RC855, IBM3270 BSC DATEX Emulator, Operating Guide

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Operating Guide

Author: Max Larsen, Susanne Berland

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Abstract: Operating Guide for RC855 IBM3270 BSC DATEX Emulator.
            Describes (as a supplement to RC855 IBM3270 BSC
            Emulator, Operating Guide RCSL No. 42-i2150): keyboard
            functions, operation, emulator messages, terminal
            setup, diagnostics. Includes the specific aspects of
            the operation of the DATEX emulator, and should be used
            together with the documentation concerning installation
            of software, applications and technical reference
            material.

            (24 printed pages).

FOREWORD

This manual is based on RCSL No. 42-i2150: RC855 IBM3270 BSC
Emulator, Operating Guide, which is taken as read.

The examples shown in the introductory section are concentrating
on the RC3800 DATEX Control Unit used in an IBM host environment.
Terminals in an RC8000 host environment use the RC8303 as DATEX
Control Unit. The RC8303 DATEX Control Unit is described in RCSL
No. 31-D709: Connection of RC855 IBM3270 BSC DATEX Terminal System
to the RC8000 Computer, General Description.

Special attention should be paid to the differencies in terminal
setup when comparing the RC3800 and the RC8303.

The RC3800 DATEX Control Unit is described separately in RCSL No.
43-GL12099: ROXS X.21 Terminal Concentrator, Operating Guide.

Susanne Berland
A/S REGNECENTRALEN af 1979, January 1984

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APPENDIXES:

1.	INTRODUCTION

DATEX is the name of data transmission service via the public, circuit switched data network. The advantages of DATEX are, among other things: high quality of transmission, short call set-up times (normally under 100 milliseconds) and a large number of additional facilities (see appendix C).

Connection to the DATEX network is not accomplished by means of the normal modems used with DATEL service. Instead of the modem, a so-called DCE is used (Data Circuit-terminating Equipment), the subscriber interface being the plug outlet on the DCE. The PTT is responsible for the installation of the DCE with the subscriber. There are different types of DCE's, see appendix C.

In principle, the IBM3270 protocol necessitates the use of permanent transmission circuits because of the constant polling of the terminals. However, to make the most of the DATEX network, financially speaking, requires automatic call establishment and disconnection between host computer and terminals for each transaction. Thus the terminal itself must take the initiative in establishing a connection via the network once the user has generated a transaction. When connection has been established and the transaction performed, disconnection should follow automatically.

Likewise, polling the terminal should not cause the connection to be kept open, if the terminal has nothing to transmit.

On the basis of this, it is only natural to install some additional equipment (a front end) between the host computer and the network to handle these changes in the protocol.

The RC855 DATEX Terminal System realizes the dynamic call establishment and disconnection by using an RC3800 DATEX Control Unit as a front end to the host computer. The primary function of the RC3800 is to simulate a traditional terminal network for the host computer and to control the establishment and disconnection of the DATEX circuit. Figure 1 shows such a network.

Thus no conversion of existing application and system software is needed as regards the host computer in question.

As far as the terminals are concerned, they are arranged in clusters of up to 8 RC855 terminals and printers each. The cluster takes the initiative in establishing a DATEX circuit connection to the RC3800 front end (and consequently the host computer), when the key "SEND" is activated by the user of the terminal. Similarly the RC3800 initiates the disconnection of the line after a certain period of time, e.g. 5 seconds, if the line has not been used. If the answer to a transaction has not arrived till the line is disconnected, the RC3800 will re-establish connection to the terminal when receiving the answer from the host computer. The line will thus only be open when needed. Establishment/disconnection is effected automatically. The user cannot see whether connection is established or not, and does not need to know.

Appendix D shows a schematic outline of an RC855 and RC3800 connection.

DATEX Security

On the face of it, terminal operation via DATEX seems to be less protected against switching of terminals and violating security measures than is the case when operating terminals via non-switched lines. However, the additional facilities of the network ensure that the security of DATEX transmission corresponds to the security on the non-switched lines.

In DATEX a terminal may be unambiguously addressed by means of its DATEX number and its device address. The difference in security between terminal operation via non-switched lines and via datex is thus limited to ensuring that:

1) It is impossible for a terminal to establish connection to a host computer and pretend to be somebody else. This is ensured by means of the additional facility "Calling line identification".

2) A call for a terminal may not be led to go astray. This is ensured by means of the additional facility "Called line identification", checking that the right connection has been established.

   Apart from these two facilities, the network includes an additional facility "Closed user group" for further security.

   As for additional facilities, see appendix C.

Communication with several Host Computers

The system makes use of the possibility of communicating with several host computers in the following way:

Connection to all the DATEX numbers known to the primary terminal is established automatically when starting up. This procedure provides the cluster with menu screens from all the RC3800's that may be called. These screens are put together to one single screen image, which is stored in the terminal cluster. The screen image may be displayed on each terminal of the cluster by pressing the "Select" key, on the basis of which the host computer may be chosen. For this the "PF"-keys are used. The menu of each RC3800 states the application systems available in the or those host computers to which the RC3800 in question is connected. Use the "PA"-keys to choose system.

Each terminal of the cluster may choose communication with a specific host computer, irrespective of what has been chosen by the other terminals of the cluster. You must choose the front end with which you want to communicate via the datex network as well as line from front end to host, as an RC3800 may be connected to 4 host computers. A cluster may communicate with 4 RC 3800's at the same time.

The DATEX additional facilities "Calling line identification" and "Group number" are utilized so that a maximum of 128 clusters (each having a maximum of 8 terminals) may share a maximum of 12 network connections per RC3800.

The configuration of the system will, however, always depend on the traffic on the network.
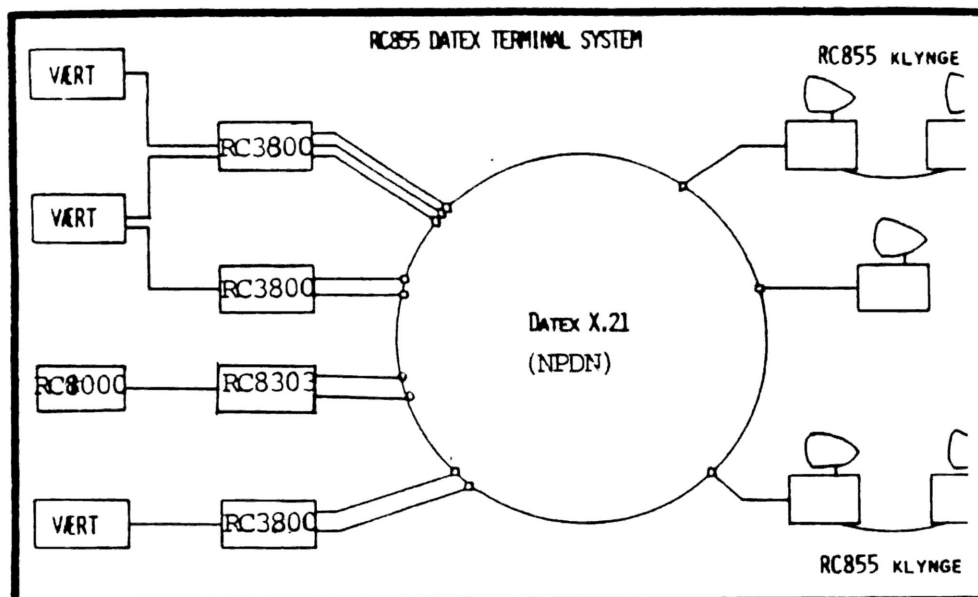
Figure 1: RC855 DATEX Terminal System

Limitations

The DATEX emulator has a few limitations compared to
the standard IBM 3270 emulator:

One difference is that it can only handle the ID-card
reader (the badge reader) in Datasaab System 37 mode,
whereas the standard emulator may use the badge reader
in 3 different ways, depending on a configuration pa-
rameter.

Another difference concerns printer reservation. In
the standard emulator the printer may be reserved by
the host computer sending a special character "USM".
The reservation is cleared by omitting this character.
In the DATEX emulator, the printer is not reserved by
means of this special character, but the printer will
be reserved for a fixed time after printing in order
to avoid printout being mixed with local printout.

2. KEYBOARD FUNCTIONS

2.1 Attention Keys

SELECT (select)	– Used to return to the application system menu (see section 1). You may then choose system by means of the PA-keys (possibly also the PF-keys). If there is an ID-card in the ID-card reader, SELECT will not work until the ID-card has been removed.
PA (Program Access)	– Used when choosing application system after having been presented to the menu.
PF (Program Function)	– Used when choosing DATEX Control Unit (see section 1).

3. OPERATION

Once the emulator has been loaded, the following message is displayed, identifying the terminal:

```
RC855 IBM 3270 BSC DATEX CU/Display Station
```

3.1 Connection to RC3800 DATEX Control Unit

An error message will be displayed, if the terminal cannot pass on what has been typed, because it is impossible to establish connection through DATEX. The communication cannot be continued until you have pressed <SHIFT> <RESET>, deleting the error message at the same time.

```
                                                    Modem off
```

The DCE is not ready, the DATEX network does not answer (when called). Check cables and DCE.

```
                                           System not available
```

- DATEX cp code 44 = receiver out of operation
-            -   45 = receiver barred
-            -   46 = error at the receiving end
-            -   47 = power failure

```
                                             System congestion
```

- DATEX cp code 20 = unsuccessful call
-            -   23 = transmission error
-            -   03 = call queued

```
                                            Configuration error
```

- Connection to DATEX Ccontrol Unit established, but RC855 A-ident is missing or unknown to the Control Unit.

- Connection to DATEX Control Unit established, but the Control Unit does not poll.

- DATEX cp code 41 = access barred
  -       -   42 = new number
  -       -   43 = not accessible
  -       -   52 = transmission rates do not match

Line not ready

- The DATEX network is not ready. Wait a while and try again.

3.2   Printer

Printer reserved

- means that the printer is still reserved by the RC3800 DATEX Control Unit. To avoid that printout is mixed with local printout, the printer reservation time exceeds what is actually needed. The time is set by the RC3800 DATEX Control Unit. The display image will be printed as soon as the printer is free.

4.   CONFIGURATION PARAMETERS

4.1   Parameters

The configuration setup difference between standard
IBM3270 emulator and DATEX IBM3270 emulator is:

CU: CU Number, does not exist in a DATEX terminal. The
cluster address is always 0, because Host-CU and Host-
device-no are converted into DATEX-no, CU=0, device-no
in the RC3800.

BRM: Badge Reader Mode does not exist as the parameter
value is always 2, corresponding to the Datasaab
System 37 mode.

DHL: Default Host Line (system choice when starting
        up)

Values: 0,1 ... 9
Meaning: DHL = 0, there is no default host line
             when starting up the system. A
             menu will be displayed when the
             system has been started, and you
             may now choose system.
             DHL > 0, When starting up, all terminals
             in the cluster will be running
             the application system chosen,
             corresponding to PA1 if DHL is
             1, PA2 if DHL is 2, etc. No menu
             will be displayed when starting
             up, but may be displayed by
             pressing the SELECT key.

DX1: The DATEX number of the RC3800 DATEX Control Unit

Values: From 1 to 16 digits.
Meaning: Used when a call is made, and when the
             terminal is called.

5.   DIAGNOSTICS

5.1   Testing the Display Image

This test is not part of the emulator diagnostics, but included in the extended self-test.

5.1.1   Loopback Test

This test program makes a loopback test of the LINE port in connection with the DATEX DCE, thus showing the state of some of the X.21 signals.

Choosing Test

Press the PA2 key. The test is finished by pressing the CLEAR key.

Test output	Meaning
R = <state>	- receive data, state may be ON or OFF. ON when the test button on the DCE has been pressed.
I = <state>	- indicating connection, may be ON or OFF. ON when the test button on the DCE has been pressed.
Result = <message)	- loopback test message, e.g.: transmit timeout (no clock signal from the DCE). receive timeout (data have not been returned). data error (garbled data). ok.

5.2   System Monitoring

5.2.1   Capture Function

PA2-flag: Set to capture data received/sent, and calls made/received.

Calls made and received will be presented by the fol-
lowing text strings.

Text String	Meaning
C> <datex-no>	- call to <datex-no> is estab-lished. If this is repeated without any data being dis-played, it means that the connection is cut off at once at the other end (terminal unknown to RC3800).
C> seq-error <cp-code>/<datex-no>	- call to <datex-no> without established connection. <cp-code> tells why the connec-tion was not established (see appendix A). If there is no cp-code but 2 boxes, it means that there is no connection to the DATEX network at all.
C> timeout <datex-no>	- call that has been too long in the queue without connec-tion being established.
C> bt-error <datex-no>	- connection has been estab-lished, but the B-ident is incorrect.
C< <datex-no>	- received call from <datex-no>, connection has been established.
C>	- external call has been estab-lished, but without A-ident. This is a configuration error in the DATEX network.

5.2.2 Statistics

Operation

PA4-flag: Set to show the counters. The display is
made in hexadecimal form.

Display image

S<<aaaa><bbbb><cccc><dddd><eeee><ffff><gggg><hhhh><iiii><jjjj>>

```
<aaaa>   text blocks transmitted
<bbbb>   text blocks received without errors
<cccc>   timeout on reception
<dddd>   timeout on received polls
<eeee>   negative acknowledgements (NAK's)
<ffff>   text blocks received with errors (CRC error)
<gggg>   calls attempted
<hhhh>   calls established
<iiii>   calls queued
<jjjj>   calls received
```

A.   CP-CODES (CALL PROGRESS CODES)

code	meaning	
02	call redirected	not supported
03	queued	connect when free
20	unsuccessful call	.
21	number busy	B-terminal engaged by another connection
22	procedural error	incorrect call procedure
23	transmission error	errors have occurred in the call signals during the transmission to the exchange of the network
41	access barred	impossible to connect A- and B-terminal. B-terminal may be barred
42	number changed	the B-terminal number has been changed recently
43	not obtainable	B-number does not exist
44	receiver out of order	B-terminal does not answer
45	receiver not ready	B-terminal working in local mode
46	error at the receiving end	B-terminal out of operation
47	power off	power failure at the DCE called
48	invalid call	request for extra facility impossible
49	local fault at the receiving end	error on the B-terminal subscriber line
52	incorrect speed class	B-terminal belongs to another speed class
60	network problem	may occur instead of 61, 63
61	network congestion	temporary overloading of the network
63	network error	error in the network between the data network exchange and B-terminal

B.   INSTALLATION GUIDE
     _____

When installing a primary DATEX terminal, special at-
tention should be paid to the following points.

Use a DCE cable, TF666 XM.

Check the connection to the DCE by means of the diag-
nostics program in the RC855 (see section 5). Press
the test button on the DCE and the test lamp should
start blinking. Press PA2 for loopback, and the result
should be OK. Release the test button.

During Setup (see section 4) you must pay attention to
the parameter DHL, which may be 0 or larger. If DHL is
0, you will get a menu display of the entire cluster
from which you may choose application system. If it is
larger than zero, the entire cluster will be automati-
cally connected to an application system when starting
up. The menu may then be displayed by pressing the
SELECT-key. The parameters DX1, DX2, ... are the DATEX
numbers of the RC3800 DATEX Control Units.

When started, the DATEX terminal will try to call the
RC3800 DATEX Control Unit to get the menu transferred.
If this fails, a status message will be displayed.

The messages "Modem off" and "Configuration error",
indicate that something is wrong with the terminal. In
case of "System not available", there is something
wrong with the RC3800 DATEX Control Unit, and "System
congestion" means that the number of users exceed the
number of Control Unit ports (maximum of 12).

"Modem off":   Hardware problem, check cable
                          and DCE as described above.

"Configuration error": If you can delete the error message by typing <shift> <reset>, something in the DATEX number is wrong, otherwise it is a case of identical device numbers within the cluster. Try to enter the capture function (section 5.2) when starting up the emulator. If the following message is displayed: C> seq-error XX/<DATEX-NO>, XX representing the cp-code and <DATEX-NO> being the DATEX number of the terminal setup, check the meaning of the cp-code in appendix A. If the following message is displayed: C> <DATEX-NO> C> <DATEX-NO> C> <DATEX-NO> it is because the DATEX emulator gets through, but is rejected by the RC3800 DATEX Control Unit, as the terminal is unknown to it.

The DCE is presumed ordered with "Calling line identification". This means that when being called, the terminal will be informed of the number that is calling. If this facility does not exist, the terminal cannot work satisfactorily, as it can never receive calls from the RC3800 DATEX Control Unit. This may be checked by holding e.g. the <SEND> key down, the control unit will then at some time or other need to call the terminal. The capture function will show C> datex-no, and the statistics will show whether the terminal has been called or not.

C.   DATEX FACILITIES REQUIRED

      The RC855 DATEX emulator and the RC3800 DATEX Control
Unit require:

          Calling line identification

      The RC3800 DATEX Control Unit requires:

          Group number (multiple lines at the same
          address)

      DCE-X synchronous, max. 9600 bps.

      The following additional facilities are supported

      As regards the RC855 emulator and the RC3800 DATEX
Control Unit:

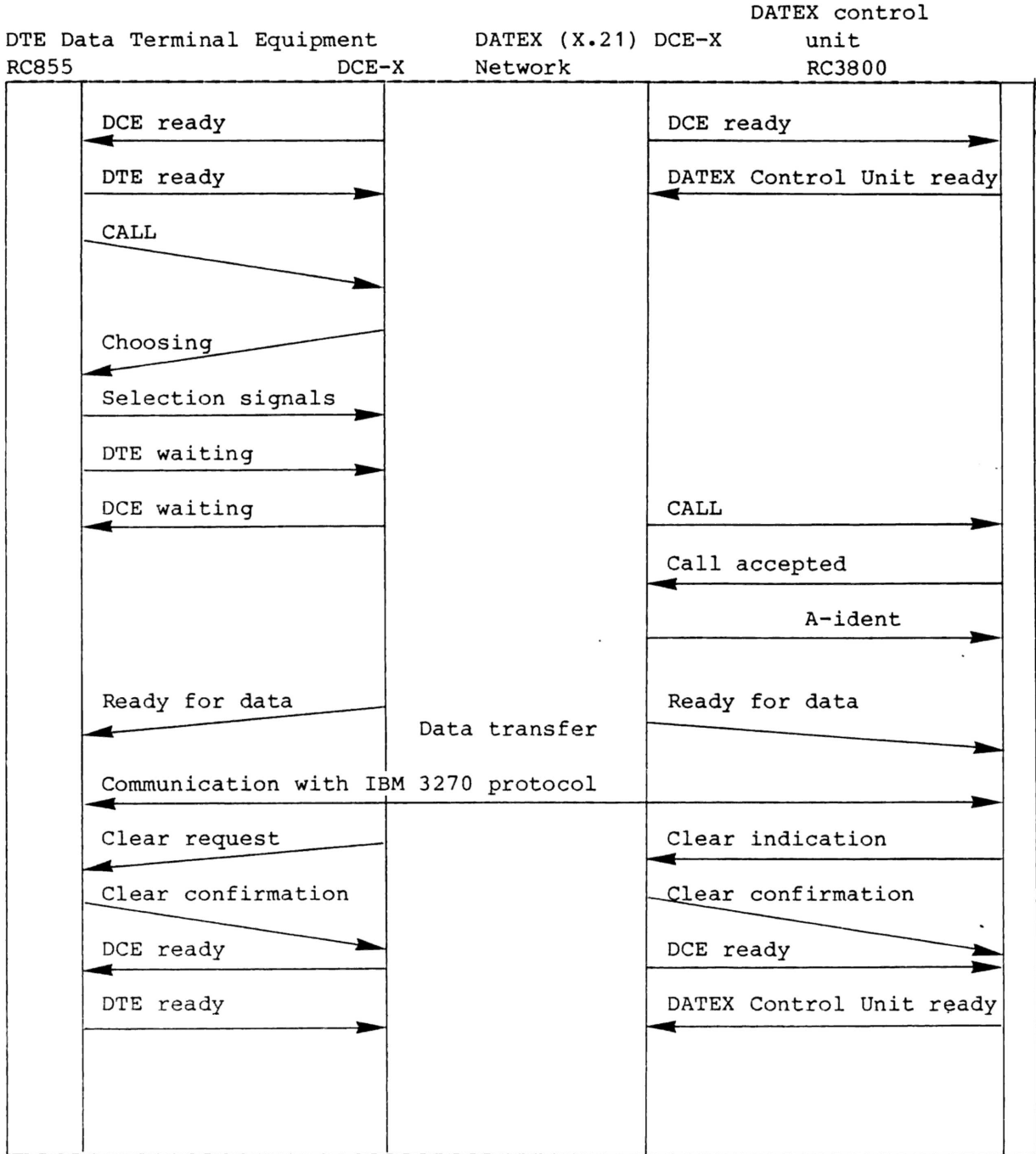| Facility	Purpose
Closed user group	To secure a group of data terminals against calls from data terminals outside the group.
Barring of outgoing (international) calls	To prevent unauthorized use of a terminal.
Barring of incoming (international) calls	To prevent other subscribers from calling a data terminal.
Calling line identification	To inform the B-terminal of the identity of the A-terminal (subscriber number).
Called line identification	To inform the A-terminal of the identity of the B-terminal (subscriber number).
Charge transfer	To debit the subscriber called with the charge of the call.

      As regards the RC855 DATEX emulator
          Waiting allowed.

      As regards the RC3800 DATEX Control Unit
          Connect when free.

The purpose of both of these is to queue incoming calls when the DCE is busy. The call is established when the DCE is free.

D.   SIGNALLING

Signalling at call set-up with full address calling.

DTE Data Terminal Equipment		DATEX (X.21)	DCE-X	DATEX control unit
RC855	DCE-X	Network		RC3800

```
DCE ready                                    DCE ready
DTE ready                                    DATEX Control Unit ready
CALL

Choosing

Selection signals

DTE waiting

DCE waiting                                  CALL

                                             Call accepted

                                                        A-ident

Ready for data                               Ready for data
                        Data transfer
Communication with IBM 3270 protocol

Clear request                                Clear indication

Clear confirmation                           Clear confirmation

DCE ready                                    DCE ready

DTE ready                                    DATEX Control Unit ready
```

The clear signal may also come from the DTE. Typically if the DTE is connected to several DATEX control units.

RETURN LETTER

Title: RC855, IBM3270 BSC DATEX Emulator
Operating Guide

RCSL No.: 42-i2373

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Information Department
Lautrupbjerg 1
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