Ver. 2.2

ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE

ASSIGNMENT GUIDELINES AND PROCEDURES

Prepared by
Telecommunications Industry Association (TIA)
Engineering Committee TR-45

September 2015

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ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE
ASSIGNMENT GUIDELINES AND PROCEDURES, VERSION 2.2

TABLE OF CONTENTS

Version 2.2 – September 2015

This document contains the guidelines and procedures for the assignment and use of Electronic Serial Numbers (ESNs) for regulatory approved Mobile Stations (MSs).

ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE ASSIGNMENT GUIDELINES AND PROCEDURES, VERSION 2.2

1.0 PURPOSE AND SCOPE

1.1 Regulatory approved MSs are those units which have the concurrence of the appropriate regulatory bodies in the country where the units are intended for use.

1.2 These guidelines are based on the content of the ANSI TIA/EIA 41 "Family of Standards" (*e.g.*, AMPS *TIA/EIA-553*), CDMA *(TIA/EIA-95 and TIA/EIA-2000)*, NAMPS *(EIA/TIA-691)* and TDMA *TIA/EIA-136))*. It is recommended that systems which are based on the ANSI TIA/EIA-41 family of standards and which are deployed outside of the United States follow these guidelines. This is to facilitate international roaming and to minimize fraud.

1.3 For the purpose of these assignment guidelines, the ESN is entered into the approved MS by the manufacturer of the MS. The ESN is composed of two basic components, the manufacturer's code and the serial number. These guidelines specify the procedure to be followed pertaining to the acquisition, transfer, return and regulation of the ESN Manufacturer's (MFR) Codes.

1.4 These assignment guidelines pertain, in one section or another, to all segments of the ESN. The ESN administrator manages all segments of the ESN, but directly administers only the ESN MFR Code segment. The remaining segment of the ESN, the Serial Number, is directly administered by the manufacturer to which the ESN MFR Code is assigned.

1.5 These guidelines were developed by the consensus of representatives of entities within the wireless sector of the telecommunications industry. See: http://www.tiaonline.org/standards/numbering-resources/electronic-serial-numbers-esn-and-meid

1.6 These guidelines apply globally; however, they do not supersede the regulations, procedures or requirements of any appropriate legal or regulatory authority.

1.7 MSs which have an ANSI TIA/EIA-41 compliant operating mode must have an ESN in accordance with these guidelines. Equipment identifiers for non TIA/EIA-41 operating modes are not addressed here. If the manufacturer of a multi-mode MS that supports at least one "TIA/EIA-41 mode" wishes to use only a single equipment identifier, that identifier must conform to these ESN guidelines.

2.0   REFERENCES

2.1   ANS/*TIA/EIA-41, Cellular Radiotelecommunications Intersystem Operations;*
Telecommunications Industry Association.

ANS/TIA/EIA-553, Cellular System Mobile Station - Land Station Compatibility Standard (i.e., AMPS); Telecommunications Industry Association.

ANS/TIA/EIA-95*, Mobile Station - Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular Systems (i.e., CDMA);* Telecommunications Industry Association.

ANS/TIA/EIA-691, Mobile Station - Land Station Compatibility Standard (i.e., NAMPS); Telecommunications Industry Association.

TIA/EIA-54, Cellular System Dual-Mode Mobile Station - Base Station Compatibility Standard (i.e., TDMA); Telecommunications Industry Association. Note: withdrawn by TIA.

ANS/TIA/EIA-136, Cellular System Mobile Station - Land Station Compatibility Standard (i.e., TDMA); Telecommunications Industry Association.

ANS J - STD - 008, *Personal Station - Base Station Compatibility Requirements for 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Communications Systems.* Note: withdrawn by TIA.

TIA-2000.1-D, Introduction to cdma2000®* Spread Spectrum Systems also cdma2000® family of standards.

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* cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA –USA)

3.0   ASSUMPTIONS AND CONSTRAINTS

These guidelines are based on the following assumptions and constraints:

3.1   These guidelines and procedures should provide the greatest latitude to manufacturers of MSs while permitting the effective and efficient management of a finite resource.

3.2   The function of the ESN administration will be performed by the TIA ESN Administrator.

3.3   The guidelines and procedures for ESN assignment as set forth in this document, remain in effect until there is either industry consensus or regulatory policy direction to change them.

3.4   These guidelines do not describe the method by which ESNs are transmitted across and processed by networks. Network interworking arrangements are contained in other standards, documents, or business agreements.

3.5   Applicants for an ESN Manufacturer Code must provide evidence that they will manufacture a regulatory approved Mobile Station. (e.g., FCC Identifier and Grant Date).

4.0   ESN FORMAT AND FUNCTION

4.1   The ESN is a 32-bit binary value which is assigned to the MS.

4.2   Each MS is assigned a unique ESN.

4.3   The ESN identifies the manufacturer of the MS.

4.4   The format of the ESN is:

FOR ESN MFR CODES IN THE RANGE OF 019_{10} TO 254_{10}

31   24 23   0

Manufacturer's Code 8 bits	Serial Number 24 bits

4.5   This thirty two bit binary value has traditionally been broken down by using the eight high order bits to identify the manufacturer of the Mobile Station while the low order twenty-four bits identify the unit.

4.6   There are several exceptions to the above described range of ESNs. These include the following:

MFR Code	Reason
128	Reserved for; Replacement for ESN MFR Codes (i.e., MEID Manufacturer Equipment IDentifier[1]
250, 255	Reserved (available 14-bit MFR Code)
000 - 018	14-bit MFR Code (see Section 4.7)

4.7   The following exception format has been established for MFR codes in the range of 000 to 018:
Note: See the monthly ESN Administrator report for updates depicting additional MFR code exceptions allocated in 14 bit format.

ESN MFR CODES IN THE RANGE OF 000_{10} TO 018_{10}

31   18 17   0

Manufacturer's Code 14 bits	Serial Number 18 bits

In this case the ESN MFR Code is designated as the high order 14 bits while the low order 18 bits identify the unit. A 14-bit ESN MFR Code may be assigned by the ESN Administrator, at his or her discretion, when it is judged that a 14-bit code may be an efficient use of the ESN MFR Code resource. See the Exception section of the ESN Equipment Manufacturer's Code Assignment table for the appropriate binary and hexadecimal designations of the 14 bits which comprise the ESN MFR Code.

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[1] see TIA MEID GHA Guidelines,   http://www.tiaonline.org/standards/numbering-resources/mobile-equipment-identifiers-meid

4.8   The ESN does not specify the frequency band, air-interface technology or supported service associated with the MS.

5.0   ASSIGNMENT PRINCIPLES

The assignment principles are defined below.

5.1   ESN MFR Codes are to be assigned and used only for the ANSI/TIA/EIA 41 family of air interface standard mobile stations. (Section 1.2).

5.2   ESN MFR Codes shall be assigned to permit the most effective and efficient use of a finite resource in order to maximize the existing allocated resource inventory and to defer, as long as practical, the need to request additional or replacement for ESN MFR Code resources. To aid in this effort both 8-bit and 14-bit ESN MFR Codes will be assigned.

5.3   Upon application, the ESN administrator will assign one ESN MFR Code for each valid MS manufacturer.

5.4   An ESN MFR Code, as part of the 32-bit ESN, shall not be simultaneously assigned to more than one ESN manufacturer. An unused ESN MFR Code that is recovered or returned from the previous assignee may be reassigned to another manufacturer in whole or in part. A partially used ESN MFR Code may be reassigned to another manufacturer for use with a limited range of serial numbers if a significant block of serial numbers associated to that ESN MFR Code remained unassigned.

5.5   ESN Serial Numbers are assigned by manufacturers to their produced MSs. An ESN is unique to a single MS. The manufacturer will exercise due diligence in the design and manufacture of the MS to ensure that alteration of the factory set ESN is not possible outside of an authorized service center.

5.6   ESN MFR Codes are a global public resource. The assignment of any ESN MFR Code does not imply ownership of the resource by either the entity to which it is assigned or by the entity performing the administrative function.

5.7   Should a manufacturer transfer production of a type of MS to a different manufacturer, then the use of the assigned ESN MFR Code is transferable to the new manufacturer. See Form D in Attachment 2.

5.8   The ESN administrator will:

•   Assign ESN MFR Codes in a fair, timely and impartial manner to any applicant that meets the criteria for assignment (Section 6).

•   Address each application in the order they are received and assign MFR Codes from the available pool of unassigned codes based on applicant information provided and historical data. ESN MFR Codes will be assigned using the following procedure:

When assigning codes in the 8-bit range, codes of 129 to 254 are assigned first followed by codes in the range of 127 to 019. Codes in the range of 14-bit Manufacturer codes, will be assigned at the discretion of the ESN Administrator when that action is judged to be an efficient utilization of the ESN Code resource. When all of the codes have been assigned, codes which had been assigned but never used and recovered by the ESN Administrator will be assigned as an exceptional measure (see Section 5.13). Following this, codes which had

been assigned and used but with significant number blocks available, may be assigned for use with limited serial numbers (see Section 5.13).

- Make all assignments based on the procedures in these guidelines (Section 8).

- Treat sensitive information received from applicants as proprietary and confidential, and not to be shared with non-administrator personnel.

5.9   Information that is requested of applicants in support of an ESN MFR Code application shall be uniform and kept to a minimum.

5.10   Assigned ESN MFR Codes should be deployed as soon as possible, but no later than twelve months after assignment. If the assignee can demonstrate that an assigned ESN MFR Code has not been deployed solely due to delays beyond its control, the time period can be extended for up to 90 days. At the discretion of the administrator, three additional 90-day extensions may be granted. Following the 12-month period, or the last granted 90-day extension, the unused ESN MFR Code(s) should be returned to the ESN Administrator. In agreement with Section 5.6, an assignee that does not completely use ESN MFR Code(s) assignments should return the unused ESN MFR Code(s) to the ESN Administrator as soon as possible.

5.11   An entity which is denied an ESN MFR Codes assignment or extension under these guidelines has the right to appeal that decision (Section 13).

5.12   Entities applying for assignment of or assigned ESN MFR Code(s) under these assignment principles shall comply with these guidelines. Entities already assigned one or more ESN MFR Codes prior to the implementation of these assignment principles should comply with these guidelines.

5.13   An ESN MFR Code(s) recovered or returned to the administrator for reassignment may remain dormant. If some or all MSs have been manufactured by the previous assignee using all or part of the assigned codes , the unused code(s) may be reissued. If, however, MSs have been produced and sold, the code(s) may be blocked from future use. As the need for ESN MFR Codes becomes critical (*e.g*., only 10% of available codes remain), codes which have been partially used by a previous assignee may be re-assigned with serial number range limitations. That is, if the previous assignee had only produced a limited number of MSs using a contiguous serial number range, the present assignee may use the code to produce MSs with serial numbers that do not duplicate those of the previous assignee.

It should be recognized that the re-issue of ESN MFR Codes 167 and 221 are considered to be exceptional and shall be assigned after "virgin" ESN (i.e., those code blocks that have never been assigned to a manufacturer) exhaust. Use of these exceptional codes for ESN assignment as recommended by TIA committee TR-45 was originally supported for 17 (seventeen) months from the date of the v2.0 ESN Guidelines approval. Currently, June 30, 2010 (originally, December 31,2009) is the last date for receipt of an ESN MFR Code block request. These exceptional codes may also be made available for UIM_ID derivation if required. If additional recovered codes become available, TR-45 will consider extending the deadline upon a recommendation of the ESN Administrator. The wireless industry should implement the replacement for ESN MFR Codes *i.e*., MEID, therefore once all outstanding ESN requests have been processed, the remaining pool of unassigned ESNs shall be used for UIMID derivation. In addition, other previously used ESNs utilized for AMPS and/or TDMA (no CDMA use), shall continue to be designated for UIM_ID derivation.

ESN MFR Code blocks in 167 and 221 are identified in the ESN Administrators report (Section III B subsection titled "[Clearinghouse / Inter-carrier Mediation Vendors and Service Providers Review Period Completed] - 8-Bit MFR Codes Redesignated and Repartitioned as 14-bit MFR

Codes--No Previous Known Technology Use). These exceptional assignments use reclaimed ESNs identified as unused (i.e., previously assigned ESN ranges stated by the original ESN assignee recipient to have not been used for any particular technology and returned to the ESN Administrator). The ESN Administrator shall identify the provided resource and any disclaimer caveats as deemed appropriate by the ESN Administrator when assigning these ranges.

It should be noted that re-assigned codes would only be supplied to manufacturers of authenticatable mobile sets for the production of authenticatable mobile sets.

5.14   There will be an administrative fee associated with an application for an ESN MFR Code(s).

5.15   As required, applicants for ESN MFR Codes must comply with all applicable regulations relative to the provisioning of regulatory approved two-way MSs.

6.0   CRITERIA FOR ESN ASSIGNMENT

The assignment criteria in this section should be considered by a potential ESN MFR Code applicant before submitting an ESN MFR Code application and will be used by the ESN administrator in reviewing and processing an ESN MFR Code application:

6.1   The ESN MFR Code applicant must be, and certify that it is, the manufacturer of approved (per 5.15) MSs for which an ESN MFR Code is requested.

6.2   The applicant/assignee of an ESN MFR Code(s) must have and provide evidence of authorization, if required, from the appropriate regulatory authorities to produce approved MSs.

6.3   An ESN MFR Code will only be assigned by the administrator upon receipt and approval of a completed *Form A – ESN Manufacturer's Code Application.*

6.4   Indicate on Form A the anticipated number of mobile stations to be produced. This information will be held confidential by the ESN Administrator. The amount indicated will be used to determine the ESN Manufacturer Code to be supplied by the ESN Administrator.

7.0 RESPONSIBILITIES OF ESN MANUFACTURER'S CODE APPLICANTS AND ASSIGNEES

Entities requesting ESN MFR Code assignments shall comply with the following; and entities already assigned one or more ESN MFR Codes should comply with the following:

7.1 ESN MFR Code applicants and assignees must meet all conditions specified in these guidelines. Copies of the guidelines may be obtained from the ESN Administrator.

7.2 Applicants must apply in writing to the ESN Administrator by completing *Form A - ESN MFR Codes Application*. Copies of all required forms are included in Attachment 2 to these guidelines.

7.3 ESN MFR Code assignees shall:

   7.3.1 Assign a different ESN to each MS. The manufacturer shall assign the ESN within the range allocated to the manufacturer.

   7.3.2 Assign and efficiently manage the Serial Number associated with the assigned ESN MFR Codes. Maintain up-to-date and accurate assignment records that match ESNs of their produced MSs. These records may be required for audit purposes (Section 10).

   7.3.3 Inform the ESN administrator of changes in the information associated with an ESN MFR Code assignment by using *Form D – Request for Change in ESN Manufacturer's Code Assignment Information*. Changes may occur because of the transfer of an ESN MFR Code(s), through merger or acquisition, to a different MS manufacturer (Section 5.7). The initial assignee of the ESN MFR Codes involved in a transfer occurring through merger, acquisition or other means must immediately inform the ESN Administrator when such a change becomes effective. Timely submission of change information enables the ESN Administrator to maintain accurate ESN MFR Code assignment records.

   7.3.4 Participate in the ESN audit process, when requested (Section 10).

   7.3.5 Deploy any ESN MFR Code, assigned either directly by the administrator or obtained through merger or acquisition, within the time period specified (Section 5.10). Inform the ESN Administrator of ESN MFR Code deployment by submitting *Form C – ESN Manufacturer's Code Deployment*.

   7.3.6 Apply to the ESN Administrator for an extension (Section 5.10) if the deployment requirement cannot be met and the ESN MFR Code is still required.

   7.3.7 Return to the Administrator, using *Form F – ESN Manufacturer's Code Assignment Return*:

   - Any ESN MFR Code no longer needed for the production of MSs,
   - Any ESN MFR Code not deployed within the time period specified, including extensions (Section 5.10), or
   - Any ESN MFR Code not used in conformance with these assignment guidelines.

   7.3.8 Return to the ESN Administrator, on an annual basis on the anniversary date of the issuance of the ESN MFR Code, a duly completed and signed Form G.

7.4   The ESN shall be factory set and shall not be alterable, capable of duplication or removable outside of an authorized service center. Any attempt to remove, tamper with, or change the ESN host component or operating system as originally programmed by the manufacturer shall render the MS inoperative.

7.5.   Where a dedicated ESN device is utilized, it must be permanently attached to the device that reads the ESN and the path to the device must be secured. The device shall not be removable and its pins shall not be accessible.

7.6   Where the ESN resides with other memory, the encoding technique shall include multiplication or division by a polynomial, cyclical coding, or the spreading of ESN bits over non-sequential memory locations.

8.0   RESPONSIBILITIES OF THE ESN ADMINISTRATOR

The role of the ESN Administrator is to manage the entire ESN resource and to directly administer the ESN MFR Code segment of the ESN. In this context, the ESN Administrator shall:

8.1   Provide to the industry general and specific information on the structure, proper use and management of ESNs for regulatory approved MSs.

8.2   Provide copies of these guidelines and forms to ESN MFR Code applicants and assignees, and assist them in completing the required forms.

8.3   Review and process ESN MFR Code applications as follows:

8.3.1   Review the application to determine if all requested information is provided and credible. If not, return the application to the applicant requesting that any deficiency be corrected.

8.3.2   Inform applicants of the status of their requests using *Form B – ESN Manufacturer's Code Application Disposition*. There are three possible dispositions: approved, denied, or additional information required. Notify the applicant in writing of the disposition within thirty days from receipt of Form A. The response will include:

- If assigned, the specific ESN MFR Code(s) assigned,

- If denied, the reasons for denial and instructions on how and where to appeal the decision,

- If additional information is required, the specific information required.

8.3.3   Keep confidential all information relative to anticipated volume of mobile sets to be produced by applicant.

8.4   Use the following ESN MFR Code assignment procedures:

8.4.1   The Administrator shall generally assign ESN MFR Codes in numerical sequence.

8.4.2   There may be technical considerations or limitations on the part of the manufacturer that require a specific assignment or preclude them being able to use the next consecutive ESN MFR Code assignment. These exceptions are set forth below and in the addenda (if any) to this document.

The following ESN MFR Code(s) are not available for 8-bit MFR Code assignment due to previous assignment and reservation:

Code 250 and 255 (Portions reserved - available 14-bit MFR Codes, NOTE; portions of MFR Code 250 may previously have been used for testing)

Code 000, 001 (presently recognized and assigned as 14-bit Codes, NOTE; Code 00000000000 - first code in first block is reserved)

Code 002-018 (Assignable 14-bit MFR Codes)

Code 128 (hexadecimal "80") (Reserved for Replacement for ESN MFR Codes i.e., MEID)

8.4.3   The ESN Administrator may, at his or her discretion, assign a 14-bit manufacturer code depending on the projected volume of mobile sets to be produced by the manufacturer based on information provided in Form A. These 14-bit ESN Manufacturer codes will be assigned from the low order codes starting at 000XX and increasing in order.

8.4.4   ESN MFR Code applicant assignments are limited to no more than 4-6 months of production wherever possible. With ESN MFR ID Code assignees, exceptions are for first time applicants who receive no more than two (2) 14-bit blocks at time of first application.

8.5   Maintain accurate and current ESN MFR Code assignment records. Update the records as required to respond to requests for changes in assignment information reported by ESN MFR Code assignees (Section 7.3.2). Respond to these requests within thirty days using *Form E – Confirmation of Change of ESN Manufacturer's Code Assignment Information.*

8.6   Publish, at least quarterly, via the agreed medium, a list of assigned ESN MFR Codes. The list will include the ESN MFR Code number, the manufacturer to which the code is currently assigned, and the entity contact and number. In the case of a code that was reassigned after having been partially used by previous assignee(s), the list shall also identify the serial number range restrictions placed on the current assignee along with the serial number range used (or presumed to have been used) by each previous assignee. Track the number of ESNs assigned and the assignment rate and report this data regularly to the TIA TR-45 Engineering Committee.

8.7   Investigate any ESN MFR Code that has not been deployed within the required time frame, and issue extensions if appropriate (Section 5.10). Notify the TIA TR-45 Engineering Committee if an assignee fails to deploy an assigned ESN MFR Code within two extensions.

8.8   Reclaim assigned ESN MFR Code(s) (Section 9), as needed.

8.9   Direct the ESN conservation program and conduct periodic audits, as required, of ESN MFR Code assignee records (Section 10).

8.10   Inform the wireless telecommunications industry, via the agreed method, of any revisions to these guidelines (Section 12).

8.11   The term of the ESN Administrator shall be for one (1) year from the date of appointment by the TR-45 Engineering Committee.

9.0 ESN MANUFACTURER'S CODE RETURN AND RECLAMATION PROCEDURES

9.1   Assignee responsibilities:

Assignees will return ESN MFR Code(s) that are no longer required, not deployed, or not used in conformance with these assignment guidelines (Sections 5.10, 7.3.5 - 7.3.6).   In addition, assignees will return the Code(s) and an indication of the range of Serial Numbers which have been used if the manufacturer has not manufactured a MS for at least one year.

Assignees will cooperate with the ESN Administrator in carrying out its reclamation and auditing responsibilities.

9.2   Administrator responsibilities:

The ESN Administrator will contact any ESN MFR Code assignee identified as not having returned to the Administrator, for reassignment, any ESN MFR Code(s) no longer required, not deployed, or not used in conformance with these assignment guidelines (Sections 5.10, 7.3.5 - 7.3.6).

The Administrator will first seek clarification from the assignee regarding any alleged non-use or misuse.   If the assignee provides an explanation satisfactory to the administrator, and in conformance with these assignment guidelines, the ESN MFR Code will remain assigned. If no satisfactory explanation is provided, the Administrator will request a letter from the assignee returning the assigned code(s) for reassignment. If a direct contact can not be made with the assignee to effect the above process, a registered letter will be sent to the assignee address of record requesting that they contact the Administrator within thirty days regarding the alleged code non-use or misuse. If the letter is returned as non-delivered, the Administrator will advise the TIA TR-45 Engineering Committee that the code will be made available for reassignment.

The ESN Administrator will consult with the TIA TR-45 Engineering Committee for guidance on any instance which is not resolved through the procedures in the paragraph above. The TIA TR-45 Engineering_Committee will coordinate with appropriate industry fora in seeking a suggested resolution.

If the Committee cannot suggest a resolution, or if the ESN MFR Code assignee will not comply with the resolution suggested by the Committee, the ESN Administrator may refer the case to the appropriate regulatory body.

9.3   TIA TR-45 Engineering Committee responsibilities.

• Accept all referrals of alleged non-use or misuse of ESN MFR Codes from the ESN Administrator or any other entity (also see section 13.0 regarding dispute resolutions),

• Investigate the referral,

• Review referrals in the context of these assignment guidelines,

• Attempt to identify a suggested resolution of the referral, and

• Inform the ESN Administrator of the suggested resolution, if identified, or that the Committee was unable to identify a suggested resolution

.• If a suggested resolution is not in conformance with the existing guidelines, the committee may initiate the guidelines revision process [Section 12].

10.0 ESN RESOURCE CONSERVATION AND ASSIGNMENT AUDITS

10.1 Assignment and management of ESN resources are undertaken with the following conservation objectives:

- To efficiently and effectively administer/manage a limited resource through code conservation, and

- To eliminate or delay the potential for ESN exhaustion.

The process to achieve these objectives should not impede the introduction of competitive wireless services which use ESNs.

10.2 To promote the efficient and effective use of numbering resources, audits of ESN MFR Code assignments may be performed to ensure consistent compliance with these guidelines. Receipt of Form G is also used as an audit tool. Unused ranges of ESN MFR Code(s) assignments may be candidates for reclamation and reassignment.

10.3 The ESN Administrator will track and monitor ESN MFR Code assignments and assignment procedures to ensure that all segments of the ESNs are being used in an efficient and effective manner. Ongoing administrator procedures that foster conservation shall include, but not be limited to, the following:

- An active reclamation program to reclaim unused or misused ESN MFR Code,

- Strict conformance with these guidelines by those assigning ESN MFR Codes and ESN Serial Numbers,

- Appropriate and timely modifications to these guidelines to enhance text that may have allowed inefficient use of ESN MFR Codes,

- Periodic specific and random audits of assignments and assignment procedures (Section 10.4).

10.4 The ESN Administrator may initiate an audit of an ESN MFR Code assignee's assignment records. The audit may be precipitated by a complaint from outside the Administrator's organization or by the Administrator. The audit shall be initiated if a request for an ESN MFR Code assignment is received from a manufacturer that already has an ESN MFR Code assignment. The purpose of an audit will be to verify the ESN MFR Code assignee's compliance with the provisions set forth in these guidelines. The audit will be performed by the ESN Administrator or by a neutral third party acceptable to the auditee and the Administrator.

10.4.1 These audits will be conducted at the ESN MFR Code assignee's premises or at a mutually agreed to location and at a mutually agreed to time.

10.4.2 The ESN Administrator will not copy or remove the information from the premises nor will they disclose the information to non-ESN Administrator personnel.

10.4.3 The ESN Administrator will expect to review the following information to ensure conformance with these guidelines and the proper use of the ESN resource:

- Verification that not more than one ESN MFR Code is assigned unless near serial number exhaustion has been reached under all but one of the assigned ESN MFR Codes, or, if a new ESN MFR Code assignment has been requested, verification

16

that near serial number exhaustion has been reached under all assigned ESN MFR Codes.

- Verification of assignment for each working ESN MFR Code,

- Date of assignment of each working ESN MFR Code,

- Implementation date of each working ESN MFR Code,

- Indication of ESN Serial Number assignment to mobile stations, and

- Status and status date of each ESN MFR Code unavailable for assignment; *i.e.*, ESN MFR Codes reserved, aging, pending and/or, suspended.

10.5 Audit results should be used to identify and recommend to the appropriate wireless industry forum specific corrective actions that may be necessary. Examples of specific corrective actions which may be proposed are as follows:

- Modifications to these assignment guidelines to reflect the specific circumstance revealed by the audit,

- Additional training for ESN MFR Code assignees concerning the assignment guidelines,

- Return of assigned ESN MFR Code,

- Requirements for supporting documentation of future ESN MFR Code requests in non-compliant situations, or

- Modifications to the process in which records are maintained or ESN MFR Codes are assigned.

10.6 Audit results with respect to ESN MFR Code assignee information and/or recommended ESN MFR Code assignee process modifications shall be treated on a proprietary and confidential basis.

10.7 Failure to participate or cooperate in an audit shall result in the activation of ESN MFR Code reclamation procedures (Section 9).

11.0   ESN RELIEF PLANNING

11.1   When 75% of all the available ESN MFR Codes have been assigned, or assignments are exceeding 10% of the resource per year, the ESN Administrator will inform the TIA TR-45 Engineering Committee.

11.2   When the ESN Administrator informs the TIA TR-45 Engineering Committee that the ESN MFR Codes are approaching exhaustion, the committee will:

- Conduct an audit of current ESN MFR Codes assignments to ensure that efficient ESN MFR Codes utilization is in effect, and, if not,

- Recommend additional procedures to be initiated to effect more efficient ESN MFR Codes utilization, or if efficient utilization is in effect,

- Make a determination of the most efficient method of expanding the ESN keeping in mind the requisite lead time required to adequately address the software requirements of switches, billing systems, data exchange formats and various data bases which utilize the ESN.

11.3   Using data provided by TIA TR-45 Engineering Committee, the wireless industry shall undertake to specify the desired method and time frame needed to implement the proposed changes in the ESN. There should be concurrence from all disciplines in the wireless industry as to the method and time frame for implementation of a replacement for ESN MFR Codes.

12.0   MAINTENANCE OF GUIDELINES

It may be necessary to modify the guidelines periodically to meet changing and unforeseen circumstances. The need for guidelines modification may be identified by the administrator, any entity in the wireless telecommunications sector or the appropriate wireless industry forum. When need for modification is identified by other than the forum, the identifying entity will submit the modification issue to the forum. The forum will coordinate the modification process. Questions or concerns regarding the maintenance of the guidelines may be directed to:

<div align="center">

Engineering Committee TR-45 ESN Administrator

c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200

Arlington,VA 22201 USA

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Phone: +1 703-907-7791

Fax: +1 703-907-7728

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13.0   APPEALS PROCESS

Disagreements may arise between the ESN Administrator and ESN MFR Code applicants or assignees in the context of the administration and management of ESN MFR Codes and the application of these guidelines. In all cases, the ESN Administrator and ESN MFR Code applicants/assignees will make reasonable, good faith efforts to resolve such disagreements among themselves, consistent with the guidelines, prior to pursuing any appeal. Appeals shall be made to the ESN Administrator within 3 (three) months of applicable decision of the ESN application in question and may include, but are not limited to, one or more of the following options:

By submitting an application for ESN MFR Codes, accepting these Guidelines, or accepting any MFR Code Assignments, the company agrees that these Guidelines and all disputes arising out of or relating to the application for or assignment of ESN MFR codes shall be governed by the laws of the state of Virginia without giving effect to applicable conflict of laws provisions. The parties further agree that they will first attempt to resolve any and all disputes, differences, or questions arising out of or relating to these Guidelines, or the validity, interpretation, breach, or violation or termination thereof through a meeting of the principals of the parties. Such meeting may be in person, via telephone or via videoconference. If such a meeting does not resolve the dispute between the parties, the matter must first be brought to a meeting of the EUMAG. If that meeting does not resolve the issue, the matter must then be brought to the industry experts participating in TR-45. In the event such meetings are unsuccessful, then such dispute shall be finally and solely determined and settled by arbitration in Washington, D.C. in accordance with the Commercial Arbitration Rules of the American Arbitration Association.   In any such arbitration proceedings, the arbitrators shall adopt and apply the provisions of the Federal Rules of Civil Procedure relating to discovery so that each party shall allow and may obtain discovery of any matter not privileged which is relevant to the subject matter involved in the arbitration to the same extent as if such arbitration were a civil action pending in a United States District Court. Judgment upon any arbitration award may be entered and enforced in any court of competent jurisdiction. All notices required hereunder shall be in writing.

Reports on any resolution resulting from the above options, the content of which will be mutually agreed upon by the involved parties, will be kept on file by the ESN Administrator. At minimum, the report will contain the final disposition of the appeal; *e.g.*, whether or not an ESN MFR Code(s) was assigned.

14.0   GLOSSARY

CMRS - Commercial mobile radio service. A mobile service (or functional equivalent) that is (1) provided for profit, (2) an interconnected service, and (3) available to the public, or to such classes of eligible users as to be effectively available to a substantial portion of the public.

Conservation – Consideration given to the efficient and effective use of a finite resource in order to minimize the need to expand its availability while at the same time allowing the maximum flexibility in the introduction of new services, capabilities and features.

ESN - The Electronic Serial Number which uniquely identifies the mobile station.

ESN Manufacturer's Code (ESN MFR Code) - The portion of the ESN that uniquely identifies the manufacturer of a mobile station.

ESN Manufacturer's Code assignee – The entity to which an ESN Manufacturer's Code has been assigned for the manufacture of mobile stations.

MEID – Mobile Equipment IDentifier

Mobile station - Interface equipment used to terminate the radio path at the user side. The mobile station contains an Electronic Serial Number and other identification information, either a Mobile Identification Number (MIN) or an International Mobile Subscriber Identity (IMSI).

Regulatory Approved Licensed two-way CMRS service provider – Any entity that is authorized, as appropriate, by local, state, or federal regulatory authorities to provide regulatory approved two-way mobile station to the public.

Serial Number - The portion of the ESN in combination with the ESN MFR Code that uniquely identifies the MS.

UIM_ID - The 32 bit Serial Number which may identify mobile equipment equipped with a R-UIM. The User Identification Module (UIM) may be either a fixed module installed in the mobile equipment or an R-UIM.   A Removable User Identity Module (R-UIM) is a smart card device that contains the subscription information.

15.0   Revision History

Version 1.1 –   March 22, 1997. Initial release.

Version 1.2 – December 1, 1997. Added paragraph 3.5, 4.9 and 15.0. Modify Form A to include the "Regulatory Agency Approval Code". Add page numbers to document.

Version 1.3

Version 1.4 - June 5, 1998

Version 1.5 - June 5, 1999

Version 1.6 - March 15, 2000. Added Form G and section 7.3.8.

Version 1.7 - June 1, 2001. Modification to allow assignment of 14-bit Manufacturer Codes

Version 1.7a - March 11, 2002. Modification to update ESN Administrator contact information

Version 1.8 – December 4, 2002, General Updating and code assignment table reformat

Version 1.8a – September 9,2003, revised TIA contact and fees information

Version 1.9 – June 2005, Expanded 14 bit MC range, Sect 9.2, 9.3 updates, Contacts, Code Assignments

and editorial updates

Version 1.9a – June 2006, Expanded 14 bit MC range 013-016 and editorial updates

Version 1.9b – September 2006, Form G use referenced and editorial updates

Version 1.9c – May 2007, Expanded 14 bit MC range 017, 018 and editorial updates

Version 2.0 – August 2008, Modification to clarify post "virgin" ESN exhaust and ESN assignments including UIMID allocation

Version 2.1 – December 2009, Modification to include clarity for return of unused ESN resources, updated ESN block request date and also adding dispute resolution clarification.

Version 2.2 – September 2015, Modification to update TIA address & logo. Also editorial updates clarifying reports.

ESN MANUFACTURER ADMINISTRATIVE CONTACT INFORMATION

Contact the TIA ESN Administrator for information.

Manufacturer	Contact Name	Contact Phone	Contact e-mail

ESN MANUFACTURER'S CODE ASSIGNMENT

Contact TIA ESN Administrator for information. The headings for this table indicate the following:

8-bit MFR Codes

The headings for this table indicate the following:

Assignment indicates the manufacturer to whom the range has been assigned.

Decimal Range indicates the range of serial numbers including the manufacturer code in 11-digit (3,8) decimal format (first 3 decimal digits Manufacturer's ID Code, next 8 decimal digits mobile serial number).

Hex indicates the hexadecimal (base 16) format of the decimal MFR code [2 digits in hex column equate to 3 digit MFR ID decimal number, e.g., decimal 030 = hex 1E].

Starting Binary (base 2) indicates the binary configuration of the first 8 bits at the beginning of the 32-bit range. (*e.g*., decimal 030/ hex 1E = 0001 1110)

NOTE: "n.c.a." = (not currently available); as pertaining to the air interface

14-bit MFR Codes (EXCEPTION CODES)

The headings for this table indicate the following:

Assignment indicates the manufacturer to whom the range has been assigned.

Decimal Range indicates the range of serial numbers including the manufacturer code in 11-digit (3,8) decimal format (first 3 decimal digits Manufacturer's ID Code, next 8 decimal digits mobile serial number).

Hex indicates the possible 14-bit combinations in hexadecimal (base 16) format for the 32-bit field ESN range [first 2 digits in hex column (from left to right) equate to 3 digit MFR ID decimal number, e.g., decimal 012 = hex 0C, next 6 hex digits mobile serial number].   NOTE: Reviewing the first four hex digits (from left-to-right) will allow for set manufacturer information to be derived for 14-bit MFR Codes shown on "EXCEPTIONS" pages in the ESN Administrator monthly report. This is in contrast to only the first two hex digits defining 8-bit MFR Codes.

Starting Binary (base 2) indicates the binary configuration of the first 14 bits at the beginning of the 32-bit range.

> (*e.g*., 0000 1100 0000 00 00 0000 0000 0000 0000 to 0000 1100 0000 00 11 1111 1111 1111 1111 would represent all possible binary combinations for the first range   NOTE: Reviewing the first fourteen (14) binary bits (from left-to-right) of the 32-bit field ESN range will allow for set manufacturer identity to be derived for 14-bit MFR Codes shown on "EXCEPTIONS" pages in the ESN Administrator monthly report. This is in contrast to only the first eight binary bits defining 8-bit MFR Codes.

NOTE: "n.c.a." = (not currently available)

ELECTRONIC SERIAL NUMBER (ESN) MANUFACTURERS CODE APPLICATION AND RELATED FORMS PACKAGE

The forms in this package are used for communication between the ESN Administrator and applicants for and assignees of these resources. Forms included in this package are:

Form A – ESN Manufacturer's Code Application

> Applicants complete, sign, and return this form to apply for an ESN Manufacturer's Code.

Form B – ESN Manufacturer's Code Application Disposition

> The ESN Administrator uses this form to notify the applicant of the outcome of his/her application, which may be a code assignment, denial, or a request for additional clarifying information.

Form C – ESN Manufacturer's Code Deployment

> The recipient of an ESN Manufacturer's Code Assignment uses this form to notify the ESN Administrator that the assigned code has been deployed.

Form D – Request for Change in ESN Manufacturer's Code Assignment Information

> ESN Manufacturer's Code assignees use this form to notify the ESN Administrator of a change in any of the assignment information; for example, a change in the name, address, or phone number of the contact person in the company holding the ESN Manufacturer's Code. As a more complex example, this form should also be used to record the transfer of an ESN Manufacturer's Code to a new company, as might happen as a result of a merger or acquisition.

Form E – Confirmation of Change of ESN Manufacturer's Code Assignment Information

> The ESN Administrator uses this form to acknowledge a change initiated by a ESN Manufacturer's Code assignee through submission of Form D.

Form F – ESN Manufacturer's Code Assignment Return

> ESN Manufacturer's Code assignees use this form to return to the pool any ESN Manufacturer's Codes which are no longer required.

Form G – CERTIFICATION OF COMPLIANCE WITH ESN GUIDELINES

> ESN Manufacturer's Code assignees use this form on an annual basis, on the anniversary date of the issuance of the ESN MFR Code. Receipt of Form G is also used as an audit tool.

Return completed forms to:

<div align="center">

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)
1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

</div>

FORM A – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE APPLICATION

Entity requesting assignment: ....

General description of the mobile station to be provided: ....

....

....

<u>Anticipated number of mobile sets to be produced per year</u>...

Regulatory Agency Approval Code……………………………………………………...

Do special considerations apply, per section 8.4.2 or an addendum?

☐   YES   ☐   NO

If YES, please specify the special consideration needed

....

....

FORM A – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE APPLICATION
(CONTINUED)

The ESN shall be factory set and shall not be alterable, capable of duplication or removable outside of an authorized service center. Any attempt to remove, tamper with, or change the ESN host component or operating system as originally programmed by the manufacturer shall render the MS inoperative.

Where a dedicated ESN device is utilized, it must be permanently attached to the device that reads the ESN and the path to the device must be secured. The device shall not be removable and its pins shall not be accessible.

Where the ESN resides with other memory, the encoding technique shall include multiplication or division by a polynomial, cyclical coding, or the spreading of ESN bits over non-sequential memory locations.

Contact name: ....

Company: ....

Address: ....

Room: ....

City, State, ZIP: ....

Phone: .... Fax: .... E-mail: ....

Signature below indicates that the applicant:

- Certifies the accuracy of the information provided in this application,
- Commits to deploy any assigned ESN Manufacturer's Code(s) within the time period specified by the assignment guidelines (Section 5.10),
- Certifies that the service to be provided with the ESN Manufacturer's Code for mobile sets used in public two-way CMRS,
- Certifies that any required authorization has been secured from the appropriate federal, state, or local regulatory bodies, and
- Understands and agrees that the use of any assigned ESN Manufacturer's Code(s) in a manner other than in conformance with the assignment guidelines may result in forfeiture.

Authorized name: ....

Authorized signature: ....

Date of application: ....

FORM A – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE APPLICATION
(CONTINUED)

There is a non-refundable application fee for each ESN Manufacturer's Code requested. <u>Pricing for applications are set by the ESN Administrator. Please refer to the TIA website for the current fee structure.</u> Payment of the non-refundable application fee is:

☐ by enclosed check (made payable to Telecommunications Industry Association) or

☐ by credit card (mark one):   ☐ MasterCard

                                           ☐ Visa

                                           ☐ American Express

            Credit card number_____

            Expiration date_____

Signature of card holder_____

Printed name of card holder_____

Dated:_____

Return completed application forms to:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

FORM B – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE APPLICATION DISPOSITION

Your application filed .... for assignment of an ESN Manufacturer's Code has been reviewed

by the ESN Administrator. The box checked below indicates the action taken:

☐   Your application has been approved. The ESN Manufacturer's Code assigned for your use is:

....

The assignment is effective as of: ....

The information recorded for this assignment is shown below. Please notify the ESN Administrator immediately of any errors in or changes to this information.

(*Display computer generated assignment information here.*)

☐   Your application has been denied for the following reason(s):

....

....

You are entitled to appeal this denial as specified in Section 13 of the assignment guidelines.

☐   The following additional information is needed to process your application:

....

....

Authorized name: ....

Authorized signature: ....

Date: ....

FORM C – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE DEPLOYMENT FORM

By submitting this form, I certify that

ESN Manufacturer's Code: ....

Assigned to: ....

Is deployed effective (date): ....

Authorized name: ....

Authorized signature: ....

Date of this notification: ....

Return completed application forms to:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

**FORM D – REQUEST FOR CHANGE IN ELECTRONIC SERIAL NUMBER
MANUFACTURER'S CODE INFORMATION**

Effective (date): ....

The assignment information for ESN Manufacturer's Code: .... should be changed.

The changes are described below:

Authorized name: ....

Authorized signature: ....

Date of this notification: ....

Return completed application forms to the:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

FORM E – CONFIRMATION OF CHANGE IN ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE ASSIGNMENT INFORMATION

Your request dated _____ for change(s) to the assignment information for ESN Manufacturer's Code _____ has been processed by the administrator and the changes have been made. Please verify the revised assignment information below and report any errors or discrepancies to the administrator.

(*Display computer generated assignment information here.*)

Authorized name: ....

Authorized signature: ....

Date of this notification: ....

Report discrepancies to the:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

FORM F – ELECTRONIC SERIAL NUMBER MANUFACTURER'S CODE ASSIGNMENT RETURN

ESN Manufacturer's Code: ....

Currently held by: ....

is no longer required effective (date) ....

and may be returned to the pool for assignment to another entity.

Authorized name: ....

Authorized signature: ....

Date of this notification: ....

Return completed forms to the:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728

FORM G - CERTIFICATION OF COMPLIANCE WITH ESN GUIDELINES

We, _____, certify that ESN Code _____, has been used in accordance
       (Assignee)

with all of the terms and provisions set forth in the ESN Guidelines as published by the

Telecommunications Industry Association and posted on the latter's web site on the date of this

certification ("ESN Guidelines"). We further specify that we have complied in specific with Sections 5, 6,

and 7 of the ESN Guidelines.

We understand that failure to comply with the ESN Guidelines (including but not limited to Sections 5, 6,

and 7) will result in the forfeiture of the above ESN Code(s).

Serial Numbers used thus far are in the range of _____ to _____.

Signed: _____

Title: _____

Date: _____

Return completed Form G to:

Engineering Committee TR-45 ESN Administrator
c/o Telecommunications Industry Association (TIA)

1320 N. Courthouse Rd. Suite 200
Arlington, VA 22201 USA
Phone: +1 703-907-7791   Fax: +1 703-907-7728