DEPARTMENT OF THE AIR FORCE
AIR FORCE FLIGHT STANDARDS AGENCY
1535 COMMAND DRIVE, SUITE D-306
ANDREWS AFB, MD 20762-7002

AT-E-07

AIR TRAFFIC CONTROL TRAINING SERIES

EQUIPMENT

AN/TPX-42A
HANDBOOK

22 July 1993

FOREWORD

PURPOSE: This publication is for use in the training of USAF air traffic controllers and is not intended to replace, substitute for, or supersede official regulations, procedures, or directives.

CLARENCE PONDS, LTC, USAF
Director, Operations and Training
Air Traffic Services Center

CORRECTIONS TO "AT" TRAINING SERIES

When you encounter an item that is not correct or needs clarification, write to us about it. Use this page and reference the series number, the page, and paragraph number. State briefly what is wrong and then write your correction or suggestion to correct or improve it. Detach this page from the booklet and return it to:

> HQ AFFSA/XAOT
> 1535 COMMAND DRIVE, SUITE D-304
> ANDREWS AFB, MD 20762-7002

You can also e-mail the above information to us at AFFSA.XAOT@andrews.af.mil. Also remember to browse the HQ AFFSA/XAO Homepage for information on current training news and products. The internet address is http://andrews.af.mil/tenants/affsa/xao.htm.

<u>INTRODUCTION</u>

This publication is designed to be used in conjunction with hands-on training and/or classroom instruction to familiarize air traffic controllers with operation of the AN/TPX-42A. It doesn't replace applicable maintenance technical orders which are the official directives for this equipment. The publication is divided into three sections:

Section I. Description and characteristics of the AN/TPX-42A controls, functions and operating indications.

Section II. Familiarization and display interpretations.

Section III. TPX-49 operating instructions.

The AN/TPX-42A interrogator set provides a beacon system that works with, but gives separate and additional capabilities to our radar air traffic control facilities. The set has four major modes available, Modes 1, 2, 3/A, and C. Modes 1 and 2 are for military use. Mode 3/A, which now has a 4096 code capability, is the common civil/military mode. Mode C is used For automatic altitude transmissions and is continuously operable. It is automatically interlaced with Mode 3/A, and causes specific altitude data from cooperative IFF targets to be displayed on the plan position indicator (PPI) when desired by the controller. The AN/TPX-42A will interrogate aircraft on all modes used, within an altitude range of -1,000 feet up to 127,000 feet.

An indicator control (A box), installed at each operational position, permits you to select up to 10 channels using basic (64 code) and/or discrete (4096 code) decoding for display on the associated PPI. You have the option of selecting beacon radar video on aircraft replying to discrete codes, or a combined presentation. Through the use of target filtering, only those targets meeting specific identity or altitude criteria are displayed to the controller concerned. This reduces target clutter on the radar indicators. The AN/TPX-42A reinforces the primary radar target through the use of brackets, and beacon and radar video information also complement one another on the radar display since the systems are made range coincident. As a result, the information presented is unmistakably associated with the reporting aircraft's video.

The data displays, or tags, consist of target symbols, numeric identity codes, altitude numerics, bracket video, and other special symbols. This allows you to rapidly identify, understand, and control your aircraft individually at each PPI. The AN/TPX-42A also provides constant monitoring of emergencies, communications failures, and hijackings independent of indicator range. Included are provisions for aural and visual indications of these conditions. To aid in target identification, a Special Position Identification (SPI) pulse may be used with any of the codes upon request. You also have the choice of displaying small position symbols, called trail dots, showing the previous locations of traffic. This feature gives you an indication of the aircraft's direction and velocity. You have the option to hold back part, or all, of the information, and place the identity code and altitude numerics (tag) in a position north, south, east, or west of the aircraft position symbol, or centered upon it. This gives you some control in relieving overlapping display situations.

These AN/TPX-42A features minimize controller-to-controller and controller-to-pilot coordination by providing needed information automatically. This allows both the controller and pilot to devote more time to other critical tasks. It also relieves frequency congestion, and allows both the controller and the pilot to make necessary radio contacts without delay. Aircraft equipped with an automatic altitude reporting transponder will continuously provide you with their altitude information, simplifying traffic advisories and reducing frequency congestion.

ABBREVIATIONS/TERMS

AART - Automatic Altitude Reporting Transponder
A Box - Indicator Control
A/C - Aircraft
ALT - Altitude
APGU - Azimuth Pluse Generator Unit
ASR - Airport Surveillance Radar
ATC - Air Traffic Control
ATCRBS - Air Traffic Control Radar Beacon System
AZ - Azimuth
B Box - Interrogator Set Control (Master Control Panel)
BRKT - Bracket
COMM - Communications
DAIR - Direct Altitude Identification Readout
DMR - Dimmer
D Switch - Discrete Feature
EMER - Emergency
FL - Flight Level
IFF - Identification Friend or Foe
INTERR - Interrogator
INTRG - Interrogator
IR - Interrogator Responder
LO - Low
MAX - Maximum
MI - Mile
NMI - Nautical Mile
OVRD - Override
POSN - Position
PPI - Plan Position Indicator
PWR - Power
RABM - Range Azimuth Beacon Monitor
RDC - Reduced
RF - Radio Frequency
SIF - Selective Identification Feature
SLS - Side Lobe Suppression
SPI - Special Position Identification
FRUIT - Clutter On Radar Display-False Displays And Code Garbling
TAG - Data Displays Consisting Of Target Symbols, Bracket Video, Identity Codes, Etc
TRAIL DOTS - Small Position Symbols Indicating Previous Aircraft Positions (Track)
COOPERATIVE AIRCRAFT - Transponder Equipped Aircraft
RING AROUND - False Targets On Several Radials At The Same Range As The True Target

SECTION I

DBSCRIPTION AND GENERAL CHARACTERISTICS

AN/TPX-42A CONTROLS, FUNCTIONS, AND OPERATING INDICATIONS

The operational controls of the AN/TPX-42A consist of two types of control boxes: A box and B box. An A box (Indicator Control) is located at each ASR scope and contains the controls and indicators required by the operator to control the selection of target data at each particular radar display. The B box (Interrogator Set Control) is the master control panel and contains the controls and indicators needed for selecting the various AN/TPX-42A capabilities and available features. It is used to monitor and control major functions of all operating positions. Both the A and B boxes include press switches that have off/on functions and illuminate when on. At those locations equipped with Programmable Indicator Data Processor (PIDP) systems, not all of the switch functions of the A and B Box apply, those switch functions not used at PIDP locations will be identified by an "*". Some switch functions in this document have been replaced by a keyboard sequence or moved to the Indicator Control Front panel assembly of the PIDP equipment. See the PIDP Operators Manual for functions transferred to the PIDP equipment.

A BOX (INDICATOR CONTROL)

This section describes the operational controls of the A box. Using Figure 4, located in the back of this guide, and Table 1 below, associate the function of each control to its location on the A box.

Table 1
A Box - Operator's Controls and Indicators

CONTROL/INDICATOR	FUNCTION

ALTITUDE FILTER SWITCH
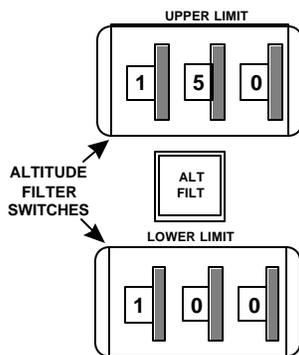
*This thumbwheel control consists of two sets of switches with numeric indicators that limit the display of Mode C readouts to a specific altitude/flight level layer, and an ALT FILT (altitude filter) button. The desired layer is selected by setting the top elevation of the layer with the UPPER LIMIT switches, and bottom elevation of the layer with the LOWER LIMIT switches. Limits are expressed in 100-foot increments from 000 to 999.

*When selected, the ALT FILT (altitude filter) button will filter out Mode C beacon returns from aircraft transponding altitude information above or below the selected altitude/flight level limits. As a result, target formats for these aircraft won't be displayed. Accepted altitude filtered targets (targets with Mode C replies which fall within the selected layer) are displayed with the select aircraft position symbol (X) or the all aircraft position symbol (O) with code/altitude numerics if selected.

NOTE 1: Above FL 180 the AN/TPX-42A sensors produce an altitude signal referenced to standard altimeter 29.92. Below FL 180 this signal is corrected to the station altimeter. Use caution when setting the top layer elevation at or near FL 160 since aircraft passing through FL 180 can have a variance in altitude readout of up to 2,000 feet. With the ALT FILT switch on, a descending aircraft could be filtered from the display until descending through 16,600 feet.

NOTE 2: Altitude correction in the continental US is based on the transition altitude (FL 180). Areas outside the US use different transition altitudes.

Targets replying without Mode C, or garbled / invalid Mode C replies are forced displayed as if they were within the altitude filter zone with the appropriate position symbols (X or O) surrounded by a box. This box isn't displayed for "ident" or "SPI " replies. Forced displays only occur when the controller has activated either the same select code channel position switch as the target, or the ALL A/C POSN switch. Again, as in all altitude displays, slash characters (///) indicate that no altitude data is available and is displayed in conjunction with the box symbol and code. Valid Mode C replies from targets reported over 99,900 feet still display three dashes (- - -) in place of altitude numerics. Regardless of the altitude/flight level, emergency, hijack, and communications failure replies, with or without Mode C, are forced displayed onto the radar indicator. Positions are displayed by the symbol X (surrounded by a box if not within the altitude filter layer) with the appropriate code and altitude, if selected.

MODE SELECTED INDICATOR

(1) (2) (3A) (C)
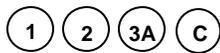
These four green indicators, when lit, indicate the interrogation modes being transmitted by the on-line transmitter-receiver.

MODE SELECT SWITCH

Selects the mode for code display interrogation, with Mode C automatically interlaced.

(2C)
(1C)   (3C)

MODE SELECTOR
SWITCH
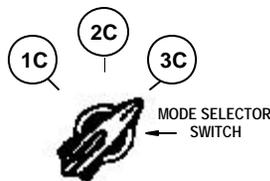
| SWITCH POSITION		INTERLACE
lC	Mode 1 and Mode C	
2C	Mode 2 and Mode C	
3C	Mode 3/A and Mode C	

Each switch position lights an associated green indicator. The actual interlace pattern being transmitted is observed on the 1/2/3A/C indicators described above. The position for ATC use is 3C.
CAUTION: Unattended A boxes should be left in the 3C position at all times to prevent "lock out" at the other positions.

NOTE: The AN/TPX-42A can interrogate in four separate codes: mode C, Mode 3/A, mode 2 and mode 1. However it can only interlace three different modes at any one time. Mode C is always interrogated so there are two options left that are available for all indicators positions. If this limitation is exceeded, there are two types of priority systems that select which request is dropped or disregarded (the particular priority system in use at your location depends on equipment configuration and is selected by maintenance). One priority system automatically drops mode 1. The other system drops the oldest mode requested. If this system is in user the oldest mode in use is normally 3A; therefore, it would automatically be dropped from the interlacing sequence. With this information, you can see the importance of returning your MODE SELECTOR to mode 3A when not actually being used to interrogate mode 1 or 2.

EMERGENCY INDICATOR
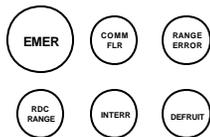
This indicator flashes red when an emergency or hijack code is received. in audible alarm also sounds three times within 5 seconds (approximately one full scan) unless reactivated by another emergency/hijack squawk. To aid in locating the aircraft on the radar presentation, the emergency/hijack aircraft's position will be marked with an X and the 7700/7500 code readout will be forced onto the display regardless of functions selected. Mode C altitude is also received, but only if the SELECT.ALT (select altitude) switch is on. The position.symbol and numerics blink on and off at a rapid rate to attract attention, and continue to blink, along with the EMER (emergency indicator), until the aircraft changes code. Automatic monitoring is available up to 260 miles unless the RANGE SELECT switch (B box) is on reduced range.

COMMUNICATIONS FAILURE
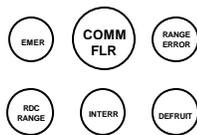
This indicator flashes red and the aural alarm sounds when a communication failure (7600) squawk is received. The symbology/numerics are forced on the display and flash the same as the reply for an emergency/hijack code.

NOTE: When a communications failure (7600) squawk is received, both the COMM FLR indicator and EMER indicator will flash. A communications failure is a valid emergency condition. The COMM FLR indicator specifies the type of emergency condition.

RANGE ERROR INDICATOR
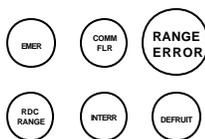
An audible alarm sounds and this indicator glows red when loss of range coincidence is detected. When this occurs, the RANGE OVRD (range override) switch at the B box must be activated immediately or the beacon system shuts down. Once overridden, the RANGE ERROR indicator flashes red.

REDUCED RANGE INDICATOR

| RDC RANGE | INTERR | DEFRUIT |
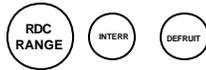
This indicator glows red to indicate that a range other than MAX has been selected at the B box..

INTERROGATION INDICATOR

| EMER | COMM FLR | RANGE ERROR |
| RDC RANGE | INTERR | DEFRUIT |
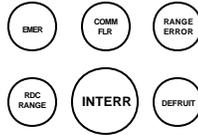
This indicator glows green to indicate RF interrogations are being transmitted by the receiver-transmitter group.

DEFRUIT ON INDICATOR

| EMER | COMM FLR | RANGE ERROR |
| RDC RANGE | INTERR | DEFRUIT |
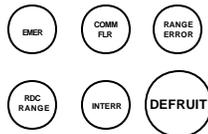
This indicator glows green when the interference blanker (DEFRUIT ON) switch on the B box is activated.

NOTE: It is important to confirm that the A Box, DEFRUIT indicator lights when the Defruit is selected on the B Box, and the indicator extinguishes when the B Box Defruit option is deactivated. This is the only way to confirm that the DEPRUIT control circuits are functioning properly.

ALL AIRCRAFT POSITION

| ALL A/C POSN | ALL A/C CODE | ALL A/C ALT |
| BRKT VIDEO | TARGET TRAIL | SELECT ALT |

*When activated, small circle symbols are displayed on the radar indicator denoting the true position of all beacon targets other than discrete codes selected by the ten identity filter switches described latter. No other ALL A/C (all aircraft) functions can be selected until this switch is activated.

ALL AIRCRAFT CODE

| ALL A/C POSN | ALL A/C CODE | ALL A/C ALT |
| BRKT VIDEO | TARGET TRAIL | SELECT ALT |
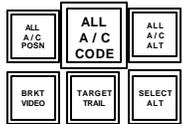
*Used to select individual code numerics of targets not selected by the Identity Filter switches. When selected, numerics are displayed along side each of the small circle position symbols on the radar indicator.

ALL AIRCRAFT CODE

| ALL A/C POSN | ALL A/C CODE | ALL A/C ALT |
| BRKT VIDEO | TARGET TRAIL | SELECT ALT |
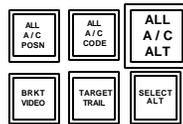
*Enables generation of individual altitude numerics display for all aircraft not selected by Identity filter Switches.

NOTE: When the ALL A/C POSN (all aircraft position) switch is depressed, the D switch (discrete) is automatically overridden, allowing display of all nonselected aircraft symbology/numerics well as discrete targets.

BRACKET VIDEO

| ALL A/C POSN | ALL A/C CODE | ALL A/C ALT |
| BRKT VIDEO | TARGET TRAIL | SELECT ALT |
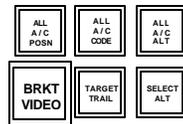
*Activates a bracket video control slash on all displays or or aircraft transmitting beacon replies to reinforce normal radar returns. A two beacon slash appeals on the indicator when the pilot "idents.

TARGET TRAIL

ALL A/C POSN	ALL A/C CODE	ALL A/C ALT
BRKT VIDEO	TARGET TRAIL	SELECT ALT

*Activates the trail dot display. One to three dots appear behind the position symbol showing the target's previous scan positions. The number of dots displayed after each current target depends on the total number of targets being processed by the memory bank, not on the number of targets displayed. When the interrogator is processing less than 33 target formats, three dots appear. When 33, but less than 43, formats are processed, two dots appear. When 43, but not more than 63, targets are processed trail dots won't appear behind any target as there aren't enough available for more than 63 target formats.

SELECT ALTITUDE

ALL A/C POSN	ALL A/C CODE	ALL A/C ALT
BRKT VIDEO	TARGET TRAIL	SELECT ALT

*When activated, reported altitude (Mode C) numerics appear on the radar indicator next to the position symb ol X for all beacon replies on the selected discrete code or within its brackets. Although code and altitude coverage is from 1,000 feet up to 127,000 beet, altitude numerics range only from 1,000 feet to 99, 900 feet in 100-foot increments. Altitude numerics are shown in three digits with zeros used where necessary. "Minus" altitude is provided by display of a small horizontal minus sign (-) in place of the first (leftmost) altitude digit, which otherwise would be zero. Aircraft replying without Mode C, or with garbled or invalid Mode C replies, show a series of three slashes (///) instead of three digits. If an aircraft has a valid Mode C reply, but is at or above 100,060 feet, the display consists of three dashes (- - -) rather than altitude numerics. Reply examples follow:

NUMERICS/SYMBOLS	DECODED
-10	Minus 1,000 feet
020	2,000 feet
100	10,000 feet
105	10,500 feet
450	FL 450
///	No Mode C/invalid/garbled
	Valid, aircraft at or
	above 100,000 feet

FORMAT DISPLAY SELECT
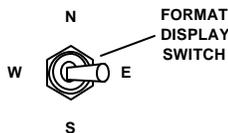
*This five -position toggle switch which selects the position of the target format (identity and numerics) on the radar indicator with respect to the target symbol as follows:

SWITCH POSITION	FORMAT POSITION
N	Above symbol
S	Below symbol
E	To right of symbol
W	To left of symbol
	Center Superimposed on symbol

VIDEO BRIGHTNESS

 *Used to control format video brightness (outside control) control) and the bracket video brightness (inside control).

VIDEO BRIGHTNESS

DIMMER / LAMP SET
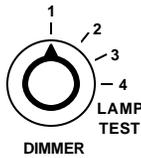
*Controls panel illumination brightness with four brightness selections and provides a lamp test for immediate check of lamp status.

1
2
3
4
LAMP TEST
DIMMER

INDENTITY FILTER SWITCHES
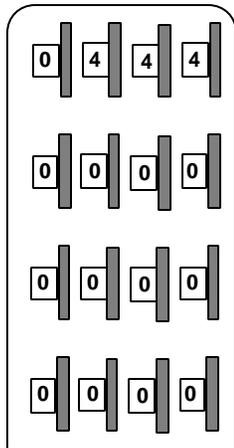
*In the center of the A box are ten rows of switches. Each row consists of four thumbwheel switches with numeric indicators that are used to select one to ten discrete identity codes. This feature allows discrete displays of ten different codes at different radar indicators, either in the same mode or a different mode. To select a specific code, Rotate the thumbwheel switches until the desired code appears in the windows. We have selected 0444 in the top row.

| 0 | 4 | 4 | 4 |

| 0 | 0 | 0 | 0 |

| 0 | 0 | 0 | 0 |

| 0 | 0 | 0 | 0 |

FUNCTION SELECT
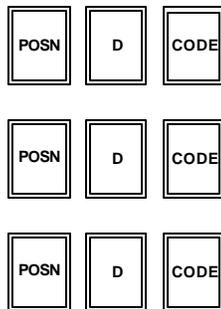
To the left of each row of Identity Filter switches are three press switches labeled POSN (position), D (discrete), and CODE. These switches are used to display the symbology/numerics desired for the selected code on the radar indicator. Discussion of these switches, and the corresponding Identity Filter switches, is limited to the top row as each succeeding row also performs the same functions.

| POSN | D | CODE |

| POSN | D | CODE |

| POSN | D | CODE |
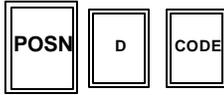
**POSITION SWITCH**   Activating this switch displays the identify/code that is
                                        contained in the associated thumbwheel window. As a
                             result, any aircraft answering that code bracket is marked with
POSN | D | CODE   the select position symbol (X) on the radar scope. The center
                             of the X indicates the aircraft's true position. For example,
                  with code 0444 selected, when POSN is depressed, all aircraft
                  squawking code 0400 through 0477 will be displayed as an X
                  on the scope, because the radar indicator inspects only the first
                  two digits of the code for a match.
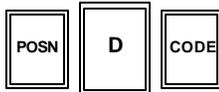
DISCRETE SWITCH   *Activates the discrete feature of the indicator when the
                                        when the associated POSN switch is already activated. When
                                        selected, the indicator rejects all replies that don't match all
POSN | D | CODE   four digits of the selected code. Symbo1ogies/numerics are
                                        displayed only on those replies that completely match the
                                        discrete code selection. No other formats will be displayed
                                        with an X except specific forced target replies, which will be
                  discussed later.
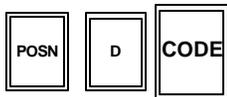
CODE SWITCH   *Causes display of a four-digit code readout adjacent to the
                                adjacent to the position symbol (X) of all beacon replies that
                                        match the first two digits of the selected code. The code
POSN | D | CODE   switch can only be activated if POSN is activated.

NOTE: A special identification pulse may be generated for display at your option. On voice command to "IDENT" the pilot activates this ident feature, and the select aircraft position symbol (X) or all aircraft position symbol (O) is modified to show reception of a civil ident (I/P) reply on the radar indicator. Position symbols will be enclosed in open circles with diameters that "shrink" from approximately 1/4 to 1/16 inch. The "shrinking" circles give the impression of bouncing balls and are displayed for the duration of a complete scan each time an ident reply is received. Replies are displayed for all selected aircraft or all aircraft targets.

B BOX (INTERROGATOR SET CONTROL)

This section describes the operational controls of the B box. Figure 5 in the back of this guide shows a front panel view of this box. Using Figure 5 and Table 2 below, associate the function of each control to its location.

TABLE 2
B Box - Supervisor's Controls and Indicators

CONTROL/INDICATOR	FUNCTION

INTERROGATOR ON/OFF

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

When this button is depressed, power is turned on and the INTRG (interrogator) lamp illuminates green indicating that the AN/TPX-42A interrogator is transmitting. When depressed a second time, the interrogator set stops transmitting and the OFF indicator glows white. A plastic shield covers the button to prevent accidental disabling.

DEFRUIT ON/OFF

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

Activates equipment which eliminates interference from the secondary radar presentation. In areas with large volumes of of air traffic several interrogators may be operating near each other, resulting in false returns and code garbling called fruit. Activation of the defruit equipment effectively removes this unwanted interference. This button should be ON for normal operation and will glow green.

NOTE: When DEFRUIT ON glows green, it indicates only that DEFRUIT has been selected. To ensure the control circuits are functioning, the DEFRUIT indicator on the A Box lights when the Interference Blanker (DEFRUIT) is functioning. The green (DEFRUIT ON) and white (DEFRUIT ON) and white (DEFRUIT ON) lights will switch when the button is depressed although the interference Blanker may not react accordingly.

RANGE ERROR / OVERRIDE

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

Enables the supervisor to override range error and permit succeeding interrogations. When range error is detected (primary radar return and beacon reply don't correspond), RANGE ERROR glows red. When this occurs, depress RANGE ERROR/OVRD to activate override, or the beacon system shuts down. In OVERRIDE, RANGE ERROR flashes red, while OVRD glows white indicating the shutdown circuit is overridden and noncoincidental video targets are displayed.

LOCAL / REMOTE

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

Indicates control of the beacon system. The lower half, RMT, illuminates green to indicate facility control of the interrogator at the B box. The upper half, LOCAL, glows white to indicate maintenance control of the interrogator.

NOTE: When both RMT indicators glow green the facility B Box has control of the system. When both LCL indicators glow white the maintenance site has control of the system. When a split configuration is indicated (one RMT green and one LCL white) occurs neither site has complete control of the system.

RF POWER LO / MAX

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

Selects interrogator power output. Most USAF facilities will operate in the RF PWR LO (radio frequency power low) position. When the RF PWR LO switch is depressed, the indicator glows amber. RF PWR MAX (radio frequency power maximum) position will normally be used only in emergency conditions and glows green when selected.

INTERROGATOR/RESPONSE SELECT

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

Selects either of the two IR (interrogator / responder) units and indicates which is on line. Depress the reserve IR if synthetic information is lost. When IR/1 is selected, IR/2 is in standby. When IR/2 is selected, IR/1 is in standby. Either the top or bottom half of the button glows green to indicate the operational unit.

APGU / AZ ERROR INDICATOR
*Selects either of the two Azimuth Pulse Generators, indicates

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP

which is on line and also indicates detection of an AZ ERROR (azimuth error) in the processor. During normal operation, the on line APGU (azimuth pulse generator unit) APGU 1 or 2 selector will glow green. The off line APGU is selected by depressing the APGU 1/2 selector switch. When the processor detects that either numerics or symbology being displayed on the radar indicator isn't in the proper azimuth, the bottom portion of the selector AZ ERROR glows red. To correct this problem, immediately activate the standby APGU. If the AZ ERROR light fails to go out, notify maintenance.

NOTE: AZ ERROR will illuminate when the standby APGU is selected. It normally will extinguish within one rotation of the antenna.

TARGET LOAD / NO BACKUP

INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2
OFF	OVRD	RF PWR LO	AZ ERROR
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD
	RMT RMT	IR / 2	NO BACKUP
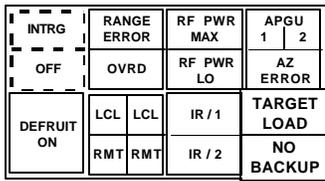
The top part of this status indicator, TARGET LOAD glows glows amber when the beacon system attempts simultaneous display of more than 128 target formats on the radar indicator in any one scan. When the 128 tag maximum is exceeded, the interrogator eliminates, from the next scan, the tag that has been in its memory bank the longest. This tag will be detected and displayed as a new format on the next successive scan, and the next oldest tag will be eliminated for one scan. This procedure continues as long as maximum capability is exceeded. Interval between erasure and refreshing is barely noticeable, as average time between scans is only 4 seconds. Reduction in mange could eliminate this condition, but automatic monitor capability would be lost beyond that range.

The bottom part of the status indicator, NO BACKUP, indicates that only one interrogator / responder unit is available.

RANGE SELECT / LAMP DIMMER

RANGE SELCT NMI

100   150

60   MAX

○ RANGE

● DIMMER
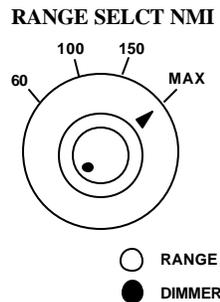
This control consists of a dual function rotary dial used to dial used to select the operating range of the processor, and to control brightness of the panel lamps. The outer portion of this dial controls the four range settings: 60 mi, 100 mi, 150 mi, and MAX (200mi). It bears no relationship to the primary radar range selected at various indicators. Normally, the range will be set for 60 mi to prevent computer overload (maximum of 128 targets). Emergencies, hijacks, and communications to failures beyond 60 mi will sti11 be forced through the system. The inner portion of the dial will control panel illumination. To increase lamp intensity, rotate the knob clockwise.

BAROMETRIC SETTING

| 29 | . | 9 | 6 | this

BAROMETRIC SETTING
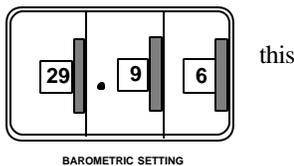
These three thumbwheel controls introduce local, current, barometric readings from 28.00 to 36.99 inches of mercury into the system. The numeric beacon decoder system uses

information when converting Mode C data for display as indicated altitude readout up to Transition altitude. To insure accurate altitude readouts, it's essential settings be kept current, as pressure changes will shift the pressure value of each altitude reading a corresponding amount. Altitude readouts of aircraft at or above transition altitude are automatically based on 29.92 inches of mercury and are shown in flight levels rather than being corrected for barometric settings. Plots may also correct altimeters to local pressure reference by voice command from the controller, allowing the cockpit reading to correspond to the ground decoded and corrected display reading.

This completes our discussion of the controls and functions of the A and B boxes. As you can see, the simplicity of its design enables visual monitoring of major functions and, at a mere touch of a finger, operational control of the AN/TPX-42A indicator control (A box) and interrogator set control (B box).

SECTION II

FAMILIZARATION AND DISPLAY INTERPRETATION

Now that the basic functions of the system controls have been explained the below familizaration exercise will demonstrate the system functions and the displayed indication.

Go to the interrogator Set Control (B Box) and perform the following:

STEP	ACTION	CONTROL	INDICATION

1. Depress the INTRG/OFF switch until INTRG position of the switch illuminates. During normal operations, INTRG box also changes section glows green.

```
┌ ─ ─ ─ ┐
│ INTRG │
├ ─ ─ ─ ┤
│  OFF  │
└ ─ ─ ─ ┘
```

INTRG/OFF indicator (B BOX) changes state INTERR indicator on   the A

state.

2. Adjust DIMMER control (inner knob) for panel illumination.

Panel lamps change intensity as knob is rotated.

```
        100   150
   60              MAX
         ◄
          ●

   ○  RANGE
   ●  DIMMER
```
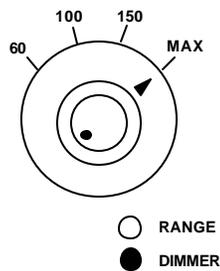
3. Rotate RANGE SELECT NMI (outer knob) to desired range.

As the RANGE SELECT NMI setting is reduced, AN/TPX-42 targets outside the selected range are eliminated. RDC range indicator on the A Box glows red when range below MAX is selected.

4. Depress the REMOTE/LOCAL switch. Normal setting is both RMT indicators green

```
┌───┬───┐
│LCL│LCL│
├───┼───┤
│RMT│RMT│
└───┴───┘
```

REMOTE/LOCAL indicators change state.

5. Depress the DEFRUIT ON switch Normal setting is DEFRUIT ON indicator illuminates green.

```
┌────────┐
│DEFRUIT │
│  ON    │
│        │
└────────┘
```

DEFRUIT ON indicator change state. DEFRUIT changes state.

6. Depress RANGE ERROR/OVRD
   switch. Normal setting
   is no lights illuminated.

RANGE
ERROR

OVRD

RANGE ERROR portion
illuminates red and
blinks, OVRD portion
illuminates white.
RANGE ERROR indicator
on the A Box illumin-
ates red and blinks.

   NOTE: During normal operation should; RANGE ERROR blink (red), aural alarm sound and RANGE
ERROR indicator on the A Box blink (red). Depress the RANGE ERROR/OVRD switch. OVRD will then
illuminate (white).

7. Depress the RF PWR MAX/
   RE PWR LO switch. Normal
   Normal setting is RF PWR LO.

RF PWR
MAX

RF PWR
LO

RE PWR MAX/RF PWR LO
changes state.

8. Select desired IR unit
   1 or 2 by depressing
   IR/1 - IR/2 switch.

IR / 1

IR / 2

IR/1 OR IR/2 indicator
will illuminate,
indicating IR unit
selected.

   NOTE: If the INTERR indicator lamp on the A Box goes out, depress the IR/1 - IR/2 switch. The INTERR
indicator on the A Box should light.

9. Depress the APGU 1/2
   switch to select the
   desired APGU unit.

APGU
1   2

AZ
ERROR

APGU 1/2 indicator
changes state.

   NOTE: During normal operation, if the AZ ERROR lamp illuminates depress the APGU 1/2 /AZ ERROR
switch. The AZ ERROR lamp should extinguish and the APGU status lamps should change.

10. BAROMETRIC PRESSURE.
     Set local barometric
     pressure using thumbwheels.

29 . 9   6
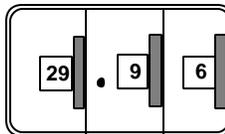
THE FOLLOWING STEPS WILL BE PREFORMED ON THE (A BOX) INDICATOR CONTROL

11. Adjust the VIDEO BRIGHT-
NESS FORMAT (outer-knob)
for desired alpha-numeric
intensity.

Alpha-numeric data
intensity level varies
me knob is rotated.

**VIDEO
BRIGHTNESS**

12. Depress BRKT VIDEO switch
and adjust BKT VIDEO level
(inner knob) to desired
intensity.

BRKT VIDEO switch lamp
glows. BRRT VIDEO
intensity level

varies as knob is
rotated.

   NOTE: BRKT VIDEO switch is a push on/off switch that controls display of bracket video at the
indicator.

13. Set the rotary DMR switch
to desired intensity.

Panel lamps react accordingly.

1
2
3
4
**LAMP
TEST**

DIMMER
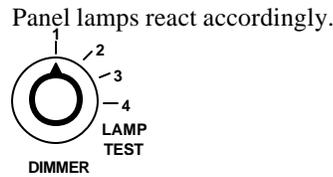
   NOTE: The LAMP TEST position will illuminate all lamps on the A Box to verify operation of lamps.

SECTION III

OPERATING PROCEDURES

AN/TPX-49A (RANGE AZMIUTH BEACOM MONITOR)

The TPX-49A is used to provide verification of beacon azimuth and range accuracy of the TPX-42A system. Proper operation and understanding of the system is essential. The TPX-49A equipment is normally located in the radar equipment area. Controllers have specific responsibilities for the operation of the TPX-49A during equipment checks and when operating in a secondary radar only environment. Position of the TPX-49A target and frequency of equipment check are outlined in facility directives.

SYSTEM   CONTROLS AND FUNCTIONS
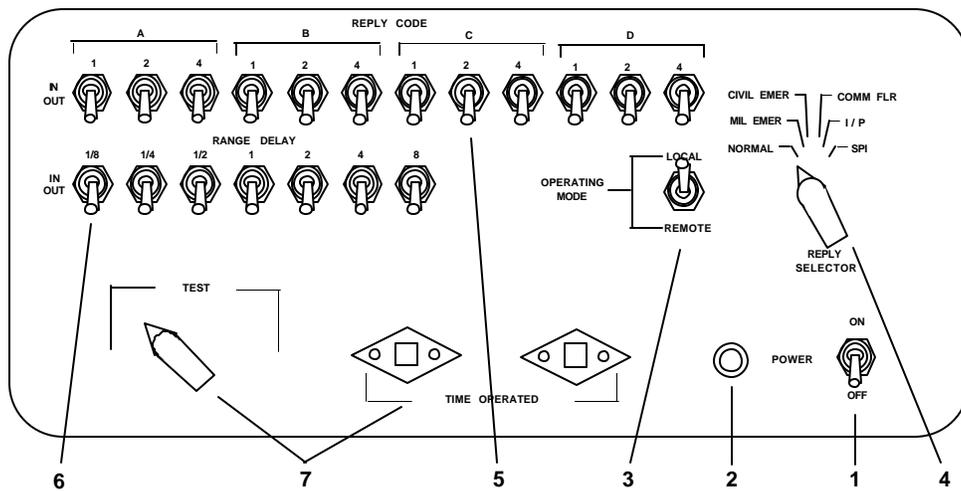
1. POWER ON/OFF SWITCH
2. POWER ON LAMP
3. OPERATING MODE
4. REPLY SELECTOR
5. REPLY CODE
6. RANGE DELAY
7. TAPE SELECTOR and
   TIME OPERATED

Figure 1. TPX-49

1. **POWER ON/OFF SWITCH:** Energizes or de-energizes the TPX-49A SYSTEM.

2. **POWER ON LAMP:** Illuminates RED when power is on.

3. **OPERATING MODE:** Selects LOCAL or REMOTE control of system. (Select LOCAL for normal operation).

4. **REPLY SELECTOR:** Six position switch to select the type of reply to be generated for an interrogation.

      a. **NORMAL:** Outputs code selected by reply code switches (5).

      b. **MIL EMERGENCY:** Outputs code 7700 in mode 3/A plus 7360 in mode 1 and 7777 in mode 2.

      c. **CIVIL EMER:** Outputs code 7760 in mode 3/A only.

      d. **COMM FLR:** Outputs code 7600 in mode 3/A only.

      e. **I/P:** Outputs code 7777 in mode 3/A only, with the IDENT pulse.

      f. **SPI:** Outputs code 7777 in mode 2 and 3/A and the IDENT pulse.

5. **REPLY CODE**: This group of twelve switches is divided into four subgroups designated A, B, C and D. Each subgroup contains switches marked 1, 2, and 4. These switches when selected to the IN position form a binary code equal to one digit of a IFF/SIF code in the designated subgroup. To set in a code f 1476 in the REPLY CODE section; set subgroup A switches(1 IN, 2 and 4 OUT); B switches (l and 2 OUT, 4 IN); C switches (1, 2 and 4 IN); D switches (l OUT, 2 and 4 IN). The sum of the switch values selected to the IN position for each subgroup equals the value of the corresponding digit of the IFF/SIF code.

6. **RANGE DELAY**: This set of seven switches determines the range at which the TPX-49A generated target will be displayed on the radar indicator. Ranges can vary from 1/8 to 15 7/8 miles. Range is determined by the sum of the value switches set to the IN position.

7. **TEST SELECTOR and TIME OPERATED**: are maintenance functions/indicators.

<div align="center">

OPERATING INSTRUCTIONS

</div>

1. Turn TPX-49 system on (on/off switch).

2. Check OPERATING MODE, select LOCAL.

3. Set RANGE DELAY for proper range. This in normally set by maintenance personnel and should not need to be changed.

4. Set REPLY SELECTOR to desired function. If NORMAL is selected set desired code in CODE REPLY section.

5. When system is no longer needed turn power switch off.

TARGET DISPLAY INTERPRETATION

1. **SIDE LOBE SUPRESSION (SLS) and REFLECTIONS**: The TPX-42 system is designed
to transmit SLS pulses to properly equipped aircraft that inhibits replies to antenna side lobes. Aircraft
transponders not equipped with SLS capabilities will respond to side lobe signals and be processed causing
false target returns at the same range as the true target, but with varying azimuth positions. This display
of false targets is commonly referred to ring-around and should not be confused with reflected targets.
Reflected targets generally appear from aircraft operating in the same general area and altitude and the
reflected target can be displayed at any range or azimuth. Neither of these undesirable effects are the
fault of the TPX-42 system, but rather old style aircraft avionics and physical geography of the local area.

2. Figure 3 is a composite display of all possible display formats of the TPX-42 system. This will help you
recognize and interpret the various format symbology and numerics displayed.

3. Figures 4 and 5 are graphic drawings of the TPX-42 "A" and "B" Boxes.

⌒   **BRACKET VIDEO TARGET**

⌒   **PRIMARY RADAR TARGET**

○   **ALL AIRCRAFT (NONSELECTED TARGET)**

✕   **SELECTED TARGET**

7206   **CODE NUMERICS**

122   **ALTITUDE NUMERICS IN
            100 FT INCREMENTS**

– – –   **ALTITUDE ABOVE 999**

/ / /   **ALTITUDE BRACKETS ONLY
                (NO VALID MODE C)**

☐   **FORCED THRU TARGET
            (ALTITUDE LAYERING)**

· · ·   **TRAIL DOTS**

◉   **SPI / IP IDENT (ALL AIRCRAFT)**

⊗   **SPI / IP IDENT (SELECTED TARGET)**

**Figure 2. Character and Symbol Presentation Legend**
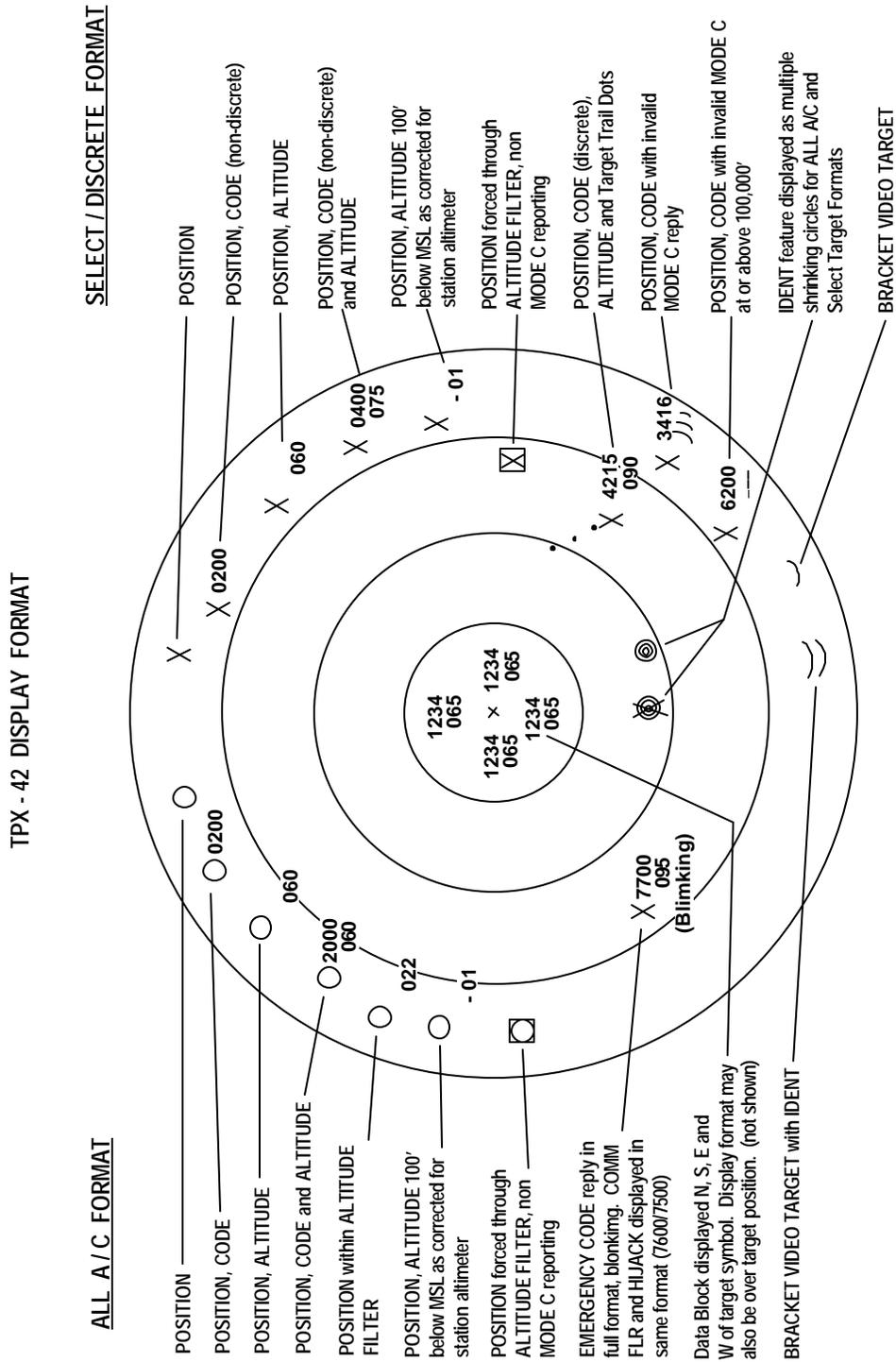
Figure 3. Target Display Legend
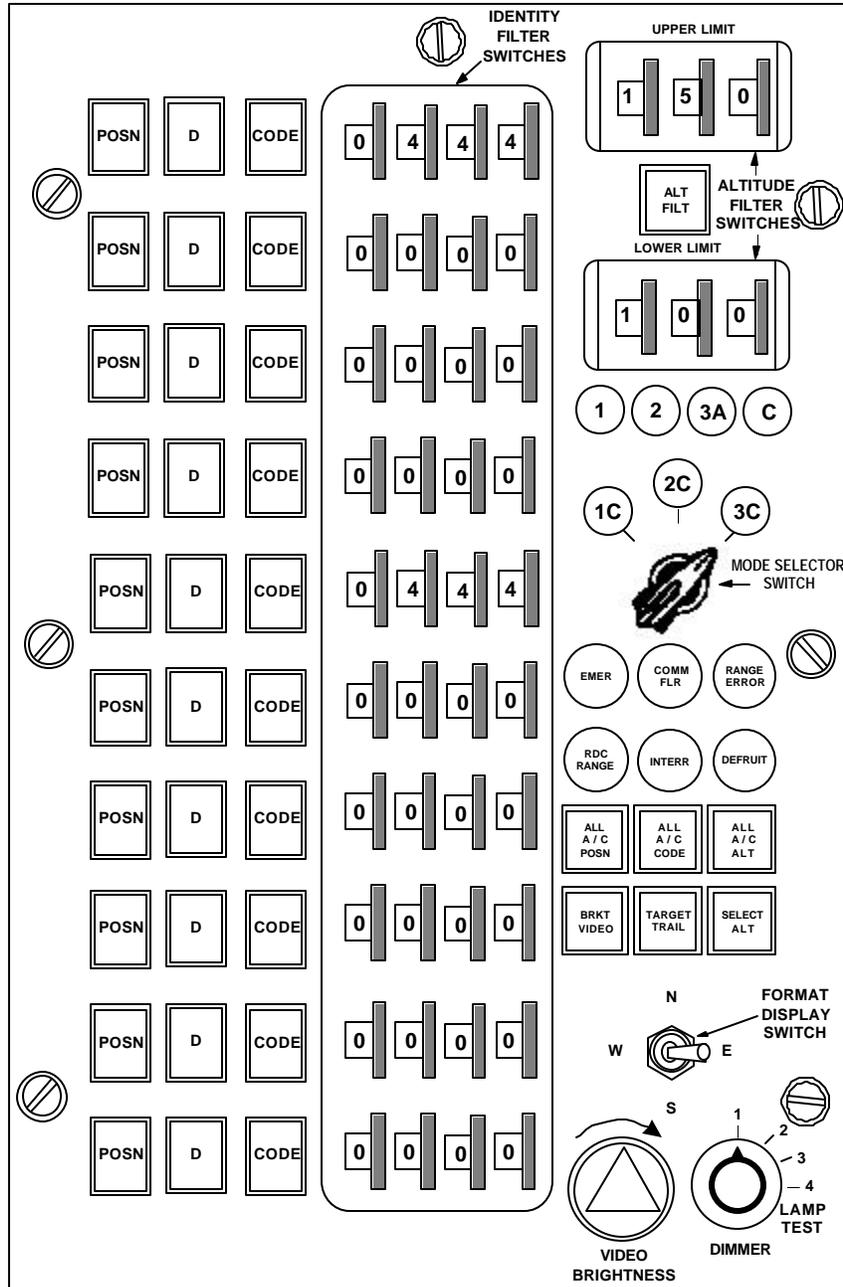
Figure 4. "A" Box (Indication Control)

				RANGE SELECT MMI		
INTRG	RANGE ERROR	RF PWR MAX	APGU 1 2			
OFF	OVRD	RF PWR LO	AZ ERROR			
DEFRUIT ON	LCL LCL	IR / 1	TARGET LOAD			
	RMT RMT	IR / 2	NO BACKUP			

100   150

60   MAX

29	9	6

BAROMETRIC SETTING

○ RANGE

● DIMMER
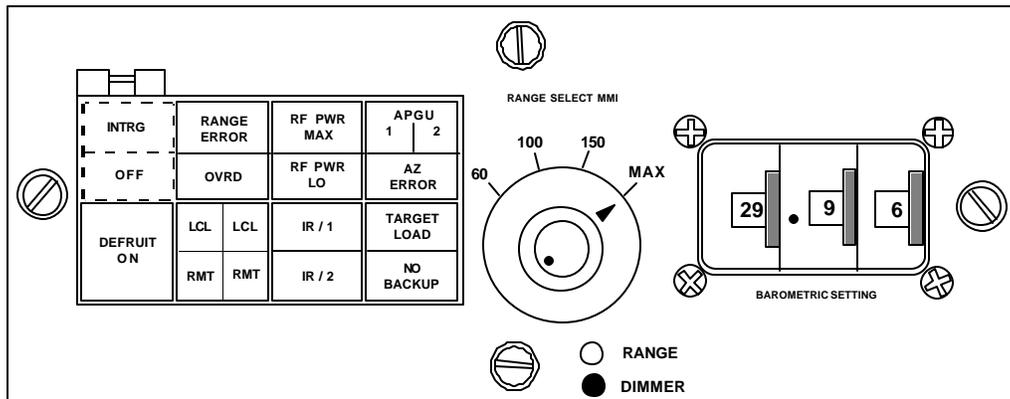
Figure 5. "B" Box (Interrogation Set Control)