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Integrated Service Technical Application - Programming

Subject   **Page**

Integrated Service System Application - Programming (ISTA/P)

Model: All Models

Production: All

OBJECTIVES

After completion of this module you will be able to:

- Explain how to convert an SSS into an ISSS

- Navigate through the various ISTA/P menus

- Successfully code/program a BMW Group Vehicle

- Understand the reports generated by ISTA/P

Introduction

Reasons for introduction of the new programming system

Due to the constantly growing complexity and ongoing development of functions over the life of vehicles, adaptation of the software on the control units is unavoidable.

The launch of the F01 brings with it a new generation of vehicles which have not only new functions but also a new control unit architecture and a new electrical system configuration.

In order to ensure that those technologies can be supported by the dealer organization today and in the future, a new workshop system is being introduced alongside them.

The new workshop system incorporates an extensive workshop network with a central server for data storage and provision of the applications. It also introduces new hardware components for diagnosis and programming.

The existing programming system, Progman, is being replaced by the Integrated Service Technical Application for Programming, ISTA/P.

ISTA/P contains the present vehicle field programming functions plus new functions and is thus designed for the future content and requirements of vehicle programming in the field.

New features when comparing ISTA/P with Progman

- Reduction and combination of input demands.

- Configurable measures plan viewable as a graphical chart or a table.

- Detailed display of control unit status.

- Automatic repetition of programming in the event of control unit programming or coding errors within the programming process.

- Importing of enabling codes/vehicle order from any location in the workshop provided there is access to the workshop system/ISTA/P.

- Measures plan can be subsequently extended and adapted.

- Programming takes place first followed by automatic coding of all control units.

- Proactive saving of customization and CBS data and re-importing into control units from F01 on.

- Saving of personal profile settings such as phone book or navigation destinations, depending on control units fitted.

- Generation of a control unit order list if hardware needs to be replaced.

- Session can be saved if parts are not immediately available.

- Display of the Progman or ISTA/P version that was last used to program the vehicle.

- Timely/faster updates.

Release Phases

The new programming system ISTA/P is to be introduced in several phases.

Phase 1
Phase 1 requires the transformation of the Software Service Station, SSS, into the Integrated Software Service Station, ISSS. This "Phase 1", allows the ISSS to be integrated in the ISIS network.

The actual data/software (ISTA/P application) needed to program the vehicles is installed in the will be on the ISSS. Updates will be applied to the ISIS via Jetstream or from DVD and then passed on to the ISSS during the maintenance cycles (off-business hours).

ISTA/P is capable of programming and coding all models.

Initially, the interface and control for programming can only take place by using keyboard and mouse on the ISSS. Soon after, programming control can take place via each individual ISID in the workshop.

The ICOM A and the ICOM B will be used as vehicle interface for programming.
The ICOM B will be used exclusively for programming MOST control units.

From the introduction of the ethernet connection in the OBD2 interface, ICOM B will not be used. (example: F01/F02)
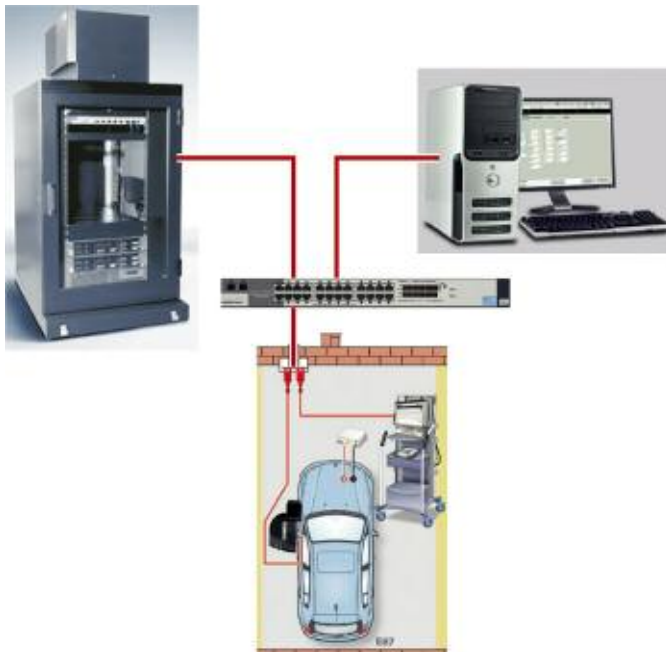
Illustration of Phase 1

Future Phases
It is planned to integrate the programming system ISTA/P entirely in the ISIS workshop server. A precise timetable for integration of ISTA/P in ISIS has not yet been established.

Transforming an SSS into an ISSS

The technical requirements for conversion demand that the SSS is at least the 2nd generation (release 2). The 1st generation SSS can not be converted.

A starter pack containing the following items will be needed:

- ISSS - basic DVD (1 disc)

- ISIS - ISTA/P client (1 disc)

- ISIS ISTA/P data/software (2 disc)

First, the basic DVD is placed in the DVD drive on the SSS and the operating system installed on the SSS. In the process, the previous application, Progman, is completely deleted. From this point on, future, updates and installation of the ISTA/P application on the ISSS will take place exclusively via the ISIS.

The ISTA/P client and then application software are installed on the ISIS. The ISSS is updated/supplied with the application software by the ISIS via the network during the maintenance cycle.

Programming

As a fundamental rule, a vehicle may only be programmed in the following circumstances:

- If a diagnosis system test module instructs that programming is to be carried out.

- As part of a technical campaign.

- In the course of conversions or retrofits.

- If the BMW Group technical support (e.g. via PuMA) specifically instructs that a vehicle is to be programmed.

Similar to An important factor for error-free programming is proper preparation of the vehicle and observance of the instructions during programming. There are special requirements that may apply to individual vehicle models. The actions that are required for all models are described in the following pages.

Note: Programming must always be preceded by carrying out a diagnosis on the vehicle and making sure that there are no faults on the vehicle. Programming must not be started before faults in the vehicle electrical system are ruled out. Always refer to the latest bulletins and information on currently known issues involving software releases.

Preparatory Measures

	Engine Turn off engine, ignition key turned to terminal 0
	Manual Gearbox/SMG/DKG - Transmission in neutral - Parking brake applied
	Automatic Transmission - Transmission in position P - System temperature below 80°C
	Parking Brake On vehicles with electromechanical parking brake, apply the parking brake by means of the parking brake button, otherwise use the handbrake.
	Electric Loads All electric loads, lights and turn indicator switched off. Wiper/washer system switched off. Make sure that the wipers can move freely. The wipers may be activated during programming. On no account block the wipers.

	Battery and Battery Charger The battery should be sufficiently charged at the start of the programming procedure (>13 V). Connect a BMW-specified and approved battery charger and set to external power supply mode (FSV mode). Do not connect or disconnect the charger during programming. The electrical system voltage must not drop below 13 volts during the programming procedure.
	Diagnosis Carry out a vehicle test on the ISTA workshop system. Using the ISTA diagnosis system, rectify any problems before programming and delete stored fault codes.
	Interfaces Programming is performed exclusively via the ICOM devices. Any vehicle equipped with a MOST bus manufactured before the F01/F02, will require the use of an ICOM A and an ICOM B.
	Programming CKM data is automatically saved by ISTA/P and written back to the control unit after programming. The data status of the ISSS must always be up to date.

Programming of Control Units

The programming system ISTA/P ensures updating of the data statuses on all vehicles by automatically generating a measures plan that should be implemented on vehicles that are bound to an i-level status.

In this context, a distinction is made between three different options. Each of these options represents a change or adaptation to the software and functions. A distinction is made between three measures:

- Programming
- Coding
- Customizing

Programming

Programming (also known as flash programming) loads a new program or data in the control unit. A distinction can be made between control units with:

- Program status and
- Program and data status

The program status of the control unit corresponds to the operating system and controls the computer program in the control unit. The data status involves the characteristic maps and characteristic curves specific to the vehicle, engine and transmission. The ISTA/P programming application automatically takes that into account when programming the control unit concerned.

With ISTA/P, the control unit has been programmed, any necessary coding procedures are performed automatically.

Coding

Coding involves adapting the control units to the specific vehicle. That means that functions and data maps already in the control modules are enabled or activated in accordance with the vehicle order for the vehicle.

Customizing

On older vehicles, the car and key memory (CKM) option located under the Vehicle option is used to enter the customer-specific settings for the car and key memory functions on certain electrical systems.
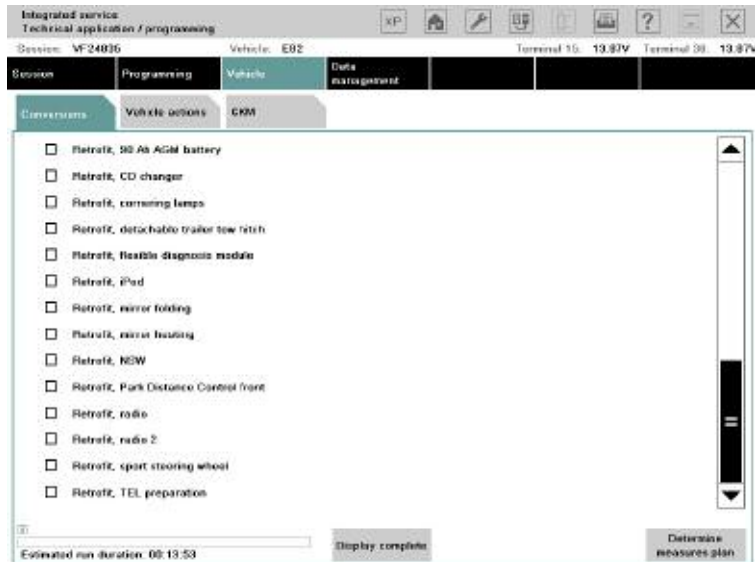

Personal Profile

On vehicles with the Personal Profile function, the customization settings are entered directly by the customer. For such vehicles, there is no Customize button on the Vehicle menu.

Programming Process

The programming process consists of various procedures, some of which require manual intervention although most are automatic.

The individual procedures are illustrated here and described in detail below.

Programming process sequence
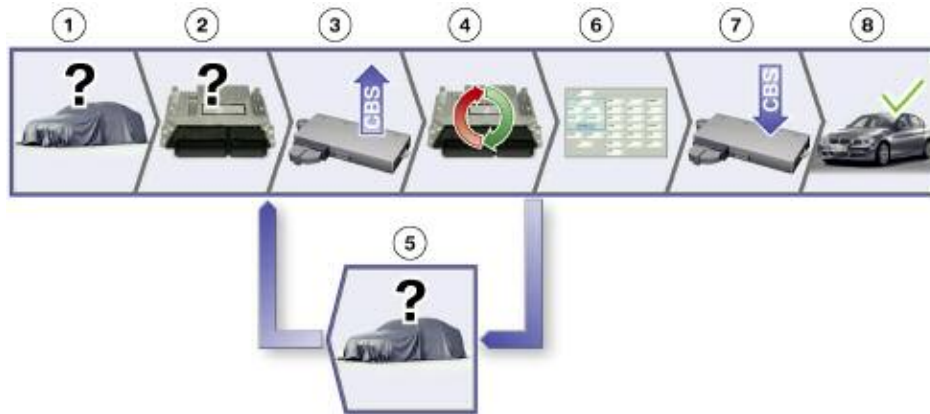
Index	Explanation
1	Identify vehicle and obtain read-out of control unit data
2	Produce and configure measures plan
3	Prepare for programming, export CBS/CKM data
4	Carry out repairs and replace control units where necessary
5	Re-check vehicle identification after repairs. Update measures plan.
6	Carry out programming
7	Carry out programming follow-up, import CBS/CKM data
8	Programming successfully completed.

Starting Programming

Essentially, ISTA/P is an independent external application that will run on the ISSS in Phase 1.

Although in a latter stage ISTA/P can be started from the ISID, it is entirely independent of the ISTA diagnosis application. That means that before programming can be started, diagnosis must be ended or interrupted.
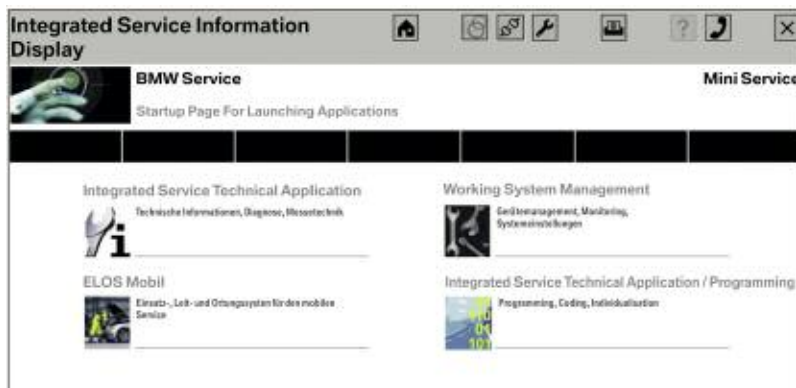
Starting and management of a new programming session can only be carried out by means of ISTA/P.

When ISTA/P is started, the user has a choice of three different actions:

- Cancel and exit ISTA/P

- Open an existing programming session

- Start a new programming session

Start screen on the ISSS Integrated Software Service Station

Start screen for ISID (not enabled initially)

Opening an Existing Programming Session

If the user decides to open an existing programming session, all the programming sessions currently in progress are listed and the user can select the session required.

On the toolbar there are various buttons for opening more menus.

On the options bar, you can select the session or the vehicle that is to be programmed or the Integrated Software Service Station (ISSS) that is to be used for programming. Depending on the vehicles models connected, each ISSS can carry out up to five programming sessions at the same time.

On the function bar is the button for selecting the vehicle access method.

The information panel shows the details of the sessions or available ICOMs.

The control buttons are used to navigate through the programming process, e.g. the "Next" button takes you to the next screen.

List of current sessions
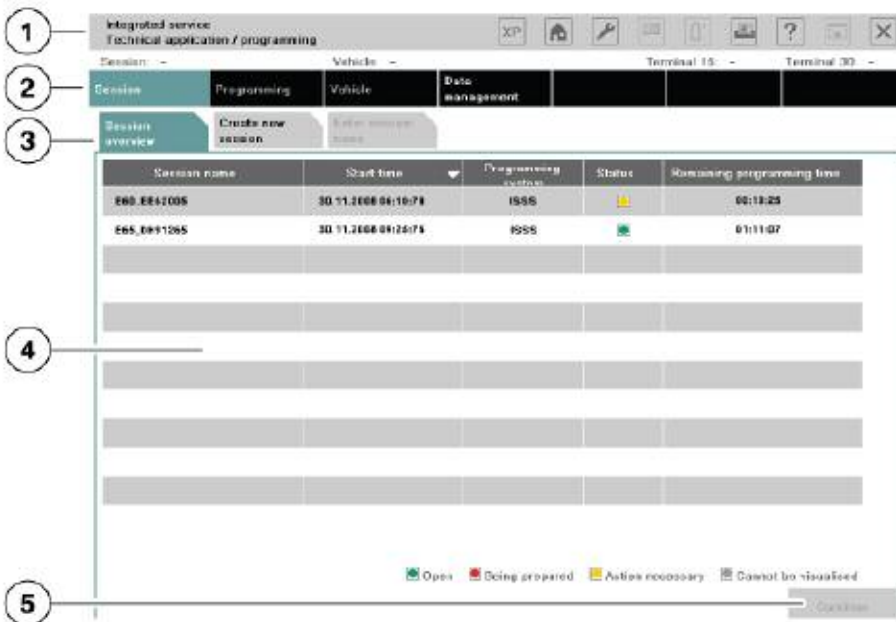
Index	Explanation
1	Toolbar
2	Options bar
3	Function bar
4	Information pane
5	Control buttons

Starting a New Programming Session

When a new programming session is to be started, the programming server on which the vehicle is to be programmed must first be selected.

The ISSS used for the session can be selected manually or automatically. Because the ISSS can only program one F01 at a time or 5 other vehicles at a time, it is recommended that the automatic ISSS selection is carried out.
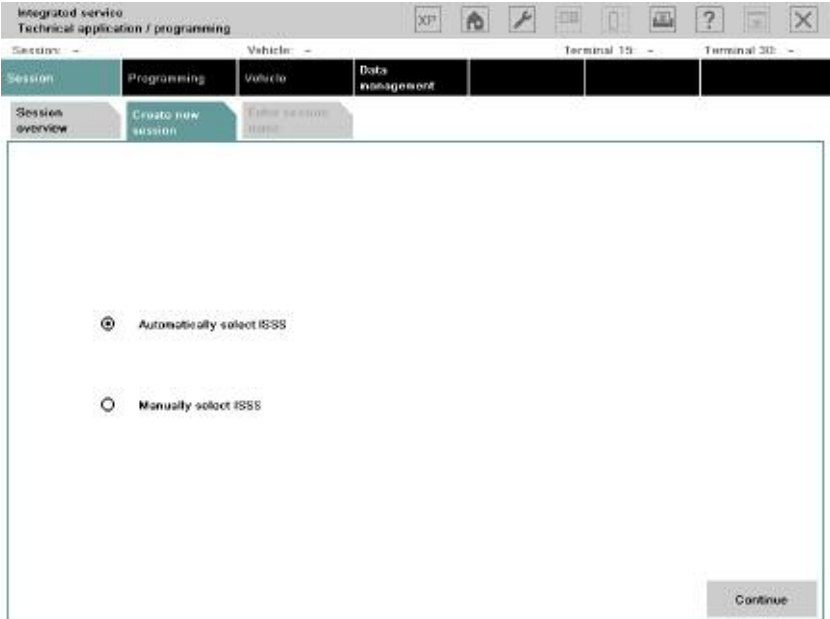

Selecting ISSS to be used for session
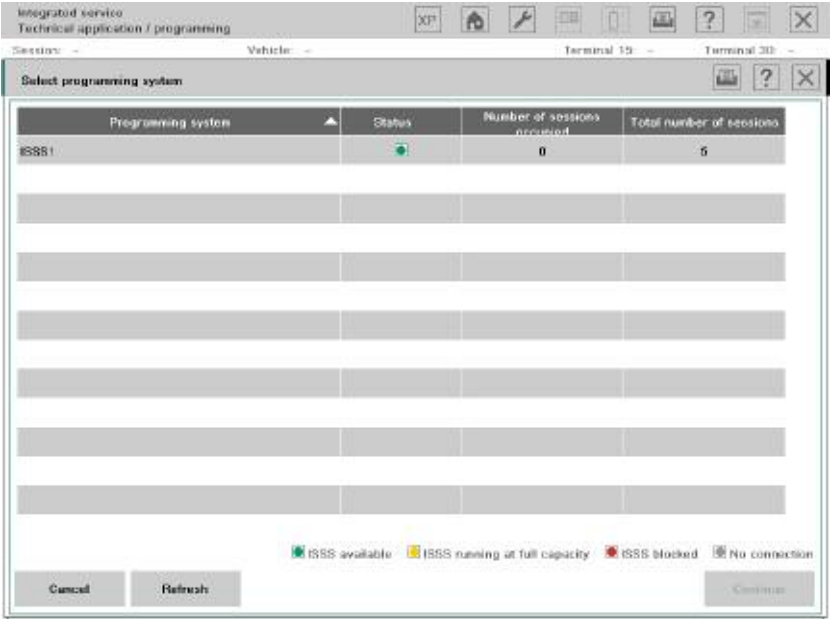
Selecting ISSS to be used for session

The connection manager on the ISIS establishes all the ICOMs that are available and displays the details. The user can select the desired ICOM or vehicle from the list displayed. ISTA/P then establishes the vehicle data. If that is not possible for any reason, the vehicle must be selected manually.
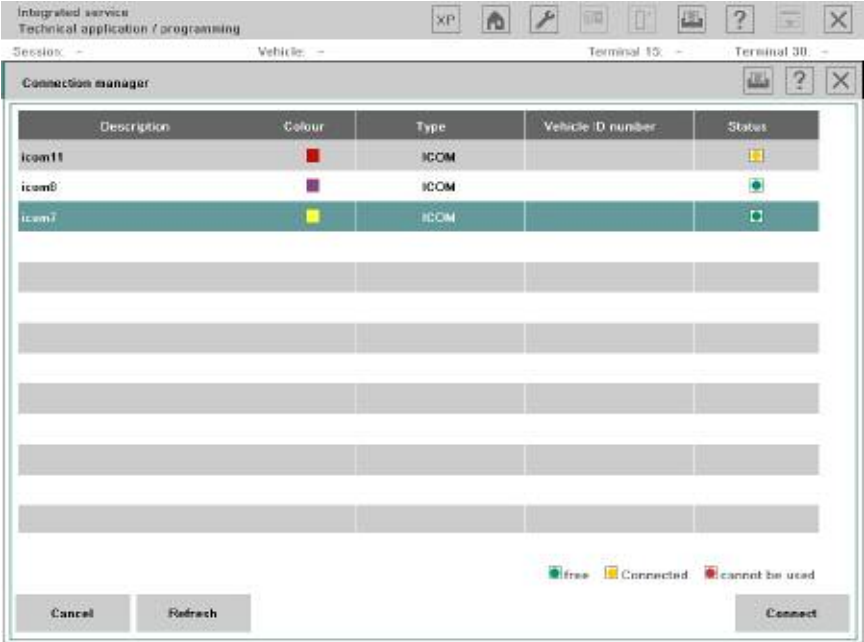
Selecting ICOM

The user then has the opportunity to give the session any individual name, but the system automatically enters the model of the vehicle along with the chassis number as an identifier (example: E60_EE12345).

Selecting Vehicle Interface

The same vehicle interfaces are used for programming with the new workshop system as for diagnosis.

From the F01 on, all control units can be programmed using only the ICOM **A**. Even though the F01/F02 is equipped with a MOST bus, ICOM **B** is not necessary due to the ethernet connection via the OBD2 connector.

For CAN-bus vehicles the ICOM A is used. MOST control units are programmed directly using the ICOM B. The ICOM B is connected to the ICOM A and the workshop network by a USB cable.

For older I-bus/K-bus vehicles with the round diagnosis connector, the ICOM C (C) is used in conjunction with the ICOM A.

Vehicle interfaces

Vehicle Access for MOST Bus

When programming vehicles with MOST bus from E65 to E9X, vehicle access is established as shown in the photograph below.

Vehicle access for programming MOST-bus vehicles

Vehicle Access for I-bus/K-bus Vehicles

On older vehicles without OBD II connection, programming is carried out via the round diagnosis connector in the engine compartment. That requires connecting the ICOM C to the ICOM A and to the workshop network.

Vehicle access for I-bus/K-bus vehicles

Vehicle Access from the F01/F02 on

All control units will be programmed exclusively using the ICOM A.

Identifying the vehicle and obtaining a read-out of control unit data

ISTA/P checks the vehicle electrical system, the central gateway and the vehicle-order control units (FRM/CAS/light module). The vehicle order is read and a consistency check carried out between the actual status and the required status.

If the central gateway does not respond, a software routine for restoring it to working order is attempted before the service technician is instructed to replace the ZGW.

First of all, the basic details of the vehicle are established such as VIN number, model, type code, etc.

Then, all control units fitted and the current I-level of the vehicle is determined. In addition, the programming system establishes, if possible, the software version last used to carry out servicing operations on the vehicle.

That makes it possible to avoid unnecessary programming if the vehicle already has the latest software version.

Afterwards, the details of the ex-works equipment options for the vehicle stored on the BMW programming system are retrieved.

Next, the control units identified and the equipment options fitted are compared (comparison of required vs. actual status).

For example, it is established whether the list of control units obtained actually matches those fitted on the vehicle and whether the level matches the current required status.

That ensures that all control units on the vehicle communicate properly with one another within the network. An I-level is a combination of networked control units validated and approved by BMW Development.

Establishing vehicle details

Index	Explanation
1	Vehicle data
2	I-level with which the vehicle left the factory
3	Current I-level of the vehicle
4	System and version last used to program the vehicle
5	List of all optional equipment fitted on the vehicle

Producing and Configuring the Measures Plan

Before programming can be carried out, the measures plan is produced and can also be configured by the user. For example, it is now possible to program refits or conversions at the same time as the software update. The configuration for that is done now so that no further manual input is required later on during the programming sequence and it can then run automatically.

After the identification process, the user is asked if any control units have been replaced on the vehicle. If the answer is YES, ISTA/P checks whether an enabling code is required for the replaced control unit and, if so, requests it from the user if it has not already been entered on the system.

Control unit replacement check

Associated customization data such as settings for the air conditioning are backed up and the action "Follow up control unit replacement" added to the list of actions.

In general it is advisable to manually back up the customer's individual settings. If the control unit is defective, they can not be read and, therefore, can not be written back to the control unit after programming either.

The necessary actions, such as "Update control unit software", are established and added to the list of actions.

Then for the first time ISTA/P produces an measures plan based on the tasks in the list of actions at that point.

The user has the option of editing the measures plan. The user can add further actions to the measures plan but not remove them. The following actions can be added to the measures plan:

- Carry out conversion
- Prepare control unit replacement
- Program control unit
- Code control unit
- Set CKM data
- Enter enabling code
- Import vehicle order

Note: **Required service functions such as initializations and clearing of fault codes are only indicated; they must be carried out on the ISTA diagnosis system.**

Display of action plan as graphical chart


Measures plan shown as a table

The measures plan can be viewed as a graphical chart by pressing the button "Control unit tree" or as a table by pressing the button "Edit control units".

The measures plan can now be confirmed, rejected or cancelled.

The measures plan indicates which control units do not require any action - they are marked green.

The other control units, on which action is required, are marked yellow or red. The actions that are required are indicated by the letter(s) shown on the control unit. The letters stand for the following:

P = Program

C = Code

I = Initialize

R = Replace

M = Mount (i.e. fit/install)

U = Unmount (i.e. remove).
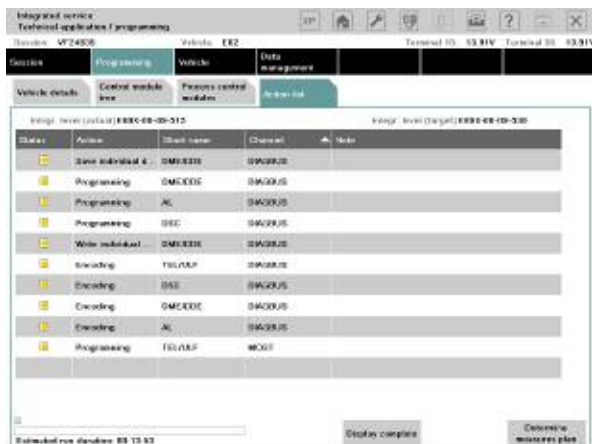
Action list

The Action list contains all information relating to the control unit concerned and which via channel (D-CAN/MOST) it is programmed.
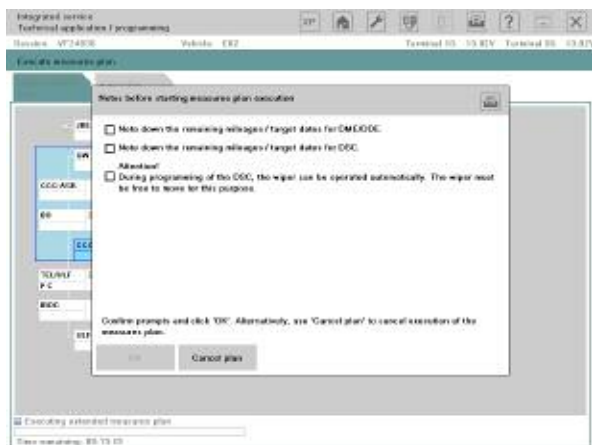
Guidance notes

Furthermore, additional guidance notes can be shown, e.g. on noting the remaining life of DME or conversion instructions for replacing control units.

Note: The guidance notes <u>must</u> be acknowledged by ticking the checkboxes and confirmed by clicking OK.

Preparing for Programming

After confirming the measures plan, the flash programmability of the control units is first checked and a notification message displayed if there is a problem. Then the customization data and the CBS data is read and backed up for rewriting later on.

If a control unit requires replacing, ISTA/P displays a message to the user indicating that the control unit should now be replaced.

After replacement is confirmed, the action "Follow up control unit replacement" is flagged for attention later on in the process.

ISTA/P then shows all required notifications, which must be acknowledged by the user before the actual programming starts.

That simultaneously starts the automatic programming process which requires no further interaction on the part of the user.

Note: As always, please keep in mind that the CAS is programmed first with the key removed. After successfully programmed, the ignition has to be switched on again.

Carrying Out Repair Tasks
If it was established in the process of identifying the vehicle that repair tasks are required, e.g. due to updating hardware or replacing a control unit, they are now carried out before the actual programming/coding process.

If the spare part is not available or the wrong part has been ordered, the session can be saved and ended at this point. As soon as the right part is available, the session can be retrieved and continued.

ISTA/P establishes from the measures plan which repair tasks are required and displays them. After successful completion of a repair task, the vehicle must be re-identified and any necessary software updates added to the measures plan.

In that way the possibility of inconsistencies on the vehicle after a repair is avoided. If a repair task fails, the programming process is cancelled.

Updating the Measures Plan
After a repair task has been carried out, ISTA/P performs the vehicle identification process again. If it identifies irregularities, e.g. that a control unit with an older I-level status has been fitted, appropriate actions are automatically set on the system or indicated to the user.

If there are irregularities, ISTA/P establishes which software updates are required based on compatibility management and adds them to the action plan. The measures plan is then updated and programming automatically started.

To prevent vehicles with inconsistencies being created, the user has no means of stopping the programming sequence.

Carrying Out Programming

This stage of the process involves the programming and subsequent coding of the control units.

In the process of programming or coding a particular control unit, the system checks in each case whether the operation has succeeded before continuing with the programming of further control units. A particular version of ISTA/P distributes only one I-level. Programming of the vehicle as a whole (meaning all control units on the vehicle) is always performed to the latest I-level (target I-level).

The next step is to write the enabling codes to the relevant control units if required and modifying the vehicle order if conversions have been carried out. The programming of control units can also be performed simultaneously if they are on different bus systems, e.g. MOST and CAN.

The progress of the programming process is indicated by a progress bar.

Carrying out programming
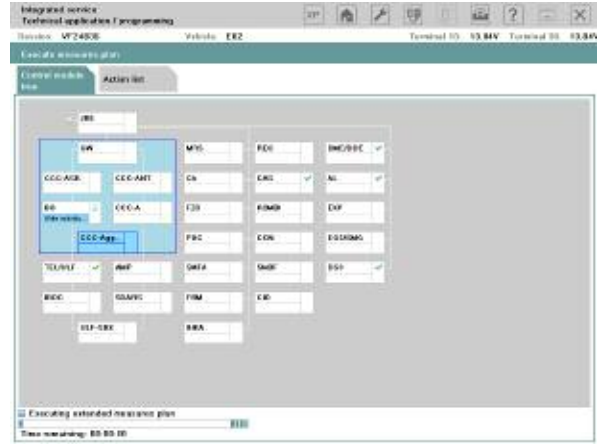
View after completion of programming

If programming/coding/initialization has been completed successfully, there is a green tick by every control unit on which an action has been performed.

If an action has failed or not been completed, the control unit concerned is marked with a red X.

By clicking the control unit concerned, you can obtain information as to why programming failed.

Completing Programming Session

The last stage of the programming process is importing the customization, CBS and CKM data. The data is written back to the control units and checked. Afterwards, the automated initialization sequences are performed where required (electric windows/slide/tilt sunroof).

The automatic programming process is them complete. The initialization sequences that require user interaction are then carried out.

Notes on follow-up

After completion of the initialization sequences, ISTA/P establishes from the measures plan what service functions are required, e.g. setting steering angle. They are shown to the user. They have to be carried out as part of the diagnosis after programming. That is carried out by way of the vehicle test on the ISTA workshop system and afterwards all fault memories must be cleared.

Finally, the actual status is checked once again and the final report produced. ISTA/P provides the user with the final report.

The user can print out the final report or else it is stored for a certain period on the ISIS.

The entire programming log is sent to BMW AG as part of the FASTA data. This allows BMW to retrace how the vehicle programming was carried out from the user actions, either for accounting purposes or if there is a subsequent fault.

Furthermore, that data is automatically analysed so that software errors can be detected at an early stage and suitable measures initiated. As a result, BMW is able to continuously monitor and improve software quality.

Final Report

Index	Explanation
1	Final report
2	Current programming data: data, time, ISTA/P version
3	Vehicle data: mileage and VIN number
4	I-levels: factory, last, current
5	SA numbers
6	Programming actions indicating success or failure over MOST
7	Programming actions indicating success or failure over I/K bus
8	Coding actions indicating success or failure
9	Data saving actions indicating success or failure
10	Additional actions, e.g. whether updating of I-levels was successful or failed.
11	End notes