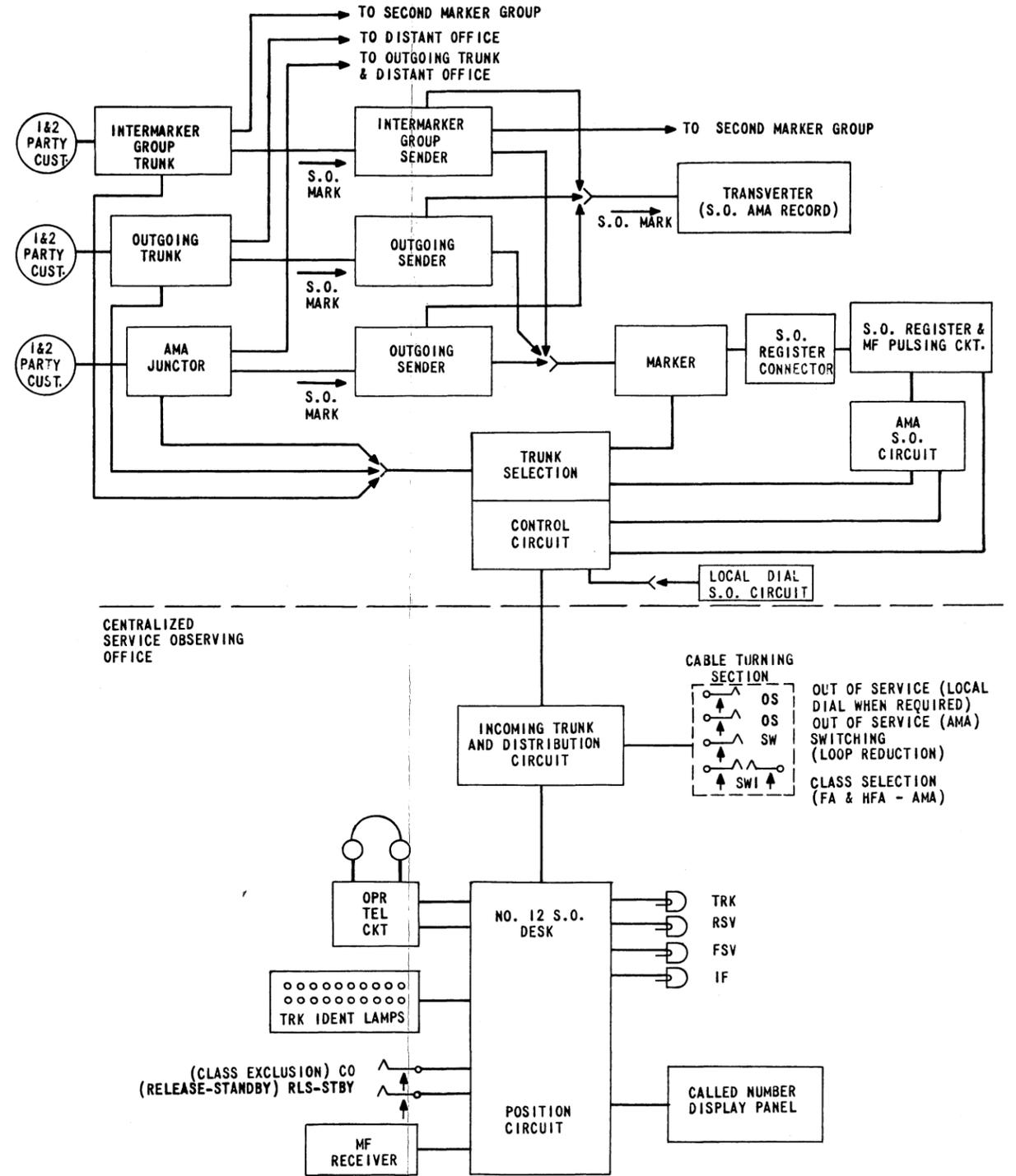


Fig. 2 - No. 5 Crossbar AMA Service Observing

SERVICE OBSERVING DESK LAMP SIGNALS

EVENTS	TRK	FSV	LOOP IDENT	S ₁ *	IND 1	F ₁ *	RSV	IF	R ₁ *	NOTES
					CALLED NO.					
TYPICAL CALL SEQUENCE:										
CALL ACCEPTED	○	○								
LOOP IDENTIFICATION	(1)	○	○					2		1,2
SENDER ATTACHED				○						
SENDER RELEASED				●						
CALLER NUMBER DIGITS RECEIVED					○					
ST PULSE RECEIVED		↓				○				
CALLER PARTY ANSWERS		●								5
CALLER PARTY DISCONNECTS		○								6
CALLING PARTY DISCONNECTS	↓	●	↓				○			
OBSERVATION RELEASED	●		●		●	●	●			
OTHER CONDITIONS:										
CALL ABANDONED		●	○	●			○			3
MORE THAN 2 MF FREQUENCIES REC FOR 1 DIGIT									○	4
TOO MANY DIGITS RECEIVED					○					4
TOO FEW DIGITS RECEIVED										4

- LAMP ON
- LAMP OFF
- ⊕ LAMP FLASHING (120 IPM)
- ↓ CONTINUING LIGHTED CONDITION
- () NOTES
- * SUBSCRIPTS REFER TO THE INDICATOR PANEL

NOTES:

1. WHEN MORE THAN ONE HUNDRED TRUNKS ARE OBSERVED ON, THE TRUNK LAMP LIGHTS STEADILY FOR TRUNKS 0-99 AND FLASHES AT 120 IPM FOR TRUNKS 100-179. THE FLASHING LAMP LIGHTS STEADILY AFTER APPROXIMATELY 15 SECONDS.
2. LOOP IDENTIFICATION CAN BE GIVEN AT ANY TIME WITHIN A LIMITED PERIOD AFTER THE CALL IS RECEIVED AT THE OBSERVING DESK. FAILURE OF LOOP IDENTIFICATION CAUSES THE IF LAMP TO LIGHT AND REMAIN ON FOR THE DURATION OF THE OBSERVATION.
3. LOOP IDENTIFICATION IS COMPLETED. IF THE CALL IS ABANDONED BEFORE THE CALLED NUMBER IS DISPLAYED, THE CALLED NUMBER WILL BE SENT TO THE DESK. ON OTHER THAN INTERMARKER TRUNKS, A "HOLD FORWARD" PERIOD OF 4 TO 7 SECONDS FOLLOWING DISCONNECT BY THE CALLING PARTY IS PROVIDED. DURING THE HOLD FORWARD PERIOD THE FSV LAMP FOLLOWS FORWARD SUPERVISION.
4. IF MORE THAN 11 DIGITS ARE RECEIVED FOR THE CALLED NUMBER AT THE DESK, AN "X" PATTERN FORMED OF THE NUMBERS 1,3,5,7, AND 9 IS LIT IN THE 12TH DIGIT SPACE OF THE FIRST INDICATOR. (SEE FIG. 14). IF ONE OF THE DIGITS OF THE CALLED NUMBER AS RECEIVED AT THE DESK CONSISTS OF MORE THAN 2 MF FREQUENCIES OR IF TOO FEW DIGITS ARE RECEIVED, THE RESULTING ACTION DEPENDS ON THE LOCATION OF THE TROUBLE. IF THE TROUBLE IS IN THE SERVICE OBSERVING CIRCUITS, THE CALL WILL BE UNAFFECTED. IF THE TROUBLE IS IN THE NO. 5 SYSTEM, REORDER TONE WILL PROBABLY BE SENT TO THE SUBSCRIBER AND OBSERVER. THE FSV LAMP REMAINS LIT STEADILY UNTIL THE SUBSCRIBER DISCONNECTS.
5. WHEN THE CALLED SUBSCRIBER CANNOT BE REACHED, THE CALLING SUBSCRIBER RECEIVES A BUSY, REORDER OR OVERFLOW TONE. THE OBSERVER RECEIVES SIGNALS AS FOLLOWS:

CONDITION	OBSERVED TRUNK		
	OUTGOING TRUNK	AMA JUNCTION	INTERMARKER GROUP TRUNK
1. WHEN OFFICE OUTSENDER FAILS TO COMPLETE TO DISTANT OFFICE, TIMES OUT AND RELEASES	FSV FLASHES (120 IPM) & TONE, IF TRANSMITTED	FSV FLASHES (120 IPM) & TONE	FSV FLASHES (120 IPM) & TONE
2. WHEN OVERFLOW ENCOUNTERED IN ORIGINATING OFFICE	NONE	FSV FLASHES (120 IPM)	TONE
3. BUSY, REORDER, OVERFLOW OR NO CIRCUIT INDICATION RECEIVED FROM DISTANT OFFICE	FSV FLASHES (60, 120 OR 30 IPM) & TONE		
3a. TERMINATING OVERFLOW FROM STEP-BY-STEP OR PANEL OFFICE	FLASH AND TONE IF TRANSMITTED	FLASH AND TONE	FLASH AND TONE
4. WHEN INITIAL AMA ENTRY CANNOT BE MADE	FSV FLASHES (120 IPM) & TONE, IF TRANSMITTED	FSV FLASHES (120 IPM)	TONE

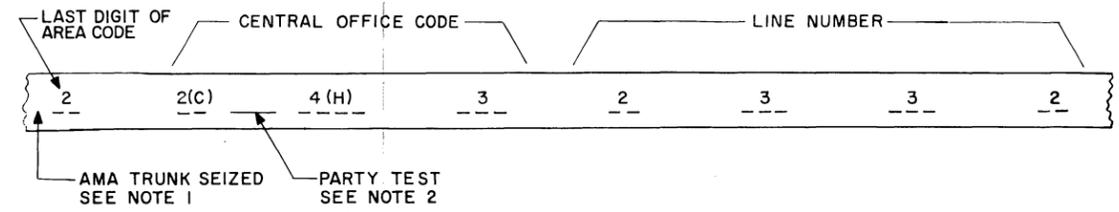
WHEN THE SUBSCRIBER DISCONNECTS, THE FSV LAMP IS EXTINGUISHED AND THE TONE IS CUT OFF. ON OBSERVATIONS ON OUTGOING TRUNKS AND JUNCTIONS, THE LAMP AND TONE SIGNALS CONTINUE THROUGH THE "HOLD FORWARD" PERIOD OF 4 TO 7 SECONDS AND THEN ARE CUT OFF.

6. IF THE CALLING PARTY HANGS UP BEFORE THE CALLED PARTY DOES, THE RSV LAMP LIGHTS. ON INTERMARKER TRUNKS THE FSV LAMP STAYS DARK AND NO INDICATION IS GIVEN WHEN THE CALLED PARTY HANGS UP. ON OTHER THAN INTERMARKER TRUNKS THE FSV LAMP FOLLOWS FORWARD SUPERVISION FOR THE "HOLD FORWARD" PERIOD OF 4 TO 7 SECONDS FOLLOWING DISCONNECT BY THE CALLING PARTY. IF THE CALLED PARTY DISCONNECTS DURING THIS INTERVAL, THE FSV LAMP LIGHTS.

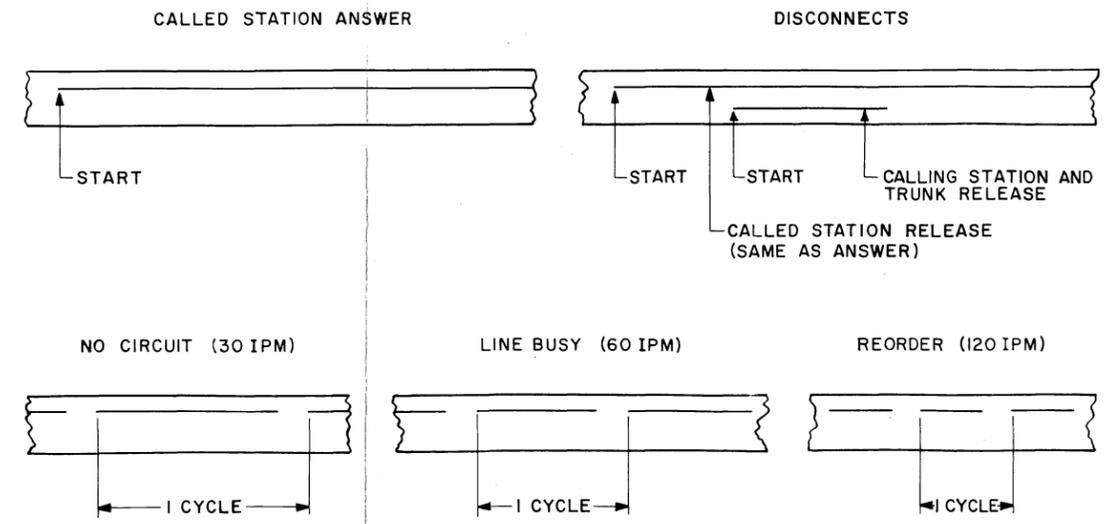
Fig. 3 - Signal Chart for AMA Observing in No. 5 Crossbar Office

PEN REGISTER TAPE INDICATIONS
TYPICAL AMA TRUNK OBSERVATION

CUSTOMER DIALING INDICATIONS — PEN NO. 1



SUPERVISORY INDICATIONS — PEN NO. 2



- NOTES:
1. THE NUMBER DIALED IN THIS ILLUSTRATION IS (N.Y.) 212-CH.3-2332. THE FIRST TWO DIGITS OF THE AREA CODE HAVE BEEN USED TO REACH THE OUTGOING AMA TRUNK.
 2. SECOND DIGIT DIALED AFTER TRUNK SEIZURE IS RECORDED IN SENDER. PARTY TEST OF THE CALLING SUBSCRIBER'S LINE IS ALWAYS MADE BETWEEN THIS AND THE NEXT DIGIT.

Fig. 5 — Pen Register Tapes for AMA Service
Observing in No. 1 Step-by-Step
(MAT) Office

NO. 5 CROSSBAR OFFICE WITH CAMA

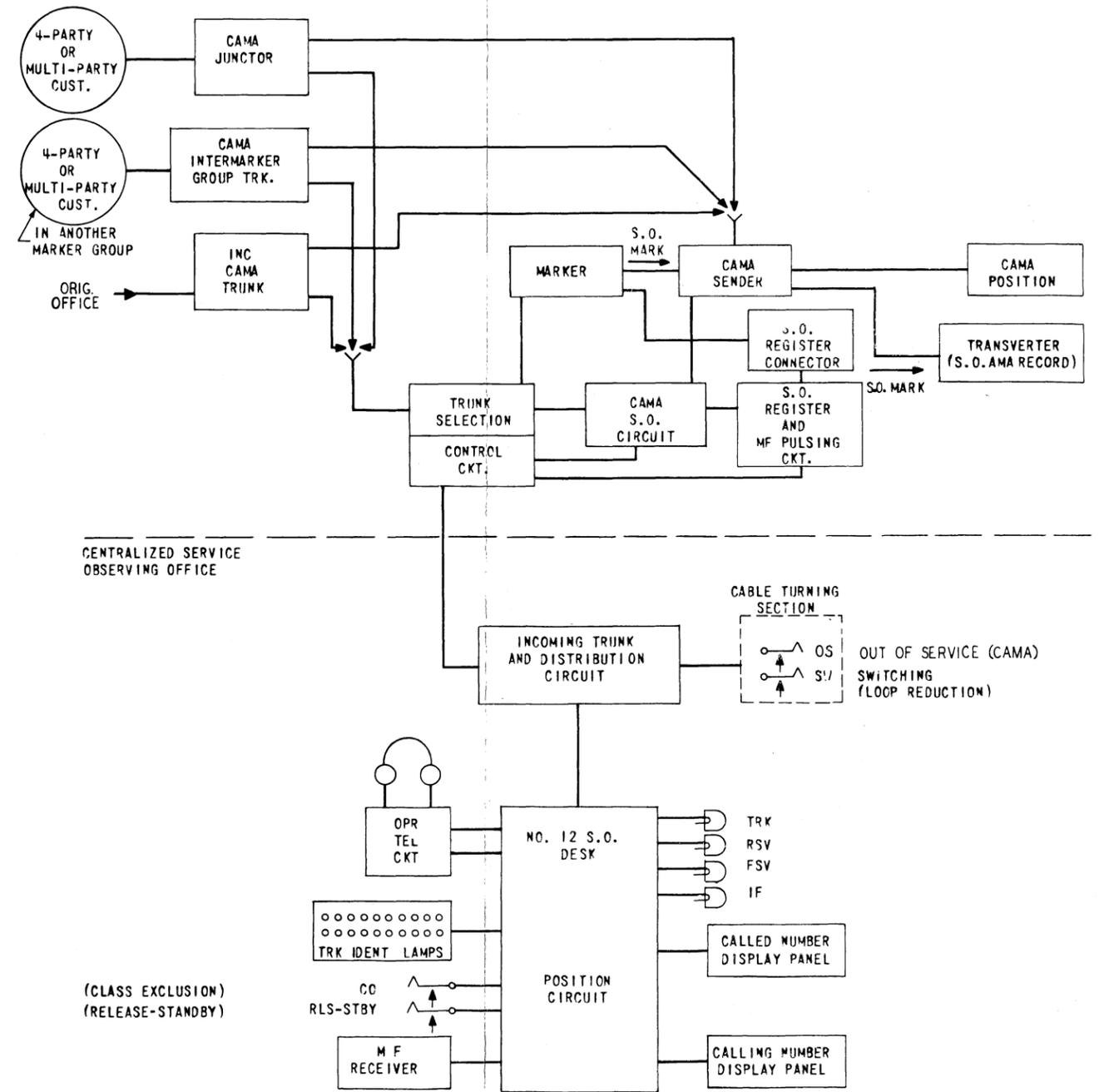


Fig. 6 - No. 5 Crossbar CAMA Service Observing

SERVICE OBSERVING DESK LAMP SIGNALS

EVENTS	TRK	FSV	LOOP IDENT	S ₁ *	IND 2	K ₂ *	S ₂ *	IND 2	F ₂ *	IND 1	F ₁ *	RSV	IF	R ₂ *	D ₂ *	W ₂ *	R ₁ *	NOTES	
					INFORM DIGIT			CALLING NO.		CALLED NO.									
TYPICAL CALL SEQUENCE:																			
CALL ACCEPTED	○	○																	
LOOP IDENTIFICATION			○										(1)					1	
CAMA SENDER ATTACHED				○															
**ANI INFORMATION DIGIT					○													10,11	
***SENDER CALLS FOR CAMA POSITION						○												10	
***CAMA POSITION ATTACHED							○											10	
CALLING NUMBER DIGITS RECEIVED								○											
**ANI START PULSE RECEIVED									○									10	
***CAMA POSITION RELEASED																		10	
SENDER RELEASED				●															
CALLER NUMBER DIGITS RECEIVED																			
START PULSE RECEIVED																			
CALLER PARTY ANSWERS																			
CALLER PARTY DISCONNECTS																			
CALLING PARTY DISCONNECTS																			
OBSERVATION RELEASED	●	●	●	●	●	●	●	●	●	●	●	●	○						
OTHER CONDITIONS:																			
CALL ABANDONED		●	○	●								○							2
CAMA POSITION ATTACHED:																			
A. MORE THAN 2 MF FREQ RECEIVED FOR 1 DIGIT														○					3
B. 1 MF FREQ RECEIVED FOR 1 DIGIT																			3
C. EXTRA DIGIT RECEIVED																			3
D. TOO FEW DIGITS RECEIVED																			3
E. POSITION DISCONNECT																			4
CAMA POSITION REORDER:																			
REGISTER RESET																			3
TOO MANY DIGITS RECEIVED FOR CALLED NO.																			5,6
MORE THAN 2 MF FREQ RECEIVED FOR 1 DIGIT OF CALLED NUMBER																			7

- LAMP ON
- LAMP OFF
- ⊕ LAMP FLASHING (120 IPM)
- ↓ CONTINUING LIGHTED CONDITION
- () NOTE REFERENCE
- * SUBSCRIPTS REFER TO RESPECTIVE INDICATOR PANELS
- ** THESE STEPS OCCUR ONLY ON AUTOMATICALLY IDENTIFIED (AI) CALLS.
- *** THESE STEPS OCCUR ON OPERATOR IDENTIFIED (OI) CALLS, ON AI CALLS REQUIRING A CAMA OPERATOR, OR IN CASES OF IDENTIFICATION FAILURE.

NOTES:

1. LOOP IDENTIFICATION CAN BE GIVEN AT ANY TIME WITHIN A LIMITED PERIOD AFTER THE CALL IS RECEIVED AT THE OBSERVING DESK. FAILURE OF LOOP IDENTIFICATION CAUSES THE IF LAMP TO LIGHT AND REMAIN ON FOR THE DURATION OF THE OBSERVATION.
2. LOOP IDENTIFICATION IS COMPLETED AND TRANSMISSION IS CUT OFF. IF A CALL IS ABANDONED BEFORE THE CALLING NUMBER IS OBTAINED, THE S LAMP IN THE FIRST INDICATOR IS EXTINGUISHED WHEN THE SENDER RELEASES, THE CALLED NUMBER IS DISPLAYED, AND THE F LAMP LIGHTS. IF A CALL IS ABANDONED WHILE THE CALLING NUMBER IS BEING KEYED, A PARTIAL OR COMPLETE CALLING NUMBER IS DISPLAYED, THE S LAMPS IN THE FIRST AND SECOND INDICATORS ARE THEN EXTINGUISHED, THE CALLED NUMBER DISPLAYED, AND THE F LAMP LIGHTED.
3. ON THE FIRST CAMA OPERATOR ERROR OR CIRCUIT TROUBLE RESULTING IN ONE OF THESE CONDITIONS, THE S LAMP IN THE SECOND INDICATOR FLASHES AND THE CAMA POSITION IS REORDERED BY THE SENDER. ON A SECOND ERROR OR CIRCUIT TROUBLE, THE S LAMP IN THE SECOND INDICATOR IS EXTINGUISHED, THE OBSERVED TRUNK IS SET TO OVERFLOW, SENDING A TONE TO THE SUBSCRIBER AND OBSERVER. HOWEVER, IF THE SECOND ERROR OR CIRCUIT TROUBLE CONSISTS OF ONE OUT OF FIVE OR MORE THAN 2 MF FREQUENCIES FOR ONE OF THE NUMERICAL DIGITS, AND IF THE CALL IS BULK BILLED, THE CALL WILL BE COMPLETED IN A NORMAL MANNER WITHOUT CHARGE. WHEN AN EXTRA DIGIT IS SENT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, AN "X" PATTERN IS FORMED BY THE NUMBERS 1, 3, 5, 7, AND 9 IN THE 8TH DIGIT SPACE OF THE SECOND INDICATOR (SEE FIG. 14B). IF, AS A FIRST ERROR, AN EXTRA DIGIT IS SENT AFTER A TRANSVERTER IS CONNECTED, THE ACTION IS THE SAME AS FOR A SECOND ERROR. WHEN MORE THAN 2 MF FREQUENCIES ARE SENT FOR ONE DIGIT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, THE R LAMP IN THE SECOND INDICATOR LIGHTS.
4. THE CAMA POSITION IS DISCONNECTED BY A POSITION DISCONNECT KEY AT THE CAMA POSITION. THIS IS USED IN ACCORDANCE WITH PRESCRIBED PRACTICES. IF THE SUBSCRIBER REMAINS CONNECTED AFTER THE KEY IS OPERATED, THE OBSERVED TRUNK IS SET TO OVERFLOW, SENDING A TONE TO THE SUBSCRIBER AND THE OBSERVER. THE FSV LAMP REMAINS STEADILY LIGHTED UNTIL THE SUBSCRIBER DISCONNECTS.
5. WHEN THE REGISTER RESET KEY AT THE CAMA POSITION IS OPERATED IN RESPONSE TO A "POSITION REORDER" SIGNAL FROM THE SENDER, ALL THE DIGITS DISPLAYED IN THE SECOND INDICATOR ARE "WIPE OUT" AND IF THE "X" PATTERN OR R LAMP IS LIGHTED, IT WILL BE EXTINGUISHED. THE S LAMP IN THE SECOND INDICATOR STOPS FLASHING AND LIGHTS STEADILY. THE W LAMP IN THE SECOND INDICATOR REMAINS LIGHTED UNTIL THE OBSERVATION IS RELEASED.
6. THE REGISTER RESET KEY CAN ALSO BE OPERATED WITHOUT A REORDER SIGNAL. IF A CAMA OPERATOR HITS A WRONG KEY, OPERATES TWO KEYS SIMULTANEOUSLY, OR PARTIALLY OPERATES A KEY, SHE CAN OPERATE THE REGISTER RESET KEY AND "WIPE OUT" THE DIGITS REGISTERED. THE W LAMP LIGHTS TO INDICATE THE OPERATION TO THE OBSERVER. IF THE REGISTER RESET KEY IS OPERATED BEFORE SEVEN DIGITS ARE KEYED, THE S LAMP IN THE SECOND INDICATOR REMAINS LIGHTED STEADILY AND THE SENDER RETAINS NO MEMORY OF THE REGISTER RESET OPERATION. THE CALLING NUMBER IS THEN REKEYED.
7. IF MORE THAN 11 DIGITS ARE RECEIVED FOR THE CALLED NUMBER AT THE DESK, AN "X" PATTERN FORMED OF THE NUMBERS 1, 3, 5, 7, AND 9 IS LIT IN THE 12TH DIGIT SPACE OF THE FIRST INDICATOR (SEE FIG. 14A). IF ONE OF THE DIGITS OF THE CALLED NUMBER AS RECEIVED AT THE DESK CONSISTS OF MORE THAN 2 MF FREQUENCIES, THE RESULTING ACTION DEPENDS ON THE LOCATION OF THE TROUBLE. IF THE TROUBLE IS IN THE SERVICE OBSERVING CIRCUITS, THE CALL WILL BE UNAFFECTED. IF THE TROUBLE IS IN THE NO. 5 SYSTEM, REORDER TONE WILL PROBABLY BE SENT TO THE SUBSCRIBER AND OBSERVER. THE FSV LAMP REMAINS LIT STEADILY UNTIL THE SUBSCRIBER DISCONNECTS.

NOTES (CONT):

8. IF THE CALL ENCOUNTERS DIFFICULTY WHILE THE CAMA SENDER IS ATTACHED, THE OBSERVED TRUNK IS SET TO OVERFLOW, RESULTING IN A TONE TO THE SUBSCRIBER AND OBSERVER, AND THE FSV LAMP REMAINS LIGHTED STEADILY UNTIL THE SUBSCRIBER DISCONNECTS. IF THE CALL ENCOUNTERS DIFFICULTY OR LINE BUSY AFTER THE CAMA SENDER IS RELEASED, A TONE IS SENT TO THE SUBSCRIBER AND OBSERVER, AND THE FSV LAMP FLASHES UNTIL THE SUBSCRIBER DISCONNECTS, AND AT THAT TIME IT IS EXTINGUISHED. IF THE CALL IS AN INTRAOFFICE CALL, THE SUBSCRIBER AND OBSERVER RECEIVE ONLY TONE AND THE FSV LAMP REMAINS LIGHTED STEADILY UNTIL THE SUBSCRIBER DISCONNECTS.
9. IF THE CALLING PARTY HANGS UP BEFORE THE CALLED PARTY DOES, THE RSV LAMP LIGHTS, BUT THE FSV REMAINS DARK. NO INDICATION IS GIVEN IN THIS CASE WHEN THE CALLED PARTY HANGS UP.
10. AUTOMATICALLY IDENTIFIED (AI) CALLS NORMALLY OMIT ALL CAMA POSITION OPERATIONS. HOWEVER, IN CASES OF IDENTIFICATION FAILURES, MULTIPARTY LINE CALLS AND CALLS ENCOUNTERING TROUBLE AFFECTING DIGIT PULSING, A CAMA OPERATOR IS CALLED IN FOLLOWING THE INFORMATION DIGIT AND THERE IS NO SUBSEQUENT ANI START PULSE. ANY DIGITS DISPLAYED ON GROUP 2 INDICATOR ARE WIPE OUT.
11. IN AUTOMATIC NUMBER IDENTIFICATION (ANI) OPERATION, VARIOUS CONDITIONS CAN BE IDENTIFIED ON THE DISPLAY PANEL BY AN INFORMATION DIGIT WHICH PRECEDES PULSING OF THE CALLING NUMBER.

Fig. 7 - Signal Chart for CAMA Service Observing in No. 5 Crossbar Office

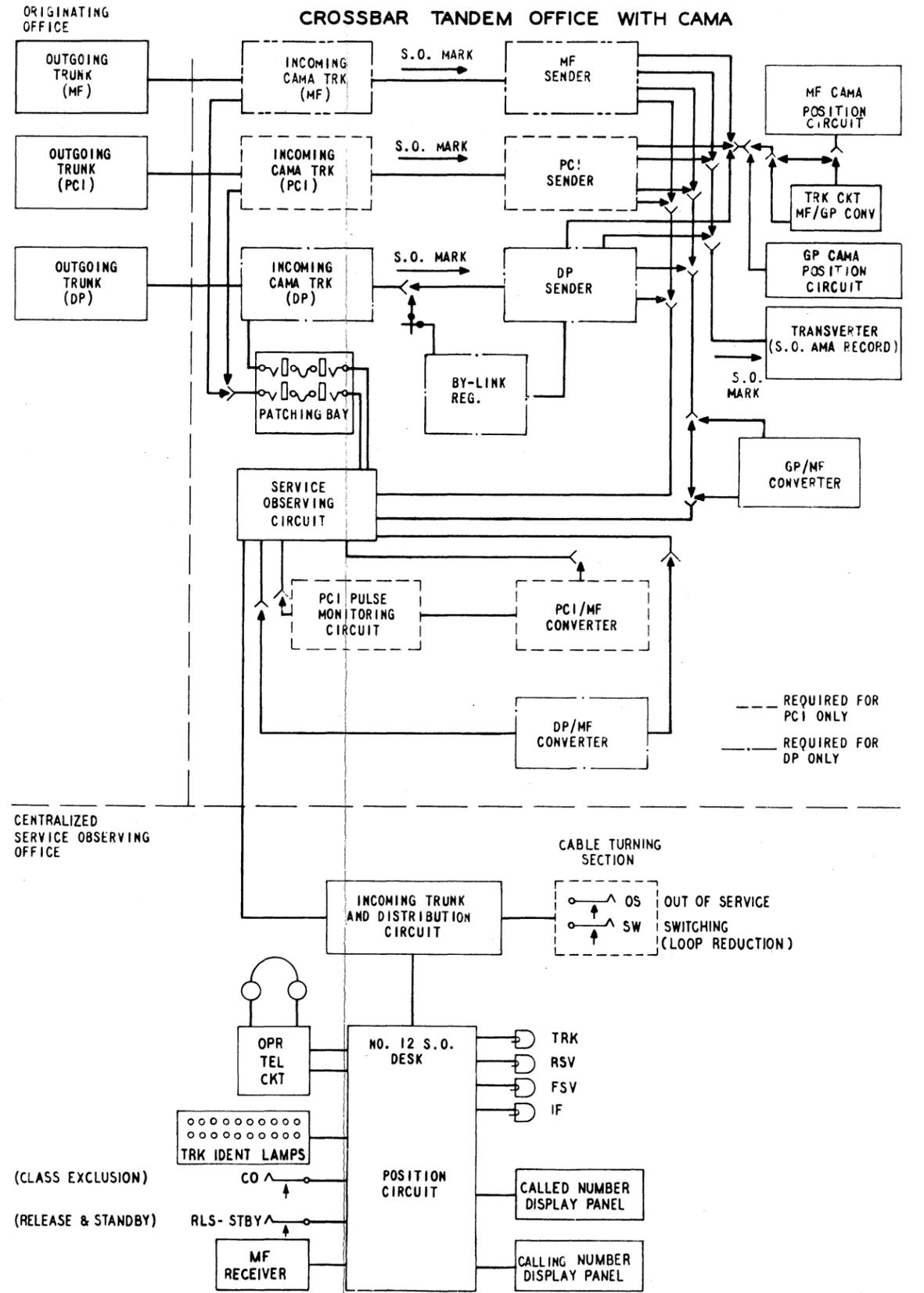


Fig. 8 - Crossbar Tandem CAMA Service Observing

SERVICE OBSERVING DESK LAMP SIGNALS

EVENTS	TRK	FSV	LOOP IDENT	S ₁ *	IND 1		K ₂ *	S ₂ *	IND 2		F ₂ *	RSV	IF	R ₁ *	D ₂ *	W ₂ *	R ₂ *	NOTES	
					CALL NO.	F ₁ *			INFORM DIGIT	CALLING NO.									
TYPICAL CALL SEQUENCE:																			
TRUNK SEIZURE	○	○																	
LOOP IDENTIFICATION			○										(1)					1	
CAMA SENDER ATTACHED				○														2	
CALLER NUMBER DIGITS RECEIVED					○														
START PULSE RECEIVED						○													
**ANI INFORMATION DIGIT																		9,10	
***SENDER CALLS FOR CAMA POSITION																		6,9	
***CAMA POSITION ATTACHED	(7)																	7,9	
CALLING NUMBER DIGITS RECEIVED																			
**ANI START PULSE RECEIVED																		9	
***CAMA POSITION RELEASED																		9	
SENDER RELEASED																			
CALLER PARTY ANSWERS																		15,17	
CALLER PARTY DISCONNECTS																			
CALLING PARTY DISCONNECTS																			
OBSERVATION RELEASED																		16	
OTHER CONDITIONS:																			
CALL ABANDONED																		3	
INVALID PCI PULSE RECEIVED						(4)												4	
TOO FEW DIGITS RECEIVED FOR CALLED NUMBER																		5	
MORE THAN 2 MF FREQ RECEIVED FOR 1 DIGIT OF CALLED NUMBER																		8	
**CAMA POSITION ATTACHED:																			
A. 3/5 REGISTRATION DETECTED																		○(11)	11
B. 1/5 REGISTRATION DETECTED																		⊕(11)	11
C. EXTRA DIGIT SENT																		⊕(11)	11
D. TOO FEW DIGITS SENT																		⊕(11)	11
E. POSITION DISCONNECT																		⊕(12)	12
CAMA POSITION REORDER:																			
REGISTER RESET																		○(14) ●(13)	13,14

- LAMP ON
 ● LAMP OFF
 ⊕ LAMP FLASHING (120 IPM)
 ▼ CONTINUING LIGHTED CONDITION
 () NOTE REFERENCE

* SUBSCRIPTS REFER TO RESPECTIVE INDICATOR PANELS.

** THESE STEPS OCCUR ONLY ON AUTOMATICALLY IDENTIFIED (AI) CALLS.

*** THESE STEPS OCCUR ON OPERATOR IDENTIFIED (OI) CALLS, ON AI CALLS REQUIRING A CAMA OPERATOR, OR IN CASES OF IDENTIFICATION FAILURE.

NOTES:

- LOOP IDENTIFICATION CAN BE GIVEN AT ANY TIME WITHIN A LIMITED PERIOD AFTER THE CALL IS RECEIVED AT THE OBSERVING DESK. FAILURE OF LOOP IDENTIFICATION CAUSES THE IF LAMP TO LIGHT AND REMAIN ON FOR THE DURATION OF THE OBSERVATION.
- IN "BY-LINK" OPERATION, IF THE BY-LINK REGISTER FAILS TO ATTACH TO THE INCOMING TRUNK BEFORE THE DIALING BEGINS, OR IF THE SENDER FAILS TO ATTACH BEFORE THE END OF THE THIRD DIGIT, THE TRUNK CIRCUIT RETURNS A REORDER TONE WHICH IS HEARD BY THE OBSERVER. THE FSV LAMP LIGHTS STEADILY AND ANY DIGITS RECEIVED ARE DISPLAYED.
- LOOP IDENTIFICATION IS COMPLETED, THE CALLED NUMBER, IF RECEIVED, IS DISPLAYED, AND THE TRANSMISSION IS CUT OFF. IF A CALL ON A PCI PULSING TRUNK IS ABANDONED BEFORE THE CALLED NUMBER IS OUTPULSED BY THE ORIGINATING SENDER, A SERIES OF "0'S" IS DISPLAYED. IF A CALL ON A PCI PULSING TRUNK IS ABANDONED WHILE THE SENDER IS ATTACHED, THE DISCONNECT IS NOT RECOGNIZED UNTIL THE SENDER RELEASES. IF A CALL ON A NON BY-LINK DIAL PULSING TRUNK IS ABANDONED BEFORE THE SENDER IS ATTACHED TO THE INCOMING TRUNK, THE CALLED NUMBER WILL NOT BE DISPLAYED. IF A CALL ON A DIAL PULSING TRUNK IS ABANDONED DURING THE PULSING, ANY DIGITS STORED BY THE DP/MF CONVERTER ARE SENT TO THE DESK. IF A CALL IS ABANDONED WHILE THE CALLING NUMBER IS BEING KEYPED, A PARTIAL OR COMPLETE CALLING NUMBER WILL BE RECEIVED AND THE S LAMPS IN THE FIRST AND SECOND INDICATORS ARE EXTINGUISHED.
- AN "I" PATTERN IS FORMED BY THE NUMBERS 1,3,4,5,6,7, AND 9 IN THE 12TH DIGIT SPACE OF THE FIRST INDICATOR AND THE DIGIT "0" IS SHOWN IN PLACE OF THE INVALID PULSE. THE "I" PATTERN IS SHOWN FOR ONLY THE FIRST INVALID PULSE. (SEE FIG.14A)
- IF TOO FEW DIGITS ARE RECEIVED FOR THE CALLED NUMBER, THE SENDER TIMES OUT, SENDING A TONE TO THE SUBSCRIBER AND THE OBSERVER, AND THE FSV LAMP FLASHES.
- THIS SIGNAL IS NOT GIVEN BY THE OBSERVING CIRCUIT DESIGNED FOR PCI OBSERVING ONLY.
- ON OPERATOR IDENTIFIED (OI) CALLS, WHEN MORE THAN ONE CAMA TEAM IDENTIFICATION IS PROVIDED, THE TRK LAMP LIGHTS STEADILY FOR TEAM A, FLASHES AT 120 IPM FOR TEAM B, AND FLASHES AT 60 IPM FOR TEAM C. THE FLASHING LAMP LIGHTS STEADILY AFTER APPROXIMATELY 15 SECONDS. TEAM IDENTIFICATION CAN BE PROVIDED ONLY IF THE "SENDER CALLS FOR POSITION" SIGNAL IS PROVIDED.
- REORDER TONE IS ALSO SENT TO THE SUBSCRIBER AND OBSERVER, AND THE FSV LAMP FLASHES.
- AUTOMATICALLY IDENTIFIED (AI) CALLS NORMALLY OMIT ALL CAMA POSITION OPERATIONS. HOWEVER, EXCEPT IN CASES OF IDENTIFICATION FAILURES, MULTIPARTY LINE CALLS AND CALLS ENCOUNTERING TROUBLE AFFECTING DIGIT PULSING, A CAMA OPERATOR IS CALLED IN FOLLOWING THE INFORMATION DIGIT AND THERE IS NO SUBSEQUENT ANI START PULSE. ANY DIGITS DISPLAYED ON THE GROUP 2 INDICATOR ARE WIPED OUT.
- IN AUTOMATIC NUMBER IDENTIFICATION (ANI) OPERATION, VARIOUS CONDITIONS CAN BE IDENTIFIED ON THE DISPLAY PANEL BY THE INFORMATION DIGIT WHICH PRECEDES PULSING OF THE CALLING NUMBER.

NOTES (CONT):

- ON THE FIRST CAMA OPERATOR ERROR OR CIRCUIT TROUBLE RESULTING IN ONE OF THESE CONDITIONS, THE S LAMP IN THE SECOND INDICATOR FLASHES AND THE CAMA POSITION IS REORDERED BY THE SENDER. ON A SECOND ERROR OR CIRCUIT TROUBLE, THE S LAMP IN THE SECOND INDICATOR IS EXTINGUISHED AND THE FSV LAMP MAY FLASH OR CONTINUE TO LIGHT STEADILY. THE FSV LAMP FLASHES IF THE CALL IS CONNECTED TO AN OVERFLOW TRUNK. IF ALL OVERFLOW TRUNKS ARE BUSY, THE FSV LAMP LIGHTS STEADILY AND THE CALL IS IN A "HIGH AND DRY" CONDITION. THE FSV LAMP IS ALSO LIGHTED STEADILY AND THE CALL IS SENT THROUGH FREE IF THE SECOND ERROR OR CIRCUIT TROUBLE CONSISTS OF ONE OUT OF FIVE OR THREE OUT OF FIVE REGISTRATIONS DETECTED FOR ONE OF THE NUMERICAL DIGITS, AND IF THE CALL IS BULK BILLED. WHEN AN EXTRA DIGIT IS SENT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, AN "X" PATTERN IS FORMED BY THE NUMBERS 1,3,5,7, AND 9 IN THE 8TH DIGIT SPACE OF THE SECOND INDICATOR (SEE FIG.14B). WHEN THREE OUT OF FIVE REGISTRATIONS IS DETECTED FOR ONE DIGIT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, THE R LAMP IN THE SECOND INDICATOR LIGHTS.
- THE CAMA POSITION IS DISCONNECTED BY A POSITION DISCONNECT KEY AT THE CAMA POSITION. THIS IS USED IN ACCORDANCE WITH PRESCRIBED PRACTICES. IF THE SUBSCRIBER REMAINS CONNECTED AFTER THE KEY IS OPERATED, THE CALL IS ROUTED TO AN OVERFLOW TRUNK AND THE FSV LAMP FLASHES. IF ALL OVERFLOW TRUNKS ARE BUSY, THE FSV LAMP REMAINS LIGHTED STEADILY AND THE CALL IS IN A "HIGH AND DRY" CONDITION.
- WHEN THE REGISTER RESET KEY AT THE CAMA POSITION IS OPERATED IN RESPONSE TO A "POSITION REORDER" SIGNAL FROM THE SENDER, ALL THE DIGITS DISPLAYED IN THE SECOND INDICATOR ARE "WIPED OUT" AND IF AN "X" PATTERN HAS BEEN FORMED OR THE R LAMP IN THE SECOND INDICATOR HAS BEEN LIGHTED, THE SIGNAL WILL BE EXTINGUISHED. THE S LAMP IN THE SECOND INDICATOR STOPS FLASHING AND LIGHTS STEADILY. THE W LAMP IN THE SECOND INDICATOR REMAINS LIGHTED UNTIL THE OBSERVATION IS RELEASED.
- THE REGISTER RESET KEY CAN ALSO BE OPERATED WITHOUT A REORDER SIGNAL. IF THE CAMA OPERATOR HITS A WRONG KEY, OPERATES TWO KEYS SIMULTANEOUSLY, OR PARTIALLY OPERATES A KEY, SHE CAN OPERATE THE REGISTER RESET KEY AND "WIPE OUT" THE DIGITS REGISTERED. THE W LAMP LIGHTS TO INDICATE THE OPERATION TO THE OBSERVER. IF THE REGISTER RESET KEY IS OPERATED BEFORE SEVEN DIGITS ARE KEYPED, THE S LAMP IN THE SECOND INDICATOR REMAINS STEADILY LIGHTED AND THE SENDER RETAINS NO MEMORY OF THE REGISTER RESET OPERATION.
- IF THE CALL IS ROUTED TO AN OVERFLOW TRUNK, THE FSV LAMP FLASHES AND THE CALLING PARTY RECEIVES AN OVERFLOW TONE. IF NO OVERFLOW TRUNKS ARE AVAILABLE, THE FSV LAMP LIGHTS STEADILY AND THE CALL IS IN A "HIGH AND DRY" CONDITION.
- IF THE CALLING PARTY HANGS UP BEFORE THE CALLED PARTY DOES, THE FSV LAMP LIGHTS MOMENTARILY UNTIL THE RSV LAMP LIGHTS, AT WHICH TIME THE FSV LAMP AGAIN GOES DARK. NO INDICATION IS GIVEN WHEN THE CALLED PARTY HANGS UP.
- IF CALL ENCOUNTERS BY, NC OR OVERFLOW BEYOND THE TANDEM OFFICE, FSV FLASHES AND TONE WILL USUALLY BE HEARD.

Fig. 9 - Signal Chart for CAMA Service Observing in Crossbar Tandem Office

NO. 4A OR 4M CROSSBAR OFFICE WITH CAMA

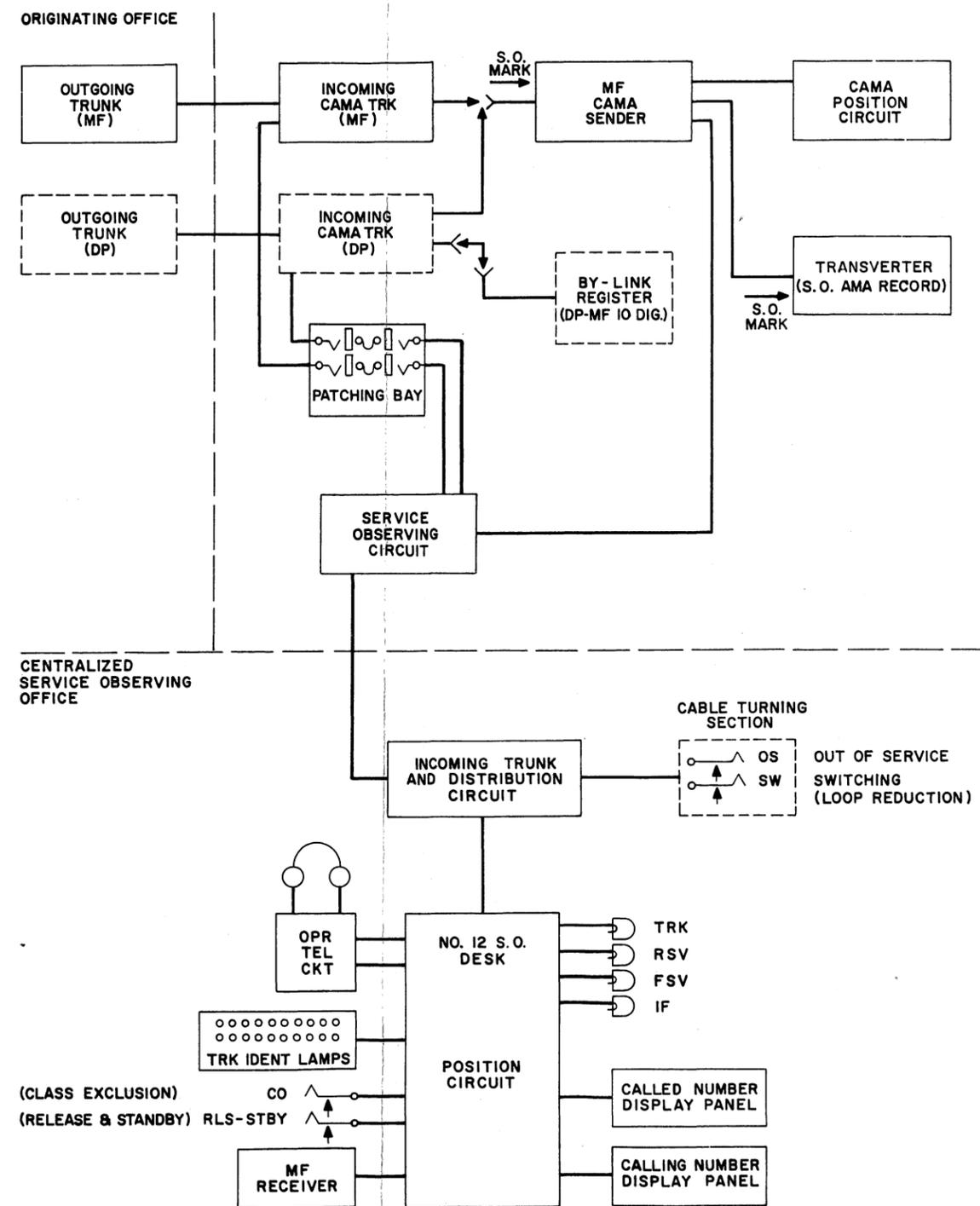


Fig. 10 - No. 4A or 4M Crossbar CAMA Service Observing

SERVICE OBSERVING DESK LAMP SIGNALS

EVENTS	TRK	FSV	LOOP IDENT	S ₁ *	IND 1 CALLED NO.	F ₁ *	IND 2 INFORM DIGIT	K ₂ *	S ₂ *	IND 2 CALLING NO.	F ₂ *	RSV	IF	R ₁ *	D ₂ *	W ₂ *	R ₂ *	NOTES	
TYPICAL CALL SEQUENCE:																			
TRUNK SEIZURE	○	○																	
LOOP IDENTIFICATION			○										(1)						1
CAMA SENDER ATTACHED				○															2
CALLER NUMBER DIGITS RECEIVED					○														
START PULSE RECEIVED						○													
**ANI INFORMATION DIGIT							○												3,4
***SENDER CALLS FOR CAMA POSITION								○											3
***CAMA POSITION ATTACHED									○										3
CALLING NUMBER DIGITS RECEIVED										○									5
**ANI START PULSE RECEIVED											○(3)								3
***CAMA POSITION RELEASED									○										
SENDER RELEASED		○		○															
CALLER PARTY ANSWERS		●																	6
CALLER PARTY DISCONNECTS		○																	
CALLING PARTY DISCONNECTS		○																	7
OBSERVATION RELEASED	●		○		○	○	○	○	○	○	○	○							
OTHER CONDITIONS:																			
CALL ABANDONED		●	○	○									○						5
TOO FEW DIGITS RECEIVED FOR CALLED NUMBER		⊕																	8
MORE THAN 2 MF FREQ RECEIVED FOR 1 DIGIT OF CALLED NUMBER		⊕												○					9
CAMA POSITION ATTACHED:																			
A. 3/5 REGISTRATION DETECTED		⊕(10)							⊕(10)									○(10)	10
B. 1/5 REGISTRATION DETECTED		⊕(10)							⊕(10)										10
C. EXTRA DIGIT SENT		⊕(10)							⊕(10)	(10)									10
D. TOO FEW DIGITS SENT		⊕(10)							⊕(10)										10
E. POSITION DISCONNECT		⊕(12)							●								○		12
CAMA POSITION REORDER:																			
REGISTER RESET									○(14)	●(13)								○(13)	13,14

- LAMP ON
- LAMP OFF
- ⊕ LAMP FLASHING (120 IPH)
- ▼ CONTINUING LIGHTED CONDITION
- () NOTE REFERENCE
- * SUBSCRIPTS REFER TO RESPECTIVE INDICATOR PANELS.
- ** THESE STEPS OCCUR ONLY ON AUTOMATICALLY IDENTIFIED (AI) CALLS.
- *** THESE STEPS OCCUR ON OPERATOR IDENTIFIED (OI) CALLS, ON AI CALLS REQUIRING A CAMA OPERATOR, OR IN CASES OF IDENTIFICATION FAILURE.

NOTES:

1. LOOP IDENTIFICATION CAN BE GIVEN AT ANY TIME WITHIN A LIMITED PERIOD AFTER THE CALL IS RECEIVED AT THE OBSERVING DESK. FAILURE OF LOOP IDENTIFICATION CAUSES THE IF LAMP TO LIGHT AND REMAIN ON FOR THE DURATION OF THE OBSERVATION.
2. IN "BY-LINK" OPERATION, IF THE BY-LINK REGISTER FAILS TO ATTACH TO THE INCOMING TRUNK BEFORE THE DIALING BEGINS, OR IF THE REGISTER TIMES OUT WHILE WAITING FOR A SENDER, THE TRUNK CIRCUIT RETURNS AN OVERFLOW TONE WHICH IS HEARD BY THE OBSERVER. THE FSV LAMP REMAINS LIGHTED AND ANY DIGITS RECEIVED ARE NOT DISPLAYED.
3. AUTOMATICALLY IDENTIFIED (AI) CALLS NORMALLY OMIT ALL CAMA POSITION OPERATIONS. HOWEVER, IN CASES OF IDENTIFICATION FAILURES, MULTI-PARTY LINE CALLS AND CALLS ENCOUNTERING TROUBLE AFFECTING DIGIT PULSING, A CAMA OPERATOR IS CALLED IN FOLLOWING THE INFORMATION DIGIT AND THERE IS NO SUBSEQUENT ANI START PULSE. ANY DIGITS DISPLAYED ON THE GROUP 2 INDICATOR ARE WIPED OUT.
4. IN AUTOMATIC NUMBER IDENTIFICATION (ANI) OPERATION, VARIOUS CONDITIONS CAN BE IDENTIFIED ON THE DISPLAY PANEL BY AN INFORMATION DIGIT WHICH PRECEDES PULSING OF THE CALLING NUMBER.
5. WHEN LOOP IDENTIFICATION IS COMPLETED AND THE CALLED NUMBER IS RECEIVED AND DISPLAYED, THE TRANSMISSION IS CUT OFF. NO DIGITS ARE DISPLAYED ON CALLS ABANDONED BEFORE THE SENDER IS ATTACHED; ANY MF DIGIT ALREADY PULSED WILL BE DISPLAYED. IF A CALL IS ABANDONED WHILE THE CALLING NUMBER IS BEING KEYED, A PARTIAL OR COMPLETE CALLING NUMBER WILL BE RECEIVED AND THE S LAMPS IN THE FIRST AND SECOND INDICATORS ARE EXTINGUISHED.
6. IF THE CALL IS ROUTED TO AN OVERFLOW TRUNK, THE FSV LAMP FLASHES AND THE CALLING PARTY RECEIVES AN OVERFLOW TONE. IF NO OVERFLOW TRUNKS ARE AVAILABLE, THE FSV LAMP LIGHTS STEADILY AND THE CALL IS IN A "HIGH AND DRY" CONDITION.
7. IF THE CALLING PARTY HANGS UP BEFORE THE CALLED PARTY DOES, THE FSV LAMP LIGHTS MOMENTARILY UNTIL THE RSV LAMP LIGHTS, AT WHICH TIME THE FSV LAMP AGAIN GOES DARK. NO INDICATION IS GIVEN WHEN THE CALLED PARTY HANGS UP.
8. IF TOO FEW DIGITS ARE RECEIVED FOR THE CALLED NUMBER, THE REGISTER OR SENDER TIMES OUT, SENDING A TONE TO THE SUBSCRIBER AND THE OBSERVER. ON MF TRUNKS, A FLASHING FSV LAMP WILL ALSO BE RECEIVED.
9. REORDER TONE IS ALSO SENT TO THE SUBSCRIBER AND OBSERVER AND THE FSV LAMP FLASHES.
10. ON THE FIRST CAMA OPERATOR ERROR OR CIRCUIT TROUBLE RESULTING IN ONE OF THESE CONDITIONS, THE S LAMP IN THE SECOND INDICATOR FLASHES AND THE CAMA POSITION IS REORDERED BY THE SENDER. ON A SECOND ERROR OR CIRCUIT TROUBLE, THE S LAMP IN THE SECOND INDICATOR IS EXTINGUISHED AND THE FSV LAMP MAY FLASH OR CONTINUE TO LIGHT STEADILY. THE FSV LAMP FLASHES IF THE CALL IS CONNECTED TO AN OVERFLOW TRUNK. IF ALL OVERFLOW TRUNKS ARE BUSY, THE FSV LAMP REMAINS LIGHTED AND THE CALL IS IN A "HIGH AND DRY" CONDITION. WHEN AN EXTRA DIGIT IS SENT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, AN "X" PATTERN IS FORMED BY THE NUMBERS 1,3,5,7, AND 9 IN THE 8TH DIGIT SPACE OF THE SECOND INDICATOR (SEE FIG. 14 B). WHEN THREE OUT OF FIVE REGISTRATION IS DETECTED FOR ONE DIGIT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, THE R LAMP IN THE SECOND INDICATOR LIGHTS. ON AN ANI CALL, IF TOO FEW DIGITS OF CALLING NUMBER ARE RECEIVED OR IF A DIGIT IS MUTILATED, THE SENDER TIMES OUT AND CALLS FOR A CAMA OPERATOR AND ANY NUMBER DISPLAY IS WIPED OUT. THE FSV LAMP REMAINS LIGHTED WITHOUT FLASHING.

NOTES (CONT):

11. IF THE TRANSVERTER FAILS TO CHECK THE CALLING AND CALLED NUMBER AS A VALID CAMA CALL, IT CAUSES THE SENDER TO REORDER THE CAMA POSITION.
12. THE CAMA POSITION IS DISCONNECTED BY A POSITION DISCONNECT KEY AT THE CAMA POSITION. THIS IS USED IN ACCORDANCE WITH PRESCRIBED PRACTICES. IF THE SUBSCRIBER REMAINS CONNECTED AFTER THE KEY IS OPERATED, THE CALL IS ROUTED TO AN OVERFLOW TRUNK AND THE FSV LAMP FLASHES. IF ALL OVERFLOW TRUNKS ARE BUSY, THE FSV LAMP REMAINS LIGHTED STEADILY AND THE CALL IS IN A "HIGH AND DRY" CONDITION.
13. WHEN THE REGISTER RESET KEY AT THE CAMA POSITION IS OPERATED IN RESPONSE TO A "POSITION REORDER" SIGNAL FROM THE SENDER, ALL THE DIGITS DISPLAYED IN THE SECOND INDICATOR ARE "WIPED OUT" AND IF AN "X" PATTERN HAS BEEN FORMED OR THE R LAMP IN THE SECOND INDICATOR HAS BEEN LIGHTED, THE SIGNAL WILL BE EXTINGUISHED. THE S LAMP IN THE SECOND INDICATOR STOPS FLASHING AND LIGHTS STEADILY. THE W LAMP IN THE SECOND INDICATOR LIGHTS AND REMAINS LIGHTED UNTIL THE OBSERVATION IS RELEASED.
14. THE REGISTER RESET KEY CAN ALSO BE OPERATED WITHOUT A REORDER SIGNAL. IF THE CAMA OPERATOR HITS A WRONG KEY, OPERATES TWO KEYS SIMULTANEOUSLY, OR PARTIALLY OPERATES A KEY, SHE CAN OPERATE THE REGISTER RESET KEY AND "WIPE OUT" THE DIGITS REGISTERED. THE W LAMP LIGHTS TO INDICATE THE OPERATION TO THE OBSERVER. IF THE REGISTER RESET KEY IS OPERATED BEFORE SEVEN DIGITS ARE KEYED, THE S LAMP IN THE SECOND INDICATOR REMAINS LIGHTED STEADILY AND THE SENDER RETAINS NO MEMORY OF THE REGISTER RESET OPERATION.

Fig. 11 - Signal Chart for CAMA Service Observing in No. 4A or 4M Crossbar Office

NO. 1 STEP-BY-STEP OFFICE WITH CAMA

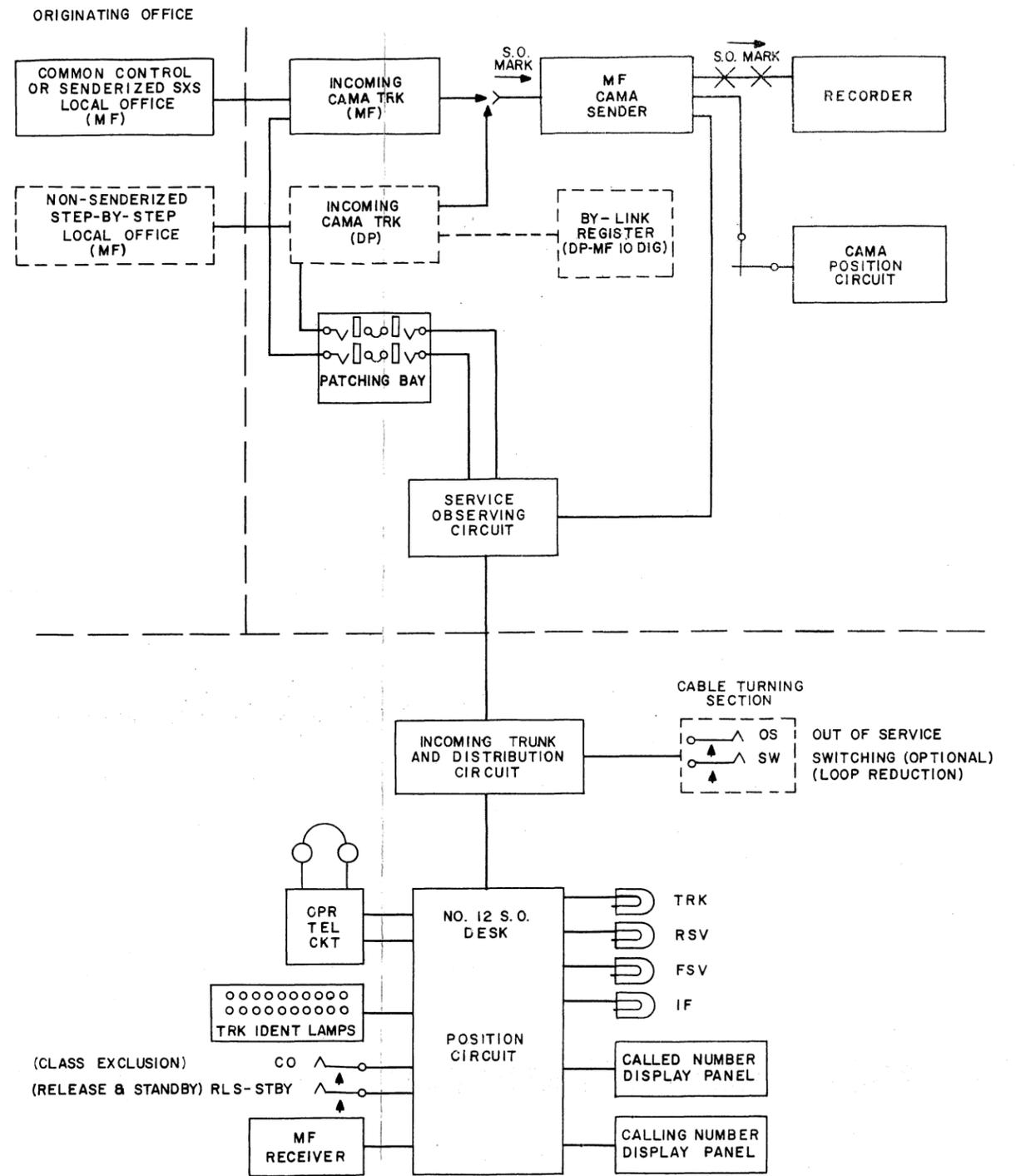


Fig. 12 - Step-by-Step Intertoll
CAMA Service Observing

SERVICE OBSERVING DESK LAMP SIGNALS

EVENTS	TRK	FSV	LOOP IDENT	S ₁ *	IND 1	F ₁ *	IND 2	K ₂ *	S ₂ *	IND 2	F ₂ *	RSV	IF	R ₁ *	D ₂ *	W ₂ *	R ₂ *	NOTES
					CALLED NO.		INFORM DIGIT			CALLING NO.								
TYPICAL CALL SEQUENCE:																		
TRUNK SEIZURE	○	○																
LOOP IDENTIFICATION			○(2)										(1)					1,2
CAMA SENDER ATTACHED				○														3
CALLER NUMBER DIGITS RECEIVED					○													
DESK POSITION CONNECTED LATE	⊕(4)																	4
START PULSE RECEIVED						○												
**ANI INFORMATION DIGIT							○											5,6
***SENDER CALLS FOR CAMA POSITION								○										5
***CAMA POSITION ATTACHED									○									5
CALLING NUMBER DIGITS RECEIVED										○								
**ANI START PULSE RECEIVED											○							5
***CAMA POSITION RELEASED									●									5
SENDER RELEASED				●														
CALLER PARTY ANSWERS		●																7,8
CALLER PARTY DISCONNECTS		○																
CALLING PARTY DISCONNECTS	●	●																9
OBSERVATION RELEASED	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
OTHER CONDITIONS:																		
CALL ABANDONED		●	○	●	○													3,10
TOO FEW DIGITS RECEIVED FOR CALLED NUMBER		⊕		●														11
MORE THAN 2 MF FREQ RECEIVED FOR 1 DIGIT OF CALLED NUMBER		⊕		●										○				12
**CAMA POSITION ATTACHED:																		
A. 3/5 REGISTRATION DETECTED		(13)							(13)								○(13)	13
B. 1/5 REGISTRATION DETECTED		(13)							(13)									13
C. EXTRA DIGIT SENT		(13)							(13)	(13)								13
D. TOO FEW DIGITS SENT		(13)							(13)									13
E. POSITION DISCONNECT		⊕(14)		●					●						○			14
CAMA POSITION REORDER:									⊕									13
REGISTER RESET									○(16)	●(15)						○(15)		15,16

- LAMP ON
- LAMP OFF
- ⊕ LAMP FLASHING (120 IPM)
- ▼ CONTINUING LIGHTED CONDITION

- () NOTE REFERENCE
- * SUBSCRIPTS REFER TO RESPECTIVE INDICATOR PANELS.
- ** THESE STEPS OCCUR ONLY ON AUTOMATICALLY IDENTIFIED (AI) CALLS.
- *** THESE STEPS OCCUR ON OPERATOR IDENTIFIED (OI) CALLS, ON AI CALLS REQUIRING A CAMA OPERATOR, OR IN CASES OF IDENTIFICATION FAILURE.

NOTES:

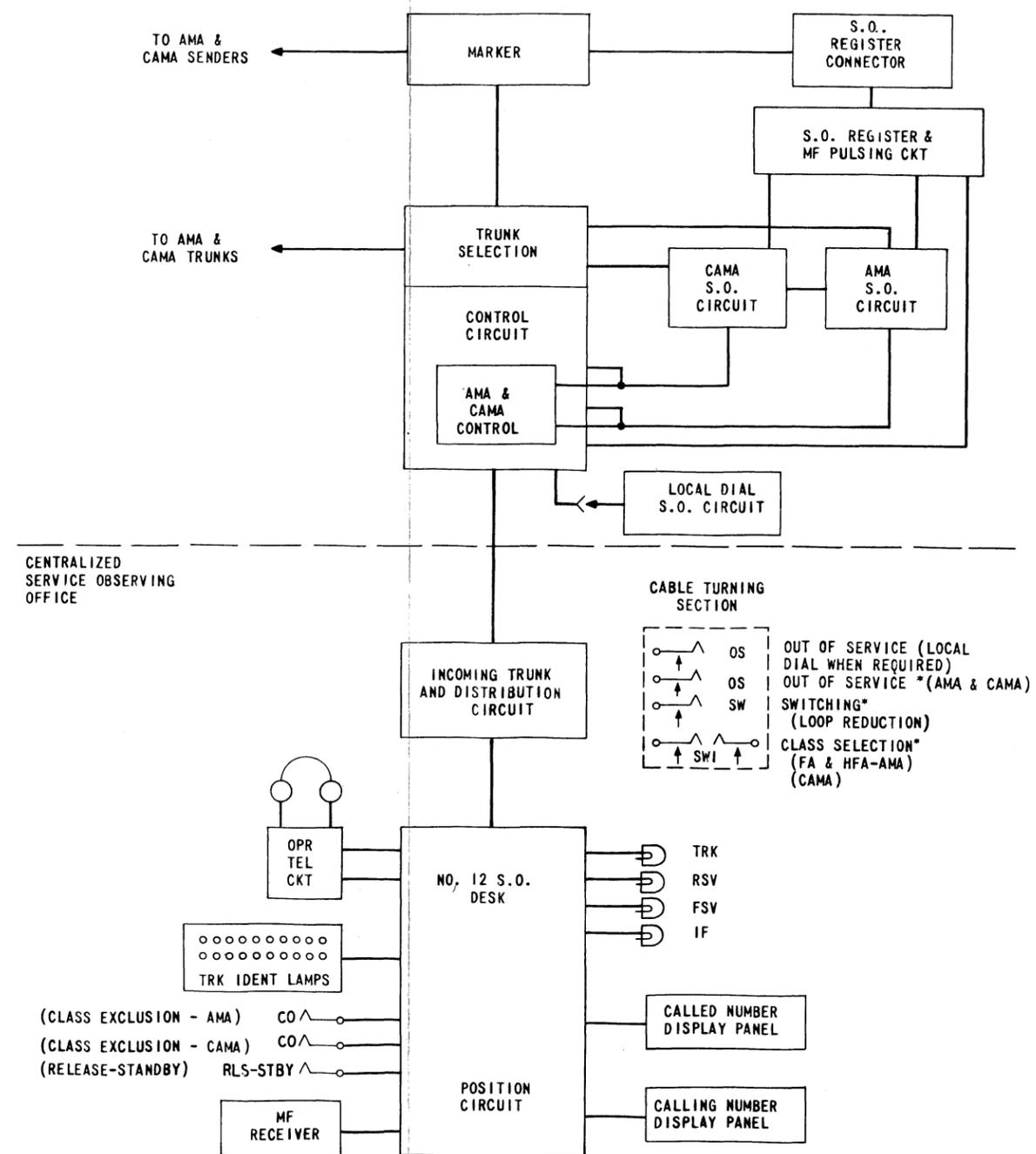
1. LOOP IDENTIFICATION CAN BE GIVEN AT ANY TIME WITHIN A LIMITED PERIOD AFTER THE CALL IS RECEIVED AT THE OBSERVING DESK. FAILURE OF LOOP IDENTIFICATION CAUSES THE IF LAMP TO LIGHT AND REMAIN ON FOR THE DURATION OF THE OBSERVATION.
2. ON AN ABANDONED CALL, IF A CUSTOMER HANGS UP BEFORE LOOP IDENTIFICATION IS COMPLETED, THE DISCONNECT ACTION WILL BE DELAYED UNTIL LOOP IDENTIFICATION IS COMPLETED.
3. IN "BY-LINK" OPERATION, IF THE BY-LINK REGISTER FAILS TO ATTACH TO THE INCOMING TRUNK BEFORE THE FIRST DIGIT FOLLOWING THE DIRECTING CODE OR IF THE REGISTER TIMES OUT BETWEEN DIGITS, OR WHILE WAITING FOR A SENDER, THE TRUNK CIRCUIT RETURNS AN OVERFLOW TONE WHICH IS HEARD BY THE OBSERVER. THE FSV LAMP REMAINS LIGHTED AND ANY DIGITS RECEIVED ARE NOT DISPLAYED.
4. WHEN OBSERVING ON MF INCOMING TRUNKS, THERE IS A SMALL PROBABILITY THAT THE DESK MAY BE CONNECTED TOO LATE TO RECEIVE THE FIRST DIGIT OF THE CALLED NUMBER. IN THIS CASE NO DIGIT INFORMATION IS DISPLAYED AND THE TRUNK LAMP FLASHES IMMEDIATELY AT 240 IPM.
5. AUTOMATICALLY IDENTIFIED (AI) CALLS NORMALLY OMIT ALL CAMA POSITION OPERATIONS. HOWEVER, IN CASES OF IDENTIFICATION FAILURES AND MULTIPARTY LINE CALLS, A CAMA OPERATOR IS CALLED IN FOLLOWING THE INFORMATION DIGIT, AND THERE IS NO SUBSEQUENT ANI START PULSE. ON CALLS ENCOUNTERING TROUBLE AFFECTING DIGIT PULSING, A CAMA OPERATOR IS ALSO CALLED IN TO MAKE MANUAL IDENTIFICATION. ANY DIGITS DISPLAYED ON THE GROUP 2 INDICATOR ARE WIPED OUT.
6. IN AUTOMATIC NUMBER IDENTIFICATION (ANI) OPERATION, VARIOUS CONDITIONS CAN BE IDENTIFIED ON THE DISPLAY PANEL BY AN INFORMATION DIGIT WHICH PRECEDES PULSING OF THE CALLING NUMBER. (SEE PAR 1.06 OF SECTION 961.501.06).
7. IF THE CALL ENCOUNTERS OVERFLOW, THE FSV LAMP MAY FLASH AND THE CALLING PARTY AND THE OBSERVER RECEIVE AN OVERFLOW TONE.
8. IF CALL ENCOUNTERS BY, NC OR OVERFLOW BEYOND STEP-BY-STEP OFFICE FSV FLASHES AND TONE WILL USUALLY BE HEARD.
9. IF THE CALLING PARTY HANGS UP BEFORE THE CALLED PARTY DOES, THE FSV LAMP LIGHTS MOMENTARILY UNTIL THE RSV LAMP LIGHTS; AT WHICH TIME THE FSV LAMP AGAIN GOES DARK. NO INDICATION IS GIVEN WHEN THE CALLED PARTY HANGS UP.
10. WHEN LOOP IDENTIFICATION IS COMPLETED, THE CALLED NUMBER, IF RECEIVED, MAY BE DISPLAYED, ON GROUP 1 INDICATOR, AND THE TRANSMISSION IS CUT OFF. WHERE A CALLED NUMBER IS MF PULSED BY THE INCOMING TRUNK, THE DIGITS ARE DISPLAYED AS RECEIVED UP TO ABANDONMENT. WHERE A CALLED NUMBER IS DIAL PULSED BY THE INCOMING TRUNK, NO CALLED NUMBER DIGITS ARE DISPLAYED IF THE CALL IS ABANDONED BEFORE THE SENDER IS ATTACHED. IF A CALL IS ABANDONED WHILE THE CALLING NUMBER IS BEING KEYED, A PARTIAL OR COMPLETE CALLING NUMBER WILL BE RECEIVED AND THE S LAMPS IN THE FIRST AND SECOND INDICATORS ARE EXTINGUISHED.
11. IF TOO FEW DIGITS ARE RECEIVED FOR THE CALLED NUMBER, THE SENDER TIMES OUT, SENDING A TONE TO THE SUBSCRIBER AND THE OBSERVER, AND THE FSV LAMP MAY FLASH.

NOTES (CONT):

12. RECORDER TONE IS ALSO SENT TO THE SUBSCRIBER AND OBSERVER, AND THE FSV LAMP MAY FLASH.
13. ON THE FIRST CAMA OPERATOR ERROR OR CIRCUIT TROUBLE RESULTING IN ONE OF THESE CONDITIONS, THE S LAMP IN THE SECOND INDICATOR FLASHES AND THE CAMA POSITION IS REORDERED BY THE SENDER. ON A SECOND ERROR OR CIRCUIT TROUBLE, THE S LAMP IN THE SECOND INDICATOR IS EXTINGUISHED, THE INCOMING TRUNK IS SET TO REORDER POSITION, AND THE FSV LAMP MAY FLASH OR CONTINUE TO LIGHT STEADILY AND THE TONE IS HEARD BY THE SUBSCRIBER AND THE OBSERVER. IF AN EXTRA DIGIT IS RECEIVED WHILE CONNECTED TO TRANSVERTER, POSITION IS REORDERED FOR 1ST OR 2ND EXTRA DIGIT. IF TRANSVERTER IS NOT CONNECTED, ACTION IS AS FOR OTHER ERRORS. WHEN AN EXTRA DIGIT IS SENT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, AN "X" PATTERN IS FORMED BY THE NUMBERS 1,3,5,7, AND 9 IN THE 8TH DIGIT SPACE OF THE SECOND INDICATOR (SEE FIG. 14 OF THIS SECTION). WHEN THREE OUT OF FIVE REGISTRATION IS DETECTED FOR ONE DIGIT AS THE FIRST ERROR, SECOND ERROR, OR BOTH, THE R LAMP IN THE SECOND INDICATOR LIGHTS.
14. THE CAMA POSITION IS DISCONNECTED BY A POSITION DISCONNECT KEY AT THE CAMA POSITION. THIS IS USED IN ACCORDANCE WITH PRESCRIBED PRACTICES. IF THE SUBSCRIBER REMAINS OFF HOOK AFTER THE KEY IS OPERATED, REORDER TONE IS HEARD BY THE CUSTOMER AND THE OBSERVER AND THE FSV LAMP MAY FLASH.
15. WHEN THE REGISTER RESET KEY AT THE CAMA POSITION IS OPERATED IN RESPONSE TO A "POSITION REORDER" SIGNAL FROM THE SENDER, ALL THE DIGITS DISPLAYED IN THE SECOND INDICATOR ARE "WIPED OUT" AND IF AN "X" PATTERN HAS BEEN FORMED OR THE R LAMP IN THE SECOND INDICATOR HAS BEEN LIGHTED, THE SIGNAL WILL BE EXTINGUISHED. THE S LAMP IN THE SECOND INDICATOR STOPS FLASHING AND LIGHTS STEADILY. THE W LAMP IN THE SECOND INDICATOR REMAINS LIGHTED UNTIL THE OBSERVATION IS RELEASED.
16. THE REGISTER RESET KEY CAN ALSO BE OPERATED WITHOUT A REORDER SIGNAL. IF THE CAMA OPERATOR HITS A WRONG KEY, OPERATES TWO KEYS SIMULTANEOUSLY, OR PARTIALLY OPERATES A KEY, SHE CAN OPERATE THE REGISTER RESET KEY AND "WIPE OUT" THE DIGITS REGISTERED. THE W LAMP LIGHTS TO INDICATE THE OPERATION TO THE OBSERVER. IF THE REGISTER RESET KEY IS OPERATED BEFORE SEVEN DIGITS ARE KEYED, THE S LAMP IN THE SECOND INDICATOR REMAINS STEADILY LIGHTED AND THE SENDER RETAINS NO MEMORY OF THE REGISTER RESET OPERATION.

Fig. 13 - Signal Chart for Step-by-Step Intertoll CAMA Service Observing

NO. 5 CROSSBAR OFFICE WITH AMA AND CAMA



*IF SEPARATE CONDUCTORS ARE USED FOR AMA AND CAMA OBSERVING INSTEAD OF COMMON CONDUCTORS, AN ADDITIONAL OS KEY AND SW KEY ARE REQUIRED AND THE CAMA POSITION OF THE SWI KEY IS NOT USED.

Fig. 14 - No. 5 Crossbar AMA and CAMA Service Observing