Synthesize cDNA the SMARTer™ Way

Get better results with SMARTer PCR cDNA Synthesis Kits

- **Generate high-quality cDNA from as little as 1–2 ng of total RNA**
- **Preserve precious samples and maintain accurate gene representation**
- **Higher specificity, lower background, and increased yield**
- **Enrich for full-length cDNA**
- **No adaptor ligation necessary**
- **Amplify longer genes and rare transcripts**

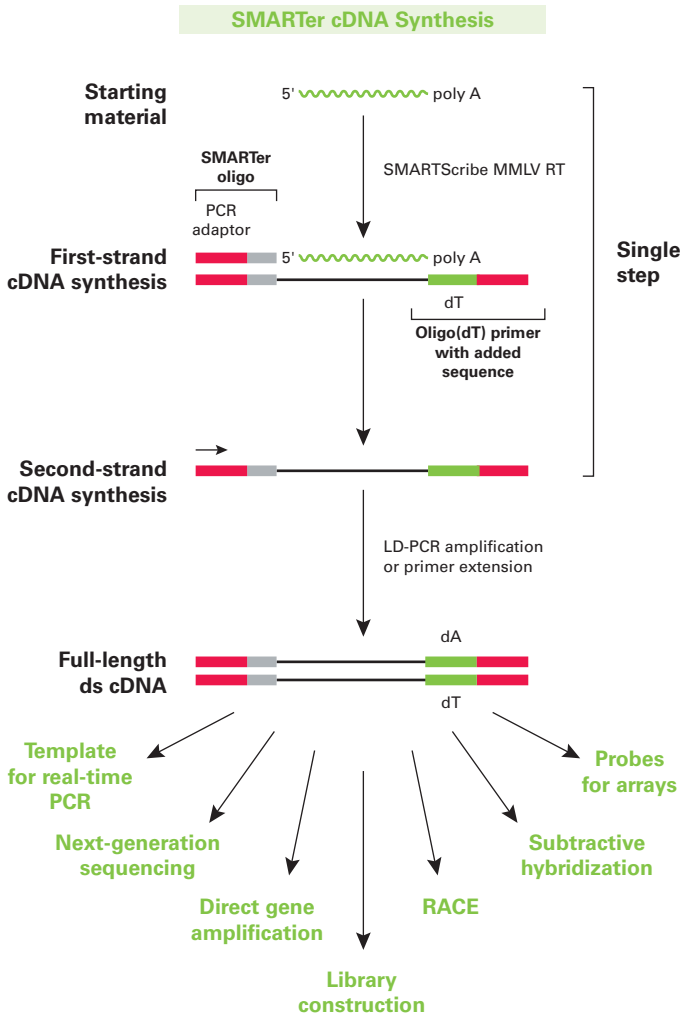
SMART™ Technology Just Got SMARTer

Clontech revolutionized cDNA synthesis with the invention of SMART (**S**witching **M**echanism **A**t the 5' end of **R**NA **T**ranscript) technology. This unique technology utilizes the intrinsic terminal transferase and template-switching activity of Moloney Murine Leukemia Virus Reverse Transcriptase (MMLV RT) to accurately synthesize full-length cDNA in a single reverse transcription reaction (1), while incorporating adaptors on both ends of the cDNA. Incorporation of these universal primer binding sites in a single-step during first-strand cDNA synthesis eliminates the need for tedious second-strand synthesis and adaptor ligation, and facilitates a number of downstream applications, including RACE (**R**apid **A**mplification of **c**DNA **E**nds), subtractive hybridization, and library construction. This simple and highly efficient cDNA synthesis method ensures higher specificity in amplifying your target cDNA, compared to conventional methods.

Clontech has recently developed a new batch of kits featuring SMART technology with improved components—the SMARTer Kits for all your cDNA synthesis applications. These new SMARTer Kits include a modified **SMARTer II A Oligonucleotide** and **SMARTScribe™ Reverse Transcriptase.** The template-switching ability of SMARTScribe Reverse Transcriptase is enhanced when combined with the new SMARTer oligonucleotide; together these new components increase the likelihood of cloning your entire gene sequence, and result in high-quality, full-length cDNA, regardless of template size or abundance (2).

Get High-Quality cDNA from Less RNA

SMARTer cDNA Synthesis Kits are especially useful for researchers who have limited starting material, such as RNA derived from laser-capture microscopy samples, cells sorted by flow cytometry, or other extremely small samples. The **SMARTer PCR cDNA Synthesis Kit** allows first-strand cDNA synthesis from only 2 ng of total RNA (Figure 1, Panel A), much less starting material than is required



SMARTer cDNA synthesis occurs in a single-step reverse transcription reaction. Following amplification, SMARTer cDNA can be used for a variety of downstream applications.

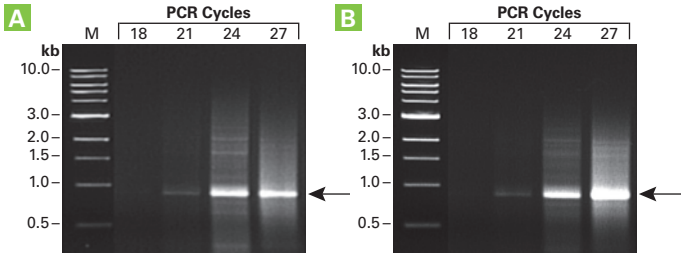


Figure 1. Typical gel profile of ds cDNA synthesized with the SMARTer PCR cDNA Synthesis Kit (Panel A) and the SMARTer Pico PCR cDNA Synthesis Kit (Panel B), using the Control Human Placental Total RNA as a template. 2 ng (**Panel A**) or 1 ng (**Panel B**) of the Control Human Placental Total RNA was subjected to first-strand cDNA synthesis and purification, followed by PCR amplification as described in the user manual for each kit. 5 µl of each PCR product was electrophoresed on a 1.2% agarose/EtBr gel in 1X TAE buffer following the indicated number of PCR cycles. Lanes M: 1 kb DNA ladder size markers. The arrows indicate the strong band at 900 bp typically seen for human placental total RNA.

for the original SMART PCR cDNA Synthesis Kit (Cat. No. 634902). Since extremely dilute RNA cannot be used in regular cDNA synthesis, we designed the new **SMARTer Pico PCR cDNA Synthesis Kit** to synthesize high-quality cDNA from even less starting material—as little as 1 ng of total RNA at a concentration as low as 20 pg/µl (Figure 1, Panel B). The SMARTer Pico Kit is the new and improved version of our original Super SMART PCR cDNA Synthesis Kit (Cat. No. 635000). The SMARTer Pico cDNA synthesis protocol makes it possible to use the entire volume of purified single-stranded cDNA for amplification, via increased reaction volumes and an additional column purification step. Both the SMARTer and SMARTer Pico protocols produce ds cDNA yields ranging from 1–2 µg.

Amplify Longer Transcripts

Clontech's new **SMARTer RACE cDNA Amplification Kit,** an improved version of our original SMART RACE cDNA Amplification Kit (Cat. No. 634914), allows you to identify the complete sequence of your RNA transcript from a small region of known sequence within the transcript all the way to the 5'- or 3'-end of the RNA, starting with as little as 2 ng of total RNA.

Following reverse transcription, SMARTer cDNA can be used directly in 5'- and 3'-RACE PCR reactions, without an additional adaptor ligation step. A side-by-side test of the new SMARTer oligo and the SMART oligo included in the original kit revealed an increased overall yield of 5'-RACE PCR products with the SMARTer oligo (Figure 2). The SMARTer RACE Kit facilitates RACE PCR via the included **Universal Primer Mix,** which is also sold separately. Additionally, the kit includes **random primers** for researchers whose RNA lacks a poly(A) tail.

References

1. Chenchik, A. *et al.* (1998) In *Gene Cloning and Analysis by RT-PCR.* Eds Siebert, P. & Larrick, J. (*BioTechniques* Books, MA) Ch 22.
2. Be SMART™ About First-Strand cDNA Synthesis (January 2009) *Clontechniques* **XXIV**(1):15–17.

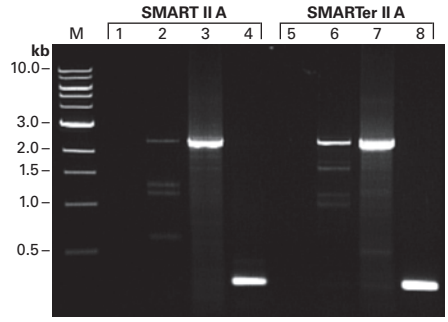


Figure 2. The SMARTer II A Oligo increases the overall yield of the 5'-RACE PCR products. Note the difference in intensity between the 2.6 kb 5'-RACE product in Lane 2 (produced by the SMART II A oligo) and that in Lane 6 (produced by the SMARTer II A oligo); both bands resulted from the amplification of only 2 ng of human placental total RNA template. In the assay shown, first-strand cDNA synthesis and 5'-RACE PCR amplification were performed as described in the user manual (PT4096-1). Lanes 1 & 5: No RNA 5'-RACE control. Lanes 2 & 6: Transferrin Receptor (TFR) 5'-RACE starting from 2 ng total RNA. Lanes 3 & 7: TFR 5'-RACE starting from 50 ng total RNA. Lanes 4 & 8: 5'-cDNA internal control using 2 ng total RNA as template. Lane M: 1 kb DNA Ladder.

Ordering Information

Product	Size	Cat. No.
SMARTer™ PCR cDNA Synthesis Kit	10 rxns 20 rxns	634925 634926
SMARTer™ Pico PCR cDNA Synthesis Kit	10 rxns	634928
Universal Primer Mix	100 rxns	634922