TRAFFIC SERVICE POSITION SYSTEM INTERFACE

NO. 2 ELECTRONIC SWITCHING SYSTEM

1. GENERAL

1.01 The purpose of this section is to familiarize the network administrator with the TRAFFIC SERVICE POSITION SYSTEM (TSPS) interface with No. 2 Electronic Switching System (ESS). Knowledge of the TSPS interface should aid the network administrator in administration of No. 2 ESS offices.

1.02 When this section is reissued, this paragraph will contain the reason for reissue.

1.03 The title of each figure includes a number(s) in parentheses which identifies the paragraph(s) which the figure is referenced.

1.04 The Traffic Service Position System (TSPS) interface consists of a combination of hardware and software arrangements provided to establish compatibility between the No. 2 Electronic Switching System (ESS) and the TSPS. This arrangement is made so that toll calls and other operator assisted calls, either originating at or passing through the ESS, can be handled by the TSPS. The TSPS is used to control the charging and billing of toll calls and to provide operator services.

1.05 The TSPS provides a means for extending customer local and direct distance dialing (DDD) to include special toll calls, such as person-to-person, collect, credit card, and charge to third party. It also provides for coin station, 0- (dial 0), manual line calls, and calls requiring special toll billing (formerly known as QZ billing). Additionally, this arrangement aids in the completing and recording of local and toll dial assistance calls. Operator assistance is needed to aid in the completion of these calls to assure recording correct charge data and to supervise coin deposits on calls originating from coin stations. This assistance is furnished by operators at cordless positions under control of the TSPS.

1.06 Included in the existing types of calls routed to TSPS are some customer dialed 1+ noncoin calls and special toll calls of the following types:

- *Noncoin—Person:* paid, collect*, charge to third party, credit card, and special billing service calls

- *Noncoin—Station:* collect*, charge to third party, credit card, and special billing service calls

- *Coin—Person:* paid, collect*, charge to third party, credit card, and special billing service calls

- *Coin—Station:* paid, collect*, charge to third party, credit card, and special billing calls

- *Coin and noncoin:* dial zero (0-).

*Includes calls billed to third number, credit card and special billing numbers per *called* party instructions.

Additionally, a TSPS trunk group may be used to provide the necessary operator assistance to complete calls originating from manual lines (such as those provided for handicapped customers). When this type of service is provided, a special originating major class (10) and a dedicated route index (11) are required.

1.07 Trunks are provided from the No. 2 ESS to the toll office with TSPS trunk circuits interposed in between the two offices as shown in Figure 1. These trunks may be considered as connecting the No. 2 ESS and the TSPS even though the ultimate connection is onward through the TSPS to the toll office. The TSPS only provides the switching and control to the operator position through a bridged connection. When the operator functions are completed, the TSPS disconnects the operator and sets up the through connection to the toll office.

1.08 The TSPS times the call through the initial period and any overtime periods. It also maintains supervision of both the calling and called parties until on-hook occurs. At that time, the TSPS causes the charging information for the call to be stored on a magnetic tape, and finally the TSPS trunk circuit is returned to its idle state to enable the processing of a new call.

1.09 The No. 2 ESS must have the ability to perform several functions in order to be compatible with TSPS. These functions are as follows:

- Recognize a call requiring TSPS handling

- Recognize and outpulse the type of handling required (ie, whether or not operator assistance is required)

- Identify the calling party's telephone number (provided the calling party is not a trunk or multiparty line)

- Outpulse the telephone numbers of the calling *and* called parties

- Outpulse pertinent information regarding the identity of the calling party (such as a hotel-motel customer or coin station)

- Receive and process commands from the TSPS to perform rering, coin collect, and coin return operations.

1.10 The No. 2 ESS can route 1+, 0+, no prefix, and 0- (dial zero) calls to TSPS over separate trunk groups, the same trunk group, or any combination of trunk groups. The single group method (called a "combined" group to TSPS) is recommended over separate groups.

1.11 In addition, various combinations of coin, noncoin, and hotel-motel calls are allowed over the same No. 2 ESS trunk group to TSPS. For offices not arranged for Dial-Tone-First (DTF) coin, trunk groups can be set up to handle noncoin traffic only, prepay coin traffic only, or a combination of both types over the same trunk group. The latter is recommended. In offices arranged for DTF (+48 volts) operation, trunk groups may handle noncoin traffic only, coin traffic only (both prepay and DTF in the same group) or a combination of all three types over the same trunk group. Again, the latter is recommended. All generic programs are capable of handling this type of operation. Regardless of the group arrangement, translations in the TSPS machine must be set up to receive combined, coin, and noncoin traffic over each group from a No. 2 ESS office. (This type of group is called a "supercombined" group in TSPS language.) This arrangement is required when working with No. 2 ESS for two reasons.

(1) No. 2 ESS can only send the supercombined type of signals to a TSPS. (These signals will also work when separate groups are set up.)

(2) TSPS will not always send inband MF signals for rering (required by No. 2 ESS) in the nonsupercombined mode of operation.

2. SYSTEM PERSPECTIVE

SOFTWARE DATA STRUCTURES

2.01 The software required to interface the No. 2 ESS and the TSPS is provided by the generic program. Any current issue generic program can provide this feature.

2.02 The basic translation sequence required to complete a call to TSPS is shown in the translation layout of Figure 2. Each trunk group to TSPS must be accordingly represented by the TSP/CMA indicator in the Trunk and Service Circuit Group Data table of the trunk group translator.

HARDWARE

2.03 Hardware items that must be considered when providing this feature are:

- Outgoing trunk circuits for high-low and reverse battery supervision (SD-2H144)

- Two-way trunk circuits for E&M supervision (SD-2H112)

- MF transmitters

- MF receivers (for coin control and rering functions).

Although none of these hardware items are exclusive to TSPS calls, they are essential to them and this fact should be considered in the overall composition of the No. 2 ESS office.

FEATURE OPERATION

2.04 When a customer goes off-hook to make a toll call via TSPS, the origination process begins just as with any other call. A transient call record (TCR) is selected to monitor the progress of the call, the calling party's terminal equipment number (TEN) is translated in order to identify the calling party, and an originating register (OR) is selected to store the customer's dialed digits. The TEN translation yields the billing number associated with the calling party directory number (they may be the same number).

2.05 When dialing has begun, the 3-digit translator yields a code index based on the 1 or 0 prefix, or absence of prefix, area code (if present), and the office code dialed by the customer. This code index is expanded in order to obtain a screening table address and a direct route index. The screening table address is used to index the proper screening table which provides a charge index and route index. The charge index will be 001 which indicates that the call is free to TSPS. The TSP will record all the required toll charging information for billing purposes.

2.06 The direct route index or the route index is used to access the route index expansion. This expansion provides the next route index, an exit type of 10 and the expected number of dialed digits. (Exit type 10 is used for all calls routed to TSPS.) The next route index is expanded to obtain the TSPS trunk group number. This second route index expansion will be a type 02 or 04. Usually exit types 02 and 04 are used to define the number of digits expected (10 or 7 digits, respectively); however, since the first route index expansion provided the number of expected digits, the 02 and 04 exit types are arbitrary.

2.07 The trunk group number is translated next to select an idle member. The first step in this translation is the Trunk and Service Circuit Group Data table which provides the largest member number, the call store address of the Group Status Block, the program store address of the Trunk Circuit List, the TSP/CMA indicator (11 represents a TSPS group), and the circuit state index.

2.08 The Group Status Block is accessed to select an idle member of the trunk group (by examination of the status bits) and to update the traffic information. The Trunk Circuit List is entered to obtain the scan point number (SPN) for the selected trunk. The Circuit State Table is entered to determine the relay states required to place the selected trunk circuit in the desired state, and finally, the scan point number for the selected trunk is translated to obtain the associated TEN.

2.09 When the TSPS trunk has been properly selected, a path between the calling party and the trunk circuit must also be selected. The trunk circuit is placed in the bypass state and a multifrequency (MF) sender is selected and connected to trunk circuit in order to outpulse the called party and calling party telephone numbers.

2.10 Next, the trunk seizure signal (off-hook), as shown in Figure 3, is sent to the TSPS to indicate that a call is in progress. An off-hook wink is returned from the TSPS to indicate that it is ready to receive the MF pulses. If for some reason this start sending signal is *not* received within 15 seconds after seizure, the customer is given reorder tone and the call must be redialed.

2.11 If the start sending signal is received, the called number is retrieved from the OR and outpulsed to the TSPS preceded keypulse (KP) signal and followed by the appropriate start code. The appropriate start code is selected on the basis of the first digit dialed by the customer and the type of line originating the call (coin or noncoin).

2.12 When the called number information has been received by the TSPS, an automatic number identification (ANI) signal (off-hook) is returned to the No. 2 ESS. Reorder tone is returned to the customer if this ANI signal is *not* received. Upon reception of the ANI signal, the calling party's billing number must be retrieved from the line's originating translation and stored in the OR to be outpulsed to the TSPS. This translation process also indicates whether or not special toll billing (QZ) is required.

2.13 An information digit, based on the line's originating translation, is written into bit position 0 of the OR prior to outpulsing. This information digit tells the TSPS what type of handling is required for the call.

2.14 The billing number (including the information digit), is retrieved from the OR and outpulsed preceded by the KP signal and followed by the appropriate start code. (If information digit 1 or 2 is present, no billing number is provided by the originating translation process.) The call is made stable and the TSPS operator is responsible for obtaining the necessary billing information. The TSPS then controls the call to completion.

2.15 TSPS has the responsibility for informing billing personnel of hotel/motel lines of the total charges for calls made from their lines when the calls are disconnected. TSPS performs this task orally (by calling hotel/motel operator) or automatically (by using the Hotel Billing Information Center [HOBIC] that returns time and charges information to hotel/motel by TTY). This allows the hotel/motel to bill its customers immediately without having to wait for the monthly bill.

2.16 The TSPS operator can perform coin collect, coin return, and rering functions for calls originating at the No. 2 ESS office. First, the operator causes an on-hook wink to be returned to the No. 2 ESS, which causes an MF receiver to be connected to the trunk circuit. The operator then sends the information digit associated with the desired function. The information digit is received by the MF receiver and decoded so that the proper service circuit (coin control or ringing circuit) can be connected to the customer's line to perform the desired function.

2.17 A functional flow diagram describing the operations performed to place a toll call via TSPS is shown in Fig. 4.

2.18 When manual line treatment is required, the customer's originating translation yields an originating major class of 10. This major class is used only for manual lines. The system then automatically routes the call to TSPS via route index 11. Since the customer dials no digits, the call arrives at the TSPS as a 0- (dial 0) call. The TSPS operator then routes the call in accordance with the customer's wishes.

3. COMPATIBILITY AND INTERACTIONS

3.01 This feature was designed in order to make the No. 2 ESS compatible with the TSPS. Although No. 2 ESS cannot automatically identify the calling party when the call originates from another office or from a multiparty line, the TSPS operator is notified to verbally obtain the customer's billing number. This feature does not interact with any other features.

4. ASSIGNMENTS AND RECORDS

Assignment Recommendations and Guidelines

4.01 Manual lines to be routed to TSPS (for handicapped customers, etc) must be assigned an originating major class of 10 and they must be routed via route index 11. Hotels and motels must be assigned to originating major classes 34 (PBX/MLHG) and 40 (individual). This indicates to the TSPS operator that the toll charges must be reported to the hotel or motel personnel upon completion of a toll call placed by a hotel or motel guest.

Input and Record Keeping

4.02 The following translation input forms must contain information required to implement the TSPS interface feature. These forms must be submitted to the WECo Regional Data Center for the initial office data administration (ODA) run. Refer to TG-2H—Translation Guide No. 2 ESS for detailed information required to complete these forms.

FORMS	TITLE
2100	Directory Number Table
2201	Trunk Assignment Table
2202	Trunk Group Table
2204	Trunk Feature Table
2300	Three- and Six-Digit Translation Table
2301	Rate and Route Table
2303	Route Index Expansion Table
2304	Code Group Translation Table
2306	Line Class Code Table

4.03 Form 2100 is used to assign line class codes to directory numbers (ie, hotels, motels, and manual lines for purposes relating to TSPS). This information is recent changeable (using the A RC:L/ message) and effective immediately after the RC message is accepted by the system.

4.04 The originating and terminating major classes are associated with the line class codes on Form 2306. Pertinent information provided on the remainder of the previously listed forms is shown in Figure 2.

4.05 Changes in routing and trunk group translations may be made using the following RC messages:

MESSAGE	EXPLANATION
A RC:CRI	Used to change a route index on a given code index
A RC:DIG	Used to make changes in the 3- and 6-digit translator
A RC:GRP	Used to change single translation words in trunk and service circuit group tables
A RL:RI	Used to change a route index
A RC:TRK	Used to change data associated with trunk groups.

Further details about these messages and their use can be found in IM-2H200.

4.06 If previously defined spare trunk groups are available, an ODA run is unnecessary to implement the TSPS interface feature into an existing No. 2 ESS. The recent change messages listed under ASSIGNMENTS AND RECORDS may be used to assign the spare trunk groups to TSPS.

4.07 If spare trunk groups are unavailable, or in the case of a new installation, the forms listed under ASSIGNMENTS AND RECORDS must be completed and submitted to the WECo Regional Data Center.

5. TESTING

5.01 Tests to verify translation information in the No. 2 ESS consist of the various verify messages entered via the TTY. These messages are as follows:

A VY:L/	Originating line translation (hotels, motels, and manual line)
A VY:TRK	Trunk translations

A VY:SVC	Service circuit translations (MF senders, MF receivers, etc)
A VY:GRP	Trunk group translations

IM-2H200—Input Message Manual No. 2 ESS provides information pertaining to the variable fields of these messages. OM-2H200—Output MessageManual No. 2 ESS provides the interpretation for the response of these messages.

6. MEASUREMENTS

6.01 Peg count, usage, overflow, and maintenance busy traffic measurements are available for the trunks and service circuits associated with the TSPS interface feature. No other measurements are necessary for this feature.

7. CHARGING

7.01 Toll calls placed via TSPS are free as far as No. 2 ESS is concerned. The TSPS records all necessary charging information for billing purposes.

8. GLOSSARY

8.01 The following list defines abbreviations and terms which may be unfamiliar to the reader.

- ANI—Automatic Number Identification —automatic equipment at a local central office used on customer-dialed toll calls to identify the calling station so that this identity can be sent to the CMA or TSPS equipment.

- DDD—Direct Distance Dialing—customer dialed toll calls.

- LCC—Line Class Code—a 3-character alphanumeric code that specifies a customer class of service.

- Manual Line—A customer's line (and originating major class) that is automatically

routed to an operator upon detection of off-hook.

- MF Signaling—Multifrequency signaling —a method of sending numerical address information from a local central office to a toll office by sending simultaneously a combination of two tones out of a group of six frequencies.

- Off-hook—The condition indicating that a station is in use (line loop closed).

- On-hook—The condition indicating that a station is idle (line loop open).

- OR — Originating Register — A call register used to collect and store digits received from a customer dial receiver.

- Outpulse—The process of sending called and calling party telephone numbers from the No. 2 ESS to the TSPS.

- Rering—A signal used by a TSPS operator to call the calling subscriber after the completion of a toll call.

- SPN—Scan Point Number.

- TCR—Transient Call Record—An 8-word block of temporary storage assigned to monitor calls in a transient state.

- TEN—Terminal Equipment Number.

- Toll Office—A center exclusively for the switching of toll calls.

- TSPS—Traffic Service Position System.

- Wink—A brief off-hook signal sent from the TSPS to the No. 2 ESS to indicate that the TSPS is ready to receive the called party telephone number.
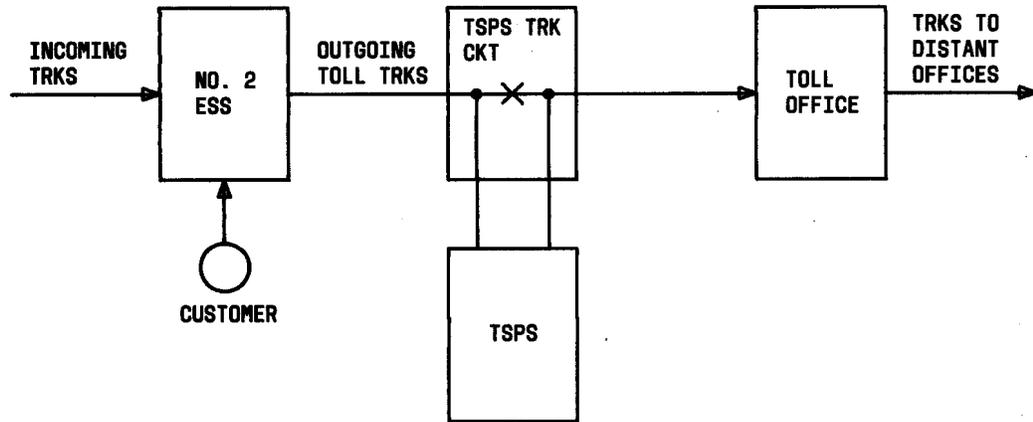
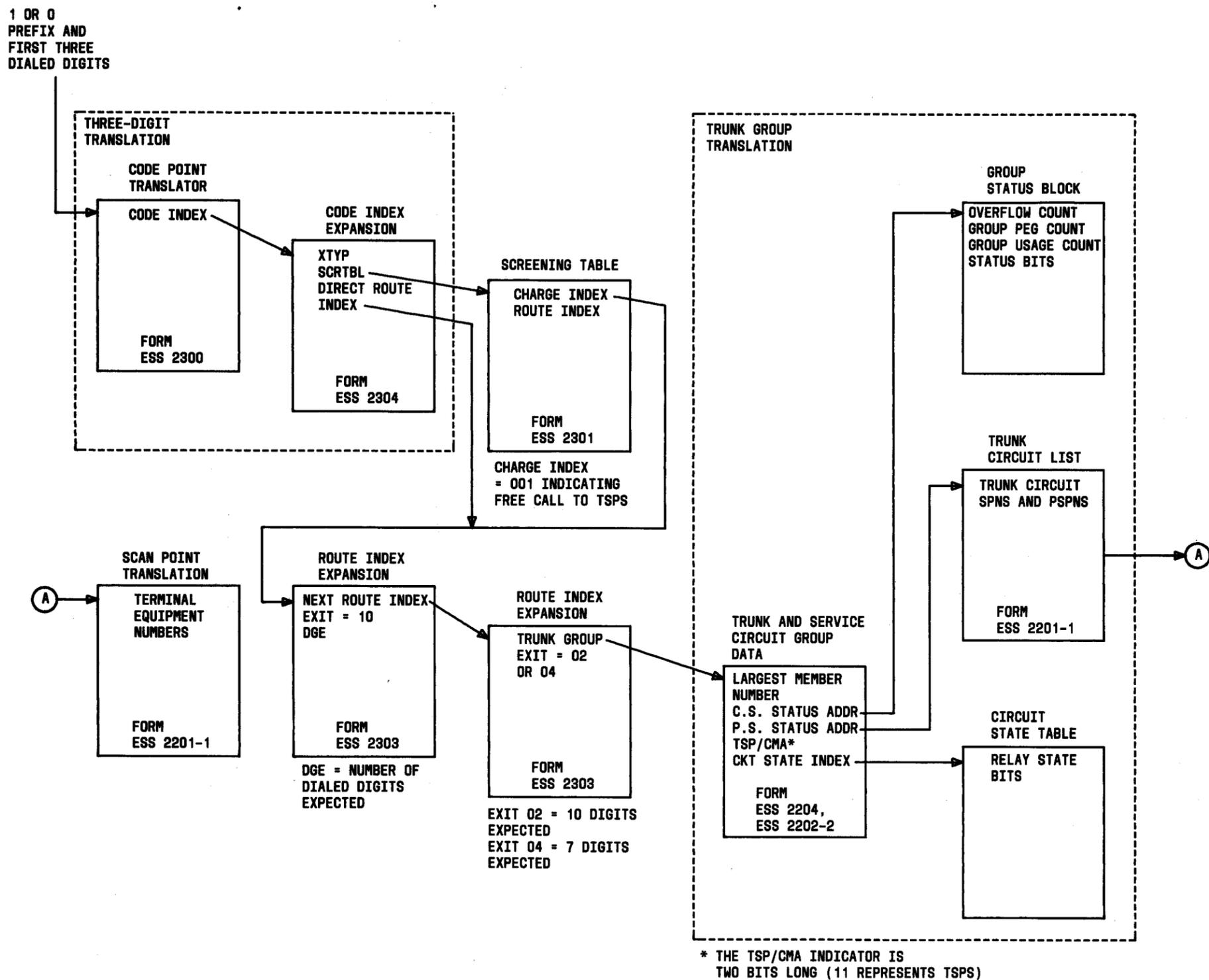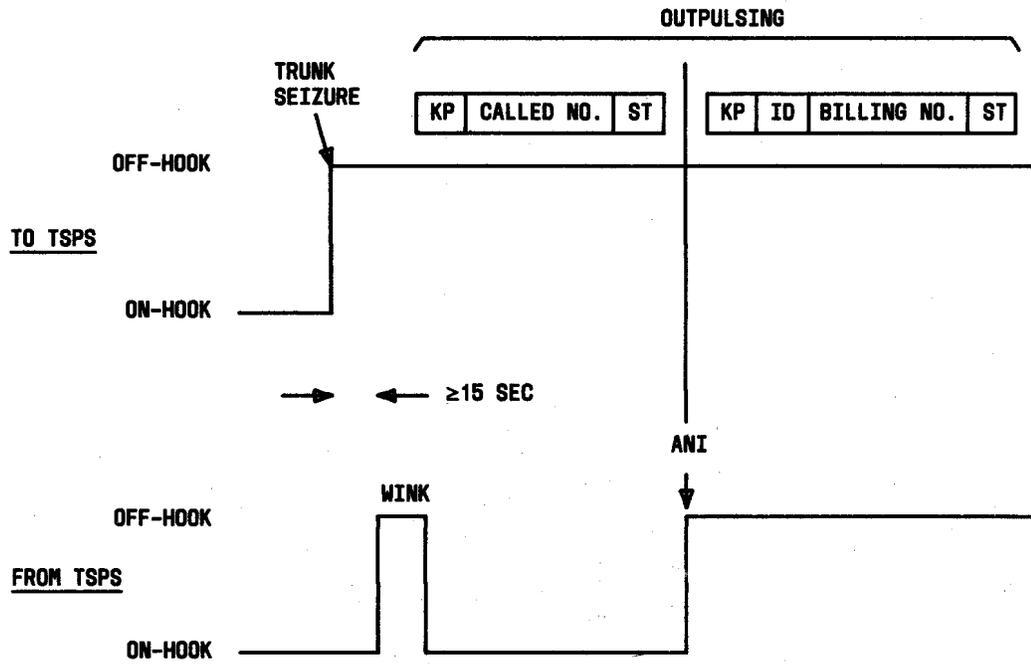Fig. 1—Block Diagram of Connections Between No. 2 ESS and TSPS (1.07)

1 OR 0
PREFIX AND
FIRST THREE
DIALED DIGITS

THREE-DIGIT
TRANSLATION

CODE POINT
TRANSLATOR

CODE INDEX

FORM
ESS 2300

CODE INDEX
EXPANSION

XTYP
SCRTBL
DIRECT ROUTE
INDEX

FORM
ESS 2304

SCREENING TABLE

CHARGE INDEX
ROUTE INDEX

FORM
ESS 2301

CHARGE INDEX
= 001 INDICATING
FREE CALL TO TSPS

TRUNK GROUP
TRANSLATION

GROUP
STATUS BLOCK

OVERFLOW COUNT
GROUP PEG COUNT
GROUP USAGE COUNT
STATUS BITS

TRUNK
CIRCUIT LIST

TRUNK CIRCUIT
SPNS AND PSPNS

FORM
ESS 2201-1

SCAN POINT
TRANSLATION

Ⓐ

TERMINAL
EQUIPMENT
NUMBERS

FORM
ESS 2201-1

ROUTE INDEX
EXPANSION

NEXT ROUTE INDEX
EXIT = 10
DGE

FORM
ESS 2303

DGE = NUMBER OF
DIALED DIGITS
EXPECTED

ROUTE INDEX
EXPANSION

TRUNK GROUP
EXIT = 02
OR 04

FORM
ESS 2303

EXIT 02 = 10 DIGITS
EXPECTED
EXIT 04 = 7 DIGITS
EXPECTED

TRUNK AND SERVICE
CIRCUIT GROUP
DATA

LARGEST MEMBER
NUMBER
C.S. STATUS ADDR
P.S. STATUS ADDR
TSP/CMA*
CKT STATE INDEX

FORM
ESS 2204,
ESS 2202-2

CIRCUIT
STATE TABLE

RELAY STATE
BITS

Ⓐ

* THE TSP/CMA INDICATOR IS
TWO BITS LONG (11 REPRESENTS TSPS)

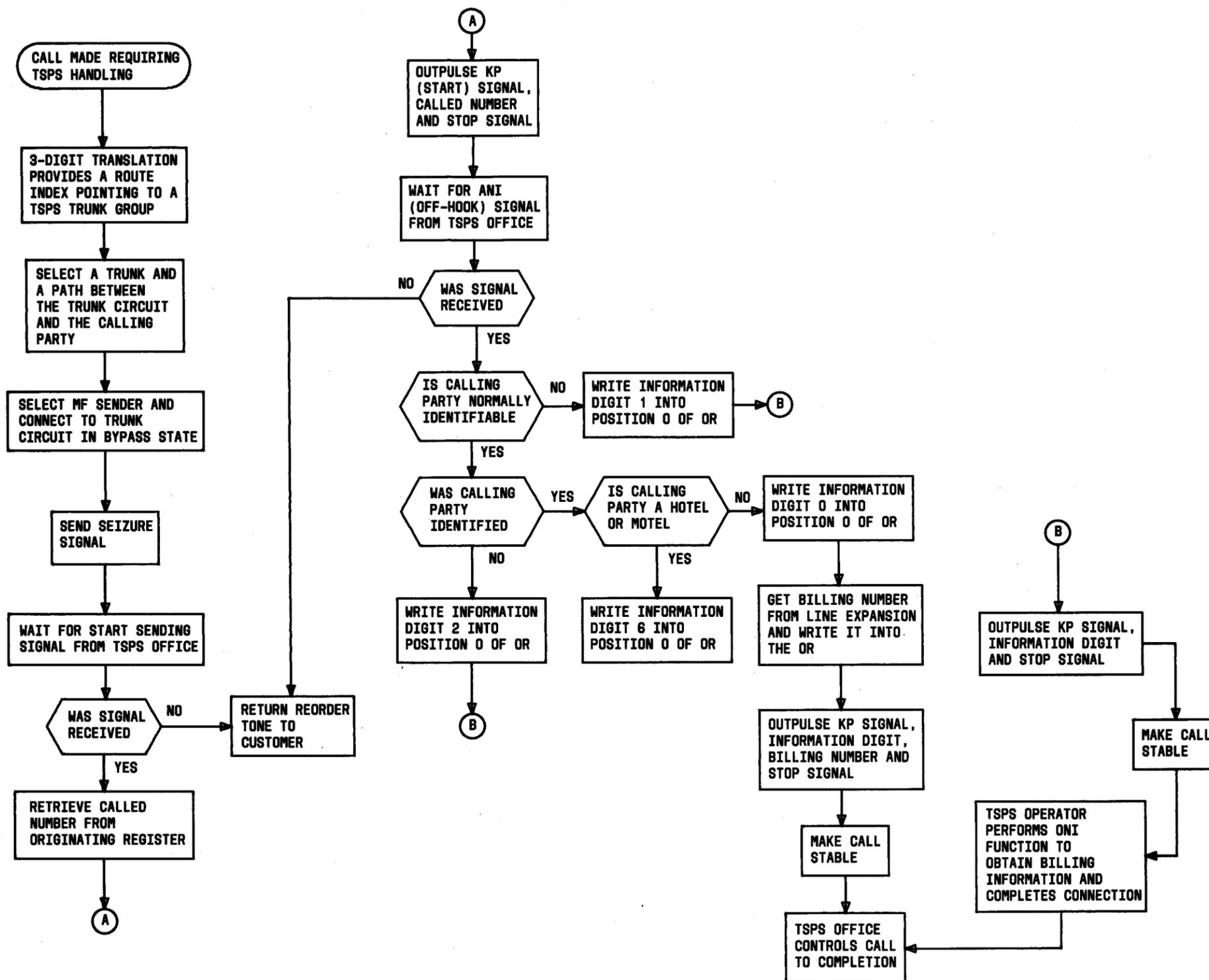Fig. 2—TSPS Interface Translation Layout (2.02, 4.04)

Fig. 3—Signaling To and From TSPS (2.10)

Fig. 4—TSPS Interface Flowchart (2.17)