

TIRKS MANAGEMENT MANUAL—SYSTEM PERFORMANCE
NETWORK ADMINISTRATION—CIRCUIT PROVISIONING
NETWORK SERVICES METHODS

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Batch Sizing	4	1.01 This section describes the tools available to the user to monitor and, to a degree, control various aspects of the system performance of the Trunks Integrated Records Keeping System (TIRKS). The TIRKS performance is a function of two sets of parameters. They are:	
DETERMINATION OF COMPUTER CONFIGU- RATION	5	(1) EDP parameters which include size of the cen- tral processor, size of the data base, number of regions allocated, data base tuning, etc	
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2. ELECTRONIC DATA PROCESSING (EDP) PARAMETERS

ON-LINE SIZING CONSIDERATIONS

A. TIRKS Implementation Schedule

2.01 A TIRKS implementation schedule should be developed for all TIRKS modules and features to be used by a company. If the company has multiple Circuit Provisioning Centers (CPCs), this schedule should be developed separately for each CPC and associated user organizations in order to derive the Central Processor Unit (CPU) usage for each CPC.

Process Used for Order Processing

2.02 Using the TIRKS module/feature deployment schedule from paragraph 2.01, detailed order flow scenarios should be developed for ADD, DISCONNECT, and REARRANGE activity for message trunks and special services for each TIRKS installation. ADD, DISCONNECT, and REARRANGE scenarios for carrier system processing are also required in TIRKS Production Release 12 time frame (1981) if this feature of TIRKS is to be used.

2.03 The standard TIRKS order flow scenarios for full TIRKS operations are described in Business Information System Practices (BISPs), Series 756-551-4XX. These order flows should be reviewed and modified to include any additional factors peculiar to a particular TIRKS installation such as:

- (1) Physical CPC layout which may necessitate a deviation from the standard order flow.
- (2) Data base considerations which may impact order flows. (If the Circuit/Preparation [C1/PREP] data base is not fully loaded with existing circuits, the REARRANGE and DISCONNECT processing will be impacted for both message trunks and special services. If the Trunk Administration System [TAS] data base is partially loaded, order processing will be different for orders involving TAS and orders not involving TAS.)
- (3) The level of order tracking to be used in TIRKS should be defined. If location level (CKL/CWL) tracking is to be used, the average number of CKL/CWLs for each type of order or activity should be determined.
- (4) If the in-bureau tracking feature is to be used, the number of updates, as well as the point in

the order processing that the update occurs, should be defined.

- (5) If a given TIRKS module or feature is not used by a company, the standard order flows should be modified to reflect the impact of not using that module or feature.
- (6) Any other deviations from the standard flows should be defined (CPC on-line interaction with Plug-in Inventory Control System [PICS] or Computer System for Main Frame Operations [COSMOS], any on-line quality control procedures, etc).
- (7) Scenarios should also be developed for handling supplement and jeopardy activity.

Circuit Order Item Activity

2.04 The average monthly circuit order "item" activity for all years covered by the CPU sizing study should be projected. This item activity projection should be broken down by order type, ie, message trunk, special services, carrier systems and by type activity, ie, ADD, DISCONNECT, and REARRANGE. It is extremely important to make the item activity projections as accurate as possible since they are a **key** element in determining CPU sizing requirements.

2.05 Volume projections for supplement and jeopardy activity is also needed for the message trunks and special services.

Note: For message ADD projections, the average number of orders per month should be provided along with the average number of items per order.

2.06 The daily transaction volume for support functions such as Field Assistance, Reference Data, Records Purification, Inventory Scans, On-Line Data Base Loads, etc, should be determined where possible. For existing TIRKS installations, the support transaction volume can be determined by identifying all terminals involved with support functions and using TIRKS Report RCSR09 in conjunction with International Business Machines (IBM) Utility DFSILTAO to identify the transactions associated with each support terminal. The daily transaction volume generated by order status inquiries should also be determined. The inquiry transaction

volumes are normally a function of the number of terminals located in central office and/or other locations external to the CPC.

2.07 If a company is unable to quantify the volume of transactions attributable to support and inquiry functions, the following estimates have been obtained by Bell Telephone Laboratories (BTL) from several companies with full TIRKS installed:

(1) For companies with a small network of terminals (less than 25) external to the CPC, the use of the inquiry function should be minimal. An estimate of the volume of support and inquiry transactions can be obtained by multiplying the total daily transactions by **1.2**.

(2) For companies with a large network of terminals external to the CPC, the use of the inquiry function will be substantial. An estimate of the volume of support and inquiry transactions can be obtained by multiplying the total daily transactions by **1.3**.

B. TIRKS Transactions

General Explanation

2.08 Usage of the TIRKS command and function key features produces TIRKS transactions. In many cases, there is a one-to-one correspondence between command/function key usage and transaction generation, but in some cases the one-to-one relationship does not exist. Some examples of TIRKS command/function relations to transaction generation are:

(1) COMMAND/FUNCTION key usage which generates **no transactions** include such items as finding a blank mask (CD, WA, COCORD, etc) via the **ENTER** command or **FIND** key and clearing the screen via the **CLEAR** key.

(2) COMMAND/FUNCTION key usage which generates **one transaction** include such items as:

- FIND (CLO, CAC, or CKT ID)
- COPY
- MOVE
- MODE

- COMPUTE
- UPDATE
- CCSTATI
- POST
- CCPSTTY (dial terminal transaction)
- ADD
- FORWARD (within mask)
- BACK (within mask)
- REFRESH
- ETC.

(3) COMMAND/FUNCTION key usage which generates **two transactions** include such items as:

- JUMP FIND
- FORWARD (to new mask - CD to TD, etc)
- BACK (to previous mask - TD to CD, etc)
- ISSUE.

(4) In addition to the status and **FIND** transactions associated with due date completions into **COC**, an internal completion transaction is generated to each TIRKS module involved (**E1**, **F1**, and **C1**).

Determination of Transactions Associated with Order Flows

2.09 The TIRKS COMMAND/FUNCTION relationships to transactions described in paragraph 2.08 should be applied to the various TIRKS order flows developed from the work effort described in paragraph 2.02 and 2.03. Specific examples of how this effort is accomplished for the standard order flows are presented in Attachments A1 through A7.

Determination of Busy Hour Transaction Volumes

2.10 The volume of transactions to be presented to the system during the peak or busy hour

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should be determined from Report RCSR09 and the Information Management System (IMS) log tape analysis as described in Section 2.2 of BISP 756-551-940. Where the log tape analysis cannot be done (new installations, new modules, etc), a projection of the busy hour can be calculated as follows:

(1) Determine the total daily transactions (TDT):

TDT =

$$\frac{\text{No. Items}}{\text{Month}} \times \frac{\text{Transactions}}{\text{Item}} \times \frac{1 \text{ Month}}{20 \text{ Days}} \times \frac{\text{Support and Inquiry}}{\text{Inquiry}} \times 1.1$$

(Note 1) (Note 2) (Note 3) (Note 4)

Note 1: Items per month as projected in paragraphs 2.04 and 2.05.

Note 2: Transactions per item as generated from the order flow activity discussed in paragraph 2.09.

Note 3: The support and inquiry rate as determined in paragraphs 2.06 and 2.07.

Note 4: An overhead factor of 10 percent is applied to account for transactions associated with miscellaneous activity which generates transactions not considered under the order flow or support/inquiry categories.

(2) Determine the volume of busy hour transactions (BHT):

$$\text{BHT} = \frac{1.35^*}{H^\dagger} \times \text{TDT}$$

Note: This number should be used to estimate BHT volume in the absence of any special circumstances. Factors such as multiple time zones, staggered start/stop times, staggered lunch times, staggered break times, etc, will also impact the busy hour and should be considered.

* BTL busy hour loading estimate based on data from several TIRKS operations. (See BISP 756-551-940, paragraph 2.2.)

† Number of hours of scheduled on-line TIRKS operation. Note that increasing the value of H decreases the number of transactions during the busy hour.

Data Base Sizing

2.11 BTL has developed a program to generate data access storage device (DASD) requirements for COC, E1, F1, and C1 based on the circuit order volume and the amount of inventory (equipment, facilities, and circuits) to be maintained in TIRKS. The specific data required from the Bell operating companies (BOCs) are defined in BISP 756-551-940.

2.12 To utilize the BTL program, each BOC should provide the required data base sizing information to the BTL Operations Analysis Group. Any problems encountered with collecting the data should be referred to the appropriate American Telephone and Telegraph (AT&T) TIRKS Implementation Group.

Batch Sizing

2.13 Batch sizing must consider all aspects of batch requirements including data base maintenance runs, standard TIRKS application runs, and specific BOC-developed report runs.

2.14 The maintenance activity consists of data base reorganization, backup and recovery, IMS runs, etc. Details concerning data base maintenance activities can be found in BISP 756-551-910.

2.15 The standard TIRKS application runs are defined in the TIRKS Batch Run Summary (BISP 756-551-500). Estimates of CPU run times can be found for many of the standard batch runs in the BISP 756-55X-5XX series. RL 80-04-414 provides run time estimates for the TIRKS data base integrity programs gleaned from the Southwestern Bell trial.

2.16 The run requirements for BOC-developed application runs must also be defined and included in the batch sizing study.

2.17 The batch sizing job is primarily the responsibility of each BOC. In approaching the batch sizing study, all required batch runs should be identified along with the frequency of the runs and an estimate of the run time. It may be helpful to list this run information on a monthly calendar to obtain a graphic picture of the total time requirement for batch runs.

DETERMINATION OF COMPUTER CONFIGURATION

2.18 After all TIRKS on-line and batch computer requirements have been determined, a computer hardware configuration which will support these requirements should be determined. BISPs 756-551-940 and 756-551-941 should be used as guidelines in determining the appropriate computer configuration.

2.19 Prior to finalizing a computer configuration, a joint BOC, BTL, AT&T Information Systems Organization (ISO), and AT&T TIRKS Project Management meeting should be held to review the proposed computer configuration. The expertise resident in the BTL/TIRKS Systems Administration Group will be available to assist the BOCs in this endeavor. The appropriate AT&T/TIRKS Implementation Group should be contacted to set up the meeting.

SYSTEM TUNING

2.20 After the TIRKS system is on-line, data base "tuning" will be required to maximize the efficiency of the computer. The TIRKS Configuration Planning and Performance Tuning Guide (BISP 756-551-940) should be used as a basis for performance tuning.

2.21 Tuning of TIRKS is considered primarily a BOC responsibility. However, the expertise of the BTL/TIRKS System Administration Group and the AT&T/ISO Organization is available to assist the BOCs with tuning problems which they are unable to resolve.

APPLICATIONS ANALYSIS

2.22 Once TIRKS is loaded and tuned, it is important to assure that the system is being used in an efficient manner from both a batch and on-line aspect. Periodic TIRKS operational analysis reviews will be performed in the BOCs by a joint AT&T/BTL task force. Feedback sessions will be scheduled with the BOCs in which TIRKS problem areas will be identified along with recommendations for resolving these problem areas. The TIRKS operational analysis reviews will be coordinated by the AT&T/TIRKS project management group.

2.23 Each BOC should set up an internal TIRKS operational analysis review effort to supplement the AT&T/BTL reviews. This is especially

needed in the BOCs that have multiple CPCs in that normally only one CPC is included in an AT&T/BTL review. It is recommended that these reviews be conducted on an annual basis.

3. USER PARAMETERS

NETWORK CONFIGURATION PLANNING

3.01 The goal of network configuration planning is to enable the BOCs to plan and size their TIRKS corporate network needs. The process is valid for dedicated private line networks and is adaptable for dial-in/dial-out networks. As such, it assists the BOCs to optimize their current networks as well as plan their future corporate networks.

3.02 In order to develop a TIRKS network configuration plan, a BOC/TIRKS project team, including representatives from all impacted organizations, should be formed. This team should be responsible for developing the overall TIRKS communications requirements for inclusion in the BOC corporate communications plan.

DEVELOPING THE COMMUNICATIONS PLAN

A. Work Flows

3.03 Each project team representative must completely analyze the existing processing flows within their respective organization and document these flows considering the interaction between organizations. The impact of the corporate TIRKS implementation plans on these flows must then be determined. Only those TIRKS modules scheduled to be implemented during the study period should be considered when developing these work flows.

3.04 As part of the work flow development, the project team must consider miscellaneous factors which will impact the work flows within the study period; such as systems administration, training requirements, and data base corrections. In addition, TIRKS manual and mechanized interfaces such as Circuit Maintenance System 1 (CMS-1) and Computer System for Main Frame Operations (COSMOS) are a necessary consideration of the work flow process and must be included to achieve accurate results.

3.05 Standard TIRKS work flows are described in paragraph 2.01. These work flows are very detailed and must be aggregated to a level which will

depict the typical activity at the TIRKS work stations. Once this is done, the traffic for this work station can be characterized and analyzed. It is up to the BOC to identify their work flows and combine them into **work station operations equating to work scenarios** which reflect their TIRKS operation.

3.06 Each project team representative must evaluate the work flows within that representative's organization to ensure they are both accurate and efficient. Timely concurrence on the work flows **must** be obtained from each organization prior to proceeding with the integration of flows within the project team. Appropriate actions/approvals must be taken to modify work flows where required to agree with the overall corporate operation plan for TIRKS implementation.

B. Circuit Activity

3.07 The circuit activity for special services, message trunks, and carrier system must be determined as described in paragraphs 2.04 through 2.07.

C. Work Operations and Work Volumes

3.08 The type and volume of work performed at each work unit must be identified based upon information obtained in Part 2 of this section. To determine the average required hourly work operations, divide the number of work operations required in a given period of time by the number of work hours in the same period. Peak work operation volumes are determined from either historical data or from BOC weighted average work volumes. A typical example of the application of this formula is:

Example: To determine the average required hourly work operations, divide the number of work operations required in a given time period by the number of hours in the same period. (Work operations in a given time period equals 2,800. Number of hours in the same period equals 7 hour work day times 20 work days per month equals 140 hours.)

Average Required Hourly Work Operations:

$$\frac{2,800}{140} = 20$$

D. Geographic Considerations

3.09 The identification and mapping of all existing work locations which will be part of the user set of interaction points for TIRKS is a key element in determining an optimum network configuration. The project team must be fully aware of today's environment and work activities to a level of detail sufficient to allow quick analysis and identification of the existing business.

3.10 The identification of all existing work locations which may be impacted by TIRKS requires an in-depth knowledge of TIRKS and the current BOC method of operation. Candidates for identification include such work groups as:

- (1) Order screening position in CPC
- (2) Order screening position in Business Services
- (3) Engineering completions position in CPC
- (4) Order completions position in Network Operations
- (5) Circuit order preparation position in CPC
- (6) Equipment inventory entry position in Equipment Engineering
- (7) Long and short range planning in Facilities Engineering
- (8) The many remote locations which may have to post jeopardies/completions
- (9) Network Administration groups responsible for trunk relay inventory and assignment, etc.

3.11 The project team needs to prepare an accurate list of the various input locations and overlay this with the work flow plans developed previously. This list must include, as a minimum, the terminal hardware at the location (if any), the daily usage, the specific work operations to be performed, and a brief description of the type of work performed.

3.12 The final step in the identification phase is to prepare a geographical map of these locations to support each work flow and identify possible network design deficiencies in the areas of availability and reliability.

3.13 The procedure for identifying and mapping proposed locations to be used with TIRKS is

somewhat the same. The following two distinct types of work flows require different considerations.

- (1) Work flows that adapt to a standard TIRKS environment
- (2) Work flows which need substantial modification.

In the first category, the identification of proposed TIRKS work locations is straightforward. The lists can be developed by the project team rather easily and can be overlaid on the work flows. The second circumstance will require extensive analysis of work flows coupled with a working knowledge of functions which TIRKS can perform.

E. Characteristics of Individual Work Operations

3.14 To accurately obtain meaningful data for this entire study, a detailed analysis of keyboard display operations is required. Each particular work operation identified above needs to be broken down to a sequence of discrete steps or key strokes. For example, to issue a Work Order Record Details (WORD) document, the following keyboard operations may be used.

- (1) Press **CLEAR**
- (2) Type **/FOR DIST**
- (3) Press **SEND/RECEIVE**
- (4) Type in CLO and Item number
- (5) Press **FIND** (PF1)
- (6) Or **JUMP FIND** from other C1-PREP formats
- (7) Press **SEND/RECEIVE**
- (8) Type in administration data—typically 10 characters
- (9) Type in destinations—typically 6 to 8 RROs, 25 characters
- (10) **UPDATE** (PF 5)
- (11) **ISSUE** (PF 11).

Note: Italicized items are action causing functions.

A similar scenario must be developed for each work function in each flow. This must be documented in a form that will permit duplication in a controlled test environment.

3.15 A working TINY TIRKS system is required to provide a controlled test environment. In addition, TIRKS Response Analysis Monitor (TRAM), which is data capture software from BTL, scheduled to be available with TIRKS Production Release 12.2, must be in the computer and enabled. Appropriate arrangements should be made with the Information Systems Organization and other TINY TIRKS users to ensure sole use of TINY TIRKS for this exercise.

3.16 The procedure is to physically repeat each work function scenario a number of times to capture the quantity of data transmitted to the computer and received by the terminal. This may take a significant amount of elapsed time to ensure accurate results.

3.17 The results of the data capture software must be analyzed to provide data characters transmitted/received over the data communications line. This is used in obtaining the individual work station's terminal/line sizing data by determining how many characters are processed by the individual work function scenarios.

3.18 The same methodology may be applied to multiple terminal work stations to ensure adequate line sizing. This is based on how many characters are processed by action causing keys on the keyboard (eg, PF1, PF2, S/R, etc). The entire analysis will produce data in the following forms:

- (1) User input timing information:
 - Average time per user action
 - Average time per work operation.
- (2) Data transmission characteristics:
 - Average characters transmitted/received per user action
 - Average characters transmitted/received per work operation.

F. Preliminary Network Sizing

3.19 The procedures identified in this part represent a first order approximation. Multiply the

average required hourly work operations obtained from paragraph 3.08 times the average time per work operation from paragraph 3.18. The results obtained will equate to the minimum number of terminals required per work operation.

3.20 To determine the character load to the network, add the results of multiplying the average required hourly work operations obtained from paragraph 3.08 times the average characters transmitted to CPU obtained from paragraph 3.18, to the results of multiplying the average required hourly operations obtained from paragraph 3.08 times the average characters transmitted to the terminals obtained from paragraph 3.18. A typical example of the application of this formula is shown in the following example:

Example: Utilizing TINY TIRKS with TRAM enabled, the log order function for Administration Area XY produced the following information:

- Log order function equals 6 minutes.
- Characters transmitted to the CPU per hour equals 300.
- Characters transmitted to the terminal per hour equals 1,500.

Minimum Number of Terminals

3.21 To determine the minimum number of terminals required per work operation, multiply the average required hourly work operation obtained from paragraph 3.08 times the average time per work operation/function obtained from paragraph 3.20.

- Minimum number of terminals equals average required hourly work operations times average time per work operation:

$$20 \times \frac{6 \text{ Minutes}}{60 \text{ Minutes/Per Hour}} = 20 \times \frac{1}{10} = 2 \text{ Terminals}$$

Character Load to the Network

3.22 To determine the character load to the network, add the results of multiplying the average required hourly work operations times the average characters transmitted to the CPU to the results of multiplying the average required hourly operations times the average characters transmitted to the terminals.

- Character load to network equals average required hourly work operations times characters transmitted to CPU plus average required hourly work operations times characters transmitted to terminal:
 - = 20 × 300 + 20 × 1,500
 - = 6,000 + 30,000
 - = 36,000 per hour

G. Finalizing Network Configuration

3.23 The preliminary terminal requirements obtained from paragraph 3.19 should be adjusted to incorporate the following considerations:

- (1) The terminal is an essential tool for doing the production work of a CPC in a TIRKS environment. As such, optimization of CPC efficiency may dictate that more terminals be placed in the CPC than appears to be needed from the preliminary estimates obtained in paragraph 3.19.
- (2) No more than six to eight circuit provisioning production type terminals should be allocated to a 4800 baud data line.
- (3) The terminals of a work group should be spread across several type data lines, where possible, to minimize the impact of line outage on the work group.

3.24 In order to develop an initial model of the network configuration, the BOC should combine the initial results with the following considerations:

- Geography
- Diversity
- Line Utilization
- Costs
- Line Speed.

3.25 Additional consideration in finalizing the network configuration include:

- (1) Determine the minimum number of lines by dividing the total character load by a given line speed adjusted by the appropriate line utilization factor.
- (2) Locate the data sets and controllers for the lines in a central location where possible. This will facilitate the ease of testing and identifying line, data set, and/or controller problems.
- (3) Determine the requirement for backup capability for the private lines. This backup can be in the form of spare data lines which can be substituted for lines with problems and/or dial backup features which utilize the Direct Distance Dialing (DDD) network.

3.26 The final network configuration plan for both terminals and lines should be reviewed with Corporate Communications Planning to ensure compliance with corporate strategies prior to submitting the plan for corporate approval.

USER TOOLS FOR IMPROVING NETWORK EFFICIENCY

3.27 The major tool available to the user for improving network efficiency is the control of network "busy hours." These busy hours adversely impact terminal response time since during these times, both the network and host computer are presented with higher than normal work loads.

3.28 To minimize the impact on response time, the work load should be evenly distributed during

each hour of the working day. Empirical data from BOCs using TIRKS indicate that TIRKS transactions are concentrated in two busy hours during the day, ie, one in the morning (typically 10:00 to 11:00 am) and one in the afternoon (typically 2:00 to 3:00 pm). This concentration of transactions places a heavy work load on the system during the busy hours, resulting in degraded response time. The user can reduce the work load during the busy hour and thus improve response time by instituting administrative controls such as:

- (1) Staggering the start and stop times of various work groups
- (2) Staggering breaks and lunch periods
- (3) Scheduling overtime to accomplish mass Circuit Order Control (COC) logging and completion activities associated with Electronic Switching System (ESS) cutovers, etc.

3.29 The administrative controls will have a level-loading effect on the work load distribution and thus reduce the work load volume of the busy hour(s).

NETWORK PERFORMANCE MONITORING

3.30 Line and terminal usage must be monitored subsequent to establishing the communications network. The project team must periodically evaluate various reports, statistics, enhancements, or changes in user modes of operation to identify possible deviations from the corporate approved design. The project team must initiate corrective procedures or network redesign as required.

TRANSACTION ANALYSIS OF 12.0 FLOWS

ASSUMPTIONS for A2-A7

1. Standard flows as in the following Business Information System Practices:
 - 756-551-403
 - 756-551-405
 - 756-551-407
 - 756-551-412
 - 756-551-414
 - 756-551-415
2. One circuit per special service order.
3. Four circuit locations (ckls) tracked per special service circuit.
4. Two loops or a loop and a len for special service.
5. No Trunk Administration System (TAS) assignments for special service.
6. Loop, terminal, and signal involved in rearrange.
7. Use CDS for special services.
8. Two CD pages for special services.
9. Seven trunks per message order.
10. One end of TAS, terminal, and signal involved in rearrange.
11. Use prototype for message trunk.
12. Test details automatically generated for message trunks and special services.
13. ALL type completions used when possible.
14. No jeopardies or supplements included.

ATTACHMENT 1

(A1)

SPECIAL SERVICE ADD

4
 COCORD
 ADD.CCORDA
 FIND.CCORDS
 ADD.CCORDA
 REFRESH

4
 LOOP
 FIND.DACALC
 UPDATE.DACALC
 FIND.DACALC
 UPDATE.DACALC

3
 FESEL
 FIND.FEPPICK
 POST.FEPPICK
 .FEPBUMP

2
 COCISC
 FIND.CCISCD
 UPDATE.CCISCD

CDS DESIGN
 PROCESS
 CD (6)
 FIND.CLR
 DESIGN.CLRCD
 .EISMABD
 FORWARD.CLRUPD
 JUMP FIND.CLRUPD
 .CLRCRI

2
 CRI
 JUMP-FIND.CLRUPD
 .CLRNAS

2
 WA
 JUMP-FIND.CLRUPD
 .CLRST

4
 DIST
 UPDATE.CLRST
 ISSUE.CLRST
 .CLRISSU
 .CLRSEND

MANUAL
 DESIGN PROCESS
 CD (11)
 FIND.CLR
 MOVE.CLR
 POST.CLRPOST
 SMAS.CLR
 .EISMABD
 POST.CLRPOST
 COMPUTE.CLRCD
 SARTS.CLR
 FORWARD.CLRUPD
 JUMP FIND.CLRUPD
 .CLRCRI

10
 (DVA)
 COCPLT
 FIND.CCPLTD(5)*
 UPDATE.CCPLTD(5)*

2
 (FCD)
 COCPLT
 FIND.CCPLTD
 UPDATE.CCPLTD

13
 (DD & OVP)
 COCPLT
 FIND.CLPTLD(5)**
 UPDATE.CCLTD(5)**
 .CLRCMPL
 .EOMPL
 .FCOMPL

(1) TOTAL TRANSACTIONS (CDS FLOW) = 52
 (2) TOTAL TRANSACTIONS (MANUAL FLOW) = 57

*ASSUMES ITEM LEVEL UPDATE AND 4 CWL/CKL UPDATES
 REQUIRED FOR DVA.

**ASSUMES 4 CKL UPDATES FOR DD AND THAT ITEM LEVEL
 DD AND OVP ARE UPDATED AT SAME TIME.

ATTACHMENT 2

(A2)

SPECIAL SERVICE REARRANGE

3
 COCORD
 ADD.CCORDA
 FIND.CCORDS
 ADD.CCORDA

3
 WA
 FIND.CLRWAS
 FIND.CLRWAS
 COMDC.CLRWAS

1
 COMD
 COPY.CLRCOMD

2
 LOOP
 FIND.DACALC
 UPDATE.DACALC

2
 FESEL
 FIND.FEPPICK
 SWITCH.FEPPICK

CDS DESIGN
 CD (8)
 FIND.CLR
 FORWARD.CLRUPD
 POST.CLRPOST
 DESIGN.CDRCS
 .E1SMABD
 FORWARD.CLRUPD
 JUMP FIND.CLRUPD
 .CLRCRI

- (1) TOTAL TRANSACTIONS FOR CDS FLOW = 54
- (2) TOTAL TRANSACTIONS FOR MANUAL FLOW = 58

3
 CRI
 JUMP-FIND.CLRUPD
 .CLRWAS
 .FEPBUMP

1
 WA
 UPDATE.CLRWAS

2
 COCISC
 FIND.CCISCD
 UPDATE.CCISCD

4
 DIST
 FIND.CLRDST
 ISSUE.CLRDST
 .CLRISSU
 .CLRSEND

MANUAL DESIGN
 CD (12)
 FIND.CLR
 FORWARD.CLRUPD
 MOVE.CLR
 POST.CLRPOST
 SMAS.CLR
 .ELSMABD
 POST.CLRPOST
 COMPUTE.CLRCS
 SARTS.CLR
 FORWARD.CLRUPD
 JUMP FIND.CLRUPD
 .CLRCRI

- * ASSUMES ITEM LEVEL UPDATE AND 4 CWL/CKL UPDATES REQUIRED FOR DVA.
- ** ASSUMES 4 CKL LEVEL UPDATES FOR DD AND THAT ITEM LEVEL DD AND OVP ARE UPDATED AT SAME TIME.

10
 (DVA)
 COCPLT
 FIND.CCPLTD (5)*
 UPDATE.CCPLTD (5)*

2
 (FCD)
 COCPLT
 FIND.CCPLTD
 UPDATE.CCPLTD

13
 (DD & OVP)
 COCPLT
 FIND.CCPLTD(5)**
 UPDATE.CCPLTD(5)**
 .CLRCMPL
 .ECOMPL
 .FCOMPL

[Empty box]

ATTACHMENT 3

(A3)

SPECIAL SERVICE DISCONNECT

4	3	2	2	3	3
COCORD	WA	NOTE 1 CD	COCISC	WA	DIST
ADD.CCORDA FIND.CCORDS ADD.CCORDA REFRESH	FIND.CLRWAS FORWARD.CLRWAS .CLR	POST.CLRPOST .FEPBUMP	FIND.CCISCD UPDATE.CCISCD	FIND.CLRWAS JUMP-FIND.CLRWAS .CLRST	ISSUE.CLRDST .CLRISU .CLREND
10 (13)	13				
(DD) COCPLT	(IAD) COCPLT				
FIND.CCPLTD(5) UPDATE.CCPLTD(5) .CLRCMPL* .ECOMPL* .FCOMPL*	FIND.CCPLTD (5) UPDATE.CCPLTD (5) .CLRCMPL .ECOMPL .FCOMPL				

* NOT USED IF IAD IS INVOKED
 (1) TRANSACTION COUNT USING IAD = 40
 (2) TRANSACTION COUNT NOT USING IAD = 30

NOTE 1:
 ADDITIONAL TRANSACTIONS WILL BE
 REQUIRED IF C1/PREP RECORD DOES NOT
 EXIST AND/OR IF ± E1/F1 COMPONENTS
 EXIST.

ATTACHMENT 4

(A4)

MESSAGE TRUNK ADD

1	2	3	2+	4+	42**
COCORD	FESEL	CRI	TAS	SELECTION INDEX	TAS
ADD.CCORDA	FIND.FEPPICK SWITCH.FEPPICK	FIND.CLRCRI JUMP-FIND.CLRCRI .CLR	FIND.C1AOFN END.C1AOFN	FIND.ETA#FN ADD.ETA#AD FIND.ETA#FN ADD.ETA#AD	FIND.C1AOFN UPDATE.C1AOFN(7) FORWARD.C1AOFN(7) UPDATE.C1AOFN(7) END.C1AOFN(7) UPDATE.C1AOFN(7) NEXT.C1AOFN(6)
2	8*	4	22*	4	
COCENG	COMD	WA	CD	DIST	
FIND.CCENG UPDATE.CCENG	COPY.CLRCOMD .FEBUMP(7)	FIND.CLRWAS RANGE.CLRWAS FORWARD.CLRWAS .CLR	POST.CLRPOST(7) COMPUTE.CLR CDS(7) NEXT.CLR(6) JUMP-FIND.CLRUPD .CLRST	ISSUE.CLRDST .CLRISU .CLRSEND .CLRINT	
2	37*				
NOTE 1 (DVA) COCPLT	NOTE 1 (DD) COCPLT				
FIND.CCPLTD UPDATE.CCPLTD	FIND.CCPLTD UPDATE.CCPLTD .CLRCPML(7) .C1AC(7)+ .ECOMPL(7) .FCOMPL(7) .ETAXC(7)+				

* TRANSACTION COUNT ASSUMES 7 MESSAGE ITEMS/ORDER
+ TAS RELATED TRANSACTION

- (1) TOTAL TRANSACTION COUNT IN TAS ENVIRONMENT = 133
- (2) TOTAL TRANSACTIONS IN NON-TAS ENVIRONMENT = 71

NOTE 1:
ASSUMES COMMAND
ALL IS USED FOR
DVA AND DD
COMPLETIONS.

ATTACHMENT 5

(A5)

MESSAGE TRUNK REARRANGE

1	14*+	2+	21*+	2	
COCORD	XE1TAS	SELECTION INDEX	TAS	COCENG	
ADD.CCORDA	FIND.ETAXFN NEXT.ETAXN(6) ADD.ETAXD(7)	FIND.ETA\$FN ADD.ETA\$AD	FIND.C1AOFN FORWARD.C1AOFW(7) UPDATE.C1AOP(7) NEXT.C1AONX(6)	FIND.CCENGD UPDATE.CCENGD	
15*	35*	21*	2	4	
WA	CD	CRI	WA	DIST	
FIND.CLRWAS FORWARD.CLRWAS(7) .CLR(7)	MERGE.CLR(7) POST.CLRPOST(7) COMPUTE.CLRCDS(7) JUMP-FIND.CLRUPD(7) .CLRCRI(7)	JUMP-FIND.CLRCRI(7) .CLRWAS(7) .FEPBUMP(7)	RANGE.CLRWAS JUMP-FIND.CLRDST	ISSUE.CLRDST .CLRISU .CLRSEND .CLRINT	
2	37*				
NOTE 1	NOTE 1				
(DVA) COCPLT	(DD) COCPLT				
FIND.CCPLTD UPDATE.CCPLTD	FIND.CCPLTD UPDATE.CCPLTD .CLRCMPL(7) .C1AC(7)+ .ECOMPL(7) .FCOMPL(7) .ETAXC(7)+				

NOTE 1:
ASSUMES COMMAND
ALL IS USED FOR
DVA AND DD
COMPLETIONS.

* TRANSACTION COUNT ASSUMES 7 MESSAGE ITEMS/ORDER
** TAS RELATED TRANSACTION

(1) TOTAL TRANSACTION COUNT IN TAS ENVIRONMENT = 154
(2) TOTAL TRANSACTIONS IN NON-TAS ENVIRONMENT = 103

MESSAGE TRUNK DISCONNECT

1
COCORD
ADD.CCORDA

14**
XE1TAS
FIND.ETAXFN
NEXT.ETAXNX(6)
ADD.ETAXD(7)

35**
TAS
FIND.C1AOFN
FORWARD.C1AOFW(7)
UPDATE.C1AOP(7)
END.C1AEN(7)
UPDATE.C1AOP(7)
NEXT.C1AONX(6)

2
COCENG
FIND.CCENG
UPDATE.CCENG

TOTAL TRANSACTIONS
IN TAS ENVIRONMENT
(A) IAD INVOKED = 135
(B) IAD NOT INVOKED = 121

3
WA
FIND.CLRWAS
FORWARD.CLRWAS
.CLR

21*
CD
POST.CLRPOST(7)
.FEPBUMP(7)
JUMP-FIND.CLRUPD
.CLRWAS
NEXT.CLR(6)

4
WA
FIND.CLRWAS
RANGE.CLRWAS
JUMP-FIND.CLRWAS
.CLRST

4
DIST
ISSUE.CLRDST
.CLRISU
.CLRSEND
.CLRINT

TOTAL TRANSACTIONS IN
NON-TAS ENVIRONMENT
(A) IAD INVOKED = 86
(B) IAD NOT INVOKED = 72

2*(37)*
NOTE 2
(DD)
COCPLT
FIND.CCPLTD
UPDATE.CCPLTD
NOTE 1 { .CLRCMPL(7)
.C1AC(7)+
.ECOMPL(7)
.FCOMPL(7)
.ETAXC(7)+

49*
NOTE 3
(IAD)
COCPLT
FIND.CCPLTD (7)
UPDATE.CCPLTD (7)
.CLRCMPL(7)
.C1AC(7)+
.ECOMPL(7)
.FCOMPL(7)
.ETAXC(7)+

* TRANSACTION COUNT ASSUMES 7 MESSAGE ITEMS/ORDER
+ TAS RELATED TRANSACTION

NOTES:
1. NOT USED WHEN IAD IS INVOKED
2. ASSUMES COMMAND "ALL" IS USED FOR DD COMPLETION
3. ASSUMES IAD IS UPDATED AT CWL LEVEL

ATTACHMENT 7

(A7)