# DATA TECHNICAL (DATEC) SUPPORT

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## 1. GENERAL

1.01 This section describes the objectives and operation of Data Technical Support (DATEC Support). In addition, it outlines the background, the coordinating procedures, and the test equipment DATEC personnel need to perform effectively.

1.02 The growth in number and complexity of data services has shown the necessity of establishing teams of data technical experts. These DATEC Support personnel must have the knowledge and equipment to go beyond the normal capabilities of the installation and repair forces in solving data communications problems. The existence and effective functioning of Data Technical Support is absolutely essential to maintaining high quality data service and in ensuring customer satisfaction.

### Objectives of DATEC Support

1.03 The foremost objective of DATEC Support is to improve our data communications services by bringing data service problems to the attention of technical personnel through the use of mandatory escalation procedures. The use of these procedures in conjunction with existing Bell System Practices can be an effective aid in reducing long service delays which cause acute customer

dissatisfaction. An initial step toward the objective of improving data service is to ensure that the installation and maintenance forces are properly trained and equipped to carry out their basic data assignments.

**1.04** A second objective of DATEC Support is aiding the coordination of intercompany and interarea data service problems by establishing definite procedures for obtaining technical assistance from distant locations. Following these procedures should help in promoting a teamwork approach to mutual problems and aid in providing a uniform grade of service.

**1.05** A third objective of DATEC Support is to provide business machine representatives a contact for those technical questions regarding Bell System data services that are not routinely referrable to Data Specialists or Data Service Advisors. These types of contacts can be cultivated in both directions and could become invaluable when interfacing problems arise.

**1.06** The data services of concern to DATEC Support will include the following:

- DATA-PHONE® service
- DATASPEED® service
- Data access arrangements
- Acoustic and inductive coupled data services
- Private line data service (switched and nonswitched)
- Wideband data service
- Data line concentrator service
- Teletypewriter service.

DATEC Support personnel may also be concerned with transmission problems associated with Telegraph and Telephoto Services.

**1.07** For the purposes of this section, the term "field forces" refers to the installation, maintenance, and testing personnel and their supervision who are involved with the normal provision of data services. These persons may be located at central offices, test centers, high frequency equipment, customer premises, or intermediate locations. Also, the term "Associated Company" refers to any Bell System Operating Company with the exception of Long Lines.

## 2. DATEC SUPPORT PERSONNEL

**2.01** This part describes the typical qualifications, organization, responsibilities, and activities of DATEC Support personnel.

### A. Qualifications

**2.02** In order to perform effectively, DATEC Support personnel must be experienced or trained in the following items:

- Transmission and circuit design
- Bell System data apparatus and terminals
- Interface circuits and arrangements
- Switching equipment and network structures
- Tariffed service offerings.

**2.03** In addition to the telecommunication disciplines, DATEC Support personnel should have a good appreciation for the following:

- Computer technology and teleprocessing
- Software operations
- Modulation and coding schemes
- Customer-provided equipment (CPE).

**2.04** DATEC Support personnel will often be communicating with individuals and organizations both inside and outside the Bell System. Therefore, they must have a sufficient technical background to be effective in these situations. Support personnel should also have a working knowledge of the Intercompany Services Coordination (ISC) plan, Data Specialist, and other administrative procedures and functions.

### B. Organization

**2.05** The specific manner in which DATEC Support is organized may vary in different locations. However, technical designees from both Plant

Operations and Engineering departments are essential ingredients. Local preference may place primary responsibilities in either organization.

**2.06** The number of DATEC Support personnel needed for proper coverage is strongly influenced by the quantity, geographical dispersion, and complexity of data services in the operating area. These should be a minimum of two management level technical designees for each operating area and two second echelon DATEC Support designees at the Company Headquarters. These teams may be one and the same in single area companies. They must be able to travel to outlying points whenever necessary to carry out DATEC responsibilities.

### C. Responsibilities

**2.07** The responsibilities of DATEC Support personnel fall into two general categories: ***Fundamental Responsibilities*** and ***Continuing Responsibilities.*** The ***Fundamental Responsibilities*** apply directly to the main objective of DATEC Support which is the technical backup of the data field forces. Items that fall into this first category will demand immediate attention when they arise. The ***Continuing Responsibilities*** apply indirectly to the main objectives of DATEC Support and should be performed between Fundamental case occurrences or during a particular case when they apply.

#### Fundamental Responsibilities

**2.08** ***On-Site Technical Field Assistance:*** DATEC Support personnel will be required to go to customer locations, central offices, and intermediate locations when necessary to identify and resolve technical data service problems. The Support personnel should coordinate their efforts in these locations with local work groups according to normal administrative procedures. When assistance is needed at locations outside their assigned territories, Support personnel should coordinate their activities with the DATEC Support personnel at the distant locations.

**2.09** ***Technical Counsel:*** DATEC Support personnel will advise on questions of a technical nature relating to data communications. These questions may originate from inside or outside the Bell System and may concern any of the following:

- Advice on specific types of data problems, ie, what to do first, second, third, etc
- Specific data set options
- Compatibility between CPE and Bell System equipment in accordance with current interconnection guidelines
- Tariff compliance of channels for customer-provided modems
- Suitability of switching machines for certain data services
- Advice on the technical feasibility of a customer service.

**2.10** ***Policy Counsel:*** The DATEC Support personnel will assist the field forces in interpreting the Bell System's technical responsibilities in data communications. · Some of the major items of concern may be the following:

- Technical responsibilities outlined in the Tariffs
- Technical Reference requirements
- Maintenance philosophy of Data Transmission Systems as opposed to Data Transmission Assemblies
- Activities at the interface of data access arrangements
- Performance expectations of Bell System-provided equipment, facilities, and services
- Limits of responsibility on channel-only data services using customer-provided data modems.

**2.11** ***Supplemental Training of Field Forces:*** DATEC Support personnel will supplement the formal training of the field forces through on-site contacts on difficult data service problems. The use of sophisticated test equipment and methods should be demonstrated and explained where practical. This training can be of great benefit to both the field forces and Support personnel by sharing knowledge gained during problem

investigations. Informal training, such as this, will take place automatically but should be carefully cultivated and can be augmented by verbal and written communication from the DATEC Support personnel.

#### Continuing Responsibilities

**2.12** ***Quality Control:*** Quality control is a major Continuing Responsibility of DATEC Support personnel. In their position, the technical designees are able to observe the whole data service effort. They should identify areas where improvement is needed and refer them to the responsible organizations. Items of concern may include the following:

- Test equipment shortages, updating, and maintenance
- Poor service order documentation or flow
- Recommendation of improvements in administrative procedures
- Feedback on initial service planning and installation deficiencies to the groups originally responsible
- Technical recommendations for data service improvements
- Recommendations to AT&T on Bell System equipment design or BSP improvements.

**2.13** ***Monitor Training Requirements and Effectiveness:*** DATEC Support personnel's frequent contact with the interdepartmental activities involved with data services offers an excellent opportunity to monitor training needs and effects. Some items of interest under this topic may include the following:

- Repeated field force difficulty with similar problems
- Excessive time to complete BSP tests before escalating data service problems
- Misunderstandings by sales forces or customers of a data service's operation, capabilities, or limitations.

The Support personnel should document any training deficiencies and recommend improvements to the appropriate administrative organization.

#### Availability

**2.14** DATEC Support personnel must always ensure that someone is accessible to assist on data service problems during normal working hours. After-hours assistance requests should be handled through normal off-hour administrative channels. The Support personnel must not be so encumbered by non-DATEC duties that they are unavailable to the field for technical support activities. Apart from safety, no other job function shall have a higher priority over their time.

#### Relationship to Data Specialists

**2.15** There are wide differences in the functions of Data Specialists in the various companies. Because of this, no clear and consistent relationship can be formulated between Data Specialists and DATEC Support personnel. The DATEC Support responsibility is primarily technical while a Data Specialist may have both technical and administrative responsibilities. However, the DATEC Support function might logically be included as a responsibility of the Engineering and Plant Data Specialists in some cases.

### D. Recording DATEC Support Activities

**2.16** All case activities of DATEC Support personnel should be recorded on the DATEC Case Report form shown in Fig. 1. This report is available as AT&T Form E-6236 from stationary stock. The standard maintenance sections in the 314, 59X, 660, and 668 Divisions, as they are reissued, will include an outline of the information DATEC Support personnel require when called from the field for assistance.

**2.17** Documentation, such as the DATEC Case Report with an outline of the problem and its solution, is an invaluable aid in appraising data service efforts and DATEC Support effectiveness. Nonescalated cases of advising on field force questions over the telephone and assisting on other DATEC Support team's data service problems might also deserve recording since a good deal of operational time may be involved.

**DATEC CASE REPORT**

TO AREA: Date _____ Time _____

TO CO. HQ: Date _____ Time _____

TO AT&T HQ: Date _____ Time _____

☐ Installation/Pre-service
☐ Maintenance/In-service

Circuit No. _____ Customer _____

Location _____ Contact & Tel. # _____

Assistance Requested By _____ Location _____ Tel. # _____

Request Received By _____ DATEC Location _____ Tel. # _____

1. First Customer Report: Date _____ Time _____
2. Problem Resolution: Date _____ Time _____
3. Type of Service:

☐ DATA-PHONE ☐ Intrastate P. L. ☐ Voiceband
☐ DAA ☐ Interstate P. L. ☐ Wideband
☐ Other _____

4. Method of Operation: Data Set Rate _____

☐ Point-to-Point ☐ Automatic Calling ☐ HDX ☐ Polling
☐ Multipoint ☐ Automatic Answer ☐ FDX
☐ Other _____

5. Station Equipment:

Bell System: DAA/Data Set _____ Aux. Set(s) _____
Options _____ ; _____
CPE: Modem _____ Mfr. _____ Model _____
Terminal: Type _____ Mfr. _____ Model _____
Far End Eqpt: ☐ Same. ☐ Other _____

6. Summary of Problem and Symptoms: _____

**Fig. 1—DATEC Case Report (Sheet 1 of 2)**

DATEC CASE REPORT (Cont.)

7. Problem solution including methods and tests which isolated the problem:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

8. Special Test Equipment Used (commercial or black boxes): ☐ None
   Function _____ Mfr. _____ Model _____
   Function _____ Mfr. _____ Model _____

9. Attach additional information, such as sketches, circuit layout, test data, pictures, recordings, or other items, which further illustrate the problem and/or its solution. ☐ Attachments

10. Problem resolution reached by: ☐ Telephone; ☐ On-site visit

11. Was involvement of DATEC Support due to deficiencies in field force training, customer training, test equipment or techniques, circuit design, BSP s, etc?

    ☐ No ☐ Yes (State what and explain) _____
    _____
    _____
    _____

12. Remarks (commendations, suggestions, conclusions, reasons for DATEC assistance delays, other DATEC teams involved, etc): _____
    _____
    _____
    _____
    _____
    _____

Completed By _____

Tel. # _____

**Fig. 1—DATEC Case Report (Sheet 2 of 2)**

**2.18** A copy of each closed DATEC Case Report must be forwarded to the Company's Headquarters DATEC Support designee. These closed case reports are compiled monthly into the DATEC Support Cases—Summary shown in Fig. 2. The Summary Report must be forwarded to AT&T Headquarters by the 15th of the following month.

**2.19** Particular data service problem solutions may be of interest to DATEC Support personnel in other areas. These cases, when received by Headquarters DATEC Support, should be distributed to others within the company and forwarded to AT&T with the Summary Report if they are of systemwide interest.

### E. Job Aids

#### Intercompany Communications

**2.20** There is frequent need for intracompany and intercompany communications among DATEC Support personnel. To encourage this communication, Section 010-521-101 contains the names, telephone numbers, and addresses of the Support personnel throughout the Bell System.

**2.21** There are frequent requests from customers and business machine representatives for contacts within the Bell System to discuss data service problems at a technical level. This communication should be encouraged at both company headquarters and area levels within the Operating Companies as the alternative to outside escalation of problems to high company officials. A new Technical Reference on maintenance and troubleshooting will be published including the names and the telephone numbers of Company Headquarters DATEC Support personnel.

#### Supportive Documentation

**2.22** In order to keep adequately informed, DATEC Support personnel will require an up-to-date file of reference information. This information falls into two general categories: information from Bell System sources and information from non-Bell System sources.

**2.23** ***Information From Bell System Sources:*** Some useful Bell System documents that cover data-related material are as follows:

- Bell System Practices on data apparatus and equipment, private line channels, etc
- "Bell System Data Communications Technical References"—available from WECo, Indianapolis
- "Data & Teletypewriter Advance News"—available from AT&T Headquarters
- "AT&T Executive Summary"—available from AT&T Headquarters
- "Data Bits" and "Data Reference List"—available from AT&T Long Lines
- "Transmission Systems for Communications," Fourth Edition—available from WECo, Indianapolis.

In addition to the above items, DATEC Support personnel must have ready access to Engineering Letters, AT&T General Letters, SDs, CDs, etc.

**2.24** ***Information From Non-Bell System Sources:*** Some worthwhile references available from outside the Bell System include the following:

- Electronic Industries Association, Interface Standards RS-232-B, RS-232-C, and RS-334
- "Data Transmission" by W. R. Bennett & J. R. Davey, McGraw-Hill, 1965
- "Principles of Data Communications" by R.W. Lucky, J. Salz, & E. J. Weldon, Jr., McGraw-Hill, 1968

*NOTES*

# DATEC CASE SUMMARY

Company _____ Reporting Month _____

Area _____ Prepared by _____ Date _____

| Categories | Installation | | Maintenance | | Total |
|---|---|---|---|---|---|
| | Telephone | On Site | Telephone | On Site | |
| 1. Customer Related Troubles | | | | | |
| A. Customer System Design | | | | | |
| B. Training | | | | | |
| C. CPE Trouble | | | | | |
| 1. Modem | | | | | |
| 2. Terminal | | | | | |
| D. Other | | | | | |
| II Bell System Station Equipment | | | | | |
| A. Data Sets, DAS and DAA | | | | | |
| 1. 100 Series | | | | | |
| 2. 201 A/B | | | | | |
| 3. 201C | | | | | |
| 4. 202 C/D/E/R | | | | | |
| 5. 202 S/T | | | | | |
| 6. 208 A/B | | | | | |
| 7. 209A | | | | | |
| 8. Other Type | | | | | |
| B. Teletype Equipment | | | | | |
| 1. TTY Set | | | | | |
| 2. DATASPEED® Term | | | | | |
| 3. DATASPEED® 40 Term | | | | | |
| 4. Other | | | | | |
| C. PBX | | | | | |
| D. Other | | | | | |
| III Procedure or Design | | | | | |
| A. Data Equipment Option | | | | | |
| 1. Engineering Error | | | | | |
| 2. Installation Error | | | | | |
| 3. Mktg/Cust Error | | | | | |
| B. EL-EM Fix | | | | | |
| C. Installation Error | | | | | |
| D. Testing Procedure | | | | | |
| E. Incorrect Design | | | | | |
| F. Other | | | | | |
| IV Documentation and Training | | | | | |
| A. BSP in Error | | | | | |
| B. BSP not Available | | | | | |
| C. BSP not Followed | | | | | |
| D. BSP/Tech Ref. not clear | | | | | |
| E. Training Required | | | | | |
| F. Other | | | | | |
| V Facility or Office Trouble | | | | | |
| A. Loop/Local Channel (Cable) | | | | | |
| B. Carrier Trouble | | | | | |
| 1. N/ON Type | | | | | |
| 2. T Type | | | | | |
| 3. LMX Type | | | | | |
| 4. Other | | | | | |
| C. C.O. or STC Equipment | | | | | |
| D. Other | | | | | |
| Total | | | | | |

Mail To: American Tel. & Tel. Co. 195 Broadway
DATEC Control Center C-2937
New York. N.Y. 10007

- Certain relevant papers listed in the bibliographies of various Technical References, such as the Technical Reference entitled "Data Communications Using the Switched Telecommunications Network"
- A frequently updated source of information on data communications equipment, such as "Auerbach," "Office Automation," etc
- Publications by various vendors on their equipment and its operation
- Military Standard—MIL. STD 188-type.

A good working relationship should be established between DATEC Support personnel and data services vendors and contacts should be made periodically to discuss mutual technical problems and to exchange information related to current data services and hardware.

## 3. CASE ESCALATION

**3.01** Formal and uniform escalation procedures are necessary to bring the proper resources to bear on data service problems. Complex problems encountered by the field forces, such as incompatibility between the data apparatus and the customer's method of operation, programming difficulties in the business machine, or poor performance due to an unusual transmission impairment, often require expert assistance for a fast resolution of the problem. To improve the installation and maintenance of data services and to help avoid long service delays and customer complaints, the field forces must be provided with rapid access to technical personnel who can assist in resolving these problems.

**3.02** There are two basic kinds of escalation for data service problem cases: administrative and technical. These two types of escalation and the conditions under which they apply are outlined below.

### Administrative Escalation

**3.03** Administrative escalation is the normal organizational technique for resolving problems that is fairly well defined in most companies. This procedure refers problem cases through the chain of command successively higher until a supervisory level is reached that can resolve the problems on an intra- or interdepartmental basis. This type of escalation is effective in dealing with administrative problems but is not always the most effective method of rapidly resolving difficult technical problems.

**3.04** Administrative escalation is appropriate and effective in dealing with the following kinds of data service problems:

- Basic deficiencies in planned customer service
- Service order deficiencies—orders late, incomplete, too many supplements, etc
- System design—physical equipment layout, circuit design deficiencies, normal data set option assignment, known interface incompatibilities
- Field personnel availability
- Component availability and supply—data apparatus, key telephone units, channel equipment, and facilities
- Inadequate test equipment—quantity, quality, availability
- Difficulty in coordinating personnel for end-to-end testing
- Customer training deficiencies.

### Technical Escalation

**3.05** Technical escalation is the direct referral of data service problems to DATEC Support personnel by field force supervisors and subsequent referral by Support personnel to higher levels of technical assistance as required. These technical escalation procedures are intended to supplement existing administrative procedures and standard Bell System Practices by assisting the normal work groups in fulfilling their responsibilities but not supplanting them.

**3.06** There are three levels of Data Technical Support available for assisting field forces on data service problems. The first level of technical support is the DATEC Support personnel in an area or division organization. The second level of technical assistance is from DATEC Support personnel at the Company Headquarters. The third level of

support is available as assistance from AT&T Headquarters.

**3.07** Technical escalation of data service problems is appropriate under the following conditions:

(1) The service meets Bell System specifications but does not meet the customer's performance expectations.

(2) The service does not meet Bell System specifications and the problem source cannot be identified.

(3) The service has generated a high incidence of trouble reports.

**Technical Escalation Timing**

**3.08** Technical escalation will only work successfully if a time limit for required actions is established and observed. Meeting the time limit will require local procedures to keep field supervision informed of the status and expected disposition of data service problems.

**3.09** The following time limits for escalation are intended as a Bell System objective:

(1) When a service meets Bell System specifications but fails to meet the customer's performance expectations, ***escalate immediately*** (3.10).

(2) When a service does not meet Bell System test requirements and the problem source cannot be identified, ***escalate within 4 hours*** of the discovery of the problem (3.11).

(3) When three similar trouble reports on the same service are received within 30 days and have been closed out as "test OK", "came clear", "found OK", "no trouble found", etc, ***escalate immediately*** when the third report is received (3.12).

**3.10** Situations, such as in 3.09 (1), may occur at installation when the customer attempts to use the service for the first time or on a repair visit. ***Do not optimize parameters when test results are clearly within limits.*** The test results must be available when escalating to DATEC Support personnel.

**3.11** In the case of 3.09 (2), the ***within 4 hours*** limit means that escalation can occur before 4 hours but must not exceed this if a resolution of the problem is not in sight. These hours are usually considered to be working hours but could be continuous hours in the case of a severe data service problem.

**3.12** The requirement for escalation in 3.09 (3) may be difficult to oversee without the aid of local maintenance groups. A local procedure should be implemented to assist in this area.

**Escalation Procedure**

**3.13** The following is a step-by-step procedure of the activities resulting from a case of technical escalation:

(a) Field force supervisors must request technical assistance under the conditions outlined in 3.09.

(b) The Area DATEC Support designee will render initial assistance by telephone. Some stubborn cases may not be cleared quickly by phone consultation and will require travel to the problem location. He must arrange to provide ***on-the-job assistance after four hours*** have expired from the time he was first consulted if resolution of the problem is not in sight. This procedure gives the field forces up to eight hours of trouble investigation—four hours without and four hours with technical consultation by phone. Standard contingency travel arrangements should be planned in advance to all parts of the territory covered by the DATEC Support personnel.

(c) After ***eight hours of on-site assistance*** by the Area DATEC Support personnel, the designee must contact the Company Headquarters for technical support if resolution of the problem is still not imminent.

(d) Requests from Area Support personnel to the Headquarters DATEC Support personnel for information and documentation must be honored either verbally or with the actual material within two hours from the time the request was initiated.

(e) Company Headquarters DATEC Support personnel must arrange to provide on-site assistance after ***16 working hours*** have expired

from the time of their initial notification of the data service problem if the cause of the problem has not been identified.

(f) Problems referred to Company Headquarters DATEC Support personnel which remain unresolved may be referred to AT&T Headquarters for advice and assistance. The Company Headquarters designee will usually make this referral in a time interval at his discretion.

(g) AT&T Headquarters, with the aid of Bell Telephone Laboratories, Teletype Corporation, or Western Electric, will provide assistance on the problem as soon as possible.

**3.14** The flow chart in Fig. 3 depicts the escalation procedures described in 3.09 through 3.13.

## 4. COORDINATION

**4.01** This part discusses some of the coordination aspects involved with the DATEC Support effort. These coordination procedures are intended to supplement, not replace, existing administrative and control office responsibilities and practices by efficiently bringing in the proper DATEC Support assistance on complex technical data problems.

**4.02** There must be efficient coordination and cooperation among all the parties concerned with the provision of data services. This applies equally to both inter- and intracompany relationships. When more than one location's DATEC Support team is involved with a particular data service problem, the team that resolves the problem should always provide feedback of the results to the other teams that have assisted.

### Interdepartmental Coordination

**4.03** The successful fulfillment of the DATEC Support personnel's responsibilities depends upon how well the Support personnel in turn are supported by other organizations within the company. Regardless of the department to which the designee is assigned (see 2.05), he must be able to freely contact and work with all the other company organizations involved with data services and vice versa. The quality of a customer's service is of utmost importance and the DATEC Support personnel's recommendations for improvement should be taken in that light.

### Coordination Between Associated Companies

**4.04** Associated company DATEC Support personnel must coordinate their efforts with other Associated Company Support personnel to obtain assistance at work locations outside their territory. Situations arise where a data service problem is escalated at one location resulting from a problem which exists at the far end or where the same data service problem is escalated at each location. In these cases, coordination is a necessity and some illustrations, which also apply to interarea situations, are shown in the following examples:

- ***Example 1:*** A data station working on the Switched Telecommunications Network in Associated Company A territory has a problem communicating with a data station in Associated Company B territory. The data service problem is escalated to DATEC Support personnel in Company A. Investigation and further testing shows the problem source appears to be within Company B territory. Company A's designee consults with Company B DATEC Support personnel and recounts the testing activity and conclusions. Company B's designee confirms the findings and agrees to assume the major investigative role for the resolution of the problem. Company A's designee assists with further testing where necessary and awaits feedback of the problem resolution from Company B's Support personnel.

- ***Example 2:*** A switched network data service between Associated Company A and Associated Company B develops a data service problem. Company A receives the first report and, eventually, the problem is escalated to Company A's DATEC Support personnel. Meanwhile, escalation occurs in Company B. While the additional testing recommended by Company A's designee is taking place, he learns of the dual escalation and contacts Company B's DATEC Support. They agree that Company A's DATEC Support will assume the major investigative role since it was the initial reporting location and Company B's Support personnel will assist where necessary. Further investigation indicated that the data problem source appears to be in Company B's territory. The two Company designees confer and decide that Company B's DATEC Support should now take on the major investigative role in his location and provide feedback of the problem resolution.

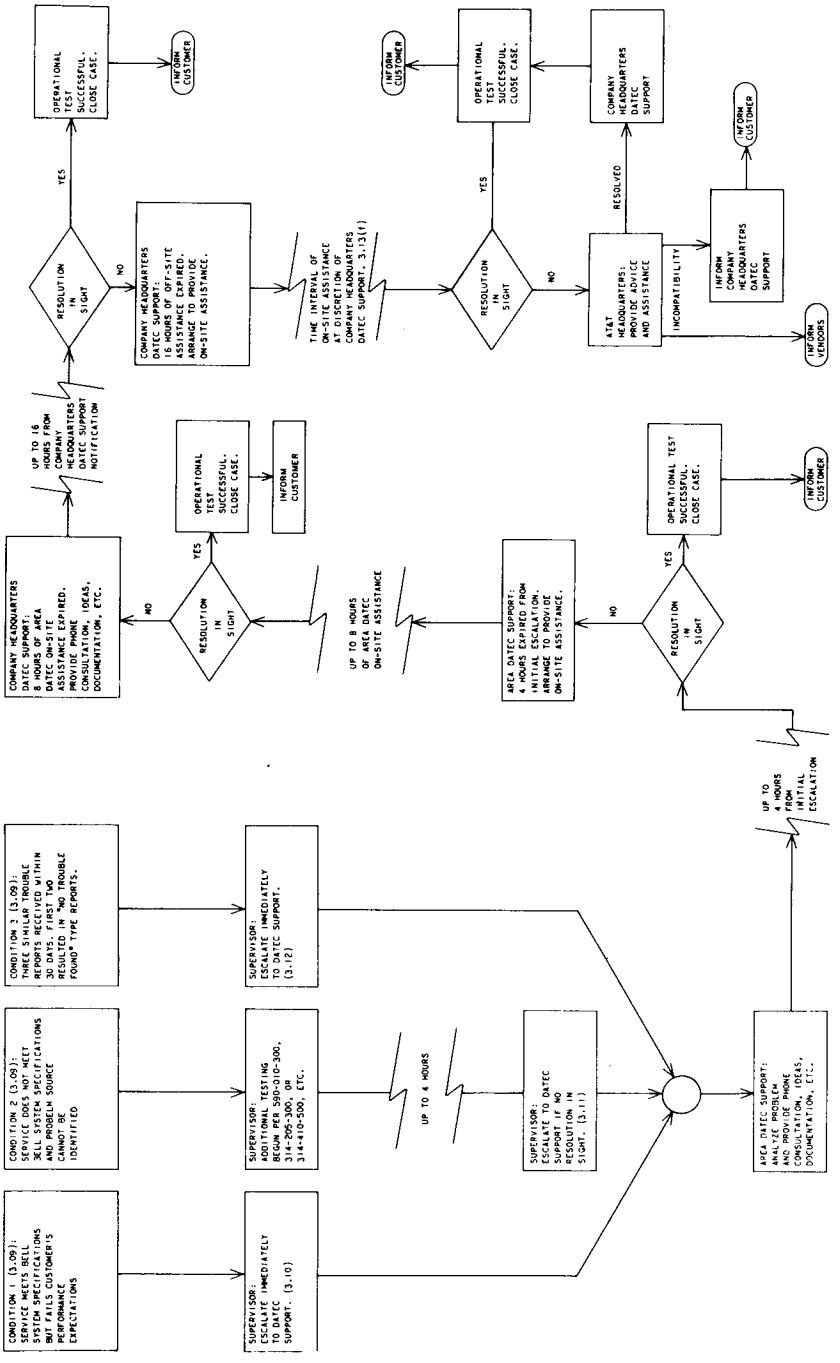


**Fig. 3—Flowchart of Data Service Problem Technical Escalation**

*NOTES*

**4.05** The two examples illustrated above point out two general rules for coordination:

(1) In single escalation cases, the DATEC Support team will coordinate the problem investigation until either the case is resolved, or until it is mutually agreed that a DATEC team in another territory can more effectively handle the investigation coordination due to the problem source, main customer location, etc (Fig. 4).

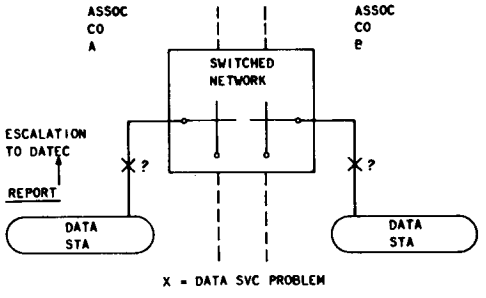


**Fig. 4—Associated Company Case 1**

(2) In dual escalation cases, the initial problem reporting location's DATEC Support team will coordinate the problem investigation with the assistance of the DATEC team at the other location until either the case is resolved, or the problem cause is indicated to be within the other DATEC team's territory and they agree to assume coordination (Fig. 5).

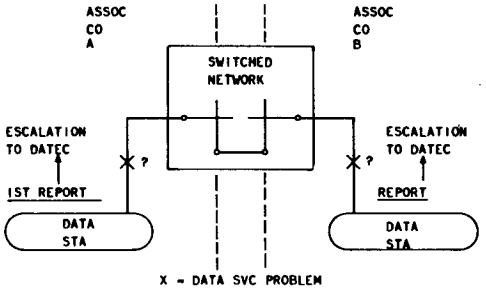


**Fig. 5—Associated Company Case 2**

**Coordination Between Long Lines and Associated Companies**

**4.06** Long Lines DATEC Support personnel must coordinate their efforts with Associated Company Support personnel to obtain technical assistance at work locations outside their jurisdiction and vice versa. The coordination guidelines supplement normal control office procedures for difficult data service problems.

**4.07** The following general guidelines should be used for coordinating DATEC Support activities involving Long Lines and Associated Company personnel:

(1) When a switched network data service problem has been isolated by Associated Company DATEC Support personnel to a particular group of Long Lines facilities and the problem can be corrected by temporarily bypassing the problem source, the Control Office will assume the major investigative role, escalate to its DATEC Support personnel, if necessary, and provide feedback of the problem resolution to the Associated Company support personnel (Fig. 6).

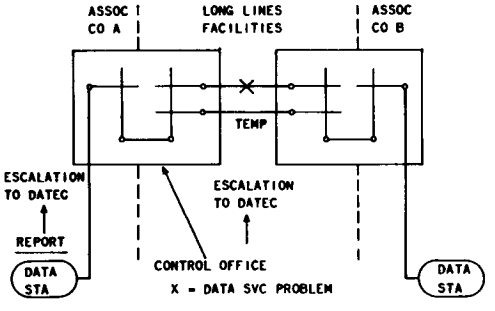


**Fig. 6—Long Lines Case 1**

(2) When a switched network data service problem has been isolated by Associated Company DATEC Support personnel to a particular group of Long Lines facilities and the problem source cannot be readily identified or bypassed, the Associated Company designee will notify the Control Office that he is contacting the Long Lines DATEC Support personnel to provide

assistance and assume the major investigative role (Fig. 7).

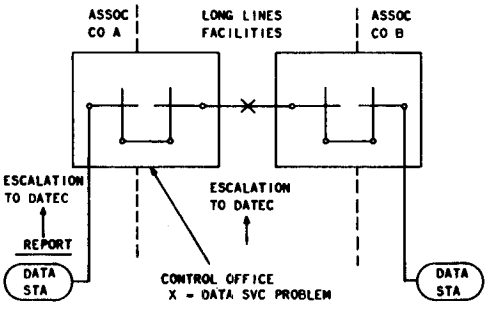


**Fig. 7—Long Lines Case 2**

(3) When a data service problem on a circuit involving Long Lines and Associated Company facilities is reported to the Control Office and the Control Office testing indicates the problem source is in an Associated Company's area of responsibility, escalation proceeds through the Associated Company's technical support hierarchy with Long Lines DATEC Support assistance, if necessary, until either the problem is resolved or its source is indicated elsewhere and the Long Lines Support personnel assume coordination (Fig. 8).

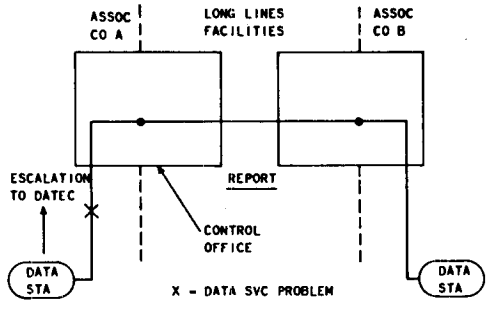


**Fig. 8—Long Lines Case 3**

(4) When a data service problem involving Long Lines and Associated Company facilities is reported to the Control Office and the Control Office testing indicates the problem source is in the Long Lines area of responsibility, escalation should proceed through the Long Lines technical support hierarchy, with Associated Company DATEC Support assistance, if required, until either the problem is resolved or its source is indicated elsewhere and that location's DATEC Support team could more efficiently handle coordination (Fig. 9).

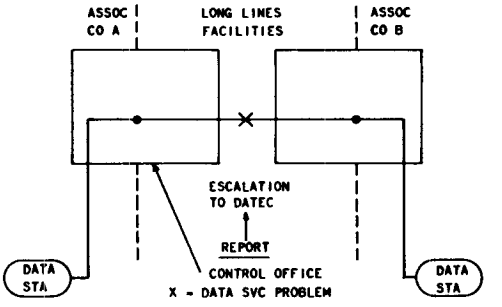


**Fig. 9—Long Lines Case 4**

**Coordination Between Bell System and Independent Companies**

**4.08** Due to the traditional close-working relationship between Independent Telephone Companies and the Bell System Associated Companies, the coordination of DATEC Support efforts on services partially provided by an Independent Company should be handled by the Associated Company in whose vicinity the Independent Company operates. The coordination of data service problem investigations should proceed similar to 4.05 or 4.07, depending on the circuit configuration, and according to the guidelines of the local Bell Independent Relations department. On some particularly complex data service problems, the Independent Company may request or agree to assistance from Bell System DATEC Support personnel. This, also, should be handled according to local Bell Independent Relations procedures.

**4.09** Two of the data problem situations that may arise should be handled as follows:

(1) When a problem develops on a data service jointly provided by an Independent Company and the Bell System and testing indicates the

problem source appears to be in a Bell System location, escalation and coordination of DATEC Support efforts should be handled by the Bell System Company in whose area the problem source is indicated (Fig. 10).

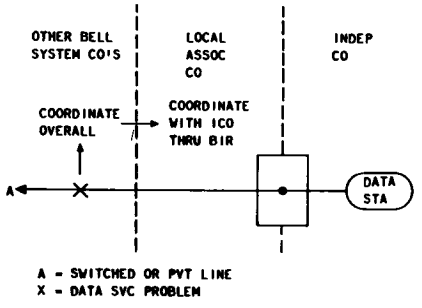


**Fig. 10—Bell—ICO Case 1**

(2) When a problem develops on a data service jointly provided by an Independent Company and the Bell System and testing indicates the problem source appears to be in an Independent Company location, the local Associated Company should handle coordination of DATEC Support efforts with that Independent Company and agree to provide assistance, if necessary (Fig. 11).

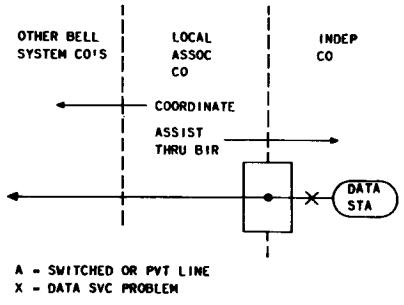


**Fig. 11—Bell—ICO Case 2**

## 5. TEST EQUIPMENT

**5.01** The technically complex nature of data communications services demands that the persons involved with the installation and maintenance of these services be adequately equipped with the proper test equipment. This part provides recommendations for a basic set of voiceband test equipment for field force use and additional transmission and specialized equipment for DATEC Support personnel. Additional test equipment is necessary for narrowband and wideband services.

### A. Field Force Test Equipment

#### Basic Test Equipment

**5.02** The field forces who install and maintain the data services listed in 1.06 must be equipped to perform the basic tests outlined in the Bell System Practices on data services. These same tests are usually made when a data service problem arises for comparison to the most recently recorded benchmarks. The parameters that may be measured are as follows:

- Net loss
- Frequency response
- Impulse noise
- Message circuit noise
- Average error rate
- Envelope delay distortion.

**5.03** Table A lists the types of equipment or their equivalents needed by the field forces to make the above measurements. Although the average error rate test can be made with 901, 902, and 903 Data Test Sets, a 914-type Data Test Set combines the functions of these three separate test sets along with some other valuable features. If a new data test set is to be purchased, a 914-type is preferred since it is a more highly versatile unit with many features not found in the 901, 902, and 903 test sets.

#### Accessible Test Equipment

**5.04** Situations may arise during installation or maintenance testing of a particular type of data service in which more than the basic tests should be made. This is true in the case of high-speed Bell System modems which operate above 2400 bits per second or similar customer-provided modems which operate at information rates at or

**TABLE A**

**SUGGESTED BASIC VOICEBAND TEST EQUIPMENT FOR DATA FIELD FORCES**

| FUNCTION | MODEL | REFERENCE |
|---|---|---|
| Net Loss and Freq. Response | 3550B Portable Test Set (Hewlett-Packard) — or — TTS 4 BNH Transmission Test Set and TTS 4 BXV LID (Northeast Electronics) — or — Equivalent | Manufacturer's Instructions 103-204-100 |
| Impulse Noise * and Message Circuit Noise † | 6F Voiceband Noise Measuring Set (WECo) | 103-626-100 |
| Error Rate | 914-Type Data Test Set (WECo) | 107-101-100 |
| Envelope Delay and Freq. Response | 25B Voiceband Gain and Delay Set (WECo) | 103-115-101 |

*6H Voiceband noise measuring set (WECo) may also be used (103-620-101).
†3C Noise measuring set (WECo) may also be used (103-611-101).

above 2400 bits per second. Some suggested equipment that should be available to the field forces for making these types of tests is listed in Table B. Means for centralizing field force accessible test equipment should be established where such means do not now exist.

**5.05** Of particular importance to the performance of high-speed modems is the effect of phase jitter, single frequency interference, and harmonic distortion. Since these parameters are contributed primarily by carrier systems, the most logical arrangement for their measurement is between STC s or end offices where intervening carrier facilities exist. The measuring sets for these tests should be available to personnel in those offices from which the high-speed modem service is offered. These instruments are also included in Table B.

**5.06** Among the most useful of the troubleshooting test equipment in Table B for field force use is the portable dual trace oscilloscope. The scopes shown have a 15-MHz bandwidth which is more than adequate for rise time measurements on dc interface signals. Other oscilloscopes may be substituted, provided they have the following features:

(a) Dual trace, separate vertical amplifiers

(b) At least 10-MHz bandwidth (3 dB down)

(c) Vertical amplifier sensitivity of at least .05 volt/div

(d) DC balance adjustment on each amplifier

(e) External trigger capability.

**5.07** Suggested data field force applications of an oscilloscope are as follows:

- Verification of voltage levels or fluctuations on interface leads which must conform with EIA or other standards
- Observation of impulse noise, excessive circuit noise, distortion on line signals, or eye patterns
- Monitoring ac power lines to note the correlation between hits on the ac power

TABLE B

SUGGESTED ADDITIONAL TEST EQUIPMENT
ACCESSIBLE TO DATA FIELD FORCES

| FUNCTION | MODEL | REFERENCE |
|---|---|---|
| Phase Jitter<br>Phase Hits<br>Gain Hits | 48 Phase Jitter Set<br>(Hekimian Labs)<br>— or —<br>Equivalent | Manufacturer's<br>Instructions |
| Harmonic Distortion and Single Frequency Interference | 1568A Wave Analyzer<br>(General Radio)<br>— or —<br>302 Wave Analyzer<br>(Hewlett-Packard)<br>— or —<br>Equivalent | Manufacturer's<br>Instructions<br><br>Manufacturer's<br>Instructions |
| Frequency Shift Measurements and Electronic Counter | 5321B Electronic Counter<br>—10 MHz (Hewlett-Packard)<br>— or —<br>1192 Counter —32 MHz<br>(General Radio)<br>— or —<br>Equivalent | Manufacturer's<br>Instructions<br><br>Manufacturer's<br>Instructions |
| Dual Trace Oscilloscope, 15 MHz, Portable | 422 Dual Trace Oscilloscope<br>(Tektronix) — or —<br>VP-561A Dual Trace Oscilloscope<br>(Panasonic) — or —<br>Equivalent | Manufacturer's<br>Instructions<br>Manufacturer's<br>Instructions |
| X-Y Recorder | 136A Two Pen Recorder<br>(Hewlett-Packard) — or —<br>Equivalent | Manufacturer's<br>Instructions |
| Oscillator | 3550B Portable Test Set<br>(Hewlett-Packard) — or —<br>Equivalent | Manufacturer's<br>Instructions |
| P/AR Measurements | 27 P/AR Measuring Set (WECo) | 103-110-110 |
| Return Loss | KS-20501 Return Loss<br>Measuring Set (Acton Labs) — or —<br>Equivalent | 103-106-115 |
| Singing Point Margin | 2D Singing Point Test Set<br>(WECo) — or —<br>TTS 12A Singing Point Test Set<br>(Northeast Electronics) — or —<br>Equivalent | 103-106-105<br><br>Manufacturer's<br>Instructions |

and errors received by Bell System data modems

- Verification of noise or spurious signals on dc interface leads.

When signals are observed on the telephone lines, a test adapter for transformer isolation must be used since the local loop is electrically balanced and oscilloscopes without differential amplifiers and some other models of test equipment are unbalanced to power ground at their inputs. A test adapter for monitor isolation is described in Section 107-180-100.

### B. DATEC Support Test Equipment

**5.08** The test equipment needs of the Area or Company Headquarters DATEC Support personnel fall into three categories as follows:

(a) Transmission test sets

(b) Data modem test sets

(c) Special test equipment.

**5.09** The equipment recommended in these categories could be used by one or more DATEC Support groups, depending upon the number of data services within an operating area and the need. The recommendations are designed to equip the Support groups with adequate equipment usable on the wide variety of data services. The equipment should be assigned to the DATEC Support groups for use either by themselves or in particular situations by the field forces.

#### Transmission and Data Test Sets

**5.10** The recommended transmission test equipment for DATEC Support groups is contained in Table A and Table B. Use of this equipment is basically for testing voice channels in carrier systems with the exception of gain and delay, P/AR, noise, and return loss which is also required for local loop testing. This equipment gives DATEC Support personnel the capability of measuring the following transmission parameters:

- Phase jitter (incidental FM)
- Phase and gain hits
- Harmonic distortion
- Single frequency interference
- Frequency shift (carrier offset)
- Return loss
- Singing point margin
- Envelope delay distortion
- P/AR
- Frequency response
- Noise
- Loss.

**5.11** The recommended data modem test set for average error rate measurement is a 914-type. The 914-type test set, as described in Section 107-101-100, is very useful for a number of tests other than error runs which may or may not be possible to obtain from several other pieces of test equipment.

#### Special Test Equipment

**5.12** Occasionally, data service problems develop where standard tests do not uncover the source of the problem. Some special test equipment is necessary in these instances to provide the capability of in-service monitoring of data set interfaces and line signals and performing further data equipment tests.

**5.13** Information on several locally constructed units of special test equipment is available in the following sections:

- 107-180-100—Bridging Devices—Description, Application, and Construction
- 107-180-101—Digital Signal Recording and Playback Using a Pulse Transmitter/Receiver—Description, Application, and Construction
- 107-180-102—Interface Test Adapter for Data Set 303-Type—Description, Application, and Construction

- 107-180-103—Multiple Data Set 403D-Type Test Arrangement—Description, Application, and Construction Information

- 107-180-104—Wideband Data Test and Service Bay Connector Panel—Description, Application, and Construction Information.

Information on two other locally constructed items, Polling Test Set and ACU Exerciser, has been distributed to Data Specialists and Headquarters DATEC personnel in AT&T General Letter 71-01-185.

**5.14** Several commercially available items which are very useful in the investigation of particularly elusive data service problems are as follows:

(a) Oscilloscope with delayed sweep capability—Tektronix Type 453 or Panasonic Model VP-551A; oscilloscopes with storage capability should also be considered

(b) Audio spectrum analyzer—Singer Model MF-5, Systron-Donner Model 710/800A, or Nelson-Roll 0—20 kHz type

(c) Light beam oscillograph and signal amplifiers—Honeywell Model 1508A Visicorder with Type M13,000 light deflecting galvanometers and 120 ips drive (see Section 107-180-100, Part 3).

**5.15** It is strongly recommended that an oscillograph similar to that listed in 5.14 be made a basic tool of DATEC Support personnel. The number of such instruments, because of their high cost and relative operating sophistication, should be limited to this group of Support designees and, in some cases, shared between several groups. To effectively use an oscillograph, the Support personnel must have a good working knowledge of Bell System data set interfaces and the general operation of the business machine communication control equipment, interface, and data format and coding. It is also helpful to understand the overall operation of the customer's system—hardware and software. With sufficient facts about operating methods of particular equipment, the oscillograph provides a positive indication of whether the problem source is located somewhere in the business machine or in the Bell System portion of the service.

**5.16** These special test sets are used only on a small percentage of data service problem cases and serve as a last resort when standard tests have not isolated the problem. For the DATEC Support groups, the equipment in the three categories listed in 5.08 should fill the designee's needs when field assistance must be rendered. The special test equipment should be obtained primarily for the DATEC Support groups' field use, but it may be made available to other knowledgeable personnel when difficult data problems arise.

## *NOTES*