"The market prices of commodities vary from day to day and often several times a day. This occurs when there is no radical difference in the proportion of supply and the natural demands. This fact is conclusive proof that our system is controlled by manipulators and is fundamentally wrong. I have sought to elucidate this problem within this volume and have suggested a plan which, if adopted, would make the people themselves master of the world, instead of the present master – The Money Trust."

--- Quote from *Currency, Banking, and the Money Trust* by Minnesota Congressman Charles Lindbergh, Sr., the father of aviator Charles Lindbergh, Jr.

This book was originally titled *The Economic Pinch* and was first published in 1913. In 1917, Charles Lindbergh brought articles of impeachment against members of the Federal Reserve Board, including Paul Warburg and William Proctor Gould Harding. Lindbergh charged that the Federal Reserve Board members were involved "... in a conspiracy to violate the Constitution and laws of the United States."

Charles Lindbergh, Sr. and his son were true American heroes.

---

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DIGITAL CARRIER TRUNK INTERFACE
DESCRIPTION AND MAINTENANCE CONSIDERATIONS
NO. 1 AND NO. 1A
"ESS**" SWITCHES

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1. GENERAL

1.01 This section describes the digital carrier trunk (DCT) frame and its application as used in the No. 1 and No. 1A ESS switches. Maintenance considerations for this frame are also included.

1.02 The reasons for reissuing this section are to add maintenance information contained in Section 231-049-101 and to add information on the circuit switched digital capability (CSDC) feature. Revision arrows are used to emphasize significant changes.

1.03 The DCT frame provides an intelligent inter-face between the T-carrier transmission lines and switching network of the central office.

1.04 The DCT frame provides an interconnection for processing 1 to 480 one-way or two-way voice frequency circuits between the No. 1/1A office and the far-end office with up to 40-T1, 20-TIC, or 10-T2 digital transmission lines. This is accomplished by a microprocessor controlled interface for signaling and status reporting. Digits are received, converted to digital data, and a channel unit is selected for outputting. There may be up to 10 banks contained in one DCT frame. Each bank has two digroups and each digroup contains 24 channels for a total of 480 channels per DCT frame.

1.05 The CSDC feature provides end-to-end circuit-switched transmission interface for 56 kilohertz per second digital data signals. To provide the CSDC feature, the DCT bank must be equipped with combined alternate data/voice (CADV) channel
units, alarm and digroup control unit (A&DUC, List 2) and an office interface unit (OIU-I). See Section 231-390-380 for feature description. Refer to Part 4 for additional DCT (CSI) description.

1.06 The DCT frame common equipment and test equipment are listed in Table A.4

2. DIGITAL CARRIER TRUNK FRAME DESCRIPTION

2.01 The DCT frame consists of a peripheral unit controller (PUC), ten DCT banks, and an optional maintenance bank mounted in a 7 foot high (2133 mm), 6 foot 6 inch wide (1981 mm) 3-bay frame. The PUC, two banks, and the optional maintenance bank are placed in the center bay and four banks are placed in each of the side bays (Fig. 1).

PERIPHERAL UNIT CONTROLLER

2.02 The PUC is a microprocessor duplex controller located in the top portion of the center DCT bay. With the BELLMAC*-S microprocessor as the heart of the processing unit, the PUC is self-contained with memory and power supplies. Refer to Section 231-037-020 for a description of the PUC.

2.03 The function of the PUC may be defined as call processing, and it is located between the No. 1/1A central control (CC) and the digital carrier systems. Although the PUC handles signaling, channel assignment, bit formatting, error checking and diagnostics, the CC commands and externally controls the call processing functions. A hierarchical command structure controls data flow to and from the combined channel units (CCU) (Fig. 2).

2.04 The PUC receives instructions from the CC over the peripheral unit address bus (PUAB). The PUC reports back to the CC over the peripheral unit reply bus (PURB). These instructions include those to be executed within the PUC as well as those to be passed on to the individual digroups.

2.05 For outgoing trunk (or channel) selection, the PUC receives a command from the CC over the PUAB and selects an idle circuit to handle the call. Signaling is also provided by the PUC. One PUC is required for each DCT frame.

2.06 The information returned to the CC consists of PUC and digroup status. This information

is returned to the CC over the PURB when the CC periodically interrogates the PUC.

2.07 The PUC contains its own diagnostic tests and will report failures to the CC. Upon request, the status of the DCT is printed out on the maintenance teletypewriter (TTY) for use by maintenance personnel.

2.08 A DCT application program resides in the erasable programmable read only memory (EPROM) within the PUC. This program is the DCT application firmware. This firmware (identified as MCI4000) is used by the PUC to detect changes in trunk signaling, detect and report changes in trunk supervisory states, automatically detect and report transmission facility maintenance information, and receive or generate revertive and dial pulse digits.

DIGITAL CARRIER TRUNK CHANNEL BANK

2.09 The DCT channel bank is a 48-channel pulse code modulated (PCM) terminal which serves as the transmission interface between T-carrier lines and the No. 1 or 1A trunk distributing frame. The bank is compatible with other D-type channel banks and digital multiplexers over T1, T1C, or T2 digital carrier systems. The DCT channel bank layout is shown in Fig. 3.

2.10 The function of the DCT bank is to translate analog voice frequency (VF) signals to and from PCM signals for transmission over digital line facilities. An exception to this is the digital data use by CSDC as explained in Part 4. The DCT channel units convert the VF signals to pulse amplitude modulation (PAM) samples. The PAM pulses from the 24 channel units are encoded in the transmit unit (TU) to form the PCM signal. The PCM signal is processed in the line interface unit for application to the digital T-line. The receiving unit (RU) performs the complementary decoding function.

2.11 In addition to VF processing, circuits are provided for the transmission of per-channel signaling and supervisory information.

2.12 The principle difference between the DCT bank and other channel banks is that the DCT bank is a 3-port device. The third port permits a direct exchange of signaling, supervisory and maintenance information in a digital format with the No. 1/1A ESS switch.

2.13 High-frequency line connections to the DCT bank are in the standard DS1/DS1C and DS2 formats.
### TABLE A

**LIST OF DCT COMMON EQUIPMENT AND TEST EQUIPMENT**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>EQUIPMENT CODE</th>
<th>SS/CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>660 Communication Panel</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>Alarm and Digroup Control Unit</td>
<td>J98732AA-1</td>
<td>3C208-01</td>
</tr>
<tr>
<td>Combined Channel Unit</td>
<td>J98732BA-1</td>
<td>3C329-01</td>
</tr>
<tr>
<td>3B/4D Portable Test Set</td>
<td>J98732AL-1</td>
<td>3C113</td>
</tr>
<tr>
<td>DCT Channel Bank</td>
<td>J98732A</td>
<td>3C315-01</td>
</tr>
<tr>
<td>DCT Frame Application</td>
<td>J98732A</td>
<td>3C316-01</td>
</tr>
<tr>
<td>DCT Maintenance Bank Test Set</td>
<td>J98732MJ-1</td>
<td>3C401-01</td>
</tr>
<tr>
<td>DCT Maintenance Bank</td>
<td>ED-98732M</td>
<td>3C400-01</td>
</tr>
<tr>
<td>Digroup Control Unit</td>
<td>J98732AB-1</td>
<td>3C209-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-1D)</td>
<td>J98726AC-1</td>
<td>3C230-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-2)</td>
<td>J98726AF-1</td>
<td>3C301-01</td>
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<tr>
<td>Line Interface Unit (LIU-3)</td>
<td>J98726AH-1</td>
<td>3C302-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-4R)</td>
<td>J98726AP-1</td>
<td>3C314-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-4BA)</td>
<td>J98726AS-1</td>
<td>3C314-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-4T)</td>
<td>J98726AN-1</td>
<td>3C314-01</td>
</tr>
<tr>
<td>Line Interface Unit (LIU-4TA)</td>
<td>J98726AR-1</td>
<td>3C313-01</td>
</tr>
<tr>
<td>Office Interface Unit (OIU-1)</td>
<td>J98726AJ-1</td>
<td>3C308-01</td>
</tr>
<tr>
<td>PUC/DCT Bus Control and Interface Unit</td>
<td>JA098AA-1</td>
<td>1A477-01</td>
</tr>
<tr>
<td>PUC/Digital Carrier Trunk Unit</td>
<td>J1A098A</td>
<td>1A477-01</td>
</tr>
<tr>
<td>Power Alarm and Control Circuit</td>
<td>J1A099AC</td>
<td>1A479-01</td>
</tr>
<tr>
<td>Power Converter Unit</td>
<td>J98732BC-1</td>
<td>82731-01</td>
</tr>
<tr>
<td>Power Distribution Unit</td>
<td>J98726AK-1</td>
<td>3C312-01</td>
</tr>
<tr>
<td>Receive Unit</td>
<td>J98726AB-4</td>
<td>3C306-03</td>
</tr>
<tr>
<td>Shelf Assembly (DCT Bank)</td>
<td></td>
<td>3C315-01</td>
</tr>
<tr>
<td>Signaling Path Test Set (DCT)</td>
<td>J98732MH-1</td>
<td>3C284</td>
</tr>
<tr>
<td>Synthesizer Unit</td>
<td>J98726AG-1</td>
<td>3C303-01</td>
</tr>
<tr>
<td>Transmit Unit</td>
<td>J98726AA-1</td>
<td>3C303-01</td>
</tr>
<tr>
<td>Trunk Processing Unit</td>
<td>J98726AD-1</td>
<td>3C311-01</td>
</tr>
</tbody>
</table>

**CSDC USE ONLY**

| Alarm and Digroup Control Unit             | J98732AA-2     | 3C288    |
| Combined Alternate Data-Voice Channel Unit | J98732PA       | 7C390    |
| Digroup Control Unit                       | J98732AB-2     | 3C296    |
| Office Interface Unit (OIU-4)              | J98726AY-1     | 3C470    |
2.14 The DCT channels are formatted into two 24-channel digroups to make DCT compatible with D1D/D2, D2/D1D, D3, and D4 types of far-end terminal equipment. Each digroup contains an individual transmit unit and receive unit. These units connect to other common equipment as designated by the operational mode.

2.15 Four operating modes are provided to interface with the T1, TIC, or T2 digital carrier systems (Fig. 4). Selection among the modes depend upon the line facility and the far-end terminal equipment. The T1 (24 two-way channels), TIC (48 two-way channels), and T2 (96 two-way channels) lines are used with line interface units to configure the four operating modes.

(a) Mode 1 multiplexes up to 48 VP trunk circuits (channels) into a single 3.152 megabit per second bit stream for application to a T1C line where D1 or DCT banks terminate at the far-end of the system.

(b) Mode 2 multiplexes up to 48 VP trunk circuits into a single 3.152 megabit per second bit stream for application to a T1C line which terminates in an M1C multiplexer at the far-end of the system.

(c) Mode 3 multiplexes up to 48 VP trunk circuits into two digroups of 24 channels each for application to two T1 lines, each with a 1.544 megabit
per second bit stream. The far-end terminates in D1D, D2, D3, D4 or DCT banks.

(d) Mode 4 multiplexes up to 96 VF trunk circuits into a single 6.304 megabit per second bit stream for application to a T2 line, with the far-end terminating in D1D, D2, D3, D4, or DCT banks. Mode 4 operation requires two DCT banks (four digroups) to multiplex 96 lines. One bank is the transmit bank for an output of two digroups. The second bank is the receive bank for the two digroups.

2.16 Depending on the bank mode of operation, either one or two alarm and digroup control units (A&DCU) are provided. Mode 1 requires one such unit plus one digroup control unit. Modes 2, 3, and 4 require two alarm and digroup control units per bank.

**DIGITAL CARRIER TRUNK BANK PLUG-IN UNITS**

*Note:* The terms plug-in unit and circuit pack are synonymous when referring to DCT only.

2.17 The DCT bank contains two 24-channel digroups with associated plug-ins for control. The top two shelves are for units dedicated to digroup B and the bottom two shelves contain units for digroup A (Fig. 5).

2.18 In mode 1 both digroups operate synchronously, therefore a full complement of common equipment is required initially. In modes 2, 3, and 4, the two digroups operate independently and may be initially equipped for single digroup operation.

A. Trunk Processing Unit

2.19 The trunk processing unit (TPU) provides trunk processing control signals to the chan-
### B. Combined Channel Unit

The combined channel unit (CCU) is used in the DCT banks to perform voice channel and trunk circuit functions. The CCU is designed to replace most of the standard 2-wire No. 1/1A ESS switch trunk circuit design functions. Refer to Section 231-099-152 for a listing of trunk circuit types replaced by DCT-CCUs.

#### 2.21

The CCU provides the interface between the office VP trunk link frames and the common equipment units. Each channel unit includes transmitting and receiving circuits plus signaling and supervisory circuits. In the transmitting circuit, outgoing VP information is sampled at an 8-kilohertz rate, providing PAM signals which are fed to the transmit unit. Also, outgoing per-channel signaling...
Fig. 5—Channel Bank Plug-ins
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information is separately supplied to the transmit unit for periodic multiplexing with the voice samples. On the receiving side of the channel unit, the PAM signals are accepted from the receive unit and converted back to VP. In addition, signaling information from the receive unit is demultiplexed and converted to signaling and supervisory information for connection to the VP trunk. Signaling and supervisory information on the office side of the trunk is supplied via channel data leads to the digroup controller where it is sent to the PUC.

2.22 Transmission measurements can be made using patch cords via jack access on the face of each channel unit.

C. Transmit Unit

2.23 The transmit unit (TU) encodes the PAM signal from each channel and combines the PCM words with framing pulses and signaling information.

D. Receive Unit

2.24 The receive unit (RU) performs the complementary function of the transmit unit. It decodes the PCM signals, demultiplexes the individual voice channel, and extracts framing and per-channel signaling information.

E. Syndes Unit

2.25 The syndes unit (SU) is used with the LIU2 unit for mode 2 operation, LIU4T and LIU4R for mode 4 operation, plus LIU4TA and LIU4RA for mode 4A operation. The SU and LIU2 furnish the functions provided by the M1C multiplexer used in 48 channel applications in existing systems, i.e., it insures compatibility with the digital format required for T1C lines and that of two DCT digroups. This unit also adds synchronizing pulses to the data stream to synchronize digroup inputs. Unlike the other operational modes, digroup looping in modes 2 and 4 is performed in the SU rather than in the associated line interface unit when looping via the LT switch.

F. Line Interface Unit

2.26 The line interface unit (LIU), provides signal processing for the transmit and receive sections of each digroup. It converts the unipolar bit stream from the transmit unit to a bipolar bit stream for application to the digital line. The LIU also contains the transmit clock and receiving bipolar to unipolar converter circuitry.

2.27 There are four types of LIUs for the four operational modes of the DCT bank. Modes 1, 2, and 3 require LIU 1D, LIU 2, and LIU 3, respectively. Two LIUs are required for mode 4 and mode 4A. Mode 4 requires LIU 4T and LIU 4R. Mode 4A requires LIU 4TA and LIU 4RA.

G. Office Interface Unit

2.28 The office interface unit (OIU) provides the means of locking the clock frequency of the DCT bank clock circuit to the incoming bipolar line bit rate. This circuit also provides interface between the T-carrier administration system (TCAS) and the bank alarms. The OIU is used in operational mode 3 with No. 4 ESS switch at far-end facility.

H. Alarm And Digroup Control Unit

2.29 The alarm and digroup control unit (A&DCU) is a plug-in consisting of two circuit boards. One board is the alarm control unit (ACU) and the other board is the digroup control unit (DCU). Separate alarm circuitry is not required for digroup B in mode 1 and in this case the digroup controller is self-contained in a DCU plug-in. In all cases, the functions of the digroup controller are independent of its physical association with the digroup alarm circuits.

Alarm Control Unit

2.30 The ACU provides the primary alarm indication and alarm control center for the DCT bank. It detects alarm conditions, controls local and remote office alarms, and initiates trunk processing for removal or restoration of service. The ACU also monitors particular -48 volt office battery leads and the output voltages of the bank de-to-dec converter.

2.31 The ACU provides the means of testing bank performance by looping the high-frequency output to the input while holding the bank and trunks out of service.

2.32 Lamps and switches on the faceplate of the A&DCU are used for trouble indications and isolation (Fig. 6). When a trouble condition develops, the ACU initiates signals to the trunk processing unit and digroup controller which affects trunk con-
tioning appropriate for the given situation. When
the trouble clears, service is automatically restored.
One ACU for mode 1 or two ACUs for modes 2, 3, and
4 are required for each DCT bank.

2.35 The ACU provides a three-position switch
which is used as an aid in locating troubles.
The positions are for normal (NORM) bank trunk
looping (LT) and T-line looping (LL) operation. Two
lamps are used to indicate LT or LL operation. This
switch is used to condition the bank for looping pro-
cedures which are used in trouble locating. The
switch is only functional when trunks are removed
from service by the TPU, normally as a result of an
AR or AY alarm, and after the ACO has been operat-
ed.

2.36 The LT operation can also be requested via the
DCT-BANK TTY input message. The same
restrictions as in the manual LT operation apply.

2.37 The LT operation causes the digital output
of the bank to be looped at the LIU for opera-
tional modes 1 and 3. For operational modes 2 and 4,
the looping occurs in the SU. Looping the digroup
within itself aids in solving bank problems.

2.38 The LL operation causes a yellow alarm to be
transmitted to the far-end. This will hold the
far-end bank out of service and allow line trouble-
shooting. Proper operation of the LL feature requires
that both banks (far-end and near-end) be in LL op-
eration to avoid inadvertent restoration of one or both
terminals under noisy line conditions.

**Digroup Control Unit**

2.39 The digroup control unit (DCU) receives sta-
tus requests and trunk command information
from the PUC via a serial data link. It selects the
proper CCU and prepares it for service via channel
data leads. Signaling and supervisory information
from each CCU is received by the DCU via the same
channel data leads. This information is then sent to
the PUC. Two digroup controllers are required for
each bank (digroup A and B).

1. **Power Distribution Unit**

2.40 The power distribution unit (PDU) accepts the
-48 volt dc central office battery and provides
a fused power distribution arrangement for applica-
tion of power to the DCT bank. Office alarms are acti-
vated by any fuse operation.

2.41 The PDU also provides filtering for the talk
battery to reduce noise and ripple.
<table>
<thead>
<tr>
<th>LOCATION OF LAMP</th>
<th>LAMP STATE (LIGHTED)</th>
<th>PROBABLE CAUSE OF TROUBLE OR FUNCTION</th>
<th>LOCATION OF LAMP</th>
<th>LAMP STATE (LIGHTED)</th>
<th>PROBABLE CAUSE OF TROUBLE OR FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDU</td>
<td>ALM</td>
<td>Bank alarm; fuse or signal failure</td>
<td>LIU-2</td>
<td>PASS</td>
<td>Fast loop test OK</td>
</tr>
<tr>
<td>PCU</td>
<td>FAIL</td>
<td>Low converter output voltage PCU input switch off</td>
<td>LIU-4T, LIU-4R</td>
<td>FAIL</td>
<td>Fast loop test fails; trouble in SU or LIU</td>
</tr>
<tr>
<td>RU</td>
<td>RCV</td>
<td>Loss of framing PCM receive signal</td>
<td>LOC</td>
<td></td>
<td>Incoming problem (LIU or SU)</td>
</tr>
</tbody>
</table>
| A&DCU            | DL                   | 1. Loss of data from PUC  
2. Loss of clock from PUC  
3. Babbling CCU  
4. Glare in DCU to PUC | TPU              | TPD-A, TPD-B | Digit (A or B) has completed trunk processing |
| AR               | RUC                  | Bank alarm for:  
1. Loss of -48F or -48S  
2. Loss of PUC data  
3. Loss of receive signal  
4. Loss of receive multiplex | A&DCU            | RUC, RCV flashing | Improper cross-connect has been made. The T&R is reversed at DSX or office repeater bay |
| AY               |                      | 1. Far-end failure  
2. Near-end transmit failure | A&DCU            | AR,AY flashing | Hierarchy failure Mode 2 and Mode 4 only. Multiplexer at far-end |
| ACO              |                      | Office alarms have been cleared — depressing ACO | A&DCU            | AY,TPD-A or B flashing | 1. Bank in loop mode but digroup has not been removed from sevice  
2. Incorrect attenuation (not enough) in CCU transmit  
3. Open CCU (T&R without termination) |
| DCU              | DL                   | 1. Loss of data from PUC  
2. Loss of clock from PUC  
3. Babbling CCU  
4. Glare in DCU to PUC |                      |                      |                                      |
J. Power Converter Unit

2.42 The power converter unit (PCU) accepts a fused output from the PDU and converts the nominal -48 volt dc central office battery to regulated dc voltages of +5.0 volts, -12 volts, and +12 volts required for the operation of the DCT circuitry.

MAINTENANCE BANK

2.43 The DCT maintenance bank (Fig. 7) provides "hot spares" of plug-in units, testing facilities, and centralized maintenance. The heart of the maintenance bank is the maintenance bank test set (MBTS). The MBTS (Fig. 8) has circuits which, when used in conjunction with a digroup of DCT common equipment, will monitor the performance of CCUs and the common plug-ins. A thorough functional test of the CCU is performed in conjunction with the DCU using a microprocessor in the MBTS. In addition, network loss and distortion tests are performed on the CCU and common equipment. These tests, in conjunction with the built-in alarms on the common equipment, will verify that all units which test good will perform satisfactorily in a working bank.

2.44 One shelf of plug-ins is required for testing DCT banks operating in modes 1, 2, or 3. To test mode 4 functions, an additional shelf is required which is hard wired to the first shelf.

2.45 Testing configuration requires the DL-ACO/NORM switch on the ADCU be set to DL-ACO and the 3-position switch set to NORM.

A. Maintenance Bank Test Set

2.46 The MBTS, in conjunction with bank common equipment, tests all DCT plug-in units. The switches and lamps on the MBTS are used for testing as described in the following paragraphs. The switch and lamp functions are described in Table C.

2.47 The alarm disable switch (ALM DISABLE) is used to disable maintenance bank alarms generated by the common equipment and the MBTS. This switch will turn off office alarms to which the maintenance bank is connected through the PUC power alarm and control unit. When testing, operate the alarm disable switch to silence any office alarms caused by the testing. When testing is not in progress, leave the alarm disable switch in the released position (out) so that office alarms will be activated in the case of a maintenance bank alarm.

2.48 The test jack is used to check looped common equipment using the DU/D4 test set and channel access unit (CAU). The MBTS CCU simulator is tested at its four-wire points.

2.49 The transmit and receive attenuator switches (TRMT and RCV) complete or build out the loss of the transmit or receive paths under test. With the attenuators set, a CCU VF problem can be detected via the voice tests generated by the MBTS. Attenuator buttons pushed in indicates zero attenuation. With the button out, the attenuation is as marked.

2.50 The following test switches are activated when pushed in and only one can be activated at a time. The PASS and FAIL lamps provide the result of the test performed.

2.51 The DIGL CCU-DGU tests the digital portion of the microprocessor in the MBTS. The supervisory and control functions are tested in a manner similar to the way the CCU operates in a working system with the microprocessor communicating with the CCU. The replies from the DCO to the microprocessor are then compared with the desired results in memory. When testing a CCU in the DIGL CCU-DGU mode, the first test may fail because a unit just plugged in could have its logic and relays in any state but the correct state that the test sequence expected. In this case, the test should be repeated after performing a test using the following test switches.

2.52 The VF TRMT switch tests the CCU transmit circuitry. It inserts a test tone into the tip/ring of the CCU under test, then routes its PAM pulses through the looped common equipment and into the receive side of the CCU simulator where it is detected. A deviation of ±0.5 dB is detected as a failure.

2.53 The VF RCV switch tests the CCU receive circuitry. It inserts a VF tone into the transmit side of the CCU simulator. The PAM pulses from the simulator are then looped through the common equipment into the receive portion of the CCU under test. This tone is detected at the tip/ring of the CCU as VF. A deviation of ±0.5 dB is detected as a failure.

2.54 The MC TRMT switch tests the CCU transmit side for multichannel interference or crosstalk.

2.55 The MC RCV switch tests the CCU receive side for multichannel interference.
Fig. 7 — Maintenance Bank

LEGEND:
- ASDCU - ALARM & DIGROUP CONTROL UNIT
- CCU - COMBINED CHANNEL UNIT
- LIU - LINE INTERFACE UNIT
- MBTS - MAINTENANCE BANK TEST SET
- OTU - OFFICE INTERFACE UNIT
- POU - POWER DISTRIBUTION UNIT
- PCU - POWER CONVERTING UNIT
- POU - POWER DISTRIBUTION UNIT
- RU - RECEIVE UNIT
- SPS - SIGNALLING PATH TEST SET
- SU - SYMONS UNIT
- TPU - TRUNK PROCESSING UNIT
- TU - TRANSMIT UNIT

*EQUIP AS SHOWN:

<table>
<thead>
<tr>
<th>MODE</th>
<th>LIU(1)</th>
<th>SU</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>LIU(1)</td>
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</tr>
<tr>
<td>2</td>
<td>LIU(2)</td>
<td>INSTALLED</td>
</tr>
<tr>
<td>3</td>
<td>LIU(3)</td>
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</tr>
<tr>
<td>4</td>
<td>LIU(4)</td>
<td>INSTALLED</td>
</tr>
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</table>
B. Common Unit Testing

2.56 Warning: Excessive plug-in removal and insertion in the maintenance bank may cause wear on the connector. This may lead to erroneous fault indications by the maintenance bank. Do not use the maintenance bank for routine testing of plug-ins. Common equipment plug-in units suspected of being faulty are tested by performing one of the VF tests and the DIGL CCU/DCU tests. To test the digroup control unit, place it into the alarm and digroup control unit position and perform the DIGL CCU/DCU test. The DL-ACO switch selection should be made during the test in order to silence the alarm.

3. MAINTENANCE

3.01 Maintenance procedures pertaining to DCT are contained in the following task oriented practice (TOP) documents:

- TOP 231-050-015: DCT frame maintenance (DCT and PUC)
- TOP 231-050-006: DCT trunk testing (1E6 or 1A6 Generic program)
- TOP 231-050-007: DCT trunk testing from the manual trunk test position (MTPP)
- TOP 231-050-008: DCT trunk testing from the supplementary trunk test position (STPP)
- TOP 231-050-009: DCT trunk testing from the trunk and line test panel (TLP)

3.02 Maintenance for DCT is performed using TTY messages, switches and lamps on the DCT frame and various trunk test positions. Remote maintenance from a console at the Switching Control Center (SCC) is also available to the DCT which is similar to that available in the central office.
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#TABLE C#

MAINTENANCE BANK TEST SET CONTROLS

<table>
<thead>
<tr>
<th>TEST KEY</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGL</td>
<td>Test logic portion of the CCU and DCU. Causes DCU to set and check signaling bits, operates CCU relays K1 and K2, and compares the results with the desired result in memory.</td>
</tr>
<tr>
<td>CCU-DCU</td>
<td></td>
</tr>
<tr>
<td>VF TRMT</td>
<td>Tests the transmitting portion of the CCU. Signal path for the test includes common equipment.</td>
</tr>
<tr>
<td>VF RCV</td>
<td>Test the receiving portion of the CCU. Signal path for the test includes common equipment.</td>
</tr>
<tr>
<td>MC TRMT</td>
<td>Tests interference into other time slots.</td>
</tr>
<tr>
<td>MC RCV</td>
<td>Tests interference from other time slots.</td>
</tr>
<tr>
<td>ALM DISABL</td>
<td>Prevents maintenance bank alarms from being reported when depressed.</td>
</tr>
<tr>
<td>TRMT (1.6B — 3.2 dB)</td>
<td>Level adjust attenuators used to build out loss in channel unit transmit and receive paths.</td>
</tr>
<tr>
<td>RCV (1 dB — 3.2 dB)</td>
<td></td>
</tr>
<tr>
<td>PASS/FAIL LAMP</td>
<td>Indicates the result of test.</td>
</tr>
</tbody>
</table>

Printouts are available and maintenance messages are inputted to manually call up lists, diagnostics, etc.

TESTS

3.03 Tests are done to verify that the DCT and associated circuits are operating properly.

A. Installation Tests

3.04 The DCT banks must pass the installation requirements before they are ready for service. These tests include:

- Power verification
- Common unit configuration
- Bank functional tests.

3.05 For acceptance procedures, refer to TOP 231-050-015.

B. Growth

3.06 After adding a DCT bank (or a DCT frame) to an office, with connection being complete between central control and the T-lines, circuit order tests are required.

3.07 Refer to TOP 231-050-015 for growth procedures.

C. Testing from the Trunk Test Positions

3.08 The DCT tests from the trunk test positions consist of operational tests and signaling tests. These tests are contained in the following documents:

- TOP 231-050-006: DCT trunk testing (1B6 or 1A6 generic program)
- TOP 231-050-007: DCT trunk testing from the manual trunk test position (MTTP)
3.09 The operational test is to verify that the CBU can be placed in all states by the central control. This is achieved by manual selection of each state from the MTTP, STTP, or TLTP.

3.10 The signaling test is to verify that the signaling is transmitted properly through the network and the CBU. From the MTTP, STTP, or the TLTP, the signaling tests are performed by selecting the trunk network numbers (TNN) as in any trunk circuit test. There are no visual indicators at the MTTP to inform the operator that the trunk under test is a DCT circuit. The channel unit is placed in a special access state using the same procedure (key operation at the MTTP or STTP) which would be used to place a conventional E&M trunk circuit into the E&M access state. Test results are obtained by observation of the E&M lamps.

D. Testing from the Digital Carrier Trunk Frame

3.11 End-to-end tests verify that the circuit is operating as a complete facility. These tests are contained in TOP 231-050-015. Tests that fall in this category are:

- Net loss
- Noise
- Signaling.

E. Testing from the Teletype

3.12 Maintenance messages for DCT can be inputted from the switching office maintenance TTY or from a remote location such as the SCC.

3.13 For the DCT, the input message for commands is DCT-BANK-aaa bb cc and is used for:

- Looping
- Restoring the looped terminal
- Requesting alarm status
- Clearing out-of-frame count

3.14 Refer to the appropriate input and output message manuals for the format and description of TTY messages.

TROUBLE INDICATORS

3.15 Trouble associated with the DCT frame is indicated by audible office alarms, alarm lamps on the DCT frame, and TTY messages. Procedures contained in TOP 231-050-015 are used to clear troubles. Refer to Table B for bank alarm lamp indicators.

3.16 Facility maintenance and associated trouble indicators refer to the maintenance of all the equipment on the T-line side of the common channel unit. It extends from the bank common equipment transmit unit and receive unit out through the T-line proper. This equipment is partially self-checked in that some failures are detected internally and reported to the CC via the PUC as alarms.

3.17 The purpose of facility maintenance for DCT is to protect service and provide sectionalization information in the event of serious failure. The maintenance personnel is informed of certain conditions indicating that the system, end-to-end, is not performing at design levels.

A. Carrier Group Alarm

3.18 A carrier group alarm (CGA) relay is provided by the DCT on a digroup basis, with contact pairs for connection to a scan point in the master scanner. This alarm is remoted to the SCC and in turn remotes it to the T-carrier administration system (TCAS). The CGA gives an indication that the facility is unable to provide voice communications end-to-end. Upon a detection of a CGA, the following actions are initiated in the trunk hardware after a nominal 2.5 second delay:

- A disconnect is sent backwards on all channels to the network (in the affected digroup).
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- A seize forward is sent on all channels to the far-end.
- The CGA is continuously monitored for bank restoral (an alarm will remain for at least 15-20 seconds).

3.19 The CGA is indicated by the AR and AY lamps on the alarm control unit.

3.20 The RED alarm (AR lamp lighted) is an indication that the near-end receive unit is unable to frame in the incoming bit stream.

3.21 The RED alarm is caused by one of the following:
- Loss of filtered talk battery (-48S). The circuit path for this alarm is from the fuse at the PDU to the CCU and then to the ACU. The cause of this alarm could be a fuse failure, ACU detection circuit, or backplane wiring error.
- Loss of battery (-48S). The circuit path for this alarm is from the PDU to the ACU. The cause of this alarm could be fuse failure, ACU detection circuit, or backplane wiring error.
- Receive framing (RFAL) out-of-frame or loss-of-clock alarm. This alarm is generated by the RU from the incoming PCM digital stream. The cause of this alarm at the near-end office could be a faulty RU, LIU, SU, cross-connet panel, office repeater, or line repeater. The cause of this alarm at the far-end office could be a faulty TU, SU, TPU, cross-connet panel, office repeater, or line repeater.
- Digroup control unit failure (DCUF). This is caused by a loss of the serial bit stream and/or loss of the clock pulses from the PUC to the DCU. Possible causes of this alarm are a faulty PUC digroup buffer, PUC to DCU cable, A&DUCU, DCU, TU, or CCU.
- Loss of receive multiplex signal (LOSP). This alarm is caused by the loss of the bipolar signal from the T-line to the LIU for modes 2 and 4 only. Causes of this alarm at the near-end could be the cross-connet panel, office repeater, line repeater, SU, or LIU. At the far-end this alarm could be caused by the SU, LIU, TPU, cross-connet panel, or office repeater.

3.22 A YELLOW alarm (AY lamp lighted) is an indication that the far-end receive unit is unable to frame on the output of the near-end transmit unit. This alarm can be caused by a near-end transmit failure or a far-end receive failure. A unit with a RED alarm is able to transmit a signal causing a YELLOW alarm at the far-end (ie, when a RED alarm occurs at the far-end bank, it transmits a signal and causes a YELLOW alarm at the near-end bank).

3.23 A RED over YELLOW alarm occurs when an existing YELLOW alarm becomes a RED alarm because the far-end bank has been looped, opening the T-line. Both RED and YELLOW states are reported to the PUC.

3.24 Alternate RED and YELLOW alarms are a result of a failure higher up in the digital hierarchy. If the lamps alternate RED-YELLOW-RED-YELLOW — — at a rate of approximately 1.8 seconds each, the indications imply the trouble is not in the local T1 system but a trouble in a higher order system (T2, T3 or above). If the failure occurs (above T1 rate), it creates down stream failures at the T1 rate; therefore, the first indication seen would be a RED (which would stay up long enough to create a CGA) then alternate YELLOW-RED-YELLOW-RED, etc.

3.25 When a CGA occurs, the following actions are automatically taken by the CC:
- Remove from service all idle circuits in the affected digroup (ie, place them in a software CGA state).
- Camp on non-idle circuits until they are free to be removed from service.
- If the No. 1/1A CC is the control end of the facility, the count of the CGA occurrence is incremented in translation records.
- Print out on the maintenance TTY the following message:

FM01 CGA DCT aa DIG bb cc ddd e ffff ff

and if the alarm is determined to be an hierarchy failure, then the second FM message is printed out:
FM02 DCT aa DIG bb HIERARCHY FAILURE

3.26 The data link alarm (DL lamp lighted) occurs when the DCU loses incoming serial data or clock from the PUC.

B. Automatic Line Monitoring

3.27 Automatic line monitoring and reporting to the PUC and CC is part of the overall maintenance plan. The error conditions reported are line error monitoring and line out-of-frame monitoring.

3.28 For line error monitoring, the receiving T-line’s performance is monitored and reported back to the PUC. The bank and digroup controller will report to the PUC (and hence to the CC) when line error performance exceeds the low threshold (10^-3 bit error rate) or the high threshold (10^-2 bit error rate). These conditions will be reported in two separate reports; however, if the error rate exceeded both high and low threshold in one report interval, only the high threshold report will be made. Reporting is done via the FM03 DCT output message. When the high threshold is exceeded, the customer data transmission is significantly impaired. The information at the maintenance TTY will show the affected digroup and the error threshold exceeded.

3.29 The receiving T-line signal is continually monitored in the receive unit for an out-of-frame (OOF) state. The PUC accumulates the OOF count and a report is generated when OOF exceeds low threshold of 17 or high threshold of 512. Reporting is accomplished via the FM04 DCT output message.

FAULT ISOLATION

3.30 When a DCT related trouble is indicated to maintenance personnel, raw data analysis and looping are used to isolate the fault.

A. Raw Data Analysis

3.31 A raw data TTY output message (MN02 DCT) is printed if the CC detects a DCT order failure. This message identifies the content of various registers at the time of failure. Conversion of the identified DCT circuit numbers in the message is necessary to identify the DCT bank and digroup having the order failure. Refer to Table D for this conversion.

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B. Looping

3.32 If a DCT related fault is detected, it is important to determine which equipment is causing the fault. The failure is isolated by looping data back at different points in the transmission path and observing the lighted lamps on the channel banks. The looping procedures are contained in TOP 231-059-015. Looping diagrams for operating modes 1, 2, 3, and 4 are shown in Fig. 9, 10, 11, and 12, respectively.

3.33 The looping procedures should be used to isolate a fault to the DCT bank, near-end office repeater bay, transmission line, or far-end office. The far-end office is required to participate when setting up the looping configuration. Should the far-end office be unable to set up the proper loop, they should refer to the appropriate TOP volumes as follows:

- TOP 365-880-002: D4 Channel Bank
- TOP 365-170-000: D4 Channel Bank
- TOP 365-880-002: T-Carrier, T1 Line.

C. Voice Frequency Signal Flow and Looping

3.34 For mode 3 operation, the VF signal flow into the the channel units is converted to a PAM signal and sent to the transmit unit. The PAM signal is converted to a PCM signal in the transmit unit and sent to the line interface unit. The line interface unit converts the signal to the bipolar format required for the T1 line and sends it to the trunk processing unit equalizers. The signal is then sent out on the T1 line. The inverse occurs on the receive side.

3.35 For mode 3 operation, LT looping (LT position of 3-position switch on the A&DCU) causes the signal output to be looped back to the input in the line interface unit. This occurs on an individual digroup basis.

3.36 Mode 1 LT looping is identical to mode 3 looping except that both digroups are looped.

3.37 Operating modes 2 and 4 require the addition of the syndes unit between the transmit or receive unit and the line interface unit. Looping occurs on an individual digroup basis within the syndes unit for LT looping.

3.38 Looping can also be performed using the LP jacks on the line interface units. All looping
## TABLE D

**DCT DIGROUP TO CIRCUIT NUMBER CONVERSION**

*(NOTE)*

<table>
<thead>
<tr>
<th>CCU NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>BANK</th>
<th>DIGROUP</th>
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<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
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<td>B</td>
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</table>

Note: Circuit numbers 120 through 127 and 248 through 255 are not used for DCT application.
and then occur within the DLCs. In modes 1 and 2, both digroups are looped. Mode 3, however, has individual digroup UP points to enable if 2 loop digest are looped.

3.39 Modes 2 and 3 have an additional form of testing called the “fast loop.” The first fault occurs internal to the line interface unit and is simulated by a loop using the UP jack on the line interface unit. The difference is that the digroups may be looped. The test may be removed from service for a fast loop. To avoid resuming customer connections, signal bit patterns are used in all DLCs. If a receive failure occurs while a loop remains during an LT loop, the probable cause is the receive unit or trans unit. If the alarm clears, the test (TST) pushbutton can be pressed to activate the “fast loop.” This loop allows all digroups in the bank internal to the line interface unit for 200 milliseconds. If no receive failures are detected, the PASS lamp on the line interface unit will light, which indicates that the test is outside the local bank. If a receive failure is detected, the FAIL lamp on the line interface unit will light, which positively identifies the local trans unit or line interface unit as defective. After the test, the LT switch should be returned to NORM. This will clear the test indications on the line interface unit.

PLUG-IN REPLACEMENT USING MAINTENANCE BANK PLUG-INS

3.40 If a fault is detected and looping procedures isolate the failure to the DCT bank, plug-in replacement can be used to determine the responsible plug-in. The plug-in replacement procedures are in TOP 231-090-015.

3.41 Warning: Excessive plug-in removal and insertion in the maintenance bank may cause wear on the connector. This may lead to erroneous fault indications by the maintenance bank. Do not use the maintenance bank for routine testing of plug-ins. Maintenance bank plug-ins are constantly diagnosed by the MIBS in order to maintain fault tree. These plug-ins are termed “hot spares” and should be used for plug-in replacement. If a DCT bank plug-in is suspected of causing a failure, the plug-in can be removed and replaced with a “hot spare.”

3.42 After replacing the suspect plug-in, the equipment should be returned to service. If the problem is corrected, the “hot spare” should be left in the bank and a new loop should be inserted in the maintenance bank. If it is still questionable whether the correct plug-in was inserted, the failure can be inserted in the maintenance bank for testing.

4. DCC/ESD SEARCHABLE DIGITAL CAPABILITY (CSDC) FEATURES

4.01 The DCT provides the switching requirements for CSDC capability, and it is used to accommodate the introduction of a No. 1 ESS channel on No. 1A with DCC/GSM. The local search is made by any of three digroups: a Search loop and separate facility test loop (SLT) or direct connections to SLT. SLT is the local search loop carrier, and SLT remote exchange test (SLT) feature can be included in the LAK7 generic. The DCC/GSM feature is available in MIBS.

4.02 The DCT bank is configured in any of three modes (Fig. 18) for 8 line carrier facilities with the following equipment modification being required in the near-end DCT bank:

- Office Interface Unit (OIU-I) providing slip detection
- Combined alternate data/voice (CADV) channel units
- Alarm and digroup control unit (A/DCU), list 2, slip detection and reporting
- Digroup control unit (DCU), list 2, slip detection
- Channel bank wiring table option Y providing ASLIP, ESLIP signals to A/DCU. Banks manufactured after 6/81 should contain this wiring option. This can be verified by “LIST T” as the bar and “GROUP WA” on the bank (EDC018).

4.03 See TOP 231-090-015 for DCT-CSDC frame growth.

4.04 A DCT frame need not be dedicated to CSDC banks only but can be mixed with standard DCT trunking applications; the digroup also can be mixed but a channel restriction occurs. Because of high current drain, a digroup having some channels for CSDC cannot assign all 24 channels as it would normally for DCT. Channel assignment is dependent * Trademark.
Digital Carrier Trunk Interface – Description and Maintenance / #1A ESS

4.05 The OUI-4 provides the synchronization for the line interface unit (LIU) by deriving its reference clock from the receiver carrier line timing and the external clock signal (XCLK) for the combined alternate data voice channel unit (CADDV) as required.

4.06 The OUI-4 can be operated in any of three timing modes: external (EXT), loop (LTP), and local (LOC) timing.

(a) In the EXT mode an external 64 or 8 kHz clock signal is provided by a digital office timing supply (DOTS), digital data system (DDS) clock supply, or another OUI-4.

(b) The LT mode of timing does not use an external timing clock but derives its own synchronized 64 kHz clock (INCLK) by using an internal voltage controlled oscillator and phase comparator with input signals (4 kHz subframe clock) from the TUs (ATMF or BTMF) and E (ARIFT or BRIFT).

(c) The LOC mode allows the LIU oscillator to free run at its nominal frequency, thus bypassing the OUI, but this mode cannot be used for CSDC.

4.07 The slip detection function is performed in the EXT mode only. A compare of the received T-carryer clock (ARIFT or BRIFT) with the external clock (CCIN) looking for a loss of synchronization between the two. A sampling of this synchronization phase comparison is done once per second for a non-compare condition known as a “slip.” Should a slip be detected, the following occurs: (1) A&DUCU notified of error condition; (2) SLIP counter incremented; and finally (4) RST SLIP switch on the OUI-4 (Fig. 14).

4.08 An office major alarm occurs when more than 255 slips are reported in a 24-hour period, and a minor alarm occurs when more than 25 slips are reported in the same period. A slip detection function for each customer in the same carrier trunking group has been made so that a single bank of OUI-4's for that trunking unit may be classified.

4.09 The DAVY provides asynchronous frequency transmission interface between the No. 1A ESS switch and the T-carrier line carrier in the CSDC or standard DCC/120 V interface. In addition, digital data transmission is provided to the customer at a 9.6 kbps rate per second rate (16 kbps). Once the customer rate loop has been established, loop signaling from the customer will cause the DAVY to configure for conversion of the customer's 56 kbps data to 9.6 kbps rate (DS0) for T-carrier transmission. The conversion process in the DAVY is the same for the received DS0 data from the burned facility to the customer loop.

4.10 The A&DUCU performs the same as normal DCT operations but in addition, List 2 has been modified to provide slip detection and reporting to the PUC, the same is true for the DCU plug-in. Signaling and control are provided by the PUC through the A&DUCU.

TTY SLIP ERROR MESSAGE REPORTING

4.11 Slip detection is reported by the PUC with TTY message formats FM10 and FM11. The FM10 is restricted to digroups having only CSDC use and will report the failure rate (major or minor) and number of slips detected. The FM11 reports both out-of-frame errors and slips for mixed digroups 4.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

5.01 The following abbreviations and acronyms are used in this section:

A&DUCU Alarm and digitgroup control unit
CADV Combined alternate data voice
CAU Channel access unit
CC Central control
CCU Combined channel unit

Page 27
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGA</td>
<td>Carrier group alarm</td>
<td>PUC</td>
<td>Peripheral unit controller</td>
</tr>
<tr>
<td>CSDC</td>
<td>Carrier group alarm</td>
<td>PURB</td>
<td>Peripheral unit reply bus</td>
</tr>
<tr>
<td>DCT</td>
<td>Digital carrier trunk</td>
<td>RFAL</td>
<td>Receive framing alarm</td>
</tr>
<tr>
<td>DCU</td>
<td>Digroup control unit</td>
<td>RU</td>
<td>Receive unit</td>
</tr>
<tr>
<td>DCUF</td>
<td>Digroup control unit failure</td>
<td>SCAB</td>
<td>Scanner answer bus</td>
</tr>
<tr>
<td>EPROM</td>
<td>Erasable programmable read only</td>
<td>SCC</td>
<td>Switching Control Center</td>
</tr>
<tr>
<td>LIU</td>
<td>Line interface unit</td>
<td>STTP</td>
<td>Supplementary trunk test position</td>
</tr>
<tr>
<td>LOSP</td>
<td>Loss of receive multiplex signal</td>
<td>SU</td>
<td>Syndes unit</td>
</tr>
<tr>
<td>MBTS</td>
<td>Maintenance bank test set</td>
<td>TCAS</td>
<td>T-carrier Administration System</td>
</tr>
<tr>
<td>MFT</td>
<td>Metallic facility terminal</td>
<td>TLTP</td>
<td>Trunk and line test panel</td>
</tr>
<tr>
<td>MTTP</td>
<td>Manual trunk test position</td>
<td>TNN</td>
<td>Trunk network number</td>
</tr>
<tr>
<td>OIU</td>
<td>Office interface unit</td>
<td>TOP</td>
<td>Task oriented practices</td>
</tr>
<tr>
<td>OOF</td>
<td>Out-of-frame</td>
<td>TPU</td>
<td>Trunk processing unit</td>
</tr>
<tr>
<td>PAM</td>
<td>Pulse amplitude modulated</td>
<td>TTY</td>
<td>Teletypewriter</td>
</tr>
<tr>
<td>PCU</td>
<td>Power converter unit</td>
<td>TU</td>
<td>Transmit unit</td>
</tr>
<tr>
<td>PDU</td>
<td>Power distribution unit</td>
<td>VF</td>
<td>Voice frequency</td>
</tr>
<tr>
<td>PUAB</td>
<td>Peripheral unit address bus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fig. 14—DCT Bank Configuration for CSDC
**Overview**

Low-cost 10 MHz rubidium frequency references ("clocks") are starting to hit the amateur radio surplus market for under $100. Most of these rubidium clocks where originally used as the backup frequency standard in cellular phone and pager base stations. Because the rubidium "clock" inside the frequency reference itself has about a 10 year lifespan, they are constantly being swapped out as part of a preventive maintenance move. As long as you don't keep these surplus rubidium clocks continuously powered, they should still last for many more years.

The 10 MHz rubidium frequency reference discussed here is the common Efratom (DATUM) LPRO−101. This frequency reference is based on the atomic resonance of a rubidium gas discharge lamp exposed to a RF signal near its transition frequency of 6,834,682,612 Hz. There is a "dip" in the discharge lamp's output when the exact atomic resonant frequency is found. This frequency is then used as a phase−lock source which is eventually divided down to just about exactly 10 MHz. The datasheet for the LPRO−101 dives into the technical operation in much more detail, so you should read that before starting this project.

There is really no long warmup period for the LPRO−101. After about 3 to 5 minutes from applying +20 VDC (1.7A) to the LPRO−101, the unit will come into "lock." After coming to lock, the current draw will then drop to around 500 mA. At this point, the 10 MHz output signal already about 1,000 times more accurate than zero−beating a regular clock oscillator to WWV! After about a 15 minute warm−up period, the unit will be operating at its most accurate frequency, within a few millihertz of exactly 10 MHz.

The LPRO−101 does get fairly warm and **SHOULD NOT** be run without proper heatsinking. One trick which can be used to reduce the overall heating of the unit is to run it at only +19 or +20 VDC, instead of at +24 VDC.

The LPRO−101 has a Built−In Test Equipment (BITE) signal (pin 6) which can be used to determine if the unit is locked. When this pin is "high," the unit is unlocked and the output frequency will not be accurate. When the BITE signal goes low, the unit is locked and should be on frequency. A simple 74HCT04 hex inverter and two LEDs will be used to monitor the status of the BITE signal. A **RED** LED will light when the unit is unlocked, and a **GREEN** LED will light when the unit comes into lock.

One of the signal pins is for monitoring the rubidium lamp voltage (pin 5) which can be used to determine the remaining life of the unit. This pin should measure above 3 volts in a "good" unit.

There is also an "External C−Field" tuning line (pin 7) which can be used to tweak the final output frequency a few millihertz up−or−down. This makes it possible to sync the LPRO−101 with an even more accurate clock source, like from a cesium or GPS−based reference source. Bertrand Zauhar (VE2ZAZ) has an article entitled "A Simplified GPS−Derived Frequency Standard" in the Sep./Oct. 2006 issue of *QEX* which should be compatible with the LPRO−101.

The 10 MHz output from the Efratom LPRO−101 is around +7 dBm, with a standard impedance of 50 ohms. It's safe to assume that the unit could drive a number of external devices, but just to be safe we'll be adding a simple buffer amplifier. This should also help to protect the Efratom LPRO−101 from any external mismatches. Depending on your load requirement, you may want to avoid "squaring up" the 10 MHz sine wave output signal to reduce the number of spurs and harmonics generated.
Overview of the label on a surplus Efratom LPRO-101 10 MHz rubidium frequency reference.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 MHz RF Output (Sine wave, 50 ohms, +7 dBm)</td>
</tr>
<tr>
<td>2</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>3</td>
<td>DC Isolated RF Ground (Isolated ground in case of ground loops)</td>
</tr>
<tr>
<td>4</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>5</td>
<td>Lamp Voltage (Above 3 volts = unit is good)</td>
</tr>
<tr>
<td>6</td>
<td>BITE (HIGH = unlock, LOW = lock)</td>
</tr>
<tr>
<td>7</td>
<td>External C-field (Remote frequency control)</td>
</tr>
<tr>
<td>8</td>
<td>+24V Ground</td>
</tr>
<tr>
<td>9</td>
<td>Crystal Voltage Monitor (Voltage monitor of the internal sweep oscillator)</td>
</tr>
<tr>
<td>10</td>
<td>+24V</td>
</tr>
</tbody>
</table>
Mounting the Efratom LPRO–101 10 MHz rubidium frequency reference in an old printer switch case.

The bottom of the printer switch case was sanded down to the bare metal and coated with heatsink compound before mounting the LPRO–101.

The front-panel has banana jacks for the +24 VDC input and some LEDs for the lock status indicators.
Three circuit boards were added for controlling the Efratom LPRO−101 10 MHz rubidium frequency reference.

One is a voltage regulator board based around a Micrel MIC29302, a 78M12, and a 78L05. This takes the incoming +24 VDC and converts it down to +20 VDC, +12 VDC, and +5 VDC, respectively.

The middle circuit board contains an optional buffer based around an Avantek GPD−462 amplifier. This buffer probably isn't needed, but it will help to isolate the LPRO−101 from any external devices and will be capable of driving a longer run of coax.

The bottom circuit board contains a 74HCT04 hex inverter to monitor the LPRO−101’s BITE signal status. This is used to control the respective LEDs on the front panel.
Alternate view.

The (buffered) 10 MHz output is via a panel-mounted BNC jack.

A panel-mounted RCA jack connects to pin 7 on the LPRO−101, for an optional external tuning circuit.
Testing the Efratom LPRO−101 on a low−cost Fluke frequency counter.

It's safe to assume the LPRO−101 is "on" frequency and any observed frequency errors are from the reference clock timebase within the frequency counter itself.

Because the rubidium gas within the LPRO−101's lamp is "consumed" when the unit is operating, there will be a finite lifespan for these units. Use them sporadically, like only as an external reference source for test equipment.

For longer−life operations, stick will quality oven− or temperature−compensated crystal oscillator and use the rubidium reference source to "zero−beat" tune the final output frequency.
Completed Efratom 10 MHz rubidium frequency reference.

Use a Mini−Circuits ZFSC−2−1 (or similar) two−way splitter if you need to drive multiple loads.

This helps to maintain the proper 50 ohm impedance and isolation between all the ports.
Efratom LPRO-101 Voltage Regulator
Efratom LPRO-101 Lock Status Indicator

BITE Signal (High on unlock) To Pin 6

+5 VDC

0.1 μF

74HCT04

Unlock

Lock

180Ω

180Ω

+5 VDC
Efratom LPRO-101 Buffer Amplifier

10 MHz RF Input

13 dB Attenuator

Avantek GPD-462

10 MHz RF Output

15 MHz Lowpass Filter

3 dB Attenuator
Building a Centrex Service in a DMS–100 Switch

Overview

This document covers the procedures for building a Centrex with the "Assume 9" option in the Nortel DMS switch. The Assume 9 option is built within customer group tables to enable a customer to access an outside line without manually dialing a "9."

A customer group is a collection of subscribers belonging to the same organization. A customer group table defines a customer group within the switch and also determines what features and resources are available to that group.

Business Rules

1. Assume 9 Centrex service will require the customer to dial an "#" (octothorpe) before the station to be called. The switch provisioning agent will communicate this requirement to the customer or customer vendor at the time of change.

2. Assume 9 Centrex Service will affect call forwarding options. All call forwarding options must have the prefix 9 removed from the forwarding DN for proper call forwarding.

Step One

Associates certain parameters to the customer group. You must find the next available Administrative Number (ADNUM) before you enter translations. It is important to add tuples sequentially. Do not jump around.

In this example, the next Administrative Number (ADNUM) is 22.

| CI:             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| &gt;TABLE CUSTENG # Customer Group Engineering |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| TABLE CUSTENG:  |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| &gt;BOT; FORMAT PACK; UP 10; LIS 11 |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| CUSTNAME ADNUM NONCOS NOIBNTMT CONSOLES DOMAIN GROUPID OPTIONS |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESKMSV 19 32 32 N PUBLIC 1 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| POTSDATA 4092 1 1 Y PUBLIC 0 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| IBN001 21 6 25 Y PRIVATE 21 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| VMAIL 2 256 0 N PUBLIC 0 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESGNBO 10 256 32 N PUBLIC 10 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESBURL 11 256 32 N PUBLIC 11 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESMONT 12 256 32 N PUBLIC 12 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESSMFL 13 256 32 N PUBLIC 13 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESWNFL 14 256 32 N PUBLIC 14 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| LNSGNBO 20 25 63 N PRIVATE 20 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESKMSV 19 32 32 N PUBLIC 1 | $ |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| &gt;ADD |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
Step Two

Contains call control information for the customer group.

Before completing this step, the switch agent must identify the rate center for the Centrex customer as well as a LINEATTR, XLAPLAN, and RATEAREA value.

CI:
>TABLE XLNAME  # Translator Name
TABLE XLNAME:
>ADD
XLNAME:  # Translator Name. Enter 8 alphanumeric characters.
>NWUCX00  # The XLNAME is some form of abbreviation of the customer name followed by CX00.
TRSEL:  # Trunk Selector
>NET
ACR:  # Account Code Record
>N
SMDR:  # Simplified Message Desk Record
>N
NO_ACCODE DIGITS:  >0
SECOND_DIAL_TONE:  >N
DGCOLNM:  # Digit Collection Name
>POTS
CRL:  >N
INTRAGROUP:  # Default is N.
>N
NET_TYPE:  # Network Type
>GEN
OPTION:  # Option for Line Attribute
>LATTR
LINEATTR:  # Line Attribute. Enter a number from 0 to 31,999
>1234
XLAPLAN:  # Translation Plan. Enter value from table LINEATTR.
>NPA_NC0003_1234
RATEAREA:  # Rate Area. Enter value from table LINEATTR.
>RATE_LATA_LTG
OPTION:  # Option for Equal Access (Long Distance)
>EA
PIC:  # Primary Inter-LATA Carrier. Enter the carrier code.
>0288
CHOICE:  # "N" restricts customer from casual dialing - 1010XXX.
>Y
INVEAFLX:  # Invalid Flexible Intercept Number
>0
OPTION:  # If order requests an Intra-LATA PIC (LPIC), enter here.
Step Three

Create an octothorpe translator in table XLANAME in customer group translations to allow station-to-station dialing.

Customer must prefix station number with "#" to invoke an internal call. To complete 3- or 4-digit station to station dialing in an Assume 9 Centrex, an octothorpe translator must be established in XLANAME.

Step Four

Defines specific group dialing options or system features.
Step Five

Datafill defines the dialing plan or dialing restrictions on a whole group, part of, or individual stations in a customer group.

If all stations within the customer group access the same dialing options, then only one Network Class of Service (NCOS) is needed. A separate NCOS is needed for each different dialing option plan.

<table>
<thead>
<tr>
<th>CI:</th>
<th>TABLE NCOS</th>
<th># Network Class of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADD</td>
<td>CUSTGRP:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NATIONWIDE_UTAH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NCOS:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NC0003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LSC:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TUPLE TO BE ADDED:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>QUIT</td>
</tr>
</tbody>
</table>

Step Six

This defines a treatment for misdialed calls.

<table>
<thead>
<tr>
<th>CI:</th>
<th>TABLE IBNTREAT</th>
<th># Integrated Business Network Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IBNTREAT:</td>
<td>Integrated Business Network Treatment</td>
</tr>
<tr>
<td></td>
<td>ADD</td>
<td>CUSTGROUP:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NATIONWIDE_UTAH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IBNTREATMT:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Step Seven

Defines the caller name and number information.

LOG:  # Do you want a log created?
>N
RTESEL:  # Route Selector
>S
CLLI:  # Common Language Location Identifier
>T120
TUPLE TO BE ADDED:
ADD NATIONWIDE_UTAH 0 N S T120
ENTER Y TO CONFIRM, N TO REJECT AND E TO EDIT.
>Y
>QUIT

Step Eight

The customer's station–to–station dialing entries in table IBNXLA (IBN Translation) must be added to the octothorpe translator.

Add the entries in table IBNXLA for every station number using the octothorpe translator name created in Step 3 (i.e. NWUOX00)

Repeat these steps for every station–to–station entry for the customer group.
**Step Nine**

Defines the station option parameters for the entire group.

There are 8 minimum standard entries in this table for every Centrex. (i.e., There will be 8 separate times in which the ADD command will be used.)

```plaintext
CI:
>TABLE CUSTSTN # Customer Group Station
CUSTSTN:
>ADD
CUSTNAME:
>NATIONWIDE_UTAH
OPTION:
>CFCW # Call Forwarding of Call Waiting

or

OPTION:
>CFDATIM # Call Forward Don't Answer Timeout
CFDATO: # Call Forward Don't Answer Time in seconds. (1 ring = 6 seconds)
>24 # Default 4 rings.

or

OPTION:
>CFWVAL # Call Forward Validation
TERMOPTN: # Terminating Option
>Y
```
OPTION:
>CFXFEAT       # Call Forwarding for Intragroup
RINGCFI:
>Y

or

OPTION:
>CFXOPT        # Call Forwarding Option
PCSCFA:
>N/Y           # Default "N"
PCSCFB:
>N/Y           # Default "N"
PCSCFD:
>N/Y           # Default "N"
MULTICFA:
>N/Y           # Default "N"
MULTICFB:
>N/Y           # Default "Y"
MULTICFD:
>N/Y           # Default "Y"
CFXTRK:
>N/Y           # Default "Y"
BUSYTRMT:
>N/Y           # Default "N"

or

OPTION:
>CXFER         # Call Transfer - Customer Group
XFERRCL:
>N
METHOD:
>STD

or

OPTION:
>CXFERSUP      # Call Transfer Enhanced
IBNTKSEL:
>ALLIBN
ALLOW
ALLTRKS:
>ALLOW
POTSTKSEL:
>ALLPOTS
ALLOW
ALLTRK:
>ALLOW
CXFERTON:
>Y

or

OPTION:
>DISPDIGS      # Display Digits
NUMODIGS:
>10
Step Ten

Complete a FINDREF for the tables CUSTENG and XLANAME.

Dump translations onto hardcopy and keep with the order.

Verify your translations changes by completing another FINDREF for the CUSTENG and the XLANAME.

CI:
> FINDREF CUSTENG NATIONWIDE_UTAH
> FINDREF XLANAME NWUCX00
Dear Louis Beam, (Customer ID: 7413451)

1&1 Internet Inc. ("1&1") has recently received reports of content on your websites which represents a clear breach of 1&1's General Terms and Conditions of Service ("GT&C"). Upon further investigation, 1&1 has confirmed those reports.

Accordingly, we hereby provide you with notice of termination under the GT&C effective ten days from today's date. Please ensure that all files and other data are removed from 1&1's servers and domain names transferred by that date, as your data and files will be irrevocably deleted after termination. Please note, 1&1 is entitled to and reserves the right to terminate your account without further notice should it be necessary to protect 1&1 Internet or its personnel, or to prevent additional breaches of the GT&C.

Sincerely,

1&1 Legal

Nancy McNelis
Legal Department
1&1 Internet Inc.

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prothink.org, zioncrimefactory.com, 911missinglinks.com, jewishproblem.com, and louisbeam.com have just recently been censored from the Internet, most likely by pressure from the racist Jew Abe Foxman and his Mossad–front, anti–White hate group – the Anti–Defamation League of B’nai B’rith (ADL).

Fight back! Mirror and support these websites as much as you can!

(www.digitaljournal.com/article/329530)
Greek goddess Voula Papachristou was expelled from the 2012 Olympics for making a "racist" Twitter post.

John Carlos and Tommie Smith give the "Black Power" salute during the 1968 Olympics in Mexico. They were paraded around like heroes by the liberal/Jewish media.

Marxist "thought crimes." Coming to a country near you...
The Kronen Zeitung is Austria's largest newspaper, with a daily readership of around three million people. On July 28, 2012, those readers were treated to the top image of war-torn Aleppo, Syria − bombed out and desperate.

Except, as one sharp-eyed Redditor points out, that wasn't the scene at all. It was just another Photoshop job.

Just to be clear, the family in the photograph is, in fact, in Syria; the original photo (on the bottom) came from the European Pressphoto Agency. But merely fleeing a city ravaged by guns and mortars apparently isn't quite dramatic enough on its own. The editors of the Krone − as it's commonly called needed this baby to sing.

"'Who cares?' she said impatiently. 'It's always one bloody war after another, and one knows the news is all lies anyway.'"

--- Quote from the book 1984 by George Orwell.
As you can see, the liberal boycott against Chick-fil-A for their anti-faggotry stance has been a rousing success! LOL!
"HOLY SHIT!
FREE SPEECH ON THE INTERNET?!

WE'D BETTER PUT A STOP TO THIS!"

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White students in public schools now have to suffer thanks to the failure of Blacks. I'll bet liberals have no problems with taking the White man's tax dollars to continue funding these "failing" schools, though! Change! Believe it or not, I found this story on the Huffington Post... However, like good little Commies, are censoring any comments which point out it's the Black students who are causing public schools to "fail" in the first place!

Failing Louisiana School Will Not Transfer White Students Out Because of 1960s Court Ruling

August 1, 2012 – From: huffingtonpost.com

Rayville Elementary School in Louisiana received a failing grade this year, based on the state's School Performance Scores. Under the state's Public School Choice policy, eligible students in schools flagged as failing and in need of certain levels of improvement can transfer to an "academically acceptable school."

But an interesting and controversial issue has arisen that may actually challenge equal opportunity intended by the law. In a letter to parents dated July 25, Rayville Elementary school officials inform families of the school's "F" grade and list two other institutions -- with letter grades C– and B -- that the parents can choose to transfer their children to. But there'reds a disclaimer:

Please note that white students at Rayville Elementary School will not be allowed to transfer to the listed schools due to the present provisions issued in the federal Richland Parish School desegregation case.

The case in question refers to a 1968 court decision that, in an effort to maintain desegregated schools, prohibits white students from leaving schools if their departure could cause the school to be considered "all–Negro."

But the court's effort to cultivate and protect fairness may now be yielding the opposite effect, some say, as a number have called the issue "reverse–racism" and discrimination.

"We agree that it is, but unfortunately we're bound by federal law and we have to [here] to those standards," Richland Parish School Board President Kevin Epinette told WNYC. He adds that the decision affects between 45 and 55 students at the school.

One Redditor notes that the situation doesn't appear to be hateful or malicious in intent, but merely "the application of conflicting laws," adding that "this shouldn't be too difficult to sort out."

Epinette told WNYC that the Justice Department visited the district in the spring and will send an official report with suggestions on how to "be able to get out from under these de–seg orders," but the process could take months.

This isn't the first time Richland Parish families have seen a letter like this. A 2008 letter sent to families of Delhi Elementary School, estimated at the time to yield a failing SPS, were also offered a transfer option, but with a similar disclaimer:

Due to the court order, students may be offered a choice in the school in which their race would be in the minority. White students may be offered Rayville Elementary School. Black students may be offered Holly Ridge Elementary School or Start Elementary School.
At the time, Rayville, where the white students were permitted to go, was estimated to have an SPS at least 20 points below those for Holly Ridge and Start.

The letter out of Rayville elementary comes amid the inception of a new voucher program in Louisiana. Under the new initiative, the most sweeping voucher program in the country, tens of millions of taxpayer dollars will be shifted from public schools to pay private schools, private businesses and private tutors to educate students across Louisiana.

The program is the cornerstone of Republican Gov. Bobby Jindal's bold effort to reform public education in the state. Critics are concerned about funding and fairness — vouchers would cover the full cost of tuition at more than 120 private schools, including small, Bible–based church schools. Jindal says the program will spur school competition and expand parental choice.

Several of those religious schools that will be receiving public funds to take in new students from public schools also teach curricula that question the age of the universe, defying scientific evidence and theory and promote religious doctrine that "challenges the lessons central to public school science classrooms," according to the Associated Press.

Louisiana’s School Performance Scores are based on varying combinations of testing results, attendance, dropout and graduation rates as well as growth and performance data.

Based on the SPS, each school receives a "growth target," which represents how much progress each school must make annually to reach state goals. The SPS also serves as a determinant of whether a school meets federal Adequate Yearly Progress requirements under the No Child Left Behind law. A poor SPS and failure to meet AYP could mean state intervention that range from giving students the option to transfer out to school closures and staff turnover or transfer to the state’s Recovery School District.

Louisiana, however, is one of 32 states and Washington, D.C. that have been granted waivers from NCLB under the Obama administration.
Why Goldman Sachs, Jon Corzine, and the Rest of Wall Street Will Never Face Prosecution From Democrats


We learned courtesy of Goldman's 10-Q, that the U.S. Justice Department will not press criminal charges against Goldman Sachs. This, despite Senator Carl "Shitty Deal" Levin (Jew), in one of the most bombastic kangaroo court spectacles on live TV ever, asking for a criminal investigation after the subcommittee he led spent years looking into Goldman, and in which he said Goldman misled Congress and investors (and according to which billions in fraudulent RMBS misrepresentations are all still only Fabrice Tourre's fault, at that time under 30 years old).

And so we pose the same answer, and provide the same answer, as yesterday, only flipped around: "Confused Why Goldman Will Face No Criminal Charges? Here's Why":

Charles Schumer (Jew) – Member of the:

- Senate Finance Committee
- Banking, Housing and Urban Affairs Committee
- Subcommittee on Housing, Transportation and Community Development
- Subcommittee on Financial Institutions and Consumer Protection
- Subcommittee on Securities, Insurance and Investment
## Top Contributors

*Senator Charles E. Schumer*

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*See the Jew...*