From an email on the Garmin 480 List in January 2008. The procedures discussed apply to the Garmin 530W, 430W, GTN 750, and GTN 650 as well.

Elliot,

I have added my comments to yours.

IFR Approaches using the GNS-480, DAC GDC-31 GPSS and a KFC-200 autopilot.

To recap our conversation today, I understand that on GPS approaches LPV or LNAV   a procedure that works on this equipment set-up is as follows:

Vectors to Final Scenario:

1. Transitioning from the enroute portion of the flight, your GPSS is switched to GPS and it has a steady light. The KFC-200 is in the HDG mode and not in the NAV mode.
2. When the first vector is given, set the heading bug to the vector heading and then switch the GPSS control to HDG and continue to control the heading of the aircraft with the heading bug on the HSI, leaving the KFC-200 in HDG mode.

3. Somewhere during the preparation for the approach which could be downwind, base leg or on the intercept heading for the inbound course, you arm the approach function of the autopilot by pushing the APPR button on the KFC-200 controller. Set the course select OBS pointer on the HSI to the proper inbound heading.

GPSS is automatically terminated in APPR mode. My understanding is that the 480 handles the CDI much like a localizer, that it is not necessary to set the CDI on the HSI to the inbound course. Desireable, but not necessary. Correct me if I am wrong.

In most autopilot implementations, GPSS is unknown to the autopilot. GPSS add on adapters have been designed as a modification of the heading system. The modification intercepts the heading bug command information coming from the HSI that goes to the autopilot. The adapter also is interfaced to the GPS and obtains steering information from it. Finally, the adapter has a switch that allows either the HSI heading information or the GPS derived heading information to be connected to the autopilot heading input. Therefore, the only time that GPSS information is steering the autopilot is when the autopilot is in heading mode. When the autopilot is in heading mode, and GPS steering is providing guidance, the setting of the OBS is not required by the autopilot, but as you point out it is useful to align the setting of the OBS with the desired course.

When you switch the autopilot to APPR mode, the setting of the OBS becomes relevant to the autopilot. The autopilot uses the OBS setting to perform the alignment of the aircraft with the final approach course. If you have not set the OBS properly, the autopilot may not be able to track the final approach course. This is due to the fact that as the CDI centers, the autopilot will command a turn to align the heading with the OBS setting. If the OBS is not set to the correct course, the autopilot will interpret any movement of the CDI as wind drift. If you are only 20 degrees off in your OBS setting, the autopilot will most likely adjust, much more than that and the autopilot will not likely be able to handle the error.

In the KFC200 autopilot, when you arm APPR mode, if heading mode was on, heading will remain on to provide the guidance for the autopilot until the CDI comes alive and reaches approximately half scale deflection. At this point, the heading mode is extinguished, and the autopilot commands the turn to the course on the OBS. When heading mode is extinguished, heading commands from either the heading bug or the GPS steering are no longer used by the autopilot.

So, to answer your question, your understanding is correct with respect to the 480, but the autopilot requires the OBS be properly set.

One more point, GPS Steering and vertical guidance are mutually exclusive on our generation of autopilots, so if you want your autopilot to track the GS, you must not be in heading mode on the autopilot, rather you must be in APPR mode.

4. On the intercept heading to the final approach course, you
can switch the GPSS back to GPS from HDG once the deviation bar on
the HSI centers. This is in preparation for a possible missed
approach where you will want to use GPSS for steering.

Don't have the manual for the DAC31 yet. Seems confusing to me. If GPSS is automatically terminated during the APPR mode does the GPSS selector for the DAC31 autoswitch to CDI so you need to set it back to HDG after the MAP or does it just stay inactive in HDG mode waiting for you to change the autopilot from APPR to HDG. In other words, does one just switch KFC 150/200 from APPR to HDG at the MAP or does one need to set both the autopilot to HDG and the DAC31 to GPS?.

The reason Jim recommends setting the GPSS to GPS is in preparation for a possible missed approach. As you have reasoned, this has no effect on the operation of the autopilot while in APPR mode. When initiating the missed approach, you press HDG on the autopilot to put it back into heading mode so that it can provide guidance during the missed approach. To obtain GPS Steering, the GPSS must be in GPS mode. You could wait until you have started the missed approach and command the autopilot into heading mode and switch the GPSS to GPS at that time and get the same general effect. Be aware that if you command heading mode on the autopilot and the GPSS is still in heading mode, the autopilot will follow the heading bug setting on the HSI, which was last used to intercept the final approach course. IMHO, it is wise to set the heading bug to align with the final approach course while on the approach once the heading mode has extinguished. Otherwise you may get an unintentional turn if you engage the autopilot.

5. When the autopilot senses that the inbound course heading is
alive, it couples up and flies that course (as it would a LOC) to the
airport. When it sees the glideslope pointers center, it captures
that and provides vertical guidance to the pitch servos to follow the
glideslope down to the DA.

Full Procedure Scenario:

1. The KFC-200 remains in the HDG mode from the enroute phase of
the flight. The GPSS switch is in GPS.
2. The GNS-480 steers to the IAF, then either initiates a turn
around a holding pattern , turns to the middle of the "T" or
otherwise follows the published approach procedure.
3. Once you are established inbound from the holding course
reversal , nearing the middle of the "T" or other feeder route
structures, you arm the KFC-200 with the APPR button making sure that
the course select pointer on the HSI is set to the proper inbound
heading.

Clarification: If you select APPR before inbound from holding or procedure turn reversal you lose GPSS steering for the
hold entry, course reversal. Yes. What happens if you select APPR when given "Direct" to the IAF of a T shaped
procedure. Will the autopilot not follow the entire T? It will try, but you have to change the HSI OBS setting to align with
each course segment you are on and the autopilot will do a terrible job of handling the 90 degree turn, and there will not
be guidance on any hold or procedure turn. Why do you need to wait until the intermediate segment to activate that? If
you activate APPR prior to being aligned with the course, as you stated, you loose the GPS Steering. But GPS Steering is
mutually exclusive with vertical guidance. When executing the full approach, you will not have a GS until you are on the
leg formed by the IF that connects to the FAF. Up until this point, the GPS Steering can be used to follow the
procedure. After this point, if you want to follow the GS, you must be in APPR mode with sufficient time to capture the
GS.

  4. The KFC-200 will show the glideslope pointers as you cross
over the IF (IAF) that defines the leg ending at the FAF. As soon as
they get to the level position, the GS capture light will
illuminate. If it doesn't and you are still fairly close to being on
the glideslope, you can usually force a capture by cycling the ALT
button on the KFC-200 mode controller.
5. Course guidance and correct pitch control will follow the ILS-
like course down to DA (or MDA) with no further button-pushing. The
DA is a decision altitude and momentum may cause the aircraft to
continue to descend below the DA for a brief time. Totally not true
with an MDA. You will have to level off at or above the MDA without
descending below the MDA until you have the runway in sight and are
in a normal position to descend. In other words, don't treat the MDA
as a DA.

There is a variation of the second scenario where you are given a
direct to clearance to an IF that is not an IAF. In this case, the
intercept angle at the IF cannot exceed 90 degrees and you must be
given the clearance at least 5 NM prior to arriving at the IF,
otherwise you would be wise to not accept the clearance and let the

controller know they will have to vector you and give you more time to setup. To accomplish the direct to, you would normally scan thru the approach waypoint list in flight plan mode and initiate a direct to the IF called out by ATC. If you chose "vectors" when you put in the approach, you will have to go back to the procedures page, select the approach and change the IAF box to a specific fix outside of the desired IF and execute that. You will then get the IF waypoint you are looking for in the flight plan expanded list that you can use to go direct to and not lose the remaining sequencing.

For an ILS, everything is similar except that you must have tuned in and identified the ILS frequency and selected the localizer as the navigation source for you're HSI.

Finally: going through the 530W/430W course on the web by the Eastern FSDO they make a strong case for always loading the entire approach, not VTF. Major difference is that they load the approach after the Destination Airport in the flight plan, not before the Destination in the modified flight plan for the 480. But the logic seems the same. It is fewer button pushes to switch to VTF if the entire approach is loaded than to reload the approach if it is changed. Is that reasonable to do with the 480 as well or is it better suited to the 430W/530W?

Jim and I stepped thru this on the 480 simulator (actually Jim guided me through the operatin of the simulator) and the recommendation of theEastern FSDO seems to apply for the 480 as well. Note that there is an advantage in switching to VTF if you are aligned with the final approach course, but have not yet crossed the IF leading to the FAF (usually a step down). When using VTF, the GS comes on anytime you are within 30 NM of the FAF, so you can intercept the GS further out. The GS should respect the step down altitude and you can verify that it does by observing the distance between the step down and the FAF and cross checking your actual altitude.

Regards,

John Collins