GBPPR 'Zine

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"ZOG is an abbreviation of 'Zionist Occupation Government,' a name applied by modern neo–Nazis since the early 1980s to the U.S. federal government in Washington D.C. According to such groups as the Ku Klux Klan, the Silent Brotherhood, Posse Comitatus, and various militia factions, Jewish conspirators based in Israel or elsewhere have captured control of the United States, including the presidency, Congress, and the Supreme Court, dictating subversive policies which threaten White supremacy and otherwise conform to the board terms of world domination outlined in the fraudulent 'Protocols of the Elders of Zion.' No evidence supports this fascist fantasy, but it persists regardless, finding new adherents in the ranks of gullible skinheads and other disaffected youth who seek scapegoats for personal failure."

––– Entry for the word "ZOG" in *The Enclyclopedia of Conspiracies & Conspiracy Theories* by Michael Newton. His book is dedicated "For Harold Weisberg."

See the Jew...

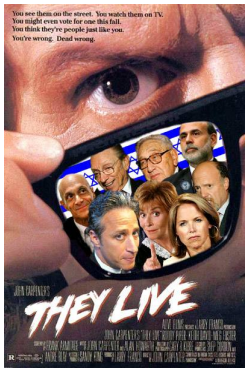

Table of Contents

AT&T PRACTICE
Standard

AT&T 231-290-600
Issue 3, April 1985

MOBILE TELEPHONE SWITCHING OFFICE FEATURE

FEATURE DOCUMENT

2-WIRE 1A "ESS™" SWITCH

"AUTOPLEX™"/SYSTEM 100

CONTENTS PAGE

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CONTENTS PAGE

CONTENTS PAGE

INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This practice contains information for using the MTSO (Mobile Telephone Switching Office) feature with the 1A ESS switch.

Note: The AMPS System has been officially named the AUTOPLEX System 100. This name, or the shorter version System 100, has been used in this practice. However, where the AMPS name appears due to translations, set cards, parameters, etc., it will continue to be used.

REASON FOR REISSUE

1.02 This practice is reissued to update coverage for the 1AE8A generic program. Since this is a general revision, change arrows have not been used.

FEATURE AVAILABILITY

1.03 The MTSO feature is an optionally loadable feature and is available with the 1AE8A (release 2) generic program.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The MTSO feature provides mobile telephone service to large numbers of subscribers in a MSA (mobile service area) with transmission quality, availability, and reliability approaching that of wire-line service. Subscribers obtain service from a system operator in a MSA in which they normally expect to place and receive calls. Subscribers may also travel outside this MSA and obtain service from other systems on a roamer basis.

2.02 The following paragraphs provide a brief description of the features existing in release 1 and currently scheduled for release 2.

A. Release 1 Features

2.03 The ***Automatic Message Accounting*** feature automatically records billing information on magnetic tape at the MTSO for later processing by the accounting center. See reference (14) in Part 18 for automatic message accounting details.

2.04 The ***Roamer I Service*** feature provides the capability to set up a call to or from a roaming mobile unit. A roamer is defined as a mobile unit located in a foreign MSA. A land-line customer with Touch-Tone dialing must dial a special roamer access code. Upon receipt of a second dial tone, the 10-digit DN (directory number) of the roamer is dialed. A land-line customer equipped with rotary dial or a coin phone user must be processed through an attendant to complete the call. See reference (12) in Part 18 for roamer service I details.

2.05 The ***Speed Calling*** feature permits the use of 1-digit codes (2 through 9) to dial eight of the frequently called local and/or long distance numbers. Speed calling is implemented by dialing the 1-digit code representing the local and/or long distance number. See reference (6) in Part 18 for speed calling details.

B. Release II Features

MTSO Features

2.06 The ***Call Delivery*** feature is provided in conjunction with the roamer service TLDN (temporary local directory number). The roamer service representative at the host system arranges with the mobile user's home system to forward calls from the home system to the TLDN at the host system. This service can be provided only if the roamer has call forwarding in his home system. See reference (13) in Part 18 for call delivery details.

2.07 The ***Conditional Call Forwarding*** feature redirects a mobile subscribers incoming calls to another destination of the user's choice. Conditional call forwarding redirects an incoming call if the mobile is busy, does not respond to mobile unit paging, or does not answer within a specified time (about 15 seconds). A mobile subscriber may activate conditional call forwarding at any time by dialing the appropriate access code and the desired number from his/her mobile telephone. See reference (8) in Part 18 for conditional call forwarding details.

2.08 The ***Immediate Call Forwarding*** feature redirects a mobile subscriber's incoming calls to another destination of the user's choice. Immediate call forwarding redirects an incoming call immediately, and attempts to signal the mobile subscriber by a short alert. A mobile subscriber may activate immediate call forwarding at any time by dialing the appropriate access code and the desired number from his/her mobile telephone. See reference (7) in Part 18 for immediate call forwarding details.

2.09 The ***Call Waiting*** feature permits a mobile user to detect an incoming call when he/she is already on a call. The mobile user may answer the new call, alternately converse with either party while the other party is held, and at any time disconnect one of the parties and continue talking to the remaining party. The call waiting feature is service order changeable when first introduced. Consequently, per call cancellation, occasional use, and usage-sensitive billing is not provided as part of the initial basic ser-

vice. See reference (10) in Part 18 for call waiting details.

2.10 The ***Data Services*** feature gives the mobile subscriber the ability to make data calls to land locations that use standard telephone modems and get special error protection for the data transmission. a special group of trunks tied to the MTSO and each trunk will have a cellular data modem interconnected back-to-back with a 212A standard telephone modem. See reference (15) in Part 18 for data services details.

2.11 The ***Improved Access to Interexchange Carriers*** feature allows the mobile user to place calls through interexchange/international carriers using either the 950-10XX or 10XXX method. Presubscription to interexchange/international carriers is also supported. See reference (1) in Part 18 for carrier interconnect details.

2.12 The ***Priority Calling*** feature provides as an adjunct to call forwarding. Priority calling allows the customer to be alerted even though his/her calls have been forwarded to another number. In priority calling a TLDN is used as a SDN (second directory number) for a home as well as a roaming subscriber. The SDN can then be used to reach the mobile subscriber when ICF is active on his/her primary directory number. see reference (11) in Part 18 for priority calling details.

2.13 The ***Roamer II Service*** feature provides the roamer with the option of requesting a directory number in the system in which he is roaming. This directory number, referred to as a temporary local (TLDN), is assigned for a period of time specified by the roamer. A land-line customer can then reach the mobile unit directly by dialing the TLDN. The roamer may also have vertical services associated with the TLDN. The roamer service representative at the host system assigns to the TLDN those vertical features requested by the roamer, subject to their availability in the host system. See reference (13) in Part 18 for roamer service II details.

2.14 The ***Remote Cell Site Service*** feature permits a single MTSO to serve two groups of cell sites. These cell sites are arbitrarily called the main cell site group and the remote cell site group. Each of these groups of cell sites serve a distinct CGSA (cellular geographic service area). The service provided to each CGSA must be no different from that which would be provided by two separate MTSOs. A CGSA is defined to be an area that a system operator is authorized to serve and into which another co-channel system may not encroach.

2.15 The ***3-Way Calling*** feature permits a mobile subscriber, during a call, to dial and consult with a third party while the second party is held. The mobile user may either drop the third party and return to the second party, or include both in a 3-way call. If a 3-way call is set up, the subscriber may at any time drop the third party and continue with the second party, or end the call by releasing. (The mobile customer cannot drop out of a 3-way call and leave the other parties connected.) The system will always apply confirmation tone before completing the call. See reference (9) in Part 18 for 3-way calling details.

2.16 The ***Voice Privacy*** feature provides the mobile subscriber call privacy with high quality voice transmission. Since normal calls can be monitored by an FM radio tuned to cellular frequencies, this feature is desirable for communication of private business. See reference (15) in Part 18 for voice privacy details.

Cell Features

2.17 The ***Dynamic Power Control*** feature provides a means of controlling interference by varying power levels. There are two forms of dynamic power control, directed and autonomous. Directed dynamic power control is used by a cell site to control the radiate levels of subscriber units. Autonomous dynamic power control is used by a cell site to control its own radiated levels. In both cases, radiated power levels are controlled dynamically in response to changing signal level conditions at the subscriber unit and cell site. When received signal levels are inadequate, transmitter levels are increased. Conversely, when received levels are more than adequate, transmitter levels are reduced.

2.18 The ***Multiple Cell Generic Capability*** feature provides a multiple cell generic environment in which more than one cell generic is supported at the MTSO. This capability is useful for many reasons. An official and work issue can reside simultaneously, multiple copies can aid in coordinating changes, and different generics may be permantly resident. This feature is highly desirable when Mod 1 and Mod 2 cell sites are mixed in a system since they require different cell generics.

2.19 The ***SAT Detection During High-Order Locates*** feature is utilized in high density situations to remove interference dominated locates. The supervisory audio tone frequency is detected in addition to the voice channel signal strength. This feature reduces the cutoff call rate by at least a factor of two in an interference limited system.

2.20 The ***32-Digit Mobile Dialing Capability*** feature increases the number of digits that can be received from a mobile unit. It is necessary to increase the number of digits from 16 to 32 because of 10XXX dialing with carrier interconnect for international calls, and if 10XXX or IDDD (international direct distance dialing) numbers are allowed as destinations for call forwarding.

Custom Features

2.21 The ***Message Desk Service*** feature allows a mobile subscriber to use a voice storage system where a calling party can leave messages for the subscriber. A call to the message desk service subscriber who is busy or does not answer, is forwarded by the MTSO via a special trunk group to the voice message exchange machine. The calling party can leave a message which the subscriber is able to retrieve at a later time. See reference (16) in Part 18 for message desk service details.

2.22 The ***Roamer Serial Number Announcement*** feature returns a special announcement to an originating roamer that is denied service as a result of a FSN list search. The call is brought up to a voice channel and a special announcement is provided by the MTSO. See reference (13) in Part 18 for roamer serial number announcement details.

2.23 The ***Roamer Serial Number Registration*** feature provides the capability for a positive fraudulent serial number list. An MTSO using the roamer serial number registration feature will have a fraudulent serial number list which contains the serial numbers of roamers which are to be allowed service. See reference (13) in Part 18 for roamer serial number registration details.

BACKGROUND

2.24 The System 100 represents a new concept in mobile system design employing the latest software, hardware, and call processing technology. The hierarchy of the System 100 is illustrated in Fig. 1.

2.25 The System 100 supplies mobile telephone service using a cellular radio plan. The cellular plan divides a metropolitan area into a number of coverage areas or cells. Each cell is assigned a portion of the available radio channels. The channels used in one cell are reusable in spatially separated cells in the same MSA.

2.26 The System 100 consists of a 1A ESS switch as the MTSO and up to 255 cell sites.

2.27 The MTSO may be connected by either wire-line voice or carrier facilities to a distributed array of cell sites which, in turn, communicate via radio voice channels and data paths with ***mobile units***. A message switch and wire-line data links or carrier facilities provide the necessary communication medium for the MTSO and cell sites. A MTSO interconnects with the PSTN (public switched telephone network) through wire-line voice facilities to one or more class 5 central offices. The OSS (Operations support systems) facilitate the operation, administration, and maintenance of the System 100 by the service provider.

2.28 The MTSO is the central controller and coordinator for the System 100. The MTSO switches calls to and from the PSTN, sets up and monitors calls by interfacing with the cell sites, and supervises overall system maintenance and administrative functions.

2.29 The cell site controls the radio environment and provides the interface between the facilities which interconnect with a MTSO and the radio channels assigned to each cell. Each site exchanges and processes information received from a MTSO and a mobile unit to accomplish the following tasks:

- Set up calls.
- Monitor calls to ensure that adequate quality is maintained.
- Cooperate with other system elements in selecting a new voice channel (in another cell or on a different face of the same cell) and moving the call to that channel (i.e., handoff) when a mobile unit has traveled beyond the confines of the initial site's serving area.

- Ensure system reliability by diagnosing, isolating, and correcting internal faults.

2.30 For a detailed description of the System 100 hardware, see reference (3) in Part 18.

DESCRIPTION

3. USER OPERATION

CUSTOMER

A. Mobile Origination

3.01 To originate a call, the user must first turn on the mobile telephone set by placing the vehicle ignition switch to the on or accessory position. If the LOCK indicator remains lighted, the telephone set may be unlocked by dialing the assigned 3-digit unlock code. The user may now dial the called number including the area code, if required. Dialing may be done with the handset in or out of its cradle. The dialed number is shown on the dialed digits display, allowing the user to check for dialing errors before placing the call. Entries on the dialed digits display move from right to left as they are dialed. Up to ten digits are displayed. The entire number can be reviewed by depressing the NMBR key. If an error is made in dialing, the CLR key must be depressed and the complete number dialed again. After the number is correctly dialed, the SEND key must be depressed to place the call. If the handset has not been lifted from its cradle, the called party answer is heard on the telephone set speaker. In order to talk, the caller must remove the handset from the cradle.

B. Termination of Call

3.02 If a call fails to complete, a fast busy signal may be received indicating that either the MTSO or the telephone company did not process the call. In this case, the call should be terminated and attempted again (depress END, then SEND). If an alternating tone intercept signal is received indicating a dialing error, the call should be terminated (depress END) and redialed. An active call may be terminated at any time by returning the handset to its cradle or by depressing the END key.

3.03 While preorigination dialing permits the user to dial a number into memory at any time before placing the call, even during another conversation, the user should not pause more than 2 minutes during dialing. If a delay longer than 2 minutes occurs, all previously dialed digits are cleared from memory when the next digit is dialed. This digit starts a new sequence. That is, if the user believes a pause longer than 2 minutes has occurred between dialed digits, the user should depress the CLR key and redial the entire number.

CELLULAR SERVICE PROVIDER

A. MTSO/Cell Site/Mobile Unit Interface Call Processing Functions

3.04 These functions are MTSO and cell site actions which require information to be transferred across the MTSO/cell site and cell site/mobile unit interfaces. Typically, these functions are performed during call setup, call release, voice channel selection, invocation of vertical services, flash, etc. The MTSO/cell site/mobile unit functions are as follows:

(a) ***Mobile Unit Origination:*** This function provides the capability to process a mobile unit request to originate a call.

(b) ***Mobile Unit Termination:*** This function provides the capability to process an incoming call from a zone office or from another mobile unit to a mobile unit.

(c) ***Release:*** This function provides the capability to process a disconnect or release request from the mobile unit or zone office.

(d) ***Handoff:*** This function provides the capability to direct a mobile unit to a new voice channel and switching path through the MTSO during a call.

(e) ***Mobile Unit Flash and Customer Service Request:*** This function provides the capability to process a mobile unit flash or request for customer services.

(f) ***Land Data Link Control:*** This function provides the capability to transmit data across the MTSO/cell site data interface.

(g) ***Radio Data Link Control:*** This function provides the capability to transmit data across the cell site/mobile unit data interface consistent with cellular system technical standards.

B. Mobile Telephone Switching System/Operator Interface Call Processing Functions

3.05 These functions are MTSO and operator system actions which require information to be transferred across the MTSO/operation position interface. Typically, these functions are performed whenever an operator-assisted call is received for or placed by the mobile unit, or the operator position is signaled by the mobile unit. The information transmitted across the MTSO/zone office interface associated with operator assistance consists of 0+ calls, 0- calls, and flashes. Access is provided to public switched network operators via a zone office. Capability is provided to recall operators after the operator completes a call.

C. Internal Call Processing Functions

3.06 These functions are MTSO and cell site actions which do not require the transfer of information across system interfaces. Typically, these functions are performed during any of the various stages of a call (i.e., setup, tear down, handoff, etc.). The internal call processing functions are as follows:

(a) ***Paging:*** This function provides the capability to determine cell sites involved in paging and to format and control page messages. Mobile units are paged globally at all designated paging cell sites associated with a MTSO.

(b) ***Roamer Functions:*** These functions provide the capability to set up a call to or from a roaming mobile unit. This includes the ability to establish direct access using end-to-end Touch-Tone service signaling as well as call handling by a System 100 attendant for originating parties without Touch-Tone service signaling. The System 100 attendant is a station associated with the MTSO but is not located at the MTSO.

(c) ***Multiple NPA (Numbering Plan Area) Functions:*** These functions provide the capability to serve multiple NPAs within a MSA.

(d) ***Fraud Prevention:*** This function provides the capability to verify serial numbers for home mobile and roamer units, to scan both an invalid serial number list and a valid roamer service list (permissible exchanges) for roaming mobile units, and to record possible fraudulent calls.

(e) ***Digit Interpretation:*** This function provides the capability to decode and analyze dialed digits received from a mobile unit. This includes IDDD (international direct distance dialing) capability.

(f) ***Incomplete Call Treatment:*** This function provides the capability to dispose of a call which cannot be completed or which has been abnormally terminated. This includes the use of appropriate announcements and tones.

(g) ***Routing:*** This function provides the capability to route a call originated by a mobile unit to the zone office or to another mobile unit. The selection of an outgoing zone office is based upon the called number. Alternate routing is available.

(h) ***Screening and Class-of-Service:*** These functions provide the capability to handle calls to or from mobile units with a class of service that requires screening to determine the manner in which a call should be completed. Capability is provided to deny calls to or from mobile units.

(i) ***Overload:*** This function provides the capability to detect and control system overload conditions.

4. SYSTEM OPERATION

HARDWARE

A. I/O (Input/Output) Processor Frame

4.01 The MTSO feature uses the existing 1A ESS switch I/O processor to provide a 2-way interface between the using system I/O devices and the MTSO central control. An I/O processor consists of a DMAC (direct memory access controller), an IOMP (I/O microprocessor) community with up to eight LIU (line interface units), and a fanout board with up to eight PC (peripheral controllers). For historical reasons, these units can be referred to by other names. The DMAC is referred to as an IOUS (I/O unit selector). The fanout board is referred to as an IOMP (the I/O microprocessor community is IOMP 0 and the fanout is IOMP 1). The LIU and PC are referred to as IOUC (I/O unit controller). The DMAC provides a supervisory and control processing interface for data exchanged between the 1A ESS switch processor and the microprocessor communities. The fanout board is simply a buffer, since the micropro-

cessor is in the PC. The LIU is used for low-speed TTY channels. The PC is used for high-speed synchronous data links. For the MTSO feature, the PC implements the BX.25 level 2 synchronous link protocol.

4.02 For System 100 usage, each data link to a cell must be on a different I/O frame and power bus. The I/O frames are powered by two buses. Bus 0 powers IOUS 0 while bus 1 powers IOUS 1. Therefore, each pair of data links to a cell will link through an IOUS 0 and IOUS 1 on different I/O frames.

4.03 The I/O processor frame is a 1-bay frame, 2 feet 2 inches wide and 7 feet high. Figure 2 is a front-view illustration of an I/O processor frame equipped with 3B I/O processor growth units. An I/O processor frame may be partially or fully equipped. A fully equipped I/O processor frame contains:

(a) Two I/O processor bus units, J5A006DA-1

(b) Two I/O processors, each consisting of:

(1) One I/O processor logic unit, J5A006DB-1

(2) One I/O processor growth unit, J1C130AB-1.

(c) One I/O filter unit, J5A006DC-1.

Note that an I/O processor is not assigned a J code. The I/O processor units are merely a grouping of equipment.

4.04 A block diagram of the I/O processor frame, as used for the MTSO feature, is shown in Fig. 3. Each I/O processor frame contains two DMACs which is the main interface to the peripheral bus for each set of channels. Each DMAC contains a microprocessor and a growth unit or fanout. The microprocessor connects through LIUs to the channels used for TTY links, while the fanout connects through PCs to the channels which can be used as System 100 cell data links. Each TTY channel may have up to three ports or three simultaneous users on that channel.

B. MTSO/Cell Site Data Links

4.05 Two dedicated data links carry call processing and control information between the MTSO and each cell site. One dedicated data link carries call processing information, and the other dedicated data link carries control and maintenance information. Should one data link fail, the other data link can pick up the failed link's responsibility. The data links can be divided into three basic sections. These sections are the I/O processor hardware at the MTSO, the RS449 standard interface at the cell site, and the transmission facilities connecting both ends.

4.06 The RS449 standard interface can work at many different speeds and is the cell site interface for any data links provided for the MTSO feature. Currently, the cell site MTSO data links are provided for 9.6 kb/s operation.

4.07 The data transmission channels are supplied by a local carrier. Required data terminal equipment may be owned by System 100, or may be supplied by a local carrier. All transmission equipment supplied by the local carrier must conform to the System 100 specifications.

C. Cell Site Trunks

4.08 Voice-grade trunks that are connected between the MTSO and cell sites are referred to as cell site trunks. The trunk circuit used for this application is the SD-1A236-05. The cell site transmission facilities may be metallic, radio, or carrier. The cell site trunk circuits (SD-1A236-05) required for the MTSO feature will be obtained from AT&T as part of the MTSO equipment order.

D. Loop-Around Trunks

4.09 On mobile-to-mobile calls within the same MTSO, the connection is made entirely within the System 100 network by connecting two cell site trunks together at the MTSO through a loop-around trunk circuit. The SD-1A236-05 trunk circuit is used in the loop-around trunk application.

E. Cell Site Hardware

4.10 The voice frequency attenuators (4 dB pads) should be removed from all loop-around trunks in the MTSO. This is recommended regardless of the generic program issue or features installed. Most MTSOs were engineered with NJ01061F-1 units mounted on the distributing frame. These units are able to accept up to 96 KS-21265 plug-in attenuators.

4.11 For a detailed description of the cell site hardware, see reference (3) in Part 18.

OFFICE DATA STRUCTURES

A. Translations

4.11 The System 100 translations data base consists of data which is either office dependent or cell site dependent and which is resident in the MTSO and the cell site. The cell site data base has a master copy residing in the MTSO.

4.12 The System 100 translations data consists of three major categories: (1) modified existing 1A ESS switch translators, (2) System 100 MTSO-only translators which exist only at the MTSO, and (3) System 100 cell site master translators which contain the master copy of the System 100 data resident at each cell.

4.13 The three categories of System 100 translators are listed below.

(a) Modified existing 1A ESS switch translators are as follows:

(1) Directory number translator

(2) Line equipment number translator

(3) Trunk group number translator auxiliary block

(4) Trunk group number translator auxiliary block for loop-around trunks

(5) Trunk network number to trunk group number translator auxiliary block for loop-around trunks

(6) Trunk group number supplementary table translator

(7) Trunk network number to trunk group number translator auxiliary block for cell site trunks

(8) Pseudo route index expansion table for PRI 045, 057, 058, 059, 060, and 061

(9) Route index expansion table for RI131.

(b) The System 100 MTSO-only translators are as follows:

(1) The directory number to serial number translator

(2) Cell site translator

(3) Cell site trunking translator

(4) The AMPS miscellaneous information translator

(5) Input/output processor KCODE to cell site channel number translator

(6) Input/output processor member number translator

(7) Cell dialup channel translator.

(c) The System 100 cell site master translators are as follows:

(1) Cell master status translator

(2) Cell master equipage translator

(3) Cell master location translator.

Modified Existing 1A ESS Switch Translators

4.14 The MTSO feature uses an abbreviated code (type 2 entry) except when call forwarding is used for the given DN. When call forwarding is used, an auxiliary block entry is required. See reference (7) and (8) in Part 18 for call forwarding details. Each mobile is assigned a PLEN (pseudo line equipment number). The PLEN is used to describe a line which is not equipped in the MTSO. Item 7 in word 1 of the abbreviated code expansion table (Fig. 4) is set to indicate a mobile DN. The terminating major classes used for the MTSO feature is 4FIND and 4FDT83.

4.15 Figure 5 displays how mobile DNs are randomly assigned from the DNs of their zone offices. Translations required to route a call from the MTSO to a DN that is assigned to its zone office is shown in Fig. 4. To avoid rapid depletion of NGNs at the MTSO, a common NGN is assigned to NXX, D4 combinations assigned at the zone office. Each NGN assigned at the MTSO has a route index associated with it. This route index is directed to a trunk group

routed to the proper zone office. The route index must reside in the DN head table entry for this NGN (Fig. 4). The translation layout for the NOC-NGN translator is shown in Fig. 5 with an example of a common NGN assignment. The example assumes that zone 1 has the ZZZ exchange, the MTSO has DNs 222-5000 through 222-5999, and that NOC 1 represents NXX222. In the left hand side of the NOC-NGN table, all bits are set to indicate that this is a common NGN.

4.16 The MTSO feature uses an abbreviated code (type 2 entry) for LEN (line equipment number) translations (Fig. 6) without speed calling. When speed calling (one digit only) is used, an auxiliary block entry is required. Item 7 in word 2 of the abbreviated code expansion table is set to indicate a mobile LEN. The originating major classes used for the MTSO feature are 4FDENO, 4FIND, and 4FMAN.

4.17 The TGN (trunk group number) auxiliary block for trunks connected to the cell site is shown in Fig. 7. Trunk groups with trunks between the MTSO and the cell site may have TGTYPE (trunk group type) equal to 6. When TGTYPE is equal to 6, TU (trunk usage), a field of the trunk class code will always be 2, indicating 2-way trunks. For some MTSO offices, System 100 must have the ability to use/assign cell site trunk groups with trunk group type 13 and a trunk class code defining 1-way trunks. Three fields are defined in the auxiliary block for the MTSO feature. These fields are the CSN (cell site number), the antenna face (ANT), and the SG (server group). Item ANT is the antenna face, ranging from 0 through 3. Antenna 0 represents the omni directional antenna. Antennas 1 through 3 represent directional antennas and are numbered clockwise from antenna 1. Item SG is the server group. Server group 0 is the primary server group, or preferred set of radios, the mobile is to be served on. Server group 1 only exists for dual cells. All cell site trunks (SD-1A236, circuit program index [CPI] 21) have scan point 0 assigned a TPI (trunk program index) of 0 and scan point 1 assigned a TPI of 57.

4.18 Trunk groups with trunks between the MTSO and the cellular mobile radio office must have TGTYPE equal to 6, trunk class code equal to 2, with an originating class of 27.

4.19 Trunk groups consisting of MTSO loop-around trunks are required to have TGTYPE equal to 2. Trunk usage must be 2, indicating 2-way trunks. Refer to Fig. 8 for a layout of the trunk group number auxiliary block for loop-around trunks.

4.20 The trunk network number-to-trunk group number HILO intraprocessor auxiliary block for loop-around trunks is shown in Fig. 9. This auxiliary block is not impacted by the System 100 feature and is included for information purposes only.

4.21 The MTSO feature uses the type 3 TGN supplementary table translator (Fig. 10) for MTSO loop-around trunks. For the MTSO feature, item l0 in word 0 must be set to 1 to indicate that the optional word is to be built. Item 0 of optional word K must be set to 1 to indicate at the MTSO that this is a MTSO loop-around trunk group. Item 1 of the optional word K must be set to 1 to indicate at the zone office that an MTSO trunk group is being used. In addition, item 2 of the optional work K must be set to 1 to indicate MTSO loop-around trunk groups without attenuation padding.

4.22 The trunk network number to trunk group number auxiliary block for cell site trunks shown in Fig. 11 has the following fields defined for the MTSO feature:

(a) Item VRCHNL indicates the channel number the radio uses to transmit and receive on.

(b) Item VR is the voice radio number within the voice radio functional group. This number is input as a decimal number, ranging from 0 through 7.

(c) Item VRG is the voice radio group, ranging from 0 through 12.

(d) All cell site trunks use TYPE 3 supervision in the trunk class codes.

4.23 The PRI (pseudo route index) expansion tables required for the MTSO feature are shown in Fig. 12. The PRIs required for the MTSO feature, applicable when the 9F164 AMPS common feature package is activated, are as follows:

(a) ***PRI 045:*** This index is used to route to the MTSO loop-around trunks for an intraoffice mobile call.

(b) ***PRI 057—No Page Response:*** The mobile did not respond to a page which means the

mobile is either turned off, not accepting calls, or out of the mobile service area.

(c) ***PRI 058—Incoming Facilities:*** This index is used for routing when problems with facilities occur during a terminating call to a mobile after the mobile has responded to paging and before ring time-out.

(d) ***PRI 059—Mobile Roamer Intercept:*** A roamer (mobile belonging to another service area) is denied service in this mobile service area.

(e) ***PRI 060—Alerting Discontinued:*** The mobile was alerted (ringing) and timed out (mobiles are only allowed to ring for a specified time).

(f) ***PRI 061—No Mobile Service Treatment:*** The mobile DN was unassigned or illegal.

4.24 The fixed route index expansion table required for the MTSO feature is shown in Fig. 13. Route index 131 is assigned for a dedicated group of milliwatt test lines used for a loop-around trunk diagnostic.

System 100 MTSO-Only Translators

4.25 The DN to SN (serial number) translator (Fig. 14) provides the serial number of the mobile, a 32-bit quantity used for identification and security purposes. The 32-bit SN is input as an 11-digit octal number, with the most significant digit limited to a range of 0 through 3 (in order to keep the serial number to 32 bits). The 2-word entry in the DN to SN subtranslator contains the SN of the mobile, the paging channel over which the mobile may be paged, and a flag to indicate how the mobile shall be paged. Each 2-word entry consists of the following:

(a) The 32-bit serial number (broken up into bits 0 through 23 and 24 through 31) is used to uniquely identify a mobile.

(b) The PC (paging channels) indicator indicates which PC set (set of frequencies) the mobile is to be paged on (notifying the mobile for initial setup of a terminating call). A 0 indicates that the mobile is to be paged over the first set; a 1 indicates that the mobile is to be paged over the second set.

(c) The EMIN (extended mobiles identification number) flag indicates whether a long MIN (mobile identification number) or a short MIN is used to page the mobile. A MIN is an encoded form of the DN. A short MIN only encodes the first seven digits of a DN (24 bits), while a long MIN encodes the NPA digits as well (34 bits). When set, it indicates the mobile should be paged with a long MIN.

4.26 The purpose of the cell site translator (Fig. 15) is to store information needed about the cell sites. Each entry in the head table points to another head table for that particular cell site information.

4.27 The cell site trunking translator (Fig. 16) is required for the following purposes:

(a) To determine the voice trunk route index for a set of voice radios serving a specific antenna face and server group

(b) To determine the antenna face and server group which contains a specific cell site voice radio

(c) To determine the trunk network number of the trunk connecting a voice radio to the MTSO.

4.28 The cell site trunking translator head table is indexed by the cell site number. Each entry is an address of an auxiliary block. A second piece of data, the antenna face and server group, is used to index into word 1 through word 8 of the auxiliary block. Word 1 through word 8 of the auxiliary block contains the RI (route index) for the antenna face and server group. There is only one RI allowed per antenna face and server group. The second index into the auxiliary block is the voice radio number at the cell (0 through 95). This indexed data word contains the trunk network number the voice radio is dedicated to and the antenna face and server group the radio belongs to at the cell. Item NO. OF RADIOS in word 0 of the auxiliary block specifies the total number of equipped radios in the cell. Item CELSTAT specifies the state of the cell. The mode of the cell is specified as follows: 00 = unequipped, 01 = illegal, 10 = growth, 11 = equipped.

4.29 The function of the AMPS miscellaneous information translator (Fig. 17) is to provide

miscellaneous information needed for the MTSO feature as follows:

(a) System wide parameters, most of which must be broadcast from the cell to the mobile

(b) A list of paging cell sites, those cell sites which are used to initially access the mobile for a mobile terminating call

(c) A list of other service areas not in this MSA, which are allowed access to this system

(d) An individual list of roamers that are not allowed to access this system (a list of fraudulent serial numbers).

4.30 Each entry in the AMPS miscellaneous information head table (Fig. 17) is unique in its data. The first auxiliary block (AMPS miscellaneous auxiliary block), pointed to from the head table, contains miscellaneous functional capabilities and MSA wide data for System 100 software. The auxiliary block fields are defined as follows:

(a) Item RSV enables the roamer service validation function at the MTSO. This function checks to determine if the roamer is allowed access in this system.

(b) Item LPB enables the long page bundling function at the MTSO. This function puts packages of long pages into a single message before broadcasting to all the paging cell sites.

(c) Item CPA indicates combined paging and access channels.

(d) Item SRN is an indicator sent from the cell to the mobile, indicating to the mobile to send its serial number when accessing the system.

(e) Item DTX allows discontinuously transmitting mobiles (such as hand held portables) to access the system.

(f) Item RCF is an indicator sent from the cell to the mobile to read the control filler word.

(g) Item NWAC indicates that access channels start on a different channel than what is burned into the mobile's read-only memory. When this parameter is set, the fields CMAX and NEWACC should also be initialized.

(h) Item CMAX specifies the maximum number of access channels the mobile must scan. This value is input as a decimal number. When item CPA is initialized, item CMAX ranges from 1 through 21 (CMAX and N must be equal). When item CPA is zeroed, item CMAX ranges from 1 through 128.

(i) Item WRDN specifies the number of words in the auxiliary block.

(j) Item N specifies the number of paging channels the portable has to scan. This value is stored as N-1 to conform to the information sent to the mobile. Value N-1 is input as a decimal number ranging from 1 through 21. This value is internally stored as 0 through 20 by subtracting 1 from the input.

(k) Item NEWACC specifies a setup channel. This value is input as a decimal integer ranging from 1 through 333 if in channel set A, or from 334 through 666 if in channel set B.

(l) Item LOCREQ specifies the location request limit. This is the maximum number of requests a cell will accept for signal strength measurements from other cells whose signal strengths have fallen below their primary signal strength threshold. This limit is used by overload to determine how many requests will be allowed to reach the cell on a per second basis before they are dropped. This limit ranges from 1 through 15 requests. The default value for this field is six requests.

(m) Item SID specifies the 14-bit system identification of the MSA. This value is input as a 5-digit decimal number ranging from 1 through the full range of 14 bits. Bit 0 is used to represent the channel set group, 0 = channel set B, 1 = channel set A.

(n) Item OVRLTI specifies the total time (in seconds) between three successive signal strength measurement pairs taken on a voice radio while a call is in progress during overload conditions. The range for this field is from 1 through 255. The default value for this field is 10.

(o) Item TEVST specifies a threshold used for traffic event recording. There are two traffic counters involved: EVSUCC (This is pegged whenever an event recording message is successfully transmitted) and EVFAIL (This is pegged whenever an event recording message cannot be transmitted.) Whenever EVSUCC equals TEVST, EVFAIL is decremented by one and EVSUCC is zeroed. This field is 8 bits long with a range from 0 to 255.

(p) Item TEVFT also specifies a threshold used for traffic recording. When EVFAIL exceeds TEVFT, a minor alarm is sounded indicating an overload of the output channel. In this case, event recording is stopped. This field is 16 bits long with a range from 0 to 65535.

(q) Item SDT specifies a threshold used to determine if the collected SATs are within the valid spectrum. During location, these SATs are collected from the cells being considered for handoff. This field is 8 bits long ranging from 0 to 255.

(r) Item GCPCF specifies whether dynamic power control is turned off/on at the individual cell sites. Only the rightmost bit is used, the allowable value for the field is 0 or 1.

(s) Item GMPCF specifies whether dynamic power control is turned off/on at the mobiles within the cell site. Only the rightmost bit is used, the allowable value for the field is 0 or 1.

(t) Item DCT specifies a threshold used to determine the number of diversity state changes during a periodic locate interval below which a trending state may be activated. This field is 8 bits long with a range from 0 to 255.

(u) Item SLPV determines the number of locate periods skipped while in a trending state. This field is 8 bits long with a range from 0 to 255.

(v) Item MPCT specifies the mobile process counter threshold. Further action is taken if the number of executions of a specific task within the mobile power adjustment process exceeds this value. This field is 8 bits long with a range from 0 to 255.

(w) Item CPCT specifies the cell site process counter threshold. Further action is taken if the number of executions of a specific task within the cell site power adjustment process exceeds this value. This field is 8 bits long with a range from 0 to 255.

(x) Item FGDIFF specifies the difference in gain (in dB) between the path from the receive-antenna-transmission-line output to the control-frame-radio (setup or locating) receiver input and the path from the receiver-antenna-transmission-line output to the voice-channel-radio receiver input. This field ranges from 0 to 31 dB and is decimal input from 0 to 31 with increments in steps of 1 dB.

4.31 The second auxiliary block (paging cell sites auxiliary block), pointed to from the head table (Fig. 17), contains the list of paging cell sites for this MSA. The first parameter in word 0 contains the number of bytes (8 bits) in the auxiliary block (not including word 0). Word 1 starts with the list of paging cell sites, packed three cell site numbers to a word. The next byte after the last cell on the list contains the total number of paging cell sites (maximum 255). This data is used by the paging process to format a broadcast message to the paging cell sites.

4.32 The function of the IOP K-code to cell site channel number translator (Fig. 18) is to translate the cell site number to a specific data link hardware location, needed by the data link software in order to send messages. Each cell has two data links: a high priority and a low priority link.

4.33 The structure of the IOP K-code to cell site channel number translator is actually two separate tables. The tables are pushed together into one structure in order to save space. Although these two tables are the inverse of each other, they are of different lengths; and hence, the member number and channel number contained in each word are not related to each other.

4.34 The cell site channel number to IOP K-code table is indexed by a 9-bit cell site channel number, 8 bits indicating the cell site number, and a low-order bit indicating the low (1) or high (0) priority data link. Each entry contains the data link member number. Since each cell site requires two data links and the highest numbered cell is 255, the maximum length is 512 entries.

4.35 The IOP K-code to cell site channel number table structure is the opposite of the cell site channel number to IOP K-code table, indexing by the I/O processor member number to obtain the 9-bit channel number. The I/O processor member number field is broken up into five fields, with the hardware configuration represented in Fig. 18. The five fields are as follows:

(a) ***I/O Group:*** The I/O group contains four I/O frames.

(b) ***IOUC (Unit Controller):*** The IOUC controls one data link as shown in Fig. 19. The System 100 data links only use IOUC 10 through 17 of any given IOUS.

(c) ***IOMP (Microprocessor):*** The IOMP controls eight I/O unit controllers. There exists only one IOMP and one fanout as shown in Fig. 19; but for simplicity, the microprocessor which controls the TTY channels is designated IOMP 0 and the fanout for the System 100 data links is designated IOMP 1.

(d) ***IOUS (Unit Selector):*** The IOUS controls two I/O microprocessors.

(e) ***I/O Frame:*** The I/O frame contains two IOUSs.

4.36 The System 100 cell site data links can only exist on IOMP 1; therefore, for the cell site channel number to IOP K-code table, the IOMP field must be set. For the IOP K-code to cell site channel number table, the CHAN field is zeroed when indexed with an IOMP of zero.

4.37 An additional set of requirements is that each data link to a cell be on a different I/O frame.

4.38 Since each I/O processor has the capacity for 16 members (although only 8 members can be System 100 data links), the length of the IOP K-code to cell site channel number table is 16 times the maximum number of I/O processors in the office, for a length of 1024 entries.

4.39 The function of the I/O processor member number translator (Fig. 20) is to store equipage information about each IOUS and its channels (Fig. 19). This translator is a unit-type translator stored in the unit-type head table (master head table + 512). The I/O processor member number subtranslator address is contained in the unit-type head table + 59. The subtranslator is indexed by the IOUS member number which is made up of I/O group number (0 through 7), I/O frame number within the group (0 through 3), and the IOUS within the frame (0 through 1). The first eight entries in the subtranslator are zeroed out (the information about IOUS 0 through 7 is stored in parameters). Any unequipped IOUS has a subtranslator entry of 0. Each equipped entry in the subtranslator is a pointer to an auxiliary block of information whose fields are defined as follows:

(a) Item WRDN specifies the number of words in the auxiliary block.

(b) Item MPO specifies the equipage status of microprocessor 0 (the IOMP). This is a 2-bit field with 00 = unequipped, 01 = growth, 11 = equipped, and 10 a special growth which is not used by the MTSO feature.

(c) Item MP1 specifies the equipage of microprocessor 1 (the fanout). Item MP1 has the same units as item MP0.

(d) Item IOUS specifies the equipage status of the IOUS. Item IOUS has the same units as item MP0.

(e) Item IOUSTYPE specifies the type of IOUS currently being used. This field is always one for the MTSO feature to indicate that this IOUS contains a microprocessor.

(f) Item LDI specifies the hardware LDI number which describes the current hardware version of the IOUS. The current hardware version is represented as a member-type number assigned in the hardware LDI and is changed every time a class A change has occurred in the IOUS. Item LDI is used by the diagnostic controller to determine what set of diagnostics to use for this IOUS.

(g) Item PPADR specifies the pulse point address or the address of the maintenance point needed to talk to the IOUS. Each I/O frame has a pair of GCP (generated control pulses) points starting with IOUS 0, which has the even-numbered pulse point, and IOUS 1, which has the odd-numbered pulse point. The octal address is stored in this field and is input as the pulse source

name. These pulse points must be assigned in the pulse source range PPU030 (octal address 00404001) to pulse source PPU093 (octal address 02001010). Pulse source PPU030 and PPU031 is the first pulse point pair in this range. The pulse source name and octal address is shown in Table A.

(h) Item PTSOURCE specifies the format of the IOUS pulse point source. This item is equal to zero for the MTSO feature.

(i) Eight consecutive scan points are assigned per I/O frame and are grouped as shown in Fig. 21. Items SCNPT and PUBSCNPT are defined as follows:

(1) The supervisory master scanner octal scan point address of the power control switch, item SCNPT, assigned to each IOUS is the address of the first of the two points of the given IOUS. For IOUS 0, SCNPT is the address of the first scan point for IOUS 0. For IOUS 1, SCNPT is the address of the first scan point for IOUS 1. Refer to Fig. 21 for the lead designations.

(2) The supervisory master scanner octal scan point address for each PUB, item PUBSCNPT, is the same for both PUBs of an I/O frame. This field contains the address of the first of two scan points needed for PUB 0 of the frame. The scan point address for PUB 1 is calculated by adding 4 to the PUB 0 address. Refer to Fig. 21 for the lead designations.

(j) Eight CPD (central pulse distributor) points are assigned per I/O frame and are grouped as shown in Fig. 21. Items MDPNT and PUBMDPNT are defined as follows:

(1) The bipolar CPD point address of the CPD points for each IOUS, item MDPNT, is assigned the same as for SCNPT. Refer to Fig. 21 for the lead designations.

(2) The bipolar CPD point address of the CPD points for each PUB, item PUBMDPNT, is the same for both PUBs of an I/O frame and is assigned the same as for PUBSCNPT. Refer to Fig. 21 for lead designations.

(k) Item NMEMN specifies the other I/O member number in the I/O frame. This item consists of the IOUS number within the frame (item 0), the I/O frame number within the group (items 1 and 2), and the I/O group number (items 3 through 5). Item 6 is zeroed.

(l) Item IOFSTMP specifies the I/O frame number stamped on the I/O frame.

(m) Items FRAME, LINE, and GRID in word 8 of the I/O processor member number auxiliary block are zero for the MTSO feature.

(n) Item CPADR specifies a unipolar CPD point. The CPD points are assigned in consecutive order for the entire group of I/O processors (8 through 63). Refer to Fig. 21 for the lead designations.

(o) Item CNTRLPT specifies a CPD point (= 0) for I/O processors 8 through 63.

(p) Items IOC0 through IOC7 specify the equipage fields for I/0 unit controllers 0 through 7. These I/0 unit controllers are for the TTY channels and are always unequipped (= 00) for the MTSO feature.

(q) Item MPOTYPE specifies the type of microprocessor for microprocessor 0. This item is set to 1 to indicate a phase 1 microprocessor for the MTSO feature.

(r) Items IOC8 through IOC15 specify the equipage of I/0 unit controllers 8 through 15. These items are designated the same as item MPO.

(s) Item MP1TYPE specifies the type of microprocessor for microprocessor 1. This item is set to 2 to indicate a phase 2 microprocessor for the MTSO feature.

4.40 Words 12 through 26 of the auxiliary block are zeroed, since the MTSO feature is not using the TTY channels. The rest of the auxiliary block contains information concerning each channel in the IOUS.

4.41 Two words are required in the auxiliary block for each channel equipped in the IOUS. This 2-word block is indexed by the I/0 member number (made up of IOMP [bit 3] and IOUC within the IOMP

[bits 0 through 2]). The fields needed for the cell data link channels are defined as follows:

(a) Item PTO specifies the equipage of port 0 in the same units as item MPO.

(b) Item PT1 specifies the equipage of port 1. Port 1 is always unequipped for the MTSO feature.

(c) Item PT2 specifies the equipage of port 2. Port 2 is always unequipped for the MTSO feature.

(d) Item DSIO specifies the data set indicator for port 0, indicating the type of connection the port has. This field is always set to 2 for the MTSO feature to indicate a private line data set.

(e) Item DSI1 specifies the data set indicator for port 1. This field is zeroed for the MTSO feature.

(f) Item DSI2 specifies the data set indicator for port 2. This field is zeroed for the MTSO feature.

(g) Item AB0 specifies whether port 0 is equipped with answer back (handshaking). This field is zeroed for the MTSO feature to indicate no answer back.

(h) Item AB1 specifies the answer back for port 1. This field is zeroed for the MTSO feature.

(i) Item AB2 specifies the answer back for port 2. This field is zeroed for the MTSO feature.

(j) Item CHNLSPD specifies the channel speed of the channel. This field is 0 to indicate 9.6 kb/s for the MTSO feature.

(k) Item IOCTYPE specifies the type of I/O unit controller on the channel. This field is always set to 7 for the MTSO feature to indicate a TN82 board doing BX.25 level 2 synchronous protocol.

(l) Item FDX specifies whether the channel is half or full duplex. This field is set to 1 for the MTSO feature to indicate full duplex.

(m) Item ACU specifies whether there is an automatic call unit connected to the channel. This field is always zeroed to indicate no call unit for the MTSO feature.

(n) Item DSTYPE specifies the type of data set on the channel. This field is set to either decimal 13 to indicate a 500A data set or decimal 14 to indicate a DATAPHONE® II data set for the MTSO feature.

(o) Item AP specifies whether an application (as opposed to common routines) is controlling this link. This field is always set to indicate application control for the MTSO feature.

(p) Item SC specifies the type of transmission on the channel. A 0 indicates a continuous transmission; 1 indicates a switched carrier or discontinuous transmission. This field is zeroed for the MTSO feature.

4.42 All eight scan points needed per I/O frame are assigned to the even numbered IOUS of the frame. Therefore, the MEMN field of the subtranslator word of the master scanner number translator or the central pulse distributor number translator (Fig. 22) is designated as an even numbered member number for the MTSO feature.

4.43 The function of the cell dialup channel translator (Fig. 23) is to obtain the DN of the dedicated maintenance TTY channel to a cell site. The head table is indexed by a cell site number, and each entry contains the address of a 11-word auxiliary block. The auxiliary block contains the BCD (binary coded decimal) representation of the 7- or 10-digit number as shown. The low-order byte following the last digit contains an end of number indicator (decimal value 15). With the addition of the carrier interconnect feature, additional word types have been added to the auxiliary block. These added word types allow for 7- and 10-digit numbers with the carrier interconnect 10xxx digits and 7 and 10 digits with 1+ dialing and carrier interconnect digits.

System 100 Cell Site Master Translators

4.44 The cell site master translators are those translators which are accessed at the cell site for cell site processing. A master copy of the cell resident data is kept at the MTSO and used for initializing and updating the cell memory. The cell site master translators are defined in paragraphs 4.45 through 4.53.

4.45 The function of the cell master status translator (Fig. 24) is to provide the cell site with in-

formation that the cell site needs to broadcast to the mobile and to provide generic information required for the multicell generic capability. The cell master status translator head table is indexed by the cell site number. Each entry in the head table points to an auxiliary block (if assigned) of a fixed size of two words containing the following data:

(a) The EMIN (extended MIN) item indicates, when set, that the mobile should access the system using a 34-bit MIN.

(b) The WFOM (wait for an overhead message) item indicates, when set, that the mobile must wait to read an overhead message from the cell.

(c) The CMAC (control mobile attenuation code) item indicates the instructions given to the mobile to control the mobile power level during initial accessing of the system. The CMAC value must be input as decimal numbers with the binary representation stored internally in the translator. The value of CMAC ranges from 0 through 7. The mobile-unit transmitter power level for setup and voice channels are given in Fig. 25.

(d) Item MAXBUSY-PGR specifies the number of times a mobile is allowed to find a setup channel busy before giving up with its page response message. The MAXBUSY-PGR value must be input as decimal numbers with the binary representation stored internally in the translator. The value of MAXBUSY-PGR ranges from 0 through 15.

(e) Item MAXBUSY-OTHER is the same as item MAXBUSY-PGR, except that the mobile is attempting to access the system for another reason besides page response (origination or registration, for example).

(f) Item DCC specifies the digital color code of the cell used to uniquely identify a cell during access. The DCC value must be input as decimal numbers with the binary representation stored internally in the translator. The value of DCC ranges from 0 through 3.

(g) Item WRDN is the number of words in the auxiliary block, in this case, two words.

(h) Item MAXSZTR-PGR specifies the number of times a mobile is allowed to try to seize a setup channel before giving up with its page response. The MAXSZTR-PGR value must be input as decimal numbers with the binary representation stored internally in the translator. The value of MAXSZTR-PGR ranges from 0 through 15.

(i) Item MAXSZTR-OTHER is the same as item MAXSZTR-PGR, except that the mobile is attempting to seize a channel with another type of message besides a page response (origination or registration, for example).

(j) Item SCC specifies the SAT (supervisory audio tone) color code of the cell. Item SCC must be input as a frequency and internally represented as a 2-digit binary field as follows:

- 5970 Hz is 00.
- 6000 Hz is 01.
- 6030 Hz is 10.
- Illegal is 11.

(k) Item LOCFCS specifies the location equipped antenna faces at the cell site which are equipped for location measurements. When the LOCFCS item is set, there is more than one antenna face equipped for location.

(l) Item UPN specifies the last generic update applied to the system. the value of UPN ranges from 1 to 99.

(m) Item GENISS specifies the last load (issue) of the current generic. The value of GENISS ranges from 1 to 15.

(n) Item GENRELS specifies the generic release number. The value of GENRELS ranges from 1 to 9.

(o) Item GENTYPE specifies the generic type and is stored as the octal representation of an ASCII character. The decimal range for this field is from 65 to 90. These are ASCII characters A through Z. This field distinquishes betweem different operational cell generics and is initialized as ASCII character C.

Interpretation of Mobile Attenuation Codes and Mobile Station Power Class

4.46 The CMAC and VMAC (voice mobile attenuation code) indicates the mobile-unit transmitter power level for setup and voice channels, respectively. A CMAC value must be associated with each cell site, and VMAC value must be associated with each face of each site. Classes I, II, and III signify maximum nominal transmitter power levels of 8, 4, and 0dBm, respectively. The MA (Mobile attenuation) is a positive number, defined as the difference in dB between 8dBm and the power level at which a mobile unit of a particular power class (MPC) transmits in response to a particular CMAC or VMAC. Figure 25 shows the value of MA for every possible combination of power class and MA code.

4.47 The function of the cell master equipage translator (Fig. 26) is to provide the cell with initialization information for peripheral equipment and maintenance power and frequency thresholds. The cell master equipage translator head table is indexed by the cell site number. Each entry in the head table points to an auxiliary block containing fields which are set or changed as shown in paragraphs 4.49 through 4.52.

4.48 Some of the fields contained in this auxiliary block involve detailed knowledge about the system (in a geographical or radio coverage sense) and hence would not be set or changed frequently by the personnel normally used for changing the ESS translations data base. These values are determined by a System 100 planning team, a team of experts who finely tune a system into its environment at both installation time and system growth points. The fields which require this type of expert assistance to change or set are referred to as expert assistance fields.

4.49 Normally, expert assistance fields are not in translations, as they are not changed often enough (or at all after installation) to warrant recent change commands. These types of fields are placed into the ESS switch in the form of parameters. In the case of System 100, some of this type of data has to be transmitted to the cell site and changed while the system is running. For simplicity, the only way System 100 can transmit and change this data at the cell site is through recent change. Therefore, any parameters needed at the cell site are put into the cell master translators and the AMPS miscellaneous information translator at the MTSO.

4.50 The fields contained in the auxiliary block are defined as follows:

(a) Item WRDN specifies the number of words in the auxiliary block.

(b) Item RSSIBD specifies the RSSI (received signal strength indicator) branch correlation difference threshold. This is the threshold used to indicate the minimum difference in signal strengths (in microvolts) received from the two diversities (two leads on an antenna) before one diversity is definitely chosen as having the stronger signal. This is an expert assistance field, input as a decimal number.

(c) Item RVDT is the reverse voice data time-out or the time limit (0 through 255 seconds) waited for a data message on the reverse channel (the channel used by the mobile to communicate back to the cell site). This is input as a decimal number.

(d) Item AAST is used in conjunction with item AAFT to generate an autonomous error report. When the number of successful access attempts exceeds this value, the success and failure counters are both zeroed. This is an expert assistance field and ranges from 0 through 255.

(e) Item AAFT is used in conjunction with item AAST to generate an autonomous error report. When the number of access attempt failures exceeds this value, an error report is generated. This is an expert assistance field and ranges from 0 through 255.

(f) Item UBCHRT specifies the power threshold of an incoming signal before it is allowed to be processed as a message (this eliminates interference noise which may look like a message). This value is input as a decimal integer, ranging from 0 through 127, determined by taking the integer part of the equation V/.03906, where V is the voltage measured in volts, ranging from 0 through 10 (at V = 10 use 255). This is an expert assistance field.

(g) Item SIL specifies the maximum expected co-channel interference on a voice channel. This

is an expert assistance field and ranges from 0 through 127, determined by the equation (INTERF + 130/.7812), where INTERF is the interference level in dBm.

(h) Item DDTSU specifies the dotting detection threshold for the setup radio transmission. This threshold is the number of received bits needed to determine whether a signal is being received. This is an expert assistance field, input as a decimal integer.

(i) Item DDTVR is the same as item DDTSU, except that this field is for the voice radio transmission.

(j) Item VRLTI specifies the total time (in seconds) between three successive signal strength measurement pairs taken on a voice radio while a call is in progress. The default for this field is 5 and is derived from the formula (16 × .1024) × 3, where 16 × .1024 (seconds) is the interval for one measurement pair. This is an expert assistance field and ranges from 1 through 255. Note that although the range for this field is through 255, it is unlikely this will ever be reached.

(k) Items SU0, SU1, SU2, and SU3 specify the status fields for setup radios 0 through 3 (00 = unequipped, 11 = equipped, 10 = growth, and 01 is an illegal designation).

(l) Item SUCHNL1 specifies the setup channel number for setup radio 1. This field is input as a decimal digit ranging from 1 through 333 if in channel group A, and 334 through 666 if in channel group B. All setup and voice channel numbers are determined by System 100 engineering.

(m) Item SUCHNL2 specifies the setup channel number for setup radio 2.

(n) Items LC0 and LC1 specify the status fields for location radios 0 and 1, respectively. These fields have the same designations as SU0.

(o) Item SUCHNL3 specifies the setup channel number for setup radio 3.

(p) Item RF specifies the status field for the test radio. This field has the same designations as SU0.

(q) Items RG0 and RG1 specify the status fields for reference generator 0 and 1. These fields have the same designations as SU0.

(r) Item MI specifies the status for the measuring instruments. This field has the same designations as SU0.

(s) Item AL specifies the status of the alarm interface. This field has the same designations as SU0.

(t) Item XVSU0 specifies the transmitter output value for setup radio 0, ranging from 250,000 through 4 million microvolts. This is an expert assistance field, set at installation and growth, and input as a decimal digit.

(u) Items XVSU1, XVSU2, and XVSU3 specify the transmitter output values for setup radios 1 through 3, respectively, set the same as for XVSU0.

(v) Items SUTRL0, SUTRL1, SUTRL2, and SUTRL3 specify the return loss (in microvolts) that should be measured by the test receiver for an output signal from an individual setup radio transmitter that is reflected from the antenna cable system. This is an expert assistance field, ranging from 250,000 through 4 million microvolts.

(w) Item BOGSU specifies the bog threshold for the setup radio functional tests. This field indicates the number of times the setup radio functional test fails to complete (or is bogged down) before the craftsperson is notified (via a TTY message sent from the cell). This is an expert assistance field and the data is input as a decimal number.

(x) Item BOGLC specifies the bog threshold for the location radio functional test. This field is defined the same as item BOGSU.

(y) Item BOGRD specifies the bog threshold for the routine diagnostics. This field is defined the same as item BOGSU.

(z) Item SUFTI specifies the setup radio functional test interval or the interval, in seconds, between performance of the setup radio functional test. This is an expert assistance field and the data

is input as a decimal number ranging up to 86,400 seconds.

(aa) Item LCFTI specifies the location radio functional test interval. This field is defined the same as item SUFTI.

(bb) Item TODRD specifies the time-of-day for routing diagnostics to be performed at the cell. The time-of-day is indicated by seconds from midnight. This is an expert assistance field and the data is input as a decimal number ranging up to 86,400 seconds.

(cc) Words 19 through 30 of the auxiliary block contain the address for the voice radio functional group auxiliary block. Each entry in the auxiliary block is indexed by the voice radio frame number (ranging from 0 through 5) and the voice radio functional group within the frame (0 or 1).

(dd) Item VRPO specifies the voice radio output power 0 (primary server group power). Each antenna may have up to two power levels, although it may not be the same as another antenna. This value is input in decimal microvolts, with the same range as XVSU0. This is an expert assistance field and is determined at installation and growth points.

(ee) Item VRP1 specifies the voice radio output power 1 (secondary server group power).

(ff) Item ANTS is used by diagnostics to determine whether diagnostic tests should be performed on an antenna. Item ANTS can be either 0 or 1, where a 0 means no diagnostic tests are performed and 1 means diagnostic tests are performed.

(gg) Item TRL specifies the return loss value (in microvolts) that should be measured by the test receiver for an output signal from a voice radio transmitter that is reflected from the antenna and antenna cable system. This is an expert assistance field with a range from 250,000 through 4 million microvolts.

(hh) Item REPL specifies a diagnostic constant that represents the RSSI value in dBm of signal level that should be measured on a voice radio receiver for a signal injected from the test generator. This is an expert assistance field ranging from 0 through 127.

(ii) Item RRL specifies the return loss value in dB that should be measured on a voice radio receiver for a signal injected from the test generator and reflected from the antenna and antenna cable system. This is an expert assistance field ranging from 0 through 127.

(jj) Item RFPC0 specifies the radio frequency power control threshold for server group 0.

(kk) Item RFPC1 specifies the radio frequency power control threshold for server group 1.

4.51 The function of the voice radio functional group auxiliary block is to provide information for the voice radio functional groups at the cell site. The voice radio functional groups are indexed by the functional group number into the cell master equipage translator auxiliary block. The voice radio functional group auxiliary block is indexed by the radio number. The voice radios at the cell site are grouped into hardware units of eight radios, called a voice radio functional group. There is a maximum of two functional groups on a voice radio frame and a maximum of six frames at a cell site. All auxiliary block fields are craft modifiable. The fields contained in the auxiliary block are defined as follows:

(a) Item FSTAT specifies the status of the entire functional group with the same units as SU0.

(b) Item VG determines whether voice group 0 or 1 is being used when a cell is equipped with 16 channels (8 channels/voice group).

(c) Item VRGCT determines whether there are 8 or 16 channels on this voice radio group (0 = 8 channels, 1 = 16 channels).

(d) Item MODEL determines what type of radio equipment is being used (01 = mod 1, 10 = mod 2, 11 = mod 3). A value of 0 is reserved for future use.

(e) Item WRDN specifies the number of words in the auxiliary block.

(f) Item VRCHNL specifies the channel number the radio is transmitting on. The channel num-

bers range from 1 through 312 if in group A, or from 355 through 666 if in group B.

(g) Item STAT specifies the status of the voice radio with the same units as SU0.

(h) Item ANT specifies the antenna number the voice radio is connected to. Voice radios 0 through 3 are connected to one antenna, and voice radios 4 through 7 are connected to another antenna. This field is the same as explained for the ANT field in the TGN auxiliary block (Fig. 7).

(i) Item SG specifies the server group the voice radio is transmitting over on the antenna it is connected to. This field has the same designation as the SG field in the TGN auxiliary block (Fig. 7).

Cell Master Location Translator

4.52 The function of the cell master location translator (Fig. 27) is to provide mobile signal location information to the cell site. The cell master location translator head table is indexed by the cell site number. Each entry in the head table points to an auxiliary block whose fields are defined as follows:

(a) Item WRDN specifies the number of words in the auxiliary block.

(b) Item LASTRY specifies the indicator signifying to the mobile whether or not the call can be redirected to another cell site for alternate access (used when the cell cannot handle the call due to overload conditions) (0 = the mobile may try again, 1 = last try).

(c) Item CTYPE specifies the cell type (0 = single, 1 = dual).

(d) Item SG0 is composed of 3-bit fields needed for server group 0. The bit fields are defined as follows:

(1) Item STYPE specifies the type of server group (0 = omni, 1 = directional).

(2) Item SS specifies the serving face/strongest face indicator. This indicator determines whether the serving logical antenna (face) or the strongest face should be used for obtaining location information (0 = use the serving face, 1 = use the strongest face).

(3) Item S0 specifies the strongest only indicator. When set, this item specifies that only the strongest face should be used for location candidate selection.

(e) Item SG1 contains the same information for server group 1.

(f) Item VCEQP specifies which faces are equipped with voice radios. Each bit in the VCEQP field represents an antenna face and server group (0 through 7) with 0 = not equipped, 1 = equipped.

(g) Item NDSLT specifies the number of times a signal level trigger is ignored during a delayed trigger state. This value is used when a call is in a degraded state (the signal is weak) yet no other cell can handle the call. The signal is below the threshold strength, but the trigger to hand the call to another cell is ignored NDSLT times. The value for NDSLT is input as a decimal digit ranging from 0 through 3.

(h) Item DRL specifies the alternate cell sites the mobile is directed to for alternate cell site access. Each entry is 8 bits (as opposed to the full 10-bit channel number), as this list is used as a group of offsets from the first setup channel in the MSA. If the cell does not have a set of alternate channels, all entries are zero. The directed retry channel offset list is input as a list of alternate cell sites. The value of FIRSTCHAN is dependent upon various factors, one of them being which channel set is being used (channel set A = channels 1 through 333, channel set B = channels 334 through 666). This can be determined by checking bit 0 of the SID field in the AMPS miscellaneous information translator (Fig. 17), where 1 = channel set A, and 0 = channel set B. There are two base formulas for calculating these offsets, dependent upon which channel set is being used. The formulas are as follows:

For channel set A, offset = (FIRSTCHAN — INCHAN) — 1

For channel set B, offset = (INCHAN — FIRSTCHAN) + 1 where INCHAN is the channel to which the mobile is to be redirected.

There are three conditions that determine the value of FIRSTCHAN:

(1) The first condition exists if the CPA bit in the AMPS miscellaneous auxiliary block is set (when set, this indicates that combined paging and access is allowed). For channel set A, FIRSTCHAN is equal to 333; for channel set B, FIRSTCHAN is equal to 334.

(2) The second condition exists if CPA = 0 and NWAC = 0 (a bit in the AMPS miscellaneous auxiliary block indicating whether access channels start on a different channel than what is burned into the mobile's memory). If NWAC is equal to 0, this indicates that the setup channels follow immediately after the paging channels. For channel set A, FIRSTCHAN = 333 — N, where N is the number of paging channels the mobile has to scan (N-1 field in the AMPS miscellaneous auxiliary block plus 1). For channel set B, FIRSTCHAN = 334 + N.

(3) The third condition exists when CPA = 0 and NWAC = 1 (indicating that access channels start on a different channel than what is burned into the mobile's memory). For both channel sets, FIRSTCHAN is equal to NEWACC. NEWACC is the field in the AMPS miscellaneous auxiliary block, indicating the starting channel number of the new set of access channels.

4.53 The rest of the auxiliary block is a list of pointers to the cell site neighbor auxiliary block and is indexed by antenna face (0 through 3) and server group (0 through 1). Refer to Table B for the indexing scheme. The cell site neighbor auxiliary block contains a list of information needed for every cell site neighbor (a cell which may take over the call the current cell is handling). The fields contained in this auxiliary block are defined as follows:

(a) Item PRIM specifies the primary signal strength threshold (used to compare with the measured signal strength of the mobile radio), input as a decimal integer ranging from 0 through 127. Decimal integer 0 is — 130 dBm, 127 is — 30 dBm, with the rest of the integers evenly distributed across the numerical range.

(b) Item SCND specifies the secondary signal strength threshold with units the same as PRIM.

(c) Item CNDLST specifies the minimum number of location candidates (cells to give the call to) allowed on the list, which is sent to the MTSO for possible handoff. This value is input as a decimal digit ranging from 0 through 3.

(d) Item INTP specifies the interference signal strength protection threshold used to determine if a signal is really being received on a channel or whether noise is being received. This field has the same units as PRIM.

(e) Item ACC specifies the access signal strength threshold used to measure the mobile radio signal strength upon access to the system. This field has the same units as PRIM.

(f) Item VMAC specifies the voice mobile attenuation code used to tell the mobile what power level to transmit on the voice channel of the call. This value is input as a decimal digit ranging from 0 through 7, represented the same as for CMAC in the cell master status translator (Fig. 24).

(g) Item GINGHBR specifies the number of group 1 neighbors. These cells are the preferred cells for handoff. These cell site neighbors are the first neighbors on the neighbor list (starting in the next word), with group 2 neighbors listed afterwards. Each cell site face may have up to 12 cell site neighbors (group 1 plus group 2).

(h) Item DPCI is the dynamic power control indicator. The dynamic power control indicator, when set, indicates that the dynamic power control feature is allowed and words 2 through 8 contain information for dynamic power control. If the dynamic power control indicator is not set, words 2 through 8 will be part of the neighbor cell site list (depending on the number of neighbors) and will not contain dynamic power control information.

(i) Item SGPAID indicates which power amplifier currently is used by the server group. This field is 2 bits long: 0 indicating a 12-watt programmable amplifier is in use, 1 indicating a 45-watt nonprogrammable amplifier, and 2 indicating a 45-watt programmable amplifier.

(j) Item STF specifies a speed trending flag. The speed trending flag controls the ability of the system to use speed trending to reduce real-time processing. When set (=1), speed trending is used.

Scotty's Spectrum Analyzer – Clock Oscillator

Overview

This is my version of the master clock oscillator for Scotty Sprowls' Modularized Spectrum Analyzer (MSA) project. The original MSA oscillator design is SLIM–MO–64.

The main difference here is using a 10 MHz Temperature Compensated Clock Oscillator (TCXO) instead of the recommended 64 MHz clock oscillator. The MSA software has a setting for changing the clock oscillator frequency, and it looks like 10 MHz will work, but this hasn't been tested yet.

The recommended Analog Devices AD9850 DDS has an (undocumented) internal 4x multiplier which can be used to convert the 10 MHz external clock into a 40 MHz internal clock. Since the DDS is programmed to output a 10.7 MHz signal, the *minimum* internal clock frequency is 21.4 MHz (Nyquist), so the 40 MHz should work out quite well. The overall phase noise will also be slightyly increased by using the multiplier, but should be well within spec. The Analog Devices AD9851 may be a better "drop in" choice. Also, the 1024 MHz second local oscillator for my version of the spectrum analyzer will be done using a Mini–Circuits KSN–1024A+ fixed oscillator and it requires a 10 MHz reference input.

The master oscillator module contains a 10 MHz clock oscillator and three 7SZ04 buffered line output drivers (Digi–Key Part: NC7SZ04M5XCT–ND). Each output is 5 volt CMOS that can drive a 50 ohm line that is terminated with either a high impedance load or 50 ohms. A 33 ohm resistor is shown as a series element in each output.

For a 50 ohm line, with a high impedance load at the end of that line, the mismatched load will create a reflection. The reflected signal will be dissipated in the series 33 ohm resistor plus the internal resistance of the 7SZ04 driver (approximately 17 ohms). For a 50 ohm line, with a 50 ohm load at the end of that line, the 50 ohm load will receive a 2.5 volt peak–to–peak square wave. If this is not sufficient, the 33 ohm series resistor can be replaced with a low–impedance coupling capacitor (0.01 µF).

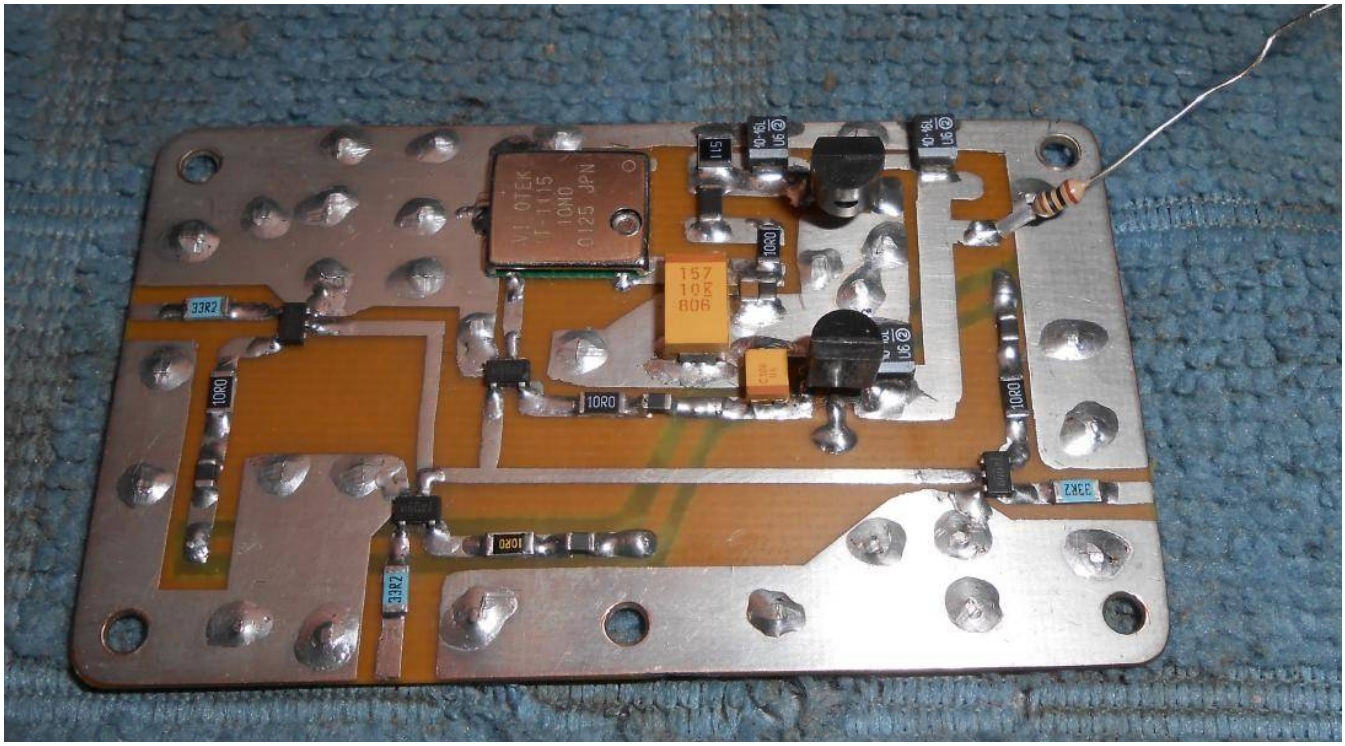
The clock oscillator used here is a Vectron T–1115–10M0 miniature 10 MHz TXCO. These are available for $6 (for two) on eBay from the seller "rfextra." They appear to have a custom part number, but the datasheet for the "OSC Series" of oscillators from Vectron covers this model.

These Vectron oscillators have decent specifications for such a low cost and small package. They have a +/– 2.5 ppm frequency stability with a +/– 3 ppm mechanical trim adjust on top. Phase noise at 100 Hz is –125 dBc/Hz and at 1,000 Hz is –145 dBc/Hz. The mechanical trim adjustment will require a special trim tool (Vectron Part: KMDR050) – or you just need to do a little bit of hacking in order to tweak the final output frequency. The stock, untrimmed output frequency of the oscillator used here was 9,999,987 Hz after about 15 minutes of warm–up time.

The 7SZ04 high–speed inverters are required to reduce clock jitter and hence phase noise. Also, using individual inverter/buffers allows you to decouple each of their Vcc lines from each other, further reducing the potential for EMI.

Using a square wave clock for a spectrum analyzer has the potential to generate alot of strong harmonics which may be seen as spurious images on the analyzer's display screen. For this reason semi–rigid hardline coax, such as RG–402, RG–405, UT–141, etc., should be used throughout the spectrum analyzer project.

Pictures & Construction Notes



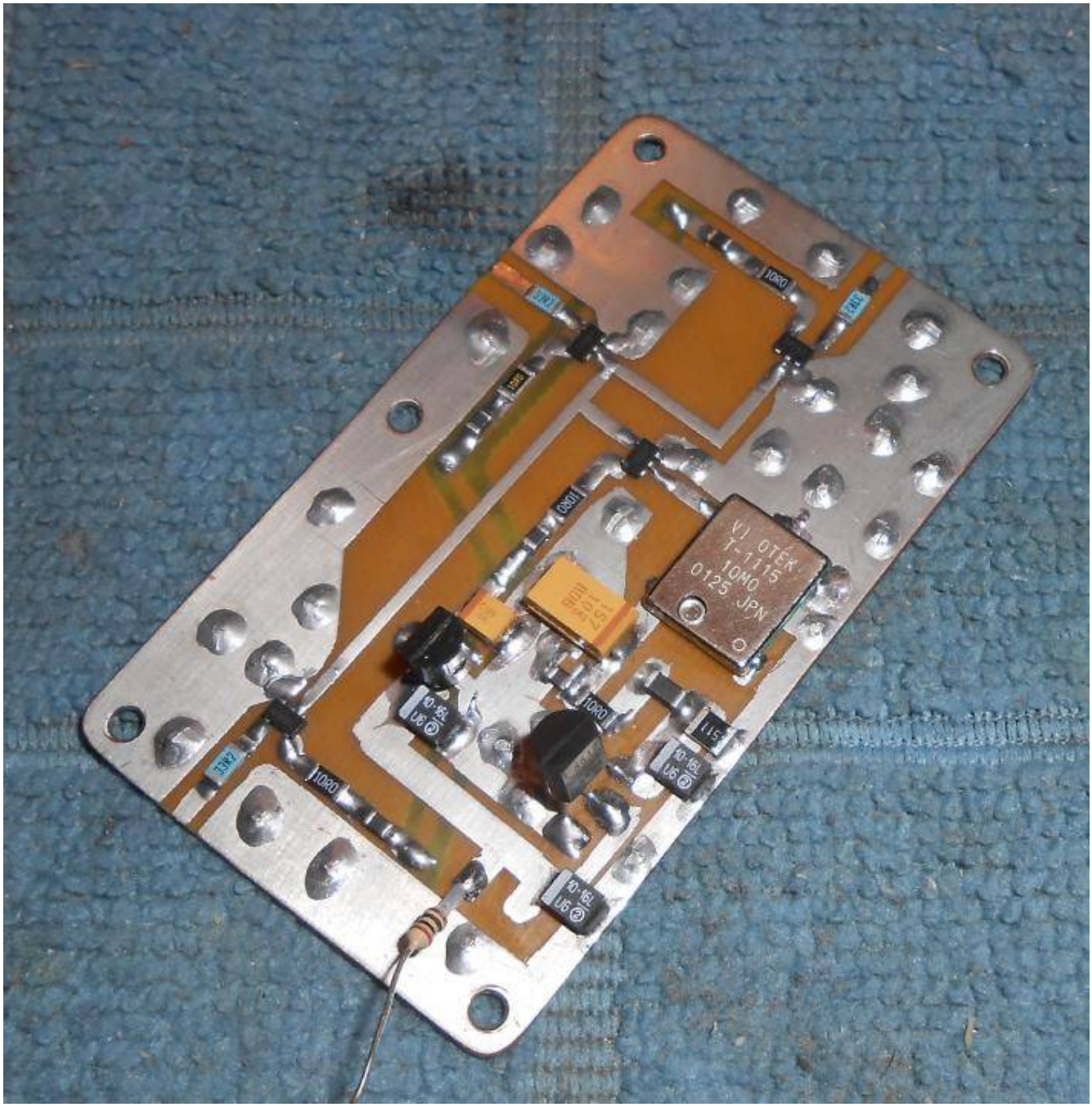
Overview of the 10 MHz TCXO master oscillator circuit board.

The +5 VDC power supply for the oscillator should be from a very stable and fairly low−noise regulator, like a Sieko S−81250SG or TL431 reference, but a regular 78L05 will do.

Most voltage regulators can have their output voltage noise reduced by increasing their output current with an extra load resistor. A 510 ohm resistor will provide a steady 10 mA current draw at 5 volts.

Ideally, the Vectron T−1115−10M0 oscillator should have its own +5 VDC low−noise voltage regulator to help further isolate it from the digital switching logic noise.

The pictures don't match the schematic due to circuit tweaking. The schematic is correct.



Alternate view

The +5 VDC voltage regualtors are the two TO−92 devices on the bottom.

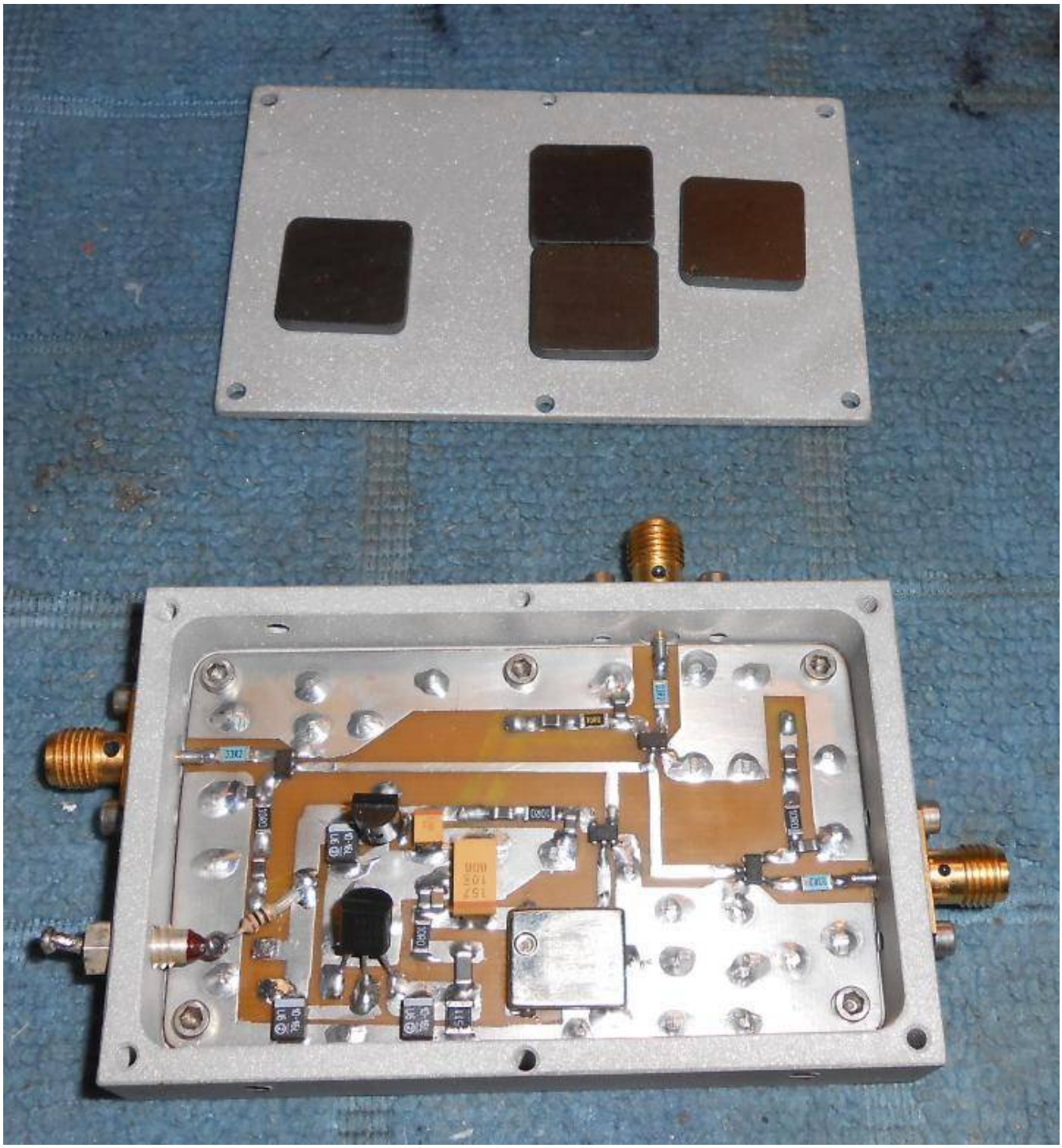
The Vectron oscillator requires a special trim tool − which I didn't have.

I ended up using a fine−tipped metal scrib to "twist" the tuning control a bit to raise the frequency a few Hertz.

Overview of the bottom of the printed circuit board.

The trace is for the +5 VDC power for the 7SZ04s.

It's covered in Kapton tape to prevent it from shorting out when mounted in the case.



Mounting the 10 MHz master oscillator circuit in an old cellular phone receive pre−amplifier case.

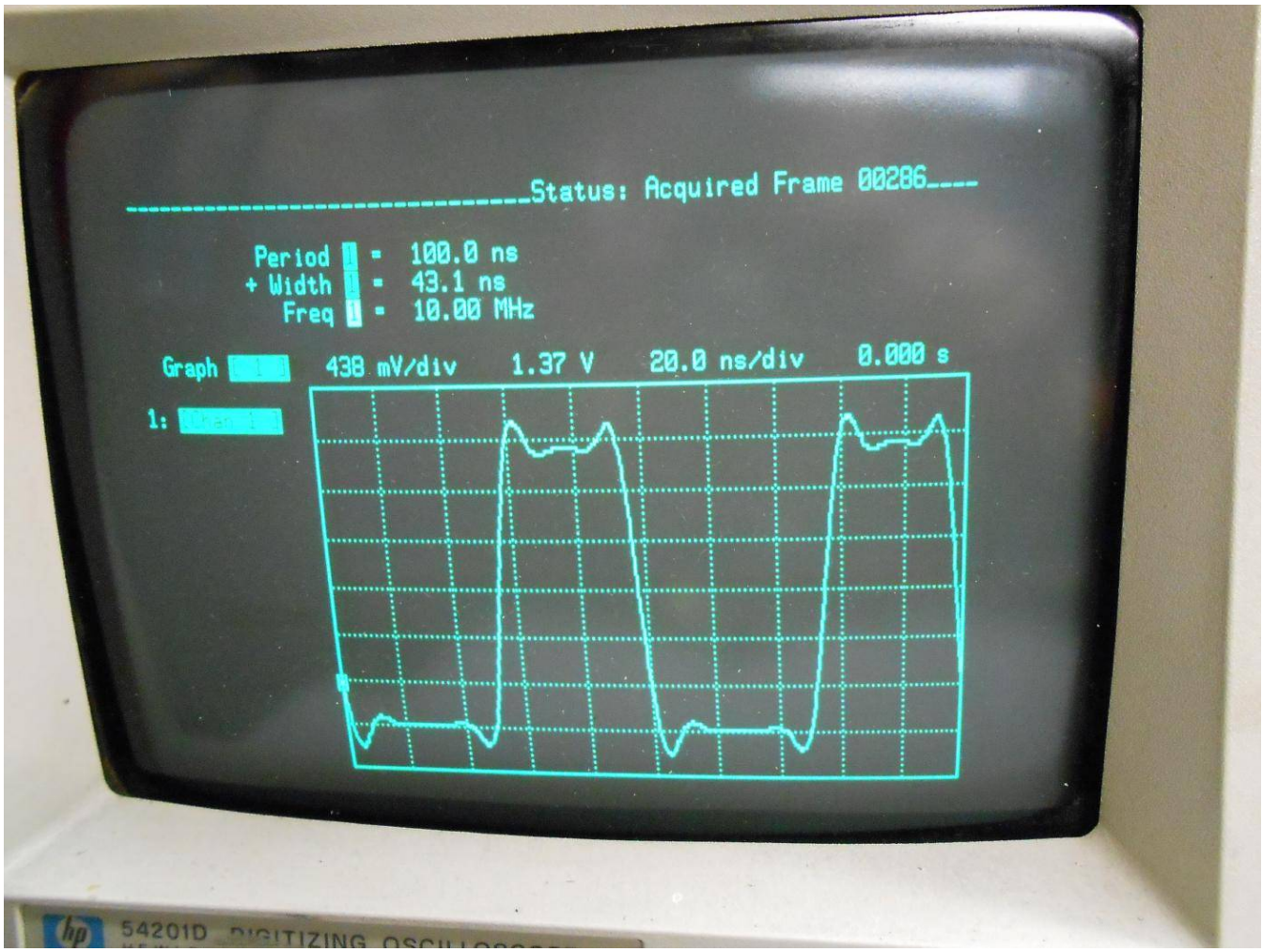
Three SMA jacks are used for the clock outputs.

A 1000 pF feed−through capacitor is for the +12 VDC power input.

The lid of the case has a few stick−on ferrite EMI absorption plates (Digi−Key Part: 240−2264−ND). These are optional, but the idea is to help reduce any radiated interference from creating spurious images on the spectrum analyzer display.

Completed 10 MHz master oscillator circuit overview.

The **MASCLK1**, **MASCLK2**, and **MASCLK3** connections should be via 100% shielded RG−405 or UT−141 semi−rigid coax to reduce interference.



100 MHz oscilloscope view of the output waveform.

No major circuit problems or oscillations were found.

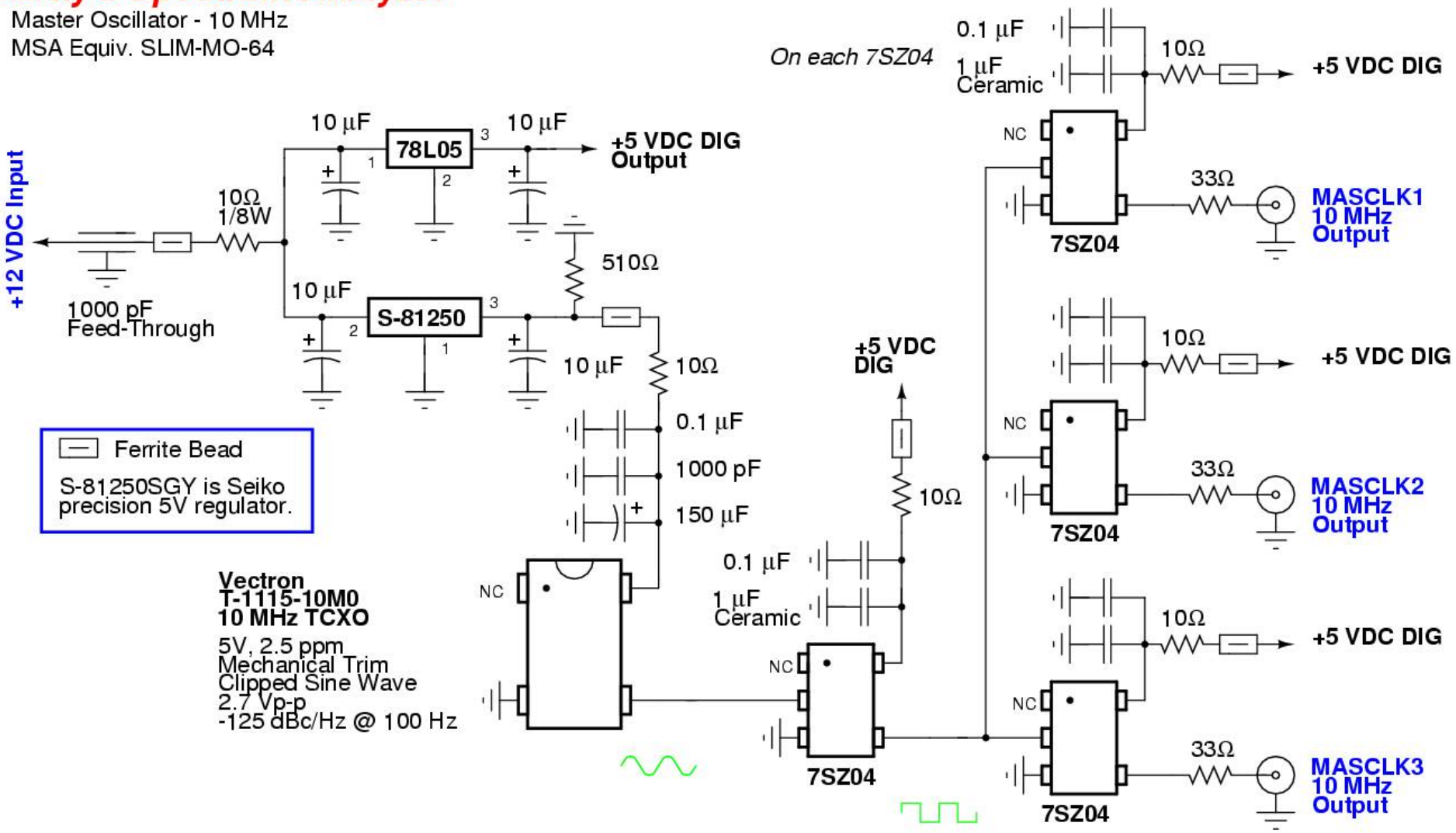
The output voltage is "halfed" as the scope was set for a 50 ohm termination.

The waveform has a 100 nanosecond period with a 43.1 nanosecond pulse width for close to 50% duty cycle.

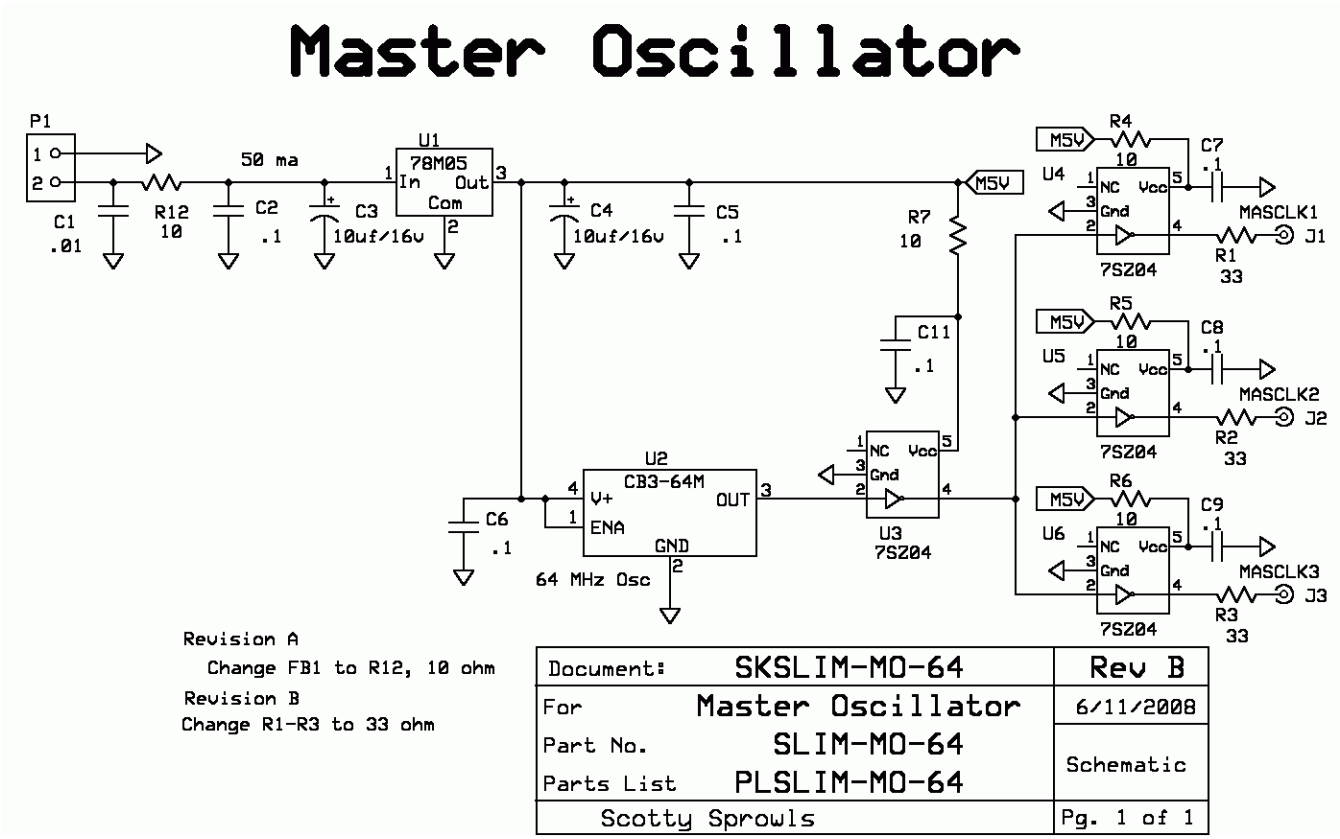
Most low–cost clock oscillators of this type provide a 60/40 percent duty cycle.

Scotty's Spectrum Analyzer

Master Oscillator - 10 MHz
MSA Equiv. SLIM-MO-64



Original SLIM–MO–64 Schematic



Scotty's Spectrum Analyzer – Control Board

Overview

This is my version of the control board for Scotty Sprowls' Modularized Spectrum Analyzer (MSA) project. The original MSA control board design is SLIM–CB–NV.

There are no major differences between my version and the Scotty version, except for adding ferrite beads on the incoming DB25 data lines.

The latch section of the control board consists of four 74ACT573 buffer latches with CMOS outputs and TTL compatible inputs The inputs are from the computer's standard LPT printer port, carried via a DB25 female connector and matching double–male DB25 cable. Try to keep the cable length as short as possible.

The outputs of the latches are accessible via four 9–pin SIP sockets used as headers. These are optional, but recommended to help in troubleshooting.

Another 4–pin header is a direct connection for the four LPT status signals which are "read" by the computer. Two of these signals, ACK (pin 10) and WAIT (pin 11), are used by the MSA's A–to–D converter. Note that the WAIT line is often referred to as the BUSY line. The other two status lines, PE (pin 12 – Paper End or Paper Out) and SELECT (pin 13) are not used by the MSA or VNA, but may be in the future.

The four status signals should have 2.2 kohm pull–up resistors (to +5V). Some home computers do not have internal pull–up resistors and, if so, these resistors are necessary. Here is a test to see if the pull–up resistors are required. Re–boot the computer, the use a voltmeter to measure from computer ground to LPT port pins 10, 11, 12, and 13. If any of these pins are showing greater than +2.0 volts, the pull–ups are not required.

All four of the 74ACT573 latch ICs are fed by the parallel data from the computer. The data will be passed to the latch's output when its "latch enable" line is commanded high. If enable is kept high, the output data will follow the input data. When the enable is brought low, the data will be retained as a latch.

The control board is a generic module that will be integrated into a higher assembly. Therefore, the signal names in the schematic are generic. For example, the data signal that exits the computer is called D0. It is buffered by the four 74ACT573 latches, labeled P1–P4. The name changes at the output of each latch, for example, P1D0. This is Data Bit 0 on connector P1 (P1 output). Once the control board is integrated into a higher assembly, the signals are assigned more meaningful names.

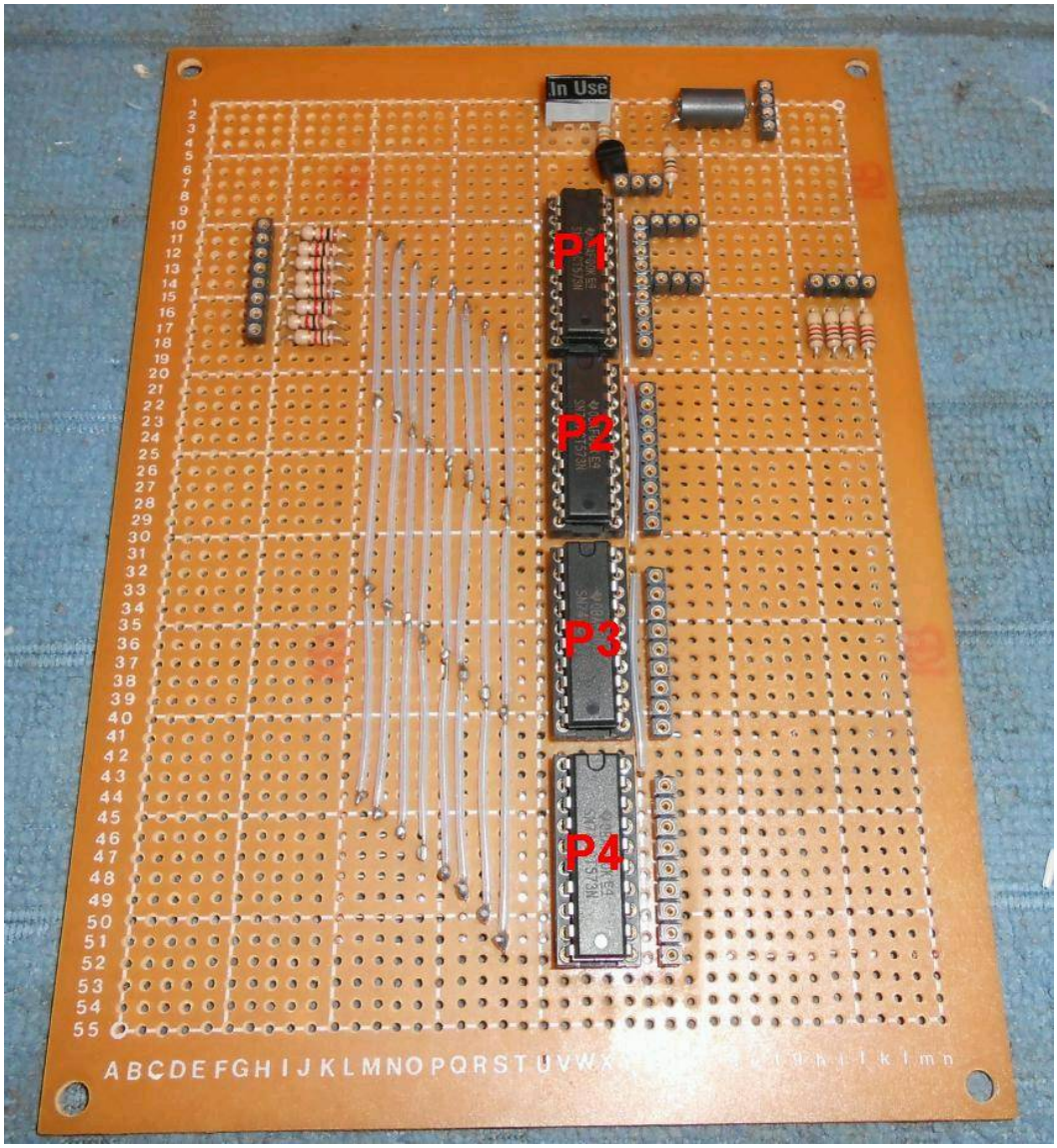
The control board is the only module which doesn't require shielding or a proper circuit board. The control board shown here was made using a perf board from Radio Shack (276–147). The 74ACT573s should be in sockets to ease replacement in case of damage from static or anything else. The wiring on the perf board can be done using point–to–point solder "blobs" and tinned buss wire.

Not all the signals will be used when just building the spectrum analyzer, but they all should be noted in case you want to expand on the design or build the matching Vector Network Analyzer (VNA) or tracking generator in the future.

Control Board – Latch Section Wiring Diagram

Latch Output	Module Signal
P1D0	CLK for PLO1, PLO2, PLO3, DDS1 (WCLK), DDS3 (WCLK)
P1D1	DATA for PLO1
P1D2	BD7 for DDS1
P1D3	DATA for PLO3 (not used)
P1D4	DATA for PLO2, BD7 for DDS3
P1D5	A0 for Filter Bank (not used)
P1D6	A1 for Filter Bank (not used)
P1D7	Not used
P2D0	LE for PLO1
P2D1	FQUD for DDS1
P2D2	LE for PLO3 (not used)
P2D3	FQUD for DDS3 (not used)
P2D4	LE for PLO2
P2D5	Reserved PDM (not used)
P2D6	INVP for PDM (not used)
P2D7	Not used
P3D0	Not used
P3D1	Not used
P3D2	Not used
P3D3	Not used
P3D4	Not used
P3D5	Not used
P3D6	SERCLK for ADC
P3D7	CONVERT for ADC
P4D0	V0 for Video Filter (not used)
P4D1	V1 for Video Filter (not used)
P4D2	G0 for RF Path Switch (not used)
P4D3	G1 for RF Path Switch (not used)
P4D4	FR for DUT Switch (not used)
P4D5	TR for VNA Bridge (not used)
P4D6	Not used
P4D7	PULSE for DUT or RF Path Switch (not used)

Pictures & Construction Notes



Overview of the control board built on a piece of Radio Shack perf board.

The 74ACT573 latches should be in 20–pin sockets.

SIP sockets are used as headers for the output connections. This allows both matching with another SIP socket or direct soldered wired connections.

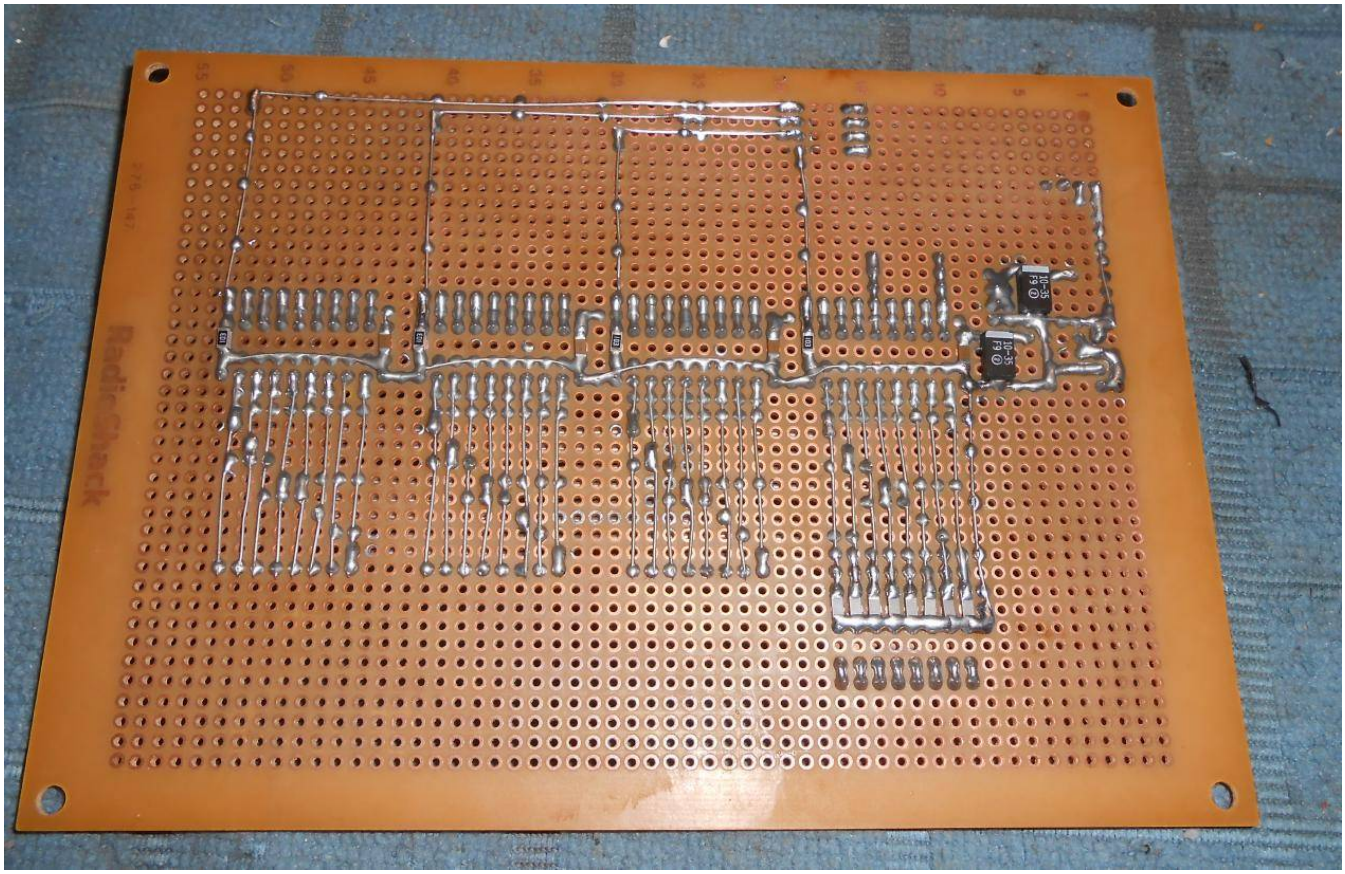
The parallel inputs to the latches are on the left.

The outputs from the latches are on the right.

The 4–pin SIP sockets on the right side is for the latch enable lines.

The 4–pin SIP sockets on the top near the ferrite bead are for the circuit's +12 VDC power input.

The series 1 kohm resistors are used to prevent signal reflections on the parallel cable connection to the computer.



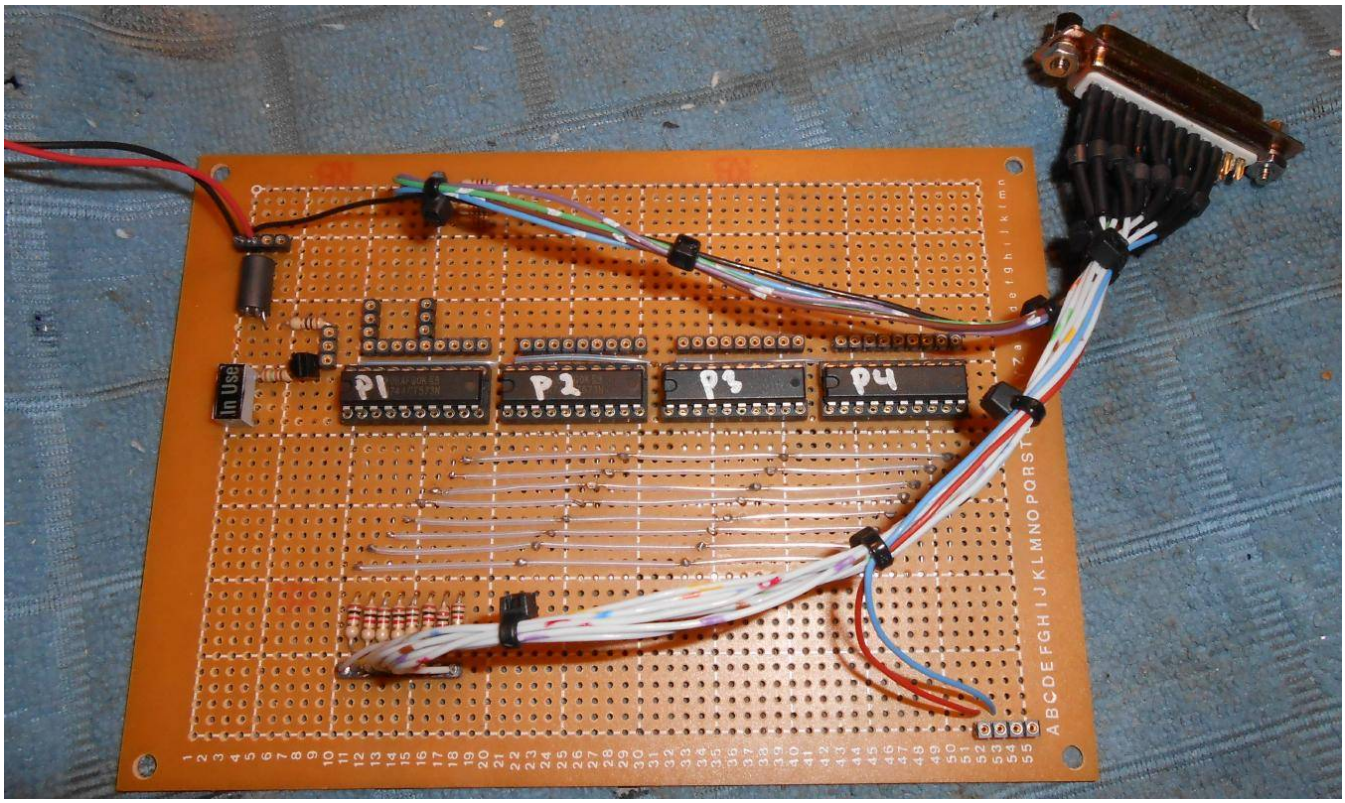
Bottom overview of the control board.

Solder blobs and tinned buss wire are used for all the connections.

The 0.1 inch copper pad spacing on the perf board means you can use 1206 size surface−mount components for the 100 pF capacitor / 10 kohm resistor network on the 74ACT573 latch enable lines and for the 0.1 µF capacitor on the Vcc lines.

There are also surface−mount 100 pF capacitors on the `D0 - D7` input lines from the parallel port.

A standard 78L05 voltage regulator with 10 µF caps on the input and output supplies the +5 VDC for the 74ACT573 latches. This is not shown in the schematic.

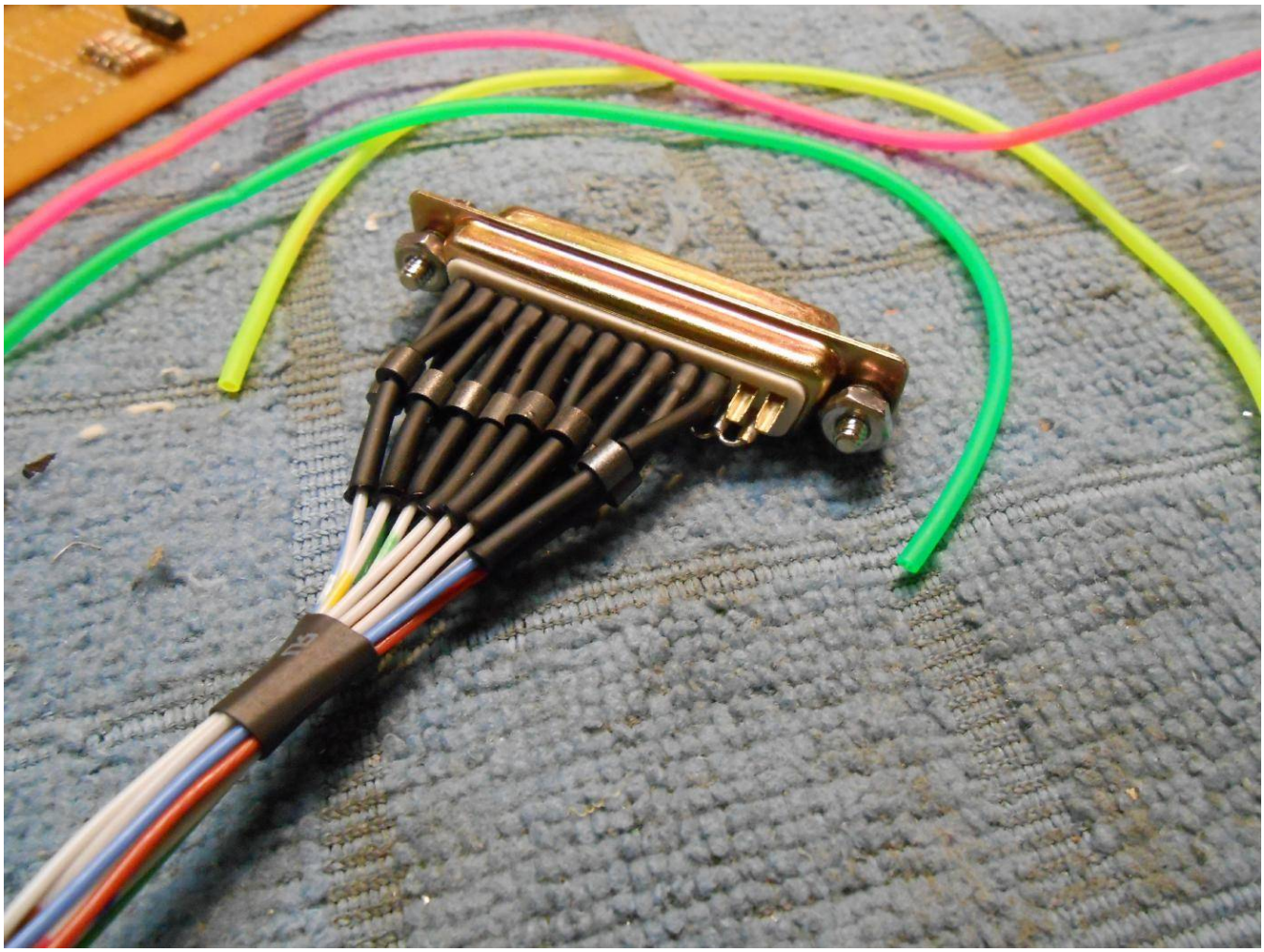


Overview of the completed control board with the DB25 (female) wiring added.

The DB25 wires should be as short as possible.

The wire connections to the outputs of the latches should be in a "star" configuration, that is, tied to a single point.

This is especially important for the `P1D0` connection as this serves at the clock signal for a number of modules. Also try to make those interconnection wires all the same length to minimize clock signal reflections.



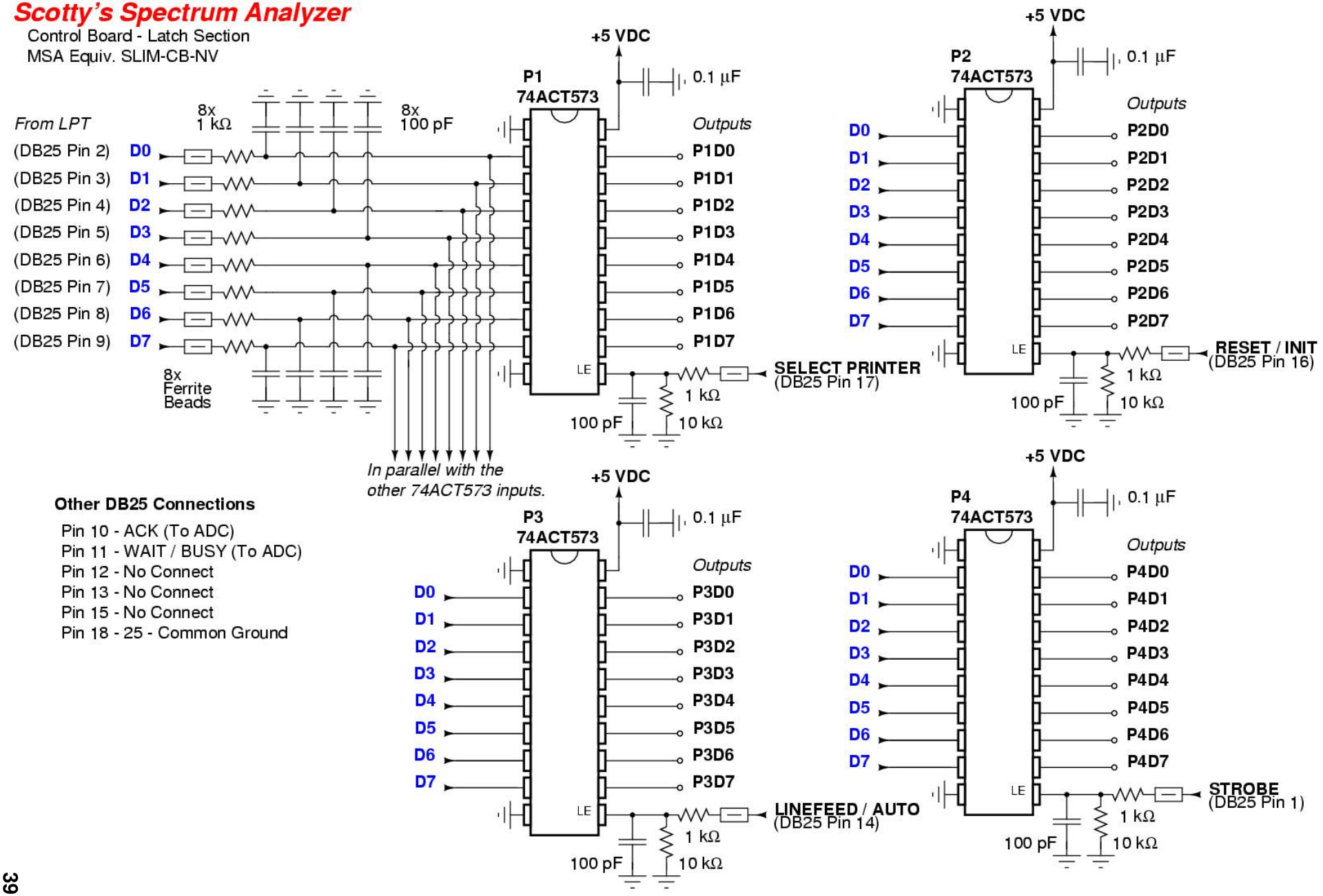
Ferrite beads were added to each of the data and status lines on the DB25 connector.

"Jelly" bracelet material available at Hobby Lobby is used to isolate each of the solder connections and to secure the ferrite beads.

The common ground wires (pins 18 – 25) should not have a ferrite bead on it.

Scotty's Spectrum Analyzer

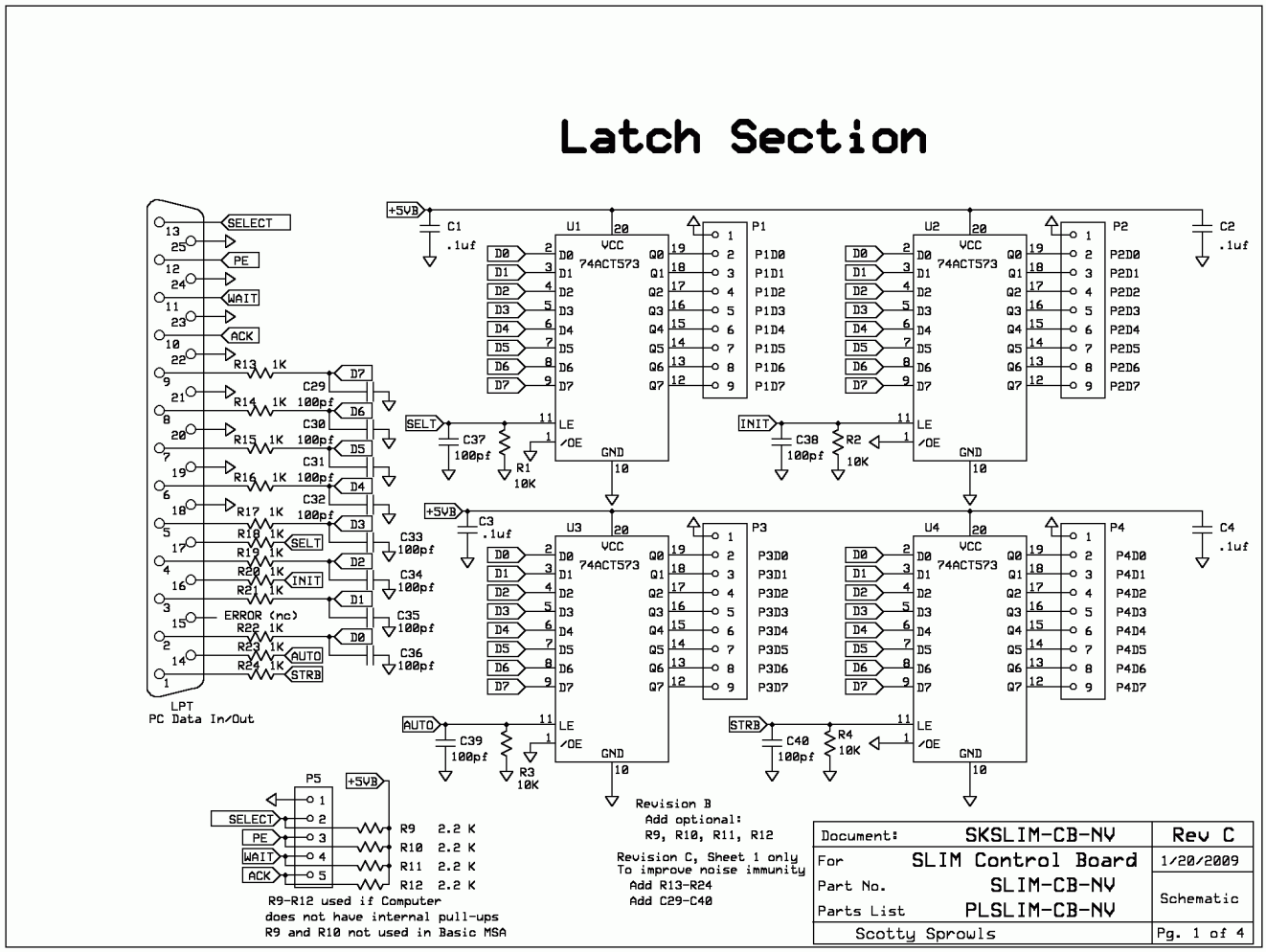
Control Board - Latch Section
MSA Equiv. SLIM-CB-NV



Other DB25 Connections

Pin 10 - ACK (To ADC)
Pin 11 - WAIT / BUSY (To ADC)
Pin 12 - No Connect
Pin 13 - No Connect
Pin 15 - No Connect
Pin 18 - 25 - Common Ground

Original SLIM-CB-NV Schematic



Bonus

This is how *REAL* charity is done!

Golden Dawn America (New York) collected over 3 tons of food, aid, and medicine for shipment to needy families in Athens, Greece.

They received donations from all over the U.S. and even as far away as Australia!

It was distributed on July 24, 2013 in Attica Square in Central Athens.

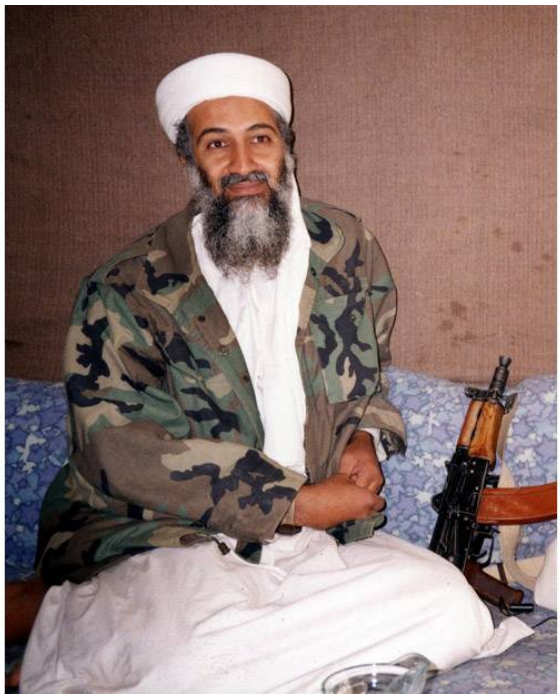
"Like many places in the center of Athens, Attica Square was once a peaceful residential area with many small businesses and families, by around 2007, the area around the square had become infested with mostly Bangladeshi, Afghan, and African illegal immigrants, who used the square to sleep in, sell drugs, and to rob the elderly people walking near it. Golden Dawn stepped in and since that time after much work, the area around the square has improved dramatically, and next week this same area will be used to distribute aid to the people Greek politicians care about the least."

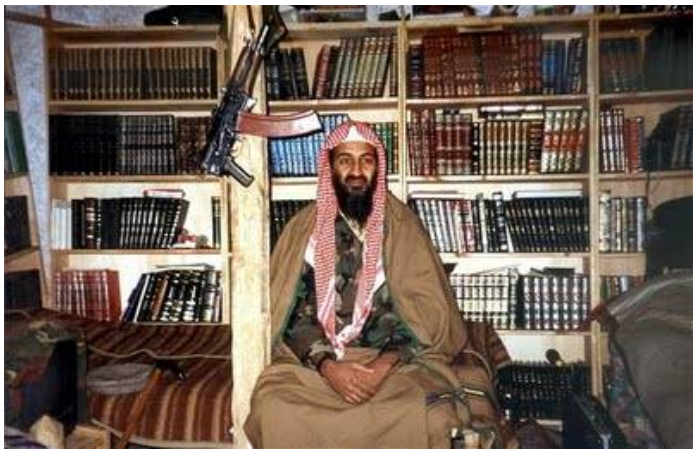
End of Issue #112

Any Questions?

Editorial and Rants

On display at the CIA's internal museum – which isn't open to the public: Usama bin Laden's "iconic AK–47" captured by Navy SEALs during the May 1, 2011 raid on his compound in Pakistan.

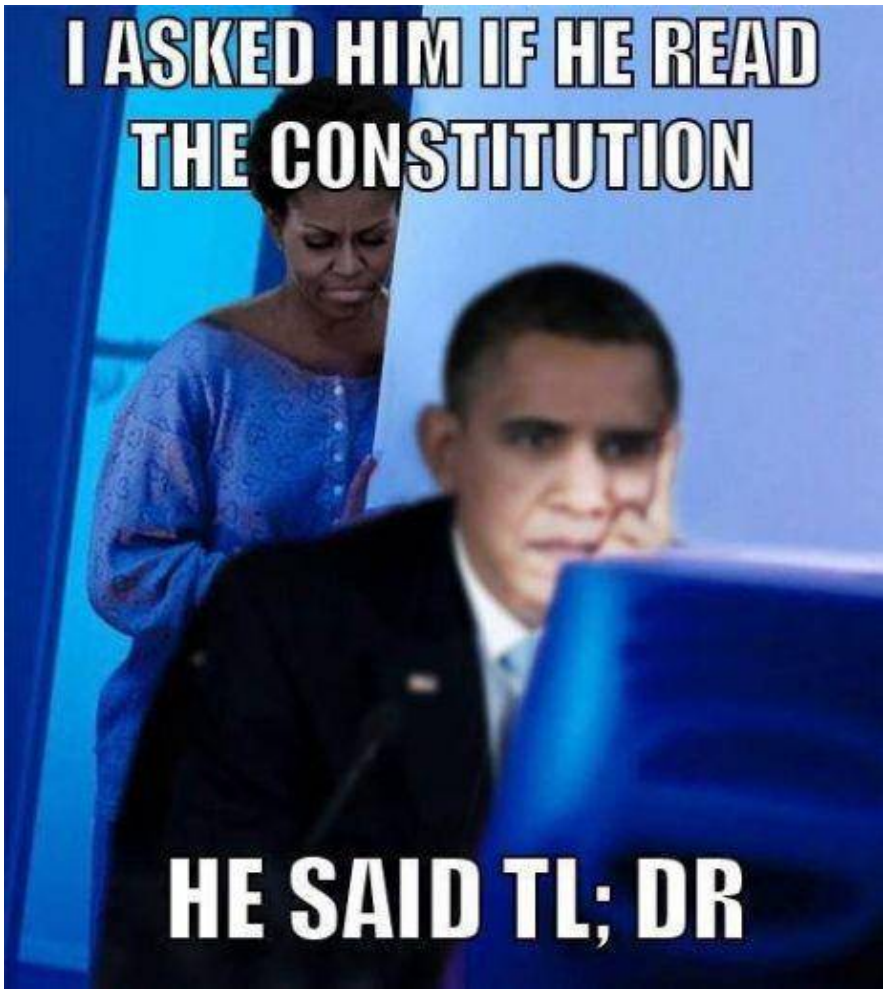




Just one little problem... Usama bin Laden carried an AKS–74U with what appears to be a bakelite RPK–74 (5.45 x 39) 45 round magazine! UBL allegedly took this weapon from a dead Russian soldier during their invasion of Afghanistan in the 1980s.

Change!


42°
LOCAL
6
Gun Shaped Cloud Spotted Over School
ALL STUDENTS SUSPENDED FOR 5 DAYS


I ASKED HIM IF HE READ THE CONSTITUTION
HE SAID TL; DR

(wikileaks.org/gifiles/docs/1210665_obama–leak–investigations–internal–use–only–pls–do–not.html)

Michael Hastings was investigating CIA director John Brennan just before his death on June 18, 2013.

Poking through the Stratfor emails on WikiLeaks found this gem.

Don't ask questions, kid...

"Just for the fun of it."