IFF SIF control for DCS A10C and UH-1

The control panel for the APX-72 is normally not evaluated by the DCS simulator. Nevertheless, the switch position of the panel can be taken to emulate the entire logic of the APX-72. For the Aries Radar Systems, a IFF/SIF function is important to follow the rules for ATC and GCI.

IFF / SIF APX-72

A Receiver-Transmitter, APX-72 when used with auxiliary equipment, provides automatic radar identification of aircraft or surface vessel to all suitably equipped challenging aircraft, surface ships, and ground facilities within the operational range of the system. The RT-859/APX-72 receives, decodes, and responds to the characteristic interrogations of operational modes 1, 2, 3/A, C and 4. The receiver section operates on a frequency of 1080 megahertz (MHz) and the transmitter section operates on a frequency of 1090 MHz. Specially coded identification of position (1P) and emergency.

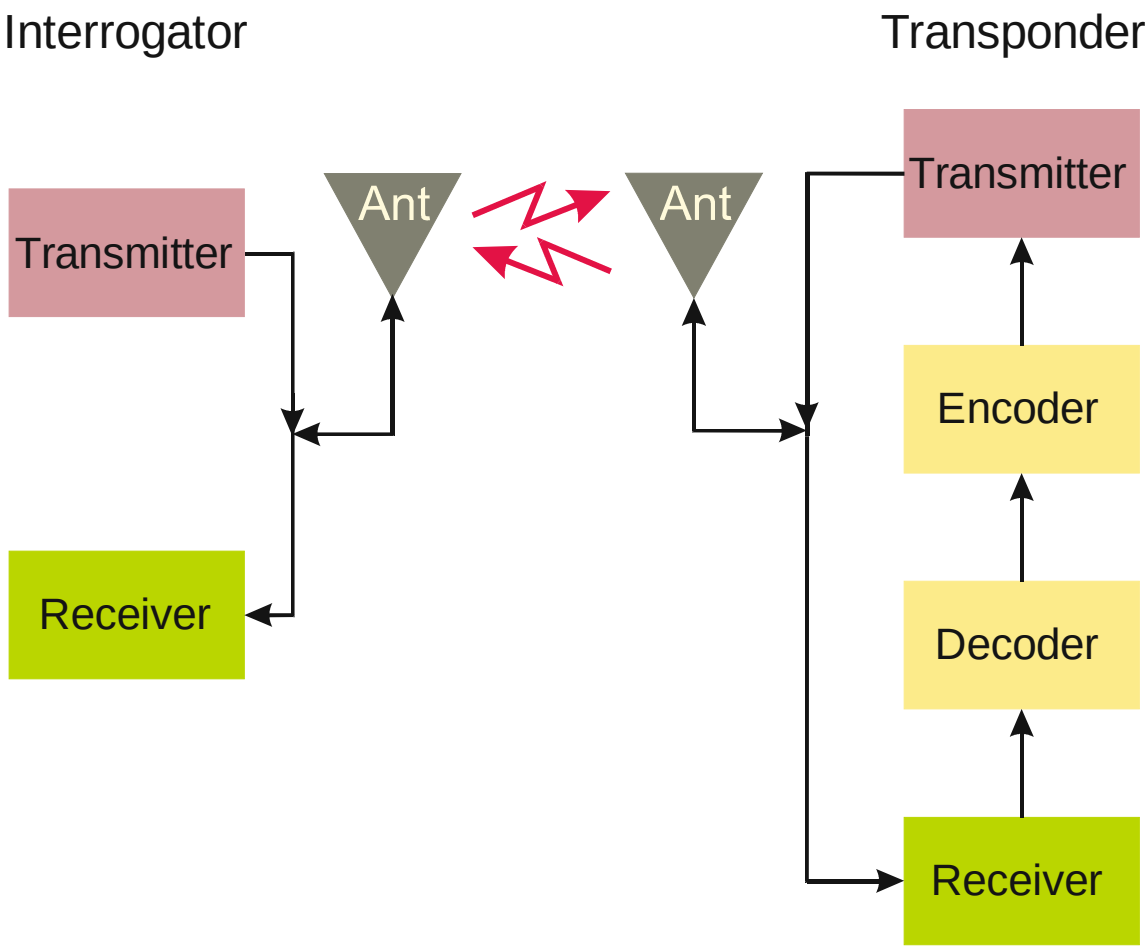


Figure 1 IFF diagram

A-10C an UH-1 IFF/SIF usage

The control panel for the APX-72 in the A-10C can be found on the left consol, left behind the throttle levers:

Figure 2 A-10C IFF/SIF control panel

For the UH-1 the panel can be found in the mid console:

Figure 3 UH-1 IFF/SIF control panel

Panel Description

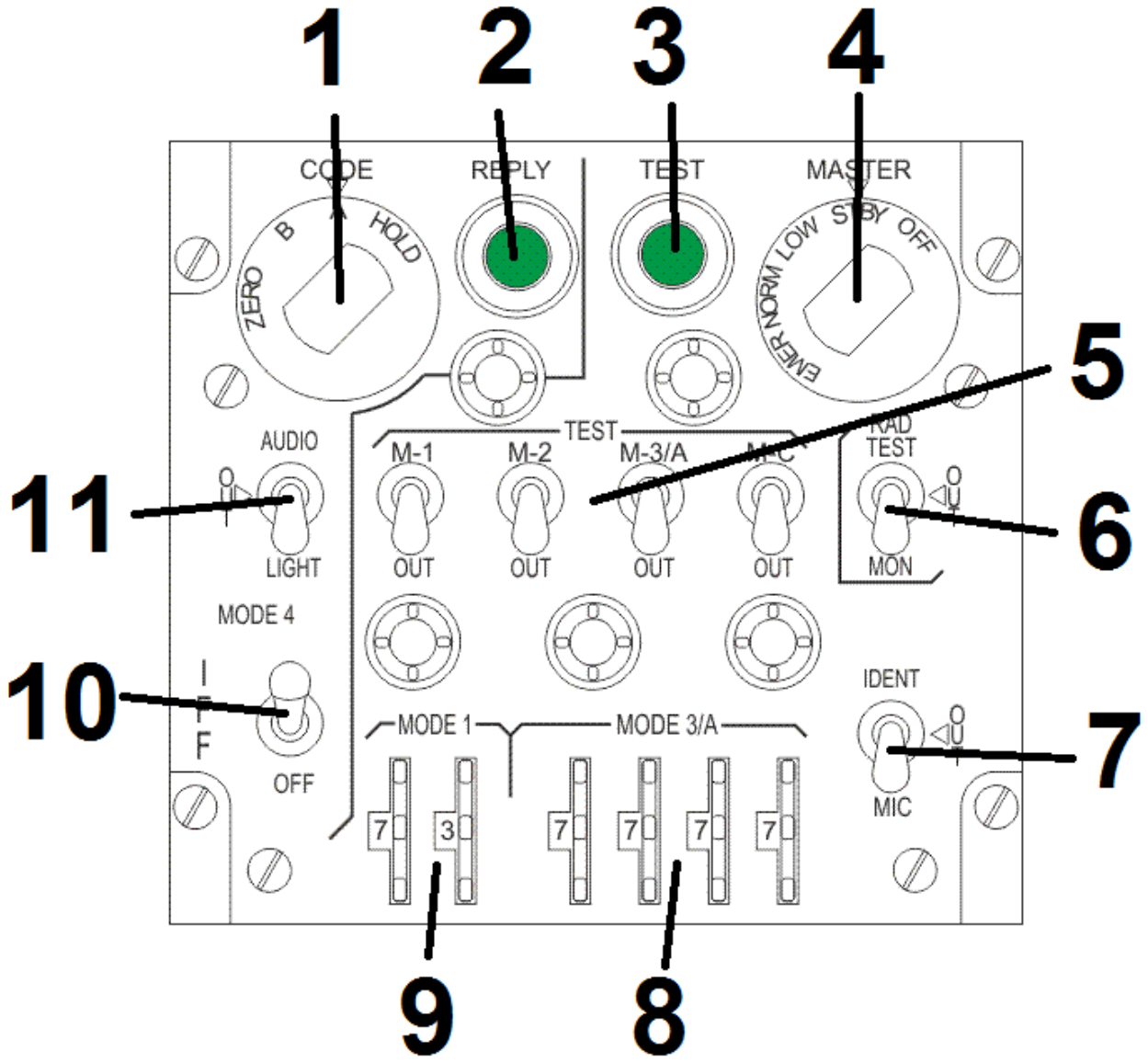


Figure 4 C-6280(P)APX layout

Nbr	Control	Position	Function
1	CODE	A	Mode 4 transponder answers only on interrogations which match the code behind [A]. The code is set before the pilot enters the aircraft. The radar antenna transmits the code as interrogation. For the DCS simulation a fixed code is set internally, depending on the coalition selected for the aircraft.
		B	Mode 4 transponder answers only on interrogations which

			match the code behind [B]. The code is set before the pilot enters the aircraft. The radar antenna transmits the code as interrogation. For the DCS simulation a fixed code is set internally, depending on the coalition selected for the aircraft.
		ZERO	In case of bail out or forced landing in enemy territory, all classified codes can be erased in the mode 4 transponder. The codes cannot be restored during the flight. Therefore it should used caution when handling this turn button. To switch to this position, the turn button must be pulled and then turned. This is necessary to avoid a deletion of all codes accidently.
		HOLD	Function not supported
2	REPLY		If switch 11 is set to light or audio, this control lamp [2] is lit. Provided, the mode 4 function is switched ON, the lamp will go off for 500 ms if the receiver is hit by a interrogator signal and answers on it. This is a useful indication for a pilot to be sure, that a friendly radar sent this interrogation.
3	TEST		Function not supported
4	MASTER	OFF	The entire APX-72 system is switched off
		STBY	The APX-72 is under power but does not answer on any interrogation. This position is useful if it is necessary to strangle all IFF/SIF functions when entering enemy territory. To switch back to full functionality afterwards, it does not require a warm up phase. Even ATC sometimes request to squawk [STBY]. This comes normally on ground during taxi operations.
		LOW	Under certain circumstances it can be necessary to prevent over interrogation by antennas in the surroundings. The receiver sensitivity is lowered so as to respond only to interrogations of a certain power level. The normal interrogation trigger level is between 52 and 67 db. If set to LOW the trigger must be higher than 67 db.
		NORM	This is the normal receiver configuration to respond to interrogations of at least 52 db.
		EMER	Transmits emergency reply signals (7700) to mode 1, 2 or 3/A regardless of mode control settings. This position retains the codes set with the code wheels [8] and/or [9]. On a radar screen, the correlation is not lost because it receives the emergency signal and the manual set code as well.
5	Mode Enable	MID	The switches enable or disable the functionality of modes 1, 2, 3/A , 4 and mode C. The mid position(default) enables the function.
		TEST	Not supported
		OFF	Function suppressed
6	RAD TEST-MON switch		Function not supported
7	IDENT/MIC	IDENT	The transponder adds an IDENT signal to the transponder reply. An observing radar sees a special symbol on the screen for 25 seconds. The special symbol is normally a flashing target symbol.

			ATC uses this function to safely identify an aircraft on the screen. The usage of IDENT is normally requested by ATC with the instruction "Squawk ident.". The switch is spring loaded and moves back to OUT if it is released.
		OUT	No ident signal is sent.
		MIC	If set to MIC, every time the PTT button is pressed, the IDENT function is triggered like with IDENT. The switch holds its position until manually moved back to OUT. This function is not useful because the visual signal on the radar screen may be delayed by the time for one antenna revolution.
8	MODE 3/A		This four rotary wheels define the code for mode 3/A. The code is set by the pilot if a station instructs him "Squawk nnnn", where nnnn is the code to be set. The code digits have a range between 0 and 7 because of the octal style. Therefore 4096 different codes are possible. Mode 3/A is used worldwide on military and civilian side.
9	MODE 1		This rotary wheels set the military code for mode 1. The higher digit can be set between 0 and 7 while the lower digit covers only 0 to 3. So 32 different codes are possible. Mode 1 is mainly used for timed flight operations. The headquarter defines mode 1 settings for specific areas at a given time. The pilot is responsible to set the right code in an area at the right time. Otherwise he will be identified as hostile aircraft.
10	Mode 4	ON	Powers the entire mode 4 functionality. Interrogations are answered only if they match the code selected by rotary switch [1] (CODE).
11	AUDIO/LIGHT	LIGHT	The reply lamp [2] is lit. Every time an interrogation is answered, the light will be switched off for 500 ms.
		OUT	No feedback for interrogation answers. The light remains off.
		AUDIO	The reply lamp [2] is lit. Every time an interrogation is answered, the light will be switched off for 500 ms. In addition, the pilot hears a 'Ping' signal in his headphones.

IFF/SIF remote control panel

Pilot procedures

The usage of the IFF/SIF functionality is bound to specific situation. ATC and GCI expect a standardized usage during aircraft operations. If a working IFF/SIF is available on board, it must be used to support ATC radar service and GCI safety obligations.

Startup

Before powering the APX-72 make sure, that the CODE rotary switch [1] is **not** set to position ZERO!

As soon as the bus is powered at which the APX-72 is connected to the MASTER rotary switch [4] shall be set to **STBY**. The system powers up and is ready if the usage is requested by ATC.

If any code was given in advance by AIS or by ATC via radio, it can be set immediately in the STBY condition.

In the real world, the pilot would use the test functions to ensure a proper functionality. In the DCS simulation, test functions are not supported.

Check:

- Mode 1 schedule chart available as briefed.
- CODE rotary switch [1] is set to position 'A'.
- Function switches [5] for mode 3/A and mode C are set on.
- IDENT/MIC switch[7] is in OUT position.
- Codes set in [9] and [8] set as required . If operating on a VFR flight plan, set mode 3/A to the national code for military VFR flight. These codes are different over the world.
- Set the code for mode 1 according to the mode 1 schedule chart.
- Mode 4 switch [10] is OFF.
- AUDIO/LIGHT switch [11] as suitable.
- MASTER rotary switch [4] on STBY.

Taxi procedures

If not otherwise instructed by ATC leave the IFF/SIF equipment on STBY.

Receiving IFR clearance by ATC

One item of the IFR enroute clearance is the mode 3A code to be used when contacting the radar service after takeoff. The code should be set immediately while the equipment remains in STBY configuration if not otherwise instructed by ATC.

Lining up for takeoff

As soon as the aircraft enters a runway for takeoff, MASTER rotary switch [4] must be set to NORM. If the aerodrome is located close to enemy terrain, MODE 4 switch [10] should be set to ON.

Fence in

When coming close to enemy terrain or in range of an enemy radar, there are two procedures to be used for precaution:

1. switch the entire IFF/SIF system to STBY. The enemy radar will see only a primary target without any additional information. Unfortunately, friendly radars will see even the primary target only.

2. switch MODE 4 [10] to on and set the CODE rotary switch [1] to 'A' or 'B' if instructed. The friendly radar will see the entire SSR information while the enemy radar sees the primary target only. If

the enemy radar receives a mode 4 transponder reply by accident, it cannot evaluate the data because they are encoded.

In any case, set the code for mode 1 according to the mode 1 schedule chart .

Fence out

If safe out of range of any enemy radar, the IFF/SIF equipment may be configured for normal use. If operating with mode 4 the current setting should be maintained until landing.

Check the mode 1 schedule chart for proper mode 1 setting.

ATC war time radar operations

During war time ATC operates with some security procedures which ensure, that no hostile aircraft is undiscovered if penetrating the airspace of responsibility. The main procedure is a time/area approach with a specific code set in the aircraft. If Mode 1 interrogation is available in the ground radar station, this procedure bases on the right mode 1 code setting onboard. If no mode 1 equipment is available the same procedure could be used with mode 3A. But is has to be considered, that unsecured mode 3A settings may also be read by the enemy.

Approach for landing

The procedure bases on a specific airspace layout around an aerodrome:

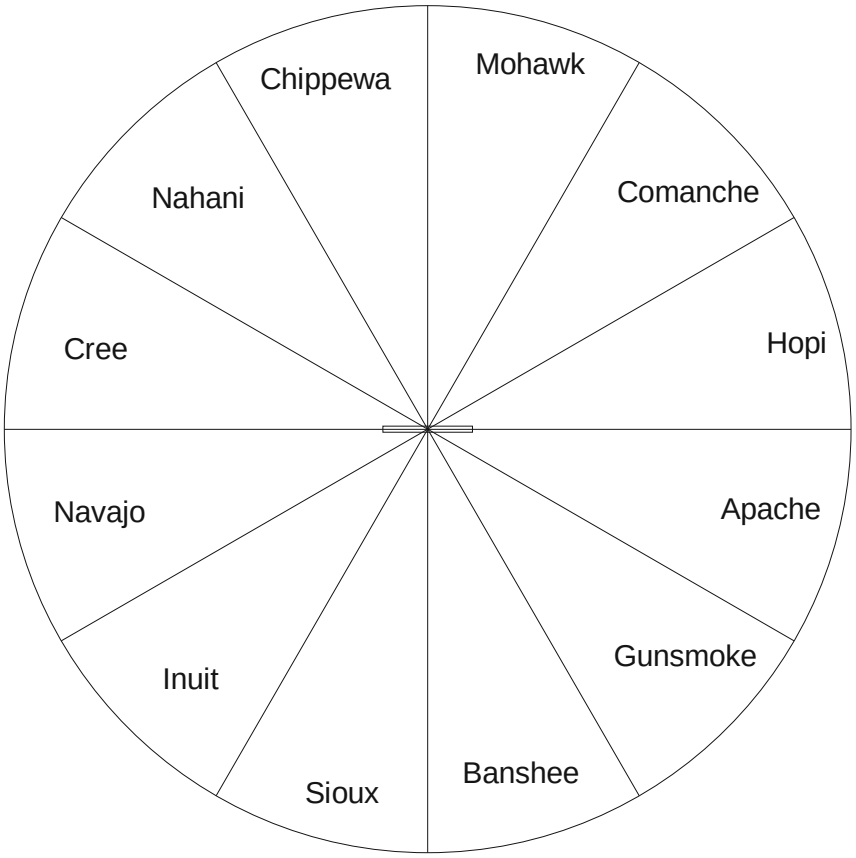


Figure 5 War time approach sectors

Each 30° degree sector has a name which may be changed periodically. So the entire procedure bases on a correct preflight planning with the classified approach layout around the target aerodrome.

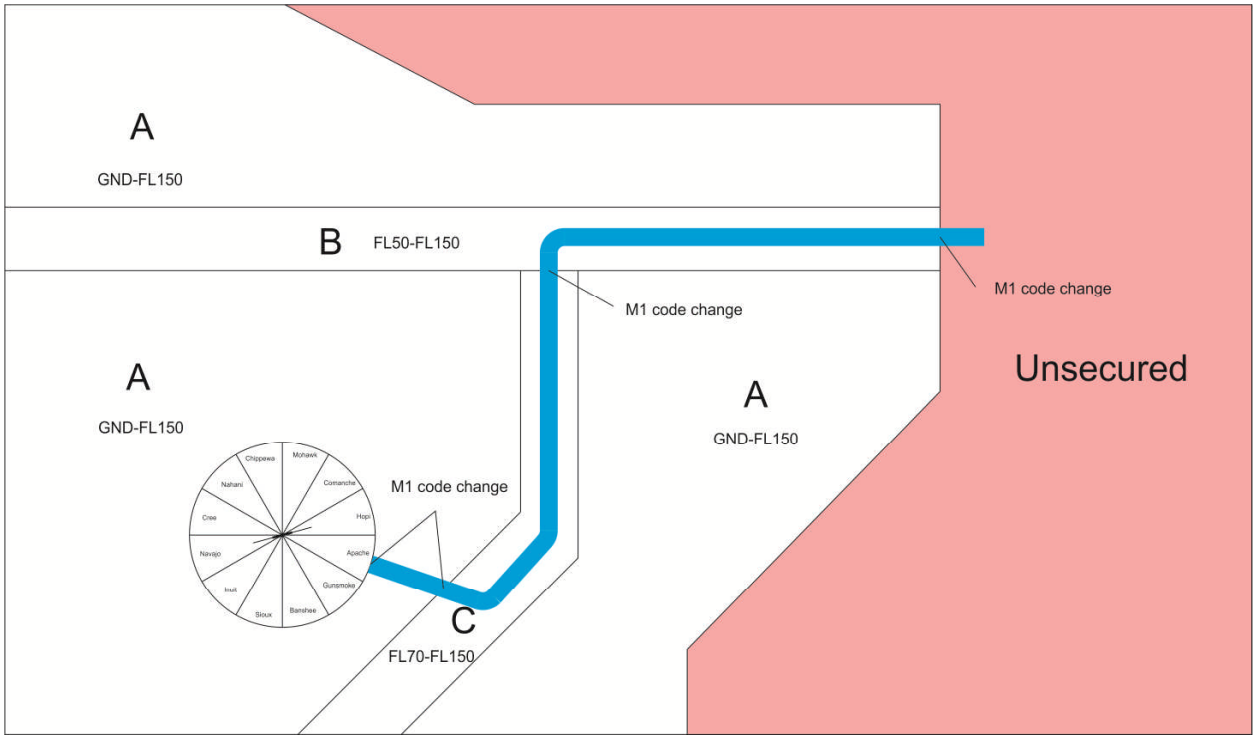
Before the pilot enters his aircraft, he will receive some classified documents from the destination aerodrome. The documents contain the current sector layout shown in the image above and a list of mode 1 codes to be set when entering a specific sector at a given time. Under worst condition, the entire approach can be a silent procedure while ATC observes a target in a sector with the right code set.

Normally, the pilot would contact ATC and would state the entry sector. He will do that immediately when crossing the outer circle of the layout. Assuming, that the circle has a diameter of 30 NM, ATC knows the position of the arriving aircraft right in time. As an example, the initial contact of an aircraft with the call sign 'COLDFIRE', approaching an airfield named 'YELLOWKNIFE'.

"YELLOWKNIFE from COLDFIRE entering BANSHEE". The pilot has already set the mode 1 code for BANSHEE valid between 12:00 and 12:20. The entire flight path for the approach procedure out of BANSHEE is standardized and no further communication is required unless safety requires further instructions. It may happen, that a specific entry sector was observed to be threatened by enemy forces. In this case ATC would advice the closest safe entry sector. As soon as the aircraft is on short final to land, the pilot requests the landing clearance.

Enroute procedures

The entire operation area will be divided in controlled airspace sections. In opposite to civilian traffic, the flight rules IFR or VFR are not observed in the procedures. The sectors are build to identify friend and foe. There are secured areas and unsecured areas. Secured areas are under complete control of own forces. Under normal conditions they are build up outside of the battle area and shall protect the own aerodromes or troop concentrations. The identification procedure is held very simple but requires a high concentration level for the pilot. To penetrate a secured area, the pilot has to follow specific flight corridors. When entering such a corridor, he has to set a predetermined mode 1 value in his transponder. This mode 1 value is valid only during a given period of time. So the pilot must always be aware of his current position and has to compare the preflight documents with the current time and location.



Breath Monkey

During the cold war we had a corridor along the German border to the east called ADIZ (Air defense and identification zone). Each aircraft, civilian or military, had to inform the responsible GCI station before takeoff, if a penetration of the ADIZ was planned. It very often happened, that an unreported aircraft was on heading east, penetrating the ADIZ. For this situation there was a procedure established which should warn the pilot if he was unintended on easterly heading in the ADIZ. The GCI controller, in this case, transmitted on all available frequencies (mainly on guard) the key words "breath monkey". This was a alerting notice to all aircraft to check their position, heading and code setting. If an pilot was uncertain about his position, he head to pick up a westerly heading immediately. This procedure should be used in the simulation too, if a GCI controller observes an unidentified target in a secure area.

To be continued

Appendix A Abbrevations

A

ADIZ	Air defense and identification zone
AIS	Aeronautical Information Service
ATC	Air Traffic Control

G

GCI	Ground Controlled Intercept

I

IFF	Identification Friend Foe

P

PTT	Push To Talk

S

SIF	Selected Identification Feature