AP-1.4
AutoPASS Processing of Signal Codes

Version: 6.0
Date: 4 March 2025

DOCUMENT STATUS

Document nr.	AP-1.4 AutoPASS Processing of Signal Codes

Status	Version	Description
Approved	6.0	

REVISION HISTORY

Version	Date	Author	Main Changes
1.0	20 June 2017	NPRA	Original document “4.1 Processing of Signal Codes”
2.01	13 April 2021	NPRA	Relabelled the document to AP-1.4. Signal codes 21, 33, 35 and 36 added. Signal code 19 modified.
3.0	2 August 2021	NPRA	Added detailing of SC21 – requirement for matching ANPR from front and rear images.
4.0	4 July 2023	NPRA	Redefined MMI in table 1. Other minor clarifications.
5.0	4 July 2024	NPRA	Repositioned SC19 in *Figure 1*, expanded detailing of its use, and changed to no picture to be taken for this SC. Added new *Figure 2*. Clarification on MMI in section 3.2.3. Various minor clarifications.
6.0	4 March 2025	NPRA	Corrected SC19 in *Figure 1*. “Video” was “Yes”. Corrected to “No” to be in accordance with *Table 2*.

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1 PREFACE

1.1 Objectives

This document provides a detailed specification of the passage handling logic to be implemented in all CPE in AutoPASS Samvirke. Common principles for the determination of different passage signal codes are necessary in order to handle transactions in a uniform way in the various back-office systems, independent of the supplier and type of CPE.

This specification is aimed at all actors including their subcontractors/suppliers that are handling transactions in AutoPASS Samvirke.

1.2 Reference Documents

The following table lists the documents that are referenced in this document. Other documents of relevance to the topic of this document may also be listed:

Table 1 – Reference Documents

Ref.	Document Title	Description
1.	AP-1.0 AutoPASS Definisjoner, Standarder og Direktiver	Lists and describes all concepts, definitions, standards, and directives that are relevant for the specifications of AutoPASS Samvirke.
2.	AP-1.5A Overordnet kravspesifikasjon for AutoPASS vegkantutstyr	General requirements for roadside equipment.
3.	AP-1.5B Detaljerte krav til AutoPASS vegkantutstyr	Detailed requirements for roadside equipment.

1.3 Concepts, Definitions, Standards, and Directives

For concepts, definitions, standards, and directives, please see ref. [1].

Ref. [2] outlines the purpose and guidelines for the technology and operation of roadside equipment.

Detailed requirements for the roadside equipment can be found in ref. [3]

2 SIGNAL CODES

Signal Codes (SC) describe the type of transaction as a result of the processing of the passage in the CPE. The CPE shall process vehicle detections and OBE readings according to the flow chart in *Figure 2* as well as to the descriptions given in this document.

Table 2 - Overview of Signal Codes

Code	Image	MMI [1)]	Description	Basis for Charge (Assigned by AP-IP)
02	No	255	Approved passage with OBE in the OBUStatusfile	OBE
08	No	255	Passage with valid OBE but without corresponding vehicle detection.	OBE
19	No	255	The CPE has detected that there is more than one OBE in the same vehicle. There is already detected another OBE with a chargeable Signal Code of equal or higher priority. This OBE reading shall therefore not be given a chargeable Signal Code. The OBE may be with or without a valid contract.	No charge
21	Yes	255	Passage with a valid OBE that is in the OBUStatusfile. There is mismatch between the LPN in the OBUStatusfile versus the ANPR result from the roadside. Signal Code 21 is only to be used when the ANPR results from the front and rear images are identical (LPN and nationality).	Video Enforcement
22	Yes	n/a	Passage without any detected OBE or with a not approved OBE type (EFC Context Mark (EFC_CM) is not approved).	Video Enforcement
23	Yes	1	Passage with an OBE of a legal type, but the OBE is not declared in the OBU StatusFile.	Video Enforcement
25	Yes	2	Passage with a legal OBE type but authentication failed.	Video Enforcement
26	Yes	2	Passage with a legal OBE type but the access credential check failed.	Video Enforcement
33	No	1	OBE passage without a vehicle detection and with an OBE of a legal type that is not declared in the OBU StatusFile.	No charge
35	No	2	OBE passage without a vehicle detection, with an OBE of a legal type, but authentication failed.	No charge
36	No	2	OBE passage without a vehicle detection, with an OBE of a legal type, but access credential check failed.	No charge
40	No	255	Passage in a lane in mode "free of charge".	No charge
42	Yes	n/a	Passage in a lane without an OBE reader. To be used for a passage in the charging direction in a bus-bay or opposed lane.	Video Enforcement

1) Explanations of MMI (Man-Machine Interface) codes that are sent from CPE to OBE to give audible feedback to the driver about the result of the processing of the passage:

   0 = OK
   1 = Not OK
   2 = Contact Service Provider
   255 = No Signalling

3 SIGNAL CODES-PROCESS DIAGRAM

3.1 Flow chart

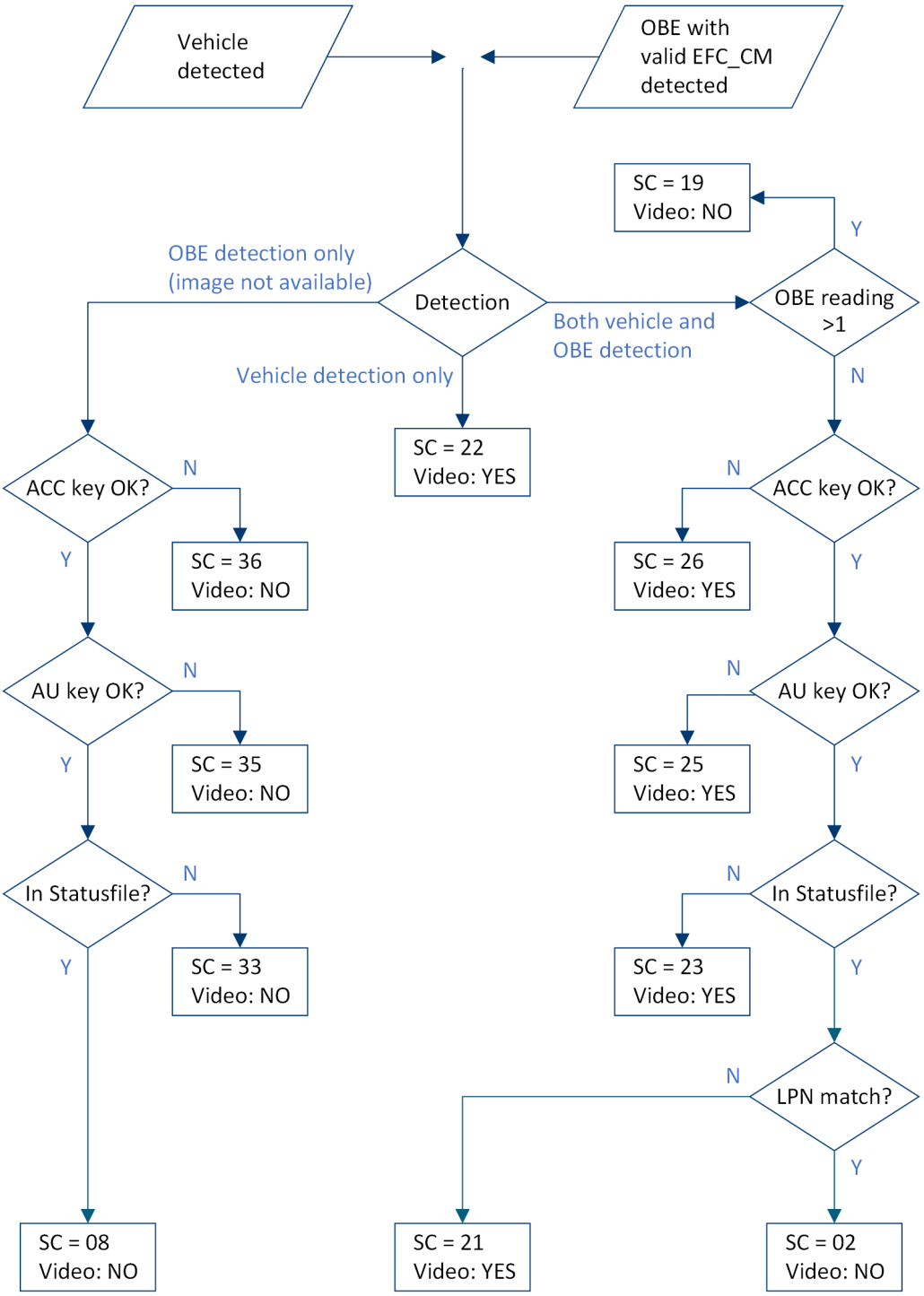

Figure 1 - Flow chart of Signal Code assignment

3.2 Explanation of the flow chart

The diagram in *Figure 1* shows the different verification steps needed to determine the signal codes and video enforcement of a passage. The CPE Supplier shall implement logic in the CPE that is consistent with this diagram.

3.2.1 OBE reading with vehicle detection

The basic principle in the diagram is that both the OBE reader (antenna) and a vehicle detection system can trigger the processing of a passage. If there is an OBE detection there is normally also an associated vehicle detection. The rightmost path of the flow chart shows the logic in this situation.

3.2.2 OBE reading without vehicle detection

It is assumed in the diagram that only a vehicle detection triggers the video system to capture pictures of the vehicle. If an OBE detection has no corresponding vehicle detection, pictures are not available. An OBE reading without an associated vehicle detection shall be accepted.

3.2.3 Multiple OBE readings for a single passage

It is not uncommon that there is more than one valid OBE in a vehicle. A basic principle is that there should never be more than one accepted chargeable OBE reading per passage. Therefore, the CPE must check whether the same vehicle detection is seen to be related to several OBE readings. If this is the case, only the OBE reading of the highest priority shall be given a chargeable Signal Code, and all other accepted OBE readings shall be assigned SC19.

The order of priority of Signal Codes:

1) 02
2) 21
3) 23, 25 and 26 – They all have the same priority.

The flow chart in *Figure 2* illustrates the above.

The MMI to be given to each OBE shall be determined by the Signal Code first assigned to the OBE reading. Hence, if an OBE reading is first given e.g. SC23 and is later changed to SC19, the MMI shall still be given for SC23.

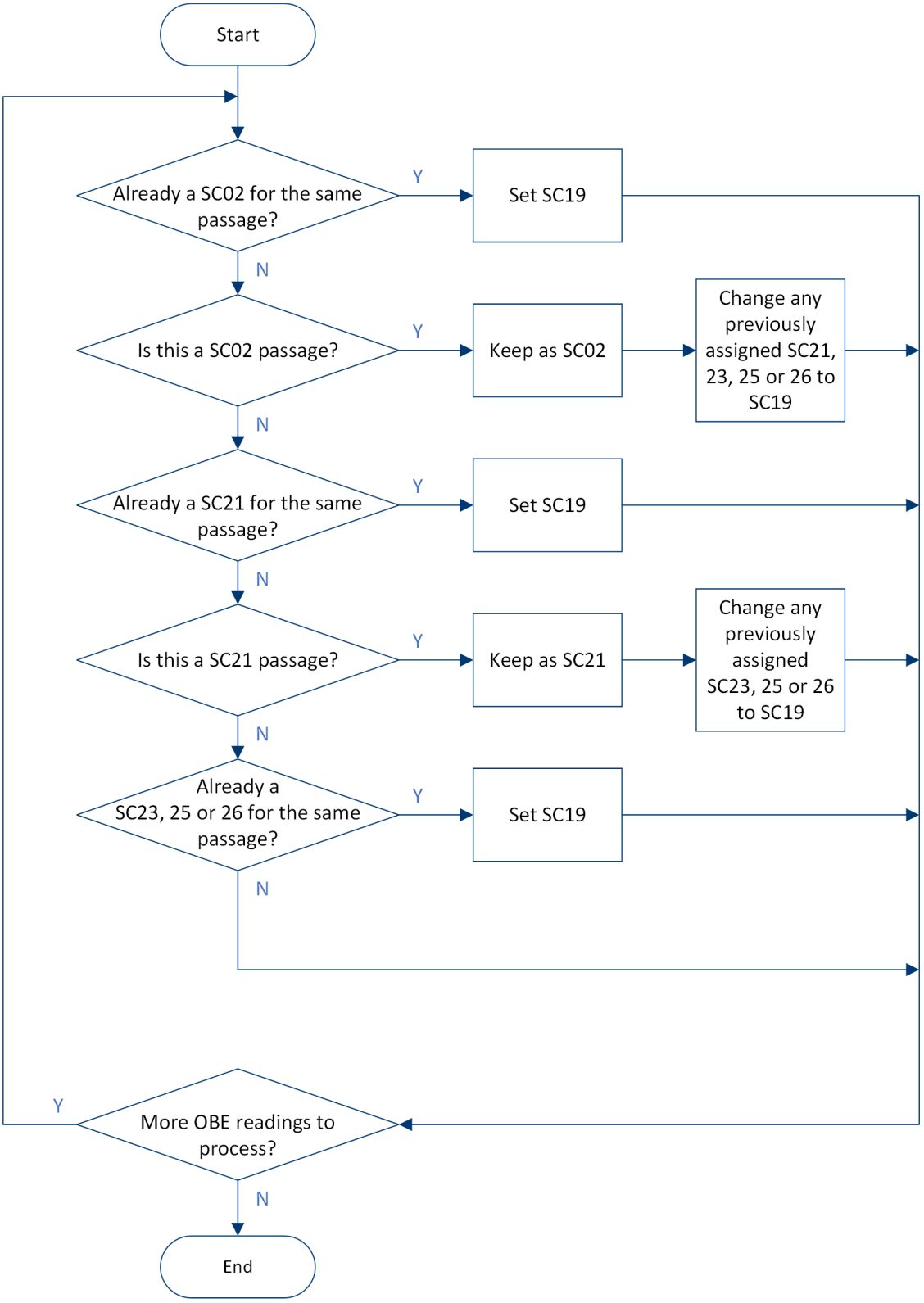

Figure 2 - Flow chart for handling of multiple OBE in a single passage

3.2.4 Signal Code 42

Signal code 42 in *Table 2* does not appear in the flow chart in *Figure 1*. SC42 is to be used for passages made in the charging direction where there is no OBE reader, e.g. in a bus-bay or in a lane in the opposite direction to the charging direction. *Figure 3* describes this situation. Such passages shall be handled in the same way as a SC22 passage, i.e. with video enforcement.

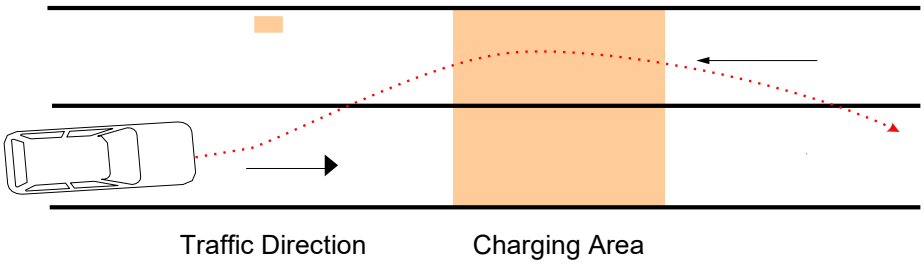

Figure 3 - Signal Code 42 case

4 SIGNAL CODES OVERVIEW

The following signal codes may occur when processing is triggered by the vehicle detection system and/or the OBE reading:

Table 3 - Possible Signal Codes dependent of source of passage triggering

	OBE	Detection system	Antenna system	Possible Signal codes	Comments
1		OK	OK	02, 21, 23, 25, 26	Reading of legal OBE type in AutoPASS with a corresponding vehicle detection.
2		Not OK	OK	08, 33, 35, 36	The OBE reading has no matching vehicle detection.
3		OK	Not OK	22, 42	Either a vehicle with no OBE, - or an OBE may be detected which is not of legal type in AutoPASS and therefore not processed. SC42 is passage in bus-bay or opposed lane.
4		OK	OK	OBE 1: 02, 21, 23, 25, 26 OBE 2 and any following OBE: 19	The OBE reading of the highest priority as outlined in chapter 3.2.3 shall be given a chargeable Signal Code. All other OBE readings for the same passage shall be given SC19.
5		Not OK	OK	All OBE: 08, 33, 35, 36	Multiple OBE in one vehicle without a corresponding vehicle detection will result in OBE transactions with neglectable time difference.