TELECOMMUNICATIONS ALARM

SURVEILLANCE AND CONTROL SYSTEM (TASC)

ENGINEERING GUIDELINESS FOR

MONITORING OF T1, N, 0, AND 0N

CARRIER SYSTEMS

1. GENERAL

1.01 This document provides engineering guidelines for the monitoring of D-type channel banks associated with T-carrier, using the Telecommunications Alarm Surveillance and Control (TASC) System. The guidelines also apply to the monitoring of 0, 0N, N1, N2, and N3 carrier terminal equipment. These guidelines cover Generic 1 and Generic 2.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 A TASC System provides remote alarm monitoring and control of a wide variety of equipment in the associated telephone company environment. This includes the following equipment:

- Electromechanical switching and associated equipment

- Transmission equipment

- Associated building and power equipment.

1.04 A TASC System consists of a computer-controlled central to which the state of monitored equipment alarms, statuses, and control points are transmitted by a number of E-telemetry remotes. One or more data transmission networks are provided to connect E-telemetry remotes to the TASC central. Other equipment in the TASC System includes:

- Attendant terminals which can be collocated with the central or other locations interconnected by data sets

- SCOTS-C1 interface remotes

- Equipment, in the stand-by mode, to provide back-up in case of failure to the primary central equipment.

1.05 TASC provides the capabilities necessary to support a number of alarm and surveillance applications which exist in the telephone company plant. One of the basic functions of TASC is to

provide information on equipment failure, referred to as "hard outage."

1.06 The TASC System planner should be well versed in the telephone company's (TELCO) operational structure and know the future operational and maintenance needs and goals of TELCO. This knowledge is necessary in order to apply engineering guidelines defined in this document. The decisions made in applying the engineering guidelines involve operational/economic tradeoffs. The tradeoffs are made in agreement with the defined operational needs of the TELCO.

1.07 A second operational support system may be under consideration when interfacing with T-carrier equipment. The T-Carrier Administration System (TCAS) may be planned or already existing in the same environment as TASC. TCAS is designed to perform administration of large concentrations of T-Carrier Systems. Certain environments, to which TASC may be applied, require that the TASC designer have knowledge of uses of TCAS in order to apply TASC engineering guidelines defined in this document. For more information concerning TCAS, refer to the TCAS Engineering Section 865-201-100.

1.08 Service measurement capability is a TASC Generic 2 feature which is applicable to E2A SAC remotes. It is intended primarily to supplant manual data gathering which must be performed on a per T-Carrier System per control office basis in order to support the T-Carrier Service Measurement Plan (Section 365-020-005). This feature is designed to be generally flexible so that it may find applications other than T-carrier. Examples of other applications are data collection for N-carrier, diesel engine operations, service removal (make busy) activities, and protection channel indications.

1.09 The TASC Generic 1 may be used for the hard outage detection of T-Carrier Systems. The TASC Generic 2 service measurement capability adds a major enhancement to the monitoring of D-type channel bank alarms associated with T-carrier. Service measurement automates the manual data collection process which must be performed to support the T-carrier service measurement plan by providing the following:

(a) A running count of all carrier group alarms (CGAs) on a per T-Carrier System basis. (This data corresponds to "register readings" .)

(b) An alarm report which is generated when the number of counts exceeds a locally specified value in a 1-hour period.

(c) A weekly CGA report for each remote station (control office) which provides the following:

(1) The number of controlled systems monitored

(2) The number of controlled systems which experienced at least one CGA in the week

(3) The total number of CGAs on all controlled systems

(4) The average number of CGAs per controlled system with CGAs (Item 3 divided by Item 2)

(5) The system equipment identity and CGA count for all controlled systems experiencing CGAs in that week.

(d) A running record on a per-system basis of the accumulated outage time. (Any single outage begins when the telemetry first reports the CGA. It ends when the telemetry shows that the CGA has cleared.) The outage time will be accumulated in minutes and will be reported in terms of hours and tenths of hours.

(e) A monthly outage report for each remote station (control office) which provides the following:

(1) The number of controlled systems monitored

(2) The total outage time accumulated for all controlled systems

(3) The average outage time per system (Item 2 divided by Item 1)

(4) The number of controlled systems experiencing total outage of one hour or more per month

(5) The system equipment identity and outage time for all systems referenced in Item 4

(6) The total outage time accumulated for all systems referenced in Item 4.

1.10 The weekly and monthly reports generated by TASC Generic 2 can be assimilated on a per control office basis. It is provided to the T-carrier restoration control center (TRCC) for use in the generation of monthly performance reports and performance summaries as specified in Section 365-020-005. This feature replaces the manual activity of register readings and outage logs for use in control offices not covered by TCAS. The economic benefit of this feature for each control office can be calculated by determining the present expense involved in the manual activity less the cost of any additional detailed carrier monitoring which may be required at the remote station within the monitored control office.

1.11 Since any set of scan points at a status polled remote can be defined as a service measurement class number, this SVM feature can be applied to various types of indications. The reports include each occurrence (active for at least 12 seconds which is the sampling interval-polling rate) of each scan point. For indications which can have durations shorter than 12 seconds (eg, protection channel and low microwave output) the information reported may be sufficient to identify on a weekly or monthly basis the relative activity of the various scan points within the class. This provides an inexpensive method to detect previously undetected problems that may have been responsible for degrading transmission performance. For indications which have durations longer than 12 seconds (eg, D-type channel bank alarms associated with T-carrier) the total information is reported; however, indications which release and reclose in less than 12 seconds may be counted as only one indication rather than two or more. Some possible service measurement class numbers are as follows:

- CGAs for controlled systems (supports T-carrier service measurement plan)

- CGAs for uncontrolled systems (where the other terminal office is the control office)

- Carrier failure alarms for N, 0, or 0N carrier

- PBX major/minor

- Commercial ac failure

- Diesel engine operating indications

- Dial tone marker made busy indications

- Protection Channel indications

- Low microwave output indications.

Thus, the SVM feature is a data collection capability which will enhance scan point processing capability.

2. DETERMINATION OF ENVIRONMENT

2.01 Two TELCO environments are defined for guidelines application. The two environments are TASC in a small T-carrier environment, and TASC in a large T-carrier environment. In each environment, TASC is assumed to exist (usually for electromechanical switching equipment alarm and surveillance) independent of the need for narrowband carrier surveillance.

A. Environment With a Small Concentration of T-Carrier

2.02 A small concentration T-carrier is a TELCO area that has a small number of T-carrier (typically less than 1000 systems) without TCAS. It can also be a 1000 T-Carrier System area with or without a TRCC.

B. Environment With a Large Concentration of T-Carrier

2.03 A TELCO area which contains more than 1000-T-Carrier Systems is considered an area with a large concentration of T-carriers. In addition to a TRCC, these areas have either the potential for TCAS (implemented within the next three to five years) or they have already deployed TCAS.

2.04 The designer must review the proposed TASC plan for monitoring wire centers and/or microwave radio stations and identify the TASC offices which contain narrowband carrier equipment. The designer must then determine which environments exists; the large or small concentration of T-carrier. If the concentration is small, continue with Part 3 of this section. If the amount of T-carrier is large, proceed with Part 4.

3. TASC IN A SMALL T-CARRIER ENVIRONMENT

3.01 Each office must be examined to determine the monitoring method for narrowband carrier equipment. In general, only two viable methods

of monitoring carrier alarms exist; (1) detailed monitoring (Section A), (ie, monitoring of each individual CGA and CF alarm point in the office) or (2) minimal monitoring (Section B), (ie, monitoring the carrier major and carrier minor alarms that usually exist in the office).

3.02 Other monitoring methods have been evaluated and generally cost as much or more than detailed monitoring while providing much less information. These methods are:

- The access and creation of new alarms for carrier major (MJ) and minor (MN)

- Accessing and combining alarm points to provide a digital MJ and an analog MJ

- Accessing and combining alarms to form a carrier MJ per type of equipment

- Accessing and combining alarms associated with individual routes out of or into an office.

In all cases, accessing the alarm points is the major expense. Accessing is also the major expense involved in detailed monitoring. Thus, these other methods incur the major portion of the expense with far fewer benefits.

Note: These methods are not recommended.

3.03 The TELCO engineer should review the pros and cons for any method considered before deciding on the method to be used in any specific application.

A. Detailed Monitoring Method

3.04 Detailed monitoring provides a dedicated indication for each CGA and/or carrier fail (CF) alarm in the office. The CGA provides an indication of a trouble on an individual T-Carrier System basis. The CF alarm provides an indication of trouble on an individual analog carrier system basis.

3.05 The CGA and CF alarms allow the TASC central to provide "hard outage" information on an individual digital or analog system basis. "Hard outage" is defined as a CGA or CF alarm that is present for a specified period of time. The typical period of time is 10 minutes. After the

"hard outage" threshold has been reached, there is a very high probability that an actual equipment problem exists, rather than a "hit". Corrective action can be reasonably initiated by the TASC operator. The "hard outage" information is presented to the TASC operator in English text (maximum of 30 characters per indication). In TASC Generic 1, trouble indications which are present for less than the specified period of time are not stored as retrievable data. The TASC Generic 2 System includes a service measurement feature which not only identifies hard outages but also records and stores data related to hits and outage time (see paragraphs 1.08 through 1.11).

3.06 An alarm message (maximum of 30 characters) plus any comment is displayed as an event for the office. The printout will include office name, date, and time. The event is automatically stored in the history log for future retrieval.

Note: Figure 1 contains an example of the alarm message format for Generic 1 and Generic 2; Fig. 2 is an example of the weekly SVM report and Fig. 3 is an example of the monthly SVM report. The latter two are only available with Generic 2.

3.07 The TASC central allows a terminal to be designated to receive only the narrowband carrier alarm information. The terminal may be located in the TRCC or other transmission operations centers. The following paragraphs contain engineering guidelines for detailed monitoring in a TASC office.

3.08 In TASC offices with less than 250 CGAs (D-channel banks), use the E2A status and command (SAC) remote. The remote is shared among the electromechanical switch, building and power equipment, and carrier equipment. The SAC remote exists in the office primarily to monitor the switching machine. CGAs should be accessed and collected using the T-carrier connector junction panel as used with TCAS. If an analog carrier also exists in the office, CF alarms should be brought to the same remote. If N1, 0, or ON carrier is present, an alarm reset control must be connected to the E2A SAC remote.

3.09 The TASC interconnection information for transmission equipment (SD-1 P130-01) contains information on transmission system interconnections to the E2A (SAC) remote.
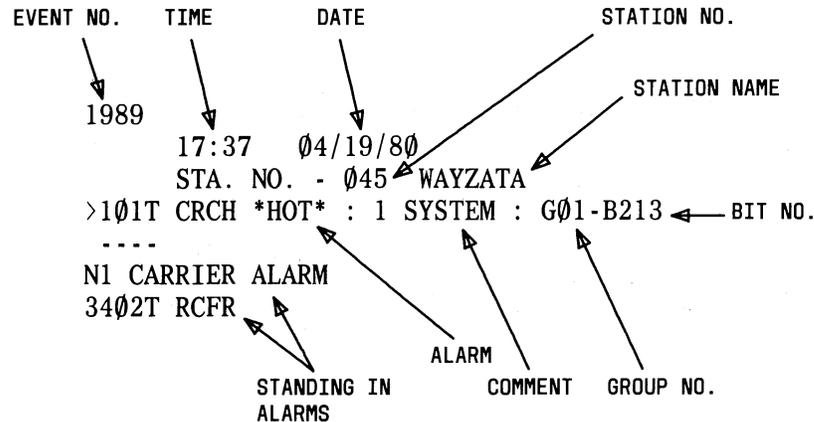
```
         EVENT NO.    TIME       DATE                    STATION NO.

                                                              STATION NAME
            1989
                      17:37    04/19/80
                      STA. NO. - 045   WAYZATA
           >101T  CRCH  *HOT*  : 1 SYSTEM : G01-B213 ◄── BIT NO.
           ....
           N1 CARRIER ALARM
           3402T RCFR
                                              ALARM
                                   STANDING IN       COMMENT   GROUP NO.
                                   ALARMS
```

Fig. 1—Alarm Message Format for Generic 1 and Generic 2

3.10 In TASC offices with more than 250 CGAs (D-channel banks), use the shared E2A SAC remote to monitor the analog carrier CF indications and the restore carrier control, if required. Use a second remote, an E2A alarm processing remote (TCAS Engineering Section 865-201-100) as a guide monitoring the CGAs. Both remotes initially connect to the TASC central, but the E2A APR remote is compatible with TCAS and can be rehomed to a TCAS central should TCAS be applied in this environment at a later date.

> *Note:* The reason for using the APR remote in this situation is to provide individual CGA monitoring capability for TASC in a manner which is also telemetry compatible with TCAS.

3.11 The operational advantages of the detailed monitoring method are contained in Table A.

3.12 The disadvantage of detailed monitoring is higher capital cost than minimal monitoring method. The actual costs will vary depending on the office. The evaluation of these costs should include standard office modifications and WE engineering and installation charges. It is suggested, however, that costs associated with office wiring and records clean up not be charged against the TASC project in making this evaluation.

3.13 Operational advantages must be weighed against the capital cost estimate for each TASC office to determine which offices are best suited for detailed monitoring. The decision of which monitoring method to use is important. One

consideration is the operational advantages to be gained by automatic retreival of data for the T-carrier service measurement plan. Another consideration is how many carrier systems, not monitored in detail in other TASC offices, could be covered by applying detailed monitoring to the candidate office.

> *Note:* Carrier alarms generally appear simultaneously at the offices at both ends of the carrier facility. If most CGAs are being picked up at other offices, the benefits of monitoring CGAs in the office under question are reduced.

B. Minimal Monitoring Method

3.14 Minimal monitoring provides only two alarm points (carrier major and minor) per office. Any carrier alarm in the office will cause one of these alarms. If carrier major and minor alarm points do not exist, then the office major and minor should be monitored or else the detailed monitoring method should be used. Minimal monitoring precludes the use of TASC to gather service measurement data in the office.

3.15 Connect existing carrier major and minor indications to either a shared E2A SAC remote, or a shared E2A CDO satellite to provide minimal monitoring. The telemetry equipment provided in the office to monitor the switching equipment determines whether to use a E2A SAC CDO satellite. The engineering and installation activity to modify existing alarm multiples could cost as much, or more than detailed monitoring.

```
#SMR
READOUT DEVICE? CO
TYPE OF REPORT:WEEKLY(W),MONTHLY(M),CURRENT(C)? W
SVC MEAS.CAT.NO.(1-128)?  15
ENTER STATIONS: A
@


                  WEEKLY SERVICE MEASUREMENT REPORT
                  *********************************


11:49   Ø4/21/8Ø
STATION  Ø45  WAYZATA
DATA FOR WEEK ENDING  12:Ø5 AM  MON., 21  APR.,  198Ø
SERVICE MEASUREMENT CATEGORY:    15


.................POINTS EXPERIENCING EVENTS......................


        GROUP            MONITORED POINT              WEEKLY
         BIT                  NAME                    EVENTS

        -------      ---------------------------     ----------


        GØ1-B2Ø8  1Ø1T HNVR                              2
        GØ1-B2Ø9  1Ø1T RCFR    *HOT*                     1
        GØ1-B21Ø  1Ø2T RCFR                              1
        GØ1-B211  1Ø3T RCFR    *HOT*                     2
        GØ1-B213  1Ø1T ORCH    *HOT*                     1
        GØ2-BØ16  3Ø1T HNVR    *HOT*                     1
        GØ2-BØ28  33Ø1T HAML   *HOT*                     1
        GØ2-BØ29  33Ø2T HAML                             1
        GØ2-BØ45  34Ø2T RCFR                             1

                                                  ----------
                        TOTAL EVENTS:          11
                   NUMBER OF POINTS WITH EVENTS:               9
AVERAGE NUMBER OF EVENTS FOR POINTS EXPERIENCING  EVENTS:     1.2
                    TOTAL NUMBER OF POINTS  MONITORED:        111

REQUEST COMPLETE
```

Fig. 2—Weekly Service Measurement Report for Generic 2

Note: Service measurement capability is not applicable to E2A CDO satellite locations.

3.16 The advantage of minimal monitoring is that it is lower in capital cost than the detailed monitoring method, simply because there are far fewer points to monitor. However, minimal carrier alarm monitoring is generally the method of choice in an office which has little or no analog carrier and is equipped with TCAS for monitoring T-carrier CGAs.

3.17 The operational disadvantages of minimal monitoring are listed in Table B.

```
#SMR
READOUTDEVICE? PR
TYPE OF REPORT:WEEKLY(W),MONTHLY(M), CURRENT(C) ? M
SVC MEAS.CAT.NO.(1-128)? 2
ENTER REPORT THRESHOLD IN HRS&TENTHS OF HRS(0.0-24.0): .5
ENTER STATIONS:2
@
```

```
                    MONTHLY SERVICE MEASUREMENT REPORT
             ★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

        15:38 05/12/80
        STATION 002 PIKE LAKE
        DATA FOR MONTH ENDING 12:05 AM WED.,23 JULY,1980
        SERVICE MEASUREMENT CATEGORY: 2

        ........POINTS EXPERIENCING 0.5 HOUR(S) OR MORE OUTAGE....................
```

GROUP BIT	MONITORED POINT NAME	OUTAGE TIME (HRS)
G02-B015	201T-PIKE LAKE-MELROSE	62.1
	TOTAL	62.1

```
        NUMBER OF POINTS WITH 0.5 HOUR (S) OR MORE OUTAGE:    1
          % OF POINTS WITH 0.5 HOUR (S) OR MORE OUTAGE:       20.0

                      TOTAL OUTAGE TIME ALL POINTS:    62.1
                    TOTAL NUMBER OF POINTS MONITORED:  5
                AVERAGE OUTAGE HOURS PER MONITORED POINT:  12.4

        REQUEST COMPLETE
```

Fig. 3—Monthly Service Measurement Report (SMR) for Generic 2

4. TASC IN A LARGE T-CARRIER ENVIRONMENT

4.01 In the large T-carrier environment, it is necessary to identify the potential or existing TCAS offices, using TCAS Engineering Section 865-201-100. The next step for the designer is to identify the TASC offices which are also potential or existing TCAS offices. In offices that are candidates for both system, TASC should not be involved in T-carrier surveillance. This requires that the operational activities concerning T-carrier remain in its present state until TCAS is implemented.

4.02 In each office the analog carrier (0, 0N, N1, N2 and N3) should be monitored with TASC using the shared E2A status and command (SAC) remote, while following the TASC engineering information for detailed monitoring. Minimal monitoring is generally not desirable due to extensive alarm masking; ie, a single carrier terminal or line failure results in masking of all other carrier fail indications multiplied to the same point.

4.03 The T-carrier should be monitored by the TCAS central using an E2A alarm processing remote (APR). TCAS Engineering, Section

865-201-100 should be followed when performing this procedure.

4.04 In this environment, the TASC offices which are not TCAS offices should be treated the same as offices in small T-carrier areas.

5. GUIDELINES SUMMARY

5.01 A summary of the engineering guidelines is provided in flowchart form in Fig. 4. The TASC System planner should be aware of the TELCO narrowband carrier maintenance operational structure. Since decisions involve operational-economic tradeoffs, it is important that the designer know the needs and goals of the future operational plans for maintenance administration. Generic 2 provides service measurements as a feature. This feature provides a data collection capability which enhances the present scan point processing capability. With service measurement, detailed monitoring becomes a more desirable method of monitoring equipment.

6. REFERENCES

6.01 The following is a list of the TASC sections available for reference. Some of the sections cover Generic 1 while others cover Generic 2. The sections are labeled accordingly. Also listed are engineering letters (ELs) and schematic drawings (SDs).

SECTION	TITLE
190-210-101	Telecommunications Alarm Surveillance and Control System Description, Generic 1 and 2
190-210-102	Telecommunications Alarm Surveillance and Control System Central Terminal Description, Generic 1
190-210-103	Telecommunications Alarm Surveillance and Control System Remote Equipment Description, Generic 1 and 2
190-210-112	Telecommunications Alarm Surveillance and Control System Central Terminal Description, Generic 2

SECTION	TITLE
190-210-300	Telecommunications Alarm Surveillance and Control System Central Terminal Operation, Generic 1/190-210-301 Telecommunications Alarm Surveillance and Control System Central Terminal Operation, Generic 1
190-210-302	Telecommunications Alarm Surveillance and Control System Data Base Planning, Generic 1
190-210-303	Telecommunications Alarm Surveillance and Control System Program Sequencer, Generic 1 and 2
190-210-304	Telecommunications Alarm Surveillance and Control System Data Base Planning, Generic 1 and 2
190-210-305	Telecommunications Alarm Surveillance and Control System Application Program Operations, Generic 1 and 2 G2/G2
190-210-310	Telecommunications Alarm Surveillance and Control System Central Terminal Operations, Generic 2
190-210-311	Telecommunications Alarm Surveillance and Control System Data Base Planning, Generic 2
190-210-312	Telecommunications Alarm Surveillance and Control System Data Base Operations, Generic 2
865-200-120	Engineering and Implication Methods (EIMS)
865-200-122	Engineering Guidelines—High Capacity Carrier for Generic 1 and 2
865-201-100	T-Carrier Administration System Overall Engineering Consideration System

SECTION	TITLE	SECTION	TITLE
865-201-101	T-Carrier Administration System Center @DSH Central Engineering @DSH Operating Support Systems	SD-1P125-01	Telecommunication Alarm Surveillanceand Control System Application of E2A SAC Remote
865-201-102	T-Carrier Administration System Data Base Implementation	SD-1P130-01	Telecommunications Alarm Surveillance and Control System Interconnection Information for Transmission Equipment and Control System Planning
865-201-103	T-Carrier Administration System @DSH General Code D		
865-201-190	EIMS Guide for the T-Carrier Administration System	SD-1P123-01	Telecommunication Alarm Surveillance and Control System Planning
EL 4528/PL	Telecommunication Alarm Surveillanceand Control System Planning	SD-1P125-01	Telcommunication Alarm Surveillance and Control System Application of E2A Remote
SD-1P123-01	Telecommunication Alarm Surveillance and Control System Planning	SD-1P130-01	Telecommunications Alarm Surveillance and Control System Interconnection Information for Transmission Equipment

TABLE A

OPERATIONAL ADVANTAGE OF DETAILED MONITORING	EXPLANATION
No masking	Carrier System is monitored individually. No masking of the status or other systems occurs.
Determination of potential for office isolation	Information available from office allows determination of possibility of office isolation.
Identification of critical private line circuits	Critical private line circuits can be identified in alarm message.
Reduction in callouts and minimized false dispatching	Using available information, many evening and night major carrier alarms which would have resulted in immediate dispatches could be handled the next work day. "Hard outage" information eliminates reaction to alarm "hit" situation.
Aid TRCC	Detailed alarm information helps support activities of TRCC.
Upward compatible with TCAS	Use of E2A APR in offices with greater than 250 CGAs (D-channel banks) is upward compatible with TCAS.
Service measurement (available for Generic 2)	Automates gathering of T-carrier service measurement data. This feature may also be used for other applications.

TABLE B

OPERATIONAL DISADVANTAGES OF MINIMAL MONITORING	EXPLANATION
Masking	Single system "hard outage" masks all subsequent outages and all multiple outages.
Office isolation (office isolation occurs when all transmission links with other offices have failed)	It cannot be determined if an office is isolated since the number of system failures cannot be determined.
No reduction in callouts	Information is not useful in reducing callout activity.
Minimum growth capability with E2A CDO satellite	If E2A CDO satellite is used, it is not compatible with the detailed monitoring in the future because of lack of growth capability.
Manual reading of CGA registers on D-banks and extraction of T-carrier outage time from trouble tickets	As required for T-carrier service measurement index.

```
                              Start

                                │
                                ▼
┌─────────────────────────┐          ┌─────────────────────────┐          ┌─────────────────────────┐
│ Plan TASC System using  │          │ Examine a TASC office   │          │ In this TASC office     │
│ TASC EL 4528/PL3103.    │          │ to determine the        │          │ - monitor all narrow-   │
│ Identify TASC offices   │          │ proper monitoring       │          │ band carrier minimal    │
│ with narrowband carrier │          │ method. (Part III)      │          │ monitoring and either   │
│ equipment               │          └─────────────────────────┘          │ a TASC E2A SAC remote   │
└─────────────────────────┘                      │                        │ or a TASC E2A CDO       │
                                                  ▼                        │ satellite. (Part III B) │
                                         Is this TASC                      └─────────────────────────┘
        Is the TASC                      office a candidate   No
        installation in a   No           for detailed    ─────────▶
        large T-Carrier  ─────────▶       monitoring?
        environment.
        (Part II)                                 │ Yes                              Go to
               │ Yes                                                                    B
                                         ┌─────────────────────────┐
┌─────────────────────────┐              │ If this TASC office has │
│ Consider TCAS and identify│            │ less than 250 T-Carrier │
│ the potential or existing │            │ Systems                 │
│ TCAS offices using TCAS   │            │ - monitor all narrow-band│
│ BSP series 865-201-100    │            │ carrier using detailed  │
│ (Part IV)                 │            │ monitoring and the TASC │
└─────────────────────────┘              │ E2A SAC remote          │
                                         ├─────────────────────────┤
                                         │ If this TASC has more than│
        Are there TASC                   │ 250-Carrier Systems     │
        offices which are   No           │ - monitor analog carrier using│
        also potential or ─────────▶     │ detailed monitoring and the TASC│
        existing TCAS                    │ E2A SAC remote.         │
        offices?                         │ - monitor T-carrier using a │
               │ Yes                     │ E2A APR compatible with TCAS.│
                                         │ (Part III A)            │
┌─────────────────────────┐              └─────────────────────────┘
│ In each of these        │                          │
│ offices                 │                          ▼
│ - monitor analog carrier│                        Go to
│ using detailed monitoring│                         B
│ and the TASC E2A SAC remote│
│ - monitor T-Carrier with│
│ TCAS central using a TCAS│
│ E2A APR (Part IV)       │
└─────────────────────────┘
               │          (B)
               ▼
        Are there more      Yes
        TASC offices     ─────────▶
        to consider?
               │ No
               ▼
              End
```
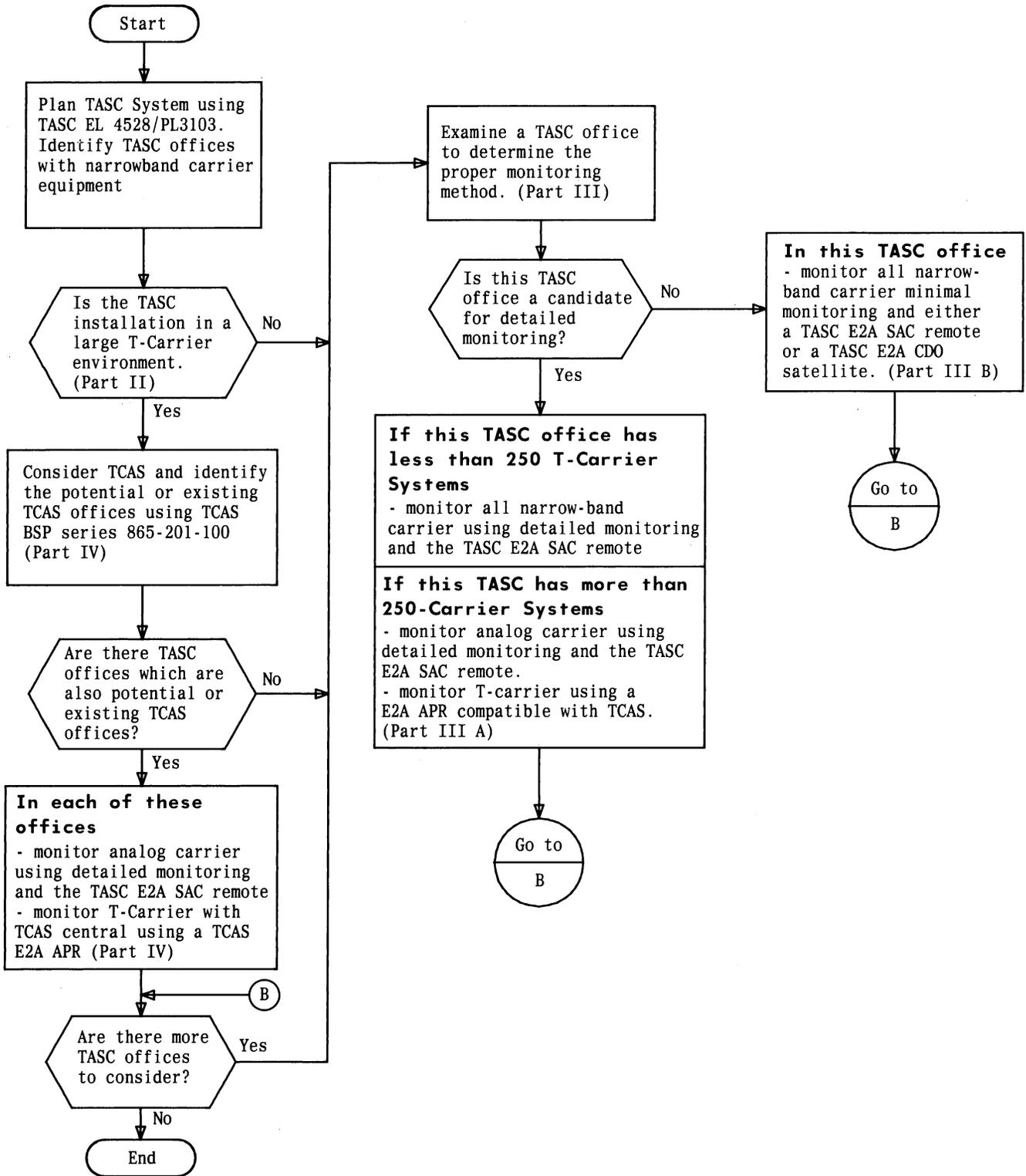
Fig. 4—Flowchart of Engineering Guidelines