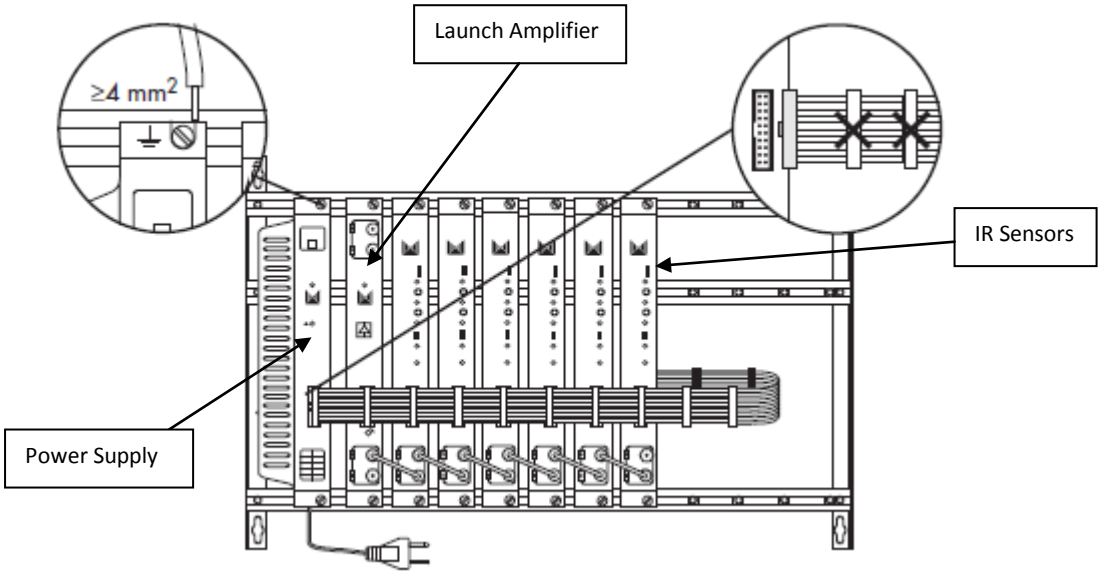
Technote10: Setting up DM-102 COFDM Modulators with PS-011

DM-102 is a fully agile Digital Modulator which is designed to convert 2 AV signals into a digital modulated channel.



IMPORTANT: Layout of the modules must be as shown above. Power Supply (FA-312) must be located on the far left hand side and launch amplifier (PA-720) must be the next module in the chain. Please look at the layout above. A limit of 6 DM-102 modules can be powered by one FA-312. If FA-310 is being used only 3 modules is the limit due to power consumption.

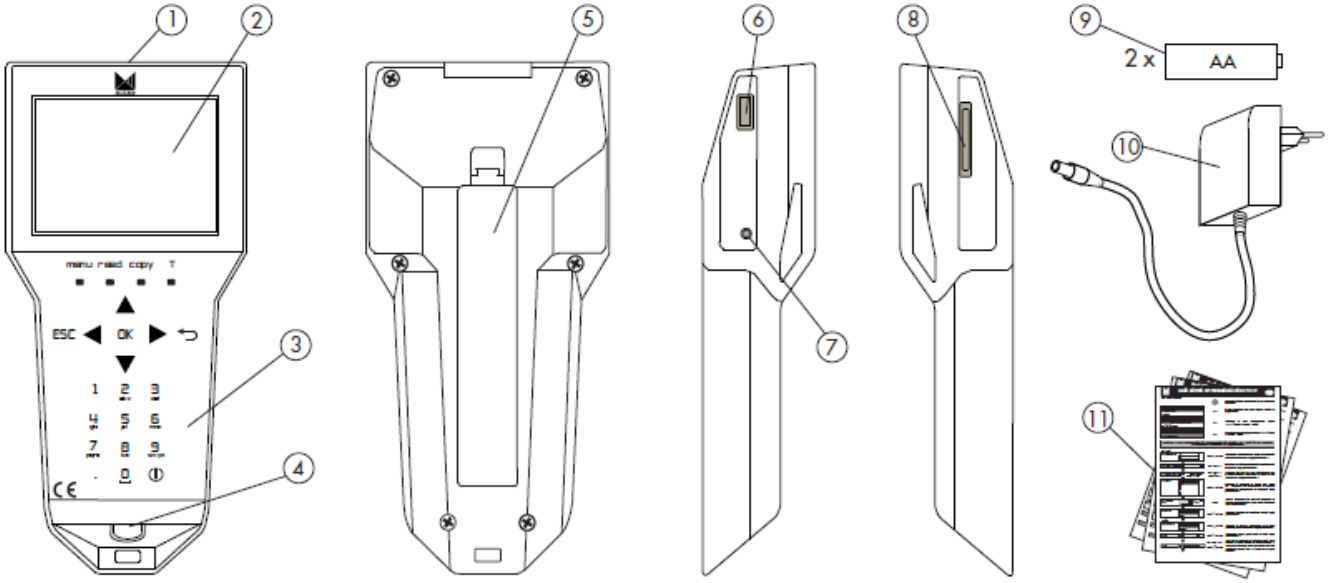
AIM PROGRAMMER TO IR SENSOR LOCATED ON EACH DIGITAL MODULATOR WHEN PROGRAMMING

Programming of Modules

Ensure the following prior to programming:

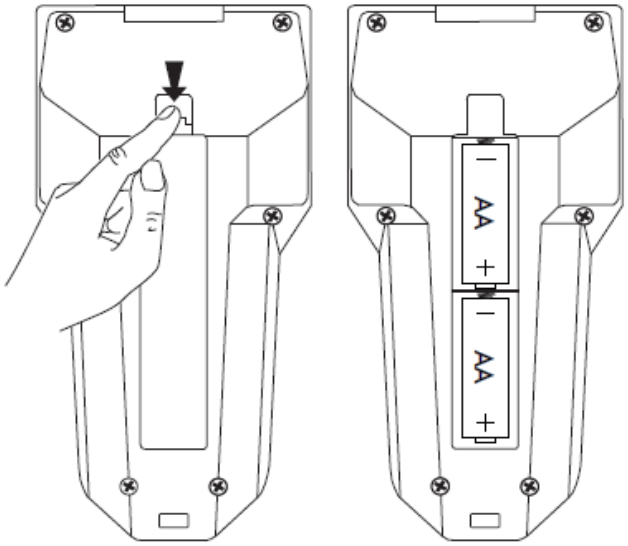
- It is necessary to connect all the modules to the support frame SP-226 (code 9120130) for the system to function.
- It is also recommended that you make the earth connection to the building using a cable with a section of at least 4 mm.
- Ensure that you have the Alcad programmer PS-011 with ***firmware version 1.11*** or later.
- Power supply/Control cable must be plugged into each module. **DO NOT ADD OR REMOVE** modules without disconnecting mains supply power from wall outlet. Always disconnect the equipment, and then reconnect it to the mains supply. Failure to do so can cause equipment to fail.

OPERATION OF PS-011 PROGRAMMER



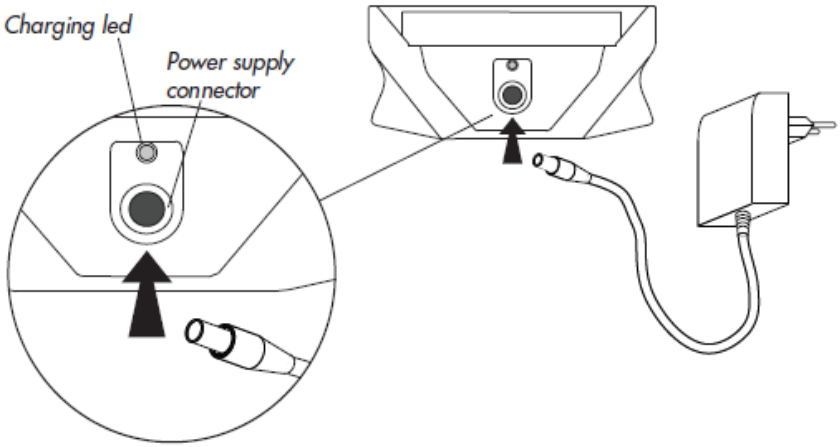
1. Infrared transmitter/receiver
2. Screen
3. Keypad
4. Connector for charging
5. Batteries cover
6. USB connector for external memory
7. RESET button
8. Slot for SD memory cards
9. Batteries
10. Charger
11. Fast programming guides

Before turning on the remote for the first time, make sure that the rechargeable batteries are positioned correctly. When you have done this, connect the programmer to the mains supply and leave it connected until a complete charging cycle has been completed.



During the charging process, the icon of a battery being charged will appear on the screen and the LED located next to the power supply connector will remain lit up. When the batteries are completely charged, the LED will blink and the icon of a fully charged battery will appear on the screen.

The rechargeable batteries supplied with the programmer are charged using the DC charger which is also supplied with the PS-011.



The PS-011 programmer will work when connected to the mains supply whether the batteries are installed or not. Note also that if the batteries of the programmer run down and you do not have access to a 230V plug, you can use AA alkaline batteries instead. You must bear in mind, however, that the autonomy of this type of battery may be considerably reduced.

On/off: the PS-011 programmer is turned both on and off by pressing the key ⏻ once. . It can also be turned off from any of its screens. When the programmer is turned off, the screen automatically becomes blank. It is important to know that if the remote control is turned off during the programming of a device and then immediately turned on again, it does not restart at the point it was at when turned off, but rather reverts to the main menu.

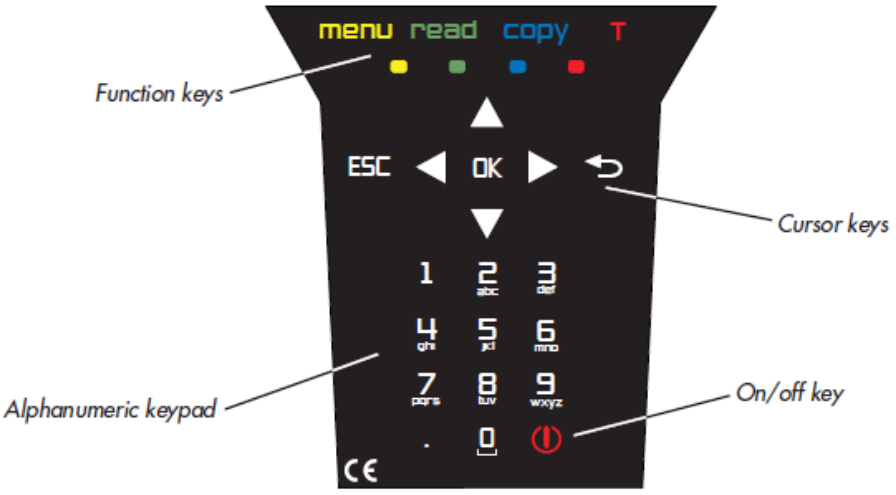
Located in the top part of the keypad are the menu, read, Copy and T function keys.

menu:	reveals the options available within the various screens.
read:	allows you to read the data saved in the modules to be programmed.
copy:	is used for the transmission of the data of the module.
T:	transmits the information from the programmer to the equipment shown in the field selected on the screen.

The cursor keys ◀▶▲▼, ⮌, OK y ESC, used for navigating through the menus of the programmer software, are described below.

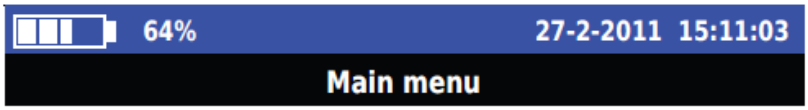
◀▶▲▼:	cursor keys used for moving around within a screen.
⮌:	used for erasing any characters entered by mistake.
OK:	this key is used whenever you wish to select an option or validate a value you have entered.
ESC:	allows you to exit from the lists of options or to go backwards through the screens of the programming environment.

The alphanumeric keypad is used to enter numbers and letters. Pressing a key once enters the corresponding number on the screen. By pressing it again repeatedly, the letters which appear under the number are entered.



Information regarding the present state of the batteries as well as the current date and time is permanently displayed on the blue band in the upper part of the screen.

The state of the batteries is shown as a percentage, indicating the remaining battery life. If, however, the programmer is being used while connected to the mains supply but with charged batteries, the icon displayed will be completely green. If the batteries have been removed and the programmer is connected to the mains, the edge of the icon will be shown in red.



Immediately beneath the blue band is a black band in which the name of the currently active menu is displayed. The rest of the screen, with a white background, shows the various options available in the current menu (shown in the black band at the top of the screen).

When the programmer is turned on, it opens at the main menu and shows the general options of the PS-011, as follows:

a. *Select Series*: gives access to the programming options of various types of ALCAD equipment.

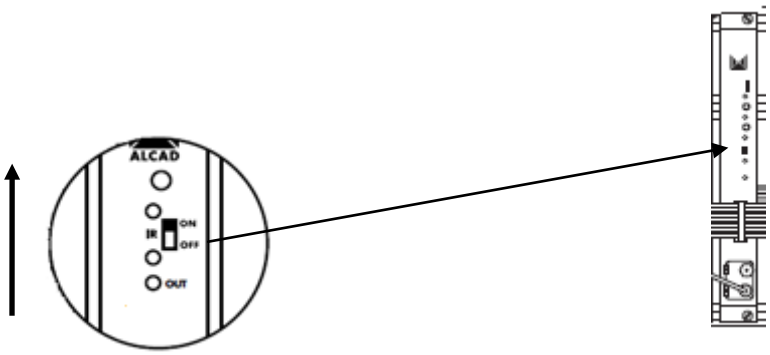
b. *NIT table /NIT table reset*: includes all the options related to generating and deleting the NIT table of an installation.

c. *Manage files*: is used for handling the files contained in memory.

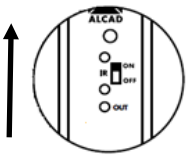
d. Configure PS Programmer: gives access to all the setup options of the programmer, such as choice of language, setting of time and date, management of series to be programmed, as well as other options of a general nature.

1.0 Programming of the Modulator

To program the Digital Modulator, place the programming switch in the ON (upward) position which can be seen from picture below. When you turn the switch in the “ON” position the programming indicator will light up. While the programming indicator remains lit, the modulator is ready to receive data from the PS programmer. When the modulator has been programmed, programming mode should be deactivated by placing the switch in the “OFF” position. The programming indicator light will go out.

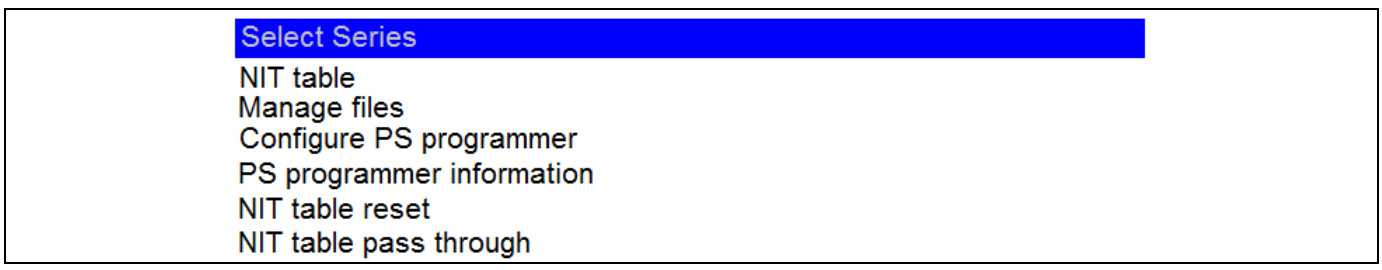


To start programming the DM-102 module you desire to programme please slide the programming indicator switch to the ON position.

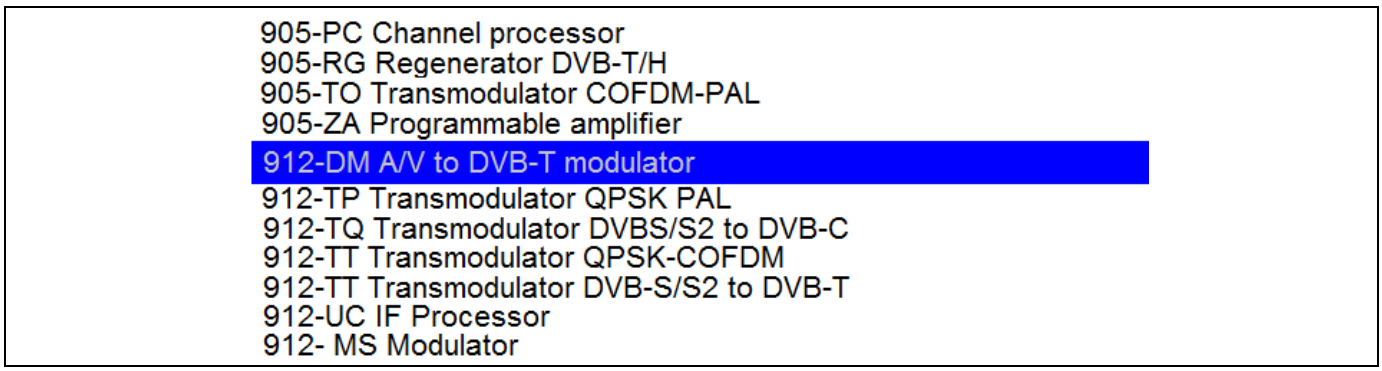


Press the On/Off button on the PS-011 programmer to turn on programmer.

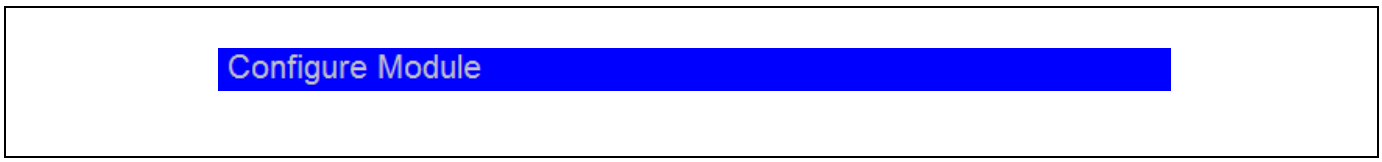
You should then see the window below which gives you the following options:



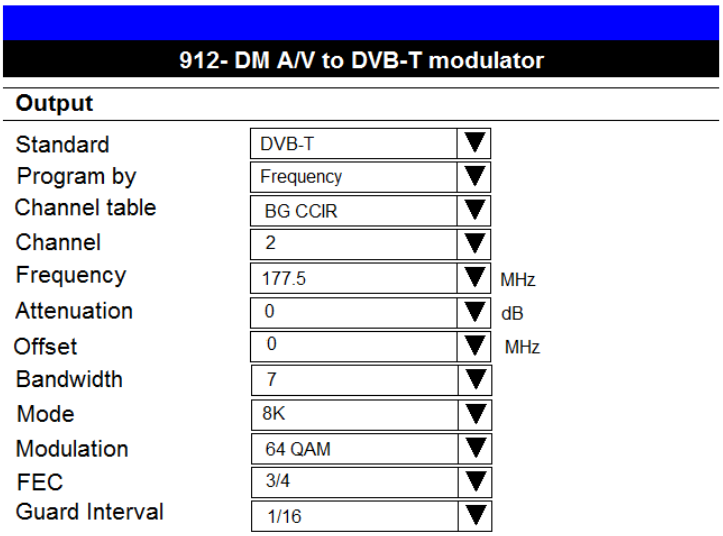
Ensure that “Select Series” is highlighted then press the OK button which will take you to the window on the next page. Using the arrow down scroll down to ***“DM A/V to DVB-T modulator”***



Once you have scrolled the selection bar to the modulator press the OK button to take you to another window which can be seen below



Press the OK button to take you to “Output” configuration screen which can be viewed below



The following output settings options are as follows:

Standard has two options:

- **DVB-T** is an abbreviation for Digital Video Broadcasting-Terrestrial. Select this option for Television reticulation.
- **DVB-H** is an abbreviation for Digital Video Broadcast-Handheld. Select this option for Mobile Handsets.

Once you have selected the "Standard" option press  **transmit button on the programmer to send the change through to module.**

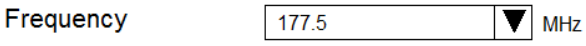
Program by has two options:

- **Frequency** meaning that the output of the modulator is done so by the frequency entered e.g. 655.50.
- **Channel** meaning that the output of the modulator is done so by channel number.

You should always select to Program by "FREQUENCY" as this stops confusion of any changes made to country channel plans.

Once you have selected the Frequency option press the  transmit button to send the changes through to the modulator. The next two options ***'Channel table'*** and ***'Channel'*** will be locked and not applicable if the setting 'Program by Frequency' has been selected on the last option as per ALCAD recommendation.

Frequency is the selection box where you need to enter the output digital RF frequency you desire the modulator to output the V/A feeds to. If you are unsure of the frequencies please note the Australian digital Channel/ Frequency plan below.



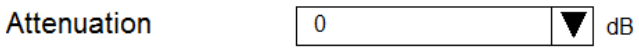
DIGITAL FREQUENCIES FOR AUSTRALIA ARE HIGHLIGHTED IN YELLOW

Press  **transmit button on the programmer to send the change through to module.**

Band	Channel	Aust. Ch.	Picture carrier MHz	Digital Freq. MHz	Sound carrier MHz
I		0	46.25		51.75
		1	57.25		62.75
		2	64.25		69.75
Low S-Band (SI)	S2		112.25		117.75
	S3		119.25		124.75
	S4		126.25		131.75
	S5		133.25		138.75
	S6		140.25		145.75
	S7		147.25		152.75
	S8		154.25		159.75
	S9		161.25		166.75
	S10		168.25		173.75
III		6	175.25	177.5	180.75
		7	182.25	184.5	187.75
		8	189.25	191.5	194.75
		9	196.25	198.5	201.75
		9a	197.25	205.5	202.75
		10	209.25	212.5	214.75
		11	216.25	219.5	221.75
		12	223.25	226.5	228.75
High S-Band (SI-1)	S11		231.25		236.75
	S12		238.25		243.75
	S13		245.25		250.75
	S14		252.25		257.75
	S15		259.25		264.75
	S16		266.25		271.75
	S17		273.25		278.75
	S18		280.25		285.75
	S19		287.25		292.75
	S20		294.25		299.75
Hyperband (SII)	S21		303.25		308.75
	S22		310.25		315.75
	S23		317.25		322.75
	S24		324.25		329.75
	S25		331.25		336.75
	S26		338.25		343.75
	S27		345.25		350.75
	S28		352.25		357.75
	S29		359.25		364.75
	S30		366.25		371.75
	S31		373.25		378.75
	S32		380.25		385.75
	S33		387.25		392.75
	S34		394.25		399.75
	S35		401.25		406.75
	S36		408.25		413.75
	S37		415.25		420.75
	S38		422.25		427.75
	S39		429.25		434.75
	S40		436.25		441.75
	S41		443.25		448.75

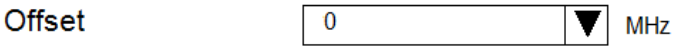
Band	Channel	Aust. Ch.	Picture carrier MHz	Digital Freq. MHz	Sound carrier MHz
UHF	E 21		471.25		476.75
	E 22		479.25		484.75
	E 23		487.25		492.75
	E 24		495.25		500.75
	E 25		503.25		508.75
	E 26		511.25		516.75
	E 27		519.25		524.75
		28	527.25	529.5	532.75
		29	534.25	536.5	539.75
		30	541.25	543.5	546.75
		31	548.25	550.5	553.75
		32	555.25	557.5	560.75
		33	562.25	564.5	567.75
		34	569.25	571.5	574.75
		35	576.25	578.5	581.75
		36	583.25	585.5	588.75
		37	590.25	592.5	595.75
		38	597.25	599.5	602.75
		39	604.25	606.5	609.75
		40	611.25	613.5	616.75
		41	618.25	620.5	623.75
		42	625.25	627.5	630.75
		43	632.25	634.5	637.75
		44	639.25	641.5	644.75
		45	646.25	648.5	651.75
		46	653.25	655.5	658.75
		47	660.25	662.5	665.75
		48	667.25	669.5	672.75
		49	674.25	676.5	679.75
		50	681.25	683.5	686.75
		51	688.25	690.5	693.75
		52	695.25	697.5	700.75
		53	702.25	704.5	707.75
		54	709.25	711.5	714.75
		55	716.25	718.5	721.75
		56	723.25	725.5	728.75
		57	730.25	732.5	735.75
		58	737.25	739.5	742.75
		59	744.25	746.5	749.75
		60	751.25	753.5	756.75
		61	758.25	760.5	763.75
		62	765.25	767.5	770.75
		63	772.25	774.5	777.75
		64	779.25	781.5	784.75
		65	786.25	788.5	791.75
		66	793.25	795.5	798.75
		67	800.25	802.5	805.75
		68	807.25	809.5	812.75
		69	814.25	816.5	819.75

Attenuation is the dropdown box that allows you to adjust the power level output of the modulator.



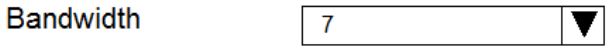
Press T transmit button on the programmer to send the change through to module.

Offset is the dropdown box that gives you the option to add or subtract either 0.166 or 0.125MHz of the output digital RF frequency. Look at table to give you the decimal conversion.



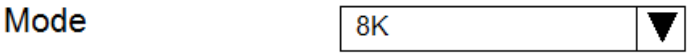
Fraction Offset	Decimal Offsets
+ 1 / 6	+0.166
- 1 / 6	-0.166
+ 1 / 8	+0.125
- 1 / 8	- 0.125

Bandwidth in Australia must **'ALWAYS'** be set to **7 MHz** .



Press T transmit button on the programmer to send the change through to module.

Mode can be set to either 2K or 8K. DVB-T offers a choice of two options for the number of carriers, each with the same fundamental data capacity. In ***"2K" mode***, 1705 carriers are used to carry symbols with a useful duration of 224m s, whereas in ***"8K" mode*** there are 6817 carriers with a useful symbol duration of 896m s. The reason for having two modes is to allow a trade-off to be made between receiver complexity and the ability to withstand long echoes.



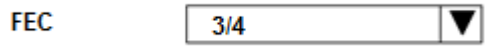
Press T transmit button on the programmer to send the change through to module.

Modulation has 3 modulation options QPSK, 16QAM, 64QAM. There is a balance between the amount rate at which data can be transmitted and the signal to noise ratio that can be tolerated. The lower order modulation formats like QPSK do not transmit data as fast as the higher modulation formats such as 64QAM, but they can be received when signal strengths are lower.

Press T transmit button on the programmer to send the change through to module.

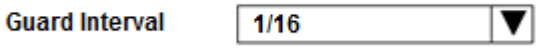
FEC (forward error correction) has 5 option rates. All broadcast systems transmitting data will suffer errors. In order to correct these errors various forms of error correction are used. The rate at which this is done affects the rate at which the data can be transmitted. The higher the level of error correction that is applied, the greater the level of supporting error correction data that is needed in order to be transmitted.

In turn this reduces the data rate of the transmission. Accordingly it is necessary to match the forward error correction level to the requirements of the broadcast network. The error correction uses Convolutional Coding and Reed Solomon with rates **of 1/2, 2/3, 3/4, 5/6**, and **7/8** dependent upon the requirements.



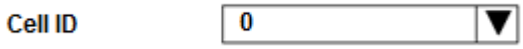
Press T transmit button on the programmer to send the change through to module.

Guard Interval has 4 different interval rates **1/32, 1/16, 1/8** and **1/4.** Guard Intervals are used to ensure that individual transmissions do not interfere with each other. In COFDM systems the beginning of each symbol is preceded by a guard interval. As long as the echoes fall within this interval they will not affect the receiver's ability to safely decode the actual data. We generally recommend using **1/16**.



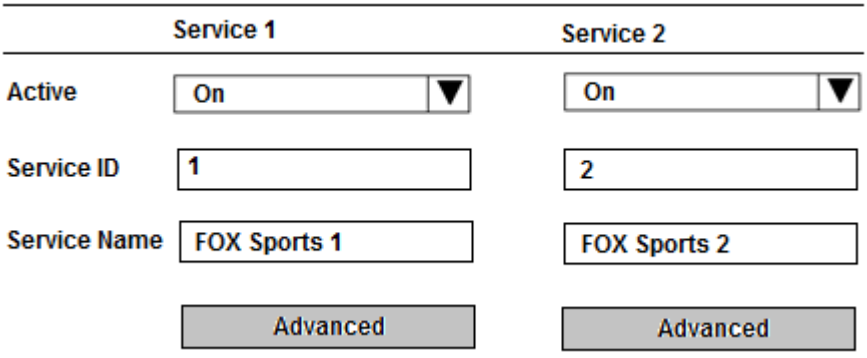
Press T transmit button on the programmer to send the change through to module.

Cell ID is a unique number that is used to identify the transmission from base station tower.

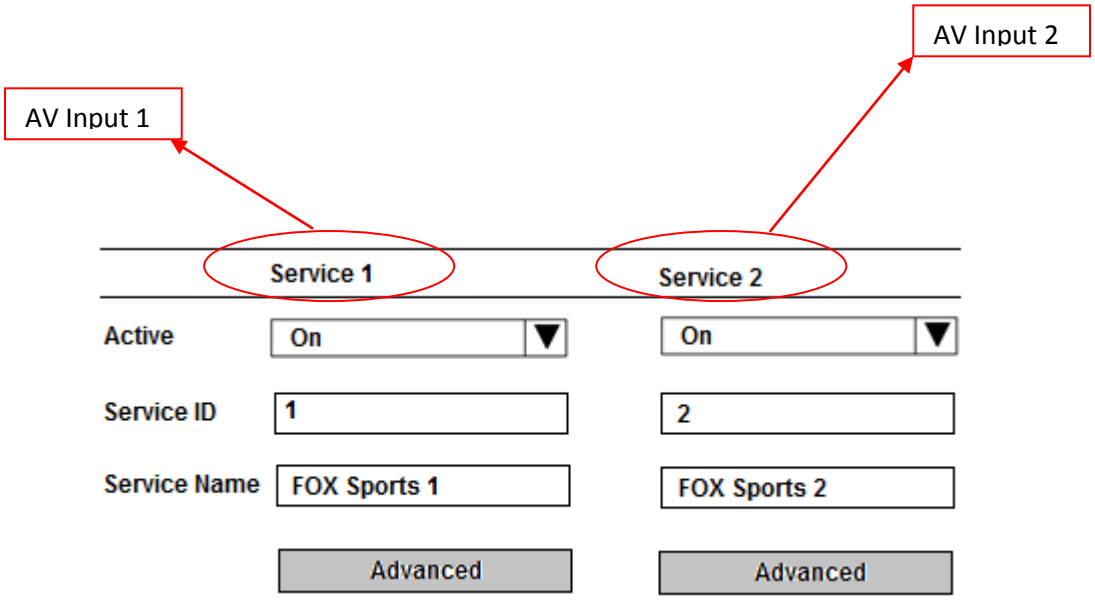


Press T transmit button on the programmer to send the change through to module.

We now come to the services section of the programmer. Please look below at the screenshot below.



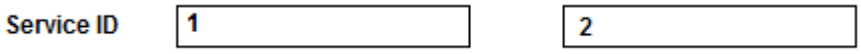
Please note the following screenshot and settings:



ACTIVE- To enable the input to be active the option must be set to “ON”. If you do not want the input to be seen or is not going to be used set to “OFF”.

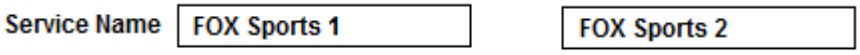
Press T transmit button on the programmer to send the change through to module.

SERVICE ID – This number needs to be unique and never repeated with any other modulator on the same network. Thus on the next modulator service ID must be 3 and 4 and so on



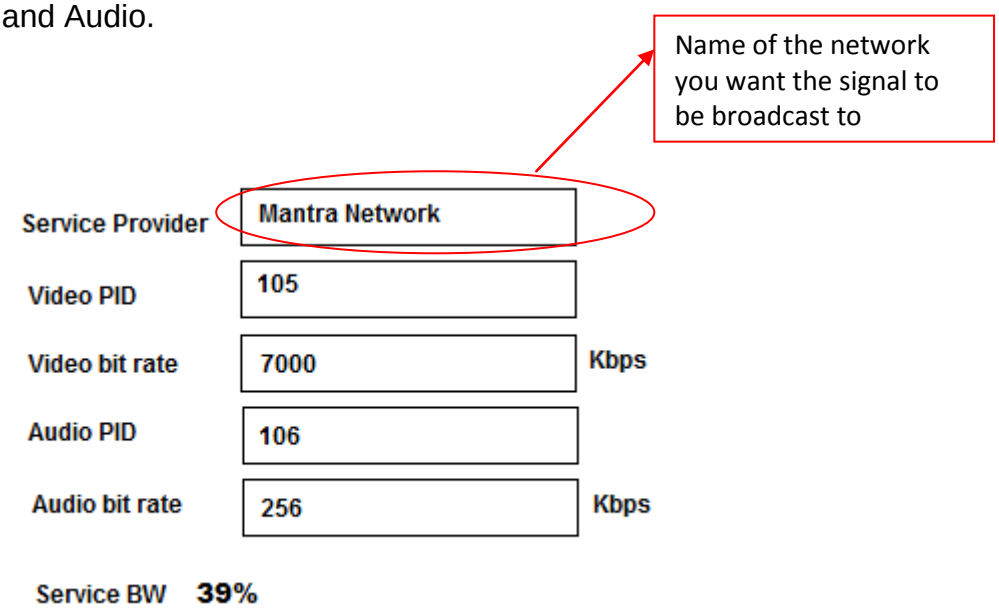
Press T transmit button on the programmer to send the change through to module.

SERVICE NAME – Enter the Service Name which will be displayed on the Television Screen when the user goes to this channel on the TV set. This is like GEM, ONE, GO which the general broadcasters use.



Press T transmit button on the programmer to send the change through to module.

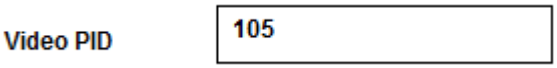
ADVANCED – The ADVANCED menu option needs to be set to enable PID and bitrate configurations for Video and Audio.



Service Provider - This name entered needs to be used on all modulators that are on this same network. Therefore if you have 4 modulators on the system you will need to enter whatever name of the network you use on all 4 modulators. In this case we have used Mantra Network for this example but you can use Quest or Crown. It is best to use the name of the building that the equipment is being installed , so that serviceman can identify that this channel being broadcast is from the building and not Free-to – air services.

Press T transmit button on the programmer to send the change through to module.

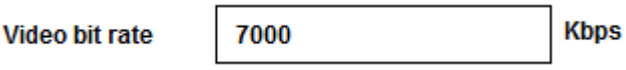
Video PID – This number needs to be unique and should never be repeated on any other modulator within the same network. A good value to start at is 105.



When you set the second input the Video PID should be 110. Always allow 5 values from your last PID. On the second modulator the Video PIDS should be 115 and 120 etc...

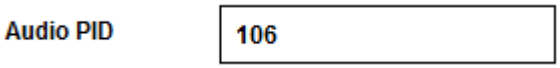
Press T transmit button on the programmer to send the change through to module.

Video Bit Rate- The video bit rate is a desired setting from the user we generally say that 7000 Kbps to 8000Kbps gives the best results and allows enough room for fluctuations of bandwidth within the modulator.



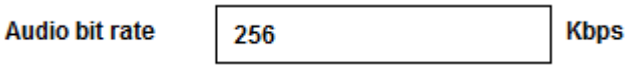
Press T transmit button on the programmer to send the change through to module.

Audio PID- This value should ALWAYS be one value increment of the Video PID that was entered. Thus if you have set 105 for the Video PID then you should set 106 for the Audio PID.

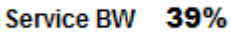


Press T transmit button on the programmer to send the change through to module.

Audio bit rate – The audio bit rate refers to the number of bits used per unit of playback time to represent a continuous medium such as audio. There are 10 options for you to choose from. We generally recommend using 192 or 256 Kbps. The lower the value the poorer the audio quality will be. The value is also proportional to the bandwidth being used from the modulator which is displayed below this setting.

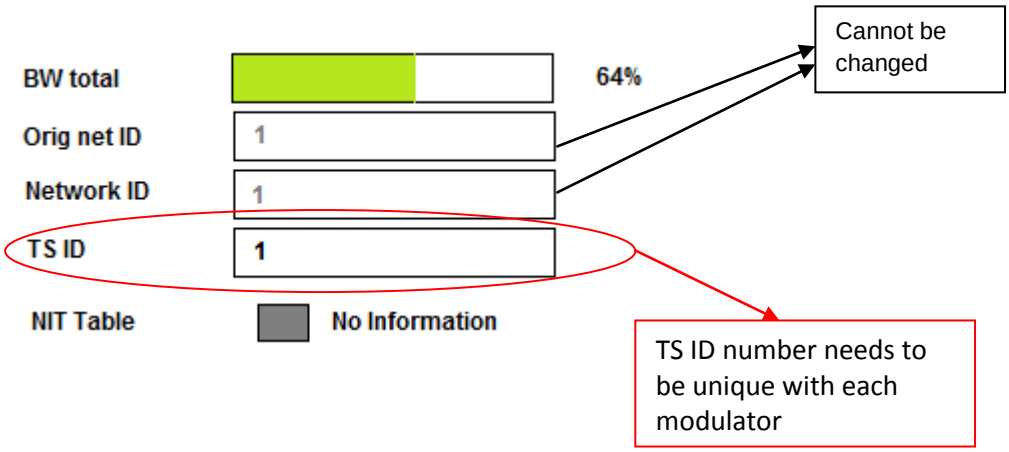


Press T transmit button on the programmer to send the change through to module.



The Service bandwidth is indication information and should never exceed 45%. If the Service BW is higher than 45% you can lower the rate by dropping he Video Bit rate or the Audio bit rate.

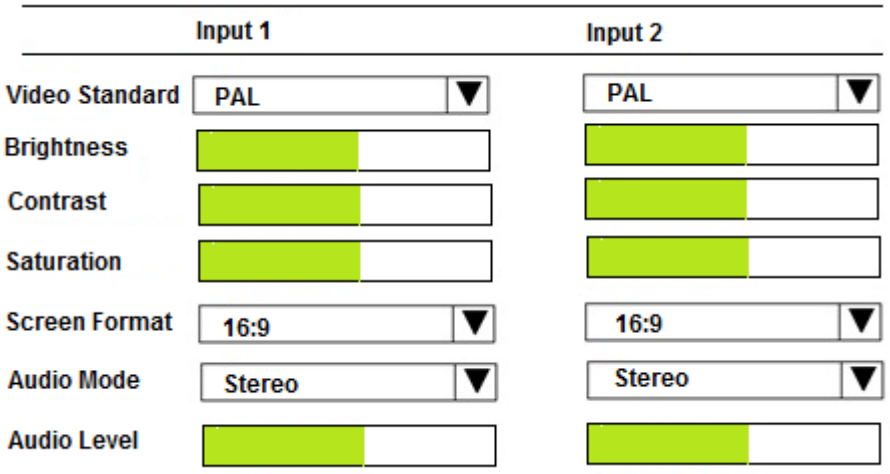
Once you have set all the parameters to your liking press the ESC button to take you back into the previous parameters screen that can be seen below.



TS ID- This number needs to be unique to the modulator system. We recommend that this number coincides with the position of where it sits on base plate. Transport Stream ID number must not be repeated again on another modulator on the same network.

Press T transmit button on the programmer to send the change through to module.

Press the down arrow to take you to the next window of parameters that need to be set.

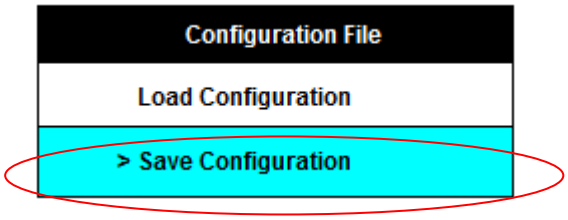


Please set these settings to your liking.

Press  **transmit button on the programmer to send the change through to module on each parameter that has been changed.**

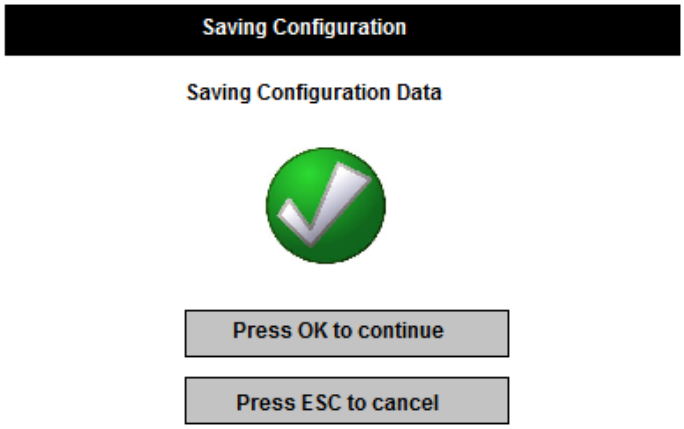
You now need to save the settings. To do this you need to press the “MENU” button on the programmer.

Pressing the Menu button will bring up “Configuration File” window. This window enables you to either save or load a previous configuration.

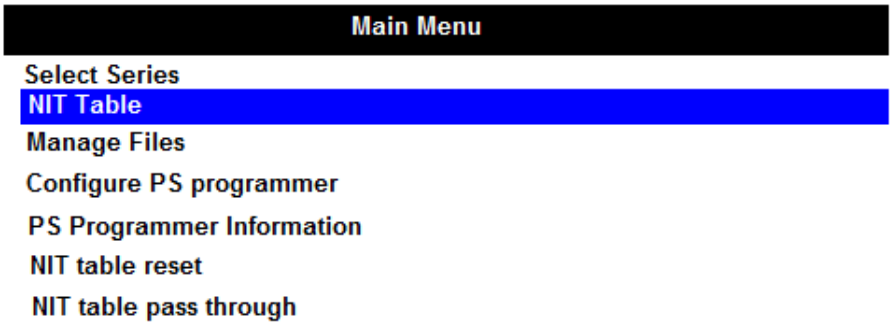


In this case you need to save the configuration. Highlight the save configuration and press the OK button and you will be asked to give the file a name, so enter the name of the file.

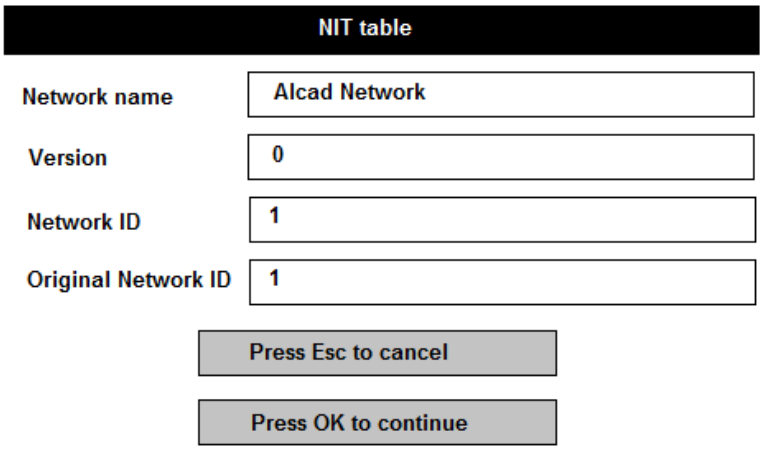
Once you have entered name you desire press okay and enter module number 1. This name must also be unique. Each modulator configuration settings file should be called a different name e.g. Quest 1. Press OK and you are given confirmation of your saving of the configuration file as can be seen below.



Press OK once again and then press ESC button 3 times to take you back to the Main Menu window. You then need to highlight “NIT Table” and press OK.

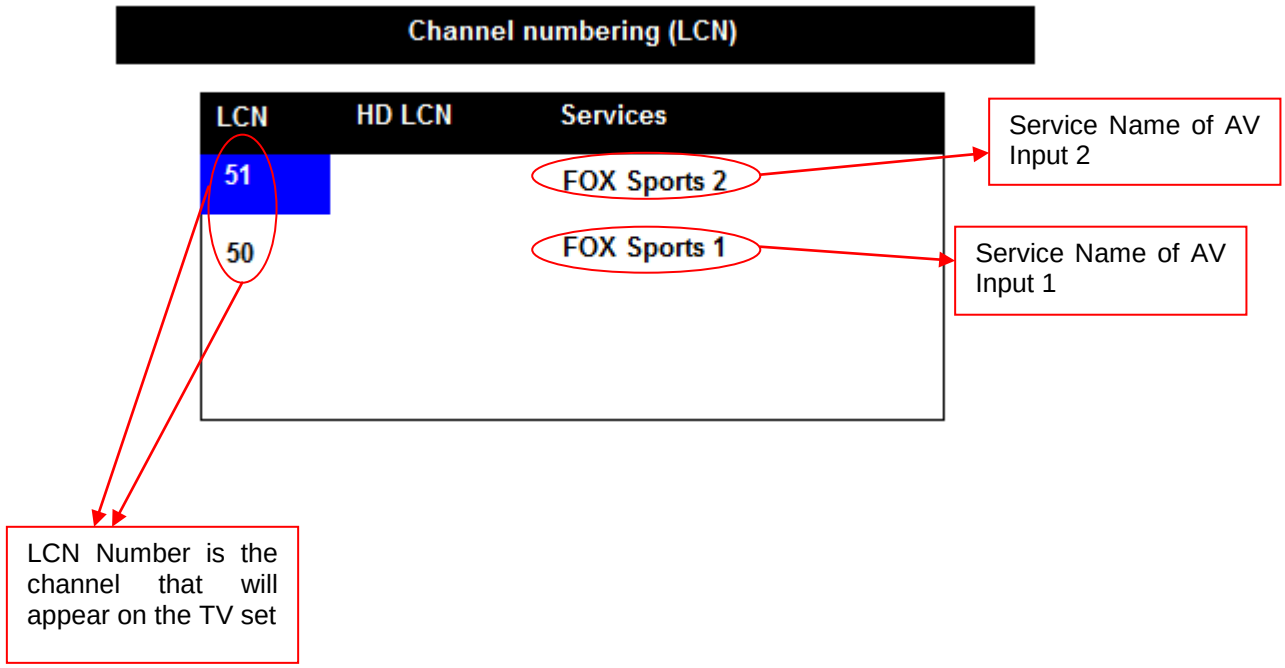


You will then be taken to a screen where you need to select the “configuration file” of the modulator you wish to set the LCN (Logical Channel Numbers) to. The file will be xxx.cfi . Highlight the file and then press OK button to take you to the “NIT table” window which can be seen below.



Enter the Network name as the Service provider that you entered prior the name of the Building the network was installed “Mantra Network”.

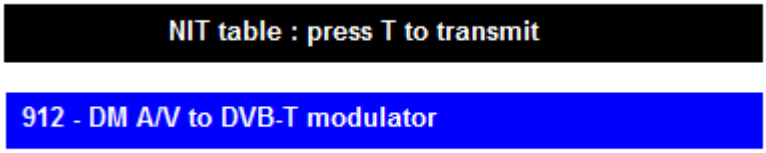
Press the OK button and you will be taken to the Channel Numbering (LCN) window. Look at screenshot below which shows the program names of the modulator you are setting the LCN for.



Where the blue block is highlighted enter the desired LCN number with the Program name and the press down arrow so that the blue highlight block is on the next LCN. Once you have entered the desired LCN channel numbers press the OK button.

DO NOT USE ANY LCN NUMBERS THAT ARE BEING USED BY FREE-TO-AIR BROADCASTERS SUCH AS 90,99,10,24 etc.....

For a brief period a window will show calculating NIT, and move to the screenshot that can be seen below.



Press the 

button to send the NIT to the modulator. Successful completion of the NIT transmission is confirmed by the programmer with the green tick on the window.

You have now successfully programmed the DM-102 modulator. If you are still experiencing problems with programming, please contact ALCAD technical support on 03 9720 5329.