TEKTELIC COMMUNICATIONS INC.

KONA SW UPGRADE GUIDE

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PROPRIETARY:

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1 Introduction

1.1 Summary

This document describes the procedure required for SW upgrade on Kona Mega/Macro/Micro Gateways (document does not apply to the Kona Pico Gateway).

SW upgrade of the Kona Gateways require that an upgrade server be provisioned that is accessible to the Gateways through the KonaFT GUI. The KonaFT only supports upgrading of a single Gateway at a time.

If an upgrade server is not available, upgrade of the Gateways is possible using KonaFT 0.30 or later.

1.2 Requirements

The minimum requirements of the Kona Gateway for SW upgrade guide is:

- KonaFT GUI v0.30 or later
- Kona_Mega_SW_Release_Package_1.5.3 or later.
- Kona_Macro_SW_Release_Package_1.6.5 or later.
- Kona_Micro_SW_Release_Package_1.3 or later.

1.3 Definitions

Term	Definition
SW Release Package	SW provided by Tektelic that includes a BSP, FE FPGA, and GPIO
	FPGA.
	(Kona Micro does not have an FE FPGA)
BSP	Board Support Package: Collection of software installation files for
	the Linux OS.
Patches	Other installation files installed on top of a BSP
FE FPGA	Front-End FPGA, responsible for digital signal processing on Kona
	Mega and Kona Macro
GPIO FPGA	Low-level FPGA
KonaFT	Kona Field Tool GUI application used for Gateway monitoring and
	control (version 0.30 or later is required)

1.4 High Level Procedure

The following is the high level upgrade procedure:

- 1) Tektelic provides a SW upgrade package to be placed on the upgrade server. The upgrade server may be a remote location (web server), or a folder on the Gateway.
- 2) The network operator unpacks the upgrade package onto the upgrade web server. In the case of files locally on the Gateway, unpacks the files to a specified folder on the Gateway.
- 3) Point the Gateway feed file to the files locations
- 4) Trigger the Gateway Upgrade

1.5 External Webserver for Upgrade Files

The following web server configurations have been tested: Xubuntu 12.04 with lighttpd 1.4.28 and Xubuntu 16.04 with Apache 2.4.18. Other OS and web server variants should work as well. The default web home directory for lighttpd and Apache is /var/www/.

1.6 Connecting to the Gateway

- 1) Open KonaFT
- 2) In the Tools Menu, select Find My Gateway

Find My Gateway File Transfer	Firewall Wreless Modern HM 4	Nam Log				
W Upgrøde wireless modern FW +]	Packet Forwarder Application			Spectral Scan	
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Module Name:		Check	Switch	5	Sanpie Perio	d: 0.5 μs
Module Ravision: Gateway ID:		Current pkt find:	sentech running		Antenna Selectio	n: Antenna 0
MAC Address:		# of transmitted p With first tex	packets: 7 enteres: 0		Avgerage cour	i de
Gateway Temperature: Operating Band:		Without fine tro	estamp: 0		Start Frequency (etc	2): 963100
Module Time:		# of received p ORC	packets: 253139 passed: 172668		Stop meguency (in	4/- 300
OPS Status: Uniod	ed	C Rx packet en	DRC fail: 80471 mrnate: 0.317893		Start Spectrum Analyzer	1
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Altitude:			Reset Counters			
			[enset from the	ingerto Re	8	
			input fan fle	en en la factoria de la constante de la consta		

Figure 1-1 Using KonaFT to Find Gateway IP Address

3) Select an interface to use - this is the network range that the tool will scan over. Press the scan button.

way into	Packet Farwarder Appication	Spectral Scien	
Nodule TCODE:	500	Sart Sart	
Serve number: Makde Neme	(her)		Sample Period: 0.510
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Longitude:	No neth 0	Már P	•
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		Mr. Cond. Sol	

Figure 1-2 Scanning for Gateway IP Address

4) When the scan is complete, look up the MAC address of the gateway you want to connect to and highlight it by clicking on it.

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44-77 day 40-42-20 13.77.236 44-77 day 40-43-49 13.77.236 44-77 day 40-43-49 13.77.236 44-77 day 40-43-46 13.77.236 44-77 day 40-52-20 13.77.246 44-77 day 52-20 13.77.246 44-77 day 52-20 13.77.246 42-20 performent floored Select			64-71-41-00-42-70	18.7.7.121					
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48.77-44-49-47 13.7.3.30 48.77-44-49-43 13.7.3.30 48.77-44-49-43 13.7.2.32 48.77-44-49-43 13.7.2.32 48.77-44-49-53-20 13.7.2.32 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-53-20 13.7.2.30 48.77-44-49-54-53 13.7.2.30 48.77-44-49-54-53 13.7.2.30 48.77-44-49-54-54-54-54-54-54-54-54-54-54-54-54-54-			04-71-08-00-43-20	183.9.130					
40-77-da-60-43-40 10.77.23.00 40-77-da-60-43-60 10.77.23.00 40-77-da-60-43-60 10.77.23.00 40-77-da-60-43-60 10.77.23.00 40-77-da-60-52-200 10.77.23.00			64-71-da-00-43-97	18.7.7.160					
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			22 Quienelly round		And Landers				
	10.7.7.121 (2019 V2: * Poling Interval: 5 *	•							- -
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5) Press the Select Button. This will copy the IP address to the IP address field located at the bottom left of the General tab. Press the Start button to connect to the gateway. A message window may open warning of an Agent Mismatch Detected. This is expected when connecting a newer version of KonaFT to a gateway that has an older software release installed. This warning will go away once the gateway software is upgraded.

ateuro Info	Parket Forwarder Andraton			1210220		
Module TCODE: T0004976				Spectral Scan Spectrum Applicates		
Serial Number: 1000/0003	5100	Start		derine water		
Module Name: Macro Kona	Chedu	Switch			Sample Period: 0.5 µs	
Fodule Revision: A Contempty ID: 640FD4FFFFD0427C	Current pkt fivd:	sented: nurring			Antenna Selection: Antenna	0
MAC Address: 647FDA00427C	# of transmitted packs	eta: 7			Avgeräge count: 1	
Gateway Temperature: 42 °C	With the timesta Without fine timesta	mp:0 mp:0			Start Prequency (JPIz): 063300	
Operating Band: 80868	# of received pack	ets: 253225			Stop Frequency (94z) 069900	
GPS Status: Unicked	CRC pass CRC	ied: 172718 fail: 80507			Bin Specing (Mtz): 200	
Lethude: 0	Rx packet error ra	nte: 0.317927		Start Spectrum Analys	eer 2	
Longitude: 0	No ma	itth 0		No overlay	•	
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Figure 1-4 Agent Mismatch Warning

2 Unpacking the Upgrade Files

2.1 External Webserver

Tektelic will provide upgrade files in SW Release Package. The SW Release Package will contain a .zip file of all the applicable files needed for the upgrade. The SW Release Package will be in the following format:

SW_Release_Package_X.YY.zip

where X.YY is the release number.

The .zip file will contain folders for each element of the Gateway.

/bsp

/fe-fpga

/gpio-fpga

Extract the .zip file to a webserver location available to the Gateway.

For example, for lighttpd and Apache:

/var/www/bsp /var/www/fe-fpga

/var/www/gpio-fpga

2.2 Using Files Locally on the Gateway

Extracting the upgrade files locally on the Gateway will require direct access to the Gateway. Direct access to the Gateways will require the user to know the login credentials of the Gateway.

- 1) Connect to the Gateway (see section 1.6 for details)
- 2) On the Tools menu select "File Transfer". A dialog box will open.

	Find My Gateway				
	File Transfer	Pinewall Wireless Modern HM Alarm Log			
	Ret Upgrade wireless modern l	W + Badup and Restore Mac.			
Composed Yess Add Serves - Type New Type New	rt List · Read Versions		Bep Statue Read Upgradable Read Installable Upgrade Set		
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Figure 2-1 File Transfer to Gateway

3) Click the browse button to find the compressed file containing the new software release. Select the Decompress option in the check box.

		0.0
Board Details Utilities Configuration Firewall Wireless Hodem HM A	w Log	
Results Performance 51/ Management Backup and Restore Misc		
tLat · Read Versions		Bup Status Read Upgradable Read Installable Upgrade All Upgrade Selects
Compe	ent	Version
		I CONTRACTOR OF
grade Servers		
Type Name	Pen ,	Read Serve Crufty Add Brity Remote Sectod pitter Server Carify
een (5.7.7.12) (200 v.), * 51 500 betsland Februar 5 5 5 Anto * Lades result?	C Adout	
		GUI S/W v0.30 FE FPGA v 104 GPIO FPGA v 0x3003.208 BSP v 1.9.5 A

Figure 2-2 Browsing to Software Image Location

4) After selecting the file location press the "upload" button. The software image folders will be extracted to the /lib/firmware directory. The gateway is now ready for upgrade (see next section).

3 Upgrading through KonaFT

3.1 Description

KonaFT is the preferred tool to upgrade the Kona Macro Gateway. This method requires that the KonaFT be able to connect to Gateway via SNMP. KonaFT supports upgrading from an external webserver or locally on the Gateway. An external webserver is the preferred method to house upgrade files.

3.2 Edit the -feed.conf file with upgrade file locations

The Gateway –feed.conf file contains the location of the upgrade files for the Gateway. Each upgrade folder (bsp, fe-fpga and gpio-fpga) must be defined. The file can be updated using KonaFT.

- 1) Open KonaFT GUI and connect to the gateway (see section 1.6 for details)
- 2) Go to the "Board Details" "SW Management" tab.
- 3) Click "Read Server Config". The current upgrade server locations will display.

KonaFT	X - 2 - 18 8	Step 2		1000 Mar. 1 100	Type at Type 10		Reality 1 Inc.		×
Preferences	· · · · · · · · · · · · · · · · · · ·	L	1						
General	Board Detets SX130	1 Configuration	Firewall HM Alarm	Wireless Modem Log					_
Perform	nance SW Managemen	t							
Short L	List 🔻 Read Versions				Read Upgradable Re	ad Installable	Upgrade All	grade Selected	
	Component				Version				
								S	tep 3
Upgra	ade Servers								
IP Address Port	Type Na s 10.7.7.107 161 101	me Stop (Connection Initialized	Path	L	ta Y	Read Se Add Write Se TEK	rver Config d Entry e Selected erver Config TELLIC	s
GUI S/W v0.1	11								

Figure 3-1: Board Details - SW Management Tab

4) Edit the server configuration fields to the location of the upgrade files. The following rules apply:

"Type": Must be src/gz

"Name": The folder name

"Path": The location of the upgrade files on the web server, or the files located locally on the gateway.

For files on a web server, the "Path" fields will start with http:// or https://.

For files locally on the Gateway the "Path" fields will start with file:///.

To add additional lines for the different upgrade folders (bsp, fe-fpga and gpio-fpga), click the "Add Entry" button.

							Step 4	
Upg	rade Servers							
	Туре	Name			Path		^ Rei	ad Server Config
1	src/gz	bsp	http://10.7.7.122/bs	p				Add Entry
2	src/gz	fe-fpga	http://10.7.7.122/fe-	fpga			E R	emove Selected
3	src/gz	gpio-fpga	http://10.7.7.122/gp	io-fpga				ite Server Config
			ſ					
Addre	ss 10.7.7.214	SNMP V2c 🔻		Polling Interval: 5 s 🜲		. 🖘 🔇		KTFI IC
rt	161	Stop I	interface Initialized	Poll Now Do Not Poll	Reboot	LORA	/ comm	nunication
st IP	Auto 🔻	Update Host IP				<u> </u>	9	
/W v0	.23 FE FPGA v 17	GPIO FPGA v 0x5	5010.32 BSP v 1.8.1					

Figure 3-2: Files on a web server example

by the sector			
Type	Name	Path	Read Server Config
1 sec/gz	bsp	file:////bi/firmware/bip	Add Entry
2 src/gz	fe-tpga	fael//bh/tamasaelte-tiga	E Remove Selected
I sec/gz	gpio-fpga	file://lib/firmware/gpio-fpga	- Write Server Conf
em (10, 7, 7, 12)	[944 v2; *		÷
fress [30, 7, 7, 121 [554]	914F V2: *	Initialized Poling Interval: 5 0 Reboot	
	A CONTRACTOR OF A CONTRACTOR O	Pol Now Do Not Pol	

Figure 3-3: File located locally example

5) Commit the changes to the server configuration by clicking "Write Server Config"

Туре	Name			Path		 Read Server Config 	
1 src/gz	bsp	file:///lib/firmware/	file:///lib/firmware/bsp 🗉 🛛 Add Entry S			Step	
2 src/gz	fe-fpga	file:///lib/firmware/	file://lib/firmware/fe-fpga				
3 src/gz	gpio-fpga file:///lib/firmware/gpio-fpga						
tress 10.7.7.206	SNMP V2c 🔻		Polling Interval: 5 s 🌩		. 🛜 🛇	🖉 ΤΕΚΤΕΙ	
161	Stop	Interface Initialized	Poll Now Do Not Poll	Reboot	LoRa	communicati	o n s
D Aude	V Undate Host ID				\leq		

Figure 3-4: Write Server Config

6) Verify the server location was committed by clicking "Read Server Config". The file location information will refresh.

	Туре	Name	Path	A Read Server Config			
1	src/gz	bsp	file:///lib/firmware/bsp 🗉 🛛 Add Entry				
2	src/gz	fe-fpga	file:///lib/firmware/fe-fpga				
3	src/gz	gpio-fpga	file:///lib/firmware/gpio-fpga				
dr	10.7.7.206	SNMP V2c v	Interface Initialized Polling Interval: 5 s				

Figure 3-5: Verify Server Location

٦

3.3 Perform the SW Upgrade

3.3.1 **Description**

Upgrading the module SW utilizes the tektelic-dist-upgrade utility that manages the order of which packages are installed. It is not recommend to upgrade packages individually when performing a full SW upgrade (BSP, FE-FPGA and GPIO-FPGA).

Note, third party packet forwarder upgrades are not included in Tektelic SW Releases. Upgrading of third party packet forwarders are handled via their corresponding network server.

3.3.2 Prerequisites

3.3.2.1 If Starting from BSP 1.5.3 or older:

 Backup the config.json file otherwise it will be overwritten by the packet forwarder (applies to Semech packet forwarder). Click on the "Configuration" tab, and press the Refresh files button. From the dropdown menu, select /etc/default/config.json.

Board Details Utilities	Configuration Prevail Wreless Modern MM Alarm Log	
ry Default Refresh files	Jeto;Sefault;confg.sson	Read Write Delete
	Application Application Application Application Application Application Application Application Applicati	
(11.7,7.12) [9449-12c	Palling Intervals 1s 0	

2) Press the "Read Button". Copy all the displayed text from the window and paste it to a new file on your PC using a text editor like Notepad.

teast i						
ferences Tools						
eneral Board Details Utilities Configuration Prevail Windess Moden 144 Alarm Log						
Factory Default Retreah files Jetschefault/config son				- Read	Write	Delete
5 1010 μmm, μmm? [Total (and 100 km); South	1ssi, offset, oseff (s') 20,	hst_offiet_coeff_β1 205,	buri			
>//						
¹⁰ J. Zimmer 2, Tops J. gam 5, Wells Lamer 13, Well SL, Landez, etc. 7, Jack J. Landez, Landez, Landez, J. Zim 6, Jack J. Landez,						
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1 του, ματαία Υπου, του, ματαία Υπου, του, ματαία Υπου, του, ματαία Υπου, ματαία Υπου, του, ματαία Υπου, ματαία Υπου, του, ματαία Υπου, ματαία						
"deg.methel" https:// forg.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/ "deg.com/staff.com/staff.com/staff.com/staff.com/staff.com/ "deg.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/st taff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/staff.com/st						
Address (s) 27,121 (See V2) ** rt (s) Dec See See See See See See See See See S				LoRa	TEK	FELIC
			GUES/W	0.30 FE FPGA v 104 0	PIO FPGA v 0x3003.20	BSP v 1.9.5 Agent

3) After the upgrade, paste the text back into the same window, and for the same filename press the "Write" button.

3.3.3 Trigger the upgrade

1) In the "Board Details" – "SW Management" Tab click "Read Upgradable". Select opkgarch-config and press the "Upgrade Selected" button.

nces Teols						
6 Board Details Utilities Configuration Previal Wreless Moder	HH Alarm Log					
Results Performance SW Management Badup and Restore Misc						
rtList • Read Versions			thep 5	Bop Status Read Libgradable Read Installable Upgrade All Upgrade Select		
Component		Current Version		New Version		
opig-arch-config	19-0		2.0-r2-tektelic2-kona-mega			
anago-gpl-notice	10-4		1.0-r3-tektelic0			
ca-certificates	20161130-41		20170717-40			
				Step 1		
grade Servers Type Name src/gt big file///db/fermaate/big		Path		Read Server Config Add Strive		
z src/gz fe-fpga file:///lib/fernware/fe-fpga				Renove Selected		
) src/gz gpio-fpga file//3b/firmware/gpio-fpga				Write Server Config		
Interview Interview Interview Pathog Interview To Interview Interv	o test Pad					
			10	SULS W v0.30 FE FPGA v 104 GPIO FPGA v 0v3003.208 BSP v 1.9.5		

- 2) In the "Board Details" "SW Management" Tab click "Read Upgradable". This will display all the available packages to upgrade. If a new BSP is available, KonaFT will prompt the user if they wish to trigger the full upgrade.
- 3) IMPORTANT: If upgrading from software release 1.9.5 (Macro or Mega GW) or 1.3.0 (Micro GW) an extra step is required. Click "No" in the "BSP upgrade selected" window. Find and select "tektelic-upgrade" from the list of components and press "Upgrade Selected". After the Upgrade is complete, click "Read Upgradeable" one more time. Proceed to the next step.



Figure 3-6: Start the Upgrade

ral Board Details Utilities Configuration Firewall Wireless Modem HH Alarm Log					
ST Results Performance SW Management Backup and Restore Misc.					
hart List * Read Versions	<mark></mark>	cial packages detected, bulk upgrade/install operations disabled [the Status] Read Upgradable Read Installable [Upgrade 47]	Upgrade Selecte		
Composent	Current Version	New Version			
5 strongswan-plugin-sqlite	553-0	553-tharagol			
6 kona6i-fefpge-binary	104-14	106-17			
7 shadow	41,4,3+(13-tektelic2	421-0-tektelc0			
python-re	273-03	27.13-4			
kmod	9-00	24+gir0+ef4257b59c+r0			
0 mync	103-40	113-0			
1 packagegroup-core-boot	1.0-dl-tektelo4	1.0-d17-tektelic0			
2 strongswan-plugin-u509	553-0	5.5.3-rQarego4			
13 strongswan-plugin-stroke	353-0	5.3.3-r0.arago4			
4 strongswan-plugin-pem	333-0	5.5.1-r0.arago4			
6 strongswan-plugin-rc2	553-0	533-r0.arago4			
6 net-snmp-mes	5.72-0-textends	5.7.3-40-tektels/2			
7 sphibles	1437-4	181-0			
s textelo-triewal-setup	1.0-12	11-0			
9 ntp-tickadj	4.26p5+6.0-tekteix11	42.6p5-6.0.4ektels23			
() librationep30	5.7.2-iO-tektelic8	\$73-r0-tektelik2			
1 korubi-pkt-formatider-ubis	1521-020	10.7-72			
D inche-oppinge	0.38-64	9.42.22			
3 peri	5143-4	5,24,2-40			
pgrade Servers			-		
Type Name	Path	- Bet	ud Server Config		
2 sector factors file///db/formare/factors			Add Lintry		
a no go no ngga na			the Second Could		
BLX (12) (peering) Palog browd Se E B1 580 hotsland more tell Image browd Second Second </td <td>1</td> <td>LoRa TEKT</td> <td>ELIC</td>	1	LoRa TEKT	ELIC		
P Auto * Laplate Heat P		communi 🤤	cation		

Figure 3-7 Install tektelic-upgrade

4) Start the upgrade by selecting "Yes" on the upgrade prompt displayed.

BSP upgrade selected					
	The selected package	e will upgrade the whole BSP			
-	Continue?	Step 4			
		Yes <u>N</u> o			



- 5) Full BSP upgrades will take up to 17 minutes to complete and will trigger up to three reboots. During the time the module is rebooting KonaFT will not be able to communicate with the Gateway. Each reboot takes approximately 2 minutes. During each reboot, the module LED will flash Green.
- 6) After approximately 17 minutes, reconnect to the Gateway using KonaFT.
- 7) In the "Board Details" "SW Management" Tab click "BSP Status". The bottom message bar of KonaFT will show "BSP upgrade succeeded"

4 Upgrading Individual Released Packages

4.1 Description

Between major BSP releases, if individual packages require updating, they may be updated using the KonaFT GUI or on the SSH command line. In this case, a release folder will be provided by Tektelic containing the upgraded packages and a Packages.gz file (this file is required to be in the upgrade folder to identify to the Gateway what files are available for upgrade).

4.2 Installation Steps Using KonaFT

The following steps can be used to upgrade a single package release using KonaFT

- 1) Place the received upgrade folder on the upgrade server or locally on the Gateway in folder /lib/firmware
- 2) Open KonaFT
- 3) Go to the Board Details -> SW Management Tab
- 4) Click Read Server Config
- 5) Update the path to the new upgrade folder on the upgrade server or the local file on the Gateway
- 6) Click Write Server Config
- 7) Selected the package to upgrade in the central window
- 8) Click Upgrade Selected

KonaFT Preferences	
General Board Details SX1301 Ctore 2 all HM Alarm	Wireless Modem Log
Performance SW Management	Step 8
Short List Read Versions	Read Upgradable Read Installable Upgrade All Upgrade Selected
Component	Step 7 New Version
1 Konao4-ns-switcher U.o-r2	
Upgrade Servers	Step 4
Type Name	Step 5 Read Server Config
1 src/gz tektelic-lab http://10.7.7.122/opk/kona64_	NS_for_nokia/
	Remove Selected Step 6
	Write Server Config
IP Address 10.7.7.141	
Port 161 Connection Initialized	
GUI S/W v0.11	

5 Upgrading Individual Released .ipk Package

5.1 **Description**

Between major BSP releases, if an individual .ipk packages requires updating, they may be updated on the SSH command line. In this case, an .ipk will be provided by Tektelic for the package that requires updating.

5.2 Installation Steps Using SSH Command Line

The following steps can be used to upgrade a single package release using SSH command line

- 1) Place the received .ipk in the folder /tmp using WinSCP (or equivalent)
- 2) Connect to the Gateway using an SSH terminal (such Teraterm or Putty) as root.
- 3) If prompted for a password, use the 9-character alphanumeric serial number¹ of the Gateway printed on the label affixed to the Gateway.
- 4) Type opkg install /tmp/<filename>.ipk
- 5) Type reboot

¹ Serial number format is YYWWM####, where YY is two decimal digits representing the year, WW is two decimal digits representing the week number, M is one alphanumeric character identifying the manufacturer and #### is four digit number.