IBM

Series/1

GA34-1554-0

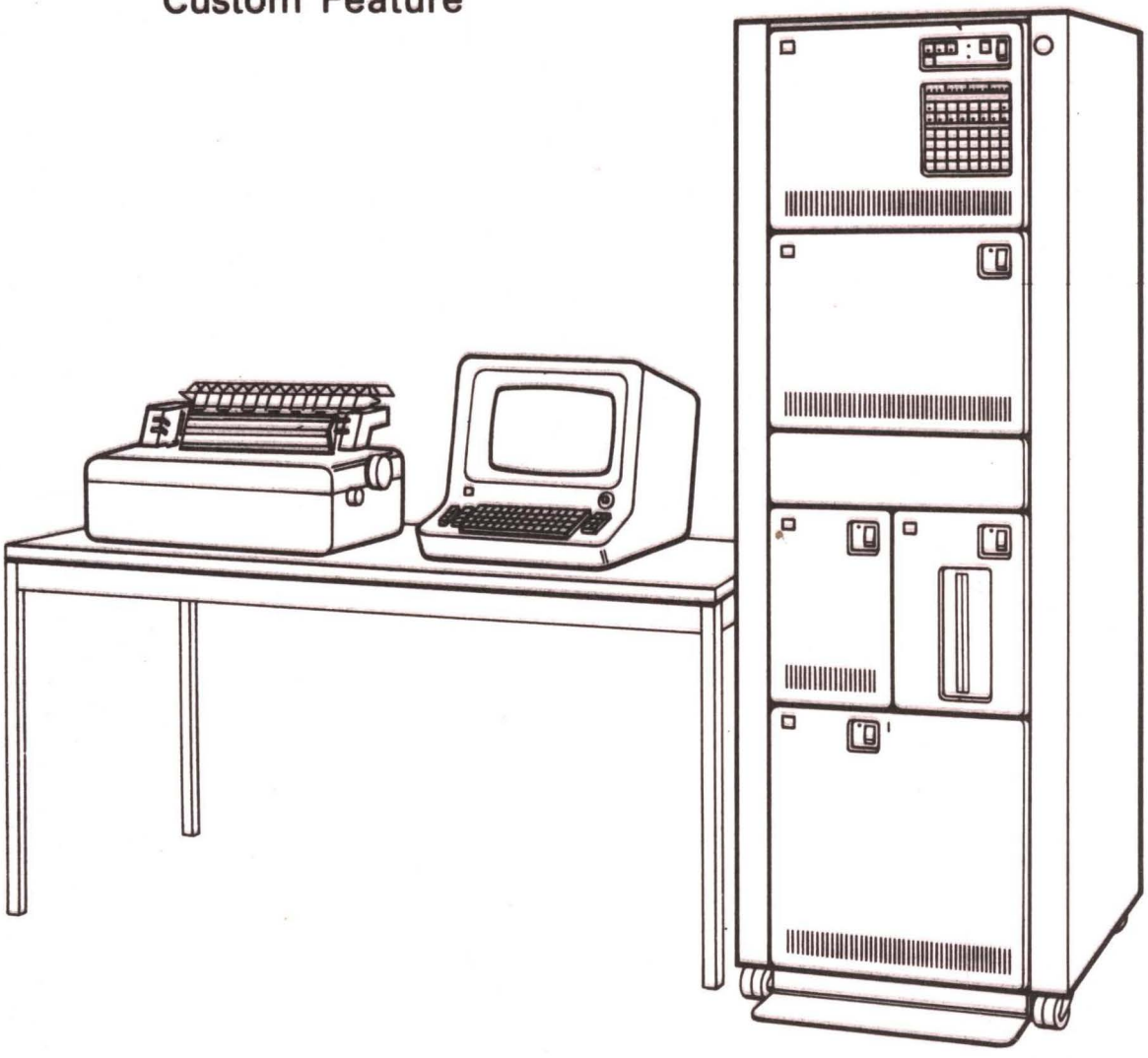
File No. S1-13

AUTO CALL ORIGINATE FEATURE

IBM Series/1

Auto Call Originate (RPQ D02013)

Custom Feature



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Contents

This manual provides general information and planning information about the Auto Call Originate Attachment Card for the Series/1. This book includes descriptions of the following RPQs:

- D02013—Auto Call Originate Attachment Card
- D02014—Auto Call Originate Attachment Cable
- D02031—Auto Call DI/DO Cable

Specific topics are:

- Functional description
- Operations
- Physical planning

Prerequisite Knowledge

This manual assumes the user is familiar with data processing and teleprocessing concepts and has a basic understanding of the Series/1 and its capabilities.

Prerequisite Publications

- *IBM Series/1 Model 4955 Processor and Processor Features Description*, GA34-0021.
- *IBM Series/1 Model 3 4953 Processor and Processor Features Description*, GA34-0022.
- *IBM Series/1 System Summary*, GA34-0035.
- *IBM Series/1 Installation Manual—Physical Planning*, GA34-0029.
- *IBM Series/1 Communications Features Description*, GA34-0028

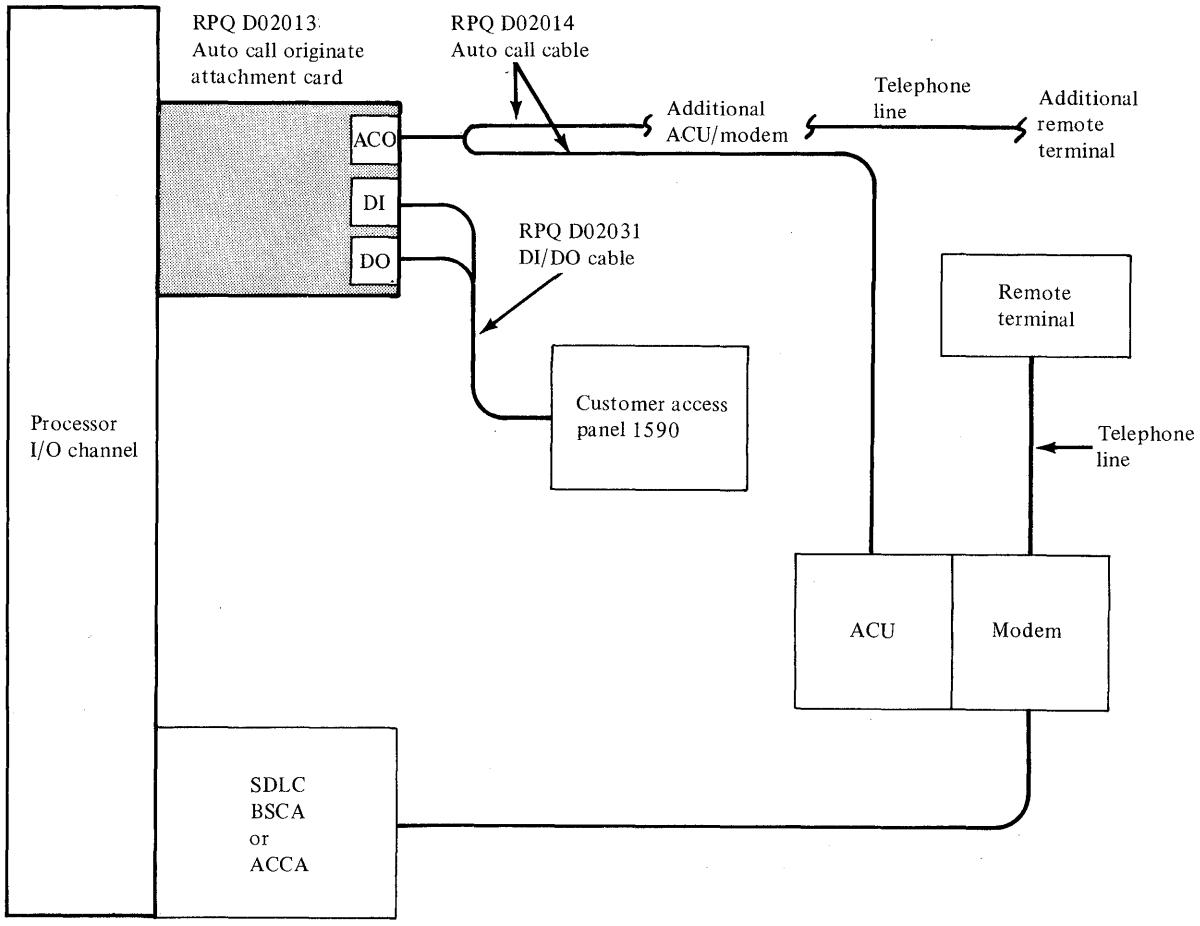
Chapter 1. Introduction

The Auto Call Originate (ACO) Attachment Card (RPQD02013) is a teleprocessing card which allows a Series/1 to automatically connect, via switched telephone lines, to a distant station for the purpose of transmitting data. One of the following communication features must be used in conjunction with the ACO:

- BSCA Single line (medium speed)
- BSCA Multi-line
- ACCA Single line
- ACCA Multi-line
- SDLC Single line

The ACO may be used in any processor input/output (I/O) channel slot of the 4953 or 4955 processor unit or the 4959 I/O expansion unit.

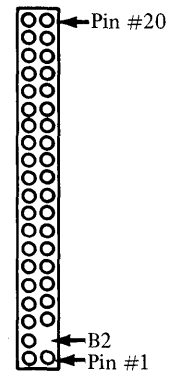
The ACO provides, under program control, two EIA RS366 compatible interfaces to allow control of up to two ACO modems. Telephone number digits are presented to the RS366 interface one at a time in binary coded decimal (BCD) format; the dialing rate is controlled by the modem.



Chapter 2. Functional Description

Auto Call

Signals are supplied through the auto call connector to two ACO interface modems by means of a 25-foot shielded cable (RPQD02014) divided into two, 13- signal groups. At the auto call card end, both groups are terminated into one, 40-pin Berg connector (see figure 2-3) while at the modem end, the cable splits into two, 25-pin connectors. See auto call cable chart Figure 2-1.



ACO Berg 2 X 20			
Modem I	*Modem II*	*Signal name*	*Modem connector* *
– –	– –	Frame ground	1
B18	B03	Digit present	2
B15	B08	Abandon call & retry	3
B20	B01	Call request	4
B12	B09	Present next digit	5
B14	B07	Power indication	6
A17	A04	Signal ground	7
B16	B05	Distant station connected	13
A20	A01	Digit lead 1	14
A19	A02	Digit lead 2	15
A18	A03	Digit lead 4	16
B17	B04	Digit lead 8	17
B13	B06	Data line occupied	22
B11	B10	Test **	25

* Cinch DB-19604-432 or equivalent with Cinch DB-51226-1 hood.
** Added for Series/1 diagnostic testing.

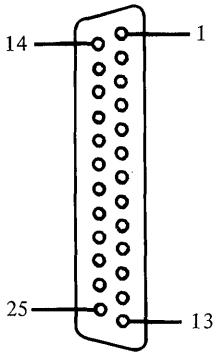


Figure 2-1. Auto Call Cable Chart

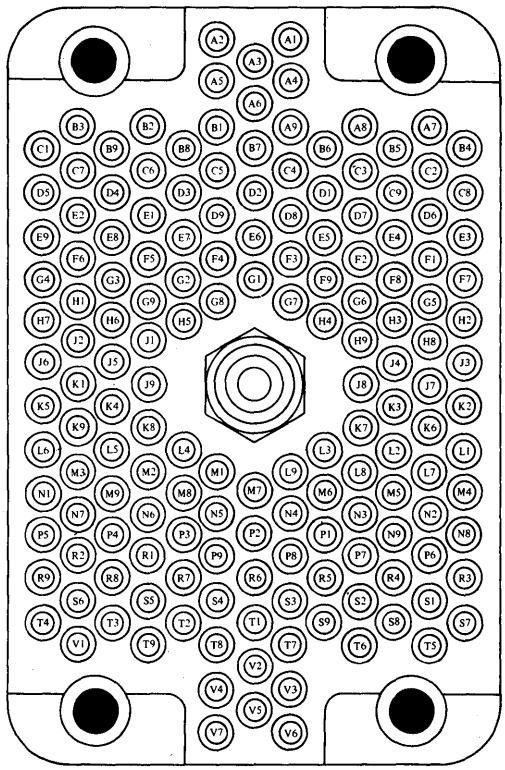
DI and DO

Two, 40-pin Berg connectors on the auto call card allow cable (RPQD02031) hook-up to the 160-pin connector on the customer access panel (feature 1590).

DI/DO cable pin and signal assignments are illustrated in Figure 2-2. Each group of the 16 DI or 16 DO points has an external sync signal and a ready signal (see figure 2-3).

Digital input

Signal name		Pin
DI 00	+	E2
	–	B3
DI 01	+	D9
	–	C5
DI 02	+	D8
	–	B7
DI 03	+	D6
	–	B5
DI 04	+	D5
	–	A2
DI 05	+	B1
	–	A5
DI 06	+	A9
	–	A8
DI 07	+	D4
	–	B9
DI 08	+	A7
	–	A4
DI 09	+	J6
	–	G4
DI 10	+	M4
	–	L8
DI 11	+	J5
	–	G9
DI 12	+	M3
	–	M2
DI 13	+	J4
	–	G6
DI 14	+	M1
	–	G8
DI 15	+	L9
	–	M7
Ext Sync	+	L6
	–	J9
Ready	+	M6
	–	P1



Digital output

Signal name		Pin
DO 00	+	T3
	–	T9
DO 01	+	T2
	–	S5
DO 02	+	T1
	–	V2
DO 03	+	S9
	–	V3
DO 04	+	S8
	–	S2
DO 05	+	S7
	–	N8
DO 06	+	S6
	–	V1
DO 07	+	S4
	–	T8
DO 08	+	S3
	–	T7
DO 09	+	S1
	–	P6
DO 10	+	R9
	–	N1
DO 11	+	R8
	–	P4
DO 12	+	R7
	–	P3
DO 13	+	R6
	–	P2
DO 14	+	R5
	–	P7
DO 15	+	R4
	–	N9
Ext Sync	+	L4
	–	H5
Ready	+	M5
	–	N3

Figure 2-2. DI/DO Interface Assignments

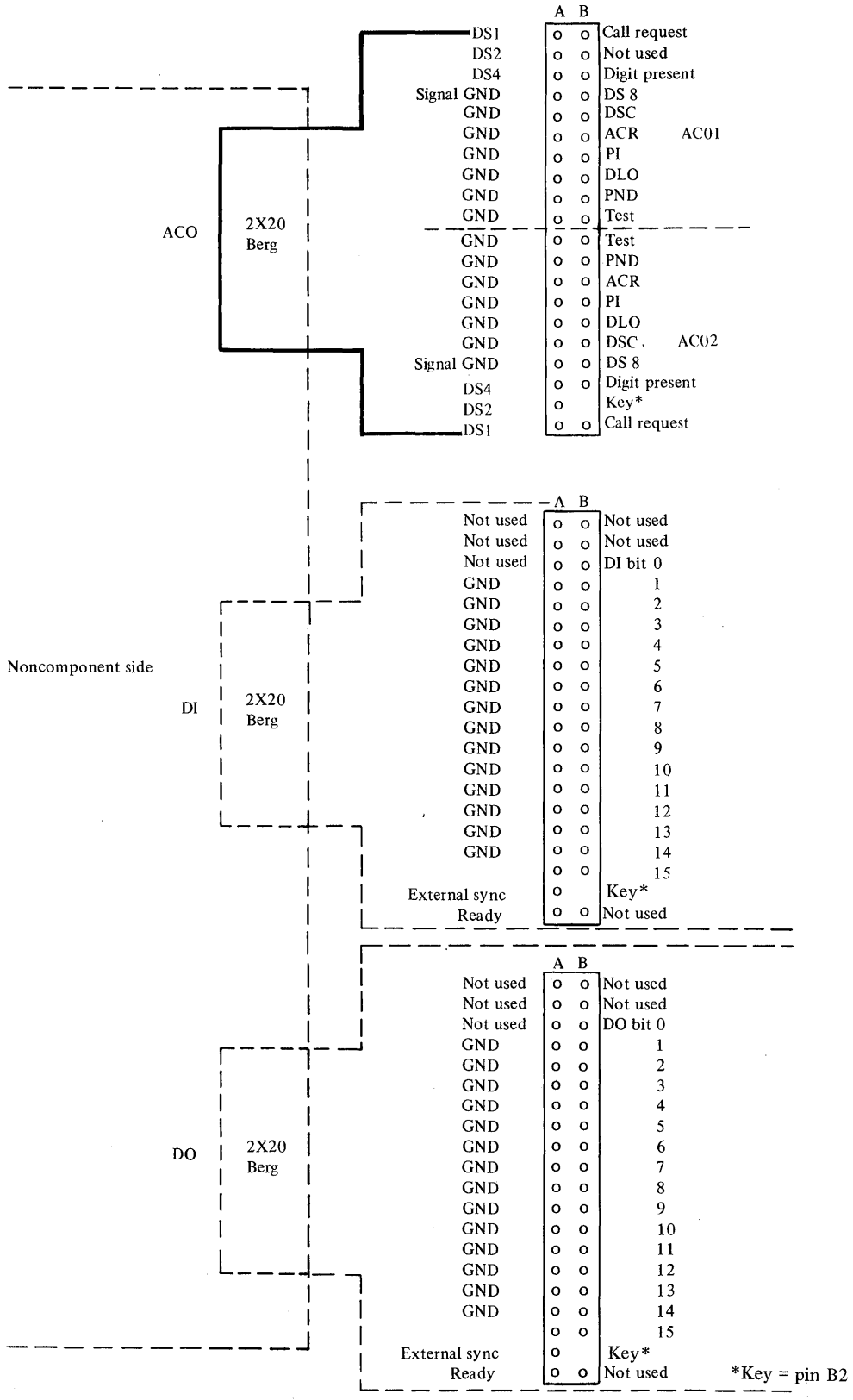


Figure 2-3. ACO Berg Connectors

ACO Interface Description

Call Request (CRQ)

Signals generated on this lead by the Series/1, request the auto call unit (ACU) to originate a call.

The 'ON' condition indicates a request to originate a call and must be maintained during the complete call origination period (i.e., prior to DSC coming on) in order to hold the communication line "off-hook." The 'OFF' condition indicates that the Series/1 has completed its use of the automatic calling equipment. This lead *must* be turned off between calls (or call attempts) and is not turned on unless power indication (PWI) is on and data line occupied (DLO) is off.

Digit Signals (DS1, DS2, DS4, DS8)

The Series/1 generates parallel binary signals on these circuits. The information presented on these leads may either be transmitted as the called number or used locally as a control signal (end-of-number, and separation characters).

Use of the control signals (EON and SEP) and codes /A, /B, /E and /F is dependent upon the design of the particular ACU used. The use of these codes should be verified before being presented on the ACO interface, otherwise, the results will be unpredictable.

Digit Present (DPR)

Signals generated on this lead by the Series/1 indicate the ACU may now read the code combination presented on the digit leads DS1, DS2, DS4, DS8.

The 'ON' condition indicates that the Series/1 has set the digit leads for the next digit. DPR must be turned on after present next digit (PND) comes on and remains on until PND goes off. Then DPR must be turned off and held off until PND comes on again. The digit leads must not change state when DPR is on. After the ACU has accepted the last digit and turned PND off, DPR must be held off when PND comes back on.

Present Next Digit (PND)

Signals generated on this lead by the ACU control the presentation of digits on the digit leads. During dialing, the 'ON' condition indicates that the ACU is ready to accept the next digit indicated on leads DS1, DS2, DS4, and DS8.

The 'OFF' condition indicates that the Series/1 must turn off DPR and set the digit leads for the next digit. PND is not activated as long as DPR is still on.

Power Indication (PWI)

Signals generated on this lead by the ACU indicate that power is available within the ACU.

The 'ON' condition indicates that power is available to the ACU. The 'OFF' condition, indicates that the automatic calling equipment is inoperative because of loss of power. This circuit should not be interpreted to indicate power status in any other equipment.

Data Line Occupied (DLO)

Signals generated on this lead by the ACU indicate that the communication channel is in use for automatic calling, data communication, voice communication, or testing of the automatic calling or data communication equipment.

The 'ON' condition indicates that the communication channel is in use.

The 'OFF' condition indicates that the Series/1 may originate a call provided that PWI is on.

Distant Station Connected (DSC)

Signals generated on this lead by the ACU indicate the status of the local data communication equipment.

The 'ON' condition indicates that the telephone line is connected to the data set to be used for data communication, and that the data set is in the data mode.

Abandon Call and Retry (ACR)

Signals on this lead indicate that a pre-set time (usually a strapping option within the ACU) has elapsed since the last change of state of PND.

The 'ON' condition indicates to the Series/1 to abandon the call and try again later if the connection has not yet been completed. The ACU does not abandon the call when this lead is turned on.

Signal Ground (SGD)

This point provides a common ground reference via the frame of the ACU for ACO interface circuits.

Frame Ground (FGD)

This lead provides an electrical connection between the frames of the ACU and the Series/1. This lead should not be used as a ground for the associated Series/1 because the frames of both the ACU and the associated Series/1 should be separately connected to a common external ground.

ACO Dialing Sequence

A sample of the ACO dialing sequence is illustrated in Appendix A.

Device Address

Two groups of drivers and receivers are required for control of the two ACO interfaces (one group per interface). The drivers and receivers are arranged in two groups of twelve, each containing six drivers and six receivers. Each group must be addressed by using two device addresses. Drivers going out from the ACO card to the modem are controlled by one device address, and the receivers are read and controlled by the other device address.

Chapter 3. Operations

This chapter discusses the data flow, ACO commands, operate I/O instruction, and interrupt condition codes.

Data Flow

Data Transfer Operations

Data is transferred on the processor I/O channel between the processor and the attachment, in a parallel operation (16 data bits plus 2 parity bits). The number of data words transferred and the direction in which they move on the channel is determined by the I/O command. The I/O command also transfers data to or from main storage under direct program control (DPC).

Direct Program Control (DPC)

When data is transferred under direct program control, only one word of immediate data moves to or from main storage. After moving the immediate data, the processor continues processing other instructions.

Operate I/O Instruction

The following description is an overview of the operate I/O instruction. Refer to the processor description manuals listed in the "Prerequisite Publications" section in the preface for a more detailed description.

All I/O operations between the processor and the ACO are initiated by an operate I/O instruction. An address field (bits 16–31) and the R2 field (bits 8–10) in the operate I/O instruction (Figure 3-1 point to a processor storage location containing an immediate device control block (IDCB).

The IDCB is a two-word block of storage that contains the device directed I/O commands. Before issuing the operate I/O instruction for an operation, the command field of the IDCB (bits 0–7) must be set, along with a device address (bits 8–15), and any field of immediate data required by the command in the IDCB (bits 16–31).

The information specified in the immediate field depends on the command to be performed. Refer to the *IBM Series/1 Model 5 4955 Processor and Processor Features Description*, GA34-0021 or the *IBM Series/1 Model 3 4953 Processor and Processor Features Description*, GA34-0022, for a more detailed description of the operate I/O instruction.

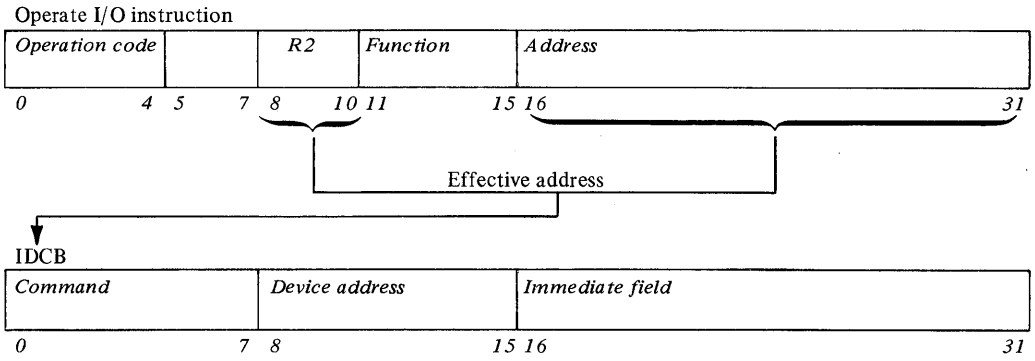


Figure 3-1. Operate I/O Instruction and IDCB Format

Using the IDCB

An immediate device control block (IDCB) is required for every I/O command issued to the ACO. The format of the IDCB is shown below. Before issuing an I/O instruction, an I/O command must be stored in the associated IDCB. The immediate data field of the IDCB should contain a data word. All ACO commands execute under direct program control, thereby requiring a data word.

IDCB (immediate device control block)

Command field	*Device address field*
X X X X X X X X	0 X X X X X X X

0 *7* *8* *15*

00–7F

Immediate data field
DCB address/immediate data word

16 *31*

Addressing

The ACO card is a direct program control (DPC) device. The card responds to four device addresses, but has one prepare field whereby only one device can interrupt at a time and all devices are prepared to the same level. Two device addresses are required for control of a single ACO interface. The same two addresses are used for both interfaces, one address for digital input (DI) and one for digital output (DO).

The six, high-order (leftmost) bits of the device address field are defined by jumpers on the card (see Chapter 4. Physical Planning, and also in Figure 4-1). The last two bits are used to define a particular I/O group. Bit values of 00 and 10 are used to address both ACO interfaces where a bit value of 01 defines the DI group and a bit value of 11 defines the DO group. Device address assignments are shown in Figure 3-2.

Interrupt capability is provided through DI in the form of a process interrupt (PI). PI is described in this chapter.

The immediate data field of the IDCB determines which interface is being addressed. For example, byte 0 (high order) is assigned to ACO interface 1, and byte 1 (low order) is assigned to ACO interface 2. IDCB data word bit assignments are explained in this chapter, "ACO Commands."

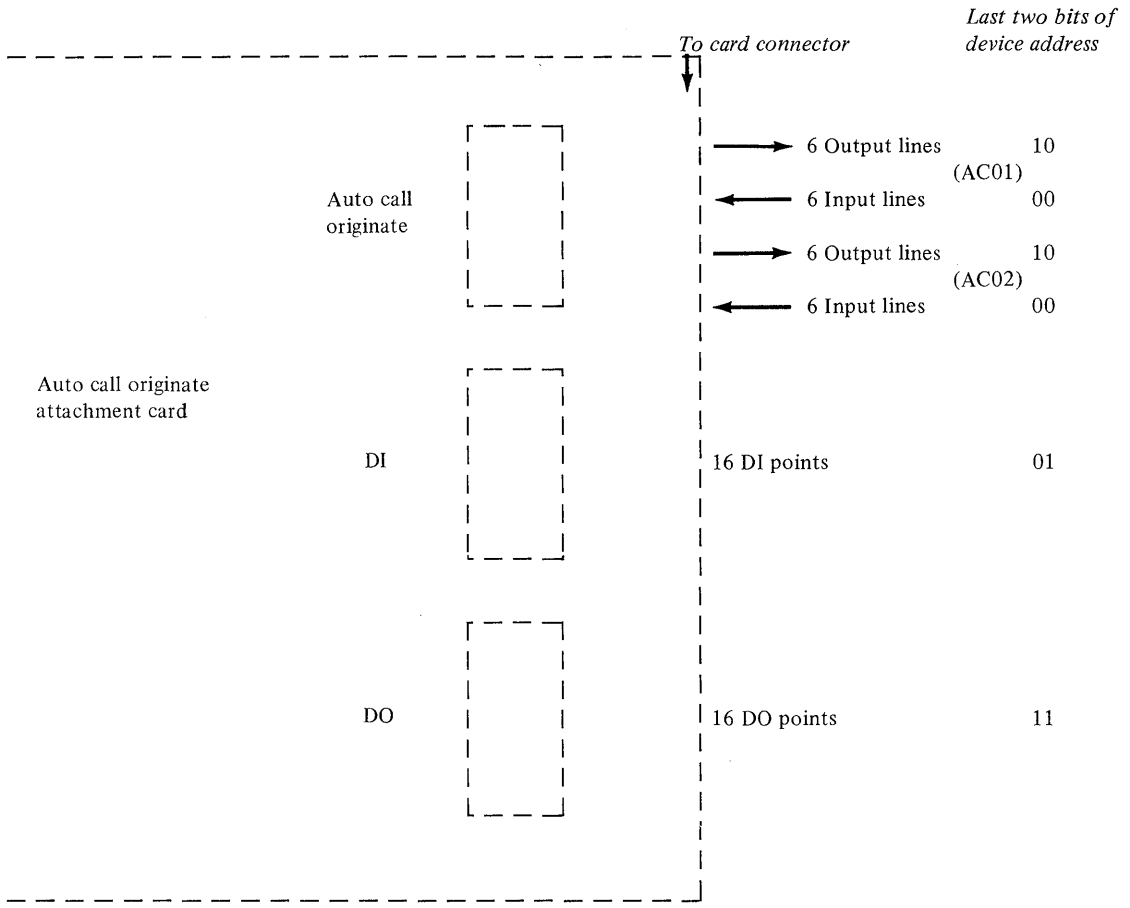


Figure 3-2. Device Address Assignments

ACO Commands

Prepare

This operation prepares the attachment card to interrupt on the level defined in the data word field of the IDCB. Auto call, DI, and DO are prepared to the same level and are enabled to interrupt by the same I-Bit. If condition code 5 is reported, the operation is not executed.

IDCB (immediate device control block)

Command field	*Device address field*
0 1 1 0 0 0 0 0	X X X X X X X X
0 *7*	*8* *15*
60	00–FF

Immediate data field		
Zeros	Level	I
16 *26* *27*	*30*	*31*

Read ID

Execution of this operation reads the attachment card ID into the data word field of the IDCB. For auto call input and DI, the ID word is "/C230" and for auto call output and DO, the ID word is "/C238." If condition code 5 is reported the operation is not executed.

IDCB (immediate device control block)

Command field	*Device address field*
0 0 1 0 0 0 0 0	X X X X X X X X
0 *7*	*8* *15*
20	00–FF

Immediate data field			
1 1 0 0 0 0 1 0	0 0 1 1	0 0 0 0	
16			*31*
C	2	3	0

Read Status

This operation reads the status word into the data word field of the IDCB. If condition code 5 is reported, the operation is not executed.

Associated with the attachment card are two status word formats: one for digital input and one for digital output.

IDCB (immediate device control block)

Command field	*Device address field*
0 0 1 0 1 0 0 0	X X X X X X X X
0 *7*	*8* *15*
28	00–FF

Immediate data field
Status word from DI or DO group
16 *31*

DI and Auto Call Input Status Word

Bit 0–1	Not used
Bit 2	PI mode is armed
Bit 3	External sync mode is armed (not used with auto call)
Bit 4	Set test 1 mode is set (not used with auto call)
Bit 5	Set test 0 mode is set (not used with auto call)
Bit 6–7	These bits indicate the interrupt status of the device. No interrupt is present if bits 6 and 7 are equal to 00. If bits 6 and 7 are equal to 11, the device is in the interrupt state and this bit combination is presented in the Interrupt Information Byte (IIB). When bits 6 and 7 are equal to 01, the interrupt has been serviced by the channel but either the PI register has not been reset (PI mode) or 'ready' is not active (external sync mode). Value 10 is an invalid state.
Bits 8–15	Not used

DO and Auto Call Output Status Word

Bits 0–1	Not used
Bit 2	Disable mode is set
Bit 3	External sync mode is armed (not used with auto call)
Bit 4	Diagnostic external sync is set (not used with auto call)
Bit 5	Not used
Bits 6–7	These bits reflect the interrupt status of the device. No interrupt is present if bits 6 and 7 are equal to 00. If bits 6 and 7 are equal to 11, the device is in the interrupt state and this bit combination is presented in the IIB. When bits 6 and 7 are equal to 01, the interrupt has been serviced by the channel but READY is not active. A value of 10 is an invalid state.
Bits 8–15	Not used

Device Reset

This operation resets an interrupt pending, status, arm condition, diagnostic mode, and data register associated with the addressed ACO interface. Since both ACO interfaces are driven from the same input and output groups, any device reset operation directed to one ACO interface affects both.

IDCB (immediate device control block)

Command field								*Device address field*							
0	1	1	0	1	1	1	1	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
6F								00–FF							

Immediate data field
Zeros
16 ... *31*

Write DO

Initiate Call Request

This operation is executed with bit 2 (ACO1) or bit 10 (AC02) set on in the data word of the IDCB.

This operation activates the 'call request' line on the modem. The operation is not executed if an interrupt is pending and condition code 1 (busy) is returned. If condition code 5 (interface data check) is reported, the operation is not executed.

Set Digit Present

This operation is executed with bit 3 (ACO1) or bit 11 (AC02) set on in the data word of the IDCB.

The operation causes the 'digit present' line to become active, if not already active. The operation is not executed if an interrupt is pending and condition code 1 (busy) is returned. If condition code 5 (interface data check) is reported, the operation is not executed.

Set Digit Signal

This operation is executed with bits 4, 5, 6, and 7 (ACO1) or bits 12, 13, 14 and 15 (AC02) of the data word of the IDCB set to the BCD value of the digit to be set on the interface. The operation is not executed if an interrupt is pending and condition code 1 (busy) is returned. If condition code 5 (interface data check) is reported, the operation is not executed.

IDCB (immediate device control block)

Command field								*Device address field*							
0	1	0	0	1	0	0	0	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
48								00–FF							

	Immediate data field															
	AC01								AC02							
Note 1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Note 2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Note 3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
	16						*23*	*24*								*31*

Note 1. Initiate call request
Note 2. Set digit present
Note 3. Set digit

Read DI

Read Auto Call Input

This operation transfers the status of the inbound auto call lines into the data word field of the IDCB. If condition code 5 is reported, the operation is not executed.

Immediate data field bit assignment ACO-1.

Bit 0–1	Not used, always zero
Bit 2	Used for diagnostics only
Bit 3	Present next digit
Bit 4	Abandon call and retry
Bit 5	Power indication off
Bit 6	Data line occupied off
Bit 7	Distant stated connected

Immediate data field bit assignment ACO-2.

Bit 8–9	Not used, always zero
Bit 10	Used for diagnostics only

Bit 11 Present next digit
Bit 12 Abandon call and retry
Bit 13 Power indication off
Bit 14 Data line occupied off
Bit 15 Distant station connected

IDCB (immediate device control block)

Command field								*Device address field*							
0	0	0	0	0	0	0	0	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
00								00–FF							

	Immediate data field															
	AC01								AC02							
Note 1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Note 2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Note 3	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Note 4	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Note 5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Note 6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	16							*23*	*24*							*31*

Note 1. Test
Note 2. Present next digit
Note 3. Abandon call and retry
Note 4. Power indicator off
Note 5. Data line occupied off
Note 6. Distant station connected

Arm Interface for Interrupt (Arm PI)

This operation sets both ACO interfaces to the interrupt mode. If an interrupt is pending, condition code 1 (busy) is returned and the operation is not executed. If condition code 5 is reported, the operation is not executed.

IDCB (immediate device control block)

Command field								*Device address field*							
0	1	1	0	1	0	0	0	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
68								00–FF							

Immediate data field
Zeros
16 *31*

Read PI

Read Auto Call Latched Input

This operation is executed following an interrupt. The bit in the data word of the IDCB that corresponds to the line that caused the interrupt is set to a logical one. The input data register is not reset. If condition code 5 is reported, the operation is not executed. If this operation is executed prior to the interrupt, the data word is set to all zeros.

IDCB (immediate device control block)

Command field								*Device address field*							
0	0	0	0	0	0	0	1	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
01								00–FF							

Immediate data field
Data from PI
16 *31*

Interrupts are presented when the ACO interface lines make the following transitions:

Interface line time	*Transition*	
	From	*To*
Present next digit (PND)	Off	On
Abandon call and retry (ACR)	Off	On
Power indication (PWI)	On	Off
Data line occupied (DLO)	On	Off
Distant station connected (DSC)	Off	On

Read PI With Reset

Read Auto Call Latched Input With Reset

This operation is executed following an interrupt. The bit in the data word of the IDCB that corresponds to the line that caused the interrupt is set to a logical one. The input data register is then reset. If condition code 5 is reported, the operation is not executed. If this operation is executed prior to the interrupt, the data word is set to all zeros.

IDCB (immediate device control block)

Command field								*Device address field*							
0	0	0	0	0	0	1	0	X	X	X	X	X	X	X	X
0							*7*	*8*							*15*
02								00–FF							

Immediate data field
Data from PI
16 *31*

Programming Support/Limitations

The user controls and interprets the use of the RS366 interface. In the case where two auto call modems are utilized simultaneously, it must be determined through software application which auto call modem is interrupting. This determination is made by understanding which section of input and output lines are connected to which auto call modem.

A Series/1 auto call support program PRPQ #P82533, program number 5799-TBC, is available if desired. Consult the *Auto Call User's Guide*, SC34-1565, for complete details.

Chapter 4. Physical Planning

The ACO requires the same physical planning as the Series/1. Refer to *IBM Series/1 Installation Manual—Physical Planning,* GA34-0029.

Electrical Characteristics

The Frame Ground (FGD) lead provides an electrical connection between the frames of the ACU and the Series/1. This lead should not be used as a ground for the associated Series/1 because the frames of both the ACU and the associated Series/1 should be separately connected to a common external ground. The auto call attachment card requires the following voltage and corresponding current inputs:

Voltage	*Current (nominal ± 10%)*
+5	1.2 A
+12	55 mA
−12	20 mA

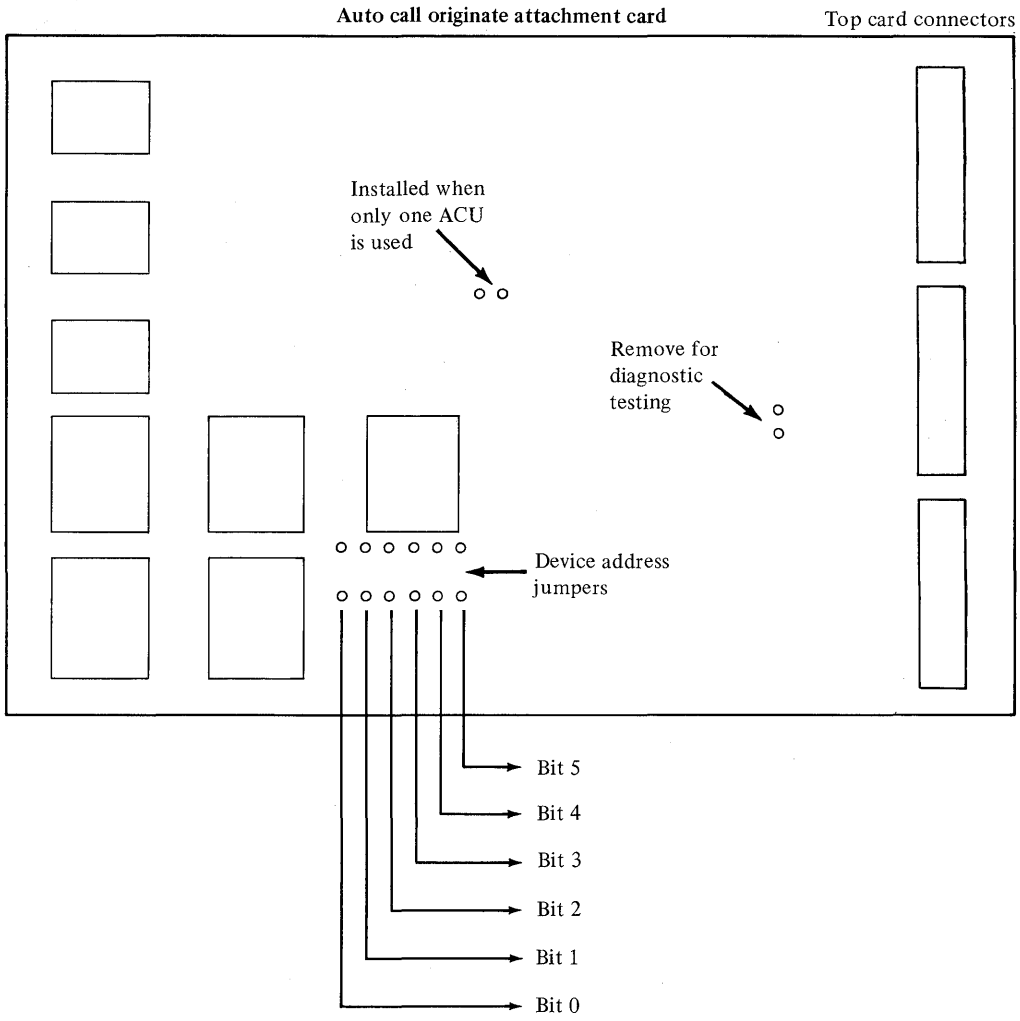
Installation Information

The card device address is selected by six jumpers. An address jumper installed, equals a logical zero.

An additional jumper is used when only one ACO interface is installed. When this jumper is used, auto call interface 2 (AC02) is disabled and auto call interface 1 (AC01) is connected.

Another jumper is provided for diagnostic testing only. During normal operation this jumper is installed, however when testing is being performed this jumper is removed.

The jumper locations are shown in Figure 4-1.



Note. Address Jumper installed equals logical zero.

Figure 4-1. Jumper Locations

Chapter 5. Maintenance

Testing

Hardware implementation under program control can simulate and set the DI and external sync to zeros or ones.

Hardware is also available to read the data in the DO output registers. It is also possible to disable outputs (DO and READY) as well as simulate the setting of the external sync inputs.

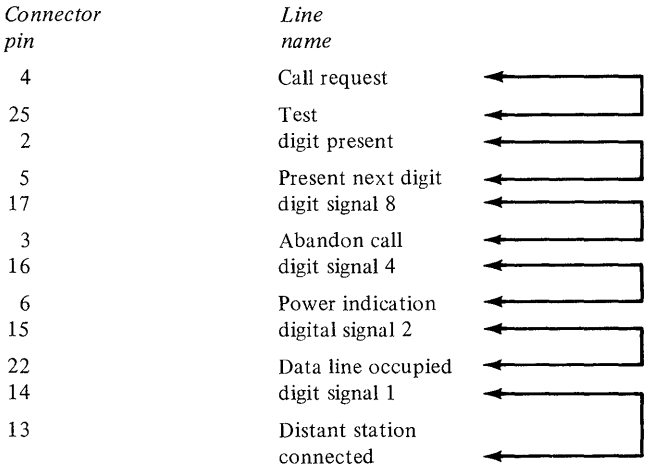


Figure 5-1. Auto Call Wrap Connector

A wrap-back line allows the looping of all lines on the ACU. The auto call wrap connector is illustrated in Figure 5-1.

Testing of the DI/DO drivers and receivers between the digital input and digital output lines is accomplished using the wrap cable as shown in Figure 5-2.

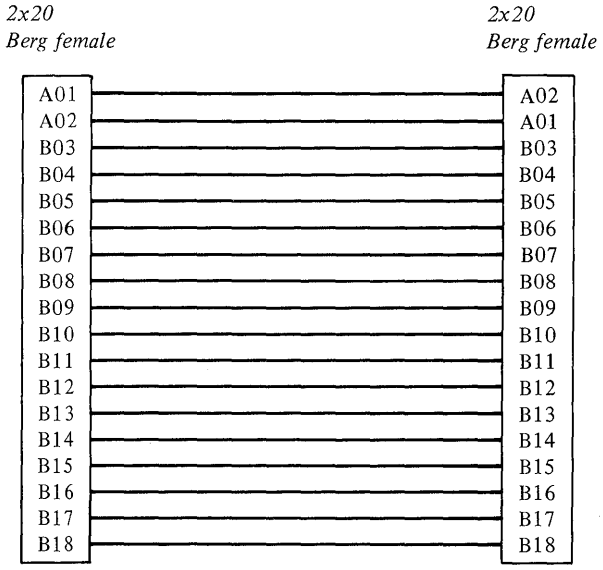
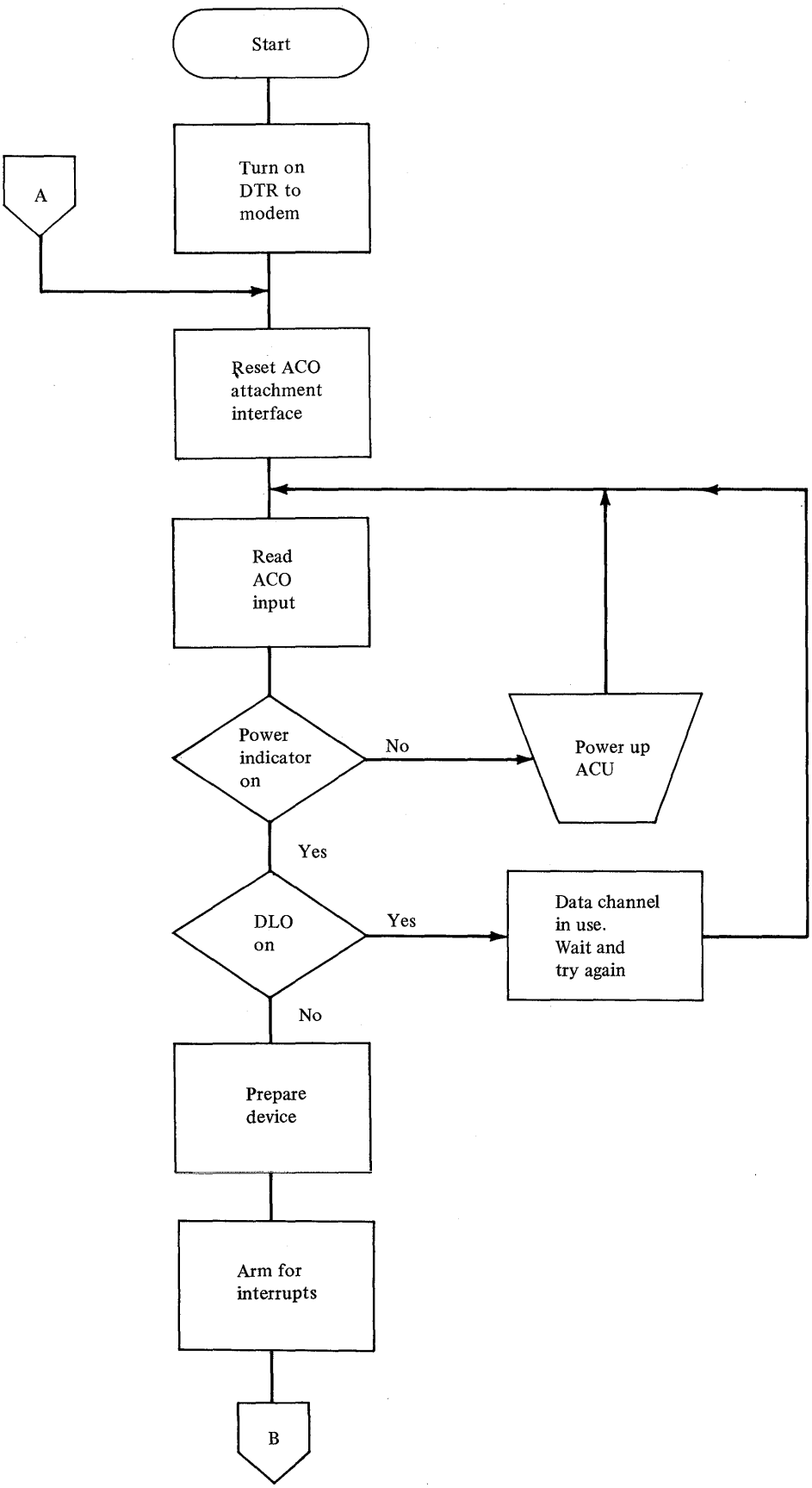
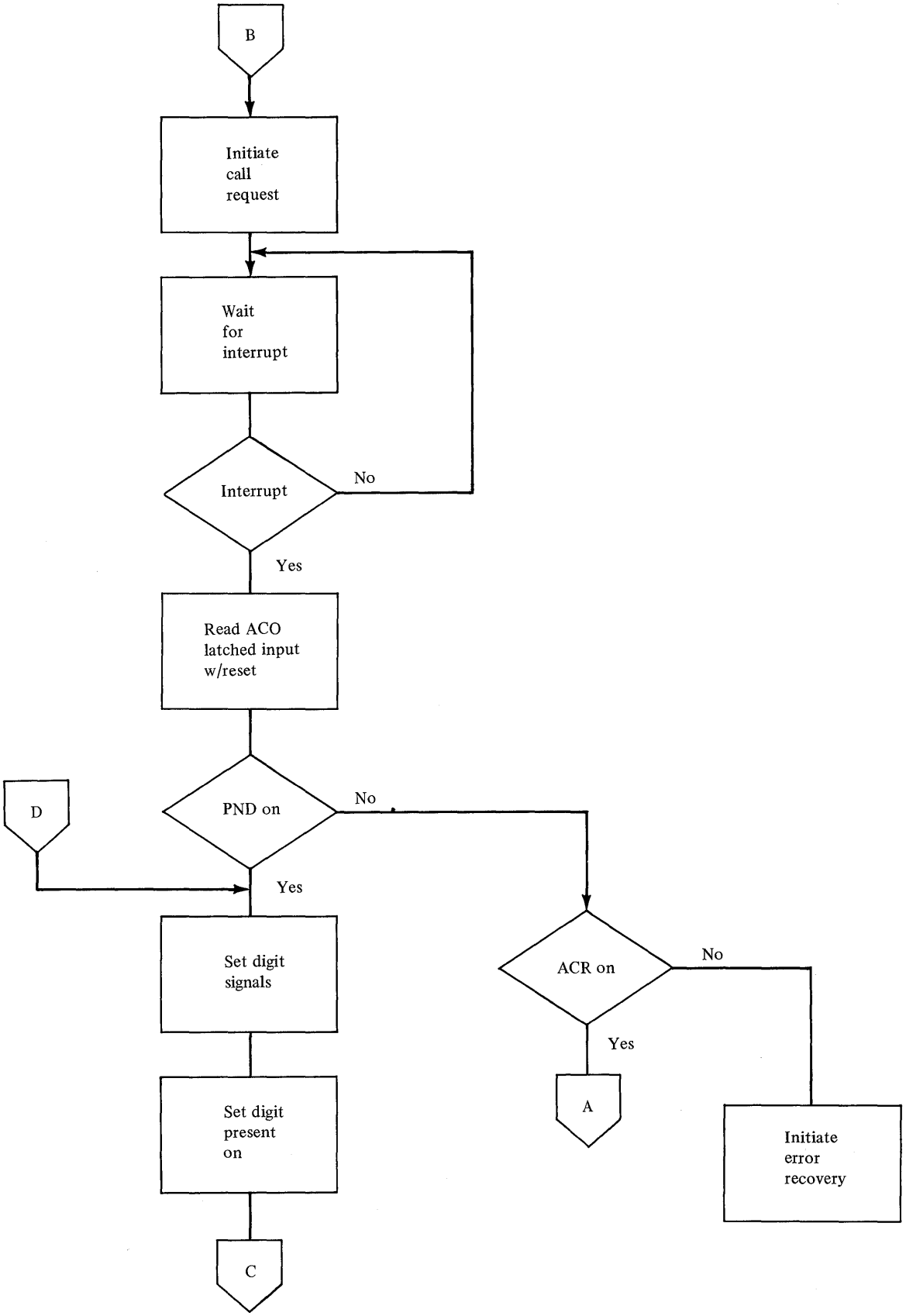


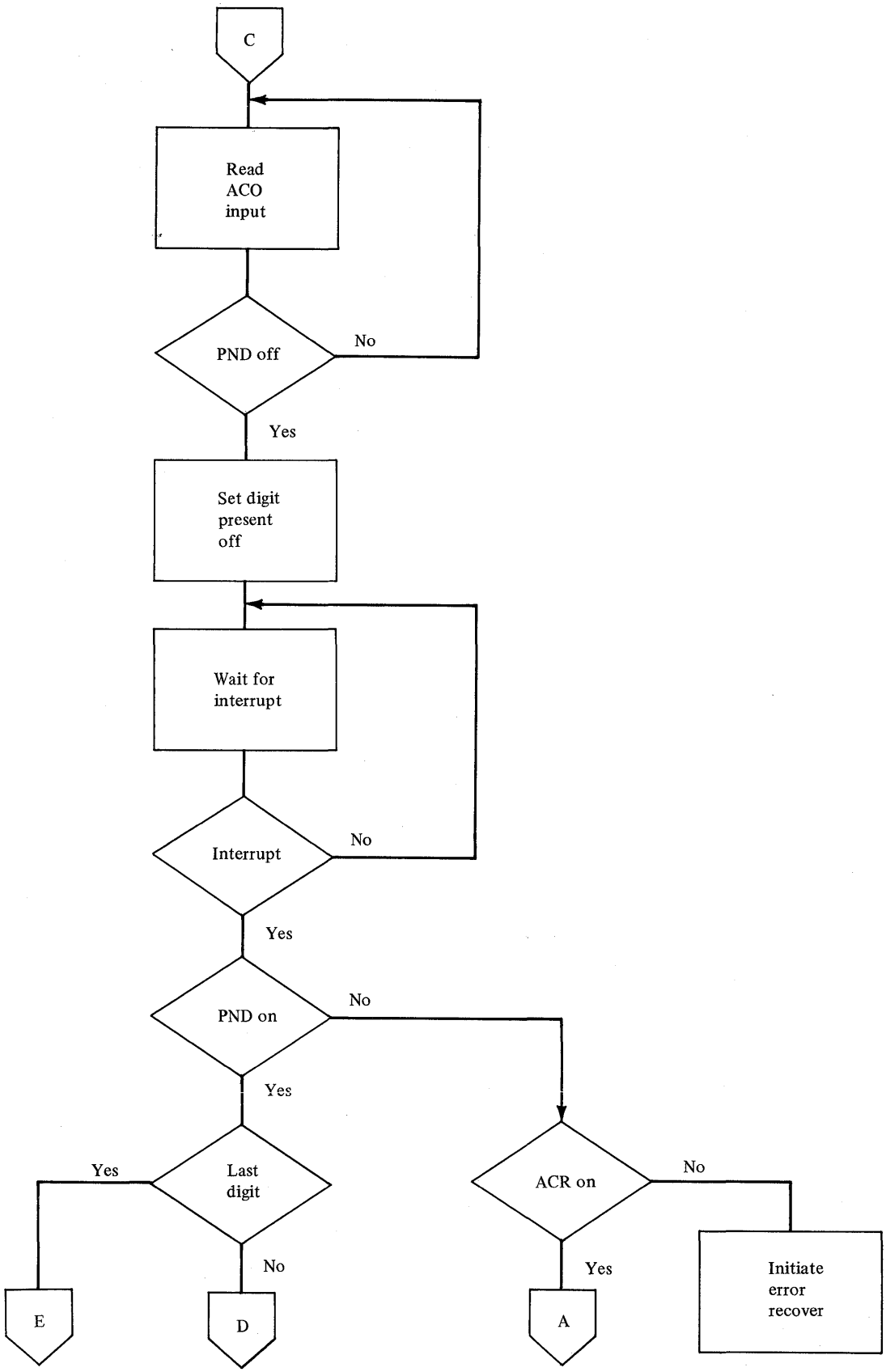
Figure 5-2. DI/DO Wrap Cable

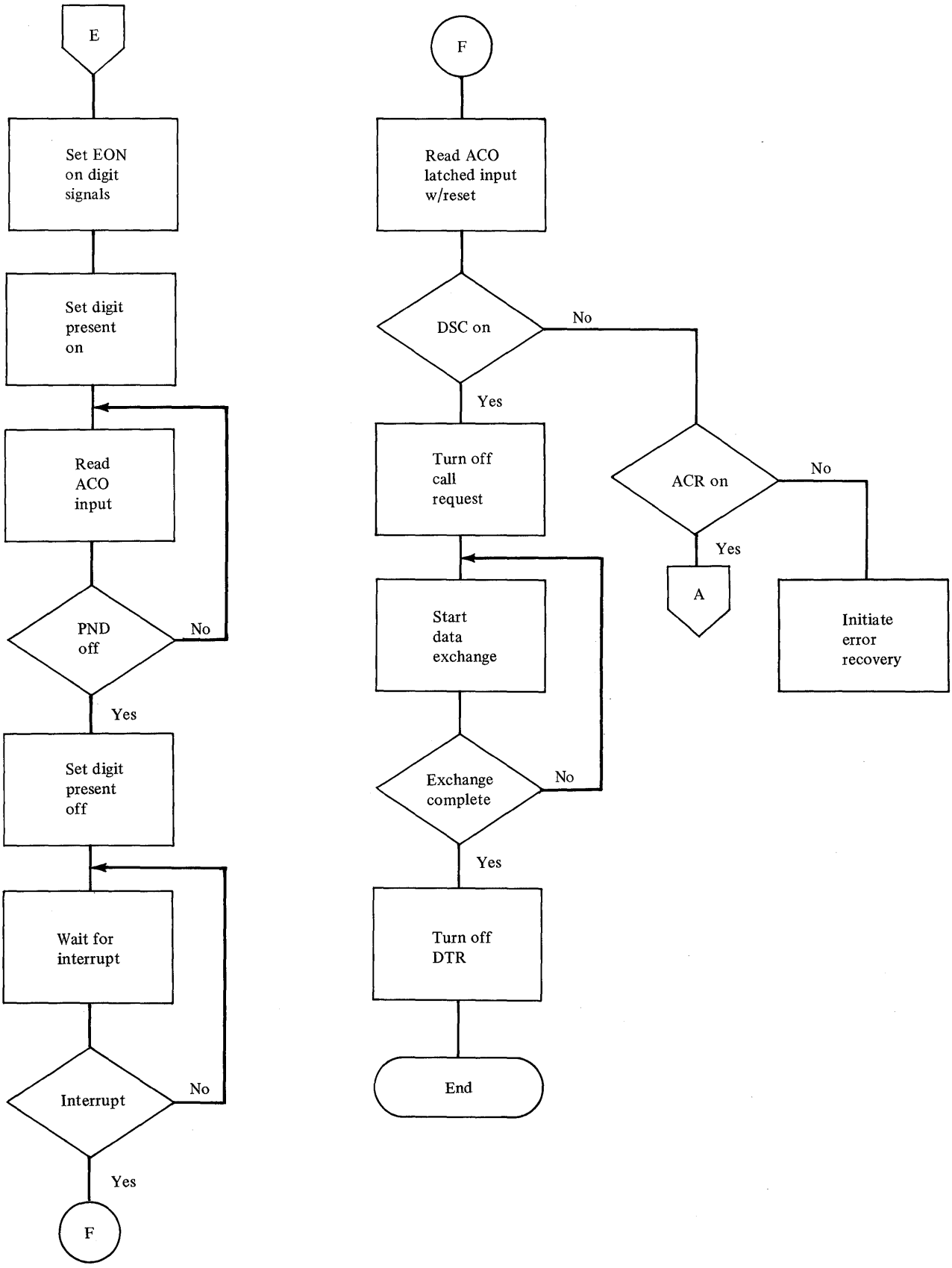
Appendix A. Sample Dialing Sequence

The following flowchart depicts a sequence that may be used in dialing a series of numbers via the ACO.


Start
Turn on DTR to modem
A
Reset ACO attachment interface
Read ACO input
Power indicator on
No
Power up ACU
Yes
DLO on
Yes
Data channel in use. Wait and try again
No
Prepare device
Arm for interrupts
B


B
Initiate call request
Wait for interrupt
Interrupt
No
Yes
Read ACO latched input w/reset
D
PND on
No
Yes
Set digit signals
Set digit present on
C
ACR on
No
Yes
A
Initiate error recovery


C
Read ACO input
PND off
No
Yes
Set digit present off
Wait for interrupt
Interrupt
No
Yes
PND on
No
Yes
Last digit
Yes
No
E
D
ACR on
No
Yes
A
Initiate error recover


E
Set EON on digit signals
Set digit present on
Read ACO input
PND off
No
Yes
Set digit present off
Wait for interrupt
Interrupt
No
Yes
F
F
Read ACO latched input w/reset
DSC on
No
Yes
Turn off call request
Start data exchange
Exchange complete
No
Yes
Turn off DTR
End
ACR on
No
Yes
A
Initiate error recovery

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